SITE CHARACTERIZATION, CORRECTIVE ACTION AND DECOMMISSIONING REPORT

HIPAS OBSERVATORY
7795 CHENA HOT SPRINGS ROAD
FAIRBANKS (TWO RIVERS), ALASKA

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1.0 EXECUTIVE SUMMARY

NORTECH Environment, Energy, Health and Safety Consultants (***NORTECH***) has been retained by the University of California, Los Angeles (UCLA) to provide management and environmental services related to the decommissioning of the High Power Aurora Stimulation (HIPAS) Observatory near Fairbanks, Alaska (the Site). HIPAS is located on approximately 130 acres about 25 miles east of Fairbanks in Two Rivers, Alaska.

Initial development of the Site occurred in the 1960s as Chena Valley Radio. This was operated by the University of Alaska, Fairbanks (UAF) Geophysical Institute (GI) and included several structures, the main road, and several groups of antennas. HIPAS began operation as a joint venture of the UAF GI and UCLA in the early 1980s. UCLA leased the Site in 1985 and HIPAS expanded to approximately 10 primary structures and more than a dozen antennas performing a variety of grant-funded research related to energy in the atmosphere. Funding for research at HIPAS was decreasing by 2006 and the final research at the facility was completed in October 2008.

University of Alaska Land Management (UA) provided UCLA with the requirements for termination of the lease in 2008. With the closure of HIPAS, UCLA began the tasks to facilitate termination of the lease. A Phase I Environmental Site Assessment in late 2008 confirmed a number of potential environmental concerns. Most drums and other containerized waste materials were disposed of in 2009. UCLA completed an inventory of physical assets in 2009 and conducted auctions to dispose of most structures, antennas, research equipment, and scrap materials in 2010 and 2011.

Following the auction in 2010, a detailed site-wide environmental characterization was undertaken. This included identification, delineation, and corrective action at multiple areas with potential petroleum contamination as well as the collection and disposal of potentially hazardous wastes. This also included cleaning and disposal of mercury-contaminated items related to the Liquid Mirror Telescope (LMT) in the LIDAR Tower. The results of these activities were incorporated into the conceptual decommissioning and closure plan produced in 2010. This document was provided to UA and ADEC and the feedback provided was incorporated into the final decommissioning plan.

The final decommissioning of the facility was completed in 2012. This involved the collection and removal of remaining visible surface debris, including the few remaining capacitors and transformers. The former drinking water wells and wastewater disposal systems were decommissioned. Environmental cleanup included remediation of petroleum contaminated soil from multiple areas as well as the remediation of mercury contaminated soil from the former LIDAR tower. Laboratory testing confirmed that the corrective actions resulted in clean closure at each location. The only features remaining at the Site are the gravel pads, several building foundations, and a number of buried utilities. Based on discussions between UA, UCLA, and ***NORTECH***, the conditions at the Site meet the conditions necessary to terminate the lease.

2.0 SITE DESCRIPTION, PREVIOUS WORK SUMMARY, AND OBJECTIVES

2.1 Site Description

The Site is located in the Fairbanks North Star Borough (FNSB) in the community of Two-Rivers, approximately 25 miles east of the Fairbanks urban area. The Site is identified by FNSB assessment records as Tax Lot 3604 in Section 36, Township 1 North, Range 4 East of the Fairbanks Meridian. The property is owned by the University of Alaska and has been leased to the University of California, Los Angeles (UCLA) for the operation of the HIPAS Observatory since approximately 1985.

The HIPAS property is approximately 130 acres in area and is generally rectangular with a small portion extending to the west. The Site is in a residential/agricultural area with a mixture of private and public properties near the western edge of the Chena River State Recreation Area. The property is bound to the east by Tract A1A of the Pleasant Valley Subdivision and TL-3104, each privately owned. Parcels to the north include TL-3606 and TL-3607, both privately owned. The parcel to the south is TL-3600 and is owned by the State of Alaska Department of Natural Resources (ADNR) and leased for agricultural purposes. Properties to the west include parcels TL-3603, TL-3605 and TL-3608, each of which is privately owned. Figure 1 is the general geographical location map. Figure 2 shows the Site and vicinity, and Figure 3 shows the layout of the Site, including Site structures as interpreted from the 2007 aerial photograph and site observations.

The Site is located in the Yukon-Tanana Uplands physiographic province, a band of low domed mountains comprised primarily of metamorphic rocks. The Site itself is located within the Chena River floodplain, which is comprised primarily of alluvial sediments derived from the surrounding uplands. Topographically, the Site is situated within a relatively flat vegetated floodplain including low terraced benches of the Chena River. The Chena River runs generally east-west at a slope of approximately 3.5 feet per mile with significant meandering in this area. The closest reach of the Chena River is approximately 0.5 miles southwest of the site.

Typical soils in the Chena flood plain consist of several feet of silt, underlain by alluvial sands and gravels to a considerable depth. These granular deposits generally become coarser with depth, exhibit wide variability in structure and stratification and apparently represent ancient glacio-alluvial deposition. Silt-filled swales and oxbow lakes generally represent former positions of rivers and streams. The thickness of alluvial sediments overlying bedrock in the region can be as great as 400 to 500 feet. Lenticular deposits of silt, sand, and gravel produce a wide range of permeability and transmissivity.

The HIPAS site and surrounding area generally have 5 – 15 feet of silt above a thick layer of gravel. Drilling logs do not indicate the bottom of the gravel material. Properties around HIPAS have been developed as commercial gravel mining operations, indicating the extent of gravel in the area. Foundation and other excavations at HIPAS do not appear to have reached the native gravel layer and gravel at the surface has been imported from nearby sources. The northwestern portion of the Site is located on a natural bench that is several feet higher than the remainder of the property. Groundwater depth in this area is typically 20 to 25 feet as indicated in well logs and confirmed by static water level measurements of onsite wells in 2012.

The property was originally developed by the University of Alaska Fairbanks (UAF) Geophysical Institute in the 1960s as the Chena Valley Radio facility. This development included the bunkhouse and garage and several antenna arrays as shown in aerial photographs. A lease arrangement with UCLA led to the development of the HIPAS Observatory in the early 1980s. The HIPAS operation continued to use most of the previous developments and expanded with the construction of several new buildings and antenna arrays.

Seven primary structures were used by HIPAS: the Bunkhouse, an ATCO unit, the LIDAR Building, the Shop/Garage adjacent to the LIDAR building, the Dipole shed/antenna, the Generator Building, and the Transmitter Building. Additional structures included two trailer structures in the Boneyard, numerous connex boxes at multiple locations, and several modified semi-trailers used for storage. More detailed descriptions of the structures and various areas can be found later in this report and are shown in the attached Figures in Appendix 1.

2.2 Initial Phase I Environmental Site Assessment

NORTECH completed a Phase I Environmental Site Assessment (ESA) of the HIPAS Observatory for UCLA in 2008 at the end of active research operations. The ESA was completed in general accordance with the American Society of Testing and Materials (ASTM) Standard E 1527-05 and is attached in Appendix 9. The ESA was reviewed by UA and utilized by UCLA as the basis of the environmental assessment and cleanup activities. The ESA identified recommendations for both ongoing operations as well as decommissioning. The remainder of this section summarizes observations and the conclusions drawn in the ESA related to decommissioning because the facility did not resume operations following the ESA.

