Final Contaminated Soil Landfarming Report at the Former Port Heiden Radio Relay Station

Port Heiden, Alaska

Prepared for:

611th Civil Engineer Squadron

July 2013

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Draft Soil Landfarming Report

Former Port Heiden Radio Relay Station

Port Heiden, Alaska

May 2013

The following information is provided in compliance with *Site Characterization Work Plan and Reporting Guidance for Investigation of Contaminated Sites*, prepared by the Alaska Department of Environmental Conservation, September 23, 2009.

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Site name: Former Port Heiden Radio Relay Station

ADEC file number: 2637.38.002

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Acronyms and Abbreviations

AAC	Alaska Administrative Code
ADEC	Alaska Department of Environmental Conservation
AK	Alaska
AOC	Area of Concern
APCS	APC Services, LLC
ASTM	American Society for Testing and Materials
ATV	All-Terrain Vehicles
BGS	Below Ground Surface
BLO	Black Lagoon Outfall
CA	Cooperative Agreement
CES	Civil Engineer Squadron
CFU	Colony Forming Units
COC	Chain of Custody
DEW	Distant Early Warning
DOD	Department of Defense
DRO	Diesel Range Organics
ELAP	Environmental Laboratory Accreditation Program
FPC	Former Pipeline Corridor
GC-MS	Gas Chromatography - Mass Spectrometry
GLO	Gray Lagoon Outfall
GWMR	Ground Water Monitoring Report
HSE	Health Safety and Environment
ICP-MS	Inductively Coupled Plasma Mass Spectrometry
LOD	Limit of Detection
LSA	Land Spreading Areas
MCL	Maximum Contaminant Level
MDL	Method Detection Limit

NVPH	Native Village of Port Heiden
ORP	Oxidation Reduction Potential
PCB	Polychlorinated Biphenyl
PID	Photo Ionization Detector
POL	Petroleum Oils Lubricants
PPM	Parts Per Million
PQL	Practical Quantitation Limit
PVC	Polyvinylchloride
QA	Quality Assurance
QA/QC	Quality Assurance / Quality Control
QAP	Quality Assurance Plan
QP	Qualified Person
RCRA	Resource Conservation and Recovery Act
RRO	Residual Range Organics
RRS	Radio Relay Station
SCR	Site Characterization Report
TB	Trip Blank
USACE	United States Army Corp of Engineers
USAF	United States Air Force
UST	Underground Storage Tank
WACS	White Alice Communication Sites
WP	Work Plan

Executive Summary

Landfarming was selected as the preferred method to remediate Petroleum, Oil and Lubricant (POL)-contaminated soil from Areas of Concern (AOC) within the boundaries of the former Port Heiden Radio Relay Station (RRS), Port Heiden Alaska. POL-contaminated soil stockpiled during excavations at the site in 2009 and 2011 was transported to five Landspreading Areas (LSA) constructed north of the Black Lagoon Outfall (BLO). Soil was spread in a layer approximately 12 inches thick over a combined area of approximately 28,900 square yards. Each LSA was rototilled at monthly intervals in 2012 to promote microbial biodegradation of petroleum products within the soil through aeration.

In July 2012, 16′ x 16′ grids were staked out at each LSA and soil within each grid square screened using a photoionization detector (PID) to assess levels of remaining POL-contamination. Soil samples were collected from anomalies identified by PID for laboratory analysis for Diesel Range Organics (DRO) using Alaska Method AK102 to evaluate the progress of remediation and whether Alaska Department of Environmental Conservation (ADEC) clean-up levels had been achieved.

It was determined that soil within LSA5 was below ADEC clean-up levels, per 18 AAC 75.345 (ADEC, 2012). Approval was received from ADEC to use material from LSA5 as backfill. Areas LSA1 and LSA4 contain POL-contaminated soil that tested marginally above ADEC clean-up levels and will require additional rototilling in 2013. All soil samples from within LSA2 and LSA3 were below ADEC clean-up levels.

1 Introduction.

The Native Village of Port Heiden (NVPH) and APC Services, LLC (APCS) is conducting investigation and contaminated soil removal activities at the former Port Heiden Radio Relay Station (RRS) as part of a Cooperation Agreement (CA) with the United States Air Force (USAF). This report pertains to CA 11AF-09-0100 and is written in conjunction with a groundwater monitoring report and a site characterization report, relating to Polychlorinated Biphenyl (PCB) contamination, under separate covers.

The work was conducted in accordance with the US Army Corps of Engineers (USACE) Alaska District CA "Remediate Former Port Heiden RRS." The scope of work for this project has been derived from two CA's, numbers 11AF-09-0100 and 11AF-10-0100.

This report consists of the following sections.

Section 1 provides the introduction and summarizes the report organization.
Section 2 outlines the scope of the investigations and scope of work.
Section 3 provides the project background. A description of the Former Port Heiden RRS and the local environmental setting is also provided.
Section 4 describes the field activities. Landspreading area construction, soil screening, and sampling, methodologies are presented.
Section 5 presents results for screening and soil sampling within the Landspreading areas.
Sections 6 – 7 covers the quality assurance programs and summary.
Section 8 provides reference information for all works cited.

Appendix A is a work log.
Appendix B is a record of field notes.
Appendix C includes laboratory reports on soil and groundwater samples.
Appendix D contains laboratory quality control information.
Appendix E contains copies of Chain of Custody (COC) reports.

2 Project Objectives.

During the 2011 field season, soil was excavated and stockpiled from several AOC's at the Port Heiden RRS. Excavated soil was categorized as being of two main types:

- Soils contaminated by polychlorinated biphenyl (PCB) compounds above ADEC's clean-up levels for migration to groundwater of 1 mg/kg.
- Soils contaminated by POL above ADEC clean-up levels of 250 mg/kg for (DRO) and 11,000 mg/kg for Residual Range Organics (RRO) per 18 AAC 75.3451.

Soils contaminated by PCB's were collected in Super Sacks® containers and placed in stockpiles for removal from the site, but on-site remediation options were evaluated for DRO-contaminated soils. Of these options, landfarming was selected as the most appropriate remediation option given the levels of POL-contamination, the climate of Port Heiden, soil characteristics at the site and cost effectiveness.

According to the Environmental Protection Agency (EPA; 1994), an ideal soil for landfarming to be effective has a pH of between 6 – 8, a temperature between 10^{o}C and 45^{o}C and a background heterotrophic bacteria level of greater than 1,000 colony forming units (CFU)/gram. Based on average Port Heiden temperatures this equates to a landfarming window of over 4 months which should be sufficient for effective soil treatment.

Landfarming has been proven effective in reducing concentrations of most constituents of petroleum products. This remediation method involves spreading a layer of contaminated soil up to 18 inches in thickness on the ground surface and stimulating microbial activity within the soils through aeration. The enhanced microbial activity results in degradation of absorbed POL products through microbial respiration. Lighter, more volatile, hydrocarbons tend to be removed through evaporation during tilling and to a lesser extent by microbial action, while heavier fractions remain in the soil and are subject to biodegradation.

2.1 Scope of work.

In 2012, a landfarming workplan was developed that included the following components:

1. Rototill soil contained within five LSA's on a monthly basis to promote microbial biodegradation.
2. Lay out a 16 foot x 16 foot grid within each LSA.
3. Screen soil samples collected within each grid square using a PID to assess biodegradation.
4. Collect soil samples for laboratory analysis for DRO by Method AK102 to confirm that clean-up targets have been achieved, per 18 AAC 75.345.
5. Submit request for closure to ADEC when DRO clean-up levels are attained at each LSA.
6. Use remediated soil as backfill on the site.

Petroleum hydrocarbon clean-up for soil was determined using Method Two in 18 AAC 75, based on a contamination scenario with annual precipitation of less than 40", for migration to groundwater, per Table B2. As the average rainfall in Port Heiden is less than 22" (NOAA) this is a valid scenario. Method Two generated clean-up levels of 250 mg/kg for DRO, determined using Methods AK102.

2.2 Project Personnel.

The field crew for this project was staffed primarily with Port Heiden locals. However, subcontractors fulfilled select project functions.

2.2.1 Program manager.

Ms. Gerda Kosbruk was the Program Manager. Ms. Kosbruk had overall responsibility for all technical, contractual, and administrative matters. She was responsible for ensuring that this Project was executed with a high level of efficiency and accuracy. As required, the Program Manager delegated tasks to the Project Manager or any other members of the Project Team.

2.2.2 Project manager.

Ms. Gerda Kosbruk was also the 2012 Project Manager for the Former RRS remediation efforts. The Project Manager was responsible for the work specified in the task order and reported directly to the NVPH. Responsibilities included reviewing the quality of deliverables and monitoring budgets and schedules for compliance with project goals. The Project Manager also served as the primary point of contact for the 611 Civil Engineer Squadron (CES), USACE, and ADEC.

2.2.3 Project superintendent.

Mr. Mark Kosbruk was the 2012 Project Superintendent for the Former RRS remediation efforts. The Project Superintendent reported to the Project Manager and was responsible for leading field activities for the duration of this project. The Superintendent provided direct supervision of field staff.

2.2.4 Project HSE manager.

Ms. Hattie Albecker was the 2012 Health, Safety and Environmental (HSE) Manager for the Former RRS remediation efforts. The HSE reported to the Project Manager and also served as the de facto Site Safety Officer. The HSE Manager was responsible for reviewing, approving, and most importantly, implementing the project health and safety plan. This individual ensured that the project work was conducted in a safe manner and that there were no spills during the course of these activities.

2.2.5 ADEC qualified person.

Greg DuBois, Galen Laird and Nicole Ward were the ADEC Qualified Persons (QP) on site during the period covered by this report. ADEC guidance provides the following responsibilities and duties for a Qualified Person:

"Qualified people have direct responsibility to prepare reports or make an interpretation regarding field data, and can exercise onsite control over all work that requires assessment, investigation, characterization, reporting, or interpretation at contaminated and underground storage tank sites."

"They can also exercise onsite or offsite control over routine tasks associated with the physical act of sample collection and transportation."

2.2.6 Quality Assurance/ Quality Control (QA/QC) officer.

Mr Greg DuBois served as the Quality Assurance/Quality Control (QA/QC) Officer. In line with the requirements of 18 AAC 75.355(b), the QA/QC Officer was the responsible person that ensured the collection, interpretation, and reporting of data, and the required sampling and analysis was conducted by a qualified, impartial third party. The QA/QC Officer was also responsible for training NVPH personnel to conduct analytical sampling (soil and groundwater), prepare the Site Characterization Report (SCR) and Ground Water Monitoring Report (GWMR), manage surveying activities, and interacting with regulatory agencies during the course of this project. This position ensured that the requisite number of confirmation samples were collected from excavations and that contaminated soil was properly characterized, excavated, and removed.

2.2.7 Subcontractors.

The NVPH utilized two primary subcontractors related to groundwater monitoring activities: (1) APCS undertook soil screening and soil sample collection; (2) SGS North America conducted laboratory analyses.

3 Background.

3.1 Site History.

Port Heiden is a traditional Alutiiq community located 424 miles southwest of Anchorage, at the mouth of the Meshik River on the north side of the Alaska Peninsula, as shown in Figure 1. In 1942 the War Department acquired over a million acres for Fort Morrow, which consisted of several hundred buildings over several square miles and housed as many as 5,000 personnel. The site was abandoned following WWII.

