PUREX STORAGE TUNNELS
CHAPTER 3.0
WASTE ANALYSIS PLAN

CHANGE CONTROL LOG

Change Control Logs ensure that changes to this unit are performed in a methodical, controlled, coordinated, and transparent manner. Each unit addendum will have its own change control log with a modification history table. The "**Modification Number**" represents Ecology's method for tracking the different versions of the permit. This log will serve as an up to date record of modifications and version history of the unit.

Modification History Table

Modification Date	Modification Number
10/2006	

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CHAPTER 3.0
WASTE ANALYSIS PLAN

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CHAPTER 3.0
WASTE ANALYSIS PLAN

TABLE OF CONTENTS

TABLE

GLOSSARY

ALARA	as low as reasonably achievable
ECOLOGY	Washington State Department of Ecology
~~EHW~~	~~extremely hazardous waste~~
EPA	U.S. Environmental Protection Agency
pH	negative logarithm of the hydrogen-ion concentration
PUREX	plutonium-uranium extraction
QA/QC	quality assurance and quality control
TSD	treatment, storage, and/or disposal
WAC	Washington Administrative Code
WAP	waste analysis plan

METRIC CONVERSION CHART

The following conversion chart provides the reader an aid in conversion.

Into metric units			Out of metric units		
If you know	Multiply by	To get	If you know	Multiply by	To get
Length			Length		
inches	25.40	millimeters	millimeters	0.0393	inches
inches	2.54	centimeters	centimeters	0.393	inches
feet	0.3048	meters	meters	3.2808	feet
yards	0.914	meters	meters	1.09	yards
miles	1.609	kilometers	kilometers	0.62	miles
Area			Area		
square inches	6.4516	square centimeters	square centimeters	0.155	square inches
square feet	0.092	square meters	square meters	10.7639	square feet
square yards	0.836	square meters	square meters	1.20	square yards
square miles	2.59	square kilometers	square kilometers	0.39	square miles
acres	0.404	hectares	hectares	2.471	acres
Mass (weight)			Mass (weight)		
ounces	28.35	grams	grams	0.0352	ounces
pounds	0.453	kilograms	kilograms	2.2046	pounds
short ton	0.907	metric ton	metric ton	1.10	short ton
Volume			Volume		
fluid ounces	29.57	milliliters	milliliters	0.03	fluid ounces
quarts	0.95	liters	liters	1.057	quarts
gallons	3.79	liters	liters	0.26	gallons
cubic feet	0.03	cubic meters	cubic meters	35.3147	cubic feet
cubic yards	0.76456	cubic meters	cubic meters	1.308	cubic yards
Temperature			Temperature		
Fahrenheit	subtract 32 then multiply by 5/9ths	Celsius	Celsius	multiply by 9/5ths, then add 32	Fahrenheit

Source: *Engineering Unit Conversions*, M. R. Lindeburg, PE, Second Ed., 1990, Professional Publications, Inc., Belmont, California.

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3.0 WASTE ANALYSIS PLAN

This chapter provides information on the chemical, biological, and physical characteristics of the dangerous waste stored in the PUREX Storage Tunnels. Waste in the tunnels is stored and managed as mixed waste. The PUREX Storage Tunnels provide the necessary shielding for the protection of employees and the environment from mixed waste. The PUREX Storage Tunnels are no longer in active operation and will be identified as "closure units."

On May 9, 2017 workers discovered a portion of Tunnel Number 1 had collapsed, prompting an immediate response action to protect workers and the environment. A structural evaluation revealed the threat of further failure of Tunnel Number 1. An interim stabilization measure to fill Tunnel Number 1 with engineered grout was taken under Section J.4.5 of the PUREX Tunnels Contingency Plan and Permit Condition V.25.A.1 of the Hanford Facility RCRA Permit. Grouting in Tunnel Number 1 was completed in November 2017. Filling the tunnel void spaces with grout improved tunnel stability, provided additional radiological protection, and increased durability while not precluding final closure actions.

A structural evaluation revealed the threat of future failure of Tunnel Number 2. To protect stored waste containers from potential damage caused by a tunnel failure event (e.g., puncture of a container by a falling structural member) and to prevent any associated release of dangerous waste constituents to the environment, an interim closure action to cover the stored waste and fill Tunnel Number 2 void spaces around the waste with engineered grout is being taken. The waste analysis plan (WAP) reflects information about the waste currently in storage in the tunnels.

3.1 Chemical, Biological, and Physical Analyses

Regulated material presently stored in the PUREX Storage Tunnels contains the following dangerous waste:

- Lead
- Mercury
- Silver and silver salts
- Chromium
- Cadmium
- Barium
- Mineral oil

In general, dangerous waste is either attached to, contained within, or actually is material removed from the PUREX Plant and other onsite sources. Changes in dangerous waste stored is updated annually in the annual dangerous waste report submitted to Ecology. ~~Future storage of barium and selenium may occur in Tunnel Number 2.~~ The PUREX Storage Tunnels are permitted as ~~a~~ miscellaneous units under WAC 173-303-680 because the tunnels are not ~~a~~ typical containerized storage units. That is, the bulk of the material stored in the tunnels is not placed in a container; rather, this material is placed on a portable device (railcar) used as a storage platform. The mixed waste stored in the PUREX Storage Tunnels is encased or contained within carbon or stainless steel plate, pipe, or vessels that meet the WAC 173-303-040 definition of container. Therefore, the mixed waste normally is not exposed to the tunnel environment.

The only free-liquid dangerous waste stored in the tunnels is elemental mercury. The mercury is contained within thick-walled (0.8-centimeter) thermowells. The amount of mercury per thermowell is less than 1.7 liters.

Other liquid containers, such as large discarded process tanks, are stored in the PUREX Storage Tunnels. These containers are 'empty' [per WAC 173-303-160(2)(a)]. ~~In the future, containers will be flushed and~~

~~the final rinsate sampled and analyzed to verify that the residual heel is not a dangerous waste.~~

The only stored mixed waste that is designated as either reactive or ignitable (D001) is silver nitrate in the silver reactors [WAC 173-303-090(5)]. There is no mixed waste designated as reactive (D003). The potential for ignition from this source is considered negligible because this material is dispersed on ceramic packing and is physically isolated from contact with any combustible material or ignition source.

3.2 Tracking System

~~Specific waste tracking forms for~~ Documentation of the movement of waste ~~destined~~ for storage in the PUREX Storage Tunnels ~~are used. These waste tracking forms effectively track waste inventories from generation through storage.~~

~~The waste tracking forms and other supporting documentation~~ will be maintained at the Hanford Facility for a minimum of 5 years following closure of the PUREX Storage Tunnels.

3.3 Facility Description

This ~~waste analysis plan (~~WAP~~)~~ has been prepared for the PUREX Storage Tunnels, located on the Hanford Facility, Richland, Washington. This WAP applies to all mixed waste (containing dangerous components) regulated by WAC 173-303 that is ~~transferred to and/or~~ contained in the PUREX Storage Tunnels.

