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2001 Wastewater Land Application Site Performance Reports for the Idaho National Engineering and Environmental Laboratory

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Idaho National Engineering and Environmental Laboratory
Bechtel BWXT Idaho, LLC

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Central Facilities Area Sewage Treatment Plant
Idaho Nuclear Technology and Engineering Center Percolation Ponds
Idaho Nuclear Technology and Engineering Center New Percolation Ponds
Idaho Nuclear Technology and Engineering Center Sewage Treatment Plant
Test Area North/Technical Support Facility Sewage Treatment Plant

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ABSTRACT

The *2001 Wastewater Land Application Site Performance Reports for the Idaho National Engineering and Environmental Laboratory* describe site conditions for the facilities with State of Idaho Wastewater Land Application Permits. Permit-required monitoring data are summarized, and any permit exceedences or environmental impacts relating to the operation of any of the facilities during the 2001 permit year are discussed. Additionally, any special studies performed at the facilities, which relate to the operation of the facility or application of the wastewater, are discussed.

SUMMARY

The *2001 Wastewater Land Application Site Performance Reports for the Idaho National Engineering and Environmental Laboratory* (INEEL) describe site conditions for the following facilities as required by the applicable State of Idaho Wastewater Land Application Permits (WLAPs):

- Central Facilities Area (CFA) Sewage Treatment Plant (STP), Permit Number LA-000141-01
- Idaho Nuclear Technology and Engineering Center (INTEC) (formerly the Idaho Chemical Processing Plant or ICPP) Percolation Ponds, Permit Number LA-000130-02
- INTEC New Percolation Ponds, Permit Number LA-000130-03
- INTEC STP, Permit Number LA-000115-02
- Test Area North/Technical Support Facility (TAN/TSF) STP, Permit Number LA-000153-01.

These reports contain the following information:

- Site description
- Facility and system description
- Status of special compliance conditions
- Permit-required monitoring data
- Discussions of environmental impacts by the facilities
- Special studies.

The CFA report covers from December 1, 2000, through November 30, 2001, while the INTEC and TAN reports cover from November 1, 2000, through October 31, 2001. These reporting periods are based on the individual facility permits.

The original WLAP issued for the CFA STP expired August 7, 1999. A renewal application was submitted February 9, 1999. A letter authorizing the continued operation of the CFA STP under the original WLAP was issued by the Idaho Department of Environmental Quality (DEQ) on September 18, 2000. The original WLAPs issued for the INTEC STP and the INTEC Percolation Ponds expired September 17, 2000. Renewal applications for these two WLAPs were submitted during March 2000. Authorization to continue to operate the existing Percolation Ponds and INTEC STP was received in June 2000 and January 2001, respectively. The original WLAP issued for the TAN/TSF STP expired on May 8, 2001. The renewal application for this facility was submitted on

November 2, 2000. Authorization to continue to operate the TAN/TSF STP was received from DEQ on July 12, 2001.

Authorization by DEQ to continue to operate the CFA, INTEC, and TAN/TSF STPs is in effect until new WLAP permits are issued for each of these facilities. DEQ granted an extension authorizing the continued operation of the INTEC Percolation Ponds under the terms and conditions of the permit (LA-000130-02) until December 2003.

A WLAP was issued for the INTEC New Percolation Ponds and became effective on September 10, 2001. The New Percolation Ponds were still under construction during the 2001 permit year, and no wastewater has been discharged. As required in Section G of the permit, a status of uncompleted activities identified in Section F of the permit and the results of water quality testing performed at the Weapons Range well are presented. In accordance with the DEQ Drinking Water Program, nitrate and bacteria were sampled at Weapons Range B21-608 Building. No bacteria was detected, and the concentration of nitrate (0.9 mg/L) was well below the primary constituent standard of 10 mg/L.

During the 2001 permit year, approximately 14.7 million gallons of treated wastewater was land applied in the irrigation area at CFA. Soil and weather conditions combined with the relatively low volume of wastewater applied during the 2001 permit year resulted in no leaching loss for the year, compared to the permit limit of 3 in. per year. Soil sampling in the application area showed elevated sodium adsorption ratios (SARs) compared to past SARs and to those in the nonapplication areas adjacent to the application area. However, the SARs in the application area remain well below those found in soils classified with sodium problems. The impact to vegetation in the application area continues to suggest that the sagebrush steppe community is more susceptible to change as a result of wastewater application than other communities. No impact to breeding bird species was evident during the 2001 permit year. Results from small mammal trapping suggest that application area vegetation communities support larger populations of white-footed deer mice than similar nonapplication area vegetation communities.

Evaluations conducted to date on the nitrate + nitrite concentrations detected in the groundwater near the CFA STP have determined that the new STP is not a likely source.

Annual flow volume to the INTEC Percolation Ponds and contaminant concentrations in the groundwater remained within limits established by the permit during the 2001 permit year. As in previous years, concentrations of total dissolved solids (TDS), chloride, and sodium were elevated in the compliance wells (USGS-112 or USGS-113) compared to the background wells. These elevated concentrations were the result of water softening and treatment operations. Decreasing trends were found for chloride in both USGS-112 and USGS-113, and for TDS in USGS-113. With the addition of the 2001 permit year data, the trends in the compliance wells for both TDS and chloride are beginning to follow the trends in the Percolation Pond effluent.

Construction of the INTEC New Percolation Ponds began in August 2000. Since the New Percolation Ponds are still under construction and no wastewater is being discharged to the ponds, no environmental impact has occurred as a result of operating the ponds. Future annual reports will address any environmental impacts resulting from the New Percolation Ponds, once the ponds are operational and required monitoring begins.

The INTEC STP effluent flow volumes, effluent total suspended solids, and concentrations of monitored parameters in groundwater were all within permit limits during the 2001 permit year. Monthly average total nitrogen concentrations in the effluent exceeded the permit limit (20 mg/L) three times during the 2001 permit year. However, the yearly average concentration decreased from the 2000 yearly average. Maintenance and operational corrective actions have been implemented and are being evaluated to determine their effectiveness in reducing nitrogen concentrations. Concentrations of chloride, total Kjeldahl nitrogen (TKN), TDS, nitrate, and total phosphorus were elevated in the perched water well at the INTEC STP compared to background aquifer concentrations. Concentrations of TKN and total phosphorus from the aquifer compliance well were indistinguishable from background aquifer concentrations. Concentrations of TDS, chloride, and nitrate from the compliance well measurements, while higher than the background well, were well below the permit limit.

The TAN/TSF effluent flow volumes and concentrations were within permit limits during the 2001 permit year. Groundwater iron concentrations exceeded permit limits in wells TANT-MON-A-001, TANT-MON-A-002, and TAN-13A in April and wells TANT-MON-A-001, TAN-10A, and TAN-13A in October. In August 3, 2001, well maintenance was performed on all four wells, which included replacing the galvanized riser pipes attached to the dedicated submersible pumps in each well with stainless steel. Corrosion in the riser pipes in the wells is the probable cause of the elevated iron concentration. Groundwater TDS concentrations in April exceeded permit limits in compliance well TAN-10A. The corrosion in the riser pipes is also a possible cause of the elevated TDS concentrations. Total coliform was absent in the 2001 sampling with the exception of the October sample from well TAN-10A. The coliform species identified in well TAN-10A is a species that is commonly found in natural water bodies and soils and did not exceed the permit limit. Overall, environmental impacts are considered negligible.

Four monitoring wells associated with the TAN/TSF facility have been approved for a "no-longer-contained-in" determination from DEQ. These wells include two monitoring wells associated with the Wastewater Land Application Permit (TAN-10A and TAN-13A) and wells TAN-27 and TSFAG-05. During the 2001 permit year, no purge water was discharged to the TAN/TSF Disposal Pond as a result of sampling these wells.

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TABLES

ACRONYMS

BBWI	Bechtel BWXT Idaho, LLC
BLR	Big Lost River
BOD	biochemical oxygen demand
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CES	Cascade Earth Sciences, Ltd.
CFA	Central Facilities Area
CFR	Code of Federal Regulations
COD	chemical oxygen demand
DEQ	Department of Environmental Quality
DO	dissolved oxygen
DOE-ID	Department of Energy Idaho Operations Office
EBR-I	Experimental Breeder Reactor I
EC	electrical conductivity
EPA	Environmental Protection Agency
ESRF	Environmental Science and Research Foundation
ESRP	Eastern Snake River Plain
FFA/CO	Federal Facilities Agreement/Consent Order
ICPP	Idaho Chemical Processing Plant
IDAPA	Idaho Administrative Procedures Act
INEEL	Idaho National Engineering and Environmental Laboratory
INTEC	Idaho Nuclear Technology and Engineering Center
N	nitrogen
NLCI	no-longer-contained-in
NNN	nitrate + nitrite as nitrogen
NO_2N	nitrite as nitrogen
NO_3N	nitrate as nitrogen
NH_3N	ammonia as nitrogen
NH_4N	ammonium
OU	Operating Unit
P	phosphorus
PCS	primary constituent standards
RE	removal efficiency
RI	rapid infiltration
ROD	Record of Decision
SAR	sodium adsorption ratio
SCS	secondary constituent standards
SRPA	Snake River Plain Aquifer
STP	Sewage Treatment Plant

TAN	Test Area North
TDS	total dissolved solids
TKN	total Kjeldahl nitrogen
TSF	Technical Support Facility
TSS	total suspended solids
USGS	United States Geological Survey
WAG	Waste Area Group
WLAP	Wastewater Land Application Permit
WGS	Waste Generator Services

2001 Wastewater Land Application Site Performance Reports for the Idaho National Engineering and Environmental Laboratory

1. INTRODUCTION

The *2001 Wastewater Land Application Site Performance Reports for the Idaho National Engineering and Environmental Laboratory* (INEEL) describe site conditions for the facilities listed in Table 1-1 as required by the State of Idaho Wastewater Land Application Permits (WLAPs).

Table 1-1. Idaho National Engineering and Environmental Laboratory facilities and permit numbers.

Facility	Permit Number
Central Facilities Area (CFA) Sewage Treatment Plant (STP)	LA-000141-01
Idaho Nuclear Technology and Engineering Center (INTEC) (formerly the Idaho Chemical Processing Plant or ICPP) Percolation Ponds	LA-000130-02
INTEC New Percolation Ponds	LA-000130-03
INTEC STP	LA-000115-02
Test Area North/Technical Support Facility (TAN/TSF) STP	LA-000153-01

These reports contain the following information:

- Site description
- Facility and system description
- Status of special compliance conditions
- Permit-required monitoring data
- Discussions of environmental impacts by the facilities
- Special studies.

The Central Facilities Area (CFA) report covers from December 1, 2000, through November 30, 2001, while the Idaho Nuclear Technology and Engineering Center (INTEC) and Test Area North/Technical Support Facility (TAN/TSF) reports cover from November 1, 2000, through October 31, 2001. These reporting periods are based on the individual facility permits.

The original WLAP issued for the CFA Sewage Treatment Plant (STP) expired August 7, 1999 (Green 1994). A renewal application was submitted February 9, 1999 (Bennett 1999). A letter authorizing the continued operation of the CFA STP under the original WLAP was issued September 18, 2000 (Johnston 2000b). The original WLAPs issued for the INTEC STP (Green 1995a) and the INTEC

Percolation Ponds (Green 1995b) expired September 17, 2000. Renewal applications for these two WLAPs were submitted during March 2000 (Graham 2000b; Graham 2000c). Authorization to continue operation was received in June 2000 for the existing INTEC Percolation Ponds (Johnston 2000a) and in January 2001 for the INTEC STP (Johnston 2001). The original WLAP issued for the TAN/TSF STP expired on May 8, 2001 (Green 1996). A renewal application was submitted on November 2, 2000 (Guymon 2000a). Authorization to continue operating the TAN/TSF STP was received in July 2001 (Teuscher 2001). DEQ issued a WLAP on September 10, 2001, for the INTEC New Percolation Ponds (Eager 2001b). The permit is effective as of September 10, 2001 and expires on October 1, 2006.

Operations at all facilities are conducted by Bechtel BWXT Idaho, LLC (BBWI) for the Department of Energy Idaho Operations Office (DOE-ID).

1.1 Idaho National Engineering and Environmental Laboratory Site Description

The INEEL is approximately 890 mi^2 and is located on the Eastern Snake River Plain (ESRP) in southeastern Idaho (Figure 1-1). It was established as a nuclear energy research and development testing station in the late 1940s and was designated a National Environmental Research Park in 1975. All land within the INEEL is protected as an outdoor laboratory where the effects of energy development and industrial activities on the environment and the complex ecological relationships of this cool desert ecosystem can be studied. The INEEL serves as a research area for scientists from several universities and state and federal agencies.

Subsurface geology at the INEEL consists of successive layers of basalt and sedimentary strata, overlaid at the surface by wind- and water-deposited sediments. The primary groundwater source of the region is the Snake River Plain Aquifer (SRPA). Most of the INEEL is located in the Mud Lake-Lost River Basin (Pioneer Basin), which is an informally named, closed drainage basin. Surface water within the Pioneer Basin includes that from the Big Lost River, the Little Lost River, and Birch Creek, all of which drain mountain watersheds located to the north and northwest of the INEEL. All three water bodies may flow onto the INEEL during high flow years, but are otherwise intermittent. In addition, local rainfall and snowmelt contribute to surface water mainly during the spring. The portion of surface water that is not lost to evapotranspiration infiltrates into the subsurface. Both aquifer and surface waters are used for irrigating crops and other applications outside the INEEL.

The SRPA is approximately 199 mi long and 20 to 60 mi wide and encompasses an area of about 9,650 mi^2. The depth to the SRPA varies from 200 ft in the northeastern corner of the INEEL to 886 ft in the southeastern corner. The SRPA is approximately 250 ft thick (Robertson 1974). The SRPA is the ESRP's source of groundwater. It is also the source of process water and drinking water for both on and off the INEEL. The SRPA may contain as much as 2×10^9 acre-ft of water. Approximately 6.5×10^6 acre-ft of water is used for irrigation upgradient of the Hagerman area. Aquifer recharge occurs from infiltration of irrigation water (1.5×10^6 acre-ft), river seepage (1.3×10^6 acre-ft), and infiltration of precipitation (0.6×10^6 acre-ft) (Lewis and Jensen 1984). Groundwater in the SRPA flows generally to the southwest, although locally the direction of flow is influenced by recharge from rivers, surface water spreading areas, and heterogeneities in the aquifer. Tracer studies at the INEEL indicate that natural flow rates range from 5 to 20 ft/d. Aquifer transmissivities range from 3×10^4 to 1.8×10^7 gal/d/ft; storage coefficients range from 0.01 to 0.06 (Robertson, Shoen, and Barrachlough 1974).

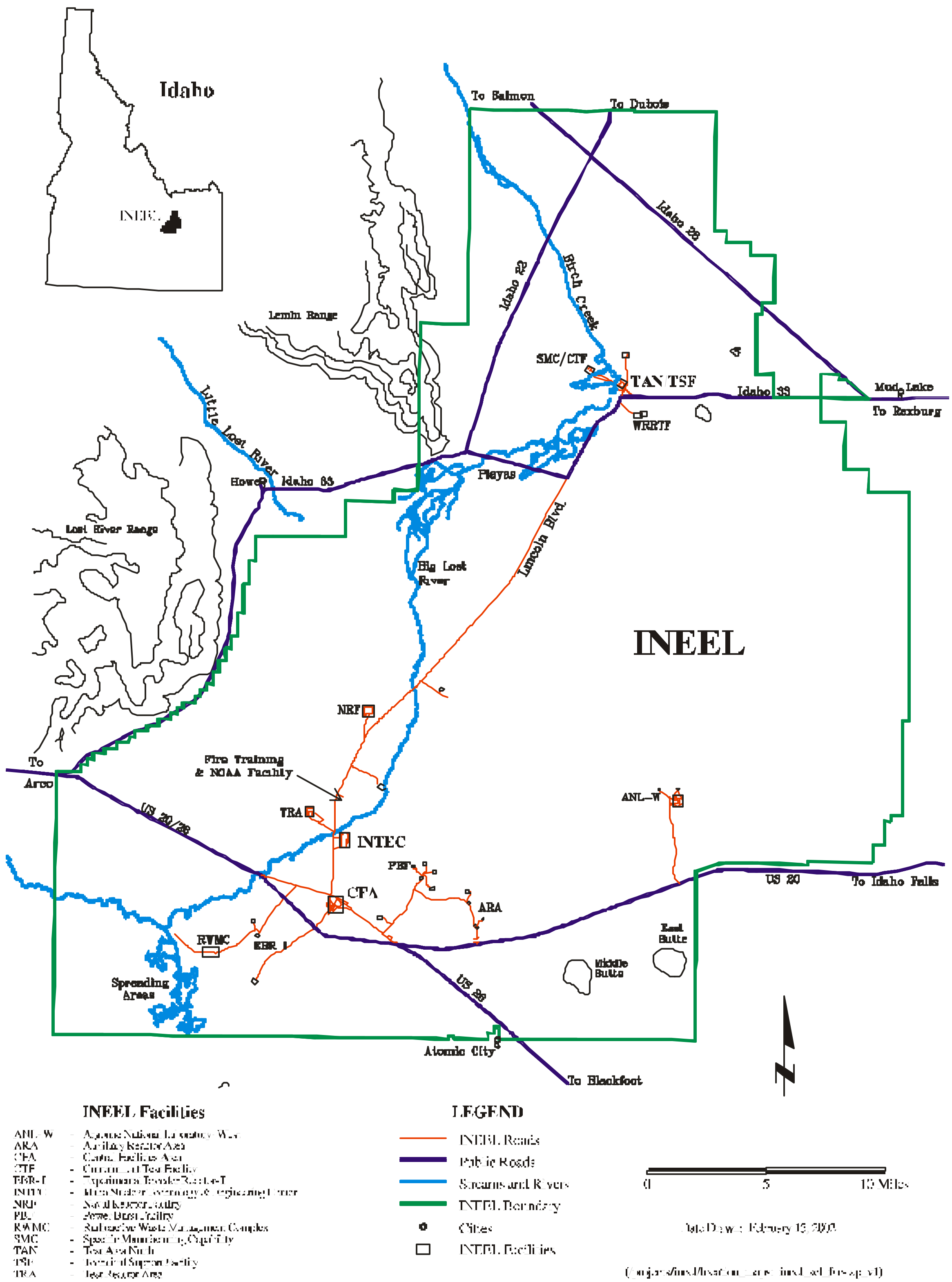

Figure 1-1. Idaho National Engineering and Environmental Laboratory.

Meteorological and climatological data that apply to the INEEL region are collected and compiled from several meteorological stations operated by the National Oceanic and Atmospheric Administration field office in Idaho Falls, Idaho. Thirteen stations are located on the INEEL. Annual rainfall at the INEEL is light, and the region is classified as arid to semiarid (Clawson, Start, and Ricks 1989). The long-term average annual precipitation at the INEEL is 8.7 in. (at the CFA station). Monthly precipitation is usually highest in April, May, and June and lowest in July and October. The average daytime maximum temperature is 87°F (July), while the average daytime minimum temperature is 5°F (January).[a] The INEEL is in the belt of prevailing westerly winds, which are channeled within the plain to produce a west-southwesterly or southwesterly wind at most locations on the INEEL.

1.2 Liquid Effluent Monitoring Program

The INEEL Liquid Effluent Monitoring Program monitors effluent discharges at facilities operated by Bechtel BWXT Idaho, LLC (BBWI) at the INEEL. This program involves sampling, analysis, and data interpretation carried out under a quality assurance program. The INEEL Liquid Effluent Monitoring Program conducted effluent and influent monitoring as required by the Wastewater Land Application Permits (WLAPs) for the CFA STP, the INTEC STP, and the TAN/TSF STP during the 2001 permit year. INTEC Operations monitored effluent to the INTEC Percolation Ponds. Effluent samples were collected each month according to sampling procedures and a randomly generated sampling schedule.

Effluent samples were analyzed using methods described in 40 Code of Federal Regulations (CFR) 136, (40 CFR 136), with the exception of the INTEC Percolation Pond effluent samples in which anions were analyzed using Environmental Protection Agency (EPA) Method 300.0 (EPA 1984) approved for drinking water.

The INTEC New Percolation Ponds were still under construction during the 2001 permit year, and no wastewater has been discharged; therefore, no effluent samples were collected during the 2001 permit year.

1.3 Drinking Water Program

For the INTEC New Percolation Ponds, Section G of the permit requires reporting of the results of water quality testing performed at the Weapons Range B21-608 Building, which is monitored in accordance with the DEQ Drinking Water Program. These samples are collected by the INEEL Drinking Water Program and analyzed using approved drinking water methods.

1.4 Groundwater Monitoring Program

Groundwater was monitored in support of the WLAPs for the INTEC Percolation Ponds, the INTEC STP, and the TAN/TSF STP following the sampling and analysis plan and approved procedures. All samples were collected in April and October at INTEC and TAN facilities. All samples were analyzed using EPA-approved methods.

a. N. Hukari, NOAA, e-mail to M. Lewis, INEEL, January 17, 2002.

2. CENTRAL FACILITIES AREA SEWAGE TREATMENT PLANT DATA SUMMARY AND ASSESSMENT

2.1 Site Description

The Central Facilities Area (CFA) is located about 50 mi west of Idaho Falls, Idaho, in Butte County Idaho, approximately 5 mi from the INEEL southern boundary. The CFA facilities provide functional space for crafts, offices, services, and laboratories for approximately 900 employees. CFA includes approximately 72 buildings and 62 other structures.

The CFA STP serves all major facilities at CFA. The STP is southeast of CFA, approximately 2,200 ft downgradient of the nearest drinking water well (Figure 2-1). A public road passes approximately 0.75 mi south of the STP, and the nearest inhabited building is approximately 2,000 ft from the wastewater land application area.

2.2 System Description and Operation

The CFA STP was built in 1994 and put into service on February 6, 1995. Approximately 127,000 gallons per day (gpd) of water were processed from sanitary sewage drains throughout CFA during the 2001 permit year. Wastewater is derived from restrooms, 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 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 native desert rangeland.

Lagoon sizes presented for Lagoon No. 1 and No. 2 differ from those reported in previous annual reports. The sizes reported here are based on the 8-foot design depth. Under existing flow conditions, the winter storage capacity of the lagoons or ponds has been at least 8 months worth. Aeration can be used to mix, aerate, and agitate the wastewater within the cell of Lagoon No. 1.

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 permit limits wastewater application to 25 acre-in./acre/year from March 15 through November 15 and limits leaching losses to 3 in./year.

In 2001, wastewater application began June 12 and continued through September 27. The end gun on the pivot was used during 2001, resulting in an application area of 73.5 acres. Aerial photographs of the STP area are presented in Appendix A as a visual record of changes in vegetation due to the operation

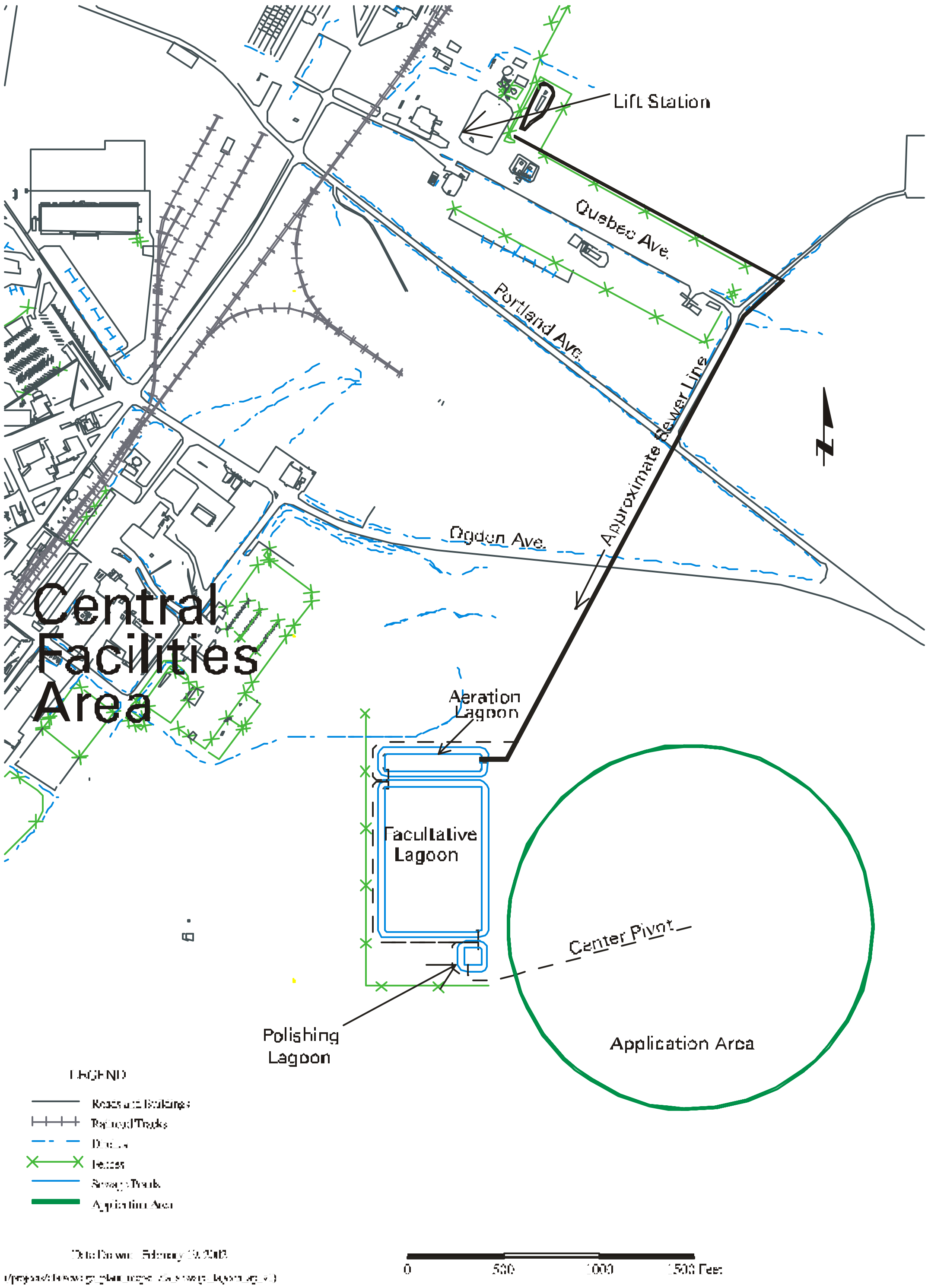

Figure 2-1. Central Facilities Area Sewage Treatment Plant.

of the pivot. A photograph is included for each year since the permit was issued, except for the 2001 permit year. Photographs were scheduled to be taken in late fall 2001. However, due to the increased security and closed airspace over the INEEL after September 11, 2001, aerial photographs could not be taken prior to the end of the 2001 permit year.

The original WLAP issued for the CFA STP expired August 7, 1999 (Green 1994). A renewal application was submitted February 9, 1999 (Bennett 1999). A letter authorizing the continued operation of the CFA STP under the original WLAP was issued September 18, 2000 (Johnston 2000b). In compliance with Section 1 of the permit, which states that "wastewater shall be managed substantially in accordance with the plan of operation," the CFA STP Operations and Maintenance Manual was modified during the 2001 permit year to reflect current operating methodologies. The manual was submitted to DEQ on November 29, 2001 (Rugg 2001).

2.3 Status of Special Compliance Conditions

No special compliance conditions were in effect in 2001.

2.4 Influent and Effluent Monitoring Results

The permit year is from November 16, 2000, through November 15, 2001. However, to provide a more complete data set and for water balance calculations, it was deemed more appropriate to report data collected from December 1, 2000, through November 30, 2001.

Influent samples were collected monthly from the lift station at CFA (prior to Lagoon No. 1) during the permit year. Effluent samples were collected from the pump pit (prior to the pivot) starting in June and continued through the months of pivot operation. All samples collected were 24-hour composite samples, except the pH and coliform samples, which were collected as grab samples. Tables 2-1 and 2-2 summarize the influent and effluent results.

Yearly average concentrations for all parameters measured in the influent to the lagoons were at or below concentrations typically classified as "weak" municipal wastewater (biochemical oxygen demand [BOD] < 110, chemical oxygen demand [COD] < 250, total suspended solids [TSS] < 100, and total nitrogen [N] < 20 mg/L) (Metcalf and Eddy 1979). The average total Kjeldahl nitrogen (TKN) and the nitrate + nitrite concentrations in the influent were greater than those for the 2000 permit year, while average COD and BOD concentrations were less than those for the 2000 permit year. For all of these parameters, the 2001 permit year averages were within the historical ranges.

The concentrations for all parameters (except BOD, fecal coliform, and pH) measured in the effluent discharged to the pivot were lower than those of the previous year. Both average BOD and average fecal coliform counts increased over the past year due to high concentrations in June 2001. However, average fecal coliform counts were below the "secondary disinfected" wastewater classification of 200 colonies/100 mL (IDAPA 16.01.02). The 2001 monthly pH readings were some of the highest reported to date; however, all were below the historical maximum of 9.97.

Removal efficiencies (REs) were calculated to estimate treatment in the lagoons and are presented in Table 2-3. Average REs were higher than the previous year, with the exception of COD. The RE for total N achieved its projected efficiency of 80%. The REs for both BOD and TSS were just slightly below their projected efficiency of 80%, and the RE for COD was well below the projected efficiency of 70%. During the 2001 permit year, all average REs were within the historical ranges, and treatment in the lagoons was still sufficient to produce a good quality effluent for land application.

Table 2-1. Central Facilities Area Sewage Treatment Plant influent water quality data from lift station.

Sample Month	Sample Date	TKN (mg/L)	NNN (mg/L)	BOD (mg/L)	COD (mg/L)	TSS (mg/L)	pH
December	12/13/2000	17.10	0.415	33.4	221.0	43.7	7.79
January	1/4/2001	22.70	1.15	41.6	217.0	75.3	7.84
February	2/15/2001	20.10	0.513	34.9	136.0	54.1	7.60
March	3/22/2001	27.50	0.557	31.6	111.0	52.8	7.89
April	4/10/2001	12.50	0.249	223.0	113.0	47.3	8.40
May	5/2/2001	24.30	0.093	36.0	136.0	80.6	7.69
June	6/27/2001	11.20	0.874	34.2	92.8	23.5	7.41
July	7/19/2001	5.64	0.805	15.3	40.2	6.2	7.61
August	8/22/2001	7.85	1.03	22.4	77.4	42.2	7.65
September	9/25/2001	7.12	0.811	10.2	21.4	5.5	7.62
October	10/23/2001	12.50	0.547	23.2	41.8	19.9	7.97
November	11/15/2001	19.50	0.408	35.1	79.4	21.5	7.77
Yearly Average[a]		15.67	0.621	45.1	107.3	39.5	7.77

a. Yearly average is determined from the average of the monthly values.

Table 2-2. Central Facilities Area Sewage Treatment Plant effluent water quality data prior to pivot.

Sample Month	Sample Date	TKN (mg/L)	NNN (mg/L)	BOD (mg/L)	COD (mg/L)	TSS (mg/L)	pH	Total P (mg/L)	Fecal Coliform[a] (col/100 mL)	Total Coliform[a] (col/100 mL)
June	6/27/2001	1.25[b]	0.010 U[b,c]	16.26[b]	31.55[b]	4.00 U[b]	9.81	0.105[b]	100	14
July	7/19/2001	0.971	0.010 U	2.00 U R[d]	38.20	4.00 U	9.64	0.149	0	30
August	8/22/2001	1.50	0.010U	2.00 U R	25.40	4.00	9.81	0.137	1	15
September	9/25/2001	1.78	0.022	2.00 U	41.20	4.00 U	9.91	0.170	1	11
Yearly Average[e]		1.38	0.009	8.63	34.09	2.5	9.79	0.140	21	15

a. Coliform samples were collected independent of the composite samples on 6/27/2001, 7/18/2001, 8/22/2001, and 9/27/2001.

b. The result shown represents the average of duplicate samples taken for the month. A U flag indicates that all results for that month were reported as below the detection limit.

c. U flag indicates that the result was reported as below the detection limit.

d. R flag indicates that the result was rejected during data validation. The analytical hold time was missed by more than twice. The result is not used in the average calculation.

e. Yearly average is determined from the average of the monthly values. Half the reported detection limit was used in the yearly average calculation for those results reported as below the detection limit.

Table 2-3. 2001 removal efficiency[a] percentages for Central Facilities Area Sewage Treatment Plant permit monitoring parameters.

Sample Month	Total N[b] (%)	BOD (%)	COD (%)	TSS (%)
June 2001	90[c]	52	66	91[c]
July 2001	85[c]	NC[d]	5	68[c]
August 2001	83[c]	NC	67	91
September 2001	77	90[c]	NC	64[c]
Average RE	84	71	46	78

a. Removal efficiency (RE) = [(average monthly influent concentration – average monthly effluent concentration) ÷ average monthly influent concentration] × 100.

b. Total N is calculated as the sum of the TKN and NNN results.

c. Half the detection limit was used in the RE calculation for the effluent concentration since the results were reported as below the detection limit.

d. NC—removal efficiency was not calculated. For BOD, the effluent concentrations were rejected during validation. For COD, the effluent concentration was greater than the influent concentration.

2.4.1 Flow Volumes and Loading Rates

Daily influent flow readings were recorded at the flow meter prior to the first lagoon during the permit year. Daily effluent flow readings were recorded at the pivot control panel when the pivot was operating. All flow readings were recorded in gallons per day (gpd) Monday through Thursday. Prior to August 3, 2001, values for Friday, Saturday, Sunday, and holidays were daily averages of the total flow recorded over the period. Starting on August 3, 2001, actual daily readings were recorded. Table 2-4 summarizes monthly and annual flow data, and Appendix A presents daily flow readings.

Daily influent flows averaged less than 127,000 gpd, which was much less than the design flow of 250,000 gpd. Average daily flows continued to be greatest during the summer, probably due to air conditioner usage. Total influent flow volume was approximately 46 million gallons (MG) for the permit year. Discharge to the pivot averaged less than 171,000 gpd when it operated. The end gun was used during the entire 2001 application period. Application rates did not exceed 0.1 acre-in./day.

Table 2-5 presents hydraulic and nutrient loading rates. The total volume of applied wastewater for 2001 was approximately 14.7 MG, which is significantly less than the design hydraulic loading of 40.5 MG. Hydraulic loading peaked in August. Nitrogen loading rates were significantly lower (2.3 lb/acre/yr) than the projected maximum loading of 32 lb/acre/year. As a general rule, nitrogen loading should not exceed the amount necessary for crop utilization plus 50%. However, wastewater is applied to native rangeland without nitrogen removal via crop harvest. To estimate nitrogen buildup in the soil under this condition, a nitrogen balance was prepared by Cascade Earth Sciences, Ltd. (CES) that estimated it would take 20 to 30 years to reach normal nitrogen agricultural levels in the soil (based on loading rates of 32 lb/acre/year) (CES 1993). The extremely low 2001 nitrogen loading rate of 2.3 lb/acre/year had a negligible effect on nitrogen accumulation.

