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HIGH LEVEL WASTE FACILITIES - CONTINUING OPERATION OR ORDERLY SHUTDOWN

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HIGH LEVEL WASTE FACILITIES- CONTINUING OPERATION OR ORDERLY SHUTDOWN

EIS NO ACTION ENGINEERING STUDY

Published April 1998

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Department
High Level Waste Program
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ABSTRACT

Two options for Environmental Impact Statement No-action alternatives describe operation of the radioactive liquid waste facilities at the Idaho Chemical Processing Plant at the Idaho National Engineering and Environmental Laboratory. The first alternative describes continued operation of all facilities as planned and budgeted through 2020. Institutional control for 100 years would follow shutdown of operational facilities. Alternatively, the facilities would be shut down in an orderly fashion without completing planned activities. The facilities and associated operations are described. Remaining sodium bearing liquid waste will be converted to solid calcine in the New Waste Calcining Facility (NWCF) or will be left in the waste tanks. The calcine solids will be stored in the existing Calcine Solids Storage Facilities (CSSF). Regulatory and cost impacts are discussed.

SUMMARY

Waste storage and treatment facilities at the Idaho Chemical Processing Plant have been in operation since 1953. Plans for treatment and disposal of radioactive liquid and mixed hazardous waste are underway. The Department of Energy, Idaho Operations Office, is preparing an Environmental Impact Statement to comply with the NEPA process. The EIS will discuss a "No Action" treatment and disposal alternative. Other extensive treatment and disposal alternatives will be discussed in other reports. The continuing operations option of the No-action Alternative will complete planned waste Idaho Chemical Processing Plant operations. The orderly shutdown option will quickly complete in-process batches and shut down early without completing the planned treatment of liquid wastes.

Continued operation of the New Waste Calcination Facility (NWCF) will complete calcination of the radioactive liquid waste until the inventory is depleted and the resulting calcine stored in the existing bin sets for an indefinite period. Settlement Agreement milestones for calcining all sodium bearing waste and emptying the Tank Farm by December, 2012 will be fulfilled. The Settlement Agreement milestone to treat the calcined solid waste to be ready for removal from the state by 2035 will not be met. The total cost for operation of the Calcine Solids Storage Facility bin sets including institutional control for 100 years is estimated to be \$ 27,371,000. The total No Action alternative cost for continued operation is estimated to be \$1,170,331,000 (Through 2020 except for the CSSF).

Orderly shutdown will begin as soon as directed. Batches that are in the process of being treated would be completed and feed tanks will be rinsed. The orderly shutdown cost is estimated at \$36,080,000.

CONTENTS

INTRODUCTION	1
Purpose of Study	1
Background	1
The NEPA Environmental Impact Statement Process	2
Assumptions for Continuing Operation Alternative	2
Assumptions for Orderly Shutdown Alternative	3
 FACILITIES AND PROCESSES	 4
New Waste Calcining Facility (NWCF-CPP-659)	4
ICPP HEPA Filter Leaching System (CPP-659)	4
NWCF Debris Treatment Facility (CPP-659)	5
ICPP Process Equipment Waste (PEW) System	5
Liquid Effluent Treatment and Disposal (LET&D)	5
ICPP Tank Farm	6
High-Level Liquid Waste Evaporator (HLLWE)	6
Calcline Solids Storage Facilities (CSSF)	6
Gaseous Waste Systems	7
Support Facilities	8
 DESCRIPTION OF THE NO-ACTION ALTERNATIVES	 9
Continuing Operation	9
Orderly Shutdown	12
 PROJECTS	 15
Electrical and Utility System Upgrade Project	15
NWCF modifications for the MACT rule.	15
Radioactive Liquid Waste Tanks	16
Basis for the MACT Project Data Sheet	16
Basis for the Radioactive Liquid Waste Tanks Data Sheet	23
 REFERENCES	 30

TABLES

Table 1. Inventory of the CSSF bin sets as of February 1998	7
Table 2. Tank Farm Volumes	10
Table 3 Continuing Operation Cost Estimate	12
Table 4 Project Data Sheet for NWCF MACT Compliance Facility	17
Table 5 Project Data Sheet for Radioactive Liquid Waste Tanks	24

HIGH LEVEL WASTE FACILITIES - CONTINUING OPERATION OR ORDERLY SHUTDOWN

EIS NO ACTION ENGINEERING STUDY

INTRODUCTION

Purpose of Study

The U. S. Department of Energy Idaho Operations Office (DOE-ID) is preparing an Environmental Impact Statement (EIS) for High-Level Waste and Facilities Disposition. The EIS will be prepared in accordance with the National Environmental Policy Act (NEPA) to support the decision-making process regarding high-level waste (HLW) management at the Idaho National Engineering and Environmental Laboratory (INEEL). The EIS evaluates all reasonable alternative proposals and environmental impacts. The "no-action" alternative is a baseline alternative for comparison of environmental impacts of the other alternatives. This study describes two no-action alternatives.

Background

In 1953, the Idaho Chemical Processing Plant (ICPP) located at INEEL was chartered to reprocess government-owned spent nuclear fuel (SNF) to recover fissile uranium. With the diminishing need to recover and recycle this material, the United States Department of Energy (DOE) discontinued reprocessing SNF in April 1992. This shifted the ICPP focus toward continued management and disposition of SNF and waste accumulated from previous reprocessing activities.

The current DOE mission for the ICPP includes: (1) managing SNF, and (2) managing and treating for disposal (a) radioactive and hazardous wastes generated during past SNF reprocessing, (b) waste generated from other on-going operations at the INEEL, and (c) waste that will be generated during future waste processing and decontamination and decommissioning activities. Milestones for cleanup activities are established in the October 1995 Settlement Agreement between the State of Idaho, the U.S. Navy, and DOE. The Settlement Agreement court order requires the DOE to empty the tank farm tanks contained in pillar and panel vaults by mid-year 2009 and calcine the liquids stored in the ICPP Tank Farm Facility by year 2012. (DOE 1998)

HLW is the highly radioactive waste material that results from the reprocessing of spent nuclear fuel. HLW includes liquid waste produced directly from reprocessing and any solid waste derived from the liquid that contains a combination of transuranic contaminants and fission products in concentrations requiring permanent isolation. High-level waste may include other highly radioactive material that the U. S. Nuclear Regulatory Commission, consistent with existing law, determines requires permanent isolation. HLW at the INEL includes calcine solids. Radioactive liquid waste includes sodium-bearing waste yet to be calcined. (USDOE 1997a).