In the 1950s the Air Force acquired 172 acres within the former Fort Morrow and constructed the White Alice site. Port Heiden was also one of 12 Distant Early Warning (DEW) line radar stations constructed throughout Alaska. From 1950 through 1959, 18 Aircraft Control and Warning and 12 DEW line radar stations were constructed throughout Alaska to detect possible attacks from the Soviet Union. These numbers include an Aleutian segment of DEW line stations consisting of the main station at Cold Bay and auxiliary stations at Port Heiden, Port Moller, Cape Sarichef, Driftwood Bay, and Nikolski. The White Alice Communication Sites (WACS) formed a U.S. Air Force telecommunication link system in Alaska during the cold war for military and civilian purposes. Each site had large parabolic, tropospheric scatter antennas (Weston Solutions, 2006).

The Air Force operated the WACS in Port Heiden until 1969 when it was converted to RRS, which became obsolete in the 1970s and was abandoned in November 1978. The original native village of Meshik was located along the shoreline, but residents have been moving from the old village site to higher ground near the airport and the former White Alice site. Approximately 100 people live at Port Heiden.

The site had consisted of the Former Facility Area, the Marine Terminal Area (a former location of a POL tank farm and pump house), and a Former Pipeline Corridor FPC connecting the Marine Terminal Area to the Former Facility Area. There are approximately 18 source areas at this site. No buildings or structures are left at the site. The site is located in Section 27, Township 37 South, Range 59 West, Seward Meridian. Port Heiden is in the Kvichak Recording District. A location map of the property is shown in Figure 1.

Figure 1. Location of former Port Heiden Radio Relay Station, Port Heiden, Alaska.

3.2 Previous Work.

The Department of Defense (DOD) has arranged for an Administrative Record (Adminrec) to be posted online. The Adminrec summarizes various Environmental Restoration projects conducted under DOD oversight. The Adminrec website identifying 611 CES projects in Alaska is listed below:

http://www.adminrec.com/PACAF.asp?Location=Alaska

At this website, the user can select the "Port Heiden" link for access to a list of historical Former Port Heiden RRS documents. Note that not all of the historical Port Heiden RRS documents are available at this link.

3.3 Regional Setting.

3.3.1 Latitude and longitude datum.

Latitude: 56.9676950

Longitude: -158.650724 (WGS84)

3.3.2 Climate.

Port Heiden has a maritime climate, with cool summers, relatively warm winters, and rain. Snowfall averages 58 inches per year. January temperatures average 25 degrees Fahrenheit (^{o}F) and July temperatures average 50^{o}F.

3.3.3 Culture.

Port Heiden is a traditional Alutiiq community, with a commercial fishing and subsistence lifestyle (State of Alaska, 2010).

3.3.4 Economy.

Commercial fishing and government jobs provide the majority of cash income. In 2009, 12 residents held commercial fishing permits. Subsistence harvests of salmon, other fish, and marine mammals average 109 pounds per person. Game, birds, plants, and berries are also an important part of villagers' diets (State of Alaska, 2010).

3.3.5 Facilities.

Individual wells and septic tank systems are used by most homes in Port Heiden. The school operates its own well and treatment system. Thirty one of thirty seven occupied households are fully plumbed. The city provides septic pumping services and collects refuse three times a week. The permitted Class III Landfill is located 6.5 miles northeast of the community (State of Alaska, 2010).

3.3.6 Transportation.

The state-owned airport consists of a lighted gravel, 5,000' long by 100' wide runway and a 4,000' long by 100' wide lighted gravel crosswind runway. It can accommodate up to Boeing 737 aircraft, and regular air services are provided. The airstrip serves as a point-of-transfer for flights to the Pacific side of the Alaska Peninsula. There is a natural boat harbor but no dock. A boat haul-out, a beach off-loading area, and marine storage facilities are available. Cargo from Seattle is periodically delivered via chartered barge and is lightered and offloaded on the beach. Autos, all-terrain vehicles (ATV)s, and snow machines are the local means of transportation (State of Alaska, 2010).

3.3.7 Other Information.

Previous investigations are online as part of an Administrative Record by the DOD. The ADEC File Number is 2637.38.002.

4 2012 Fieldwork Summary.

4.1 POL-Contaminated Soil at Port Heiden RRS.

Figure 2 shows the location of AOCs within the Port Heiden RRS. DRO-contaminated soil had been stockpiled within the boundaries of LSA1 from earlier remediation work by Weston in 2009 and is referred to as Biopile 1 (POL1), Biopile 2 (POL2) and Biopile 3 (POL3) in previous reports. Soil biopiles at POL1, POL2 and POL3 were excavated and spread out in 2011 to create LSA1 and LSA2. Material from the Grey Lagoon Outfall (GLO) was transferred and spread out as a 1 foot thick layer within the boundaries of LSA3, LSA4 and LSA5 in 2011.

DRO-contaminated soil was excavated in 2011 from the Black Lagoon Area (BLO) and stockpiled. This material was transferred to the LSA3 and LSA4 in early 2012 and spread out in a 1 foot layer.

Prior to construction of the LSAs, background soil samples were collected in September 2011 from the area and analyzed for PCB by Method SW8082 and DRO by Method AK102 .

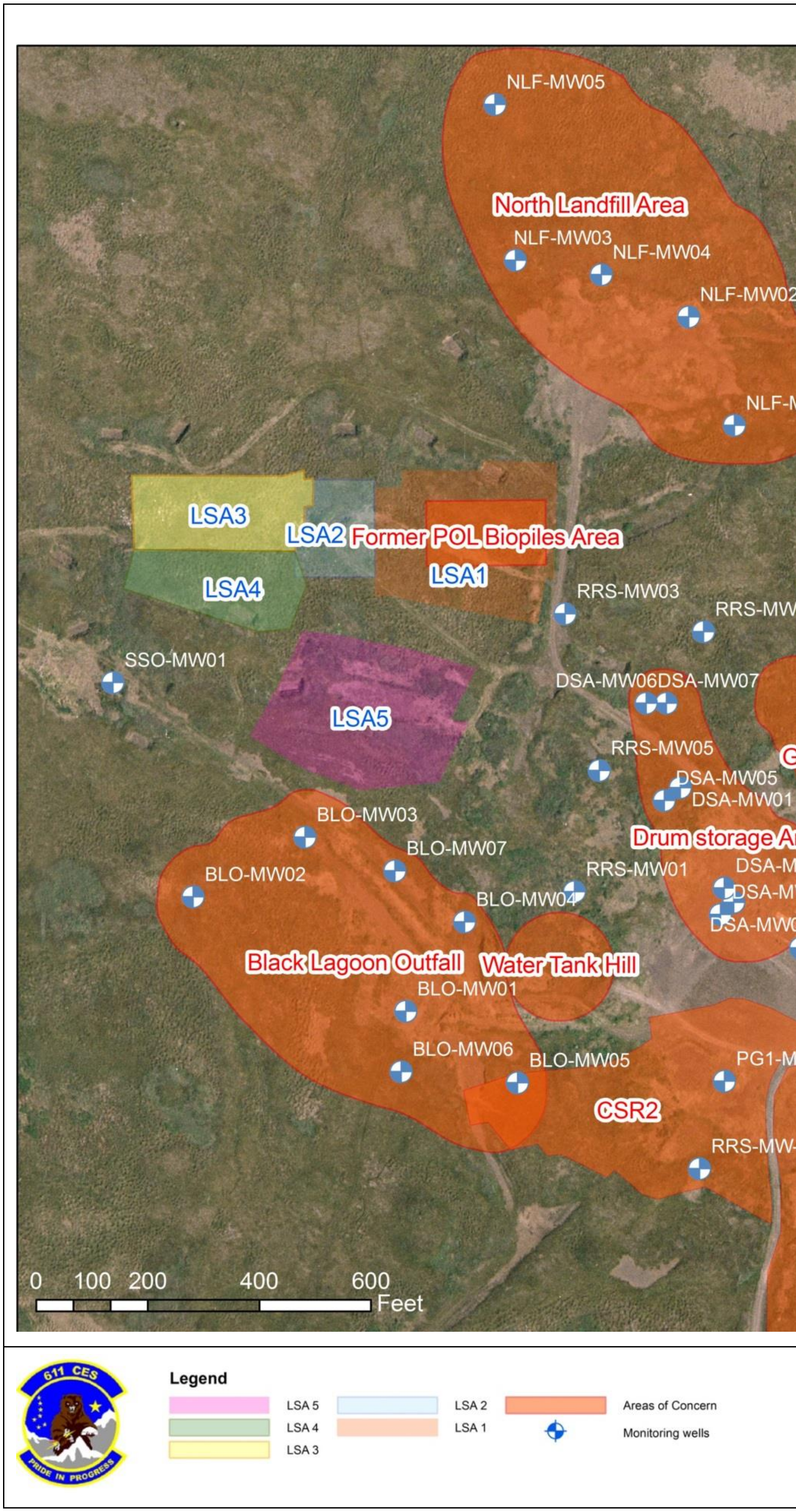


Figure 2. AOC at Port Heiden RRS.

