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2011 Annual Industrial Wastewater Reuse Report for the Idaho National Laboratory Site's Materials and Fuels Complex Industrial Waste Ditch and Industrial Waste Pond

February 2012

The INL is a U.S. Department of Energy National Laboratory
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February 2012

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Idaho Falls, Idaho 83415

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ABSTRACT

This report describes conditions, as required by the state of Idaho Industrial Wastewater Reuse Permit (#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, 2010 through October 31, 2011. 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 2011 reporting year, an estimated 6.99 million gallons of wastewater were discharged to the Industrial Waste Ditch and Pond which is well below the permit limit of 13 million gallons per year. Using the dissolved iron data, 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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CONTENTS

ABSTRACT ... iii

ACRONYMS ... vii

1. INTRODUCTION ... 1

2. FACILITY, SYSTEM DESCRIPTION, AND OPERATION ... 1

3. INDUSTRIAL WASTE POND EFFLUENT MONITORING ... 4
   - 3.1 Sampling Program and Analytical Methods ... 4
   - 3.2 Effluent Monitoring Results ... 4
     - 3.2.1 Industrial Waste Pipeline ... 4
     - 3.2.2 Effluent to Ditch C ... 4
   - 3.3 Flow Volumes and Hydraulic Loading Rates ... 9
     - 3.3.1 Industrial Waste Pipeline to Industrial Waste Pond ... 9
     - 3.3.2 Industrial Waste Water Underground Pipeline to Ditch C ... 9
     - 3.3.3 Summary ... 10

4. GROUNDWATER MONITORING ... 11
   - 4.1 Sampling Program ... 11
   - 4.2 Analytical Methods ... 11
   - 4.3 Monitoring Wells ... 11
   - 4.4 Groundwater Monitoring Results ... 11
   - 4.5 Water Table Information ... 12

5. PERMIT YEAR SUMMARIES ... 17
   - 5.1 Status of Permit Required Compliance Activities ... 17
   - 5.2 Non-compliance Issues ... 17

6. ENVIRONMENTAL IMPACTS ... 18

7. REFERENCES ... 19

Appendix A Discharge Volumes from the Industrial Waste Pipeline and Industrial Waste Water Underground Pipe at the Materials and Fuels Complex ... 20

FIGURES

Figure 1. MFC Industrial Waste Ditch and Industrial Waste Pond. ... 2

Figure 2. Groundwater contour map based on the April 2011 water level measurements. ... 15

Figure 3. Groundwater contour map based on the September 2011 water level measurements ... 16

TABLES

Table 1. Summary of MFC facilities with routine discharges to the Industrial Waste Ditch and Pond. 3

Table 2. Analytical results for 24-hour composite samples collected from the Industrial Waste Pipeline (WW-016001). 6

Table 3. Analytical results for quarterly grab samples collected from the wastewater discharged to Ditch C from the Industrial Waste Water Underground Pipe (WW-016002). 8

Table 4. Volume of waste water discharged from the Industrial Waste Pipeline. 9

Table 5. Volume of waste water discharged from the Industrial Waste Water Underground Pipe to Ditch C. 10

Table 6. Summary of groundwater quality data collected for the Wastewater Reuse Permit for the MFC Industrial Waste Ditch and Pond. Dissolved constituent concentrations from filtered samples are in parentheses. 13

Table A-1. Estimated discharge volumes from the Industrial Waste Pipeline and Industrial Waste Water Underground Pipe during the 2011 reporting year. 21

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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2011 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) #LA-000160-01 issued by the Idaho Department of Environmental Quality (DEQ). The permit was effective on May 1, 2010 and will expire on April 30, 2015 (Neher 2010).

This report summarizes the facility system and operation, monitoring data, special compliance conditions, non-compliances, and environmental impacts for the 2011 reporting year (November 1, 2010 through October 31, 2011).

2. FACILITY, SYSTEM DESCRIPTION, AND OPERATION

The Materials and Fuels Complex (MFC) is located on approximately 60 acres in the southeastern portion of the INL, approximately 35 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 (Table 1). 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. On July 26, 2011 a leak in the potable water line to the TREAT reactor building was noted flowing down an embankment and into the Industrial Waste Pond. The duration and volume of the release is not precisely known.