The PUREX Storage Tunnels are permitted as ~~a~~ miscellaneous units under WAC 173-303-680, but are no longer in active operation and comprise Closing Unit Group 25. The bulk of the waste stored in the PUREX Storage Tunnels is not placed in a typical container; rather, this waste is placed on a portable device (railcar) that is used as a storage platform. In general, the mixed waste stored in the PUREX Storage Tunnels is encased or contained within carbon or stainless steel plate, pipe, or vessels. Therefore, the mixed waste normally is not exposed to the tunnel environment.

The PUREX Facility, located in the 200 East Area, consists of two separate treatment, storage, and/or disposal (TSD) U~~u~~nit Groups, the PUREX Plant (202-A Building) and the PUREX Storage Tunnels. Access to the PUREX Storage Tunnels is by means of the railroad tunnel.

The PUREX Storage Tunnels branch off from the railroad tunnel and extend southward from the east end of the PUREX Plant. The tunnels are used for storage of mixed waste from the PUREX Plant and from other onsite sources. Each storage tunnel is isolated from the railroad tunnel by a water-fillable shielding door. There are no electrical utilities, water lines, drains, fire detection or suppression systems, or communication systems provided inside the PUREX Storage Tunnels.

Material selected for storage was~~is~~ loaded on railcars modified to serve as both transport and storage platforms. Normally, a remote-controlled, battery-powered locomotive was used to position the railcar in the storage tunnel. In the past ~~and possibly in the future~~, other remote movers, e.g., standard locomotive with a string of railcar spacers, power winch, etc., have or could have been used to position a railcar in the tunnel or to withdraw a car from the tunnel. The railcar storage positions are numbered sequentially, commencing with Position 1 that abuts the rail stop bumper at the south end of each tunnel. Position 2 is the location of the railcar that abuts the railcar in Position 1 and so forth. The railcars and material remain in the storage tunnel until final disposition is determined. ~~Each railcar is retrievable; however, because the railcars are stored on a single, dead-end railroad track, the railcars can be removed only in reverse order (i.e., last in, first out).~~

Construction of Tunnel Number 1 was completed in 1956. The Tunnel has three areas, the water-fillable door, the storage area, and the vent shaft. The water-fillable door is located at the north end of Tunnel Number 1 and separates the storage tunnel from the railroad tunnel. The door is 7.5 meters high, 6.6 meters wide, and 2.1 meters thick, and is constructed of 1.3-centimeter steel plate. The door is hollow so that the door could~~can~~ be filled with water to act as a shield when the door is in the down (closed) position. ~~If the door is filled with water, the water must be pumped from the door before the door can be~~

~~raised~~The door does not currently contain water and will not be refilled. Above the door is a reinforced concrete structure in which the door is raised to open the tunnel. Electric hoists used for opening and closing the door are located on the top of this concrete structure.

The storage area is that portion of the tunnel that extends southward from the water-fillable door. Inside dimensions of Tunnel Number 1 are 109.1 meters long, 6.7 meters high, and ~~5.9~~5.8 meters wide. Ceiling and walls are 35.6-centimeters thick and constructed of 30.5- by 35.6-centimeter creosote pressure-treated Douglas fir timbers arranged side by side. The first 30.5 meters of the east wall are constructed of 0.9-meter-thick reinforced concrete. A 40.8-kilogram mineral-surface roofing material was used to cover the exterior surface of the timbers before placement of nominally 2.4 meters of earth fill. The earth cover serves as protection from the elements and as shielding. The timbers that form the walls rest on reinforced concrete footings 0.9 meter wide by 0.3 meter thick. The floor consists of a railroad track laid on a gravel bed. The space between the ties is filled to top-of-tie with gravel ballast. The tracks are on a 1.0 percent downward slope to the south to ensure that the railcars remain in their storage position. A railcar bumper is located 2.4 meters from the south end of the tracks to act as a stop. The capacity of the storage area is eight, 12.8-meter-long railcars.

In June 1960, the first two railcars were loaded with a single, approximately 12.5-meter-long, failed separation column and a box containing jumpers (connectors) and placed in Tunnel Number 1. Between June 1960 and January 1965, six more railcars were placed in Tunnel Number 1, filling the tunnel. After the last car was placed in the northern-most storage position (Position 8), the water-fillable door was closed, filled with water, and deactivated electrically. The door was subsequently drained and sealed and will not be refilled.

On May 9, 2017 workers discovered a portion of Tunnel Number 1 had collapsed, prompting an immediate response action to protect workers and the environment. A structural evaluation revealed the threat of further failure of Tunnel Number 1. An interim stabilization measure to fill Tunnel Number 1 with engineered grout was taken under Section J.4.5 of the PUREX Tunnels Contingency Plan and Permit Condition V.25.A.1 of the Hanford Facility RCRA Permit. Grouting in Tunnel Number 1 was completed in November 2017. Filling the tunnel void spaces with grout improved tunnel stability, provided additional radiological protection, and increased durability while not precluding final closure actions.

Construction of Tunnel Number 2 was started and completed in 1964. Like Tunnel Number 1, Tunnel Number 2 consists of three functional areas: the water-fillable door, the storage area, and the vent shaft. Construction of Tunnel Number 2 differs from that of Tunnel Number 1 as follows.

- A combination of steel and reinforced concrete was used in the construction of the storage area for Tunnel Number 2 rather than wood timbers, as used in Tunnel Number 1.
- Tunnel Number 2 is longer, having a storage capacity of five times that of Tunnel Number 1.
- The floor of Tunnel Number 2, outboard of the railroad ties, slopes upward to a height of approximately 1.8 meters above the railroad bed, whereas the floor in Tunnel Number 1 remains flat all the way out to the sidewalls.
- The railroad tunnel approach to Tunnel Number 2 angles eastward then angles southward to parallel Tunnel Number 1. The approach to Tunnel Number 1 is a straight extension southward from the PUREX Plant. Center-line to center-line distance between the two tunnels is approximately 18.3 meters.

The physical structure of the water-fillable door at the north end of Tunnel Number 2 essentially is identical to the water-fillable door for Tunnel Number 1. The water-fillable door for Tunnel Number 2 is approximately 57.9 meters south and 18.3 meters east of the water-fillable door for Tunnel Number 1. As of March 1997, the door was~~is~~ empty and ~~there is no plan to fill the door~~it will not be refilled.

The storage area of Tunnel Number 2 is that portion of the tunnel extending southward from the water-fillable door. Construction of this portion of Tunnel Number 2 consists of a 10.4-meter diameter, steel (0.5 centimeter plate), and semicircular-shaped roof, supported by internal I-beam wales attached to external, reinforced concrete arches. The concrete arches are 0.4 meter thick and vary in width from 0.4 to 1.8 meters. The arches are spaced on 4.8-meter centers. This semicircular structure is supported on reinforced concrete grade beams approximately 1.8 meters wide by 1.2 meters thick (one on each side) that run the full length of Tunnel Number 2. The interior and exterior surfaces of the steel roof are coated with a bituminous coating compound to inhibit corrosion. The entire storage area is covered with nominally 2.4 meters of earth fill to serve as shielding.