The present ICPP HLW waste treatment activities produce a granular solid waste, or calcine, that contains fission products, transuranic isotopes (TRU), and fuel-cladding material. Decontamination and laboratory activities at the ICPP produce liquid radioactive sodium-bearing waste (SBW) that is currently stored in the ICPP tank farm tanks. These and other operations at the ICPP produce liquid wastes that contain low levels of radioactivity and TRU. The radioactive liquid wastes and related calcined solids are considered mixed waste because of hazardous constituents.

The no-action alternatives provide environmental baselines against which the impacts of other alternatives can be compared.

The National Environmental Policy Act (NEPA) Environmental Impact Statement (EIS) Process

Under NEPA, the EIS process must describe a no-action alternative that describes the consequences of not changing the current operations. The High-Level Waste and Facilities Disposition EIS evaluates new facilities for treating, storage, and disposal of waste and closing facilities to the no-action alternatives of continuing processing and monitoring waste or orderly shutdown.

In the NEPA process, a no action alternative may not necessarily comply with applicable laws and regulations, but it provides an environmental baseline against which the impacts of other alternatives can be compared. (USDOE 1997b)

Assumptions for Continuing Operation Alternative

- Operation of the NWCF according to the current plan will convert all of the radioactive liquid waste to solid calcine material by 2012.
- Operation of the NWCF for calcination of SBW and continued SNF operations at ICPP will continue to generate liquid radioactive waste through 2012.
- All radioactive waste systems and infrastructure facilities at ICPP will remain in operation to support the NWCF operation until the NWCF is placed in standby after completion of the tank farm closure.
- Maximum Achievable Control Technology (MACT) licensing requirements will be met by a modification to the off-gas treatment system for NWCF for operation of the NWCF after 2007. (Rawlins1997)

- Calcination of SBW will be performed at 600 degrees C to reduce the quantity of added non-radioactive aluminum nitrate.^a
- The contents of bin set #1 will not be transferred as part of the no action alternative.(ICPP 1996b)^b
- A new bin set (#8) will not be required for the no action alternative because of improved waste management processes.^c
- Low activity liquid waste that is generated after closure of the tank farm will be treated or stored by the waste generators.
- Regulatory requirements will apply to the No Action alternatives for planned activities through planned tank farm closure. (Wichmann 1996; Spaulding et. al. 1998a). Regulatory issues were also discussed by Palmer (1994).

Assumptions for Orderly Shutdown Alternative

- Decision to shutdown is made in FY-2000.
- None of the waste storage or treatment facilities would be RCRA closed.
- The tank farm will not be RCRA closed.
- Shutdown facilities will be left in safe condition after expenditure of reasonable efforts but will be unmonitored.
- Public access will be restricted until after 2095.

^a Earlier feasibility studies identified potential high temperature modifications with an estimated TPC of \$6.6 M. (Henry Welland, INEL/INT-97-00075, NWCF Process Modification for Sodium-Bearing Waste Project Conceptual Design, April, 1997. Further studies show that no facility modifications are required for high temperature operation.

^b Recent analysis (to be published) shows that the accident scenario for Bin Set #1 would not exceed the evaluation guidelines for safety analysis. (For guidelines, see York, Cary, LMITCO, Letter to Robert M. Stallman, DOE-ID, INEEL RISK EVALUATION GUIDELINES - YORK-024-97, June 23, 1997)

^c Millet, C. B., Concurrence with no Need for Bin Set 8, Letter to W. B. Palmer, MIL-01-98, April 22, 1998

FACILITIES AND PROCESSES

The following existing radioactive waste treatment facilities are operational at ICPP. (DOE 1998)
Liquid waste is stored in various interim storage tanks. These facilities and processes treat wastes to reduce the liquid volume, and to convert the liquid wastes to solids for continued interim storage.

New Waste Calcining Facility (NWCF-CPP-659)

The NWCF is a concrete and steel structure approximately 250 ft long by 145 ft wide and extends 57-ft belowgrade and 43 ft abovegrade located inside the ICPP fence. The NWCF converts radioactive liquid waste to a solid granular form. (ICPP 1998)

The Calcination Process. SBW is pumped by steam jet from the tank farm to the waste blend and hold tanks in the NWCF for temporary storage, sampling, and adjustment. Feed batches are prepared in the process makeup vessels in the NWCF by adjusting the SBW with aluminum nitrate, calcium nitrate, and boric acid. The liquid is fed into a hot, fluidized bed of solid particles where the water and other volatile compounds are flashed as vapor into the off-gas. The off-gas is cleaned and filtered before being released to the ICPP stack. Calcination occurs in the fluidized bed. Pressurized air atomizes the liquid feed solution through the feed nozzles. Process heat for calcination is provided by burning kerosene fuel with pure oxygen in the fluidized bed. During the process, bed level increases as particles grow from solids deposition and water flashes off as vapor. Particle attrition and bed withdrawal maintain the bed height at a steady, working level. Solids produced in the calcining process are pneumatically conveyed through a double-contained stainless steel line (encased in concrete) to solids storage bins.

The calciner processes liquid waste at a gross feed rate of about 180 gallons per hour. The scrub solution buildup, non-radioactive chemical additions, and non-processing downtime produce a net tank depletion rate of 30 to 80 gallons per hour.

- The continuing operation alternative would complete calcination of the SBW and would support waste management activities during tank farm closure.
- Orderly shutdown would immediately cease calcination of SBW. Process vessels would be emptied of waste solutions and solid product. Some decontamination rinses would be performed.

ICPP HEPA Filter Leaching System (CPP-659)

The high efficiency particulate air (HEPA) filters that are used in the off gas systems at ICPP are categorized as mixed waste because of the hazardous and radioactive components that are collected by the filter media. The filter leaching system uses chemical extraction to remove radionuclides and other hazardous constituents from used HEPA filters. The system treats both mixed waste and transuranic-contaminated waste. After leaching, the filters are ready for packaging for low level radioactive waste (LLW) disposal. The leachate generated by HEPA filter leaching is treated or stored in the ICPP liquid radioactive waste system.

- The continuing operation alternative would complete treatment of all spent HEPA filters.

- Orderly shutdown would complete only those HEPA filters in process at the time of shutdown.