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 2011 the north leg of Ditch A was replaced with a culvert to facilitate the expansion of a storage and staging area (Figure 1). Figure 1 has also been revised to more accurately depict the ditches and utilities at MFC.

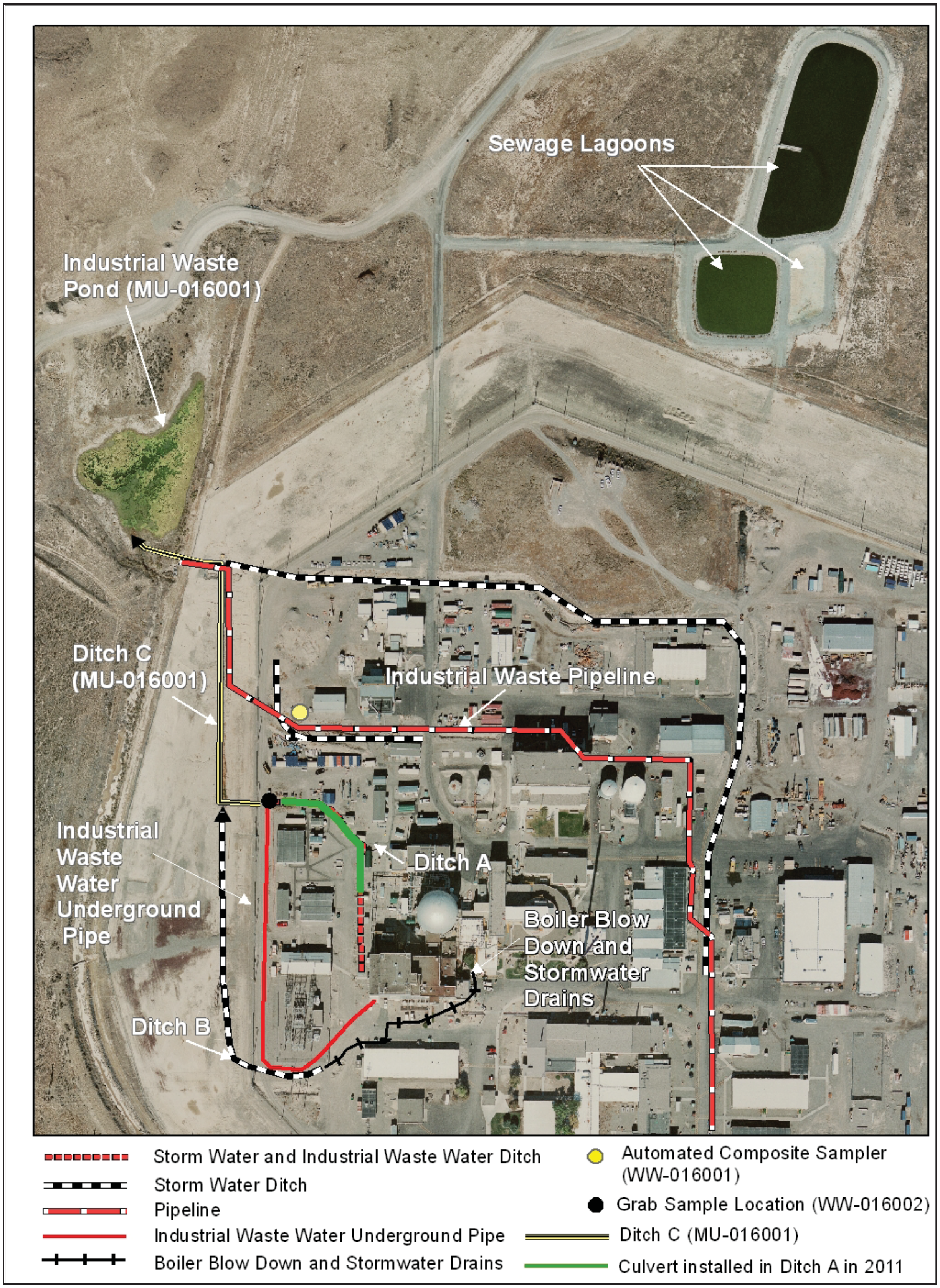

Figure 1. MFC Industrial Waste Ditch and Industrial Waste Pond.

Table 1. Summary of MFC facilities with routine discharges to the Industrial Waste Ditch and Pond.

