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2017 Annual Reuse Report for the Idaho National Laboratory Site's Advanced Test Reactor Complex Cold Waste Ponds

February 2018

The INL is a U.S. Department of Energy National Laboratory
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Idaho National Laboratory

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Idaho Falls, Idaho 83415

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ABSTRACT

This report describes conditions and information, as required by the state of Idaho, Department of Environmental Quality Reuse Permit I-161-02, for the Advanced Test Reactor Complex Cold Waste Ponds located at Idaho National Laboratory from November 1, 2016–October 31, 2017. The effective date of Reuse Permit I-161-02 is November 20, 2014 with an expiration date of November 19, 2019. A permit modification, I-161-02: Modification 1, became effective March 7, 2017. The modification incorporated clarification to the delivery of analytical reports and chain of custody forms. This report contains the following information:

- Facility and system description
- Permit required effluent monitoring data and loading rates
- Permit required groundwater monitoring data
- Status of compliance activities
- Issues
- Discussion of the facility’s environmental impacts.

During the 2017 permit year, 234.05 million gallons of wastewater were discharged to the Cold Waste Ponds which is below the maximum annual permit limit of 375 million gallons.

Sulfate and total dissolved solids concentrations continue to remain highest in well USGS-065, which is the closest downgradient well to the Cold Waste Ponds. As shown by the groundwater sampling data, sulfate and total dissolved solids concentrations decrease rapidly as the distance downgradient from the Cold Waste Ponds increases. The concentrations of all permit-required parameters were below their respective groundwater quality standard levels (IDAPA 58.01.11) for all six groundwater monitoring wells.

There was one noncompliance with the Reuse Permit during the 2017 permit year. Approximately 600 gallons of cooling water was discharged to ground surface outside of the designated application site. DEQ was notified of the noncompliance.

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ACRONYMS

ATR	Advanced Test Reactor
CCN	correspondence control number
CFR	Code of Federal Regulations
CTS	Commitment Tracking System
CWP	Cold Waste Pond(s)
DEQ	Idaho Department of Environmental Quality
EPA	U.S. Environmental Protection Agency
FM	flow measurement or monitoring description or identifier
GW	prefix for groundwater reporting serial number
IDAPA	Idaho Administrative Procedures Act
INL	Idaho National Laboratory
MDL	method detection limit
MG	million gallons
MU	prefix for management unit reporting environmental serial number
NA	Not Applicable
NAVD	North American Vertical Datum
OOS	out of service
PCS	Primary Constituent Standard
PO	Plan of Operation
QAPP	Quality Assurance Project Plan
R&MS	Regulatory and Monitoring Services
SCS	Secondary Constituent Standard
s.u.	standard units for pH
TDS	total dissolved solids
TKN	total Kjeldahl nitrogen
TN	total nitrogen
TRA	prefix for groundwater reporting (well) common designation number
USGS	prefix for groundwater reporting (well) common designation number
WW	prefix for wastewater reporting serial number

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1. INTRODUCTION

The Advanced Test Reactor (ATR) Complex Cold Waste Ponds (CWP) is a reuse facility operated by Battelle Energy Alliance, LLC at Idaho National Laboratory (INL). During the 2017 reporting year, operations were conducted under Reuse Permit No. I-161-02 (Neher 2014) and Reuse Permit No. I-161-02, Modification 1, which became effective March 7, 2017 (Neher 2017) as issued by the State of Idaho Department of Environmental Quality (DEQ). The modification incorporated clarification to the delivery of analytical reports and chain of custody forms. The permit expires on November 19, 2019.

This annual report summarizes the facility system and operation, monitoring data, special compliance conditions, issues/noncompliances, and environmental impacts for the 2017 reporting year (November 1, 2016, through October 31, 2017).

2. FACILITY, SYSTEM DESCRIPTION, AND OPERATION

The ATR Complex (Figure 1) is located on approximately 100 acres in the southwestern portion of INL, approximately 47 miles west of Idaho Falls, Idaho, in Butte County. The ATR Complex consists of buildings and structures utilized to conduct research associated with developing, testing, and analyzing materials used in nuclear and reactor applications and both radiological and nonradiological laboratory analyses.

The CWP are located approximately 450 ft from the southeast corner of the ATR Complex compound and approximately 3/4 of a mile northwest of the Big Lost River channel (Figure 1). The existing CWP were excavated in 1982. The CWP consist of two cells, each with dimensions of 180 × 430 ft across the top of the berms, and a depth of 10 ft. Total surface area for the two cells at the top of the berms is approximately 3.55 acres. Maximum capacity is approximately 10,220,000 gal (31.3 acre ft).

Wastewater discharged to the CWP consists primarily of noncontact cooling tower blowdown, once-through cooling water for air conditioning units, coolant water from air compressors, secondary system drains, and other nonradioactive drains throughout the ATR Complex. The wastewater flows through collection piping to the TRA-764 Cold Waste Sample Pit (Figure 2) where the flow rate is recorded and compliance monitoring samples are collected. The wastewater then flows to the Cold Waste Sump Pit (TRA-703). The sump pit contains submersible pumps that route the water to the appropriate pond through 8-in. valves.

Wastewater enters the ponds through concrete inlet basins located near the west end. Most of the water percolates into the porous ground within a short distance from the inlet basins. The entire floor of a pond is rarely submerged. If the water level rises significantly in a pond (e.g., 5 ft), the flow would be diverted to the adjacent pond, allowing the first pond to dry out. An overflow pipe connects the two ponds at the 9-ft level.

The normal operation is to route the wastewater to one pond at a time. Historically, the flow to the ponds was switched annually. Section 4.2 of the Reuse Permit states "DEQ recommends each basin be operated using periods of wetting and drying cycles at set frequencies that provide for both anaerobic and aerobic treatment of the wastewater through the vadose zone."

Beginning in February 2015, the frequency for switching ponds was increased to approximately monthly. The dates when the effluent flow to the ponds were switched can be found in Appendix A. The change in frequency is based on a modeled vadose zone drain-out period for the zone above the shallow perched water zone below the CWP.

There are no existing or planned cross-connections or interconnections between the Cold Waste System wastewater and any water supplies (potable or nonpotable) that would require backflow prevention devices or methods.

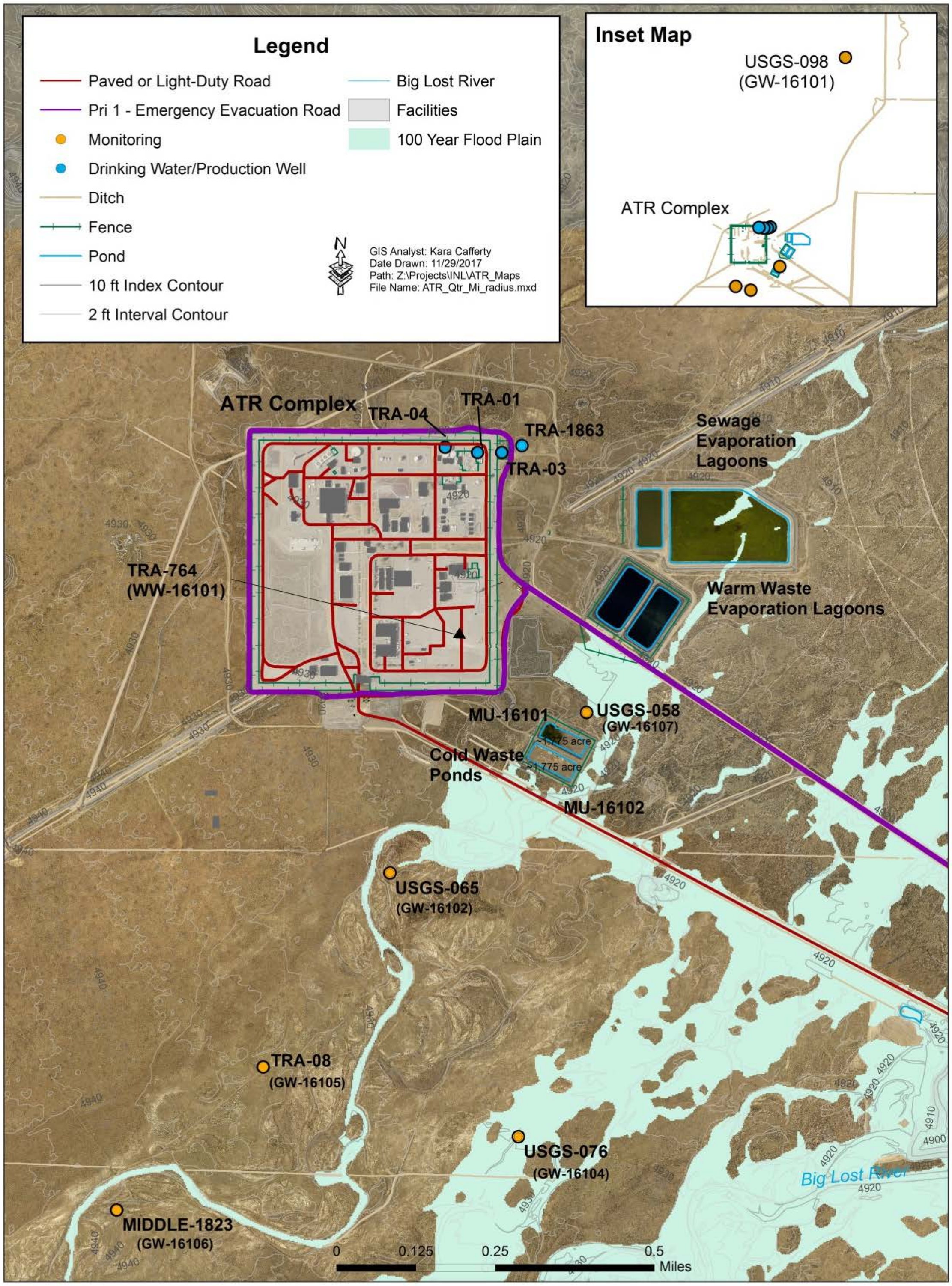

Figure 1. Advanced Test Reactor Complex facility map showing location of the Cold Waste Ponds, monitoring and drinking water wells, Big Lost River, and other associated surface features.

