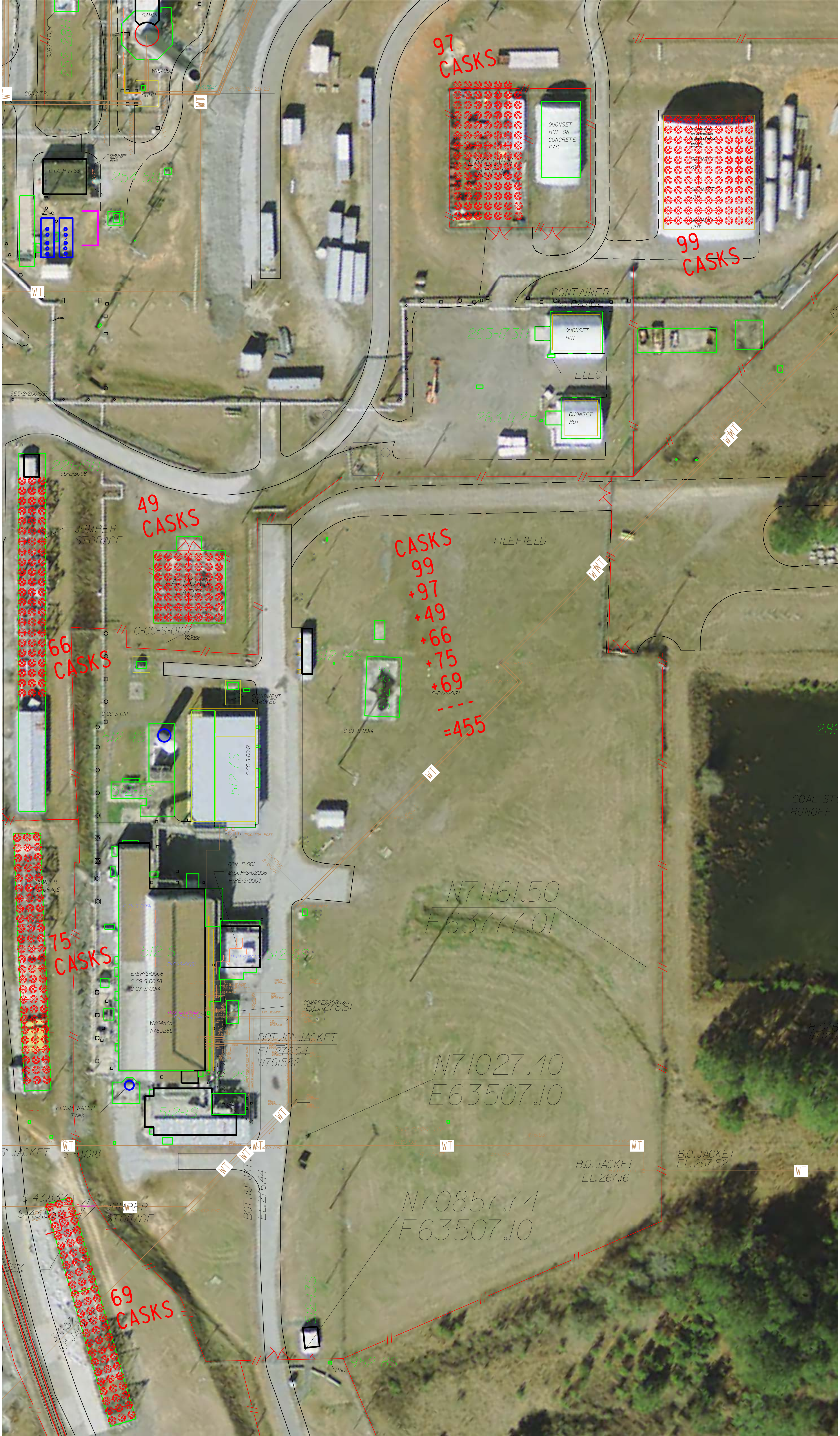
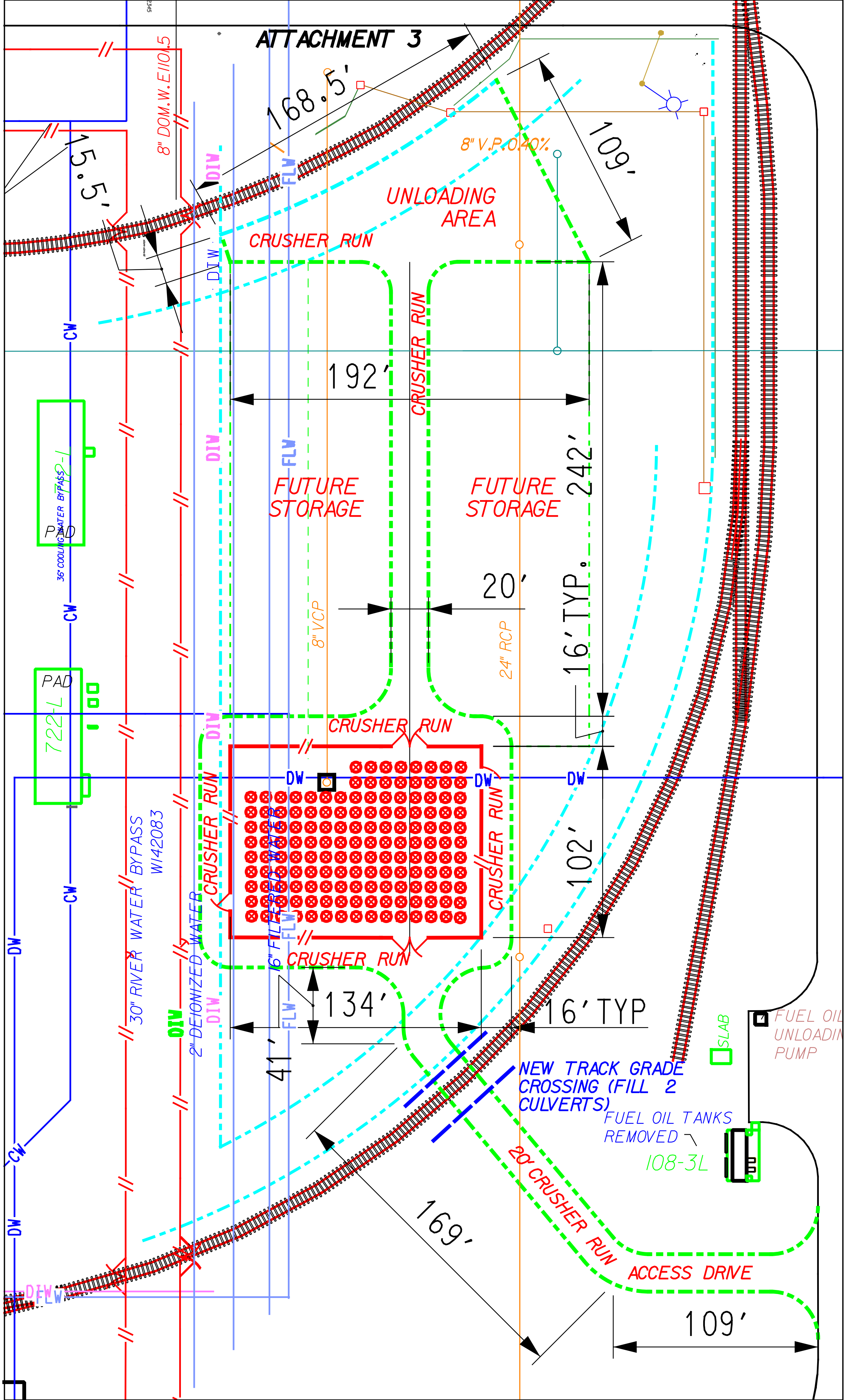
ALL SENSITIVE INFORMATION HAS BEEN REMOVED FROM THIS DOCUMENT



97 CASKS
QUONSET HUT ON CONCRETE PAD
99 CASKS
CONTAINER
QUONSET HUT
ELEC
QUONSET HUT
49 CASKS
JUMPER STORAGE
66 CASKS
C-CC-S-0107
TILEFIELD
CASKS
99
+97
+49
+66
+75
+69

=455
75 CASKS
JUMPER STORAGE
N71161.50
E63777.01
COMPRESSOR & CHILLER
BOT.10" JACKET
EL.276.04
N71027.40
E63507.10
FLUSH WATER TANK
B.O.JACKET
EL.267.16
B.O.JACKET
EL.267.52
N70857.74
E63507.10
69 CASKS
JUMPER STORAGE
WT


ATTACHMENT 3
168.5'
109'
15.5'
8" DOM.W.E110.5
8" V.P. 0.40%
UNLOADING AREA
CRUSHER RUN
192'
242'
FUTURE STORAGE
FUTURE STORAGE
20'
16' TYP.
8" VCP
24" RCP
PAD
PAD
722-L
CW
DW
DIW
FLW
30" RIVER WATER BYPASS W142083
2" DEIONIZED WATER
16" FILTERED WATER
102'
134'
41'
16' TYP
NEW TRACK GRADE CROSSING (FILL 2 CULVERTS)
FUEL OIL TANKS REMOVED
108-3L
SLAB
FUEL OIL UNLOADING PUMP
20' CRUSHER RUN
ACCESS DRIVE
169'
109'

Data Call for German Fuel EIS

This data call is organized as five matrices addressing different groups of activities at SRS required to receive, store, and disposition the German fuel. The five matrices are:

I. **Receipt, Storage, and Transfer of CASTOR Casks –** Characterize the receipt of CASTOR casks at SRS, the storage of the casks at L-Area or H-Area, and the transfer of the casks to H-Canyon or within L-Area for processing. Include information as needed on any improvements to the SRS rail spur and roads, and construction of a storage pad or other storage facility at L-Area or H-Area.

II. **Carbon Digestion at H-Canyon or L-Area –** Characterize the receipt at H-Canyon or L-Area of CASTOR casks, the removal of cans (containing the graphite spheres) from the casks, the removal of the graphite spheres from the cans, and the separation of the carbon matrix from the fuel. The intent is to address activities at H-Canyon until the separated fuel is ready to be dissolved for solvent extraction or activities at L-Area until separated fuel is ready to be blended with depleted uranium.

III. **Processing of Uranium at H-Canyon or L-Area** - Characterize the dissolution of the HEU kernels at H-Canyon in terms of the processing and disposition options for the HEU or the melt/dilute processing and storage of the HEU kernels in L-Area.

IV. **Storage of Downblended Uranium –** Characterize the storage of downblended uranium oxide at SRS pending shipment of the uranium to an offsite vendor.

V. **Process and Vitrify Liquid Waste at S-Area, Z-Area, and H-Area –** Characterize the principal required activities after processing the HEU in H-Canyon according to the two process options or after processing after the melt/dilute process in L-Area. This would involve the cementation process in H-Area for Option 2&2T, pretreatment and processing liquid waste through DWPF, HLW canister storage in S-Area, and storage or disposal of LLW at SRS (including Saltstone) or offsite.

In addition, the data call requests information needed to analyze transportation and socioeconomic impacts.

Draft Dated 8/26/2014 – Initial transmittal

Draft Dated 8/27/2014 – Transmittal

Draft Dated 8/29/2014
- The changes made to the matrices and descriptions above were carried forward to the following pages. The corresponding changes in the headers on the following pages are not highlighted.
- Since carbon digestion may be performed in either H-Canyon or L-Area, a second column was added to the table in Matrix II. The first column will address carrying out digestion in H-Canyon and the second for digestion in L-Area.
- Since the downblend of HEU for reuse as LEU (referred to as Option 1 in previous versions of the Data Call) is not considered a valid option, the columns in Matrix III have been realigned to correspond to options (as identified in contractor documents) being evaluated. The first column addresses Option 1 – dissolution of the kernels in H-Canyon and direct discard to H Tank Farm. (This is the same as Option 2 in previous versions of the Data Call.) The second column addresses Options 2/2T – dissolution of the kernels in H-Canyon, separation of the uranium (2) and thorium (2T) from fission products and actinides by solvent extraction, and discard of the U/Th as LLW in grout drums. (This is the same as Option 3 in previous versions of the Data Call.) The third column addresses Option 6 – melt and dilute the kernels with storage of the ingots in L-Area. The Matrix III column information in the previous versions of the Data Call was moved to the corresponding column in this revision.

Draft Dated 9/5/2014 - Transmittal

Draft Dated 9/12/2014
- The final draft of the document SRNL-TR-2014-00209, "Process Description for Processing of HTGR Pebble Fuel at SRS", is included in this submittal. Due to the nature of multiple inputs into the various sections of the Data Call, there may be inconsistencies between the text of the Data Call and SRNL document. Where inconsistencies exist, the SRNL document should be considered the authoritative source.

Draft Dated 9/18/2014
- The two plot plans for the potential location of the CASTOR casks are included in this submittal of the Data Call.
- There are still a few areas of information still To be provided. Those are clearly identified in the Data Call.

Draft Dated 9/25/2014
- An updated draft of SRNL-TR-2104-00209, "Process Description for Processing of HTGR Pebble Fuel at SRS", is included in this submittal. The document show track changes for changes from the draft submitted on 9/12. Of particular note is updated Table ES-1.
- Also included is a draft of SRNL-RP-2014-00221, "Waste/Material Disposition Strategy'. Unless specifically noted, the SRNL documents should be considered the authoritative source.

Draft Dated 10/09/2014
- Updates from the follow-up questions from September 30 have been incorporated.

Draft Dated 10/22/2014
- Additional updates from the follow-up questions from September 30 have been incorporated.

I. Receipt, Storage, and Transfer of CASTOR Casks *Characterize the receipt of CASTOR casks at SRS, the storage of the casks at L-Area or H-Area, and the transfer of the casks to H-Canyon or within L-Area for processing. Include information as needed on any improvements to the SRS rail spur and roads, and construction of a storage pad or other storage facility at L-Area or H-Area.*	
Information Requested	**Receive up to 900 kilograms of HEU in CASTOR casks; Temporarily store the casks at L-Area; and Transfer to H-Canyon or within L-Area for processing (please provide numerical data in commonly reported units)**
General	
Describe any construction or modifications needed at **L-Area and elsewhere on SRS** to receive, store, and transfer CASTOR casks, including (as needed) construction or modification to the rail spur and roads, and construction or modification of an existing pad or other storage facility for storage of the CASTOR casks. The description of modifications could entail, as appropriate: - A plot plan - Features that prevent unauthorized entry (unclassified description) - Features that ensure safeguards against malevolent acts or material diversion by internal and external entities (unclassified description) - Fire protection systems - Features that control releases of airborne contaminants - Features that control releases of waterborne contaminants (include diagram of treatment train) - Features/procedures that prevent criticality Also provide a schedule for the proposed activities: - Design - Construction or modification of L-Area or elsewhere (indicate where)	Use of existing rail systems to receive and store CASTOR casks in L-Area or H-Area is planned. No modifications to the SRS site rail system are anticipated to support CASTOR cask receipts and storage. Some improvements such as re-topping of existing roads along the 211-H rail siding is anticipated if casks are stored in H-Area. Installation of crushed stone roads adjacent to cask laydown pads in L-Area will be required. It is anticipated that the length of road (crushed stone) in L-Area will be less than 1200 feet. Current plans are to utilize existing roads in H-Area. In H-Area, existing concrete jumper storage pads will be repurposed by relocating existing stored equipment to other storage locations available inside H-Area and F-Area. Storage pad locations for CASTOR casks for H-Area are shown on a plot plan. The existing pads to be used are elevated precluding water migration issues. No diking of pads is anticipated, no liquid releases are expected from dry graphite balls in multiple layers of steel containment. Additional pads (7,000 SF) will have to be installed to meet security requirement of 2 ft spacing of casks for inspection since all of casks cannot be stored on existing concrete pads. Two additional locations have been identified. Crusher stone will be used as the foundation for the storage locations and area surrounding the storage pads. In L-Area, crushed stone pads (40,000 SF) will be installed to stage and store CASTOR casks, see plot plan for layout of L-Area storage location. Both H-Area and L-Area are considering installation of commercially designed and fabricated weather (steel super structure and fabric covers) enclosures over the proposed storage pads. No additional features to prevent airborne releases are anticipated. Features to prevent unauthorized entry into storage areas, such as fencing with lockable access gates and detection may be required for L-Area and H-Area storage pads as a worst case. Installation of Jersey bouncers or concrete dividers may be required around the pads to prevent inadvertent vehicle impacts. No fire protection features are anticipated for L-Area or H-Area storage pads locations. No specific features are expected to be necessary to prevent criticality as close packing and staging in casks is not expected to be a criticality concern. SRS will perform criticality safety review to confirm. Will lease or buy crane and transportation equipment as necessary if not available. Design and construction of crushed stone roads and storage pads in L-Area are expected to begin if DOE/German contract is approved by Jan. 30, 2015 and construction completed by Apr 30, 2015 for initial receipt of AVR pebbles.
Construction/modification	
Land disturbed (acres or hectares)	Land disturbances in H-Area will be about 17,000 SF for the additional storage and area surrounding the storage pads. L-Area land disturbances are estimated to about 75,000 SF. The land disturbance will be for installation of crushed stone roads and pads for the storage of casks. See the plot plans provided with the September 18th submittal of the Data Call.
Description of construction/modification needs and activities (e.g., decontamination/removal/ disposal of existing equipment, land clearing, new roads)	H-Area preparations would include relocation of stored spare equipment and jumpers from concrete pads to alternate existing storage areas and removal of less than six free standing and anchored jumper racks and potential resurfacing existing pads. Installation of an additional 25,000 SF of gravel or concrete pads. Installation of commercially designed and fabricated weather enclosures (steel super structure and fabric covers) over the proposed storage pads erected after casks are staged. L-Area modifications would include installation of 75,000 SF of crushed stone for roads and storage pads. Installation of commercially designed and fabricated weather enclosures (steel super structure and fabric covers) over the proposed storage pads erected after casks are staged. Installation of crushed stone roads circling the pad and connected to existing road.
Type and quantity of air pollutant emitting equipment and frequency and duration of use.	Diesel and gas powered heavy equipment to install crushed stone needed on day shift only for no more than 4 months
Type and quantity of noise producing equipment and frequency and duration of use.	Diesel and gas powered heavy equipment to install crushed stone needed on day shift only for no more than 4 months
Emission release parameters: – For fugitive releases - release location and dimensions of source area	No changes are expected in air emissions release parameters due to construction or modification activities.
Air emissions (fugitive): - Criteria Pollutants (metric tons/yr) - HAPs (kilograms/yr) - Radioisotopes (curies/yr)	No changes are expected in air emissions over normal maintenance activities and within limits of permits for existing SRS portable heavy equipment operation due to construction activities.
Liquid effluents, if any - Location(s) of discharge(s) and copies of permit(s) - Rate(s) of discharge(s) (units/day) - Concentrations of contaminants (picocuries/liter or micrograms/liter)	No liquid effluents anticipated in the construction of the storage pads and road services.
Employment for each year (FTEs)	Construction of storage pads to be less than 12 FTE per day for 4 months
Shifts	Construction activities on day shift only
Is any construction in a radiation area? If so:	No construction of storage pads in radiation zones.
Total worker dose (person-rem) or dose rate	N/A
Duration of work in rad area (months)	N/A
Number of exposed workers	N/A
Utilities needed: - Water (units/yr) - Electricity (units) - Gasoline (units/yr) - Diesel Fuel (units/yr)	Water- no water utility needed. Electricity- portable generators to be used for construction. Gasoline- <6,000 gal. Diesel fuel- <6,000 gal

I. Receipt, Storage, and Transfer of CASTOR Casks *Characterize the receipt of CASTOR casks at SRS, the storage of the casks at L-Area or H-Area, and the transfer of the casks to H-Canyon or within L-Area for processing. Include information as needed on any improvements to the SRS rail spur and roads, and construction of a storage pad or other storage facility at L-Area or H-Area.*		
Information Requested	**Receive up to 900 kilograms of HEU in CASTOR casks; Temporarily store the casks at L-Area; and Transfer to H-Canyon or within L-Area for processing (please provide numerical data in commonly reported units)**	
Resources needed (e.g.): - Concrete (units) - Asphalt (units) - Steel (units) - Crushed stone (units) - Sand & Gravel (units) - Soil (units) - Lumber (units) - Chemicals (units) - Gases (units) - Other construction materials (units)	**H-Area** Concrete – none expected Asphalt - none expected Re-enforcing steel - none expected Crushed stone - <20,000 CF Sand &Gravel - none expected Soil - none or minimal if any Lumber - minimal, if any Chemicals - none expected Gases - none expected Other - none identified at this time	**L-Area** Concrete – none expected Asphalt - none expected Re-enforcing steel - none expected Crushed stone - <100,000 CF Sand &Gravel - none expected Soil - none or minimal if any Lumber - minimal, if any Chemicals - none expected Gases - none expected Other - none identified at this time
Waste generated (provide solid and liquid separately) (units/yr): - TRU - LLW - MLLW - Hazardous - Non-Hazardous	No TRU, mixed TRU, LLW, MLLW, or hazardous waste are expected to be generated in receipt, storage or transfer of CASTOR casks. Small quantities of non-hazardous waste will likely be generated to construct storage pads in L-Area.	
Disposition plans for wastes: - Packaging (e.g., drums, boxes) - Onsite or offsite disposal (where?) - Need for temporary storage (where?)	Non-hazardous waste will be disposed of on site at Three Rivers Landfill.	
Operations		
Land area occupied by the completed storage facility (acres or hectares)	Completed storage facilities to be less than 2 acres for all casks, whether stored solely in H-Area or L-Area.	
Schedule for operations and deactivation, and decommissioning of the storage area.	Operations on days shifts only	
Description of the process for receiving and storing the CASTOR casks, and transferring the casks to H-Canyon or within L-Area (e.g., surveys, manifest verification, transfer vehicles, traffic control). Include throughput (units/yr)	It is expected that that CASTOR casks will come to SRS on railcars with two CASTOR casks in shipping frames/ISO-containers on each railcar. Shipments of up to16 casks/8 railcars per shipment are expected. Eight shipments (128 casks) per year are anticipated. CASTOR cask receipts from Germany in H-Area or L-Area will entail taking hand off from commercial rail carrier to SRS rail road group who will deliver to respective area rail siding. Receipt within H or L-Areas will include radiological surveys and manifest verification. Removal of CASTOR casks from shipping frames will be performed with a mobile 195 ton rough terrain crane or equivalent. Casks will be manually rigged with specifically designed yoke or slings if required and swung around to storage position on storage pad adjacent to rail spur or loaded onto low-boy trailers designed to carry and transport the CASTOR casks. The casks will be and transported to storage pad location as necessary. Shipping frames/ISO-containers will remain on railcars and be returned to port for shipment back to Germany for reloading. After the receipt of all casks, a number (4) of shipping frames will be retained for rail transport of casks to H-Area for disposition of the fuel. Since the shipping frames are clean, several options can be considered for disposition. These include sale for use elsewhere or discard as non-hazardous waste onsite in Three Rivers Regional Landfill.	
Emission release parameters - For fugitive releases - release location and dimensions - Emissions from emergency generators, boilers, and other ancillary equipment	No changes are expected in air emissions release parameters due to receipt, unloading, and storage activities.	
Air emissions - Criteria pollutants (metric tons/yr) - HAPs (kilograms/yr) - Radioisotopes (curies/yr)	No changes are expected in air emissions over normal maintenance activities and within limits of permits for existing SRS portable heavy equipment operation due to operations activities.	
Liquid effluents, if any - Location(s) of outfall(s) - Rate(s) of discharge(s) (units/day) - Concentrations of contaminants (picocuries/liter or micrograms/liter)	No liquid effluents anticipated, as material contents are dry and casks will be sealed for transport.	
Employment (FTEs) – will the activity require any new staff or preserve existing jobs? Is so, how many?	Operational activities estimated to be less than 10 FTE per day during receipt and unloading (~50 days/yr). Storage surveillance activities estimated to be < 3 FTE/yr if storing in both H-Area and L-Area	
Shifts	Receipt and storage activities will be performed on day shift only.	
Employee radiological exposure for receipt and placing into storage:		
What is the nominal dose rate (mrem/hr) and exposure duration or total worker dose (person-rem per cask or per shipment (16 casks))	The nominal dose rate at contact on the CASTOR casks are less the 1 mrem/hr. Therefore, the maximum exposure is estimated at less than 16 mrem (4 workers x 1 mrem x 4 hrs) per cask unloaded. Would have to hug cask for 4 hrs , so this should be bounding. Expect ~10 workers, but only riggers will likely get any dose. Drivers, crane operator, supervisors, etc. not expected to receive dose as they will be at a distance.	
Number of exposed workers	Number of exposed workers to be less than 10 workers per cask (crews of <10) to unload to storage. Estimate total number exposed to be less than 40 workers total as rigging, transportation, and operations crews assigned to this work are not expected to be large.	
Employee radiological exposure for storage:		
What is the frequency and duration that staff would be exposed for inspections/maintenance?	In storage inspections are estimated to be up to once per day. Duration will increase as inventory of casks increase, but would not expect to exceed 8 hrs per day for one worker with full inventory.	
What dose (person-rem) or dose rate (mrem/hr) associated with inspection/maintenance?	Dose rate of less than 1 mrem/hr at contact of cask, but would expect rate to be more like rate @ 30cm for daily inspection. Would expect rate to be less than 4 mrem/day for inspections. Don't know about any proposed maintenance activities yet.	
Utilities needed (as applicable): - Water (units/yr) - Electricity (kw/hr) - Natural gas (units/yr) - Diesel Fuel (units/yr) - Heating fuel oil (units/yr)	Diesel fuel estimated to be used 10,000 gals/yr for cranes and transportation equipment Electricity –Permanent electricity for new security lighting will show no discernible increase Water – none expected Natural gas – none expected Heating Fuel – none expected	
Resources needed, as needed - Metals (units/yr) - Chemicals (units/yr) - Gases (units/yr) - other materials (units/yr)	No resources expected to be needed for operations other than diesel fuel and gasoline for heavy equipment (cranes, trucks, forklifts, locomotive, portable generators.	

I. **Receipt, Storage, and Transfer of CASTOR Casks** ***Characterize the receipt of CASTOR casks at SRS, the storage of the casks at L-Area or H-Area, and the transfer of the casks to H-Canyon or within L-Area for processing. Include information as needed on any improvements to the SRS rail spur and roads, and construction of a storage pad or other storage facility at L-Area or H-Area.***	
Information Requested	**Receive up to 900 kilograms of HEU in CASTOR casks; Temporarily store the casks at L-Area; and Transfer to H-Canyon or within L-Area for processing (please provide numerical data in commonly reported units)**
Waste generated (solid or liquid) (units/yr): - TRU - Mixed TRU - LLW - MLLW - Hazardous - Non-Hazardous	No TRU, mixed TRU, LLW, MLLW, or hazardous waste are expected to be generated in receipt, storage or transfer of CASTOR casks. Small quantities of non-hazardous waste will likely be generated from operations in H-Area or L-Area.
Disposition plans for wastes: - Packaging (e.g., drums, boxes) - Onsite or offsite disposal (where?) - Need for temporary storage (where?)	Non-hazardous waste will be disposed of on site at Three Rivers Landfill.
Transfer to H-Canyon or within L-Area: - Proposed method of transport - Safety procedures - Number of workers to load/unload - Estimated worker dose (load/unload)	Proposed method of transport is by rail car to H-Area or by lowboy trailer in L-Area. SRS site safety and rigging procedures will be used. Number of workers estimated to be 8-10 workers to load or unload. Estimate total number exposed to be less than 40 workers total as rigging, transportation, and operations crews assigned to this work are not expected to be large. Estimated worker dose to load/unload each cask - <16 mrem/cask
Provide any safety documentation, including preliminary or draft scoping-level analyses (e.g., hazards analyses, preliminary safety assessments, safety analysis reports) that would be applied to receipt and storage activities for this material. Recognizing that we are early in the scoping evaluation and planning stages, pertinent information related to potential accident evaluations from other sources would also be appreciated.	Preliminary consolidated hazards analysis was performed for receipt and storage. Awaiting additional information on the safety analysis for the CASTOR cask before the scoping calculations for unmitigated release can be performed to provide input to this CHAP.
Please confirm that the fuel will be stored in CASTOR casks while in L-Area.	Fuel will be stored in CASTOR casks in either H-Area and L-Area and not removed until processed in H-Area or L-Area.
Aircraft crash frequency – Provide air craft crash frequency or a document addressing this hazard (e.g., existing safety analysis.	This information is contained in the existing H-Canyon, L-Area facility DSAs. There are separate frequencies for different types of aircraft (helicopter, light plane, etc.). S-CLC-G-00278, Aircraft Impact Frequencies for SRS Facilities, is available in DCR. This will change as a result of this modification. Additional frequencies are needed to determine the frequency given the size of the new storage pads for the casks. Initial scoping indicates the frequency to be at least in the Extremely Unlikely range.

II. Carbon Digestion at H-Canyon or L-Area

Characterize the receipt at H-Canyon or L-Area of CASTOR casks, the removal of cans (containing the graphite spheres) from the casks, the removal of the graphite spheres from the cans, and the separation of the carbon matrix from the fuel. The intent is to address activities at H-Canyon until the separated fuel is ready to be dissolved for solvent extraction or activities at L-Area until separated fuel is ready to be blended with depleted uranium.

Information Requested	**Process up to 900 Kilograms of HEU through H-Canyon or L-Area (Action Alternative), Carbon Digestion Step (please provide numerical data in commonly reported units)**	
	Carry out digestion in H-Canyon	**Carry out digestion in L-Area**
General		
Describe the construction and/or modifications required at H-Area or L-Area for receipt and any storage of the fuel and to digest/separate carbon from 900 Kg of HEU. The description of modifications could entail, as appropriate: - Floor space used (units) - Plot plan - Floor plan with equipment arrangement - Features that prevent unauthorized entry (unclassified description) - Features that ensure safeguards against malevolent acts or material diversion by internal and external entities (unclassified description) - Fire protection systems - Features that control releases of airborne contaminants (include diagram of treatment train) - Features that control releases of waterborne contaminants (include diagram of treatment train) - Features/procedures that prevent criticality - Description of liquid and non-liquid waste processing Also provide a schedule for the proposed activities: - Design - Modification of H-Canyon or new construction at H-Area or L-Area	See SRNL-TR-2014-00209, “Process Description for Processing of HTGR Pebble Fuel at SRS” for digestion of carbon spheres. Modifications to H-Canyon to allow receipt of HTGR fuel and to provide a carbon digestion capability require installation of new process equipment in the following areas: - Railroad Tunnel Airlock – Installation of mobile cask platform for access to the CASTOR casks - Hot Shop – Installation of TLK canister cutting and fuel transfer equipment including canister staging racks and monitors - Swimming Pool – Modifications for routine maintenance of carbon digestion process equipment and decontamination of failed equipment prior to disposal - Bundle Storage – Installation of a new storage rack for kernel cans from carbon digestion operations. The storage rack will be located in the existing Section 3 bundle storage area of the Hot Canyon. All handling and monitoring of the fuel will be performed remotely by the Hot Canyon Crane and there will be no worker dose associated with storage. The storage rack will be sized (9 x 18 x 4 array) to hold the full inventory of kernel cans. - Section 5 Hot Canyon – Removal of the existing HB-Line resin digestion tank (Tank 5.3), installation of a new HB-Line resin digestion tank in Section 5.1, removal of the existing 5.4 waste tank and 5.4D frames dissolver, installation of two new carbon digestion process modules in Sections 5.1 and 5.3, installation of a new salt canister turntable in Section 5.2, installation of a new offgas condensate tank and salt dissolver tank in Section 5.4 and installation of new remote robotic arms in Sections 5.1 and 5.3 to support the carbon digestion modules - Section 5 Warm Canyon – Installation of new offgas condensate tank in Section 5.8 - Section 6 Warm Canyon – Installation of new offgas high efficiency mist eliminator and offgas condenser in Section 5.5 and installation of new condensate collection tank in Section 5.6 Equipment to be installed in the canyon process cells will be fabricated, mocked up and tested over a 3 year period prior to installation in H-Canyon. Other modifications such as installation of a canister grapple system on the hot canyon crane, piping installation and changes, electrical and instrument installation and changes are also required.	See SRNL-TR-2014-00209, “Process Description for Processing of HTGR Pebble Fuel at SRS” for digestion of carbon spheres. The cask unloading would take place using the existing, large Stack Area Crane. The cask, located on a low-boy platform would be moved into the Stack Area and located under the Stack Area Crane. The lid would be removed and checked for contamination. A mating plate would be located above the cask and a new shielded transfer system (STS) would be placed above the cask and docked to the mating plate. The can would be raided from the cask and into the STS. The STS has a closing shutter door to capture the can. A pictorial of a similar dry transfer system is provided below for conceptual understanding. The shielded transfer system would be located in a dolly in the horizontal position and moved to the new process cell, located in the Purification wing. This process equipment would be located in the L-Area Purification hot-cell facility. The facility now has an overhead crane serving two cells. An elevation view of the proposed modifications and equipment is shown in the following figure. The existing hot-cell would require significant modification. These modifications include removing the existing floor and piping in the existing two cells, creating a cell space equivalent in height to the existing canyon cells. In addition, two other cells would be created by installing new walls and removing a section of the floor. This design change would require building a new truckwell, while leaving an area for waste staging and removal behind a shield wall when the new shield door is opened. The result would be to create four cells: an unloading cell, a digester and salt wash cell, an offgas and solution handling cell, and an alloying furnace cell. As previously discussed, cans would be removed from casks in the Stack Area (in another building) and moved for introduction into the new unloading cell through use of a shielded transfer system with dolly. Once in the cell the cans would be opened and the pebbles batched in the unloading (can opening) cell. The pebbles would be processed through the digester, with the resultant salt being dissolved and converted into LLW in the offgas and solution handling cell. Changes per hour in the rooms that the required ventilation load for the new cell area would be about 20,000 scfm. Based on the design of the Building 235-F sand filter, built in the 80s, the required sand filter and exhaust system would look something like a modified F-Area pictorial as shown below. Other significant scope items include the following: • New truck-unloading station • Shielded roll-up door • LR-56 loading station in new truckwell • LR-56 unloading station into Tk 50- 15’x50’ truckwell • Cold Feed building and tanks per M&E list • D&D costs • Concrete and building modifications, etc. • Sump liners and cell covers • Install new shield windows • Install shield roll-away door Because of the preliminary nature of the design, a parametric method was used to estimate the extent of these upgrades. Substantial upgrades to the L-Area services would be required to support the new process. See final section of this report for details.
Construction/modification		
Land disturbed (acres or hectares)	It is not anticipated that any land will be disturbed. Equipment will be installed in the existing H-Canyon facility.	For the most part, equipment will be installed in the existing 105 Building in L-Area. A small amount of land would be disturbed to add the sand filter, fan room, stack, cold feed, and new truckbay. The total land disturbed should be less than 1 acre.
Description of activities conducted (e.g., decontamination/removal/disposal of existing facilities/equipment, and modifications needed (e.g., floors, walls, support beams, roof, waste management, ventilation)	The H-Canyon cells being used have one failed tank and one dissolver that will be removed and disposed as LLW and one operating tank that will be replaced and relocated with a new tank. Process equipment removed from H-Canyon will be decontaminated as necessary to allow disposal in the E-Area facilities.	Several existing pieces of equipment in the L-purification trailer space must be removed and disposed prior to project start. Additional multiple floor and wall penetrations must be completed per the prescribed process description above.

