INL/EXT-14-31051

2013 Annual Industrial Wastewater Reuse Report for the Idaho National Laboratory Site's Materials and Fuels Complex Industrial Waste Ditch and Industrial Waste Pond

February 2014

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operated by Battelle Energy Alliance

INL/EXT-14-31051

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Michael G. Lewis

February 2014

Idaho National Laboratory
Idaho Falls, Idaho 83415

http://www.inl.gov

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

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, 2012 through October 31, 2013. 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 2013 reporting year, an estimated 9.64 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 applicable Idaho Department of Environmental Quality's groundwater quality standard levels.

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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
PCS	Primary Constituent Standard
SCS	Secondary Constituent Standard
TN	total nitrogen
TSS	total suspended solids

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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 2013 reporting year (November 1, 2012 through October 31, 2013).

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, 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 IWD (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.

The maximum hydraulic loading rate allowed by the permit for both discharges, IWP and Ditch C, is 17 million gallons/year.

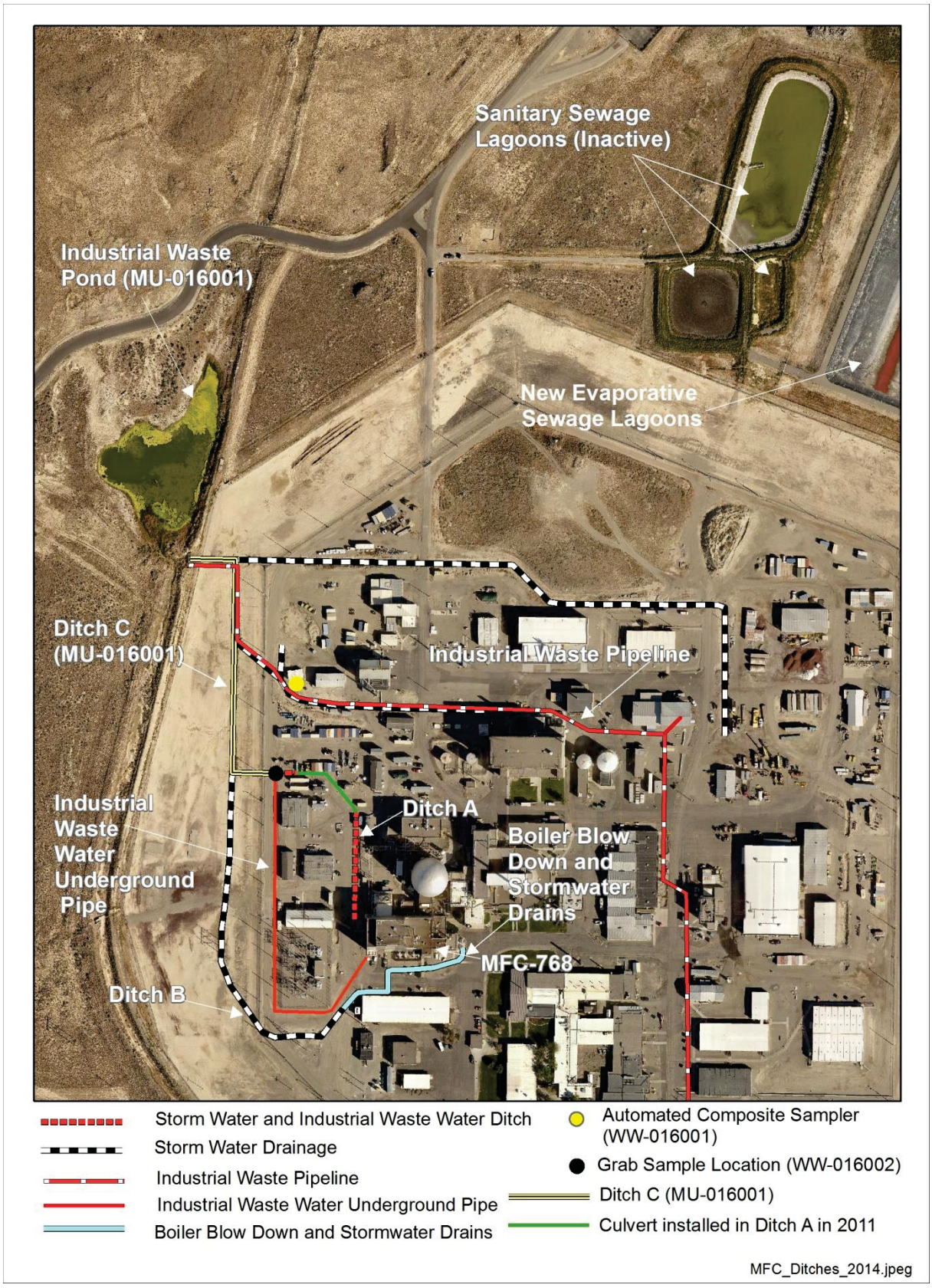

Figure 1. MFC Industrial Waste Ditch and Industrial Waste Pond.

3. EFFLUENT MONITORING

This section describes the sampling and analytical methods used in the MFC IWP and Ditch C monitoring programs. 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 are typically collected during a preselected week following a randomly generated sampling schedule to represent normal operating conditions. On occasion, the sampling schedule must be changed. This was the case for the sampling events originally scheduled for June 12th and 13th and August 7th and 8th. When the composite sampler was checked on June 13th, the sample container had filled up at approximately 12 AM because of high flows and therefore, a 24-hour composite sample was not collected. The June sampling event was rescheduled for June 17th and 18th where a 24-hour composite sample was collected on June 18.