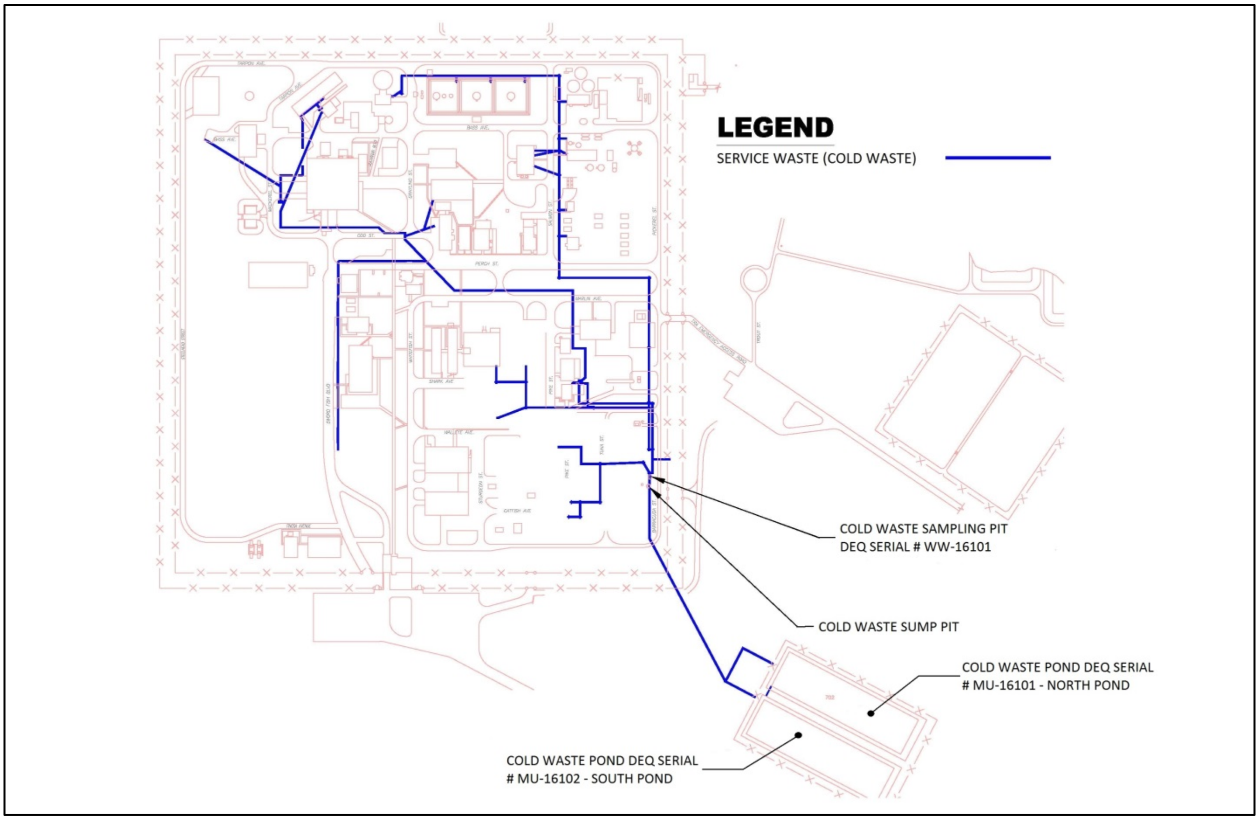

Figure 2. Advanced Test Reactor Complex Cold Waste system flow schematic.

3. COLD WASTE PONDS EFFLUENT MONITORING

This section describes the sampling and analytical methods used in the ATR Complex CWP effluent monitoring program. Effluent monitoring and flow data for wastewater discharged to the ATR Complex CWP are provided.

3.1 Sampling Program and Analytical Methods

Battelle Energy Alliance, LLC, Regulatory and Monitoring Services (R&MS) personnel monitor effluent discharges at the ATR Complex CWP. The R&MS program involves sampling, analysis, and data interpretation carried out under a quality assurance program. A Quality Assurance Project Plan (QAPP), as required by the Reuse Permit, was submitted to DEQ on May 18, 2015 (Miller 2015a).

The QAPP identifies the scope of monitoring, the organization and individuals involved, data quality objectives, monitoring procedures, and specific quality control measures. The purpose of the QAPP is to ensure data of sufficient quantity and quality are collected to meet permit and regulatory expectations.

Regulatory and Monitoring Services personnel collect monthly effluent samples as required in Section 5.1.1 of the Reuse Permit. Effluent samples were collected from the TRA-764 Cold Waste Sample Pit (sampling location WW-16101) prior to discharge to the CWP. All samples were collected according to established programmatic sampling procedures. These procedures are now identified in the QAPP.

Effluent sampling events are randomly scheduled within the constraints of the sampling staff and laboratory availability. Effluent samples are typically collected early in the month (first or second week) and on a Tuesday or Wednesday of the selected week. This ensures the laboratory can receive the samples during normal working hours so that temperature control and holding time requirements are met. This also allows time in the month to collect samples in the event there are issues with the original samples, sampling equipment, flow meter, etc. On occasion, the sampling schedule must be changed, but the rescheduled events always occur within the same month as the original scheduled event.

Analytical methods specified in 40 Code of Federal Regulations (CFR) 141, "National Primary Drinking Water Regulations"; 40 CFR 143, "National Secondary Drinking Water Regulations," or 40 CFR 136, "Guidelines Establishing Test Procedures for the Analysis of Pollutants" were used for analysis of all permit-required parameters.

Permit required effluent pH and conductivity analyses are performed at the time of sample collection by R&MS personnel using a calibrated meter. All other permit required samples were submitted under full chain of custody to GEL Laboratories in Charleston, South Carolina.

3.2 Effluent Monitoring Results

Effluent samples were collected monthly from the TRA-764 Cold Waste Sample Pit (prior to discharge to the CWP) during the permit year. Effluent samples were collected as 24-hour flow proportional composite samples. All samples were collected and analyzed as required by the permit (Table 1). The permit year covered in this report is November 1, 2016–October 31, 2017.

Total nitrogen is a permit required parameter and there are no permit limits for total nitrogen. Total nitrogen is calculated as the sum of total Kjeldahl nitrogen (TKN) and nitrate plus nitrite nitrogen. For results reported as a negative value, the method detection limit (MDL) of 0.033mg/L replaced the result for calculation purposes and the product was reported as a less than (<) number. For positive results reported below the instrument detection limit, the MDL was used in the total nitrogen calculation and the product was also reported as a less than (<). Total nitrogen concentrations in the effluent ranged between <0.90 mg/L in the August 2017 sample to 4.87 mg/L in the June 2017 sample (Table 1).

Although, there are no effluent permit limits for total dissolved solids (TDS) or sulfate, these parameters are roughly 100 mg/L higher in USGS-065 than the other five groundwater monitoring wells evaluated for this permit. Therefore, a summary comparison of these parameters with the Ground Water Quality Rule Secondary Constituent Standards (SCS) found in Idaho Administrative Procedures Act (IDAPA) 58.01.11.200.01.b. is provided below:

The SCS for TDS is 500 mg/L. The TDS concentration in the effluent to the CWP ranged from 223 mg/L in the July and September 2017 samples to 1,220 mg/L in the June 2017 sample (Table 1). Concentrations of TDS in the effluent were above the SCS level in 4 out of the 12 months.

Similar to the TDS effluent levels, sulfate concentrations were above the SCS of 250 mg/L in 4 of the 12 monthly samples (Table 1). Sulfate ranged from a minimum of 20.2 mg/L in the July 2017 sample to a maximum of 644 mg/L in the June 2017 sample.

The ATR evaporative cooling process evaporates approximately one-half of the water volume and concentrates naturally occurring TDS and additives in the blowdown discharged to the CWP. Elevated sulfate levels are generated by reactions between sulfuric acid additives placed in the cooling water and calcium and magnesium carbonates in the water.

Total iron concentrations ranged from less than 0.033 mg/L, in multiple samples, to 0.288mg/L, in the sample collected November 2016. For comparison, the filtered (dissolved) iron concentrations ranged from less than 0.033mg/L, in half the samples, to 0.269mg/L. The remaining metal concentrations remained at low levels.

Several effluent sample results were qualified during data validation. Although the reported concentrations may be considered questionable, inaccurate, or imprecise, the estimated values are provided in Table 1. These qualified data are discussed below:

- The July 6, 2017, nitrite + nitrate sample and field duplicate sample results were J qualified due to high matrix spike recovery and poor replicate precision.
- The TKN result for the sample collected February 7, 2017, was J qualified due to high initial calibration bias and low matrix spike recovery.
- The TKN results for the samples collected March 8, 2017, and May 10, 2017, were U qualified both due to blank contamination. A qualification of U during data validation indicates the analyte was detected at or above the applicable detection limit but the value was not more than 5 times the highest positive amount in any laboratory blank.
- The TKN result for the samples collected April 12, 2017; July 6, 2017; August 9, 2017; and October 5, 2017, were UJ qualified due to blank contamination and low matrix spike recoveries.
- The chloride results for the samples collected January 17, 2017; February 7, 2017; April 12, 2017; August 9, 2017; and October 5, 2017, were J qualified due to high initial calibration and high initial calibration biases.
- The sulfate results for the samples collected April 12, 2017, and June 6, 2017, were J qualified due to high calibration verification bias and high matrix spike recovery.
- The manganese results for samples collected February 7, 2017, and June 6, 2017, were J qualified due to the potential for a false positive and a high initial calibration.

Table 1. Advanced Test Reactor Complex Cold Waste Ponds effluent (WW-16101) data for samples collected in accordance with Reuse Permit I-161-02.

