INL/RPT-22-65859

Removal of Institutional Controls at CERCLA Site ANL-01 Ditches A, B, and C at the Materials and Fuels Complex

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Idaho National Laboratory

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ABSTRACT

ANL-01 is a Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) site within Operable Unit (OU) 9-04 at the Materials and Fuels Complex (MFC). The ANL-01site includes the Industrial Waste Pond and its associated ditches. Ditches A, B, and C within ANL-01 were remediated in accordance with the *Final Record of Decision for Argonne National Laboratory - West* (DOE-CH 1998a).

Due to the success of the selected and contingent remedies for the ditches and the determination that they are protective of human health and the environment, institutional controls (ICs) are no longer required, and Idaho National Laboratory (INL) recommends termination of the ICs. In addition, the documentation requirements of the INL *Site-wide Institutional Controls, and Operations and Maintenance Plan for CERCLA Response Actions* (DOE-ID 2017) have been met to allow termination to occur.

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ACRONYMS

ANL-W	Argonne National Laboratory - West
CERCLA	Comprehensive Environmental, Response, Compensation, and Liability Act
COC	contaminant of concern
DOE	U.S. Department of Energy
DOE-CH	U.S. Department of Energy Chicago Operations Office
DOE-ID	U.S. Department of Energy Idaho Operations Office
EPA	U.S. Environmental Protection Agency
ESD	explanation of significant differences
FFA/CO	Federal Facility Agreement and Consent Order
FSP	field sampling plan
IC	institutional control
IC/O&M	institutional control/operations and maintenance
ICP	Idaho Cleanup Project
INL	Idaho National Laboratory
MFC	Materials and Fuels Complex
OU	operable unit
RD/RA	remedial design/remedial action
RI/FS	remedial investigation/feasibility study
ROD	record of decision
UCL	upper confidence limit
WAG	waste area group

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1. SCOPE AND BRIEF DESCRIPTION

Argonne National Laboratory (ANL)-01 is a Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) site within Operable Unit (OU) 9-04 at the Materials and Fuels Complex (MFC) (formerly Argonne National Laboratory – West (ANL-W)) that includes the Industrial Waste Pond and its associated ditches. This report documents that Ditches A, B, and C within ANL-01 site have met the remediation goals of the *Final Record of Decision for Argonne National Laboratory – West* (DOE-CH 1998a), and institutional controls (ICs) are no longer required.

2. DISCUSSION/ANALYSIS

The *INL Site-wide Institutional Controls, and Operations and Maintenance Plan for CERCLA Response Actions* (IC/O&M Plan) (DOE-ID 2017) addresses changes to ICs. ICs can be terminated by one of three mechanisms:

- As part of a CERCLA decision through a Record of Decision (ROD), Explanation of Significant Differences (ESD), or ROD amendment
- By completing a remedial action and documenting a site's suitability for unrestricted land use in a remedial action report
- Through a mechanism of nonsignificant change to a ROD processed in accordance with the IC/O&M Plan.

This report consists of a document review of the ANL-W ROD, the *Remedial Action Report for Waste Area Group 9, Operable Unit 9-04 at the Idaho National Laboratory* (Portage 2005a), the *Final Explanation of Significant Difference for Argonne National Laboratory-West Operable Unit 9-04, Idaho National Engineering and Environmental Laboratory* (DOE-CH 2000; DOE-CH 2004), and other documents approved by the Environmental Protection Agency, Department of Energy, and Idaho Department of Environmental Quality (Agencies, collectively). CERCLA site ANL-01 includes three drainage ditches that traverse the western side of the MFC (Figure 1).

The results of this review support the termination of ICs from Ditches A, B (based on criteria one and two), and C (based on criteria one), as allowed in DOE-ID 2017.

MFC Waste Area Group 9 (WAG 9) is one of the ten WAGs identified in the *Federal Facility Agreement and Consent Order* (DOE-ID 1991).