NWCF Debris Treatment Facility (CPP-659).^d

The debris treatment area in the NWCF has decontamination cubicles, a spray booth, a decontamination cell, and a low-level decontamination room. Treatment technologies include water washing, chemical washing, high-pressure water and steam sprays, liquid abrasive spray, CO₂ blasting and ultrasonic cleaning. Future plans include addition of secondary containment to the hot decontamination area for treatment of highly radioactive debris. The facility supports the ICPP waste operations by decontaminating equipment and tools for repair and reuse.

- Continuing operation of the Debris Treatment facility would support waste management activities until after the Tank Farm Closure.
- The orderly shutdown alternative would cease debris treatment.

ICPP Process Equipment Waste (PEW) System

Dilute radioactive liquid wastes are collected from the various facilities at ICPP in the PEW system. Waste is concentrated in the PEW evaporator (PEWE) after temporary storage in PEW tanks. The PEW is part of the ICPP liquid radioactive waste water treatment system. The system has collection vessels, feed tanks, thermosyphon evaporators, instrumentation, and controls.

The PEW has four 4500 gal collection tanks in CPP-601 (WG-100, -101, WH-100, -101). Wastes are pumped from the collection tanks through underground lines to the PEWE feed tanks in CPP-604. Each feed tank has a capacity of 18,400 gallons. There are two steam heated thermosyphon evaporators with a heat transfer capacity of 3.25 million Btu/h each. The concentrated waste from the bottom of the evaporator is transferred to the tank farm. The condensate from the overhead vapors goes to the Liquid Effluent Treatment and Disposal (LET&D) for further treatment

- Continuing operation of the PEW system would support waste management activities until after the Tank Farm Closure.
- The orderly shutdown alternative would cease operation of the PEW.

Liquid Effluent Treatment and Disposal (LET&D)

The LET&D building is a steel-frame metal-sided building 21 m (68 ft) by 10 m (34 ft) by 16 m (53 ft) high within the ICPP fence. Process equipment includes acid fractionators, reboilers, condensers, separators, bottoms coolers, feed tank, and bottoms tank. The off gas system includes HEPA filters,

^dProject Design Criteria for CPP-659 New Waste Calcining Facility Debris Rule Compliance Project , Rev 1, March 31, 1997

blowers, and superheaters. A distributed control system (DCS) monitors and controls the process.

The two main processes occurring in the LET&D are complexing and acid fractionation. Complexing involves the chemical bonding of the fluoride ion to the aluminum ion. The fluoride ion in some of the liquid waste is very corrosive when concentrated and heated. Aluminum is used to chemically bond the fluoride ion to reduce its corrosive action on equipment. Acid fractionation concentrates nitric acid and distills most of the water off as steam. The water vapor is heated, filtered through HEPA filters, and exhausted to the ICPP stack. The LET&D facility eliminates the liquid volume of the PEWE condensates that otherwise would be routed to service waste and the percolation pond. The bottoms from the LET&D are recycled to NWCF or sent to the ICPP Tank Farm for storage pending final treatment. (ICPP 1992)

- Continuing operation of the LET&D would support waste management activities until after the Tank Farm Closure.
- The orderly shutdown alternative would cease operation of the LET&D.

ICPP Tank Farm

Interim storage space for radioactive liquid waste before calcination is provided by eleven 300,000-gal underground tanks (WM-180 to -190). Each of the 300,000-gal liquid waste storage tanks is totally enclosed inside an underground concrete vault. The tanks do not comply with RCRA storage requirements. (Palmer et. al. 1998; Spaulding 1998)

SBW can be jetted (pumped) from any of the 300,000-gal waste tanks to the NWCF for solidification. Waste can also be transferred between tanks in the tank farm. Tank contents are generally segregated according to composition for proper adjustment during calcination. (ICPP 1996a)

- Continuing operation of the tank farm and related radioactive waste systems would empty the tank farm and close to RCRA landfill standards. Three new RCRA permitted tanks would be constructed and operated.
- The orderly shutdown alternative would not empty nor close the tank farm.

High-Level Liquid Waste Evaporator (HLLWE)

The HLLWE, located in the blend and hold cell of the NWCF, is used to concentrate selected tank farm solutions to the nominal specific gravity of 1.3. The HLLWE reduces the volume of waste to be stored or calcined. Liquid waste volume can be reduced faster and at lower cost in the HLLWE than in the NWCF. The HLLWE handles feed from the Tank Farm and is able to run independently of calciner operations. The evaporator is steam heated. The concentrated bottoms are sent to the tank farm; the condensate is sent to the LET&D for further treatment.

Calcine Solids Storage Facilities (CSSF)

There are seven CSSFs, each with four to seven stainless steel bins. Each bin set is enclosed in a

concrete vault. The stainless steel bins are designed for interim storage of calcine solids for up to 500 years. (Hoffman 1975) The first through fifth CSSFs are filled to operating capacity. The sixth CSSF is receiving the calcine from the current NWCF campaign. The seventh CSSF is empty and available for future NWCF campaigns.

A detailed inventory of the calcined waste in storage in the ICPP CSSFs was prepared from an examination of calciner startup data, waste solution calcination records, calcine solids storage bin data, and other operational records. The calcined solids in the bins consist of mixed-metal oxides and fluorides containing Sr-90, Cs-137, and transuranics. ^e

Table 1. Inventory of the CSSF bin sets as of February 1998

CSSF Bin Set	Reference for Description	Total capacity ft³	Usable volume ft³	Filled contents ft³
1	ICPP 1996b	8300	8000	7650
2	ICPP 1994a	31600	30200	30200
3	ICPP 1994a	40000	38700	38500
4	Schindler 1980; ICPP 1994b	17700	17200	17200
5	ICPP 1984	36200	35000	35000
6	ICPP 1997	55200	53200	5800
7	Mozes 1985	63,000	63,000	0

Gaseous Waste Systems

Gaseous waste systems support the operation of the HLW facilities by treating, monitoring, and releasing process off gas and ventilation air to the atmosphere. (ICPP 1996c)

The Atmospheric Protection System (APS) and Main Stack Gaseous waste is filtered and released through the APS and the ICPP main stack. The APS provides final filtration for several process off gas and ventilation systems before release to the environment.