Sample Month	November	December	January	February	March	April	May	June	July[a]	August	September	October
Sample Date	11/03/16	12/08/16	1/17/2017	2/7/2017	3/8/2017	4/12/2017	5/10/2017	6/6/2017	7/6/2017	08/9/17	09/14/17	10/05/17
Nitrite + nitrate as nitrogen (mg/L)	3.59	0.912	2.77	2.88	1.02	0.941	0.885	3.68	1.14J[b] (1.05)J	0.87	0.905	0.935
Total Kjeldahl nitrogen (mg/L)	0.772	0.0214U[c]	0.864	0.818J	0.0957U	0.0907UJ[d]	0.0613U	1.19	0.00198UJ (0.181UJ)	-0.014UJ	-0.0209U	0.129UJ
Total nitrogen[e] (mg/L)	4.36	0.93	3.63	3.70	1.12	1.03	0.95	4.87	1.14 (1.23)	<0.90	<0.94	1.06
pH (s.u.)	6.94	7.19	6.80	6.64	7.17	7.50	7.36	6.59	6.70	6.90	7.18	7.45
Electrical conductivity (µS/cm)	1,438	481	1,173	1,200	458	397	444	1,324	452	479	435	447
Chloride (mg/L)	42.1	9.75	37.7J	35J	11.7	12.9J	11.4	44.5	9.20 (9.24)	9.88J	11.9	13.2J
Sulfate (mg/L)	616	22.2	432	465	46.5	28.5J	27.0	644J	20.2 (20.2)	21.3	27.4	34.7
Total dissolved solids (mg/L)	1,130	256	880	904	269	224	231	1,220	223 (227)	239	223	231
Aluminum, total (mg/L)	0.0438	0.0222	0.0412	0.015U	0.0165	0.0193U	0.0193U	0.0208	0.0193U (0.0285)	0.0193U	0.0193U	0.0193U
Aluminum, filtered (mg/L)	0.0379	0.016	0.034	0.015U	0.015U	0.0193U	0.0193U	0.0193U	0.0193U (0.028)	0.0193U	0.0193U	0.0193U
Chromium, total (mg/L)	0.0144	0.00375	0.00957	0.0102	0.00353	0.00455	0.00374	0.0158	0.00484 (0.00508)	0.00432	0.00441	0.00419
Chromium, filtered (mg/L)	0.0149	0.00382	0.00971	0.0105	0.00335	0.0041	0.00355	0.0152	0.00495 (0.047)	0.00456	0.00449	0.00451
Iron, total (mg/L)	0.288	0.033U	0.209	0.0338	0.033U	0.033U	0.033U	0.070	0.065 (0.0527)	0.0971	0.124	0.139
Iron, filtered (mg/L)	0.269	0.033U	0.189	0.033U	0.033U	0.033U	0.033U	0.033U	0.0452 (0.0439)	0.0957	0.121	0.108
Manganese, total (mg/L)	0.00242	0.001U	0.001U	0.00112J	0.001U	0.001U	0.001U	0.00375J	0.001U (0.001U)	0.001U	0.001U	0.00198
Manganese, filtered (mg/L)	0.00235	0.001U	0.001U	0.00106J	0.001U	0.001U	0.001U	0.00348J	0.001U (0.001U)	0.001U	0.001U	0.00127

a. Results shown in parenthesis are from field duplicate samples collected in July.

b. J flag indicates the associated value is an estimate and may be inaccurate or imprecise.

c. U qualification indicates the analyte was not detected above the instrument detection limit or the analyte was detected at or above the applicable detection limit but the value is not more than 5 times the highest positive amount in any laboratory blank and is U qualified as a result of data validation.

d. UJ flag indicates the sample was analyzed for, but was not detected. The associated value is an estimate and may be inaccurate or imprecise.

e. Total nitrogen is calculated as the sum of the TKN, nitrite nitrogen, and nitrate nitrogen. For results reported as a negative value, the method detection limit (MDL) of 0.033 mg/L replaced the result for calculation purpose and the product was reported as a less than (<) number. For positive results reported below the instrument detection limit, the MDL was used in the total nitrogen calculation and the product was reported as a less than (<). Results were rounded to the nearest hundredth.

3.3 Flow Volumes and Hydraulic Loading Rates

Daily flow readings were taken by ATR Complex CWP Operations during the 2017 permit year, as required by Section 5.1.2 of the Reuse Permit, at the TRA-764 Cold Waste Sample Pit where the flow meter (FM-16101) is located. The flow meter measures flow to the North Pond (MU-16101) and to the South Pond (MU-16102). All flow readings were recorded in gallons per day.

Table 2 summarizes monthly and annual flow data. Daily effluent flow data is provided in Appendix A.

Table 2. Cold Waste Ponds flow summaries.

Month	North Pond (MU-16101) (MG)[a]	South Pond (MU-16102) (MG)	Monthly Total for Both Ponds (MG)
November 2016	17.00	0.00	17.00
December 2016	0.76	16.79	17.55
January 2017	12.61	0.39	13.00
February 2017	0.00	12.27	12.27
March 2017	23.24	0.00	23.24
April 2017	1.40	21.46	22.86
May 2017	22.55	0.00	22.55
June 2017	0.00	20.28	20.28
July 2017	23.80	0.90	24.70
August 2017	0.00	24.10	24.10
September 2017	20.33	3.22	23.55
October 2017	0.00	12.95	12.95
Annual Total	**121.69**	**112.36**	**234.05**

a. MG-million gallons. Reuse Permit I-161-02 requires monthly flow volumes to be report to the nearest 0.00 MG.

Section 4.2 of the permit requires that the total annual volume discharged to the North and South Ponds shall not exceed a 5-year moving annual average of 300 million gallons (MG)/year. No single year shall exceed 375 MG/yr. Annual hydraulic loading data from previous reporting years are used to determine compliance with the moving annual average. Figure 3 shows that the 5-year moving average is below the permit limit.

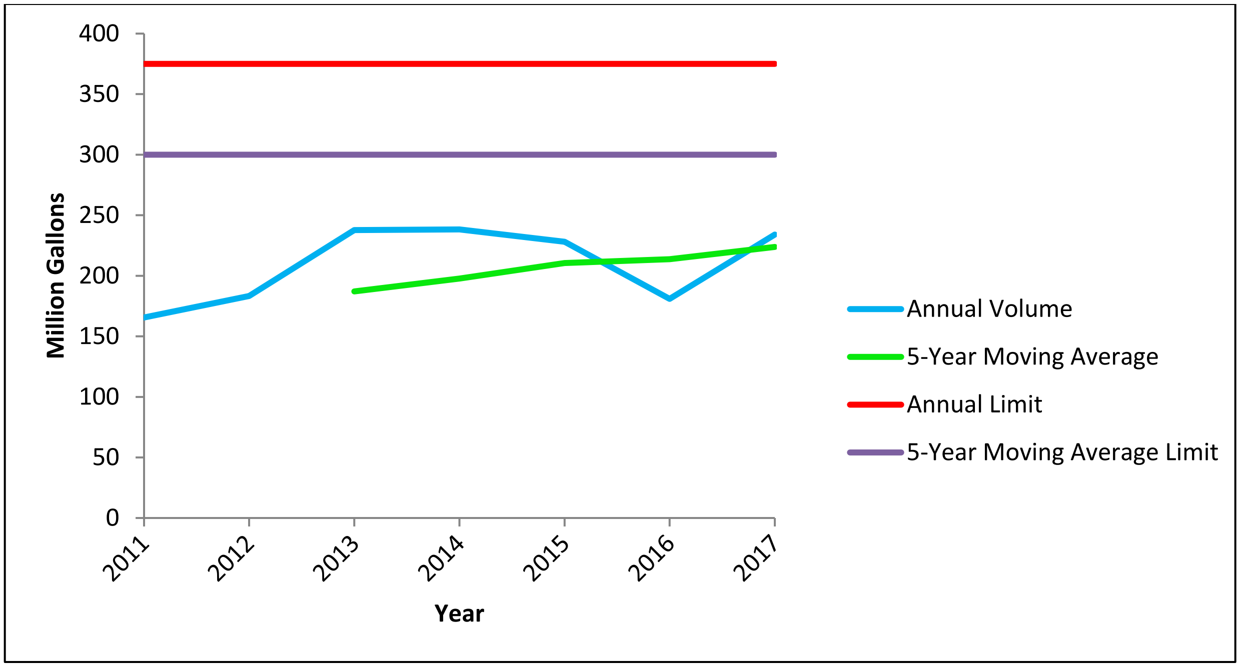

Figure 3. Advanced Test Reactor Complex Cold Waste Ponds wastewater 5-year moving average.

For permit year 2017, the total volume discharged to the North and South ponds was 121.69 MG and 112.36 MG, respectively. The total annual volume discharged to both ponds was 234.05 MG which is significantly less than the maximum Reuse Permit annual limit of 375 MG.

3.3.1 Flow Meter Calibration

Calibration is performed annually and was performed on June 8, 2017, by the ATR Complex maintenance organization. The calibrations were performed to +/- 2% of full scale (full scale = 1400 gpm). The as found calibration of the flow meter was determined to be satisfactory.

4. GROUNDWATER MONITORING

The groundwater monitoring sections provide information concerning the INL sampling program, analytical methods used, and monitoring results, and water table information.

4.1 Sampling Program

The ATR Complex CWP Reuse Permit identifies six INL compliance wells. The permit requires that groundwater samples be collected from these six compliance wells semiannually in April or May and September or October.

The R&MS personnel collected groundwater samples in May and September 2017. The R&MS personnel use project-specific sampling and analysis plans and procedures that govern sampling activities and quality control protocols. The 2017 groundwater sampling was conducted in accordance with the QAPP that was submitted to DEQ on May 18, 2015 (Miller 2015a). The permit identifies a specific list of parameters that are to be analyzed in the groundwater samples. Constituent concentrations in the compliance wells are limited by primary constituent standards (PCS) and SCS specified in IDAPA 58.01.11, “Ground Water Quality Rule” with the exception of chromium. In accordance with the Reuse Permit, Section 5.2.2, footnote a., “compliance with the Primary Constituent Standard for Chromium, under this permit, shall not apply.”