The August sampling event also had to be rescheduled for August 12th and 13th because of unexpected high flows in the Industrial Waste Pipeline. As a result of the increased flow rate, the composite sampler bottle filled before a 24-hour composite sample could be collected. The composite sampler was reprogrammed on August 12th and a representative 24-hour composite sample was collected on August 13th.

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 flow proportional composite samples as required by the permit. 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 3.80 mg/L in September 2013. All TSS results were below the laboratory instrument detection limit of 4 mg/L with the exception of June and October. The sample results for June and October were 8.8 mg/L and 13.4 mg/L, respectively. No permit limits are specified for the other required analytes at the Industrial Waste Pipeline.

Several metals (e.g., iron, lead, zinc) showed elevated levels in June and/or October. Figure 2 shows the lead levels for the Industrial Waste Pipeline from November 2010 through October 2013. Lead concentrations in the June and October samples were 4.4 ug/L and 80.9 ug/L, respectively.

The specific cause of the higher metal concentrations is unknown at this time. There were higher than normal flows noted in the sampling logbook for June and August. The higher flows were possibly due to an air compressor being operated with once through cooling water instead of re-circulating the cooling water.

For the October samples, it was noted in the sampling logbook that reddish solids were present. Table 1 shows the October TSS concentration at 13.4 mg/L compared to the typical below detection level for TSS of 4 mg/L. Operations personnel indicated that they were starting up the MFC boiler systems in the October time frame which may have caused some built up corrosion particles to break loose and enter the waste stream. No other operational changes/activities have been identified at this time that could have affected the metal concentrations. As required by the permit, samples will continue to be collected monthly and the results will continue to be evaluated.