4.2 Landspreading Area Construction.

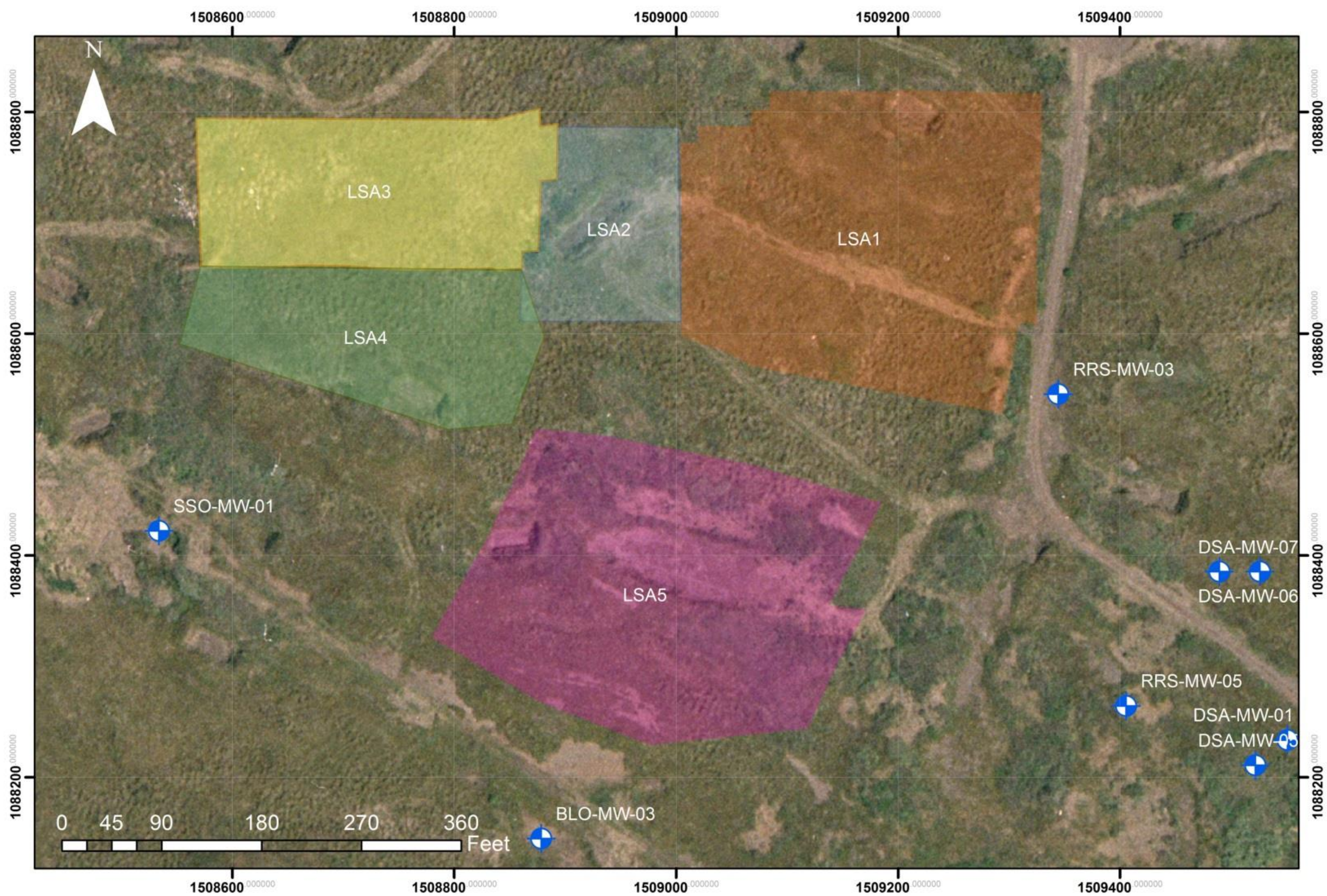
Landspreading was the chosen remediation option for POL-contaminated soil excavated at Port Heiden RRS. Landspreading areas were constructed in accordance with ADEC's landspreading guidance presented in Title 18 of AAC Sections 75.356(D) and 75.990(56) in 2011. Five areas north of the BLO were chosen for use as landspreading areas, as shown in Figure 3. The choice of these areas, referred to as Landspreading Areas (LSA) was in part determined by the presence of stockpiles of DRO-contaminated soil from previous work at LSA1, the close proximity of POL-contaminated soil stockpiles excavated in the 2011 field season and road access.

The LSA's were designed as an open treatment cell without a base liner and were limited to a soil depth of 12 inches or less to allow rototilling. Each LSA was enclosed within a berm constructed of clean fill to minimize run-off and soil erosion. Dimensions of each LSA are shown in Table 1, with approximate volumes of contaminated soil in each LSA.

Table 1. Dimensions of Landspreading Areas (LSA) at Port Heiden RRS.

LSA	Area (ft^2)	Area (yd^2)	Volume (yd^3)	# of screening samples	Material source	Notes
LSA1	79,780	8,843	2,959	296	POL1	Includes soil from BLO
LSA2	22,553	2,506	835	84	POL2 POL3	
LSA3	41,925	4,658	1,553	155	GLO BLO	
LSA4	35,815	3,979	1,326	133	GLO BLO	
LSA5	80,134	8,904	2,968	297	GLO	Clean-up goals met

LSA area determined using ArcGIS.



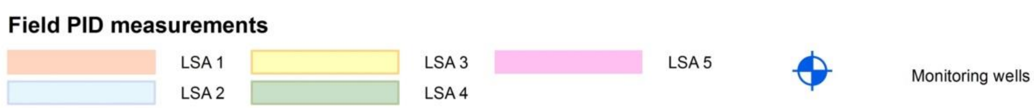


Figure 3. Location of Landspreading Areas (LSA) at Port Heiden RRS.

4.3 Field Documentation.

Notes collected during field activities were entered in the project logbook and/or into field data sheets. The portions of the logbook and field forms that were associated with the field events described in this report are presented in Appendix B, which is provided as an electronic attachment.

4.4 Site Description.

Port Heiden RRS is located approximately 4,000 feet north of the NNW/SSE airstrip at Port Heiden airport and seven miles north of the village of Port Heiden, on the north side of the Alaska Peninsula, Alaska.

The Former Port Heiden RRS is situated on a low glacial moraine at an elevation of 95 feet above mean sea level. The topography of the site slopes gently to the west and southwest. Additional information about the environmental setting at Port Heiden is presented below. Much of this information is excerpted from the State of Alaska, Division of Community and Regional Affairs.

4.5 Field Activities.

Construction of LSA's was completed in 2011, as outlined in Section 4.2. POL-contaminated soil was spread out to an approximate thickness of one foot in each LSA and tilled beginning May 2012 after the ground had thawed and standing water dissipated.

4.6 Soil Screening.

Per ADEC 18 ACC 78, a soil sample was screened for every 10 yards^3 of material, with duplicates every 10 samples. This equated to a surface area of 16′ x 16′ at the average POL-contaminated soil depth of 1′ within each LSA. After the initial tilling in May 2012, a grid with individual cell dimensions of 16′ x 16′ was staked out in each LSA and used as a guide for soil screening sample collection.

Grid cells were field screened using a PID that was calibrated each day. Approximately 500 grams of soil were collected as a discrete sample using a new stainless steel spoon, from the bottom 3 inches of a 1 foot deep hole below the center of the grid or the point of maximum contamination as determined by olfactory senses. The soil sample was transferred to a new 1-quart Ziplock® plastic bag and sealed. Depending on the ambient air temperature, the sample was placed in a warm area for 5 – 10 minutes to bring the soil temperature up to 20^{o}C and allow the headspace vapors to develop. The bag was agitated for 15 seconds before measurement. Soil samples were screened within 1 hour of collection by carefully inserting the probe of a MiniRae 3000 PID into the headspace, taking care to avoid moisture and soil particles, with the maximum reading recorded in the field notebook. The PID was calibrated daily using 100parts per million (ppm) isobutylene as span and ambient air as zero according to the manufacturer's instructions.

4.6.1 Soil analytical samples.

Soil samples were collected from locations within the LSA's with high PID results. Laboratory samples were collected at the screening site using a stainless steel spoon, then transferred from a to a glass amber jar with Teflon-liner. For DRO analyses by ADEC methods AK102, a clean 4 ounce amber jar provided by the analytical laboratory was filled to the brim with soil using a de-contaminated stainless steel scoop. The label on the glass jar was annotated with the sample number, date and time of collection and the initials of the responsible person. Samples were stored inside a cooler, maintained at $4^{o}C \pm 2^{o}C$ until delivery to the analytical laboratory, within the specified holding time.

Soil samples were sent to SGS North America Inc. for analysis. SGS maintains a formal (QA/QC) program. A copy of their Quality Assurance Plan (QAP), which outlines this program, is available on request. Their laboratory certification numbers are AK00971 (DW Chemistry & Microbiology) & UST-005 (CS) for ADEC and 2944.01 for DOD Environmental Lab Accreditation Program (ELAP)/ISO 17025 (RCRA methods: 1020A, 1311, 3010A, 3050B, 3520C, 3550C, 5030B, 5035B, 6020, 7470A, 7471B, 8021B, 8082A, 8260B, 8270D, 8270D-SIM, 9040B, 9045C, 9056A, 9060A, AK101 and AK102/103).

4.7 Field Modifications to the Work Plan.

Monthly rototilling was not performed to schedule at each LSA because of equipment issues.

LSA3 and LSA4 grids were mistakenly all labelled as LSA3 in the field, as were the soil samples submitted for laboratory analysis. Grids G001 through G117 were from LSA3, while G148 and higher were from LSA4.

5 Results and Findings.

5.1 Landspreading Area LSA1.

Soil samples were screened by PID from samples collected from 294 16′ x 16 grids within LSA1 during August 2012. In accordance with the workplan, 14 soil samples were collected for laboratory analysis for DRO by Method AK102 and the results are shown in Table 2. Figure 4 shows the distribution of soil screening values within LSA1, together with laboratory determined DRO values. There is a well-defined swath of POL-contaminated soil within LSA1, running NE-SW with elevated DRO values.

Laboratory determined DRO concentrations ranged from 158 mg/kg to 654 mg/kg, with most samples above ADEC's clean-up value of 250 mg/kg. Additional rototilling will be required to complete the remediation of DRO-contaminated soil within this LSA.

Table 2. PID screening values and laboratory analysis of LSA1.

Cell #	PID screen (ppm)	DRO lab mg/kg	Cell #	PID screen (ppm)	DRO lab mg/kg	Cell #	PID screen (ppm)	DRO lab mg/kg
1	0.0	-	100	12.2	-	199	0.1	-
2	0.0	-	101	0.8	-	200	0.5	-
3	0.2	-	102	0.0	-	201	5.6	-
4	1.5	-	103	0.7	-	202	3.4	-
5	0.1	-	104	4.5	-	203	3.9	-
6	0.0	-	105	7.8	-	204	5.6	-
7	0.0	-	106	8.8	-	205	3.6	-
8	0.2	-	107	0.5	-	206	3.6	-
9	0.3	-	108	0.9	-	207	11.1	-
10	0.0	-	109	2.6	-	208	7.9	-
11	0.3	-	110	12.9	-	209	9.3	-
12	0.0	-	111	1.5	-	210	10.9	-
13	0.2	-	112	0.5	-	211	18.7	-
14	2.2	-	113	5.5	-	212	5.7	-
15	0.4	-	114	29.3	210	213	0.4	-
16	0.0	-	115	6.0	-	214	1.3	-
17	0.3	-	116	7.6	-	215	4.3	-
18	0.2	-	117	8.4	-	216	7.6	-
19	0.2	-	118	49.3	**436**	217	2.3	-
20	0.4	-	119	3.8	-	218	0.9	-
21	0.2	-	120	19.1	-	219	0.9	-
22	0.0	-	121	3.5	-	220	9.5	-