The ~~nominal~~ overall inside dimensions of Tunnel Number 2 are 514.5 meters long, 7.9 meters high, and 10.4 meters wide. However, because of the arch-shaped cross-section of Tunnel Number 2 and entry clearance at the water-fillable door, the usable storage area (width and height above top-of-rail) is 6.7 meters high and 5.8 meters wide, the same dimensions as for Tunnel Number 1. The floor consists of a railroad track laid on a gravel bed. The space between ties is filled to top-of-tie with gravel ballast. Commencing at the ends of the 2.4-meter-long ties, the earth floor is sloped upward on a 1 (vertical) to 1 1/2 (horizontal) grade. The tracks are on a 1/10 of 1 percent downgrade slope to the south to ensure the railcars remain in their storage position. A railcar bumper is located 2.4 meters from the south end of the tracks to act as a stop. The capacity of the storage area is 40, 12.8-meter-long railcars.

The first railcar was placed in storage in December 1967. Table 3.1 contains an approximate inventory of waste stored in the PUREX Storage Tunnels.

After Tunnel Number 1 collapsed, a structural evaluation was performed that revealed the threat of future failure of Tunnel Number 2. To protect stored waste containers from potential damage caused by a tunnel failure event (e.g., puncture of a container by a falling structural member) and to prevent any associated release of dangerous waste constituents to the environment, an interim closure action to cover the stored waste and fill Tunnel Number 2 void spaces around the waste with engineered grout is being taken.

3.3.1 Process and Activities

The function of the PUREX Tunnels is to store mixed waste until ~~the waste can be processed for~~ final disposal. When waste was~~is to be~~ placed in the storage tunnels, a work plan, describing the overall transfer activities, and a storage tunnel checklist were~~are~~ prepared. The work plan and storage tunnel checklist were~~are~~ routed for review and concurrence by key personnel and forwarded to management for approval. No new waste will be added to the tunnels. The following sections describe processes used when the tunnels were in active operation.

3.3.2 Physical Characterization of Material to be Stored

Physical characterization of waste includes an evaluation of the following physical properties:

- Length, width, and height
- Gross weight and volume
- Preferred orientation for transport and storage
- Presence of dangerous waste constituents

Information sources used in physical characterization include equipment fabrication and installation drawings, operational records, and process knowledge. Physical characterization provides information necessary to describe the waste material. Such information also was~~is~~ used to design and fabricate, if required, supports on the railcar.

Before removal from service, the equipment could be flushed to minimize loss of products, to reduce contamination, and to reduce dangerous waste constituents present in a residual heel to nonregulated levels. When equipment was~~is~~ flushed, analysis of the rinsate was~~is~~ used to determine when these goals ~~have been~~were achieved.

3.4 Identification/Classification and Quantities Of Dangerous Waste Managed Within The PUREX Storage Tunnels

Table 3.1 contains an approximation of the total amount of waste stored within the PUREX Storage Tunnels.

3.5 Waste Analysis Parameters

Analytical requirements were selected based on knowledge required for the safe handling and storage of the waste within the PUREX Storage Tunnels, including any operational compliance issues.

3.5.1 Waste Identification

~~A prerequisite step in proper waste management is to address whether waste being considered for management within the PUREX Storage Tunnels falls within the scope of this unit's permit. This includes identifying any dangerous waste in accordance with regulatory and permit requirements and applicability of any land disposal restrictions.~~

This section provides information on how the chemical and physical characteristics of the mixed waste currently stored in the PUREX Storage Tunnels were determined so that the waste was~~is~~ stored and managed properly.

Regulated material presently stored in the PUREX Storage Tunnels contains the following dangerous waste:

- Lead
- Mercury
- Silver and silver salts
- Chromium
- Cadmium
- Barium
- Mineral oil

Storage of non-PUREX Plant waste was~~is~~ reviewed on a case-by-case basis. Sampling, chemical analysis, process knowledge (as discussed in the following section), and/or inventory information from waste tracking forms provided from other onsite sources were~~are~~ required to confirm the characteristics and quantities of mixed waste to be stored. ~~Future waste and dangerous constituents might not be in the same configuration or form as described in the following sections.~~

3.5.1.1 Lead

Lead stored was used in various capacities during past Hanford Facility operations. Primary functions of lead included use as weights, counterweights, and shielding. Often the lead is encased in steel (carbon or stainless) to facilitate its attachment to various types of equipment.

Lead exhibits the characteristic of toxicity as determined by the toxicity characteristics leaching procedure and is designated D008 [WAC 173-303-090(8)]. The quantity of lead present could produce an extract greater than 500 milligrams per liter should the lead be exposed to a leachate. However, because the bulk of the lead is encased in steel, is stored inside~~ a~~ weather-tight structures that are or will be filled with grout to encapsulate the waste, and is elevated above floor level on railcars that isolate the lead from other materials stored, the potential for exposure of bare lead to a leachate is considered negligible.

Sampling and chemical analysis was~~is~~ not performed on lead associated with the material placed in the PUREX Storage Tunnels. Therefore, the accuracy of the estimate on the amount of lead presently stored in each tunnel is limited to the data available from process knowledge. Counterweights on equipment dunnage and lead used for shielding cannot be quantified by existing historical records and are not included for lead listed on Table 3.1. ~~However, if removed from the tunnels, the material will be~~

~~examined and any suspect attachments will be removed, evaluated, and disposed of in accordance with established methods.~~

3.5.1.2 Mercury

Mercury is contained within thermowells that were~~are~~ an integral part of spent reactor fuel dissolvers used at the PUREX Plant. The dissolvers are large 304L stainless steel process vessels that are approximately 2.7 meters in diameter, 7.3 meters tall, and weigh approximately 26,309 kilograms. The outer shell is constructed of a 1-centimeter-thick plate. The dissolvers were used in decladding and dissolving spent reactor fuel in the PUREX Plant.

~~Depending on the specific dissolver in question, 19.1 or~~Approximately 45~~.4~~ kilograms of mercury (~~1.4 or~~less than ~~-~~1.7~~7~~ liters) were poured in each of the two thermowells per dissolver ~~(38.2 or 90.8 kilograms total per dissolver)~~ following vertical installation of the dissolvers inside the PUREX canyon and before the dissolver was installed in a process cell. The mercury served to transfer heat from the dissolver interior to the thermohm temperature sensor mounted within the thermowell. This mercury remains within the thermowells of discarded dissolvers. In preparation for storage, the thermohms were removed and the upper end of each thermowell was plugged with a 304L stainless steel nozzle plug. In storage, the discarded dissolver rests in an inclined position in a cradle on the railcar. The mercury contained in the thermowells remains in the lower portion of each thermowell and, under normal conditions, is never in contact with the mechanical closure on the nozzle end of the thermowell.

Mercury exhibits the characteristic of toxicity as determined by the toxicity characteristics leaching procedure and is designated D009 [WAC 173-303-090(8)].