As required by the Reuse Permit, unfiltered samples were collected and analyzed for nitrate + nitrite, as nitrogen, TKN, TDS, pH, electrical conductivity, chloride, chromium, and sulfate. Filtered samples were collected and analyzed for aluminum, chromium, iron, and manganese.

Groundwater pH and conductivity analyses are performed at the time of sample collection by R&MS personnel using a calibrated meter(s). All other permit required groundwater samples are submitted under full chain of custody to GEL Laboratories in Charleston, South Carolina for analysis.

4.2 Analytical Methods

Analytical methods specified in 40 CFR 141, “National Primary Drinking Water Regulations”; 40 CFR 143, “National Secondary Drinking Water Regulations” or 40 CFR 136, “Guidelines Establishing Test Procedures for the Analysis of Pollutants” were used for analysis of all permit-required parameters.

4.3 Monitoring Wells

To measure potential impacts to groundwater from the ATR Complex CWP, the permit requires that groundwater samples be collected from six monitoring wells located in the Snake River Plain Aquifer (Figure 1):

- USGS-098 (GW-16101)
- USGS-065 (GW-16102)
- USGS-076 (GW-16104)
- TRA-08 (GW-16105)
- Middle-1823 (GW-16106)
- USGS-058 (GW-16107).

All six wells are Reuse Permit compliance points. Wells with sufficient water volume are purged to a minimum of three casing volumes or one well volume with three successive field measurements, taken not less than one minute apart, for pH, conductivity, and temperature and meet the following conditions: temperature must be within 1°C of each other, and conductivity values must be within 10% of each other (LI-330).

Groundwater monitoring well TRA-07 (GW-16103) was required under the previous permit as a compliance point monitoring well. However, under the current Reuse Permit Section 5.2.1 “Ground Water Monitoring Point Descriptions” table references TRA-07 in the table’s footnotes as “not required under this permit.” Therefore, no samples or water level information were obtained from this well.

4.4 Groundwater Monitoring Results

Table 3 shows the 2017 reporting year water table elevations and depth to water table, determined prior to purging and sampling, and the analytical results for all parameters specified by the permit for the six aquifer wells. For USGS-058, the Reuse Permit only requires sampling, analysis, and reporting of TDS and sulfate.

The permit-required parameters were below their respective Ground Water Quality Rule (IDAPA 58.01.11) PCSs or SCSs during the 2017 reporting year for all six wells.

The filtered aluminum, iron, and manganese concentrations in all five wells were significantly lower than their respective SCS. Filtered aluminum, iron and manganese concentrations in the five monitoring wells were typically below the laboratory instrument minimum detection limits or just slightly above.

The sulfate and TDS concentrations in the groundwater wells continued to be monitored. USGS-065, downgradient of the CWP, tends to have elevated sulfate and TDS concentrations compared to the other monitoring wells, but these concentrations remain well below their applicable SCS of 250 mg/L and 500 mg/L, respectively. The highest sulfate concentration was 150 mg/L in the May 2017 sample and the highest TDS concentration was 417 mg/L in the September 2017 sample. The sulfate and TDS concentrations in the other five monitoring wells, including USGS-058, were significantly lower than those in USGS-065. The concentrations of sulfate and TDS from USGS-058, located slightly upgradient of the North Pond, were similar to concentrations in Middle-1823 which is located significantly downgradient from the CWP. A detailed trend analysis for sulfate and TDS is discussed in Section 6.

Although some of the reported concentrations may be considered questionable, inaccurate, or imprecise, the estimated values are provided in Table 3. These qualified data are discussed below:

- The May 2017 TKN result for USGS-098, USGS-065, TRA-08, Middle-1823 was U qualified due to blank contamination.
- The September 2017 TKN result for USGS-065, TRA-08, and Middle-1823 (duplicate) was U qualified due to blank contamination. A U qualification during data validation indicates the analyte was detected at or above the applicable detection limit but the value was not more than 5 times the highest positive amount in any laboratory blank.
- The September 2017 chloride result for USGS-065 was J qualified due to high initial calibration bias.
- The May 2017 manganese result for TRA-08 and Middle-1823 was J qualified due to a potential false positive.

4.5 Water Table Information

Depth to water and water table elevations for the May and September, 2017 sampling events are shown in Figure 4 and Figure 5, respectively. The elevations are presented in North American Vertical Datum of 1988 (NAVD 88). In addition, the figures show the inferred general groundwater flow direction in the vicinity of the ATR Complex. In this area, the flow is in a south to southwest direction. The general groundwater flow direction at the INL Site is to the southwest.

Table 3. Advanced Test Reactor Complex Cold Waste Ponds aquifer monitoring well data for the 2017 reporting year.

WELL NAME	USGS-098 (GW-16101)		USGS-065 (GW-16102)		USGS-076 (GW-16104)		TRA-08 (GW-16105)		Middle-1823 (GW-16106)		USGS-058 (GW-16107)		PCS/SCS[a]
Sample Date	05/4/17	09/12/17	05/09/17	09/13/17	05/08/17	09/13/17	05/08/17	09/13/17	05/04/17	09/12/17	05/04/17	09/14/17	
Water Table Depth (ft below ground surface)	429.36	429.64	476.97	476.74	484.95	484.67	490.18	489.84	494.56	494.56	472.93	472.66	NA[b]
Water Table Elevation (above mean sea level in ft)[c]	4459.85	4459.57	4451.60	4451.83	4448.26	4448.54	4448.88	4449.22	4448.31	4448.31	4448.96	4449.23	NA
Borehole Correction Factor (ft)[d]	2.53	2.53	NA	NA	NA	NA	0.63	0.63	NA	NA	NA	NA	NA
Nitrite + nitrate as nitrogen (mg/L)	1.07	0.825	1.41	1.24	1.04	0.93	0.975	0.822	0.985	0.855 (0.865)[e]	NR[f]	NR	10 (PCS)
Total Kjeldahl nitrogen (mg/L)	0.0398U[g]	0.0325U	0.132U	0.0817U	-0.0032U	-0.00857U	0.0362U	0.0793U	0.146U	-0.0097U (0.314U)	NR	NR	NA
Total nitrogen[h] (mg/L)	1.11	0.86	1.54	1.32	<1.07	<0.96	1.01	0.90	1.13	0.89 (1.18)	NR	NR	NA
pH (s.u.)	7.24	6.75	7.59	7.20	7.90	6.83	7.84	7.26	7.61	7.09	NR	NR	6.5 to 8.5 (SCS)
Electrical conductivity (µS/cm)	393	386	567	553	419	380	417	388	404	420	NR	NR	NA
Chloride (mg/L)	13.4	13.7	17.1	17.5J[i]	11.8	11.8	10.4	10.3	10.4	10.3 (10.4)	NR	NR	250 (SCS)
Sulfate (mg/L)	21.5	21.6	150	143	34.8	34.3	44.5	43.7	34.3	33.6 (33.5)	35.9	34.3	250 (SCS)
Total dissolved solids (mg/L)	221	196	394	417	243	267	231	280	243	260 (247)	216	236	500 (SCS)
Aluminum, filtered (mg/L)	0.0193U	0.0193U	0.0193U	0.0193U	0.0193U	0.0193U	0.0953	0.0235	0.0193U	0.0193U (0.0193U)	NR	NR	0.2 (SCS)
Chromium[j], total (mg/L)	0.00752	0.00699	0.0852	0.0749	0.0119	0.0119	0.097	0.0202	0.0105	0.0105 (0.0101)	NR	NR	0.1 (PCS)
Chromium[j], filtered (mg/L)	0.00677	0.00689	0.0112	0.00769	0.0115	0.0112	0.0209	0.0195	0.0108	0.0102 (0.0107)	NR	NR	0.1 (PCS)
Iron, filtered (mg/L)	0.03U	0.03U	0.03U	0.03U	0.03U	0.03U	0.0324	0.03U	0.03U	0.03U (0.03U)	NR	NR	0.3 (SCS)
Manganese, filtered (mg/L)	0.001U	0.001U	0.001U	0.001U	0.001U	0.001U	0.00124J	0.001U	0.00167J	0.00118 (0.00115)	NR	NR	0.05 (SCS)

a. Primary constituent standards (PCS) and secondary constituent standards (SCS) in groundwater referenced in the Ground Water Quality Rule, IDAPA 58.01.11.200.01.a and b.

b. NA- Not applicable.

c. Elevation data provided using the North American Vertical Datum of 1988 (NAVD 88).

d. The USGS performed gyroscopic surveys on TRA-08 and USGS-098 (circa 2002 to 2005) and discovered some well deviation which can cause discrepancies in the water level measurements. The borehole correction factors determined from gyroscopic surveys attempt to reconcile these discrepancies.

e. Results shown in parenthesis are from the field duplicate samples.

f. NR indicates the parameter is not required by the Reuse Permit.

g. U qualification indicates the analyte was not detected above the instrument detection limit or the analyte was detected at or above the applicable detection limit but the value is not more than 5 times the highest positive amount in any laboratory blank and is U qualified as a result of data validation.

h. Total nitrogen is calculated as the sum of the total Kjeldahl nitrogen (TKN) and nitrite +nitrate as nitrogen. For results reported as a negative value, the method detection limit (MDL) of 0.033 mg/L replaced the result for calculation purpose and the product was reported as a less than (<) number. For positive results reported below the instrument detection limit, the MDL was used in the total nitrogen calculation and the product was reported as a less than (<). Results were rounded to the nearest hundredth.

i. J flag indicates the associated value is an estimate and may be inaccurate or imprecise.

j. PCS for Chromium does not apply under this permit.