Cell #	PID screen (ppm)	DRO lab mg/kg	Cell #	PID screen (ppm)	DRO lab mg/kg	Cell #	PID screen (ppm)	DRO lab mg/kg
23	0.4	-	122	1.1	-	221	4.8	-
24	0.8	-	123	6.2	-	222	2.8	-
25	10.2	-	124	6.1	-	223	2.4	-
26	4.4	-	125	5.2	-	224	1.4	-
27	2.4	-	126	3.9	-	225	4.2	-
28	1.5	-	127	12.9	-	226	3.0	-
29	3.3	-	128	17.9	-	227	6.4	-
30	0.3	-	129	15.2	-	228	15.5	-
31	3.1	-	130	5.9	-	229	24.6	**403**
32	1.3	-	131	0.9	-	230	1.5	-
33	0.5	-	132	0.8	-	231	16.0	-
34	0.8	-	133	8.0	-	232	26.1	**283**
35	1.8	-	134	7.9	-	233	16.9	-
36	1.5	-	135	2.0	-	234	1.8	-
37	0.6	-	136	6.9	-	235	11.3	-
38	0.6	-	137	2.1	-	236	7.2	-
39	1.0	-	138	1.6	-	237	11.4	-
40	0.4	-	139	1.3	-	238	9.6	-
41	2.5	-	140	3.1	-	239	18.7	-
42	0.4	-	141	4.2	-	240	5.4	-
43	4.5	-	142	1.8	-	241	4.8	-
44	1.7	-	143	3.9	-	242	5.1	-
45	4.7	-	144	8.6	-	243	12.2	-
46	1.9	-	145	0.0	-	244	1.0	-
47	0.4	-	146	2.1	-	245	21.9	**437**
48	1.2	-	147	0.0	-	246	27.9	**527**
49	0.6	-	148	0.0	-	247	6.9	-
50	0.6	-	149	1.2	-	248	3.7	-
51	0.5	-	150	0.8	-	249	5.1	-
52	5.1	-	151	2.9	-	250	6.0	-
53	2.2	-	152	0.6	-	251	3.7	-
54	2.0	-	153	0.4	-	252	3.1	-
55	1.8	-	154	0.4	-	253	0.7	-
56	0.0	-	155	0.2	-	254	0.0	-
57	0.6	-	156	38.8	**250**	255	0.1	-
58	0.8	-	157	26.4	**1,180**	256	0.0	-
59	0.3	-	158	8.9	-	257	0.4	-
60	3.6	-	159	2.1	-	258	5.7	-
61	1.9	-	160	11.1	-	259	2.9	-
62	2.8	-	161	14.6	-	260	3.2	-

Cell #	PID screen (ppm)	DRO lab mg/kg	Cell #	PID screen (ppm)	DRO lab mg/kg	Cell #	PID screen (ppm)	DRO lab mg/kg
63	0.8	-	162	17.1	-	261	1.5	-
64	1.6	-	163	6.2	-	262	5.8	-
65	1.5	-	164	10.8	-	263	2.8	-
66	0.2	-	165	3.7	-	264	6.9	-
67	0.4	-	166	2.8	-	265	1.5	-
68	0.3	-	167	1.0	-	266	8.2	-
69	1.4	-	168	10.7	-	267	3.0	-
70	0.9	-	169	14.6	-	268	23.2	**366**
71	1.5	-	170	2.0	-	269	8.2	-
72	0.0	-	171	13.0	-	270	2.9	-
73	0.7	-	172	1.0	-	271	1.1	-
74	14.6	-	173	0.0	-	272	1.2	-
75	13.0	-	174	4.2	-	273	6.7	-
76	7.5	-	175	0.4	-	274	14.8	-
77	19.0	**323**	176	4.0	-	275	2.6	-
78	4.9	-	177	0.0	-	276	3.1	-
79	11.5	-	178	4.8	-	277	3.2	-
80	2.1	-	179	2.4	-	278	2.0	-
81	23.0	**344**	180	9.1	-	280	2.5	-
82	17.6	-	181	5.7	-	281	5.5	-
83	5.5	-	182	0.8	-	282	6.4	-
84	2.2	-	183	4.0	-	283	5.6	-
85	0.2	-	184	2.1	-	284	4.2	-
86	0.0	-	185	0.5	-	285	2.3	-
87	0.0	-	186	2.3	-	286	1.2	-
88	0.0	-	187	6.5	-	287	2.3	-
89	2.2	-	188	9.8	-	288	5.0	-
90	1.3	-	189	2.7	-	289	3.9	-
91	0.1	-	190	12.5	**35**0	290	8.0	-
92	0.2	-	191	3.7	-	291	27.6	**654**
93	0.1	-	192	7.2	-	292	4.3	-
94	4.1	-	193	30.1	**279**	293	4.4	-
95	2.7	-	194	22.2	158	294	0.0	-
96	1.1	-	195	2.1	-			
97	0.3	-	196	9.2	-			
98	1.1	-	197	6.0	-			
99	0.3	-	198	2.7	-			

- Not sampled for laboratory analysis
- Values in **bold** are above ADEC clean-up values.

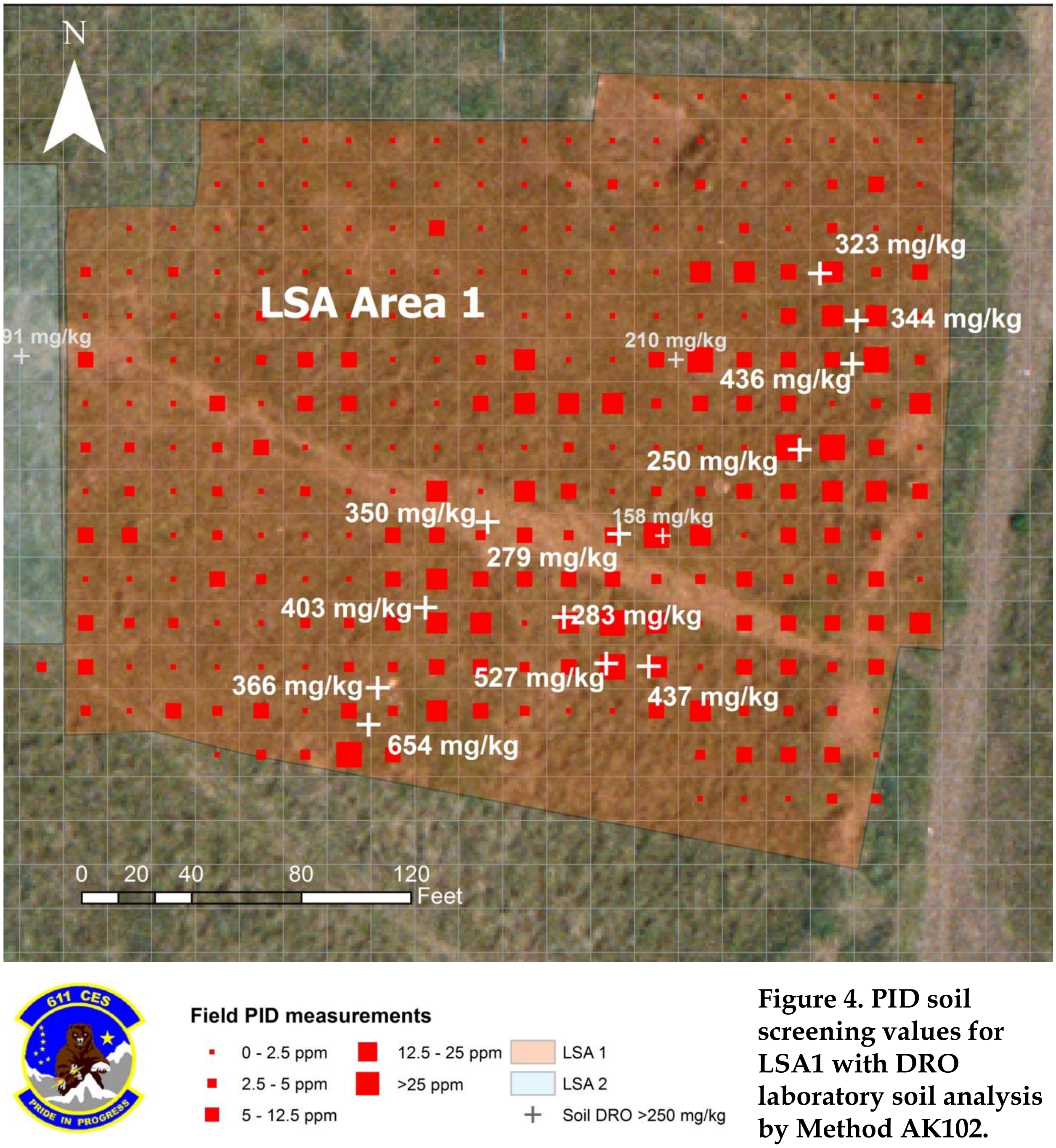


Figure 4. PID soil screening values for LSA1 with DRO laboratory soil analysis by Method AK102.

DRO laboratory soil analytical results are shown in white.

5.2 Landspread Area LSA2.

Table 3 shows PID screening values within LSA2. All of the soil samples had a DRO concentration of less than 239 mg/kg. Although this is below ADEC's clean-up value of 250 mg/kg, it may indicate that there are still some POL-contaminated hot spots within the LSA and additional rototilling is required. The distribution of PID screening results is shown in Figure 5. It should be noted that LSA1 and LSA2 currently form a single LSA.

Table 3. PID screening values and laboratory analysis of LSA2.

Cell #	PID screen (ppm)	DRO lab mg/kg	Cell #	PID screen (ppm)	DRO lab mg/kg	Cell #	PID screen (ppm)	DRO lab mg/kg
1	0.0	-	**29**	1.9	-	**57**	2.8	-
2	0.7	-	**30**	1.9	-	**58**	1.3	-
3	0.1	-	**31**	2.7	-	**59**	11.2	-
4	5.1	-	**32**	3.8	-	**60**	0.5	-
5	1.2	-	**33**	5.6	-	**61**	3.3	-
6	4.9	-	**34**	0.0	-	**62**	4.5	-
7	0.0	-	**35**	11.4	-	**63**	5.7	-
8	14.5	-	**36**	1.0	-	**64**	6.7	-
9	3.6	-	**37**	20.2	29.4	**65**	4.5	-
10	0.4	-	**38**	18.2	-	**66**	5.4	-
11	0.1	-	**39**	28.4	-	**67**	2.6	-
12	0.0	-	**40**	1.4	-	**68**	1.3	-
13	1.5	-	**41**	33.0	-	**69**	1.5	-
14	0.2	-	**42**	33.6	239	**70**	0.8	-
15	0.0	-	**43**	9.9	-	**71**	4.8	-
16	1.3	-	**44**	2.4	-	**72**	8.0	-
17	1.1	-	**45**	2.8	-	**73**	13.7	-
18	11.3	-	**46**	12.6	-	**74**	16.6	151
19	1.9	-	**47**	2.4	-	**75**	3.9	-
20	19.8	74.5	**48**	5.9	-			
21	2.0	-	**49**	2.0	-			
22	2.0	-	**50**	15.0	-			
23	3.1	-	**51**	13.6	-			
24	4.4	-	**52**	3.4	-			
25	6.2	-	**53**	10.2	-			
26	1.1	-	**54**	9.4	-			
27	11.3	-	**55**	1.6	-			
28	19.8	91.3	**56**	0.8	-			

