INL/EXT-12-27900

2012 Annual Industrial Wastewater Reuse Report for the Idaho National Laboratory Site's Materials and Fuels Complex Industrial Waste Ditch and Industrial Waste Pond

February 2013

The INL is a U.S. Department of Energy National Laboratory
operated by Battelle Energy Alliance

INL/EXT-12-27900

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Idaho Falls, Idaho 83415

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Prepared for the
U.S. Department of Energy
Office of Nuclear Energy
Under DOE Idaho Operations Office
Contract DE-AC07-05ID14517

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ABSTRACT

This report describes conditions, as required by the state of Idaho Industrial Wastewater Reuse Permit (WRU-I-0160-01, formerly LA-000160-01), for the wastewater reuse site at the Idaho National Laboratory Site's Materials and Fuels Complex Industrial Waste Ditch and Industrial Waste Pond from November 1, 2011 through October 31, 2012. The report contains the following information:

- Facility and system description
- Permit required effluent monitoring data and loading rates
- Groundwater monitoring data
- Status of special compliance conditions
- Discussion of the facility's environmental impacts

During the 2012 reporting year, an estimated 11.84 million gallons of wastewater were discharged to the Industrial Waste Ditch and Pond which is well below the permit limit of 17 million gallons per year. The concentrations of all permit-required analytes in the samples from the down gradient monitoring wells were below the Ground Water Quality Rule Primary and Secondary Constituent Standards.

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ACRONYMS

BEA	Battelle Energy Alliance, LLC
bgs	below ground surface
CFR	Code of Federal Regulations
DEQ	Idaho Department of Environmental Quality
gpm	gallons per minute
IDAPA	Idaho Administrative Procedures Act
INL	Idaho National Laboratory
IWD	Industrial Waste Ditch
IWP	Industrial Waste Pond
IWRP	Industrial Wastewater Reuse Permit
MFC	Materials and Fuels Complex
MG	Million gallons
MS	Monitoring Services
NA	Not Applicable
O&M	Operation and Maintenance (Manual)
PCS	Primary Constituent Standard
SCS	Secondary Constituent Standard
TN	total nitrogen
TSS	total suspended solids

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2012 Annual Industrial Wastewater Reuse Report for the Idaho National Laboratory Site's Materials and Fuels Complex Industrial Waste Ditch and Industrial Waste Pond

1. INTRODUCTION

The Materials and Fuels Complex (MFC) Industrial Waste Ditch (IWD) and associated Industrial Waste Pond (IWP) is an industrial wastewater reuse facility operated by Battelle Energy Alliance, LLC (BEA) under Industrial Wastewater Reuse Permit (IWRP) WRU-I-0160-01 (formerly LA-000160-01) issued by the Idaho Department of Environmental Quality (DEQ). The initial permit was issued in April 2010; Modification 1 was issued in June 2012 (Neher 2010; Neher 2012). The permit will expire on April 30, 2015 (Neher 2012).

This report summarizes the facility system and operation, monitoring data, special compliance conditions, non-compliances, and environmental impacts for the 2012 reporting year (November 1, 2011 through October 31, 2012).

2. FACILITY, SYSTEM DESCRIPTION, AND OPERATION

The MFC is located on approximately 60 acres in the southeastern portion of the Idaho National Laboratory (INL), approximately 30 miles west of Idaho Falls, Idaho, in Bingham County. The MFC consists of buildings and structures for research and development on nuclear technologies, nuclear environmental management, and space radioactive power source development.

The IWP is located near the northwest corner of the MFC (Figure 1). The IWP was first excavated in 1959 and has a design capacity of 285 million gallons (MG) at a maximum water depth of 13 feet.

Industrial wastewater discharged to the IWP system consists primarily of noncontact cooling water, boiler blowdown, cooling tower overflow and drain, air wash flows, and steam condensate. Small amounts of industrial wastewater from the MFC facility process holdup tanks may also be discharged to the IWP system, once approved by the facility supervisor and environmental compliance staff. The IWP also receives storm water runoff from MFC and immediate environs.

Most of the industrial wastewater generated at MFC flows through collection piping to a lift station where it is pumped into the Industrial Waste Pipeline and discharged to the pond (Figure 1). A flow meter and composite sampler are located on the pipeline near the western boundary of MFC (Figure 1, WW-016001).

Wastewater composed of cooling water blowdown, intermittent reverse osmosis effluent, and discharge to floor drains and a laboratory sink is transported from the MFC-768 Power Plant to Ditch C via the Industrial Waste Water Underground Pipe (Figure 1). The wastewater discharged to Ditch C seldom flows more than a few tens of feet past the sampling point (WW-016002) before it evaporates, infiltrates, or is taken up by plants.

In March 2012 the INL requested a major modification to revise the maximum hydraulic loading rate in Section F, Permit Limits and Conditions, from 13 million gallons per year to 17 million gallons per year (Stenzel 2012). The proposed increase will consist of up to 4 million gallons per year of noncontact cooling water discharged from a Hot Isostatic Press in building MFC-794. In response to the request, DEQ issued Modification 1 of the IWRP in June 2012 (Neher 2012).

In April 2012, the DEQ was notified of an additional water discharge associated with two electric boilers in operation at the MFC-768 Power Plant since the fall of 2011 (Stenzel 2012a). Each boiler had a continuous noncontact cooling water discharge of approximately five gallons per minute (gpm) when in operation. The cooling water for the boilers is supplied by the MFC production/potable water wells. The once through, noncontact cooling water was discharged into Ditch B on the east side of MFC-768.

