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Status Update for Implementing Best Available Technology per DOE Order 5400.5

September 2003

Idaho National Engineering and Environmental Laboratory
Bechtel BWXT Idaho, LLC

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Idaho Falls, Idaho 83415

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Assistant Secretary for Environmental Management
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ABSTRACT

This report identifies discharges of liquid waste streams that require documentation of the best available technology selection process at Bechtel BWXT Idaho, LLC, operated facilities at the Idaho National Engineering and Environmental Laboratory. The best available technology selection process is conducted according to Department of Energy Order 5400.5, Chapter II (3), "Management and Control of Radioactive Materials in Liquid Discharges and Phaseout of Soil Columns" and Department of Energy guidance. This report evaluates only those liquid waste streams and facilities where the best available technology selection process was determined to be applicable. In addition, the Department of Energy Idaho Operations Office will submit this report to their field office manager for approval according to DOE Order 5400.5, Chapter II, Section 3.b.(1).

According to Department of Energy guidance, "If the liquid waste stream is below maximum contaminant levels, then the goals of the best available technology selection process are being met and the liquid waste stream is considered "clean water." However, it is necessary to document this through the best available technology selection process." Because liquid waste streams below drinking water maximum contaminant levels are already considered "clean water," additional treatment technologies are considered unnecessary and unjustifiable on a cost-benefit basis and are not addressed in this report.

Two facilities (Idaho Nuclear Technology and Engineering Center New Percolation Ponds and Test Area North/Technical Support Facility Disposal Pond) at the Idaho National Engineering and Environmental Laboratory required documentation of the best available technology selection process (Section 4). These two facilities required documentation of the best available technology selection process because they discharge wastewater that may contain process-derived radionuclides to a soil column even though the average radioactivity levels are typically below drinking water maximum contaminant levels. At the request of the Department of Energy Idaho Operations Office, the 73.5-acre Central Facilities Area Sewage Treatment Plant land application site is included in Section 4 of this report to ensure the requirements of DOE Order 5400.5, Chapter II, Section 3 are met. The Central Facilities Area Sewage Treatment Plant effluent contains process-derived radionuclides from radioactive tracers used in certain analytical procedures. The radioactivity levels of these radionuclides are below maximum contaminant levels.

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ACRONYMS

BAT	best available technology
BBWI	Bechtel BWXT Idaho, LLC
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFA	Central Facilities Area
CFR	Code of Federal Regulations
DCG	Derived Concentration Guide
DEQ	Department of Environmental Quality
DOE	Department of Energy
ECF	Engineering Change Form
ICARE	Issue Communication and Resolution Environment
ICS	interim control strategy
INEEL	Idaho National Engineering and Environmental Laboratory
INTEC	Idaho Nuclear Technology and Engineering Center
LET&D	Liquid Effluent Treatment and Disposal
MCL	maximum contaminant level
NE-ID	Department of Energy Idaho Operations Office
pCi/L	picocuries per liter
PEW	Process Equipment Waste
STF	sewage treatment facility
STP	sewage treatment plant
TAN	Test Area North
TSF	Technical Support Facility
WGS	Waste Generator Services
WLAP	Wastewater Land Application Permit

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1. INTRODUCTION

This report identifies the discharges of liquid waste streams that require documentation of the best available technology (BAT) selection process at Bechtel BWXT Idaho, LLC (BBWI)-operated facilities at the Idaho National Engineering and Environmental Laboratory (INEEL). The best available technology selection process is conducted according to Department of Energy (DOE) Order 5400.5, Chapter II (3), "Management and Control of Radioactive Materials in Liquid Discharges and Phaseout of Soil Columns"[1] and DOE guidance.[a] In addition, the DOE Idaho Operations Office (NE-ID) will submit this report to their field office manager for approval according to DOE Order 5400.5, Chapter II, Section 3.b.(1).

Last year's "Status Update for Implementing Best Available Technology per DOE Order 5400.5"[2] was reviewed. The purpose of the review was to identify those liquid waste streams and/or facilities that require documentation of the BAT selection process or further evaluation. In addition, a request was submitted to the appropriate BBWI personnel and organizations to determine if any previously unidentified liquid waste streams require the BAT selection process.

It was determined from the review, that only liquid waste streams that will continue to be discharged to soil columns for indefinite periods and that contain or may contain process-derived radionuclides require documentation of the BAT selection process. Currently, no liquid waste streams containing process-derived radionuclides discharge to surface waters, and no liquid waste streams discharge to a sanitary sewerage at greater than five times derived concentration guide[3] (DCG) values for radionuclides.

For this report, liquid waste (wastewater) from the following INEEL sources were reviewed:

- Sewage treatment plants (STPs)
- Routine operations that dispose of process wastewater
- Septic tanks
- Nonroutine projects, such as decontamination and decommissioning, surveillance, and maintenance.

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a. James R. Cooper, DOE-ID, e-mail to Brett R. Bowhan, R. M. Kauffman, etc., "Perc Pond Update," February 5, 2001, 10:38 a.m., CCN 35553.

2. OVERVIEW OF THE BEST AVAILABLE TECHNOLOGY SELECTION PROCESS

2.1 Applicability of the Best Available Technology Selection Process

The BAT selection process applies to those liquid waste streams identified in Table 1.

Table 1. Liquid waste streams applicable to best available technology selection process.

Liquid Waste Stream	Requirement
Liquid wastes containing radionuclides from DOE activities that are discharged to surface water. The BAT selection process is used if the surface waters otherwise would contain, at the point of discharge and prior to dilution, radioactive material at an annual average concentration greater than the DCG values in liquids given in Chapter III of DOE Order 5400.5. **NOTE:** *For the purposes of BAT and DOE Order 5400.5, "surface water" is defined as naturally occurring waters such as rivers, streams, lakes and springs when flowing in their natural channels.*	DOE Order 5400.5, Chapter II, Section 3.a.
Liquid waste streams that will continue to be discharged to soil columns for indefinite periods and which contain process-derived radionuclides.	DOE Order 5400.5, Chapter II, Section 3.b.(1)
Liquid wastes discharged from DOE activities into sanitary sewerage containing radionuclides at concentrations, averaged monthly, that would otherwise be greater than five times the DCG values for liquids at the point of discharge.	DOE Order 5400.5, Chapter II, Section 3.d

In addition, DOE Headquarters has provided the following guidance[b]:

- If a liquid waste stream is below 1 DCG and BAT is being implemented, the discharge is considered to be "clean water" (from a radiological standpoint) and not a discharge to a soil column under DOE Order 5400.5. That is, the soil column is not functioning as a treatment system to remove radionuclides.

- If the liquid waste stream meets BAT (determined there is no need for further treatment or process modifications required to reduce radionuclide concentrations) and is below 1 DCG but is above the drinking water radiological maximum contaminant levels[4] (MCLs), it is acceptable to discharge "clean water" to the soil.

b. James R. Cooper, DOE-ID, e-mail to Brett R. Bowhan, R. M. Kauffman, etc., "Perc Pond Update," February 5, 2001, 10:38 a.m., CCN 35553.

- If the liquid waste stream is at or below MCLs, this indicates that the goals of the BAT selection process are being met and the liquid waste stream is considered "clean water." However, it is necessary to document this through the BAT selection process.

- BAT does not necessarily require a treatment system for the discharge; however, it should be shown that the water being discharged is as clean as practicable and below DCGs.