II. Carbon Digestion at H-Canyon or L-Area

Characterize the receipt at H-Canyon or L-Area of CASTOR casks, the removal of cans (containing the graphite spheres) from the casks, the removal of the graphite spheres from the cans, and the separation of the carbon matrix from the fuel. The intent is to address activities at H-Canyon until the separated fuel is ready to be dissolved for solvent extraction or activities at L-Area until separated fuel is ready to be blended with depleted uranium.

Information Requested	Process up to 900 Kilograms of HEU through H-Canyon or L-Area (Action Alternative), Carbon Digestion Step (please provide numerical data in commonly reported units)	
	Carry out digestion in H-Canyon	**Carry out digestion in L-Area**
Type and quantity of air pollutant emitting equipment and frequency and duration of use.	No new type or quantity of pollutants will be generated during construction activities.	Diesel or gas powered back hoe, front end loader, road grader, crane, bucket truck, manlifts, dump truck, concrete truck and pumpers, utility flatbed truck, forklift, miscellaneous utility trucks & pickup trucks to D&R floors, cells, tanks, piping & miscellaneous equipment. Equipment use would include installation of new walls, cells, foundation for sand filter & associated equipment and truck well. Construction time is estimated to be 4 years.
Type and quantity of noise producing equipment and frequency and duration of use.	No new type or quantity of noise producing equipment will be used during construction activities.	Diesel or gas powered back hoe, front end loader, road grader, crane, bucket truck, manlifts, dump truck, concrete truck and pumpers, utility flatbed truck, forklift, miscellaneous utility trucks & pickup trucks to D&R floors, cells, tanks, piping & miscellaneous equipment. Equipment use would include installation of new walls, cells, foundation for sand filter & associated equipment and truck well. Construction time is estimated to be 4 years.
Emission release parameters: – For fugitive releases - release location and dimensions of source area – For any stack releases - release location, stack height, stack diameter, stack exhaust velocity or flow rate, exhaust air temperature	None anticipated during construction activities.	None anticipated during construction activities.
Air emissions (fugitive and point source): - Criteria pollutants (metric tons/yr) - HAPs (kilograms/yr) - Radioisotopes (curies/yr)	None anticipated during construction activities.	None anticipated during construction activities.
Liquid effluents - Location(s) of discharge(s) and copies of permit(s) - Rate(s) of discharge(s) (units/day) - Concentrations of contaminants (picocuries/liter or micrograms/liter)	None anticipated during construction activities.	None anticipated during construction activities.
Employment for each year (FTEs)	71 craft and 17 non-manual	115 craft and 28 non-manual
Shifts	Construction activities will be performed on a day shift only.	Construction activities will be performed on a day shift only.
Are any construction/modifications in a radiation area? If so:	Yes	Construction activities will be conducted in a Contamination Area. No construction work should be performed in a Radiation Area.
Total worker dose (person-rem) or dose rate	50 person-rem total.	N/A
Duration of work in rad area (months)	A maximum of 36 months	N/A
Number of exposed workers	No more than half the craft workers - 36	N/A
Utilities needed - Water (units/yr) - Electricity (units) - Gasoline (units/yr) - Diesel Fuel (units/yr)	Water – 375,000 gallons Electricity – 200 kVA Gasoline – 7,500 gallons Diesel Fuel – 5000 gallons	Water – 375,000 gallons Electricity – 200 kVA Gasoline – 7,500 gallons Diesel Fuel – 5000 gallons
Resources needed - Concrete (units) - Asphalt (units) - Steel (units) - Crushed stone (units) - Sand & Gravel (units) - Soil (units) - Lumber (units) - Chemicals (units) - Gases (units) - Other construction materials (units)	<u>Concrete</u> – Little to none <u>Asphalt</u> - Little to none <u>Steel Structural</u> – 140,000 pounds <u>Steel Stainless/Alloy</u> – 200,000 pounds <u>Crushed Stone</u> – Little to none <u>Sand and Gravel</u> – Little to none <u>Soil</u> – Little to none <u>Lumber</u> – 10,000 SF <u>Chemicals</u> – 100 gallons <u>Gas-Acetylene</u> – 30 cubic meters <u>Gas-Oxygen</u> – 150 cubic meters <u>Gas-CO_2/Argon</u> – 50 cubic meters <u>Gas-Nitrogen</u> – 100 cubic meters <u>Gas-Trimix</u> – 10 cubic meters <u>Gas-Argon</u> – 800 cubic meters <u>Gas-Helium</u> – 20 cubic meters	<u>Concrete</u> – 550 cubic yards <u>Asphalt</u> – Little to none <u>Steel Structural</u> – 300,000 pounds <u>Steel Stainless/Alloy</u> – 200,000 pounds <u>Crushed Stone</u> – 100 cubic yards <u>Sand and Gravel</u> – 100 cubic yards <u>Soil</u> – Little to none <u>Lumber</u> – 20,000 SF <u>Chemicals</u> – 100 gallons <u>Gas-Acetylene</u> – 30 cubic meters <u>Gas-Oxygen</u> – 150 cubic meters <u>Gas-CO_2/Argon</u> – 50 cubic meters <u>Gas-Nitrogen</u> – 100 cubic meters <u>Gas-Trimix</u> – 10 cubic meters <u>Gas-Argon</u> – 800 cubic meters <u>Gas-Helium</u> – 20 cubic meters
Waste generated (provide solid and liquid separately) (units/yr): - TRU - LLW - MLLW - Hazardous - Non-Hazardous	<u>TRU</u> – Little to no TRU waste is expected to be generated <u>LLW</u> – LLW is primarily the existing 5.3 resin digestion tank, the 5.4 waste tank, the 5.4D dissolver and associated jumpers removed from Section 5 of the hot canyon – 40,000 pounds total Also included will be transfer jumpers associated with the vessels being removed. <u>MLLW</u> – Little or no MLLW is expected to be generated <u>Hazardous Liquid</u> – 50 gallons <u>Hazardous Solid</u> – 200 pounds <u>Non-Hazardous Liquid</u> – 2,500 gallons <u>Non-Hazardous Solid</u> – 150 cubic yards	D&D would generate some LLW, but no TRU. The total LLW waste should be less than 100,000 pounds of steel and 750,000 pounds of concrete. Non-hazardous waste will be disposed in the Three Rivers Regional Landfill and the SRS Construction and Demolition (C&D) Landfill as applicable. Assume 90% of concrete is non-hazardous waste. The remaining 10% would be from PCBs associated with the paint used when the building was built. In addition, the concrete could also be contaminated.

II. Carbon Digestion at H-Canyon or L-Area

Characterize the receipt at H-Canyon or L-Area of CASTOR casks, the removal of cans (containing the graphite spheres) from the casks, the removal of the graphite spheres from the cans, and the separation of the carbon matrix from the fuel. The intent is to address activities at H-Canyon until the separated fuel is ready to be dissolved for solvent extraction or activities at L-Area until separated fuel is ready to be blended with depleted uranium.

Information Requested	Process up to 900 Kilograms of HEU through H-Canyon or L-Area (Action Alternative), Carbon Digestion Step (please provide numerical data in commonly reported units)	
	Carry out digestion in H-Canyon	**Carry out digestion in L-Area**
Disposition plans for wastes: - Packaging (e.g., drums, boxes) - Onsite or offsite disposal (where?) - Need for temporary storage (where?)	Wastes generated by modification/construction activities will be disposed of onsite. The following LLW streams will be disposed in the E-Area facilities: 5.3 Resin Digestion Tank – D-Tank Storage Box 5.4 Waste Tank – D-Tank Storage Box 5.4D Dissolver – Metal Jumper Transport Box Jumpers – Metal Jumper Transport Box The D-Tank Storage box has a volume of 70 cu yd and the Metal Jumper Transport Box has a volume of 140 cu yd. Total volume will be 420 cu yd.	Wastes generated by modification/construction activities will be disposed of onsite. The following LLW waste will be disposed in the E-Area facilities: 200 cu yd – concrete blocks wrapped in plastic 1800 cu ft – 20 B-25 boxes 6400 cu ft – 10 Skid pans Containers are lined with plastic; skid pans are covered with plastic for transporting.
Operations		
Schedule for operations.		
Description of the process for receipt of CASTOR casks, removal of cans from the CASTOR casks, removal of the graphite balls from the casks, and separation of the HEU from graphite (digestion). Include flowcharts and the projected throughput (units/yr). Describe the disposition of the emptied CASTOR casks, the emptied cans, and the residues from the digestion and filtration steps.	See SRNL-TR-2014-00209, "Process Description for Processing of HTGR Pebble Fuel at SRS" for digestion of carbon spheres.	See SRNL-TR-2014-00209, "Process Description for Processing of HTGR Pebble Fuel at SRS" for digestion of carbon spheres. The capacity of the L-Area option is ½ that of the H-Area option, i.e., sized for 500 versus 1000 pebbles per day. Disposition of the castor casks and empty cans would be the same as in the H-Area case.
Emission release parameters - For stack releases - release location, stack height, stack diameter, stack exhaust velocity or flow rate, exhaust air temperature - Emissions from emergency generators, boilers, and other ancillary equipment	There will be no change from the existing emission release parameters in H-Area. Existing equipment, stack, ventilation system, emergency equipment will be utilized.	Handle Offgas from Digester: The offgas system is the same in concept as that described for option 1. The overall scrubber system is designed to attain a DF of 20,000 [redacted]. A film cooler, with reaming brush, provides a means to transition from the furnace at 600-700 degrees C to around 400 degrees C. Any particles leaving the furnace are maintained at an adequate velocity by line sizing to minimize particulate collection. The gas stream with particulate is then passed through a quencher, which discharges to a condensate tank. The offgas from the condensate tank is then treated with a steam atomizing scrubber with a cyclone separator to remove particulates. Note that a design option is to replace the steam atomized scrubber with a packed bed [redacted]. The gas stream then passes through a condenser and a HEME filter to remove excess moisture and particulate. The gas stream is then heated and passed through a HEPA filter and exhauster for the process offgas located outside the cell on the lower level. See description for option 1 system for more details. See discussion provided for the H-Area option for basis for the scaling assumptions for the L-Area offgas system. Given the lower flowrate for one digester versus two, the offgas system equipment should be sized for about 1/3 the flow on the front and ¼ the flow on the backend as designed for in DWPF. These estimates are approximate.
Air emissions - Criteria pollutants (metric tons/yr) - HAPs (kilograms/yr) - Radioisotopes (curies/yr)	Criteria pollutants [redacted] The total CO_2 will be 206 tons per year. The total radiological emissions will be gases after scrubbing operations. C-14 – 4.31E+01 Ci/yr CL-36 – 7.11E-02 Ci/yr I-129 – 6.74E-03 Ci/yr H-3 – 5.31E+02 Ci/yr Kr-85 – 5.94E+02 Ci/yr Rn-219,-220,-222 & At-217 – 5.83E+00 Ci/yr	Criteria pollutants [redacted] There should be no change in the HAPs. The total CO_2 will be 103 tons per year. The total radiological emissions will be gases after scrubbing operations. C-14 – 2.16E+01 Ci/yr CL-36 – 3.56E-02 Ci/yr I-129 – 3.37E-03 Ci/yr H-3 – 2.66E+02 Ci/yr Kr-85 – 2.97E+02 Ci/yr Rn-219,-220,-222 & At-217 – 2.91E+00 Ci/yr
Liquid effluents - Location(s) of outfall(s) - Rate(s) of discharge(s) (units/day) - Concentrations of contaminants (picocuries/liter or micrograms/liter)	There will be no change to the liquid effluents from H-Area.	The location of the outfalls remain unchanged. No new outfalls are anticipated. The plans are to have a closed loop cooling system and therefore minimize any discharges.
Employment (FTEs) – will the activity require any new staff or preserve existing jobs? If so, how many?	For each shift the activity will require 3 operators to prep the casks for removal of the inner cans and decontaminate the cask for release. Two Rad Con technicians will support the operation. In addition, two more operators and a First Line Manager will be required for control room operations support the digestion process.	The employment for L-Area should be no more than that required for H-Area
Shifts	The facility will utilize a 4-shift operation to allow 24/7 operation.	The facility will utilize a 4-shift operation to allow 24/7 operation.
Employee radiological exposure for carbon digestion		

II. Carbon Digestion at H-Canyon or L-Area

Characterize the receipt at H-Canyon or L-Area of CASTOR casks, the removal of cans (containing the graphite spheres) from the casks, the removal of the graphite spheres from the cans, and the separation of the carbon matrix from the fuel. The intent is to address activities at H-Canyon until the separated fuel is ready to be dissolved for solvent extraction or activities at L-Area until separated fuel is ready to be blended with depleted uranium.

Information Requested	**Process up to 900 Kilograms of HEU through H-Canyon or L-Area (Action Alternative), Carbon Digestion Step (please provide numerical data in commonly reported units)**	
	Carry out digestion in H-Canyon	**Carry out digestion in L-Area**
What is the annual total worker dose (person-rem) or nominal dose rate (mrem/hr)	The nominal dose rate at contact on the CASTOR casks are less the 1 mrem/hr. The maximum exposure is estimated at less than 16 mrem (4 workers x 1 mrem x 4 hrs) to prepare each cask for removal of cans. Assuming 135 CASTOR casks are processed per year, total exposure of 2,160 mrem/yr. Can removal will be by crane with no exposure due to remote operation. The carbon digestion will be performed in a cell of the hot canyon and all interfacing with the processing will be remotely with the crane. There will be no exposure during digestion of the pebbles.	The total exposure should be less than or equal to H-Canyon. The activities performed will be similar for preparation of the CASTOR cask. Since the processing of the material in L-Area is double the time for H-Canyon the exposure will be half, or 1,080 mrem/year. Can removal will be by crane with no exposure due to remote operation. The carbon digestion will be performed in a cell and all interfacing with the processing will be remotely with the crane. There should be no exposure during digestion of the pebbles.
Number of exposed workers (FTE)	Estimate total number exposed to be less than 20 workers (5 per shift for 4 shifts).	The total number of exposed workers should be less than or equal to H-Area digestion.
Utilities needed - Water (units/yr) - Electricity (kw/hr) - Natural gas (units/yr) - Diesel Fuel (units/yr) - Heating fuel oil (units/yr)	For information purposes only, the following data shows the utilities use by H-Canyon for FY10 and FY14. FY10 / FY14 Electricity 21,590 MWhr / 19,241 MWhr Steam 29,683 Klb / 68,315 Klb Domestic Water 22,638 Kgal / 11,779 Kgal Sanitary Water 22,352 Kgal / 11,678 Kgal Process Water 177,654 Kgal / 89,878 Kgal The differences shown are based on processing activities and staffing levels during the respective years. The following are estimated yearly increases for digestion. Electricity 7,000 MWhr Steam 5,000 Klb Domestic Water 5,000 Kgal Sanitary Water 5,000 Kgal Process Water 25,000 Kgal	For information purposes only, the following data shows the utilities use by L-Area for FY14. FY14 Electricity 9,988 MWhr Steam 13,949 Klb Domestic Water 4,615 Kgal Sanitary Water 4,344 Kgal River Water 259,200 Kgal The following are estimated yearly increases for digestion. Electricity 3,500 MWhr Steam 5,000 Klb Domestic Water 5,000 Kgal Sanitary Water 5,000 Kgal Process Water 25,000 Kgal
Resources needed - Metals (units/yr) - Chemicals (units/yr) - Gases (units/yr) - Other materials (units/yr)	Total chemical use for the pebble digestion process based on no reuse of salt $NaNO_3$ – 115,000 kg/yr NaOH – 21,000 kg/yr [redacted] KF – 500 kg/yr $Al(NO_3)_3$ – 5,200 kg/yr H_2O_2 – 8,000 kg/yr	Total chemical use for the melt dilute process based on 10:1 reuse of salt $NaNO_3$ – 115,000 kg/yr NaOH – 7,400 kg/yr [redacted] H_2O_2 – 8,000 kg/yr Aluminum – 13,100 kg/yr Ca or Mg – 2,800 kg/yr Minor quantities (<200 kg) of crystalline silicotitanate, monosodium titanate, and zeolite
Waste generated (solid or liquid) (units/yr): - TRU - Mixed TRU - LLW - MLLW - Hazardous - Non-Hazardous Include the disposition of the empty cans previously containing the graphite balls and any other significant generation of waste from the processes covered in this module.	The empty cans will be placed back into the CASTOR casks. The casks will be disposed as LLW in the E-Area trenches. In addition, there will be job control rad waste generated. Based on generation of 10 cu ft job control waste per cask, 135 casks per year, it is expected there will be total of about 790 cu yd/yr LLW discarded to E-Area trenches.	Since the same amount of material would be processed, the waste should be similar, except L-Area would not generate the 200,000 gallons of HLW from the dissolution process and would not generate the 400,000 or so gallons of HLW from the salt dissolution. The L option would generate no HLW canisters. Instead it would generate 78 spent fuel canisters, equivalent in size to HLW glass canisters, and it would generate 300,000 or so gallons of LLW salt waste. Since the processing time for L-Area is double that for H-Area, there will be about 400 cu yd/yr LLW from the CASTOR casks. There will be about 45 cu yd/yr LLW from the TLK cans.
Disposition plans for wastes: - Packaging (e.g., drums, boxes) - Onsite or offsite disposal (where?) - Need for temporary storage (where?)	Non-hazardous waste will be disposed on site at Three Rivers Landfill	The LLW salt solution would be transferred via LR-56s to the tank farm for blending with other LLW requiring solidification in Saltstone. See discussion in next section for melt and dilute disposition.

II. Carbon Digestion at H-Canyon or L-Area

Characterize the receipt at H-Canyon or L-Area of CASTOR casks, the removal of cans (containing the graphite spheres) from the casks, the removal of the graphite spheres from the cans, and the separation of the carbon matrix from the fuel. The intent is to address activities at H-Canyon until the separated fuel is ready to be dissolved for solvent extraction or activities at L-Area until separated fuel is ready to be blended with depleted uranium.

Information Requested	**Process up to 900 Kilograms of HEU through H-Canyon or L-Area (Action Alternative), Carbon Digestion Step (please provide numerical data in commonly reported units)**	
	Carry out digestion in H-Canyon	**Carry out digestion in L-Area**
Provide any safety documentation, including preliminary or draft scoping-level analyses (e.g., hazards analyses, preliminary safety assessments, safety analysis reports) that would be applied to this facility for this material. Recognizing that we are early in the scoping evaluation and planning stages, pertinent information related to potential accident evaluations from other sources would also be appreciated.	A *Safety in Design Tailoring Strategy for HTGR Fuel Receipt and Disposition Feasibility Study*, N-ESR-H-00027, has been written to describe the overall safety approach to be taken for the HTGR Fuel Receipt and Disposition. For the *HTGR Disposition* part of the project, the safety basis development will be governed by DOE-STD-1189-2008, *Integration of Safety into the Design Process* at least until the final alternative is chosen and a major modification determination can be performed. This Safety Design Tailoring Strategy largely mimics the format and content of a Safety Design Strategy and will be used as an enhanced planning document for the integration of safety into the design process. The intent of the *Safety In Design Tailoring Strategy* at this phase of the feasibility study is to document the preliminary back of the envelope safety work that was performed during this feasibility study and to communicate the DOE expectations for execution of safety activities during design and provide a plan for the major safety deliverables for estimating purposes. The feasibility of HTGR carbon digestion was preliminarily studied from a criticality safety perspective. With a specific set of assumptions on processing rates, tanks, and material content, (as yet to be determined), the analysis initially postulates that a criticality accident is unlikely and may indeed be not credible. A complete criticality analysis is required once complete processing information is finalized. The project could opt to use geometrically-favorable tanks to further reduce the risk.	The current mission for the L Area Facility is limited to the safe receipt, storage, and shipment of spent nuclear fuel. No chemical processing capability presently exists or is authorized in L Area. Thus, the existing Safety Basis documents do not address hazards of the types anticipated for the carbon digestion process. New safety analyses will be developed for the L Area Facility as required by 10 CFR Part 830 and in accordance with DOE Standard 3009-94. A preliminary hazards analysis has not yet been developed. To the extent practical, hazards analysis for L Area processing of spent fuel will build upon existing analyses utilized in the currently-operating SRS fuel processing facility (i.e., H Canyon).
List any new accident scenarios (other than those in existing safety or NEPA documents) that need to be added for H-Canyon or L-Area because of changes produced by the proposed action (e.g., unloading cask, opening cans, transfer spheres to digester). Are there existing accidents for which the inventory and release fractions for this fuel; please provide? Would any of the potential accident scenarios and releases associated with the proposed action fall outside the existing safety bounds for H-Canyon or L-Area? Would the potential for failed/contaminated fuel from AVR impact the potential accident scenarios (or normal ops releases)? For any new or substantially modified scenarios, the information listed below will ultimately be needed for the Draft EA and any insights from existing or ongoing analyses would be appreciated. We expect to use the same basic assumptions as the SPD SEIS with appropriate modifications to reflect the proposed action:	A Consolidated Hazards Analysis Process (CHAP) will be used to identify accident scenarios, assess consequences, and guide development of controls. Until the preliminary CHAP is performed, the extent to which the proposed new process creates new types of accident scenarios is unknown. The H-Canyon facility is a heavily shielded large scale radiochemical separations facility with current missions which include the dissolution of enriched uranium and plutonium materials along with the separation and recovery of enriched uranium from fission products and other impurities. H-Canyon is currently classified as a Hazard Category 2 facility. The existing Safety Basis documents including the Documented Safety Analysis, S-DSA-H-00001, were prepared in accordance with U.S. Department of Energy (DOE) Standard (STD) DOE-STD-3009-94. Fire, explosion, loss of confinement, direct radiological exposure, criticality, external hazards (such as vehicle or handling accidents), and natural phenomena (seismic and wind) are potential initiating events for public and worker exposures, and environment damaging releases. The hazards associated with these broad categories were evaluated to provide a basis for selecting a set of bounding accidents to be analyzed, and the identification of Safety Class (SC) and Safety Significant (SS)Systems, Structures, and Components (SSCs). A robust suite of SC and SS controls has been selected to prevent or mitigate the consequences of the accidents to well below the evaluation guidelines. Some of these robust SC controls include the facility building structure, canyon exhaust ventilation system, sand filter and backup diesel generators, various monitoring, alarm, and interlock systems, and vessel air purge system. A robust suite of Safety Significant controls have also been selected including Nuclear Incident Monitors (NIMS). This same process with the same types of initiators would be applied to the new carbon digestion process for this new mission. The robust suite of existing SC or SS controls are already available for use. A review of the existing accident analysis calculations for H-Canyon did not immediately rule out the use of L-area for the digestion process with only SS active ventilation instead of SC with a sand filter.	The existing Consolidated Hazards Analysis Process (CHAP) will be used to identify accident scenarios, assess consequences and guide development of controls. Until the preliminary CHAP is performed, the extent to which the proposed new process creates new types of accident scenarios is unknown. The existing Safety Basis for L Area includes hazards associated with handling spent fuel casks and unloading high activity materials within shielded equipment, including events such as fires, direct exposure, and nuclear criticality. While the specific scenarios for handling this fuel will be unique, many of the types of events are common with materials presently handled in the facility. The primary new type of scenarios will be those identified for the actual removal of fuel cladding and release of fission products; activities not currently allowed in L Area. The L Area Safety Basis utilizes a fictitious bounding Reference Fuel Assembly (RFA) to determine Material at Risk and consequences for credible accidents. A comparison of CASTOR cask contents with this RFA has not been performed to determine extent to which existing consequence assessments may be bounded by current analyses. The potential for failed fuel, failed cans, and failed casks will all be considered in the normal hazards analysis process. Controls will be established to prevent or mitigate consequences commensurate with the risk.
Radiological accidents: - Accident description (include release pathways and mitigating factors) - Accident frequency category - Material at risk - Material characteristics - Source term released to environment (curies by isotope) - Release parameters: release fractions, release timing, location, release height, release duration, and heat of release - Filtration (specify efficiency)	Each credible accident scenario, as identified in the CHAP process, will be individually evaluated to determine unmitigated frequency and consequences for the facility worker, co-located worker, and the public. The Material at Risk, release fraction, event duration, etc. may be unique to each scenario. Based upon the risk and proximity to Evaluation Guideline values, controls are identified to prevent the event, mitigate the consequences, or both. This is an iterative process; applied early in the design phase and refined throughout the process. Thus, it is premature to specify radiological consequences for credible accidents. SRS is awaiting information from the safety basis analysis for the CASTOR Cask SARP for this material to further evaluate the material characteristics and release fractions.	Each credible accident scenario, as identified in the CHAP process, will be individually evaluated to determine unmitigated frequency and consequences for the facility worker, co-located worker, and the public. The Material at Risk, release fraction, event duration, etc. may be unique to each scenario. Based upon the risk and proximity to Evaluation Guideline values, controls are identified to prevent the event, mitigate the consequences, or both. This is an iterative process; applied early in the design phase and refined throughout the process. Thus, it is premature to specify radiological consequences for credible accidents.

II. Carbon Digestion at H-Canyon or L-Area

Characterize the receipt at H-Canyon or L-Area of CASTOR casks, the removal of cans (containing the graphite spheres) from the casks, the removal of the graphite spheres from the cans, and the separation of the carbon matrix from the fuel. The intent is to address activities at H-Canyon until the separated fuel is ready to be dissolved for solvent extraction or activities at L-Area until separated fuel is ready to be blended with depleted uranium.

Information Requested	Process up to 900 Kilograms of HEU through H-Canyon or L-Area (Action Alternative), Carbon Digestion Step (please provide numerical data in commonly reported units)	
	Carry out digestion in H-Canyon	**Carry out digestion in L-Area**
Chemical inventory for chemical accident analysis: - List chemicals, total facility inventory, and annual usage of the chemical - Size and location of largest tank (storage container) for each chemical. Include floor area or diked area that would contain the spill when applicable. - Concentration of chemical in largest tank (identify if this is the highest concentration of the chemical being stored). If not, also list the other storage locations, size of tank and concentration of chemical being stored.	As H-Canyon facility is a large scale radiochemical separations facility, they have a strong history with safely managing an extensive chemical inventory in Outside Facilities. The existing facility DSA contains listings of chemicals, quantities, vessels and sizes, and Material at Risk. The CHAP process will perform a chemical hazard evaluation in addition to looking at radiological accidents. SS controls will be identified to prevent the exposure of a Worker to a concentration of Hazardous Material in an occupied area inside a building, as determined by uniform distribution of the released material in the occupied area that would challenge a concentration of PAC-3. SS controls would also be required to ensure that any Credible Event shall not exceed the threshold value of PAC-3 for a Collocated Worker Chemical Evaluation Criteria or a PAC-2 to an individual member of the public based on the analysis approach described in DOE-STD-1189, Appendix B.	The CHAP process will perform a chemical hazard evaluation in addition to looking at radiological accidents. SS controls will be identified to prevent the exposure of a Worker to a concentration of Hazardous Material in an occupied area inside a building, as determined by uniform distribution of the released material in the occupied area that would challenge a concentration of PAC-3. SS controls would also be required to ensure that any Credible Event shall not exceed the threshold value of PAC-3 for a Collocated Worker Chemical Evaluation Criteria or a PAC-2 to an individual member of the public based on the analysis approach described in DOE-STD-1189, Appendix B.
Design basis earthquake frequency and intensity (if different from SPD SEIS)	This information for all SRS facilities is contained in WSRC-TM-95-1, Standard No. 01060 (pages 22-23), which is provided as an attachment.	
Earthquake frequency that would result in loss of structural integrity intensity (if different from SPD SEIS)	No analyzed earthquake events result in loss of structural integrity for the H-Canyon or L-Area facility. The DSA discusses the damage that occurs (cracking, etc.), but the structure remains intact. The frequency that would result in loss of structural integrity is not precisely known, but will be less than 4E-04.	
Other natural phenomena that would result in loss of structural integrity and their frequency intensity (if different from SPD SEIS)	This information is contained in the existing H-Canyon and L-Area facility DSAs. No other NPH events result in loss of structural integrity for the H-Canyon facility.	
Aircraft crash frequency intensity (if different from SPD SEIS)	This information is contained in the existing H-Canyon, L-Area facility DSAs. There are separate frequencies for different types of aircraft (helicopter, light plane, etc.). S-CLC-G-00278, Aircraft Impact Frequencies for SRS Facilities, is available in DCC.	

III. Processing of Uranium at H-Canyon or L-Area

Characterize the dissolution of the HEU kernels at H-Canyon in terms of the processing and disposition options for the HEU or the melt/dilute processing and storage of the HEU kernels in L-Area.

Information Requested	**Process up to 900 Kilograms of HEU through H-Canyon or L-Area (Action Alternative), Melt/dilute, Dissolution and/or Purification Options (please provide numerical data in commonly reported units)**		
	Option 1 – Dissolve and direct discard to HTF as HLW	**Options 2/2T – Separate HEU and/or thorium**	**Option 6 – Melt & dilute in L-Area**
General			
Describe the construction and/or modifications required at H-Area or L-Area to dissolve and process the HEU kernels as a function of process options. The description of modifications could entail, as appropriate: - Floor space used (units) - Plot plan - Floor plan with equipment arrangement - Features that prevent unauthorized entry (unclassified description) - Features that ensure safeguards against malevolent acts or material diversion by internal and external entities (unclassified description) - Fire protection systems - Features that control releases of airborne contaminants (include diagram of treatment train) - Features that control releases of waterborne contaminants (include diagram of treatment train) - Features/procedures that prevent criticality - Description of liquid and non-liquid waste processing Also provide a schedule for the proposed activities: - Design - Modification of H-Canyon or new construction at H-Area or L-Area	Essentially no modifications needed to dissolve and purify if existing canyon dissolver is available for use to support this campaign. Currently only two canyon dissolvers are operational. If a third dissolver is needed due to multiple mission dissolving needs, then a third canyon dissolver which is currently not operational could be restored and placed into service. No construction modifications are anticipated to process through solvent extraction to purify and remove fission products. Some process flow sheet modifications may be requires such as making chemical input adjustments depending on the desired purity and need to separation from U from Th.	Essentially no modifications needed to dissolve and purify if existing canyon dissolver is available for use to support this campaign. Currently only two canyon dissolvers are operational. If a third dissolver is needed due to multiple mission dissolving needs, then a third canyon dissolver which is currently not operational could be restored and placed into service. No construction modifications are anticipated to process through solvent extraction to purify and remove fission products. Some process flow sheet modifications may be requires such as making chemical input adjustments depending on the desired purity and need to separation from U from Th. Down blending and storage prior to solidification would likely be in the Canyon to preclude needing to shield outside facility tanks due to the U-232 content. Storage could be accomplished by utilizing existing large hot canyon bi-cell tanks. It is estimated that adequate space is available in tanks, 16.3, 16.4, and 18.3 to hold the required lag storage prior to solidification. Small piping changes may be required to transfer nitric acid solutions containing natural or depleted uranium used to down blend U-235 isotopics from 211-H unloading station to canyon vessel designated for down blending operations. Installation of a solidification or cementation system would need to be installed. A scaled down version of a cementation system designed for the Waste Solidification Building could be used and installed outside the bounds of the H-Canyon building. The cementation system is discussed in more detail in the SRNL document and in Section V of this document.	The information in this area was deleted. This was basically the process description that is described in other documents. The construction/modification required will be associated with the installation of the equipment for the melt/dilute process. The construction work for modification of the 105-L building in support of pebble digestion included the facility layout changes required for the installation of the equipment. A description of the equipment to be constructed and the layout for installation is shown in the SRNL Process Description document.
Construction/modification			
Land disturbed (acres or hectares)	Not applicable, no modifications outside foot print of canyon.	Not applicable. Other than the cementation process discussed in Section V, no modifications are required in H-canyon.	None unique to this unit operation. See discussion for general L-Area modifications.
Description of activities conducted (e.g., decontamination/removal/ disposal of existing facilities/equipment, and modifications needed (e.g., floors, walls, support beams, roof, waste management, ventilation)	Not applicable, no modifications	Not applicable. Other than the cementation process discussed in Section V, no modifications are required in H-canyon.	None unique to this unit operation. See discussion for general L-Area modifications.
Type and quantity of air pollutant emitting equipment and frequency and duration of use.	Not applicable, no modifications	Not applicable. Other than the cementation process discussed in Section V, no modifications are required in H-canyon.	Gasoline powered portable welding machines, generators, or light plants (<4)
Type and quantity of noise producing equipment and frequency and duration of use.	Not applicable, no modifications	Not applicable. Other than the cementation process discussed in Section V, no modifications are required in H-canyon.	Hand held cutting, grinding, welding equipment (<4-5)on day shift within H-Canyon for a duration of ~2 yrs. Gasoline powered portable welding machines, generators, or light plants.
Emission release parameters – For any stack releases - release location, stack height, stack diameter, stack exhaust velocity or flow rate, exhaust air temperature	Not applicable, no modifications	Not applicable. Other than the cementation process discussed in Section V, no modifications are required in H-canyon.	The information in this area was deleted. This was basically the information related to emissions during operations that is described in other documents. The appropriated information is being obtained.
Air emissions (point source): - Criteria Pollutants (metric tons/yr) - HAPs (kilograms/yr) - Radioisotopes (curies/yr)	Not applicable, no modifications	Not applicable. Other than the cementation process discussed in Section V, no modifications are required in H-canyon.	The small amount of NOx emissions from this portion of the process are bounded by the overall process emissions, previously discussed.
Liquid effluents - Location(s) of discharge(s) and copies of permit(s) - Rate(s) of discharge(s) (units/day) - Concentrations of contaminants (picocuries/liter or micrograms/liter)	Not applicable, no modifications	Not applicable. Other than the cementation process discussed in Section V, no modifications are required in H-canyon.	None unique to this portion of the process.