The ICPP Main Stack is a 250-ft tall concrete structure lined with stainless steel. The inside diameter of the stack is a uniform 8-ft tapering to 6.5 ft at the very top. The main stack (CPP-708) is the final release and monitoring point for ventilation air and process off-gas that has been filtered by the APS. An isokinetic sample and analysis system monitors the stack effluent. The sample line withdraws a sample from a probe located 90 ft above the base of the stack. The sample flow is proportional to the main stack flow

^e M. D. Staiger, Review of Calcined High-Level Waste Stored at the ICPP (To Be Published April 1998)

Support Facilities

Infrastructure and support facilities provide utilities and support services for waste operations. A remote analytical laboratory, utilities, maintenance and office buildings, and security systems are operational. (ICPP 1980; ICPP 1994)

DESCRIPTION OF THE NO-ACTION ALTERNATIVES

Continuing Operation

Normal operation of the ICPP process and support facilities will continue as planned and budgeted for radioactive waste treatment and storage. The ICPP manages several types of radioactive waste: calcined solid waste, SBW, debris, and HEPA filters. These wastes are considered mixed waste because they contain hazardous components regulated under RCRA.

The NWCF will continue to operate until 2012 to empty the tank farm. Newly generated waste will be concentrated by the HLLWE, to minimize stored volume, and collected in new RCRA compliant tanks after 1012. The NWCF offgas cleanup system will be modified to control emission at or below the levels required by EPA's proposed Maximum Achievable Control Technology (MACT) rule. The operation with MACT will receive an operating permit. The calcine material will remain in storage in the CSSF bin sets. Other currently used waste management facilities will continue in operation or surveillance.

Continuing operation - calcination of SBW in the NWCF.

Calcination is a proven ICPP Process that uses high temperatures to convert liquid waste into a granular solid. Liquid wastes are sprayed into a hot (500 to 600°C), air-fluidized bed of granular solids where volatile components are flashed and the metallic salts are converted to oxides. The calciner off-gas is passed through a cyclone, where most of the entrained fine particles are settled out. The fine particles are combined with the larger solids that are removed by the product take-off lines. The solids are transported by air entrainment to the CSSF for storage. Transport air is returned to the calciner. Calciner off-gas is treated by passing it through a quench tower, venturi scrubber and demister. The quench tower is used to cool the off-gas and remove moisture and solid particles. The resulting scrub solution is continually recirculated through the quench tower and venturi scrubber and is eventually recycled back to the feed system and processed in the calciner. The off-gas then passes through silica gel beds, demister, superheater, HEPA filters and is exhausted to the Atmospheric Protection System (APS), which exhausts to the main stack.

Calcination greatly reduces the volume of stored radioactive waste. Converting radioactive liquid waste to solid calcined waste minimizes the amount of storage space required. Risks to the environment are significantly decreased by removing liquid wastes from the tank farm and putting them in a less corrosive, less mobile form (calcine). Aluminum nitrate, calcium nitrate, and boric acid are added to the calciner for proper operation of the process. Aluminum nitrate ensures that Na + K mol% of the calcine produced does not cause bed agglomeration. Calcium nitrate reduces volatilization of fluorides, chlorides, sulfates and phosphates. Boric acid is added to limit the formation of insoluble alpha alumina during calcination. (Murphy 1995)

The Decontamination Facility. The decontamination and debris treatment area in the NWCF Building (CPP-659) will continue in operation until 2020 to support ongoing waste storage and treatment operations. reduce personnel radiation exposures; 2) preclude contaminant spread from work areas; 3) provide newer, more efficient and effective decontamination techniques; and 4) treat mixed hazardous waste for disposal. The area has an ultrasonic cleaner, two sinks with ventilation hoods, decontamination

solution makeup tanks and transfer pumps. There is a shielded storage box and a shielded area

NWCF Process Control Modification. After approval of the safety analysis report, the calciner temperature control will be changed to 600°C. The higher temperature will limit bed agglomeration with smaller amounts of added aluminum nitrate. A MACT facility is planned that will modify the off gas emissions to meet the MACT standards. The calciner will be permitted as a waste treatment facility.

NWCF Shutdown and Standby. As the calciner completes the calcination of SBW, several batches of low activity waste will be calcined. Use of low activity feed will reduce the residual contamination in the process equipment. Further decontamination can be achieved by feeding unirradiated batches of aluminum nitrate to produce non-radioactive aluminum oxide solids. Transfer of non-radioactive solids to the CSSF would clean some of the residual contamination in the solids transport line. The success of these decontamination efforts would be monitored by the decreasing level of activity in the off-gas scrub solution. When the desired lower level of contamination is reached, the liquid feed and fuel would be stopped, and the solid calciner bed would be removed to the CSSF. The calciner would be placed in standby in that condition. No chemical rinses that would produce additional radioactive liquid waste would be used. The blowers would be turned off and the ventilation dampers would be closed. The building and process equipment would be stable and would contain radioactive contamination for indefinite, extended periods.

Continuing operation - Tank Farm

Tank Farm Operation. The tank farm will continue to receive concentrated radioactive waste from the operation of the HLLWE and the PEWE. Liquid SBW and concentrated wastes in the tank farm will continue to be fed to the NWCF until the installed piping could no longer remove solution. Dilute waste such as water from the fuel storage basins will be used to dilute the residual liquid heel in each of the tanks. Tank contents will be sequentially transferred from one tank through the next one to continually reduce the concentration of hazardous and radioactive components in the heels. The HLLWE will be operated to concentrate the dilute tank farm solutions for feed to the NWCF.

Six storage tanks (WM-180, -181, -183, -184, -185, and -186) currently contain SBW with an average calculated radionuclide activity of 0.18 Ci/L (decayed to 2016).^f The other 5 storage tanks contain heels from earlier HLW operations.

Table 2. Tank Farm Volumes (Gallons, as of March 31, 1998)

Vault Type		Tank Identification and Volume			
Pillar and Panel	WM-182	WM-183	WM-184	WM-185	WM-186
	10,300	21,900	262,500	93,200	281,000
Square Vaults	WM-187	WM-188	WM-189	WM-190	
	51,600	13,100	107,000	500	
Octagon Vaults	WM-180	WM-181	Total Liquid in 300,000-gallon Tank Farm Tanks		
	278,600	277,400	1,297,100 gallons		

^f Reference: Wenzel, D. R., Calculation of Radionuclide Inventories for Sodium Bearing Wastes, Letter to N. E. Russell, Wen-23-97, November 26, 1997

Tank Farm Closure. The tanks will be emptied down to the lowest level achievable by the installed piping systems. Additional sump pumps will be placed in the tanks to further reduce the residual liquid heel. The concentration of the waste will be reduced by rinsing with clean water. The waste solutions will be processed by the NWCF. Spaulding (1998) estimated a cease use and closure sequence for the eleven tanks. The small remaining tank heels will be solidified in place in the tanks by the addition of grout. After the heels are solidified, the tanks and vaults will be filled with grout for RCRA landfill closure.(Spaulding 1998)

Continuing operation - Liquid Waste Systems.