According to the ROD for WAG 09, eight areas at ANL-W were determined to pose a threat of releases of hazardous substances, which, if not addressed by implementing an appropriate remedy, may have presented an imminent and substantial endangerment to human health or the environment.

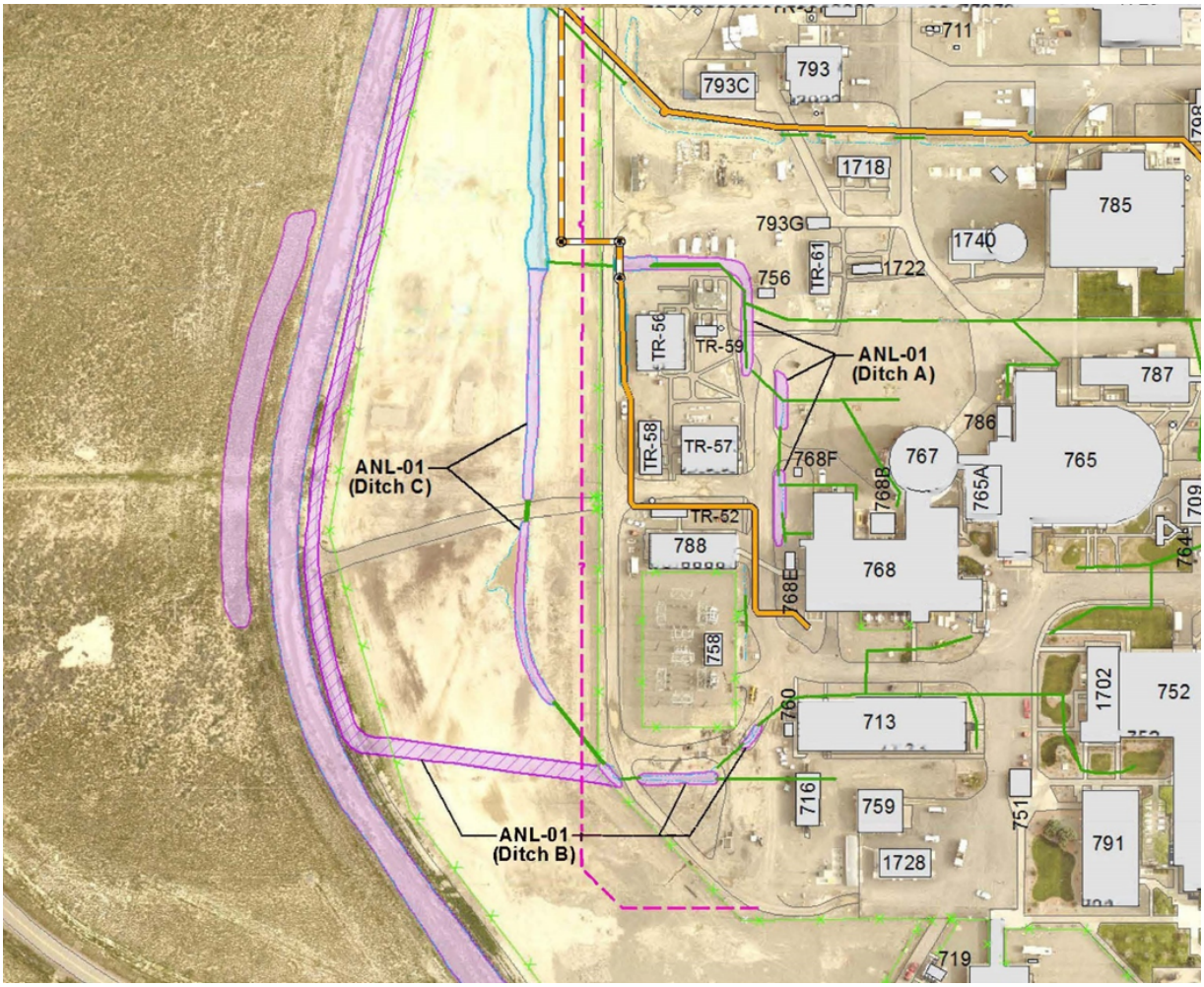

Figure 1. ANL-01 Ditches A, B, and C.