III. Processing of Uranium at H-Canyon or L-Area *Characterize the dissolution of the HEU kernels at H-Canyon in terms of the processing and disposition options for the HEU or the melt/dilute processing and storage of the HEU kernels in L-Area.*			
Information Requested	**Process up to 900 Kilograms of HEU through H-Canyon or L-Area (Action Alternative), Melt/dilute, Dissolution and/or Purification Options (please provide numerical data in commonly reported units)**		
	Option 1 – Dissolve and direct discard to HTF as HLW	**Options 2/2T – Separate HEU and/or thorium**	**Option 6 – Melt & dilute in L-Area**
Employment for each year (FTEs)	Not applicable, no modifications	Not applicable. Other than the cementation process discussed in Section V, no modifications are required in H-canyon.	Employment should be less than ¼ that of H Area given the order of magnitude smaller size of the facility, but the operation would take place twice as long.
Shifts	Not applicable, no modifications	Not applicable. Other than the cementation process discussed in Section V, no modifications are required in H-canyon.	Same as for H.
Employee radiological exposure for H-Canyon or L-Area processing	Not applicable, no modifications	Not applicable. Other than the cementation process discussed in Section V, no modifications are required in H-canyon.	Radiological exposure would be less than for H-Area since L would have smaller staff. However, the work would be the same, so the reduction would be minimal.
What is the annual total worker dose (person-rem) or nominal dose rate (mrem/hr)	Not applicable, no modifications	Not applicable. Other than the cementation process discussed in Section V, no modifications are required in H-canyon.	Radiological exposure would be less than for H-Area since L would have smaller staff. But the reduction would be minimal since the same work is performed.
Number of exposed workers (FTEs)	Not applicable, no modifications	Not applicable. Other than the cementation process discussed in Section V, no modifications are required in H-canyon.	N/A – As was stated in Section II, construction activities will be in a contamination area only.
Utilities needed - Water (units/yr) - Electricity (units) - Gasoline (units/yr) - Diesel Fuel (units/yr)	Not applicable, no modifications	Not applicable. Other than the cementation process discussed in Section V, no modifications are required in H-canyon.	See Section II. The utilities figures shown there are inclusive of construction activities for this portion of the process.
Resources needed – e.g.: - Concrete (units) - Asphalt (units) - Steel (units) - Crushed stone (units) - Sand & Gravel (units) - Soil (units) - Lumber (units) - Chemicals (units) - Gases (units) - Other construction materials (units)	Not applicable, no modifications	Not applicable. Other than the cementation process discussed in Section V, no modifications are required in H-Canyon.	See Section II. The resources figures shown there are inclusive of construction resources for this portion of the process.
Waste generated (provide solid and liquid separately) (units/yr): - TRU - LLW - MLLW - Hazardous - Non-Hazardous	Not applicable, no modifications	Not applicable. Other than the cementation process discussed in Section V, no modifications are required in H-canyon.	Other than 78 SNF canisters of aluminum alloy slugs in the form of SNF, the waste covered elsewhere,
Disposition plans for wastes: - Packaging (e.g., drums, boxes) - Onsite or offsite disposal (where?) - Need for temporary storage (where?)	Not applicable, no modifications	Not applicable. Other than the cementation process discussed in Section V, no modifications are required in H-canyon.	Disposition of SNF from the melt and dilute process would be the same as envisioned in the melt and dilute NEPA.
Operations			
Schedule for operations.	The facility currently works a 4-shift rotation schedule to provide 24-hour coverage, 365 days per year. The projected time for operations is approximately 42 months.	The facility currently works a 4-shift rotation schedule to provide 24-hour coverage, 365 days per year. The projected time for operations is approximately 48 months. The processing of the kernels through solvent extraction and the cementation process should be completed with 6 months after completion of digestion. See Section V for cementation system.	The facility would operate for 7 years. Staffing practice would be same for H-Area.
Description of the process options including flowcharts and the projected throughput (units/yr). Describe any projected modifications to E-Area or to E-Area operations to address the waste generated by the activities covered under this module.	See SRNL-TR-2014-00209, "Process Description for Processing of HTGR Pebble Fuel at SRS" for the discussion for processing the kernels.	See SRNL-TR-2014-00209, "Process Description for Processing of HTGR Pebble Fuel at SRS" for the discussion for processing the kernels. See Section V for cementation system.	See SRNL-TR-2014-00209, "Process Description for Processing of HTGR Pebble Fuel at SRS" for the discussion for processing the kernels through the melt/dilute process.
Emission release parameters - For stack releases - release location (latitude & longitude), stack height, stack diameter, stack exhaust velocity or flow rate, exhaust air temperature - Emissions from emergency generators, boilers, and other ancillary equipment	No changes are expected in emission release parameters.	No changes are expected in emission release parameters. See Section V for cementation system.	The permit level for the L-Area stack would have to be raised to that of the H-Area stack.
Air emissions - Criteria pollutants (metric tons/yr) - HAPs (kilograms/yr) - Radioisotopes (curies/yr)	No significant changes from historical norms are expected in radiological and nonradiological air emissions for H-Canyon. The dissolution of the uranium kernels, neutralization and discard to HTF are similar to historical operations.	No significant changes from historical norms are expected in radiological and nonradiological air emissions for H-Canyon. The dissolution of the uranium kernels, processing the material through solvent extraction and storage for the cementation system are similar to historical operations See Section V for cementation system.	Emissions would be bounded by those discussed for H Area. However, the L-Are stack would have to permitted for the same levels as H.

III. Processing of Uranium at H-Canyon or L-Area

Characterize the dissolution of the HEU kernels at H-Canyon in terms of the processing and disposition options for the HEU or the melt/dilute processing and storage of the HEU kernels in L-Area.

Information Requested	Process up to 900 Kilograms of HEU through H-Canyon or L-Area (Action Alternative), Melt/dilute, Dissolution and/or Purification Options (please provide numerical data in commonly reported units)		
	Option 1 – Dissolve and direct discard to HTF as HLW	**Options 2/2T – Separate HEU and/or thorium**	**Option 6 – Melt & dilute in L-Area**
Liquid effluents - Location(s) of outfall(s) - Rate(s) of discharge(s) (units/day) - Concentrations of contaminants (picocuries/liter or micrograms/liter)	No changes are expected in location of outfalls or concentration of contaminants in liquid effluents being discharged for H-Canyon. The rate of discharge of segregated cooling water effluent may increase by less than 2% due to operation of a third (3rd) canyon dissolver to support dissolution of the kernels (two canyon dissolvers are normally operated). Dissolution, purification, and recovery of uranium are currently being performed under existing permits and limits. Liquid effluents do not contain solutions from plutonium/uranium processing. Cooling water, which is in contact with vessels used for plutonium processing via cooling coils, does not contain plutonium materials unless a coil failure occurs. In those conditions, the failure is detected and cooling water diverted from the outfall prior to release.	No changes are expected in location of outfalls or concentration of contaminants in liquid effluents being discharged for H-Canyon. The rate of discharge of segregated cooling water effluent may increase by less than 2% due to operation of a third (3rd) canyon dissolver to support dissolution of the kernels (two canyon dissolvers are normally operated). Dissolution, purification, and recovery of uranium are currently being performed under existing permits and limits. Liquid effluents do not contain solutions from plutonium/uranium processing. Cooling water, which is in contact with vessels used for plutonium processing via cooling coils, does not contain plutonium materials unless a coil failure occurs. In those conditions, the failure is detected and cooling water diverted from the outfall prior to release. See Section V for cementation system.	Outfall emissions for L-Area would not be changed. The liquid effluent of 1.5 million liters of LLW waste would require shipment to the tank form for inclusion with saltstone.
Employment (FTEs) – will the activity require any new staff or preserve existing jobs? If so, how many?	Expected to preserve existing jobs estimated at 40-50 workers.	Expected to preserve existing jobs estimated at 40-50 workers. See Section V for cementation system.	The workers dedicated to the process would be the same as H-Area. It would require around 100 workers of so to run the process and the facility.
Shifts	No changes are expected in the basic H-Canyon facility shift schedules due to this campaign. The facility currently works a 4-shift rotation schedule to provide 24-hour coverage, 365 days per year.	No changes are expected in the basic H-Canyon facility shift schedules due to this campaign. The facility currently works a 4-shift rotation schedule to provide 24-hour coverage, 365 days per year. See Section V for cementation system.	Same as for H-Area.
Employee radiological exposure - total dose (person-rem)	There are no changes expected in the basic H-Canyon facility radiological exposure due to this campaign. The facility operations will be no different from historical operations.	There are no changes expected in the basic H-Canyon facility radiological exposure due to this campaign. The facility operations will be no different from historical operations. See Section V for cementation system.	There is no radiological exposure during the processing of the kernels to ingots. There will be same small quantity of exposure for packaging the ingots into dry storage canisters. The quantity should be the same or less than that for unloading the casks. The total exposure should be less than 1,080 mrem/yr.
Number of exposed workers	There are no changes expected in the number of exposed workers for the dissolution and discard of the material due to this campaign. The facility operations will be no different from historical operations.	There are no changes expected in the number of exposed workers for the dissolution, solvent extraction, and storage of the material due to this campaign. The facility operations will be no different from historical operations. See Section V for cementation system.	The number of exposed workers should be less than 20, 5 per shift for four shift operation,
Utilities needed - Water (units/yr) - Electricity (kw/hr) - Natural gas (units/yr) - Diesel Fuel (units/yr) - Heating fuel oil (units/yr)	The following are estimated increases for dissolution and discard. These are increase above that required for digestion. Electricity 5,000 MWhr Steam 25,000 Klb Process Water 25,000 Kgal	The following are estimated increases for dissolution, solvent extraction and discard. These are increases above that required for digestion. Electricity 10,000 MWhr Steam 35,000 Klb Process Water 45,000 Kgal See Section V for cementation system.	The L-Area facility is an order of magnitude smaller than the canyon and does not need steam for dissolution. Steam use for the process should not exceed 200 pounds per hour. Given the much small footprint and the process designed to minimize water use, the L-Area services should be 1/10 or so of those shown for H-Area. Updated information to be provided.
Resources needed - Metals (units/yr) - Chemicals (units/yr) - Gases (units/yr) - other materials (units/yr)	Section II not only lists the chemicals required for carbon digestion, but also for dissolution and discard. No additional resources are required.	Section II not only lists the chemicals required for carbon digestion, but also for dissolution, solvent extraction, and discard. The only chemical not included is depleted uranium. Depleted uranium – 3.2 metric tons (2,100 gallons uranyl nitrate at 400 g/l or 3,850 kg UO_3 powder) See Section V for cementation system.	See Section II. With the exception of the DU required for downblend, the figures shown there are inclusive of processing resources for this portion of the process. Depleted uranium – 3.2 metric tons (6.5 cubic feet metal @ 17 g/cc).
Waste generated (solid or liquid) (units/yr): - TRU - Mixed TRU - LLW MLLW - Hazardous - Non-Hazardous	Other than the waste generated as identified in the process description and Section II above, no other significant wastes will be generated beyond that normally generated with H-Canyon operations.	Other than the waste generated as identified in the process description and Section II above, no other significant wastes will be generated beyond that normally generated with H-Canyon operations. See Section V for cementation system.	See Section II above for LLW waste generated from the CASTOR casks and TLK cans. The SNF canisters (approximately 78) would be placed on a pad in L-Area pending disposal to a national HLW/SNF repository. The SNF canisters would not be significantly different than exist L-Area aluminum clad SNF. The resultant aluminum alloy would be no different than that considered under the previous meld and dilute NEPA action. The canisters would be stored in empty locations on the same pad as the Castor casks. A new storage pad will not be required.

III. Processing of Uranium at H-Canyon or L-Area *Characterize the dissolution of the HEU kernels at H-Canyon in terms of the processing and disposition options for the HEU or the melt/dilute processing and storage of the HEU kernels in L-Area.*			
Information Requested	**Process up to 900 Kilograms of HEU through H-Canyon or L-Area (Action Alternative), Melt/dilute, Dissolution and/or Purification Options (please provide numerical data in commonly reported units)**		
	Option 1 – Dissolve and direct discard to HTF as HLW	**Options 2/2T – Separate HEU and/or thorium**	**Option 6 – Melt & dilute in L-Area**
Disposition plans for wastes: - Packaging (e.g., drums, boxes) - Onsite or offsite disposal (where?) - Need for temporary storage (where?)	Other than the waste generated as identified in the process description, no other significant wastes will be generated beyond that normally generated with H-Canyon operations.	Other than the waste generated as identified in the process description, no other significant wastes will be generated beyond that normally generated with H-Canyon operations. See Section V for cementation system.	Pad storage for 78 SNF canisters in 14 concrete overpacks would be required pending disposal to the repository.
Provide any safety documentation, including preliminary or draft scoping-level analyses (e.g., preliminary safety assessments, safety analysis reports) for that would be applied to processing the AVR and THTR fuel in H-Canyon or L-Area.	A *Safety in Design Tailoring Strategy for HTGR Fuel Receipt and Disposition Feasibility Study*, N-ESR-H-00027, has been written to describe the overall safety approach to be taken for the HTGR Fuel Receipt and Disposition. For the *HTGR Disposition* part of the project, the safety basis development will be governed by DOE-STD-1189-2008, *Integration of Safety into the Design Process* at least until the final alternative is chosen and a major modification determination can be performed. This Safety Design Tailoring Strategy largely mimics the format and content of a Safety Design Strategy and will be used as an enhanced planning document for the integration of safety into the design process. The intent of the *Safety In Design Tailoring Strategy* at this phase of the feasibility study is to document the preliminary back of the envelope safety work that was performed during this feasibility study and to communicate the DOE expectations for execution of safety activities during design and provide a plan for the major safety deliverables for estimating purposes. H-Canyon currently dissolves, and historically purifies, and blends down enriched uranium fuels and spent nuclear fuel. The existing facility DSA (S-DSA-H-00001) contains listings of chemicals, quantities, vessels and sizes, and Material at Risk. However, H-Canyon may reconfigure piping and use a few (2-3) tanks to support HLW minimization efforts. An existing canyon vessel may be removed and replaced with a larger bi-cell tank to enhance solution storage capability.	A *Safety in Design Tailoring Strategy for HTGR Fuel Receipt and Disposition Feasibility Study*, N-ESR-H-00027, has been written to describe the overall safety approach to be taken for the HTGR Fuel Receipt and Disposition. For the *HTGR Disposition* part of the project, the safety basis development will be governed by DOE-STD-1189-2008, *Integration of Safety into the Design Process* at least until the final alternative is chosen and a major modification determination can be performed. This Safety Design Tailoring Strategy largely mimics the format and content of a Safety Design Strategy and will be used as an enhanced planning document for the integration of safety into the design process. 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A *Safety in Design Tailoring Strategy for HTGR Fuel Receipt and Disposition Feasibility Study*, N-ESR-H-00027, has been written to describe the overall safety approach to be taken for the HTGR Fuel Receipt and Disposition. For the *HTGR Disposition* part of the project, the safety basis development will be governed by DOE-STD-1189-2008, *Integration of Safety into the Design Process* at least until the final alternative is chosen and a major modification determination can be performed. This Safety Design Tailoring Strategy largely mimics the format and content of a Safety Design Strategy and will be used as an enhanced planning document for the integration of safety into the design process. The intent of the *Safety In Design Tailoring Strategy* at this phase of the feasibility study is to document the preliminary back of the envelope safety work that was performed during this feasibility study and to communicate the DOE expectations for execution of safety activities during design and provide a plan for the major safety deliverables for estimating purposes. The current mission for the L Area Facility is limited to the safe receipt, storage, and shipment of spent nuclear fuel. No chemical processing capability presently exists or is authorized in L Area. Thus, the existing Safety Basis documents do not address hazards of the types anticipated for the melt and dilute process. New safety analyses will be developed for the L Area Facility as required by 10 CFR Part 830 and in accordance with DOE Standard 3009-94. A preliminary hazards analysis has not yet been developed. To the extent practical, hazards analysis for L Area processing of this material will build upon prior analyses utilized for the pilot-scale L Experimental Facility melt & dilute process.

III. Processing of Uranium at H-Canyon or L-Area ***Characterize the dissolution of the HEU kernels at H-Canyon in terms of the processing and disposition options for the HEU or the melt/dilute processing and storage of the HEU kernels in L-Area.***			
Information Requested	**Process up to 900 Kilograms of HEU through H-Canyon or L-Area (Action Alternative), Melt/dilute, Dissolution and/or Purification Options (please provide numerical data in commonly reported units)**		
	Option 1 – Dissolve and direct discard to HTF as HLW	**Options 2/2T – Separate HEU and/or thorium**	**Option 6 – Melt & dilute in L-Area**
List any new accident scenarios (in existing safety or NEPA documents) that need to be added for H-Canyon or L-Area because of changes produced by the proposed action. It is recognized that the inventory and release fractions might change from the existing analyses. Would any of the potential accident scenarios and releases associated with the proposed action fall outside the existing safety bounds for H-Canyon or L-Area? Would the presence of U-233 and U-232 (and daughters) in the HEU flow stream present any new accident scenarios or radiological concerns in the product and waste streams at H-Canyon or L-Area and other waste product and waste handling facilities? What would be the radiation dose rate buildup as a function of time after initial separation of the uranium stream from the thorium and other contaminants and how would this impact the accident scenarios for other portions of H-Canyon or L-Area and other SRS facilities? For any new or substantially modified scenarios, the information listed below will ultimately be needed for the Draft EA and any insights from existing or ongoing analyses would be appreciated. We expect to use the same basic assumptions as the SPD EIS with appropriate modifications to reflect the proposed action:	A Consolidated Hazards Analysis Process (CHAP) will be used to identify accident scenarios, assess consequences, and guide development of controls. Until the preliminary CHAP is performed, the extent to which the proposed new process creates new types of accident scenarios is unknown. However, for any accident scenario's found outside the existing safety bounds, a robust suite of existing SC or SS controls are already available for use. The H-Canyon facility is a heavily shielded large scale radiochemical separations facility with current missions which include the dissolution of enriched uranium and plutonium materials along with the separation and recovery of enriched uranium from fission products and other impurities. H-Canyon is currently classified as a Hazard Category 2 facility. The existing Safety Basis documents including the Documented Safety Analysis, S-DSA-H-00001, were prepared in accordance with U.S. Department of Energy (DOE) Standard (STD) DOE-STD-3009-94. Fire, explosion, loss of confinement, direct radiological exposure, criticality, external hazards (such as vehicle or handling accidents), and natural phenomena (seismic and wind) are potential initiating events for public and worker exposures, and environment damaging releases. The hazards associated with these broad categories were evaluated to provide a basis for selecting a set of bounding accidents to be analyzed, and the identification of Safety Class (SC) and Safety Significant (SS)Systems, Structures, and Components (SSCs). A robust suite of SC and SS controls has been selected to prevent or mitigate the consequences of the accidents to well below the evaluation guidelines. Some of these robust SC controls include the facility building structure, canyon exhaust ventilation system, sand filter and backup diesel generators, various monitoring, alarm, and interlock systems, and vessel air purge system. A robust suite of Safety Significant controls have also been selected including Nuclear Incident Monitors (NIMS).	A Consolidated Hazards Analysis Process (CHAP) will be used to identify accident scenarios, assess consequences, and guide development of controls. Until the preliminary CHAP is performed, the extent to which the proposed new process creates new types of accident scenarios is unknown. However, for any accident scenario's found outside the existing safety bounds, a robust suite of existing SC or SS controls are already available for use. The H-Canyon facility is a heavily shielded large scale radiochemical separations facility with current missions which include the dissolution of enriched uranium and plutonium materials along with the separation and recovery of enriched uranium from fission products and other impurities. H-Canyon is currently classified as a Hazard Category 2 facility. The existing Safety Basis documents including the Documented Safety Analysis, S-DSA-H-00001, were prepared in accordance with U.S. Department of Energy (DOE) Standard (STD) DOE-STD-3009-94. Fire, explosion, loss of confinement, direct radiological exposure, criticality, external hazards (such as vehicle or handling accidents), and natural phenomena (seismic and wind) are potential initiating events for public and worker exposures, and environment damaging releases. The hazards associated with these broad categories were evaluated to provide a basis for selecting a set of bounding accidents to be analyzed, and the identification of Safety Class (SC) and Safety Significant (SS)Systems, Structures, and Components (SSCs). A robust suite of SC and SS controls has been selected to prevent or mitigate the consequences of the accidents to well below the evaluation guidelines. Some of these robust SC controls include the facility building structure, canyon exhaust ventilation system, sand filter and backup diesel generators, various monitoring, alarm, and interlock systems, and vessel air purge system. A robust suite of Safety Significant controls have also been selected including Nuclear Incident Monitors (NIMS).	The existing Consolidated Hazards Analysis Process (CHAP) will be used to identify accident scenarios, assess consequences and guide development of controls. Given that there are few similarities between current fuel handling activities in L Area and those involved in the melt and dilute process, it is anticipated that almost all credible process-related accident scenarios will be new for the facility.
Radiological accidents - Accident description (include release pathways and mitigating factors) - Accident frequency category - Material at risk - Material characteristics - Source term released to environment (curies by isotope) - Release parameters: release fractions, release timing, location, release height, release duration, and heat of release - Filtration (specify efficiency) - Number of involved workers	Each credible accident scenario, as identified in the CHAP process, will be individually evaluated to determine unmitigated frequency and consequences for the facility worker, co-located worker, and the public. The Material at Risk, release fraction, event duration, etc. may be unique to each scenario. Based upon the risk and proximity to Evaluation Guideline values, controls are identified to prevent the event, mitigate the consequences, or both. This is an iterative process; applied early in the design phase and refined throughout the process. Thus, it is premature to specify radiological consequences for credible accidents. SRS is awaiting information from the safety basis analysis for the CASTOR Cask SARP for this material to further evaluate the material characteristics and release fraction.	Each credible accident scenario, as identified in the CHAP process, will be individually evaluated to determine unmitigated frequency and consequences for the facility worker, co-located worker, and the public. The Material at Risk, release fraction, event duration, etc. may be unique to each scenario. Based upon the risk and proximity to Evaluation Guideline values, controls are identified to prevent the event, mitigate the consequences, or both. This is an iterative process; applied early in the design phase and refined throughout the process. Thus, it is premature to specify radiological consequences for credible accidents. SRS is awaiting information from the safety basis analysis for the CASTOR Cask SARP for this material to further evaluate the material characteristics and release fractions.	Each credible accident scenario, as identified in the CHAP process, will be individually evaluated to determine unmitigated frequency and consequences for the facility worker, co-located worker, and the public. The Material at Risk, release fraction, event duration, etc. may be unique to each scenario. Based upon the risk and proximity to Evaluation Guideline values, controls are identified to prevent the event, mitigate the consequences, or both. This is an iterative process; applied early in the design phase and refined throughout the process. Thus, it is premature to specify radiological consequences for credible accidents.

III. Processing of Uranium at H-Canyon or L-Area

Characterize the dissolution of the HEU kernels at H-Canyon in terms of the processing and disposition options for the HEU or the melt/dilute processing and storage of the HEU kernels in L-Area.

Information Requested	Process up to 900 Kilograms of HEU through H-Canyon or L-Area (Action Alternative), Melt/dilute, Dissolution and/or Purification Options (please provide numerical data in commonly reported units)		
	Option 1 – Dissolve and direct discard to HTF as HLW	**Options 2/2T – Separate HEU and/or thorium**	**Option 6 – Melt & dilute in L-Area**
Chemical inventory for chemical accident analysis - List chemicals, total facility inventory, and annual usage of the chemical - Size and location of largest tank (storage container) for each chemical. Include floor area or diked area that would contain the spill when applicable. - Concentration of chemical in largest tank (identify if this is the highest concentration of the chemical being stored). If not, also list the other storage locations, size of tank and concentration of chemical being stored.	As H-Canyon facility is a large scale radiochemical separations facility, they have a strong history with safely managing an extensive chemical inventory in Outside Facilities. The existing facility DSA contains listings of chemicals, quantities, vessels and sizes, and Material at Risk. The CHAP process will perform a chemical hazard evaluation in addition to looking at radiological accidents. SS controls will be identified to prevent the exposure of a Worker to a concentration of Hazardous Material in an occupied area inside a building, as determined by uniform distribution of the released material in the occupied area that would challenge a concentration of PAC-3. SS controls would also be required to ensure that any Credible Event shall not exceed the threshold value of PAC-3 for a Collocated Worker Chemical Evaluation Criteria or a PAC-2 to an individual member of the public based on the analysis approach described in DOE-STD-1189, Appendix B.	As H-Canyon facility is a large scale radiochemical separations facility, they have a strong history with safely managing an extensive chemical inventory in Outside Facilities. The existing facility DSA contains listings of chemicals, quantities, vessels and sizes, and Material at Risk. The CHAP process will perform a chemical hazard evaluation in addition to looking at radiological accidents. SS controls will be identified to prevent the exposure of a Worker to a concentration of Hazardous Material in an occupied area inside a building, as determined by uniform distribution of the released material in the occupied area that would challenge a concentration of PAC-3. SS controls would also be required to ensure that any Credible Event shall not exceed the threshold value of PAC-3 for a Collocated Worker Chemical Evaluation Criteria or a PAC-2 to an individual member of the public based on the analysis approach described in DOE-STD-1189, Appendix B.	The CHAP process will perform a chemical hazard evaluation in addition to looking at radiological accidents. SS controls will be identified to prevent the exposure of a Worker to a concentration of Hazardous Material in an occupied area inside a building, as determined by uniform distribution of the released material in the occupied area that would challenge a concentration of PAC-3. SS controls would also be required to ensure that any Credible Event shall not exceed the threshold value of PAC-3 for a Collocated Worker Chemical Evaluation Criteria or a PAC-2 to an individual member of the public based on the analysis approach described in DOE-STD-1189, Appendix B.
Design basis earthquake frequency and intensity (if different from SPD SEIS)	This information for all SRS facilities is contained in WSRC-TM-95-1, Standard No. 01060 (pages 22-23), which is provided as an attachment.		
Earthquake frequency that would result in loss of structural integrity intensity (if different from SPD SEIS)	No analyzed earthquake events result in loss of structural integrity for the H-Canyon facility or 105-L. The DSA discusses the damage that occurs (cracking, etc.), but the structure remains intact. The frequency that would result in loss of structural integrity is not precisely known, but will be less than 4E-04.		
Other natural phenomena that would result in loss of structural integrity and their frequency intensity (if different from SPD SEIS)	This information is contained in the existing H-Canyon and L-Area facility DSAs. No other NPH events result in loss of structural integrity for the H-Canyon facility or 105-L.		

IV. Storage of Downblended Uranium

Characterize the storage of downblended uranium oxide at SRS pending shipment of the uranium to an offsite vendor.

Information Requested	Storage of up to 900 Kilograms of Downblended Uranium Pending Shipment to an Offsite Vendor (please provide numerical data in commonly reported units)
General	
Identify the storage location for the LEU	**No longer considered valid option per DOE**
Describe the construction and/or modifications required at the projected SRS facility for storage of the downblended uranium. The description of modifications could entail, as appropriate: - Floor space used (units) - Plot plan - Floor plan with equipment arrangement - Features that prevent unauthorized entry (unclassified description) - Features that ensure safeguards against malevolent acts or material diversion by internal and external entities (unclassified description) - Fire protection systems - Features that control releases of airborne contaminants (include diagram of treatment train) - Features that control releases of waterborne contaminants (include diagram of treatment train) - Features/procedures that prevent criticality - Description of liquid and non-liquid waste processing Also provide a schedule for the proposed activities: - Design - Modification or new construction	**No longer considered valid option per DOE**
Construction/modification	
Land disturbed (acres or hectares)	**No longer considered valid option per DOE**
Description of activities conducted (e.g., decontamination/removal/disposal of existing facilities/equipment, and modifications needed (e.g., floors, walls, support beams, roof, waste management, ventilation)	**No longer considered valid option per DOE**
Describe type and quantity of air pollutant emitting equipment and frequency and duration of use.	**No longer considered valid option per DOE**
Describe type and quantity of noise producing equipment and frequency and duration of use.	**No longer considered valid option per DOE**
Emission release parameters: - For fugitive releases - release location and dimensions of source area – For any stack releases - release location, stack height, stack diameter, stack exhaust velocity or flow rate, exhaust air temperature	**No longer considered valid option per DOE**

IV. Storage of Downblended Uranium

Characterize the storage of downblended uranium oxide at SRS pending shipment of the uranium to an offsite vendor.