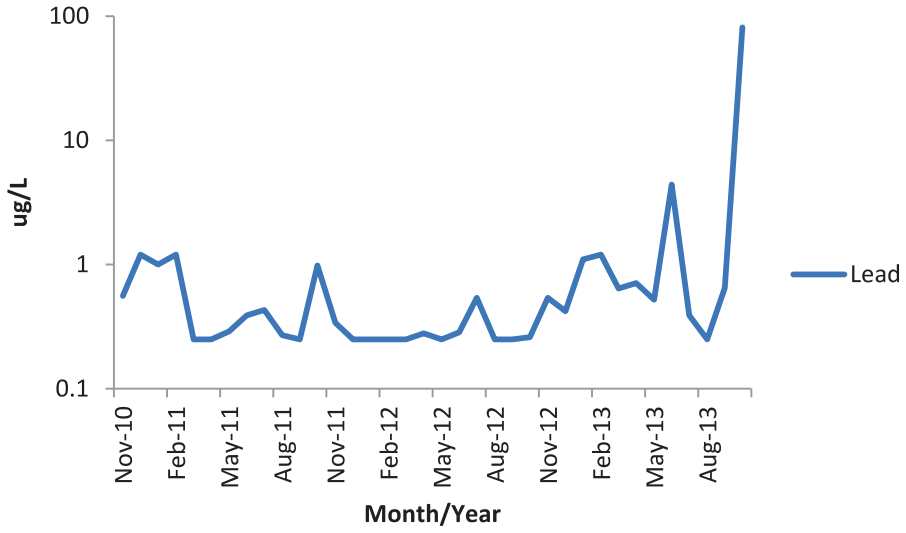

Figure 2. Lead concentrations in the Industrial Waste Pipeline from November 2010 through October 2013.

NOTE: For lead sample results below the laboratory instrument detection levels shown in Figure 2, the detection level was used. During months where a duplicate sample was collected, the regular sample and duplicate sample results were averaged.

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 7.012 mg/L in the third quarter (July 2013) sample. The maximum TSS result of 19.8 mg/L was from the sample collected during the fourth quarter. There are no effluent permit limits specified for the other required analytes.

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	11/07/12	12/13/12	01/09/13	02/06/13	03/20/2013	04/03/13	05/07/13	06/18/13	07/23/13	08/13/13	09/04/2013	10/10/2013
Nitrite + nitrate as nitrogen (mg/L)	1.97	1.9	1.77	1.85 (1.87)[a]	1.96	2.12	2.22	2.16	2.36	2.16	2.26	1.98
Total Kjeldahl nitrogen (mg/L)	0.154	0.254	0.147	0.226 (0.244)	0.338	0.196	0.463	1.17	0.284	0.471	1.54	0.202
Total nitrogen[b] (mg/L)	2.124	2.154	1.917	2.076 (2.114)	2.298	2.316	2.683	3.33	2.644	2.631	3.80	2.182
Total suspended solids (mg/L)	4 U[c]	4 U	4 U	4 U (4 U)	4 U	4 U	4 U	8.8	4 U	4 U	4 U	13.4
Total dissolved solids (mg/L)	250	305	202	217 (206)	244	278	272	323	282	264	294	264
Chloride (mg/L)	31.7	46.6	18.4	18.7 (18.5)	19.8	34.6	23.5	43.7	24.6	26	24.2	33.1
Fluoride (mg/L)	0.596	0.553	0.631	0.587 (0.58)	0.529	0.6	0.618	0.542	0.673	0.646	0.578	0.568
pH	8.49	8.39	8.26	8.05	8.43	7.27	8.48	8.31	8.37	8.43	8.24	7.96
Total phosphorus (mg/L)	0.0658	0.137	0.0964	0.0849 (0.0963)	0.125	0.13	0.117	0.526	0.137	0.361	0.165	0.131
Sulfate (mg/L)	17	17	16	16.3 (16.2)	16.7	17.6	19.7	19.6	20.6	19.7	21.8	17.2
Arsenic (µg/L)	2.5 U	2.5 U	2.5 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	5.0 U	5.0 U
Barium (µg/L)	35.3	34	29.2	33 (32.8)	29.5	32.2	35.6	41.7	35.5	33.5	37.4	38.2
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 (2.5 U)	2.5 U	2.5 U	2.5 U	8.4	2.5 U	2.5 U	2.5 U	5.7
Iron[d] (µg/L)	107	84.1	37.9	87.2 (107)	86.5	105	85.3	517	142	25.0 U	82.5	1,710
Lead (µg/L)	0.54	0.42	1.1	1.1 (1.3)	0.64	0.71	0.52	4.4	0.39	0.25 U	0.65	80.9
Manganese[d] (µg/L)	2.5 U	2.5 U	2.5 U	2.5 U (2.5 U)	2.5 U	2.5 U	2.5 U	8	2.5 U	2.5 U	5.9	22.7