2.2 Liquid Discharges Not Requiring the Best Available Technology Selection Process

The BAT selection process only applies to those liquid waste streams containing process-derived radionuclides at the point of discharge from the conduit to the environment (DOE Order 5400.5, Chapter II, Section 3). The following are examples of liquid discharges that do not meet this requirement:

- Storm water that may be contaminated as a result of radiological contamination from atmospheric deposition or past operating practices (residual radioactive material).

- Production water, potable water, firewater, steam condensate, etc., that has not passed through a radiologically contaminated process.

- Street and building wash water. Radiological contamination would be from atmospheric deposition or past operating practices (residual radioactive material).

- Liquid discharges to evaporation ponds.

- INEEL well purge water. Radiological contamination would be from atmospheric deposition or past operating practices (residual radioactive material).

2.3 Radiological Evaluations

The INEEL had previously used a number of different references or screening values to evaluate wastewater for its associated risk to human health and the environment. The objective of using these references was to meet DOE requirements, protect human health, and minimize potential future environmental characterization and cleanup liability at INEEL wastewater disposal sites.

Currently, for radiological contaminants in wastewater, MCLs and DCGs are the primary standards used at BBWI-controlled facilities at the INEEL to determine acceptable release levels to a soil column.

2.4 Documentation of the Best Available Technology Selection Process

As noted in last year's report for facilities requiring documentation of the BAT selection process, wastewater was discharged to the INTEC Existing Percolation Ponds through August 25, 2002. Beginning August 26, 2002, the wastewater was routed to the INTEC New Percolation Ponds. Radiological data provided in the previous report was for Calendar Year 2001. The only radionuclide identified as a positive detection in the monthly gamma analysis was cobalt-60. Cobalt-60 was detected in the April 2001 sample at 1.81 pCi/L and well below the MCL of 100 pCi/L.

For the period of January 1, 2002, through August 25, 2002, the data again showed that the radioactivity in the wastewater to the Existing Percolation Ponds was low. Only cesium-137 was positively detected in the monthly composite samples. This detection occurred in the August sample. The sample activity was 8.2 pCi/L compared to the MCL of 200 pCi/L.

Because the Existing Percolation Ponds have been permanently taken out of service, a more detailed discussion in Section 4 will not be provided.

Table 2 shows the three facilities identified for additional documentation of the BAT selection process, the justification, and applicability. The average radioactivity levels in the effluent discharged to these three facilities are typically below MCLs. As indicated in the guidance in Section 2.1, when the liquid waste stream is at or below MCLs, the goals of the BAT selection process are being met and the waste stream is considered clean water from a radiological standpoint; however, this must be documented.

Table 2. INEEL facilities identified for documentation of best available technology selection process.

Facility	Justification for BAT Selection Process	Applicability
INTEC New Percolation Ponds	Liquid waste streams potentially containing process-derived radionuclides will continue to be discharged to a soil column for an indefinite period	Low potential for inadvertent releases (for example, equipment failures) of process-derived radionuclides. Facility may be used for disposal of individual waste streams containing process-derived radionuclides.
Test Area North/Technical Support Facility (TAN/TSF) Sewage Treatment Facility (STF) Disposal Pond	Liquid waste streams potentially containing process-derived radionuclides will continue to be discharged to a soil column for an indefinite period	Low potential for inadvertent releases (for example, equipment failures) of process-derived radionuclides. Facility may be used for disposal of individual waste streams containing process-derived radionuclides.
Central Facilities Area (CFA) Sewage Treatment Plant (STP)	NE-ID request	Discharge of wastewater containing radioactive tracers used in certain analytical procedures. Facility may be used for disposal of additional waste streams containing process-derived radionuclides. CFA STP wastewater is then discharged to a 73.5-acre land application site.

2.5 Best Available Technology Selection Process

Typically, selection of BAT for a specific application is made from among candidate alternative treatment technologies. Those alternative treatment technologies are identified by an evaluation process according to DOE Order 5400.5, Chapter II, Section 3.a.(1)(a). The evaluation process includes factors related to technology, economics, and public policy considerations.

As discussed in Section 2.1, if the liquid waste stream is at or below MCLs, the goals of the BAT selection process are being met and the liquid waste stream is considered "clean water." The DOE Headquarters guidance further states that this must be documented through the BAT selection process. However, because of the already low radioactivity levels in the wastewater discharged from the three facilities identified in Section 2.4, the detailed BAT selection process will not be performed. This is based on the cost consideration component of the BAT selection process, which would preclude the need for additional treatment. In other words, any additional treatment would be unjustifiable on a cost-benefit basis.

Therefore, the information provided in Section 4 of this report shall be considered adequate documentation of the BAT selection process. Depending on the facility, this information may include the following:

- Facility description
- Interim control strategy
- Sources and control of radiological contamination
- Radiological sample results.

3. LIQUID DISCHARGES REQUIRING FURTHER EVALUATION

Four septic tanks (Table 3) at the Idaho Nuclear Technology and Engineering Center (INTEC) were identified as requiring further evaluation. Preliminary characterization had been performed. However, final characterization of the septic tanks has not been completed.

Presented below is a discussion on the current status of these tanks and the applicability of the BAT selection process. The term "characterization" as used in the discussion below, refers to characterizing the waste through process knowledge, analytical data, or a combination of both and is left to the discretion of the responsible manager.

Septic tank VES-CW-100 was sampled, and radiological analyses were performed. The validated data have been received. The data will be evaluated to determine the status of the tank contents (above or below MCLs for radionuclides) or whether further characterization is required. Applicability of the BAT selection process can be determined after the final characterization is complete.

Further evaluation of septic tanks VES-MA-107, VES-CA-101, and ST-SFE-102 is under consideration. These three septic tanks were sampled in support of the Voluntary Consent Order Program. Analyses for VES-CA-101 and ST-SFE-102 included gamma spectroscopy on both the liquid and solid matrices for these two tanks. These sample results are being reviewed. Radiological analysis was not performed on VES-MA-107. A determination will be made whether additional characterization is required for these three tanks. After the final characterization for these tanks is complete, applicability of the BAT selection process can be determined.

New information on the characterization efforts will be provided in the 2004 report.

Table 3. Septic tanks and associated buildings at the Idaho Nuclear Technology and Engineering Center.

Tank	Buildings
VES-CW-100	For CPP-655
VES-MA-107	For CPP-662
VES-CA-101	For CPP-656
ST-SFE-102	New tank for CPP-626

4. DOCUMENTATION OF THE BEST AVAILABLE TECHNOLOGY SELECTION PROCESS FOR BBWI-OPERATED FACILITIES

The following sections describe the BBWI-operated facilities (Central Facilities Area [CFA], Idaho Nuclear Technology and Engineering Center [INTEC], Test Area North/Technical Support Facility [TAN/TSF]; see Figure 1), their respective wastewater disposal sites, the potential to discharge radionuclides, and the methodology to ensure compliance with DOE Order 5400.5.