Information Requested	Storage of up to 900 Kilograms of Downblended Uranium Pending Shipment to an Offsite Vendor (please provide numerical data in commonly reported units)
Air emissions (fugitive, point source): - Criteria pollutants (metric tons/yr) - HAPs (kilograms/yr) - Radioisotopes (curies/yr)	**No longer considered valid option per DOE**
Liquid effluents - Location(s) of discharge(s) and copies of permit(s) - Rate(s) of discharge(s) (units/day) - Concentrations of contaminants (picocuries/liter or micrograms/liter)	**No longer considered valid option per DOE**
Employment for each year (FTEs)	**No longer considered valid option per DOE**
Shifts	**No longer considered valid option per DOE**
Total worker dose (person-rem) or dose rate and duration/frequency for management of material in storage	**No longer considered valid option per DOE**
Number of exposed workers	**No longer considered valid option per DOE**
Utilities needed: - Water (units/yr) - Electricity (units) - Gasoline (units/yr) - Diesel Fuel (units/yr)	**No longer considered valid option per DOE**
Resources needed - Concrete (units) - Asphalt (units) - Steel (units) - Crushed stone (units) - Sand & Gravel (units) - Soil (units) - Lumber (units) - Chemicals (units) - Gases (units) - Other construction materials (units)	**No longer considered valid option per DOE**
Waste generated (provide solid and liquid separately) (units/yr): - TRU - LLW - MLLW - Hazardous - Non-Hazardous	**No longer considered valid option per DOE**
Disposition plans for wastes: - Packaging (e.g., drums, boxes) - Onsite or offsite disposal (where?) - Need for temporary storage (where?)	**No longer considered valid option per DOE**
Operations	
Schedule for operations. How long will the LEU be stored?	**No longer considered valid option per DOE**
Description of the process for receipt and storage of downblended uranium (process option 1), including flowcharts and throughput (units/yr), if any. Describe any surveillance or monitoring activities involving the stored material.	**No longer considered valid option per DOE**
Emission release parameters - For stack releases - release location (latitude & longitude), stack height, stack diameter, stack exhaust velocity or flow rate, exhaust air temperature - Emissions from emergency generators, boilers, and other ancillary equipment	**No longer considered valid option per DOE**
Air emissions - Criteria pollutants (metric tons/yr) - HAPs (kilograms/yr) - Radioisotopes (curies/yr)	**No longer considered valid option per DOE**
Liquid effluents - Location(s) of outfall(s) - Rate(s) of discharge(s) (units/day) - Concentrations of contaminants (picocuries/liter or micrograms/liter)	**No longer considered valid option per DOE**
Employment (FTEs) – will the activity require any new staff or preserve existing jobs? If so, how many?	**No longer considered valid option per DOE**
Shifts	**No longer considered valid option per DOE**
Employee radiological exposure - total dose (person-rem)	**No longer considered valid option per DOE**
Number of exposed workers	**No longer considered valid option per DOE**
Utilities needed: - Water (units/yr) - Electricity (kw/hr) - Natural gas (units/yr) - Diesel Fuel (units/yr) - Heating fuel oil (units/yr)	**No longer considered valid option per DOE**
Resources needed: - Metals (units/yr) - Chemicals (units/yr) - Gases (units/yr) - Other materials (units/yr)	**No longer considered valid option per DOE**
Waste generated (solid or liquid) (units/yr): - TRU - Mixed TRU - LLW - MLLW - Hazardous - Non-Hazardous	**No longer considered valid option per DOE**

IV. Storage of Downblended Uranium ***Characterize the storage of downblended uranium oxide at SRS pending shipment of the uranium to an offsite vendor.***	
Information Requested	**Storage of up to 900 Kilograms of Downblended Uranium Pending Shipment to an Offsite Vendor (please provide numerical data in commonly reported units)**
Disposition plans for wastes: - Packaging (e.g., drums, boxes) - Onsite or offsite disposal (where?) - Need for temporary storage (where?)	**No longer considered valid option per DOE**
Provide any safety documentation, including preliminary or draft scoping-level analyses (e.g., preliminary safety assessments, safety analysis reports) for that would be applied to storing this material for this facility.	**No longer considered valid option per DOE**
List any accident scenarios (in existing safety or NEPA documents) that need to be modified because of changes produced by the proposed action. It is recognized that the inventory and release fractions might change from the existing analyses. Would any of the potential accident scenarios and releases associated with the proposed action fall outside the existing safety bounds for this facility? For any new or substantially modified scenarios, the information listed below will ultimately be needed for the Draft EA and any insights from existing or ongoing analyses would be appreciated. We expect to use the same basic assumptions as the SPD EIS with appropriate modifications to reflect the proposed action:	**No longer considered valid option per DOE**
Radiological accidents - Accident description (include release pathways and mitigating factors) - Accident frequency category - Material at risk - Material characteristics - Source term released to environment (curies by isotope) - Release parameters: release fractions, release timing, location, release height, release duration, and heat of release - Filtration (specify efficiency)	**No longer considered valid option per DOE**
Chemical inventory for chemical accident analysis - List chemicals, total facility inventory, and annual usage of the chemical - Size and location of largest tank (storage container) for each chemical. Include floor area or diked area that would contain the spill when applicable. - Concentration of chemical in largest tank (identify if this is the highest concentration of the chemical being stored). If not, also list the other storage locations, size of tank and concentration of chemical being stored.	**No longer considered valid option per DOE**
Design basis earthquake frequency and intensity	**No longer considered valid option per DOE**
Earthquake frequency that would result in loss of structural integrity	**No longer considered valid option per DOE**
Other natural phenomena that would result in loss of structural integrity and their frequency	**No longer considered valid option per DOE**
Aircraft crash frequency	**No longer considered valid option per DOE**

V. Process and Vitrify Liquid Waste at S-Area, Z-Area and H-Area *Characterize the principal required activities after processing the HEU in H-Canyon according to the two process options or after processing after the melt/dilute process in L-Area. This would involve pretreatment and processing through DWPF, HLW canister storage in S-Area, and storage or disposal of LLW at SRS (including Saltstone) or offsite.*			
Information Requested	**Vitrify Liquid Waste From Processing Up to 900 Kilograms of HEU through H-Canyon or L-Area(Action Alternative), Dissolution and Purification Options (please provide numerical data in commonly reported units)**		
	Option 1 – Process HLW (Pu, U, Th, FP) from H-Canyon Discards	**Options 2/2T – Process HLW (Pu, FP) from H-Canyon Discards to HTF, and downblend, solidify, and dispose of U/Th**	**Option 6 – Receive and process LLW salt solution**
General			
Describe any projected need for construction and/or modifications to DWPF, the HLW canister storage capabilities at S-Area (e.g., glass waste storage buildings, dry cask storage), waste tank farm infrastructure (e.g., piping), and Saltstone, to disposition the high-activity waste stream from H-Canyon (as a function of process option). The description could entail, as appropriate: - Floor space used (units) - Plot plan - Floor plan with equipment arrangement - Features that prevent unauthorized entry (unclassified description) - Features that ensure safeguards against malevolent acts or material diversion by internal and external entities (unclassified description) - Fire protection systems - Features that control releases of airborne contaminants (include diagram of treatment train) - Features that control releases of waterborne contaminants (include diagram of treatment train) - Features/procedures that prevent criticality - Description of liquid and non-liquid waste processing Also provide a schedule for the proposed activities: - Design - Construction/modification by facility	No modifications are expected for DWPF or for the waste tank farm infrastructure. HLW canister storage capability for approximately 100 additional canisters is not expected to require modification or addition of a glass storage building. The additional gallons of Saltstone grout created is not expected to require modification or addition of a grout storage vault.	No modifications are expected for DWPF or for the waste tank farm infrastructure. HLW canister storage capability for approximately 15-30 additional canisters is not expected to require modification or addition of a glass storage building. The additional gallons of Saltstone grout created is not expected to require modification or addition of a grout storage vault. Construction of a cementation system will be required solidify the downblended U or the U/Th waste stream. It is assumed that the existing blend-down tankage in H-Outside Facilities will be used to blend uranium solution from the canyon with 400 g/l DU solution to make 200 g/l feed for the cementation system. A description, schematic and potential layout is shown in the attached SRNL document. This system is patterned after the Waste Solidification Building (WSB) project built to support the MOX project. The information provided in the remainder of this section either copies or scales down that developed for the WSB project and is considered bounding for this construction.	This option has no impact on DWPF, but will result in approximately 80 canisters of down blended spent nuclear fuel in a solid form suitable for dry storage. The additional gallons of Saltstone grout created is not expected to require modification or addition of a grout storage vault. The L-Area option would require transfer of about 1.5 million liters of LLW solution from L Area to a new entry station to feed into the new waste process facility. The volume of salt stone waste would be much less than for the H-Area option. Although the quantity is well-bounded by existing and planned operations, the new addition station would require a permit modification. The transfers would take place using the approved LR-56 transfer system. The station should require a small PC3 structure with an underground lag storage tank, with a volume less than 5,000 gallons. The truck unloading station and tank should require a building no larger than 2000 square feet in footprint. LLW salt solution from L-Area will be delivered to the tanker unloading station(s) at the Low Point Drain Tank and/or the Effluent Treatment Facility for transfer into Tank 50 for storage prior to being processed at the Saltstone Processing Facility
Construction/modification			
Land disturbed (acres or hectares)	Not applicable, no modifications.	5 acres – scaled down from WSB	Not applicable, no modifications.
Description of activities conducted (e.g., decontamination/removal/ disposal of existing facilities/equipment, and modifications needed (e.g., floors, walls, support beams, roof, waste management, ventilation)	Not applicable, no modifications.	Various Constructions activities to include but not limited to earth work, concrete placement, road ways & parking lot development, site utilities installation, structural steel fabrication and erection, etc. The construction is estimate to require approximately 2 years.	Not applicable, no modifications.
Type and quantity of air pollutant emitting equipment and frequency and duration of use.	Not applicable, no modifications.	Heavy Equipment operation during all of the construction duration.	Not applicable, no modifications.
Type and quantity of noise producing equipment and frequency and duration of use.	Not applicable, no modifications.	Heavy Equipment operation during all of the construction duration.	Not applicable, no modifications.
Emission release parameters: - For fugitive releases - release location and dimensions of source area - For any stack releases - release location, stack height, stack diameter, stack exhaust velocity or flow rate, exhaust air temperature	Not applicable, no modifications.	Air pollution release location is the 5 acres of the construction site at ground level.	Not applicable, no modifications.

V. Process and Vitrify Liquid Waste at S-Area, Z-Area and H-Area

Characterize the principal required activities after processing the HEU in H-Canyon according to the two process options or after processing after the melt/dilute process in L-Area. This would involve pretreatment and processing through DWPF, HLW canister storage in S-Area, and storage or disposal of LLW at SRS (including Saltstone) or offsite.

Information Requested	**Vitrify Liquid Waste From Processing Up to 900 Kilograms of HEU through H-Canyon or L-Area(Action Alternative), Dissolution and Purification Options (please provide numerical data in commonly reported units)**		
	Option 1 – Process HLW (Pu, U, Th, FP) from H-Canyon Discards	**Options 2/2T – Process HLW (Pu, FP) from H-Canyon Discards to HTF, and downblend, solidify, and dispose of U/Th**	**Option 6 – Receive and process LLW salt solution**
Air emissions (point source and fugitive): - Criteria Pollutants (metric tons/yr) - HAPs (kilograms/yr) - Radioisotopes (curies/yr)	Not applicable, no modifications.	WSB Numbers – No scale down Pollutant (kg/yr) / Diesel Equipment / Construction Fugitive Emissions Carbon monoxide / 20,300 / 0 Nitrogen dioxide / 52,700 / 0 Sulfur dioxide / 24,400 / 0 Volatile organic compounds / 3,900 / <1 Total suspended particles / 3,930 / 21,600 Pollutant (kg/yr) / Concrete Batch Plant / Vehicles Carbon monoxide / 0 / 48,700 Nitrogen dioxide / 0 / 14,100 Sulfur dioxide / 0 / 0 Volatile organic compounds / 0 / 6,520 Total suspended particles / 2610 / 49,900	Not applicable, no modifications.
Liquid effluents: - Location(s) of discharge(s) and copies of permit(s) - Rate(s) of discharge(s) (units/day) - Concentrations of contaminants (picocuries/liter or micrograms/liter)	Not applicable, no modifications.	WSB Numbers – No scale down. Storm water discharges are controlled under Construction Storm Water Permit (SCR100000). A detention basin will be constructed and designed to collect construction site runoff. Flow from the detention basin will be metered at the historic rate to the outfall pipe. The rate of discharge for the design basis storms will be 6.9 cfs for the 2 year, 24 hour rainfall and 11.4 cfs for the 10 year, 24 hour rainfall.	Not applicable, no modifications.
Employment for each year (FTEs)	Not applicable, no modifications.	5% increase over above construction requirements for H-Canyon digestion – 7 craft and 2 non-craft	Not applicable, no modifications.
Shifts	Not applicable, no modifications.	Construction activities will be performed on a day shift only.	Not applicable, no modifications.
Is any construction/modification work in a radiation area? If so:	Not applicable, no modifications.	No	Not applicable, no modifications.
Total worker dose (person-rem) or dose rate	Not applicable, no modifications.	Not applicable	Not applicable, no modifications.
Duration of work in rad area (months)	Not applicable, no modifications.	Not applicable	Not applicable, no modifications.
Number of exposed workers	Not applicable, no modifications.	None	Not applicable, no modifications.
Utilities needed - Water (units/yr) - Electricity (units) - Gasoline (units/yr) - Diesel Fuel (units/yr)	Not applicable, no modifications.	Scaled down from WSB Water – 500K gallons/yr Electricity – 450 kVA Gasoline – 10,000 gallons/yr Diesel Fuel – 10,000 gallons/yr	Not applicable, no modifications.
Resources needed – e.g.: - Concrete (units) - Asphalt (units) - Steel (units) - Crushed stone (units) - Sand & Gravel (units) - Soil (units) - Lumber (units) - Chemicals (units) - Gases (units) - Other construction materials (units)	Not applicable, no modifications.	Scaled down from WSB Concrete – 6,000 CY Asphalt – 3,000 SY @ 2” thick Steel – 100 TN Structural, 750 TN Rebar Crushes Stone, Sand & Gravel –150TN Soil – 5,000 CY Lumber – 12,000 SF Chemicals – 100 gallons Gases: Acetylene – 30 m^3 Oxygen – 150 m^3 CO_2/Argon – 50 m^3 Nitrogen – 100 m^3 Trimix – 10 m^3 Argon – 1,000 m^3 Helium – 20 m^3	Not applicable, no modifications.
Waste generated (provide solid and liquid separately) (units/yr): - TRU - LLW - MLLW - Hazardous - Non-Hazardous	Not applicable, no modifications.	Scaled down from WSB TRU – None LLW – None MLLW – None Hazardous Liquid – 50 gal/yr Hazardous Solid – 200 lbs/yr Non-Hazardous Liquid – 3,000 gal/yr Non-hazardous Solid – 150 cu yd/yr	Not applicable, no modifications.
Disposition plans for wastes: - Packaging (e.g., drums, boxes) - Onsite or offsite disposal (where?) - Need for temporary storage (where?)	Not applicable, no modifications.		Not applicable, no modifications.
Operations			

V. Process and Vitrify Liquid Waste at S-Area, Z-Area and H-Area ***Characterize the principal required activities after processing the HEU in H-Canyon according to the two process options or after processing after the melt/dilute process in L-Area. This would involve pretreatment and processing through DWPF, HLW canister storage in S-Area, and storage or disposal of LLW at SRS (including Saltstone) or offsite.***			
Information Requested	**Vitrify Liquid Waste From Processing Up to 900 Kilograms of HEU through H-Canyon or L-Area(Action Alternative), Dissolution and Purification Options (please provide numerical data in commonly reported units)**		
	Option 1 – Process HLW (Pu, U, Th, FP) from H-Canyon Discards	**Options 2/2T – Process HLW (Pu, FP) from H-Canyon Discards to HTF, and downblend, solidify, and dispose of U/Th**	**Option 6 – Receive and process LLW salt solution**
Schedule for operations.	This option will require ~100 additional days of operation DWPF and ~24 additional days of operation of the Saltstone Production Facility and the future SWPF.	This option will require 30 additional days of operation of the existing Liquid Waste facilities including the future SWPF The cementation system is expected to operate for approximately 1 and ½ years.	This option will require 16 additional days of operation of the existing Saltstone Processing Facility
Description of the process including flowcharts and throughput (units/yr).	This option will require ~100 additional days of operation DWPF and ~24 additional days of operation of the Saltstone Production Facility and the future SWPF.	This option will require 30 additional days of operation of the existing Liquid Waste facilities including the future SWPF Cementation - See SRNL-TR-2014-00209.	This option will require 16 additional days of operation of the existing Saltstone Processing Facility
Emission release parameters - For stack releases - release location, stack height, stack diameter, stack exhaust velocity or flow rate, exhaust air temperature - Emissions from emergency generators, boilers, and other ancillary equipment	This option will require ~100 additional days of operation DWPF and ~24 additional days of operation of the Saltstone Production Facility and the future SWPF.	This option will require 30 additional days of operation of the existing Liquid Waste facilities including the future SWPF Cementation - WSB Numbers – No scale down or adjustment Stack Releases – Stack Height: 50 feet Stack diameter: 60 inches Exhaust flow: 60,000 cfm Exhaust Air Temp: 30 ºC Caustic Tank Vent Height: 10 feet Acid Tank Vent Height: 10 feet Building Drain Tank Vent Height: 5 feet Diesel Generator Vent Height: TBD Diesel Fuel Tank Vent Height: TBD	This option will require 16 additional days of operation of the existing Saltstone Processing Facility
Air emissions - Criteria pollutants (metric tons/yr) - HAPs (kilograms/yr) - Radioisotopes (curies/yr)	This option will require ~100 additional days of operation DWPF and ~24 additional days of operation of the Saltstone Production Facility and the future SWPF.	This option will require 30 additional days of operation of the existing Liquid Waste facilities including the future SWPF Cementation - WSB Numbers – No scale down Uncontrolled Metric ton/yr / Controlled Metric ton/yr PM 3.19E-01 9.24E-04 PM-10 1.18E-01 8.41E-05 PM-2.5 1.14E-01 8.41E-05 VOC 7.24E-03 7.24E-03 Uncontrolled kg/yr / Controlled kg/yr Arsenic 7.83E-05 9.02E-05 Beryllium 5.37E-07 8.16E-06 Cadmium 8.44E-06 3.25E-08 Chromium 1.78E-04 1.11E-04 Lead 6.80E-05 4.72E-05 Manganese 1.34E-02 2.67E-05 Nickel 9.22E-04 2.07E-04 T.Phos 2.78E-03 3.19E-04 Selenium 0.00E+00 6.52E-06 SC Toxics Nitric Acid: 176 kg/yr (both controlled and uncontrolled)	This option will require 16 additional days of operation of the existing Saltstone Processing Facility

V. Process and Vitrify Liquid Waste at S-Area, Z-Area and H-Area

Characterize the principal required activities after processing the HEU in H-Canyon according to the two process options or after processing after the melt/dilute process in L-Area. This would involve pretreatment and processing through DWPF, HLW canister storage in S-Area, and storage or disposal of LLW at SRS (including Saltstone) or offsite.

Information Requested	**Vitrify Liquid Waste From Processing Up to 900 Kilograms of HEU through H-Canyon or L-Area(Action Alternative), Dissolution and Purification Options (please provide numerical data in commonly reported units)**		
	Option 1 – Process HLW (Pu, U, Th, FP) from H-Canyon Discards	**Options 2/2T – Process HLW (Pu, FP) from H-Canyon Discards to HTF, and downblend, solidify, and dispose of U/Th**	**Option 6 – Receive and process LLW salt solution**
Liquid effluents - Location(s) of outfall(s) - Rate(s) of discharge(s) (units/day) - Concentrations of contaminants (picocuries/liter or micrograms/liter)	This option will require ~100 additional days of operation DWPF and ~24 additional days of operation of the Saltstone Production Facility and the future SWPF.	This option will require 30 additional days of operation of the existing Liquid Waste facilities including the future SWPF Cementation - WSB Numbers – No scale down or adjustment The liquid effluent will be to the SRS Effluent Treatment Project (ETP), which has an NPDES permit. The ETP controls emissions within the NPDES permit by establishing Waste Acceptance Criteria (WAC). The cementation system will maintain effluent levels to below the ETP's WAC. Flow rate of 30 gal/min Annual Rate of 2,233,000 gal 260 batches/yr at 8590 gal/batch Values as given in ETP WAC limits Pu : 0.76 mg/yr HEU: 0.67 mg/yr Tritium: TBD	This option will require 16 additional days of operation of the existing Saltstone Processing Facility
Employment (FTEs) – will the activity require any new staff or preserve existing jobs? If so, how many?	This option will require ~100 additional days of operation DWPF and ~24 additional days of operation of the Saltstone Production Facility and the future SWPF.	This option will require 30 additional days of operation of the existing Liquid Waste facilities including the future SWPF Cementation - New or reassigned staff will be required. Estimated 20 FTEs – Scaled down from WSB	This option will require 16 additional days of operation of the existing Saltstone Processing Facility
Shifts	This option will require ~100 additional days of operation DWPF and ~24 additional days of operation of the Saltstone Production Facility and the future SWPF.	This option will require 30 additional days of operation of the existing Liquid Waste facilities including the future SWPF Cementation - 4 – 12 hr shifts	This option will require 16 additional days of operation of the existing Saltstone Processing Facility
Employee radiological exposure -			
What is the estimated annual worker dose (person-rem) from processing?	This option will require ~100 additional days of operation DWPF and ~24 additional days of operation of the Saltstone Production Facility and the future SWPF.	This option will require 30 additional days of operation of the existing Liquid Waste facilities including the future SWPF Cementation - 10 person-rem/yr – Scaled down from WSB	This option will require 16 additional days of operation of the existing Saltstone Processing Facility
Number of exposed workers	This option will require ~100 additional days of operation DWPF and ~24 additional days of operation of the Saltstone Production Facility and the future SWPF.	This option will require 30 additional days of operation of the existing Liquid Waste facilities including the future SWPF Cementation - 15 – Scaled down from WSB	This option will require 16 additional days of operation of the existing Saltstone Processing Facility
Utilities needed - Water (units/yr) - Electricity (kw/hr) - Natural gas (units/yr) - Diesel Fuel (units/yr) - Heating fuel oil (units/yr)	This option will require ~100 additional days of operation DWPF and ~24 additional days of operation of the Saltstone Production Facility and the future SWPF.	This option will require 30 additional days of operation of the existing Liquid Waste facilities including the future SWPF Cementation - Scaled down from WSB Water - 3,000,000 gallons/yr Electricity - 1,000 kw/hr Natural gas – N/A Diesel Fuel – 1,000 gal/yr Heating fuel oil – N/A	This option will require 16 additional days of operation of the existing Saltstone Processing Facility
Resources needed - Metals (units/yr) - Chemicals (units/yr) - Gases (units/yr) - other materials (units/yr)	This option will require ~100 additional days of operation DWPF and ~24 additional days of operation of the Saltstone Production Facility and the future SWPF.	This option will require 30 additional days of operation of the existing Liquid Waste facilities including the future SWPF. Cementation - Scaled down from WSB Metals – 20,000 kg/yr 304L SS Chemicals: HNO_3 – 1,000 Kg/yr NaOH – 4,000 kg/yr Flyash – 10,000 kg/yr Portland – 30,000 kg.yr ZrO_2 – 10,000 kg/yr Gases: Argon – 500,000 liters/yr P-10 – 15,000 liters/yr Nitrogen – 2,000 liters/yr	This option will require 16 additional days of operation of the existing Saltstone Processing Facility

V. Process and Vitrify Liquid Waste at S-Area, Z-Area and H-Area

Characterize the principal required activities after processing the HEU in H-Canyon according to the two process options or after processing after the melt/dilute process in L-Area. This would involve pretreatment and processing through DWPF, HLW canister storage in S-Area, and storage or disposal of LLW at SRS (including Saltstone) or offsite.

Information Requested	**Vitrify Liquid Waste From Processing Up to 900 Kilograms of HEU through H-Canyon or L-Area(Action Alternative), Dissolution and Purification Options (please provide numerical data in commonly reported units)**		
	Option 1 – Process HLW (Pu, U, Th, FP) from H-Canyon Discards	**Options 2/2T – Process HLW (Pu, FP) from H-Canyon Discards to HTF, and downblend, solidify, and dispose of U/Th**	**Option 6 – Receive and process LLW salt solution**
Waste generated (solid or liquid) (units/yr): - HLW canisters - TRU - Mixed TRU - LLW - MLLW - Hazardous - Non-Hazardous	Disposition waste/products produced: • DWPF canisters – 100 • Saltstone grout – 1.45 million gallons • LLW (CASTOR casks with empty fuel canisters) – (72,000 cubic feet) Waste generated at DWPF and Saltstone will not change.	Disposition waste/products produced: • DWPF canisters – 15-30 • Saltstone grout – 1.65 million gal to LW grout – 27,500 gallons, 500 drums inside 455 CASTOR casks – (72,000 cubic feet) • LLW (empty fuel canisters plus empty fuel canisters from 455 CASTOR casks –1100 55 gal drum equiv (9,000 cubic feet) Waste generated at DWPF and Saltstone will not change. Waste produced via cementation – Scaled down from WSB - TRU – none - Mixed TRU – none - LLW – 50,000 gal/yr (liquid) - LLW – 50 m^3/yr (solid) - MLLW – none - Hazardous – 0.1 m^3/yr (solid) - Non-Hazardous – 500,000 galyr (liquid) Non Hazardous – 50 m^3/yr (solid)	Disposition waste/products produced: • 80 SNF canisters • Saltstone grout – 970,000 gallons • LLW (CASTOR casks with empty fuel canisters) – (72,000 cubic feet) Waste generated at Saltstone will not change.
Disposition plans for wastes: - Packaging (e.g., drums, boxes, casks) - Onsite or offsite disposal (where?) - Need for temporary storage (where and duration?)	All waste will be dispositioned onsite via existing paths: DWPS canisters, Saltstone grout, LLW waste disposal in CASTOR casks in E-Area.	Most waste will be dispositioned onsite via existing paths: DWPF canisters, Saltstone grout, and CASTOR casks and empty fuel canisters in E-Area. LLW grout with U or U/Th may be dispositioned onsite in Castor casks and/or drums in E-Area or offsite.	All material will be dispositioned onsite: SNF canisters in dry storage in L-Area, Saltstone grout, and LLW waste disposal in CASTOR casks in E-Area.
Provide any safety documentation, including preliminary or draft scoping-level analyses (e.g., preliminary safety assessments, safety analysis reports) for that would be applied to storing this material for this facility.	No safety documentation changes needed.	No safety documentation changes needed for H Tank Farm, DWPF, or Saltstone. Cementation – no safety documentation developed to date.	TBD – The proposed activity may require a revision to the Tank Farm DSA to include LLW tanker unloading.
List any accident scenarios (in existing safety or NEPA documents) that need to be modified because of changes produced by the proposed action. It is recognized that the inventory and release fractions might change from the existing analyses. Would any of the potential accident scenarios and releases associated with the proposed action fall outside the existing safety bounds for this facility? For any substantially modified scenarios, the information listed below will ultimately be needed for the Draft EA and any insights from existing or ongoing analyses would be appreciated. We expect to use the same basic assumptions as the SPD SEIS with appropriate modifications to reflect the proposed action. Please provide new assumptions if different from those for the SPD SEIS:	None	Cementation – no safety documentation developed to date. Based on WSB, expect analysis to cover: Facility wide fire Cementation area fire Waste handling fire Transfer line loss of confinement Process room loss of confinement Seismic event Aircraft crash	TBD – The Tank Farm DSA may need to be revised to include LLW tanker unloading accident scenario. It is not anticipated that the potential accident scenarios and releases associated with the proposed action would fall outside the existing safety bounds.
Radiological accidents Accident description (include release pathways and mitigating factors) Accident frequency category Material at risk Material characteristics Source term released to environment (curies by isotope) Release parameters: release fractions, release timing, location, release height, release duration, and heat of release Filtration (specify efficiency)	No new radiological accidents or increases in material at risk.	No new radiological accidents or increases in material at risk for H Tank Farm, DWPF, or Saltstone. Cementation – no safety documentation developed to date. Based on WSB, expect analysis to cover: Facility wide fire Cementation area fire Waste handling fire Transfer line loss of confinement Process room loss of confinement Seismic event Aircraft crash	TBD

V. Process and Vitrify Liquid Waste at S-Area, Z-Area and H-Area

Characterize the principal required activities after processing the HEU in H-Canyon according to the two process options or after processing after the melt/dilute process in L-Area. This would involve pretreatment and processing through DWPF, HLW canister storage in S-Area, and storage or disposal of LLW at SRS (including Saltstone) or offsite.

Information Requested	Vitrify Liquid Waste From Processing Up to 900 Kilograms of HEU through H-Canyon or L-Area(Action Alternative), Dissolution and Purification Options (please provide numerical data in commonly reported units)		
	Option 1 – Process HLW (Pu, U, Th, FP) from H-Canyon Discards	**Options 2/2T – Process HLW (Pu, FP) from H-Canyon Discards to HTF, and downblend, solidify, and dispose of U/Th**	**Option 6 – Receive and process LLW salt solution**
Chemical inventory for chemical accident analysis - List chemicals, total facility inventory, and annual usage of the chemical - Size and location of largest tank (storage container) for each chemical. Include floor area or diked area that would contain the spill when applicable. - Concentration of chemical in largest tank (identify if this is the highest concentration of the chemical being stored). If not, also list the other storage locations, size of tank and concentration of chemical being stored.	No new chemical accidents or changes in chemical inventories.	No new chemical accidents or changes in chemical inventories for H Tank Farm, DWPF, or Saltstone. Cementation – Annual usage scaled down from WSB. Inventory from largest tank. HNO_3 (50%) – 1,000 Kg/yr – 250 gal inventory, largest tank NaOH (50%) – 4,000 kg/yr – 1000 gal inventory, largest tank	No new chemical accidents or changes in chemical inventories.
Design basis earthquake frequency and intensity (if different from SPD SEIS)	This information for all SRS facilities is contained in WSRC-TM-95-1, Standard No. 01060 (pages 22-23), which is provided as an attachment.		
Earthquake frequency that would result in loss of structural integrity intensity (if different from SPD SEIS)	The frequency that would result in loss of structural integrity is not precisely known, but will be < 4E-04.		
Other natural phenomena that would result in loss of structural integrity and their frequency intensity (if different from SPD SEIS)	This information is contained in the existing facility DSAs. No other NPH events result in loss of structural integrity for the various facilities.		
Aircraft crash intensity (if different from SPD SEIS)	This information is contained in the existing facility DSAs. There are separate frequencies for different types of aircraft (helicopter, light plane, etc.). .		

VI. Additional Information

General Project Information

Information Requested	Response
Provide a summary description of the storage configuration of the fuel at the German reactors, the planned process for retrieving and loading the fuel into the CASTOR cask, and whether any US Government representatives will participate as observers. This is for completeness, not analysis.	No US Government observers planned to participate in transport from Germany. MORE INFO COMING FROM GERMANS To be provided
Provide a basic discussion of how the fuel would be transported in Germany to the port and the process of loading it aboard the ship. This is for completeness, not analysis.	MORE INFO COMING FROM GERMANS To be provided
Provide information regarding the vessels to be used for transport across the Atlantic to Joint Base Charleston (e.g., PNTL or other purpose-built ship; what will the INF class of the vessel be?). Will ships be chartered (i.e., sole cargo)?	The ship for the transports has yet to be selected from 2 competing providers. This will be decided after the October meetings. Ship A can be selected from two sister vessels that are currently trading as general cargo vessels that would be modified to meet the INF2 criteria for ocean transport if selected for the project. Ship B can be selected from a fleet of purpose built INF3 vessels. This fleet was designed to the INF3 standard and would not require any modifications to be chartered into this project. Either vessel type will be sailing with the casks shipped from Julich as their sole cargo. The cumulative activity of the casks selected for both the 8 and 16 cask shipments will be within the INF2 limit. On discharge at JBC the vessel will return on a ballast-only voyage to Germany to undertake the next consecutive voyage.
Provide a description of the chain of custody for the spent fuel, i.e., when is the fuel ownership transferred to the US?	To be provided
Provide a description of the current status of the CASTOR cask for German and international transport (i.e., certificate(s) of compliance with what regulations).	The CASTOR cask is being reviewed by DOE Packaging and Transportation for evaluation of meeting the TYPE B requirements. A DOE CoC is planned to be issued (don't know the timing on this because it is handled at LLNL). Should be soon they've been reviewing for over a year. Then a competent authority review will be requested from the DOT. 10CFR71 are the code requirements for Type B containers/casks that must be met regardless of if it's a DOE or NRC certification.
Please confirm that there is no intent to store the casks at the US port; that casks will be transferred directly from the ship to rail cars for transport to SRS.	There is no intent for storage at the Port except for assembly of the ISOs for rail transport.
Provide summary description of security requirements specific to the ship transport as well as land transport to SRS.	This is not releasable information
Describe the communications that will occur with regulators and the public both before and during the proposed shipment of the spent fuel to SRS.	This is not releasable information

Radiological Characteristics	
Information Requested	**Response**
Provide a safety analysis report for packaging for the CASTOR cask.	This is being worked due to issues with proprietary information. Wouldn't the CoC/SER be better for the EA than the entire SAR? It should be available in the Fall.
Is there a difference in the compositions in the AVR versus THTR fuel? If so explain and provide data (below).	Yes, the AVR reactor tested many different compositions of the fuel both BISO and TRISO versus the THTR which utilized mainly TRISO fuel.
Provide average radiological characteristics for the CASTOR cask inventories for both the AVR and THTR spent fuel. - Typical curie content per pebble or cask for the key radionuclides decayed to the current timeframe (isotopic composition of HEU and fission product inventories from AVR and from THTR in a cask (curies of each isotope)). - The expected dose rate at 1 meter from the cask.	To be provided
Provide data on the current inventory of U-233 and U-232 from the irradiation of thorium in each pebble or in a cask.	To be provided
Information on the pebble integrity would be appreciated. Are any of the pebbles contaminated from the failed AVR fuel? Are any of the failed AVR fuel pebbles included?	Failed Fuel (cracked pebbles) is contained within the CASTOR Casks. Based on SRNL research to date the fission products have remained in the fuel kernels.
Provide documentation on the structural integrity of the fuel, and its behavior in a severe accident involving high temperature fire events. - provide analysis on the integrity CASTOR inner basket in a severe accident. - provide data on the release fractions from fuel for the following categories; noble gases, halogens, semi-volatiles, and particulate fines.	To be provided
Provide information on dose rate buildup as a function of time (for example, after processing, how will the dose rate change with time?).	To be provided

Transportation	
Information Requested	**Response**
For shipments of spent fuel from Germany:	There will be 29-30 shipments. See below
- Number of CASTOR casks per shipment. (S-2 Briefing says 12; S-1 Briefing says 16). We can assume 12 casks in a shipment (to be conservative in the number of shipments). Is this OK?	The current plan is for the first voyage to have 8 casks onboard. The subsequent 9 voyages will have 16 casks onboard and thereby complete the shipping of the entire Julich AVR inventory. Eight casks are considered a prudent quantity for the first voyage, which would allow for the grounding of procedures and protocols so as to ensure the 16 cask shipments will be conducted in a safe, efficient and timely manner. The THTR inventory consists of 303 casks, assuming the 16 casks/ship would result in 18 shipments of 16 casks and 1 shipment of 15 casks. (However the transportation group is not focused on the THTR inventory at this time so the information is only a guess based on what is working best for Juelich.)
- Configuration of casks for ship transport.	To be provided
- Duration of trip from Germany to US port (assume 22 days?).	Distance from North German port to Charleston is 4,019 nautical miles. The service speed for the ships is considered to be 15 or 16 knots. At 15 knots - 11 days 4 hrs. At 16 knots - 10 days 11 hours. For the purpose of scheduling the shipments the current plan allows 15 days for the transatlantic voyage. In the winter months additional days may be required, particularly on the westerly crossing of the Atlantic.
- Number of crew members on board and number of inspections of the cargo per day (i.e., inspecting cargo to ensure it is secure). Assume one inspection per day with 2 workers per inspection with inspection lasting 1 hour?	With respect to inspections, it is the responsibility of each offgoing watch deck officer and the engineer to inspect the cargo at the end of their 4-hour watch which means the cargo would be inspected six times per 24 hour period by two crew. Regarding the crew, the complement would meet the statutory requirements (each flag state specifies the number of crew in a safe manning certificate issued by the flag state) for either Vessel A or B. However, both ships, when carrying an INF cargo, will carry in excess of the numbers specified in the safe manning certificates.
Number of workers at the port to remove casks from ship and approximate proximities (handlers, security, others) and duration (e.g., per cask or per shipment). (Actual experience from the FRR SNF receipt at the port).	10-12 workers
Are there any plans to use ISO containers for shipment or will the CASTOR casks be the outmost shipping packaging?	The CASTOR casks will not be the outmost shipping container. The casks will be within the shipping frame which has integrated hard shell sides, top and bottom, designed to meet the specifications of an ISO.
Configuration of casks for transport in US. (we can assume 1 cask per rail car).	Planning for 2 casks per rail car
For each type of waste to be shipped offsite for disposition: - Projected packaging (e.g., type of cask) - Type of vehicle (i.e., rail or truck) - Estimated number of waste containers per shipment - Projected waste disposition location	Currently, the only waste planned for shipment off site is the HLW generated from the additional DWPF cans. LLW generated will be discarded to Saltstone and the E-Area trenches. While the U/Th from the cementation process has the option for shipment off-site, the preferred method will be disposal within CASTOR casks in the E-Area trenches.
For projected shipments of downblended uranium to an offsite vendor (process option 1): - Projected packaging - Type of vehicle - Estimated number of packages per shipment - Projected vendor receiving uranium	**No longer considered valid option per DOE**
For delivery of major quantities of resources to SRS for construction activities (e.g., concrete, steel, asphalt), indicate the projected source locations for the resources	The soil, crushed stone, asphalt, and concrete will be obtained from local suppliers. The steel products will be purchased using approved suppliers and the normal purchasing process.

