

2010 Radiological Monitoring Results Associated with the Advanced Test Reactor Complex Cold Waste Pond

Michael G. Lewis

February 2011



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

2010 Radiological Monitoring Results Associated with the Advanced Test Reactor Complex Cold Waste Pond

Michael G. Lewis

February 2011

**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 summarizes radiological monitoring performed of the Idaho National Laboratory Site's Advanced Test Reactor Complex Cold Waste wastewater prior to discharge into the Cold Waste Pond and of specific groundwater monitoring wells associated with the Industrial Wastewater Reuse Permit (#LA-000161-01, Modification B). All radiological monitoring is performed to fulfill Department of Energy requirements under the Atomic Energy Act.

CONTENTS

ABSTRACT.....	iii
1 BACKGROUND.....	1
2 RADIOLOGICAL SAMPLE RESULTS.....	1
2.1 Reporting Period	1
2.2 Effluent Sample Results.....	1
2.3 Groundwater.....	2
3 REFERENCES.....	5

TABLES

Table 1. Advanced Test Reactor Complex Cold Waste Pond effluent radiological results for the period of November 2009 through October 2010.....	2
Table 2. Positive detection results from samples collected in April and October 2010 from the Advanced Test Reactor Complex Cold Waste Pond Industrial Wastewater Reuse Permit monitoring wells.	3

2010 Radiological Monitoring Results Associated with the Advanced Test Reactor Complex Cold Waste Pond

1 BACKGROUND

The radiological information presented in this report is provided based upon an agreement between the Idaho Department of Environmental Quality and the U.S. Department of Energy Idaho Operations Office. This report fulfills the terms of agreement documented in the current Industrial Wastewater Reuse Permit (IWRP) #LA-000161-01 for the Idaho National Laboratory Site's Advanced Test Reactor Complex (ATR Complex, formerly Reactor Technology Complex) Cold Waste Pond (CWP). The IWRP was issued on February 26, 2008 (Johnston 2008) and modified (Modification B) on August 20, 2008 (Eager 2008).

As stated in Section H ("Standard Reporting Requirements"), items 6 and 7 of the IWRP:

- The permittee agrees to provide to the Department the results of radiological monitoring of the effluent, prior to discharge into the percolation pond, with respect to the INL-ATR Complex Cold Waste Pond that is performed to fulfill Department of Energy requirements under the Atomic Energy Act. The permittee agrees to provide the results with the Annual Report.
- The permittee agrees to provide to the Department the results of ground water radiological monitoring with respect to the INL-ATR Complex Cold Waste Pond that is performed to fulfill Department of Energy requirements under the Atomic Energy Act. The permittee agrees to provide the results with the Annual Report.

2 RADIOLOGICAL SAMPLE RESULTS

2.1 Reporting Period

For the ATR Complex CWP, this IWRP reporting year runs from November 1, 2009 through October 31, 2010. As stated in the "Facility Monitoring Table" of Section G of the IWRP, groundwater sampling shall be conducted in April and October each year. Therefore, the groundwater results presented will be from the April and October 2010 sampling events.

2.2 Effluent Sample Results

Samples were collected to satisfy the surveillance objectives of DOE Order 450.1A and the release objectives of DOE Order 5400.5.

Monthly composite samples were collected from TRA-764 (WW-016101) using a flow proportional composite sampler. The monthly composite samples were analyzed by gamma spectrometry, and for gross alpha and gross beta. If the gross beta activity exceeded 15 pCi/L, a contingency analysis for strontium-90 was performed on the sample. Gross beta levels exceeded 15 pCi/L in the samples collected in May and July. Strontium-90 levels were below detection levels in these samples.

Additional iodine-129, strontium-90, and tritium analyses were performed on samples collected in October 2010. The results for these radionuclides were reported as undetected by the laboratory.

All monthly gamma spectrometry results were reported as undetected with the exception of two potassium-40 samples collected in December 2009 and January 2010 at 46.7 pCi/L and 24.1 pCi/L,

respectively. The other 10 samples collected throughout the year showed potassium-40 as undetected. Potassium-40 is a naturally occurring isotope of potassium.

Table 1 shows the monthly gross alpha and gross beta results. Positive detections are considered measurements exceeding the instrument's minimum detection level and greater than two times the uncertainty.

Table 1. Advanced Test Reactor Complex Cold Waste Pond effluent radiological results for the period of November 2009 through October 2010.