- Not sampled for laboratory analysis

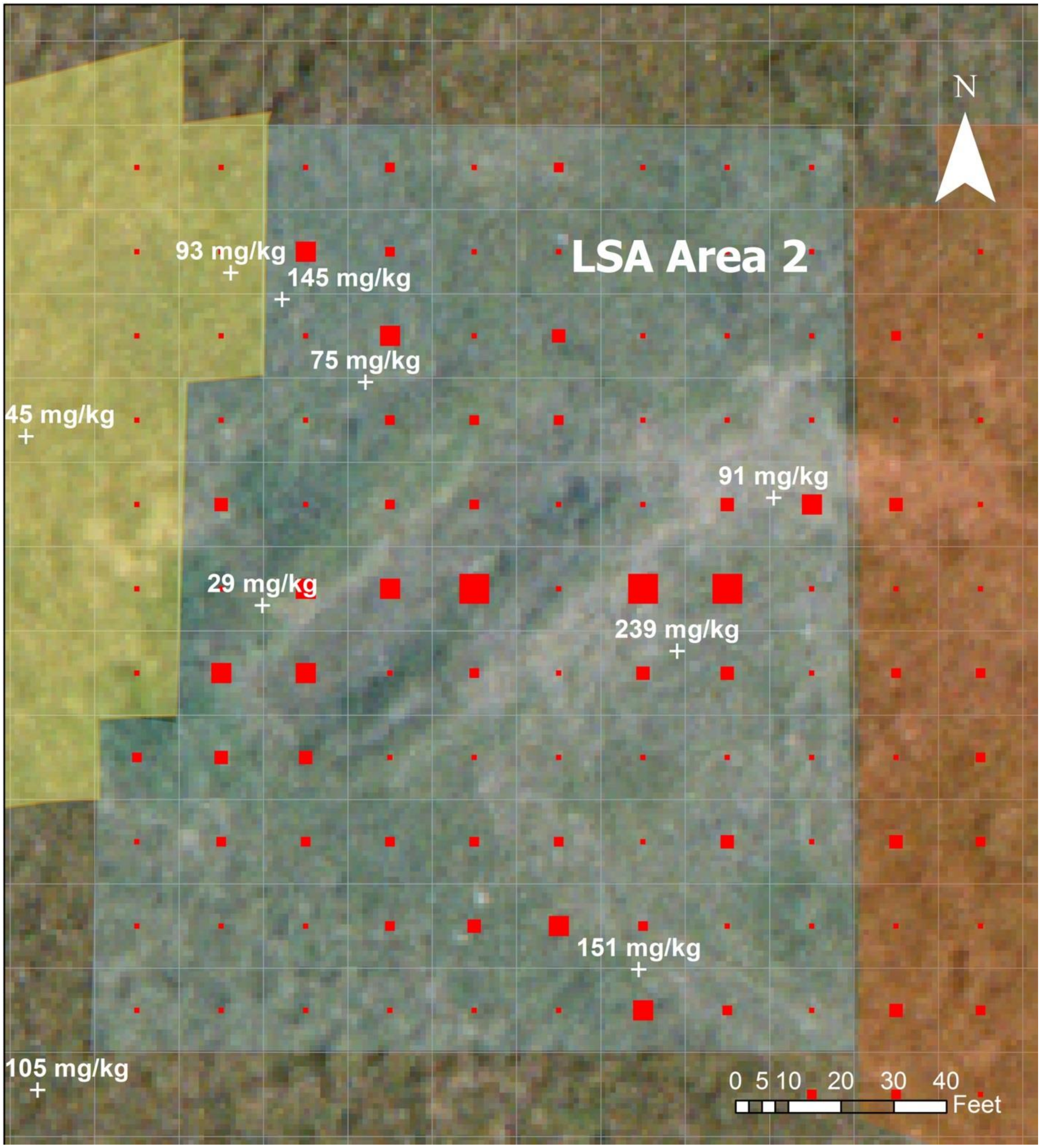


Figure 5. PID soil screening values for LSA2 with DRO laboratory soil analysis by AK102.

DRO laboratory soil analytical results are shown in white.

5.3 Landspread Areas LSA3 and LSA4.

A total of 270 PID field measurements were made in August 2012 from LSA3 and LSA4, corresponding to one measurement within each 16′ x 16′ grid square. LSA3 and LSA4 grids were mistakenly all labelled as LSA3 in the field, as were the soil samples submitted for laboratory analysis. Grids G001 through G117 were from LSA3, while G148 and higher were from LSA4.

Samples were collected for laboratory analysis for DRO by Method AK 102 from the 16 grids with the highest screening values in accordance with the workplan. Results from this survey are shown in Table 4. A single soil sample (LSA4_G176 = 319 mg/kg) within LSA4 had DRO concentrations above ADEC's clean-up value of 250 mg/kg.

Table 4. PID screening values and laboratory analysis of LSA3 & LSA4.

Sample	Northing	Easting	Elevation	Field PID (ppm)	Laboratory DRO mg/kg
LSA3_G001	1088774	1508886.8	92.697	41.6	-
LSA3_G002	1088774.7	1508874.3	90.127	0.9	-
LSA3_G003	1088774.2	1508858.2	88.112	3.1	-
LSA3_G004	1088773.4	1508842.6	87.81	12	-
LSA3_G005	1088772.2	1508826.4	87.787	17	74.2
LSA3_G006	1088773.3	1508806.9	87.473	2.6	-
LSA3_G007	1088773.2	1508793.9	87.897	3.8	-
LSA3_G008	1088773.4	1508777.9	88.625	1.8	-
LSA3_G009	1088772	1508761.6	88.585	3.4	-
LSA3_G010	1088771.6	1508745.6	88.254	1.6	-
LSA3_G011	1088770.3	1508729.7	87.605	1.7	-
LSA3_G013	1088769.5	1508713.5	87.506	8.1	-
LSA3_G014	1088768.5	1508697.8	87.454	1.5	-
LSA3_G015	1088767.7	1508681.7	87.06	2.8	-
LSA3_G016	1088767.3	1508665.7	86.872	3.4	-
LSA3_G017	1088766.6	1508649.5	86.59	0.5	-
LSA3_G018	1088766.1	1508635.1	85.789	2.2	-
LSA3_G019	1088764.9	1508617.8	84.287	1.9	-
LSA3_G020	1088749	1508616.6	84.51	1.3	-
LSA3_G021	1088750.2	1508632.6	85.812	4.6	-
LSA3_G022	1088750.4	1508648.3	86.951	1.8	-
LSA3_G023	1088750.4	1508664.2	87.06	4	-
LSA3_G024	1088751.3	1508680.5	87.364	6.3	-
LSA3_G025	1088752.1	1508696.3	87.388	3.2	-
LSA3_G026	1088752.9	1508711.8	88.35	3.6	-
LSA3_G027	1088753.7	1508727.8	88.562	20.1	52.5
LSA3_G028	1088755	1508743.7	88.779	2.7	-
LSA3_G029	1088756.5	1508759.6	88.976	1.2	-

Sample	Northing	Easting	Elevation	Field PID (ppm)	Laboratory DRO mg/kg
LSA3_G030	1088757	1508776.9	88.116	1.8	-
LSA3_G031	1088756.1	1508791.5	87.689	4.8	-
LSA3_G032	1088756.4	1508806.7	87.449	2.4	-
LSA3_G033	1088756.8	1508822.4	87.647	15	-
LSA3_G034	1088757.8	1508837.2	88.381	7.2	-
LSA3_G035	1088758.9	1508854.1	89.48	13.6	-
LSA3_G036	1088759.1	1508869.9	91.034	5.1	-
LSA3_G037	1088758.7	1508886	92.554	50.5	93.5
LSA3_G038	1088743.9	1508882.8	91.823	0	-
LSA3_G039	1088743.8	1508866.8	90.327	0.1	-
LSA3_G040	1088743.1	1508850.8	89.459	0	-
LSA3_G041	1088742.4	1508834.8	89.007	0.3	-
LSA3_G042	1088741.6	1508818.5	88.302	5.4	-
LSA3_G043	1088742.3	1508806.4	88.627	1.3	-
LSA3_G044	1088738.2	1508790.5	88.598	0.8	-
LSA3_G045	1088738.7	1508776.5	88.933	1.7	-
LSA3_G046	1088741	1508756.5	89.121	2.7	-
LSA3_G047	1088739.4	1508741.7	88.834	9.8	-
LSA3_G048	1088738.6	1508725.5	88.02	2.4	-
LSA3_G049	1088737	1508709.3	88.678	4.5	-
LSA3_G050	1088735.9	1508693.5	87.895	0.8	-
LSA3_G051	1088737.2	1508678.9	87.369	3.1	-
LSA3_G052	1088736.8	1508662.6	87.291	0.5	-
LSA3_G053	1088734.8	1508646.1	86.583	0.2	-
LSA3_G054	1088734.2	1508630.9	85.856	0	-
LSA3_G055	1088732.3	1508615	84.883	1	-
LSA3_G056	1088716.9	1508611.2	85.186	1.4	-
LSA3_G057	1088718.7	1508626.7	85.927	1.2	-
LSA3_G058	1088719.4	1508642.4	86.594	0.4	-
LSA3_G059	1088718.3	1508658.2	87.232	2	-
LSA3_G060	1088719.1	1508673.6	87.888	0.4	-
LSA3_G061	1088720.5	1508689	88.035	3.1	-
LSA3_G062	1088720.9	1508705.6	88.464	0.8	-
LSA3_G063	1088721.9	1508721.3	88.914	0.6	-
LSA3_G064	1088723.4	1508737.6	89.217	0.5	-
LSA3_G065	1088725	1508770.3	89.508	1.8	-
LSA3_G066	1088724.3	1508784.4	89.172	3.2	-
LSA3_G067	1088725.4	1508799.2	88.78	6.4	-
LSA3_G068	1088726.4	1508814.8	89.347	14.3	32.2
LSA3_G069	1088726.7	1508830.7	88.89	3.4	-
LSA3_G070	1088727.6	1508847.2	89.26	15.9	44.7

Sample	Northing	Easting	Elevation	Field PID (ppm)	Laboratory DRO mg/kg
LSA3_G071	1088728.5	1508862.7	90.006	1.5	-
LSA3_G072	1088727.9	1508879.1	91.38	1.2	-
LSA3_G073	1088713.3	1508874.9	91.233	2.2	-
LSA3_G074	1088712.9	1508860.7	90.19	0.1	-
LSA3_G075	1088711.8	1508843.8	88.964	8.7	-
LSA3_G076	1088709.2	1508830.7	88.996	35.2	81.2
LSA3_G077	1088709.3	1508813.6	89.228	2.3	-
LSA3_G078	1088708.8	1508796.9	89.536	14.2	-
LSA3_G079	1088708.2	1508780.5	89.532	23.3	-
LSA3_G080	1088708.2	1508764.7	89.447	7.1	-
LSA3_G081	1088707.9	1508749.8	89.737	20.9	-
LSA3_G082	1088707.1	1508734	89.821	2.7	-
LSA3_G083	1088706.5	1508717.8	89.302	15	-
LSA3_G084	1088706.1	1508701.8	88.536	6	-
LSA3_G085	1088705.1	1508685.9	88.498	0.7	-
LSA3_G086	1088704.2	1508669.5	87.831	8.4	-
LSA3_G087	1088702.9	1508654.3	87.463	6.5	-
LSA3_G088	1088703	1508654.3	87.46	1.7	-
LSA3_G089	1088702.3	1508638	86.725	4.4	-
LSA3_G090	1088701.7	1508622.2	86.18	4.6	-
LSA3_G091	1088701.4	1508607.8	85.976	2.4	-
LSA3_G092	1088687.8	1508620	86.554	1.6	-
LSA3_G093	1088688.5	1508636	86.803	6.5	-
LSA3_G094	1088686.3	1508651.5	88.037	0.7	-
LSA3_G095	1088687.1	1508667.6	88.52	8.5	-
LSA3_G096	1088687.8	1508682	88.997	34.8	48.1
LSA3_G097	1088689.1	1508698.8	89.367	4.9	-
LSA3_G098	1088690.3	1508714.7	89.39	1.5	-
LSA3_G099	1088690.9	1508730.6	90.237	1.4	-
LSA3_G100	1088694.5	1508746.2	90.264	1.9	-
LSA3_G101	1088693.7	1508761.8	89.518	0	-
LSA3_G102	1088694.3	1508776.5	89.324	14	-
LSA3_G104	1088694.5	1508793	89.294	0	-
LSA3_G105	1088695.5	1508807.5	89.438	0	-
LSA3_G106	1088695.6	1508823.8	89.13	4.4	-
LSA3_G107	1088696.3	1508839.8	89.3	1.6	-
LSA3_G108	1088697.3	1508855.6	90.324	0	-
LSA3_G109	1088696.9	1508871.7	91.031	0	-
LSA3_G110	1088681.5	1508867.9	90.544	2	-
LSA3_G111	1088681.9	1508852.4	90.016	0.8	-
LSA3_G112	1088680.5	1508836.4	89.55	0.2	-