Two of these areas, Ditch A and Ditch B, were located within ANL-01 and were remediated by implementing the response action selected in the ANL-W ROD and subsequent ESDs. ICs were implemented for these ditches only because they were administratively tied to the Industrial Waste Pond under ANL-01.

One additional area, the Ditch C portion of ANL-01, was initially identified as having inorganic contaminants that posed unacceptable risks to the ecological receptors in the *Proposed Plan for Waste Area Group 9 – Argonne National Laboratory – West, Idaho National Engineering and Environmental Laboratory* (DOE-CH 1998b). Ditch C was later eliminated as an area requiring remediation after determining that the 95% upper confidence level (UCL) concentration versus the maximum concentration reduced the ecological receptors hazard quotients at this site to acceptable levels. However, ICs were implemented at this site because it was administratively tied to the Industrial Waste Pond under ANL-01.

Based on this review, ICs should be terminated at Ditches A, B, and C because all remediation goals have been met in accordance with DOE-CH 1998a, DOE-CH 2000, and DOE-CH 2004, and verified in Portage 2005a.

Additionally, the following information is cited directly from pertinent sections of other documents approved by the Agencies that support the removal of ICs from the subject areas.

3. DOCUMENT REFERENCES

3.1 *DOE/NE-ID-11201, Five-Year Review of CERCLA Response Actions at the Idaho National Laboratory* (DOE-ID 2005)

The following from DOE-ID 2005 discusses remediation efforts and results for Ditch A and B.

> *11.1.3.2 Ditch A (Site ANL-01). In May 1999, phytoremediation actions were initiated at Ditch A, which contained mercury contamination that posed an unacceptable risk to ecological receptors. Phytoremediation was estimated to take seven years to meet the remediation goal of 0.74 mg/kg for mercury. Preliminary results from a two-field season showed that phytoremediation with hybrid willows and poplars was working better than expected and that remediation goals could be met after four years rather than the estimated seven years.*
>
> *Phytoremediation activities continued in 2001 and 2002, and confirmation samples were collected in 2003 and summarized in the Data Quality Assessment Report for Post-Phytoremediation Characterization of ANL-W CERCLA Sites (Portage 2005b). The sampling results indicated that hot spots remained, so the decision was made to implement the contingent remedy of excavation and disposal in 2004. The excavation and disposal activities were also completed in 2004, with the excavated soil being transported to the Central Facilities Area (CFA) bulky waste landfill and placed at a depth greater than 10 ft to prevent exposure to ecological receptors. The 50 yd^3 of waste was tracked using Waste Profile 4428P in IWTS.*
>
> *Tables 13 and 16 of the Data Quality Assessment Report for the Post-Remedial Action Confirmation Sampling of the ANL-W CERCLA Sites (Portage 2005a) show the statistical calculation of mercury for the surface and subsurface soils, respectively. The UCL values in the surface and subsurface soils were 0.64 mg/kg and 0.74 mg/kg, respectively, which are at or below the mercury remediation goal of 0.74 mg/kg.*
>
> *11.1.3.3 Ditch B (Site ANL-01). An ESD (DOE-CH 2000) issued in February 2000 implemented the contingent remedy of excavation and disposal of the soil, rather than phytoremediation, at Ditch B. The excavation activities were conducted in June 2000 using front-end loaders and backhoes to remove the soil from the ditch down to the top of the basalt. Dump trucks moved the soil to the staging area. The soil was stockpiled near the ditch and covered with plastic material to prevent the spread of contamination from windblown dust, rainfall, and leachate. The soil remained at the stockpiled area until the soil could be accepted at a new waste cell in the CFA landfill. The soil was deposited in the bottom of the cell at a depth greater than 10 ft to prevent exposure to ecological receptors. Confirmation samples could not be collected because all the soil was removed. The 30 yd^3 of waste was tracked using Waste Profile 2550P in IWTS.*

3.2 *DOE/ID-11429, Five-Year Review of CERCLA Response Actions at the Idaho National Laboratory Site—Fiscal Years 2005–2009* (DOE-ID 2011)

DOE-ID 2011 provides functional descriptions, sampling activities, contaminants of concern (COCs), remedial activities, and remedy outcomes for Ditches A and B.