The 2001 annual total COD loading at CFA STP (56 lb/acre/year) was less than the previous year and was substantially less than the state guidelines of 50 lb/acre/day (which is equivalent to 18,250 lb/acre/year).

Table 2-4. Central Facilities Area Sewage Treatment Plant flow summaries.

Sample Month	Influent to Pond				Effluent to Pivot			
	Average (gpd[a])	Minimum (gpd)	Maximum (gpd)	Total (MG)[b]	Average (gpd)	Minimum (gpd)	Maximum (gpd)	Total (MG)[b]
December 2000	81,001	60,744	119,830	2.51	NF[c]	NF	NF	NF
January 2001	77,787	60,744	114,822	2.41	NF	NF	NF	NF
February 2001	78,826	64,665	109,257	2.21	NF	NF	NF	NF
March 2001	91,576	71,146	136,622	2.84	NF	NF	NF	NF
April 2001	89,210	55,817	192,303	2.68	NF	NF	NF	NF
May 2001	118,292	79,446	216,730	3.67	NF	NF	NF	NF
June 2001	166,182	145,314	207,879	4.99	158,700	156,900	173,100	1.59
July 2001	204,880	164,411	259,720	6.35	183,161	156,300	198,300	4.21
August 2001	198,804	135,410	237,057	6.16	175,535	156,500	196,000	5.09
September 2001	168,482	127,123	241,995	5.05	157,124	155,700	157,900	3.77
October 2001	143,834	81,018	200,793	4.46	NF	NF	NF	NF
November 2001	98,573	49,861	150,593	2.96	NF	NF	NF	NF
Yearly Summary	126,800	49,861	259,720	46.28	170,479	155,700	198,300	14.66

a. gpd—gallons per day.

b. Monthly and annual totals are shown in millions gallons (MG).

c. NF—No flow.

Table 2-5. 2001 hydraulic and nutrient loading rates.[a]

Sample Month	Applied Wastewater				
	Total (MG)[b]	Per Acre (MG)	Total Nitrogen[c] (lb/acre)	COD (lb/acre)	Total P (lb/acre)
June[d]	1.59	0.022	0.229	5.78	0.019
July	4.21	0.057	0.463	18.13	0.071
August	5.09	0.069	0.865	14.59	0.079
September	3.77	0.051	0.765	17.50	0.072
Yearly Total	14.66	0.199	2.322	56.00	0.241

a. Loading rates calculated for wastewater application on up to 73.5 acres (hydraulic management unit MU-014101).

b. MG—million gallons.

c. Total nitrogen is determined from the sum of the TKN and NNN results.

d. All June nutrient loading rates are based on average monthly nutrient concentrations.

The annual total phosphorus loading rate (0.241 lb/acre/year) was well below the projected maximum loading rate of 4.5 lb/acre/year. The small amount of phosphorus applied was probably removed by sorption reactions in the soil and utilized by vegetation, rather than lost to groundwater.

2.4.2 Volumetric Water Balance for Ponds

In 1998, a volumetric water balance was developed for the CFA STP ponds to address measured discrepancies between influent and effluent flow volumes. Seepage rates for the ponds were calculated at an average of 0.135 in./day based on: information for pond inflows (measured influent and precipitation), pond outflows (measured effluent to the pivot and an assumed pond evaporation rate of 45 in./year), and no net storage gain or loss over the evaluation periods (INEEL 1999).

Because the calculated seepage rates exceeded the 0.125 in./day allowed by the Department of Environmental Quality performance criteria (DEQ 1991), seepage testing was performed at the CFA STP ponds in 1999. Testing was conducted in accordance with the DEQ *Guidelines for Evaluating Seepage Rates* (DEQ 1991) and was performed in May 1999 (Hansen 1999). All testing was conducted prior to wastewater application to isolate the lagoons during the test periods. Results of the testing indicated an average seepage rate for Lagoon No. 1 of 0.0141 in./day, and an average seepage rate for Lagoon Nos. 2 and 3 of 0.0157 in./day. Both rates were significantly lower than the calculated average seepage rate of 0.135 in./day. Using the higher of these two rates as an average seepage rate for the CFA STP ponds, the volumetric water balance presented in Table 2-6 was updated for permit years 1996 through 2001. Based on this water balance, evaporation rates were calculated to be significantly higher than the commonly accepted values of 32 to 46 in./year. As Table 2-6 shows, calculated evaporation rates ranged from 77.0 in./year (1999) to 98.0 in./year (1996). The calculated evaporation rate is the difference between the total inflow (measured), effluent to pivot (measured), and seepage (from the 1999 seepage test).

Empirical data taken between July 18 and September 11, 1994, at another INEEL facility approximately 5 miles from the CFA ponds, was used to calculate 38.8 in. of evaporation (George 1994). Since this study only encompassed the period during which 30% of the annual evaporation occurs (Molnau, Kpordze, and Craine 1992), the estimated annual evaporation rate would approximate the calculated evaporation rates presented in Table 2-6.

An evaporation pan test was conducted at the CFA ponds for the period June 21 until October 2, 2000. A standard Class A evaporation pan was used, and precipitation was accounted for. During this period, approximately 35.0 in. of water evaporated from the evaporation pan, accounting for approximately 60% of the total evaporation during the year. Using the pan data and applying a 0.75 correction factor for pan evaporation relative to pond evaporation (Fetter 1994) resulted in a calculated evaporation rate of 43.75 in./year. This rate closely agrees with the assumed evaporation rate of 45 in./year used in the original WLAP permit application information.

The calculated evaporation rates in Table 2-6 are approximately twice the assumed evaporation rate of 45 in./year, and the 2000 evaporation pan test rate of 43.75 in/year. Factors that may account for the difference between the assumed evaporation rate and the higher calculated evaporation rates in Table 2-6 and in the 1994 study include:

- Inaccurate flow readings
- Mechanical aeration (decreasing surface water tension and thus increasing evaporation rate)

Table 2-6. Annual volumetric water balance for Central Facilities Area Sewage Treatment Plant ponds.

	Inflows			Outflows			
Year	Influent (gallons)	Precipitation gallons (inches)	Total (gallons)	Effluent to Pivot (gallons)	Seepage[a] gallons (inches)	Evaporation[b] gallons (inches)	Total (gallons)
2001	46,280,000	1,350,000 (4.08)	47,630,000	14,660,000	1,890,000 (5.73)	31,080,000 (94.0)	47,630,000
2000	40,680,000	2,160,000 (6.54)	42,840,000	10,740,000	1,890,000 (5.73)	30,021,000 (91.0)	42,840,000
1999	39,970,000	2,498,000 (7.57)	42,470,000	15,200,000	1,890,000 (5.73)	25,380,000 (77.0)	42,470,000
1998	40,270,000	3,470,000 (10.53)	43,740,000	13,770,000	1,890,000 (5.73)	28,080,000 (85.0)	43,740,000
1997	41,390,000	3,270,000 (9.92)	44,660,000	15,590,000	1,890,000 (5.73)	27,180,000 (83.0)	44,660,000
1996	42,810,000	3,015,000 (9.16)	45,830,000	11,640,000	1,890,000 (5.73)	32,300,000 (98.0)	45,830,000

a. Based on seepage test performed in 1999.
b. Calculated from the difference between inflows and outflows.

- Relative pond height above surrounding topography increasing wind speed and evaporation rates
- Inaccurate seepage rate measurements.

2.4.3 Soil Water Balance

A monthly water balance software package was prepared by Cascade Earth Sciences, Ltd. to determine leaching losses (Maloney 1993; Bruner 1994). This water balance software calculates leaching losses based on:

- Soil available water capacity
- Precipitation
- Wastewater application
- Evapotranspiration.

This calculation:

- Assumes full soil profile water storage on April 1
- Applies an adjustment factor of 84% to the measured precipitation values to account for interception by vegetation onsite

- Applies an irrigation efficiency factor to the measured wastewater flows to account for evaporation resulting from spraying. (Irrigation efficiencies of 70% were used for the center pivot for June, July, and August, 80% for September, and 90% for October.)

Potential and actual evapotranspiration values are estimated based on average monthly temperatures and the volume of water stored in the soil, respectively. The National Oceanic and Atmospheric Administration measures monthly precipitation and temperature values at the CFA Weather Station.

A projected water balance was submitted with the original permit application material to the DEQ. Table 2-7 shows the water balance for the 2001 permit year. A total of 7.50 acre-in./acre of wastewater was applied over 73.5 acres during the 2001 permit year, which was 1.92 in. more than that applied in 2000. This total, when adjusted for irrigation efficiency and added to the total adjusted precipitation for the permit year, yields 8.87 acre-in./acre, which is well below the permit limit of 25 acre-in./acre/year. The relatively low volume of wastewater, coupled with below normal annual precipitation (by 4.6 in.) and monthly average temperatures that were slightly above normal (by 0.83°F), resulted in no leaching loss.

Table 2-7. Central Facilities Area Sewage Treatment Plant monthly water balance for 14.66 MG wastewater applied to the irrigation area.[a]

	Water Applied (in.)					Evaporation[b] (in.)			
Month	PPT[c]	ADJ PPT[c]	Waste[d]	ADJ Waste[d]	Total	PET	ACT	Stored in Soil	Leaching Loss[e]
December 2000	0.13	0.11	0	0	0.11	0.16	0.16	0	0
January 2001	0.36	0.30	0	0	0.30	0.11	0.11	0.19	0
February 2001	0.80	0.67	0	0	0.67	0.16	0.16	0.70	0
March 2001	0.20	0.17	0	0	0.17	0.56	0.55	0.32	0
April 2001	0.68	0.57	0	0	0.57	1.23	1.18	8.22	0
May 2001	0.02	0.02	0	0	0.02	2.98	2.38	5.85	0
June 2001	0.33	0.28	0.80	0.56	0.84	3.99	3.13	3.55	0
July 2001	0.20	0.17	2.16	1.51	1.68	5.42	4.00	1.23	0
August 2001	0.12	0.10	2.62	1.83	1.93	5.00	3.96	0	0
September 2001	0.55	0.46	1.92	1.54	2.00	2.91	2.74	0	0
October 2001	0.29	0.24	0	0	0.24	1.14	1.07	0	0
November 2001	0.40	0.34	0	0	0.34	0.39	0.39	0.01	0
Total:	4.08	3.43	7.50	5.44	8.87	24.06	19.85	0	0
					Soil Available Water Capacity[f]:			8.22	

a. Water balance was calculated using the method outlined in *Irrigation Water Requirements* (Department of Agriculture 1979).

b. PET—potential evapotranspiration; ACT —actual evapotranspiration.

c. PPT— precipitation. ADJ PPT—adjusted precipitation. An efficiency factor was applied to the raw monthly data to account for interception by native vegetation (Linsley, Kohler, and Paulhus 1982).

d. Waste—applied wastewater. ADJ Waste—applied wastewater adjusted for irrigation losses. A monthly efficiency factor was applied to correct for irrigation losses due to evaporation (Department of Agriculture 1986).

e. Leaching losses of water moving below the rooting zone (assumed to be a depth of 52 in.).

f. Soil available water capacity was determined from field measurements and textural analyses to be 8.22 in.

2.5 Evaluation of Groundwater Data

Groundwater monitoring is not required by the current permit based on the following:

- Quantity and quality of water discharged
- Local geology and hydrology
- Distance to nearest downgradient drinking water well (Experimental Breeder Reactor [EBR]-I production well approximately 3.5 mi southwest).

However, as discussed in previous WLAP reports, groundwater sampling results of several wells downgradient of the STP identified nitrate + nitrite near or above the applicable state groundwater quality concentration limits. These limits are the primary constituent standards (PCSs) and secondary constituent standards (SCSs) specified in IDAPA 58.01.11, "Ground Water Quality Rule."

Three wells, which were constructed as part of the CFA regional groundwater monitoring network in 1995 (CFA-MON-A-001, -002, and -003), are located generally downgradient of the new CFA STP (Figure 2-2). Since 1995, nitrate + nitrite concentrations in well CFA-MON-A-001 were well below the primary constituent standard of 10 mg/L (Figure 2-3). Over the same period, the nitrate + nitrite concentrations in wells CFA-MON-A-002 and -003 (Figures 2-4 and 2-5, respectively) were above or near the primary constituent standard. As a result, the nitrate + nitrite data from CFA-MON-A-002 and CFA-MON-A-003 were analyzed to determine if statistically significant trends could be identified. Based on data collected from 1996 through 2001, neither CFA-MON-A-002 nor CFA-MON-A-003 exhibited a statistically significant trend in nitrate + nitrite concentrations. The decreasing nitrate + nitrite trend indicated in CFA-MON-A-002 at the end of the 2000 permit year is no longer evident with the addition of the higher 2001 result.

Several evaluations have been conducted to determine the potential source of the nitrate + nitrite. The most recent evaluation (INEEL 2000b) was completed by Waste Area Group (WAG) 4, which is responsible for implementing characterization and cleanup activities at CFA under the INEEL's Federal Facilities Agreement and Consent Order (FFA/CO) as part of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Program. On the basis of a nitrogen isotope analysis, it was concluded that the most likely source of the nitrate + nitrite contamination was from the former CFA STP drainfield that ceased operation in 1995 when it was replaced by the new CFA STP.

The new CFA STP is not a likely source of nitrate + nitrite based on effluent concentrations and the vadose zone and groundwater travel time between the new CFA STP and the wells (INEEL 2000a). Total nitrogen concentrations in the CFA STP effluent are consistently too low to provide a steady source of nitrate from lagoon seepage at the levels detected in the wells. In addition, based on water balance calculations showing minimal leaching losses from land application, it is improbable that any effluent is migrating from the land application area to the aquifer.

The groundwater nitrate + nitrite concentrations will continue to be monitored by the INEEL FFA/CO Program, since the source is not believed to be the new CFA STP.

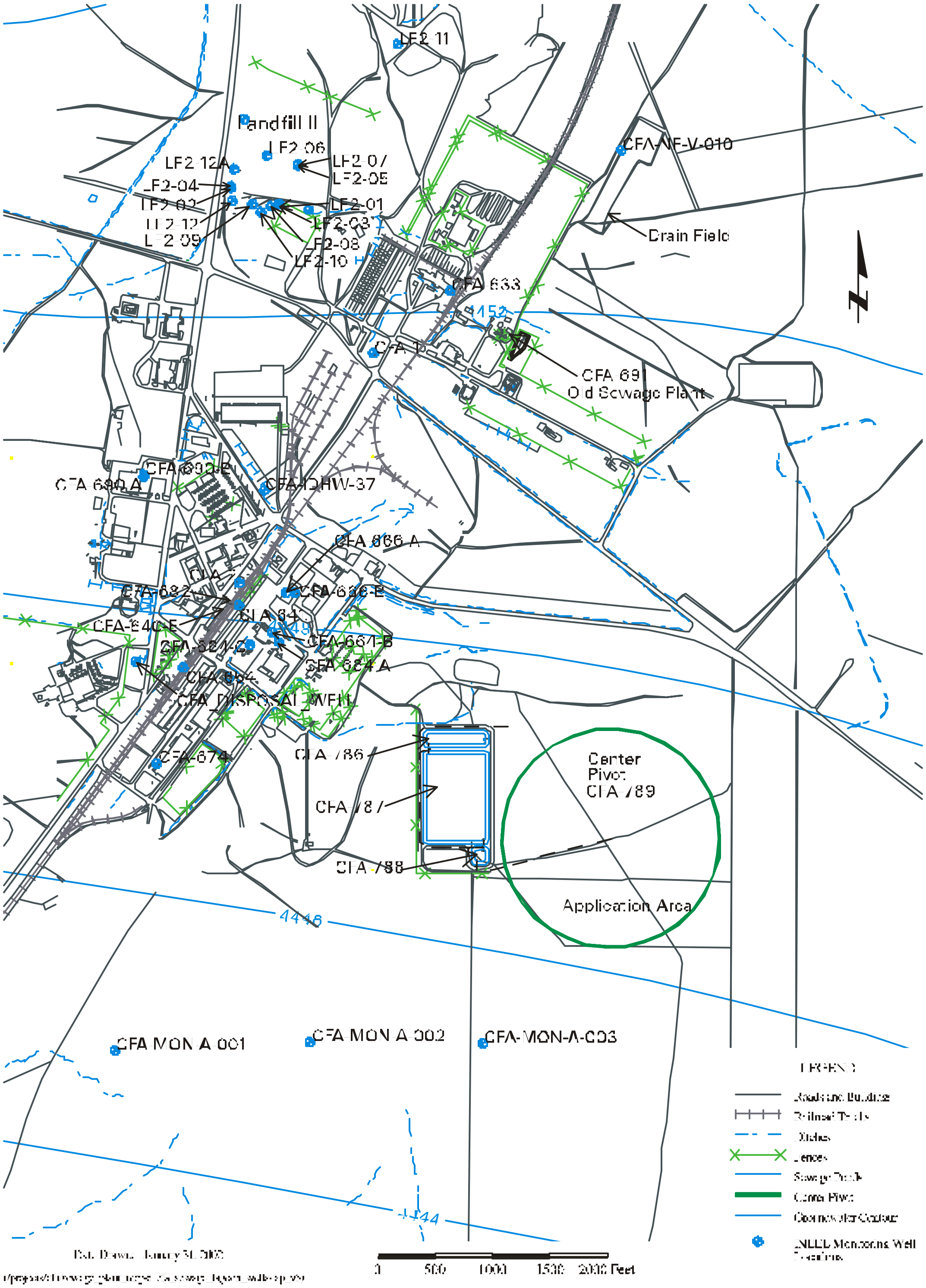

Figure 2-2. Locations of monitoring wells in the vicinity of the Central Facilities Area Sewage Treatment Plant.

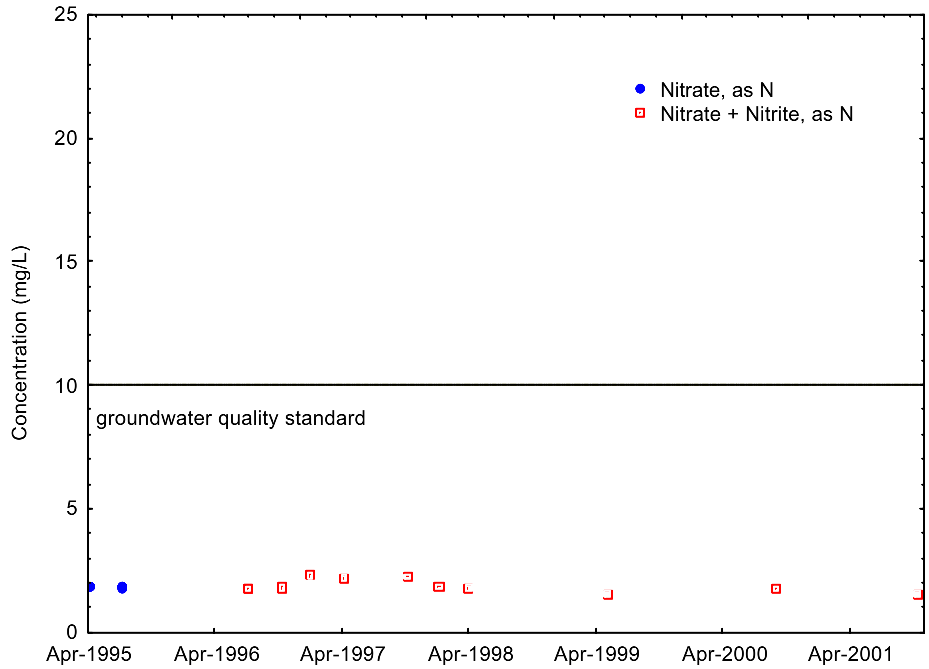

Figure 2-3. Nitrate and nitrite (as N) at CFA-MON-A-001.

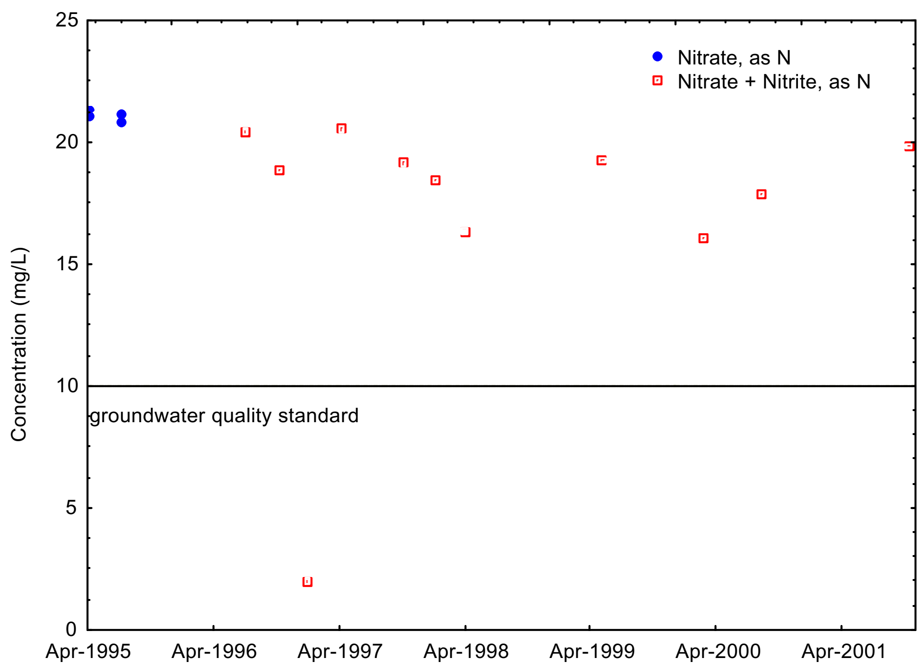

Figure 2-4. Nitrate and nitrite (as N) at CFA-MON-A-002.

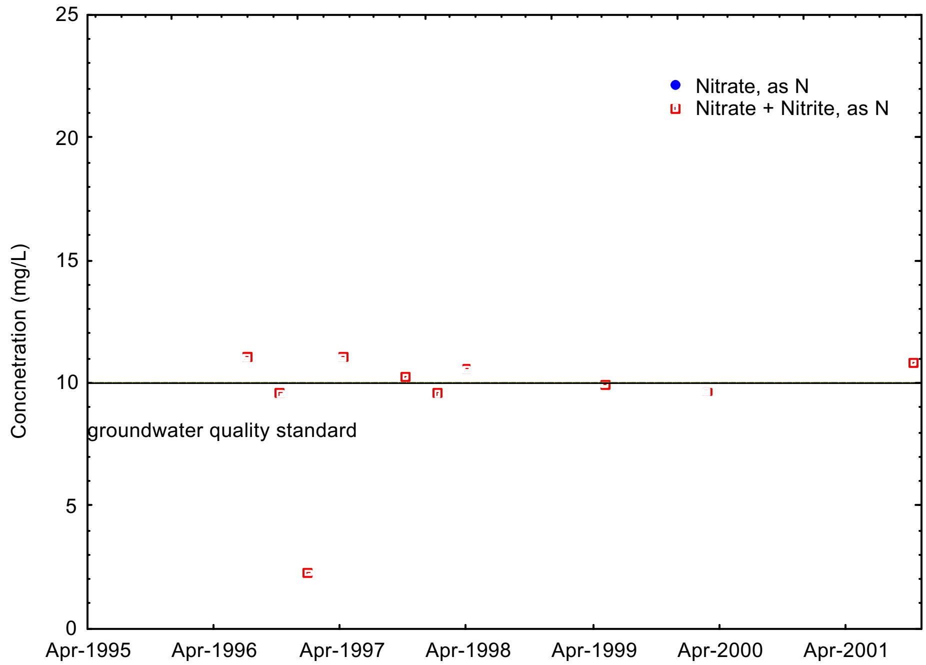

Figure 2-5. Nitrate and nitrite (as N) at CFA-MON-A-003.

2.6 Soil Monitoring

Cascade Earth Sciences, Ltd. characterized soils at the CFA STP prior to construction. Soils in the upper 6 in. are predominantly silty clay loam, and from 6 to 52 in. are predominantly silt loam. Soils at CFA were determined to be suitable for slow-rate wastewater application (EG&G 1993).

Soils have since been sampled from the land application area (locations 1 through 5 shown in Figure 2-6) following each application season. Subsamples were taken from 0–12 in. and 12–24 in. at each location and composited, yielding two composite samples, one from each depth. These results are presented in Table 2-8. In addition, preapplication data collected by Cascade Earth Sciences, Ltd. are presented for comparison purposes.

pH levels remained fairly constant during the application period (Table 2-8), even though the pH level at the 12–24 in. interval during 2001 represents the application period minimum. Percent organic matter varied around preapplication concentrations; however, it is expected to take several years for decomposed vegetation to be incorporated into the soil profile.

The soil salinity levels were within acceptable ranges, based on electrical conductivity (EC) results. Soil salinity levels between 0–2 mmhos/cm are generally accepted to have negligible effects on plant growth. During 2001, the electrical conductivity in the 0–12 in. interval was near the maximum, and the 12–24 in. interval was higher than any previous application level. Both intervals remained within the 0–2 mmhos/cm range.

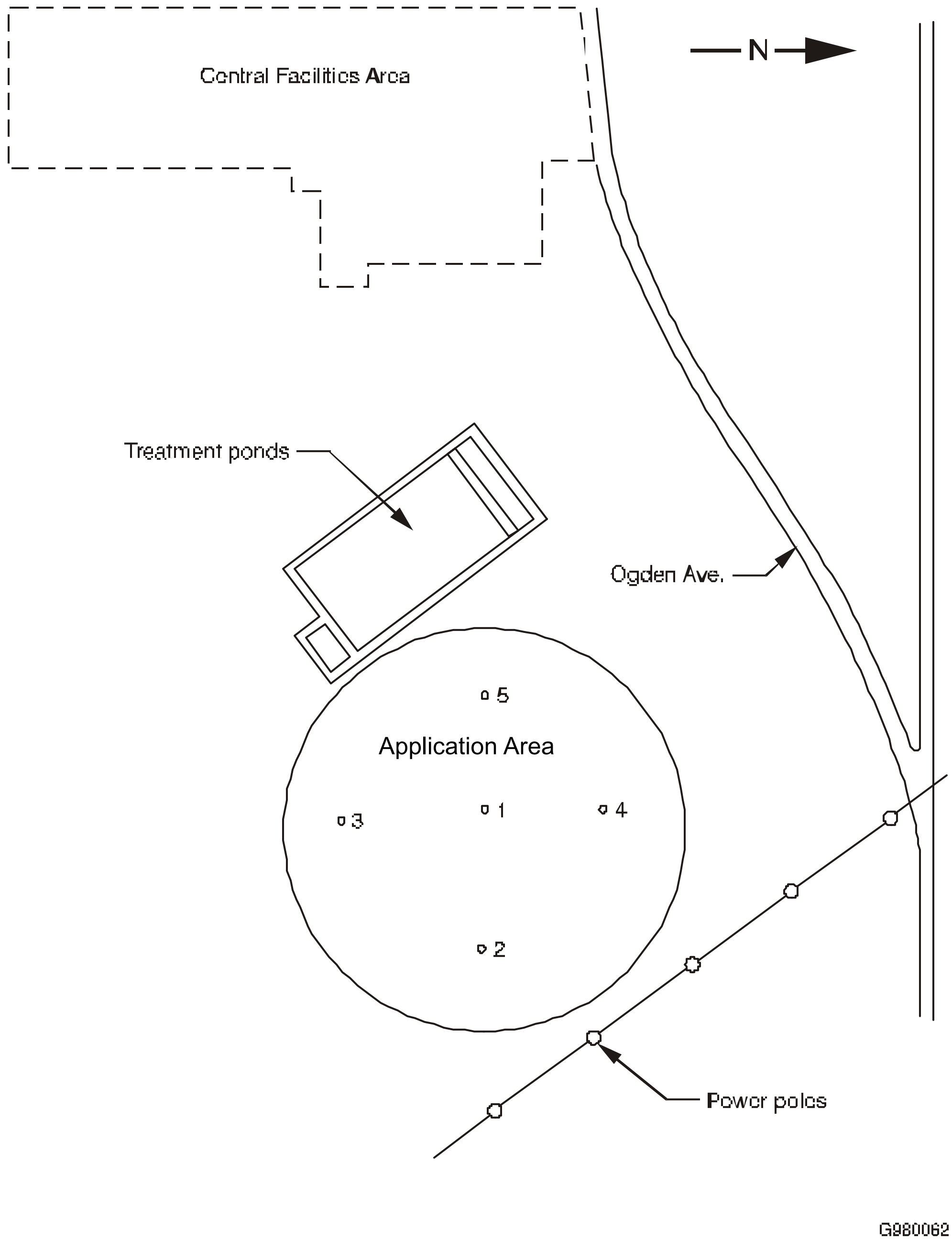

Figure 2-6. Central Facilities Area Wastewater Land Application Permit soil monitoring locations.

Table 2-8. Central Facilities Area Sewage Treatment Plant application area soil monitoring results.

	Preapplication Period[a]		Application Period				
				1995 through 2000			
Parameter	Depth (in.)	1993	Depth (in.)	Minimum	Maximum	Average	2001
pH	0–6	7.6	0–12	8.0[b]	8.4[b]	8.2[b]	8.0
	6–16	8.0	12–24	8.1[b]	8.6[b]	8.3[b]	7.9
	16–30	8.1					
Electrical conductivity (mmhos/cm)	0–6	0.6	0–12	0.36	1.20	0.67	1.12
	6–16	0.7	12–24	0.20	1.10	0.53	1.64
	16–30	0.6					
Organic matter (%)	0–6	2.2	0–12	0.63[b]	3.09[b]	1.78[b]	2.17
	6–16	1.6	12–24	0.56[b]	2.29[b]	1.16[b]	1.18
	16–30	1.4					
Total Kjeldahl nitrogen (ppm)[c]	0–6	1,200	0–12	733	1,500	1,193	796
	6–16	900	12–24	362	1,300	722	492
	16–30	500					
Nitrate nitrogen (ppm)	0–6	16	0–12	2.05[d]	6.00	3.54[e]	2.91
	6–16	6	12–24	0.43[d]	5.20	1.94[e]	2.25 U[f]
	16–30	3					
Ammonium nitrogen (ppm)	0–6	7.9	0–12	1 U	6.10	3.21[e]	5.20
	6–16	7.6	12–24	1 U	6.00	2.70[e]	5.44
	16–30	7.4					
Phosphorous (ppm)[g]	0–6	29	0–12	4.9	12.0	8.40	8.8
	6–16	18	12–24	2 U	10.2	4.28[e]	3.7
	16–30	12					
Sodium adsorption ratio	0–6	1.0	0–12	0.35	3.33	1.96	6.72
	6–16	1.4	12–24	0.31	2.51	1.14	4.03
	16–30	2.6					

a. Preapplication sample results were based on a composite of three representative samples taken at each depth. Preapplication soil depths and locations differ from permit samples.

b. The summary statistics shown do not reflect a result from 1995. While samples were collected in 1995, the analytical laboratory failed to analyze them.

c. TKN was not a required parameter for the permit, but was analyzed for additional information.

d. The minimum shown is the minimum of the detected results. For the 0–12 in depth, a result of less than 2.5 ppm was reported in 1997. For the 12–24 in depth, a result of less than 1 ppm was reported in 1999.

e. Where applicable, half the reported detection limit was used to calculate the average.

f. U flag indicates that the reported result is below the detection limit.

g. Available phosphorous was analyzed rather than the total phosphorus analysis specified in the permit. The total phosphorous reported for 1995 is not included in the summary statistics presented.

Soils with sodium adsorption ratios (SARs) below 15 and EC levels below 2 mmhos/cm are generally classified as not having sodium or salinity problems (Bohn, McNeal, and O'Connor 1985). While 2001 SARs were elevated at both depths relative to preapplication SARs and to past application SARs, they remain well below 15. The SAR in the deeper interval was lower than at the surface, but SARs in both intervals appear to be increasing with time. The SAR is an indicator of the exchangeable sodium levels in the soil. Soils with high exchangeable sodium levels tend to crust badly or disperse, which greatly decreases soil hydraulic conductivity.

Nitrogen data suggest negligible nitrogen accumulation from wastewater application. Prior to 1998, surface soil TKN concentrations were slightly greater than the preapplication concentrations. Since 1998, the TKN concentrations have remained at or below preapplication concentrations. Ammonium (NH_4N) and nitrate (NO_3N) concentrations continue to be well below preapplication concentrations. The low soil-available nitrogen (NH_4N and NO_3N) concentrations suggest that the native sagebrush and grass vegetation utilize all of the plant-available nitrogen and that the total nitrogen application is low. Increased nutrients and water from wastewater application may be stimulating plant growth, which in turn rapidly utilizes plant-available nitrogen. The ammonium and nitrate nitrogen concentrations are comparable to those of nonfertilized, background agricultural soils.

The permit requires total phosphorus analysis of soils; however, since the total phosphorous content includes the digestion of phosphate minerals, the results of total phosphorous analyses are not indicative of plant-available phosphorous or water-soluble phosphorous that could leach to groundwater. Phosphorous soluble in sodium bicarbonate is the common method for determining plant-available and soil-solution phosphorous, which can then be correlated to fertilizer needs or environmental concerns. Therefore, this analysis was requested since the 1996 soil monitoring. In 2001, available phosphorous concentrations remained below preapplication concentrations and at concentrations less than that considered adequate for range and pasture crop growth (EPA 1981).

2.7 Special Studies

2.7.1 Soil Profile Impact Study

In addition to permit-required soil sampling, additional soil and soil pore-water sampling was initiated in 1997 as part of an ongoing special study. The primary objective of this study was to evaluate the effects additional nitrogen and salt loading have on the soil profile in a native sagebrush steppe environment (one of three plant communities in the application area) and implications on the long-term ecological health of the area. This study planned to measure soil chemistry for the same constituents (except phosphorous) as those required for the WLAP inside the application area and compare them to similar measurements made immediately outside the application area in the same plant community. Lysimeters were also installed to extract soil pore-water at the same locations and depth intervals as the soil samples.

Sampling locations were chosen based on their proximity to the Environmental Science and Research Foundation's (ESRF's) neutron probe access tubes. During the summer of 1997, a cluster of three lysimeters (at 12, 24, and 36 in. depths) were placed adjacent to five neutron probes within the application area, and five neutron probes were placed in an adjacent control area. Soil pore-water sampling began at these locations in the spring of 1998 and continued in the spring of 1999. While soil pore-water sampling was not conducted in 2001, soil sampling was conducted at 0–12, 12–24, and 24–36 in. depths in May, and again in October in conjunction with the WLAP permit-required sampling.

Soluble salts have been elevated inside the application area compared to the control area for the past 5 years in the top two surface intervals (Figure 2-7). However, soil salinity levels are still in the range of those from the permit sampling and are considered to have a negligible effect on plant growth. SARs have increased over time in the 0–12 in. interval of the application area when compared to the control area (Figure 2-8). However, as stated in Section 2.6, soils with ECs below 2 mmhos/cm and SARs below 15 are generally classified as not having sodium or salinity problems.