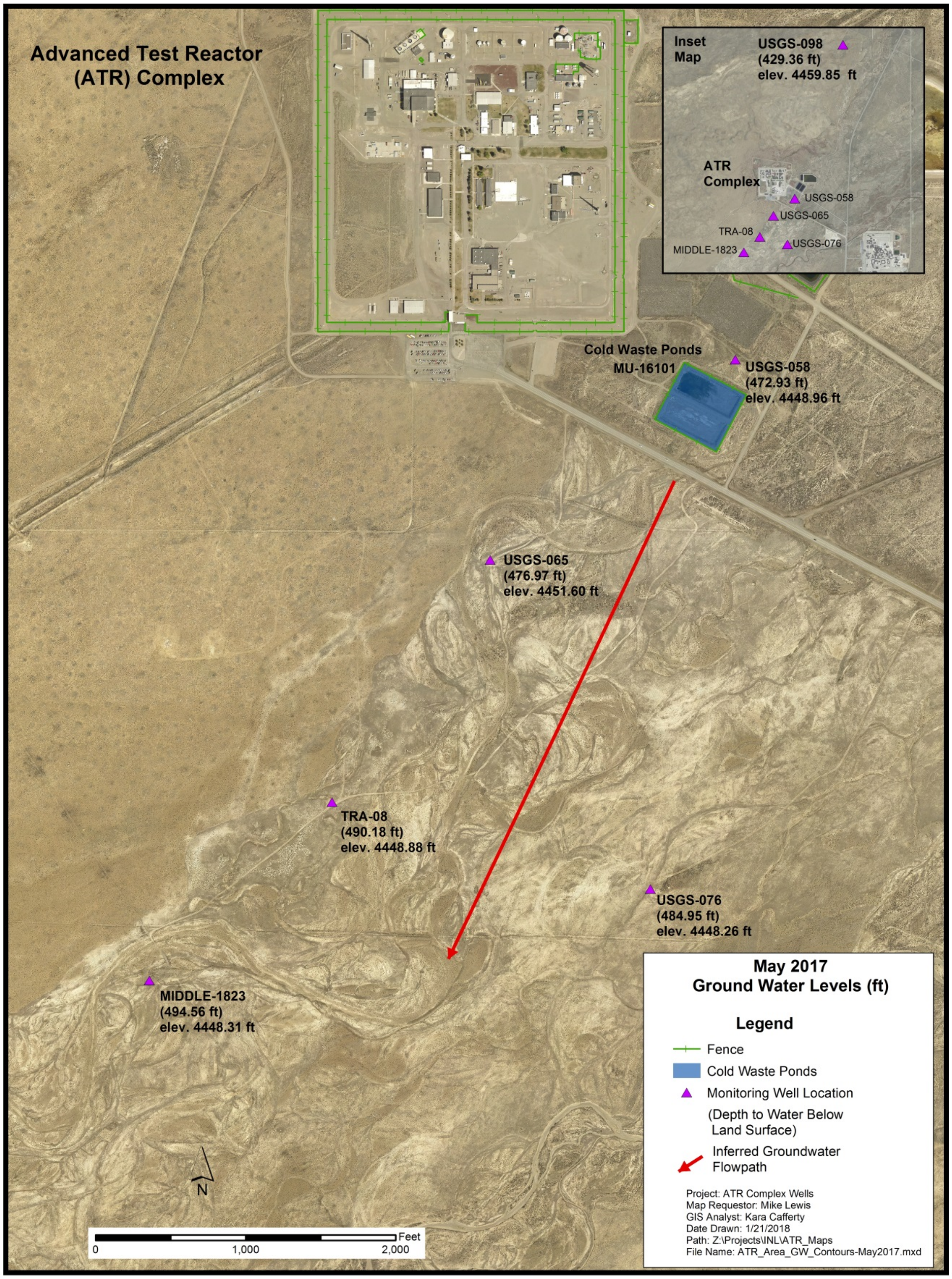

Figure 4. Map showing depths and elevations based on the May 2017 water level measurements.

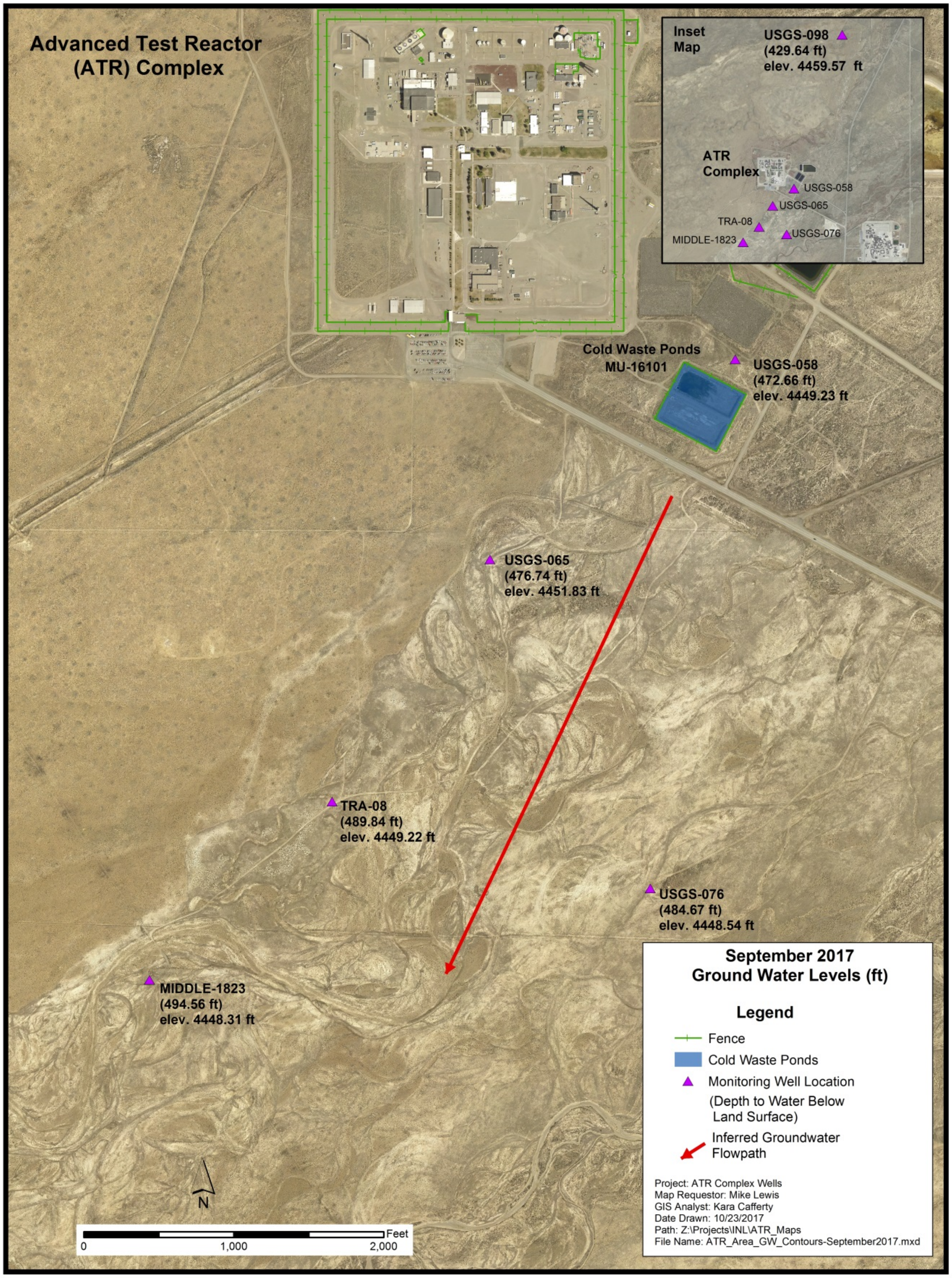

Figure 5. Map showing depths and elevations based on the September 2017 water level measurements.

5. PERMIT YEAR SUMMARIES

This section provides information and status associated with permit required compliance activities and noncompliance issues.

5.1 Status of Permit Required Compliance Activities

Section 3 of the Reuse Permit identifies four compliance activities (CA-161-01 through 04) discussed below:

CA-161-01 – Within 12 months of permit issuance, the permittee shall submit for review and approval a Plan of Operation (PO) that reflects current operations and incorporates the requirements of the Reuse Permit. The PO shall be updated as needed to reflect current operations. The permittee shall notify DEQ of material changes to the PO and copies shall be kept on site and made available to DEQ upon request.

The PO was submitted to DEQ on November 19, 2015 (Miller 2015b). Approval of the PO from DEQ has not been received (John 2016).

CA-161-02 – Within 6 months of permit issuance, the permittee is required to prepare and implement a Quality Assurance Project Plan (QAPP) that incorporates all monitoring and reporting required by the permit. A copy of the QAPP and a written notice that the QAPP has been implemented shall be provided to DEQ.

A copy of the QAPP and the implementation notice were submitted to DEQ on May 18, 2015 (Miller 2015a).

CA-161-03 – Twelve months prior to permit expiration, the permittee shall contact DEQ and schedule a pre-application workshop to discuss the compliance status of the facility and the content required for the reuse permit application package.

This requirement has been added to the INL electronic Commitment Tracking System (CTS). This system provides automatic reminders to those responsible for completing the action. The permit expiration date is November 19, 2019; therefore, the first reminder date for this activity is May 18, 2018.

CA-161-04 – Six months prior to permit expiration the permittee shall submit to DEQ a complete permit renewal application package, which fulfills the requirements specified at the pre-application workshop identified in CA-161-03.

The first CTS reminder date for this activity is also May 18, 2018.

5.2 Noncompliance/Issues

There was one permit noncompliance for the 2017 reporting year. Condition 9.1.2 and IDAPA 58.01.01.16.600.2 requires application of wastewaters restricted to the premise of the application site.

Noncompliance

On July 25, 2017, a ball valve was discovered open westerly of TRA-671 (ATR Cooling Tower Pump House). Approximately 600 gallons of cooling water from ATR heat exchangers secondary cooling system (nonradioactive) was released to ground surface outside of the Reuse Permit, I-161-02, application site. The wastewater released contained corrosion inhibitors and biocide but did not endanger public health or the environment.