Building	Routine Discharge Description
Building 704. Fuel Manufacturing Facility (FMF)	Noncontact cooling water
Building 752. Analytical Laboratory and Office Building (L&O)	Air wash, floor drain
Building 754, 707 Fire Pumps	Clean water pressure relief flows
Building 768. Power Plant	Noncontact cooling water, cooling water blowdown, boiler blowdown. Capability to have once through cooling water if water system is down for maintenance. This could increase effluent flows by over 10 gpm. Effluent from reverse osmosis system.
Building 772. EBR II Engineering Laboratory	Noncontact cooling water
Building 774. Zero Power Physics Reactor (ZPPR)	Noncontact cooling water
Building 785. Hot Fuel Examination Facility (HFEF)	Noncontact cooling water, air washer drains, drinking fountains, hot water tank blowdown
Building 785-A Cooling Tower	Cooling water tower drain and blowdown
Building 793. Sodium Components Maintenance Shop (SCMS)	Noncontact cooling water, steam condensate, air wash
Building 799. Sodium Processing Facility (SPF)	Noncontact cooling water, steam condensate

3. INDUSTRIAL WASTE POND 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 August 23 was moved up to August 10 to accommodate installation of a new flow meter on the Industrial Waste Pipeline. Because of heavy rain on the afternoon of August 9 it was determined that the sample would not be representative so sampling was rescheduled for August 16. Similarly, the sampling event scheduled for September 21 was moved to September 7 to accommodate excavation associated with installation of the new flow meter. 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 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 (SwRI) 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 because the flow meter was not working. The problems with the flow meter were reported to DEQ in the INL State Water Self Disclosure Log (Lee 2010). The time-proportional samples are considered representative of normal operations. Table 2 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 3.32 mg/L in May. With the exception of the 8 mg/L TSS reported in the July sample, 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 3.

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 5.747 mg/L in March. All TSS results were below the laboratory instrument detection limit of 4 mg/L. No permit limits were specified for the other required analytes.

Table 2. 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	11/16/10	12/15/10	01/13/11	02/09/11	03/03/11	04/26/11	05/03/11	06/23/11	07/19/11	08/16/11	09/07/11	10/25/11
Nitrite + nitrate as nitrogen (mg/L)	2.08	1.97	2.06	1.80	1.95	2.07	1.83	2.10	2.14	2.04 (2.04)	1.97	2.38
Total Kjeldahl nitrogen (mg/L)	1.04	0.542	0.278	0.372	0.206	0.724	1.49	0.937	1.03	0.424 (0.488)	0.323	0.553
Total nitrogen[b] (mg/L)	3.12	2.512	2.338	2.172	2.156	2.794	3.32	3.037	3.17	2.464 (2.528)	2.293	2.933
Total suspended solids (mg/L)	4 U[c]	4 U	4 U	4 U	4 U	4 U	4 U	4 U	8	4 U (4 U)	4 U	4 U
Total dissolved solids (mg/L)	345	374	318	277	292	254	327	376	341	331 (347)	247	278
Chloride (mg/L)	72.5	98.9	65.5	41.8	27.0	21.0	58.6	88.1	56.5	67.4 (68.2)	21.1	38.0
Fluoride (mg/L)	0.639	0.605	0.645	0.597	0.642	0.596	0.676	0.629	0.598	0.631 (0.629)	0.608	0.585
pH	8.44	8.44	8.64	8.46	8.48	8.40	8.61	8.39	8.64	8.61	8.41	8.30
Total phosphorus (mg/L)	0.609	0.299	0.435	0.286	0.165	0.123	0.308	0.357	0.134	0.410 (0.402)	0.103	0.0995
Sulfate (mg/L)	19	17.5	18.5	16.7	17.3	17.0	16.7	19.2	19.7	18.4 (18.4)	17.8	21.7
Arsenic (µg/L)	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	3.2	3.6	2.5 U	2.5 U	2.5 U (2.5 U)	3.0	3.2
Barium (µg/L)	33.4	38.8	36.7	35.6	34.7	33.0	35.6	38.6	40.0	34.2 (34.5)	35.8	37.5
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	3.1	2.5 U	2.5 U	2.5 U	2.5 U (2.5 U)	2.5 U	3.0
Iron[d] (µg/L)	137	162	107	84.7	37.3 R[e]	73.6	70.2	105	98.8	48.2 (69.0)	58.3	138
Lead (µg/L)	0.56	1.2	1.0	1.2	0.25 U	0.25 U	0.29	0.39	0.43	0.25 U (0.29)	0.25 U	0.98
Manganese[d] (µg/L)	16.2	6.4	3.6	3.2	2.6	4.6	3.0	11.5	4.6	2.6 (3.0)	2.5 U	3.3