Ammonium, nitrate as nitrogen, and TKN concentrations in the soil have remained very low; however, ammonium is slightly higher than in the past. Since ammonium was also proportionately higher in the control area, it is likely that this difference is the result of soil conditions at the time of sample collection and not the direct result of wastewater application. Ammonium, nitrate as nitrogen, and TKN concentrations in the application area were all below those in the control area. As stated in Section 2.6, it is possible that increased nutrients and water available to the plants as a result of wastewater application are actually stimulating plant growth, resulting in more rapid utilization of plant-available nitrogen and ammonium than is occurring in the control area.

Percent organic matter in the application area remained similar to that of the control area. Surface interval levels were slightly elevated in 2001, when compared to the previous year, for both the control and application area. However, significant changes in the percentage of organic matter within the application area are not expected for several years until plant matter from several growing seasons is incorporated into the soil profile. Soil pH appears to be unaffected by the application of wastewater.

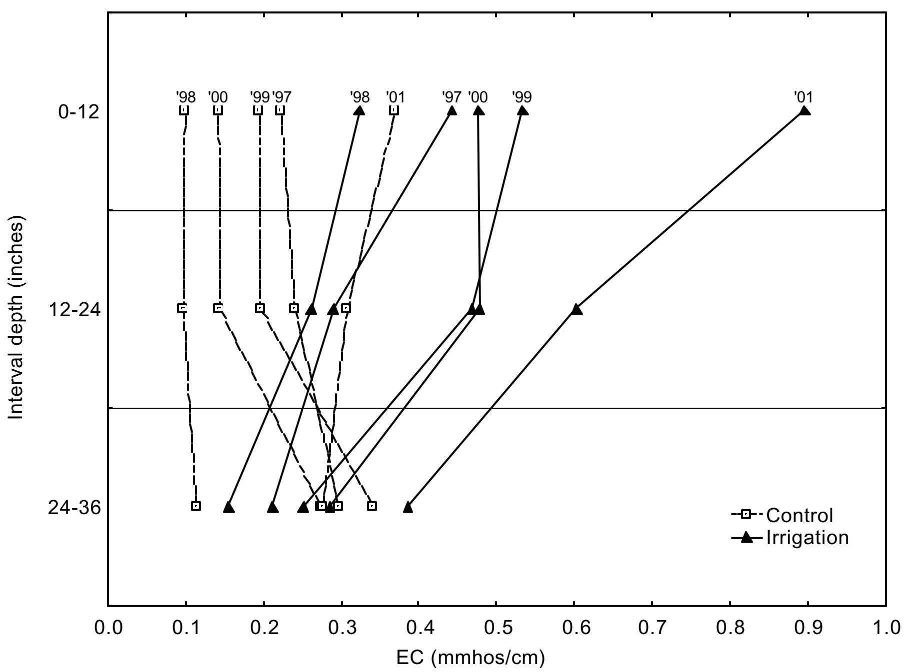

Figure 2-7. Electrical conductivity vs. soil depth (fall sampling).

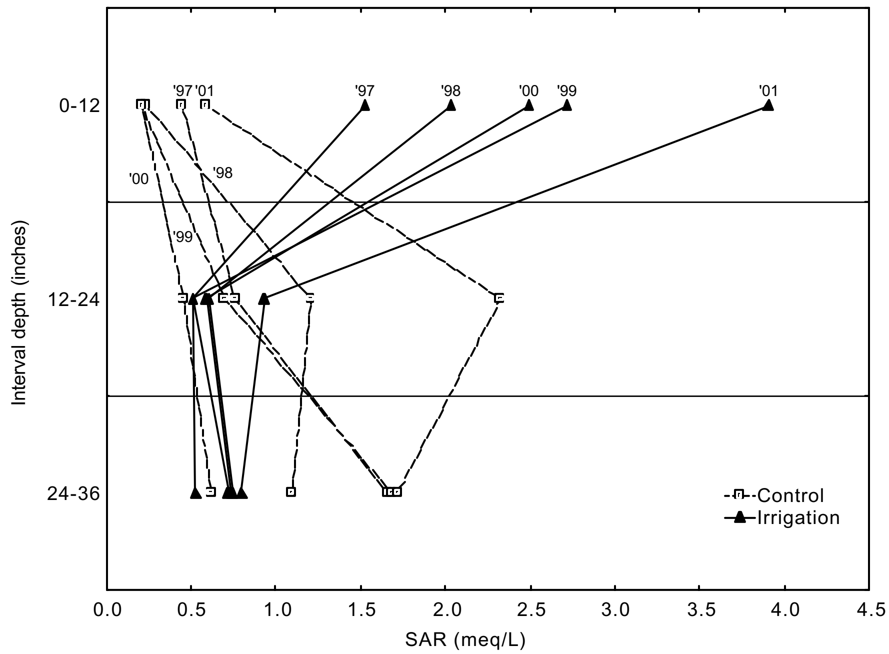

Figure 2-8. Sodium adsorption ratio vs. soil depth (fall sampling).

2.7.2 Ecological Impact Study

In 1996, a special research study began at the wastewater application area. The primary objective of the research study was to determine the ecological benefits or hazards of applying wastewater on native vegetation in semiarid regions. Specific objectives were developed to determine the potential for impacts on rangeland quality, resident wildlife populations, and soil water balance; and the potential for trace metal contamination of the environment. Additionally, the study would measure plant community characteristics, soil moisture, wildlife use, and plant and soil chemistry inside the wastewater application area and compare them to similar measurements immediately outside the wastewater application area (control area).

The present vegetation inside the application area includes at least three distinct community types:

- Sagebrush steppe
- Crested wheatgrass planting
- Transitional zone between sagebrush steppe and crested wheatgrass.

Sampling locations were assigned such that each of these community types was adequately represented. Plant species composition and cover were determined at 20 plots inside and 20 plots outside the application area. At the same locations, access tubes for neutron moisture probes were installed. Transects were also established for small mammal trapping both inside and outside the wastewater application area to determine species composition and abundance. The transects were generally the same location as those used for the vegetation and soil moisture measurements. A transect for the breeding bird survey was also established at the wastewater application area.

The following subsections summarize studies performed during the 2001 permit year. Refer to past WLAP annual reports for information on the ecological studies performed during previous permit years.

2.7.2.1 Vegetation. Total plant cover during the 2001 growing season was similar in both application and control crested wheatgrass plots with 25.6% and 24.3 % cover, respectively (Table 2-9). All plant cover in the crested wheatgrass plots resulted from grass cover, with the most abundant species being crested wheatgrass (*Agropyron cristatum*), and a small amount of cover resulting from Great Basin wildrye (*Leymus cinerus*).

As with crested wheatgrass plots, cover was similar in application and control plots within the transition zone (Table 2-9). In both application and control plots, grasses comprised the majority of total plant cover, with approximately 17% cover. Shrubs consisted of about 5% of the total plant cover, and forbs had relatively low cover of 0.1% to 0.2%. Species richness, or the number of the different species present within a plot, was also the same between application and control plots within the transition zone. The average species richness was 2.4 in both the application and control plots. Species that commonly occur in the transition community type include crested wheatgrass, Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*), and winterfat (*Krascheninnikovia lanata*).

More substantial differences between control and application plots occurred within the sagebrush steppe community type. Total plant cover was 32.5% and 24.6%, respectively. Although this difference was not statistically significant ($p = 0.165$), the power of the test was too low (0.158) to conclude that the application and control plots were statistically the same. Grass cover was slightly higher in the application plots; however, shrub cover was considerably lower in the application plots (Table 2-9). The difference in shrub cover between the application and control plots was marginally significant ($p = 0.089$). In the application area, total forb cover was slightly higher and native forb cover was significantly greater ($p = 0.017$). Species richness was similar between the application and control plots. Average species richness was 4.6 in control plots and 4.8 in application plots. Mean cover of dead shrubs was slightly higher in application plots than control plots with 8% and 5% absolute cover, respectively. Wyoming big sagebrush, green rabbit-brush (*Chrysothamnus viscidiflorus*), thick-spiked wheatgrass (*Elymus lanceolatus*), bottlebrush squirreltail (*Elymus elymoides*), and tapertip hawksbeard (*Crepis acuminata*) are species common to the sagebrush steppe community.

The Simplified Morisita's Similarity Index (Morisita 1959) was used to determine how similar the plant communities were between the application and control plots for each community type by permit year (Table 2-10). This index returns a value of 1.0 for two plant communities that are identical and a value of 0.0 for two communities that have no similar community elements. These values can be considered as a "percent similarity." In past WLAP annual reports, Morisita's Similarity Index results were presented for absolute cover. For 2001, Morisita's Similarity Index results are presented for relative cover, rather than absolute cover; hence, the change in some index values from previous years' reports. The change was made in order to evaluate plant community composition (including litter, bare ground, and dead shrub cover) in relation to total vegetative cover.

In 2001, as with most previous years, the similarity in plant community composition was quite high between application and control plots within the crested wheatgrass community. The index value between the application and control plots within the transition community was also high in 2001. Plant community composition between application and control sagebrush steppe plots were the least similar, with an index

Table 2-9. Percent cover of vegetation in application and control plots for each community type within and surrounding the wastewater application area.

	Grass Cover	Shrub Cover	Forb Cover	Total Cover
Control area crested wheatgrass	24.3	0.0	0.0	24.3
Application area crested wheatgrass	25.6	0.0	0.0	25.6
Control area transition	16.0	5.2	0.1	21.3
Application area transition	17.7	4.1	0.2	22.0
Control area sagebrush steppe	7.4	23.8	1.3	32.5
Application area sagebrush steppe	9.6	12.6	2.4	24.6

Table 2-10. Morisita's Similarity Index measuring similarity of vegetation community composition between application and control plots for each community type.

Permit Year	Crested Wheatgrass	Transition	Sagebrush Steppe
1996	0.99	0.85	0.83
1997	0.91	0.78	0.93
1998	0.96	0.93	0.85
1999	0.94	0.89	0.61
2000	0.89	0.97	0.79
2001	>0.99	0.99	0.85

value of 0.85 (Table 2-10). Simplified Morisita's Similarity Index values since 1996 indicate that application and control plots within the crested wheatgrass community are the most similar, and community composition between application and control plots within the sagebrush steppe community are the least similar (Table 2-10). Similarity indexes were slightly higher in 2001 than in previous years. This trend can likely be explained by the timing of wastewater application in 2001. Vegetation data were collected in mid-July, and very little wastewater had been applied previous to that time.

Results from the absolute cover data and the Simplified Morisita's Indexes indicate that applying sewage wastewater affects sagebrush steppe plant communities the most and crested wheatgrass communities the least.

2.7.2.2 Animal Species. Small mammal trapping was conducted throughout the summer of 2001. Trapping took place during consecutive nights in one week for each month of June, July, and August. Three trap lines of ten traps each were placed in both application and control areas within the crested wheatgrass community type. The application and control areas within the transition zone both contained seven trap lines each, and the application and control areas within the sagebrush steppe community type contained ten trap lines each. Jolly-Seber (Krebs 1989) population estimating methods were used to estimate abundance of white-footed deer mice (*Peromyscus maniculatus*). Population size estimates depend on the size of the sample area; therefore, comparisons can only be made between application and control areas within the same vegetation community type in this study.

Sample sizes within the crested wheatgrass community were too small to determine any differences in population size between application and control areas with any certainty. However, population size estimates differed between application and control areas in transition and sagebrush steppe community types. Population size estimates were greater in the application area transition community than in the control area transition community, and population size estimates were also greater in the application area sagebrush steppe community than in the control area sagebrush community (Table 2-11). These results suggest that application area vegetation communities support larger populations of white-footed deer mice than similar nonapplication area vegetation communities.

Additional small mammal species trapped within and surrounding the wastewater application area included: Great Basin pocket mouse (*Perognathus parves*), least chipmunk (*Tamias minimus*), and sagebrush vole (*Lemmiscus curtatus*). Jolly-Seber population estimates could not be performed on these species because there were not enough data available for any single species.

Breeding bird surveys also continued on the wastewater application area during 2001. Results from the breeding bird surveys were comparable to previous years. Western meadowlark (*Sturnella neglecta*) was the most abundant species. Other common species included: brown-headed cowbird (*Molothrus ater*), Brewer' Sparrow (*Spizella breweri*), and Brewer's blackbird (*Euphagus cyanocephalus*). The breeding bird population on the application area was similar to that on the CFA breeding bird survey route.

Table 2-11. Jolly-Seber population estimates for the white-footed deer mouse in each community type within and surrounding the wastewater application area.

	Creasted Wheatgrass		Transition		Sagebrush Steppe	
Sample Date	Control	Application	Control	Application	Control	Application
June 20, 2001	1.5	0.0	3.0	9.2	17.9	16.8
June 21, 2001	0.0	0.0	3.8	19.2	13.6	18.8
July 24, 2001	0.0	2.0	3.3	4.5	10.3	21.5
July 25, 2001	1.5	2.0	8.0	11.6	13.4	20.9
July 26, 2001	3.0	2.0	4.5	8.8	14.0	31.5
August 21, 2001	2.0	0.0	0.0	4.0	39.6	37.9
August 22, 2001	3.8	0.0	18.0	4.8	7.5	31.9
Mean	1.8	0.9	5.8	8.9	16.6	25.6

2.8 Summary of Environmental Impacts

Operations of the CFA STP continued to have little environmental impact during the 2001 permit year. The relatively weak wastewater influent, followed by treatment in the CFA STP lagoons, produced a good quality effluent for application for the 2001 permit year. When combined with an annual hydraulic loading rate that was lower than that of the design criteria, the nutrient loading rates were below projected levels. Soil and weather conditions, combined with the relatively low volume of wastewater applied during the permit year, resulted in no leaching loss for the year, compared to the permit limit of 3 in. per year. As a result, land application of wastewater appeared to have negligible impact on soils and groundwater. Soil sampling in the application area showed elevated sodium adsorption ratios when compared to past application SARs and to those in the nonapplication area adjacent to the application area. However, the SARs in the application area remain well below those found in soils classified with sodium problems. The impact to vegetation in the application area continues to suggest that the sagebrush steppe community is more susceptible to change as a result of wastewater application than other communities. No impact to breeding bird species was evident during the 2001 permit year. Results from small mammal trapping suggest that application area vegetation communities support larger populations of white-footed deer mice than similar nonapplication area vegetation communities.

Evaluations conducted to date into the high nitrate + nitrite concentrations detected in the groundwater near the new STP have determined that the new STP was not the likely source. Since the source is not believed to be the STP, WAG 4 (under the INEEL FFA/CO) will continue to monitor the groundwater nitrate + nitrite concentrations.

3. IDAHO NUCLEAR TECHNOLOGY AND ENGINEERING CENTER PERCOLATION PONDS DATA SUMMARY AND ASSESSMENT

3.1 Site Description

The Idaho Nuclear Technology and Engineering Center (INTEC) is a 210-acre, multipurpose plant located on the INEEL (Figure 3-1). It was constructed in 1951 and presently includes approximately 230 buildings and structures. Within INTEC are all of the facilities necessary to receive and store spent nuclear fuels, process the fuels to recover uranium-235, and handle waste generated by those functions. However, due to a change in mission in 1992, uranium-235 is no longer recovered at INTEC. Currently, INTEC receives and stores spent nuclear fuel and isolates and solidifies the waste fission products resulting from the spent fuel recovery process. In addition, research and development work is conducted to develop and improve fuel management and waste processing technologies.

The Idaho Nuclear Technology and Engineering Center generates 1 to 2 MG/day on average of process wastewater during normal operations. This wastewater, commonly called service waste, is discharged to Percolation Ponds No. 1 or No. 2 (Figure 3-2) via the service waste system. In the event of unusual circumstances, the Percolation Ponds could accommodate up to 5 MG/day.

The Percolation Ponds receive only the discharge of nonhazardous wastewater. Hazardous wastewater from INTEC processes and laboratories is disposed of in accordance with applicable Resource Conservation and Recovery Act regulations. Sanitary wastes from restrooms and the INTEC cafeteria are either discharged to the STP or directed to on-Site septic tank systems.

3.2 System Description and Operation

The service waste system serves all major facilities at INTEC. This process-related wastewater from INTEC operations consists of:

- Steam condensates
- Noncontact cooling water
- Reverse osmosis, water softener and demineralizer regenerate, and boiler blowdown wastewater
- Other nonhazardous liquids.

All service waste enters CPP-797, the final sampling and monitoring station, prior to discharge to the Percolation Ponds. In CPP-797, the combined effluent is measured for flow rate and monitored for radioactivity, and samples are collected for analyses. No radioactivity is expected since multiple simultaneous failures would first have to occur. However, if radioactivity is detected above a trigger level, all contaminated waters would be diverted to diversion tank VES-WM-191 rather than discharged to the Percolation Ponds. Two sets of two pumps transfer the wastewater from CPP-797 to the Percolation Ponds.

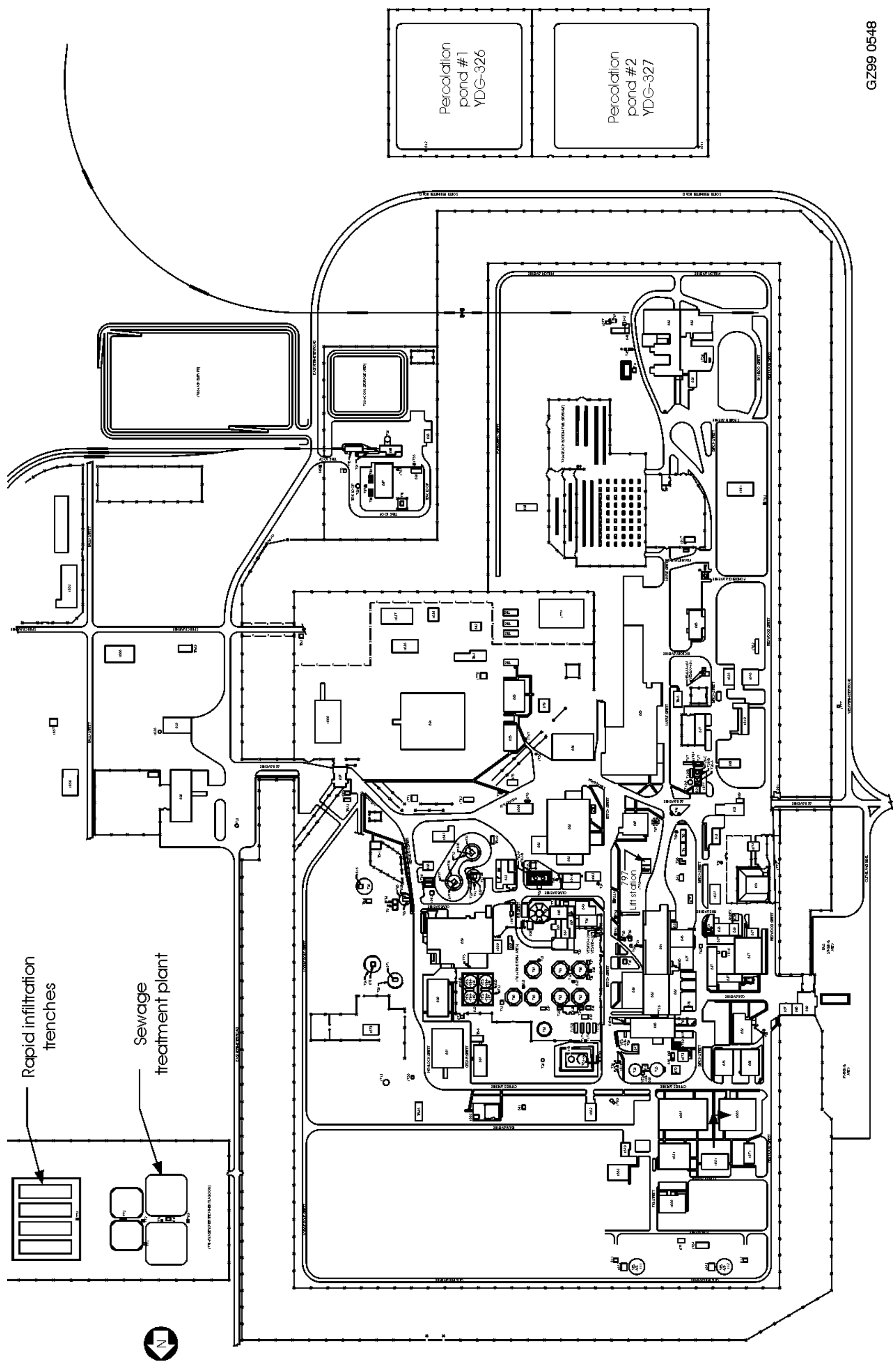

Figure 3-1. Idaho Nuclear Technology and Engineering Center facility map showing the Sewage Treatment Plant and Percolation Ponds.

Figure 3-2. Idaho Nuclear Technology and Engineering Center Percolation Ponds.

Percolation Pond No. 1 is located southeast of CPP-603. It is approximately 480 × 410 ft at the top and 16 ft deep. The gravelly alluvium in which the pond was excavated is approximately 20 to 35 ft thick and overlies basalt. Prior to operation, soil was backfilled into the pond to its present depth of 16 ft. The pond is designed to accommodate continuous discharge of approximately 2 MG/day.

Percolation Pond No. 2 is located immediately west of Percolation Pond No. 1. It is approximately 500 × 500 ft and 12 to 14 ft deep. Percolation Pond No. 2 was built by removing approximately 12 ft of surficial sediments. The thickness of the remaining surficial sediments is estimated to range from 20 to 40 ft. The pond is designed to accommodate continuous discharge of approximately 3 MG/day based on the observed percolation rates.

Wastewater is normally sent to only one pond at a time. In the event the flow capacity of one pond is exceeded, the total capacity of both ponds (5 MG/day) is available. The ponds are enclosed by an 8-ft-high chain-link fence to restrict access.

Under the Comprehensive Environmental Response, Compensation, and Liability Act Record of Decision for Operable Unit 3-13 (DOE-ID 1999), it was decided to discontinue discharging to the existing Percolation Ponds. On January 3, 2000, a WLAP application was submitted to DEQ to construct and operate two New Percolation Ponds (Graham 2000a). The DEQ approved plans and specifications to construct the new ponds on May 18, 2000 (Hall 2000) and are currently under construction. A discussion of the new ponds is provided in Section 4.

The WLAP for the existing Percolation Ponds expired on September 17, 2000. However, DEQ granted an extension for continued coverage under the existing WLAP on June 5, 2000 (Johnston 2000a). The extension authorizes operation of the existing Percolation Ponds until December 2003.

3.3 Status of Special Compliance Conditions

No special compliance conditions are associated with this permit.

3.4 Effluent Monitoring Results

A 24-hour flow-proportional composite sample is collected monthly from the sample point located in CPP-797 and analyzed for parameters listed in Schedule B of the permit. Table 3-1 presents effluent water quality data for permit year 2001 (November 2000 through October 2001).

The quality of wastewater discharged to the Percolation Ponds in 2001 is consistent with previous years. The permit does not specify concentration limits for effluent to the ponds; however, concentrations were compared to the applicable primary or secondary constituent standards (IDAPA 58.01.11). Yearly average effluent concentrations for all constituents met these standards. The yearly average concentration for total dissolved solids (TDS) has continued to decrease since the permit was issued and fell below the secondary constituent standard of 500 mg/L this permit period (475 mg/L). However, some of the monthly results exceeded the standard. Additionally, while the yearly chloride average concentration did not exceed the secondary constituent standard of 250 mg/L, both the November 2000 and June 2001 monthly concentrations were greater than 250 mg/L. June 2001 concentrations for chloride, TDS, and sodium represented permit year highs and correspond to the high salt consumption discussed below.

Chloride, TDS, and sodium concentrations in the effluent are primarily from the water softening and water treatment operations in CPP-606. In January 1998, a reverse osmosis unit was installed, and a demineralizer system was put into operation; both have reduced the amount of salt additions required for

Table 3-1. Idaho Nuclear Technology and Engineering Center Percolation Pond effluent data.

Sample Month Sample Date	November 11/21/2000	December 12/12/2000	January 1/10/2001	February 2/21/2001	March 3/13/2001	April 4/18/2001	May 5/8/2001	June 6/6/2001	July 7/17/2001	August 8/15/2001[a]	September 9/11/2001	October 10/16/2001	Yearly Average[b]
TKN (mg/L)	0.14	0.12	0.19 U[c]	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.21 U	0.14 U	0.13
Cl (mg/L)	311	103	16	189	145	77	191	405	175	56	117	112	158
TDS (mg/L)	746	393	259	522	451	341	531	820	522	312	396	411	475
Na (mg/L)	172	86	70	120	103	79	121	258	91	80	113	85	115
NO_2N (mg-N/L)	0.004 U	0.004 U	0.009 U	0.004 U	0.004 U	0.010 U	0.003 U	0.004 U	0.004 U	0.004 U	0.004 U	0.003 U	0.002 U
NO_3N (mg-N/L)	0.99	1.00	0.91	0.97	0.92	0.90	0.88	0.85	0.85	0.82	0.86	0.90	0.90
As (mg/L)	0.0040 U	0.0040	0.0040 U	0.0045 U	0.0045 U	0.0045 U	0.0029 U	0.0029 U	0.0061 U	0.0028 U	0.0028 U	0.0028 U	0.0021
Cd (mg/L)	0.0005 U	0.0005 U	0.0005 U	0.0003 U	0.0003 U	0.0003 U	0.0004 U	0.0004 U	0.0006 U	0.0004 U	0.0004 U	0.0004 U	0.0002 U
Cr (mg/L)	0.0049	0.0045	0.0061	0.0048	0.0054	0.0054	0.0053	0.0055	0.0053	0.0061	0.0055	0.0052	0.0053
Hg (mg/L)	0.0001 U	0.0001 U	0.0001 U	0.0001 U	0.0001 U	0.0001 U	0.0001 U	0.0001 U	0.0001 U	0.0001 U	0.0001 U	0.0001 U	0.0000 U
Se (mg/L)	0.0048 U	0.0048 U	0.0048 U	0.0029 U	0.0029 U	0.0029 U	0.0048 U	0.0048 U	0.0035 U	0.0032 U	0.0032 U	0.0032 U	0.0019 U
Ag (mg/L)	0.0015 U	0.0015 U	0.0015 U	0.0017 U	0.0017 U	0.0017 U	0.0020 U	0.0020 U	0.0011	0.0017 U	0.0017 U	0.0017 U	0.0009
F (mg/L)	0.20	0.22	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.21	0.20	0.20
Fe (mg/L)	0.0353	0.1690	0.0364	0.0167	0.0168	0.0209	0.0179	0.0099 U	0.0078 U	0.0206	0.0157	0.0128	0.0309
pH (composite)[d]	8.28	7.99	8.31	8.29	8.10	8.17	8.17	8.21	8.25	8.24	8.40	8.20	8.22
pH (grab)[e]	8.81	7.90	8.07	8.62	8.16	8.19	8.30	8.29	8.15	8.12	8.20	8.10	8.24
Mn (mg/L)	0.0007	0.0025	0.0012	0.0010	0.0007	0.0009	0.0008	0.0013 U	0.0007	0.0008 U	0.0006	0.0006	0.0009
Cu (mg/L)	0.0054	0.0058 U	0.0037	0.0049	0.0020	0.0039	0.0036	0.0019	0.0024 U	0.0049	0.0018	0.0034 U	0.0032
Al (mg/L)	0.0098 U	0.0098 U	0.0138	0.0063	0.0058 U	0.0058 U	0.0062 U	0.0062 U	0.0105 U	0.0070 U	0.0076	0.0074	0.0055

a. Fluoride and nitrate are from a sample collected on August 22, 2001.

b. Yearly average is determined from the average of the monthly values. One half the detection limit was used in the yearly average calculations for those results reported as below the detection limit.

c. U flag indicates that the result was reported as below the detection limit by the analytical laboratory, or that the result was impacted by laboratory quality control issues and flagged during validation.

d. pH result is from a 24-hour composite sample.

e. pH result is from a grab sample.

treated water. Decreasing concentration trends exist for effluent TDS, sodium, and chloride concentrations when considering all data since 1995 (Figure 3-3). These decreases over time appear to be partially related to a decrease in salt usage at INTEC (Figure 3-4). The correlations between TDS and chloride (r = 0.90), sodium and chloride (r = 0.89), and TDS and sodium (r = 0.86) continue to be good. However, the correlations between salt usage and chloride (r = 0.54), salt usage and TDS (r = 0.44), and salt usage and sodium (r = 0.58) are weaker, and suggest that salt usage is only one of the factors in the decreased concentrations over time.

In April 2001, the brine feed to the water softener system was modified, removing the reclaimed brine cycle. The modification was made to further reduce the salt usage. However, salt usage increased in the months following the modification, with a peak in June 2001 (Figure 3-4). An investigation is currently under way to determine the cause of the increased salt usage and what measures need to be taken to reduce overall salt usage.

Table 3-1 presents pH results from both grab and composite samples. The permit requires that the pH result come from a composite sample. In addition, a verbal request was received from DEQ for pH to be analyzed from a grab sample.[b] Both results are provided in Table 3-1 to meet these requirements. The results varied slightly between the grab and composite samples over time. However, when a paired t-test was performed on the pH results from both the grab and composite samples from January 1997 through the 2001 permit year, no statistical difference was found between the two groups (grab vs. composite).

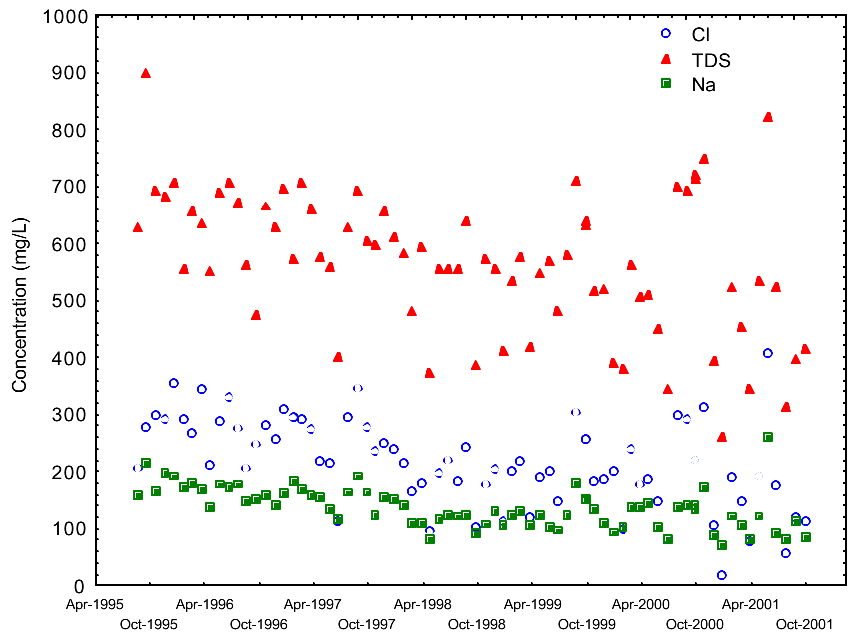

Figure 3-3. Percolation Pond chloride, total dissolved solids, and sodium effluent data.

b. R. Huddleston, DEQ, E. D. Walker, INEEL, Personal Communication, March 6, 1996.

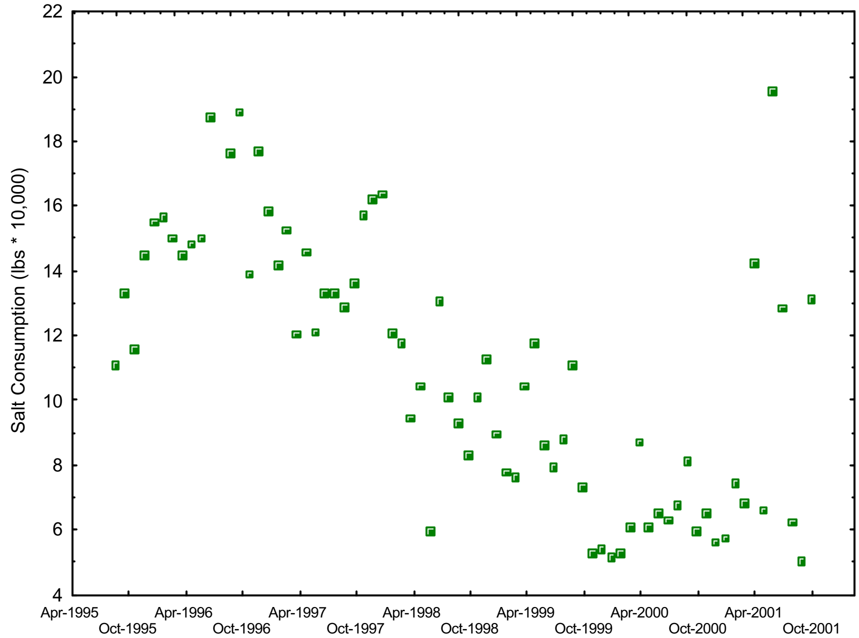

Figure 3-4. Idaho Nuclear Technology and Engineering Center monthly salt consumption.

3.4.1 Flow Volumes

The flow volumes to the Percolation Ponds were recorded daily from the flow meter located in CPP-797. Table 3-2 presents monthly and total flow volumes, and Appendix B presents daily flow readings. For the permit year, the majority of the flow (502.8 MG of 527 total MG) was discharged into Percolation Pond No. 1. Percolation Pond 2 was only used during June 2001 for a short period for a tracer test. The tracer test was performed to determine the relative contribution of various perched water recharge sources, including the Percolation Ponds, to the perched water under INTEC in general, and the Tank Farm in particular, and was part of the CERCLA Operating Unit (OU) 3-13 Group 4 (perched water) remedial action. Total flow during the 2001 permit year increased over that for the previous year, but was well below the permit limit of 912 MG/year.

3.5 Groundwater Monitoring Results

To measure potential Percolation Pond impacts to groundwater, the permit requires that groundwater samples be collected from four monitoring wells (see Figure 3-5):

- One background aquifer well (USGS-121) upgradient of INTEC
- One aquifer well (USGS-048) immediately upgradient of the Percolation Ponds
- Two aquifer wells (USGS-112 and -113) downgradient of the Percolation Ponds, which serve as points of compliance.

Sampling must be conducted semiannually during April and October and must include a number of specified parameters for analysis. Contaminant concentrations in USGS-112 and -113 are limited by primary constituent standards (PCSs) and secondary constituent standards (SCSs) specified in IDAPA 58.01.11, "Ground Water Quality Rule." Variances from these standards have been established for TDS and chloride, which have specified permit limits set at 800 mg/L and 350 mg/L, respectively.

Table 3-2. Idaho Nuclear Technology and Engineering Center Percolation Pond flow summaries.