In the fall of 2012, the boilers cooling systems were replaced. Now, when the boilers are in operation, the cooling systems function as closed loop systems and do not discharge into Ditch B. However, when the boilers are in standby mode, they still discharge approximately one to two gallons/minute noncontact cooling water into Ditch B. Under normal conditions, all the water flowing into Ditch B seeps into the ground prior to where Ditch B joins Ditch C.

Figure 1. MFC Industrial Waste Ditch and Industrial Waste Pond.

3. EFFLUENT MONITORING

This section describes the sampling and analytical methods used in the MFC IWP monitoring program. Effluent monitoring and flow data is provided.

3.1 Sampling Program and Analytical Methods

Environmental professionals from Monitoring Services (MS) perform the monthly and quarterly effluent monitoring required in Section G of the permit. Effluent samples were collected monthly from the Industrial Waste Pipeline (sampling location WW-016001) prior to discharge to the IWP (Figure 1). In addition, quarterly grab samples were collected from the effluent discharging into Ditch C from the Industrial Waste Water Underground Pipe (WW-016002). All samples were collected according to established programmatic sampling procedures.

Effluent samples were typically collected during a preselected week following a randomly generated sampling schedule to represent normal operating conditions. The sampling event scheduled for March 22 was rescheduled for March 27 because Operations was manually cycling the pump at the industrial waste lift station to test holding capacity in preparation for connecting the Experimental Fuels Facility to the Industrial Waste Pipeline. As a result, the flow in the Industrial Waste Pipeline was insufficient to collect a sample for extended periods of time. All samples were analyzed using methods identified in 40 Code of Federal Regulations (CFR) 136, "Guidelines Establishing Test Procedures for the Analysis of Pollutants," 40 CFR 141, "National Primary Drinking Water Regulations," 40 CFR 143, "National Secondary Drinking Water Regulations," or approved by the DEQ.

The hydrogen ion activity (pH) of the samples was measured with a calibrated meter at the time of sample collection. All other permit required samples were submitted under full chain of custody to Southwest Research Institute's Analytical and Environmental Chemistry Department located in San Antonio, Texas for analyses.

3.2 Effluent Monitoring Results

3.2.1 Industrial Waste Pipeline

Effluent samples were collected monthly from the Industrial Waste Pipeline (WW-016001) prior to discharge to the IWP. All effluent samples were collected as 24-hour composite samples. The permit requires flow-proportional samples; however, time-proportional samples were collected through April 2012 while the flow meter system was being replaced. Initial calibration of the new flow meter was completed in April 2012. A flow proportional sample was collected in May. However, precipitation caused a short in the flow meter sensor in late May resulting in a time-proportional sample being collected in June. The flow sensor was replaced and the system recalibrated in mid-June. Flow proportional samples were then collected in July, August, September, and October. The problems with the flow meter were originally reported to DEQ in the INL State Water Self Disclosure Log (Lee 2010). The time-proportional samples are considered representative of normal operations. Table 1 summarizes the analytical results for the monthly samples collected from the Industrial Waste Pipeline.

Section F of the IWRP specifies effluent permit limits based on a 30-day average for total nitrogen (TN) and total suspended solids (TSS) of 20 mg/L and 100 mg/L, respectively. Total nitrogen is calculated as the sum of total Kjeldahl nitrogen and nitrate plus nitrite, as nitrogen. The maximum TN was 7.12 mg/L in July. The other 11 TN results were 1.06 mg/L or less. All TSS results were below the laboratory instrument detection limit of 4 mg/L. No permit limits were specified for the other required analytes at the Industrial Waste Pipeline.

3.2.2 Effluent to Ditch C

Grab samples were collected quarterly from the wastewater discharging into Ditch C from the Industrial Waste Water Underground Pipe (Figure 1). The analytical results are summarized in Table 2.

Section F of the IWRP specifies effluent permit limits based on a 30-day average for total nitrogen (TN) and total suspended solids (TSS) of 20 mg/L and 100 mg/L, respectively. Total nitrogen is calculated as the sum of total Kjeldahl nitrogen and nitrate plus nitrite nitrogen. The maximum TN was 13.516 mg/L in the third quarter (August 2012) sample. The maximum TSS result of 50.4 mg/L was also from the third quarter sample. No permit limits were specified for the other required analytes.

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Table 1. Analytical results for 24-hour composite samples collected from the Industrial Waste Pipeline (WW-016001).