A courtesy conference call with DEQ was conducted on July 25, 2017 to discuss the release (Lewis 2017a). On July, 27, 2017, a five day written report was submitted as required by Section 8.500.06.d. of the permit. The report contained information specific to the release including description, cause, period of noncompliance and actions taken or planned to eliminate the occurrence. The report stated operations procedure OMM-7.4.13.1.6 “Draining the Secondary Coolant and UCW Systems” and two model work orders (MWO) 198794 and 198800 will be revised to include inspections of the ball valve to eliminate the recurrence of the noncompliance (Lewis 2017b).

A revised OMM-7.4.13.1.6 was released October 25, 2017 to include specific instructions concerning the operation of the isolation valve. The model work orders have also been revised, but remain in the planning phase until future need to clean the cooling tower basin.

5.3 Department of Environmental Quality Annual Inspection

The most recent inspection of the ATR Complex CWP by personnel from the DEQ Boise office occurred on October 12, 2016. DEQ found the ATR Complex CWP in substantial compliance with the Reuse Permit (John 2016).

Reuse facilities and structures visited during the inspection included monitoring well USGS-098, TRA-703 (Cold Waste Sump Pit), TRA-764 (Cold Waste Sampling Pit), and the CWP. Current operations were discussed including a planned future upgrade to the pump system, flow meter calibration date, dates and timing for switching flow to the ponds, monitoring activities, laboratory used for sample analysis, etc. DEQ reviewed laboratory and data validation reports.

DEQ provided two recommendations:

1. INL should contact the Idaho Falls Regional Office to discuss the interpretation of Item 8 in Section 6.1.2 of the Reuse Permit. This section requires “All laboratory analytical reports and chain of custody forms” are to be submitted in the annual report.

On March 7, 2017, DEQ issued Modification 1 to the INL ATR Complex Cold Waste Ponds. The permit modification updated Section 6.1.2, to read "Laboratory analytical result reports for monitoring specified in Section 5 of the permit. Chain of custody forms, supporting information for laboratory analytical reports, and quality assurance documentation shall be available for review upon request by DEQ" (Neher 2017).

2. “The facility should continue to update DEQ on the progress of the installation of a new control system for the pumps.”

On June 20, 2017, INL notified the Idaho Falls Regional Office (DEQ) of plans to upgrade control equipment (hereafter Upgrade Project) for TRA-703, a conveyance structure for the ATR Complex’s cold waste collection system (Lewis 2017c). The notification reported that INL did not consider the upgrade to be a material modification and therefore did not require a DEQ review specified in IDAPA 58.01.17.500.06.a. On July 20, 2017, DEQ provided concurrence to the interpretation that INL did not need to submit plans and specifications for DEQ review and approval for the Upgrade Project (Rackow 2017).

On June 22, 2017, INL provided DEQ a thirty day notice of potential noncompliance due to the interruption of flowmeter service caused by the power outage necessary to install the control system upgrade for the Upgrade Pro (Miller 2017). Section 5.12 of the reuse permit requires daily flowmeter reading. As of the conclusion of the 2017 reporting year, the Upgrade Project is awaiting funding approval. Future status updates and any respective noncompliances will be provided in future annual reports.

6. ENVIRONMENTAL IMPACTS

The Reuse Permit allows 300 MG/year as a 5-year annual average, not to exceed 375 MG annually. The total volume discharged to the CWP for this period (November 1, 2016–October 31, 2017) was 234.05 MG. No runoff occurred from the application area.

Total nitrogen concentrations in the effluent ranged between <0.90 mg/L in the August 2017 sample to 4.87 mg/L in the June 2017 sample (Table 1). Nitrogen can be lost or removed from the soil by leaching, ammonia volatilization, and denitrification. Total nitrogen in the nearest downgradient well (USGS-065) from the CWP was less than 1.32 mg/L in the September 2017 sample and 1.54 mg/L in the May 2017 sample. The upgradient well (USGS-098) had total nitrogen (TN) concentrations of 0.86 mg/L and 1.11 mg/L for September 2017 and May 2017, respectively. The impact of TN on the groundwater from the CWP appears to be minimal.

Sulfate and TDS concentrations (Table 1) in the effluent have the potential to impact groundwater. Sulfate has high solubility and tends to move at a similar velocity as the groundwater (DEQ 2007). Sulfate and TDS sampling began in 2015 for USGS-098 and USGS-058. Sampling of USGS-098 and USGS-058 was not required by the previous permit.

Sulfate concentrations in the 2017 permit year effluent monthly samples ranged from a low of 20.2 mg/L in the July 2017 sample to a high of 644 mg/L in the June 2017 sample. The TDS effluent concentrations ranged from a low of 223 mg/L in the July and September 2017 sample to a high of 1,220 mg/L in the June 2017 sample. There are no Reuse Permit effluent limits for sulfate and TDS. However, as discussed below, there are groundwater quality standards for these two parameters.

Figures 6 and 7 show the sulfate and TDS concentrations in samples collected from the Reuse Permit CWP monitoring wells. Sulfate and TDS data were not available for TRA-08 for October 2009 due to insufficient water available to collect a representative sample. Where a duplicate sample was collected, the original sample was used in generating the graphs.

USGS-065 has the highest sulfate concentrations of the six monitoring wells and it is the closest downgradient well to the CWP. As shown in Figure 6, the sulfate concentration in USGS-065 has remained below the SCS of 250 mg/L.

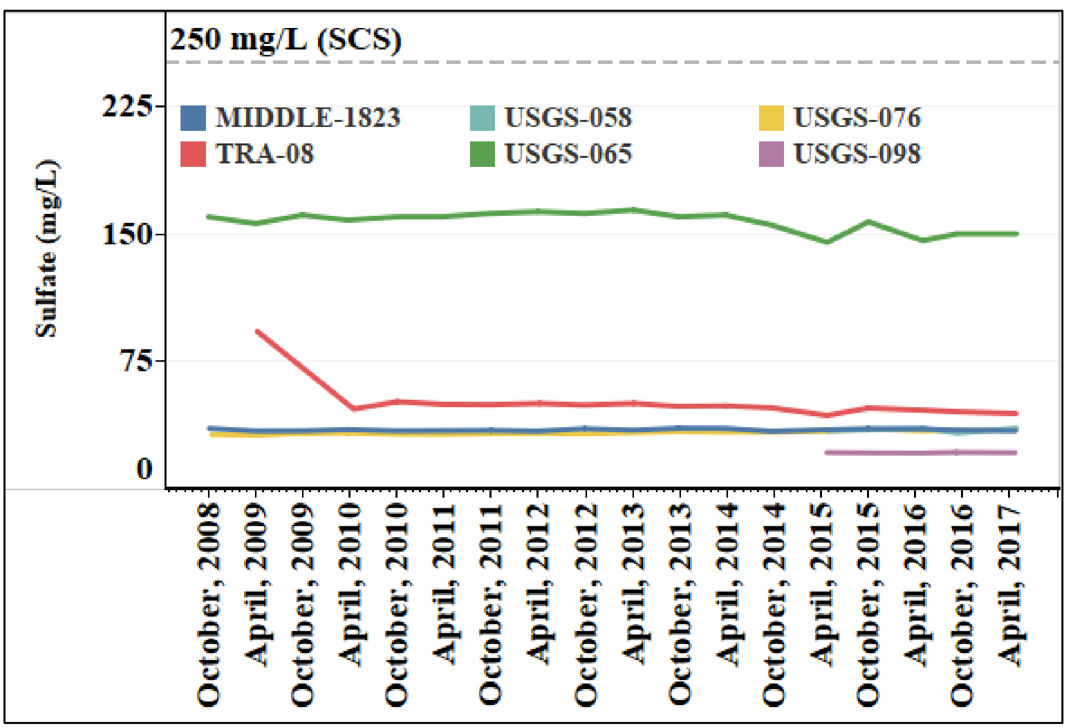

Figure 6. Sulfate concentrations in the Cold Waste Ponds monitoring wells.

Similar to sulfate, the highest TDS concentration is in USGS-065 (Figure 7). The highest TDS concentration in USGS-065, for the reporting year, occurred in September 2017 at 417 mg/L. The TDS concentration in USGS-065 has remained below the SCS of 500 mg/L (Figure 7).

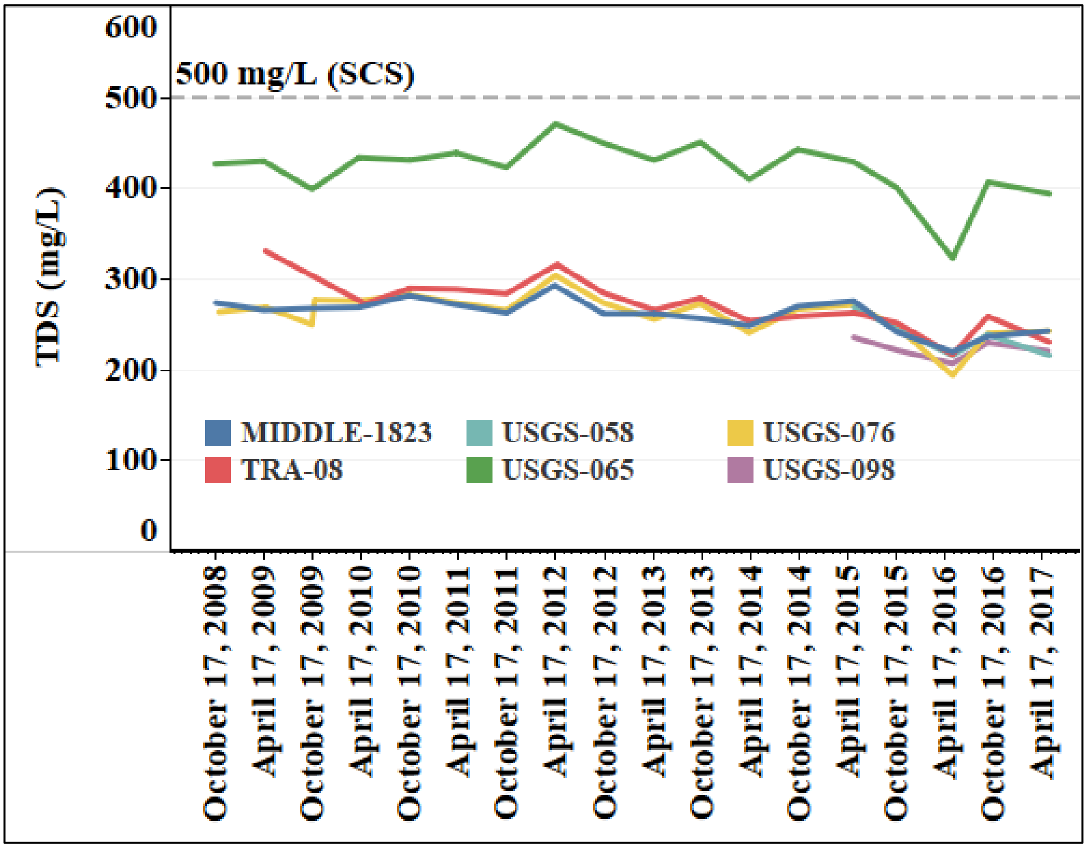

Figure 7. Total dissolved solids concentrations in the Cold Waste Ponds monitoring wells.