The potential for mercury to become exposed to leachate is considered negligible. The PUREX Storage Tunnels are designed and constructed as weather-tight structures that are or will be filled with group to encapsulate the waste. Further, the mercury is encased in a stainless steel pipe within a stainless steel vessel that is stored on a railcar above the floor level of the tunnels. Therefore, exposure of the mercury stored in the tunnels to leachate is not considered a credible occurrence.

Sampling and chemical analysis was~~is~~ not performed on mercury associated with the dissolvers stored in Tunnel Number 2. The quantity of mercury present in each thermowell is documented on Table 3.1.

3.5.1.3 Silver

Silver, mostly in the form of silver salts deposited on unglazed ceramic packing, is contained within the discarded silver reactors stored in Tunnel Number 2. The silver reactors were used to remove iodine from the offgas streams of the spent reactor fuel dissolvers. The reactor vessel is approximately 1.4 meters in diameter by 4.1 meters tall and is constructed of 1-centimeter 304L stainless steel. The vessel contains two 1.2-meter-deep beds of packing. Each bed consists of a 30.5-centimeter depth of 2.5-centimeter unglazed ceramic saddles topped with a 0.6-meter depth of 1.3-centimeter unglazed ceramic saddles. The two beds are separated vertically by a distance of about 0.6 meter, and each bed rests on a support made of stainless steel angles and coarse screen. The packing was coated initially with 113.4 kilograms of silver nitrate used for iodine retention. Nozzles on the top of the reactor were provided to allow flushing and/or regeneration of the packing with silver nitrate solution as the need arose.

Because of competing reactions, which include conversion of silver nitrate to silver iodide, reduction of silver nitrate to metallic silver, and formation of silver chloride, the packing of a stored silver reactor contains a mixture of silver nitrate, silver halides, and silver fines.

Silver salts exhibit the characteristics of toxicity as determined by the toxicity characteristics leaching procedure and are designated D011 [WAC 173-303-090(8)]. Silver salts exhibit the characteristic of ignitability and are designated as D001 [WAC 173-303-090(5)].

The potential of silver, including silver salts, stored in the PUREX Storage Tunnels to become exposed to leachate is considered negligible. Silver is contained within a stainless steel vessel, stored inside a weather-tight structure that is or will be filled with grout to encapsulate the waste, and elevated above floor level on a railcar. Therefore, exposure of the silver stored in the tunnels to leachate is not considered a credible occurrence. In addition, the contained silver is isolated from contact with any combustibles; therefore, the possibility of ignition is considered extremely remote.

Provisions for taking samples of the packing were not provided in the design of the vessels. Therefore, sampling and chemical analysis were~~are~~ not performed for silver salts before placing a silver reactor in storage. However, for accountability, the total silver content (Table 3.1) is considered silver nitrate, the salt that exhibits the characteristics of both ignitability and toxicity.

The quantity of silver salts contained within a discarded silver reactor is a function of silver nitrate regeneration history. Operating records (process knowledge) of regenerations and flushes were~~are~~ used to estimate the total accumulation of silver within each reactor.

3.5.1.4 Chromium

Presently, chromium stored in Tunnel Number 2 is contained within a failed concentrator removed from the PUREX Plant, and within stainless steel containers received from the 324 Building. The concentrator is a vertical tube structure that was used to concentrate aqueous streams from the final uranium cycle, final plutonium cycles, final neptunium cycles, and condensate from the acid recovery system for recycle. Following service, the concentrator was inspected and found to contain silicate solids with high levels of chromium from the corrosion of stainless steel. The existence of chromium within the 324 Building waste was determined through process knowledge. Chromium exhibits the characteristic of toxicity as determined by the toxicity characteristics leaching procedure and is designated D007 [WAC 173-303-090(8)]. The potential for the chromium stored in Tunnel Number 2 to become exposed to leachate is considered negligible. Tunnel Number 2~~,~~ is designed and constructed to be weather-tight and will be filled with grout to encapsulate the waste. Further, the chromium is encased within stainless steel vessels and containers that are stored on railcars above the floor level of the tunnel. Therefore, exposure of the chromium stored in the tunnel to leachate is not considered a credible occurrence.

The quantity of chromium within the concentrator was estimated by calculating the volume of silicate solids and the percentage of chromium within the silicate solids. The quantity of chromium in the 324 Building waste was based on process knowledge.

3.5.1.5 Cadmium

Presently, cadmium stored in the PUREX Storage Tunnel Number 2 is associated with shielding and with a dissolver moderator removed from the PUREX Plant, and within stainless steel containers received from the 324 Building. The cadmium was used to shield equipment and consists of sheets of the metal attached to lead, both of which could be encased in steel. The cadmium received from the 324 Building was used in waste technology research and development programs.

The dissolvers are annular vessels that are geometrically favorable for criticality safety. The dissolvers were placed over cadmium lined (neutron absorbers) moderators for additional criticality safety. The moderator is a centrally located, cylindrical, cadmium-jacketed 0.08-centimeter-thick concrete 15.2-centimeter-thick neutron absorber. The moderators are approximately 4.4 meters tall by approximately 1.5 meters outer diameter.

Cadmium exhibits the characteristic of toxicity as determined by the toxicity characteristics leaching procedure and is designated D006 [WAC 173-303-090(8)]. Cadmium lists a lethal concentration (LC50) of 0.0016 mg/L (fish, salmon). Therefore, cadmium is a Toxic Category X [WAC 173-303-100(5)]. Mixed waste on some railcars is assigned the dangerous waste number WT02. ~~If exposed to a leachate, the quantity of cadmium present could produce an extract having a concentration of greater than or equal to 1 milligram per liter, but less than 100 milligrams per liter; therefore, the mixed waste is managed as a WT02 [WAC 173-303-100(5)].~~

The potential for the cadmium stored in Tunnel Number 2 to become exposed to leachate is considered negligible. Tunnel Number 2 is designed and constructed to be weather-tight and will be filled with grout to encapsulate the waste. Further, the cadmium is stored on railcars above the floor level of the tunnel. Therefore, exposure of the cadmium stored in the tunnel to leachate is not considered a credible occurrence.

3.5.1.6 Barium

Presently, barium is stored in Tunnel Number 2 in stainless steel containers received from the 324 Building. The waste was generated during numerous research and development programs conducted in B-Cell of the Waste Technology Engineering Laboratory (324 Building). The existence of barium within the 324 Building waste was determined through process knowledge.

Barium exhibits the characteristic of toxicity as determined by the toxicity characteristics leaching procedure and is designated D005 [WAC 173-303-090(8)].

The potential for barium stored in Tunnel Number 2 to become exposed to leachate is considered negligible. Tunnel Number 2 is designed and constructed to be weather-tight and will be filled with grout to encapsulate the waste. Further, the barium is encased in steel containers stored on a railcar above the floor level of the tunnel. Therefore, exposure of the barium stored in the tunnel to leachate is not considered a credible occurrence.

3.5.1.7 Mineral Oil

Presently, mineral oil is stored in Tunnel Number 2 in stainless steel containers received from the 324 Building. The mineral oil was used in the B-Cell viewing windows in the 324 Building. Oil leaking from the windows was absorbed on rags and clay absorbent material.