Sample Month	November	December	January	February	March	April	May	June	July	August	September	October
Sample Date	11/10/11	12/06/11	01/24/12	02/15/12	03/27/2012	04/03/12	05/10/12	06/07/12	07/10/12	08/08/12	09/11/2012	10/18/2012
Nitrite + nitrate as nitrogen (mg/L)	1.90	1.88	2.02	2.05	2.10	2.05	2.02	2.07 (2.06)[a]	2.24	2.50	2.02	1.93
Total Kjeldahl nitrogen (mg/L)	0.872	1.06	0.305	0.352	0.327	0.754	0.174	0.229 (0.266)	4.88	0.100 U	0.100 U	0.338
Total nitrogen[b] (mg/L)	2.772	2.94	2.325	2.402	2.427	2.804	2.194	2.299 2.272	7.12	<2.60	<2.12	2.268
Total suspended solids (mg/L)	4 U[c]	4 U	4 U	4 U	4 U	4 U	4 U	4 U (4 U)	4 U	4 U	4 U	4 U
Total dissolved solids (mg/L)	316	317	267	297	295	347	317	257 (260)	289	301	266	274
Chloride (mg/L)	59.9	69.5	34.8	53.6	46.8	65.5	50.6	22.1 (22.3)	21.4	44.5	32.0	36.4
Fluoride (mg/L)	0.667	0.601	0.619	0.654	0.623	0.616	0.652	0.641 (0.636)	0.661	0.630	0.581	0.611
pH	8.31	8.37	7.82	7.77	7.98	8.18	8.85	8.47	8.52	8.75	8.36	8.26
Total phosphorus (mg/L)	0.217	0.247	0.342	0.157	0.134	0.208	0.104	0.0864 (0.0835)	0.150	0.105	0.0775	0.0986
Sulfate (mg/L)	17	16.6	17.2	17	18	19.3	18.6	18.8 (18.8)	23.5	20.9	17.4	17.4
Arsenic (µg/L)	2.5 U	2.5 U	5.0	2.5 U	2.5 U	3.6	2.5 U	3.1 (2.5 U)	2.5 U	2.5	2.5 U	2.5 U
Barium (µg/L)	36.1	34.2	27.7	36.8	35.5	35.7	37.6	37.2 (37.1)	39.4	37.1	37.5	38.6
Cadmium (µg/L)	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U (1.0 U)	1.0 U	1.0 U	1.0 U	1.0 U
Chromium (µg/L)	2.5 U	2.5 U	2.5 U	2.5 U	2.9	2.5 U	2.5 U	2.5 U (2.5 U)	2.5 U	2.5 U	2.5 U	2.5 U
Iron[d] (µg/L)	102	32.4	66.1	83.1	49.5	65.7	97.6	106 (110)	102	25.0 U	68.8	69.0
Lead (µg/L)	0.34	0.25 U	0.25 U	0.25 U	0.25 U	0.28	0.25 U	0.29 (0.28)	0.54	0.25 U	0.25 U	0.26
Manganese[d] (µg/L)	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	3.3	2.5 U	2.5 U (2.5 U)	8.5	2.5 U	2.5 U	2.5 U

Sample Month	November	December	January	February	March	April	May	June	July	August	September	October
Sample Date	11/10/11	12/06/11	01/24/12	02/15/12	03/27/2012	04/03/12	05/10/12	06/07/12	07/10/12	08/08/12	09/11/2012	10/18/12
Mercury (µg/L)	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U (0.20 U)	0.20 U	0.20 U	0.20 U	0.20 U
Selenium (µg/L)	0.58	0.62	0.54	0.68	0.50 U	0.81	0.76	0.56 (0.63)	3.6	0.66	0.5 U	1.4
Silver (µg/L)	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U (5.0 U)	6.9	5.0 U	5.0 U	5.0 U
Sodium[d] (µg/L)	43,600	49,500	28,600	39,200	35,000	47,500	36,800	19,900 (19,800)	24,400	36,300	27,200	29,500
Zinc (µg/L)	8.1	10.3	5.8	7.6	8.1	23.2	6.6	6.2 (6.1)	17.3	6.6	9.4	7.0

a. Results for field duplicate sample collected in June are in parentheses.
b. Total nitrogen is calculated as the sum of the TKN, nitrite nitrogen plus nitrate as nitrogen. For results reported below the instrument detection limit, the detection limit for that parameter is used in the calculation. The resulting total nitrogen is then reported as a less than (<) number.
c. U flag indicates that the result was reported as below the instrument detection limit by the analytical laboratory.
d. Permit-required analyte for groundwater monitoring but not for effluent monitoring.

Table 2. Analytical results for quarterly grab samples collected from the wastewater discharged to Ditch C from the Industrial Waste Water Underground Pipe (WW-016002).

Calendar Quarter	Fourth 2011[a]	First 2012	Second 2012	Third 2012
Sample Date	12/06/11	01/24/12	04/03/12	08/08/12
Nitrite + nitrate as nitrogen (mg/L)	3.75 (3.75)	4.37	4.36	12.7
Total Kjeldahl nitrogen (mg/L)	0.783 (0.794)	0.722	0.673	0.816
Total nitrogen[b] (mg/L)	4.533 (4.544)	5.092	5.033	13.516
Total suspended solids (mg/L)	4 U[c] (4 U)	11.7	4 U	50.4
Total dissolved solids (mg/L)	504 (503)	556	536	1,050
Chloride (mg/L)	40.4 (40.3)	43.7	43.3	127
Fluoride (mg/L)	1.28 (1.27)	1.41	1.36	2.84
pH	8.28	7.68	7.97	8.71
Total phosphorus (mg/L)	1.13 (1.13)	0.951	0.801	1.34
Sulfate (mg/L)	34.8 (34.7)	39.8	37.6	98.2
Arsenic (µg/L)	4.0 (3.8)	7.9	4.5	10.1
Barium (µg/L)	74.6 (71.7)	117	76.4	176
Cadmium (µg/L)	1.0 U (1.0 U)	1.0 U	1.0 U	1.0 U
Chromium (µg/L)	3.0 (3.3)	8.7	4.2	21.7

Calendar Quarter	Fourth 2011[a]	First 2012	Second 2012	Third 2012
Sample Date	12/06/11	01/24/12	04/03/12	08/08/12
Iron[d] (µg/L)	67.1 (62.2)	1,440	50.3	3,130
Lead (µg/L)	0.68 (0.94)	2.1	0.41	4.8
Manganese[d] (µg/L)	5.9 (5.5)	51.6	3.0	105
Mercury (µg/L)	0.20 U (0.20 U)	0.20 U	0.20 U	0.20 U
Selenium (µg/L)	1.2 (1.2)	1.2	1.2	2.8
Silver (µg/L)	5.0 U (5.0 U)	5.0 U	5.0 U	5.0 U
Sodium[d] (µg/L)	42,000 (41,800)	45,600	57,400	131,000
Zinc (µg/L)	49.6 (50.8)	36.2	32.5	108

a. Results for the field duplicate collected in December are shown in parentheses.
b. Total nitrogen is the sum of nitrate/nitrite and total Kjeldahl nitrogen.
c. U flag indicates that the result was reported as below the instrument detection limit by the analytical laboratory.
d. Permit-required analyte for groundwater monitoring but not for effluent monitoring.