Socioeconomics	
Information Requested	**Response**
Provide an updated number employed at SRS with latest information.	7224 (See below)
What would be the peak employment levels for each option?	Assuming the current site employment remains constant, the peak employment for each option would increase by 25 to 40 full time employees. There should be minimal differences in the peak employment levels for each option.

Please provide an update to this table using the latest information available.

Distribution of Employees by Place of Residence in the Savannah River Site Region of Influence in 3Q 2014

County	*Number of Employees*	*Percent of Total Site Employment*
Georgia Counties		
Burke	35	0.5%
Columbia	1152	15.9%
Jefferson	4	0.06%
Lincoln	12	0.2%
McDuffie	17	0.2%
Richmond	820	11.4%
Screven	29	0.4%
Other	28	0.4%
Georgia Totals	**2097**	**29.0%**
South Carolina Counties		
Aiken	3860	53.4%
Allendale	39	0.5%
Anderson	1	0.01%
Bamberg	86	1.2%
Barnwell	459	6.4%
Beaufort	3	0.04%
Berkeley	3	0.04%
Calhoun	3	0.04%
Charleston	3	0.04%
Colleton	24	0.3%
Edgefield	214	3.0%
Greenwood	8	0.1%
Hampton	56	0.8%
Lexington	108	1.5%
McCormick	19	0.3%
Newberry	4	0.06%
Orangeburg	100	1.4%
Richland	13	0.2%
Saluda	24	0.3%
Other	69	1.0%
South Carolina Totals	**5096**	**70.5%**
Other States	**31**	**0.4%**
Region of Influence Total	**7,224**	**100%**

The data it taken from the following link: http://sro.srs.gov/docs/srsheadcountbycountyofresidence_q3fy2014.pdf

German Fuel Data Call Response
Follow-up Questions

10/22/2014

1. Analysis indicates that Pu-238 is a dominant nuclide for the inhalation exposure pathway for accident scenarios. Please confirm that the inventory of Pu-238 in Table 1.6 of *Process Description for Processing of HTGR Pebble Fuel at SRS* is correct.	The inventory of Pu-238 as shown in Table 1.6 is correct.
2. Verify that the vessels used for transport across the global commons will at a minimum meet INF Class 2 requirements.	The vessels to be used will at a minimum meet INF Class 2 requirements.
3. On L-Area and H-Area figures that illustrate the storage of CASTOR casks: a. Does the storage area shown in L-Area exist or does it need to be constructed? We interpret the figure as indicating this is new construction. Per the data call Response, we assume this is a 70,000 sq ft pad and that an additional 120,000 sq ft of land would be disturbed for roads, etc. Please confirm.	The storage pad in L-Area does not exist and will need to be constructed. The CASTOR casks will be stored in a square-pitched array on 8 ft centers. This will require a minimum storage pad area of 29,120 sq ft. Providing for a 20 ft path through the middle of the array and a 10 ft outside perimeter would add about 10,000 sq ft. Therefore, the land disturbance for the pad would be 40,000 sq. ft. To support the off-loading of casks, a 16 ft wide travel parameter around the pad, and a 20 ft road to an access drive, an additional 35,000 sq ft land disturbance would be required.
b. We previously understood there was storage capacity (maybe only temporary) for a portion of the CASTOR casks. Where is this area, what is its size and capacity?	In H-Area, there are four existing concrete storage pads that could store the first 152 casks. Response 3.d below discusses the size and capacity of the areas. In L-Area, the storage capacity does not exist. It is thought that the storage pad for a portion of the casks would be constructed and then expanded with the receipt of additional casks.
c. The L-Area figure implies storage for only about 150 CASTOR casks; where would the other 305 casks be stored?	The figure does imply storage for 152 casks. This is the “portion” considered in 3.b. above. The other 305 casks will be stored in the same location, with the pad expanded.
d. On the H-Area figure, which of the storage areas shown are existing and what is the area of each?	The three pads labeled “Jumper Storage” (66 casks, 75 casks, 69 casks) are existing concrete pads. The pad labeled “Laydown Yard” (49 casks) is also an existing concrete pad. The area labeled “Quonset Hut” (99 casks) is a crusher stone pad. The area labeled “Laydown Area” (97 casks) will require land disturbance with a crusher stone pad. The areas are as follows: 66 casks – 5,000 sq ft, 75 casks – 5,700 sq ft, 69 casks – 5,300 sq ft, 49 casks – 3,600 sq ft, 99 casks – 7,000 sq ft, 97 casks – 7,000 sq ft.

e. On the H-Area figure, which of the storage areas need to be constructed? Per the Data Call Response, we understand that these amount to 5,000 sq ft (total?) and that the total area disturbed would be 25,000 sq ft. Please confirm.	The “Laydown Area” storage pad would need to be constructed and would be about 7,000 sq ft. Some addition land around the “Quonset Hut” and “Laydown Area” will be disturbed, estimated to be 10,000 sq ft.
f. Please explain the overall plan for CASTOR storage: would the casks be stored only in the area where their contents would be processed (i.e., only in L-Area if Melt and Dilute in L-Area were the selected technology; no storage in L-Area if one of the other technologies were selected); or could there be storage in one area with processing in the other? If storage and processing could occur in different areas, how would the CASTOR casks be moved between L- and H-Areas?	The overall plan has not been developed. The casks could be stored in the area the processing will occur, or could be stored in the alternate area. If storage and processing occur in different areas, movement of the casks will be by rail.
4. What is the process (technology) for removing the tops from the CASTOR inner canisters (e.g., shear, mechanical saw, cutting torch)?	The specifics have not been identified. The site has experience in remote handling and operation of multiple means for cutting operations.
5. The most recent draft of the Project Description Document and the Waste Management Disposition Strategy sometimes differ in their estimates of waste volumes. Please verify that in the event of a discrepancy, the Waste Management Disposition Strategy estimates take precedence.	The documents should be in complete agreement. If not, it will be corrected.
6. Provide an estimate of the annual radiological emissions from the LEU and the LEU/Th solidification capability.	There will not be any radiological emissions from the solidification facility.
7. Please provide an estimate of the annual radiological emissions from the two principal processing functions that would occur in L-Area under the melt and dilute alternatives; that is digestion and the melting?	The total radiological emissions will be gases after scrubbing operations. C-14 – 2.16E+01 Ci/yr CL-36 – 3.56E-02 Ci/yr I-129 – 3.37E-03 Ci/yr H-3 – 2.66E+02 Ci/yr Kr-85 – 2.97E+02 Ci/yr Rn-219,-220,-222 & At-217 – 2.91E+00 Ci/yr
8. What are the annual carbon dioxide (CO_2) and carbon-14 emissions from the carbon digestion process? If it would be different between H-Area and L-Area, identify the emissions from each area.	For C-14 from L-Area, see above. The annual release of CO_2 is 103 tons/yr from L-Area. The Data Call is updated with the revised values for L-Area and H-Area options.
9. Transportation: Provide the following information on the DU to be used for down blending the U or U/Th stream: - Source (where is it coming from)	 Twelves drums of depleted uranium trioxide power are stored on site. Approximately six drums will be used for downblending.

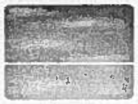
- Radiological characteristics (concentration)	Powder
- Chemical form	Uranium trioxide, UO_3
- Transport information – tank car capacity; number of tank cars; transport frequency	The DU is stored in 55 gallons drums and would be transported by truck.
10. Radiological Characterization: This is a modification of an earlier question regarding radiological characterization: Provide information on inventory and dose rate buildup as a function of time for separated HEU (for example, after processing, how will the dose rate and nominal inventory (e.g., per container) change with time?) Please provide data for after 90 days and 1 year. [Note: per discussions with DOE, we are including analysis of shipment to offsite disposal facilities so we need characterization of the grouted waste form for transportation analyses.]	The processing of the material through solvent extraction removes the activation product in-growth such that the dose rate is very low for the cementation process. However, the growth of activation products is fairly significant such that storage for more than a few months is not possible without significant shielding. Additional information being developed.
11. The Federal Register Notice of Intent stated: *Currently identified alternatives include on-site disposal in the E-Area at SRS and, potentially, pursuing reuse of the transport casks.* What activities/inquiries have been made regarding reuse of the casks and what was the result [since this was mentioned in the FR, we want to close out the issue in the EA].	Currently, no action has been taken with respect to inquiries for interest in reuse of the CASTOR casks.
12. Tables 5.9 and 5.12 of the draft Process Description for Processing of HTGR Pebble Fuel at SRS indicate that the solidified U or U/TH waste could contain relatively large quantities of plutonium isotopes. Please indicate whether the presence of these isotopes could result in the classification of the solidified U or U/Th as transuranic waste.	The flowsheet assumes the solvent extraction flowsheet removes 99.99% of the Pu and that 0.01% of the Pu in the kernels remains in the U/Th. Past operating experience has shown that the efficiency for removal is greater than the assumed value. However, even with the assumed value, the concentration of transuranics in the grout will be less than 100 nCi/g.
13. Please provide a timeline of proposed activities.	I am not sure what is being requested. To what proposed activities are being referred?

The following are questions/requests for clarification of information provided in the Data Call Response: 14. The Data Call Response indicates in various places that land would be disturbed for storage at H- and L-Areas, construction of the solidification facility in H-Area, and construction of the Melt and Dilute capability in L-Area. For all instances where land would be disturbed, is it land that has been previously disturbed?	The land that will be disturbed in L-Area is previously undisturbed. The land in H-Area has been previously disturbed.
15. **Page 5, Row: Type and quantity of air pollutant emitting equipment;** The L-Area Column indicates that approximately 1 acre of land would be disturbed. Please confirm that construction equipment would be necessary, and if so, confirm and/or update the response to be similar to the response on Page 2 for Receipt, Storage, and Transfer of CASTOR casks.	Diesel or gas powered back hoe, front end loader, road grader, crane, bucket truck, manlifts, dump truck, concrete truck and pumpers, utility flatbed truck, forklift, miscellaneous utility trucks & pickup trucks to D&R floors, cells, tanks, piping & miscellaneous equipment. Equipment use would include installation of new walls, cells, foundation for sand filter & associated equipment and truck well.
16. **Page 6, Row: Construction/modification;** For L-Area, the construction/modification is indicated to occur in contaminated areas, but the worker dose column indicates "N/A." Please provide a total worker dose or dose rate and duration.	The specific contamination areas do not generate any radiation rates, so there is no radiation dose for work in the area. The duration is marked N/A since there is not exposure to radiation rates. The duration of the construction period is 36 months.
17. **Page 6, Row: Construction/modification; Duration of work in rad area**: 36 months is indicated for H-Canyon. Please clarify if this is also the total duration of the construction period.	This is the duration of the construction period.
18. **Page 6 Row: Construction/modification; Resources needed**: The resources used don't appear to account for construction of the sand filter, fan room, and stack. Please provide the additional resources or confirm that the data call response is correct as is.	The following changes address the additional resources needed. Concrete – 550 cubic yards Steel Structural – 300,000 pounds Crushed Stone – 100 cubic yards Sand and Gravel – 100 cubic yards Lumber – 20,000 SF
19. **Page 6, Row: Construction/modification Waste Generated for L-Area:** a. Please quantify the amount of LLW that would be generated	200 cu yd – concrete blocks wrapped in plastic 1800 cu ft – 20 B-25 boxes 6400 cu ft – 10 Skid pans
b. Is any of the 200,000 lbs of steel contaminated? If so, how/with what?	The 100,000 lbs of steel to be disposed of is contaminated.

c. The Data Call Response indicates that 90 percent of the concrete is nonhazardous. What about the remaining 10 percent? Is it hazardous and/or radioactive?	The remaining 10% would be from PCBs associated with the paint used when the building was built. In addition, the concrete could also be contaminated.
20. **Page 7 Row: Operations; Annual Worker Dose:** The H-Area column indicates 3 operators and 2 rad con techs (5 workers); the L-Area column indicates 4 workers. Should there be the same number and types of workers for Carbon Digestion activities in both areas? Please clarify.	The L-Area column states that it will be the same or less. For Carbon Digestion, is should be close to the same.
21. **Page 7, Row: Air emissions**: Please provide air emissions from L-Area, including existing and any new emissions attributed to carbon digestion (asked in Question 8) and other activities proposed for L-Area. Because the existing H-Canyon activities are much different than those in L-Area, it is not possible to use H-Canyon emissions data for activities in L-Area.	The total CO_2 will be 103 tons per year. The total radiological emissions will be gases after scrubbing operations. C-14 – 2.16E+01 Ci/yr CL-36 – 3.56E-02 Ci/yr I-129 – 3.37E-03 Ci/yr H-3 – 2.66E+02 Ci/yr Kr-85 – 2.97E+02 Ci/yr Rn-219,-220,-222 & At-217 – 2.91E+00 Ci/yr
22. **Page 7, Row: Operations; Employment (FTEs)**: Are there any baseline H-Canyon staff included in these activities that are not listed in the data call? If so, please provide the additional number and indicate how that would affect the L-Area FTEs as well.	There are no baseline H-Canyon staff included in the activities for Carbon Digestion.
23. **Page 8 Row: Waste Generated:** The H-Area column indicates that 10 CF of job control waste would be generated per cask. L-Area column does not list job control waste. Would there be job control waste generated for this effort in L-Area? If so, please specify the amount.	It is anticipated the job control waste would be the same as H-Area (on a per cask basis) since the basic operation for unloading the cask would be roughly the same. The numbers shown in the Data Call include that job control waste.

24. **Page 8 Row: Waste Generated:** Indicates for the alternative of carbon digestion in H-Canyon that empty TLK cans would be placed in the CASTOR casks and disposed as LLW. In addition, 10 CF of job control LLW would be generated per cask. About 790 CY/yr of LLW is projected assuming H-Canyon processing of 135 casks (790*27*455/135 = **71,890 CF**). This is close to the volume estimate that could be obtained by considering the outside volumes of the casks plus job control LLW. [That is, the casks have an outside length of 2.743 meters and a diameter of 1.38 meters, resulting in an individual cask volume of 4.1 CM or 144.88 CF. 455 casks plus 4550 CF of job control LLW at 10 CF/cask = 65,922 + 4550 = **70,472 CF**.] Although these two estimates are in reasonable agreement, there is a discrepancy between the approximately 70,000 CF of LLW estimated on page 8 for carbon digestion and the estimate of 170,000 CF of LLW given for all three options on page 24. On page 24, options 1 and 6 both refer to disposal of empty TLK cans within CASTOR casks, while Option 2/2T refers to disposal of cemented U/Th in the CASTOR casks. As noted, one would expect that in considering the outside volume of the CASTOR casks plus job control LLW, the LLW volume involving the casks would be on the order of 70,000 CF for all three options. Please clarify the difference between this estimate and the estimate of 170,000 CF given on page 24.	The value of 170,000 was related to initial input provided. The correct number should be about 72,000 cu ft.
25. **Page 11, Rows: Construction/modification**: The Option 6, Melt and Dilute column, which refers to the General Description row, appears to be providing information for operations not construction/modification.	That is correct and has been deleted from the Data Call. The construction/modification required will be associated with the installation of the equipment for the melt/dilute process. The construction work for modification of the 105-L building in support of pebble digestion included the facility layout changes required for the installation of the equipment. A description of the equipment to be constructed and the layout for installation is shown in the SRNL Process Description document.
26. **Page 12, Row: Construction/modification, Air Emissions (point source)**: Would any radiological emissions be expected from construction in a contaminated area? If so, please specify.	No, there should not be any air emissions from construction in a contamination area.

27. **Page 13, Row: Operations, Schedule for Operations:** Please provide the projected time for operations at H-Canyon for Option 1 and Option 2/2T. [Under Option 1, the HEU kernels would be dissolved at H-Canyon then transferred to the waste system; under Option 2/2T, the HEU kernels would be dissolved and the uranium/thorium would be separated from the rest of the radioactive material using solvent extraction at H-Canyon, so the time periods would be different.]	The projected time for digestion and direct discard (Option 1) is approximately 42 months. The projected time for (Options2/2T) is approximately 48 months. The processing of the kernels through solvent extraction and the cementation process should be completed with 6 months after completion of digestion.
28. **Page 14, Row: Employee Radiological Exposure**: Please provide employee exposure data for L-Area. Because the existing H-Canyon activities are much different than those in L-Area, it is not possible to use H-Canyon data for L-Area exposure as indicated.	There is no radiological exposure during the processing of the kernels to ingots. There will be same small quantity of exposure for packaging the ingots into dry storage canisters. The quantity should be the same or less than that for unloading the casks. The total exposure should be less than 1,080 mrem/yr.
29. **Page 14, Row: Operations; Waste generated**: Where would the SNF canister storage pad be located in L-Area? Would a new pad need to be constructed?	The canisters would be stored in empty locations on the same pad as the Castor casks. A new storage pad would not be required.
30. **Page 14, Row: Operations; Waste generated**: Would the Melt and Dilute Alternative in L-Area generate wastes such as LLW or solid nonhazardous waste in addition to the SNF canisters?	Additional information being developed.
31. **Page 22, Row: Schedule for Operations:** This row states that implementing Option 6 would result in 20 additional operational days for the Saltstone facility, which is the same as indicated for Option 1, under which much more Saltstone would require processing and disposal. Please clarify.	The numbers were based on initial input for LLW to Saltstone. Based on the current values of 1.46E6 gallons for Option 1 and 9.68E5 gallons for Option 6, the number of days will be 24 days and 16 days, respectively.



Fw: NEPA for German Fuel

Herbert Crapse to: Lee Fox 10/28/2014 09:55 AM

Herbert Crapse	Fw: NEPA for German Fuel

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Date:	09/28/2014 02:05 PM
Subject:	NEPA for German Fuel

Jean and Bert-

Can you confirm/markup this section of the NEPA EA? If possible we need it by Thursday to get back to the NEPA contractor.

1.1.1.1 *High-Level Radioactive Waste*

The F- and H-Area tank farms have received over 150 million gallons (570 million liters) of HLW liquid waste from SRS operations **[DOE TO CONFIRM VOLUMES AND CHARACTERIZATION]** (SRR 2014b). Currently, approximately 37 million gallons (140 million liters) of waste containing about 287 million curies of radioactivity are stored in 45 underground tanks (SRR 2014a, 2014b). Approximately 2.3 million gallons (8.7 million liters) of operational working capacity remains in the F- and H-Area tank farms (SRR 2014b).

DOE is using a process involving deliquification, dissolution, and adjustment to treat certain salt waste, with additional processing of salt waste using the Actinide Removal Process and Modular Caustic Side Solvent Extraction Unit (SRNS 2009a). The treatment process results in a high-activity, low-volume HLW liquid waste stream that is vitrified at DWPF and a low-activity, high-volume LLW liquid waste stream (salt solution) that is disposed of onsite after processing at the Z-Area Saltstone Facility. After completion of the Salt Waste Processing Facility, expected to become operational in 2018 (SRR 2014a), additional salt waste treatment capacity will be available. After treatment operations are completed, approximately 223 million curies of salt waste will have been removed from the F- and H-Area tank farms (71 FR 3834; WSRC 2007a).

DWPF was constructed to solidify liquid HLW stored in the F- and H-Area tank farms into a vitrified form for eventual geologic disposal, which would then allow the HLW tanks to be closed. DWPF began operating in March 1996, and is projected to complete vitrification of the HLW in the F- and H-Area tank farms by 2039 (SRR 2014b). Operations consist of mixing a sand-like borosilicate glass (called frit) with the waste, melting the mixture, and pouring it into stainless steel canisters to cool and harden. Each canister is 10 feet (3 meters) tall and 2 feet (0.6 meters) in diameter and has a filled weight of about 5,000 pounds (2,300 kilograms). Filled canisters are taken from DWPF to one of two adjacent Glass Waste Storage Buildings. The estimated storage capacity for the two storage buildings is approximately 4,590 canisters (SRR 2014a). Construction of additional storage is planned. The canisters will remain in safe, secure storage pending decisions on a long-term solution for management of HLW and used nuclear fuel. DOE has terminated the program for a geologic repository for used nuclear fuel and HLW at Yucca Mountain, in Nevada. Notwithstanding the decision to terminate the Yucca Mountain program, DOE remains committed to meeting its obligations to manage and ultimately dispose of used nuclear fuel and HLW. DOE established the Blue Ribbon Commission on America's Nuclear Future to conduct a comprehensive review and evaluate alternative approaches for meeting these obligations. The Commission report to the Secretary of Energy of January 26, 2012 (BRCANF 2012) provided a strong foundation for the development of the Administration's January 2013 Strategy for the Management and Disposal of Used Nuclear Fuel and High-Level Radioactive Waste (DOE 2013a). This

Strategy provides a framework for moving toward a sustainable program to deploy an integrated system capable of transporting, storing, and disposing of used nuclear fuel and high-level radioactive waste from civilian nuclear power generation, defense, national security, and other activities. The link to the strategy is http://energy.gov/downloads/strategy-management-and-disposal-used-nuclear-fuel-and-high-level-radioactive-waste. Full implementation of this Strategy will require legislation. Through December 31, 2013, 3,754 canisters of waste containing about 52 million curies had been poured at DWPF (SRR 2014b).

1.1.1.2 *Low-Level Radioactive Waste*

Both liquid and solid LLW are treated at SRS. Most aqueous LLW streams are sent to the F- and H-Area Effluent Treatment Project (formerly called the Effluent Treatment Facility) and treated by pH adjustment, organic removal, reverse osmosis, and ion exchange to remove chemical and radioactive contaminants other than tritium. This facility is designed to process 100,000 to 250,000 gallons (380,000 to 950,000 liters) of low-level radioactive wastewater daily. The maximum permitted facility capacity is 430,000 gallons (1.6 million liters) per day, or about 160 million gallons (590 million liters) per year. Actual processing is approximately 20 million gallons (76 million liters) of wastewater per year, or 55,000 gallons (210,000 liters) per day (WSRC 2006a, 2006b, 2007b). After treatment, the effluent is discharged to Upper Three Runs through an NPDES permitted outfall. The treatment residuals are concentrated by evaporation and stored in the H-Area tank farm for eventual treatment in the Z-Area Saltstone Facility where wastes are immobilized with grout for onsite disposal (DOE 1999b; SRR 2012).

LLW is primarily disposed of in engineered trenches and slit trenches. As of February ~~2012~~ 2014 **[DOE – ANY UPDATES ON THIS INFORMATION?]**, about ~~18,000~~ 96,000 cubic yards (~~14,000~~ 75,000 cubic meters) of disposal space remained in the engineered trenches and about ~~30,000~~ 230,000 cubic yards (~~23,000~~ 180,000 cubic meters) of disposal space remained in ~~the two active~~ slit trenches (SRNS 2012a). ~~Although some disposal capacity remains in~~ Concrete vaults located in E-Area~~, these vaults~~ are used primarily ~~to stage LLW prior to shipment for off-site disposal and~~ to dispose of the higher radioactive fraction of the LLW generated at SRS. Although most solid LLW is disposed of on site at SRS, some LLW is shipped off site for disposal at DOE's Nevada National Security Site and commercial facilities (SRNS 2009a).

The Z-Area Saltstone Facility solidifies and disposes of low-activity liquid wastes including liquid waste from the Effluent Treatment Project and salt solution separated from HLW. Saltstone is solidified grout formed by mixing liquid waste with cement, fly ash, and furnace slag, and disposing of the mixture as LLW within large concrete vaults (SRR 2012).

1.1.1.3 *Hazardous Waste*

Hazardous waste is nonradioactive waste that SCDHEC regulates under RCRA and corresponding state regulations. Hazardous waste is accumulated at the generating location or stored in U.S. Department of Transportation (DOT)-approved containers in E-Area. ~~A section of the TRU waste storage pads (e.g., TRU Pad 26-E) has been permitted to store MLLW and hazardous waste and has a storage capacity of 390 cubic yards (296 cubic meters). Most~~ Hazardous waste is shipped off site to commercial RCRA-permitted treatment and disposal facilities using DOT-certified transporters (DOE 1999b). DOE also recycles, reuses, or recovers certain hazardous wastes such as metals, excess chemicals, solvents, and chlorofluorocarbons (DOE 2002).

1.1.1.4 ***Nonhazardous Waste***

Solid nonhazardous waste is sent to the Three Rivers Regional Landfill, which is located within the SRS site boundary (DOE 2002) and serves as a regional municipal landfill for Aiken, Allendale, Bamberg, Barnwell, Calhoun, Edgefield, McCormick, Orangeburg, and Saluda Counties. The Three Rivers Regional Landfill has a 300-acre (120-hectare) footprint with a remaining capacity in excess of 38 million cubic yards (29 million cubic meters) of waste as of 2014 (LRSWA 2014). Although the landfill is permitted to annually receive up to 550,000 tons (500,000 metric tons) of nonhazardous solid waste **[DOE – PLEASE PROVIDE UPDATES ON VOLUMES]** (SRNS 2012a), it typically annually receives about 250,000 tons (230,000 metric tons) of waste (TRSWA 2014). Construction and demolition debris is disposed of in an onsite landfill (DOE 2012b).

Thanks,
Maxcine Maxted

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Fw: NEPA for German Fuel
Herbert Crapse to: Lee Fox 10/28/2014 09:55 AM

Herbert Crapse	Fw: NEPA for German Fuel	10/28/2014

As discussed.

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Date: 09/28/2014 02:03 PM
Subject: NEPA for German Fuel

Bert-

Can you confirm and update the information in this section of the NEPA on waste generation? If possible we need it by Thursday to get back to the NEPA contractor

1.1.1.1 *Waste Generation*

Table 3-10 summarizes generation rates at SRS through fiscal year ~~2010~~ 2014 **[UPDATE SOUGHT FROM DOE FOR THE NUMBERS]** for low-level radioactive waste (LLW), hazardous waste, and nonhazardous solid waste and construction and demolition debris. Hazardous waste is disposed off-site, nonhazardous solid waste and construction and demolition debris are disposed on-site, and LLW may be disposed of on- or off-site. Generation rates for HLW, liquid LLW, and liquid sanitary waste are not included in Table 3-10, but are discussed in following subsections. Annual volumes of liquid wastes solidified at the Z-Area Saltstone Facility are, however, included in Table 3-10 because the solidified liquids are all disposed of on-site as LLW. Table 3-11, Table 3-12, and Table 3-13 **[UPDATE SOUGHT FROM DOE FOR THE NUMBERS],** respectively, provide summaries of current and planned treatment, storage, and disposal facilities at SRS for the wastes addressed in this EA.

Table 3-10. Waste Generation Rates at the Savannah River Site (cubic meters) [DOE UPDATE/CONFIRMATION REQUESTED FOR ALL TABLE DATA]

Waste Type	Savannah River Site – Total		L-Area Complex		H-Canyon in H-Area		HB-Line in H-Area		DWPF in S-Area		Z-Area Saltstone		E-Area and Hazardous/Mixed Waste Storage	
	5-Year Average	FY20~~10~~ 14	5-Year Average	FY20~~10~~ 14	5-Year Average	[illegible] 14	5-Year Average	FY20~~10~~ 14	5-Year Average	FY 201~~0~~ 14	5-Year Average	FY 201~~0~~ 4	5-Year Average	FY 201~~0~~ 4
LLW	13,000	~~7,700~~ 4,000	~~TBD~~ 250	~~TBD~~ 60	~~650~~ 450	400	~~97~~ 60	~~130~~ 30	~~230~~ 350	~~190~~ 430	~~TBD~~ 180	~~TBD~~ 120	5	5
Hazardous	~~83~~ 24	~~12~~ 77	~~TBD~~ 0	~~TBD~~ 0	0	0	0	0	0	0	N/A	N/A	0	0
Nonhazardous solid waste [a]	~~2,400~~ 7,000	2,600 2,500	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C&D debris [b]	~~83,000~~ 70,000	~~130,000~~ 35,500	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Source: SRNS 2012a.

C&D = construction and demolition; DWPF = Defense Waste Processing Facility; FY = fiscal year; LLW = low-level radioactive waste; N/A = not available;

[a] Sanitary waste is provided for all of the Savannah River Site (information by individual area is not available). Waste sent to the recycle facility and Three Rivers Regional Landfill (TRL) is measured by weight with volume estimated at 1 metric ton per cubic meter (1,690 pounds per cubic yard).

[b] C&D landfill waste volume is based on truck volumes received. About 36 percent of the reported waste mass/estimated volume is sent to the recycling facility and not disposed of in the C&D landfill. Waste generation does not include waste-like materials recovered through salvage and excess property operations, or materials recovered through construction services.

Note: To convert cubic meters to cubic feet, multiply by 35.314.

	Capacity	Status	Waste Type				
			High-Level Radioactive	LLW	Mixed LLW	Hazardous	Nonhazardous
Treatment Facility							
Defense Waste Processing Facility	275 canisters per year nominal[a]	Operating	X				
Tank Farm Evaporators	2H-Evaporator: 810,000 liters per week[b]; 2F and 3H-Evaporators: 2.1 million liters per week total	Operating		X			
Salt Waste Processing Facility	34 million liters per year, maximum rate	Planned for 2018	X				
Interim processing of salt waste	15 liters per minute	Operating	X				
F- and H-Areas Effluent Treatment Project	590 million liters per year	Operating		X	X		
Savannah River Technology Center Ion Exchange Treatment Probe	11,200 cubic meters per year	Operating			X		
Z-Area Saltstone Facility	28,400 cubic meters per year	Operating		X			

Treatment Facility	1.5 billion liters per year	Operating						X

Source: DOE 1999; SRNS 2012a; SRR 2014a, 2014b; WSRC 2006a, 2007a, 2007b.

[a] For sludge waste processing.

[b] Expected average annual rate of treatment of the Defense Waste Processing Facility recycle. The 2H-Evaporator only treats the Defense Waste Processing Facility recycle. All evaporators are assumed to operate at 50 percent utility.

[c] The interim processing facility, which will ultimately be replaced by the Salt Waste Processing Facility, processes salt waste from the high-level radioactive waste tanks to separate the higher activity fraction of the waste (to be sent to the Defense Waste Processing Facility for vitrification) from the lower activity fraction of the waste (to be sent to the Z-Area Saltstone Facility for disposal).

Note: There are no dedicated treatment facilities for transuranic and mixed transuranic wastes. To convert cubic meters to cubic feet, multiply by 35.315; to convert liters to gallons, multiply by 0.26417.

Table 3-11. Waste Treatment Capabilities at the Savannah River Site

Table 3-12. Waste Storage Capabilities at the Savannah River Site

Facility Name	Capacity	Status	Waste Type					
			High-Level Radioactive	Transuranic	Mixed Transuranic	Low-Level Radioactive	Mixed Low-Level Radioactive	Hazardous
Storage Facility								
High-Level Liquid Radioactive Waste Tank Farms	8.7 million liters [a]	Operating	X					
Glass Waste Storage Buildings	4,590 canisters in two existing buildings	Operating	X					
Failed Equipment Storage Vaults (Defense Waste Processing Facility)	2 exist, space allocated for 12 more vaults	Operating	X					
Transuranic Waste Storage Pads [b]	13,200 cubic meters	Operating		X	X		X	X
Solvent Storage Tanks at the Consolidated Incinerator Facility, S33–S36	105,000 liters per tank rc	Operating				X	X	

Source: DOE 1999b; DOE 2012a; SRR 2014a, 2014b; WSRC 2007a.

[a] Operational working capacity remaining in the F- and H-Area tank farms that does not include six tanks in F-Area that have been closed or space in other tanks that may not be viable for storage or is maintained for safety reasons. Currently, 37 million gallons (140 million liters) of high-level radioactive waste are stored in 45 underground storage tanks.

[b] TRU Pad s ~~26-E is~~ are permitted to accept hazardous waste and mixed low-level radioactive waste for storage. ~~and has a maximum~~

~~These tanks were originally to be used for solvent storage, however, they have been subsequently used to store other waste streams.~~

[c] Operating capacity.

Note: There are no dedicated low-level radioactive waste storage facilities. To convert cubic meters to cubic feet, multiply by 35.315; to convert liters to gallons, multiply by 0.26417.

Table 3-13. Waste Disposal Capabilities at the Savannah River Site

Facility Name	Capacity	Status	Waste Type	
			Low-Level Radioactive	Nonhazardous
Disposal Facility				
Intermediate-Level Low-Level Radioactive Waste Vaults[a]	4,300 ~~5,300~~ cubic meters per vault	Operating	X	
Low-Activity Low-Level Radioactive Waste Vaults[a]	OK 30,500 cubic meters per vault	~~Limited Operations~~ Operating	X	
Low-level radioactive waste disposal facility slit trenches[a]	360,000 ~~182,000~~ cubic meters	Operating	X	
Low-level radioactive waste disposal facility engineered trenches[a]	140,000 ~~70,800~~ cubic meters	Operating	X	
Z-Area Saltstone Facility Vaults	Current circular disposal vaults each hold about 11 million liters of grouted waste; future circular disposal vaults will each hold about 114 million liters of grouted waste.	Operating	X	
Three Rivers Regional Landfill[b]	4.2 million cubic meters per year (permitted)	Operating		X
Construction and demolition debris landfill	2.47 million cubic yards total permitted capacity	Operating		X
288-F industrial solid waste landfill for ash from the A-Area power generating facility	105,776 cubic meters	Operating		X
488-4D industrial solid waste landfill for ash from the D-Area power generating facility	94,091 cubic meters	Operating		X

Source: DOE 1999b; DOE 2012a; SRNS 2012a; SRR 2013; WSRC 2007a.