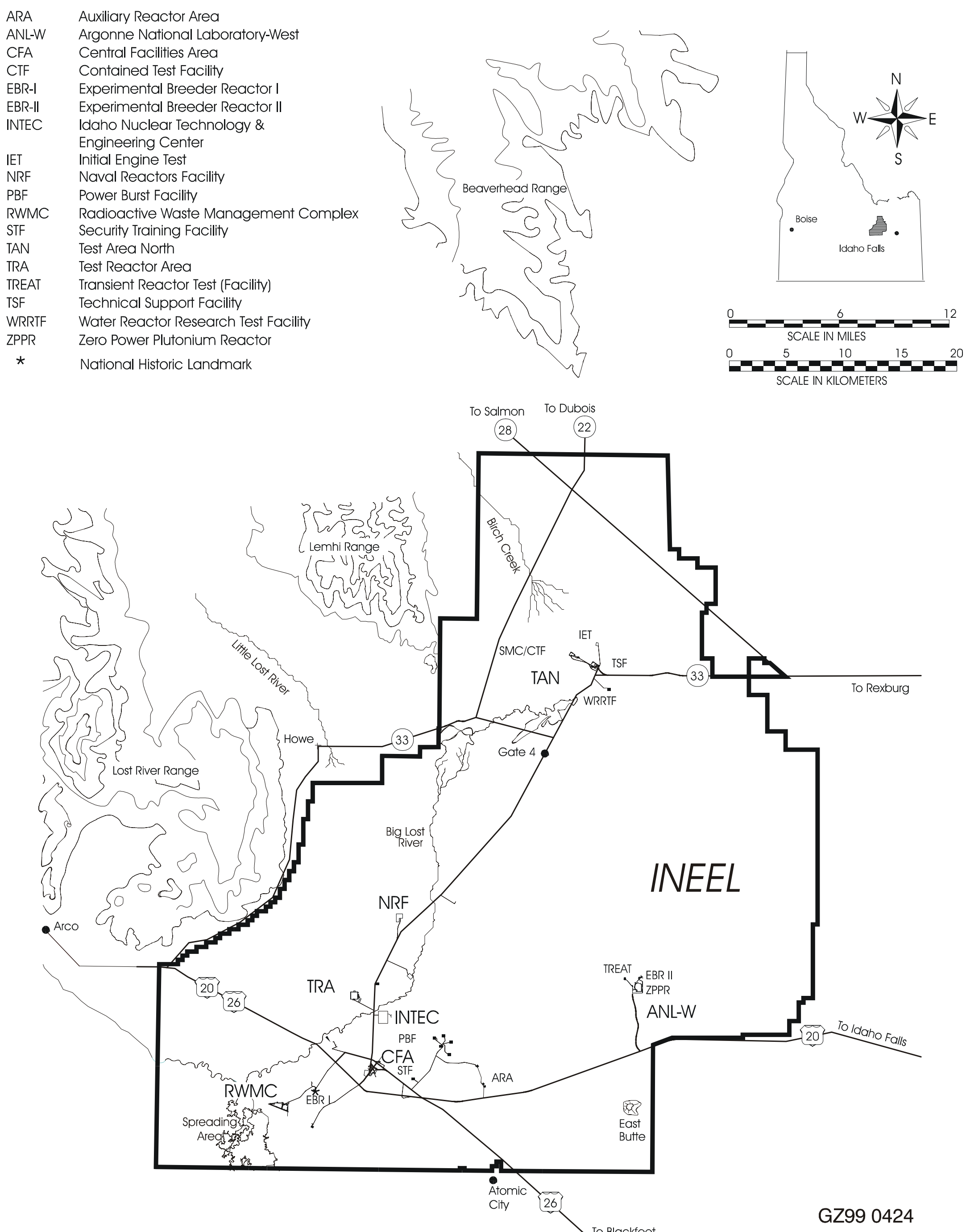

Figure 1. Idaho National Engineering and Environmental Laboratory facilities.

4.1 Documentation of the Best Available Technology Selection Process for the Central Facilities Area Sewage Treatment Plant

The CFA Sewage Treatment Plant (STP) serves all major facilities at CFA (Figure 2). The STP is southeast of the CFA area, approximately 2,200 ft downgradient of the nearest drinking water well. Wastewater from the CFA STP is applied to approximately 73.5-acres (approximately 65-acres when end gun is not in use) by a pivot sprinkler system. The CF-625 laboratory uses radionuclide tracers while performing bioassay analyses. These radionuclides (considered process-derived) are discharged to the CFA STP.

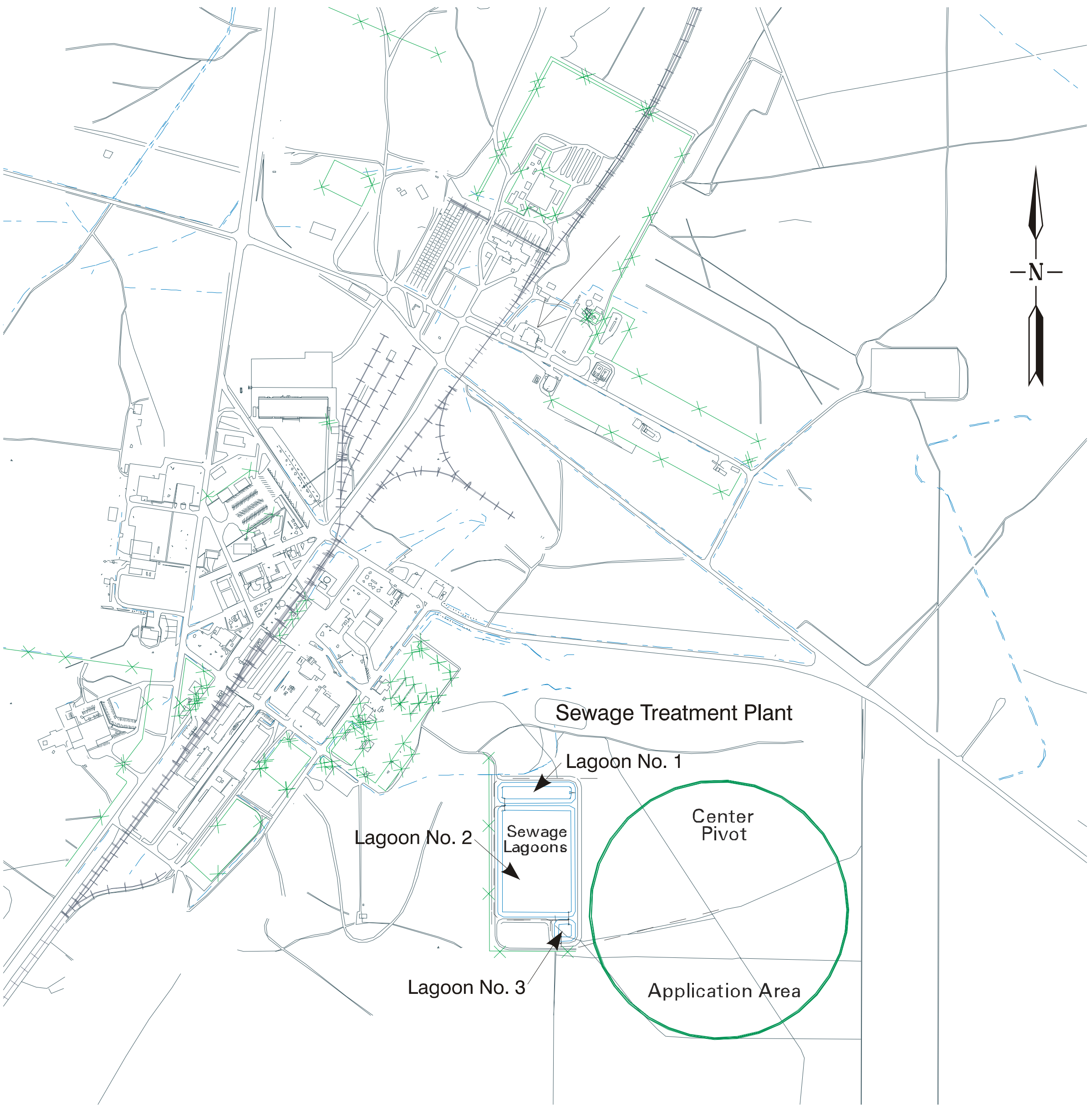

Figure 2. Map of Central Facilities Area.