The material safety data sheet for the mineral oil lists a lethal dose (LD50) of 2 grams per kilogram (dermal rabbit). Therefore, the oil designates as a Toxic Category A WT02 [WAC 173-303-100(5)].

The potential for the absorbed mineral oil stored in Tunnel Number 2 to become exposed to leachate is considered negligible. Tunnel Number 2 is designed and constructed to be weather-tight and will be filled with grout to encapsulate the waste. Further, the mineral oil is encased in steel containers stored on a railcar above the floor level of the tunnel. Therefore, exposure of the mineral oil stored in the tunnel to leachate is not considered a credible occurrence.

3.5.1.8 Identification of Incompatible Waste

The next step was~~is~~ to ensure that sufficient information concerning the waste ~~has been~~was provided so the waste can be managed properly. This includes identifying incompatible waste. These safety issues primarily were~~are~~ related to prevention of unwanted chemical reactions that could create a catastrophic situation, such as a fire, an explosion, or a large chemical release.

~~3.5.1.9 Operational Considerations~~

~~Sufficient information must be available to ensure that incoming waste meets operational acceptance limits, e.g., physical size, ALARA concerns, and WAC 173-303 requirements. These operating specifications are limits and controls imposed on a process or operation that, if violated, could jeopardize the safety of personnel, and could damage equipment, facilities, or the environment. Operating specifications have been established from operating experience, process knowledge, and calculations.~~

3.5.2 Parameter and Rationale Selection Process

This WAP describes the process to ensure that the dangerous waste components of the material stored in the tunnels were~~are~~ properly characterized and designated so that dangerous and mixed waste was~~is~~ managed properly.

The tunnels no longer receive waste. The parameters considered for waste designation under

WAC 173-303-070(3) during operation and the rationale for ~~there~~ their application are~~is~~ discussed in the following sections.

3.5.2.1 Discarded Chemical Products

The first category of dangerous waste designation is "Discarded Chemical Products" (WAC 173-303-081). The waste stored in the tunnels does not fit the definitions in WAC 173-303-081 for a discarded chemical product. Therefore, the waste stored in the PUREX Storage Tunnels is not designated as a discarded chemical product.

3.5.2.2 Dangerous Waste Sources

The second category of dangerous waste designation is "Dangerous Waste Sources" (WAC 173-303-082). The waste stored in the tunnels is not listed on the "Dangerous Waste Sources List" (WAC 173-303-9904). Therefore, the waste stored in the PUREX Storage Tunnels is not designated as a dangerous waste source.

3.5.2.3 Dangerous Waste Characteristics

The third category of dangerous waste designation is "Dangerous Waste Characteristics" (WAC 173-303-090). The characteristics are as follows.

- Characteristic of Ignitability – Although the solid silver nitrate has not been tested in accordance with Appendix F of 49 CFR 173, the waste is assumed to be an oxidizer as specified in 49 CFR 173.127(a). Therefore, the silver nitrate waste is assumed to exhibit the characteristic of ignitability under WAC 173-303-090(5) and is designated as D001.
- Characteristic of Corrosivity – Some of the material stored within the tunnels either has contained or has been in contact with corrosive liquids. The standard operating procedure has been to flush vessels with water to recover as much special nuclear material as practical. In addition, flushing removes much of the mixed waste contamination, minimizing the spread of contamination during handling. ~~Currently, the~~The final aqueous rinse was~~is~~ sampled and analyzed to confirm that the pH was~~is~~ greater than 2 and less than 12.5. Therefore, the waste stored in the PUREX Storage Tunnels is not designated as corrosive waste.
- Characteristic of Reactivity – The waste stored in the tunnels does not meet any of the definitions of reactivity as defined in WAC 173-303-090(7). The waste material is not unstable, does not react violently with water, does not form explosive mixtures, or does not generate toxic gases. Therefore, the waste stored in the PUREX Storage Tunnels is not designated as reactive waste.
- Characteristic of Toxicity – Lead, mercury, silver, chromium, barium, and cadmium are identified on the Toxicity Characteristics list. The quantity of these materials stored in the tunnels is sufficient that, should the substances come in contact with a leachate (an event considered unlikely), the concentration of the extract could be above the limits identified in the list. Therefore, this waste is designated D005, D006, D007, D008, D009, and D011.

~~The PUREX Storage Tunnels also are permitted for selenium (D010). Currently, there is no waste stored in the tunnels that is designated for D010; however, there is a potential for waste with this waste number to be stored within the tunnels.~~

3.5.2.4 Dangerous Waste Criteria

The fourth category of dangerous waste designation is "Dangerous Waste Criteria" (WAC 173-303-100). The criteria are as follows:

- Toxicity Criteria – Cadmium meets the toxicity criteria in WAC 173-303-100(5) when performing a book designation. Because of the concentrations present, the waste containing these constituents is designated as dangerous waste (DW) and is assigned the dangerous waste number of WT02.

- Persistence Criteria – Currently, no waste stored in the tunnels has been designated as persistent per WAC 173-303-100(6).

3.5.2.5 Waste Designation Summary

The mixed waste currently stored in the PUREX Storage Tunnels is designated as follows:

- Lead – D008; ~~EHW~~DW
- Mercury – D009; ~~EHW~~DW
- Silver and silver salts – D001, D011; ~~EHW~~DW
- Chromium – D007; ~~EHW~~DW
- Cadmium – D006, WT02; DW
- Barium – D005; ~~EHW~~DW
- Mineral Oil – WT02; DW

3.5.3 Rationale for Parameter Selection

Refer to Section 3.5.2.

3.5.4 Special Parameter Selection

Refer to Section 3.5.2.

3.5.5 Selection of Sampling Procedures

The following sections discuss the sampling methods and procedures that ~~will be~~were used. Sampling usually ~~will be~~was performed in accordance with requirements contained in the pertinent sampling analysis plan, procedures, and/or other documents that specify sampling and analysis parameters.

3.5.6 Sampling Strategies and Methods

The only analysis ~~presently~~ used in support of the PUREX Storage Tunnels operation ~~is~~ was a corrosivity check on the final in-place aqueous rinse of discarded vessels before the vessels ~~are~~ were released for storage.

The pH ~~is~~ was determined by a pH meter using U.S. Environmental Protection Agency (EPA) Test Method 9040 or 9041 in Test Methods for the Evaluation of Solid Waste: Physical/Chemical Methods (EPA 1986). ~~The~~ Resource Conservation and Recovery Act (RCRA) sampling ~~will not be~~was not performed on any waste currently stored in the PUREX Storage Tunnels.

~~Waste received that is not generated at the PUREX Plant could require sampling strategies associated with this waste that will be developed on a case-by-case basis.~~

~~Sampling Methods~~

Process knowledge of the characteristics and the quantities of the dangerous waste ~~to be~~ stored in the PUREX Storage Tunnels is considered sufficient to properly ~~designate and~~ manage the stored waste.