Sample Month	November	December	January	February	March	April	May	June	July	August	September	October
Sample Date	11/16/10	12/15/10	01/13/11	02/09/11	03/03/11	04/26/11	05/03/11	06/23/11	07/19/11	08/16/11	09/07/11	10/25/11
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)	0.56	0.77	0.62	0.59	0.50 U	2.9	0.59	3.9	0.93	0.78 (0.80)	0.62	0.72
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	5.0 U (5.0 U)	5.0 U	5.0 U
Sodium[d] (µg/L)	52900	63300	43600	28800	23100	20100	43100	62400	42100	45100 (45300)	18800	31400
Zinc (µg/L)	12.2	24.4	14.1	17.4	8.9	12.4	10.6	12.7	12.2	7.9 8.3	7.3	21.2

a. Results for field duplicate collected in August 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.
e. R flag indicates the accuracy of the data is so questionable that it is recommended the data not be used because of high matrix spike recovery (270%).

Table 3. 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 2010	First 2011	Second 2011	Third 2011
Sample Date	12/15/10	03/02/11	05/03/11	09/21/11
Nitrite + nitrate as nitrogen (mg/L)	4.35	4.99	4.65	4.01
Total Kjeldahl nitrogen (mg/L)	0.552	0.757	0.940	0.623
Total nitrogen[a](mg/L)	4.902	5.747	5.59	4.633
Total suspended solids (mg/L)	4 U[b]	4 U	4 U	4 U
Total dissolved solids (mg/L)	538	625	582	437
Chloride (mg/L)	44.6	49.6	45.7	41.6
Fluoride (mg/L)	1.41	1.78	1.48	1.20
pH	8.24	8.32	8.19	8.70
Total phosphorus (mg/L)	0.884	1.03	0.877	0.658
Sulfate (mg/L)	39	43.1	41.3	35.3
Arsenic (µg/L)	4.2	4.4	5.2	3.6
Barium (µg/L)	84.5	135	85.9	58.0
Cadmium (µg/L)	1.0 U	1.0 U	1.0 U	1.0 U
Chromium (µg/L)	3.4	9.4	4.2	3.1
Iron[c] (µg/L)	150	1860[d]	108	59.4
Lead (µg/L)	0.47	3.4	0.39	0.62
Manganese[c] (µg/L)	4.1	90.1	3.2	4.0
Mercury (µg/L)	0.20 U	0.20 U	0.20 U	0.20 U
Selenium (µg/L)	1.3	1.5	1.3	1.1
Silver (µg/L)	5.0 U	5.0 U	5.0 U	5.0 U
Sodium[c] (µg/L)	46800	50700	46900	40100
Zinc (µg/L)	20	55.3	26.8	58.2

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.
d. The associated value may be inaccurate due to high matrix spike recovery (270%).

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. The flow meter on the MFC Industrial Waste Pipeline was not working during the 2011 reporting year so manual flow readings were taken approximately weekly by Environmental, Safety, and Health personnel 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. Table 4 summarizes the monthly and annual flow data. The flow measurements are in Appendix A.

Table 4. Volume of waste water discharged from the Industrial Waste Pipeline.

	Average (gpm[a])	Minimum (gpm)	Maximum (gpm)	Total (MG[b])
November 2010	7.7	7	8.6	0.333
December 2010	8.3	7.4	10.3	0.371
January 2011	8.25	7	9	0.368
February 2011	11.5	8	14	0.554
March 2011	10.5	8	12	0.469
April 2011	11.8	10	15	0.510
May 2011	11.4	8	15	0.509
June 2011	13	10	16	0.562
July 2011	10.75	10	12	0.480
August 2011	13.2	10	22	0.589
September 2011	21.25	15	25	0.918
October 2011	11.33	10	12	0.506
TOTAL				6.169

a. gpm—gallons per minute.

b. MG—million gallons.

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. The new flow meter will be calibrated after installation.