Sample	Northing	Easting	Elevation	Field PID (ppm)	Laboratory DRO mg/kg
LSA3_G113	1088680.5	1508820.1	89.417	2.3	-
LSA3_G114	1088680.5	1508804.2	89.749	0	-
LSA3_G115	1088680.5	1508788.3	89.922	7.5	-
LSA3_G116	1088679.4	1508772.3	89.637	8.4	-
LSA3_G117	1088679.2	1508757.6	89.702	2.3	-
LSA3_G118	1088679.1	1508742.8	89.974	4.1	-
LSA3_G119	1088675.4	1508727.4	89.788	0	-
LSA3_G120	1088674.5	1508711.3	89.795	5.1	-
LSA3_G121	1088673.9	1508695.5	89.803	7.7	-
LSA3_G122	1088672.7	1508679.5	89.433	0.4	-
LSA3_G123	1088671	1508664	88.99	5.5	-
LSA3_G124	1088671	1508648.1	88.465	2	-
LSA3_G125	1088671.1	1508635.9	88.077	1.7	-
LSA3_G126	1088670.4	1508624.6	87.575	4.8	-
LSA3_G127	1088671.7	1508613	87.263	1.7	-
LSA3_G128	1088670.1	1508600.7	86.841	0	-
LSA3_G129	1088658.8	1508596.6	86.966	0	-
LSA3_G130	1088656.8	1508612.3	87.818	0	-
LSA3_G131	1088655.8	1508628	88.55	2.6	-
LSA3_G132	1088656.1	1508643.7	89.125	0	-
LSA3_G133	1088656.5	1508659.7	89.448	3.3	-
LSA3_G134	1088657.7	1508676	89.969	3.2	-
LSA3_G135	1088657.6	1508691.6	90.204	0	-
LSA3_G136	1088658.4	1508707.4	90.559	0	-
LSA3_G137	1088659.9	1508723.7	90.538	1.4	-
LSA3_G138	1088662.6	1508739	90.456	0	-
LSA3_G139	1088661.9	1508753.3	90.57	0	-
LSA3_G140	1088665.1	1508769.1	89.957	0.4	-
LSA3_G141	1088664.9	1508784.8	89.797	0	-
LSA3_G142	1088664.3	1508800.3	89.856	0.9	-
LSA3_G143	1088664.8	1508816.1	89.932	3.4	-
LSA3_G144	1088665.2	1508831.8	90.263	3	-
LSA3_G145	1088665.8	1508848	90.389	0.7	-
LSA3_G146	1088665.6	1508864.7	91.024	4	-
LSA3_G147	1088651.4	1508860.6	90.882	0	-
LSA4_G148	1088650.7	1508844.7	90.9	0	-
LSA4_G149	1088649.4	1508828.6	90.535	5.5	-
LSA4_G150	1088649.3	1508812.6	90.388	20.9	125
LSA4_G151	1088648.6	1508796.4	90.922	5.4	-
LSA4_G152	1088650.2	1508781.2	90.905	19.7	-
LSA4_G153	1088650.2	1508765.1	90.806	23.4	67.5

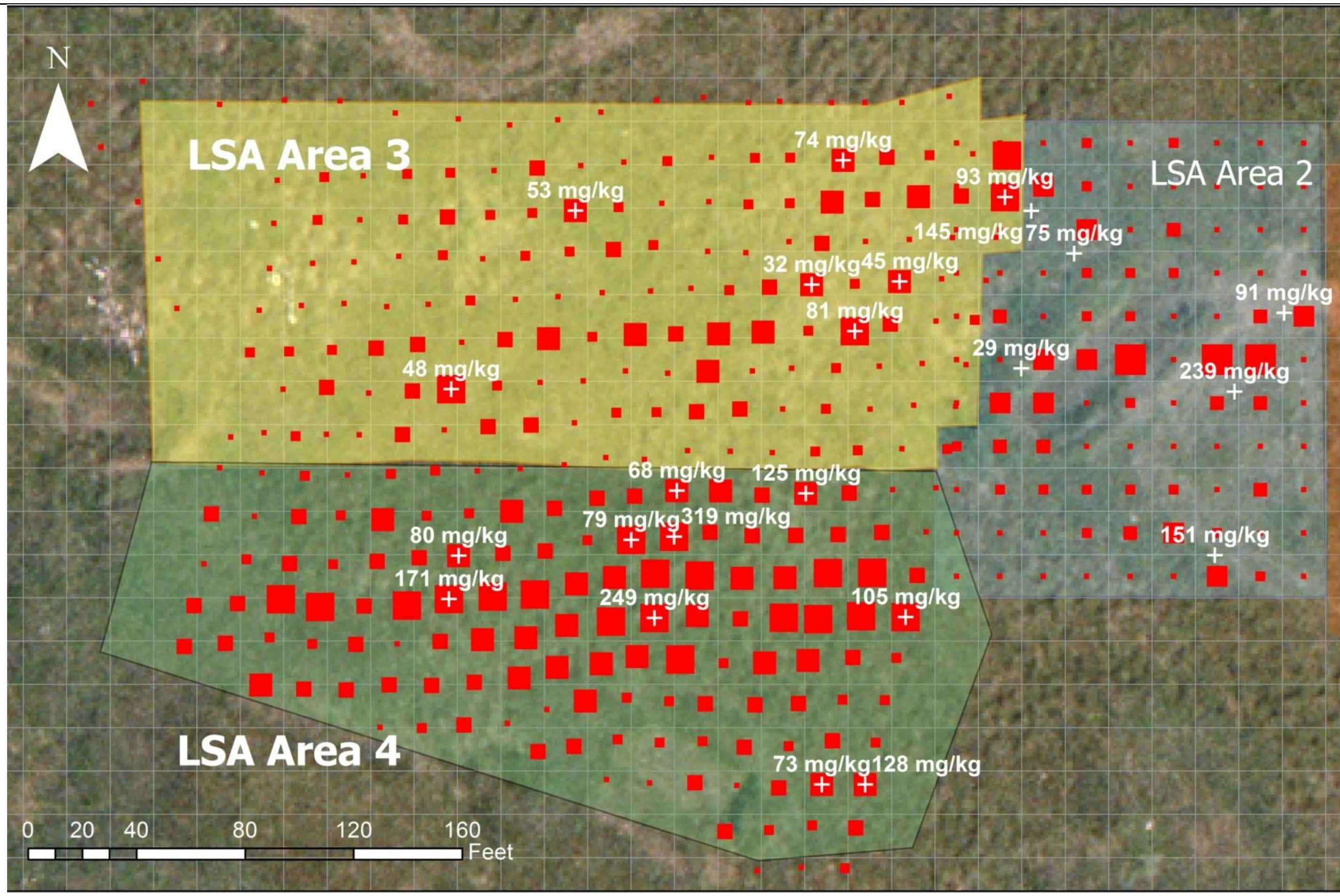
Sample	Northing	Easting	Elevation	Field PID (ppm)	Laboratory DRO mg/kg
LSA4_G154	1088648.2	1508749.6	91.162	7.4	-
LSA4_G155	1088647.5	1508735.7	90.864	9	-
LSA4_G156	1088643.8	1508720	90.441	8.9	-
LSA4_G157	1088642.7	1508704.2	90.38	13.1	-
LSA4_G158	1088641.9	1508688.5	90.02	3.4	-
LSA4_G159	1088641	1508672.9	89.743	4.7	-
LSA4_G160	1088639.6	1508656.7	89.07	14.8	-
LSA4_G161	1088641.2	1508641.2	88.858	4	-
LSA4_G162	1088640.7	1508625.7	88.306	8.8	-
LSA4_G163	1088640.9	1508609.4	87.797	0.6	-
LSA4_G164	1088641.7	1508593.6	87.391	10	-
LSA4_G165	1088623.2	1508590.9	87.369	0	-
LSA4_G166	1088625	1508606.6	87.701	2.4	-
LSA4_G167	1088623.4	1508622.3	88.305	5.5	-
LSA4_G168	1088623.1	1508638.4	88.709	4.3	-
LSA4_G169	1088624.2	1508654.6	88.95	7.7	-
LSA4_G170	1088625.6	1508670.2	89.306	10.1	-
LSA4_G171	1088626.2	1508684.7	89.853	22.6	8
LSA4_G172	1088627.2	1508701	90.437	5.3	-
LSA4_G173	1088628	1508716.6	90.434	9.2	-
LSA4_G174	1088632	1508732.1	90.678	4	-
LSA4_G175	1088632.1	1508748.3	90.76	42.2	78.8
LSA4_G176	1088633.3	1508764.1	90.74	41.2	**319**
LSA4_G177	1088634.9	1508777.3	91.015	9.1	-
LSA4_G178	1088633.7	1508792.8	91.195	7.4	-
LSA4_G179	1088633.7	1508808.9	91.251	10.5	-
LSA4_G180	1088634.1	1508824.5	91.396	6.8	-
LSA4_G181	1088634.8	1508840.6	90.869	10.6	-
LSA4_G182	1088635.1	1508857	91.665	0	-
LSA4_G183	1088619.1	1508853.6	91.718	5.2	-
LSA4_G184	1088619.8	1508837.1	91.12	28	-
LSA4_G185	1088619.8	1508820.8	91.413	28.1	-
LSA4_G186	1088618.1	1508805	91.237	14.1	-
LSA4_G187	1088617.9	1508789.1	91.141	14.3	-
LSA4_G188	1088618.9	1508773.5	90.676	38.3	-
LSA4_G189	1088619.5	1508757.1	90.906	29.7	-
LSA4_G190	1088618.1	1508742.2	90.887	22.6	-
LSA4_G191	1088615.8	1508728.2	90.792	22.1	-
LSA4_G192	1088611.8	1508712.8	90.418	65.6	-
LSA4_G193	1088611.1	1508697.3	89.842	37.1	-
LSA4_G194	1088610.2	1508681.2	89.557	66.1	171