The waste currently stored in the tunnels is lead, mercury, chromium, cadmium, barium, mineral oil, silver, and silver salts. Sampling and chemical analysis of the lead, mercury, cadmium, barium, mineral oil, or chromium to confirm their presence would not provide additional data beneficial to proper management of the waste and would not comply with As Low As Reasonably Achievable (ALARA) principles. The silver salts are dispersed over a large area on ceramic packing contained within a large stainless steel reactor vessel. Representative sampling of the ceramic packing was~~is~~ not considered to be practical and therefore was not performed.

~~If RCRA sampling is required for operation of the PUREX Storage Tunnels, representative sampling methods referenced in WAC 173-303-110 or some other method approved by the Washington State Department of Ecology (Ecology) will be used. For waste received from other Hanford Facility activities, existing sampling, chemical analysis, and/or process knowledge documentation is used to confirm the characteristics and quantities of mixed waste to be stored. Storage of non-PUREX Facility waste is reviewed on a case-by-case basis.~~

3.5.6.1 Frequency of Analyses

Because the dangerous waste components of mixed waste stored in the PUREX Storage Tunnels are stable and will remain undisturbed for a long time, the waste designations and quantities present will remain the same as assigned at the time of storage. ~~Therefore, repeated analysis is not considered necessary to ensure that waste designation data are representative.~~ The stored waste is or will be encapsulated with grout and no further sampling of the PUREX Storage Tunnels is expected until final closure. In the event that sampling is required during the extended closure period, representative sampling methods referenced in WAC 173-303-110 or some other method approved by the Washington State Department of Ecology (Ecology) will be used. The following sections describe practices that were used during operations.

3.5.7 Selection of Sampling Equipment

The only analysis ~~presently~~ used in support of the PUREX Storage Tunnels operation was~~is~~ for corrosivity on the final in-place aqueous rinse of discarded vessels before the vessels were~~are~~ released for storage. The pH was~~is~~ determined by Method 9040 or 9041 (SW-846). The RCRA sampling methods, as referenced in WAC 173-303-110, ~~will~~ were not ~~be~~ performed on any waste currently stored in the PUREX Storage Tunnels.

3.5.8 Maintaining and Decontaminating Field Equipment

All RCRA sampling equipment used to collect and transport samples must be free of contamination that could alter test results. Equipment used to obtain and contain samples must be clean. Acceptable cleaning procedures for sample bottles and equipment include, but are not limited to, washing with soap or solvent, and steam cleaning. After cleaning, cleaning residues must be removed from all equipment that could come in contact with the waste. One method to remove these residues would be a solvent (acetone or other suitable solvent) rinse followed by a final rinse with deionized water. Equipment must be cleaned before use for another sampling event.

After completion of sampling, equipment ~~should be~~was cleaned as indicated previously. If decontamination of the equipment ~~is~~ was not feasible, the sampling equipment ~~should be~~was disposed of properly.

3.5.9 Sample Preservation and Storage

Following RCRA sampling, sample preservation follows methods set forth for the specific analysis identified. Preservation is in accordance with the methods stated in SW-846 or any of the test methods adopted by the Hanford Facility that meet WAC 173-303 requirements. No preservation method was~~will be~~ used when there were~~are~~ ALARA concerns.

3.5.10 Quality Assurance and Quality Control Procedures

The only test method ~~presently~~ used in support of the PUREX Storage Tunnels operation ~~is~~ was a corrosivity check on the final in-place aqueous rinse of discarded vessels before the vessels ~~are~~ were released for storage. The RCRA sampling ~~will~~ was not ~~be~~ performed on any waste currently stored in the PUREX Storage Tunnels.

Field duplicates, field blanks, trip blanks, and equipment blanks ~~will not be~~were not taken. Split samples ~~could be~~may have been taken at the request of Ecology.

Generally, quality assurance and quality control (QA/QC) requirements for sampling ~~will be~~were divided between paperwork requirements, such as chain-of-custody, and sampling and analysis activities. This section addresses sampling QA/QC requirements. Analytical QA/QC is discussed in Section 3.6.

A chain-of-custody procedure was~~is~~ required for all sampling identified by this WAP. At a minimum, the chain of custody ~~must~~ included the following: (1) description of waste collected, (2) names and signatures of samplers, (3) date and time of collection and number of containers in the sample, and (4) names and signatures of persons involved in transferring the samples.

3.5.11 Health and Safety Protocols

The safety and health protocol requirements established for the Hanford Site ~~must be~~were followed for all RCRA sampling activities required by this WAP.

3.6 Laboratory Selection and Testing and Analytical Methods

The tunnels no longer receive waste. This section discusses laboratory selection and the types of acceptable analytical methods for RCRA samples that were applied during operations.

3.6.1 Laboratory Selection

Laboratory selection was~~is~~ limited as only a few laboratories are equipped to handle mixed waste because of the special equipment and procedures that must be used to minimize personnel exposure to mixed waste. Laboratory selection depended~~s~~ on laboratory capability, nature of the sample, timing requirements, and cost. At a minimum, the selected laboratory ~~must have~~had the following:

- A comprehensive QA/QC program (both qualitative and quantitative).
- Technical analytical expertise.
- An effective information management system.

These requirements ~~will be~~were met if the selected laboratory followed~~s~~ the pertinent requirements contained in the Hanford Federal Facility Agreement and Consent Order Action Plan, Section 6.5. The selected laboratory also ~~can meet~~could have met these requirements by having some other type of QA/QC program as long as equivalent data quality was~~is~~ achieved.

3.6.2 Testing and Analytical Methods

The testing and analytical methods for corrosivity used by the various onsite analytical laboratories are outlined in SW-846. These methods in some cases deviate from SW-846 and American Society for Testing and Materials-accepted specifications for holding times, sample preservation, and other specific analytical procedures. These deviations are discussed in Analytical Methods for Mixed Waste Analyses at the Hanford Site (DOE/RL-94-97).

3.7 Waste Re-Evaluation Frequencies

Re-evaluation of waste within the PUREX Storage Tunnels will not occur because ~~of the personnel and environmental exposure to mixed waste and the way the railcars are positioned in~~ the tunnels are or will be filled with grout. The waste is encapsulated and is expected to remain stable until final closure.

3.8 Special Procedural Requirements

The tunnels no longer receive waste. The following sections describe special procedural requirements that were associated with waste in the PUREX Storage Tunnels during operations.

~~3.8.1 Procedures for Receiving Wastes Generated Offsite~~

~~The PUREX Storage Tunnels do not accept waste generated off the Hanford Site.~~

~~3.8.2~~3.8.1 Procedures for Ignitable, Reactive, and Incompatible Waste

~~Presently, the~~The only ignitable, reactive, or incompatible dangerous waste stored in the PUREX Storage Tunnels is the silver nitrate coating on the ceramic packing inside the silver reactors. This material is confined to the interior of a large stainless steel vessel (Section 3.5.1.1) that separates this material from all other waste material stored in the tunnel. The waste is or will be encapsulated with grout, further isolating the silver nitrate from the environment. The requirements in WAC 173-303-395(1)(a) require 'No Smoking' signs be conspicuously placed wherever there is a hazard present from ignitable or dangerous waste. 'No Smoking' signs are not considered appropriate at the PUREX Storage Tunnels because of ALARA principles. Smoking is not allowed in any area with ALARA concerns and rules prohibiting smoking are strictly enforced. This policy serves to achieve the no smoking intent of WAC 173-303-395(1)(a), posting and maintaining 'No Smoking' signs are not considered appropriate.