A Mann-Kendall trend analysis was performed on sulfate and TDS concentrations in the groundwater wells for the years 2013 to 2017. Sulfate concentrations were found to have no trend in USGS-058, and USGS-098, a decreasing trend in TRA-08, USGS-065, and Middle-1823, and an increasing trend in USGS-076 at the 90% confidence level (Table 4).

The concentrations of TDS were found to have no trend in USGS-076, TRA-08, Middle-1823, and USGS-058, and a decreasing trend in USGS-098 and USGS-065 at the 90% confidence level (Table 5).

Table 4. Mann-Kendall trend analysis results for sulfate in the groundwater monitoring wells.

Well Name	# Samples	Trend ≥ 80% Confidence	Trend ≥ 90% Confidence	Stability Check (if no trend at 80% confidence)
USGS-098	6	No Trend	No Trend	Stable
USGS-065	10	Decreasing	Decreasing	NA[a]
USGS-076	10	Increasing	Increasing	NA
TRA-08	10	Decreasing	Decreasing	NA
Middle-1823	10	Decreasing	Decreasing	NA
USGS-058	6	No Trend	No Trend	Stable

a. Not applicable.

Table 5. Mann-Kendall trend analysis results for total dissolved solids in the groundwater monitoring wells.

Well Name	# Samples	Trend ≥ 80% Confidence	Trend ≥ 90% Confidence	Stability Check (if no trend at 80% confidence)
USGS-098	6	Decreasing	Decreasing	NA[a]
USGS-065	10	Decreasing	Decreasing	NA
USGS-076	10	No Trend	No Trend	Stable
TRA-08	10	No Trend	No Trend	Stable
Middle-1823	10	Decreasing	No Trend	NA
USGS-058	6	Decreasing	No Trend	NA

a. Not applicable.

With the exception of USGS-065, sulfate and TDS concentrations in the groundwater wells (Figures 6 and 7) are only slightly elevated when compared to the concentrations in background well USGS-098. The sulfate and TDS quickly dissipate with distance from the ponds. This can be seen when comparing the 2017 permit year sulfate and TDS concentrations found in USGS-065 and Middle-1823 (Figures 6 and 7). USGS-065 had a maximum sulfate concentration of 150 mg/L and a TDS concentration of 417 mg/L for the 2017 report year located approximately 1,200 ft downgradient of the CWP. In contrast, Middle-1823, located approximately 4,000 ft downgradient from the CWP, had maximum sulfate and TDS concentrations of 34.3 mg/L and 260 mg/L, respectively. The concentrations of sulfate and TDS in Middle-1823 are similar to the concentrations in the up/cross gradient well, USGS-076 (Figures 6 and 7).

As stated above, sulfate and TDS have SCSs for groundwater quality. The SCSs are generally based on aesthetic qualities including odor, taste, color, and foaming (EPA 1992). Sulfate is listed for causing a "salty taste" in drinking water. Total dissolved solids are listed for "hardness, deposits, colored water, staining, and salty taste." The nearest drinking water well is located approximately 3 miles downgradient of the CWP. Because the higher levels of sulfate and TDS are localized near the CWP and their SCSs are based on aesthetics, impacts to human health and the environment are expected to be minimal.

Groundwater concentrations for aluminum, chromium, iron, and manganese, in USGS-065, USGS-076, TRA-08, and Middle-1823, were significantly lower than the applicable PCS or SCS (Table 3).

There are positive impacts to the environment associated with the operation of the CWP. These include returning a significant portion of the industrial wastewater to the aquifer and providing needed water for several native animal species in an otherwise semi-arid environment.

7. REFERENCES

40 CFR 136, “Guidelines Establishing Test Procedures for the Analysis of Pollutants,” *Code of Federal Regulations*, Office of the Federal Register, November 2017.

40 CFR 141, “National Primary Drinking Water Regulations,” *Code of Federal Regulations*, Office of the Federal Register, November 2017.

40 CFR 143, “National Secondary Drinking Water Regulations,” *Code of Federal Regulations*, Office of the Federal Register, March 2017.

DEQ, 2007, Guidance for Reclamation and Reuse of Municipal and Industrial Wastewater, Idaho Department of Environmental Quality, September 2007.

EPA, 1992, *Secondary Drinking Water Regulations: Guidance for Nuisance Chemicals*, EPA 810/K-92-001.

GDE-8511, “Inorganic Analyses Data Validation for INL,” Revision 0, January 25, 2007.

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John, A., DEQ, to T. A. Miller, INL, October 24, 2016, “I-161-02 INL ATR Cold Waste Ponds, 2016 Inspection,” CCN 239279.

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Lewis, M. G., INL, to T. Rackow, DEQ, July 25, 2017a, “Minutes from June, 2017, Conference Call with DEQ Concerning ATR Complex Wastewater Release,” CCN 240894.

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Miller, T. A., INL, to G. Eager, DEQ, May 18, 2015a, “Reuse Permit I-161-02 Compliance Activity CA-161-02 Quality Assurance Project Plan Transmittal,” CCN 235805.

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Neher, E., DEQ, to R. Boston, DOE-ID, November 20, 2014, “I-161-02 INL ATR Cold Waste Ponds, Final Permit,” CCN 234522.

Neher, E., DEQ, to R. Boston, DOE-ID, March 7, 2017, “Idaho National Laboratory (INL) Advanced Test Reactor (ATR) Complex Cold Waste Ponds, Reuse Permit I-161-02, Modification 1,” CCN 240047.

Rackow, T., DEQ, to M. G. Lewis, INL, June 20, 2017, “DEQ Call Concerning the New Control System for the ATR Complex Cold Waste System Pumps,” CCN 240649.

Appendix A

Daily Discharge Volumes to the Advanced Test Reactor Complex Cold Waste Ponds

Appendix A

Daily Discharge Volumes to the Advanced Test Reactor Complex Cold Waste Ponds

Table A-1. Daily discharge volumes to the ATR Complex CWP for the 2017 permit year.

Date	North Pond (gal)	South Pond (gal)
11/01/16	293,520	OOS
11/02/16	300,440	OOS
11/03/16	289,370	OOS
11/04/16	291,940	OOS
11/05/16	282,250	OOS
11/06/16	299,740	OOS
11/07/16	284,760	OOS
11/08/16	660,000	OOS
11/09/16	760,380	OOS
11/10/16	573,950	OOS
11/11/16	639,670	OOS
11/12/16	548,500	OOS
11/13/16	679,900	OOS
11/14/16	661,600	OOS
11/15/16	698,230	OOS
11/16/16	590,670	OOS
11/17/16	710,900	OOS
11/18/16	677,900	OOS
11/19/16	597,500	OOS
11/20/16	650,650	OOS
11/21/16	644,910	OOS
11/22/16	644,440	OOS
11/23/16	737,340	OOS
11/24/16	600,470	OOS
11/25/16	663,190	OOS
11/26/16	569,980	OOS
11/27/16	686,760	OOS
11/28/16	692,560	OOS
11/29/16	662,510	OOS
11/30/16	610,000	OOS
12/01/16	757,620	OOS
12/02/16	OOS	628,600
12/03/16	OOS	616,200
12/04/16	OOS	654,320
12/05/16	OOS	644,050
12/06/16	OOS	665,840
12/07/16	OOS	722,580
12/08/16	OOS	682,600
12/09/16	OOS	593,300
12/10/16	OOS	682,880
12/11/16	OOS	646,580
12/12/16	OOS	687,460
12/13/16	OOS	645,960
12/14/16	OOS	756,270

Date	North Pond (gal)	South Pond (gal)
12/15/16	OOS	761,440
12/16/16	OOS	691,600
12/17/16	OOS	893,900
12/18/16	OOS	525,460
12/19/16	OOS	639,450
12/20/16	OOS	303,880
12/21/16	OOS	309,920
12/22/16	OOS	388,020
12/23/16	OOS	365,300
12/24/16	OOS	452,100
12/25/16	OOS	439,900
12/26/16	OOS	396,300
12/27/16	OOS	413,400
12/28/16	OOS	444,080
12/29/16	OOS	381,260
12/30/16	OOS	362,600
12/31/16	OOS	391,670
01/01/17	OOS	392,950
01/02/17	308,250	OOS
01/03/17	312,620	OOS
01/04/17	291,060	OOS
01/05/17	326,810	OOS
01/06/17	281,960	OOS
01/07/17	313,300	OOS
01/08/17	307,920	OOS
01/09/17	364,060	OOS
01/10/17	409,020	OOS
01/11/17	366,950	OOS
01/12/17	395,400	OOS
01/13/17	400,900	OOS
01/14/17	441,400	OOS
01/15/17	376,150	OOS
01/16/17	411,290	OOS
01/17/17	412,970	OOS
01/18/17	722,940	OOS
01/19/17	778,650	OOS
01/20/17	934,670	OOS
01/21/17	681,090	OOS
01/22/17	769,830	OOS
01/23/17	537,820	OOS
01/24/17	163,200	OOS
01/25/17	289,150	OOS
01/26/17	334,850	OOS
01/27/17	294,290	OOS