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 5 summarizes the monthly and annual flow data; the flow estimates are in Appendix A.

Table 5. Volume of waste water discharged from the Industrial Waste Water Underground Pipe to Ditch C.

	Average (gpm[a])	Minimum (gpm)	Maximum (gpm)	Total (MG[b])
November 2010	2	1	5	0.101
December 2010	1.25	1	2	0.056
January 2011	1	1	1	0.045
February 2011	1.25	1	2	0.050
March 2011	1.25	1	2	0.056
April 2011	1.8	1	3	0.078
May 2011	2.4	1	5	0.107
June 2011	1	1	1	0.043
July 2011	1	1	1	0.045
August 2011	1	1	1	0.045
September 2011	1.75	1	3	0.076
October 2011	2.67	1	4	0.119
TOTAL				0.821

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 13 million gallons (MG) per year.

Total effluent flow volume was an estimated 6.99 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 2011, 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 contstituent standards (SCS) specified in IDAPA 58.01.11, "Ground Water Quality Rule." With the exception of filtered samples for dissolved metals, none of the samples were filtered. The filtered samples for dissolved metals were collected to comply with the requirement in Section G of the permit that "Analytical results are required for dissolved iron and/or manganese only if the results for total iron and/or manganese exceed the standards in IDAPA 58.01.11.200.01.b."

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 (SwRI) 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 6 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 aquifer wells.

The concentration of total iron in the sample collected from ANL-MON-A-013 on April 27, 2011 was 459 µg/L; however, the concentration of dissolved iron was 52 µg/L, which is below the SCS of 300 µg/L.

Iron is a dominant element in the minerals in the basalt which comprises the bulk of the Snake River Plain aquifer.

The concentrations of all other permit-required analytes were below their respective groundwater standards in IDAPA 58.01.11 in the samples collected during the 2011 reporting year (Table 6). 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.

4.5 Water Table Information

Depth to water and water table elevations for the April and September sampling events are shown in Figure 2 and Figure 3, respectively. The elevations are referenced to the National Geodetic Vertical Datum of 1929 (NGVD 29). 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 6. Summary of groundwater quality data collected for the Wastewater Reuse Permit for the MFC Industrial Waste Ditch and Pond. Dissolved constituent concentrations from filtered samples are in parentheses.

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	04/27/2011	09/28/2011	04/27/2011	09/28/2011	04/27/2011	09/28/2011	
Water Table Depth (ft bgs)	657.48	658.74	645.98	647.26	644.95	646.24	NA[b]
Water Table Elevation (ft above mean sea level)	4475.22	4473.96	4474.39	4473.11	4473.13	4471.84	NA
pH	8.34	8.32	8.26	8.14	8.29	8.09	6.5 to 8.5 (SCS)
Temperature	13.7	13.2	13.0	13.2	12.5	13.8	None
Conductivity (µS/cm)	366	369	378	380	373	374	None
Nitrate nitrogen (mg/L)	1.95	1.84	2.05	1.91	2.04	1.88	10 (PCS)
Phosphorus (mg/L)	0.0121	0.0143	0.0235	0.0157	0.0115	0.0185	None
Total dissolved solids (mg/L)	253	239	265	232	262	232	500 (SCS)
Sulfate (mg/L)	16.3	16.3	19.4	18.4	18.1	17.2	250 (SCS)
Arsenic (µg/L)	2.0	1.5	2.2	1.7	2.0	1.5	50 (PCS)
Barium (µg/L)	39.6	37.5	37.5	35.7	36.8	35.6	2000 (PCS)
Cadmium (µg/L)	0.25 U[c]	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	5 (PCS)
Chloride (mg/L)	17.0	17.8	18.7	18.2	18.4	18.5	250 (SCS)
Chromium (µg/L)	2.5 U	2.5	8	2.5 U	4.6	3.8	100 (PCS)
Iron (µg/L)	73.5 (50 U)	50 U (50 U)	**459**[d] (52)	122 (50 U)	119 (50 U)	65.3 (50 U)	300 (SCS)
Lead (µg/L)	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	15 (PCS)
Manganese (µg/L)	2.5 U (2.5 U)	2.5 U (2.5 U)	7.7 (2.5 U)	3.5 (2.5 U)	2.5 U (2.5 U)	2.5 U 2.5 U	50 (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	04/27/2011	09/28/2011	04/27/2011	09/28/2011	04/27/2011	09/28/2011	
Mercury (µg/L)	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	2 (PCS)
Selenium (µg/L)	0.56	0.59	0.54	0.50 U	0.73	0.53	50 (PCS)
Silver (µg/L)	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	100 (SCS)
Sodium (µg/L)	18000	16700	19400	17500	18100	16600	None
Zinc (µg/L)	2.8	2.5 U	3.3	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. U flag indicates the result was reported as below the instrument detection limit by the analytical laboratory.
d. Concentrations shown in bold are above the Ground Water Quality Rule SCS. Filtered sample results, shown in parentheses, are below the SCS.