~~Isolated areas within the PUREX Storage Tunnels make periodic inspections inconsistent with ALARA guidelines[e.g., an annual fire inspection as required by WAC 173-303-395(1)(d) for storage areas containing ignitable waste]. Therefore, such inspections are not performed.~~ Ignitable waste storage units are required by WAC 173-303-395(1)(d) to have inspections conducted at least yearly by a fire marshal or professional fire inspector familiar with the requirements of the uniform fire code. However, annual inspection was not feasible during active operations because of the highly radioactive environment and was not justifiable under ALARA guidelines. Personnel entry for inspection is no longer possible in Tunnel Number 1 because of the grout fill and is prohibited in Tunnel Number 2 because of the threat of structural failure. Following the interim closure action, personnel entry into Tunnel Number 2 waste storage area will no longer be possible. The grout fill in Tunnel Number 1 and the grout to be placed in Tunnel Number 2 during the interim closure action encapsulates the waste containers, further isolating the silver nitrate from ignition sources.

~~3.8.3~~3.8.2 Provisions for Complying with Land Disposal Restriction Requirements

~~Operation of the PUREX Storage Tunnels does not involve land disposal or treatment of dangerous waste.~~ The information provided by the generating unit regarding land disposal restrictions (LDR) of dangerous waste was~~is~~ sufficient to operate the PUREX Storage Tunnels in compliance with land disposal restriction requirements. When final disposition of the waste occurs, this information will be passed on for final treatment or disposal of the waste. The purpose of grouting is for tunnel stabilization. Grouting macroencapsulates the waste which is an accepted treatment for hazardous debris under 40 CFR 268.45. When determining the final closure decisions, the appropriate LDR treatment standards for waste that is not debris will be considered. If the appropriate LDR treatment standard cannot be achieved due to physical limitations or if treatment is otherwise inappropriate, a petition for variance from the treatment standard will be submitted in accordance with 40 CFR 268.44.

~~3.8.4~~3.8.3 Deviations from the Requirements of this Plan

Management may approve deviations from this plan if special circumstances arise that make this prudent. These deviations must be documented in writing with a copy to be retained by the management.

3.9 Recordkeeping

Records associated with this ~~waste analysis plan~~WAP and waste verification program are maintained on the Hanford Facility. These records will be maintained until closure of the PUREX Storage Tunnels. Records associated with the waste inventory will be maintained for 5 years.

3.10 References

Ecology, EPA, and DOE, 2003, Hanford Federal Facility Agreement and Consent Order, Washington State Department of Ecology, U.S. Environmental Protection Agency, and U.S Department of Energy, Richland, Washington, amended periodically.

DOE/RL-94-97, Analytical Methods for Mixed Waste Analyses at the Hanford Site, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

EPA, 1986, Test Methods for the Evaluation of Solid Waste: Physical/Chemical Methods, SW-846, 3rd ed., U.S. Environmental Protection Agency, Washington, D.C.

Table 3.1. PUREX Storage Tunnels Inventory

PUREX ~~#1 Storage~~ Tunnel Number 1 (218-E-14)

~~Tunnel #1 is at its Capacity as of 1/22/65~~

PUREX ~~#1 Storage~~ Tunnel Number 1 is located at the southeast end of the PUREX Plant and is an extension of the railroad tunnel. The storage area is approximately 109 meters long, ~~6.9~~6.7 meters high, and 5.8 meters wide. The tracks have a one percent downgrade toward the south end of the tunnel. The capacity of the Storage Tunnel is eight modified railroad cars, 12.8 meters long. Tunnel Number 1 reached full capacity in January 1965. The tunnel void spaces around the waste have been filled with grout. This improved tunnel stability, provided additional radiological protection, and increased durability while not precluding final closure actions.

Position	PUREX ~~#1 Storage~~ Tunnel Number 1 (218-E-14)
1. & 2.	HA column and miscellaneous jumpers in box placed in Tunnel #1 on 6/60 HA 4,700 Cu. Ft. Jumpers 2,190 Cu. Ft., Pb-~115 Kg
3.	E-F11 #1 (1WW Waste) Concentrator failed 7/24/60. Placed in Tunnel #1 on 7/29/60, 1,900 Cu. Ft.
4.	G-E2 Centrifuge, miscellaneous jumpers in box and two tube bundles. Placed in Tunnel #1 on 12/24/60. (FUG SER# 762) 2,465 Cu. Ft., Pb-~115 Kg.,
5.	E-H4 (3WB) Concentrator failed 1/4/61. Placed in Tunnel #1 on 1/4/61, 2,336 Cu. Ft.
6.	E-F6 (~~2\NW~~2WW Waste) Original Concentrator failed 4/21/61. Placed in Tunnel #1 on 4/21/61, 2,336 Cu. Ft.
7.	E-F11 (1WW Waste) #2 Concentrator failed 2/1/62. Placed in Tunnel #1 on 2/8/62, 2,336 Cu. Ft.
8.	E-F6 (2WW Waste) #3 Spare Concentrator failed 5/23/64. Placed in Tunnel #1 on 1/22/65 Flat Car 3621, 2400 Cu. Ft.

Table 3.1. PUREX Storage Tunnels Inventory (con't)

PUREX Tunnel Number 2 (218-E-15)

~~The~~ PUREX Tunnel Number 2 storage area is approximately 514.5 meters long, 6.7~~7.9~~ meters high, and 5.8~~10.4~~ meters wide. The tracks have a ~~one~~ 0.1 percent downgrade toward the south end of the tunnel. The capacity of the ~~the Storage~~ Tunnel Number 2 is 38-40 modified railroad cars, 12.8 meters long. The ~~Tunnel~~tunnel contains 28~~21~~ cars as of ~~2/95~~ June 1996. The tunnel void spaces around the waste will be filled with grout. Grouting will improve tunnel stability, provide additional radiological protection, and increase durability while not precluding final closure actions.