Time Period	Effluent (gpd[a]) Average	Maximum	Minimum	Total (MG[b]) Pond 1	Pond 2	Ponds 1& 2
November 2000	1,206,443	1,371,200	981,900	36.19	NF[c]	36.19
December 2000	1,221,868	1,428,000	942,200	37.88	NF	37.88
January 2001	1,204,623	1,671,700	924,900	37.34	NF	37.34
February 2001	1,504,868	1,864,400	1,035,800	42.14	NF	42.14
March 2001	1,630,919	2,128,100	1,435,700	50.56	NF	50.56
April 2001	1,775,753	2,299,900	1,459,300	53.27	NF	53.27
May 2001	1,370,636	1,864,900	1,042,400	42.49	NF	42.49
June 2001	1,715,153	2,094,400	725,800	27.20	24.25	51.45
July 2001	1,583,758	1,809,200	1,478,000	49.10	NF	49.10
August 2001	1,584,710	1,967,800	1,312,800	49.13	NF	49.13
September 2001	1,198,770	1,637,500	624,000	35.96	NF	35.96
October 2001	1,339,526	1,710,900	851,700	41.53	NF	41.53
Yearly Summary	1,443,937	2,299,900	624,000	502.79	24.25	527.04

a. gpd—gallons per day.

b. Monthly and annual totals are shown in million gallons (MG).

c. No flow reported to Pond 2 during this period.

During the 2001 permit year, groundwater was sampled in April and October. Table 3-3 shows water levels (recorded prior to purging and sampling) and analytical results for all parameters specified by the permit. Analytical results were very similar to those of previous years; no permit levels were exceeded at either compliance well during the permit year. Chloride, TDS, and sodium concentrations continued to be elevated in USGS-112 and -113 compared to USGS-048. These elevated concentrations resulted from the continued operation of the water softening and treatment processes at INTEC, which introduce chloride, TDS, and sodium into the service waste system.

A decreasing trend in chloride was found for both USGS-112 and USGS-113 and in TDS for USGS-113, when considering all permit data through October 2001. No trends were evident for sodium in either well. All three parameters have exhibited a decreasing trend since 1995 in the Percolation Pond effluent (refer to Figures 3-6, 3-7, and 3-8, respectively). TDS and chloride concentrations have been expected to follow the trends exhibited by the effluent, but with lower concentrations due to mixing in the aquifer, and a time lag and dampening effect from the 450-ft thick vadose zone. With the addition of the 2001 permit year data, the trends in the compliance well concentrations are beginning to follow the decreasing trends in the effluent. The trends in the compliance wells will continue to be evaluated as more data become available.

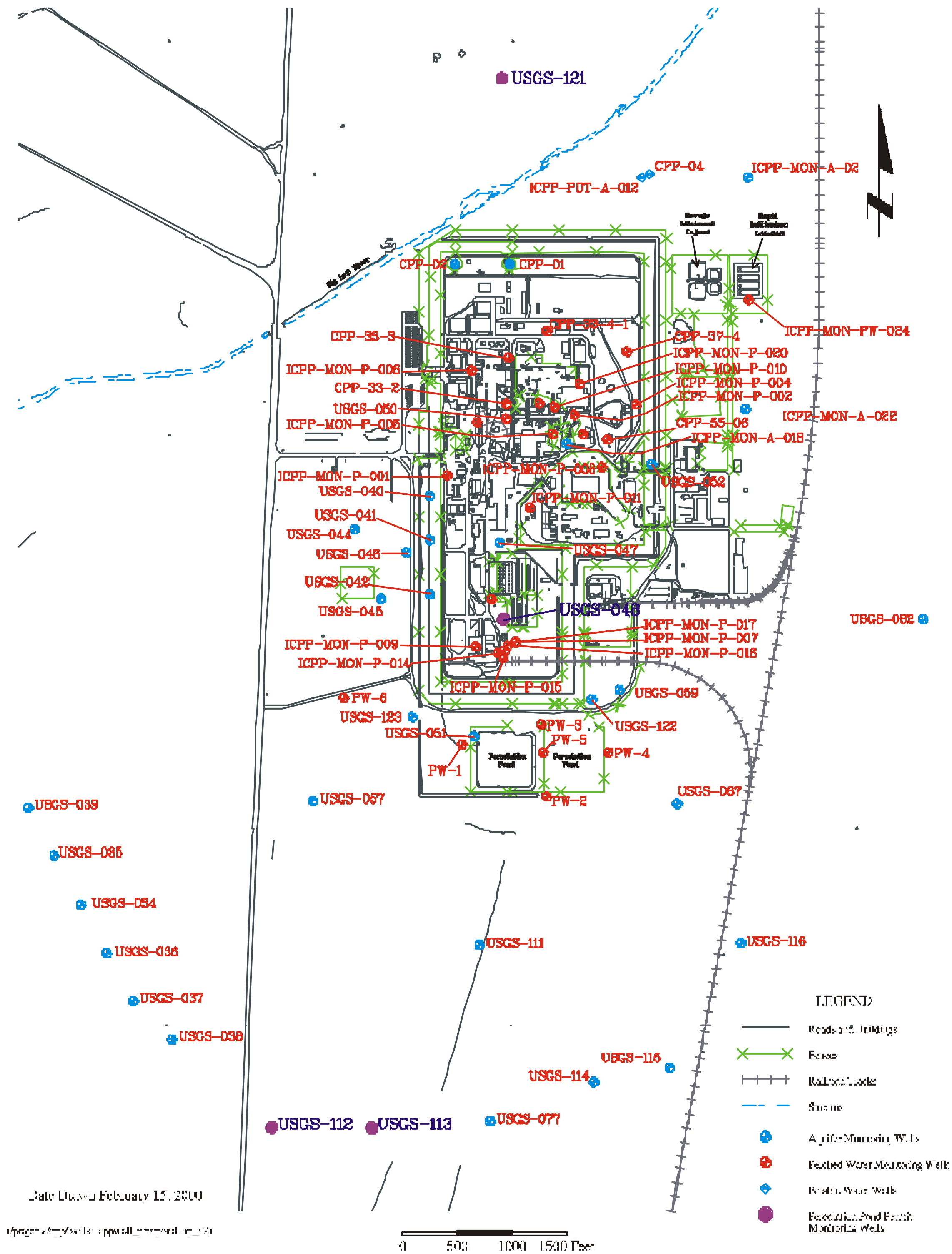

Figure 3-5. Locations of Idaho Nuclear Technology and Engineering Center monitoring wells.

Table 3-3. Idaho Nuclear Technology and Engineering Center Percolation Pond groundwater data for April and October 2001.

Depth to Water	USGS-048		USGS-112		USGS-113		USGS-121		PCS/SCS[a]
Table (ft)	460.66	462.45	416.64	477.96	476.82	468.79	455.97	453.74	
Sample Date	4/25/01	10/10/01	4/24/01	10/10/01	4/25/01	10/10/01	4/24/01	10/10/01	
(units)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
TKN	0.219	0.1 U[b]	0.1 U	0.1 U	0.322	0.1 U	0.1 U	1.0 U	NA[c]
Chloride[d]	26.1 [27]	27.4	102 [101]	105	173 [173.8]	176	11.6 [11.4]	11.7	250 (350)[e]
TDS	303	270	455	362	623	506	258	197	500 (800)[e]
Sodium	14.7	14.9	49.5	45.3	78.9	67.6	7.1	7.47	NA
NO_3N	3.2	1.33	3.1	3.42	2.4	2.27	0.75	0.80	10
NO_2N	0.0035 U	0.10 U	0.003 U	0.10 U	0.003 U	0.10 U	0.004 U	0.10 U	1
$NO_2N + NO_3N$	3.22	3.23	3.25	3.37	2.39	2.32	0.757	0.82	10
Arsenic	0.0025 U	0.003 U	0.0025 U	0.003 U	0.0025 U	0.003 U	0.0025 U	0.003 U	0.05
Cadmium	0.0005 U	0.001 U	0.0005 U	0.001 U	0.0005 U	0.001 U	0.0005 U	0.001 U	0.005
Chromium	0.0059	0.0068	0.0055	0.0059	0.0056	0.0062	0.0041[f]	0.0053[f]	0.1
Mercury	0.0002 U	0.00022	0.0002 U	0.00013	0.0002 U	0.00011	0.0002 U	0.00017[g]	0.002
Selenium	0.0025 U	0.004 U	0.0025 U	0.004 U	0.0025 U	0.004 U	0.0025 U	0.004 U	0.05
Silver	0.0025 U	0.002 U	0.0025 U	0.002 U	0.0025 U	0.002 U	0.0025 U	0.002 U	0.1
Fluoride[d]	0.2 U [0.21]	0.20	0.2 U [0.25]	0.20	0.215 [0.22]	0.20	0.2 U [0.21]	0.20	4
Iron	0.0125 U	0.0366	0.121	0.0931	0.0125 U	0.015 U	0.0125 U	0.0345	0.3
Manganese	0.0025 U	0.001 U	0.0025 U	0.0013	0.0025 U	0.001 U	0.0025 U	0.001 U	0.05
Copper	0.0027	0.002	0.0031	0.0015	0.0025 U	0.001 U	0.0025 U	0.0016	1.3
Aluminum	0.005 U	0.049 U	0.0121	0.049 U	0.0072	0.049 U	0.005 U	0.049 U	0.2
pH	7.93	7.74	8.29	8.01	7.91	7.85	8.23	7.87	6.5–8.5

a. Primary constituent standards (PCS) and secondary constituent standards (SCS) in groundwater referenced in IDAPA 58.01.11.200.01.a and b.

b. U flag indicates that the result was reported as below the detection limit.

c. NA—not applicable.

d. Where available, duplicate results are presented in brackets.

e. The permit specifies exceptions for chloride and TDS limits of 350 mg/L and 800 mg/L, respectively.

f. Duplicate chromium results were 0.0044 mg/L for April and 0.0045 mg/L for October.

g. A duplicate mercury result was reported as 0.0001U mg/L.

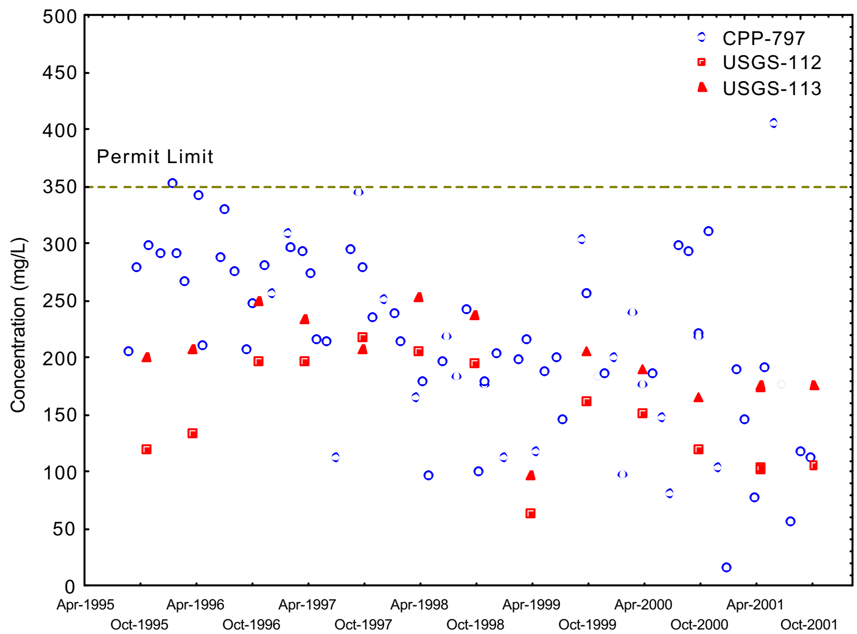

Figure 3-6. Chloride concentration from Idaho Nuclear Technology and Engineering Center Percolation Pond wells and effluent (CPP-797).

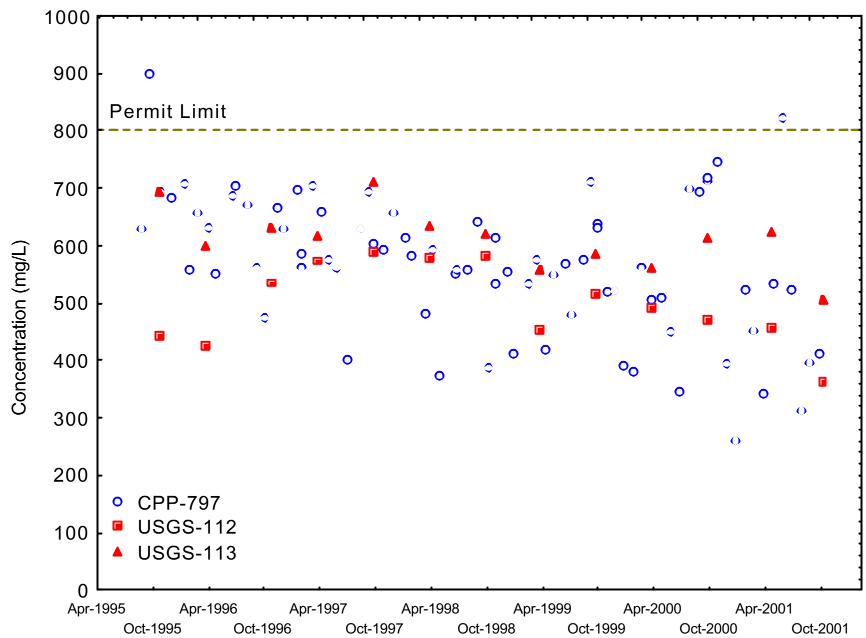

Figure 3-7. Total dissolved solids concentration from Idaho Nuclear Technology and Engineering Center Percolation Pond wells and effluent (CPP-797).

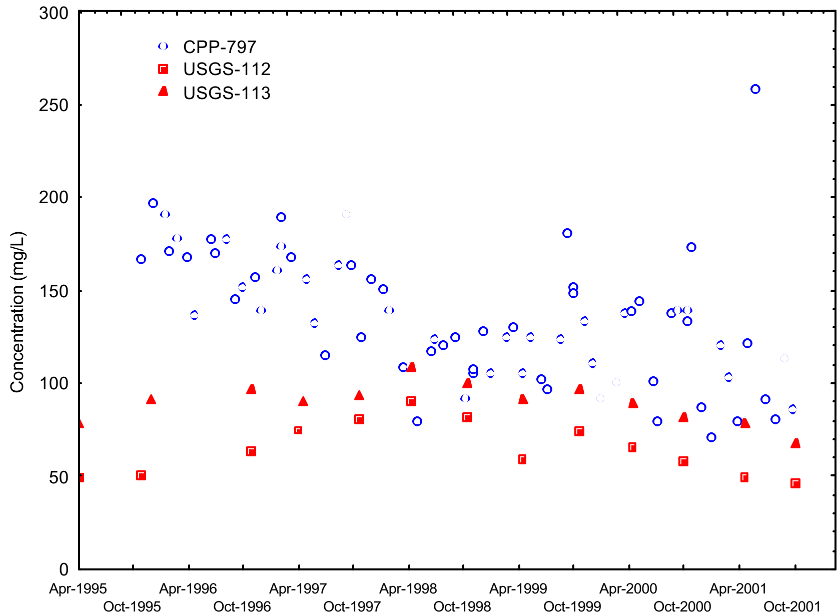

Figure 3-8. Sodium concentration from Idaho Nuclear Technology and Engineering Center Percolation Pond wells and effluent (CPP-797).

3.6 Summary of Environmental Impacts

Annual flow volume to the INTEC Percolation Ponds and contaminant concentrations in the groundwater remained within limits established by the permit during the 2001 permit year.

As in previous years, concentrations of TDS, chloride, and sodium were elevated in the compliance wells (USGS-112 or USGS-113) compared to the background wells. These elevated concentrations are the result of water softening and treatment operations. Decreasing trends were found for chloride in both USGS-112 and USGS-113, and for TDS in USGS-113. With the addition of the 2001 permit year data, the trends in the compliance wells for both TDS and chloride are beginning to follow the trends in the Percolation Pond effluent.

4. IDAHO NUCLEAR TECHNOLOGY AND ENGINEERING CENTER NEW PERCOLATION PONDS DATA SUMMARY AND ASSESSMENT

4.1 Site Description

The site description for the INTEC New Percolation Ponds is the same as that for the existing Percolation Ponds (Section 3.1), except that once the project is completed, the wastewater will be discharged to the New Percolation Ponds which will accommodate up to 3 million gallons/day each.

4.2 System Description and Operation

The same wastewater (See Section 3.2) discharged to the existing Percolation Ponds will be routed to the New Percolation Ponds once the new ponds are operational. The wastewater will be nonhazardous.

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Record of Decision for Operable Unit 3-13 (DOE-ID 1999) recommended ceasing use of the existing Percolation Ponds as the preferred alternative to decrease the perched water volume in the subsurface around INTEC. In response to this action, an alternative discharge location was identified approximately 2 miles southwest of INTEC (Figures 4-1 and 4-2).

The INTEC New Percolation Ponds were designed to function in a similar manner to the existing Percolation Ponds south of INTEC. Essentially a rapid infiltration system, the new pond complex is comprised of two cells excavated into the surficial alluvium and surrounded by bermed alluvial material. Each cell 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 discharge of approximately 3 million gallons/day.

Two sets of electric pumps transfer wastewater from CPP-797 to the ponds. Currently, the existing pumping system in CPP-797 is undergoing a complete upgrade. Stainless steel header piping is being replaced with high density polyethylene piping to minimize the effects of microbial corrosion. The existing 60–horsepower electric motors/pumps/variable frequency drives are being replaced with 100–horsepower motors/pumps/variable frequency drives/harmonic distortion filters. A new 75–horsepower diesel motor and pump have replaced the old 60–horsepower diesel motor as the backup system for the electric motor systems.

The DEQ approved construction of the New Percolation Ponds on May 18, 2000 (Hall 2000). Construction of the New Percolation Ponds began in August of 2000 (Guymon 2000b). The DEQ issued a WLAP (LA-000130-03) for the New Percolation Ponds on September 10, 2001 (Eager 2001b). Although construction is not complete on the New Percolation Ponds, the permit identifies several reporting requirements to be included in this year's annual report. These include:

- The status of the compliance activities as described in Section F of the permit that have not been completed
- The results of water quality testing for the Weapons Range well as required by the DEQ Drinking Water Program.

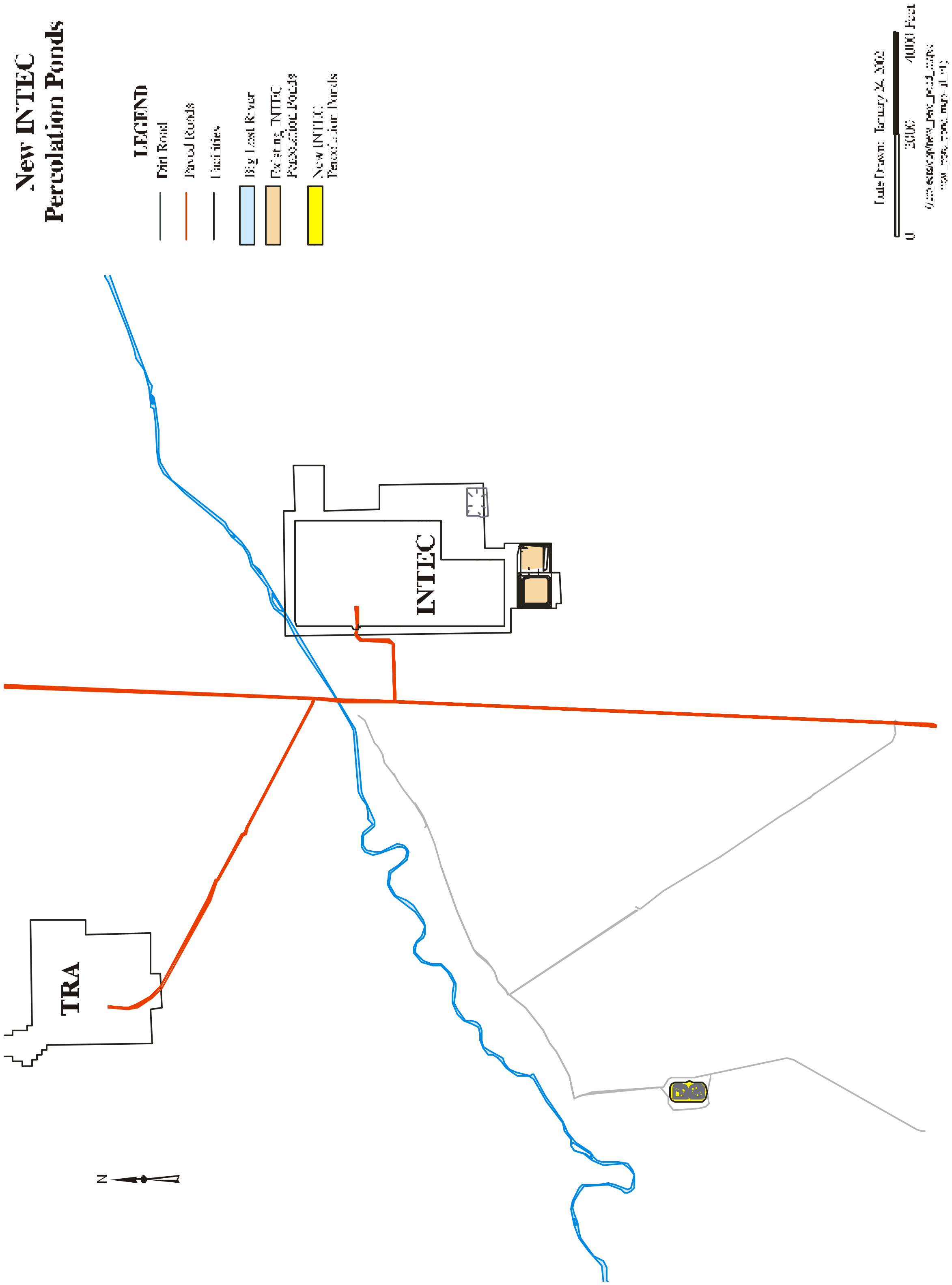

Figure 4-1. Location of Idaho Nuclear Technology and Engineering Center New Percolation Ponds.

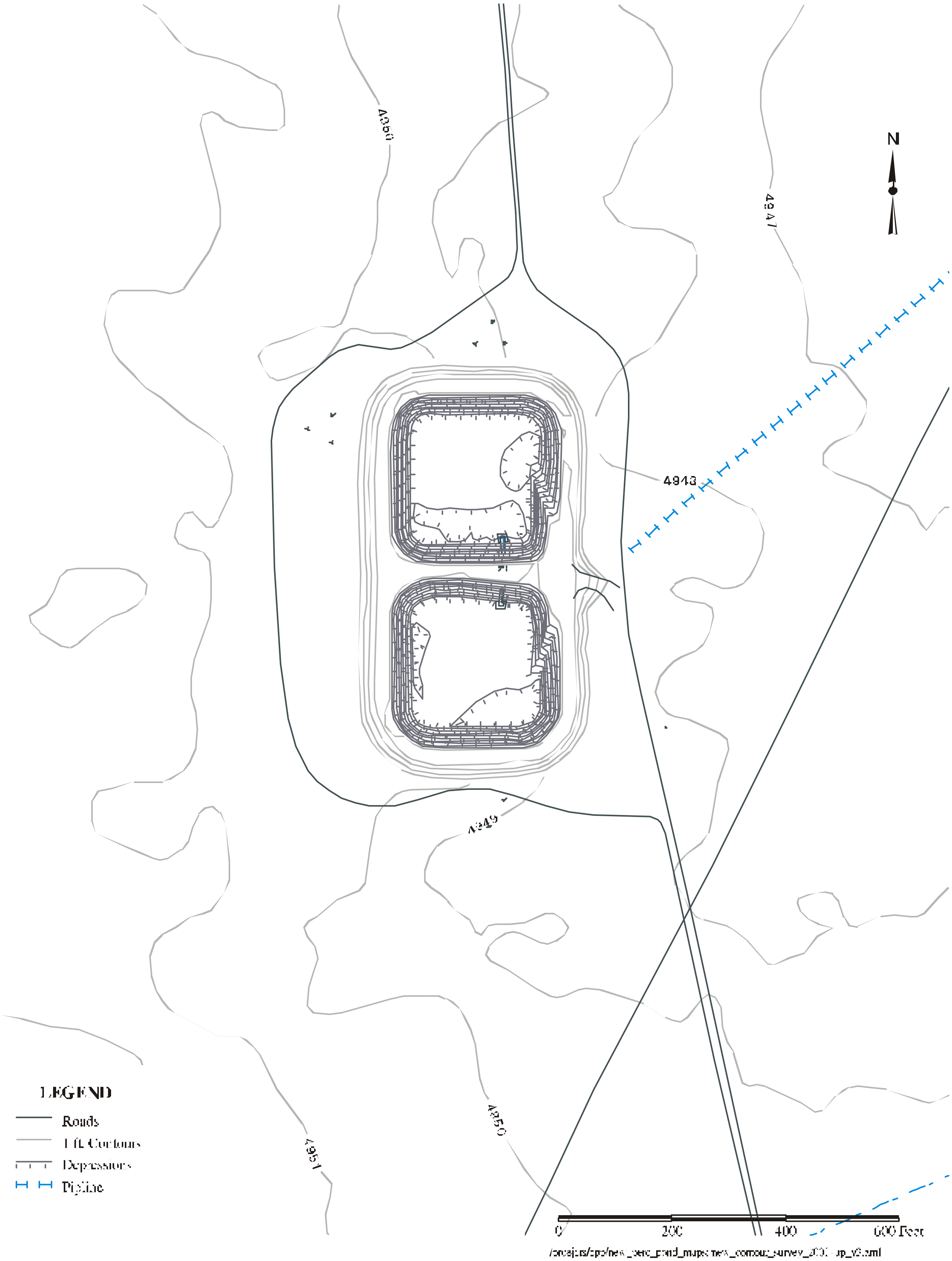

Figure 4-2. Detail of Idaho Nuclear Technology and Engineering Center New Percolation Ponds.

4.3 Status of Special Compliance Conditions

Five special compliance conditions were identified in Section F of the WLAP issued for the New Percolation Ponds. Section F compliance activity CA-130-01 requires characterization of groundwater quality in the perched water formation prior to startup of the ponds using three perched water monitoring wells specified in the permit. Groundwater characterization shall include the parameters listed in Section E of the WLAP LA-000130-03 for groundwater monitoring requirements. Perched water formations are dependent on flow in the Big Lost River (BLR). If there is no BLR flow or no perched water formations occur prior to startup, the water quality characterization is not required. Since the permit was issued on September 10, 2001, there has been no flow in the BLR. Monitoring of the perched wells in the vicinity of the New Percolation Ponds prior to permit issuance indicated that the wells were dry. Monitoring of water levels in the three perched wells is planned for the 2002 permit year to determine if characterization can be obtained prior to startup.

Compliance activity CA-130-02 requires submittal of a final Operation and Maintenance Manual to the DEQ for review and approval 15 months after startup of the New Percolation Ponds. The manual must incorporate the requirements of the permit and any operational modifications made during the first year of operation, and it must reference written procedures required for operation of the system. The New Percolation Ponds did not startup during the 2001 permit year.

Compliance activity CA-130-03 requires submittal of a report describing the fate of nutrients (nitrogen and phosphorous), and their potential groundwater impact at the New Percolation Pond site to the DEQ for review within 12 months after permit issuance. A report will be submitted to DEQ within the required time frame.

Compliance activity CA-130-04 requires submittal of the borehole logs and completion diagrams for perched monitoring well ICPP-SCI-V-212 to the DEQ within 3 months of well completion. The borehole logs and completion diagrams were submitted to DEQ on September 18, 2001 (Guymon 2001c). However, during preparation of this report, it was discovered that well identifier ICPP-SCI-V-212, while planned, was not completed as proposed when the INEEL submitted comments to DEQ on May 14, 2001, on the draft WLAP for the New Percolation Ponds (Guymon 2001a). DEQ was informed of this discrepancy,[c] and information will be submitted to resolve this issue.

Compliance activity CA-130-05 requires submittal of an analysis and report to DEQ. The report must document the source of radioactivity for all streams contributing or potentially contributing to the service waste system. Additionally, the report must list each stream contributing to the service waste system, if the stream contains or potentially contains radioactivity, the source of radioactivity, and if applicable, the category of Atomic Energy Act regulated material from which the source of radioactivity is derived (source, special, nuclear by-product material). The report will be submitted by the required date, which has been extended to February 28, 2002 (Eager 2002).

4.4 Effluent Monitoring Results

A WLAP (LA-000130-03) was issued by the DEQ on September 10, 2001, for the New Percolation Ponds, which specifies a permit year as the period from November 1 through October 31. During the 2001 permit year, no effluent monitoring was performed because the New Percolation Ponds were not

c. G. Eager, DEQ, R. Kauffman, DOE-ID, K. Miller, M. MacConnel, and J. Graham, INEEL, Conference Call, January 28, 2002.

operational. Results of effluent monitoring will be presented in future annual reports, after the New Percolation Ponds are operational.

4.5 Evaluation of Water Quality Testing for the Weapons Range

Section G of the WLAP requires reporting of water quality testing results for the Weapons Range well as required by the DEQ Drinking Water Program. The sampling location for the Weapons Range well was clarified by DEQ to be the point of compliance at Building B21-608 (Allred 2001). The water quality of the Weapons Range B21-608 Building is monitored by the INEEL Drinking Water Program in accordance with the DEQ Drinking Water Program. The Weapons Range is considered a transient, non-community water system. As such, monitoring is required yearly for nitrates and quarterly for bacteria.

The annual nitrate sampling of the Weapons Range distribution system was performed during June 2001, prior to the issuance of the New Percolation Ponds permit. Since nitrate sampling is required annually, additional nitrate sampling was not performed during the 2001 permit year (from September 10, 2001 through October 31, 2001). During the June 2001 sampling, the concentration of nitrate was 0.9 mg/L, well below the primary constituent standard of 10 mg/L.

Quarterly sampling of bacteria is required of the Weapons Range water system. As a best management practice, the INEEL Drinking Water Program samples more frequently than quarterly. Sampling for bacteria was performed on the Weapons Range water system during Calendar Year 2001 on January 3, February 6, March 6, April 3, May 1, June 5, July 10, August 8, and September 5 (just prior to the September 10 issuance of the New Percolation Pond permit). No bacteria were detected in the Weapons Range water system during Calendar Year 2001. However, during the short 2001 permit year for the New Percolation Ponds (September 10, 2001 through October 31, 2001), no bacteria samples were collected due to a pump and motor failure. Monthly bacteria sampling will resume after the pump and motor are replaced.

4.6 Evaluation of Groundwater Data

To measure potential impacts to groundwater from the New Percolation Ponds, the permit requires that groundwater samples be collected from six monitoring wells (see Figure 4-3):

- One background aquifer well (ICPP-MON-A-167) upgradient of the New Percolation Ponds
- One background perched water well (ICPP-MON-V-191) north of the New Percolation Ponds and just south of the Big Lost River
- Two aquifer wells (ICPP-MON-A-165 and -166) downgradient of the New Percolation Ponds
- Two perched water wells (ICPP-MON-V-200 and ICPP-SCI-V-212) located directly adjacent to the New Percolation Ponds. Well ICPP-MON-V-200 is located just north of the New Percolation Ponds. As stated in Section 4.3, well ICPP-SCI-V-212 was not constructed as planned and is therefore not shown on Figure 4-3.

Sampling will be conducted semiannually during April and October and will include the WLAP-specified parameters for analysis. Sampling results will be reported in future annual reports after the New Percolation Ponds become operational and sampling begins.

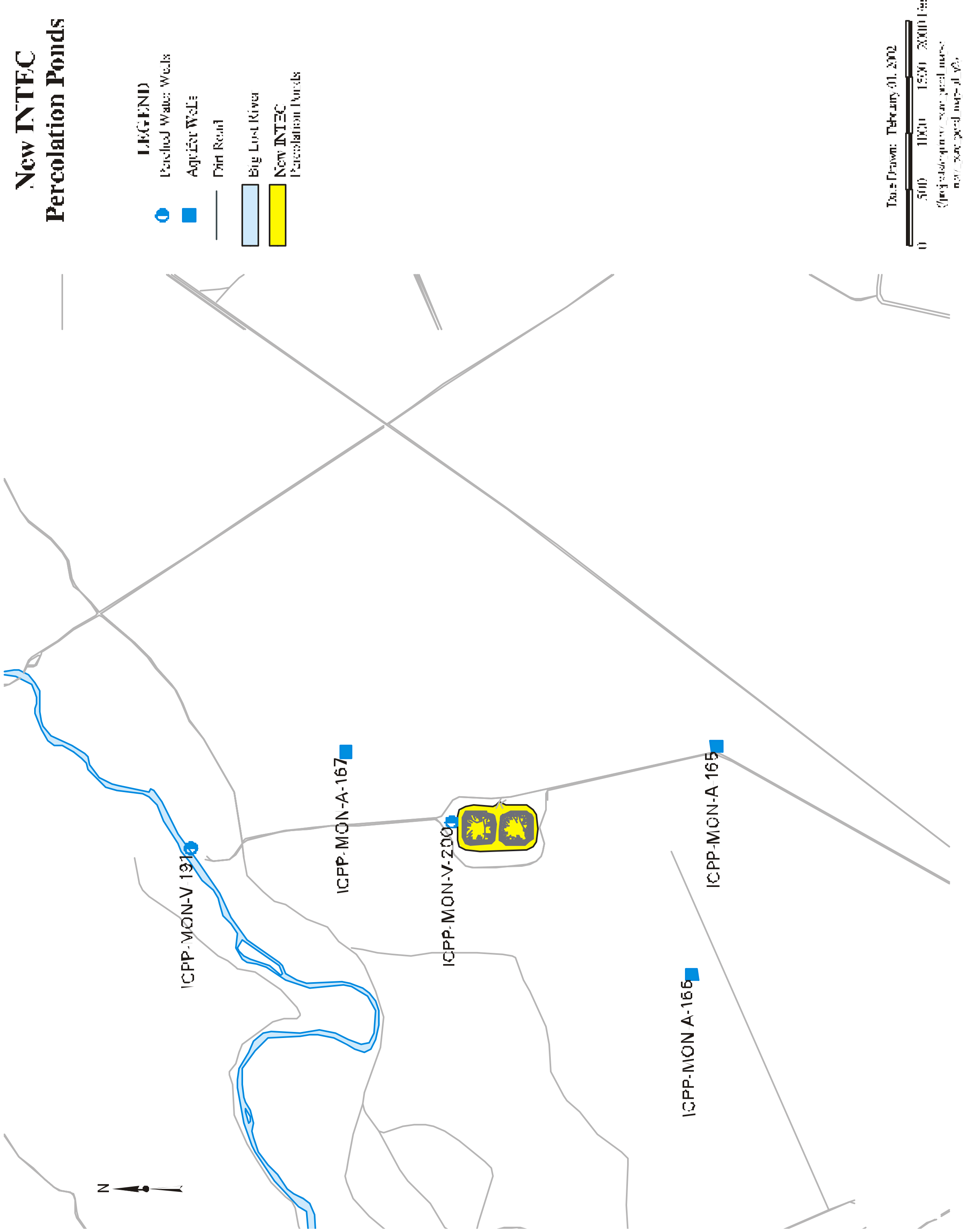

Figure 4-3. Locations of Idaho Nuclear Technology and Engineering Center New Percolation Pond monitoring wells.