> *9.3.2.2 ANL-01 Ditch A. Ditch A conveyed industrial wastewater from the EBR-II power plant auxiliary cooling tower to the industrial waste pond. Ditch A is*

still being used today to transport storm water run-off as well as intermittent auxiliary cooling tower waters. Discharges to Ditch A flow into the main cooling tower blowdown ditch and ultimately into the industrial waste pond.

Soil samples were collected from Ditch A as part of two different investigations. These are the Chen-Northern study in 1988 (Chen-Northern 1989) and the 1994 Argonne National Laboratory-West study (ETAS 1995). Appendix A of the OU 9-04 Comprehensive Remedial Investigation/Feasibility Study (Lee et al. 1997) shows the sampling location plan map, color intensity profile maps, and statistics for COC by pathway. In the 1988 Chen-Northern study, eight soil samples were collected from three locations in the western part of the ditch. In the 1994 Argonne National Laboratory-West study, 30 soil samples were collected from 11 locations throughout the entire length of the ditch.

Mercury was retained as a contaminant of potential concern for ecological receptors and was detected in 74% (27/38) of the samples analyzed. All mercury detections exceeded the upper limit of the 95% upper confidence limit background concentration (0.074 mg/kg). The source of the mercury is most likely from mercuric chloride used as a wood preservative in the cooling tower or from a neutron absorber in the power plant, which is being decommissioned. A maximum concentration of 4.1 mg/kg was detected at Location #10W in the surface sample (0 to 6 in.). The upper confidence limit concentration for mercury in Ditch A was 3.94 mg/kg. In all but one instance, the surface samples at each location contained the highest concentrations of mercury, with the exception of Location #26E. The mercury contamination in Ditch A is spread through the entire length, with the highest concentrations near the intersection of the main cooling tower blowdown ditch and Ditch A. The mercury concentrations also decrease with increasing depth, with the highest concentrations in the surface 0 to 6-in. samples. Therefore, the extent of contamination is the dimensions of both the eastern and western part of Ditch A (5 ft × 400 ft) and 0 to 6 in.

In May 1999, phytoremediation was initiated at Ditch A, which contained mercury contamination that posed an unacceptable risk to ecological receptors. Phytoremediation was estimated to take 7 years to meet the remediation goal of 0.74 mg/kg for mercury. Preliminary results from two field seasons showed that phytoremediation with hybrid willows and poplars was working better than expected and that remediation goals could be met after 4 years.

Phytoremediation continued in 2001 and 2002, and confirmation samples were collected in 2003 and summarized in the Data Quality Assessment Report for the Post-Phytoremediation Characterization of ANL-W CERCLA Sites (Portage 2005b). The sampling results indicated that hot spots remained; therefore, the MFC implemented the contingent remedy of excavation and disposal and completed activities in 2004. The excavated soil was transported to the CFA bulky waste landfill and placed at a depth greater than 10 ft to prevent exposure to ecological receptors.

Tables 13 and 16 of the Data Quality Assessment Report for the Post-Remedial Action Confirmation Sampling of the ANL-W CERCLA Sites (Portage 2005c) show the statistical calculation of mercury for the surface and subsurface soils, respectively. The upper confidence limit values in the surface and subsurface soils were 0.64 mg/kg and 0.74 mg/kg, respectively, which are at or below the mercury remediation goal of 0.74 mg/kg.

9.3.2.3 ANL-01 Ditch B. Ditch B was also used to transport storm water run-off as well as wastewater from the EBR-II power plant and the fire station

(MFC-768 and MFC-759) to the industrial waste pond. Only a small 125-ft portion of Ditch B is still being used today since the majority 1,275 ft of Ditch B was backfilled with clean soil to grade with approximately 5 ft of soil during the installation of a secondary security fence.