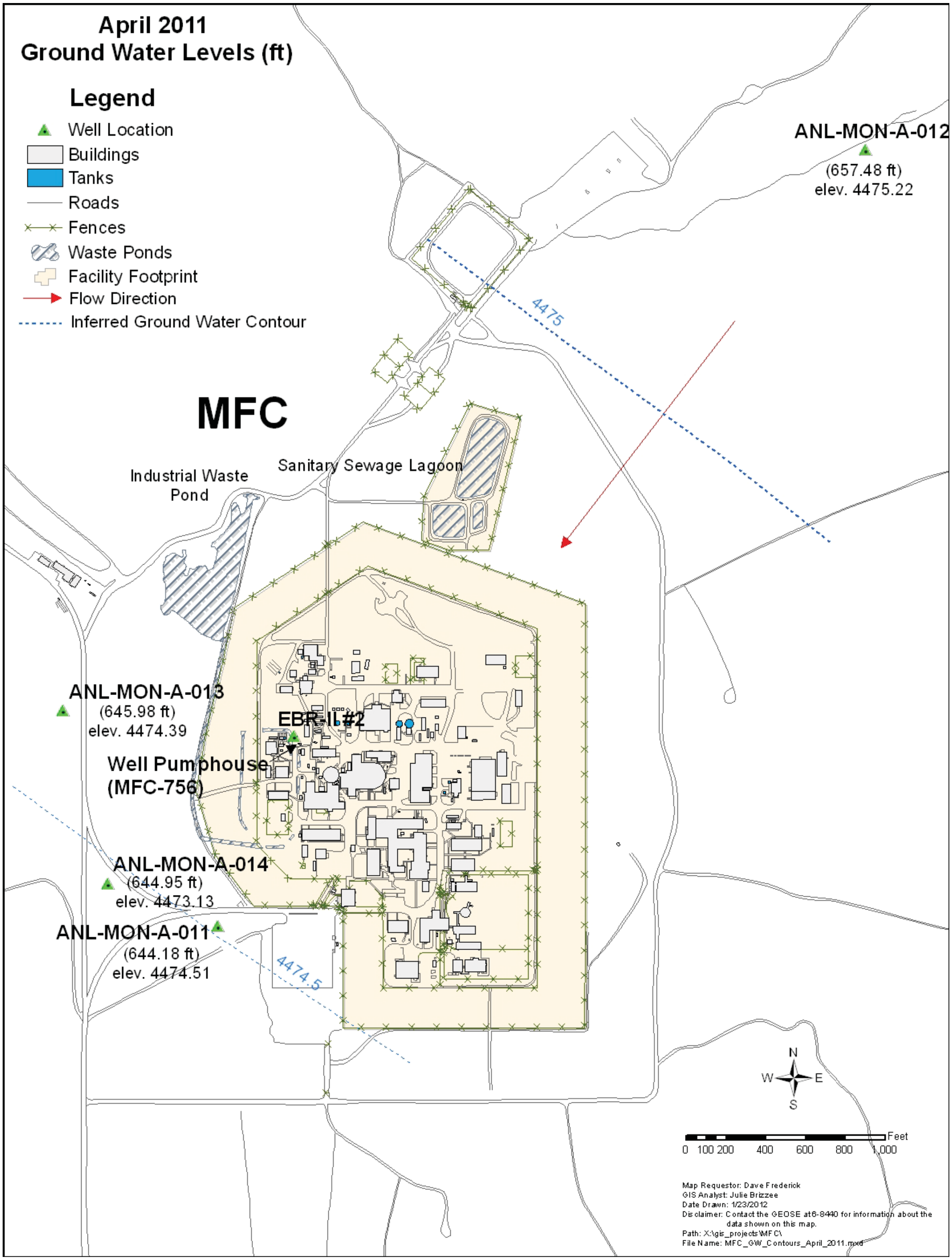

Figure 2. Groundwater contour map based on the April 2011 water level measurements.