LET&D. The ICPP LET&D will continue to reduce the PEWE condensate liquid volume. The process reduces the volume of the PEWE condensate liquid by distillation and concentrates the nitric acid. The concentrated bottoms will be sent to the tank farm for storage or directly to the NWCF for use in the calciner off-gas scrub. The vapor will continue to be exhausted to the ICPP stack.

PEW. The PEW system will continue to receive contaminated liquid waste from ICPP operations. The PEWE will continue to concentrate the dilute waste. The condensate from the evaporator will be sent to the LET&D for further treatment and the concentrated bottoms will be sent to the tank farm.

The Calcined Solids Storage Facilities Continuing Operation.

The calcined solids from the SBW calcination by the NWCF will be sent to the sixth and seventh CSSF. The CSSF operation is managed in conjunction with the NWCF operation. Calcined solids fill the bins in the CSSF as the transport air flows from the NWCF. The solids are disengaged from the transport air in the cyclone separator near the top of the CSSF. The transport air returns to the NWCF for filtration and release. When the NWCF shuts down, the CSSF is placed in standby and monitoring mode.

Operating Cost Estimate

Operating cost estimates for the no action alternative are based on operating experience at ICPP. Project costs will be refined as detailed designs are developed for construction. Operating costs continue to be validated by review, efficiency improvements, and experience. (DOE 1998)

Table 3 Continuing Operation Cost Estimate

Facility	FY 2000 Estimate	FY 2000 to 2020 Estimate	Other
Liquid Waste Systems (PEW, LET&D, SW, Stack)	\$ 8,030,000	\$168,630,000	Inactivated in 2020
Liquid Waste Systems Utilities	\$1,300,000	\$ 24,717,000	Zero after 2020
Calciner Operation	\$12,883,000	\$256,748,000	Shutdown after 2020
Calciner Utilities	\$2,105,000	\$39,018,000	Zero after 2020
Calciner Modifications (Operating)	\$ 3,238,000	\$ 25,338,000	None after 2020
Calciner Modifications (Capital)	\$10,550,000	\$ 70,250,000	Zero after 2020
CSSF Bin Sets Operation	\$ 271,000	\$5,691,000	\$21,680,000 for 80 additional years of institutional control.
CSSF Utilities	\$ 60,000	\$ 1,302,000	Included in institutional control after 2020.
Administration & Oversight	\$6,013,000	\$ 122,094,000	Covered in 80 years of institutional control.
Technology Development	\$ 6,664,000	\$ 96,074,000	None after 2020
Support Facilities Utilities	\$2,300,000	\$ 48,300,000	Zero after 2020
Tank Farm Operation	\$2,688,000	\$ 52,285,000	Tank farm closed
Tank Farm Utilities	\$430,000	\$ 9,114,000	Zero after 2020
Tank Farm Addition (Capital)	0	\$138,390,000	Closed after 2020
Tank Farm Closure (Spaulding 1998)		\$ 90,700,000	Assumes conceptual design begins in FY 2000.
Sub-Total	\$56,532,000	\$ 1,148,651,000	\$21,680,000
Total			\$1,170,331,000

Orderly Shutdown

Orderly shutdown will begin immediately upon notification and direction to shutdown. A detailed plan for the sequence of shutdown will be prepared. Criteria for completion of shutdown will be established.

The collection and feed tanks for each of the evaporators will be processed and flushed. The bottoms collection tanks will be transferred to the tank farm. The LET&D feed tanks will be processed, the bottoms collection tanks will be transferred forward through the normal path. The calciner makeup and feed tanks will be processed through the calciner. Several batches of unirradiated aluminum nitrate feed solution will be processed through the calciner to convert the bed to unirradiated solids. The scrub solution will be changed out several times during the last batches to flush radioactivity forward. The final bed will be cooled and transferred to the CSSF. The unirradiated feed batches will produce solids with much lower radioactivity than normal operational batches. The final batch transferred will scour the product transfer line and reduce the background and contamination levels. After the NWCF solids bed is transferred, the bed will be collapsed and left in place.

Inflow of all waste streams will be shut off. Valves will be closed and selected lines will be cut and

capped. The instrumentation, off gas blowers, and building HVAC systems will be shut down. Main power breakers will be disconnected. The main ICPP stack blowers will be shut down. Facility inlet dampers will be closed.

The tank farm will be left with large inventories of radioactive liquid.

Operating Costs. All waste facilities would be operational until the last one is shutdown for continuity of integrated operation. One year of operation would be required at an estimated cost of \$36,080,000.

Consequences. All facilities would contain hazardous and radioactive material. Structure condition would degrade. Building roofs would leak. Facility liquid sump would accumulate liquid up to some steady state level. Evaporation and leakage to ground would limit the amount of accumulation. Tanks would develop leaks eventually. The worst case leak would be that of a tank farm tank full of SBW. The environmental consequence of a catastrophic tank failure has been analyzed in the safety analysis report. Off site consequences would be 2 mrem CEDE after 100 years from drinking water. The airborne consequence would be one mrem TEDE at the site boundary within that period.

The CSSF contents are expected to remain stable for 500 years. After 500 years, the remaining hazardous constituents will be mostly transuranic isotopes and heavy metals. Institutional control would cease at the completion of shutdown. Site security will limit public access.

Penalties would be imposed for violation of the settlement agreement and RCRA regulations.

PROJECTS

Projects are planned that will improve the operation of the ICPP waste treatment and storage facilities. Continued operation after planned improvements will support waste storage, treatment, and disposal. NWCF operation will continue after a permit is granted. The tank farm will be RCRA closed by 2020.

Electrical and Utility System Upgrade Project

The ICPP Electrical and Utility System Upgrade Project is not considered part of the no action alternative. However, it is currently implemented and will be completed as planned to support all activities at ICPP. The total life-cycle cost associated with this project is \$56 million. Construction completion is scheduled for December 2001.⁸

NWCF modifications for the MACT rule.