Sample Month	Gross Alpha (pCi/L)	Gross Beta (pCi/L)
November 2009	ND ^a	ND
December 2009	ND	6.47 (± 0.952) ^b 10.4 ^c (± 1.28)
January 2010	3.72 (± 1.26)	11.4 (± 1.45)
February 2010	ND	ND
March 2010	ND	10 (± 1.37)
April 2010	2.29 (± 0.921)	6.55 (± 1.29)
May 2010	3.24 (± 0.834)	17.6 (± 1.8)
June 2010	4.46 (± 1.08)	6.97 (± 1.09)
July 2010	ND	15.5 (± 1.78)
August 2010	ND	4.56 (± 1.32)
September 2010	3.09 (± 1.06)	14.8 (± 1.49)
October 2010	2.45 (± 0.913)	ND
a. ND – Not detected. b. One sigma uncertainty shown in parenthesis. c. Duplicate sample result.		

2.3 Groundwater

Samples were collected to satisfy the surveillance objectives of DOE Order 450.1A.

Groundwater samples for radiological parameters were collected from aquifer wells Middle-1823, TRA-07, TRA-08, USGS-065, and USGS-076 in April and October 2010. A field duplicate sample was collected from USGS-065 on April 6, 2010. Samples were analyzed by gamma spectrometry, gross alpha, gross beta, tritium, and strontium-90.

Table 2 shows the positive detections for gross alpha, gross beta, strontium-90, and tritium in well samples collected in April and October 2010. In addition, gamma spectrometry results for positive detections of potassium-40 are shown. All other gamma spectrometry results for April and October were reported as undetected. Positive detections are considered measurements exceeding the instrument's minimum detection level and greater than two times the uncertainty.

Table 2. Positive detection results from samples collected in April and October 2010 from the Advanced Test Reactor Complex Cold Waste Pond Industrial Wastewater Reuse Permit monitoring wells.

Monitoring Well	Sample Date	Parameter	Sample Result (pCi/L)
USGS-065	04/06/10	Gross Alpha	ND ^a 1.97 ^b (± 0.789) ^c
		Gross Beta	3.88 (± 1.11) 3.91 ^b (± 0.98)
	Potassium-40	ND 26.2 ^b (± 12.6)	
	Tritium	5,680 (± 600) 5,110 ^b (± 544)	
	10/14/10	Gross Beta	6.95 (± 1.26)
		Tritium	4,640 (± 485)
TRA-07	04/20/10	Tritium	11,200 (± 1,140)
	10/12/10	Gross Alpha	3.82 (± 1.02)
		Gross Beta	6.49 (± 1.39)
		Tritium	10,400 (± 1,050)
TRA-08	04/29/10	Gross Alpha	7.55 (± 1.43)
		Gross Beta	7.69 (± 1.49)
		Potassium-40	37.4 (± 14.7)
		Tritium	1,390 (± 201)
	10/14/10	Gross Alpha	3.02 (± 0.987)
		Gross Beta	5.5 (± 1.3)
		Tritium	1,640 (± 199)
USGS-076	04/07/10	Potassium-40	42.4 (± 14.1)
		Tritium	765 (± 140)
	10/12/10	Tritium	583 (± 122)
Middle-1823	04/07/10	Tritium	1,150 (± 172)
	10/12/10	Tritium	1,280 (± 173)
a. ND – Not detected. b. Analytical result from field duplicate sample collected on April 6, 2010. c. One sigma uncertainty shown in parentheses.			

In addition to the April and October 2010 groundwater samples, a sample was collected for strontium-90 analysis on August 19, 2010 from a tank being used to collect purge water from well TRA-08. At the time, well TRA-08 was undergoing additional purging in order to complete the development of the well. The sample was collected to ensure proper disposal of the purge water.

The August 19, 2010 strontium-90 result of 17.5 pCi/L was significantly higher than either the April or October strontium-90 results from well TRA-08 that were reported as below the detection limit at -0.112 pCi/L and 0.151 pCi/L, respectively. It is unclear why the August result from the tank was higher than either the April or October results for samples collected directly from the well. Possibilities include high suspended solids in the tank from the purging activity or residual contamination in the collection tank which is also used in other environmental monitoring activities unrelated to TRA-08. In either case, the strontium-90 result from the collection tank is not considered a representative sample from this well.

3 REFERENCES

42 USC § 2011–2259, 1954, “Atomic Energy Act of 1954,” *United States Code*.

DOE Order 450.1A, June 4, 2008, “Environmental Protection Program,” U.S. Department of Energy.

DOE Order 5400.5, Change 2, 1993, “Radiation Protection of the Public and the Environment, U.S. Department of Energy.

Eager, G., DEQ, to W. Hamel, DOE-ID, August 20, 2008, “Minor Modification B, Facility Name Change from Reactor Technology Complex (RTC) to Advanced Test Reactor Complex (ATR Complex), Cold Waste Pond, Wastewater Reuse Permit No. LA-000161-01,” CCN 214687.

Johnston, J., DEQ, to W. Hamel, DOE-ID, February 26, 2008, “Reactor Technology Complex (RTC) Cold Waste Pond, Wastewater Reuse Permit No. LA-000161-01 (Industrial Wastewater),” CCN 212842.