Sample Month	November	December	January	February	March	April	May	June	July	August	September	October
Sample Date	11/07/12	12/13/12	01/09/13	02/06/13	03/20/2013	04/03/13	05/07/13	06/18/13	07/23/13	08/13/13	09/04/2013	10/10/13
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)	0.6	0.66	0.54	1.8 (2.1)	0.81	0.89	6.6	2.7	0.73	0.64	1.2	1.8
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	6.4	5.0 U	5.0 U	5.3	5.0 U
Sodium[d] (µg/L)	27,000	32,700	17,400	17,600 (17,600)	17,900	29,500	22,200	23,600	21,800	24,300	24,700	26,700
Zinc (µg/L)	14.3	8.1	9.3	12.6 (13.0)	9.4	9.6	11.3	51.1	13.8	7.3	21.6	34.9

a. Results for field duplicate sample collected in February 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 2012	First 2013	Second 2013	Third 2013
Sample Date	11/07/12	01/09/13	04/03/13	07/23/13
Nitrite + nitrate as nitrogen (mg/L)	4.33	4.31	5.08	6.29
Total Kjeldahl nitrogen (mg/L)	0.555	0.495	0.277	0.722
Total nitrogen[a] (mg/L)	4.885	4.805	5.357	7.012
Total suspended solids (mg/L)	19.8	4.0 U[b]	4.0 U	4.0 U
Total dissolved solids (mg/L)	527	482	592	636
Chloride (mg/L)	45.2	41.8	52.4	61
Fluoride (mg/L)	1.44	1.39	1.53	1.65
pH	8.06	7.96	7.34	8.49
Total phosphorus (mg/L)	1.3	1.15	0.275	0.307
Sulfate (mg/L)	40	38.2	43.7	49.5
Arsenic (µg/L)	3.4	3.3	5.4	5.0 U
Barium (µg/L)	103	75.9	84.4	80
Cadmium (µg/L)	1.0 U	1.0 U	1.0 U	1.0 U
Chromium (µg/L)	6.3	3.3	4.0	3.8
Iron[c] (µg/L)	654	25 U	133	102
Lead (µg/L)	1.7	0.28	0.49	0.25 U
Manganese[c] (µg/L)	27.6	2.5 U	2.5 U	2.5 U
Mercury (µg/L)	0.20 U	0.20 U	0.20 U	0.20 U
Selenium (µg/L)	1.3	1.1	1.4	1.5
Silver (µg/L)	5.0 U	5.0 U	5.0 U	5.0 U
Sodium[c] (µg/L)	46,600	42,000	48,000	55,400
Zinc (µg/L)	24.5	6.9	11.1	13.2

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

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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 monthly volume of flow to the Industrial Waste Pond from the Industrial Waste Pipeline to the nearest 0.000 million gallons. As reported in the previous annual report, monthly flow volumes were recorded from the new flow meter system after it was calibrated and returned to service on July 1, 2012. On November 29, 2012, the INL submitted the as-built drawings and engineering report for the new flow meter system to the DEQ (Stenzel 2012). Table 3 summarizes the monthly and annual flow data.

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

	Average (gpm[a])	Total (MG[b])
November 2012	23.0	0.992
December 2012	22.5	1.006
January 2013	11.4	0.510
February 2013	10.3	0.416
March 2013	10.7	0.478
April 2013	9.3	0.402
May 2013	11.8	0.526
June 2013	17.0	0.734
July 2013	16.4	0.732
August 2013	19.9	0.889
September 2013	21.0	0.907
October 2013	33.9	1.511
TOTAL		9.102

a. gpm—gallons per minute.
b. MG—million gallons.

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.

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

	Average[a] (gpm[b])	Total (MG[c])
November 2012	1	0.045
December 2012	1	0.045
January 2013	1	0.045
February 2013	1	0.040
March 2013	1	0.045
April 2013	1	0.043
May 2013	1	0.045
June 2013	1	0.043
July 2013	1	0.045
August 2013	1.3	0.058
September 2013	1	0.043
October 2013	1	0.045
TOTAL		0.542

a. Average of multiple visual flow estimates during the month.

b. gpm—gallons per minute.

c. 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 9.64 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 (Ditch C) and Pond identifies three INL compliance wells. The permit requires the collection of groundwater samples in April or May and September or October.