4.7 Summary of Environmental Impacts

Construction of the New Percolation Ponds began during 2000. Because the New Percolation Ponds are still under construction and no wastewater is being discharged to the ponds, no environmental impact due to operation of the New Percolation Ponds has occurred. Future annual reports will address any environmental impacts resulting from the New Percolation Ponds, after the ponds are operational and required sampling begins.

5. IDAHO NUCLEAR TECHNOLOGY AND ENGINEERING CENTER SEWAGE TREATMENT PLANT DATA SUMMARY AND ASSESSMENT

5.1 System Description and Operation

The STP is located east of the INTEC, outside the fenced plant area. The STP treats and disposes of sanitary and other related wastes at INTEC. Approximately 31 permanent buildings within INTEC are connected to the STP. The sewage system consists of six lift stations, each with two pumps (except CPP-1713, which has only one). Four of the lift stations (CPP-768, CPP-1713, CPP-1772, and CPP-724) pump the waste into one of the two main lift stations (CPP-728). This main lift station and the eastside main lift station (CPP-733) both contain a sewage grinder that the wastewater passes through before being pumped to the STP. The INTEC STP (Figure 5-1) consists of:

- Two aerated lagoons (Cell Nos. 1 and 2)
- Two quiescent, facultative stabilization lagoons (Cell Nos. 3 and 4)
- Four rapid infiltration (RI) trenches
- Six control stations (weir boxes) (CPP-769, CPP-770, CPP-771, CPP-772, CPP-773, and CPP-774).

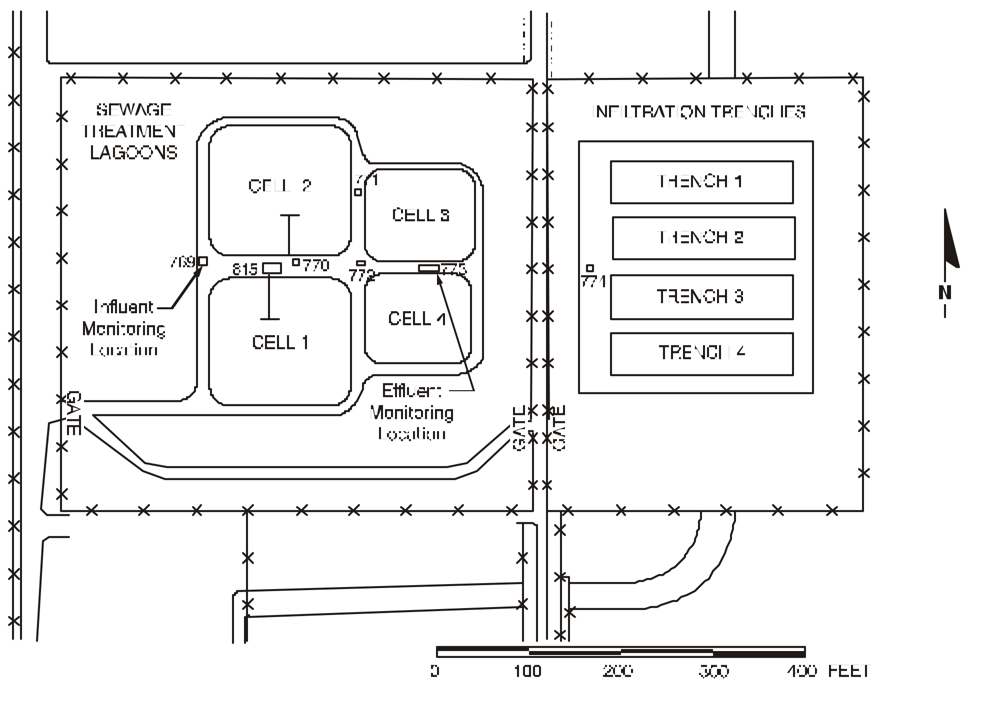

Figure 5-1. Idaho Nuclear Technology and Engineering Center Sewage Treatment Plant and rapid infiltration trenches.

The six control stations direct the wastewater flow to the proper sequence of lagoons and infiltration trenches. Automatic flow-proportional composite samplers are located at control stations CPP-769 (influent) and CPP-773 (wastewater from the STP to the RI trenches). The composite samplers are connected to flow meters, thus allowing flow-proportional samples to be taken.

The influent wastewater is routed to aerated lagoon Cell No. 1. The wastewater then passes from Cell No. 1 through control station CPP-770 to aerated lagoon Cell No. 2. From Cell No. 2, all flow is divided in control station CPP-771, where half goes to quiescent facultative lagoon Cell No. 3 and the other half to quiescent facultative lagoon Cell No. 4. However, with the installation of two surface aerators in lagoon Cell No. 3 on April 26, 2001, this cell is no longer functioning as a quiescent facultative lagoon. The INTEC STP depends on natural biological and physical processes (digestion, oxidation, photosynthesis, respiration, aeration, and evaporation) to treat the wastewater.

The STP was originally designed to treat a flow of 80,000 gallons per day (gpd). However, an influent flow of 40,000 gpd more closely approximates the actual average influent flow (based on the 1999 and 2000 reporting years). Lagoon Cell Nos. 1 and 2 each have a retention time of 11 days at the designed flow of 80,000 gpd and 22 days at 40,000 gpd. Lagoon Cell Nos. 3 and 4 each have a designed retention time of 4.5 days at the maximum flow of 80,000 gpd to each cell. Because the flow splits, with 20,000 gpd going to each cell, the calculated retention time for each cell is approximately 18 days.

As discussed in more detail in Section 5.2, the additional aeration from operating both blowers in Cell Nos. 1 and 2 and the surface aerators in Cell No. 3 are expected to increase the removal of ammonia from the wastewater. Ammonia is removed through the process of air stripping and thereby, reduces the concentration of total nitrogen in the effluent.

After treatment, the wastewater passes through control station CPP-773 to CPP-774 where it is then routed to one of four RI trenches. In March 1997, trench rotation frequency was increased from biweekly to weekly to maximize the nitrification/denitrification process in the soil beneath the RI trenches.

In August 2001, approximately 700 gallons of wastewater from a sewer line from CPP-1713 (one of the four lift stations which pumps waste into main lift station, CPP-728) was discharged to a storm water drainage ditch, rather than being pumped to the STP. The CPP-1713 lift station was being repositioned in order to facilitate construction of the Tank Farm drainage system upgrade. The discharge was identified as domestic wastewater consisting primarily of potable water from a leaking valve. The pumping of the lift station water to the storm water ditch was a permit noncompliance, and DEQ was notified in August (Miller 2001). The wastewater tested positive for coliform (at 330 and 350 colonies/100mL) and had a nitrate concentration of 3.6 mg/L, well below the drinking water primary constituent standard of 10 mg/L. No other unplanned discharges occurred during the year.

5.2 Status of Special Compliance Conditions

In accordance with the permit, the INTEC STP was required to meet the total nitrogen limit of 20 mg/L measured at the influent to the RI trenches (CPP-773, effluent) within 2 years of permit issuance, or submit a preliminary engineering report outlining modifications that would bring the facility into compliance. Because the total nitrogen did not exceed 20 mg/L since permit issuance (September 20, 1995), it was agreed during a conference call on April 1, 1997, between DEQ and the INEEL that an approved engineering plan was not required. However, in December of 1997, the total nitrogen limit was exceeded for the first time. Due to this and several subsequent exceedences, an engineering study and a corrective action plan were submitted to DEQ on November 11, 1998 (Graham 1998), for review and approval.

As discussed in the 2000 Wastewater Land Application Site Performance Reports for the INEEL (INEEL 2001), the majority of corrective actions identified in the corrective action plan were completed prior to the start of the 2001 permit year. However, a maintenance corrective action (considered long term) to replace the shear gates located in the control structures began during the 2001 permit year. Replacing the shear gates was expected to improve control of wastewater flow throughout the STP. The construction phase of the project began on November 13, 2000, and initial installation of the new slide gate valves was completed on December 14, 2000. However, it was later determined that several of the new slide gate valves were leaking (Guymon 2001b). All of the leaks associated with the new slide gate valves have since been eliminated except for one slide gate in control structure CPP-773. To control this leak, a temporary plug was installed. A replacement slide gate is scheduled for installation in the spring of 2002.

In addition to the corrective actions identified in the corrective action plan, the effects of additional aeration to strip ammonia from the wastewater continue to be evaluated. The simultaneous operation of two blowers, providing aeration to lagoon Cell Nos. 1 and 2, and the installation and operation of two surface aerators in lagoon Cell No. 3 are being tested. Section 5.3.1 discusses nitrogen concentrations and nitrogen removal in the STP lagoons.

5.3 Influent and Effluent Monitoring Results

The permit sets effluent (CPP-773, wastewater from the STP to the RI trenches) limits for total nitrogen (TKN + NNN) and TSS and requires that the influent and effluent be sampled and analyzed monthly for several parameters. Influent samples were collected from control station CPP-769, and effluent samples were collected from control station CPP-773. The samples were analyzed for the parameters required by Schedule B of the permit. The data are summarized in Tables 5-1 and 5-2.

Except for the monthly total coliform grab sample, all samples are to be collected as 24-hour flow-proportional composites. During the 2001 permit year, it was discovered that all effluent electrical conductivity samples taken prior to the May 2001 sampling had been collected as grab samples, rather than as 24-hour flow proportional composites. The DEQ was notified on April 12, 2001 (Graham 2001b), and since May 2001, composite samples for effluent electrical conductivity have been taken as required.

Two other anomalies were discovered with the influent sampling for the 2001 permit year. During November 2000, a composite sample was taken from the influent and sent to an outside analytical laboratory for TSS analysis. However the analytical laboratory failed to perform the requested analysis. The missing TSS result was discovered during preparation of this report. The DEQ was verbally notified during a conference call on December 13, 2001.[d] It was agreed to during the conference call, that documenting the missed laboratory analysis in this report and including the TSS results from three grab samples collected by the CFA Wastewater Operations would satisfy the permit-required notifications. The average TSS concentration of the three grab samples taken by CFA Wastewater Operations during November 2000 is presented in Table 5-1, rather than the permit-required composite result. Also, the December 2000 influent sample was not taken due to a miscommunication concerning the Shear Gate Replacement Project. The DEQ was notified on February 1, 2001, of the missed compliance sample (Graham 2001a).

d. W. Teuscher, DEQ, M. MacConnel, INEEL, Conference Call, December 13, 2001.

Table 5-1. Idaho Nuclear Technology and Engineering Center Sewage Treatment Plant influent data.

Sample Month	Sample Date	TKN (mg/L)	NNN (mg/L)	Total P (mg/L)	TSS (mg/L)	BOD (mg/L)
November	11/2/2000	41.80	0.016	5.92	111[a]	363.0
December	—[b]	—	—	—	—	—
January	1/30/2001	59.20	0.295	9.10	399.0	116.0
February	2/6/2001	43.00	0.173	5.61	181.0	92.4
March	3/7/2001	41.60	0.251	4.71	189.0	185.0
April	4/11/2001	63.45[c]	0.022[c]	7.41	243.0[c]	125.9[c]
May	5/9/2001	57.05[c]	0.039[c]	4.95	165.0[c]	114.1[c]
June	6/6/2001	46.50[c]	0.100[c]	5.34	174.5[c]	129.0[c]
July	7/25/2001	52.00[c]	0.032[c]	6.09	102.4[c]	152.7[c]
August	8/29/2001	51.90[c]	0.010 U[c,d]	5.77	115.3[c]	129.0[c]
September	9/6/2001	53.40[c]	0.022[c]	4.96	249.6[c]	111.8[c]
October	10/3/2001	56.60	0.010 U	6.43	134.0	78.9
Yearly Average[e]		51.50	0.087	6.03	187.6	145.3

a. A composite sample was taken on 11/2/2000 and submitted for TSS analysis. However, the analytical laboratory failed to perform the requested analysis. The result shown is the average of grab samples taken by CFA Wastewater Operations on 11/9/2000 (113 mg/L), 11/15/2000 (124 mg/L), and 11/30/2000 (97 mg/L).

b. No influent sample was taken in December as the result of a miscommunication.

c. The result shown is the monthly average of all reported results for the month. Additional samples were taken on 4/11/2001, 5/9/2001, 6/6/2001, 7/10/2001, 8/15/2001, and 9/26/2001. Half the detection limit was used in the average calculation for those results reported as below the detection limit

d. U flag indicates that the result was reported as below the detection limit.

e. Yearly average is determined from the average of the monthly values. Half the detection limit was used in the average calculation for those results reported as below the detection limit.

Monthly average effluent TSS concentrations remained below the monthly average limit of 100 mg/L, with an annual average of 31 mg/L. During the 2001 permit year, the average monthly total nitrogen exceeded the monthly average limit of 20 mg/L during February, March, and April. Typically, the highest nitrogen concentrations occur during the colder months. However, due to work being performed on the Shear Gate Replacement Project, the potential for both TSS and total nitrogen exceedences existed until the treatment system had time to stabilize (Graham 2001a). The nitrogen results are discussed further in Section 5.3.1.

Most permit-required parameters were within the range of concentrations reported in past years. Exceptions were the effluent yearly average concentrations of nitrate + nitrite and total coliform, which were the lowest reported averages since the permit was issued; and effluent BOD, TDS, chloride, and electrical conductivity, which were higher than past years. Based on the Mann-Kendall nonparametric test for trends, increasing trends over time were found for effluent BOD, TDS, and electrical conductivity concentrations. The average BOD concentration (17.62 mg/L) was only slightly higher than the 2000 permit year average of 17.22 mg/L. The higher-than-normal concentrations of TDS, chloride, and

Table 5-2. Idaho Nuclear Technology and Engineering Center Sewage Treatment Plant effluent data.

Sample Month	Sample Date	TKN (mg/L)	NNN (mg/L)	BOD (mg/L)	TSS (mg/L)	Total P (mg/L)	EC (umhos/cm)	TDS (mg/L)	Cl (mg/L)	Total Coliform[a] (col/100 mL)
November	11/2/2000	10.30	2.73	15.10	25.90	4.65	731.8[b]	535.0	91.60	800
December	—[c]	—	—	—	—	—	—	—	—	—
January	—[c]	—	—	—	—	—	—	—	—	—
February[d]	2/27/2001	30.30	1.21	11.10	4.90	5.55	846.3[b]	375.0	82.00	160
March	3/28/2001	21.10	0.417	19.60	17.50	4.70	679.4[b]	370.0	64.10	800
April	4/11/2001[e]	25.30	0.765	21.00	22.70	NA[e]	827.5[b]	NA	NA	NA
May	5/23/2001	17.10	0.970	23.70	55.90	5.04	826.3	562.0	145.0	800
June	6/6/2001	11.85[f]	1.09[f]	19.65[f]	23.20[f]	7.75	992.8	633.0	154.0	280
July	7/25/2001	13.26[f]	1.12[f]	20.15[f]	26.40[f]	4.50	992.2	620.0	171.0	31
August	8/29/2001	6.97[f]	0.363[f]	25.15[f]	56.15[f]	1.80	1023.0	653.0	197.0	145
September	9/6/2001	6.79[f]	0.835[f]	14.40[f]	47.07[f]	1.82[f]	991.3	616.5[f]	192.5[f]	86
October	10/3/2001	6.36	0.945	6.33	26.70	2.55	1021.0	641.0	184.0	365
Yearly Average[g]		14.93	1.045	17.62	30.64	4.26	893.2	556.2	142.4	385

a. Coliform samples were collected independent of the other effluent samples on 11/9/2000, 2/28/2001, 3/7/2001, 5/23/2001, 6/21/2001, 7/26/2001, 8/30/2001, 9/6/2001, and 10/4/2001.

b. The electrical conductivity result shown is from a grab sample, rather than a 24-hour flow-proportional composite sample.

c. No effluent samples were taken during December 2000 and January 2001 due to the Shear Gate Replacement Project.

d. The February sample was taken as a time-proportional composite sample. The normal flow-proportional composite sample could not be obtained due to icy buildup in the control structure.

e. Not available. The compliance sample scheduled for the week of April 23, 2001 was not taken due to ongoing work on the shear gates; therefore no results are shown for total phosphorous, TDS, or chloride. The results shown for the remaining parameters are from a special sample taken on April 11, 2001, for the nitrogen study.

f. The result shown is a monthly average of all reported results for the month. Additional samples were taken on 6/6/2001, 7/10/2001, 8/15/2001, 9/6/2001, and 9/26/2001.

g. Yearly average is determined from the average of the monthly values. Half the detection limit was used in the average calculation for those results reported as below the detection limit.

electrical conductivity are most likely the result of increased mixing caused by refilling the ponds and the increased aeration in Pond 3 not allowing the wastewater to settle. The decrease in average nitrate + nitrite concentration can also be attributed to draining the ponds in support of the Shear Gate Replacement Project. The ponds were drained during the colder part of the year (initially in November 2000 and again in April 2001), and the nitrifying bacteria, which convert ammonia to nitrate + nitrite, would have been removed from the ponds. In addition, the cold weather would have inhibited bacteria regrowth. The decrease in the average total coliform count could also be attributed to these same factors, which could have resulted in reduced coliform growth.

Table 5-3 summarizes calculated removal efficiencies (REs) for total nitrogen, BOD, and TSS. As in previous years, in general BOD and TSS continue to be treated more efficiently than total nitrogen by a lagoon system, with yearly average REs of 87% for BOD, 80% for TSS, and 68% for total nitrogen. For the 2001 permit year, the lower RE yearly average for TSS could be the result of the work performed during the Shear Gate Replacement Project and decreased settling time in Pond 3.

Table 5-3. Removal efficiency[a] for permit monitoring parameters at the Idaho Nuclear Technology and Engineering Center Sewage Treatment Plant.

Sample Month	Total Nitrogen[b] (%)	BOD (%)	TSS (%)
November 2000	69	96	NC[c]
December 2000	NC	NC	NC
January 2001	NC	NC	NC
February 2001	27	88	97
March 2001	49	89	91
April 2001	59	83	91
May 2001	68[d]	79	66
June 2001	72[d]	85	87
July 2001	72	87	74
August 2001	86[d]	81	51
September 2001	86	87	81
October 2001	87[d]	92	80
Yearly Average	68	87	80

a. Removal efficiency (RE) = [(average monthly influent concentration – average monthly effluent concentration) ÷ average monthly influent concentration)] × 100.

b. Total nitrogen includes NNN and TKN.

c. NC—not calculated. For November TSS, no influent result was available for the RE calculation. For December and January, no effluent result was available for the RE calculation due to the Shear Gate Replacement Project.

d. Half the detection limit was used in the RE calculation for the influent NNN concentration, where applicable, for those results reported as below the detection limit.

5.3.1 Wastewater Nitrogen Concentrations

Figure 5-2 shows the influent (CPP-769) and effluent (CPP-773) total nitrogen concentrations from 1995 through the current reporting year. Since the 2000 annual WLAP report was published, additional information was received from the analytical laboratory about the December 1999 and January 2000 influent TKN results originally reported as 196 mg/L. As a result of this information and further validation of the associated data packages, the results were rejected and are considered unusable. TKN is a component of total nitrogen, and the total nitrogen concentrations shown in Figure 5-2 reflect this change.

Samples were not collected from the influent in December 2000, or from the effluent in December 2000 and January 2001 due to construction activities associated with the Shear Gate Replacement Project. During the 2001 permit year, total nitrogen concentration exceeded the permit limit three times in the effluent. These exceedances occurred in February, March, and April of 2001. Typically, the highest nitrogen concentrations occur during the colder months. However, the high concentrations for these 3 months may have been a result, at least in part, of the lagoons being lowered during the Shear Gate Replacement Project and not having a chance to stabilize. Wastewater did not begin to flow through CPP-773 until February 2001 and was intermittent throughout the month.

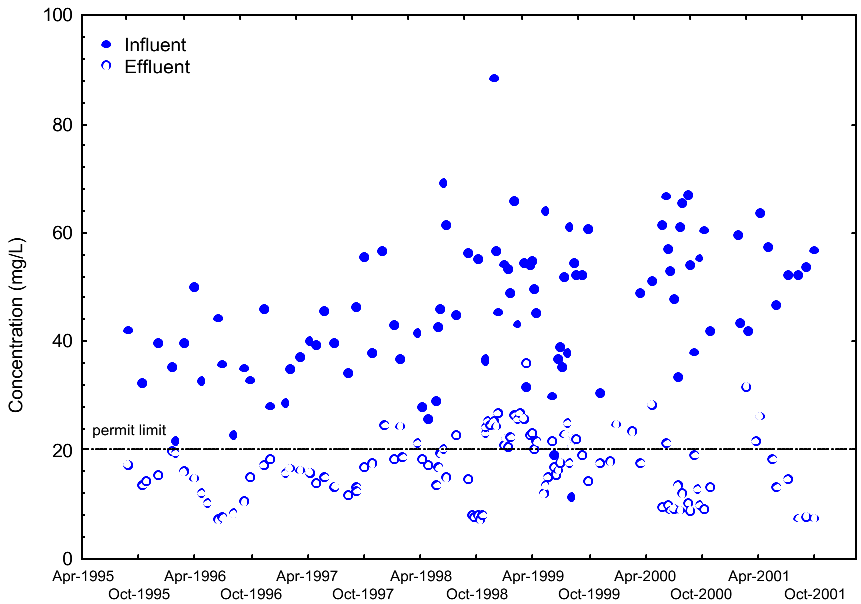

Figure 5-2. Idaho Nuclear Technology and Engineering Center Sewage Treatment Plant total nitrogen concentrations.

The effects of additional aeration to strip ammonia from the wastewater are continuing to be evaluated. It has been determined through sampling and analysis that the majority of total nitrogen in the wastewater entering the STP is in the form of ammonia (Figure 5-3), although some nitrification/denitrification still occurs. Total nitrogen is defined as the sum of TKN and nitrate + nitrite. TKN is the sum of free ammonia and organic nitrogen compounds. Therefore, reducing the ammonia concentration will reduce the total nitrogen concentration.

Two blowers are available to aerate lagoon Cell Nos. 1 and 2. Normal operation is to run one blower at a time. Both blowers began operating simultaneously in mid-June of 2000. Operating both blowers approximately doubles the airflow rate to Cell Nos. 1 and 2. Use of the blowers was discontinued November 13, 2000, through January 7, 2001, as a result of draining the lagoons in support of the Shear Gate Replacement Project. Both blowers were restarted on January 8, 2001. Operation of both blowers ceased in February when ice build-up around the aerators in Pond 2 caused problems with the pressure relief valve and gauge. The ice build-up results in back pressure, which causes the relief valves to lift. Use of a single blower continued until March 5, 2001, when the ice thawed and the pressure relief valve and gauge began operating correctly. Both blowers have been operating since March 5, 2001. Preliminary results from samples taken at control structure CPP-771 (effluent from lagoon Cell No. 2) indicate that operating the two blowers has increased ammonia removal. Two, 5–horsepower, surface aerators were installed in lagoon Cell No. 3 on April 26, 2001. The aerators began operating on June 4, 2001. No aerators were installed in lagoon Cell No. 4. In this way, Cell No. 4 can be used as a control to compare the effects of aeration vs. no aeration. A plan to test the surface aerators was submitted to the DEQ on May 24, 2001, and approved by the DEQ on June 5, 2001 (Eager 2001a).

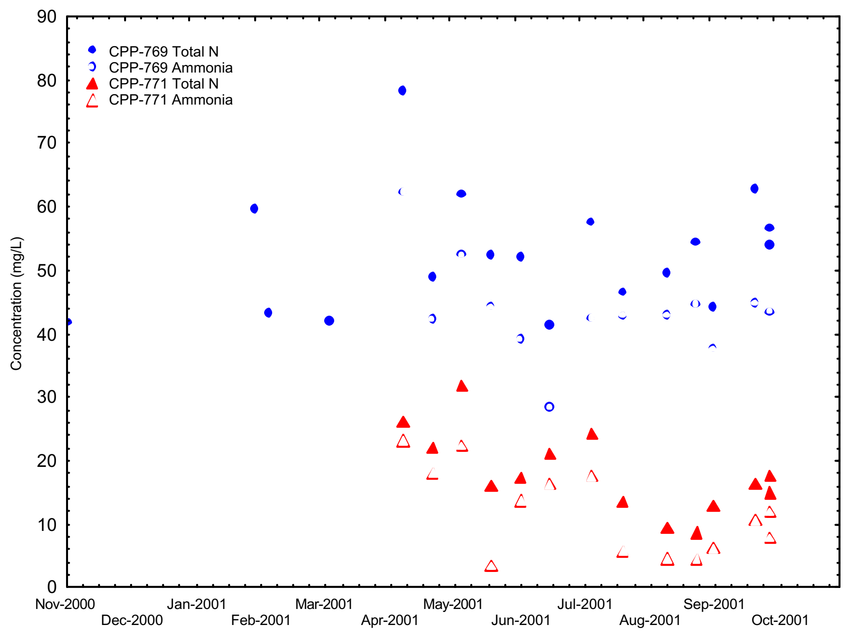

Figure 5-3. Comparison of total nitrogen and ammonia concentrations at sampling locations CPP-769 and CPP-771.

Beginning on April 11, 2001, grab and composite samples were collected bimonthly from control structures CPP-769, -771, and -773 as well as from lagoon Cell Nos. 3 and 4. All five locations were scheduled to be sampled on the same day. However, due to work associated with the Shear Gate Replacement Project, some of the samples scheduled for CPP-773 and Cell Nos. 3 and 4 were not able to be collected on the scheduled days in April and May. All samples were collected as scheduled starting May 23, 2001. The samples were analyzed for TKN, ammonia, nitrate, and nitrite. In addition, the samples were also analyzed for BOD, TSS, alkalinity, temperature, pH, and dissolved oxygen (DO). Temperature, pH, and DO were taken as field measurements. The other samples were shipped to an off-Site laboratory.

Sample results (Figure 5-4) show that operation of the surface aerators in Pond 3 has removed additional ammonia at a higher percentage than the control pond, Pond 4, which relies on the nitrification/ denitrification cycle. A status report for the surface aerators covering the period of April 11, 2001, through September 26, 2001, was submitted to DEQ on February 4, 2002 (Guymon 2002).

Total nitrogen in the effluent has not exceeded the permit limit since the surface aerators in Pond 3 began operating in June of 2001. However, cold temperatures reduce the efficiency of the air-stripping process. Sampling and analysis will continue throughout the winter to evaluate if operating both blowers in Ponds 1 and 2 and the surface aerators in Pond 3 will maintain the effluent total nitrogen concentration below the permit limit.

5.3.2 Flow Volumes

Influent flow is measured by two ultrasonic, dual transducer, clamp-on-design flow meters attached to the force main lines coming from final lift stations CPP-728 and CPP-733. These flow meters are located just prior to the CPP-769 (influent to the STP) control structure. The effluent (CPP-773, wastewater from the STP to the RI trenches) flow meter consists of an ultrasonic level sensor and a

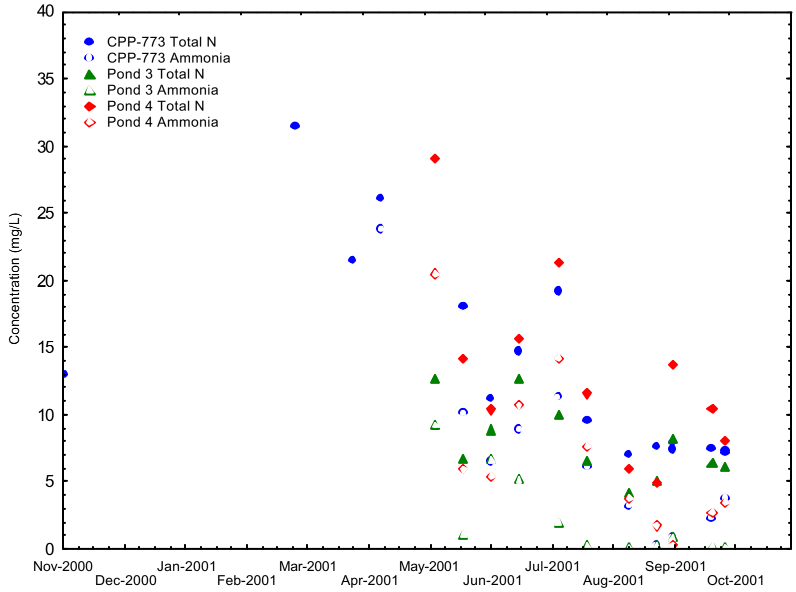

Figure 5-4. Comparison of total nitrogen and ammonia concentrations at sampling locations CPP-773, Pond 3, and Pond 4.

V-notch weir plate. The two influent flow meters and the effluent flow meter provide continuous flow data. Daily flow readings are taken and recorded in gpd. Table 5-4 summarizes monthly and total flow volume, and Appendix C presents daily flow readings.

Beginning March 17, 1997, the rotation frequency of the infiltration trenches was changed from 2 weeks to 1 week. This increased rotation frequency allowed greater soil wetting and drying in an effort to maximize nitrogen removal. Table 5-5 summarizes the monthly flow to each trench. The 1 week rotation frequency was maintained during the 2001 permit year, even during periods of no flow, with two exceptions. Trench 2 was used from November 13, 2000, through December 3, 2000 to empty the ponds, and from December 18, 2000, through January 2, 2001. In addition, Trench 2 was taken out of service in March 2001 due to erosion and returned to service in May 2001. For the 2001 permit year, Trench 3 was out of service until April 23, 2001, due to erosion.

Total annual effluent flow to the trenches was 4.48 MG during the 2001 permit year, which is well below the permit limit of 30 MG/year, and significantly less than previous years. During 1997 a disparity between the measured influent and effluent values was identified. Since 1997 (as documented in past annual reports), engineering studies, corrective actions, and flow studies have been performed to address the disparity. However, the disparity continued through the 2000 permit year. During the annual calibration performed in April 2001, one influent flow meter was found to be malfunctioning due to a problem with the ultrasonic transducer. A diagnostic check performed on the other influent flow meter in June 2001 suggested that the flow meter was working properly.[e] In July 2001, the ultrasonic transducer associated with the effluent flow meter failed. Both flow meters were repaired and became fully functional in September 2001. Problems with the influent and effluent flow meters and the lack of flow resulting from the work associated with the Shear Gate Replacement Project during the 2001 permit year makes it difficult to fully assess the disparity. Monitoring of the influent and effluent flows will continue.

e. P. Kucmas, Panametrics, e-mail to K. Noah, INEEL, July 6, 2001.

Table 5-4. Idaho Nuclear Technology and Engineering Center Sewage Treatment Plant flow summaries.

Sample Month[a]	Influent Average (gpd[b])	Influent Minimum[c] (gpd)	Influent Maximum (gpd)	Influent Total (MG[d])	Effluent Average (gpd)	Effluent Minimum[c] (gpd)	Effluent Maximum (gpd)	Effluent Total (MG)
November 2000	41,709	21,103	76,699	1.25	18,719	15,485	1,540,000[e]	1.95
December 2000	29,307	18,203	46,813	0.91	NF[f]	NF	NF	NF
January 2001	28,700	15,223	42,571	0.89	NF	NF	NF	NF
February 2001	29,149	18,557	41,860	0.82	2,117	1,437	13,303	0.06
March 2001	35,043	15,676	85,433	1.09	9,329	2,257	68,598	0.29
April 2001	48,604	20,120	73,937	1.46	25,870	5,526	720,000[g]	0.78
May 2001	NF	NF	NF	NF	44	2	688	0.001
June 2001	NF	NF	NF	NF	4,201	124	12,625	0.13
July 2001	39,509	4,507	70,013	1.23	7,791	45	29,629	0.24
August 2001	54,054	19,457	200,000[h]	1.68	3,353	672	11,131	0.10
September 2001	31,939	9,347	60,228	0.96	12,744	283	31,371	0.38
October 2001	32,509	3,877	60,160	1.01	17,739	1,123	46,565	0.55
Yearly	30,895	3,877	200,000	11.28	12,267	2	1,540,000	4.48

a. Accuracy of influent flow readings is suspect for the months of April through August due to problems with the ultrasonic transducer. Accuracy of effluent flow readings is suspect for the months of July through August due to problems with the ultrasonic transducer. The flow meters were repaired during the first week of September.

b. gpd—gallons per day.

c. Minimums shown for the month are based on days when the flow meters were operational.

d. Monthly and annual permit totals are shown in million gallons (MG).

e. The high maximum flow represents an estimate of the total flow from the ponds prior to initiation of the Shear Gate Replacement Project.

f. NF—no flow. Effluent flow was discontinued on November 14, 2000, due to the Shear Gate Replacement Project. Flow resumed intermittently on February 18, 2001, for the remainder of the year. Flow meter problems prevented measuring influent flow during May, June, and the first 3 days of July.

g. The high maximum flow represents an estimate of the total flow from Ponds 3 and 4, which were drained to repair the shear gates.

h. The high maximum influent flow is most likely the result of problems with the flow meters, which were repaired in September.

5.4 Groundwater Monitoring Results

To measure potential STP impacts to groundwater, the permit requires that groundwater samples be collected from three monitoring wells (see Figure 5-5):

- One background aquifer well (USGS-121) upgradient of INTEC
- One perched water well (ICPP-MON-PW-024) immediately adjacent to the STP
- One aquifer well (USGS-052) downgradient of the STP, which serves as the point of compliance.

Sampling must be conducted semiannually and must include a list of specified parameters for analysis. Contaminant concentrations in USGS-052 are limited by primary constituent standards and secondary constituent standards specified in IDAPA 58.01.11, “Ground Water Quality Rule."

Table 5-5. Monthly flow to each trench.

Sample Month	Trench 1 (MU-011501) (MG)[a]	Trench 2 (MU-011502) (MG)	Trench 3 (MU-011503) (MG)	Trench 4 (MU-011504) (MG)
November 2000	0.21	1.74	NF[b]	NF
December 2000	NF	NF	NF	NF
January 2001	NF	NF	NF	NF
February 2001	0.05	NF	NF	0.01
March 2001	0.03	0.11	NF	0.15
April 2001	NF	NF	NF	0.78
May 2001	NF	NF	NF	0.001
June 2001	0.03	0.03	0.04	0.03
July 2001	0.09	0.02	0.08	0.04
August 2001	0.04	0.04	0.01	0.01
September 2001	0.09	0.08	0.11	0.11
October 2001	0.15	0.16	0.10	0.14
Yearly Total	0.69	2.19	0.34	1.25

a. Trench totals are in million gallons (MG).

b. NF—No flow.

During the 2001 permit year, groundwater samples were collected in April and October. Table 5-6 shows the water levels (collected prior to purging and sampling) and analytical results for all parameters required by the permit. Groundwater samples collected from USGS-052 were in compliance with all permit limits during 2001. Chloride and nitrate concentrations in USGS-052 were elevated compared to USGS-121, as in previous years.