Position	PUREX ~~#2 Storage~~ Tunnel Number 2 (218-E-15)
1.	E-F6 # (2WW Waste) Concentrator, TK F 15-2, One tube bundle and agitator motors, placed in Tunnel on 12/12/67 on Car 61439. 2,400 Cu. Ft.
2.	E-F6 #5 (E-H4 3WB) Concentrator, two tube bundles placed in Tunnel on 3/26/69. On Car MILW 60883, 2,400 Cu. Ft.
3.	E-F6 #6 (2WW Waste) Concentrator, two tube bundles failed placed in Tunnel on 3/19/70. On Car 3612, 2,400 Cu. Ft.
4.	L Cell Package in a sealed steel box (H2-66012) placed in Tunnel on 12/30/70 on Car MILW 60033, 2,400 Cu. Ft.
5.	F2 Silver Reactor, F6 Demister, Vessel Vent Line, Steel Catwalk and Guard Rails, placed in Tunnel on 2/26/71. On Gondola Car 4610, 2,400 Cu. Ft., Ag-~625 Kg

Position	PUREX #2 Storage Tunnel Number 2 (218-E-15)
6.	Modified A3-1 tower, scrubber, liquidlid, and vapor line placed in Tunnel on 12/12/71. On Gondola Car 4611, 2,400 Cu. Ft.
7.	A3 Dissolver placed in Tunnel on 12/22/71. On 9 Ft. shortened Car B58, 2,400 Cu. Ft., Hg--~45 Kg.
8.	A1W1 Fuel ends in steel liner box and NPR fuel handling equipment. Used with the suspected canisters, on Car 19808. Placed in Tunnel on 8/29/72, 800 Cu. Ft.
9.	C3 Dissolver placed in Tunnel on 9/30/72, on Car 19811, 1590 Cu. Ft., Hg-~45 Kg.
10.	E-H4 (3WB) Concentrator, #61 tube bundle, prototype cooling coil, and F-Fl Filter Tank, placed in Tunnel 8/30/83, on Car CDX-1, 2,400 Cu. Ft.
11.	A3 Dissolver (Vessel #10) and E-A2 Heater (Vessel #6), placed in Tunnel on 1/18/86, on Car 3613, 3960 Cu. Ft. Hg-~40 Kg., Cd-~43 Kg
12.	White box (H-2-58456) containing eight tube bundles-; PG-J6 Pulse Generator (#5), Dissolver Lid, 9 Dumping Trunnions. Car 3611 placed in tunnel on 1/20/86; 5,438 Cu. Ft.#S 57.
13.	J5 Tank (Vessel #30), FL F-1 condenser (Vessel #13), and F12-B Cell Block, old four-way dumper, disc yoke, and flange plate placed in Tunnel on 1/21/86, on Car 19806, 2,500 Cu. Ft.
14.	L-l Pulser, 2-column cartridges, 1-jumper cutter, storage rack (H-2-96629), 3-jumper alignment tools, 9-exterior dumping trunnions, 10-pumps, 3-agitators, 4-tube bundles, 2-vent jumpers and 7-yokes placed in Tunnel on 11/18/87, on Car PX-10 (10A-19380) & Rack H2-96629.50. 50 tons, 3,600 Cu. Ft., Pb-~2540 Kg.
15.	Silver Reactor, E-F2 steam heater, and storage liner (H2-65095), full of cut up jumpers placed in Tunnel on 5/13/88, on Car PX-9 (10A-19809) & S/R Cradle SK-GLR-11-2-87. 20 tons, 2,775 Cu. Ft., Cd-~13 Kg., Ag-~115 Kg., Pb-~230 Kg.
16.	E-J8-1 Unitized Concentrator Vessel #1 H-2-52477, failed 3/11/89. Placed on storage Car H-2-99608, PxPX-6 (10A-19028) and in #2 Tunnel 4/6/89 graveyards. Estimated 42 tons, 6,000 Cu. Ft.
17.	North storage liner H-2-65095 containing six pumps, one agitator, and cut up jumper (14 tons). South storage liner H-2-65095 containing one pump, one #15 yoke and cut up jumpers (11.5 tons). Placed on storage Car PX-19 (10A-19030) and in #2 Tunnel on days 8/5/89. Estimated 25.5 tons, 2,574 Cu. Ft.
18.	T-F5 Acid absorber, ID#1-T-F5/F-168713, H2-52535 and H2-52487/488. Placed on storage Car PX-2 and in #2 Tunnel on 4/8/94. Estimated 22 tons, 835 Cu. Ft.
19.	Four metal liner storage boxes H-2-65095-3/H-2-100187-0 containing failed jumpers and miscellaneous obsolete canyon equipment items. Placed on storage Car PX-23 and in #2 Tunnel 9/16/94. Estimated 60 tons, 4032 Cu. Ft.
20.	E-H4-1 unitized concentrator (H-2-52477/56213)/(E-H4-1) Placed in Tunnel on 1/27/95, on Car PxPX-28. Estimated 40 tons, 5,760 Cu. Ft., Cr-~8 Kg.
21.	Tank E-5 (H-2-52453)/(F-166955), lead storage box assembly (H-2-131629)/ (H-2-131629-1), H4 concentrator tower (H-2-58102)/(F-223017-CBT-4), hot shop cover plate (H-2-52222)/("Q"), tube bundle wash capsule (H-2-58647), dissolver charging insert (H-2-75875)/ (H-2-75875-1), lifting yoke #7A (H-2-96837), lifting yoke #9 (H-2-52458). Placed in tunnel on 2/8/95 on Car PX-3609. Estimated 44 tons, 3,457 Cu. Ft., Pb-~1830 1930 Kg
22.	Metal liner box (H-2-6509565096) containing jumpers and failed/obsolete canyon

Position	PUREX ~~#2 Storage~~ Tunnel Number 2 (218-E-15)
	equipment. F7 neutron monitor (H-2-75825), lead storage box (H-2-131629) containing jumper counterweights and miscellaneous lead items, scrap hopper (H-2-57347) containing miscellaneous canyon equipment, canister capping station (H-2-821831), test canister containing various lengths of carbon steel pipe. Placed in Tunnel on ~~3-11-06~~3/11/96, on Car #3616. Estimated weight 22 tons, 1,712 Cu. Ft., Pb-~3232 Kg., Cd-~2 Kg.
23.	Two burial boxes (H-2-100187) containing jumpers and failed/obsolete canyon equipment, lifting yoke (H-2-99652). Placed in Tunnel 3-11-96 on Car #PX-31. Estimated weight 21 tons, 2,116 Cu. Ft.
24.	Concrete burial box (H-1-44980) storing 8 containers of 324 Building, B-Cell waste. For additional details, see PUREX Work Plan WP-P-95-60. Placed in Tunnel on Car #PX-29, on April 26, 1996. Estimated weight 36 tons, 1,890 Cu. Ft. Cd-~10.5 kg., absorbed oil-~8.5 kg., Cr-~1 kg., Ba-~ 3 kg, Pb ~1802 Kg
25.	Concrete burial box (H-1-44980) storing 9 containers of 324 and 325 Building waste. For additional details, see PUREX Work Plan WP-P-96-015. Placed in tunnel on Car #10A-3619, on June 12, 1996. Estimated weight 46.5 tons, 1,890 Cu. Ft. Ba-~4g., Cd-<1g., Cr-~2g., Pb- <1g
26.	20,000-gallon liquid waste tank Car HO-10H-~~18580~~18582, empty per RCRA, placed in Tunnel on June 19, 1996, approximately 30 tons.
27.	20,000 gallon liquid waste tank Car HO-10H-18579, empty per RCRA, placed in Tunnel on June 19, 1996, approximately 30 Tons.
28.	20,000-gallon liquid waste tank Car HO-10H-~~18582~~18580, empty per RCRA, placed in Tunnel on June 19, 1996, approximately 30 tons.