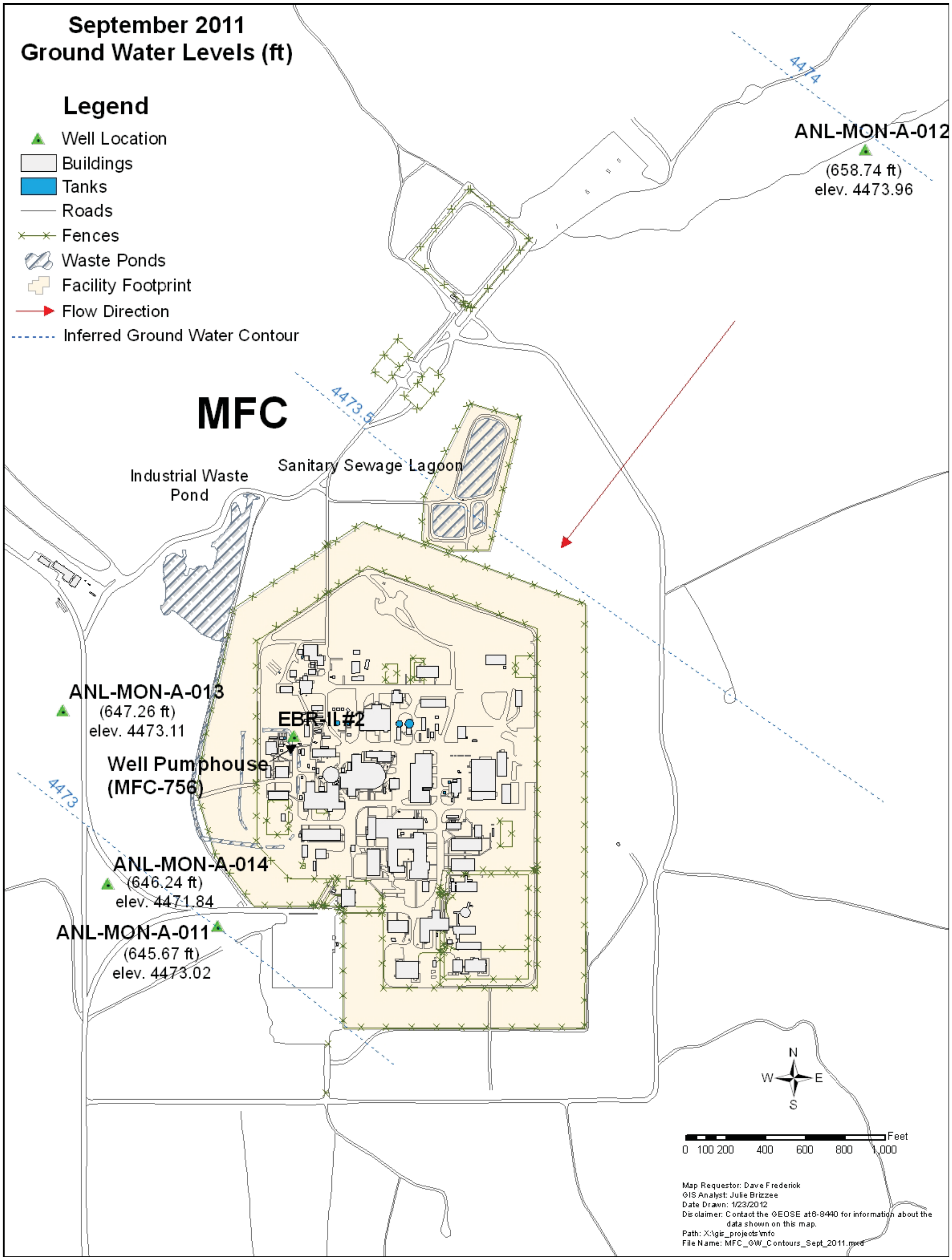

Figure 3. Groundwater contour map based on the September 2011 water level measurements.