4.1.1 Central Facilities Area Sewage Treatment Plant General Information

The CFA STP was built in 1994 and put into service on February 6, 1995. It processes approximately 110,000 gallons per day (gpd) of water from sanitary sewage drains throughout the CFA. Wastewater is derived from rest rooms, showers, and the cafeteria, a significant portion of which is comprised of noncontact cooling water from air conditioners and heating systems. This large volume of cooling water dilutes and weakens the wastewater effluent. Other contributing discharge sources include those from bus and vehicle maintenance areas, analytical laboratories, and a medical dispensary.

The STP consists of:

- 1.7-acre partial-mix, aerated lagoon (Lagoon No. 1)
- 10.3-acre facultative lagoon (Lagoon No. 2)
- 0.5-acre polishing pond (Lagoon No. 3)
- Sprinkler pivot irrigation system, which applies wastewater on up to 73.5 acres of desert rangeland vegetation.

Wastewater is collected at the lift station and pumped under pressure to Lagoon No. 1. Floating-type aerators mix, aerate, and agitate the wastewater within the cell of the first lagoon. Under normal operation, the wastewater flows by gravity from Lagoon No. 1 to Lagoon No. 2 and into Lagoon No. 3. The wastewater flows through an outlet structure in Lagoon No. 3 and is pumped out to the center pivot irrigation system.

A 400-gallon-per-minute pump applies wastewater from the lagoons to the land through a computerized center pivot system. The center pivot operates at low pressures (30 lbs/in.^{2}) to minimize aerosols and spray drift. The Wastewater Land Application Permit (WLAP) limits wastewater application to 25 acre-in./acre/year from March 15 through November 15 and limits leaching losses to 3 in./year.[5]

On July 25, 1994, the State of Idaho Department of Environmental Quality (DEQ) issued a WLAP for the CFA STP. That WLAP expired on August 7, 1999. However, on September 18, 2000, DEQ issued a letter authorizing the continued operation of the CFA STP under the original WLAP.[6] The authorization is effective until DEQ issues a new WLAP.

4.1.2 Sources and Controls for Radionuclide Contamination

Analyses on bioassay samples (urine and fecal matter) are performed at the CF-625 laboratory. Minute quantities of radioactive tracers are added to the samples prior to the analysis. Therefore, the wastewater generated during these analyses contains both process-derived and naturally occurring radionuclides. Approximately 330 gallons of this wastewater was generated in 2002 and discharged to the CFA STP. It has been determined through analysis and process knowledge that the radioactivity levels in the wastewater are below MCLs prior to discharge into the sewage system.[c]

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c. A. R. Bhatt, INEEL, e-mail to M. G. Lewis, "Radionuclide Discharges to the CFA Sewage Treatment Plant," July 14, 2003, 10:47 a.m., CCN 43737.

4.1.3 Radiological Sample Results

A 24-hour composite sample was collected on June 26, 2002, from the CFA-STF (CFA-STF is the designation for the sampling point located just prior to the wastewater being discharged to the sprinkler pivot). The sample was analyzed for gross alpha, gross beta, and gamma spectroscopy. The results are as follows:

- Gross alpha—The gross alpha sample result was reported as below the detection limit (3.22 pCi/L) at -0.46 pCi/L. A negative result occurs when the established background for a detector is greater than the count result for the sample. The detection limit and reported sample result are considerably less than the MCL of 15 pCi/L for gross alpha.

- Gross beta—Gross beta was detected in the sample with an activity of 3.78 pCi/L. Although there is no MCL for gross beta, for comparison, the result was below the conservative gross beta screening level of 15 pCi/L for community water systems utilizing waters contaminated by a nuclear facility [40 CFR 141.26.b(1)(i)]. It is expected that naturally occurring radionuclides (for example, potassium-40) in sanitary waste are contributing to the gross beta activity.

- Gamma spectroscopy—All results reported as below the detection limit.

4.1.4 Conclusion

The radioactivity levels in the CFA STP effluent show that the wastewater is below MCLs. As discussed in Section 2, wastewater below MCLs indicates that the goals of the BAT selection process are being met and that the wastewater is considered “clean” for radionuclides. However, this must be documented through the BAT selection process.

The radioactivity levels in the wastewater discharged from the CFA STP to the land application area are already below MCLs. After applying the cost consideration component of the BAT selection process, it was apparent that any additional treatment would be unjustifiable and too costly for the minimal benefit.

By procedure, the responsible manager must not generate a liquid waste without a means for disposing of it. Waste Generator Services (WGS), at the request of the responsible manager or designee, evaluates discharges (other than from new projects) to the CFA STP that may contain process-derived radionuclides. The mission of the WGS is “to provide the INEEL on-site and off-site waste generators with professional waste management services and to disposition legacy and newly generated waste in a safe, compliant, timely, and cost effective manner.” The WGS ensures the liquid waste is disposed of according to federal, state, and local regulations, and DOE orders.

Before discharging any new liquid waste streams containing process-derived radionuclides into the CFA STP, an evaluation is performed. To ensure the effluent discharged from the CFA STP complies with DOE Order 5400.5, newly identified liquid waste streams must be below MCLs prior to discharge into the CFA STP. Completion of the BAT selection process is required if the radioactivity in the wastewater is above MCLs but below 1 DCG. The BAT selection process determines if the wastewater requires additional treatment prior to discharge.

4.2 Documentation of the Best Available Technology Selection Process for the Idaho Nuclear Technology and Engineering Center New Percolation Ponds

On August 26, 2002, discharge of wastewater ceased to the Existing Percolation Ponds and was transferred to the New Percolation Ponds. This section (Section 4.2) of the report addresses discharge of service waste wastewater to the INTEC New Percolation Ponds (Figure 3).

Documentation of the BAT selection process applies to the INTEC New Percolation Ponds due to the potential for inadvertent releases (for example, due to equipment failures) of radionuclides and the possible disposal of properly approved waste streams containing process-derived radionuclides to this facility.

4.2.1 Idaho Nuclear Technology and Engineering Center Service Waste System and New Percolation Pond General Information

The Service Waste System collects the process wastewater generated at the INTEC. The wastewater consists primarily of noncontact cooling water, steam condensate, reverse osmosis regenerate, water softener, boiler blowdown wastewater, and other nonhazardous liquids. The Service Waste System monitors the waste streams for radioactivity, and the wastewater is transferred to one of two large percolation ponds for surface disposal. The Service Waste System consists of collection headers, pipes, tanks, valves, pumps, and monitoring and diversion stations (located in multiple buildings throughout INTEC).