3.3 Flow Volumes and Hydraulic Loading Rates

3.3.1 Industrial Waste Pipeline to Industrial Waste Pond

Section G of the permit requires a flow meter to measure the volume of flow to the Industrial Waste Pond from the Industrial Waste Pipeline to the nearest 0.000 million gallons. Efforts have been underway to replace the flow meter. Therefore, manual flow readings were taken approximately weekly by Environmental, Safety, and Health personnel from November 1, 2011 through June 30, 2012 to estimate the monthly volume discharged to the pond. Manual flow readings were measured in gallons per minute (gpm), averaged, and extrapolated to monthly volumes. Beginning July 1, 2012, monthly flow volumes were recorded from the flow meter. Table 3 summarizes the monthly and annual flow data. The flow measurements are presented in Appendix A.

Table 3. Volume of wastewater discharged from the Industrial Waste Pipeline to the Industrial Waste Pond.

	Average (gpm[a])	Total (MG[b])
November 2011	21.5	0.929
December 2011	15.3	0.683
January 2012	17.5	0.781
February 2012	21.3	0.887
March 2012	24.0	1.071
April 2012	21.0	0.907
May 2012	24.2	1.080
June 2012	21.0	0.907
July 2012[c]	21.0	0.937
August 2012	24.6	1.099
September 2012	22.8	0.983
October 2012	19.7	0.879
TOTAL		11.143

a. gpm—gallons per minute.
b. MG—million gallons.
c. Beginning July 1, 2012, flow volumes were taken from the Industrial Waste Pipeline dedicated flow meter. Prior to this date, manual flow measurements were used.

Section G of the IWRP requires calibration of the flow meter on the Industrial Waste Pipeline during the first year of the permit and after replacement or modification of the meter or associated piping. Installation of a new flow meter system was completed in 2012. Calibration of this new system initially occurred in April 2012.

However, in late May 2012, precipitation entered a quick disconnect junction of the sensor cable causing a short that damaged the level sensor. The level sensor was replaced and the flow meter was recalibrated on June 12, 2012. Individual measurement accuracies were within 9% of actual flow. The average error was -0.57% (Stenzel 2012b).

3.3.2 Industrial Waste Water Underground Pipeline to Ditch C

As required by Section G of the permit, the monthly flow from the Industrial Waste Water Underground Pipeline to Ditch C was visually estimated by Environmental, Safety, and Health personnel. Table 4 summarizes the monthly and annual flow data; the flow estimates are in Appendix A.

Table 4. Volume of waste water discharged from the Industrial Waste Water Underground Pipe to Ditch C.

	Average (gpm[a])	Total (MG[b])
November 2011	3.5	0.151
December 2011	2.4	0.103
January 2012	1	0.045
February 2012	1	0.042
March 2012	1	0.045
April 2012	1	0.043
May 2012	1	0.045
June 2012	1	0.043
July 2012	1	0.045
August 2012	1	0.045
September 2012	1	0.043
October 2012	1	0.045
TOTAL		0.695

a. gpm—gallons per minute.

b. MG—million gallons.

3.3.3 Summary

The permit (Section F) specifies the following:

- Application season is year round.
- Maximum hydraulic loading rate is 17 million gallons (MG) per year.

Total effluent flow volume was an estimated 11.84 MG for the reporting period.

4. GROUNDWATER MONITORING

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

4.1 Sampling Program

The IWRP for the MFC Industrial Waste Ditch and Pond identifies three INL compliance wells. The permit requires the collection of groundwater samples in April/May and September/October.

In 2012, MS personnel collected groundwater samples in May and September. The MS personnel use project-specific sampling and analysis plans and procedures that govern sampling activities and quality control protocols. The permit identifies a specified 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 secondary constituent standards (SCS) specified in IDAPA 58.01.11, "Ground Water Quality Rule." All permit-required samples were collected as unfiltered samples. **NOTE:** Filtered samples for iron and manganese analysis are only required by the permit in the event the unfiltered sample results for these two parameters exceed the applicable SCSs.

The conductivity and pH of the samples were measured at the time of sample collection by MS personnel using a calibrated meter. Groundwater temperature was also measured at the time of sample collection. All other permit required groundwater samples were submitted under full chain of custody to Southwest Research Institute's Analytical and Environmental Chemistry Department located in San Antonio, Texas for analyses.

4.2 Analytical Methods

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

4.3 Monitoring Wells

To evaluate potential impacts to groundwater from the wastewater discharges to the MFC Industrial Waste Pond, the permit requires that groundwater samples be collected from the Snake River Plain Aquifer at three monitoring wells (see Figure 2):

- ANL-MON-A-012 (GW-016001)
- ANL-MON-A-013 (GW-016002)
- ANL-MON-A-014 (GW-016003)

Prior to sampling, wells were purged a minimum of three casing volumes or one casing volume if three successive measurements for pH and specific conductance, taken at least one minute apart, had pH values within 0.2 units of each other and specific conductance readings within 10%.