At the time of the ESA, the HIPAS Observatory used heating oil to heat each of the structures and diesel fuel to power the two generators needed for research at the facility. Many of the electronic devices also contained dielectric fluids and/or glycol-based coolants. In addition to the petroleum products, a number of laboratory grade liquid chemicals and compressed gases were stored at the Site for research projects. Overall, ***NORTECH*** ranked the significance of on-site contamination at the Site as *medium-risk* based on the site inspections and available documentation.

The ESA identified two recognized environmental conditions (RECs) at the property, both of which were located at the LIDAR Building. The first REC was the reported accidental overfilling of the LIDAR heating oil tank, which resulted in a release estimated to be more than 10 gallons and less than 150 gallons. The release had not been reported to ADEC. The ESA recommended the tank should be removed and the release area assessed to identify vertical and horizontal limits of contamination and the potential for contamination beneath the building slab. The assessment data should then be used to develop a corrective action plan for submission to ADEC as notification of the release and for approval of the proposed corrective action.

The second REC was related to the LIDAR Building, which housed a liquid mirror telescope (LMT) that utilized a rotating disk of mercury to create a lens used for research projects. Normal use of this equipment was assumed to have contaminated the LMT room and all contents with mercury. At the time of the ESA, use of the LMT had been discontinued and decommissioning was recommended. The ESA recommended development of a work plan for assessment and cleanup of the LMT to address the decontamination and disposal of the mercury that remained containerized in the LMT room, other items in the LMT room, and building materials within the LMT space. Operational controls appeared to have limited the migration of mercury outside the LMT room, but the work plan also outlined a limited sampling effort outside the LMT to verify that mercury contamination was not present outside the sealed area. This work plan was also expected to address the mercury containing switches stored near the LMT room and the mercury shipping containers located in the Shop.

In addition to the RECs above, several potential environmental concerns were observed that were recommended to be addressed through some combination of operational and decommissioning planning documents for the facility. These were organized by the type of concern and included:

- Aboveground storage tanks containing heating oil, diesel fuel, and gasoline
- Drum storage areas, both interior and exterior
- Chemical and cylinder storage in the LIDAR Building and other locations
- Usable and obsolete electronic gear across the site
- Other accumulated electronics, equipment, and hardware

The ESA indicated that many items had residual value if the facility was decommissioned, while many others required special handling and/or disposal methodology. At a minimum, the ESA recommended that each storage area or unit should be inspected and/or inventoried to develop a plan for proper disposal (including re-use or recycling) of all obsolete equipment and materials. This was expected to include unloading and/or rearranged some stored materials and equipment to check for potential fluid reservoirs that would need to be addressed through the disposal plan.

The ESA also recommended inspection of the ground surface for environmental concerns following relocation of vehicles, tanks, equipment, connex boxes, and any other fluid-filled containers.

In the event that the facility was fully decommissioned, the ESA recommended a decommissioning plan be developed to create a clear scope of work and generate competitive bids from contractors that are interested in all or part of the work. The final extent of the decommissioning activities was expected to be developed in accordance with UA. In addition to the disposal issues above, the decommissioning plan was expected to include:

- Demolition of any buildings not disposed of in another manner
- Decommissioning of remaining water wells
- Decommissioning of wastewater disposal systems
- A thorough inspection of the ground surface to identify and inventory surface debris and any other environmental concerns

2.3 Objectives

During the Phase I ESA, UCLA confirmed that the HIPAS Observatory that the closure of the facility was permanent and that UCLA planned to work with UA to terminate the lease. UA had identified the terms of the lease termination in the UCLA Lease Termination Response Letter dated August 5, 2008. UCLA's annual objectives for the site were as follows:

<u>2009</u>

- Inventory and proposal for disposal of remaining liquids (petroleum, mercury, etc) and any other items that could cause significant environmental concerns

<u>2010:</u>

- Auction physical assets, including buildings
- Characterize environmental concerns and dispose of identified hazardous and petroleum contaminated wastes
- Develop bid documents to remove surface and subsurface developments,

<u>2011:</u>

- Auction remaining items and demolish LIDAR Building
- Develop bid documents for surface debris cleanup and environmental cleanup

<u>2012:</u>

- Complete remaining cleanup activities
- Final decommissioning report to ADEC and UA for termination of the lease

3.0 PROJECT ORGANIZATION AND REGULATORY FRAMEWORK

3.1 Organization and Responsibilities

The current owner of the property is the **University of Alaska, Land Management** Department (UA). Kristi Sherman is the UA project manager for the termination of the HIPAS lease. She has been involved with the HIPAS lease administration for many years and has been the primary point of contact for UA since the Phase I ESA was completed in 2008. UA retained Shannon and Wilson to provide technical review of documents submitted to UA during the decommissioning effort.

The **University of California, Los Angeles** (UCLA) is responsible for completing the necessary efforts for termination of the lease with UA. Brad Erickson is the Executive Director for UCLA Campus Service Enterprises and became the primary contact for UA following the retirement of Steven Forester in 2011. David Ott was the Manager of Environmental Health & Safety for UCLA until September 2012 and provided technical review and management for most of the cleanup and disposal work. Loana O'Reilly-Rosenblatt is the Director of the Real Estate Asset Management, which provided contract management for the environmental and construction projects. Ron Richards, a former manager of the HIPAS facility, is UCLA's facility manager and oversaw the auction activities and other non-environmental cleanup work.

NORTECH completed the Phase I ESA and was then contracted to provided project management and environmental services for the assessment and decommissioning of the HIPAS Facility. UA and UCLA agreed that ***NORTECH*** was a qualified, independent, third-party consultant as requested by UA. Peter Beardsley is ***NORTECH***'s Contract Manager and was in responsible charge of the project including administrative management and quality control. Mr. Beardsley directed the day-to-day activities for the project and is the principal point of contact. Ron Pratt was the ***NORTECH*** field manager during the 2009, 2010, and 2012 site work.

NORTECH and UCLA utilized several contractors to complete the decommissioning and remediation efforts documented in this report. The contractors were selected through bidding processes that met the UCLA procurement requirements for the size of the project. The selected contractors had documented experience in completing similar work and UA was notified upon contractor selection. Individual contractors are mentioned in the section(s) of the report which describe those portions of the decommissioning.

Documented environmental concerns are under the jurisdiction of the Alaska Department of Environmental Conservation (ADEC), which has the responsibility to protect human health and the environment. The initial ADEC inspection of HIPAS was completed by John Ebel of the ADEC Spill Response group. The current ADEC Project Manager is Jim Fish of the Contaminated Sites group.

3.2 Contaminants of Concern

Documented activities at the site indicated that the primary contaminant of concern (COC) for soil contamination were petroleum fractions from heating oil, dielectric oil in capacitors and transformers, and gasoline). Laboratory data for the individual suspected release locations is described in more detail in the sections below and has confirmed that diesel range organics (DRO) was the primary contaminant of concern in soils at the site. BTEX compounds and other VOCs were not been observed at the samples used to characterize petroleum contamination.