Monitoring well ICPP-MON-PW-024 was constructed in the perched water zone approximately 70 ft below the surface of the infiltration trenches. It is used as an indicator of treatment efficiency of the soil, rather than serving as a point of compliance. Similar to previous years, TDS and chloride concentrations in ICPP-MON-PW-024 approximated those of the effluent. Total coliform was detected in the October 2001 ICPP-MON-PW-024 sample and was present also in the effluent. However, the species of bacteria (*Enterobacter aerogenes*) detected in ICPP-MON-PW-024 is a type of bacteria that normally occurs in soils and water. Total nitrogen concentrations (comprised of NO_2N, NO_3N, and TKN) in the perched water closely followed those of the effluent prior to 1997 (Figure 5-6), the difference being that nearly all the total nitrogen in the perched water was comprised of NO_3N, while the effluent was primarily comprised of NH_3N. This suggests significant nitrification (a process whereby NH_3N is converted to NO_3N) by the soil, but little denitrification to a gas. In March 1997, the trench rotation frequency was increased from biweekly to weekly to increase denitrification in the soil column. Reductions in perched water concentrations compared to the effluent began in December 1996 (just before the trench rotation frequency was increased) and continued until the October 2001 sampling. As

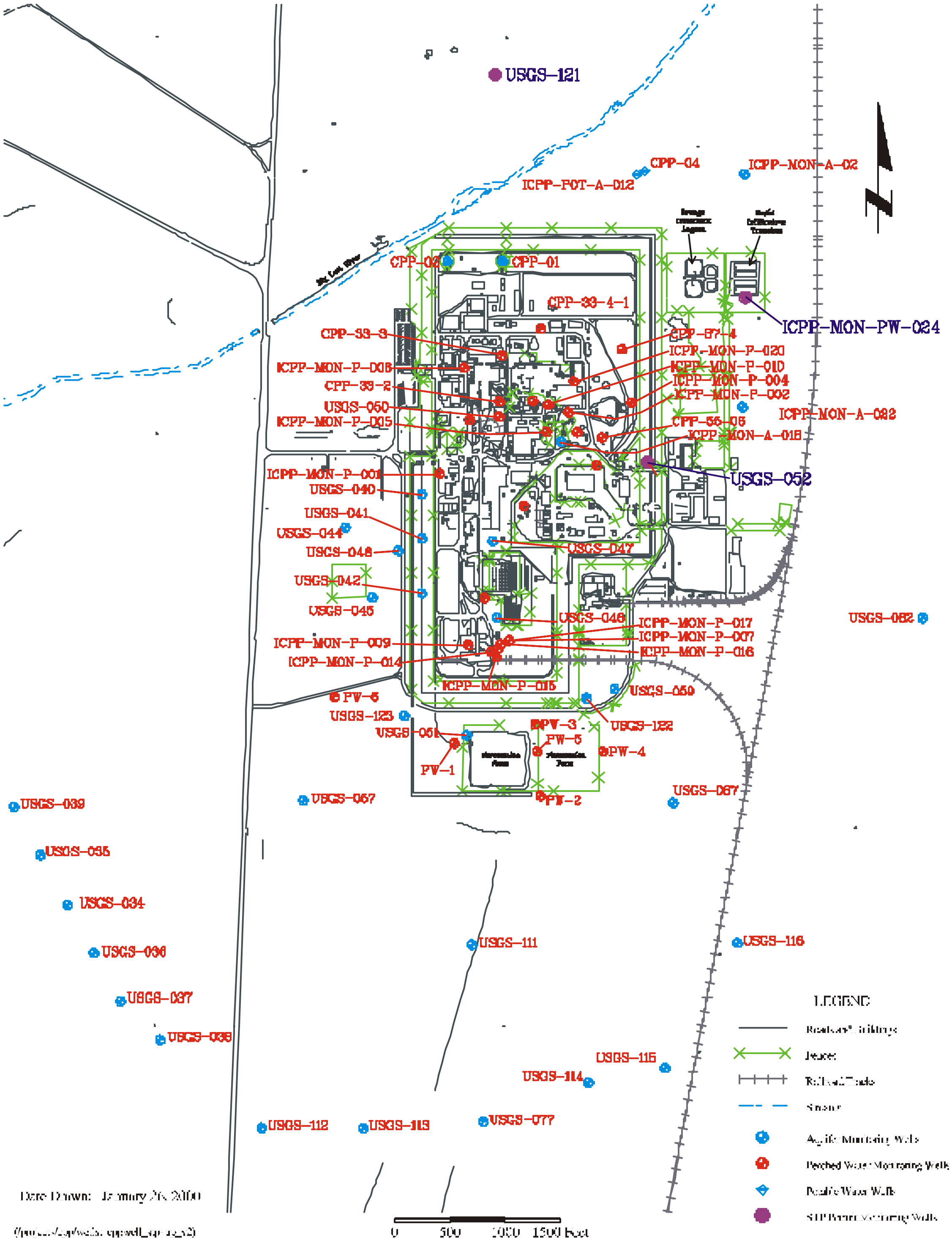

Figure 5-5. Locations of Idaho Nuclear Technology and Engineering Center Sewage Treatment Plant permit monitoring wells.

Table 5-6. Idaho Nuclear Technology and Engineering Center Sewage Treatment Plant groundwater data for April and October 2001.

	ICPP-MON-PW-024		USGS-52				USGS-121		PCS/SCS[a]
Depth to Water Table (ft)	62.71	63.46	454.36	454.36	453.39	453.39	455.97	453.74	
Sample Date (units)	4/24/01 (mg/L)	10/9/01 (mg/L)	4/25/01 (mg/L)	4/25/01[b] (mg/L)	10/22/01 (mg/L)	10/22/01[b] (mg/L)	4/24/01 (mg/L)	10/10/01 (mg/L)	(mg/L)
TKN	0.677	1.0 U[c]	0.1 U	0.1 U	1.0 U	1.0 U	0.1 U	1.0 U	NA[d]
Chloride[e]	82.1 81.8	126	25.6 25.9	25.1 25.9	27.7	27.9	11.6 11.4	11.7	250 (350)[f]
TDS	551	634	296	301	265	264	258	197	500 (800)[f]
NO_3N	12.9	12.0	3.1	3.1	3.9	3.8	0.75	0.8	10
NO_2N	0.003 U	0.10 U	0.003 U	0.003 U	0.10 U	0.10 U	0.004 U	0.10 U	1
$NO_2N + NO_3N$	13.2	16	3.32	3.33	4.0	3.84	0.757	0.82	10
NH_4N	0.01 U	0.10 U	0.01 U	0.0129	0.10 U	0.10 U	0.0405	0.1	NA
BOD	2.0 U	8.0 U	2.0 U	2.0 U	3.2	2.8	2.0 U	6.4	NA
Total P	1.95	1.8	0.0197	0.0192	0.10 U	0.10 U	0.0161	0.10 U	NA
Total coliform	Absent	6[g]	Absent	Absent	Absent	Absent	Absent	Absent	1 col/100 mL
Fecal coliform	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	NA

a. Primary constituent standards (PCS) and secondary constituent standards (SCS) in groundwater referenced in IDAPA 58.01.11.200.01.a and b.

b. Duplicate sample.

c. U flag indicates that the result was reported as below the detection limit.

d. NA—not applicable.

e. Two different samples were analyzed for chloride in April; both results are presented.

f. The permit specifies exceptions for chloride and TDS limits of 350 mg/L and 800 mg/L, respectively.

g. Coliform bacteria was speciated as *Enterobacter aerogenes*, which is a naturally occurring bacteria in soils and water.

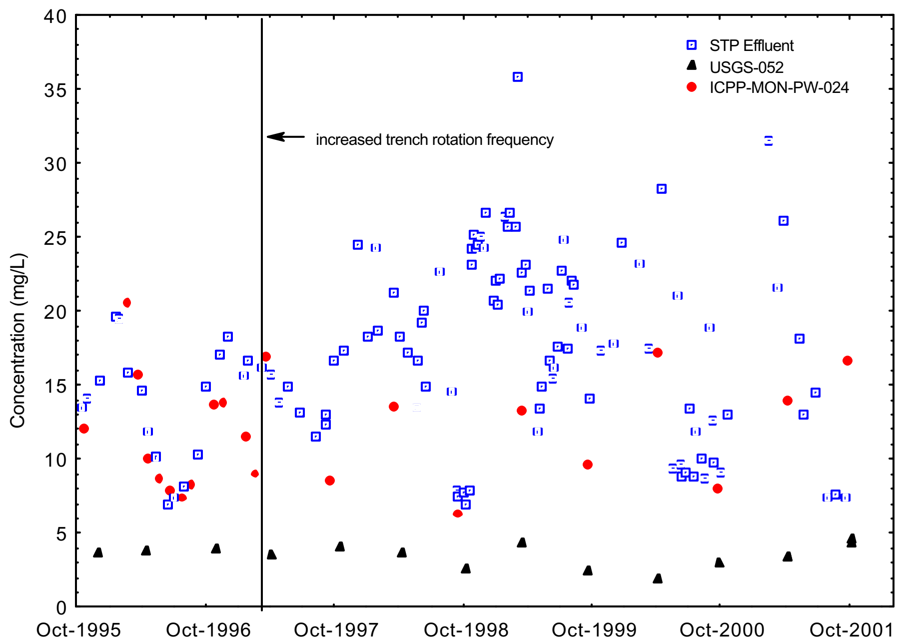

Figure 5-6. Total nitrogen concentrations in Sewage Treatment Plant effluent, ICPP-MON-PW-024, and USGS-052.

shown in Figure 5-6, total nitrogen concentrations in the perched water appeared to be reduced compared to that of the effluent, with concentrations falling between that of the effluent and that measured at USGS-052. However, since August 2001, the total nitrogen concentrations in the effluent have been reduced, resulting in the October perched water total nitrogen concentration being higher than the effluent. These facts, coupled with a smaller number of perched water data points, make it difficult to quantify the relationship between trench rotation and denitrification. Weekly trench rotation will continue, and contaminant trends will continue to be observed and tracked.

5.5 Summary of Environmental Impacts

INTEC STP effluent flow volumes, effluent TSS, and groundwater concentrations were all within permit limits. Total nitrogen concentrations in the effluent exceeded the permit limit (20 mg/L) 3 months during the 2001 permit year. However, the yearly average concentration decreased from the 2000 yearly average. Maintenance and operational corrective actions have been implemented and are being evaluated to determine their effectiveness in reducing nitrogen concentrations.

A release of approximately 700 gallons of wastewater, primarily of potable water from a leaking valve, was inadvertently discharged to a drainage ditch rather than being pumped to the STP. The concentrations of nitrates and coliform in the wastewater were below those considered to cause an adverse environmental impact. No other unplanned discharges occurred during the year.

Concentrations of chloride, TKN, TDS, nitrate, and total phosphorus were elevated in the perched water well at INTEC STP compared to background concentrations. Concentrations for TKN, TDS, and total phosphorus in the aquifer were only slightly elevated or indistinguishable from background when measured at the compliance well. Concentrations of chloride and nitrate from the compliance well, while higher than the background well, were well below the permit limit.

6. TEST AREA NORTH/TECHNICAL SUPPORT FACILITY SEWAGE TREATMENT PLANT DATA SUMMARY AND ASSESSMENT

6.1 Site Description

The Test Area North (TAN) is located at the north end of the INEEL. Major facilities at TAN include:

- Technical Support Facility (TSF)
- Containment Test Facility (formerly the Loss-of-Fluid-Test Facility)
- Specific Manufacturing Capability Facilities

TAN was initially built between 1954 and 1961 to support the Aircraft Nuclear Propulsion Program sponsored by the U.S. Air Force and the Atomic Energy Commission.

The TSF area currently has approximately 40 buildings and a work force of about 65 people, representing a reduction in the work force by over half during the 2001 permit year. The TAN/TSF STP only serves the buildings in the TSF area. The TAN/TSF STP and Disposal Pond are located southwest of the TSF area and over 1,500 ft away from the nearest drinking water well. A public road passes approximately ¼ mi southeast of the area, and the nearest inhabited building is approximately 1,000 ft from the wastewater application area (Figure 6-1). Groundwater generally flows to the southeast.

6.2 System Description and Operation

The TAN/TSF STP was constructed in 1956. It was designed to treat raw wastewater by biologically digesting the majority of the organic waste and other major contaminants, then applying it to land for infiltration and evaporation. The STP consists of:

- Wastewater-collection manhole
- Imhoff tank
- Sludge drying beds
- Trickle filter and settling tank
- Contact basin
- Infiltration disposal pond.

The TAN/TSF Disposal Pond was constructed in 1971; prior to that, treated wastewater was disposed of through an injection well.

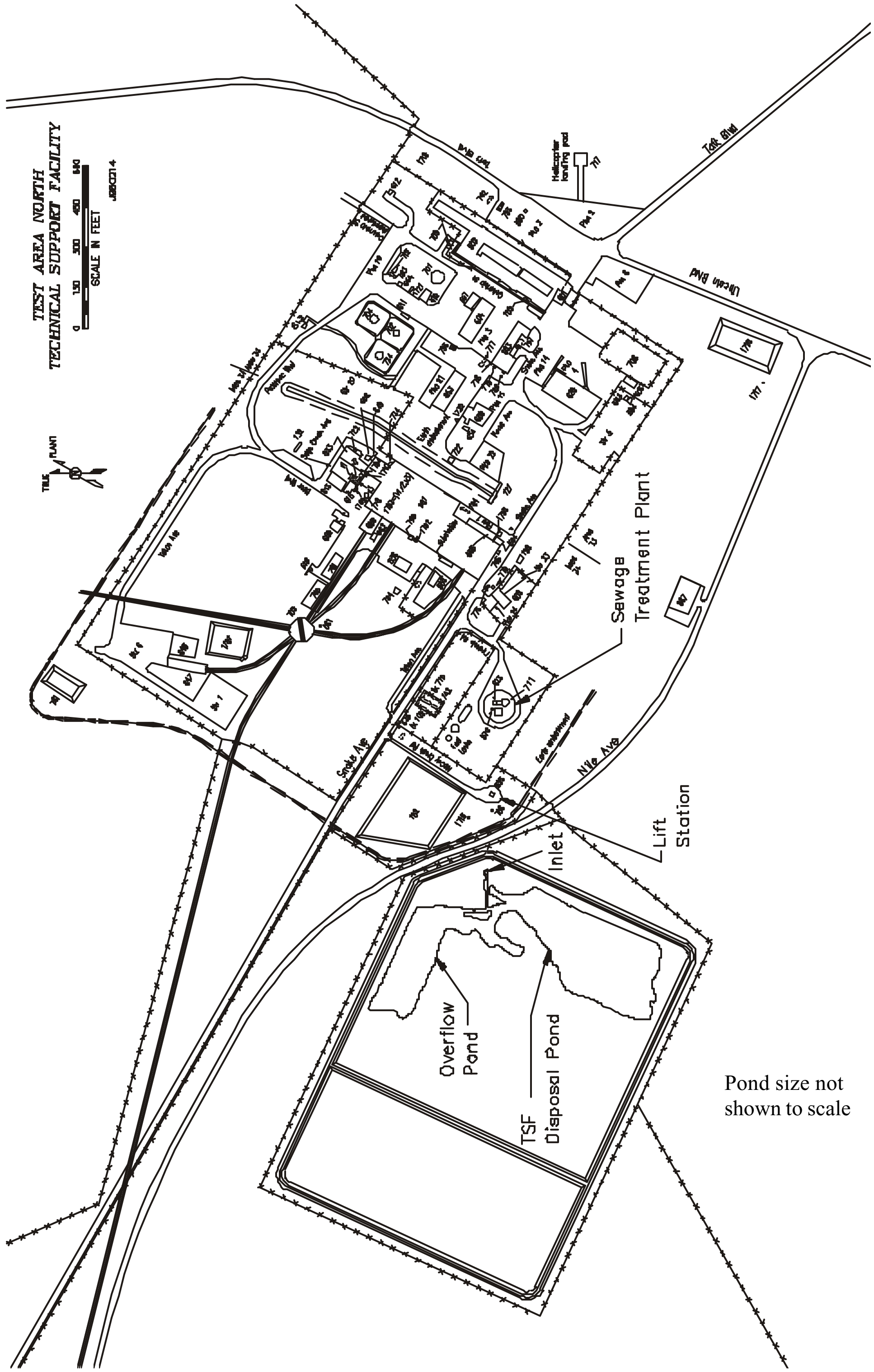

Figure 6-1. Test Area North/Technical Support Facility Sewage Treatment Plant and Wastewater Disposal Pond.

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; it is used only when the water is diverted to it for brief periods of cleanup and maintenance. The Disposal Pond and overflow pond areas are approximately 39,000 ft^2 (0.9 acres) and 14,400 ft^2 (0.330 acres), respectively, for a combined area of approximately 53,400 ft^2 (1.23 acres). In addition to receiving treated sewage wastewater, the pond also receives process wastewater, which enters the facility at the TAN-655 lift station.

The TSF sewage primarily consists of spent water containing wastes from rest rooms, sinks, and showers. The wastewater goes to the TAN-623 STP, and then to the TAN-655 lift station, which pumps to the Disposal Pond.

The process drain system collects wastewater from process drains and building sources originating from various TAN facilities. The process wastewater consists of effluent, such as steam condensate; water softener and demineralizer discharges; and cooling water, heating, ventilating, air conditioning, and air scrubber discharges. The process wastewater is transported directly to the TAN-655 lift station, where it is mixed with treated sanitary wastewater before being pumped to the Disposal Pond.

Designed output of the STP is 28,800 gpd, but can go up to 36,000 gpd, if necessary. The TAN-655 lift station has a capacity of about 800 gallons per minute, well over 1 million gpd. The pond's capacity, taking into consideration volume losses from evaporation and infiltration, is estimated at 33 MG/yr (Kaminsky et al. 1993).

There were few operational anomalies during the permit year. No flow measurements were taken on September 11, 2001, due to security shutdown; the effluent sampling scheduled for September 11, 2001, was delayed until September 27, 2001. One electrical outage affected the STP; however, no waste bypassed treatment.

6.3 Status of Special Compliance Conditions

No special compliance conditions were in effect during the 2001 permit year.

6.4 Effluent Monitoring Results

The permit for the TAN/TSF STP sets concentration limits for TSS and total nitrogen (measured at the effluent to the Disposal Pond) and requires that the effluent be sampled and analyzed monthly for several parameters. During the 2001 permit year, 24-hour composite samples (except fecal and total coliform, which were grab samples) were collected at the TAN-655 lift station effluent monthly. The permit requires that monthly samples be collected as 24-hour, flow-proportional composites. However, due to the configuration of the piping and location of the flow meter, a compositor could not be installed that collects flow-proportional samples based on real-time measurement of the two incoming waste streams. As a result, an annual flow study was started in 1997 to determine the average fluctuations in flow over a 24-hour period. The flow study is repeated every year, and the compositor is reprogrammed based on the average flows measured during different periods of the day to simulate a flow-proportional sample for the year. This method has been used to collect time-weighted, flow-proportional samples since August 1997. The DEQ verbally authorized this method of flow-proportional sampling, and written approval is pending.

Table 6-1 shows the effluent monitoring results for the 2001 permit year. Monthly concentrations of TSS were well below the permit limits (100 mg/L) throughout the entire permit year, with an average of 7.95 mg/L. All monthly total nitrogen (TKN + NNN) concentrations were well below the permit limit of 20 mg/L, with the maximum monthly concentration of 10.9 mg/L reported in February.

Table 6-1. Test Area North/Technical Support Facility water data for effluent to the TAN/TSF Disposal Pond.

	November	December	January	February	March	April	May	June	July	August	September	October	Yearly
Sample Date	11/14/2000	12/5/2000	1/24/2001	2/28/01	3/27/2001	4/25/2001	5/30/2001	6/14/2001	7/10/2001	8/14/2001	9/27/2001	10/31/2001[a]	Average[b]
Parameter (units)													
TKN (mg/L)	6.05	6.64	5.43	6.42	1.78	4.20	0.798	2.69	1.44	0.457	1.43	2.72	3.34
NH_3N (mg/L)	4.90	5.34	4.67	5.61	1.60	2.88	0.184	1.95	0.484	0.235	0.754	1.46	2.51
NNN (mg/L)	3.78	1.40	5.34	4.44	3.45	5.70	1.38	5.87	4.03	2.83	2.65	3.96	3.74
BOD (mg/L)	12.30	14.70	28.30	16.40	3.74	11.90	6.66	11.70	13.10	7.72	2.63 R[c]	12.00	12.59
Total P (mg/L)	1.17	0.996	1.15	1.28	0.903	1.38	0.295	1.33	0.756	0.542	0.433	0.821	0.921
Total coliform (col/100 mL)[d]	160,000	20,000	160,000	300,000	385,000	110,000	14,285	8,000	55,000	100,000	72,000	80,000	122,024
Fecal coliform (col/100 mL)[d]	60,000	2,000	88,000	142,000	48,000	20,000	2,000	6,000	20,500	17,500	30,000	30,000	38,833
Cl (mg/L)	279.0	149.0	227.0	192.0	24.60	79.10	12.10	22.70	18.90	106.0	16.30	143.5	105.9
As (mg/L)	0.0028	0.0025 U[e]	0.0025 U	0.0035	0.0026	0.0025 U	0.0025 U	0.0025 U	0.0025 U	0.0031	0.0025 U	0.0030	0.0020
Ba (mg/L)	0.096	0.091	0.100	0.104	0.088	0.100	0.092	0.095	0.093	0.100	0.096	0.112	0.097
Cr (mg/L)	0.0025 U	0.0028	0.0031	0.0025	0.0025 U	0.0025 U	0.0052	0.0030	0.0025 U	0.0034	0.0032	0.0025 U	0.0025
F (mg/L)	0.211	0.258	0.281	0.256	0.244	0.200 U	0.228	0.287	0.251	0.232	0.233	0.268	0.237
Pb (mg/L)	0.0031	0.0015 U	0.0015 U	0.0015 U	0.0015 U	0.0015 U	0.0015 U	0.0015 U	0.0015 U	0.0015 U	0.0015 U	0.0015 U	0.0009
Fe (mg/L)	0.352	0.117	0.064	0.150	0.056	0.065	0.122	0.098	0.114	0.071	0.029	0.139	0.115
Mn (mg/L)	0.012	0.0087	0.0080	0.0089	0.0048	0.0066	0.0041	0.0056	0.0060	0.0042	0.0028	0.0067	0.0065
Hg (mg/L)	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Se (mg/L)	0.0025 U	0.0025 U	0.0025 U	0.0025 U	0.0025 U	0.0025 U	0.0025 U	0.0025 U	0.0025 U	0.0025 U	0.0025 U	0.0025 U	0.0025 U
Na (mg/L)	168.0	91.70	141.0	114.0	15.20	45.70	7.48	12.40	10.30	56.00	9.37	80.75	62.66
Sulfate (mg/L)	44.60	42.70	43.70	44.50	33.40	31.50	32.80	37.70	39.00	38.60	33.50	35.70	38.14
TDS (mg/L)	747.0	498.0	637.0	546.0	323.0	440.0	259.0	317.0	282.0	445.0	279.0	485.0	438.2
Zn (mg/L)	0.041	0.037	0.037	0.035	0.019	0.028	0.040	0.033	0.025	0.031	0.018	0.034	0.031
TSS (mg/L)	11.20	11.70	8.70	8.90	4.00 U	7.00	7.90	10.00	9.20	6.90	4.40	7.50	7.95

a. Duplicate samples were taken on 10/31/2001 for all parameters except total and fecal coliform. For these parameters, the result shown is the average of the duplicate results. For those parameters with all results for the month reported as below the detection limit, the result shown is the reported detection limit with a U flag.

b. Half the detection limit was used in the yearly average calculations for those results reported as below the detection limit. However, for those parameters with all results for the year reported as below the detection limit, the result shown is the reported detection limit with a U flag.

c. R flag indicates that the result was rejected during data validation. Due to sample shipment delays, the required analytical hold time was missed. Therefore, the result is not included in the yearly average.

d. Coliform samples were collected independent of the composite samples on 11/29/2000, 12/13/2000, 1/24/2001, 2/28/2001, 3/27/2001, 4/23/2001, 5/30/2001, 6/16/2001, 7/11/2001, 8/16/2001, 9/13/2001, and 10/31/2001.

e. U flag indicates that the result was reported as below the detection limit.

Yearly average concentrations were lower than those measured for the previous permit year for most of the parameters. Only fecal coliform, total coliform, and sodium reported higher yearly averages than that reported for the previous permit year. Significant increasing trends were still evident for TKN and TDS, even when considering the lower concentrations for the current permit year. Elevated sodium and increasing TDS concentrations are likely the result of effluents from demineralizer regeneration, boiler blowdown, and water softening. TDS concentrations appear to increase during the winter months, which could be attributed to reduced plant efficiency and possibly to boiler operations. A review of TAN utilities chemical use records identified an increase in salt usage (for water softening) from approximately 9,050 lbs in 1997 to approximately 20,000 lbs in 1999 and 2000. The increase in salt usage during this period can be attributed to the aging/inefficient water softener system and, possibly, an increased need for softened boiler make-up water resulting from reduced condensate returns (steam leaks). A new water softener system was installed in late 2000, which resulted in reducing salt usage during 2001 to 14,760 lbs. Sodium, chloride, and TDS effluent concentrations will continue to be monitored to determine the impact of the continued reduction in salt usage. Average fecal coliform concentration (over 38,000 col/100 mL) and total coliform concentration (over 122,000 col/100 mL) both greatly exceeded past averages. The integrity of the Imhoff tank was visually inspected during the 2001 permit year. No tank leakage, which could contribute to the increased coliform concentrations, was visually evident. Further evaluation will be performed to determine the cause of the increased coliform concentrations.

6.4.1 Flow Volumes

In addition to effluent concentration limits, the permit also specifies a limit for annual effluent flow volume to the pond. The flow meters for the TAN/TSF wastewater disposal facility are at the TAN-623 STP and the TAN-655 lift station. The flow meter at the STP measures just the sewage influent volume, while the flow meter at TAN-655 measures the combined STP and the process wastewater flows, which are joined at the TAN-655 sump before being pumped to the TAN/TSF Disposal Pond. Flow measurements recorded during the permit year indicated that the process wastewater constituted approximately 82% of the total effluent to the pond. Prior to July 20, 2001, daily flow readings were recorded Monday through Thursday, with the flows reported for the remainder of the days obtained from the average of the total from those days. Beginning on July 20, 2001, the flow readings were recorded daily. No flows were recorded on September 11, 2001, due to a security shutdown. Table 6-2 summarizes monthly and total flow volumes, and Appendix D presents daily flow readings.

The permit flow limit is 34 MG per year discharged to the pond. Total effluent to the pond for the 2001 permit year was 10.34 MG. Of that amount, 1.84 MG was comprised of sewage wastewater, and the remainder was comprised of process wastewater.

6.5 Groundwater Monitoring Results

To measure potential Disposal Pond impacts to groundwater, the permit requires that groundwater samples be collected from four monitoring wells (see Figure 6-2):

- One background aquifer well (TANT-MON-A-001) upgradient of the Disposal Pond
- Three aquifer wells (TAN-10A, TAN-13A, and TANT-MON-A-002) downgradient of the Disposal Pond that serve as points of compliance.

Table 6-2. Test Area North/Technical Support Facility flow summaries.

Sample Month	Influent to STP[a]				Effluent to Pond			
	Average (gpd)	Minimum (gpd)	Maximum (gpd)	Total (MG)[b]	Average (gpd)	Minimum (gpd)	Maximum (gpd)	Total (MG)[b]
November 2000	4,747	2,895	6,420	0.14	31,100	26,250	35,000	0.93
December 2000	3,881	2,108	8,310	0.12	34,323	31,250	43,500	1.06
January 2001	5,936	983	13,230	0.18	34,839	31,000	37,000	1.08
February 2001	8,753	5,205	16,320	0.25	33,500	30,000	44,000	0.94
March 2001	5,511	3,083	10,410	0.17	33,113	27,000	37,000	1.03
April 2001	3,243	1,553	7,320	0.1	27,817	25,250	33,000	0.83
May 2001	2,597	1,598	5,190	0.08	31,123	10,000	59,600	0.96
June 2001	3,997	2,303	12,270	0.12	32,007	6,750	97,750	0.96
July 2001	5,690	2,160	13,860	0.18	18,355	6,000	43,000	0.57
August 2001	7,158	3,210	10,260	0.22	25,387	14,000	44,000	0.79
September 2001[c]	5,645	2,790	15,210	0.17	19,700	10,000	48,000	0.59
October 2001	3,703	2,220	5,550	0.11	19,226	8,000	43,000	0.6
Yearly Summary	5,049	983	16,320	1.84	28,340	6,000	97,750	10.34

a. Influent flow measurements were not required by the permit, but are presented for comparison information.

b. Annual flow totals are shown in million gallons (MG).

c. No flow was reported for 9/11/2001, due to a security shutdown. Therefore, the minimums shown for the month are determined from the reported flows greater than zero.

Sampling must be conducted semiannually and must include several specified parameters for analysis. Contaminant concentrations in TAN-10A, TAN-13A, and TANT-MON-A-002 are limited by primary constituent standards and secondary constituent standards specified in IDAPA 58.01.11, "Ground Water Quality Rule."

During the 2001 permit year, groundwater samples were collected in April and October. Table 6-3 shows water levels (recorded prior to purging and sampling) and analytical results for all parameters specified by the permit. Iron concentrations exceeded permit standards of 0.3 mg/L in TANT-MON-A-001 (the background well) and TAN-13A in April and October, in TAN-MON-002 in April, and in TAN-10A in October. These observations are consistent with results of the past few years; elevated iron concentrations historically have been detected in the TAN WLAP monitoring wells. Due to increased iron concentrations in all four of the TAN WLAP wells in 1999, a corrosion evaluation (CORRPRO 2000) was performed at TAN wells that exhibited similar increases. This evaluation confirmed that the riser pipes at several TAN wells were significantly corroded and attributed the increased iron concentrations to the corrosion. The riser pipes attached to the dedicated submersible pumps were replaced with stainless steel riser pipes in all four TAN monitoring wells during August 2001. Video log information gathered during the well maintenance showed that the

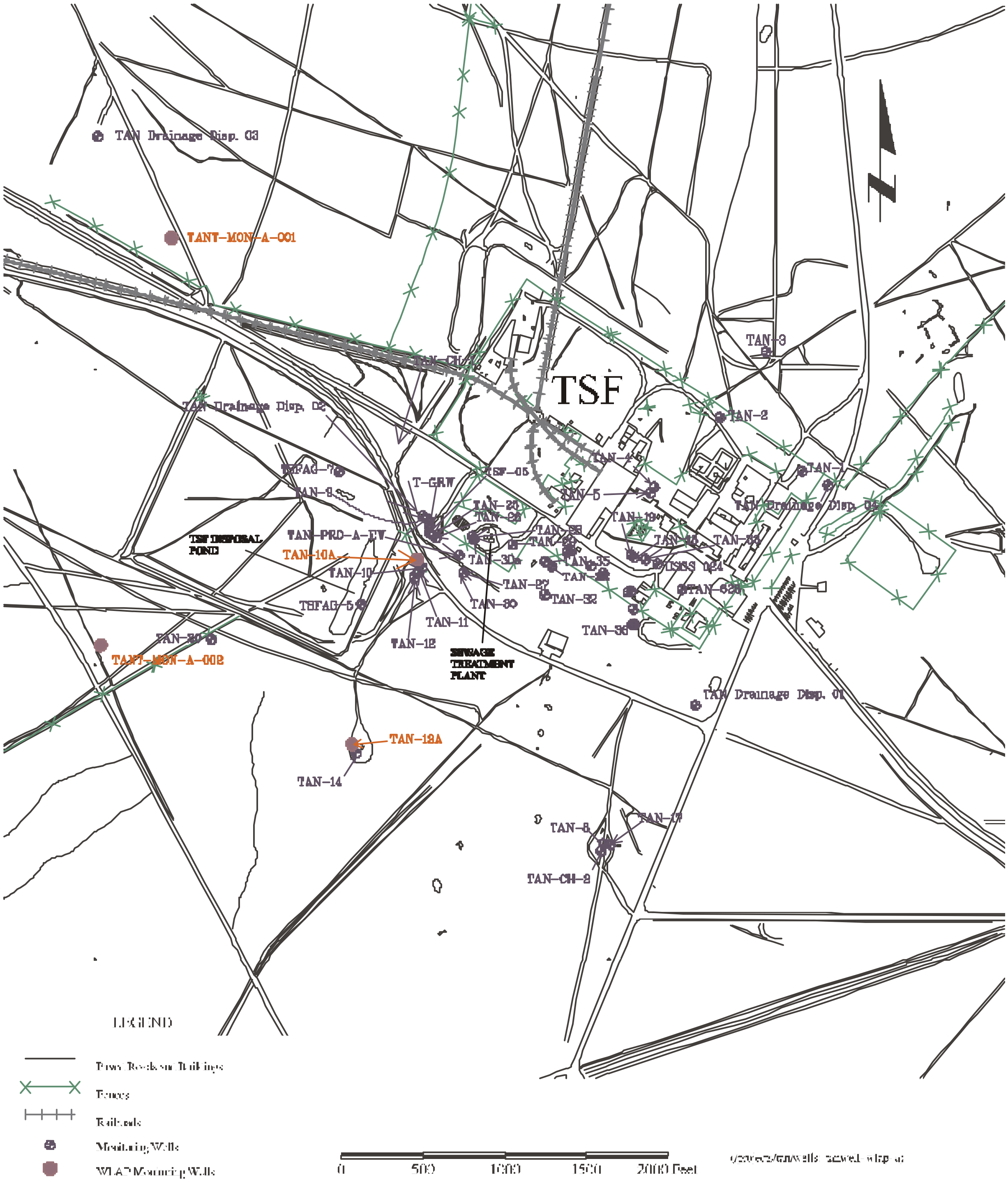

Figure 6-2. Locations of Test Area North/Technical Support Facility monitoring wells.

Table 6-3. Test Area North/Technical Support Facility Sewage Treatment Plant groundwater data for April and October 2001.