4.4 Groundwater Monitoring Results

Table 5 shows the static water table elevations and depths to the water table, measured prior to purging and sampling, and the analytical results for all parameters specified by the permit for the three monitoring wells.

The concentrations of all permit-required analytes were below their respective groundwater standards in IDAPA 58.01.11 in the samples collected during the 2012 reporting year (Table 5). The concentrations of chloride, nitrate+nitrite (as nitrogen), phosphorus, and sodium appear to be elevated in the effluent from the Industrial Waste Pipeline; however, the concentrations of these constituents in the down gradient

monitoring wells are nearly indistinguishable from the concentrations in the up gradient well (ANL-MON-A-012).

4.5 Water Table Information

Depth to water and water table elevations for the May and September 2012, sampling events are shown in Figure 2 and Figure 3, respectively. The elevations are referenced to the National Geodetic Vertical Datum of 1929. In addition, the figures show the inferred general groundwater flow direction in the vicinity of the Materials and Fuels Complex. The general groundwater flow direction at the INL Site is to the southwest.

Table 5. Summary of groundwater quality data collected for the Wastewater Reuse Permit for the MFC Industrial Waste Ditch and Pond.

WELL NAME	ANL-MON-A-012 (GW-016001)		ANL-MON-A-013 (GW-016002)		ANL-MON-A-014 (GW-016003)		PCS/SCS[a]
Sample Date	05/23/2012	09/25/2012	05/23/2012	09/25/2012	05/23/2012	09/25/2012	
Water Table Depth (ft bgs)	656.96	659.06	645.48	647.61	644.50	646.57	NA[b]
Water Table Elevation (ft above mean sea level)	4475.74	4473.64	4474.89	4472.76	4473.58	4471.51	NA
pH	8.34	8.10	8.19	8.07	8.19	8.08	6.5 to 8.5 (SCS)
Temperature (^{o}C)	13.5	13.4	13.5	13.6	13.3	13.6	None
Conductivity (µS/cm)	364	360	375	365	371	362	None
Nitrate nitrogen (mg/L)	1.93	1.97	2.02	2.03	2.00 [2.00][c]	2.01	10 (PCS)
Phosphorus (mg/L)	0.0125	0.015	0.0139	0.0145	0.0128 [0.0234]	0.0143	None
Total dissolved solids (mg/L)	238	234	251	235	252 [254]	234	500 (SCS)
Sulfate (mg/L)	16.8	16.7	19.2	18.3	18.6 [18.5]	17.5	250 (SCS)
Arsenic (µg/L)	1.7	2.7	2.1	2.7	1.6 [1.8]	2.7	50 (PCS)
Barium (µg/L)	36.6	39.7	34.1	35.4	34.2 [34.7]	36.1	2000 (PCS)
Cadmium (µg/L)	0.25 U[d]	0.25 U	0.25 U	0.25 U	0.25 U [0.25 U]	0.25 U	5 (PCS)
Chloride (mg/L)	17.3	17.9	19	18	18.7 [18.7]	18.5	250 (SCS)
Chromium (µg/L)	3.5	4.1	3.4	3.2	3.9 [3.6]	2.5 U	100 (PCS)
Iron (µg/L)	93.8	114	127	170	88.6 [183]	124	300 (SCS)

WELL NAME	ANL-MON-A-012 (GW-016001)		ANL-MON-A-013 (GW-016002)		ANL-MON-A-014 (GW-016003)		PCS/SCS[a]
Sample Date	05/23/2012	09/25/2012	05/23/2012	09/25/2012	05/23/2012	09/25/2012	
Lead (µg/L)	0.5 U	0.5 U	0.6	0.5 U	0.5 U [0.76]	0.5 U	15 (PCS)
Manganese (µg/L)	3.2	2.5 U	2.6	2.6	2.5 U [2.8]	2.5 U	50 (SCS)
Mercury (µg/L)	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U [0.2 U]	0.2 U	2 (PCS)
Selenium (µg/L)	0.54	0.68	0.55	0.58	0.57 [0.64]	0.55	50 (PCS)
Silver (µg/L)	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U [5.0 U]	5.0 U	100 (SCS)
Sodium (µg/L)	18,300	17,700	19,200	18,200	18,200 [18,300]	17,300	None
Zinc (µg/L)	4.3	4.1	2.5 U	2.5 U	2.5 U [6.0]	2.5 U	5000 (SCS)

a. Primary Constituent Standard (PCS) or Secondary Constituent Standard (SCS) from IDAPA 58.01.11 (Ground Water Quality Rule).
b. NA-Not applicable.
c. Concentrations shown in brackets are the results from field duplicate samples.
d. U flag indicates the result was reported as below the instrument detection limit by the analytical laboratory.