Polychlorinated biphenyls (PCBs) were evaluated as a COC due to the quantity of electrical equipment present at the site and the use of the site as a research facility. Hundreds of capacitors (the total weight exceeded 8,000 pounds) were assumed to have PCBs because a “non-PCB” label was not present, but no leaking capacitors were observed during packaging. Analytical results from the bulk dielectric oil and individual un-sealed transformers indicated that only three of the transformers contained polychlorinated biphenyls (PCBs) and the concentrations were less than 25.3 ppm. Petroleum contaminated soil at transformer release locations was not observed to contain PCBs following removal of visibly contaminated debris that were assumed to contain PCBs. Based on these observations, PCBs are not considered a COC outside the areas that were specifically identified.

A Liquid Mirror Telescope (LMT) was used to complete atmospheric research in the south end of the LIDAR Building. This device created an adjustable lens by slowly spinning a pool of elemental mercury on a 2.7 meter diameter rotating dish/table. The elemental mercury, table structure, and other mercury-containing objects were removed and disposed of as mercury contaminated waste. The remainder of the building was cleaned and laboratory testing indicated that the building materials were not considered hazardous. Due to the extensive, long-term use of mercury, mercury was a COC in the soil around and beneath the southern portion of the LIDAR Building. Evidence of the use or release of mercury was not observed at other locations at the Site.

Arsenic was detected above the ADEC cleanup level in some characterization and closure samples at the Site. The detected concentrations are within the documented background levels in the Fairbanks area. Arsenic concentrations did not show a relationship with other observed contamination. Based on these observations, arsenic is not considered a COC for the site.

A wide variety of laboratory chemicals, including benzene, carbon tetrachloride, methanol, and dyes, were identified within the LIDAR Building during the waste collection effort. These compounds were generally lab grade and in 1 liter or smaller containers consistent with laboratory operation. The benzene and carbon tetrachloride are believed to have been used in experiments designed to test the potential destruction of hazardous waste treatment with a plasma torch. The methanol and dyes were used in atmospheric research experiments involving the multiple lasers at the site. New and "used" bottles of each compound were identified during the disposal effort, suggesting that the portions of these compounds that were not consumed during an experiment were saved for later re-use or disposal. No evidence of releases of these compounds was observed in the LIDAR Building and these compounds are not considered contaminants of concern.

3.3 Regulatory Cleanup Levels for Clean Closure

ADEC Method Two soil cleanup levels are typically used as cleanup goals for sites managed through the ADEC spills and contaminated sites programs and are provided in 18 AAC 75. The Method Two soil cleanup levels have been developed to be protective of human health and the environment under the wide range of conditions found in Alaska. As indicated above, the primary contaminants of concern are DRO, RRO, and mercury and the most stringent cleanup criteria are listed below. Cleanup levels for other compounds observed at HIPAS are included in the appropriate tables in Appendix 1. A full list of other contaminants can be found in Table B1 and B2 and groundwater cleanup levels can be found in Table C of 18 AAC 75.341.

Analyte	Cleanup Level in mg/kg
DRO	250
RRO	11,000
Mercury	1.4
PCBs	1.0

3.4 Preliminary Conceptual Site Model

NORTECH had completed a conceptual site model (CSM) for the site based on the 2010 site characterization data and existing conditions at that time. This initial CSM was attached to the cleanup work plan.

Preliminary Conceptual Site Model	
Release Mechanisms	Aboveground storage tanks, transformers, and surface activities
Impacted Media	Building materials and surface and shallow subsurface soils
Transport Mechanisms	Volatilization of surface contamination
Exposure Pathways	Direct contact with soil, inhalation of volatiles
Potential Receptors	Cleanup workers, trespassers

Post-Cleanup Conditions:
The known sources and contaminated soil have been removed. No known impacted media remains at the Site, so no receptor exposure is complete and no CSM documents are attached to this report.

3.5 Methodology and Personnel Requirements

Project activities followed the methodologies described in the ADEC 2010 Field Sampling Guidance and other guidance as necessary. The specific methodologies for each type of field screening and laboratory sampling are described in detail in Appendix 6. An ADEC-defined Qualified Person conducted the field screening to identify, delineate, and segregate POL-contaminated soils present within the excavation during excavation activities. Unless otherwise stated, field screening refers to soil headspace field screening using a properly calibrated PID.

Mercury air monitoring and field screening with a Jerome mercury vapor monitor was conducted by an ADEC Qualified Person during the demolition of the LIDAR Tower and foundation, as well as the assessment of the soil beneath the foundation. Site specific awareness training was provided to all personnel that were working within the areas potentially impacted by mercury contamination.

Companies hired for debris removal, heavy equipment operation, contaminated material removal, concrete cutting, and other tasks had documented experience in completing similar work. Site specific aspects of each activity were discussed at brief pre-work meetings as necessary. These contractors are listed below in alphabetical order.

3.6 Health and Safety

Based on the project description and previous assessments, toxic vapors, fumes, and low oxygen conditions were not expected to be encountered during POL assessment and remediation activities. Level D Personal Protective Equipment (PPE) was considered appropriate for this level of work. Level D PPE includes hard hat, steel toed footwear, ear protection and safety goggles. Reflective vests were also worn when working around heavy equipment. Observed conditions and monitoring results confirmed this level of PPE was adequate.

Elevated mercury vapor concentrations were known to be present within the interior of the LIDAR Tower. The project documents prohibited any personnel entry into the LIDAR building without appropriate PPE (modified Level C). No entry was planned for this building, which was mechanically demolished. Mercury vapor monitoring was conducted throughout the demolition process by trained and qualified ***NORTECH*** personnel in PPE appropriate to the monitored conditions. Mercury vapor monitoring was also conducted during the soil assessment activities and confirmed this level of PPE was appropriate.

4.0 DECOMMISSIONING ACTIVITIES: NOT REGULATED BY ADEC

4.1 Surface Debris Removal

UCLA HIPAS facility manager Ron Richards oversaw the auction activities and most other non-environmental surface material removal work. ***NORTECH*** was aware of these activities and worked with Mr. Richards to verify that potentially hazardous waste was not inadvertently disposed of during this work. During these efforts, Mr. Richards identified any item that appeared to have the potential to be hazardous and set it aside until ***NORTECH*** could determine the status of the item. The major decommissioning events are listed in the table below and more detailed information concerning surface debris removal can be obtained from Ron Richards.

Major Decommissioning Events	
2010	Initial auction, including most buildings, antenna, electronic equipment, and other items (more than 1600 lots)
2011	Closeout auction to dispose of items not sold or removed as part of the auction in 2010
2012	Collection of surface debris for recycling (all metals) or disposal at the FNSB landfill

NORTECH was responsible for the disposal of wire collected from the grounding grid beneath the primary antenna array. This grid was primarily chicken wire and was determined to be a physical hazard at the Site due to damage and access following the removal of the primary antenna array. Mr. Richards "bundled" the wire using heavy equipment in September 2011 and this material was disposed of later that fall.