A new facility, called the MACT Compliance Facility (MCF), is to be constructed adjacent to the NWCF near the ICPP main stack to house the MACT control equipment. The MCF will be a high bay building approximately 46 X 108 X 40 ft. No significant environmental impacts were identified for construction activities or operations. The MCF will be constructed within the ICPP fence on an area in which the soil has been extensively disturbed during previous ICPP construction and operational activities. (Rawlins 1997).

The MACT rule imposes strict limits for the emission of (a) dioxins/furans, (b) hydrocarbons, (c) carbon monoxide, (d) particulate matter, (e) mercury, (f) semivolatile metals (i.e., lead and cadmium, (g) low-volatile metals (i.e., antimony, arsenic, beryllium, and chromium), and (h) hydrogen chloride/chlorine.

During the MCF operation, additional fuel for the secondary burner system will be used. Maintenance activities will be similar to existing activities at the ICPP. One new operator for each shift will be required to operate and maintain the new equipment. Increases in the use of water and electrical power and generation of wastewater and miscellaneous solid waste will be minimal. Over the life of the facility, approximately 28.3 m³ (1000 ft³) of granulated activated carbon containing 2,630 kg (5,800 lb) of mercury will require processing.

The MCF will be placed in standby, shutdown upon completion of NWCF operation. Environmental and regulatory concerns will be further evaluated during the project execution. The modification is based on the assumption that the MACT rule as proposed will be a requirement for an operating permit. (62FR75 1997)

The system proposed for the MCF includes a multistage combustion process to treat CO, THC, dioxins, furans, and NO_x; a water spray quench for off-gas temperature control, a demister, a heater, a sulfur-impregnated granular activated carbon Hg removal system, a heater, HEPA filters, blowers, and a continuous emissions monitoring system.

⁸ INEEL, Accelerating Cleanup: Paths to Closure, Idaho Operations Office, PLN-177, Appendix A, Page Project ID-OIM-106, February 1998

Radioactive Liquid Waste Tanks

New radioactive liquid waste tanks will be required as part of the continuing operation to support the waste storage, treatment, and disposal operations at ICPP. All of the waste treatment facilities depend on available storage tanks to handle in-process waste solutions. Three new tanks and a containment vault will be constructed and permitted for operation until after all liquid waste facilities have shut down. The tanks will accumulate and store batches of waste solutions from the PEWE, the HLLWE, the LET&D, the NWCF, the spent nuclear fuel storage facilities, and other waste generators. The tanks will be closed and decommissioned after closure of the old tank farm facility.

Basis for the MACT Project Data Sheet

General Project Objective The general purpose of the MACT Compliance Facility is to install the modifications in the New Waste Calcining Facility (NWCF) that would be required to control the off-gas emissions at or below the levels required by the Environmental Protection Agency's (EPA's) proposed MACT rule. The necessity for the MACT Compliance Facility is based on the assumption that the MACT rule will be applied to the NWCF permit to operate when implemented.

Summary of Impacts No significant environmental impacts were identified for construction activities or operations. The MCF will be constructed within the ICPP fence on an area in which the soil has been extensively disturbed during previous ICPP construction and operational activities. Maintenance activities and exposures will be similar to those currently required for the existing APS. Local contractors will accomplish construction work. Only limited construction personnel will be brought in from other areas to support the construction. No impacts to local schools or communities are expected. During the MCF operation, additional fuel (kerosene) for the secondary burner system will be brought to the ICPP area. Routine maintenance activities will be required to service filters, perform preventive maintenance on equipment, and change out carbon adsorbers. These maintenance activities are similar to existing activities at the ICPP and will be accomplished using approved written procedures. One new operator each shift will be required to operate and maintain the new equipment. Increases in the use of water and electrical power and generation of wastewater and miscellaneous solid waste will be minimal.

The filter media, carbon, and material collected by these devices will be disposed of using approved procedures. Over the life of the facility, a total of approximately 28.3 m³ (1,000 ft³) of granulated activated carbon containing 2,630 kg (5,800 lb) of mercury will require processing. Procedures exist for leaching and disposing of the high-efficiency particulate air filter elements, but new processes will have to be put into place for removing the mercury from the carbon and processing the mercury to stabilize it.

Table 4. Project data sheet for NWCF MACT Compliance Facility.

Generic Information

Description/function: MACT Compliant Off-gas Treatment System
of

NWCF

EIS alter. (A, B, etc.): No Action

Separations - 2006

Non-Separations – Vitrified waste

- HIPed Waste

- Direct Cementitious

Project Type or waste stream:

Calcliner off-gas

Action type:

New

Structure type:

Steel frame

Size, m³:

5,675 m³ (108 ft x 46 ft x 40 ft)

Other features:

Kerosene fuel tanks (57,000 L each)

Location:

Inside/outside of fence

Inside ICPP fence

Inside/outside of building

Inside of MACT Compliance Facility

Construction InformationCost (\$): Preconstruction:

Conceptual Design	\$ 3,400,000
Management Costs	2,500,000
Project Development	2,700,000
Permitting and Documentation	2,500,000
SO Test and Start-Up	10,700,000
Total Preconstruction	\$22,100,000

Cost (\$): Construction:

ED&I	\$ 8,700,000
Management (PM/CM)	6,800,000
Construction	21,900,000
G&A/PIF	2,800,000
Procurement Fees, Mgmt Reserve, and Contingency	14,500,000
Total Construction (TEC)	\$54,700,000
Schedule start/end: Preconstruction	January, 1999 through December, 2001
Schedule start/end: Construction	January, 2002 through December, 2006
Schedule start/end: SO Test & Start-up	January, 2007 through December, 2007

Table 4. (Continued.) Project data sheet for NWCF MACT Compliance Facility.

Number of workers each year of construction (new/existing)

Nonradiation	48 New workers/yr
Number of radiation workers (construction)	none
Average Annual worker radiation dose (rem/yr)	none

Heavy equipment

Equipment used	Dump trucks/flatbeds
Trips:	150 10-km round trips to spoil area; 50 12-mi round trips to RWMC; 20 trips for equipment and supplies
Hours of operation (including materials delivery vehicles)	1320 hours (total)

Acres disturbed and duration of disturbance

	January 1999 through December 2012
New	None
Previous	3.4 acres
Revegetated	0

Air emissions

Dust	9 tons (total)
Major gases (CO ₂ , H ₂ O, O ₂ , N ₂) from diesel exhaust	1,134 tons (total)
Contaminants (Particulates, CO, NO _x , SO ₂ , hydrocarbons) from diesel exhaust	3 tons (total)
SO testing air emissions (trace SO _x , NO ₂)	2 tons (total)
Total air emissions	1,148 tons (total)

Effluents

SO testing process wastewater (non-radioactive)	9,000 liters (total)
Sanitary wastewater	none
Lube Oil	negligible

Solid wastes

Type - Miscellaneous low-level waste	15 m ³ (total)
Type - Miscellaneous industrial waste	7 m ³ (total)

Table 4. (Continued.)Project data sheet for NWCF MACT Compliance Facility.