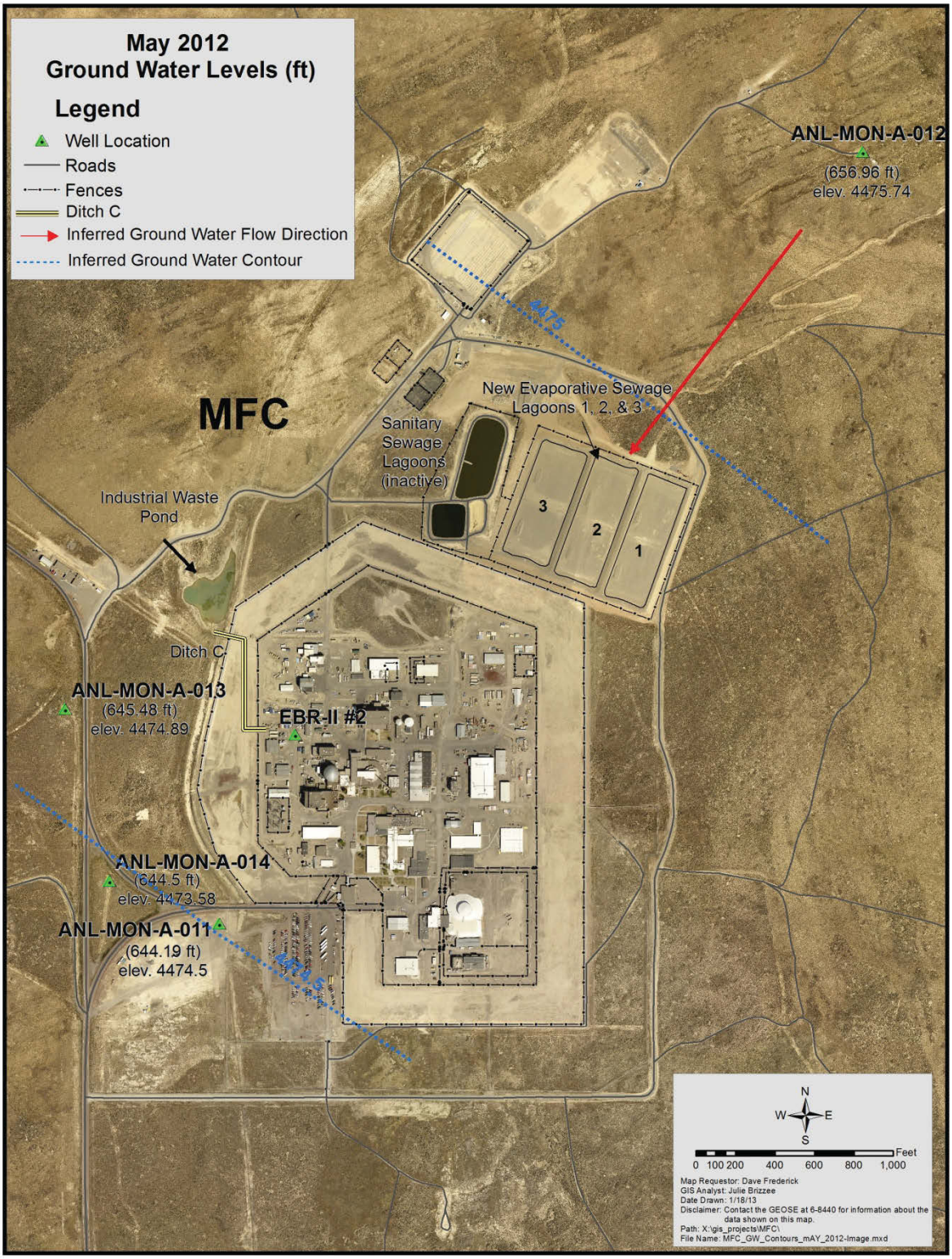

Figure 2. Groundwater contour map based on the May 2012 water level measurements.