	TANT-MON-A-001		TANT-MON-A-002		TAN-10A				TAN-13A		PCS/SCS[a]
Depth to Water Table (ft)	202.74	205.65	207.31	209.08	204.54	204.54	205.64	205.64	206.92	206.73	
Sample Date (units[c])	4/11/01 (mg/L)	10/16/01 (mg/L)	4/11/01 (mg/L)	10/16/01 (mg/L)	4/10/01 (mg/L)	4/10/01[b] (mg/L)	10/16/01 (mg/L)	10/16/01[b] (mg/L)	4/10/01 (mg/L)	10/8/01 (mg/L)	(mg/L)
TKN	0.1 U[d]	1.0 U	0.1 U	1.0 U	0.1 U	0.1 U	1.0 U	1.0 U	0.1 U	1.0 U	NA[e]
BOD	2.0 U	2.0 U	2.06	2.0 U	2.0 U	2.0 U	3.2	3.3	2.0 U	2.0 U	NA
Chloride	11.1	11.6	2.6	3.8	104	108	106	106	1.6	3.4	250
TDS	195	230	172	195	502	496	497	489	138	165	500
Total P	0.0458	0.10 U	0.0404	0.10 U	0.0723	0.0734	0.10 U	0.10 U	0.0253	0.10 U	NA
Sodium	7.32	8.12	5.99	6.54	51	51.2	46.3	46.0	5.58	4.13	NA
NO_3N	0.89	0.92	0.54	0.58	2.39	2.39	2.17	2.26	0.36	0.41	10
NO_2N	0.003 U R[f]	0.10 U	0.003 U R	0.10 U	0.003 U R	0.003 U R	0.10 U	0.10 U	0.003 U R	0.10 U	1
$NO_2N + NO_3N$	0.811	0.748	0.493	0.577	2.31	2.29	1.88	1.88	0.345	4.08	10
NH_4N	0.01 U	0.10	0.01 U	0.01 U	0.01 U	0.01 U	0.10 U	0.10	0.01 U	0.10 U	NA
Arsenic	0.0033	0.0075	0.0025 U	0.0034	0.0025 U	0.0025 U	0.0047	0.0054	0.0025 U	0.003 U	0.05
Barium	0.0823	0.083	0.0802	0.0839	0.231	0.231	0.245	0.243	0.0763	0.0722	2
Chromium	0.005	0.006	0.0062	0.0068	0.0025 U	0.0025 U	0.0016	0.0012	0.0038	0.0045	0.1
Mercury	0.0002 U	0.0001 U	0.0002 U	0.0001 U	0.0002 U	0.0002 U	0.0001 U	0.0001 U	0.0002 U	0.0001 U	0.002
Selenium	0.0025 U	0.0061	0.0025 U	0.004 U	0.0025 U	0.0025 U	0.0046	0.004 U	0.0025 U	0.004 U	0.05
Fluoride	0.2 U	0.20	0.2 U	0.2	0.2 U	0.2 U	0.10	0.10	0.2 U	0.2 U	4
Iron	3.42	2.97	2.52	0.188	0.142	0.151	1.32	1.33	3.24	0.346	0.3
Iron (filtered)	—	—	—	—	0.0754	0.0661	4.75	2.93	—	—	—
Lead	0.0035	0.0032	0.0029	0.002 U	0.0015 U	0.0015 U	0.002 U	0.002 U	0.0117	0.002 U	0.015
Manganese	0.0071	0.0075	0.0171	0.011	0.0055	0.0055	0.0112	0.0113	0.0101	0.0046	0.05
Sulfate	30.5	30.8	13.2	15.9	36.2	16.0	35.9	37.8	12.8	16.7	250
Zinc	0.54	0.622	0.811	0.271	0.534	0.513	0.219	0.213	2.02	0.578	5

Table 6-3. (continued).

	TANT-MON-A-001		TANT-MON-A-002		TAN-10A				TAN-13A		PCS/SCS[a]
Depth to Water Table (ft)	202.74	205.65	207.31	209.08	204.54	204.54	205.64	205.64	206.92	206.73	
Sample Date (units[c])	4/11/01 (mg/L)	10/16/01 (mg/L)	4/11/01 (mg/L)	10/16/01 (mg/L)	4/10/01 (mg/L)	4/10/01[b] (mg/L)	10/16/01 (mg/L)	10/16/01[b] (mg/L)	4/10/01 (mg/L)	10/8/01 (mg/L)	(mg/L)
Total coliform	Absent	Absent	Absent	Absent	Absent	Absent	1[g]	Absent	Absent	Absent	1 col/100 mL
Fecal coliform	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	NA

a. Primary constituent standards (PCS) and secondary constituent standards (SCS) in groundwater referenced in IDAPA 58.01.11.200.01.a and b.

b. Duplicate sample.

c. The units for all parameters listed are as shown, except for total and fecal coliform which are in counts of 1 col/100 mL.

d. U flag indicates that the result was reported as below the detection limit.

e. NA— not applicable

f. The result was rejected during validation; it was below the method detection limit, and the associated spike recovery was below the acceptable range.

g. Coliform bacteria was speciated as *Klebsiella oxytoca*, which is a naturally occurring bacteria in soils and water.

stainless steel well casings in wells TAN-13A, TANT-MON-A-001, and TAN-MON-A-002 appeared relatively free of rust to the water table. All three of these wells showed decreases in iron concentrations, based on samples collected prior to the maintenance (April 2001) and those collected after the maintenance (October 2001). Video log information gathered on TAN-10A showed that the carbon steel well casing appeared to be rusted most of the way to the water table. During 2001, the iron concentrations in TAN-10A increased after the maintenance, and iron concentrations for TAN-10A were the highest reported for the four wells. The condition of the well casing, coupled with the residual effects relating to the replacement of the galvanized riser pipe, may have resulted in the increased iron concentrations in TAN-10A.

The April 2001 TDS concentration from one sample taken at TAN-10A was 502 mg/L, which exceeded the permit limit of 500 mg/L. The duplicate sample reported a concentration of 496 mg/L. Neither October 2001 result for TAN-10A exceeded the limit, although both were just below. The increases in the effluent TDS concentrations over time are not believed to be the cause of the April 2001 groundwater exceedance. The average yearly TDS concentrations in the effluent for all years prior to 2001 have been below 500 mg/L, and based on estimated transport times, the increases in 2001 effluent TDS are not expected to have impacted the groundwater in TAN-10A by the April sampling. The high TDS levels in TAN-10A could be related to the corrosion found in the riser pipe for the well.

Total coliform was absent in the 2001 sampling except for the presence of *Klebsiella oxytoca* reported in TAN-10A for October 2001. The total coliform reported was 1 col/100mL, which is at the permit limit. This coliform bacteria is a relatively free-living bacteria found in natural water bodies and soils, indicating that the Disposal Pond is unrelated to the detection of coliform in the groundwater.

Zinc concentrations in the TAN WLAP wells have sporadically increased over the past 5 years, with the first exceedance occurring in October 2000 in TAN-13A. Past increased zinc concentrations are also believed to be the result of the riser pipe corrosion. No zinc exceedances were reported for the 2001 permit year.

Of the three compliance-monitoring wells, TAN-10A exhibited the highest contaminant concentrations when compared to the background monitoring well located upgradient of the facility. It is difficult, however, to establish a strong relationship between the water quality in TAN-10A and the Disposal Pond due to two factors. First, contaminants resulting from the injectate from a former injection well (located close to TAN-10A and used for disposal of numerous waste streams, including those now discharged to the Disposal Pond) are still present in the groundwater and continue to have substantial impact on groundwater quality. Second, groundwater remediation studies now underway near the former injection well have a significant influence on local hydraulic gradients and contaminant concentrations near TAN-10A. Groundwater monitoring will continue in TAN-10A (as well as the other three wells) as a part of normal WLAP activities.

No other parameters exceeded permit limits during the 2001 permit year. Monitoring results will continue to be reviewed to specifically monitor parameter concentration changes and the impact of the riser replacements completed during the 2001 permit year.

Four monitoring wells associated with TAN/TSF have been approved for a "no-longer-contained-in" (NLCI) determination from DEQ (Monson 1999). The DEQ requires that the volume of purge water placed into the TAN/TSF Disposal Pond as a result of the NLCI determination be reported in the annual WLAP report. These wells include two of the monitoring wells associated with the Wastewater Land Application Permit (TAN-10A and TAN-13A) and wells TAN-27 and TSFAG-05. During the 2001 permit year, no purge water was discharged to the TAN/TSF Disposal Pond as a result of sampling these wells.

The purge water associated with the April 2001 and October 2001 WLAP sampling of wells TAN-10A and TAN-13A was collected at the time of sampling and turned over to the INEEL Waste Generator Services (WGS) and held in a Temporary Accumulation Area. Once WGS determines that the water is not "F" Listed hazardous waste according to the NLCI determination, the purge water from the WLAP sampling of these two wells will be either placed in the TAN-607 Pool or shipped to an outside disposal facility.

During the 2001 permit year, two of these wells (TAN-10A and TAN-27) were sampled in support of the TAN groundwater remediation project, Operable Unit (OU) 1-07B. These sampling efforts are not a requirement of the TAN/TSF WLAP. The purge water generated during the OU 1-07B sampling of wells TAN-10A and TAN-27 was managed in accordance with the OU 1-07B Record of Decision (ROD) (DOE-ID 1995), the OU 1-07B ROD Amendment (DOE-ID 2001), and associated CERCLA documentation, which records agreements reached between the EPA, DEQ, and DOE-ID.

Well TSFAG-05 was not sampled during the 2001 permit year.

6.6 Summary of Environmental Impacts

The TAN/TSF effluent flow volumes and concentrations were within permit limits. Groundwater iron concentrations exceeded permit limits in April and October. Well maintenance was performed in August 2001, and corrosion in the riser pipes in the wells is the probable cause of the elevated iron concentration. TDS groundwater concentrations exceeded permit limits in compliance well TAN-10A in April. The corrosion in the riser pipes is also a possible cause of the elevated TDS concentrations. Total coliform was absent in the 2001 sampling except in TAN-10A in a form that is found in natural water bodies and soils and at the permit level. Overall, environmental impacts are considered negligible.

Four monitoring wells associated with the TAN/TSF facility have been approved for a "no-longer-contained-in" determination from DEQ. During the 2001 permit year, no purge water was discharged to the TAN/TSF Disposal Pond as a result of sampling these wells.

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Appendix A

Central Facilities Area Sewage Treatment Plant Daily Influent and Effluent Flow Readings and Sewage Treatment Plant Photographs

Appendix A

Central Facilities Area Sewage Treatment Plant Daily Influent and Effluent Flow Readings and Sewage Treatment Plant Photographs

Table A-1. CFA STP daily influent and effluent flows.

Date	Influent to Lagoon (WW-01411) (gpd)	Effluent to Pivot (WW-01412) (gpd)	Date	Influent to Lagoon (WW-01411) (gpd)	Effluent to Pivot (WW-01412) (gpd)
12/1/2000	72,435	NF[a]	12/27/2000	60,744	NF
12/2/2000	72,435	NF	12/28/2000	60,744	NF
12/3/2000	72,435	NF	12/29/2000	60,744	NF
12/4/2000	72,435	NF	12/30/2000	60,744	NF
12/5/2000	95,835	NF	12/31/2000	60,744	NF
12/6/2000	104,465	NF	1/1/2001	60,744	NF
12/7/2000	98,919	NF	1/2/2001	60,744	NF
12/8/2000	78,639	NF	1/3/2001	70,998	NF
12/9/2000	78,639	NF	1/4/2001	102,629	NF
12/10/2000	78,639	NF	1/5/2001	64,603	NF
12/11/2000	78,639	NF	1/6/2001	64,603	NF
12/12/2000	90,087	NF	1/7/2001	64,603	NF
12/13/2000	106,460	NF	1/8/2001	64,603	NF
12/14/2000	119,830	NF	1/9/2001	83,619	NF
12/15/2000	78,075	NF	1/10/2001	89,934	NF
12/16/2000	78,075	NF	1/11/2001	96,240	NF
12/17/2000	78,705	NF	1/12/2001	76,206	NF
12/18/2000	78,705	NF	1/13/2001	76,206	NF
12/19/2000	99,189	NF	1/14/2001	76,206	NF
12/20/2000	96,433	NF	1/15/2001	76,206	NF
12/21/2000	97,930	NF	1/16/2001	78,976	NF
12/22/2000	76,059	NF	1/17/2001	92,260	NF
12/23/2000	76,059	NF	1/18/2001	114,822	NF
12/24/2000	76,059	NF	1/19/2001	68,313	NF
12/25/2000	76,059	NF	1/20/2001	68,313	NF
12/26/2000	76,059	NF	1/21/2001	68,313	NF

Table A-1. (continued).

Date	Influent to Lagoon (WW-01411) (gpd)	Effluent to Pivot (WW-01412) (gpd)	Date	Influent to Lagoon (WW-01411) (gpd)	Effluent to Pivot (WW-01412) (gpd)
1/22/2001	68,313	NF	2/21/2001	102,499	NF
1/23/2001	89,014	NF	2/22/2001	92,416	NF
1/24/2001	110,497	NF	2/23/2001	66,813	NF
1/25/2001	89,580	NF	2/24/2001	66,813	NF
1/26/2001	67,219	NF	2/25/2001	66,813	NF
1/27/2001	67,219	NF	2/26/2001	66,813	NF
1/28/2001	67,219	NF	2/27/2001	89,057	NF
1/29/2001	67,219	NF	2/28/2001	89,185	NF
1/30/2001	81,506	NF	3/1/2001	97,507	NF
1/31/2001	84,477	NF	3/2/2001	99,340	NF
2/1/2001	89,934	NF	3/3/2001	99,340	NF
2/2/2001	69,606	NF	3/4/2001	99,340	NF
2/3/2001	69,606	NF	3/5/2001	99,340	NF
2/4/2001	69,606	NF	3/6/2001	99,340	NF
2/5/2001	69,606	NF	3/7/2001	117,899	NF
2/6/2001	95,348	NF	3/8/2001	115,411	NF
2/7/2001	93,426	NF	3/9/2001	75,655	NF
2/8/2001	102,538	NF	3/10/2001	75,655	NF
2/9/2001	66,226	NF	3/11/2001	75,655	NF
2/10/2001	66,226	NF	3/12/2001	75,655	NF
2/11/2001	66,226	NF	3/13/2001	108,494	NF
2/12/2001	66,226	NF	3/14/2001	100,742	NF
2/13/2001	88,671	NF	3/15/2001	101,172	NF
2/14/2001	88,912	NF	3/16/2001	73,084	NF
2/15/2001	109,257	NF	3/17/2001	73,084	NF
2/16/2001	64,665	NF	3/18/2001	73,084	NF
2/17/2001	64,665	NF	3/19/2001	73,084	NF
2/18/2001	64,665	NF	3/20/2001	106,194	NF
2/19/2001	64,665	NF	3/21/2001	136,622	NF
2/20/2001	96,645	NF	3/22/2001	71,146	NF

Table A-1. (continued).

Date	Influent to Lagoon (WW-01411) (gpd)	Effluent to Pivot (WW-01412) (gpd)	Date	Influent to Lagoon (WW-01411) (gpd)	Effluent to Pivot (WW-01412) (gpd)
3/23/2001	77,115	NF	4/22/2001	55,817	NF
3/24/2001	77,115	NF	4/23/2001	55,817	NF
3/25/2001	77,115	NF	4/24/2001	122,392	NF
3/26/2001	77,115	NF	4/25/2001	95,372	NF
3/27/2001	129,836	NF	4/26/2001	110,810	NF
3/28/2001	71,635	NF	4/27/2001	97,635	NF
3/29/2001	118,585	NF	4/28/2001	97,635	NF
3/30/2001	81,753	NF	4/29/2001	97,635	NF
3/31/2001	81,753	NF	4/30/2001	97,635	NF
4/1/2001	81,753	NF	5/1/2001	137,686	NF
4/2/2001	81,753	NF	5/2/2001	86,371	NF
4/3/2001	66,887	NF	5/3/2001	107,632	NF
4/4/2001	99,838	NF	5/4/2001	89,021	NF
4/5/2001	100,605	NF	5/5/2001	89,021	NF
4/6/2001	76,402	NF	5/6/2001	89,021	NF
4/7/2001	76,402	NF	5/7/2001	89,021	NF
4/8/2001	76,402	NF	5/8/2001	125,813	NF
4/9/2001	76,402	NF	5/9/2001	133,277	NF
4/10/2001	91,938	NF	5/10/2001	216,730	NF
4/11/2001	96,092	NF	5/11/2001	79,446	NF
4/12/2001	113,890	NF	5/12/2001	79,446	NF
4/13/2001	73,194	NF	5/13/2001	79,446	NF
4/14/2001	73,194	NF	5/14/2001	79,446	NF
4/15/2001	73,194	NF	5/15/2001	129,849	NF
4/16/2001	73,194	NF	5/16/2001	125,307	NF
4/17/2001	104,012	NF	5/17/2001	115,137	NF
4/18/2001	106,472	NF	5/18/2001	96,114	NF
4/19/2001	192,303	NF	5/19/2001	96,114	NF
4/20/2001	55,817	NF	5/20/2001	96,114	NF
4/21/2001	55,817	NF	5/21/2001	96,114	NF

Table A-1. (continued).

Date	Influent to Lagoon (WW-01411) (gpd)	Effluent to Pivot (WW-01412) (gpd)	Date	Influent to Lagoon (WW-01411) (gpd)	Effluent to Pivot (WW-01412) (gpd)
5/22/2001	128,357	NF	6/21/2001	195,605	156,900
5/23/2001	138,122	NF	6/22/2001	166,069	NF
5/24/2001	134,203	NF	6/23/2001	166,069	NF
5/25/2001	130,171	NF	6/24/2001	166,069	NF
5/26/2001	130,171	NF	6/25/2001	166,069	156,900
5/27/2001	130,171	NF	6/26/2001	207,879	156,950
5/28/2001	130,171	NF	6/27/2001	186,143	156,950
5/29/2001	130,171	NF	6/28/2001	168,070	157,000
5/30/2001	185,020	NF	6/29/2001	167,036	NF
5/31/2001	194,364	NF	6/30/2001	167,036	NF
6/1/2001	145,314	NF	7/1/2001	167,036	NF
6/2/2001	145,314	NF	7/2/2001	167,036	NF
6/3/2001	145,314	NF	7/3/2001	228,952	158,400
6/4/2001	145,314	NF	7/4/2001	164,411	NF
6/5/2001	154,004	NF	7/5/2001	164,411	NF
6/6/2001	173,188	NF	7/6/2001	199,978	156,600
6/7/2001	177,719	NF	7/7/2001	199,978	156,600
6/8/2001	164,955	NF	7/8/2001	199,978	156,600
6/9/2001	164,955	NF	7/9/2001	199,978	156,600
6/10/2001	164,955	NF	7/10/2001	259,720	157,000
6/11/2001	164,955	NF	7/11/2001	207,806	156,300
6/12/2001	181,051	173,100	7/12/2001	200,415	NF
6/13/2001	152,103	NF	7/13/2001	201,961	NF
6/14/2001	163,397	157,400	7/14/2001	201,961	NF
6/15/2001	151,379	NF	7/15/2001	201,961	NF
6/16/2001	151,379	NF	7/16/2001	201,961	195,000
6/17/2001	151,379	NF	7/17/2001	199,361	193,900
6/18/2001	151,379	157,400	7/18/2001	212,544	194,300
6/19/2001	182,929	157,100	7/19/2001	223,895	194,400
6/20/2001	198,417	157,300	7/20/2001	216,263	194,400

Table A-1. (continued).

Date	Influent to Lagoon (WW-01411) (gpd)	Effluent to Pivot (WW-01412) (gpd)	Date	Influent to Lagoon (WW-01411) (gpd)	Effluent to Pivot (WW-01412) (gpd)
7/21/2001	216,263	194,400	8/20/2001	188,433	193,800
7/22/2001	216,263	194,400	8/21/2001	207,218	193,600
7/23/2001	216,263	194,500	8/22/2001	213,250	195,000
7/24/2001	228,504	194,300	8/23/2001	212,451	157,300
7/25/2001	193,586	194,300	8/24/2001	178,835	157,300
7/26/2001	236,970	194,450	8/25/2001	201,727	157,300
7/27/2001	202,836	194,450	8/26/2001	147,114	157,300
7/28/2001	202,836	194,450	8/27/2001	195,095	157,500
7/29/2001	202,836	194,450	8/28/2001	206,756	157,300
7/30/2001	202,836	194,600	8/29/2001	216,611	157,200
7/31/2001	212,496	198,300	8/30/2001	199,824	157,560
8/1/2001	220,613	196,000	8/31/2001	212,087	157,560
8/2/2001	234,477	194,250	9/1/2001	176,656	157,560
8/3/2001[b]	236,923	194,250	9/2/2001	165,986	157,560
8/4/2001	135,410	194,250	9/3/2001	178,973	157,560
8/5/2001	175,525	194,250	9/4/2001	178,793	155,700
8/6/2001	193,186	195,500	9/5/2001	241,995	155,700
8/7/2001	219,315	195,800	9/6/2001	159,127	157,900
8/8/2001	215,526	193,600	9/7/2001	170,918	NF
8/9/2001	237,057	157,200	9/8/2001	144,788	NF
8/10/2001	202,124	157,200	9/9/2001	151,569	NF
8/11/2001	175,207	157,200	9/10/2001	170,918	157,700
8/12/2001	162,781	157,200	9/11/2001	196,111	157,400
8/13/2001	233,753	156,500	9/12/2001	198,986	157,600
8/14/2001	177,403	193,800	9/13/2001	213,289	157,250
8/15/2001	207,223	194,600	9/14/2001	134,688	157,250
8/16/2001	223,908	180,100	9/15/2001	139,481	157,250
8/17/2001	187,879	180,100	9/16/2001	137,422	157,250
8/18/2001	178,125	NF	9/17/2001	155,127	157,400
8/19/2001	167,078	NF	9/18/2001	168,514	157,300

Table A-1. (continued).

Date	Influent to Lagoon (WW-01411) (gpd)	Effluent to Pivot (WW-01412) (gpd)	Date	Influent to Lagoon (WW-01411) (gpd)	Effluent to Pivot (WW-01412) (gpd)
9/19/2001	186,825	157,300	10/19/2001	138,820	NF
9/20/2001	169,756	156,475	10/20/2001	119,074	NF
9/21/2001	149,790	156,475	10/21/2001	115,129	NF
9/22/2001	136,673	156,475	10/22/2001	122,248	NF
9/23/2001	127,123	156,475	10/23/2001	132,273	NF
9/24/2001	155,891	157,500	10/24/2001	127,744	NF
9/25/2001	183,666	157,200	10/25/2001	136,239	NF
9/26/2001	177,108	157,300	10/26/2001	117,462	NF
9/27/2001	192,444	157,400	10/27/2001	111,777	NF
9/28/2001	178,364	NF	10/28/2001	122,658	NF
9/29/2001	164,696	NF	10/29/2001	103,178	NF
9/30/2001	148,779	NF	10/30/2001	142,707	NF
10/1/2001	157,406	NF	10/31/2001	146,670	NF
10/2/2001	190,376	NF	11/1/2001	150,593	NF
10/3/2001	186,383	NF	11/2/2001	128,288	NF
10/4/2001	179,774	NF	11/3/2001	112,964	NF
10/5/2001	200,793	NF	11/4/2001	96,528	NF
10/6/2001	81,018	NF	11/5/2001	125,752	NF
10/7/2001	142,890	NF	11/6/2001	147,681	NF
10/8/2001	146,097	NF	11/7/2001	132,419	NF
10/9/2001	167,417	NF	11/8/2001	135,909	NF
10/10/2001	156,213	NF	11/9/2001	116,230	NF
10/11/2001	167,835	NF	11/10/2001	104,151	NF
10/12/2001	154,687	NF	11/11/2001	92,544	NF
10/13/2001	142,400	NF	11/12/2001	113,066	NF
10/14/2001	136,813	NF	11/13/2001	115,582	NF
10/15/2001	134,681	NF	11/14/2001	114,776	NF
10/16/2001	171,928	NF	11/15/2001	115,817	NF
10/17/2001	171,786	NF	11/16/2001	132,733	NF
10/18/2001	134,380	NF	11/17/2001	53,222	NF

Table A-1. (continued).

Date	Influent to Lagoon (WW-01411) (gpd)	Effluent to Pivot (WW-01412) (gpd)	Date	Influent to Lagoon (WW-01411) (gpd)	Effluent to Pivot (WW-01412) (gpd)
11/18/2001	85,333	NF	11/25/2001	49,861	NF
11/19/2001	77,284	NF	11/26/2001	56,041	NF
11/20/2001	74,902	NF	11/27/2001	71,259	NF
11/21/2001	80,968	NF	11/28/2001	95,582	NF
11/22/2001	73,756	NF	11/29/2001	107,113	NF
11/23/2001	53,601	NF	11/30/2001	91,677	NF
11/24/2001	51,549	NF			

a. NF—No flow.

b. Operators began taking daily flow readings.

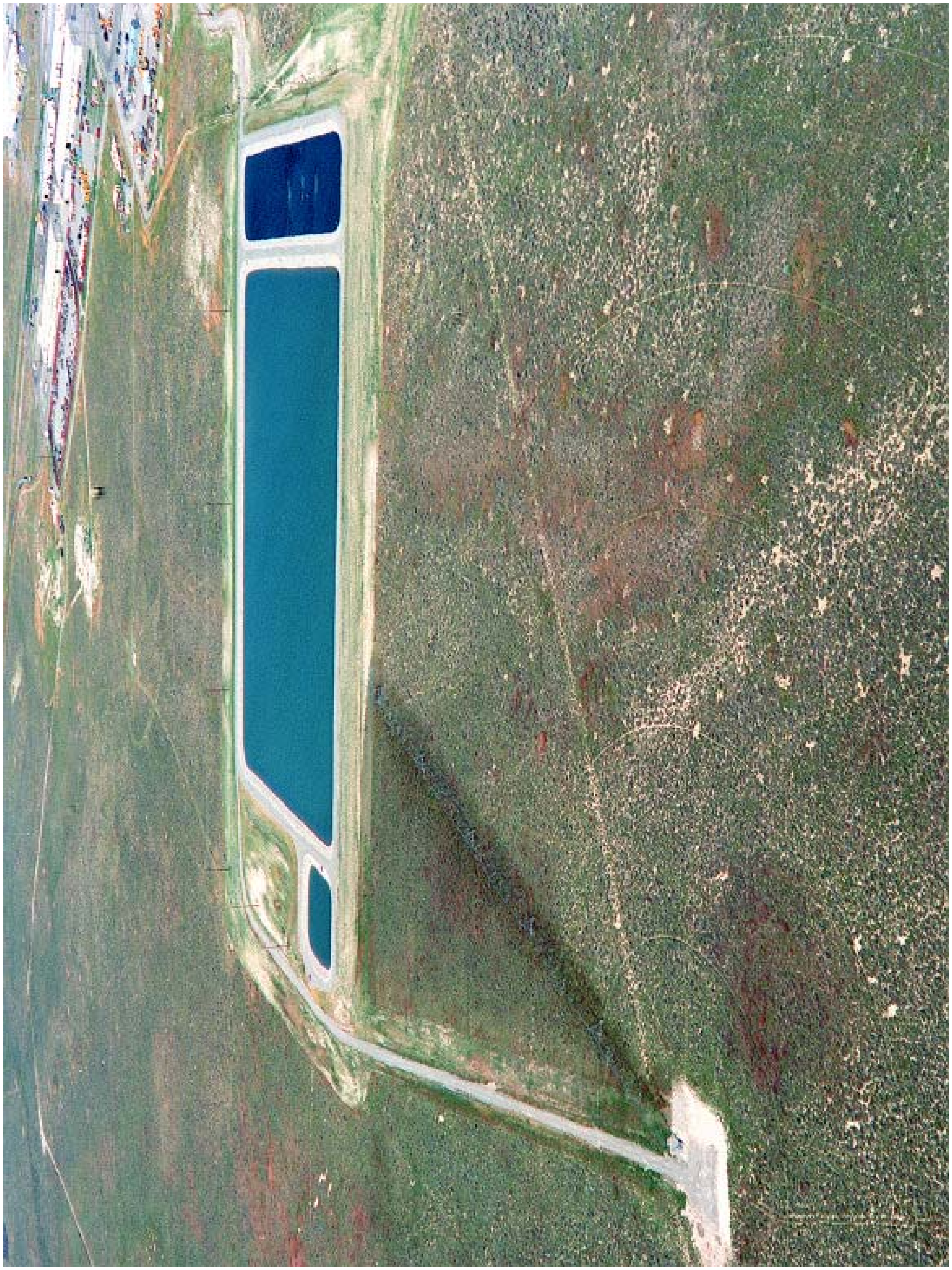

Figure A-1. Central Facilities Area Sewage Treatment Plant, 1995 (95-627-7-4).

Figure A-2. Central Facilities Area Sewage Treatment Plant, 1996 (96-174-9-8).

Figure A-3. Central Facilities Area Sewage Treatment Plant, 1997 (97-620-5-14).

Figure A-4. Central Facilities Area Sewage Treatment Plant, 1998 (98-454-11-6).

Figure A-5. Central Facilities Area Sewage Treatment Plant, 1999 (99-344-10-9).

Figure A-6. Central Facilities Area Sewage Treatment Plant, 2000 (00-296-2-2).

Appendix B

Idaho Nuclear Technology and Engineering Center Percolation Pond Daily Effluent Flow Readings

Appendix B

Idaho Nuclear Technology and Engineering Center Percolation Pond Daily Effluent Flow Readings

Table B-1. INTEC Percolation Pond daily effluent flows.

Date	Effluent (WW-013001) CPP-797 (gpd)	Date	Effluent (WW-013001) CPP-797 (gpd)
11/1/2000	981,900	11/26/2000	1,165,900
11/2/2000	1,044,100	11/27/2000	1,239,000
11/3/2000	1,048,200	11/28/2000	1,303,100
11/4/2000	1,053,100	11/29/2000	1,234,900
11/5/2000	1,068,300	11/30/2000	1,200,200
11/6/2000	1,120,600	12/1/2000	1,201,000
11/7/2000	1,274,100	12/2/2000	1,261,000
11/8/2000	1,164,400	12/3/2000	1,254,100
11/9/2000	1,117,900	12/4/2000	942,200
11/10/2000	1,080,500	12/5/2000	1,203,100
11/11/2000	1,368,000	12/6/2000	1,129,600
11/12/2000	1,261,300	12/7/2000	1,028,300
11/13/2000	1,324,800	12/8/2000	1,158,700
11/14/2000	1,118,300	12/9/2000	1,110,800
11/15/2000	1,181,000	12/10/2000	1,088,000
11/16/2000	1,371,200	12/11/2000	1,258,300
11/17/2000	1,355,400	12/12/2000	1,158,400
11/18/2000	1,294,300	12/13/2000	1,149,500
11/19/2000	1,253,000	12/14/2000	1,225,400
11/20/2000	1,318,800	12/15/2000	1,228,300
11/21/2000	1,371,200	12/16/2000	1,210,100
11/22/2000	1,306,900	12/17/2000	1,218,900
11/23/2000	1,306,900	12/18/2000	1,290,000
11/24/2000	1,141,300	12/19/2000	1,229,500
11/25/2000	1,124,700	12/20/2000	1,181,300

Table B-1. (continued).

Date	Effluent (WW-013001) CPP-797 (gpd)	Date	Effluent (WW-013001) CPP-797 (gpd)
12/21/2000	1,216,800	1/20/2001	1,062,600
12/22/2000	1,324,500	1/21/2001	1,267,100
12/23/2000	1,428,000	1/22/2001	1,281,700
12/24/2000	1,366,000	1/23/2001	1,269,900
12/25/2000	1,292,700	1/24/2001	1,269,900
12/26/2000	1,298,300	1/25/2001	1,279,800
12/27/2000	1,358,100	1/26/2001	1,344,400
12/28/2000	1,356,700	1/27/2001	1,534,500
12/29/2000	1,256,200	1/28/2001	1,601,900
12/30/2000	1,225,500	1/29/2001	1,311,600
12/31/2000	1,228,600	1/30/2001	1,404,800
1/1/2001	1,210,200	1/31/2001	1,671,700
1/2/2001	1,218,600	2/1/2001	1,678,500
1/3/2001	1,190,100	2/2/2001	1,632,300
1/4/2001	1,300,800	2/3/2001	1,578,300
1/5/2001	1,351,400	2/4/2001	1,538,100
1/6/2001	1,319,200	2/5/2001	1,677,900
1/7/2001	1,335,800	2/6/2001	1,677,300
1/8/2001	1,149,400	2/7/2001	1,647,300
1/9/2001	1,043,600	2/8/2001	1,717,000
1/10/2001	938,000	2/9/2001	1,662,700
1/11/2001	937,900	2/10/2001	1,864,400
1/12/2001	924,900	2/11/2001	1,748,100
1/13/2001	1,008,800	2/12/2001	1,625,600
1/14/2001	986,400	2/13/2001	1,559,500
1/15/2001	1,008,500	2/14/2001	1,035,800
1/16/2001	1,008,800	2/15/2001	1,346,300
1/17/2001	1,030,000	2/16/2001	1,331,400
1/18/2001	1,028,600	2/17/2001	1,341,300
1/19/2001	1,052,400	2/18/2001	1,331,100

Table B-1. (continued).

Date	Effluent (WW-013001) CPP-797 (gpd)	Date	Effluent (WW-013001) CPP-797 (gpd)
2/19/2001	1,417,400	3/21/2001	1,435,700
2/20/2001	1,465,300	3/22/2001	1,438,600
2/21/2001	1,382,900	3/23/2001	1,506,400
2/22/2001	1,450,800	3/24/2001	1,481,400
2/23/2001	1,383,200	3/25/2001	1,497,800
2/24/2001	1,405,500	3/26/2001	1,492,000
2/25/2001	1,402,400	3/27/2001	1,529,000
2/26/2001	1,394,600	3/28/2001	1,744,500
2/27/2001	1,391,600	3/29/2001	1,981,100
2/28/2001	1,449,700	3/30/2001	2,072,800
3/1/2001	1,511,600	3/31/2001	2,128,100
3/2/2001	1,706,100	4/1/2001	2,065,900
3/3/2001	1,703,900	4/2/2001	2,061,800
3/4/2001	1,703,800	4/3/2001	1,889,300
3/5/2001	1,689,400	4/4/2001	1,958,300
3/6/2001	1,717,300	4/5/2001	2,008,300
3/7/2001	1,745,200	4/6/2001	2,024,100
3/8/2001	1,462,800	4/7/2001	2,000,800
3/9/2001	1,478,100	4/8/2001	1,892,300
3/10/2001	1,452,100	4/9/2001	1,913,400
3/11/2001	1,547,700	4/10/2001	1,882,200
3/12/2001	1,553,100	4/11/2001	1,782,600
3/13/2001	1,562,600	4/12/2001	1,828,600
3/14/2001	1,518,800	4/13/2001	1,817,100
3/15/2001	1,626,200	4/14/2001	2,299,900
3/16/2001	1,673,600	4/15/2001	1,460,300
3/17/2001	1,730,700	4/16/2001	1,708,400
3/18/2001	1,766,900	4/17/2001	1,647,800
3/19/2001	1,625,400	4/18/2001	1,636,700
3/20/2001	1,475,800	4/19/2001	1,609,600

Table B-1. (continued).