[a] As of ~~February 2012~~ October 2014, the estimated unused disposal capacity remaining is approximately ~~22,000~~ 21,300 cubic meters for the Low-Activity Low-Level Radioactive Waste Vaults, ~~23,000~~ 180,000 cubic meters for the slit trenches, and ~~14,000~~ 75,000 cubic meters for the engineered trenches. ~~The Low-Activity Low-Level Radioactive Waste Vaults are generally used for waste staging;~~ The Intermediate-Level Low-Level Radioactive Waste Vaults are used for disposal of waste containing larger quantities of isotopes such as tritium and waste having surface radiation levels exceeding ~~200~~ 100 millirem per hour.

[b] The Three Rivers Regional Landfill is permitted to annually receive up to 500,000 metric tons of compacted solid waste. Assuming a pre-compaction density of 200 pounds per cubic yard, approximately 4.2 million cubic meters of pre-compacted waste can be annually disposed of at the landfill.

Note: Only low-level radioactive waste and nonhazardous waste are disposed of at SRS. To convert cubic meters to cubic feet, multiply by 35.315; cubic yards to cubic meters, multiply by 0.76456; liters to cubic meters, multiply by 0.26417.

Thanks,
Maxcine Maxted

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				Data	
Receiver	FY	Country	Reactor	Assemblies	Casks
SRS	1996	Chile	RECH-1	28	1
		Colombia	IAN-R1	21	1
		Germany	FMRB	92	3
			FRG-1	33	1
		Sweden	R2	64	1
		Switzerland	SAPHIR	42	1
	1996 Total			280	8
	1997	Canada	MNR	27	1
			PTR	14	0
		Germany	FRG-1	125	4
		Italy	Galileo	72	2
		Japan	JMTR	60	2
		Spain (Dounreay)	JEN-1	40	2
		Sweden	R2	112	2
		Switzerland	SAPHIR	92	2
	1997 Total			542	15
	1998	Australia	HIFAR	240	3
		Denmark	DR-3	61	2
		Germany	BER-ll	66	2
		Greece	GRR-1	42	1
		Italy	Galileo	13	1
			ISPRA	25	1
			RANA	38	0
		Sweden	R2	64	1
	1998 Total			549	11
	1999	Denmark	DR-3	120	4
		Germany	BER-ll	29	1
			FRJ-2	28	1
			FRM	33	1
		Indonesia	RSG-GAS	47	2
		Japan	JMTR	111	4
			JRR-2	60	2
		Philippines	PRR-1	51	2
		Portugal	RPI	39	1
		Spain (Dounreay)	JEN-1	1	1
		Sweden	R2	176	3
		Taiwan	THOR	35	1
			ZPRL	35	1
		Thailand	TRR-1	31	1
		Uruguay	RU-1	19	1
		Venezuela	RV-1	54	2
	1999 Total			869	28

Receiver	FY	Country	Reactor	Assemblies	Casks
SRS	2000	Brazil	IEA-R1	127	4
		Canada	MNR	39	1
			PTR	3	0
			SLOWPOKE Toronto	1	1
		Japan	JMTR	120	4
			JRR-2	60	2
			KUR	60	2
		Venezuela	RV-1	2	1
	2000 Total			412	15
	2001	Argentina	RA-3	207	5
		Austria	ASTRA	54	2
		Chile	RECH-1	30	1
		Germany	BER-ll	17	1
			FRG-1	33	1
			FRJ-2	120	2
		Italy	Essor	12	1
		Japan	JMTR	120	4
			JRR-2	52	2
			KUR	60	2
		Netherlands	HFR Petten	117	3
	2001 Total			822	24
	2002	Denmark	DR-3	255	6
		Germany	FRG-1	66	2
			FRJ-2	60	1
			FRM	48	2
		Japan	JMTR	240	8
			JRR-2	6	1
			JRR-3M	110	2
			JRR-4	44	1
			KUR	120	4
		Sweden	R2	153	3
	2002 Total			1102	30
	2004	Germany	BER-ll	33	1
			FRG-1	33	1
			FRJ-2	60	1
		Indonesia	RSG-GAS	112	3
		Japan	JMTR	120	4
			JMTRC	20	2
			JRR-3M	80	2
			KUR	60	2
			TTR-1	27	1
	2004 Total			545	17

Receiver	FY	Country	Reactor	Assemblies	Casks
SRS	2005	Japan	JRR-3M	80	3
			KUR	31	2
		Netherlands	HFR Petten	210	5
		Sweden	R2	128	2
	2005 Total			449	12
	2006	Austria	SAR-Graz	22	1
		Germany	FRJ-2	60	1
		Greece	GRR-1	46	2
		Netherlands	HFR Petten	210	5
	2006 Total			338	9
	2007	Australia	HIFAR	316	7
			Moata	14	0
		Japan	JMTR	120	4
			JMTRC	20	2
			JRR-3M	40	1
		Sweden	R2	192	4
	2007 Total			702	18
	2008	Argentina	RA-6	42	1
		Brazil	IEA-R1	33	1
		Germany	BER-ll	33	1
			FRG-1	33	1
			FRJ-2	158	3
		Japan	KUR	60	2
			TITAN	16	2
		Portugal	RPI	31	1
		Sweden	R2	111	3
	2008 Total			517	15
	2009	Australia	HIFAR	163	4
		Canada	MNR	42	1
		Indonesia	RSG-GAS	42	1
		Taiwan	ZPRL	36	1
			THAR	40	1
	2009 Total			323	8

Receiver	FY	Country	Reactor	Assemblies	Casks
SRS	2010	Chile	RECH-1	40	1
			RECH-2	29	1
		Germany	FRG-1	45	2
		Japan	JMTR	120	4
			JMTRC	20	2
			JRR-3M	40	1
		Israel	IRR-1	102	3
		Turkey	TR-2	29	1
	2010 Total			425	15
	2011	Canada	PTR	9	1
			SLOWPOKE Dalhousie	1	1
		South Africa	SAFARI-1	49	2
	2011 Total			59	4
	2012	Canada	SLOWPOKE Kanata	1	1
			SLOWPOKE Montreal	1	0
		Germany	BER-ll	33	1
			FRG-1	25	1
	2012 Total			60	3
	2013	Italy	Avogadro Storage Facility	1	1
	2013 Total			1	1
SRS Sum				7995	233
Grand Total				7995	233

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Cc:	Maxcine Maxted/DOE/Srs@SRS, William Stephens/SRNS/Srs@SRS, Edwin Moore/SRNL/Srs@Srs,
Bcc:	
Subject:	Re: Fw: Question Concerning Number of Pebbles
From:	Alexcia Delley/SRNS/Srs - Monday 12/08/2014 08:34 AM

History: This message has been forwarded.

During Step 1 Continuation and/or Step 2, the revised feasibility study and attachments will be updated to incorporate the latest, (best available, most appropriate, better defined etc) data.

Thanks,

Alexcia Delley, PMP
Savannah River National Laboratory
Clean Energy Directorate
Nuclear Programs - Program Manager
alexcia.delley@srs,gov
Phone: (803) 952-6318

Edwin Moore   Both numbers can find sources traceable back t...   12/08/2014 07:34:39 AM

From:	Edwin Moore/SRNL/Srs
To:	William Dyer/SRNS/Srs@SRS,
Cc:	Alexcia Delley/SRNS/Srs@Srs, Maxcine Maxted/DOE/Srs@Srs, William Stephens/SRNS/Srs@Srs
Date:	12/08/2014 07:34 AM
Subject:	Re: Fw: Question Concerning Number of Pebbles

Both numbers can find sources traceable back to the German data. The difference is in the number carried for AVR since the numbers acrried for THTR are the same in both accounts.. The higher number for AVR is from (Jülich, 09.01.2012, Pohl 2002, etc), and it is the only basis we have for the radiological information, so it is the basis used for the table in the Process Description. The lower number is from the drum inventory pebble count. We have never been able to resolve the difference. We have no way to map our radiological data to the slightly lower number. Hence, I have used the higher number as a bounding value for our study. As the feasibility report states, the proecss description should govern.

William Dyer   See the attached request. Ed, I see that there ar...   12/08/2014 06:38:47 AM

From:	William Dyer/SRNS/Srs
To:	Alexcia Delley/SRNS/Srs@Srs, Edwin Moore/SRNL/Srs@Srs,
Cc:	William Stephens/SRNS/Srs@SRS, Maxcine Maxted/DOE/Srs@SRS
Date:	12/08/2014 06:38 AM
Subject:	Fw: Question Concerning Number of Pebbles

See the attached request. Ed, I see that there are 2,400 pebbles in a column of your table 1.2 of the -00109 document. Alexcia, could you check your numbers in the -00184 document? Do you think you may have not missed the 2,400?

Thanks.

Glynn

W. Glynn Dyer
Senior Technical Advisor
H-Canyon Waste Minimization
_(803) 208-0905_
(803) 725-7243, pager 16771

----- Forwarded by William Dyer/SRNS/Srs on 12/08/2014 06:35 AM -----

From:	LSaraka@TerranearPMC.com
To:	William.Stephens@srs.gov, William.Dyer@srs.gov,
Cc:	maxcine.maxted@srs.gov
Date:	12/05/2014 01:36 PM
Subject:	Question Concerning Number of Pebbles

Bill, Glynn,

A question please. We have been reviewing the October 2014 Feasibility Study, SRNL-TR-2014-000184, and related Appendix G Process Description, SRNL-TR-2014-000209, . There is a discrepancy in the amount of pebbles reported in the Feasibility Study = 916,253 pebbles (Table 5-1 HTGR Fuel Characterization) as compared to the amount of pebbles reported in the Process Description document = 918,653 pebbles (Table 1.3 Comparison of the Radionuclide Content in Fuel). The difference is 2,400 pebbles. Please advise as to the difference in numbers of pebbles reported.

Thank you

Larry

LLW shipment answers to NEPA questions

Edwin Moore to: William Dyer 11/20/2014 08:27 AM

Cc: John Harley, William Stephens, Robert05 Jones, Thomas Severynse, Alexcia Delley, Robert Pierce, A Fellinger, Mike Mobley

This email responds to the questions about the LLW shipments.

1. See Attached email from John Harley. The weight of the Castor cask is not a show stopper for shipment to Nevada. Since it would reduce exposure to avoid having to repackage the waste, it would be preferred to use the cask for interim storage, shipment, and disposal.

2. See attached calculation for the LLW uranium case. The material does require a Type B package.

SW German Isotopes 110 Liters 2g per cc per Liter.pdf

3. See attached radiation calculation (extracted from email from Javier Reyes-Jimenez to E. Moore, November 19, 2014) . The dose builds up within a month or so that it would require shielding for transport for handling. This is why we need to put it in a shielded cask for storage and handling and disposal as planned.

4. It is assumed (per Larry Gelder) that DOE would issue a Certificate of Compliance for receipt of the Castor Cask. Use of the Castor in the future for LLW shipment would require a revision to the Certificate of Compliance to deal with the change in form. This should not be seen as limiting factor. Were there any issue, the RH-72B shipping container could be used, but like the Castor cask would require a COC revision.

5. The concrete barely fits within the cask void space for case 2T. The calculation is conservative in that it treats both U and Th as offsetting heavy metal. In fact, there is a mutual solubility, and were this taken into account the volume would not be as high as shown in the material balance. Since the entire math is based on the WSB uranium case, we need more data on the impact of thorium in the cementation operation to assess the viability and actual volume of from case 2T. There remains a higher risk with the U-Th LLW option than with the U option.

6. The material balance was recalculated using SRS DU dose based on data regarding isotopic impurities from Table 2 of NAC-0023_R1, Radioactive Waste Inventory for Clive DU PA, Clive DU PA Model v.1.2, June 5, 2014 (available on line). There was very little change.as can be seen in the following calculation. The first column shows assumed DU radionuclides on a U-238 basis. The second column shows the total program (AVR+THTR) mass of radionuclides after downblending. The third column shows the assumed values used in the published material balance assuming Portsmouth DU.

Nuclide	SRSDU per NAC-0023-R1 on U238 basis	Mass calculated assuming SRS DU	Mass caluated in original mass balance	Nuclide	SRSDU per NAC-0023-R1 on U238 basis	Mass calculated assuming SRS DU	Mass caluated in original mass balance	Nuclide	SRSDU per NAC-0023-R1 on U238 basis	Mass calculated assuming SRS DU	Mass caluated in original mass balance
	Element /U238	g	g		Element /U238	g	g		Element /U238	g	g
Fission products				Heavy metals				Heavy metals (cont.)			
H3*****		9.36E-06	9.36E-06	At217		1.38E-17	1.38E-17	Th227		4.15E-09	4.15E-09
Ba137m		1.76E-08	1.76E-08	Tl207		6.92E-14	6.92E-14	Th228		4.95E-05	4.95E-05
Cd113m		2.02E-07	2.02E-07	Tl208		6.82E-12	6.82E-12	Th229		1.29E-03	1.29E-03
Cs134		1.51E-06	1.51E-06	Bi210		2.76E-14	2.76E-14	Th230		3.41E-04	3.41E-04
Cs135		6.12E-02	6.12E-02	Bi211		3.09E-14	3.09E-14	Th231		1.19E-10	1.19E-10
Cs137	1.72E-13	1.08E-01	1.08E-01	Bi212		2.73E-10	2.73E-10	Th232		7.45E+02	7.45E+02
Ce144		1.18E-11	1.18E-11	Bi213		1.39E-12	1.39E-12	Th234		6.58E-10	6.58E-10
Eu152		6.52E-07	6.52E-07	Bi214		1.73E-16	1.73E-16	Pa231		6.61E-03	6.61E-03
Eu154		3.56E-04	3.56E-04	Fr221		1.45E-13	1.45E-13	Pa234		7.63E-12	7.63E-12
Eu155		9.94E-06	9.94E-06	Pb209		6.08E-12	6.08E-12	U232		1.83E+01	1.83E+01
Ho166m		5.52E-11	5.52E-11	Pb210		4.67E-11	4.67E-11	U233**	6.77E-07	1.02E+05	1.02E+05
I129	1.30E-07	4.28E-01	2.19E-02	Pb211		5.35E-13	5.35E-13	U234	6.56E-06	1.45E+04	1.47E+04
Kr85		8.66E-04	8.66E-04	Pb212		2.99E-09	2.99E-09	U235	1.70E-03	2.93E+05	2.97E+05
Nb93m		8.33E-07	8.33E-07	Pb214		2.42E-16	2.42E-16	U236	9.37E-05	1.00E+05	1.00E+05
Nb94		5.20E-08	5.20E-08	Po210		7.63E-13	7.63E-13	U238	1.00E+00	3.56E+06	3.56E+06
Pd107		5.74E-03	5.74E-03	Po212		1.75E-12	1.75E-12	Np237	9.95E-09	2.60E+02	2.60E+02
Pm147		4.39E-05	4.39E-05	Po213		2.11E-21	2.11E-21	Np239		3.20E-06	3.20E-06
Pr144m		1.75E-18	1.75E-18	Po214		2.38E-23	2.38E-23	Pu238***	1.52E-14	1.02E-01	1.02E-01
Pr144		4.95E-16	4.95E-16	Po215		4.30E-19	4.30E-19	Pu239	2.55E-11	3.31E-01	3.31E-01
Rb87		5.50E-02	5.50E-02	Po216		1.15E-14	1.15E-14	Pu240	1.85E-12	1.80E-01	1.80E-01
Ru106		1.32E-10	1.32E-10	Po218		2.70E-17	2.70E-17	Pu241	3.77E-14	3.08E-02	3.08E-02
Rh106		1.38E-16	1.38E-16	Rn219		1.04E-16	1.04E-16	Pu242		6.39E-02	6.39E-02
Sn121m		8.34E-06	8.34E-06	Rn220		3.59E-12	3.59E-12	Am241	5.12E-12	7.16E-03	7.15E-03
Sn126		2.70E-03	2.70E-03	Rn222		4.13E-14	4.13E-14	Am242m		5.25E-06	5.25E-06
Sb125		1.25E-06	1.25E-06	Ra223		2.47E-10	2.47E-10	Am242****		6.32E-11	6.32E-11
Sb126m		9.36E-13	9.36E-13	Ra224		2.50E-08	2.50E-08	Am243		7.29E-04	7.29E-04
Sb126		5.13E-10	5.13E-10	Ra225		6.86E-10	6.86E-10	Cm242****		1.27E-08	1.27E-08
Se79		3.93E-03	3.93E-03	Ra226	3.96E-10	1.23E-03	7.71E-09	Cm244		6.67E-05	6.67E-05
Sm 147		3.50E-02	3.50E-02	Ra228		2.54E-08	2.54E-08	Cm245		1.18E-05	1.18E-05
Sm151		1.45E-03	1.45E-03	Ac225		4.72E-10	4.72E-10	Cm246		2.39E-07	2.39E-07
Sr90	4.16E-13	6.93E-02	6.93E-02	Ac227		1.78E-07	1.78E-07	SUM	**1.00E+00**	**4.07E+06**	**4.08E+06**

Tc99	1.73E-06	5.54E+00	1.31E-01	Ac228		3.01E-12	3.01E-12
Te125m		2.08E-08	2.08E-08				
Y90		1.78E-05	1.78E-05				
Zr93		2.12E-01	2.12E-01				
Activation products							
C14		0.00E+00	0.00E+00				
Cl36		4.66E-03	4.66E-03				
Co60		6.97E-07	6.97E-07				
Ni59		2.54E-05	2.54E-05				
Ni63		1.21E-08	1.21E-08				
Mo93		3.89E-07	3.89E-07				

Calculation on Dose follows (email from Reyes-Jimenez to Moore):

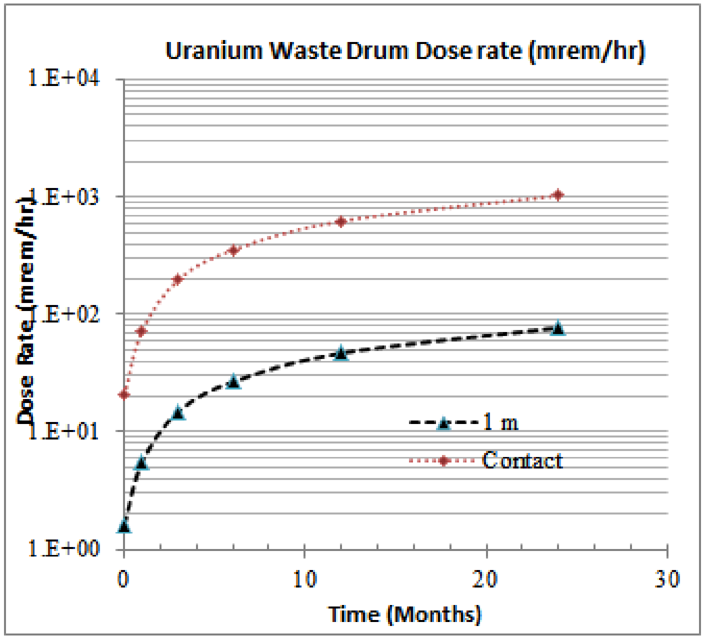
Ed,

The attached table and diagram show the dose rates from the Waste Drum up to 2 years, at contact and at 1 meter at the center. The nuclides in the excel file are uniformly mixed with regular concrete at 2 g/cc, the drum contains 220 liters of waste mass, the drum is 50 cm in diameter and a height of 112 cm (no head space included, the drum is all filled).

The dose is from Gamma, I have calculated the neutron dose, at t=0 and at the end of the 2 yrs. But it was negligible, at t=0, the dose=0.0084 mrem/hr and at 2 years= 0.0202 mrem/hr.

I have included a table with the curie due to the decay and build up from the daughter products; as expected Tl-208 increases over time due to the decay of U-232. Other nuclides that initially contribute to the dose, such as Co-60 and Cs-137 decay over time, contributing less to the dose, the increase in dose is due to the buildup of Tl-108 as shown in the curie table. Feel free to call me if you have any questions.

Gamma dose (mrem/hr)			
months	Contact	at 30 cm	1 m
0.012	2.063E+01	6.837E+00	1.619E+00
1	7.323E+01	2.370E+01	5.580E+00
3	1.978E+02	6.357E+01	1.491E+01
6	3.528E+02	1.134E+02	2.662E+01
12	6.247E+02	1.996E+02	4.680E+01
24	1.031E+03	3.294E+02	7.724E+01



Curie One Waste Drum.pdf

Javier Reyes-Jimenez
Principal Health Physicist
Radiological Protection Department
735-B Room 123
(803)952-6578
Javier.Reyes-Jimenez@srs.gov

----- Forwarded by Edwin Moore/SRNL/Srs on 11/20/2014 07:06 AM -----

From: John Harley/SRNS/Srs
To: Edwin Moore/SRNL/Srs@Srs,
Cc: Nathaniel Roddy/SRNS/Srs@Srs, Peter Fairchild/SRNS/Srs@Srs
Date: 11/19/2014 12:47 PM
Subject: Re: castor weight

I check with NNSS - 32 tonnes = ~35 tons (US) on transport options. I talked with Syd Gordon at NNSS and he said getting it there is feasible. They recently accepted some items from DOD (Maryland) that weighed over 100,000 lbs. He said it would require special logistics and DOT permitting with closest rail spur to use for the proposed shipment being ~300 miles away. Once it got to their site (be truck) they had equipment to handle with no physical/technical issues.

John Harley
Savannah River Nuclear Solutions

Solid Waste Engineering
(803) 208-1734, Pager: 15857

Edwin Moore	The THTR/AVR CASTOR is about 2.70 m long and is made of spheroidal grap...	11/19/2014 12:32:42 PM

From: Edwin Moore/SRNL/Srs
To: John Harley/SRNS/Srs@Srs,
Date: 11/19/2014 12:32 PM
Subject: castor weight

The THTR/AVR CASTOR is about 2.70 m long and is made of spheroidal graphite iron, a type of cast iron containing spheroidal graphite. Each loaded container weighs about 27 tonnes, or 32 tonnes in transport configuration. This is why it can only be moved and transported with an indoor crane and special vehicles.

Radcalc 4.1 11/19/2014 3:14 PM
File Name: SW German Isotopes 110 Liters 2g per liter.rad

Radcalc 4.1: S:\DOT-HMT\SHIPPING\RAD_SHIP\Chris' Radcalc\SW German Isotopes 110 Liters 2g per liter.rad

Performed By: Chris Solum
Checked By:

== Input Information ==

Comments:
110 liters concentrate per container 2g/cc density
Weight of Material 2.2E2 Kg
Design Weight Capacity of 55 Gallon Drum 4.00E2 Kg
110 L = 110,000 ml = 110,000 cc
110,000 X 2 = 220,000 g = 220 Kg
55 Gallon drum would be loaded to 55% weight capacity

Initial Source Data:

Isotope	Ci	Gm	TBq
H-3	9.940E-05	1.034E-08	3.678E-06
Cl-36	4.460E-08	1.351E-06	1.650E-09
Co-60	8.640E-07	7.635E-10	3.197E-08
Ni-59	2.250E-09	2.819E-08	8.325E-11
Ni-63	7.520E-10	1.332E-11	2.782E-11
Se-79	5.480E-08	1.331E-05	2.028E-09
Kr-85	3.730E-04	9.526E-07	1.380E-05
Rb-87	5.280E-12	6.097E-05	1.954E-13
Sr-90	1.060E-02	7.675E-05	3.922E-04
Y-90	1.060E-02	1.949E-08	3.922E-04
Zr-93	5.830E-07	2.318E-04	2.157E-08
Nb-93m	2.180E-07	9.136E-10	8.066E-09
Nb-94	1.070E-11	5.618E-11	3.959E-13
Mo-93	4.680E-10	4.865E-10	1.732E-11
Tc-99	2.440E-06	1.445E-04	9.028E-08
Ru-106	4.840E-10	1.463E-13	1.791E-11
Rh-106	5.370E-10	1.512E-19	1.987E-11
Pd-107	3.240E-09	6.298E-06	1.199E-10
Cd-113m	4.790E-08	2.133E-10	1.772E-09
Sn-121m	4.910E-07	9.133E-09	1.817E-08
Sn-126	8.400E-08	6.804E-06	3.108E-09
Sb-125	1.420E-06	1.369E-09	5.254E-08
Sb-126	4.690E-08	5.608E-13	1.735E-09
Sb-126m	8.070E-08	1.032E-15	2.986E-09
Te-125m	4.160E-07	2.284E-11	1.539E-08
I-129	4.240E-09	2.461E-05	1.569E-10
Cs-134	2.140E-06	1.655E-09	7.918E-08
Cs-135	7.720E-08	6.700E-05	2.856E-09
Cs-137	1.030E-02	1.185E-04	3.811E-04
Ba-137m	1.030E-02	1.914E-11	3.811E-04
Ce-144	4.100E-11	1.288E-14	1.517E-12
Pr-144	4.100E-11	5.423E-19	1.517E-12
Pr-144m	3.480E-13	1.838E-21	1.288E-14
Pm-147	4.470E-05	4.819E-08	1.654E-06
Sm-147	8.800E-13	3.833E-05	3.256E-14
Sm-151	4.040E-05	1.535E-06	1.495E-06
Eu-152	1.270E-07	7.299E-10	4.699E-09
Eu-154	1.070E-04	3.959E-07	3.959E-06
Eu-155	5.280E-06	1.088E-08	1.954E-07
Ho-166m	1.090E-13	6.071E-14	4.033E-15
Tl-207	1.440E-08	7.561E-17	5.328E-10
Tl-208	2.210E-06	7.463E-15	8.177E-08
Pb-209	3.070E-08	6.660E-15	1.136E-09
Pb-210	3.910E-12	5.089E-14	1.447E-13

Pb-211	1.450E-08	5.874E-16	5.365E-10
Pb-212	4.560E-06	3.282E-12	1.687E-07
Pb-214	8.710E-12	2.657E-19	3.223E-13
Bi-210	3.760E-12	3.031E-17	1.391E-13
Bi-211	1.390E-08	3.385E-17	5.143E-10
Bi-212	4.390E-06	2.996E-13	1.624E-07
Bi-213	2.960E-08	1.529E-15	1.095E-09
Bi-214	8.370E-12	1.896E-19	3.097E-13
Po-210	3.760E-12	8.368E-16	1.391E-13
Po-212	2.260E-06	1.266E-23	8.362E-08
Po-213	2.910E-08	2.307E-24	1.077E-09
Po-214	8.370E-12	2.599E-26	3.097E-13
Po-215	1.390E-08	4.715E-22	5.143E-10
Po-216	4.390E-06	1.261E-17	1.624E-07
Po-218	8.370E-12	3.006E-20	3.097E-13
At-217	2.450E-08	1.522E-20	9.065E-10
Rn-219	1.480E-09	1.138E-19	5.476E-11
Rn-220	3.640E-06	3.961E-15	1.347E-07
Rn-222	6.950E-12	4.518E-17	2.572E-13
Fr-221	2.750E-08	1.584E-16	1.018E-09
Ra-223	1.390E-08	2.714E-13	5.143E-10
Ra-224	4.380E-06	2.735E-11	1.621E-07
Ra-225	2.950E-08	7.524E-13	1.092E-09
Ra-226	8.360E-12	8.457E-12	3.093E-13
Ra-228	7.580E-09	2.780E-11	2.805E-10
Ac-225	3.000E-08	5.170E-13	1.110E-09
Ac-227	1.410E-08	1.950E-10	5.217E-10
Ac-228	7.720E-09	3.455E-15	2.856E-10
Th-227	1.400E-07	4.556E-12	5.180E-09
Th-228	4.450E-05	5.429E-08	1.647E-06
Th-229	3.000E-07	1.411E-06	1.110E-08
Th-230	7.890E-09	3.828E-07	2.919E-10
Th-231	6.930E-08	1.304E-13	2.564E-09
Th-232	8.930E-08	8.144E-01	3.304E-09
Th-234	1.670E-08	7.211E-13	6.179E-10
Pa-231	3.420E-07	7.241E-06	1.265E-08
Pa-234	1.670E-08	8.456E-15	6.179E-10
U-232	4.320E-01	1.957E-02	1.598E-02
U-233	1.080E+00	1.121E+02	3.996E-02
U-234	1.010E-01	1.625E+01	3.737E-03
U-235	7.040E-04	3.258E+02	2.605E-05
U-236	7.110E-03	1.113E+02	2.631E-04
U-238	1.310E-03	3.897E+03	4.847E-05
Np-237	2.010E-04	2.852E-01	7.437E-06
Np-239	8.150E-04	3.514E-09	3.016E-05
Pu-238	1.910E-03	1.115E-04	7.067E-05
Pu-239	2.250E-05	3.628E-04	8.325E-07
Pu-240	4.470E-05	1.970E-04	1.654E-06
Pu-241	3.360E-03	3.247E-05	1.243E-04
Pu-242	2.750E-07	6.955E-05	1.018E-08
Am-241	2.690E-05	7.850E-06	9.953E-07
Am-242	5.600E-08	6.938E-14	2.072E-09
Am-242m	5.600E-08	5.346E-09	2.072E-09
Am-243	1.590E-07	7.962E-07	5.883E-09
Cm-242	4.630E-08	1.398E-11	1.713E-09
Cm-244	5.920E-06	7.275E-08	2.190E-07
Cm-245	2.310E-09	1.346E-08	8.547E-11
Cm-246	7.900E-11	2.572E-10	2.923E-12
Total Activity:	1.671E+00		6.183E-02

* Radionuclides with an A1/A2 fraction of less than 0.001 will not be shown in the output.

Radcalc 4.1 11/19/2014 3:14 PM

File Name: SW German Isotopes 110 Liters 2g per liter.rad

Container Data:

Container Void Volume:	3.3	ft^3
Container Mass:	60	lb
Mass of solid beryllium, lead, graphite, and hydrogenous material enriched with deuterium:	0	kg
Gross Mass:	247.2	kg

Waste Data:

Waste Form:	Normal	
Waste State:	Solid	
Waste Volume:	4.03	ft^3
Waste Mass:	220	kg
Mass of solid lead:	0	kg
Mass of solid beryllium, graphite, and hydrogenous material enriched with deuterium:	0	kg
Waste Void Volume:	0	m^3

Decay Time Data:

Time to decay source before sealing: 0 yr

=================================== Radioactive Decay Results ===================================

Decayed Source:

Isotope	Ci	Gm	TBq
H-3	9.940E-05	1.034E-08	3.678E-06
Cl-36	4.460E-08	1.351E-06	1.650E-09
Co-60	8.640E-07	7.635E-10	3.197E-08
Ni-59	2.250E-09	2.819E-08	8.325E-11
Ni-63	7.520E-10	1.332E-11	2.782E-11
Se-79	5.480E-08	1.331E-05	2.028E-09
Kr-85	3.730E-04	9.526E-07	1.380E-05
Rb-87	5.280E-12	6.097E-05	1.954E-13
Sr-90	1.060E-02	7.675E-05	3.922E-04
Y-90	1.060E-02	1.949E-08	3.922E-04
Zr-93	5.830E-07	2.318E-04	2.157E-08
Nb-93m	2.180E-07	9.136E-10	8.066E-09
Nb-94	1.070E-11	5.618E-11	3.959E-13
Mo-93	4.680E-10	4.865E-10	1.732E-11
Tc-99	2.440E-06	1.445E-04	9.028E-08
Ru-106	4.840E-10	1.463E-13	1.791E-11
Rh-106	5.370E-10	1.512E-19	1.987E-11
Pd-107	3.240E-09	6.298E-06	1.199E-10
Cd-113m	4.790E-08	2.133E-10	1.772E-09
Sn-121m	4.910E-07	9.133E-09	1.817E-08
Sn-126	8.400E-08	6.804E-06	3.108E-09
Sb-125	1.420E-06	1.369E-09	5.254E-08
Sb-126	4.690E-08	5.608E-13	1.735E-09
Sb-126m	8.070E-08	1.032E-15	2.986E-09
Te-125m	4.160E-07	2.284E-11	1.539E-08
I-129	4.240E-09	2.461E-05	1.569E-10
Cs-134	2.140E-06	1.655E-09	7.918E-08
Cs-135	7.720E-08	6.700E-05	2.856E-09
Cs-137	1.030E-02	1.185E-04	3.811E-04
Ba-137m	1.030E-02	1.914E-11	3.811E-04
Ce-144	4.100E-11	1.288E-14	1.517E-12
Pr-144	4.100E-11	5.423E-19	1.517E-12
Pr-144m	3.480E-13	1.838E-21	1.288E-14
Pm-147	4.470E-05	4.819E-08	1.654E-06
Sm-147	8.800E-13	3.833E-05	3.256E-14
Sm-151	4.040E-05	1.535E-06	1.495E-06
Eu-152	1.270E-07	7.299E-10	4.699E-09
Eu-154	1.070E-04	3.959E-07	3.959E-06

Eu-155	5.280E-06	1.088E-08	1.954E-07
Ho-166m	1.090E-13	6.071E-14	4.033E-15
Tl-207	1.440E-08	7.561E-17	5.328E-10
Tl-208	2.210E-06	7.463E-15	8.177E-08
Pb-209	3.070E-08	6.660E-15	1.136E-09
Pb-210	3.910E-12	5.089E-14	1.447E-13
Pb-211	1.450E-08	5.874E-16	5.365E-10
Pb-212	4.560E-06	3.282E-12	1.687E-07
Pb-214	8.710E-12	2.657E-19	3.223E-13
Bi-210	3.760E-12	3.031E-17	1.391E-13
Bi-211	1.390E-08	3.385E-17	5.143E-10
Bi-212	4.390E-06	2.996E-13	1.624E-07
Bi-213	2.960E-08	1.529E-15	1.095E-09
Bi-214	8.370E-12	1.896E-19	3.097E-13
Po-210	3.760E-12	8.368E-16	1.391E-13
Po-212	2.260E-06	1.266E-23	8.362E-08
Po-213	2.910E-08	2.307E-24	1.077E-09
Po-214	8.370E-12	2.599E-26	3.097E-13
Po-215	1.390E-08	4.715E-22	5.143E-10
Po-216	4.390E-06	1.261E-17	1.624E-07
Po-218	8.370E-12	3.006E-20	3.097E-13
At-217	2.450E-08	1.522E-20	9.065E-10
Rn-219	1.480E-09	1.138E-19	5.476E-11
Rn-220	3.640E-06	3.961E-15	1.347E-07
Rn-222	6.950E-12	4.518E-17	2.572E-13
Fr-221	2.750E-08	1.584E-16	1.018E-09
Ra-223	1.390E-08	2.714E-13	5.143E-10
Ra-224	4.380E-06	2.735E-11	1.621E-07
Ra-225	2.950E-08	7.524E-13	1.092E-09
Ra-226	8.360E-12	8.457E-12	3.093E-13
Ra-228	7.580E-09	2.780E-11	2.805E-10
Ac-225	3.000E-08	5.170E-13	1.110E-09
Ac-227	1.410E-08	1.950E-10	5.217E-10
Ac-228	7.720E-09	3.455E-15	2.856E-10
Th-227	1.400E-07	4.556E-12	5.180E-09
Th-228	4.450E-05	5.429E-08	1.647E-06
Th-229	3.000E-07	1.411E-06	1.110E-08
Th-230	7.890E-09	3.828E-07	2.919E-10
Th-231	6.930E-08	1.304E-13	2.564E-09
Th-232	8.930E-08	8.144E-01	3.304E-09
Th-234	1.670E-08	7.211E-13	6.179E-10
Pa-231	3.420E-07	7.241E-06	1.265E-08
Pa-234	1.670E-08	8.456E-15	6.179E-10
U-232	4.320E-01	1.957E-02	1.598E-02
U-233	1.080E+00	1.121E+02	3.996E-02
U-234	1.010E-01	1.625E+01	3.737E-03
U-235	7.040E-04	3.258E+02	2.605E-05
U-236	7.110E-03	1.113E+02	2.631E-04
U-238	1.310E-03	3.897E+03	4.847E-05
Np-237	2.010E-04	2.852E-01	7.437E-06
Np-239	8.150E-04	3.514E-09	3.016E-05
Pu-238	1.910E-03	1.115E-04	7.067E-05
Pu-239	2.250E-05	3.628E-04	8.325E-07
Pu-240	4.470E-05	1.970E-04	1.654E-06
Pu-241	3.360E-03	3.247E-05	1.243E-04
Pu-242	2.750E-07	6.955E-05	1.018E-08
Am-241	2.690E-05	7.850E-06	9.953E-07
Am-242	5.600E-08	6.938E-14	2.072E-09
Am-242m	5.600E-08	5.346E-09	2.072E-09
Am-243	1.590E-07	7.962E-07	5.883E-09
Cm-242	4.630E-08	1.398E-11	1.713E-09
Cm-244	5.920E-06	7.275E-08	2.190E-07

Cm-245	2.310E-09	1.346E-08	8.547E-11
Cm-246	7.900E-11	2.572E-10	2.923E-12
Total Activity:	1.671E+00		6.183E-02
w/o Daughters:	1.651E+00		6.108E-02

Decay Heat:

Heat Generated at Time Zero:	0.04868	W
Heat Generated When Sealed:	0.04868	W

================================ Regulatory Requirements Warning ================================

Radcalc utilizes numerically based criteria to classify packages against the regulations. Many regulations also include subjective criteria that Radcalc does not consider. The user must check to ensure that all requirements in the regulations are met.