Service Waste System wastewater includes only nonhazardous, nonradioactive (less than MCLs or less than 1 DCG with implementation of BAT) waste streams. Separate hazardous or radioactive wastewater from processes and laboratories are managed by the Process Equipment Waste (PEW) Evaporator (low-activity streams), the New Waste Calcining Facility–Evaporator Tank System (high-activity streams), the Tank Farm Facility tanks, or packaged and shipped to a treatment, storage, and disposal facility. Sanitary wastes and other related wastes are either discharged to the INTEC STP or directed to on-site septic tank systems.

In the event radioactivity in the service waste at CPP-797 were to exceed the set threshold level of the in-line continuous monitor, an alarm would sound, and an operator would then manually divert the service waste flow to holding vessel VES-WM-191, usually in less than a minute. VES-WM-191 has a design capacity of approximately 300,000 gallons and would take approximately 2 to 8 hours to fill depending upon the processes in operation. During the diversion, it is expected the source of radioactivity would be located and isolated. Radioactively contaminated wastewater collected in VES-WM-191 would then be sent to the PEW system for disposal.

The DEQ approved construction of the New Percolation Ponds on May 18, 2000.[7] Construction of the New Percolation Ponds began in August of 2000.[8] The DEQ issued a WLAP (LA-000130-03) for the New Percolation Ponds on September 10, 2001,[9] and an amended permit on March 28, 2002.[10] On August 26, 2002, construction was complete, and the wastewater previously discharged to the existing Percolation Ponds was discharged to the New Percolation Ponds.

Two sets of electric pumps transfer wastewater from CPP-797 to the New Percolation Ponds. Stainless steel header piping was replaced with high-density polyethylene piping to minimize the effects of microbial corrosion. Two 16-inch lines (primary and redundant) are available to transport the wastewater from CPP-797 to the ponds. Typically, the primary line is used. The redundant line is used as

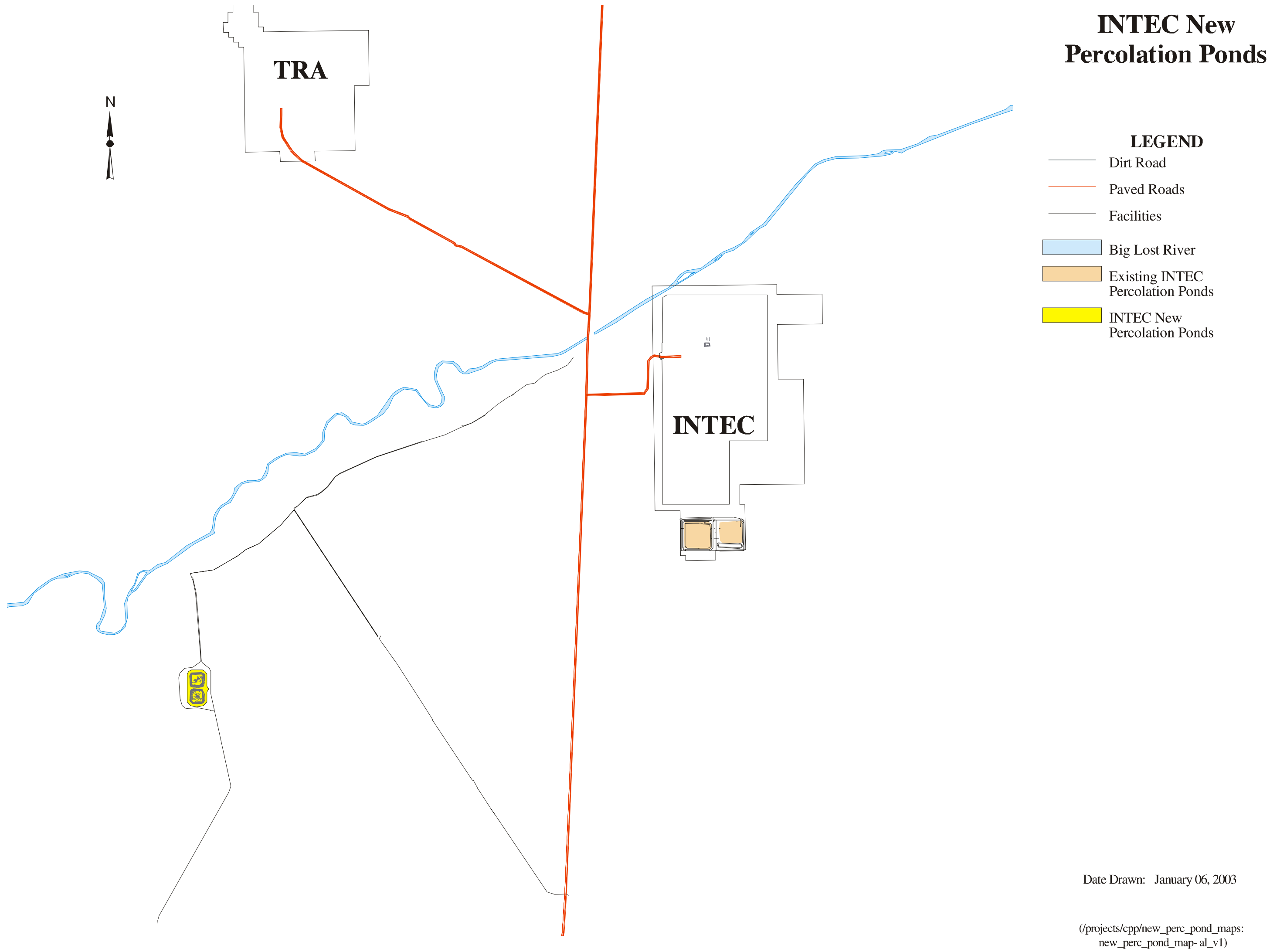

Figure 3. Idaho Nuclear Technology and Engineering Center New Percolation Ponds.

a backup in case the primary line is taken out of service. Additionally, a diesel-driven pumping system is used as the backup for the electric motor systems.

The new pond complex is a rapid infiltration system and is comprised of two ponds excavated into the surficial alluvium and surrounded by bermed alluvial material. Each pond is approximately 305 × 305 ft at the top of the berm and is about 10 feet deep. Each pond is designed to accommodate a continuous wastewater discharge rate of approximately 3 million gallons/day.

During normal operation, wastewater is discharged to only one pond at a time. Periodically, the pond receiving the wastewater will be alternated to minimize algae growth and maintain good percolation rates. Ponds are routinely inspected, and the depth is recorded via permanently mounted staff gauges.

4.2.2 Sources and Controls for Radionuclide Contamination

Through 1988, total radioactivity discharged from the Service Waste System to the Existing Percolation Ponds averaged hundreds of curies per year, with tritium being the major contributor. Since 1989 however, total radioactivity averaged less than 1 curie per year. This large reduction is mainly due to two factors: (1) INTEC no longer reprocesses spent nuclear fuel, and (2) the overhead condensates of the Process Equipment Waste (PEW) Evaporator are no longer discharged to the service wastewater stream. Since January 1993, the PEW evaporator overhead condensates have been sent to the Liquid Effluent Treatment and Disposal (LET&D) Facility for processing.

In the early 1990s, an effort was made to eliminate all potentially contaminated sources from discharging to the Service Waste System. Floor drains were capped, piping was modified, and other physical barriers were implemented to ensure that no known sources of radionuclide contamination are inadvertently discharged to the service waste stream.