Photos of typical 2010 surface conditions and surface debris removal can be found in the Appendices.

4.2 Generator Stack Asbestos Removal

The exhaust stack for one of the primary generators was damaged by the successful buyer during removal of the generator in April 2011. The damage resulted in the fire brick insulation sitting on the surface of the ground on the east side of the generator building. Testing of the fire brick determined that this material contained greater than 1% asbestos and would require disposal according to EPA guidance, but the quantity of material was less than the EPA reporting limit for an asbestos cleanup project. ***NORTECH*** retained R&D Environmental to remove and dispose of the stack structure and fire brick in accordance with EPA regulations. A visual inspection by R&D and a subsequent inspection by ***NORTECH*** indicated that the removal action was successful.

4.3 Items Remaining at the Site

Development of the decommissioning bid documents in 2010 included a surface inspection of the complete surface of the site as well as identification of buried items to the extent practical. Discussions between UCLA and UA resulted in a conceptual agreement that certain surface and subgrade items could be left at the Site as long as no environmental concerns were noted. Based on this agreement, the following items remain at the site, and are shown in the attached figures for "as-built" purposes:

- Buried power and communication lines
- The overgrown portion of an aluminum grid on the eastern portion of the site
    - Visible aluminum in forested areas was cut below the vegetative surface and removed to the extent practical
    - Aluminum wire pieces observed in cleared areas were collected and removed
    - The steel perimeter cable was removed
- A series of overgrown antennas from the Chena Valley Radio operations remains on the southeastern portion of the site
- Concrete floor slabs and sub-grade foundations except those portions removed to complete environmental remediation activities
- Soil adsorption fields and buried piping from onsite wastewater disposal systems

Photos of typical remaining items can be found in the Appendices.

5.0 DECOMMISSIONING ACTIVITIES: NO ENVIRONMENTAL TESTING

NORTECH completed inspections after the relocation or removal of each surface item that was considered a potential environmental concern, ranging from individual drums and batteries to entire buildings. The inspections generally consisted of a visual inspection for stained soil and distressed vegetation, as well as picking up soil to assess odor, cohesion, and other factors that could indicate contamination. At locations with aboveground storage tanks, tank footprints and piping runs were also field screened with a PID to identify potential concerns that might not have been observed. ***NORTECH*** also completed a review of historical data, such as the photographs provided by UA from a 2008 site visit.

In accordance with UCLA policy and a review of the ADEC guidance, UCLA and ***NORTECH*** concluded that laboratory testing was necessary at locations with evidence of a previous or on-going release. In the event that the inspection, including PID results if collected, indicated that no evidence of a release was present, no additional testing was considered necessary or performed. This section describes those locations and items that were inspected and determined to not need environmental testing because no evidence of contamination was present.

5.1 2009 Drum and Liquid Removal

In 2009 ***NORTECH*** worked with UCLA and Mr. Richards to identify items that were considered to have significant potential to cause an environmental concern if the container was damaged through natural events, vandalism, or other means. This included drums of motor oil and dielectric fluids in interior and exterior locations, bottles and cylinders of chemicals in flammables cabinets and other research storage areas, and a variety of other interior containers. Fluids that were installed in equipment, such as motor oils, dielectric fluids, and coolants were left in place, including in vehicles.

Following the identification and inventory of these items, ***NORTECH*** worked with Emerald Alaska to characterize and dispose of each waste stream. During this initial work, the bulk dielectric fluids at the site were determined to be free of PCBs and chlorinated solvents. Two disposal events removed these wastes: July 17, 2009 and August 13, 2009. The waste manifests associated with these events are located in Appendix 8.

Each individual container was inspected for potential damage, leaks, seepage, or other potential releases and none were observed. No evidence of possible releases was observed in the internal storage areas. The location of each exterior container was inspected following the removal of the item and no evidence of a release to the ground was observed at any of the locations. Based on these observations, no suspected releases had occurred and no additional environmental field screening or laboratory testing was considered necessary.

5.2 Capacitors and Transformers

Most of the research at the HIPAS Observatory was related to energy in the atmosphere and the facility had a large number of capacitors and transformer to manage energy during research activities. These items included small units installed in electrical equipment to large standalone transformers and banks of capacitors. Several custom capacitors and switchgear items were also present at the site.

While the items were diverse, ***NORTECH*** and UCLA approached each item using the same process. Items that could be opened (large transformers and custom switch gear) were sampled for PCBs. The results were provided to Emerald, which identified the appropriate disposal methodology. The custom switch gear did not contain PCBs and was drained, with the dielectric fluid being disposed of by Emerald and the dry equipment sold at auction. Emerald disposed of the transformer fluid and carcasses based on the laboratory results. The one exception was the last transformer at the site, which was recycled with other metals by K&K Recycling after the fluid was drained and disposed of by Emerald.

Sealed units, including each capacitor, were inspected for factory markings or labels indicating “non-PCB.” Any item that was not marked “non-PCB” was assumed to contain PCBs and disposed of as PCB waste by Emerald. None of these sealed items were tested to determine the concentration of PCBs in the fluids. Items with a “non-PCB” marking were assumed to be PCB free and were disposed of by Emerald. More than 8,000 pounds of capacitors and transformers were disposed of by Emerald during the course of the decommissioning effort and disposal records can be found in Appendix 8.

Similar to the drums, ***NORTECH*** completed an inspection of each capacitor or transformer unit (including weighing each unit less than 250 pounds) and each storage or installation location. No sealed units were observed to be damaged or leaking. No evidence of contamination was observed at the storage or usage locations of sealed units and no additional testing was completed. Additionally, no evidence of a release was observed at four of the six transformer locations and no additional testing was completed in these areas. Stained soil was observed at two locations with abandoned transformers (near the LIDAR Garage and the Boneyard) and these are discussed in Sections 6.3 and 6.4.

5.3 Transmitter Pad Antenna Array

The primary antenna array at the Site was located on a level pad covering several acres east of the Transmitter Building. Historic aerial photographs of the Site show that this pad was constructed in the early 1980s and a small building had been located near the base of the center antenna. This building was reported to have burned down in the

1990s and was not replaced at the same location. At the time of the ESA I inspection, the presence of snow obscured the ground surface in this area. The installation of fill for the antenna pad was also considered a potential location for the burial of debris. This location is shown in the figures of Appendix 1 and site photographs in Appendix 3.

2010 Work Completed

NORTECH personnel conducted an interview with Ed Anders, the individual who constructed the pad in preparation for construction of the antenna array. He indicated that area was cleared and leveled through cut-and-fill techniques using the silt from the existing ground surface. He indicated very little fill material was imported for this pad and was generally limited to surface gravel since the native material had been silt.

A visual inspection was conducted of the surface and no evidence of staining or other potential concerns were observed across the pad. A total of five test pits were excavated across the pad, ranging in depth between 4 and 8 feet below ground surface. One test pit was located at the site of the burned building, one test pit was located at the site of another previously removed small building located near the center of the array, two test pits were excavated near the northern edge of the array, and the remaining test pit was excavated along the eastern edge of the array. Each testing pit was advanced to undisturbed silt. The observed soil lithology in each test pit was consistent with the described cut-and-fill construction of the antenna array clearing. No evidence of buried debris or other potential concerns were observed at any of the test pit locations.