=================================== DOT Classification Results ===================================

* DOT classification calculations are made at the end of the user-specified decay time.

Radioactive Determination:

Radioactive:	Yes		(ACEMs and ALECs > 1.0)
ACEM Limit Fraction:	93230	ACEMs	(Number of ACEMs)
ALEC Limit Fraction:	20480000	ALECs	(Number of ALECs)

* This package is not exempt from 49 CFR Subchapter C.

Effective A2s for Mixture:	2.611E+09	Bq

Type Determination:

Type:	B		(A2s > 1.0)
A2 Limit Fraction:	23.4	A2s	(Number of A2s)

Limited Quantity Determination:

Limited Quantity:	No		(Fissile, not fissile excepted)
Activity:	23.4	A2	
	1.671	Ci	
	0.06183	TBq	
Fissile:	Yes		
Fissile Excepted:	No		

LSA Determination:

LSA-I:	No		(Fissile, not fissile excepted)
LSA-II:	No		(Fissile, not fissile excepted)
LSA-III:	No		(Fissile, not fissile excepted)
Specific Activity:	0.0001063	A2/gm	
	7.596E-06	Ci/gm	

HRCQ Determination:

HRCQ:	No		(A2s <= 3000, Activity <= 1000 TBq)
A2 Limit Fraction:	23.4	A2s	
Activity:	1.671	Ci	
	0.06183	TBq	

Fissile Determination:

Fissile:	Yes		(Contains fissile isotopes per 49 CFR 173.403)

Fissile Excepted Determination:

Fissile Excepted:	No		(Fissile)
Fissile Mass:	437.9	gm	
Container beryllium, lead, graphite, and hydrogenous material enriched with deuterium:	0	gm	

Container Mass:	27220	gm
Waste lead:	0	gm
Waste beryllium, graphite, and hydrogenous material enriched with deuterium:	0	gm
Waste Mass:	220000	gm
Total Uranium Mass:	4463	gm
U-233 Mass:	112.1	gm
U-235 Mass:	325.8	gm
Uranium Enrichment:	7.299	%
Total Plutonium Mass:	0.0007733	gm
Pu-239 Mass:	0.0003628	gm
Pu-241 Mass:	3.247E-05	gm

Reportable Quantity Determination:

Reportable Quantity:	Yes		(RQs > = 1.0)
RQ Limit Fraction:	55.46	RQs	(Number of RQs)

Shipping Papers and Labels:

	Isotope	Number of A2s	Fraction of A2s	Cumulative A2s	Cumulative Fraction of A2s
+	U-232	15.98	0.6832	15.98	0.6832
+	U-233	6.66	0.2847	22.64	0.9679
	U-234	0.6228	0.02662	23.27	0.9945
	Pu-238	0.07067	0.003021	23.34	0.9975
	U-236	0.04384	0.001874	23.38	0.9994

+ Contains 95% of the total A2s and must be included per 49 CFR 173.433.
* Radionuclides comprising less than 0.1% of the total A2s are not shown in the list.

=================================== DOE Classification Results ===================================

* DOE classification calculations are made at the end of the user-specified decay time.

DOE-STD-1027 Category Determination:

Category:	< Cat 3	(Cat3s <= 1.0)
Cat 2 Limit Fraction:	0.0134	
Cat 3 Limit Fraction:	0.8149	

* The DOE-STD-1027 category determination is based on dose-related limits.
  The user must apply any criticality-related limits separately.

Dose-Equivalent Curies:

ICRP-72 DE-Ci:	0.1548
FGR-11 DE-Ci:	1.04

TRU Waste Determination:

TRU Waste:	No		(TRU activity <= 100 nCi/gm)
TRU Activity:	10.03	nCi/g	

WIPP Quantities:

FGE Value:	310.4
PE-Ci Value:	0.279

=================================== NRC Classification Results ===================================

* NRC classification calculations are made at the end of the user-specified decay time.

NRC Container Category:

Container Category:	III	
LSA-I:	No	
LSA-II:	No	
LSA-III:	No	
Total Activity:	1.671	Ci
A2 Limit Fraction:	23.4	A2s

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case 1 light elements page 2

0 nuclide radioactivity, curies

basis =2.19852e-007 MTU

	initial	1E-03 y	3E-03 y	1E-02 y	8E-02 y	0.2 y	0.5 y	1.0 y	2.0 y
cl 36	8.929E-08	8.929E-08	8.929E-08	8.929E-08	8.929E-08	8.929E-08	8.929E-08	8.929E-08	8.929E-08
co 60	**1.727E-06**	**1.727E-06**	**1.726E-06**	**1.725E-06**	**1.708E-06**	**1.671E-06**	**1.617E-06**	**1.514E-06**	**1.328E-06**
ni 59	4.508E-09	4.508E-09	4.508E-09	4.508E-09	4.508E-09	4.508E-09	4.508E-09	4.508E-09	4.508E-09
ni 63	1.503E-09	1.503E-09	1.503E-09	1.503E-09	1.502E-09	1.500E-09	1.498E-09	1.493E-09	1.482E-09
zr 93	1.166E-06	1.166E-06	1.166E-06	1.166E-06	1.166E-06	1.166E-06	1.166E-06	1.166E-06	1.166E-06
nb 93m	0.000E+00	4.889E-11	1.467E-10	4.888E-10	4.070E-09	1.216E-08	2.419E-08	4.786E-08	9.370E-08
mo 93	9.359E-10	9.359E-10	9.359E-10	9.359E-10	9.359E-10	9.359E-10	9.358E-10	9.357E-10	9.356E-10
total	2.989E-06	2.989E-06	2.989E-06	2.987E-06	2.974E-06	2.946E-06	2.904E-06	2.824E-06	2.684E-06

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case 1 actinides page 4

0 nuclide radioactivity, curies

basis =2.19852e-007 MTU

	initial	1E-03 y	3E-03 y	1E-02 y	8E-02 y	0.2 y	0.5 y	1.0 y	2.0 y
tl207	2.886E-08	3.314E-08	4.349E-08	7.421E-08	1.351E-07	5.027E-08	3.685E-08	4.764E-08	7.046E-08
tl208	**4.426E-06**	**3.983E-06**	**1.917E-05**	**2.437E-04**	**7.699E-03**	**2.696E-02**	**5.153E-02**	**9.423E-02**	**1.588E-01**
tl209	0.000E+00	1.258E-09	1.282E-09	1.737E-09	8.662E-08	6.689E-07	1.725E-06	4.277E-06	8.538E-06
tl210	0.000E+00	2.956E-15	3.026E-15	3.210E-15	4.017E-15	9.139E-15	2.531E-14	8.927E-14	3.436E-13
pb209	6.149E-08	5.638E-08	5.728E-08	8.312E-08	4.145E-06	3.201E-05	8.254E-05	2.046E-04	4.086E-04
pb210	7.816E-12	7.816E-12	7.817E-12	7.818E-12	7.840E-12	7.949E-12	8.477E-12	1.225E-11	4.135E-11
pb211	2.893E-08	3.323E-08	4.361E-08	7.442E-08	1.354E-07	5.041E-08	3.695E-08	4.777E-08	7.066E-08
pb212	**9.124E-06**	**1.201E-05**	**5.293E-05**	**6.780E-04**	**2.142E-02**	**7.502E-02**	**1.434E-01**	**2.622E-01**	**4.418E-01**
pb214	1.742E-11	1.408E-11	1.440E-11	1.528E-11	1.913E-11	4.351E-11	1.205E-10	4.250E-10	1.636E-09
bi210	7.514E-12	7.529E-12	7.557E-12	7.634E-12	7.829E-12	7.956E-12	8.482E-12	1.226E-11	4.136E-11
bi211	2.781E-08	3.323E-08	4.361E-08	7.442E-08	1.354E-07	5.041E-08	3.695E-08	4.777E-08	7.066E-08
bi212	**8.770E-06**	**1.108E-05**	**5.334E-05**	**6.781E-04**	**2.142E-02**	**7.502E-02**	**1.434E-01**	**2.622E-01**	**4.418E-01**
bi213	5.910E-08	6.017E-08	6.136E-08	8.311E-08	4.145E-06	3.201E-05	8.254E-05	2.046E-04	4.085E-04
bi214	1.674E-11	1.408E-11	1.441E-11	1.529E-11	1.913E-11	4.352E-11	1.205E-10	4.251E-10	1.636E-09
po210	7.514E-12	7.514E-12	7.514E-12	7.515E-12	7.548E-12	7.609E-12	7.776E-12	9.171E-12	2.472E-11
po211	0.000E+00	9.171E-11	1.204E-10	2.054E-10	3.738E-10	1.391E-10	1.020E-10	1.318E-10	1.950E-10
po212	4.519E-06	7.098E-06	3.417E-05	4.344E-04	1.372E-02	4.806E-02	9.186E-02	1.680E-01	2.830E-01
po213	5.826E-08	5.892E-08	6.008E-08	8.138E-08	4.058E-06	3.134E-05	8.082E-05	2.004E-04	4.000E-04
po214	1.674E-11	1.408E-11	1.440E-11	1.528E-11	1.913E-11	4.351E-11	1.205E-10	4.250E-10	1.636E-09
po215	2.781E-08	3.323E-08	4.361E-08	7.442E-08	1.354E-07	5.041E-08	3.695E-08	4.777E-08	7.066E-08
po216	8.770E-06	2.471E-05	1.149E-04	9.196E-04	2.142E-02	7.502E-02	1.434E-01	2.622E-01	4.418E-01
po218	1.674E-11	1.408E-11	1.441E-11	1.529E-11	1.913E-11	4.352E-11	1.205E-10	4.251E-10	1.636E-09
at217	4.905E-08	6.015E-08	6.136E-08	8.312E-08	4.145E-06	3.201E-05	8.254E-05	2.046E-04	4.086E-04
at218	0.000E+00	2.816E-15	2.881E-15	3.057E-15	3.826E-15	8.704E-15	2.410E-14	8.502E-14	3.273E-13
rn217	0.000E+00	4.211E-12	4.295E-12	5.818E-12	2.901E-10	2.241E-09	5.778E-09	1.433E-08	2.860E-08
rn219	2.968E-09	3.323E-08	4.361E-08	7.442E-08	1.354E-07	5.041E-08	3.695E-08	4.777E-08	7.066E-08
rn220	7.278E-06	2.471E-05	1.149E-04	9.196E-04	2.142E-02	7.502E-02	1.434E-01	2.622E-01	4.418E-01
rn222	1.389E-11	1.407E-11	1.440E-11	1.528E-11	1.913E-11	4.352E-11	1.205E-10	4.251E-10	1.636E-09
fr221	5.508E-08	6.015E-08	6.136E-08	8.312E-08	4.145E-06	3.201E-05	8.254E-05	2.046E-04	4.086E-04
fr223	0.000E+00	3.897E-10	3.903E-10	3.923E-10	4.135E-10	4.616E-10	5.340E-10	6.795E-10	9.735E-10
ra223	2.775E-08	3.323E-08	4.361E-08	7.442E-08	1.354E-07	5.041E-08	3.695E-08	4.777E-08	7.066E-08
ra224	8.752E-06	2.471E-05	1.149E-04	9.196E-04	2.142E-02	7.502E-02	1.434E-01	2.622E-01	4.418E-01
ra225	5.898E-08	6.982E-08	1.012E-07	3.075E-07	8.387E-06	3.976E-05	9.059E-05	2.046E-04	4.086E-04

ra226	1.671E-11	1.672E-11	1.673E-11	1.682E-11	2.007E-11	4.352E-11	1.205E-10	4.251E-10	1.636E-09
ra227	0.000E+00	1.193E-16	2.894E-16	5.123E-16	5.628E-16	5.628E-16	5.628E-16	5.628E-16	5.628E-16
ra228	1.516E-08	1.518E-08	1.522E-08	1.536E-08	1.679E-08	2.001E-08	2.472E-08	3.371E-08	5.016E-08
ac225	6.003E-08	6.013E-08	6.134E-08	8.310E-08	4.145E-06	3.201E-05	8.254E-05	2.046E-04	4.086E-04
ac227	2.822E-08	2.824E-08	2.828E-08	2.843E-08	2.996E-08	3.345E-08	3.869E-08	4.924E-08	7.054E-08
ac228	1.543E-08	1.527E-08	1.521E-08	1.534E-08	1.680E-08	2.001E-08	2.472E-08	3.371E-08	5.016E-08
th227	2.791E-07	2.757E-07	2.691E-07	2.473E-07	1.097E-07	4.000E-08	3.692E-08	4.702E-08	6.968E-08
th228	8.903E-05	4.024E-04	1.029E-03	3.217E-03	2.582E-02	7.490E-02	1.430E-01	2.616E-01	4.409E-01
th229	6.003E-07	8.043E-07	1.212E-06	2.640E-06	1.761E-05	5.160E-05	1.026E-04	2.046E-04	4.086E-04
th230	1.578E-08	1.763E-08	2.134E-08	3.432E-08	1.704E-07	4.793E-07	9.428E-07	1.870E-06	3.724E-06
th231	1.386E-07	2.982E-04	7.183E-04	1.277E-03	1.407E-03	1.407E-03	1.407E-03	1.407E-03	1.407E-03
th232	1.785E-07	1.785E-07	1.785E-07	1.785E-07	1.785E-07	1.785E-07	1.785E-07	1.785E-07	1.785E-07
th234	3.340E-08	2.747E-05	8.147E-05	2.618E-04	1.532E-03	2.435E-03	2.611E-03	2.625E-03	2.625E-03
pa231	6.838E-07	6.838E-07	6.838E-07	6.840E-07	6.863E-07	6.914E-07	6.989E-07	7.139E-07	7.438E-07
pa233	0.000E+00	3.750E-06	1.115E-05	3.596E-05	2.179E-04	3.630E-04	3.977E-04	4.014E-04	4.014E-04
pa234	3.340E-08	9.445E-06	5.369E-05	2.341E-04	1.533E-03	2.438E-03	2.613E-03	2.625E-03	2.625E-03
u232	**8.643E-01**	**8.643E-01**	**8.643E-01**	**8.642E-01**	**8.636E-01**	**8.621E-01**	**8.600E-01**	**8.556E-01**	**8.471E-01**
u233	2.160E+00	2.160E+00	2.160E+00	2.160E+00	2.160E+00	2.160E+00	2.160E+00	2.160E+00	2.160E+00
u234	2.016E-01	2.016E-01	2.016E-01	2.016E-01	2.016E-01	2.016E-01	2.016E-01	2.016E-01	2.016E-01

1
case 1 actinides page 5
0 nuclide radioactivity, curies
basis =2.19852e-007 MTU

	initial	1E-03 y	3E-03 y	1E-02 y	8E-02 y	0.2 y	0.5 y	1.0 y	2.0 y
u235	1.407E-03	1.407E-03	1.407E-03	1.407E-03	1.407E-03	1.407E-03	1.407E-03	1.407E-03	1.407E-03
u236	1.422E-02	1.422E-02	1.422E-02	1.422E-02	1.422E-02	1.422E-02	1.422E-02	1.422E-02	1.422E-02
u237	0.000E+00	6.066E-09	1.753E-08	5.152E-08	1.571E-07	1.630E-07	1.610E-07	1.572E-07	1.497E-07
u238	2.625E-03	2.625E-03	2.625E-03	2.625E-03	2.625E-03	2.625E-03	2.625E-03	2.625E-03	2.625E-03
np237	4.014E-04	4.014E-04	4.014E-04	4.014E-04	4.014E-04	4.014E-04	4.014E-04	4.014E-04	4.014E-04
np238	0.000E+00	5.676E-11	1.518E-10	3.513E-10	5.034E-10	5.030E-10	5.023E-10	5.011E-10	4.986E-10
np239	1.629E-03	1.463E-03	1.180E-03	5.564E-04	5.270E-07	3.183E-07	3.183E-07	3.183E-07	3.182E-07
pu238	3.811E-03	3.811E-03	3.811E-03	3.811E-03	3.808E-03	3.803E-03	3.796E-03	3.781E-03	3.751E-03
pu239	4.505E-05	4.505E-05	4.505E-05	4.505E-05	4.505E-05	4.505E-05	4.505E-05	4.505E-05	4.505E-05
pu240	8.932E-05	8.932E-05	8.932E-05	8.932E-05	8.932E-05	8.932E-05	8.932E-05	8.931E-05	8.930E-05
pu241	6.725E-03	6.725E-03	6.724E-03	6.722E-03	6.698E-03	6.644E-03	6.564E-03	6.407E-03	6.103E-03
pu242	5.502E-07	5.502E-07	5.502E-07	5.502E-07	5.502E-07	5.502E-07	5.502E-07	5.502E-07	5.502E-07
am241	5.370E-05	5.371E-05	5.373E-05	5.381E-05	5.459E-05	5.636E-05	5.898E-05	6.412E-05	7.403E-05
am242m	1.119E-07	1.119E-07	1.119E-07	1.119E-07	1.119E-07	1.118E-07	1.116E-07	1.114E-07	1.108E-07
am242	1.119E-07	1.117E-07	1.116E-07	1.114E-07	1.114E-07	1.113E-07	1.111E-07	1.109E-07	1.103E-07
am243	3.183E-07	3.183E-07	3.183E-07	3.183E-07	3.183E-07	3.183E-07	3.183E-07	3.183E-07	3.182E-07
cm242	9.260E-08	9.260E-08	9.260E-08	9.259E-08	9.252E-08	9.237E-08	9.218E-08	9.187E-08	9.138E-08
cm244	1.183E-05	1.183E-05	1.183E-05	1.183E-05	1.179E-05	1.172E-05	1.161E-05	1.139E-05	1.096E-05
total	3.257E+00	3.258E+00	3.259E+00	3.266E+00	3.414E+00	3.785E+00	4.262E+00	5.090E+00	6.340E+00

1
case 1 fission products page 8
0 nuclide radioactivity, curies
basis =2.19852e-007 MTU

	initial	1E-03 y	3E-03 y	1E-02 y	8E-02 y	0.2 y	0.5 y	1.0 y	2.0 y
h 3	1.988E-04	1.988E-04	1.988E-04	1.987E-04	1.979E-04	1.960E-04	1.933E-04	1.879E-04	1.776E-04
se 79	1.096E-07	1.096E-07	1.096E-07	1.096E-07	1.096E-07	1.096E-07	1.096E-07	1.096E-07	1.096E-07
kr 85	7.463E-04	7.463E-04	7.462E-04	7.458E-04	7.423E-04	7.344E-04	7.226E-04	6.997E-04	6.560E-04

rb 87	1.055E-11	1.055E-11	1.055E-11	1.055E-11	1.055E-11	1.055E-11	1.055E-11	1.055E-11	1.055E-11
sr 90	2.117E-02	2.117E-02	2.117E-02	2.116E-02	2.113E-02	2.104E-02	2.092E-02	2.067E-02	2.017E-02
y 90	2.117E-02	2.117E-02	2.117E-02	2.117E-02	2.113E-02	2.105E-02	2.092E-02	2.067E-02	2.018E-02
nb 93m	4.361E-07	4.361E-07	4.360E-07	4.359E-07	4.345E-07	4.314E-07	4.268E-07	4.178E-07	4.002E-07
nb 94	2.138E-11	2.138E-11	2.138E-11	2.138E-11	2.138E-11	2.138E-11	2.138E-11	2.138E-11	2.138E-11
tc 99	4.870E-06	4.870E-06	4.870E-06	4.870E-06	4.870E-06	4.870E-06	4.870E-06	4.870E-06	4.870E-06
ru106	9.681E-10	9.674E-10	9.661E-10	9.616E-10	9.149E-10	8.172E-10	6.898E-10	4.916E-10	2.496E-10
rh106	1.074E-09	9.674E-10	9.661E-10	9.616E-10	9.149E-10	8.172E-10	6.898E-10	4.916E-10	2.496E-10
pd107	6.471E-09	6.471E-09	6.471E-09	6.471E-09	6.471E-09	6.471E-09	6.471E-09	6.471E-09	6.471E-09
cd113m	9.581E-08	9.581E-08	9.580E-08	9.576E-08	9.542E-08	9.464E-08	9.348E-08	9.121E-08	8.684E-08
sn121	0.000E+00	1.535E-07	3.740E-07	6.819E-07	7.617E-07	7.601E-07	7.578E-07	7.530E-07	7.436E-07
sn121m	9.826E-07	9.826E-07	9.826E-07	9.825E-07	9.816E-07	9.795E-07	9.764E-07	9.703E-07	9.581E-07
sb125	2.841E-06	2.840E-06	2.839E-06	2.834E-06	2.782E-06	2.668E-06	2.506E-06	2.210E-06	1.719E-06
te125m	8.323E-07	8.315E-07	8.300E-07	8.248E-07	7.766E-07	7.003E-07	6.306E-07	5.448E-07	4.225E-07
sn126	1.679E-07	1.679E-07	1.679E-07	1.679E-07	1.679E-07	1.679E-07	1.679E-07	1.679E-07	1.679E-07
sb126	9.381E-08	9.241E-08	8.966E-08	8.084E-08	3.624E-08	2.393E-08	2.351E-08	2.351E-08	2.351E-08
sb126m	1.613E-07	1.679E-07	1.679E-07	1.679E-07	1.679E-07	1.679E-07	1.679E-07	1.679E-07	1.679E-07
i129	8.476E-09	8.476E-09	8.476E-09	8.476E-09	8.476E-09	8.476E-09	8.476E-09	8.476E-09	8.476E-09
cs134	4.290E-06	4.289E-06	4.286E-06	4.276E-06	4.172E-06	3.945E-06	3.627E-06	3.067E-06	2.192E-06
cs135	1.550E-07	1.550E-07	1.550E-07	1.550E-07	1.550E-07	1.550E-07	1.550E-07	1.550E-07	1.550E-07
cs137	**2.054E-02**	**2.054E-02**	**2.054E-02**	**2.054E-02**	**2.050E-02**	**2.042E-02**	**2.030E-02**	**2.007E-02**	**1.961E-02**
ba137m	**2.068E-02**	**1.939E-02**	**1.939E-02**	**1.939E-02**	**1.935E-02**	**1.928E-02**	**1.917E-02**	**1.895E-02**	**1.852E-02**
ce144	8.190E-11	8.183E-11	8.168E-11	8.118E-11	7.605E-11	6.558E-11	5.252E-11	3.368E-11	1.385E-11
pr144	8.194E-11	8.183E-11	8.168E-11	8.118E-11	7.605E-11	6.559E-11	5.252E-11	3.368E-11	1.385E-11
pr144m	6.967E-13	7.791E-13	7.778E-13	7.729E-13	7.241E-13	6.245E-13	5.001E-13	3.207E-13	1.319E-13
pm147	8.938E-05	8.936E-05	8.931E-05	8.914E-05	8.743E-05	8.367E-05	7.832E-05	6.862E-05	5.269E-05
sm147	1.760E-12	1.760E-12	1.760E-12	1.760E-12	1.760E-12	1.760E-12	1.760E-12	1.761E-12	1.761E-12
sm151	8.077E-05	8.077E-05	8.077E-05	8.076E-05	8.072E-05	8.061E-05	8.046E-05	8.015E-05	7.954E-05
eu152	2.530E-07	2.530E-07	2.530E-07	2.529E-07	2.519E-07	2.498E-07	2.466E-07	2.404E-07	2.284E-07
eu154	2.133E-04	2.133E-04	2.132E-04	2.131E-04	2.119E-04	2.090E-04	2.049E-04	1.968E-04	1.815E-04
eu155	1.056E-05	1.056E-05	1.056E-05	1.054E-05	1.043E-05	1.018E-05	9.817E-06	9.127E-06	7.888E-06
ho166m	2.173E-13	2.173E-13	2.173E-13	2.173E-13	2.173E-13	2.173E-13	2.172E-13	2.172E-13	2.170E-13
total	8.491E-02	8.362E-02	8.362E-02	8.361E-02	8.346E-02	8.312E-02	8.261E-02	8.161E-02	7.965E-02

Open Tasks and Issues for the Draft Environmental Assessment (EA) for the Acceptance and Disposition of Used Nuclear Fuel Containing U.S.-Origin Highly Enriched Uranium from the Federal Republic of Germany

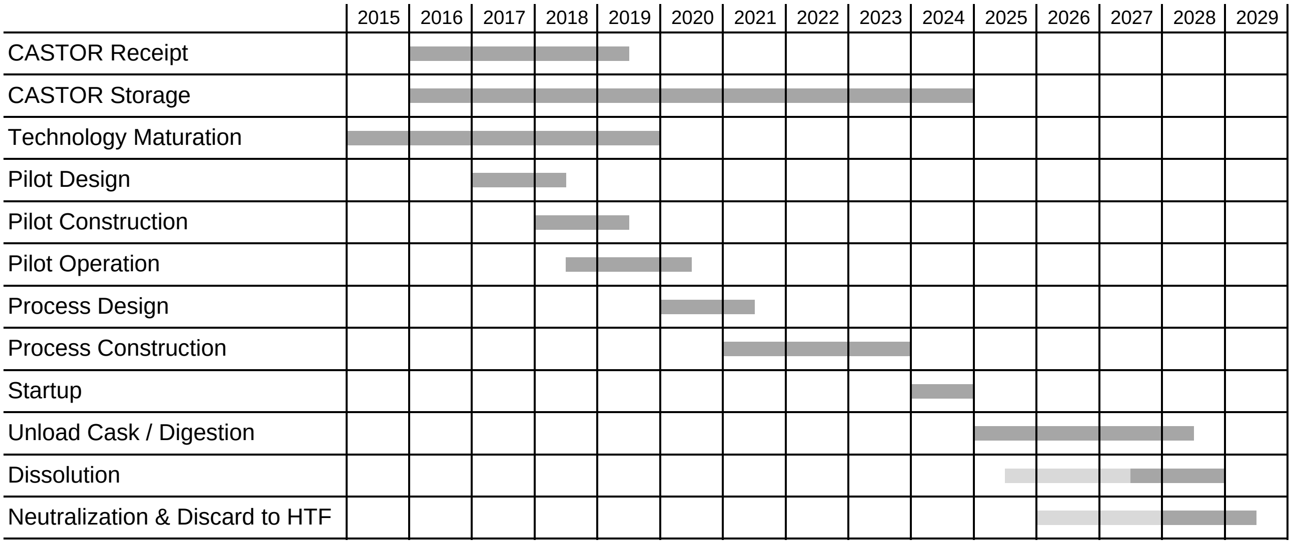
The project team met at the Department of Energy Conference Room in Aiken, S.C., on Thursday, November 13, 2014. During the course of this meeting, the following open tasks and issues were identified. This table lists the tasks and issues and the corresponding responsible person.

Number	Task	Responsible Person	Status
1.	Clarify the number of CASTOR Casks to be transported in each shipment. Draft EA currently evaluates 16 casks per shipment. Transportation coordinator is considering moving 32 casks per shipment.	Maxcine Maxted	There will be 16 casks per shipment.
2.	Clarify whether Joint Base Charleston (JBC) presents limitations on the receipt, handling, short-term storage and trans-shipment of more than 16 CASTOR Casks in a shipment.	Maxcine Maxted	The answer is moot since there will only be 16 casks per shipment.
3.	Provide a copy of the carbon digestion and vaporization process presentation.	Maxcine Maxted	Uploaded 12/11/14
4.	Provide a copy of the Final Feasibility Study (on DVD or upload to SharePoint site)	Maxcine Maxted	Uploaded 11/14/14
5.	Develop non-gaseous air emissions estimates for L-Area (environmentally conservative).	Bill Stephens	Uploaded 12/11/14 SRNL-TR-2014-00279 SRNL-L3200-2014-00053, Rev 1
6.	Identify source of depleted uranium for L-Area Melt and Dilute – revisit the math to ensure that there is enough material on site at SRS	Bill Stephens	There is 8 MT of DUO on site, more than enough to dilute the ^{235}U and ^{233}U in the HTGR kernels.
7.	Determine whether EA should include use of used fuel as an option in Melt and Dilute down-blending process.	Maxcine Maxted Drew Grainger	The EA should include use of UNF in Melt/Dilute.
8.	Provide probable specifications for proposed new emission stack associated with L-Area Alternative.	Bill Stephens	The stack to be built for the L-Area alternative would be 41 meters with an air flow of approximately 50,000 cfm, similar to that for Building 235-F.
9.	Develop a "straw man" accident risk approach, submit to Christine Hadden and initiate conversation on proposed accident risk evaluations.	TPMC	The draft StrawMan Accident Analysis with Placeholder Assumptions was provided to Christine Hadden on 12/11/14.