Soil samples were collected from Ditch B as part of three different investigations. Six soil samples were collected from the 1988 DOE study, 15 samples collected from the 1988 Chen-Northern study (Chen-Northern 1989), and 10 samples in the 1994 Argonne National Laboratory-West study (ETAS 1995). Appendix A of the OU 9-04 Comprehensive Remedial Investigation/Feasibility Study shows the sampling location plan map, color intensity profile maps, and statistics for COCs by pathway for the 1994 samples collected from Ditch B. The contaminant screening resulted in contaminants of potential concern for humans and only two inorganics being retained as contaminants of potential concern for ecological receptors. These two inorganics are trivalent chromium and zinc. The extent of the inorganic contaminants is discussed below.

The contaminants in the covered portion of Ditch B have been screened from the risk assessment since the pathway was eliminated when the area was backfilled with clean soils. The open portion of Ditch B has chromium and zinc at concentrations that could pose unacceptable human and ecological risks. The maximum concentration of trivalent chromium and zinc are 4,530 and 3,020 mg/kg and the upper confidence limit concentrations are 1,306 and 1,460 mg/kg, respectively. The extent of the inorganic contaminants spans the entire length of the open portion of Ditch B, which is 5 ft wide and 125 ft long. No stratification of inorganics was determined from the results in that portion of Ditch B; thus, the total depth of the alluvium to the basalt (0 to 1.3 ft) defines the extent of contamination.

An Explanation of Significant Differences (DOE-CH 2000) issued in February 2000 implemented the contingent remedy of excavation and disposal of the soil, rather than phytoremediation, at Ditch B. The excavation activities were conducted in June 2000 using front-end loaders and backhoes to remove the soil from the ditch down to the top of the basalt. Dump trucks moved the soil to the staging area. The soil was stockpiled near the ditch and covered with plastic material to prevent the spread of contamination from windblown dust, rainfall, and leachate. The soil remained at the stockpiled area until it could be accepted at a new waste cell in the CFA landfill. The soil was deposited in the bottom of the cell at a depth greater than 10 ft to prevent exposure to ecological receptors. Confirmation samples could not be collected because all the soil was removed.

3.3 *RPT-969, Refined Waste Area Group Ecological Risk Assessments at the INL Site* (VanHorn 2013)

This report provides functional descriptions, COCs, remedial activities, and remedy outcomes for Ditches A and B, and documents that Ditch C did not need remediation.

9.1.2 Ditch A

Ditch A collected wastewater from the EBR-II sump, including steam condensate waste and auxiliary cooling tower waste. Mercury was identified as a potential ecological risk (Lee et al. 1997); therefore, the OU 9-04 ROD (DOE-CH 1998) selected phytoremediation with a contingent remedy of excavation and disposal.

Phytoremediation began at Ditch A in 1999. Soil samples collected in 2001 indicated that mercury had been removed from much of the site, but that isolated areas of elevated concentrations persisted (ANL 2001). Phytoremediation

continued to reduce the hot spots. In 2003, surface soil data again indicated isolated hot spots. The hot spots in Ditch A were sufficiently resistant to phytoremediation that the contingent remedy of excavation and disposal was selected (DOE-CH 2004). Contaminated soil was excavated from Ditch A in 2004, and post-remediation soil samples (see Appendix A) confirmed that the remaining soil met the mercury remediation goal of 0.74 mg/kg (Portage 2005a).

9.1.3 Ditch B

Ditch B ran parallel to the Interceptor Canal for most of its course and was used from 1962 until 1976 to drain surface water, overflow waters from Building 760, and, in 1975, cooling tower blowdown. In 1976, the main portion of Ditch B (outside the MFC fence) was backfilled, leaving only the southeastern portion of its original course active. During cleanout operations at the Interceptor Canal in October 1969, radioactivity was detected above background levels. Wastewater from a retention tank at the Laboratory and Offices Building had been accidently discharged and diverted to Ditch B and was the source of radioactivity. The area was surveyed, and the contaminated soil was removed.