Soil headspace field screening samples were collected from each test pit at one foot intervals from the ground surface to the bottom of the test pit. Field screening results were <3 ppm, consistent with expected background concentrations. Since no evidence of buried material, stained soil, odors, or elevated field screening was observed, no release was suspected of having occurred in these areas and no soil sampling or other additional investigation was considered necessary.

5.4 Dipole AST

A heating oil AST was observed during the Phase I ESA investigation at the base of the Dipole Antenna structure. The Phase I ESA recommended inspection of the ground surface after the removal of the AST and Dipole building. This location is shown in the figures of Appendix 1 and site photographs in Appendix 3.

2010 Work Completed

The recommended inspection was completed in 2010 following removal of the Dipole Building, antenna, and AST. The visual and olfactory inspection did not identify any staining or odors within or adjacent to the footprint of the Dipole Antenna development. No field screening was considered necessary at this location and no soil sampling was conducted because no release from this tank and fuel system was suspected.

5.5 ATCO AST and Fuel Line

During the Phase I ESA investigation, the heating oil AST for the ATCO Building (in the eastern portion of the site) was observed approximately 25 feet north of the building. The Phase I ESA recommended inspection of the ground surface following the removal of the AST and the ATCO building. This location is shown in the figures of Appendix 1 and site photographs in Appendix 3.

2010 Work Completed

The recommended assessment was completed in 2010 following removal of the ATCO Building and AST. The ATCO AST location was assessed through visual and olfactory observations as well as headspace field screening methods. No staining or odors were noted on the soil surface beneath the former AST. The fuel line was cut and remained in place, but no evidence of a release was observed at the AST end of the fuel line. Soil headspace field screening was conducted at the former AST location and along the remaining fuel line and all results were less than 3 ppm, within the background expected for this location.

At the ATCO end of the system, the fuel line had also been cut and crimped. Approximately 12 square inches of visibly stained surface soil and a faint diesel odor was observed on the gravel surface at the remaining end point of the fuel line. Soil headspace field screening at this location had a slightly elevated screening result (18.3 ppm), indicating that a de-minimus amount of fuel was released to the ground surface from the fuel line during removal of the building.

NORTECH personnel hand excavated approximately three cubic feet of soil material from this area. Field screening results after the excavation were less than 3 ppm, similar to background soils in the area. The suspect contaminated soil was added to the existing non-hazardous petroleum contaminated soil investigative derived waste that was generated during the 2010 assessment activities. The remaining fuel line was also collected and disposed of with the petroleum contaminated soil, which was transported off-site for disposal at an appropriate TSD facility by Emerald Alaska.

Due to obvious source and the de-minimus volume of contamination observed, no laboratory sampling was considered necessary to close this area.

5.6 Former Bunkhouse Tank and Emergency Generator AST

Combining data from multiple sources, the Phase I ESA indicates that a 1,500 to 2,000 gallon buried tank was used to store heating oil when the facility was constructed. This tank was entered into the ADEC UST database in 1990, which is the primary source of information. This tank was removed from the ground in 1990 or 1991. Interviews with site personnel did not indicate a potential location for the tank or suggest that the tank may have leaked. An inspection of the site prior to and after removal of the bunkhouse did not identify lines, piping, or other evidence that could have been associated with the former bunkhouse tank. Without any evidence of a release or a specific tank location, no additional assessment was completed to address this former tank.

At the time of the Phase I ESA, the bunkhouse received heating oil from an aboveground storage tank located to the south of the bunkhouse driveway. This tank was also adjacent to the emergency generator for the facility and provided diesel that generator. The AST, the emergency generator, and the bunkhouse were removed from the Site in 2010. Most of the fuel line was located aboveground along the floor of the bunkhouse and showed no evidence of leaks or drips. The fuel line to the bunkhouse that was left in place beneath the driveway was removed and expected. No stained soil, odor, or other potential concern was observed beneath the line or the remainder of the bunkhouse footprint.

The AST area was used for storage of materials in 2010 and could not be inspected. Similarly, the emergency generator building was not removed until 2011. In 2012, a final inspection of the bunkhouse, AST area, and emergency generator shed area was completed. No stained soil, odor, or other potential concern was observed beneath or around the locations of the AST, the emergency generator shed, or the former bunkhouse location. Based on these observations, field screening and laboratory testing were not undertaken.

5.7 Well Decommissioning

The HIPAS site had five drinking water wells across the site, as shown in Figure 10. These wells were standard drinking water wells for the Fairbanks area, consisting of a 6-inch steel well casing, a pitless adapter, and a submersible pump. The pumps had been removed and sold during the second auction. The wells were located near and served the following buildings: the Bunkhouse, the LIDAR Building, the Generator Building, the Transmitter Building, and the ATCO Building. The well at the ATCO Building was not connected to the ATCO Building or any other building at the site. A well log for one of these wells was identified in the Alaska Department of Natural Resources' (ADNR) Well Log Tracking System (WELTS) and is included in Appendix 7. The well log indicated a total depth of 60 feet, suggesting this well was most likely the Generator Building well which had a total measured depth of 55 feet. , but the specific well could not be verified. No evidence of an application for water rights was identified and no other well logs were identified in HIPAS or ADNR records.

On September 12, 2012 Ron Pratt inspected and measured the stick-up height, static water level and total depth for each of the five wells. The depth to static water level ranged from 19.9 to 27.2 feet below the ground surface (bgs). These depths calculated to groundwater depths of 20 to 25 feet bgs, typical of anecdotal reports in the area. The total depth of the wells ranged from 28 to 55 feet.

Work Completed 2012

From September 21 through 25, 2012, Smallwood Creek, Inc and ***NORTECH*** decommissioned the five wells in accordance with 18 AAC 80.015(e) and AWWA A100-97, Appendix H (by reference) using the following procedure:

- The area around each well casing was excavated to six to eight feet below the adjacent ground level.
- The casing was cut off one foot above the bottom of the excavation, leaving one foot of exposed well casing in the excavated area.
- The well casing was filled to approximately two feet below the top of the casing using clean pit-run gravel and bentonite:
    - Gravel fill was inspected for possible contamination and field screened for hydrocarbons (all results were less than 3 ppm)
    - The well was filled with gravel up to approximately 10 feet below the top of the casing
    - Two bags (100 pounds) of bentonite were placed above the gravel fill
    - The bentonite was wetted and allowed to hydrate for a minimum of 24 hours
- Concrete was used to seal the top of the well casing:
    - A 2-foot diameter Sonotube concrete form 27 inches in height was placed over the top of the exposed well casing
    - The remainder of the casing and the Sonotube assembly were filled with concrete and allowed to cure for at least 24 hours
- The excavation was backfilled with clean pit-run gravel and native material from the original excavation:
    - Soil was backfilled in approximately 18 inch lifts and tamped with the backhoe
    - The final surface was mounded at least 6 inches in height above the adjacent ground surface for a radius of at least four feet to prevent ponding over the decommissioned casing

NORTECH personnel oversaw and recorded the decommissioning activities. Photographs of typical decommissioning efforts are located in Appendix 3. ***NORTECH*** also completed the ADNR Well Record of Decommissioning for each well. These documents are located in Appendix 7.