Sample	Northing	Easting	Elevation	Field PID (ppm)	Laboratory DRO mg/kg
LSA4_G195	1088607.8	1508665.6	88.968	29.8	-
LSA4_G196	1088607.6	1508649.8	88.706	11	-
LSA4_G197	1088607.2	1508633.7	88.686	30.1	-
LSA4_G198	1088610.1	1508619.1	88.142	47.2	-
LSA4_G199	1088608.5	1508603.2	87.804	8.8	-
LSA4_G200	1088607.7	1508587.1	86.97	9.6	-
LSA4_G201	1088592.7	1508583.5	86.485	7.8	-
LSA4_G202	1088593.8	1508598.7	87.43	5.3	-
LSA4_G203	1088596	1508615	88.088	4.7	-
LSA4_G204	1088593.6	1508630.7	88.519	3.6	-
LSA4_G205	1088593.5	1508646.7	88.911	7.9	-
LSA4_G206	1088593.7	1508662.1	88.623	1.4	-
LSA4_G207	1088594.5	1508677.9	89.734	10	-
LSA4_G208	1088595.2	1508693.4	89.726	13.3	-
LSA4_G209	1088595.9	1508709.5	90.127	13.3	-
LSA4_G210	1088600.5	1508724.6	90.336	13.5	-
LSA4_G211	1088601.8	1508740.9	90.761	44.6	-
LSA4_G212	1088603.2	1508756.9	90.844	72.8	249
LSA4_G213	1088604.1	1508772.7	91.044	12.9	-
LSA4_G214	1088602.8	1508788.4	90.874	9	-
LSA4_G215	1088603.3	1508804.5	91.414	40.2	-
LSA4_G216	1088602.8	1508817.2	91.324	47.1	-
LSA4_G217	1088603.9	1508833.1	91.377	26.9	-
LSA4_G218	1088603.5	1508849.4	91.376	86.7	105
LSA4_G219	1088588.4	1508846	91.282	3.2	-
LSA4_G220	1088588.6	1508829.9	91.39	12	-
LSA4_G221	1088587.5	1508813.5	90.794	17.6	-
LSA4_G222	1088586.6	1508797.5	90.793	12.7	-
LSA4_G223	1088586.5	1508782.3	90.795	3.7	-
LSA4_G224	1088587.9	1508766.3	90.666	58.6	-
LSA4_G225	1088588.9	1508750.5	90.653	17	-
LSA4_G226	1088586.3	1508737.3	90.456	19.7	-
LSA4_G227	1088584.9	1508721	90.283	13.2	-
LSA4_G228	1088581	1508707	90.372	19.6	-
LSA4_G229	1088579.4	1508690.4	89.912	10.7	-
LSA4_G230	1088578.3	1508674.8	89.623	5.4	-
LSA4_G231	1088578.5	1508659.1	89.25	5.4	-
LSA4_G232	1088576.6	1508643.2	89.024	9	-
LSA4_G233	1088576.9	1508627.6	88.218	10.3	-
LSA4_G234	1088578.4	1508611.7	87.406	12.7	-
LSA4_G235	1088562.9	1508655.7	89.006	0.5	-

Sample	Northing	Easting	Elevation	Field PID (ppm)	Laboratory DRO mg/kg
LSA4_G236	1088562.5	1508671.1	89.976	2.1	-
LSA4_G237	1088563.7	1508686.6	90.185	5.1	-
LSA4_G238	1088564.3	1508702.6	90.58	1.4	-
LSA4_G239	1088569.4	1508717.3	90.635	1.1	-
LSA4_G240	1088572.5	1508731.4	91.035	13.6	-
LSA4_G241	1088573.8	1508746.7	91.245	4.8	-
LSA4_G242	1088572.5	1508762.3	91.169	4	-
LSA4_G243	1088571.5	1508775.6	91.489	6.6	-
LSA4_G244	1088571.1	1508793.9	91.495	5.3	-
LSA4_G245	1088571.6	1508809.9	91.595	11.8	-
LSA4_G246	1088573	1508826.2	91.818	2.4	-
LSA4_G247	1088572.8	1508841.8	91.531	4.6	-
LSA4_G248	1088557.2	1508838.4	91.646	3.8	-
LSA4_G249	1088557.9	1508822.5	91.717	6.5	-
LSA4_G250	1088555.9	1508806.3	91.342	4.4	-
LSA4_G251	1088555.5	1508789.9	91.389	8.4	-
LSA4_G252	1088557.7	1508774.6	91.383	4	-
LSA4_G253	1088557.2	1508758.8	91.105	2.9	-
LSA4_G254	1088558.4	1508743.3	90.999	4.6	-
LSA4_G255	1088555.8	1508727.2	90.779	5.1	-
LSA4_G256	1088553.9	1508713.9	91.173	7.4	-
LSA4_G257	1088543.5	1508739.2	91.238	1.1	-
LSA4_G258	1088542.3	1508755.2	90.216	2	-
LSA4_G259	1088542.4	1508771.7	90.155	5.2	-
LSA4_G260	1088541.3	1508787.2	90.6	1.6	-
LSA4_G261	1088540.4	1508802.6	90.877	9.7	-
LSA4_G262	1088541.6	1508818.5	90.581	14.7	72.8
LSA4_G263	1088541.7	1508834.6	90.378	23.2	128
LSA4_G264	1088525.7	1508831.1	90.634	8.1	-
LSA4_G265	1088526.6	1508815	90.58	3.7	-
LSA4_G266	1088524.8	1508799.1	90.599	3.6	-
LSA4_G267	1088524.3	1508782.8	89.872	5.4	-
LSA4_G268	1088509.9	1508794.8	90.759	1.5	-
LSA4_G269	1088511.1	1508810.9	90.658	1.2	-
LSA4_G270	1088510.8	1508827.1	91.306	2.6	-

- Not sampled for laboratory analysis.
- Results in **bold** exceed clean-up level.

Figure 6 shows the distribution of PID readings over LSA3 and LSA4. The highest screening values were found at within LSA4.



Field PID measurements

0 - 2 ppm	12 - 25 ppm	LSA 2
2 - 5 ppm	> 25 ppm	LSA 3
5 - 12 ppm		LSA 4

Figure 6. PID soil screening values for LSA3 and LSA4 with DRO laboratory soil results by Method AK102.

DRO laboratory soil analytical results are shown in white

5.4 Landspreading Area LSA5.

Figure 7 shows the distribution of field screening values for soil within LSA5. A total of 292 16′ x 16′ grids were screened in July 2012. Soil samples from the 12 highest grids were collected and sent for laboratory analysis for DRO by Method AK102. All of the laboratory results for DRO were less than 70 mg/kg, well below ADEC's clean-up level of 250 mg/kg. A second field screening by PID was conducted in September 2012, which confirmed that all grid squares were below 1ppm.

A request was made to ADEC for approval to use LSA5 material as backfill, which was granted on October 19th, 2012.

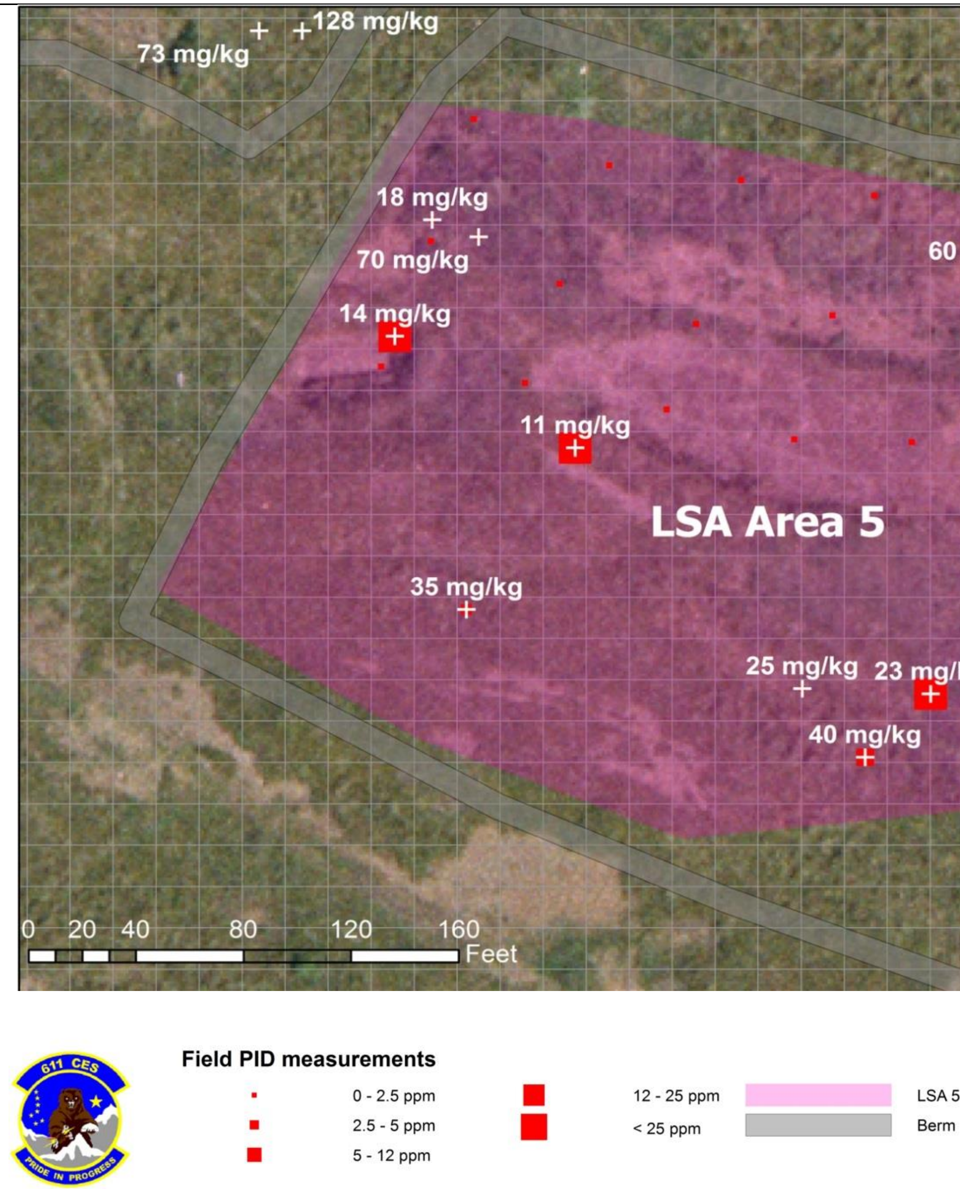


Figure 7. PID soil screening values for LSA5 with DRO laboratory soil analysis by Method AK102.

DRO laboratory soil analytical results are shown in white.

6 Quality Assurance Review.

Summary reports of samples analyzed by the laboratory are included in Appendix C. The samples were analyzed by:

SGS North America, Inc.
200 West Potter Drive
Anchorage, AK 99518

SGS North America, Inc. is a laboratory that is accredited by ADEC (UST-005).

Data quality was reviewed using the ADEC Laboratory Data Review Form by Argon, Inc., which are included for each work order in Appendix D. These are summarized in Table 5. No issues were uncovered that would affect data quality.

Table 5. Summary of Laboratory Reports.