The OU 9-04 RI/FS (Lee et al. 1997) identified trivalent chromium and zinc as ecologic risk drivers; therefore, the OU 9-04 ROD selected phytoremediation with a contingent remedy of excavation and disposal. Subsequently, the contingent remedy of excavation and disposal was selected based on unpromising results from a bench-scale study (DOE-CH 2000). In 2000, 23 m^3 (30 yd^3) of contaminated soil was excavated from Ditch B. Because soil was removed down to the underlying basalt, additional confirmation samples were not required.

9.1.4 Ditch C

1.1.3.3 Ditch C was not identified for remediation in the OU 9-04 ROD.

3.4 *DOE/ID-11289, INL Sitewide Institutional Controls Annual Report—FY 2006* (DOE-ID 2006)

The FY 2006 IC report identified only the Industrial Waste Pond in ANL-01 as requiring ICs. Ditches A, B, and C were not included as sites requiring ICs.

Currently, two CERCLA sites at the MFC require institutional controls. These areas are the industrial waste pond (ANL-01) and the interceptor canal (ANL-09).

4. CONCLUSION

Due to the success of the selected and contingent remedies and the determination that they are protective of human health and the environment, Idaho National Laboratory (INL) recommends termination of ICs for Ditches A, B, and C within ANL-01. In addition, the documentation requirements of the *INL Site-wide Institutional Controls, and Operations and Maintenance Plan for CERCLA Response Actions* (DOE-ID 2017) have been met to allow termination to occur.

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Appendix A

Post-Remediation Soil Samples Results for ANL-W

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Appendix A

Post-Remediation Soil Samples Results for ANL-W

Table 1. Summary of post-remediation concentrations of hazardous and radioactive contaminants of concern in surface soils.

Site	Analyte	95% UCL (mg/kg or pCi/g)	RG (mg/kg or pCi/g)	RG Exceeded?
MCTBD – East Portion (ANL-01A)[a]	Cr	.....	500	No
MCTBD – East Portion (ANL-01A)[a]	Hg	.....	0.74	No
MCTBD – West Portion (ANL-01A)[b]	Cr	.....54.8	500	No
MCTBD – West Portion (ANL-01A)[b]	Hg	..... 0.42	0.74	No
ICC (ANL-09)[a]	^{137}Cs	18	23.32	No
ICM (ANL-09)[a]	^{137}Cs	..... 9.54	23.30	No
IWLSDD (ANL-35)[c,d]	Ag	.....69.2	112	No
IWP (ANL-01)[c,e]	Cr	626	500	Yes[f]
IWP (ANL-01)[c,e]	Hg	..... 0.35	0.74	No
IWP (ANL-01)[c,e]	Zn	374	2200	No
IWP (ANL-01)[c,e,g]	^{137}Cs	.....10.0	23.3	No
Ditch A (ANL-01)[a]	Hg	..... 0.64	0.74	No
Ditch B (ANL-01)[a]	Cr	.....	500	No
Ditch B (ANL-01)[a]	Zn	.....	2200	No

a. DOE 1999.
b. Portage 2005a.
c. Portage 2005b.
d. Results are presented without identified “hot spots.” Additional focused soil removal actions were taken in this area following receipt of analytical results.
e. Results are presented without Sample ID ANLOI0410. Additional soil removal actions were taken in this area in November 2004, following receipt of analytical results, to remove the identified “hot spot.” Soils were removed to the underlying basalt layer, precluding the collecting of confirmation samples.
f. Although confirmation samples collected in 2004 indicated that the 95% UCL for chromium was greater than the RG, it was determined that further remediation of the IWP was not warranted. For details of this decision, see Subsection 5.4.
g. Cohen's adjustment was used to compute the mean and standard deviation used to calculate the 95% UCL.