In addition, an engineering evaluation was performed in 2001.[11] The purpose of the evaluation was to determine the risk of inadvertent discharge of radiologically contaminated liquids into the Service Waste System. This evaluation sought to confirm the results of the earlier evaluation (described previously) and identify any deficiencies due to subsequent modifications.

The evaluation identified no discharges of process-derived radionuclide-contaminated solutions. In general, INTEC facilities and processes have implemented sufficient engineered physical barriers to prevent inadvertent discharge of radionuclides to the Service Waste System in the event of an operational upset condition, except for two systems. These two systems are the CPP-666 Sump SU-FT-148 and the CPP-602 LC-Area Sump.

The CPP-666 sump is an open sump located in a radiological buffer area that could receive radiologically contaminated water solutions from a variety of locations throughout the CPP-666 facility. Under normal operation, the sump was monitored continuously and the contents were automatically diverted to a holding tank (VES-FT-134) if radioactivity was detected above 5,000 counts per minute. An Engineering Change Form (ECF) was originally submitted to complete the permanent piping modifications.[d] However, this ECF has been cancelled with the statement "No physical modifications were required to isolate CPP-666 sump from the Service Waste System. Double isolation was achieved by using existing valves." To ensure the double isolation was achieved, an Environment, Safety, and Health self-assessment was performed.[e] The line from the sump to the Service Waste System has two

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d. E. F. Armstrong, INEEL, e-mail to K. C. Barton, INEEL, "Service Waste Control Barriers for VES-FT-134," July 16, 2002, 10:36 a.m., CCN 35556.

e. E. J. Scott, INEEL, e-mail to M. G. Lewis, INEEL, "CPP-666 Sump and CPP-602LC-Area Sump," August 12, 2003, 2:46 p.m., CCN 44383.

valves that control the flow of water. One valve is manually controlled, and the other is air-actuated. Both valves are locked closed. These two valves have administrative tags and locks to prevent them from being opened, thus preventing a discharge to the Service Waste System. In addition, two valves control the flow from the sump to VES-FT-134. Similar to the valve from the sump to the Service Waste System, there is one manual valve and one air-actuated valve. Both of these valves have been locked open (administrative tags and locks) to allow water to flow from the sump into the tank.

All of the service waste drains in CPP-602 are routed to the CPP-602 LC-Area Sump. The sump area had been posted as a contamination area. In August 2003, the sump was decontaminated, surveyed, and found to be radiologically clean. As a result, the sump is no longer considered or posted as a radiological contamination area or a radiological buffer area.[12]

For the CPP-602 LC-Area sump, controls (administrative and engineering) have been implemented to ensure inputs to the sump are clean from a radiological standpoint. Caps were placed on all laboratory drain standpipes connected to the Service Waste System that are not in use. Only cooling water that has not become radiologically contaminated is discharged into those drain standpipes currently in use. Each drain standpipe was labeled to indicate that the drain was connected to the Service Waste System and radiologically contaminated discharges were not allowed.[f] All floor drains in radiological buffer areas not in use were plugged with either a mechanical drain plug or waterproof tape or both. Similar to the drain standpipes, only uncontaminated cooling water will be allowed to discharge into any floor drains currently in use. In addition, the sump was decontaminated. These corrective actions were completed on September 25, 2001, and documented in the Issue Communication and Resolution Environment (ICARE, #25416).

4.2.3 Radiological Sample Results

The radioactivity levels in the service waste are determined from samples taken at the CPP-797 monitoring station. The samples are monthly flow proportional composites collected according to approved operating procedures. The monthly composite sample is analyzed using a highly sensitive 24-hour scan for gamma-emitting radiation.

There were no radionuclides positively identified in the monthly gamma analyses for the period of September 2002 through December 2002.

4.2.4 Conclusion

The best available technology process was implemented in 1993 with the installation of the LET&D Facility, which was designed to remove the majority of process-derived radionuclides. In addition, the installation of physical barriers in the early 1990s and the engineering evaluation in 2001 were undertaken to eliminate all potentially contaminated sources from inadvertently discharging to the Service Waste System.

Data from the routine monthly samples collected for the period of September 2002 through December 2002 continued to show that radiological activity is seldom detected in the service waste effluent. All radionuclides were below laboratory instrument minimum detection levels. The INTEC High Level Waste Operations continues to routinely monitor for gamma-emitting radionuclides.

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f. K. C. Barton, INEEL, e-mail to M. G. Lewis, INEEL, “Service Waste Control Barriers in the CPP-602 Labs,” July 23, 2002, 2:32 p.m., CCN 35555.

All new discharges (other than from new projects) to the Service Waste System that may contain process-derived radionuclides are evaluated by WGS. The WGS ensures the liquid waste will be disposed of in accordance with federal, state, and local regulations, and DOE orders.

Before a new liquid waste stream containing process-derived radionuclides is discharged into the Service Waste System, an evaluation is performed. To ensure the effluent discharged to the New Percolation Ponds complies with DOE Order 5400.5, newly identified liquid waste streams must be below MCLs prior to discharge into the Service Waste System. If the wastewater is above MCLs but below 1 DCG, the BAT selection process must be completed. The BAT selection process will determine if the wastewater requires additional treatment prior to discharge.

4.3 Documentation of the Best Available Technology Selection Process for the Test Area North/Technical Support Facility Sewage Treatment Facility Disposal Pond

Only the TAN/TSF Sewage Treatment Facility (STF) Disposal Pond (Figure 4), located southwest of the TSF, requires a BAT evaluation. Documentation of the BAT selection process applies to the TAN/TSF STF Disposal Pond because radionuclides may (although unlikely) inadvertently be released (for example, due to equipment failures) to this facility. In addition, individual waste streams containing process-derived radionuclides may be disposed of to this facility. Only those individual waste streams that have received the appropriate approval may be discharged.

4.3.1 Test Area North/Technical Support Facility Sewage Treatment Facility Disposal Pond General Information

The TAN/TSF STF Disposal Pond is located southwest of the TAN/TSF (Figure 4). The TAN/TSF sewage system collects and transports sanitary waste to the STP. Water is treated and discharged to the TAN/TSF STF Disposal Pond. Sewage or sanitary waste consists primarily of spent water containing wastes from rest rooms, sinks, and showers. The process drain system collects wastewater from process drains and building sources originating from various TAN/TSF facilities and transports the wastewater to a sump where it is commingled with treated sanitary water and then discharged to the TAN/TSF STF Disposal Pond. Process water collected from the process drain system is not treated by the sewage system; rather, the process water bypasses the plant and flows directly to the common sump (TAN-655). Wastewater discharged to the process drain includes steam condensate, boiler blow down, water softener regeneration, demineralizer regenerate solution, water tank discharge, cooling water, and pressure relief discharges.

The TAN/TSF STF Disposal Pond was constructed in 1971; before that, treated wastewater was disposed of through an injection well. The Disposal Pond consists of a primary disposal area and an overflow section, both of which are located within an unlined, fenced 35-acre area. The overflow pond is rarely used, and is used only when the water is diverted to it for brief cleanup and maintenance periods. The Disposal Pond and overflow pond areas are approximately 39,000 ft^2 (0.9 acres) and 14,400 ft^2 (0.33 acres), respectively, for a combined area of approximately 53,400 ft^2 (1.23 acres).