Laboratory Report #	No. of samples	Type	Date received by lab.	Areas	Analyte	Date review checklist
1123084	7	Soil	July 18th, 2012	LSA5	DRO	Feb 19, 2013
1123166	2	Soil	July 19th, 2012	LSA5	DRO	Mar. 3, 2013
1123285	18	Soil	July 26th, 2012	LSA1	DRO	Sept. 4th 2012
1124099	23	Soil	Aug 30th, 2012	LSA2, LSA3, LSA4	DRO	Mar. 11th, 2013

6.1 Data Quality Assurance.

Summaries for each laboratory work order are shown below.

6.1.1 QA Summary for 1123084.

Precision was demonstrated by the analysis of matrix spike duplicate (MSD), laboratory control duplicate, and field duplicate samples. The laboratory control duplicate, field duplicate samples and matrix spike duplicate samples met the laboratory criteria for percentage recovery.

Accuracy was demonstrated by the analysis of laboratory control samples, matrix spike samples, and spiked surrogate compounds. All laboratory control samples met the laboratory criteria for percentage recovery. The matrix spike (MS) prepared from sample NVPH12-CSR2-G497 and the MS and MSD prepared from NVPH12-CSR2-G514 recovered low for Aroclor-1260, but in all cases the parent sample concentrations were greater than 4 times the MS/MSD spike levels and the samples are considered unaffected by the out of control recoveries.

Representativeness was demonstrated by choosing the number of samples, sample locations, and sampling procedures in order to produce results showing as accurately as possible the matrix and site conditions.

Comparability was demonstrated by keeping the analytical laboratory the same throughout the project. Analytical methods, laboratory procedures, and reporting limits were therefore consistent and comparable between laboratory reports.

Completeness was calculated at 100% for this data set, which meets the 85% goal per ADEC Underground Storage Tank (UST) Procedures Manual.

Sensitivity goals were met for all analytes by comparison of the limit of detection (LOD) (2x method detection limit MDL) or MDL and the clean-up level. Additionally, all method blank results were less than the LOD.

6.1.2 QA Summary for 1123166.

Precision was demonstrated by the analysis of a laboratory control duplicate sample. The laboratory control duplicate sample met the laboratory and project criteria for precision.

Accuracy was demonstrated by the analysis of a laboratory control sample and spiked surrogate compounds. The laboratory control sample spiked surrogate compounds met the laboratory criteria for percentage recovery.

Representativeness was demonstrated by choosing the number of samples, sample locations, and sampling procedures in order to produce results showing as accurately as possible the matrix and site conditions.

Comparability was demonstrated by keeping the analytical laboratory the same throughout the project. Analytical methods, laboratory procedures, and reporting limits were therefore consistent and comparable between laboratory reports.

Completeness was calculated at 100% for this data set, which meets the 85% goal per UST Procedures Manual.

Sensitivity goals were met for all analytes by comparison of the LOD (2x MDL) or MDL and the clean-up level. Additionally, all method blank results were less than the LOD.

6.1.3 QA Summary for 1123285.

Precision was demonstrated by the analysis of matrix spike duplicate and laboratory control duplicate samples. The matrix spike duplicate and laboratory control duplicate samples met the laboratory criteria for precision and the quality of this data set is not impacted.

Accuracy was demonstrated by the analysis of laboratory control samples, matrix spike samples, and spiked surrogate compounds. All laboratory control samples and spiked surrogate compounds met the laboratory criteria for percentage recovery. The matrix spike sample prepared from NVPH12-LSA1 recovered low for Diesel Range Organics and is considered an estimate.

Representativeness was demonstrated by choosing the number of samples, sample locations, and sampling procedures in order to produce results showing as accurately as possible the matrix and site conditions.

Comparability was demonstrated by keeping the analytical laboratory the same throughout the project. Analytical methods, laboratory procedures, and reporting limits were therefore consistent and comparable between laboratory reports.

Completeness was calculated at 100% for this data set, which meets the 85% goal per UST Procedures Manual.

Sensitivity goals were met for all analytes by comparison of the practical quantitation limit (PQL) or MDL and the clean-up level. Additionally, all method blank results were less than the PQL.

6.1.4 QA Summary for 1124099.

Precision was demonstrated by the analysis of laboratory control duplicate samples which met laboratory and project criteria for precision.

Accuracy was demonstrated by the analysis of laboratory control samples and spiked surrogate compounds. All laboratory control samples and spiked surrogate samples met the laboratory criteria for percentage recovery.

Representativeness was demonstrated by choosing the number of samples, sample locations, and sampling procedures in order to produce results showing as accurately as possible the matrix and site conditions.

Comparability was demonstrated by keeping the analytical laboratory the same throughout the project. Analytical methods, laboratory procedures, and reporting limits were therefore consistent and comparable between laboratory reports.

Completeness was calculated at 100% for this data set, which meets the 85% goal per UST Procedures Manual.

Sensitivity goals were met for all analytes by comparison of the LOD (2x MDL) or MDL and the clean-up level. Additionally, all method blank results were less than the LOD.

7 Summary.

DRO-contaminated soil from AOC's within Port Heiden RRS from stockpiles resulting from previous excavations was transported to five un-lined landspreading areas, constructed north of the Black Lagoon Outfall and spread in a layer approximately 12 inches thick. Each LSA was rototilled at regular intervals to promote microbial biodegradation of POL contamination within the soil. Soil within each LSA was screened in 2012 to assess the extent of remediation and to determine whether ADEC clean-up levels had been achieved.

It was determined that soil within LSA5 was below ADEC clean-up levels and approval was received from ADEC to use material as backfill. LSA1 and LSA4 contain POL-contaminated soil that tested above clean-up levels and will require additional rototilling. Soil within LSA2 and LSA3 was below ADEC clean-up levels, but may still benefit from additional rototilling. The status of each LSA is summarized in Table 6.

Table 6. Status of Landspreading Areas (LSA) at Port Heiden RRS.

LSA	Area (ft^2)	Area (yd^2)	Volume (yd^3)	# of screening samples	Max DRO (mg/kg)	Status
LSA1	79,780	8,843	2,959	296	**654**	Open
LSA2	22,553	2,506	835	84	239	Open
LSA3	41,925	4,658	1,553	155	145	Open
LSA4	35,815	3,979	1,326	133	**319**	Open
LSA5	80,134	8,904	2,968	297	69.6	Closed

Values in **bold** exceed ADEC clean-up levels.

8 References.

ADEC. 18 AAC 60 *Solid Waste Management*. Alaska Administrative Code April 2012

ADEC 18 AAC 70 *Water Quality Standards*, Alaska Administrative Code April 2012

ADEC 18 AAC 75 Oil and Other Hazardous Substances Pollution Control, April, 2012

ADEC Division of Spill Prevention and Response Contaminated Sites Program. *Draft Field Guidance Sampling,* May 2010

ADEC Division of Spill Prevention and Response Contaminated Sites Program. *Monitoring Well Guidance,* Feb 2009

ADEC Technical Memorandum. Environmental Laboratory Data and Quality Assurance Requirements. March 2009

ADEC Laboratory Data Review Checklist (Ver. 27). January 2010

ADEC UST Procedures Manual November 2002

ADEC Landfarming at Sites in Alaska. Technical Memorandum. March 2011

NVPH Draft Groundwater Monitoring Report - Former Port Heiden RRS Site Characterization Report, December 2010

NVPH Final Port Heiden RRS Remedial Work Plan, July 2010

State of Alaska http://www.commerce.state.ak.us/dca/commdb/CF_BLOCK.htm 2010

Weston Solutions. Final Remedial Investigation/Feasibility Study, Port Heiden Radio Relay Station, Port Heiden, Alaska. April 2006

Weston Solutions Work Plan, Remedy Selection and Implementation, Demolition and Debris Removal Port Heiden Radio Relay Station, Port Heiden, Alaska. March 2009

Appendix A Work Log.

Date	Activity	QP
6/7/12	Rototill LSAs with skid steer	JC
6/8/12	Rototill LSA	JC
6/9/12	Rototill and berm the LSA stockpile.	JC
6/12/12	LSA rototilling begins. Set up PCB stockpile area	JC.
7/4/12	Work prep for land farming	GD
7/5/12	Sampling at CSR2; Trapper Hill	GD
7/6/12	Sampling at CSR2 and Black Lagoon Outfall	GD GL
7/8/12	Sampling at Borrow Pit	GD GL
7/9/12	Grid out CSR2 south area and begin sampling. GD leaves for Anchorage	GL
7/10/12	Gridding and sampling at Water Tank Hill	GL
7/11/12	Gridding LSA5	GL
7/12/12	PID measurement at land spreading area (LSA 5)	GL
7/13/12	PID measurement at land spreading area (LSA 5)	GL
7/14/12	Begin staking POL 3 & 4.	GL
7/15/12	PID screening at LSA5. Grid out CSR2 – North End. COC 1123084 shipped out to SGS.	GL
7/16/12	Finish PID screening at LSA5	GL, JC
7/17/12	Day off for work crew.	GL
7/18/12	Sampling at CSR2.	GL
7/19/12	Finish sampling at CSR2. Lab samples collected at LSA5. COC 1123166 shipped out to SGS. Begin gridding LSA1	GL
7/20/12	PID measurements at LSA1	NW
7/21/12	PID measurements at LSA1	NW
7/22/12	PID measurements at LSA1	NW
7/23/12	PID measurements at LSA1	NW
7/24/12	Day off for work crew	NW
7/25/12	Finish PID measurements at LSA1. Collect lab samples from LSA1 – 15 samples with 2 duplicates. COC 1123285 shipped out to SGS. Field screening at LSA2.	NW
7/26/12	LSA2 field screening by PID. CSR2 grids set out.	NW
8/5/12	Prep for surveying	GD
8/6/12	Day off for work crew	GD
8/7/12	Surveying	GD
8/8/12	Surveying	GD
8/9/12	Wind issues – limited work	GD
8/10/12	Surveying	GD
8/11/12	Surveying at LSA1	GD
8/18/12	Wind day. Limited work.	GD
8/19/12	Surveying and sampling at CSR2. GD leaves	GD GL
8/21/12	Sampling at GSR2. Survey of sample points at LSA5	GL
8/22/13	PID measurements at land spreading area 3 (LSA3.) PID measurements at land spreading area 2 (LSA2).	GL
8/23/13	PID screening at LSA2. Sampling at CSR2.	GL

8/24/12	PID screening at LSA2	GL
8/25/12	PID Screening at LSA3	GL
8/26/12	PID Screening at LSA3 and LSA4	GL
8/27/12	PID Screening at LSA3 and LSA4	GL
8/28/12	Finish PID screening at LSA3 and LSA4	GL
8/29/12	Collect LSA2 and LSA3 DRO samples. COC 1124099 shipped to SGS.	GL
8/30/12	Sampling at BLO	GL
9/18/12	Re-gridding and PID measurements at LSA5	GD
9/20/12	Survey LSA5	GD
9/21/12	Sampling at LSA5	GD
9/24/12	PID measurement at LSA5. All below 1 ppm. No laboratory soil sampling needed.	GD

GD Greg DuBois; GL Galen Laird; JC Jacyln Christensen; NW Nicole Ward

Appendix B Field Notes.

Appendix C Laboratory Reports.

Appendix D Laboratory Quality Control Information.

Appendix E Chain of Custody Forms.