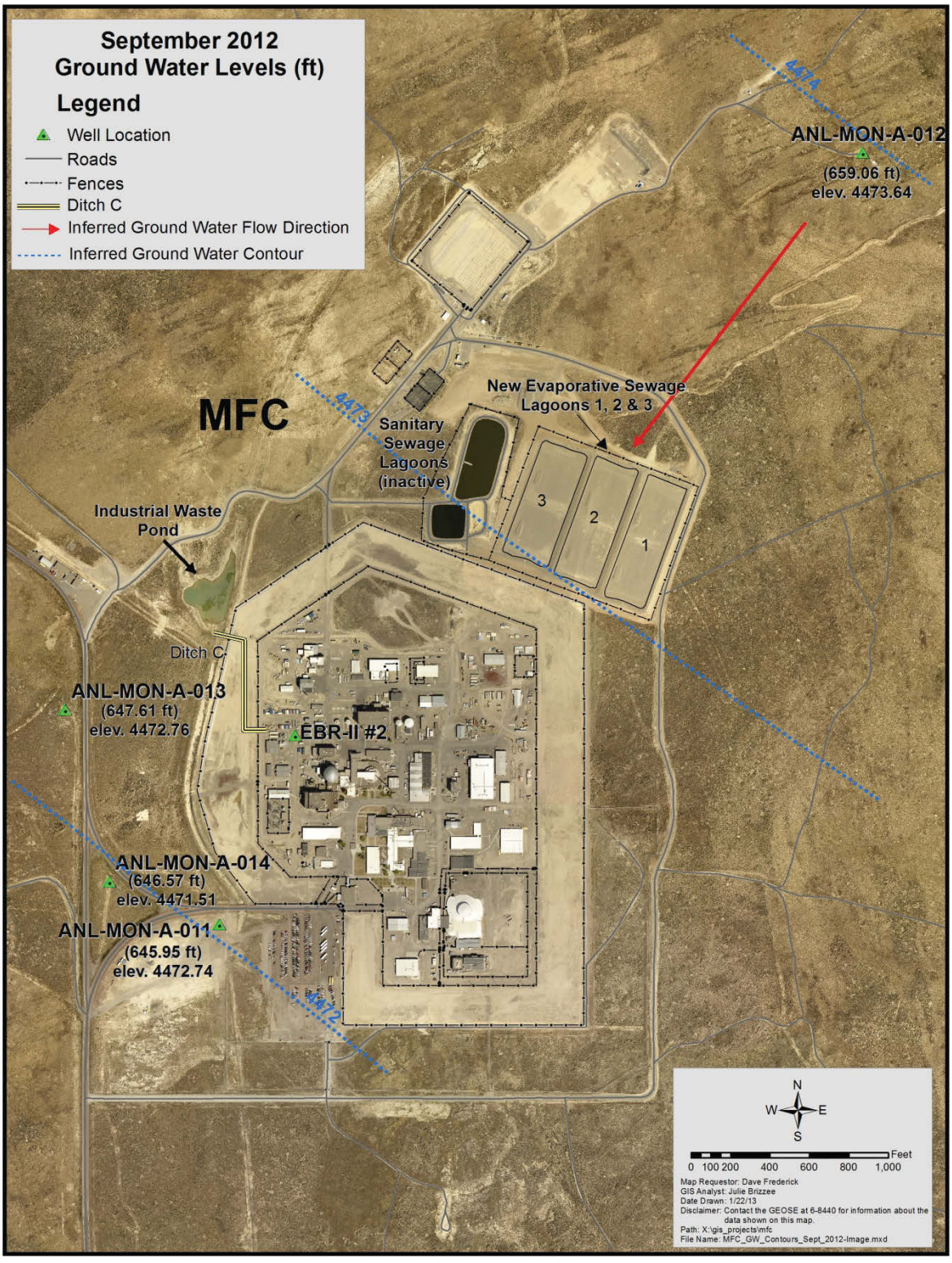

Figure 3. Groundwater contour map based on the September 2012 water level measurements.

5. PERMIT YEAR SUMMARIES

This section provides information and status associated with permit required compliance activities. Non-compliance issues are also addressed in this section.

5.1 Status of Permit Required Compliance Activities

Section E of the IWRP identifies two compliance activities: preparation of a Plan of Operation and a Waste Solids Management Plan. Section H, Paragraph 5, of the permit requires that DEQ be notified within 30 days of completing any work described in Section E, and that the annual report shall provide the status of compliance activities still in progress at the end of the permit year.

Compliance Activity CA-160-01: This compliance activity was completed in June 2011 with the approval letter from the DEQ (Rackow, 2011).

Compliance Activity CA-160-02: This compliance activity requires a Waste Solids Management Plan shall be submitted to DEQ as needed. The compliance activity states:

"A Waste Solids Management Plan shall be submitted for DEQ review and shall be approved by DEQ prior to any dredging or removal of solids, mud, or sludge from the Industrial Waste Pond. The plan shall outline actions associated with the removal (dredging) of solids in the Industrial Waste Pond. The plan shall include: specific information used in the determining the need for removal of solids, responsible person(s) for the decision, and a complete SOP for the removal of the solids."

The due date for CA-160-02 is as needed, review and approval required prior to removal of any waste solids. Currently there are not any plans to remove solids from the pond.

5.2 Non-compliance Issues

The initial flow meter on the Industrial Waste Pipeline, a Marsh McBirney Flo-Tote 3 Flowmeter System, had proven to be unreliable in this application. The sensor for the Flo-Tote 3 was replaced; however, the flow readings were still inaccurate when compared to manual measurements.

The flow meter failure was first reported to the DEQ in the INL State Water Self‑Disclosure Log (Lee 2010) dated June 22, 2010, in accordance with Section I, Item 7.d of the IWRP. Updates on the status of the flow meter replacement have been provided in subsequent disclosure logs.

An engineering review determined that the best approach was to install a 4-inch Palmer-Bowlus flume manufactured by Warminster Fiberglass. The DEQ approved the installation plans and specifications for the flow meter in May 2011 (Rackow, 2011a).

Upon completion of the installation for the new flume and flow meter, calibration testing was performed. It was determined that the flow level sensor that came with the flume did not provide an acceptable level of accuracy and was replaced in the early part of 2012. The replacement sensor is a ToughSonic Level Sensor from Senix. Calibration testing showed the new sensor is providing accurate and reliable information. Final documentation, including as-built drawings and calibration results, was submitted to the DEQ on November 29, 2012 (Stenzel 2012b).

6. ENVIRONMENTAL IMPACTS

The IWRP specifies a maximum hydraulic loading rate of 17 MG/year. The total volume discharged to the MFC Industrial Waste Ditch and Pond during the reporting period (November 1, 2011 through October 31, 2012) was 11.84 MG.

The effluent from the Industrial Waste Pipeline and the Industrial Waste Water Underground Pipe met the permit limits, based on a 30-day average, for total nitrogen (TN) and total suspended solids (TSS) of 20 mg/L and 100 mg/L, respectively. No permit limits are specified for the other analytes.

The concentrations of the permit-required analytes in the groundwater samples were all below the respective groundwater standards in IDAPA 58.01.11. The concentrations of chloride, phosphorus, and sodium appear to be elevated in the effluent from the Industrial Waste Pipeline; however, the concentrations of these constituents in the down gradient monitoring wells are nearly indistinguishable from concentrations in the up gradient well.

There are positive impacts to the environment associated with the operation of the Industrial Waste Pond. These include aquifer recharge and providing a needed source of water for numerous species of native wildlife.

7. REFERENCES

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

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

40 CFR 143, "National Secondary Drinking Water Regulations," *Code of Federal Regulations*, Office of the Federal Register.