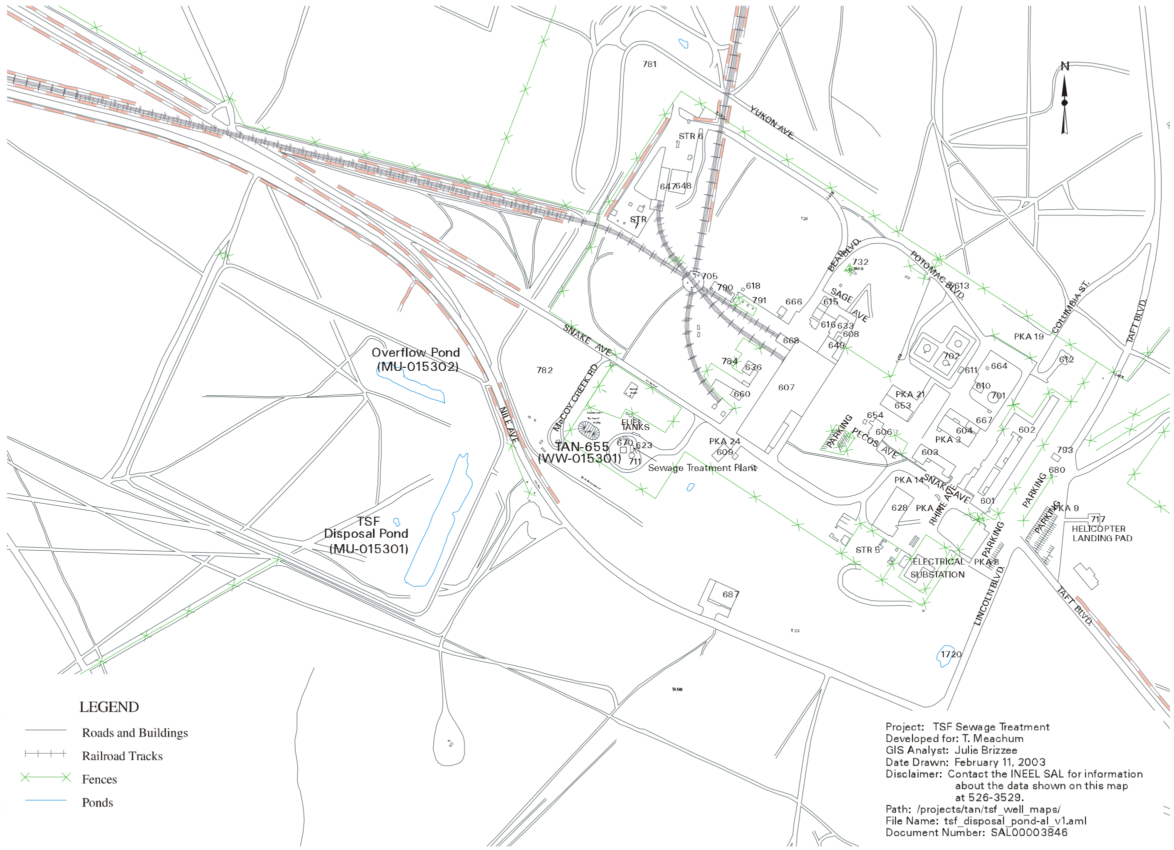

Figure 4. Map of Test Area North/Technical Support Facility.

The TAN/TSF STF Disposal Pond is a WLAP facility. On May 9, 1996, DEQ issued a WLAP for the TAN/TSF STF. The original WLAP expired on May 8, 2001. However, on July 12, 2001, DEQ issued a letter authorizing the continued operation of the TAN/TSF STF under the original WLAP.[13] The authorization is effective until DEQ issues a new WLAP.

The WLAP flow limit to the Disposal Pond is 34 million gallons/year. The average daily flow to the Disposal Pond for Permit Year 2002 (November 2001 through October 2002) was 21,463 gallons/day. The total flow for Permit Year 2002 was 7.83 million gallons, which is well below the WLAP flow limit.[5]

4.3.2 Interim Control Strategy

It was verified on May 2, 2001, that an interim control strategy (ICS) was required for the TAN/TSF Disposal Pond according to DOE Order 5400.5, Chapter II, Section 3.e(1). The ICS, dated October 2002, was approved by the NE-ID Operations Office manager on April 1, 2003.[14]

4.3.3 Sources and Controls for Radionuclide Contamination

The TAN-655 lift station was remediated in August–September 1993 as part of a Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) interim action.[15] However, some residual radioactive contamination may be in the TAN/TSF process wastewater lines, which could result in some continued radiological contaminant discharges to the sewage treatment plant and Disposal Pond.

Because of past discharges and possible residual contamination in wastewater lines, sludge from the TAN/TSF STP normally has detectable amounts of radioactivity. The sludge will be characterized prior to disposal. The sludge will be disposed based on the characterization results.

Before any new liquid waste streams containing process-derived radionuclides are discharged into the TAN/TSF STF, an evaluation will be performed. To ensure the effluent discharged to the Disposal Pond complies with DOE Order 5400.5, newly identified liquid waste streams must meet one of the three criteria (DOE Headquarters guidance) in Section 2.1.

4.3.4 Radiological Sample Results

In 2002, 24-hour composite samples were collected quarterly from the TAN-655 lift station and analyzed for gross alpha, gross beta, and gamma emitters. Strontium-89 and -90 samples were collected in March and September. Table 4 presents data for radionuclides reported above the minimum detection limits for Calendar Year 2002.

Gross alpha was positively detected in the March and April samples with an activity of 0.77 pCi/L and 3.97 pCi/L, respectively. Both results were well below the MCL of 15 pCi/L.

Gross beta was positively detected in all four samples collected. The average activity for all four samples was 8.09 pCi/L. The maximum activity for any particular sample was 20.9 pCi/L collected on March 13, 2002, and the minimum activity was 3.06 pCi/L collected on October 24, 2002. For comparison only, the average gross beta activity in the TAN-655 effluent was below the Environmental Protection Agency screening level of 15 pCi/L for community water systems utilizing waters designated by the state as contaminated by a nuclear facility.

Table 4. Test Area North/Technical Support Facility Sewage Treatment Facility (TAN-655) effluent radiological data for Calendar Year 2002.[a]

Parameter	Sample Date	Activity (pCi/L)	MCL[b] (pCi/L)
Gross alpha	3/13/02	0.77	15
Gross alpha	4/9/02	3.97	15
Gross beta	3/13/02, 4/09/02, 9/05/02, 10/24/02	8.09[c]	15[d]
Strontium-90	3/13/02	8.08	8

a. Only those parameters that were reported above the laboratory minimum detection limits are listed.

b. Maximum Contaminant Level, 40 CFR 141 unless otherwise specified.

c. Gross beta was positively detected in all four samples. Table shows average activity of all four samples.

d. Screening level of 15 pCi/L gross beta is used for community water systems utilizing waters designated by the state as contaminated by a nuclear facility [40 CFR 141.26.b(1)(i)].

As discussed previously, the March 13, 2002, gross beta sample result was 20.9 pCi/L. Because of this and the fact that strontium-90 is a strong beta emitter, a request was made to the laboratory to perform a strontium-90 analysis on the remaining sample. Table 4 shows that the strontium-90 sample result of 8.08 pCi/L slightly exceeded the MCL of 8 pCi/L. The second quarter (4/9/02) gross beta was only 4.6 pCi/L. A strontium-90 analysis was not performed on this sample. However, the third quarter sample was analyzed for strontium-90. This sample result for strontium-90 was reported as undetected at 0.58 pCi/L. The gross beta for the third quarter also showed low activity at 3.78 pCi/L. The fourth quarter gross beta again showed low activity at 3.06 pCi/L. A strontium-90 analysis was not performed on the fourth quarter sample.