Date	North Pond (gal)	South Pond (gal)
01/28/17	318,200	OOS
01/29/17	309,060	OOS
01/30/17	359,990	OOS
01/31/17	396,880	OOS
02/01/17	OOS	380,500
02/02/17	OOS	399,000
02/03/17	OOS	404,710
02/04/17	OOS	336,950
02/05/17	OOS	378,120
02/06/17	OOS	394,570
02/07/17	OOS	365,430
02/08/17	OOS	404,590
02/09/17	OOS	417,840
02/10/17	OOS	377,320
02/11/17	OOS	370,790
02/12/17	OOS	376,400
02/13/17	OOS	339,460
02/14/17	OOS	281,940
02/15/17	OOS	307,520
02/16/17	OOS	310,630
02/17/17	OOS	291,600
02/18/17	OOS	312,300
02/19/17	OOS	316,430
02/20/17	OOS	404,400
02/21/17	OOS	433,530
02/22/17	OOS	350,590
02/23/17	OOS	712,050
02/24/17	OOS	848,350
02/25/17	OOS	670,690
02/26/17	OOS	665,110
02/27/17	OOS	724,560
02/28/17	OOS	696,480
03/01/17	751,170	OOS
03/02/17	668,470	OOS
03/03/17	639,420	OOS
03/04/17	693,400	OOS
03/05/17	845,350	OOS
03/06/17	696,360	OOS
03/07/17	670,850	OOS
03/08/17	680,700	OOS
03/09/17	809,500	OOS
03/10/17	690,100	OOS
03/11/17	864,700	OOS
03/12/17	760,820	OOS
03/13/17	711,340	OOS
03/14/17	807,130	OOS
03/15/17	824,680	OOS
03/16/17	737,300	OOS
03/17/17	724,070	OOS
03/18/17	919,000	OOS
03/19/17	679,650	OOS
03/20/17	747,580	OOS

Date	North Pond (gal)	South Pond (gal)
03/21/17	730,340	OOS
03/22/17	652,080	OOS
03/23/17	739,950	OOS
03/24/17	739,130	OOS
03/25/17	697,850	OOS
03/26/17	759,290	OOS
03/27/17	670,520	OOS
03/28/17	811,480	OOS
03/29/17	744,600	OOS
03/30/17	868,400	OOS
03/31/17	902,960	OOS
04/01/17	579,920	OOS
04/02/17	823,360	OOS
04/03/17	OOS	820,170
04/04/17	OOS	782,090
04/05/17	OOS	808,050
04/06/17	OOS	915,680
04/07/17	OOS	630,040
04/08/17	OOS	884,340
04/09/17	OOS	766,080
04/10/17	OOS	646,980
04/11/17	OOS	794,670
04/12/17	OOS	695,880
04/13/17	OOS	797,010
04/14/17	OOS	651,000
04/15/17	OOS	659,500
04/16/17	OOS	688,480
04/17/17	OOS	684,670
04/18/17	OOS	738,490
04/19/17	OOS	867,360
04/20/17	OOS	767,860
04/21/17	OOS	711,860
04/22/17	OOS	911,500
04/23/17	OOS	709,320
04/24/17	OOS	732,610
04/25/17	OOS	830,950
04/26/17	OOS	804,480
04/27/17	OOS	820,140
04/28/17	OOS	830,000
04/29/17	OOS	790,000
04/30/17	OOS	724,110
05/01/17	811,170	OOS
05/02/17	794,000	OOS
05/03/17	737,600	OOS
05/04/17	918,000	OOS
05/05/17	758,450	OOS
05/06/17	832,200	OOS
05/07/17	714,900	OOS
05/08/17	816,830	OOS
05/09/17	762,260	OOS
05/10/17	840,840	OOS
05/11/17	749,490	OOS

Date	North Pond (gal)	South Pond (gal)
05/12/17	806,130	OOS
05/13/17	849,470	OOS
05/14/17	673,030	OOS
05/15/17	720,350	OOS
05/16/17	665,360	OOS
05/17/17	731,220	OOS
05/18/17	719,370	OOS
05/19/17	753,910	OOS
05/20/17	807,860	OOS
05/21/17	674,690	OOS
05/22/17	781,840	OOS
05/23/17	809,310	OOS
05/24/17	755,590	OOS
05/25/17	863,200	OOS
05/26/17	766,510	OOS
05/27/17	758,180	OOS
05/28/17	810,010	OOS
05/29/17	354,810	OOS
05/30/17	257,000	OOS
05/31/17	251,870	OOS
06/01/17	OOS	333,180
06/02/17	OOS	398,630
06/03/17	OOS	288,270
06/04/17	OOS	371,140
06/05/17	OOS	465,390
06/06/17	OOS	406,790
06/07/17	OOS	472,130
06/08/17	OOS	445,600
06/09/17	OOS	500,100
06/10/17	OOS	416,900
06/11/17	OOS	712,770
06/12/17	OOS	836,150
06/13/17	OOS	868,370
06/14/17	OOS	845,330
06/15/17	OOS	856,130
06/16/17	OOS	834,710
06/17/17	OOS	760,050
06/18/17	OOS	908,080
06/19/17	OOS	1,166,500
06/20/17	OOS	723,000
06/21/17	OOS	714,500
06/22/17	OOS	722,530
06/23/17	OOS	795,190
06/24/17	OOS	544,780
06/25/17	OOS	759,950
06/26/17	OOS	903,360
06/27/17	OOS	779,420
06/28/17	OOS	841,570
06/29/17	OOS	763,300
06/30/17	OOS	842,860
07/01/17	OOS	897,100
07/02/17	810,420	OOS

Date	North Pond (gal)	South Pond (gal)
07/03/17	771,310	OOS
07/04/17	802,900	OOS
07/05/17	997,810	OOS
07/06/17	705,080	OOS
07/07/17	880,350	OOS
07/08/17	803,620	OOS
07/09/17	826,230	OOS
07/10/17	832,360	OOS
07/11/17	735,410	OOS
07/12/17	803,950	OOS
07/13/17	901,300	OOS
07/14/17	826,490	OOS
07/15/17	839,000	OOS
07/16/17	746,520	OOS
07/17/17	674,080	OOS
07/18/17	757,110	OOS
07/19/17	647,800	OOS
07/20/17	682,700	OOS
07/21/17	750,810	OOS
07/22/17	689,700	OOS
07/23/17	659,320	OOS
07/24/17	890,520	OOS
07/25/17	778,110	OOS
07/26/17	866,280	OOS
07/27/17	887,240	OOS
07/28/17	769,860	OOS
07/29/17	769,430	OOS
07/30/17	858,880	OOS
07/31/17	838,140	OOS
08/01/17	OOS	704,590
08/02/17	OOS	751,720
08/03/17	OOS	846,270
08/04/17	OOS	661,900
08/05/17	OOS	670,800
08/06/17	OOS	811,850
08/07/17	OOS	817,980
08/08/17	OOS	670,300
08/09/17	OOS	795,690
08/10/17	OOS	1,104,270
08/11/17	OOS	588,180
08/12/17	OOS	797,920
08/13/17	OOS	725,560
08/14/17	OOS	862,800
08/15/17	OOS	828,360
08/16/17	OOS	754,370
08/17/17	OOS	941,220
08/18/17	OOS	771,100
08/19/17	OOS	834,170
08/20/17	OOS	840,650
08/21/17	OOS	707,210
08/22/17	OOS	732,190
08/23/17	OOS	730,610

Date	North Pond (gal)	South Pond (gal)
08/24/17	OOS	650,790
08/25/17	OOS	799,300
08/26/17	OOS	590,400
08/27/17	OOS	782,100
08/28/17	OOS	803,910
08/29/17	OOS	846,090
08/30/17	OOS	826,800
08/31/17	OOS	847,270
09/01/17	OOS	837,840
09/02/17	OOS	973,820
09/03/17	OOS	683,870
09/04/17	OOS	728,810
09/05/17	707,160	OOS
09/06/17	740,240	OOS
09/07/17	755,180	OOS
09/08/17	699,270	OOS
09/09/17	724,690	OOS
09/10/17	722,360	OOS
09/11/17	944,500	OOS
09/12/17	548,100	OOS
09/13/17	849,500	OOS
09/14/17	797,900	OOS
09/15/17	967,970	OOS
09/16/17	761,990	OOS
09/17/17	784,740	OOS
09/18/17	972,200	OOS
09/19/17	735,710	OOS
09/20/17	829,490	OOS
09/21/17	926,420	OOS
09/22/17	869,570	OOS
09/23/17	821,210	OOS
09/24/17	868,810	OOS
09/25/17	557,490	OOS
09/26/17	774,260	OOS
09/27/17	677,880	OOS
09/28/17	783,120	OOS

Date	North Pond (gal)	South Pond (gal)
09/29/17	733,890	OOS
09/30/17	775,800	OOS
10/01/17	OOS	623,570
10/02/17	OOS	840,080
10/03/17	OOS	799,600
10/04/17	OOS	911,500
10/05/17	OOS	782,250
10/06/17	OOS	294,850
10/07/17	OOS	261,800
10/08/17	OOS	308,900
10/09/17	OOS	289,650
10/10/17	OOS	293,350
10/11/17	OOS	361,880
10/12/17	OOS	368,310
10/13/17	OOS	364,960
10/14/17	OOS	373,930
10/15/17	OOS	370,690
10/16/17	OOS	384,730
10/17/17	OOS	378,800
10/18/17	OOS	376,300
10/19/17	OOS	405,000
10/20/17	OOS	392,900
10/21/17	OOS	360,400
10/22/17	OOS	369,080
10/23/17	OOS	324,920
10/24/17	OOS	346,100
10/25/17	OOS	314,000
10/26/17	OOS	340,980
10/27/17	OOS	258,380
10/28/17	OOS	354,790
10/29/17	OOS	333,730
10/30/17	OOS	394,120
10/31/17	OOS	370,690
a. OOS indicates pond was out of service. The respective pond is operable, but not receiving effluent.		