Date	Effluent (WW-013001) CPP-797 (gpd)	Date	Effluent (WW-013001) CPP-797 (gpd)
4/20/2001	1,782,800	5/20/2001	1,165,100
4/21/2001	1,797,500	5/21/2001	1,208,300
4/22/2001	1,587,400	5/22/2001	1,201,000
4/23/2001	1,479,100	5/23/2001	1,220,800
4/24/2001	1,480,900	5/24/2001	1,355,600
4/25/2001	1,490,200	5/25/2001	1,291,400
4/26/2001	1,459,300	5/26/2001	1,235,800
4/27/2001	1,517,300	5/27/2001	1,272,900
4/28/2001	1,525,400	5/28/2001	1,286,900
4/29/2001	1,815,100	5/29/2001	1,304,000
4/30/2001	1,850,200	5/30/2001	1,292,100
5/1/2001	1,864,900	5/31/2001	1,290,700
5/2/2001	1,775,300	6/1/2001	1,338,200
5/3/2001	1,743,900	6/2/2001	1,325,600
5/4/2001	1,642,000	6/3/2001	1,256,700
5/5/2001	1,667,000	6/4/2001	1,259,400
5/6/2001	1,724,800	6/5/2001	1,932,900
5/7/2001	1,542,200	6/6/2001	725,800
5/8/2001	1,210,100	6/7/2001	1,335,800
5/9/2001	1,151,800	6/8/2001	1,433,800
5/10/2001	1,042,400	6/9/2001	1,427,600
5/11/2001	1,295,300	6/10/2001	1,872,200
5/12/2001	1,560,200	6/11/2001	1,893,100
5/13/2001	1,406,400	6/12/2001	1,821,000
5/14/2001	1,383,300	6/13/2001	1,787,300
5/15/2001	1,290,800	6/14/2001	1,828,200
5/16/2001	1,332,600	6/15/2001	1,799,300
5/17/2001	1,397,900	6/16/2001	1,957,600
5/18/2001	1,185,600	6/17/2001	1,920,700
5/19/2001	1,148,600	6/18/2001	1,955,300

Table B-1. (continued).

Date	Effluent (WW-013001) CPP-797 (gpd)	Date	Effluent (WW-013001) CPP-797 (gpd)
6/19/2001	1,978,700	7/19/2001	1,532,000
6/20/2001	2,052,800	7/20/2001	1,545,900
6/21/2001	2,094,400	7/21/2001	1,510,100
6/22/2001	2,048,800	7/22/2001	1,696,400
6/23/2001	1,853,200	7/23/2001	1,598,900
6/24/2001	1,889,400	7/24/2001	1,530,500
6/25/2001	1,751,600	7/25/2001	1,491,800
6/26/2001	1,756,100	7/26/2001	1,585,600
6/27/2001	1,630,200	7/27/2001	1,639,300
6/28/2001	1,841,900	7/28/2001	1,635,900
6/29/2001	1,900,600	7/29/2001	1,789,900
6/30/2001	1,786,400	7/30/2001	1,675,000
7/1/2001	1,657,700	7/31/2001	1,809,200
7/2/2001	1,658,200	8/1/2001	1,913,600
7/3/2001	1,659,000	8/2/2001	1,795,400
7/4/2001	1,584,200	8/3/2001	1,967,800
7/5/2001	1,526,900	8/4/2001	1,795,600
7/6/2001	1,558,000	8/5/2001	1,815,200
7/7/2001	1,553,200	8/6/2001	1,792,700
7/8/2001	1,554,200	8/7/2001	1,848,500
7/9/2001	1,554,400	8/8/2001	1,847,300
7/10/2001	1,531,500	8/9/2001	1,838,500
7/11/2001	1,534,300	8/10/2001	1,833,600
7/12/2001	1,550,900	8/11/2001	1,849,400
7/13/2001	1,628,600	8/12/2001	1,659,400
7/14/2001	1,492,400	8/13/2001	1,446,000
7/15/2001	1,478,000	8/14/2001	1,446,900
7/16/2001	1,507,300	8/15/2001	1,449,700
7/17/2001	1,508,500	8/16/2001	1,464,100
7/18/2001	1,518,700	8/17/2001	1,459,100

Table B-1. (continued).

Date	Effluent (WW-013001) CPP-797 (gpd)	Date	Effluent (WW-013001) CPP-797 (gpd)
8/18/2001	1,390,500	9/17/2001	1,059,700
8/19/2001	1,445,100	9/18/2001	1,261,700
8/20/2001	1,408,300	9/19/2001	1,345,400
8/21/2001	1,417,500	9/20/2001	1,374,100
8/22/2001	1,416,000	9/21/2001	1,224,400
8/23/2001	1,414,700	9/22/2001	1,156,300
8/24/2001	1,481,400	9/23/2001	1,157,600
8/25/2001	1,400,000	9/24/2001	1,138,700
8/26/2001	1,427,500	9/25/2001	1,138,700
8/27/2001	1,369,800	9/26/2001	1,130,300
8/28/2001	1,356,500	9/27/2001	1,023,800
8/29/2001	1,388,700	9/28/2001	912,000
8/30/2001	1,312,800	9/29/2001	1,045,000
8/31/2001	1,674,400	9/30/2001	1,050,000
9/1/2001	1,626,300	10/1/2001	1,048,000
9/2/2001	1,637,500	10/2/2001	1,041,000
9/3/2001	1,603,400	10/3/2001	1,055,000
9/4/2001	1,594,800	10/4/2001	1,086,400
9/5/2001	1,534,900	10/5/2001	851,700
9/6/2001	1,467,400	10/6/2001	1,127,600
9/7/2001	1,201,600	10/7/2001	1,015,000
9/8/2001	624,000	10/8/2001	998,900
9/9/2001	789,000	10/9/2001	1,098,000
9/10/2001	1,074,800	10/10/2001	1,122,100
9/11/2001	1,214,200	10/11/2001	1,065,300
9/12/2001	1,149,700	10/12/2001	1,359,000
9/13/2001	1,089,100	10/13/2001	1,408,100
9/14/2001	1,055,100	10/14/2001	1,390,700
9/15/2001	1,210,900	10/15/2001	1,288,000
9/16/2001	1,072,700	10/16/2001	1,347,900

Table B-1. (continued).

Date	Effluent (WW-013001) CPP-797 (gpd)	Date	Effluent (WW-013001) CPP-797 (gpd)
10/17/2001	1,193,700	10/25/2001	1,710,500
10/18/2001	1,286,600	10/26/2001	1,710,900
10/19/2001	1,431,400	10/27/2001	1,668,100
10/20/2001	1,470,400	10/28/2001	1,649,200
10/21/2001	1,492,300	10/29/2001	1,502,800
10/22/2001	1,657,500	10/30/2001	1,474,900
10/23/2001	1,710,400	10/31/2001	1,555,800
10/24/2001	1,708,100		

Appendix C

Idaho Nuclear Technology and Engineering Center Sewage Treatment Plant Daily Influent and Effluent Flow Readings

Appendix C

Idaho Nuclear Technology and Engineering Center Sewage Treatment Plant Daily Influent and Effluent Flow Readings

Table C-1. INTEC STP influent and effluent to infiltration trenches.

Date	Influent (gpd)	Effluent to Trenches (gpd)	Date	Influent (gpd)	Effluent to Trenches (gpd)
11/1/2000	70,984	54,620	11/28/2000	34,249	NF[a]
11/2/2000	57,649	39,355	11/29/2000	34,431	NF
11/3/2000	66,180	46,439	11/30/2000	38,280	NF
11/4/2000	29,900	26,440	12/1/2000	36,425	NF
11/5/2000	40,494	18,179	12/2/2000	20,419	NF
11/6/2000	30,305	15,485	12/3/2000	18,203	NF
11/7/2000	53,398	33,137	12/4/2000	20,745	NF
11/8/2000	43,960	30,720	12/5/2000	34,945	NF
11/9/2000	48,855	42,495	12/6/2000	40,355	NF
11/10/2000	46,105	34,840	12/7/2000	27,702	NF
11/11/2000	46,737	32,780	12/8/2000	31,711	NF
11/12/2000	22,072	17,569	12/9/2000	21,702	NF
11/13/2000	26,151	15,523	12/10/2000	24,900	NF
11/14/2000	51,531	1,540,000[b]	12/11/2000	31,865	NF
11/15/2000	68,890	NF	12/12/2000	36,285	NF
11/16/2000	76,699	NF	12/13/2000	40,557	NF
11/17/2000	47,163	NF	12/14/2000	46,813	NF
11/18/2000	37,896	NF	12/15/2000	36,407	NF
11/19/2000	21,103	NF	12/16/2000	22,446	NF
11/20/2000	37,682	NF	12/17/2000	24,740	NF
11/21/2000	45,233	NF	12/18/2000	26,425	NF
11/22/2000	41,598	NF	12/19/2000	43,981	NF
11/23/2000	36,785	NF	12/20/2000	38,576	NF
11/24/2000	25,811	NF	12/21/2000	45,017	NF
11/25/2000	21,278	NF	12/22/2000	32,317	NF
11/26/2000	22,560	NF	12/23/2000	26,227	NF
11/27/2000	27,290	NF	12/24/2000	21,907	NF

Table C-1. (continued).

Date	Influent (gpd)	Effluent to Trenches (gpd)	Date	Influent (gpd)	Effluent to Trenches (gpd)
12/25/2000	23,482	NF	1/25/2001	36,537	NF
12/26/2000	23,091	NF	1/26/2001	24,476	NF
12/27/2000	20,723	NF	1/27/2001	17,942	NF
12/28/2000	23,401	NF	1/28/2001	15,223	NF
12/29/2000	20,722	NF	1/29/2001	21,721	NF
12/30/2000	22,977	NF	1/30/2001	27,848	NF
12/31/2000	23,463	NF	1/31/2001	30,120	NF
1/1/2001	23,655	NF	2/1/2001	39,205	NF
1/2/2001	25,814	NF	2/2/2001	35,067	NF
1/3/2001	38,114	NF	2/3/2001	20,655	NF
1/4/2001	41,717	NF	2/4/2001	19,805	NF
1/5/2001	29,291	NF	2/5/2001	23,840	NF
1/6/2001	24,299	NF	2/6/2001	34,742	NF
1/7/2001	27,125	NF	2/7/2001	35,839	NF
1/8/2001	30,891	NF	2/8/2001	33,267	NF
1/9/2001	37,310	NF	2/9/2001	41,860	NF
1/10/2001	31,823	NF	2/10/2001	30,774	NF
1/11/2001	41,756	NF	2/11/2001	26,714	NF
1/12/2001	38,311	NF	2/12/2001	28,879	NF
1/13/2001	26,723	NF	2/13/2001	35,604	NF
1/14/2001	24,521	NF	2/14/2001	34,280	NF
1/15/2001	33,359	NF	2/15/2001	36,031	NF
1/16/2001	18,414	NF	2/16/2001	27,380	NF
1/17/2001	30,400	NF	2/17/2001	18,557	NF
1/18/2001	42,571	NF	2/18/2001	24,559	11,458
1/19/2001	27,804	NF	2/19/2001	20,014	10,176
1/20/2001	18,637	NF	2/20/2001	35,253	11,938
1/21/2001	17,439	NF	2/21/2001	32,685	13,303
1/22/2001	17,738	NF	2/22/2001	33,031	10,960
1/23/2001	35,325	NF	2/23/2001	26,173	1,437
1/24/2001	32,807	NF	2/24/2001	21,894	NF

Table C-1. (continued).

Date	Influent (gpd)	Effluent to Trenches (gpd)	Date	Influent (gpd)	Effluent to Trenches (gpd)
2/25/2001	20,423	NF	3/28/2001	51,281	9,984
2/26/2001	22,830	NF	3/29/2001	49,748	9,564
2/27/2001	23,111	NF	3/30/2001	85,433	68,598
2/28/2001	33,690	NF	3/31/2001	74,411	28,650
3/1/2001	35,604	NF	4/1/2001	70,608	25,073
3/2/2001	26,369	NF	4/2/2001	73,937	25,502
3/3/2001	17,220	NF	4/3/2001	61,293	5,526
3/4/2001	15,676	NF	4/4/2001	59,709	720,000[c]
3/5/2001	22,968	NF	4/5/2001	50,106	NF
3/6/2001	27,107	NF	4/6/2001	54,713	NF
3/7/2001	32,377	NF	4/7/2001	31,842	NF
3/8/2001	32,237	2,257	4/8/2001	40,264	NF
3/9/2001	28,288	NF	4/9/2001	41,880	NF
3/10/2001	15,862	NF	4/10/2001	49,262	NF
3/11/2001	22,758	NF	4/11/2001	46,265	NF
3/12/2001	24,677	NF	4/12/2001	53,542	NF
3/13/2001	34,148	NF	4/13/2001	50,129	NF
3/14/2001	34,966	NF	4/14/2001	47,597	NF
3/15/2001	31,845	NF	4/15/2001	57,379	NF
3/16/2001	22,256	8,904	4/16/2001	51,573	NF
3/17/2001	22,256	8,904	4/17/2001	53,762	NF
3/18/2001	57,979	13,018	4/18/2001	47,383	NF
3/19/2001	17,907	11,950	4/19/2001	53,652	NF
3/20/2001	33,637	16,539	4/20/2001	47,993	NF
3/21/2001	16,604	18,802	4/21/2001	32,348	NF
3/22/2001	24,284	18,783	4/22/2001	43,094	NF
3/23/2001	46,676	18,377	4/23/2001	35,350	NF
3/24/2001	40,132	15,408	4/24/2001	50,338	NF
3/25/2001	40,705	12,823	4/25/2001	51,797	NF
3/26/2001	47,214	11,774	4/26/2001	50,171	NF
3/27/2001	53,698	14,879	4/27/2001	49,114	NF

Table C-1. (continued).

Date	Influent (gpd)	Effluent to Trenches (gpd)	Date	Influent (gpd)	Effluent to Trenches (gpd)
4/28/2001	39,566	NF	5/29/2001	NF	2
4/29/2001	43,340	NF	5/30/2001	NF	628
4/30/2001	20,120	NF	5/31/2001	NF	688
5/1/2001	NF	NF	6/1/2001	NF	434
5/2/2001	NF	NF	6/2/2001	NF	896
5/3/2001	NF	NF	6/3/2001	NF	580
5/4/2001	NF	NF	6/4/2001	NF	622
5/5/2001	NF	NF	6/5/2001	NF	552
5/6/2001	NF	NF	6/6/2001	NF	4,249
5/7/2001	NF	NF	6/7/2001	NF	6,971
5/8/2001	NF	NF	6/8/2001	NF	11,070
5/9/2001	NF	NF	6/9/2001	NF	3,460
5/10/2001	NF	NF	6/10/2001	NF	1,575
5/11/2001	NF	NF	6/11/2001	NF	124
5/12/2001	NF	NF	6/12/2001	NF	5,661
5/13/2001	NF	NF	6/13/2001	NF	6,953
5/14/2001	NF	NF	6/14/2001	NF	3,637
5/15/2001	NF	NF	6/15/2001	NF	11,380
5/16/2001	NF	4	6/16/2001	NF	2,523
5/17/2001	NF	NF	6/17/2001	NF	1,355
5/18/2001	NF	NF	6/18/2001	NF	784
5/19/2001	NF	NF	6/19/2001	NF	4,554
5/20/2001	NF	9	6/20/2001	NF	1,848
5/21/2001	NF	NF	6/21/2001	NF	5,520
5/22/2001	NF	NF	6/22/2001	NF	12,625
5/23/2001	NF	NF	6/23/2001	NF	6,020
5/24/2001	NF	NF	6/24/2001	NF	7,380
5/25/2001	NF	12	6/25/2001	NF	3,717
5/26/2001	NF	4	6/26/2001	NF	7,644
5/27/2001	NF	9	6/27/2001	NF	3,084
5/28/2001	NF	10	6/28/2001	NF	153

Table C-1. (continued).

Date	Influent (gpd)	Effluent to Trenches (gpd)	Date	Influent (gpd)	Effluent to Trenches (gpd)
6/29/2001	NF	4,068	7/31/2001	44,477	66
6/30/2001	NF	6,600	8/1/2001	44,358	4,910
7/1/2001	NF	15,899	8/2/2001	36,138	10,562
7/2/2001	NF	29,629	8/3/2001	39,888	10,611
7/3/2001	NF	883	8/4/2001	34,251	7,155
7/4/2001	57,367	5,089	8/5/2001	39,512	5,193
7/5/2001	5,113	15,617	8/6/2001	45,054	3,895
7/6/2001	47,937	12,091	8/7/2001	39,388	11,131
7/7/2001	47,670	8,628	8/8/2001	33,029	7,363
7/8/2001	52,087	10,551	8/9/2001	38,675	6,287
7/9/2001	53,462	11,252	8/10/2001	32,598	7,668
7/10/2001	4,507	13,381	8/11/2001	19,457	2,320
7/11/2001	59,569	12,484	8/12/2001	21,019	2,887
7/12/2001	63,762	10,900	8/13/2001	27,249	NF
7/13/2001	66,421	17,041	8/14/2001	26,754	2,904
7/14/2001	51,621	11,124	8/15/2001	40,785	6,345
7/15/2001	51,451	8,945	8/16/2001	46,390	4,467
7/16/2001	57,008	8,375	8/17/2001	28,706	NF
7/17/2001	50,350	45	8/18/2001	24,972	NF
7/18/2001	44,415	5,546	8/19/2001	28,082	NF
7/19/2001	46,084	7,998	8/20/2001	28,582	NF
7/20/2001	40,934	7,862	8/21/2001	38,820	836
7/21/2001	31,944	788	8/22/2001	38,713	1,969
7/22/2001	29,383	516	8/23/2001	35,398	1,913
7/23/2001	27,668	323	8/24/2001	79,011	NF
7/24/2001	37,696	2,956	8/25/2001	175,132	NF
7/25/2001	70,013	6,995	8/26/2001	175,825	NF
7/26/2001	45,852	9,128	8/27/2001	83,465	NF
7/27/2001	39,153	6,707	8/28/2001	200,000	NF
7/28/2001	37,470	525	8/29/2001	39,403	672
7/29/2001	29,454	110	8/30/2001	35,084	781
7/30/2001	31,909	77	8/31/2001	99,942	4,079

Table C-1. (continued).

Date	Influent (gpd)	Effluent to Trenches (gpd)	Date	Influent (gpd)	Effluent to Trenches (gpd)
9/1/2001	9,347	31,166	10/2/2001	19,504	10,219
9/2/2001	41,716	12,011	10/3/2001	34,445	12,051
9/3/2001	38,390	9,285	10/4/2001	41,279	15,454
9/4/2001	41,769	10,910	10/5/2001	28,057	13,536
9/5/2001	42,337	16,957	10/6/2001	21,703	2,159
9/6/2001	45,543	15,239	10/7/2001	3,877	2,883
9/7/2001	43,834	16,467	10/8/2001	12,382	1,123
9/8/2001	27,043	5,599	10/9/2001	35,196	8,214
9/9/2001	46,768	15,900	10/10/2001	37,660	16,493
9/10/2001	33,520	8,601	10/11/2001	30,014	14,900
9/11/2001	48,682	19,468	10/12/2001	30,302	15,491
9/12/2001	44,614	283	10/13/2001	16,590	3,524
9/13/2001	47,137	26,470	10/14/2001	16,880	2,885
9/14/2001	33,287	31,371	10/15/2001	24,755	10,636
9/15/2001	24,776	11,702	10/16/2001	43,634	27,759
9/16/2001	22,252	8,422	10/17/2001	38,853	27,078
9/17/2001	22,560	7,918	10/18/2001	34,396	21,487
9/18/2001	40,369	20,536	10/19/2001	34,241	22,184
9/19/2001	39,137	18,670	10/20/2001	20,526	13,327
9/20/2001	31,419	12,088	10/21/2001	20,771	13,324
9/21/2001	47,187	21,008	10/22/2001	20,998	12,364
9/22/2001	15,644	2,721	10/23/2001	47,145	28,318
9/23/2001	13,992	2,636	10/24/2001	47,754	27,360
9/24/2001	16,183	2,427	10/25/2001	51,193	31,832
9/25/2001	60,228	17,601	10/26/2001	43,964	33,335
9/26/2001	43,127	20,939	10/27/2001	35,684	22,784
9/27/2001	37,300	15,937	10/28/2001	39,130	21,551
9/28/2001	NF	NF	10/29/2001	35,104	17,433
9/29/2001	NF	NF	10/30/2001	60,160	38,204
9/30/2001	NF	NF	10/31/2001	54,897	46,565
10/1/2001	26,692	15,449			

a. NF – no flow. Effluent flow was discontinued on November 14, 2000 due to the Shear Gate Replacement Project. Flow resumed intermittently on February 18, 2001 for the remainder of the year. Due to problems encountered with the ultrasonic transducers, accuracy of influent flow readings is suspect for the months of April through August, and accuracy of effluent flow readings is suspect for the months of July through August. The flow meters were repaired during the first week of September.

b. High flow is the result of emptying the ponds prior to the start of the Shear Gate Replacement Project.

c. High flow is the result of emptying Ponds 3 and 4, which were full, in order to repair the leaking shear gates.

Appendix D

Test Area North/Technical Support Facility Sewage Treatment Plant Daily Influent and Effluent Flow Readings

Appendix D

Test Area North/Technical Support Facility Sewage Treatment Plant Daily Influent and Effluent Flow Readings

Table D-1. TAN/TSF STP daily influent and effluent flows.

Date	Influent (gpd)	Effluent (MU-015301) (gpd)	Date	Influent (gpd)	Effluent (MU-015301) (gpd)
11/1/2000	3,570	28,500	11/28/2000	5,790	35,000
11/2/2000	3,570	28,500	11/29/2000	4,890	31,000
11/3/2000	2,895	26,250	11/30/2000	5,610	35,000
11/4/2000	2,895	26,250	12/1/2000	8,310	43,500
11/5/2000	2,895	26,250	12/2/2000	8,310	43,500
11/6/2000	2,895	26,250	12/3/2000	8,310	43,500
11/7/2000	4,770	30,000	12/4/2000	8,310	43,500
11/8/2000	4,770	30,000	12/5/2000	5,310	36,000
11/9/2000	5,610	35,000	12/6/2000	3,630	35,000
11/10/2000	5,475	31,500	12/7/2000	4,140	35,000
11/11/2000	5,475	31,500	12/8/2000	2,573	31,250
11/12/2000	5,475	31,500	12/9/2000	2,573	31,250
11/13/2000	5,475	31,500	12/10/2000	2,573	31,250
11/14/2000	5,190	34,000	12/11/2000	2,573	31,250
11/15/2000	6,420	34,000	12/12/2000	3,420	32,000
11/16/2000	5,430	31,000	12/13/2000	4,680	36,000
11/17/2000	3,930	31,000	12/14/2000	3,330	33,000
11/18/2000	3,930	31,000	12/15/2000	2,108	32,000
11/19/2000	3,930	31,000	12/16/2000	2,108	32,000
11/20/2000	3,930	31,000	12/17/2000	2,108	32,000
11/21/2000	6,015	33,500	12/18/2000	2,180	32,000
11/22/2000	6,015	33,500	12/19/2000	3,510	36,000
11/23/2000	5,112	31,800	12/20/2000	4,320	32,000
11/24/2000	5,112	31,800	12/21/2000	4,080	32,000
11/25/2000	5,112	31,800	12/22/2000	3,185	33,000
11/26/2000	5,112	31,800	12/23/2000	3,185	33,000
11/27/2000	5,112	31,800	12/24/2000	3,185	33,000

Table D-1. (continued).

Date	Influent (gpd)	Effluent (MU-015301) (gpd)	Date	Influent (gpd)	Effluent (MU-015301) (gpd)
12/25/2000	3,185	33,000	1/27/2001	7,493	34,000
12/26/2000	3,185	33,000	1/28/2001	7,493	34,000
12/27/2000	3,185	33,000	1/29/2001	7,493	34,000
12/28/2000	3,185	33,000	1/30/2001	8,280	33,000
12/29/2000	3,185	33,000	1/31/2001	3,060	31,000
12/30/2000	3,185	33,000	2/1/2001	9,420	37,000
12/31/2000	3,185	33,000	2/2/2001	5,205	33,000
1/1/2001	3,185	33,000	2/3/2001	5,205	33,000
1/2/2001	3,185	33,000	2/4/2001	5,205	33,000
1/3/2001	4,890	35,000	2/5/2001	5,205	33,000
1/4/2001	5,220	37,000	2/6/2001	12,090	34,000
1/5/2001	983	36,000	2/7/2001	16,320	37,000
1/6/2001	983	36,000	2/8/2001	9,570	35,000
1/7/2001	983	36,000	2/9/2001	6,488	32,750
1/8/2001	983	36,000	2/10/2001	6,488	32,750
1/9/2001	11,160	37,000	2/11/2001	6,488	32,750
1/10/2001	13,020	37,000	2/12/2001	6,488	32,750
1/11/2001	12,360	36,000	2/13/2001	10,710	39,000
1/12/2001	1,298	32,750	2/14/2001	7,320	32,000
1/13/2001	1,298	32,750	2/15/2001	9,990	34,000
1/14/2001	1,298	32,750	2/16/2001	7,995	31,250
1/15/2001	1,298	32,750	2/17/2001	7,995	31,250
1/16/2001	10,020	33,000	2/18/2001	7,995	31,250
1/17/2001	13,230	36,000	2/19/2001	7,995	31,250
1/18/2001	11,430	35,000	2/20/2001	9,690	33,000
1/19/2001	3,398	36,250	2/21/2001	12,750	37,000
1/20/2001	3,398	36,250	2/22/2001	11,070	34,000
1/21/2001	3,398	36,250	2/23/2001	9,420	31,000
1/22/2001	3,398	36,250	2/24/2001	9,420	31,000
1/23/2001	9,810	37,000	2/25/2001	9,420	31,000
1/24/2001	11,940	37,000	2/26/2001	9,420	31,000
1/25/2001	10,530	34,000	2/27/2001	9,840	44,000
1/26/2001	7,493	34,000	2/28/2001	9,870	30,000

Table D-1. (continued).

Date	Influent (gpd)	Effluent (MU-015301) (gpd)	Date	Influent (gpd)	Effluent (MU-015301) (gpd)
3/1/2001	5,190	32,000	4/3/2001	4,620	31,000
3/2/2001	5,737	35,250	4/4/2001	4,710	28,000
3/3/2001	5,737	35,250	4/5/2001	4,440	28,000
3/4/2001	5,737	35,250	4/6/2001	2,573	27,250
3/5/2001	5,737	35,250	4/7/2001	2,573	27,250
3/6/2001	6,000	33,000	4/8/2001	2,573	27,250
3/7/2001	7,350	37,000	4/9/2001	2,573	27,250
3/8/2001	6,420	33,000	4/10/2001	4,080	31,000
3/9/2001	6,090	35,500	4/11/2001	4,020	33,000
3/10/2001	6,090	35,500	4/12/2001	3,960	28,000
3/11/2001	6,090	35,500	4/13/2001	3,052	27,750
3/12/2001	6,090	35,500	4/14/2001	3,052	27,750
3/13/2001	6,210	34,000	4/15/2001	3,052	27,750
3/14/2001	7,500	35,000	4/16/2001	3,052	27,750
3/15/2001	10,410	37,000	4/17/2001	4,050	30,000
3/16/2001	5,535	36,250	4/18/2001	3,750	28,000
3/17/2001	5,535	36,250	4/19/2001	3,750	31,000
3/18/2001	5,535	36,250	4/20/2001	1,553	25,250
3/19/2001	5,535	36,250	4/21/2001	1,553	25,250
3/20/2001	5,550	35,000	4/22/2001	1,553	25,250
3/21/2001	5,340	34,000	4/23/2001	1,553	25,250
3/22/2001	5,220	34,000	4/24/2001	4,020	29,000
3/23/2001	3,840	28,000	4/25/2001	4,740	28,000
3/24/2001	3,840	28,000	4/26/2001	7,320	28,000
3/25/2001	3,840	28,000	4/27/2001	2,235	26,500
3/26/2001	3,840	28,000	4/28/2001	2,235	26,500
3/27/2001	5,310	30,000	4/29/2001	2,235	26,500
3/28/2001	4,560	27,000	4/30/2001	2,235	26,500
3/29/2001	4,800	31,000	5/1/2001	3,150	39,000
3/30/2001	3,083	27,250	5/2/2001	3,000	30,000
3/31/2001	3,083	27,250	5/3/2001	3,360	27,000
4/1/2001	3,083	27,250	5/4/2001	2,235	26,750
4/2/2001	3,083	27,250	5/5/2001	2,235	26,750

Table D-1. (continued).

Date	Influent (gpd)	Effluent (MU-015301) (gpd)	Date	Influent (gpd)	Effluent (MU-015301) (gpd)
5/6/2001	2,235	26,750	6/8/2001	2,303	97,750
5/7/2001	2,235	26,750	6/9/2001	2,303	97,750
5/8/2001	3,480	26,000	6/10/2001	2,303	97,750
5/9/2001	3,870	24,000	6/11/2001	2,303	97,750
5/10/2001	3,900	29,000	6/12/2001	5,250	48,000
5/11/2001	1,598	27,750	6/13/2001	2,880	16,000
5/12/2001	1,598	27,750	6/14/2001	3,630	7,000
5/13/2001	1,598	27,750	6/15/2001	3,248	6,750
5/14/2001	1,598	27,750	6/16/2001	3,248	6,750
5/15/2001	3,000	39,000	6/17/2001	3,248	6,750
5/16/2001	2,940	39,000	6/18/2001	3,248	6,750
5/17/2001	3,210	15,000	6/19/2001	4,740	8,000
5/18/2001	1,643	12,000	6/20/2001	3,150	10,000
5/19/2001	1,643	12,000	6/21/2001	6,390	11,000
5/20/2001	1,643	12,000	6/22/2001	4,125	8,500
5/21/2001	1,643	12,000	6/23/2001	4,125	8,500
5/22/2001	3,150	13,000	6/24/2001	4,125	8,500
5/23/2001	2,790	10,000	6/25/2001	4,125	8,500
5/24/2001	4,800	12,000	6/26/2001	5,280	9,000
5/25/2001	1,956	59,600	6/27/2001	4,680	8,000
5/26/2001	1,956	59,600	6/28/2001	6,300	9,000
5/27/2001	1,956	59,600	6/29/2001	3,960	16,500
5/28/2001	1,956	59,600	6/30/2001	3,960	16,500
5/29/2001	1,956	59,600	7/1/2001	3,960	16,500
5/30/2001	5,190	50,000	7/2/2001	3,960	16,500
5/31/2001	2,970	47,800	7/3/2001	3,705	17,000
6/1/2001	2,970	47,800	7/4/2001	3,705	17,000
6/2/2001	2,970	47,800	7/5/2001	3,705	17,000
6/3/2001	2,970	47,800	7/6/2001	3,128	12,000
6/4/2001	2,970	47,800	7/7/2001	3,128	12,000
6/5/2001	3,120	53,000	7/8/2001	3,128	12,000
6/6/2001	12,270	56,000	7/9/2001	3,128	12,000
6/7/2001	3,720	49,000	7/10/2001	7,890	21,000

Table D-1. (continued).

Date	Influent (gpd)	Effluent (MU-015301) (gpd)	Date	Influent (gpd)	Effluent (MU-015301) (gpd)
7/11/2001	9,120	11,000	8/13/2001	4,140	26,000
7/12/2001	10,920	17,000	8/14/2001	8,970	21,000
7/13/2001	3,840	17,500	8/15/2001	9,750	32,000
7/14/2001	3,840	17,500	8/16/2001	9,990	34,000
7/15/2001	3,840	17,500	8/17/2001	8,010	32,000
7/16/2001	3,840	17,500	8/18/2001	4,680	25,000
7/17/2001	6,720	15,000	8/19/2001	4,530	24,000
7/18/2001	7,890	15,000	8/20/2001	4,440	19,000
7/19/2001	7,920	14,000	8/21/2001	8,520	32,000
7/20/2001[a]	7,740	18,000	8/22/2001	8,610	34,000
7/21/2001	3,750	21,000	8/23/2001	10,080	44,000
7/22/2001	3,390	43,000	8/24/2001	6,120	29,000
7/23/2001	2,400	26,000	8/25/2001	6,240	31,000
7/24/2001	8,820	17,000	8/26/2001	5,370	23,000
7/25/2001	8,310	28,000	8/27/2001	5,970	28,000
7/26/2001	9,060	30,000	8/28/2001	9,750	26,000
7/27/2001	10,350	35,000	8/29/2001	10,260	26,000
7/28/2001	2,160	6,000	8/30/2001	10,020	32,000
7/29/2001	3,810	13,000	8/31/2001	8,580	30,000
7/30/2001	5,370	21,000	9/1/2001	4,920	14,000
7/31/2001	13,860	16,000	9/2/2001	4,620	10,000
8/1/2001	7,380	14,000	9/3/2001	4,110	13,000
8/2/2001	6,030	24,000	9/4/2001	4,710	16,000
8/3/2001	9,780	24,000	9/5/2001	11,250	17,000
8/4/2001	3,450	19,000	9/6/2001	9,300	16,000
8/5/2001	4,140	15,000	9/7/2001	5,760	20,000
8/6/2001	3,210	16,000	9/8/2001	8,640	11,000
8/7/2001	8,910	29,000	9/9/2001	11,970	16,000
8/8/2001	9,630	18,000	9/10/2001	15,210	16,000
8/9/2001	9,210	23,000	9/11/2001	NF[b]	NF
8/10/2001	8,130	20,000	9/12/2001	4,695	22,000
8/11/2001	4,200	20,000	9/13/2001	6,810	17,000
8/12/2001	3,810	17,000	9/14/2001	6,570	22,000

Table D-1. (continued).

Date	Influent (gpd)	Effluent (MU-015301) (gpd)	Date	Influent (gpd)	Effluent (MU-015301) (gpd)
9/15/2001	3,840	42,000	10/9/2001	3,540	17,000
9/16/2001	3,090	41,000	10/10/2001	4,290	26,000
9/17/2001	3,270	46,000	10/11/2001	3,570	15,000
9/18/2001	5,940	45,000	10/12/2001	3,810	14,000
9/19/2001	5,130	48,000	10/13/2001	3,000	17,000
9/20/2001	4,500	13,000	10/14/2001	2,220	11,000
9/21/2001	4,470	13,000	10/15/2001	2,790	13,000
9/22/2001	3,330	15,000	10/16/2001	4,620	14,000
9/23/2001	2,880	18,000	10/17/2001	4,560	29,000
9/24/2001	2,790	12,000	10/18/2001	4,200	18,000
9/25/2001	6,180	15,000	10/19/2001	4,740	15,000
9/26/2001	5,190	17,000	10/20/2001	3,540	28,000
9/27/2001	5,970	15,000	10/21/2001	2,730	36,000
9/28/2001	5,280	14,000	10/22/2001	3,030	24,000
9/29/2001	3,990	13,000	10/23/2001	4,860	12,000
9/30/2001	4,920	14,000	10/24/2001	3,480	26,000
10/1/2001	4,980	14,000	10/25/2001	3,840	23,000
10/2/2001	5,550	16,000	10/26/2001	3,990	18,000
10/3/2001	5,280	35,000	10/27/2001	2,700	8,000
10/4/2001	5,100	43,000	10/28/2001	2,670	15,000
10/5/2001	3,960	20,000	10/29/2001	2,430	14,000
10/6/2001	3,120	13,000	10/30/2001	3,210	16,000
10/7/2001	2,880	17,000	10/31/2001	3,330	15,000
10/8/2001	2,760	14,000			

a. Operators began taking daily flow readings.

b. NF—No flow taken due to security shutdown.