5.8 Transmitter Building Foundation

The Transmitter Building had a 5-6 foot deep crawlspace beneath the southern portion of the building. This held the limited sanitary wastewater plumbing for the building, which included plumbing to a floor drain located in the northern portion of the building. The crawlspace did not appear to be used for storage or other purposes. During final decommissioning, the plumbing was inspected and removed. The floor drain was inspected and no concerns were identified. The structure was grouted to prevent further concerns. The crawlspace area was filled with gravel to the height of the adjacent concrete slab to provide a more level surface for the site.

6.0 DECOMMISSIONING ACTIVITIES: PETROLEUM CONTAMINATION

The 2008 UA Letter and the Phase I ESA identified a number of potential sources of petroleum contamination and other specific locations with observed contamination. Site characterization activities in 2010 confirmed the presence of petroleum contaminated soil at six locations through field screening and/or laboratory sampling. Inspection and field screening at a seventh location, the Generator Building floor, indicated that contamination beneath the floor was most likely limited but additional inspection was necessary after removal of the building and portions of the floor.

The assessment data and remedial efforts for each location are discussed in further detail in the sections below. Figures detailing each location, including summary tables of characterization and closure sampling results, are located in Appendix 1. The 2010 characterization results were used to identify the COCs at each location for the closure activities identified in the Work Plan and discussed in Sections 5.0 and 6.0. Photographs of each location are located in Appendix 3. Sampling methodology, including field screening and laboratory sampling techniques and frequency, are located in Appendix 7.

The following observations and actions apply to each of the seven areas of contamination below and are consolidated here to avoid repletion:

Potential Groundwater Contamination

- Groundwater investigation was not considered necessary due to the depth of groundwater beneath the site
    - Groundwater ranged from 19.9 to 27.2 feet bgs across the site
    - The deepest contaminated soil was removed from approximately 10 feet bgs at the location where groundwater was at 27.2 feet bgs
    - No contaminated soil was within 15 feet the groundwater surface

Temporary Stockpiles

- Temporary stockpiles were created adjacent to excavations when contaminated soil could not be loaded directly into a truck for transport
    - Stockpiles areas were visually inspected for potential contamination prior to construction
    - Stockpiles were constructed following ADEC short-term stockpile guidance
    - Six-mil reinforced liners and covers were used
    - Stockpiles were on-site for less than two weeks

- Following removal of each stockpile,
  - A visual inspection was completed to verify that the contaminated soil and liner had been completely removed
  - Field screening was completed on a grid to confirm that the final ground surface was within the background field screening range

Backfill

- Backfill for site excavations was obtained from one local gravel source
- Most imported backfill, including backfill for the water wells, was field screened to confirm that this material was within the background field screening range

6.1 LIDAR Garage AST, Gasoline Drum Dispenser, and Loader Area

The LIDAR Garage was located on the eastern portion of the property adjacent to the LIDAR Building. Three environmental concerns were identified on the west side of this building. The first two were an aboveground storage tank (AST) containing heating oil was located near the northern end of the building and a loader that was parked adjacent to the tank. During the ESA I, significant staining of the soil surface was observed beneath the loader and stressed vegetation was observed around the AST. The third concern was a 55-gallon gasoline drum on a stand with a gravity dispenser at the southern end of the western side of the LIDAR Garage. This was reportedly used to fuel small power equipment, such as lawnmowers. Stained scrap wood was observed near the northern end by UA personnel during an inspection in 2007 and the Phase I ESA recommended inspection of the ground surface after removal of the drum.

2010 Work Completed

The loader parking area and heating oil AST were investigated in 2010. An exploratory trench was excavated beneath the AST and indicated contamination extended several feet bgs. Field screening indicated heating oil contamination extended beneath the obvious surface staining associated with the loader. Field screening and visual observations indicated that the stained soil associated with the loader was limited to the top few inches of soil. To facilitate the assessment of the heating oil contamination, approximately three cubic yards of visibly contaminated soil was excavated from beneath the loader area. This material was placed directly into supersacks and disposed of by Emerald Alaska as non-regulated, petroleum contaminated soil.

Once the stained soil from the loader had been removed, the remaining soil contaminated with heating oil from the AST was found to extend to a depth of approximately three to four feet below grade at the deepest location. Approximately 30 cubic yards of contaminated material were estimated to require removal from this location. The soil from these trenches was returned to the trenches for subsequent remedial efforts. Due to the known sources of contamination, no laboratory samples were collected from this location as part of the assessment.

The recommended visual assessment at the drum stand location was completed in 2010 following removal of the drum and stand. The visual and olfactory inspection did not identify any staining or odors on the gravel surface beneath the drum and dispenser and field screening results were within background concentrations. Due to the typical concerns with this type of drum installation and previous site photos showing stained building materials beneath the tank, a test pit was excavated beneath the stand. The test pit was six to 12 inches below the surface beneath the stand footprint and approximately two feet deep directly below the former dispenser connection. Inspection and field screening of the excavated material and sidewalls did not identify any evidence of contamination.

2012 Remediation Activities

Remedial excavation of the AST and loader area was conducted on September 6-7, 2012. One sample, near the northern end of the remaining garage slab, exceeded the cleanup level and additional excavation was undertaken on September 18, 2012. During these remediation efforts, approximately 20 cubic yards of soil were excavated in a narrow trench along the western edge of the LIDAR garage foundation slab. The excavated soil was temporarily stockpiled on-site pending the characterization sampling results, which classified the stockpile as containing non-hazardous petroleum contaminated soil. The stockpile was transported with other petroleum contaminated soil for off-site thermal remediation.

Based on the known use of the AST to store heating oil, DRO and BTEX were COCs associated with the tank. Since the loader was a second source of contamination in this area, RRO and metals (RCRA 7) were also considered possible COCs at the western limits of this contamination where the loader was parked. Laboratory characterization and closure samples were submitted for the following analyses:

- DRO by AK 102,
- RRO by AK 103,
- BTEX by EPA 8021 and
- RCRA 8 Metals by 6010/7471.

One stockpile characterization sample was collected for laboratory analysis. In addition to the analyses listed above, a composite stockpile sample was also collected and run for PCBs at the request of ADEC. Only DRO was detected above the cleanup level for the site and PCBs were not detected.

The highest field screening readings at excavation extents were used to identify the laboratory closure sample locations shown in Figure 6. The result for each closure sample was below the cleanup level for each COC. Based on these results, clean closure for this location was achieved and no further assessment or remedial action is considered necessary.

While this work was being completed, ***NORTECH*** personnel observed two small (less than one square foot) surface stains approximately ten feet from the northwest corner of the LIDAR Garage foundation. These appeared to be related to heavy equipment operation during a previous activity at the site. These two areas were removed by hand excavation up to six inches deep and six inches outside the stained area. A grid was established and field screening was conducted at the limits of these small excavations. Laboratory sampling was not considered necessary due to the complete removal of soil at the small areas and very limited quantity of fluid released at these locations.