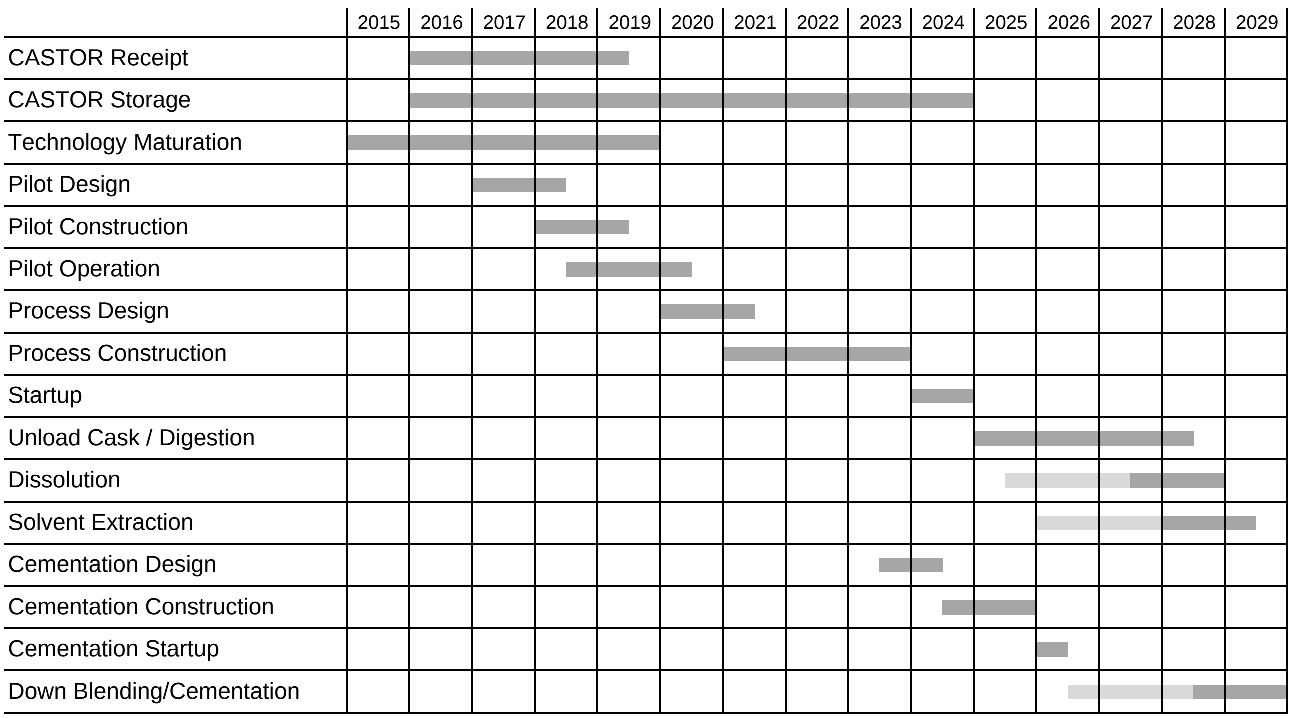
Number	Task	Responsible Person	Status
10.	Provide the probable number of HLW canisters necessary for waste storage (e.g. vitrification option currently calls for 100 canisters, LEU waste option calls for 15 canisters, etc.)	Bill Stephens	SRNL-TR-2014-00281 was uploaded to Sharepoint on 12/16/14 to address this issue.
11.	Provide estimates for air emissions from cementation process	Bill Stephens Glynn Dyer	Provided on 12/13/14 in the Data Call Response Follow-up Questions
12.	Provide current waste volumes and capacity to update Draft EA Tables 3-10 through 3-13.	Bill Stephens	Received 11/14/14
13.	Determine if the concrete waste form would require Type A or Type B packaging for offsite transport. Inquire about CASTOR casks being qualified as Type A or Type B package for concrete waste form.	Bill Stephens	The material would require a Type B package. The CASTOR cask could be used for shipment, assuming a Certificate of Compliance was issued by DOE for use of the cask.
14.	Provide write up regarding impact of this project on remediation and closure activities for SRS for the Cumulative Effects analysis. Facility life cycle write up by Chandler identified as best source.	Maxcine Maxted	To be provided by Mike Chandler by 1/31/15
15.	Provide most recent revisions of Documented Safety Analyses (DSAs) for L and H Area facilities (upload to SharePoint site).	Maxcine Maxted	Uploaded 11/14/14
16.	Provide prior analyses for melt and dilute investigations utilized for the pilot-scale L Experimental Facility melt and dilute.	Bill Stephens	Uploaded 12/15/14 LEF BIO Addendum WSRC-TR-95-0054, Add 1, Rev 0
17.	Check and update construction resources, utilities, etc. associated with the two alternatives as shown in the Data Call Response. (See Follow-up Questions 38 through 40).	Bill Stephens Glynn Dyer	The construction resources, utilities, etc. has been updated and is provided in the German Fuel Data Call Response Follow-up Questions response of 12/18/14.
18.	Revise Follow-On Questions Table and distribute to the Project Team to reflect receipt of information at the 11/13 meeting	TPMC	Transmitted to DOE-SR on 12/5/14
19.	Respond to open items on revised (per action item 18) Follow-On Questions Table.	Bill Stephens Glynn Dyer	With the exception of accident analysis information, all items have been addressed.

Updates are blue – Open items are highlighted.

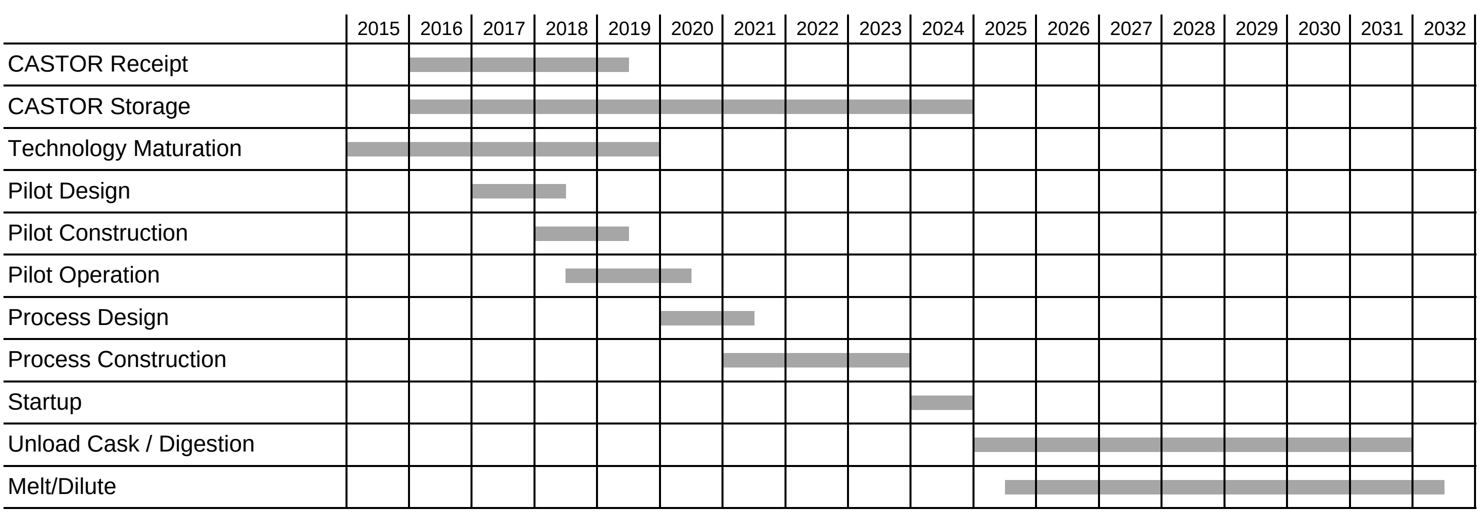
H-Area Alternative - Option 1



H-Area Alternative - Option 2 and Option 3



L-Area Alternative



Dark shaded areas are actual activity durations

Light shaded areas show early start

Grey shading in the right-hand column indicates that the question was answered in the 11/13/14 meeting at SRS or by information transmitted after the meeting.

We have indicatedour understanding of the response in brick red in grey cells in the right hand column. Please review the responses (brick red in gray boxes in the right-hand column) and indicate confirmation to verify that we have accurately captured the information provided and correct any errors that are found or revise to reflect the correct response. Additionally questions in the left column in black typeface are from the original follow-on questions; those in brick red in the left column are requested clarifications or additional follow-on questions that were provided in preparation for the November 13 meeting.

Note: question numbering is consistent with earlier versions of the follow-up questions. Those questions that were previously resolved have been deleted to simplify and streamline the table.

4. What is the process (technology) for removing the tops from the CASTOR inner canisters (e.g., shear, mechanical saw, cutting torch)? Please provide examples of candidate technologies.	The specifics have not been identified. The site has experience in remote handling and operation of multiple means for cutting operations. The process will be a mechanical process, e.g., a saw or a roller wheel can cutter. It will not be done with a torch.
6. Provide an estimate of the annual radiological emissions from the LEU and the LEU/Th solidification capability. Follow-up: Although there may be minimal emissions, is it accurate to state that there will be no radiological emissions? It has been stated that the solidification process is modeled or scaled from the WSB; the WSB is considered to have radiological emissions in the *SPD SEIS*. If radiological emissions are projected, please also provide stack parameters (height, diameter, flow rate, temperature).	It is anticipated the air from the facility would be exhausted through HEPA filters and released through a stack. The specifics for the emission release parameters (stack height, flow, etc.) have previously been provided in the Data Call response in Matrix V. Since the WSB numbers for emission release parameters are being used with no scale down, assume the same for emissions release. It is anticipated that this will be bounding.

7. Please provide an estimate of the annual radiological emissions from the two principal processing functions that would occur in L-Area under the melt and dilute alternatives; that is, digestion and melting? Follow-up: The gaseous emissions inventories are appreciated. Considering the high temperature and the amount of carryover of U into the salt, we wonder whether there would also be some small fraction of particulates that would be generated and pass through the filtration system (although this question was asked about L-Area, similar emissions are estimated for H-Area and other processing in H-Canyon results in particulate as well as gaseous emissions). Also, these appear to be associated with the carbon digestion (since they are proportional to H-Canyon digestion emissions); are there separate estimates for radiological emissions from melt and dilute? Please confirm For radiological emissions at L-Area (carbon digestion and/or melt and dilute), please provide stack parameters ((height, diameter, flow rate, temperature). For radiological emissions from H-Canyon, please confirm that emissions would be through the main stack with the following parameters: height – 59.4 meters; 14.9 square meters.	The total radiological emissions will be gases after scrubbing operations. C-14 – 2.16E+01 Ci/yr Cl-36 – 3.56E-02 Ci/yr I-129 – 3.37E-03 Ci/yr H-3 – 2.66E+02 Ci/yr Kr-85 – 2.97E+02 Ci/yr Rn-219,-220,-222 & At-217 – 2.91E+00 Ci/yr See SRNL-TR-2014-00279, uploaded on 12/11/14.
9. Transportation: Provide the following information on the DU to be used for down blending the U or U/Th stream: - Source (where is it coming from) For confirmation – then the description in the project description document regarding rail cars is superseded by this.	Sixteen drums of depleted uranium trioxide power are stored on site. Approximately seven drums will be used for downblending. OR for the H-Area options, the DU could be received as uranyl nitrate in 1 or 2 tank cars from offsite [for a bounding distance, NEPA team assumes Hanford].
- Radiological characteristics (concentration)	Powder or OR 400 g/l
- Chemical form	Uranium trioxide, UO_3 (powder) OR uranyl nitrate (H-Area options only)
- Transport information – tank car capacity; number of tank cars; transport frequency	The DU is stored in 55 gallons drums and would be transported by truck. OR 1 or 2 tank cars (for a total of 2,100 gallons).
10. Radiological Characterization: This is a modification of an earlier question regarding radiological characterization: Provide information on inventory and dose rate buildup as a function of time for separated HEU (for example, after processing, how will the dose rate and nominal inventory (e.g., per container) change with time?) Please provide data for after 90 days and 1 year. [Note: per discussions with DOE, we are including analysis of shipment to offsite disposal facilities so we need characterization of the grouted waste form for transportation analyses.]	The processing of the material through solvent extraction removes the activation product in-growth such that the dose rate is very low for the cementation process. However, the growth of activation products is fairly significant such that storage for more than a few months is not possible without significant shielding. An email entitled “Cementation Process LLW Shipment Info” was uploaded to Sharepoint on 12/16 to address this issue. While the gamma dose rate for an unshielded container containing U/Th grout can increase to 77 mrem/hr at 1m, a CASTOR cask will effectively shield the grouted material.

11. The Federal Register Notice of Intent stated: *Currently identified alternatives include on-site disposal in the E-Area at SRS and, potentially, pursuing reuse of the transport casks.* What activities/inquiries have been made regarding reuse of the casks and what was the result [since this was mentioned in the FR, we want to close out the issue in the EA]. Need to discuss with DOE – do we include or not include re-use in the EA?	Currently, no action has been taken with respect to inquiries for interest in reuse of the CASTOR casks. There was some interest by a packaging vendor, but its need and the timing of the availability of the CASTORs did not work out. [For purposes of analysis, the EA will assume an entity with the necessary radioactive materials license or qualifications to receive/use the CASTORs takes them and puts them to some unspecified use.] Per discussion with DOE, the only potential use for the CASTOR casks will be for storage of grouted U or U/Th from the H-Area cementation process. Otherwise the plan will be to dispose the casks as LLW.
13. Please provide a timeline of proposed activities. Follow-up: we are requesting information on the relative timing/overlap of the major activities. For example, for processing option 2/2T, the following activities are required: - Construction/modifications (solidification building/H-Canyon) - Receipt of CASTORs (3 years) - carbon digestion (3.5 years) - dissolution and solvent extraction (3 years), - down blending, - uranium or uranium/thorium solidification (1.5 years). Please provide for both alternatives and all options; H-Area Alternative – Option 1 H-Area Alternative – Option 2 H-Area Alternative – Option 3 L-Area Alternative Where construction is required, please include the timeline (duration) of that activity. These data would also show the length of the CASTOR cask storage period (between end of receiving casks and start of digestion).	Schedules for the H-Area and L-Area Alternatives have been uploaded to Sharepoint on 12/18/14. There would be insignificant schedule differences in Option 2 and Option 3 for the H-Area Alternative, so a single schedule is shown for both Options.
14. The Data Call Response indicates in various places that land would be disturbed for storage at H- and L-Areas, construction of the solidification facility in H-Area, and construction of the Melt and Dilute capability in L-Area. For all instances where land would be disturbed, is it land that has been previously disturbed?	The land that will be disturbed in L-Area is previously undisturbed. The land in H-Area has been previously disturbed. The land in L-Area is currently open field and is an area that was previously disturbed, cleared, graded, etc. There are underground utilities passing through the area. It is all within the L-Area protected area fence.

19. Page 6, Row: Construction/modification Waste Generated for L-Area: a. Please quantify the amount of LLW that would be generated	200 cu yd – concrete blocks wrapped in plastic 1800 cu ft – 20 B-25 boxes 6400 cu ft – 10 Skid pans This is the quantity of LLW projected; assume it includes job control waste.
b. Is any of the ~~2~~100,000 lbs of steel contaminated? If so, how/with what?	The 100,000 lbs of steel to be disposed of is contaminated. Yes, the 100,000 lbs of steel is radioactively contaminated and is included in the LLW volumes above. These materials would be disposed of at E-Area or offsite. A skid pan is a large, open top container similar to a roll-on/roll-off box (but without the wheels).
c. The Data Call Response indicates that 90 percent of the concrete is nonhazardous. What about the remaining 10 percent? Is it hazardous and/or radioactive?	The total quantity of concrete is expected to be 750,000 lbs (approximately 200 cu yd). Of this, 90% would be LLW only and 10% would be LLW with PCB contamination (TSCA regulated).
20. Page 7 Row: Operations; Annual Worker Dose: The H-Area column indicates 3 operators and 2 rad con techs (5 workers); the L-Area column indicates 4 workers. Should there be the same number and types of workers for Carbon Digestion activities in both areas? Please clarify. Correction of this question: This was incorrectly posed as an H-Area – L-Area comparison/question. Referring to the Data Call Response of 10/22/14, Matrix II, (page 8), the calculation for worker dose under the H-Area Alternative is given as (4 workers x 1 mrem x 4 hrs); 3 rows above the row with the calculation it states that there would be 3 operators and 2 rad con tech supporting the operation (5 workers); in the row below the calculation it states that the total number of exposed workers would be 5/shift for 4 shifts). Please reconcile or explain the discrepancy in the number of workers (5 vs 4).	The L-Area column states that it will be the same or less. For Carbon Digestion, is should be close to the same. The numbers are correct. It is assumed that the exposure of the 5 staff would be equal to that of 4 FTEs. Unless advised otherwise, we will continue to assume the <u>annual</u> dose to workers for L-Area operations would be about half of that for H-Area due to the processing of 500 rather than 1,000 pebbles.
28. Page 14, Row: Employee Radiological Exposure: Please provide employee exposure data for L-Area. Because the existing H-Canyon activities are much different than those in L-Area, it is not possible to use H-Canyon data for L-Area exposure as indicated.	There is no radiological exposure during the processing of the kernels to ingots. There will be same small quantity of exposure for packaging the ingots into dry storage canisters. The quantity should be the same or less than that for unloading the casks. The total exposure should be less than 1,080 mrem/yr. Yes, the worker dose for packaging the ingots is estimated to be 1,080 mrem/yr.
30. Page 14, Row: Operations; Waste generated: Would the Melt and Dilute Alternative in L-Area generate wastes such as LLW or solid nonhazardous waste in addition to the SNF canisters?	<u>H-Canyon</u> <u>L-Area</u> Sanitary Waste 275 m^3/yr 100 m^3/yr Job Control Clean 50 m^3/yr 20 m^3/yr Job Control LLW 300 m^3/yr 125 m^3/yr These numbers encompass the waste generated during digestion and processing through the respective facilities.
32. What is the relationship between the quantity of solidified U or U/Th waste that will be generated and the capacity of the CASTOR casks in which it is to be disposed? In other words, are there excess casks (and if so, how many) or a shortage of casks (and if so, what would the packaging be for the balance of the solidified waste)?	Current estimates are that there would be enough CASTORs for accepting and packaging all of the solidified U or U/Th waste, that is, no additional disposal casks would be needed.

33. Please provide copies of the following documents/documentation referred to in the data call responses: - S-CLC-G-00278, Aircraft Impact Frequencies for SRS Facilities - *Safety in Design Tailoring Strategy for HTGR Fuel Receipt and Disposition Feasibility Study*, N-ESR-H-00027 - Documented Safety Analysis, S-DSA-H-00001[in the case of this DSA, either confirm that the version we have is the most current (Rev.6, May 2012) or provide the most recent revision.] - A review of the existing accident analysis calculations for H-Canyon did not immediately rule out the use of L-area for the digestion process with only SS active ventilation instead of SC with a sand filter. [Can a copy of this review be provided to support the characterization/evaluation of bounding accidents?] - To the extent practical, hazards analysis for L Area processing of this material will build upon prior analyses utilized for the pilot-scale L Experimental Facility melt & dilute process	- Provided via upload to the SharePoint site. - Provided via upload to the SharePoint site. - Provided via upload to the SharePoint site. - Working; appropriate staff working with NEPA accident analyst to help define accident scenarios and appropriate factors. - Provided via upload to the SharePoint site.
34. Referring to the Data Call Response of 10/22/14, Matrix V, re: safety documentation – when waste is processed into a stream for Saltstone disposal and a stream for DWPF disposition, where do the U-232 daughters go? Please confirm that the presence of these daughters would not require revisions to the safety documentation for the involved facilities.	During the processing for the H-Area alternatives, all U-232 daughters would go to DWPF for disposition prior to the U/Th being separated from the other fission products. Daughter products generated after separation of U/Th will remain with the U/.Th.
38. Please revisit the L-Area construction activities presented in the 10/22/14 Data Call Response, Matrix III, Construction – it appears that the responses for a number of items under Construction are for operations. Examples: - Air emissions (if this is construction please clarify emissions "previously discussed) - Employment - Shifts - Employee rad exposure - Annual worker dose - Waste generated - Disposition plans Also, can you clarify your reference to "melt and dilute NEPA;"	Under Matrix III, Construction, for the L-Area alternative, all responses should refer to Matrix II, Construction, for the L-Area alternative. The information in Matrix II, Construction, included activates related to Matrix III, as far as the L-Area alternative is concerned. The reference to the melt and dilute NEPA should not be there. The intent was to refer to what was the prior plan for disposition of the material.
39. Referring to the 10/22/14 Data Call Response, Matrix III, Operations Utilities needed, the text relates the needs to H-Area, but does not specify which option in H-Area is being referred to. Additionally, it ends with "Updated information to be provided." Please provide the estimates for utilities for the M&D Alternative.	The following are estimated increases for melt and dilute in L-Area. These are increases above that required for digestion in L-Area. Electricity 10,000 MWhr Steam 3,500 Klb Process Water 4,500 Kgal

40. Confirmation – In the 10/22/14 Data Call Response, Matrix III, Operations Resource needs, Options 2, 2T, and 6 show a need of 3.2 metric tons of depleted uranium. Please confirm or correct the following: – This is the total need (rather than an annual requirement). – This is the same material referred to in item 9 above? – Is this quantity and source of DU applicable to both H-Area and L-Area Alternatives? – For the melt and dilute alternative, the Process Description Document also mentions the possibility of using existing aluminum-clad fuel as a source of both U and Al; what is the source and nature (fresh, spent) of this fuel? – For the above fuel, has disposition previously been addressed in a NEPA analysis?	– This is the total need. – Yes. – The 3.2 metric tons is for both alternatives. The physical form could be different – It is spent fuel. SRNL-TR-2014-00281, Blend-down Approaches for the HTGR Melt and Dilute Option, discusses the fuel that would be utilized. The document was uploaded to Sharepoint on 12/16/2014. – Yes, the fuel was previously included in the Spent Fuel Environmental Impact Statement.
41. The 10/22 Data Call Response contains the following information for operations employment: H-Canyon Alternative: • Carbon Digestion – 32 • Kernel Dissolution – 50 • Solidification – 20 L-Area Alternative: • Carbon Digestion – 32 • Salt Dissolution and M&D – 100 Page 27 (Socioeconomics) of the 10/22 data call response states: "*Assuming the current site employment remains constant, the peak employment for each option would increase by 25 to 40 full time employees. There should be minimal differences in the peak employment levels for each option.*" Please clarify Peak Employment. It would appear that Peak Employment for the H-Canyon Alternative, Options 2/2T could be closer to 102 (32+50+20). Please confirm or correct the peak number. Also review and confirm/correct peak numbers for: – the H-Canyon Option 1 – the L-Area Alternative (Options 6)? Would most of these employees be expected to be existing site employees – H-Area Alternative – L-Area Alternative In addition, would most of the construction employment for the H-Canyon and L-Area Alternatives be new or existing employees	The numbers provided are estimates and an review show them to be reasonable. A better number for peak employment would be an increase of125 to 150 during operations. Most would be existing site employees. The intent is to retain and utilize site resources before going off-site. For construction, due to the quantity of resources required, most would be new employees.

From: Larry Saraka/TPMC
To: Michael Werner/TPMC@PMC, "Groome Chadi D." <CHADI.D.GROOME@leidos.com>

Date: Wednesday, January 28, 2015 10:16AM
Subject: Fw: EA Comments and Input (Life Cycle Inputs from Chandler)

See below. Thank you.

-----Forwarded by Larry Saraka/TPMC on 01/28/2015 10:16AM -----

To: lsaraka@terranearpmc.com
From: William.Dyer@srs.gov
Date: 01/28/2015 06:31AM
Cc: Maxcine.Maxted@srs.gov, Michael.Chandler@srs.gov
Subject: Fw: EA Comments and Input

Larry,

See below on the Life Cycle Impacts.

Glynn

W. Glynn Dyer
Senior Technical Advisor
H-Canyon Waste Minimization
(803) 208-0905
(803) 725-7243, pager 16771

----- Forwarded by William Dyer/SRNS/Srs on 01/28/2015 06:24 AM -----

From: Michael Chandler/DOE/Srs
To: William Dyer/SRNS/Srs@SRS, Maxcine Maxted/DOE/Srs@SRS,
Date: 01/27/2015 03:00 PM
Subject: EA Comments and Input

Glynn, can I send these through you to he EA.

Life-Cycle Impacts

Life-cycle impacts associated with the HTGR fuel will be discussed in terms of the added time a facility has to remain in an operational status as a result of the HTGR material disposition activities. Alternative - Option operational duration impacts are listed in Table 4-14. Some of these operational impacts can occur concurrent with other missions while others can only occur in series. Consider the H-Area Alternative - Option 1, the Carbon Digestion has a 3.5 year operational impact than can occur concurrent to regular operations and therefore would have little to no life-cycle impact. However, Op ion 1 adds additional waste to the HLW system that does add 0.3 years of operational life to the DWPF process and 0.07 years of life to the Saltstone operations. These two independent operations can occur independent of each o her but are life-cycle impacts to site facilities. Ano her life-cycle impact that should be considered is whether additional de-inventory, de-activation (D&D) or facility closure activities are required that can add to he life-cycle impacts. Under this Option, no new activities that would be planned for D&D or Closure of the facilities are expected to be impacted. However, since H-Canyon D&D activities will produce flush material to the HLW system, mainly liquids impacting Saltstone Operations, the Saltstone Option 1 operational impact should be considered concurrent with the regular D&D activities of H-Canyon. In summary, Option 1 would be expected to have a realis ic life-cycle impact of 0.3 years to SRS facilities for the processing of HTGR fuel.

Op ions 2 and 3 have a different life-cycle impact. Though the Carbon Digestion process could be performed concurrently with routine canyon operations as was described for Option 1, Options 2 and 3 require he use of the H-Canyon mixer-set lers for separation of uranium or uranium and thorium. For both of hese options, the operational ime to process he HTGR fuel inventory through the mixer -settlers is about 1 5 years. While this activity can not be performed concurrently with routine H-Canyon operations, and expected to occur at the end of the facility operational life, it could occur while D&D activities are being performed within H-Canyon. The concurrent D&D activi ies may reduce the life-cycle impact to 1 year. The addition of he cementation process for the uranium or uranium and thorium streams would be expected to operate concurrent to the mixer-settler processing and operate 0.5 years after the mixer-settler operations are completed. However, the cementation process can occur concurrent with D&D activi ies, and may reduce the D&D life-cycle impacts by providing an alternative D&D flush solution pathway that currently does not exist for H-Canyon. In summary, Options 2 &3 would be expected to have a realistic life-cycle impact of 1.0 years to SRS facilities for the processing of HTGR fuel.

The life-cycle impacts of the L-Area Melt and Dilute Alternative as considered in his EA will be very little. As considered, this Option assumes the co-processing with a significant amount of current SRS fuel inventory for blending with HTGR fuel. This disposition path for the SRS inventory would occur concurrent with the HTGR fuel. If this option is chosen, D&D and Closure activities would be required as a result of processing the SRS fuel inventory independent of the HTGR fuel. Table 4-14 does identify a Saltstone impact of 0.04 years. In summary, the L-Area Melt and Dilute Option would be expected to have a realistic life-cycle impact of 0.04 years to SRS facilities for the processing of HTGR fuel.

RE: German Fuel EA Statement Verification
William Dyer to: Owens, Kirk W. (uploaded via Sharepoint) 02/09/2015 09:36 AM
Cc: William Stephens, Maxcine Maxted, Michael Chandler, Edwin Moore
Bcc: William Dyer

Kirk,

I am not sure where the 5% figure came from in the NEPA report, and when I talked to Ed Moore, he did not remember that. Regardless, the volume remaining after either salt digestion or vapor digestion will be about 2% of that fed to the digester.

I was able to come up with a figure of 5% by weight remaining after digestion. Due to the density of the kernel as compared to the pebble, the volume density would be less.

Glynn

W. Glynn Dyer
Senior Technical Advisor
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(803) 725-7243, pager 16771

"Owens, Kirk W." Glynn, Here is the other question I had about the... 02/06/2015 01:25:36 PM

From: "Owens, Kirk W." <KIRK.W.OWENS@leidos.com>
To: "William.Dyer@srs.gov" <William.Dyer@srs.gov>,
Date: 02/06/2015 01:25 PM
Subject: RE: German Fuel EA statement verification

Glynn,

Here is the other question I had about the volume remaining after carbon digestion.

In the previous draft of the EA, in describing the salt digestion process, we stated:

> The kernels remaining following digestion would be about 5 percent of the volume of pebbles fed into the digester.

The site author of the vapor digestion description paralleled the format of the EA and stated:

> The kernels remaining following digestion would be about 2 percent of the volume of pebbles fed into the digester.

Is there actually this much difference in the volume of the kernels, etc. yielded by the two carbon digestion options? Please confirm or correct the volume percent remaining, as needed.

Thanks,

KO

Kirk Owens | Leidos
Project Manager | Infrastructure Planning & Management Solutions
phone: 301.353.8228
owensk@leidos.com | leidos.com/engineering

RE: German Fuel EA statement verification

William Dyer to: 02/19/2015 03:20 PM

Cc: Edwin Moore, Maxcine Maxted, William Stephens

Kirk,

Per the process description document (SRNL-TR-2014-00290), the bounding cemented volume of Option 2 is 2.67E04 gallons and 7.54E04 gallons for Option 2T. The Option 2T value is conservative in that it treats both U and Th as offsetting heavy metal. However there is mutual solubility and when this is taken into account, the volume will be less. Since the entire math is based on the WSB uranium case, we need more data on the impact of thorium in the cementation operation to assess the viability and actual volume of from Option 2T. Regardless, the concrete would fit into the cask void space, therefore the volume of LLW is simply that of the CASTOR cask.

Glynn

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"Owens, Kirk W."	Glynn, Just a follow-up to the note below. There...	02/11/2015 05:49:49 AM

From: "Owens, Kirk W." <KIRK.W.OWENS@leidos.com>
To: "William.Dyer@srs.gov" <William.Dyer@srs.gov>,
Cc: "Maxcine.Maxted@srs.gov" <Maxcine.Maxted@srs.gov>, "William.Stephens@srs.gov" <William.Stephens@srs.gov>, "lsaraka@terranearpmc.com" <lsaraka@terranearpmc.com>, "Groome, Chadi D." <CHADI.D.GROOME@leidos.com>
Date: 02/11/2015 05:49 AM
Subject: RE: German Fuel EA statement verification

Glynn,

Just a follow-up to the note below. There is one item not answered in the below-referenced file that you said you needed to confer with others on – that is, the actual volume of cemented waste that would be generated under alternatives 2 and 2T (LEU Waste and LEU/Thorium Waste Options). My understanding from out discussion is that the reason the cemented waste volume appears the same for the 2 and 2T is that in the Feasibility Study and Project Description document, the volume being reported is the disposal volume of the CASTORs that are expected to be used to contain the cemented waste.

Thanks,

KO

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The following data/assumptions will better address the LLW differences between the LEU option and the LEU/Th option of Alternative 1.

1. There is 397 kg fissile (^{233}U and ^{235}U) in the HTGR fuel.
2. Based on past experience of LLW to Nevada National Security Site, it is expected that the maximum quantity of fissile in a Type B shipping container (CASTOR cask) will be restricted to 1 kg. To protect a 1 kg maximum, it is assumed that 900 grams would be the maximum in a CASTOR cask. Therefore, from a fissile content, it will require a minimum of 441 CASTOR casks for the cemented LEU or LEU/Th.
3. The volume of cemented grout for the LEU option is 26,700 gallons and for the LEU/Th option is 75,400 gallons.
4. The volume of a cemented grout can will be approximately that of the TLK can (also referred to as cask liner). Two cemented grout cans can fit into a CASTOR cask. The interior diameter of a can is 54 cm and the interior height is 90 cm. Assuming the grout can is 90% full, the maximum volume of grout in a can is 49 gallons.
5. Based on volume, there will be 545 grout cans of LEU. However, the fissile content in two grout cans (that can be placed in a CASTOR) would be over 1450 grams. Per note 1 above, the fissile content restriction will require a minimum of 441 CASTOR casks. Since there are 455 CASTOR casks, it is assumed that all 455 CASTOR casks will be used for the cemented LEU grout, and all of the TLK cans will be disposed as LLW equipment waste.
6. There will be 1540 grout cans of LEU/Th. Since each grout can of LEU/Th will contain about 258 g fissile, the fissile restriction on CASTOR casks will be met. However, only 910 grout cans can be placed in CASTOR casks. Therefore, 630 grout cans will be disposed as LLW, corresponding to about 5500 cubic feet, in addition to the TLK cans.

Waste Form	LEU Option	LEU/Th Option
LLW equipment waste (cubic feet)	7.89E+03	7.89E+03
LLW grout in CASTOR (cubic feet)	6.69E+04	6.69E+04
LLW grout not in CASTOR (cubic feet)		5.46E+03

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From: William.Dyer@srs.gov [mailto:William.Dyer@srs.gov]
Sent: Friday, February 06, 2015 1:02 PM
To: Owens, Kirk W.
Cc: Maxcine.Maxted@srs.gov; William.Stephens@srs.gov; lsaraka@terranearpmc.com
Subject: RE: German Fuel EA statement verification

Kirk,

I have uploaded my comments to Sharepoint on the "Items requiring confirmation v2" document you sent me.

There are two additional items I am following up on that I will not have an answer until Monday. The first is the difference with the kernels remaining after the two types of digestion and the second is related to the volume of U and U/Th cementation grout. As soon as I obtain this information, I will pass that on to you.

Glynn

W. Glynn Dyer
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From: "Owens, Kirk W." <KIRK.W.OWENS@leidos.com>
To: "William.Dyer@srs.gov" <William.Dyer@srs.gov>,
Date: 02/06/2015 08:45 AM
Subject: RE: German Fuel EA statement verification

Glynn,

Thanks for the note – I hate it when that happens.

Let's try this again. Please let me know if this email and attachment made it to you.

Thanks,

KO

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leidos

NATIONAL SECURITY | HEALTH | ENGINEERING

From: William.Dyer@srs.gov [mailto:William.Dyer@srs.gov]
Sent: Friday, February 06, 2015 6:54 AM
To: Owens, Kirk W.
Subject: RE: German Fuel EA statement verification

Kirk,

This is the first email I have received from you. Although the string shows that you sent previous emails, I did not get them. I also did not get the attachment.

I was out of the office Thursday so this is the first change I have had to respond.

Glynn

W. Glynn Dyer
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From: "Owens, Kirk W." <KIRK.W.OWENS@leidos.com>
To: "William.Dyer@srs.gov" <William.Dyer@srs.gov>,
Date: 02/05/2015 05:38 AM
Subject: RE: German Fuel EA statement verification

Glynn,

I wanted to check to see if you had a chance to look at the items for clarification.

Thanks,

KO

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From: Owens, Kirk W.
Sent: Tuesday, February 03, 2015 3:50 PM
To: 'William.Dyer@srs.gov'
Subject: German Fuel EA statement verification

Glynn,

Thanks for taking my call today. It quickly clarified a couple of items.

As discussed, there are a few statements in our description of the alternatives/options that reviewers are questioning. Could you look at the attached and confirm or correct as appropriate?

Thank you,

KO

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[attachment "Items requiring confirmation v2.docx" deleted by William Dyer/SRNS/Srs]