In 2013, MS personnel collected groundwater samples in April 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 with the exception of iron and manganese in wells that exceed the SCS for these parameters.
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 Figures 4 and 5):

- 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 quality standards in IDAPA 58.01.11 in the unfiltered samples collected during the 2013 reporting year (Table 5)

with the exception of iron in wells ANL-MON-A-013 and ANL-MON-A-014 and manganese in well ANL-MON-A-013.

Iron exceeded the SCS of 300 ug/L in well ANL-MON-013 in the April unfiltered samples. The April unfiltered iron concentrations in ANL-MON-A-013 in the sample and duplicate sample were 4,880 ug/L and 1,060 ug/L, respectively. The September unfiltered iron sample result was also above the SCS with a concentration of 334 ug/L.

The filtered April sample and duplicate sample results from ANL-MON-A-013 were 80.8 ug/L and 70.7 ug/L, respectively. The September filtered sample result for iron was undetected at 50 ug/L.

Well ANL-MON-A-014 had an iron concentration in the unfiltered April sample of 695 ug/L and a filtered concentration of 60.9 ug/L. The September unfiltered concentration for iron was 81.1 ug/L.

To demonstrate compliance, if the unfiltered samples exceed the applicable SCS for iron and/or manganese, then the filtered sample results are used. For well ANL-MON-A-013, the iron concentrations in the unfiltered samples for April and September were all above the SCS but the filtered results were all below the SCS. Well ANL-MON-A-014 had an unfiltered iron concentration in the April sample above the SCS but the filtered sample was below the SCS at 60.9 ug/L. The September unfiltered iron concentration in well ANL-MON-A-014 was below the SCS.

Figure 3 shows the variability of the iron concentrations between the three wells and between the filtered and unfiltered samples from May 2010 through September 2013. The filtered sample results for all three wells is at or near the laboratory instruments minimum detection level of 50 ug/L. The highest unfiltered sample results were typically in the April/May time frame.

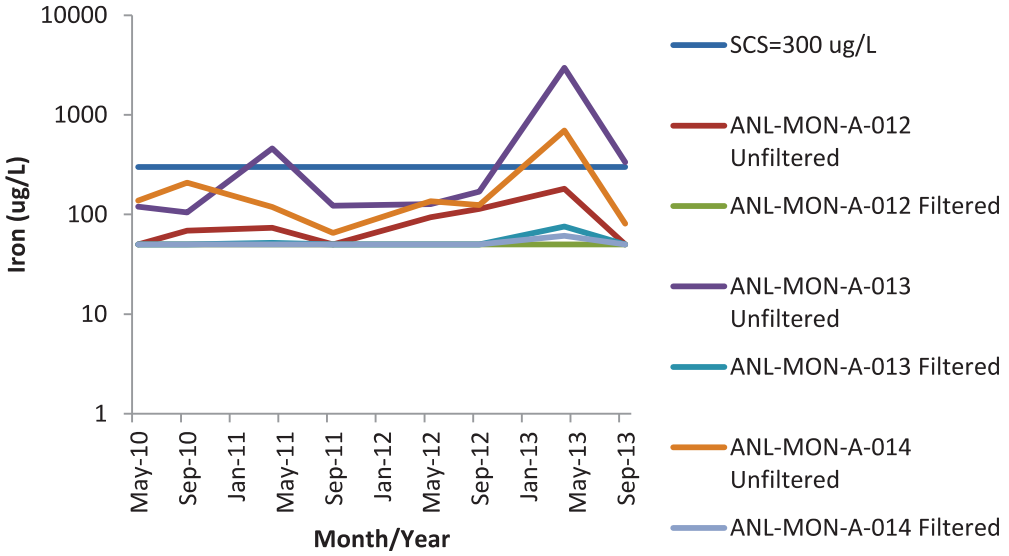

Figure 3. Iron concentrations in the unfiltered and filtered samples from the three aquifer monitoring wells for the period of May 2010 through September 2013.

NOTE: For iron sample results below the laboratory instrument detection levels shown in Figure 3, the detection level was used. During months where a duplicate sample was collected, the regular sample and duplicate sample results were averaged.