6.2 LIDAR Heating Oil Tank

During the Phase I ESA, HIPAS personnel indicate a release of heating oil had occurred at the heating oil AST on the northeast corner of the LIDAR Building. The release occurred during a transfer of heating oil from a 150-gallon truck-mounted tank to the AST and was thought to be much less than 150 gallons. An obvious heating oil odor was evident beneath the AST and in the vicinity of the northeast building corner during the Phase I ESA. The tank and stand were in good shape and sold at auction and removed from the site in 2010. The building was also sold at auction and removed from the site in 2010.

2010 Work Completed

In 2010, two perpendicular trenches were excavated to assess this contamination. One trench was parallel to the north exterior wall and one was parallel to the east exterior wall of the building at the location of the former AST. Soil headspace field screening samples were collected to delineate the contamination associated with this tank. The headspace screening results indicate that contaminated soil was present to a depth of about six feet below grade at the deepest area of contamination. Based on the impacted area and depth, approximately 30 cubic yards of contaminated material were estimated to be present at this location. The soil from these trenches was returned to the trenches for subsequent remedial efforts. Due to the known source of contamination, no laboratory samples were collected from this location.

2012 Remediation Activities

Remedial excavation was conducted at this location on September 6, 2012. Excavation continued until field screening indicated clean conditions were achieved at the limits, including beneath the concrete foundation and along the water/power utilities to the water well. Approximately 30 cubic yards of contaminated soil were removed from this location. The excavated soil was temporarily stockpiled on-site pending the characterization sampling results, which classified the stockpile as containing non-hazardous petroleum contaminated soil. The stockpile was transported with other petroleum contaminated soil for off-site thermal remediation.

The field screening results at the limits of the excavation were used to identify the laboratory sample locations. Based on the known use of the AST to store heating oil for use at the LIDAR Building, DRO and BTEX were the COCs at this location. No stockpile characterization was necessary. Five laboratory samples (4 samples and 1 duplicate) were collected from the highest field screening results as shown in Figure 5. Each closure sample was below the cleanup level for each COC. Based on these results, clean closure for this location was achieved and no further assessment or remedial action is considered necessary.

6.3 LIDAR Area Abandoned Transformer

A small transformer was identified in the tree line north of the LIDAR Garage (and east of the LIDAR Building) during the waste characterization and removal effort of 2010. This transformer appeared to have been abandoned at this location many years earlier and was not in use or near other equipment or debris. A cap was missing from the top of the transformer and visual and olfactory evidence of contamination was observed on the outside of the transformer. Approximately three square feet of stained leaves and soil was present on the ground surface around this transformer.

2010 Work Completed

A sample was collected of the oil from within this transformer during assessment work in 2010. Field characterization using a Chlor-N-Oil detection kits indicated that PCBs were not present and this result was confirmed through laboratory analysis (HP T3). This transformer, including the remaining oil, was packaged with the other non-PCB containing waste streams for disposal through Emerald in 2010.

Soil field screening with a PID and HANBY H.E.L.P. field test kits was conducted within and adjacent to the obviously stained area, confirming that contamination was present and appeared limited. Approximately 3 cubic feet of soil and organic surface litter was hand excavated from this area. Two soil samples (HP LG11 and HP LG12, a primary and duplicate sample) were collected and submitted to the laboratory for GRO, BTEX, DRO and RRO analysis to characterization the remaining soil. The primary sample was also analyzed for PCBs to confirm that PCBs were not present in the soil.

The laboratory results indicated that DRO and RRO remained above the ADEC Method 2 Cleanup Levels at this location. GRO, BTEX compounds, and PCBs were not detected in the samples, indicating that these were no longer considered COCs at the site. The excavated soil from this location was disposed of by Emerald Alaska as petroleum contaminated soil in 2010. Based on field observations and the laboratory results, 3-4 cubic yards of contaminated soil were estimated to remain at this location.

2012 Remediation Activities

Remedial excavation of the former transformer location was completed on September 10, 2012. The approximately three cubic yards of soil were excavated from this location and placed in a temporary stockpile based on field screening results and field observations. The stockpile was transported in bulk with other petroleum contaminated soil for off-site thermal remediation based on the 2010 laboratory results for both the oil and soil.

The field screening results at the limits of the excavation were used to identify the 2 laboratory sample locations for closure of the excavation shown in Figure 5. Based on the 2010 laboratory results, DRO and RRO were the only remaining COCs at this location. Each closure sample was below the cleanup level for each COC. Based on these results, clean closure for this location was achieved and no further assessment or remedial action is considered necessary.

6.4 Boneyard Area – Former Transformer Shed

A transformer was identified during the ESA I standing on the floor inside a derelict shed in the Boneyard (also called the 430 Area) located in the southeastern portion of the property. Some of the wiring remained connected and other observations also suggested that the transformer remained in the position that it had been utilized during past operation. This unit appeared to have been used to supply power to the trailers and dish in the 430 area, but had clearly not been used in many years. Aerial photos suggested that these items had been installed as part of the Chena Valley Radio operation. HIPAS personnel indicated that the trailers had only been used for storage and had not been operated as part of HIPAS. Visual and olfactory evidence of contamination was observed within the building materials of the shed and on the ground surface at the perimeter of the shed.

2010 Work Completed

During waste removal and characterization activities in 2010, a sample was collected from the small amount of oil remaining within this transformer. The oil was field characterized using a Chlor-N-Oil detection kit, which indicated that PCBs were present. Laboratory results confirmed that the oil contained 8.68 mg/kg of Aroclor 1260. This transformer was relocated to a staging area and packaged with the other PCB-containing waste streams and disposed of through Emerald.

The derelict shed had to be partially dismantled to remove the transformer. During this process, field observations indicated that the lower walls, floor surface, and sub-floor structure were contaminated with oil from the transformer. The shed was manually dismantled and the building materials below the top of the transformer (approximately four feet above the floor) were packaged into a cubic yard box as PCB containing waste based on the laboratory results from the oil. The cubic yard box was relocated to the staging area and disposed of through Emerald.

Following dismantling of the shed, the soil surface beneath the shed was visibly stained. Three cubic yards of surface soils (up to about 12 inches deep) were hand excavated from beneath the shed and to the area immediately to the west to remove the visibly stained soil. Field screening was conducted with the PID and HANBY H.E.L.P. field test kits at the limits of the excavation. Results indicated that the western area of the excavation appeared to reach clean limits while the area beneath the former shed had suspect remaining contamination. A total of three soil samples (HP BY5, HP BY6, and HP BY8) were collected at these limits and submitted to the laboratory for DRO, RRO, and PCB analysis to characterization the remaining soil.

The laboratory results indicated that DRO remained above the ADEC Method 2 Cleanup Levels in the two samples beneath the shed, while RRO was present but below the cleanup level. DRO and RRO were not present in the sample collected west of the shed. PCBs were not detected in the three samples, indicating that PCBs were no longer considered COCs at this location. The excavated soil from this location was disposed of by Emerald Alaska as PCB containing petroleum contaminated soil in 2010. Based on the surface area and the pattern of contamination observed during the hand excavation effort, approximately 10 cubic yards of additional DRO contaminated soil remained at this location.