IDAPA 58.01.11, "Ground Water Quality Rule."

Lee, S. D., INL, to T. Rackow, DEQ, June 22, 2010, "State Water Self-Disclosure Log at the Idaho National Laboratory," CCN 221280.

Neher, E., DEQ, to W. F. Hamel, DOE-ID, and D. Coburn, BEA, April 14, 2010, "Materials and Fuels Complex (MFC) Industrial Waste Ditch (IWD) and Industrial Waste Pond (IWP), Industrial Wastewater Reuse Permit No. LA-000160-01," CCN 220726.

Neher, E., DEQ, to W. F. Hamel, DOE-ID, and C. Melbihess, BEA, June 21, 2012, "Materials and Fuels Complex (MFC) Industrial Waste Ditch (IWD) and Industrial Waste Pond (IWP), Industrial Wastewater Reuse Permit No. WRU-I-0160-01 (formerly LA-000160-01), Modification 1," CCN 227704.

Rackow, T, DEQ, to J.A. Stenzel, INL, June 23, 2011, "LA-000160-01 INL MFC Industrial Wastewater Pond, CA-141-03 Plan of Operation Approval," CCN 224615.

Rackow, T, DEQ, to J.A. Stenzel, INL, May 19, 2011a, "INL Materials and Fuels Complex (MFC) Industrial Waste Pond, Flow Meter Installation Plans and Specifications for Industrial Waste Pipeline, LA-000160-01. DEQ Plan and Specification No. 11-02-12," CCN 224296.

Stenzel, J.A., INL, to T. Rackow, DEQ, March 20, 2012, "Modification Request for the Industrial Wastewater Reuse Permit, LA-000160-01, Idaho National Laboratory Materials and Fuels Complex Industrial Waste Ditch and Industrial Waste Pond," CCN 226923.

Stenzel, J.A., INL, to T. Rackow, DEQ, April 18, 2012a, "Notification of a New Water Discharge Associated with Industrial Wastewater Reuse Permit, LA-000160-01, Idaho National Laboratory Materials and Fuels Complex Industrial Waste Ditch and Industrial Waste Pond," CCN 227177.

Stenzel, J. A., INL, to T. Rackow, DEQ, November 29, 2012b, "Idaho National Laboratory Material and Fuels Complex Industrial Wastewater Reuse Permit, WRU-I-0160 Flow Meter Installation As-Built Plans and Calibration Certification for the Industrial Waste Pipeline-DEQ Plan and Specification No. 11-02-12," CCN 229088.

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Appendix A

Discharge Volumes from the Industrial Waste Pipeline and Industrial Waste Water Underground Pipe at the Materials and Fuels Complex

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Appendix A

Discharge Volumes from the Industrial Waste Pipeline and Industrial Waste Water Underground Pipe at the Materials and Fuels Complex

Table A-1. Estimated discharge volumes from the Industrial Waste Pipeline and Industrial Waste Water Underground Pipe during the 2012 reporting year.

Date	Measured Flow from Industrial Waste Pipeline - Bucket Method (gpm)	Total Monthly Flow in Industrial Waste Pipeline[a, b] (gallons)	Estimated Flow from Industrial Waste Water Underground Pipe – Visual Method (gpm)	Total Monthly Flow from Industrial Waste Water Underground Pipe[a] (gallons)
2011				
1-Nov	20		3	
8-Nov	23	928,800	4	151,200
5-Dec	16		4	
14-Dec	15		2	
22-Dec	15	683,000	1	102,700
2012				
10-Jan	15		1	
20-Jan	20	781,000	1	44,640
1-Feb	20		1	
9-Feb	20		1	
15-Feb	20		1	
23-Feb	25	887,000	1	41,760
6-Mar	25		1	
14-Mar	22		1	

Date	Measured Flow from Industrial Waste Pipeline - Bucket Method (gpm)	Total Monthly Flow in Industrial Waste Pipeline[a, b] (gallons)	Estimated Flow from Industrial Waste Water Underground Pipe – Visual Method (gpm)	Total Monthly Flow from Industrial Waste Water Underground Pipe[a] (gallons)
20-Mar	25	1,071,000	1	44,640
5-Apr	20		1	
12-Apr	14		1	
19-Apr	25		1	
24-Apr	23	907,000	1	43,200
2-May	23		1	
9-May	24		1	
17-May	23		1	
30-May	27	1,080,000	1	44,640
7-Jun			1	
12-Jun			1	
19-Jun	21	907,000	1	43,200
2-Jul			1	
9-Jul			1	
17-Jul			1	
24-Jul		937,000	1	44,640
2-Aug			1	
9-Aug			1	
15-Aug			1	
23-Aug		1,099,000	1	44,640

Date	Measured Flow from Industrial Waste Pipeline - Bucket Method (gpm)	Total Monthly Flow in Industrial Waste Pipeline[a, b] (gallons)	Estimated Flow from Industrial Waste Water Underground Pipe – Visual Method (gpm)	Total Monthly Flow from Industrial Waste Water Underground Pipe[a] (gallons)
5-Sep		983,000	1	43,200
9-Oct			1	
17-Oct			1	
23-Oct			1	
30-Oct		879,000	1	44,640

a. The volume of wastewater discharged for the month was calculated by averaging the flow rates for the month and then extrapolating the average flow to a monthly volume.
b. Beginning on July 1, 2012, the total monthly flow volumes for the Industrial Waste Pipeline were obtained from the flow meter.