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 requires a Plan of Operation to be submitted to the DEQ within twelve months after permit issuance. The compliance activity states:

"A final Plan of Operation (O&M Manual) for the wastewater reuse facility, incorporating the requirements of this permit shall be submitted to the Department for review and approval. The manual may reference other written procedures required for the operation and maintenance of the cold waste pond system. Upon approval, the Manual shall be incorporated by reference into this permit and shall be enforceable as a part of this permit."

The O&M Manual was submitted to DEQ on April 13, 2011 (Stenzel, 2011). The DEQ approved the O&M Manual in June 2011 (Rackow, 2011).

Compliance Activity CA-160-02 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, has 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.

An engineering review determined that the best approach was to install a 4-inch Palmer-Bowles flume manufactured by Warminster Fiberglass. The DEQ approved the installation plans and specifications for the flow meter in May 2011 (Rackow, 2011a). As of December 2011, the new flow meter has been installed and calibration tests are ongoing.

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.

6. ENVIRONMENTAL IMPACTS

The IWRP specifies a maximum hydraulic loading rate of 13 MG/year. The total volume discharged to the MFC Industrial Waste Ditch and Pond during the reporting period (November 1, 2010 through October 31, 2011) was 6.99 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 were specified for the other analytes.

Using the dissolved iron concentration for the sample collected from ANL-MON-A-013 on April 27, 2011, the concentrations of the permit-required analytes in the groundwater samples were 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, 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.

Rackow, T, DEQ, to J.A. Stenzel, INL, June 23, 2011, “LA-000160-01 INL MFC Industrial Wastewater Pond 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, April 13, 2011, “Submittal of the Operation and Maintenance Manual for the Materials and Fuels Complex Industrial Wastewater System,” CCN 223893.

Appendix A

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

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 2011 reporting year.

Date	Measured Flow from Industrial Waste Pipeline - Bucket Method (gpm)	Monthly Flow in Industrial Waste Pipeline[a] (gallons)	Estimated Flow from Industrial Waste Water Underground Pipe – Visual Method (gpm)	Monthly Flow from Industrial Waste Water Underground Pipe[a] (gallons)
2010				
3-Nov	8.6		5	
10-Nov	7.5		1	
17-Nov	7	332,600	1	100,800
1-Dec	10.3		1	
8-Dec	8.1		1	
15-Dec	7.4		1	
22-Dec	7.4	370,500	2	55,800
2011				
5-Jan	8		1	
13-Jan	9		1	
19-Jan	9		1	
25-Jan	7	368,300	1	44,600
3-Feb	8		1	
7-Feb	10		2	

Date	Measured Flow from Industrial Waste Pipeline - Bucket Method (gpm)	Monthly Flow in Industrial Waste Pipeline[a] (gallons)	Estimated Flow from Industrial Waste Water Underground Pipe – Visual Method (gpm)	Monthly Flow from Industrial Waste Water Underground Pipe[a] (gallons)
2011				
16-Feb	14		1	
22-Feb	14	554,400	1	50,400
1-Mar	12		1	
10-Mar	10		1	
17-Mar	8		1	
24-Mar	12	468,700	2	55,800
1-Apr	10		3	
7-Apr	10		1	
13-Apr	12		3	
21-Apr	15		1	
26-Apr	12	509,800	1	77,800
3-May	10		1	
11-May	10		5	
17-May	14		1	
25-May	15		1	
31-May	8	508,900	4	107,100
10-Jun	10		1	
15-Jun	16		1	
21-Jun	10		1	
28-Jun	16	561,600	1	43,200

Date	Measured Flow from Industrial Waste Pipeline - Bucket Method (gpm)	Monthly Flow in Industrial Waste Pipeline[a] (gallons)	Estimated Flow from Industrial Waste Water Underground Pipe – Visual Method (gpm)	Monthly Flow from Industrial Waste Water Underground Pipe[a] (gallons)
2011				
6-Jul	10		1	
14-Jul	11		1	
18-Jul	10		1	
26-Jul	12	479,900	1	44,600
3-Aug	10		1	
8-Aug	10		1	
18-Aug	12		1	
24-Aug	12		1	
30-Aug	22	589,200	1	44,600
7-Sep	20		1	
12-Sep	25		2	
26-Sep	25		1	
30-Sep	15	918,000	3	75,600
11-Oct	10		4	
19-Oct	12		1	
28-Oct	12	505,900	3	119,000

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.