All results from the quarterly gamma spectrometry analyses were reported as undetected.

4.3.5 Conclusion

Major facility construction/expansion is not planned for the TAN/TSF. Activities will be focused on deactivating facilities and completing environmental restoration activities. Therefore, no increased discharges to the TAN/TSF STF Disposal Pond requiring upgrades are expected.

As discussed in Section 2, wastewater below MCLs indicates that the goals of the BAT selection process are being met and that the wastewater is considered “clean” for radionuclides. However, this must be documented through the BAT selection process.

The radioactivity levels in the effluent from the STF were below MCLs in 2002 with the exception of strontium-90. The strontium-90 result in the first quarter sample slightly exceeded its respective MCL by 0.08 pCi/L. The sample result appears to be valid and could be expected based on the gross beta result of 20.9 pCi/L. However, there are no known sources of strontium-90 being discharged into the TAN/TSF Disposal Pond. The second, third, and fourth quarter gross beta levels decreased significantly in comparison to the first quarter. In addition, the result for strontium-90 analyzed in the third quarter sample was reported as undetected and well below the MCL.

Even though the first quarter strontium-90 result slightly exceeded the MCL, the cost for additional treatment outweighs the benefit and would therefore be unjustifiable. The quarterly gross beta results will continue to be reviewed as the data become available. If a quarterly gross beta result exceeds 15pCi/L, then a request will be made to analyze the remaining sample for strontium-90. In addition, on an annual basis, one of the routine quarterly samples will be analyzed for strontium-90.

By procedure, the responsible manager must not generate a liquid waste without a means for disposing of it. The WGS, at the request of the responsible manager or designee, evaluates discharges (other than from new projects) to the TAN/TSF Disposal Pond that may contain process-derived radionuclides. The WGS ensures the liquid waste will be disposed of according to federal, state, and local regulations, and DOE orders.

Before any new liquid waste streams containing process-derived radionuclides are discharged into the TAN/TSF STF, an evaluation is performed. To ensure the effluent discharged to the TAN/TSF Disposal Pond complies with DOE Order 5400.5, newly identified liquid waste streams must be below MCLs for radionuclides prior to discharge into the TAN/TSF STF. Completion of the BAT selection process is required if the radioactivity in the wastewater is above MCLs but below 1 DCG. The BAT selection process will determine if the wastewater requires additional treatment prior to discharge.

5. CONCLUSION

Last year's "Status Update for Implementing Best Available Technology per DOE Order 5400.5" was reviewed. The purpose of the review was to determine those previously identified liquid waste streams and/or facilities that would require documentation of the BAT selection process or further evaluation. In addition, BBWI-operated facilities were reviewed to determine if any previously unidentified liquid waste streams require the BAT selection process.

Based on the review, two BBWI facilities, the INTEC New Percolation Ponds and TAN/TSF STF Disposal Pond were determined to require documentation of the BAT selection process. In addition, NE-ID requested that the 73.5-acre CFA STP land application site be included in Section 4 ("Documentation of the Best Available Technology Selection Process for BBWI-Operated Facilities") of this report to ensure requirements of DOE Order 5400.5, Chapter II, Section 3 are met.

The review concluded that the two facilities were discharging minimal levels (typically below drinking water MCLs) of radiological contaminants (some of which may be process-derived) to a soil column. The CFA STP also discharges minimal levels of process-derived radionuclides. Guidance defined in Section 2.1 states, "If the liquid waste stream is below MCLs, this indicates that the goals of the BAT selection process are being met and the liquid waste stream is considered "clean water." However, it is necessary to document this through the BAT selection process." Section 4 of this report is documentation of the BAT selection process for the CFA STP, INTEC New Percolation Ponds, and the TAN/TSF STF Disposal Pond according to this guidance. Because liquid waste streams below MCLs are already considered "clean water," additional treatment technologies were considered unnecessary based on cost.

In addition, newly generated liquid wastes containing process-derived radiological contaminants disposed to a soil column will be evaluated before discharge. Newly identified liquid waste streams must be below MCLs for radionuclides prior to discharge. For liquid waste streams that are below 1 DCG but above MCLs, the BAT selection process must be completed. The BAT selection process will determine if the wastewater requires additional treatment prior to discharge. This ensures compliance with DOE Order 5400.5 and will also protect human health and the environment.

6. REFERENCES

1. DOE O 5400.5, Chapter II (3), "Management and Control of Radioactive Materials in Liquid Discharges and Phaseout of Soil Columns," U. S. Department of Energy.

2. INEEL, *Status Update for Implementing Best Available Technology Per DOE Order 5400.5*, INEEL/EXT-02-00838, September 2002.

3. DOE O 5400.5, Chapter III, "Derived Concentration Guides for Air and Water," U.S. Department of Energy, January 1993.

4. 40 CFR 141, "National Primary Drinking Water Regulations," *Code of Federal Regulations,* Office of the Federal Register, Current edition.

5. INEEL, *2002 Wastewater Land Application Site Performance Reports for the Idaho National Engineering and Environmental Laboratory,* INEEL/EXT-02-01562, February 2003.

6. James Johnston, DEQ, to James Graham, INEEL, "INEEL Central Facilities Area (CFA)," September 18, 2000.

7. V. Hall, DEQ, to C. M. Bennett, DOE-ID, "Idaho Nuclear Technology and Engineering Center (INTEC) Service Wastewater Discharge Facility, New Percolation Ponds, Idaho National Engineering and Environmental Laboratory," TSCE-32-2000, May 18, 2000.

8. R. H. Guymon, INEEL, to G. Eager, DEQ, "Transmittal of the Quarterly Construction Status Report for the Idaho Nuclear Technology and Engineering Center (INTEC) Service Waste Discharge Facility Project," CCN 14278, November 21, 2000.

9. G. Eager, DEQ, to J. L. Lyle, DOE-ID, and P. H. Divjak, INEEL, "INEEL Idaho Nuclear Technology and Engineering Center (INTEC) Wastewater Land Application Permit No. LA-000130-03 (Percolation Ponds)," September 10, 2001.

10. G. Eager, DEQ, to J. L. Lyle, DOE-ID, and P. H. Divjak, INEEL, "INEEL Idaho Nuclear Technology and Engineering Center (INTEC) Wastewater Land Application Permit No. LA-000130-03 (Percolation Ponds)," CCN 31280, March 28, 2002.

11. EDF-2602, "Evaluate Service Waste Sources for Radiological Discharge Risk," High-Level Waste Program, April 2001.

12. EDF-2602, "Evaluate Service Waste Sources for Radiological Discharge Risk," Rev. 1, August 2003.

13. William Teuscher, P.E., DEQ, to James F. Graham, INEEL, "Request for Continued Operation for Land Application Permit #LA-000153-01," July 12, 2001.

14. T. Perkins, DOE-ID, to R. Miklos, INEEL, "Approval of the Interim Control Strategy for the TAN/TSF Sewage Treatment Disposal Pond," TS-ETSD-03-033, April 8, 2003.

15. INEEL, *Status Update for Implementing Best Available Technology per DOE Order 5400.5*, INEEL/EXT-2000-00536, May 2000.