Manganese was above the PCS of 50 ug/L in well ANL-MON-A-013 in the April unfiltered sample with a concentration of 103 ug/L. However, the duplicate unfiltered sample collected in April was below the SCS at 21 ug/L. Both the April filtered sample and duplicate sample for manganese were undetected at 2.5 ug/L. The September unfiltered sample result was 15.1 ug/L and below the SCS.

The iron and manganese concentrations in the effluent from the Industrial Waste Pipeline are typically less than half of the SCS for iron and below or slightly above the laboratory instrument detection level for manganese.

The concentrations of chloride, nitrate+nitrite (as nitrogen), phosphorus, and sodium appear to be elevated in the effluent from the Industrial Waste Pipeline and Ditch C; 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 April and September 2013, sampling events are shown in Figure 4 and Figure 5, 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	04/24/2013	09/17/2013	04/24/2013	09/17/2013	04/24/2013	09/17/2013	
Water Table Depth (ft bgs)	656.99	659.83	645.52	648.36	644.52	647.29	NA[b]
Water Table Elevation (ft above mean sea level)[c]	4475.71	4472.87	4474.85	4472.01	4473.56	4470.79	NA
pH	8.08	8.26	8.03	7.88	8.01	7.83	6.5 to 8.5 (SCS)
Temperature (^{o}C)	12.7	13.2	12.5	13.6	13.2	13.7	None
Conductivity (µS/cm)	376	368	387	364	381	368	None
Nitrate nitrogen (mg/L)	1.98	1.96	2.04 [2.04][d]	2.04	2.07	2.00	10 (PCS)
Phosphorus (mg/L)	0.0114	0.0167	0.016 [0.0153]	0.025	0.0126	0.0173	None
Total dissolved solids (mg/L)	244	236	254 [254]	249	251	242	500 (SCS)
Sulfate (mg/L)	16.6	16.9	19.1 [19.0]	17.7	18.8	17.4	250 (SCS)
Arsenic (µg/L)	2.4	2.6	2.4 [2.3]	2.4	2.3	2.5	50 (PCS)
Barium (µg/L)	37	38.8	43.4 [35.3]	36.1	35.4	36.3	2000 (PCS)
Cadmium (µg/L)	0.25 U[e]	0.25 U	0.25 U [0.25 U]	0.25 U	0.25 U	0.25 U	5 (PCS)
Chloride (mg/L)	17.9	16.9	19.2 [19.5]	18.6	19.5	18.4	250 (SCS)
Chromium (µg/L)	3.0	2.5 U	9.4 [8.2]	3.1	4.8	3.1	100 (PCS)

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	04/24/2013	09/17/2013	04/24/2013	09/17/2013	04/24/2013	09/17/2013	
Iron (µg/L)	181	50 U	**4,880** (80.8)[f] [**1,060**] [(70.7)]	**334** (50 U)	**695** (60.9)	81.1	300 (SCS)
Lead (µg/L)	0.5 U	0.5 U	0.64 [0.5 U]	0.5 U	0.5 U	0.5 U	15 (PCS)
Manganese (µg/L)	4.4	2.5 U	**103** (2.5 U) [21.0] [(2.5 U)]	15.1	8.7	3.4	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)	0.53	0.54	0.7 [0.61]	0.59	0.66	0.5 U	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)	18,200	17,500	19,600 [19,400]	18,000	18,400	17,300	None
Zinc (µg/L)	8.8	2.5 U	14.4 [4.9]	2.5 U	2.5 U	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. Elevations are given in the National Geodetic Vertical Datum of 1929.
d. Concentrations shown in brackets are the results from field duplicate samples.
e. U flag indicates the result was reported as below the instrument detection limit by the analytical laboratory.
f. Concentrations shown in parentheses are from filtered samples.