Water usage

Dust control	230,000 liters (total)
SO testing process water (quench cooling)	14,400,000 liters (total)
Domestic water (construction and SO testing)	negligible

Hazardous/toxic chemicals and wastes

Storage/inventory	none
Pits/Ponds created (m ²)	none
Hazardous waste (SO Testing ...HEPA filters)	1 m ³ (total)
Hazardous waste (construction)	1 m ³ (total)

Energy requirements

Electrical (MWh/yr)	5 MWh/yr
Fossil fuel (liters)	10,000 liters (total)
Permits needed for construction	NEPA documentation (prior to start of Title II design); facility operations will be included with NWCF operating permit.

Operational Information

Cost (\$): Operations	
Facility/Administration	\$ 750,000
Operations/Process Facility	2,340,000
Procurement, materials, utilities, maintenance	7,810,000
Total operations	\$10,900,000
Schedule start/end	January, 2008 through December, 2012

Number of workers each year of operation (new/existing)

Operations	4
Maintenance	3
Support	1
Total	8
Number of radiation workers	4 included in above
Average annual work radiation dose (rem/yr)	0.1 rem
<u>Heavy Equipment</u>	none

Table 4. (Continued.)Project data sheet for NWCF MACT Compliance Facility.

Air Emissions

Radioactive off-gas	minimal
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Effluents

Sanitary Wastewater	none
Process water (once-through cooling water)	1,471,680 liters/yr.
Decontamination solution (nitric acid)	none

Solid Wastes

Sanitary/Industrial Trash	25 m ³ /yr.
Radioactive wastes (canisters, amalgam)	negligible

Hazardous/toxic chemicals and wastes

Pits/Ponds used (m ²)	none
Spent Carbon (mixed waste)	7 m ³ /yr.
Misc. hazardous waste	5 m ³ /yr.

Water usage

Process water (quench cooling water)	1,471,680 liters/yr.
Domestic water	none

Energy Requirements

Electrical	1146 MWh/yr.
Steam	none
Fossil fuel (liters/yr)	3,050,000 L/yr.
Permits needed (for facility operations)	Permitted as part of NWCF operations

Table 4. (Continued.)Project data sheet for NWCF MACT Compliance Facility.

Decontamination & Decommissioning (D&D) Information

Cost (\$): D&D

Decommission	\$ 200,000
Decontamination	500,000
Demolition	3,000,000
Total D&D	\$3,700,000
Schedule start/end: D&D	January, 2013 through December, 2014
Number of workers each year of D&D (new/existing)	12
Number of radiation workers (D&D)	12 included in the above
Average annual worker radiation dose (rem/yr)	0.1 rem

Heavy equipment

Equipment used	Mobile Cranes, Trucks, Dozers, Loaders
Trips Trucks	1 per day
Hours of operation (all heavy equipment)	10,500 hours (total)

Acres disturbed and duration of disturbance

New	none
Previous	3.4 acres
Revegetated	none

Air emissions

Non-radioactive Fuel combustion gases (CO ₂ , H ₂ O, O ₂ , N ₂)	6,000 tons (total)
Non-radioactive Fuel combustion contaminants (CO, particulates, NO _x , SO ₂ , hydrocarbons)	35 tons
Radioactive HEPA filtered off-gas	negligible

Effluents

Radioactive spent decontamination solution	35,000 liters trace contamination
Non-radioactive sanitary wastewater	110,000 liters
Non-radioactive lube oil	negligible

Table 4. (Continued.)Project data sheet for NWCF MACT Compliance Facility.Solid wastes

Radioactive	2,900 m ³ (total)
Non-radioactive (industrial)	2,300 m ³
Hazardous	10 m ³

Hazardous/toxic chemicals and wastes (type)

Storage/inventory	none
Pits/ponds created (m ²)	none
Radioactive (mixed waste)	1 m ³ total

Water usage

Process water	1500 liters
Domestic Water	none
Source of water	ICPP site wells

Energy requirements

Electrical (MWh/yr)	5 MWh/yr.
Fossil fuel (liters)	45,000 liters
Permits needed (e.g. for facility closures, physical characteristics and quantities of radioactive and Hazardous materials remaining after closure)	Work will be done under closure provisions of existing permits.

Basis for the Radioactive Liquid Waste Tanks Data Sheet

General Project Objective The general purpose of the Radioactive Liquid Waste Tanks is to provide a permitted storage facility for interim storage of radioactive liquid waste at the ICPP. The necessity for the Radioactive Liquid Waste Tank Facility is based on the assumption that a permitted facility will be required to support the NWCF operation for calcination of the SBW and for tank farm closure.

Summary of Impacts No significant environmental impacts were identified for construction activities or operations. The Radioactive Liquid Waste Tanks will be constructed within the ICPP fence on an area in which the soil has been extensively disturbed during previous ICPP construction and operational activities. Maintenance activities and exposures will be similar to those currently required for the existing tank farm. Local contractors will accomplish construction work. Only limited construction personnel will be brought in from other areas to support the construction. No impacts to local schools or communities are expected. Routine maintenance activities will be required to repair failed valves and perform preventive maintenance on equipment. These maintenance activities are similar to existing activities at the ICPP and will be accomplished using approved written procedures. Existing operators on shift assignment will operate and maintain the new tanks. There will be no increases in the use of water and electrical power and generation of wastewater and miscellaneous solid waste.

Table 5. Project Data Sheet for Radioactive Liquid Waste Tanks**General Information**

Description/Function:	New Radioactive Waste Collection Tanks
EIS Alternative	No-Action Continuing Operation
Project Type:	Waste Management Program
Waste Stream:	SBW, MLLW
Action Type:	New
Structure Type:	Underground Vault
Size, m ³ :	5060 (50 ft X 148 ft X 25 ft)
Other Features	Three new underground Storage tanks (100,000-gallon capacity per tank) Concrete vault, liner, leak detection, piping for transfer and vents. Tie-in to existing systems.