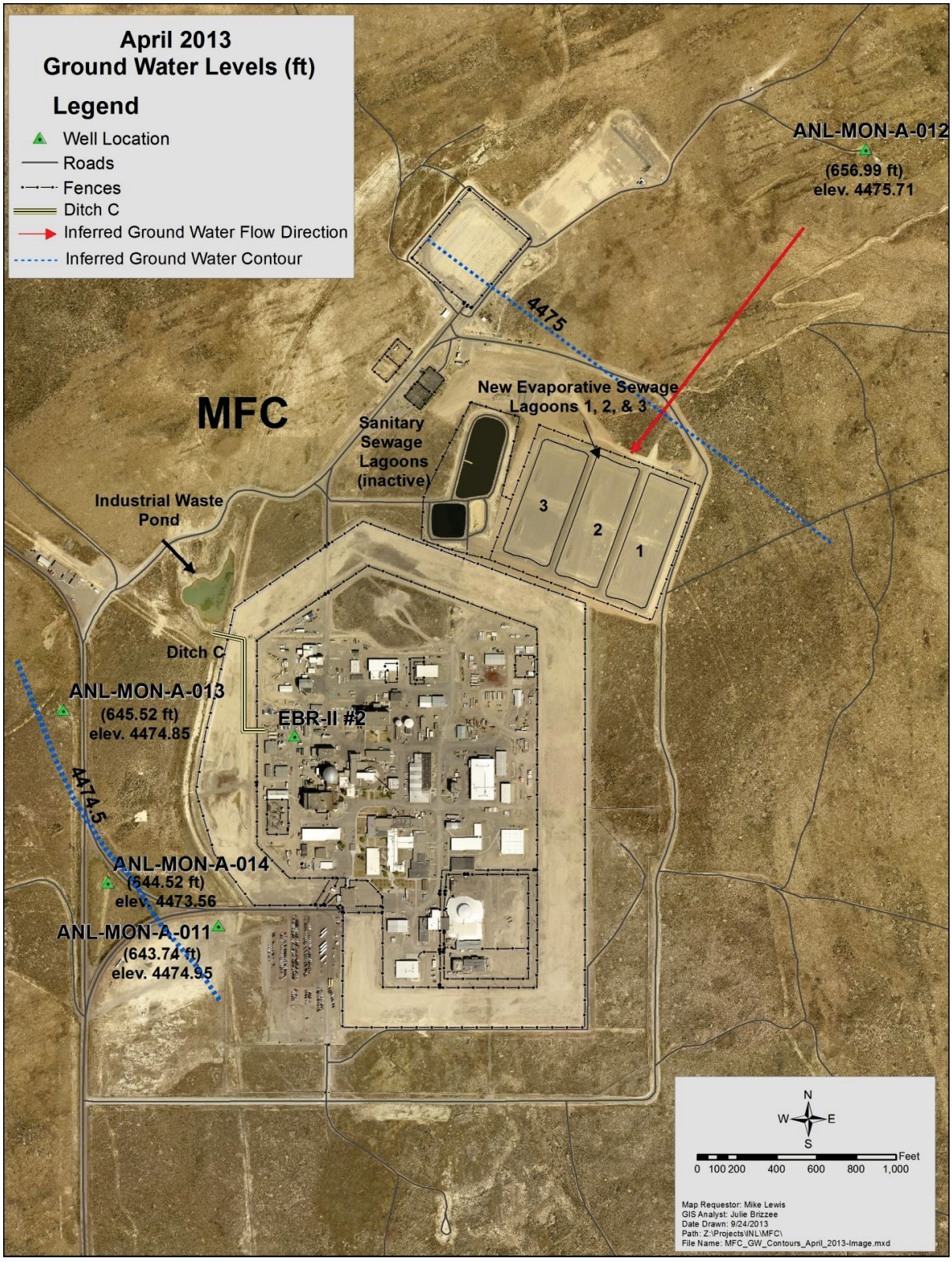

Figure 4. Groundwater contour map based on the April 2013 water level measurements.

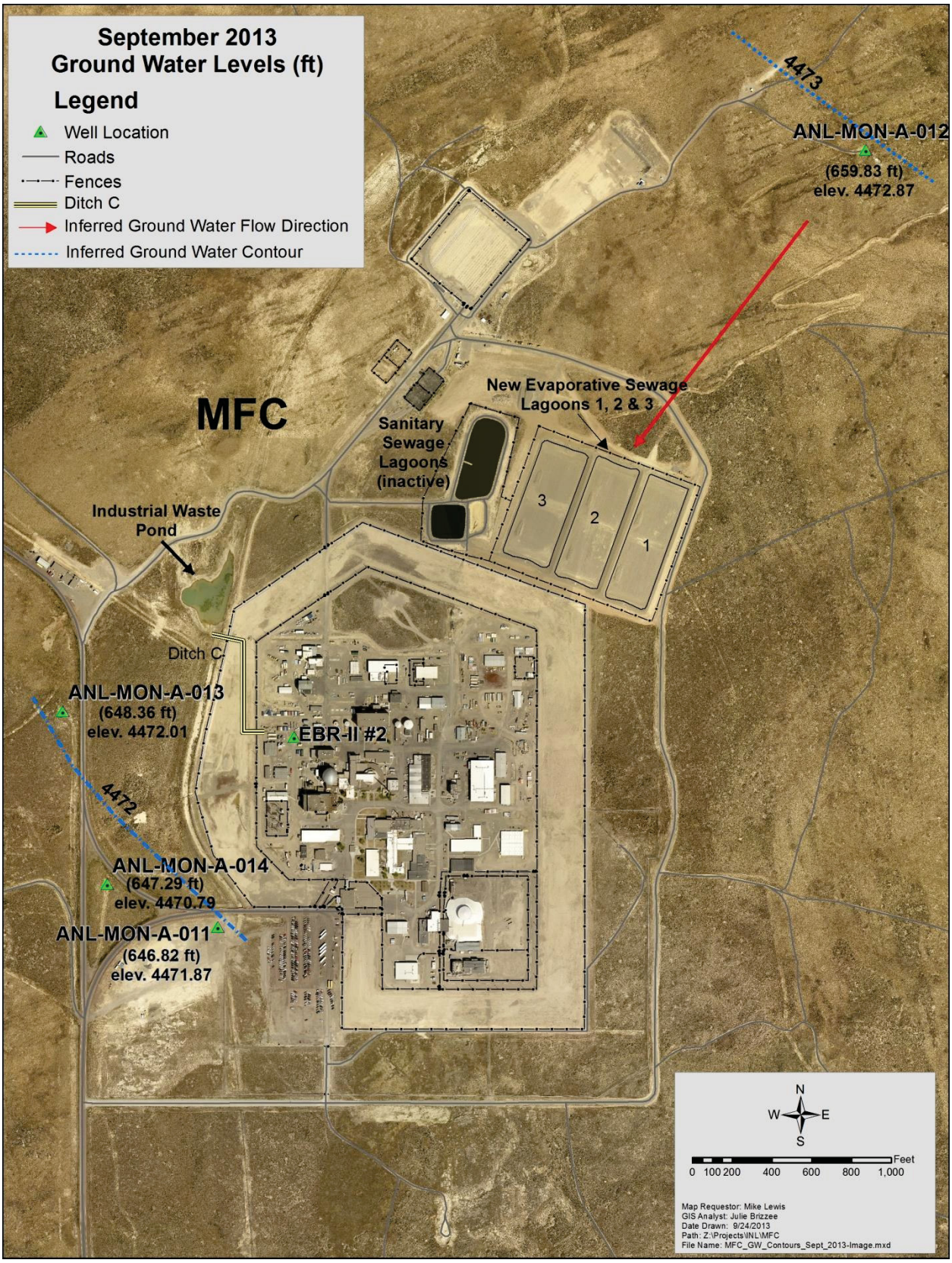

Figure 5. Groundwater contour map based on the September 2013 water level measurements.

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 to submit a final Operation and Maintenance Manual 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

There were no non-compliance issues during the 2013 permit reporting year.

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, 2012 through October 31, 2013) was 9.64 MG.

The effluent from the Industrial Waste Pipeline and the Industrial Waste Water Underground Pipe (Ditch C) 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 quality standards in IDAPA 58.01.11 as required by the IWRP. The concentrations of chloride, nitrate+nitrite (as nitrogen), phosphorus, and sodium appear to be elevated in the effluent from the Industrial Waste Pipeline and Ditch C; 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."

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.

Stenzel, J. A., INL, to T. Rackow, DEQ, November 29, 2012, "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.