Location:

Inside/outside of fence	Inside of ICPP fence
Inside/outside of building	N/A
Candidate for privatization?:	No

Construction Information**Cost (\$): Preconstruction**

Feasibility Study	\$1,142,000
Conceptual Design	\$3,630,000
Project Support	\$10,795,000
SO Test and Start-Up	\$2,931,000
Total Preconstruction	\$18,498,000

Cost (\$): Construction

ED&I	\$13,436,000
Management (PM/CM)	\$ 7,086,000
Construction	\$65,337,000
G&A/PIF	\$16,162,000
Procurement Fees, Mgmt Reserve, and Contingency	\$36,369,000

Total Construction (TEC)	\$138,390,000
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Schedule start/end: Preconstruction	January, 2001 through December, 2004
Schedule start/end: Construction	January, 2005 through December, 2009
Schedule start/end: SO Test & Startup	October, 2008 through September, 2010
<u>Number of workers (new/existing)</u>	
Nonradiation	20
Number of radiation workers (Construction)	none
Average annual worker radiation dose (rem/yr)	0.1 rem

Table 5. (Continued) Project Data Sheet for Radioactive Liquid Waste Tanks**Construction Information (Continued)****Heavy Equipment**

Equipment used	Excavator, scrapers, trucks, cranes, cement trucks
Trips	40 to bring equipment and materials to site. 200 to spoil area
Hours of operation	4,000

Acres disturbed and duration of disturbances

New	January, 2005 through September, 2037
Previous	None
Revegetated	4 acres
	0

Air Emissions

Dust	20 Tons (total)
Major gases (CO ₂ , H ₂ O, O ₂ , N ₂ ,) from diesel exhaust	1500 tons (total)
Contaminants (Particulates, CO, NO _x , SO ₂ , hydrocarbons(from diesel exhaust	3.5 tons (total)
SO testing air emissions	Negligible
Total air emissions	1524 tons (total)

Effluents

SO testing process wastewater (non-radioactive	20,000,000 liters (total)
Sanitary wastewater	None
Lube Oil	Negligible

Table 5 (Continued) Project Data Sheet for Radioactive Liquid Waste Tanks

Construction Information (Continued)Solid wastesType - Miscellaneous low-level waste 500 m³ (contaminated soil)Type - Miscellaneous industrial waste 10 m³ (total)Water usage

Dust control 300,000 liters (total)

SO testing 20,000,000 liters (total)

Domestic water (construction and SO testing) Negligible

Hazardous/toxic chemicals and wastes

Storage/inventory None

Pits/Ponds created (m²) None

Hazardous waste (SO test) None

Hazardous waste (construction) 0.5 m³ (total)Energy requirements

Electrical (MWh/yr) 7 MWh/yr

Fossil fuel (liters) 45,500 liters (total)

Permits needed for construction NEPA documentation (prior to start of Title I design); RCRA hazardous waste storage facility operating permit submitted 180 days prior to start of construction

Operational Information

Cost (\$): Operations

Facility/Administration \$ 2,421,000

Operations \$19,791,000

Procurement, materials, utilities, maintenance \$ 5,850,000

Total operations \$28,062,000

Schedule start/end October 2010 through December 2019

Number of workers each year of operation (new/existing)

Operations 2

Maintenance 1

Support 0.5

Number of radiation workers 3 included in above

Average annual work radiation dose (rem/yr) 0.1 rem

Table 5. (Continued) Project Data Sheet for Radioactive Liquid Waste Tanks

Operational Information (Continued)

<u>Heavy Equipment</u>	None
<u>Air Emissions</u>	
Radioactive off-gas	Negligible
<u>Effluents</u>	
Sanitary Wastewater	None
Process water	None
Decontamination solution	None
<u>Solid Wastes</u>	
Sanitary/Industrial Trash (@0.1 ft ³ /person/day)	3.1 m ³ /year
Radioactive wastes	1 m ³ /year
<u>Hazardous/toxic chemicals and wastes</u>	
Pits/Ponds used (m ³)	None
Miscellaneous hazardous waste	>1 m ³ /year
<u>Water usage</u>	
Process water	None
Domestic water	None
<u>Energy Requirements</u>	
Electrical	500
 Decontamination & Decommissioning (D&D) Information	
<u>Cost (\$): D&D</u>	
Decommission	\$ 200,000
Decontamination	500,000
Demolition	3,000,000
Total D&D	\$3,700,000
Schedule start/end: D&D	January, 2013 through December, 2014
Number of workers each year of D&D (new/existing)	20

Table 5. (Continued) Project Data Sheet for Radioactive Liquid Waste Tanks

Decontamination & Decommissioning (D&D) Information (Continued).

Number of radiation workers (D&D)	20 included in the above
Average annual worker radiation dose (rem/yr)	0.5 rem

Heavy equipment

Equipment used	Mobile Cranes, Trucks, Dozers, Loaders
Trips Trucks	1 per day
Hours of operation (all heavy equipment)	20,000 hours (total)

Acres disturbed and duration of disturbance

New	none
Previous	3.4 acres
Revegetated	none

Air emissions

Non-radioactive Fuel combustion gases (CO ₂ , H ₂ O, O ₂ , N ₂)	12,000 tons (total)
Non-radioactive Fuel combustion contaminants (CO, particulates, NO _x , SO ₂ , hydrocarbons)	40 tons
Radioactive HEPA filtered off-gas	negligible

Effluents

Radioactive spent decontamination solution	70,000 liters
Non-radioactive sanitary wastewater	110,000 liters
Non-radioactive lube oil	negligible

Solid wastes

Radioactive	4,000 m ³
Non-radioactive (industrial)	3,500 m ³
Hazardous	50 m ³

Table 5. (Continued) Project Data Sheet for Radioactive Liquid Waste Tanks

Decontamination & Decommissioning (D&D) Information (Continued).

Hazardous/toxic chemicals and wastes (type)

Storage/inventory	none
Pits/ponds created (m ²)	none
Radioactive (mixed waste)	10 m ³ total

Water usage

Process water	150,000 liters
Domestic Water	none
Source of water	ICPP site wells

Energy requirements

Electrical (MWh/yr)	10 MWh/yr.
Fossil fuel (liters)	90,000 liters
Permits needed (e.g. for facility closures, physical characteristics and quantities of radioactive and Hazardous materials remaining after closure)	Work will be done under closure provisions of existing permits.

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