2012 Assessment and Remediation Activities

On September 4, 2012, a test pit was excavated in the contaminated area and two characterization samples (430T-SW-2 and 430T-EC-1) were collected in two areas at different depths to verify the field conditions. Based on the 2010 laboratory results, DRO and RRO were the COCs at this location. Sample 430T-SW-2 was non-detect for both analytes, while 430T-EC-1 had a DRO concentration of 4580 mg/Kg. These results confirmed the location, depth, and volume of the contamination present.

Remedial excavation of the remaining contaminated soil occurred on September 10, 2012. Approximately 10 cubic yards of contaminated soil was excavated into a temporary stockpile based on the field screening results and field observations. The stockpile was transported in bulk with other petroleum contaminated soil for off-site thermal remediation based on the 2010 laboratory results for both the oil and soil.

The field screening results at the limits of the excavation were used to identify the two laboratory sample locations for closure of the excavation shown in Figure 6. Each closure sample was below the cleanup level for each COC. Based on these results, clean closure for this location was achieved and no further assessment or remedial action is considered necessary.

6.5 Boneyard Area – Equipment Storage Area POL Stain

In addition to the former antenna and associated equipment mentioned above, the Boneyard (also known as the 430 Area), had accumulated a wide variety of equipment and materials during the operation of HIPAS. The Phase I ESA recommended that a visual assessment of the ground surface should be conducted at the locations of former vehicles and equipment with fluid reservoirs following the removal of these items.

2010 Work Completed

Most equipment and other materials in the Boneyard were sold as scrap during the 2010 auction. The inspection following the removal of these items identified one area of significant surface soil staining covering several square yards beneath the former location of a derelict trailer-mounted aerial lift. This lift was reportedly borrowed by HIPAS from the Poker Flat Research Range for construction of the original antenna array. The lift was stored in the Boneyard upon completion of use in the early 1980s and was not returned to Poker Flat. The stained soil had an odor of hydraulic fluid, consistent with the location beneath the hydraulics of the lift. No field screening or laboratory sampling was conducted due to the visible connection between the stain and the source.

A few other small areas (less than one square foot) of darker soil were observed on the ground surface during the inspection. This type of soil was loosened and inspected, but none had an odor or an elevated field screening result. The inspection indicated the dark soil was typically less than one inch thick and may have been due to moisture, rust, or some other non-environmental concern. These small areas were not further assessed or investigated.

2012 Assessment and Remediation Activities

A second visual inspection of the Boneyard was completed in 2012 to confirm that no additional releases had occurred during surface debris removal activities in this area since the 2010 inspection. The 2012 inspection did not result in the discovery of any additional surface stains in the Boneyard.

On September 4, 2012, a test pit was excavated through the stained area associated with the aerial lift to determine the depth of the potential contamination. One characterization sample (BY-HYD-1) was collected from a depth of one foot to confirm observations and field screening results that indicated that contamination did not extend to this location. The sample was analyzed for DRO and RRO based on the documented release of hydraulic fluid. The characterization sample was non-detect for DRO and below the ADEC Method 2 Cleanup Limit for RRO.

This data was used to complete a remedial excavation directed by visual observations confirmed by headspace field screening on September 11, 2012. Approximately two cubic yards of contaminated soil were excavated and placed in a temporary stockpile. Laboratory sampling consisted of two samples for closure (P7-2-1 and P7-S-Surf) for DRO and RRO analyses. Laboratory results indicated that P7-S-Surf met the cleanup levels, while P7-2-1 had a DRO concentration of 251 mg/Kg, just above the cleanup level of 250 mg/Kg.

Based on this result, additional excavation of one cubic yard of material was conducted at the P7-2-1 location. Additional laboratory sampling for closure consisted of 1 closure sample and 1 duplicate for DRO and RRO analysis. Each closure sample was below the cleanup level for each COC. Based on these results, clean closure for this location was achieved and no further assessment or remedial action is considered necessary.

The approximately 3 cubic yards of excavated soil was temporarily stockpiled on-site pending the sampling results, which classified the stockpile as containing non-hazardous petroleum contaminated soil. The stockpile was transported in bulk with other petroleum contaminated soil for off-site thermal remediation.

6.6 Generator Building Diesel Storage Tank

A 10,000 gallon capacity diesel storage AST was identified east of the Generator Building during the ESA I conducted in 2008. This AST supplied fuel for the two large generators located inside the Generator Building that were used for atmospheric research, as well as supplying heating oil for the boilers inside both the Generator Building and the Transmitter Building to the east. This tank was located within a containment area surrounded by a soil berm with a containment liner. Standing water observed within the liner did not have a sheen, but the liner was also observed to have several penetrations near the top of the berm. The ESA I recommended visual inspection and field screening beneath the liner following removal of the tank and other materials.

2010 Work Completed
The AST was sold at auction and removed from the site in 2010. ***NORTECH*** inspected the berm and liner for possible penetrations. A small amount of standing water with no sheen or other evidence of contamination was observed. The railroad tie cribbing was collected and stacked for use as cribbing by others during building relocation efforts. The liner was rolled up and moved to allow inspection beneath the tank containment area. No stained soil or petroleum odor was observed beneath the liner. The product delivery lines running to the Generator Building were also inspected and no evidence of contamination was observed. Additionally, the fuel line to the Transmitter Building was inspected and no evidence of weeping, such as an odor, staining, or distressed vegetation, was observed.

Field screening was undertaken on a grid beneath the tank containment area, including the berm material. Field screening results were at background levels at each location, except for one elevated result near the southern edge of the containment area. One laboratory soil sample was collected from the location of the elevated screening result and submitted for GRO, BTEX, DRO and RRO analysis based on the known use of the AST for storage of heating oil / diesel fuel. The laboratory results show DRO contamination exceeded the cleanup level while GRO, BTEX compounds, and RRO were not detected. The suspect soil was returned to the excavation and measurements from nearby structures were obtained to identify this location in the future. Based on the field observations and laboratory results, approximately 10 cubic yards of contaminated material was estimated to remain at this location.

2012 Remediation Activities

Remedial excavation was conducted at this location on September 13, 2012. Soil headspace field screening confirmed that the location had elevated results, similar to those observed in 2010. Approximately 10 cubic yards of contaminated soil were excavated and placed in a temporary stockpile based on the field screening results. The field screening limits at the extents of the excavation were used to locate six closure samples (five primary samples and one duplicate) at the limits of the excavation. Each closure sample was below the cleanup level for each COC. Based on these results, clean closure for this location was achieved and no further assessment or remedial action is considered necessary..

At the request of ADEC, a composite stockpile sample was also collected and run for PCBs. No detectable levels of PCE were found in the composite sample and the stockpile was classified as containing non-hazardous petroleum contaminated soil. Based on these results, the stockpile was transported in bulk with other petroleum contaminated soil for off-site thermal remediation.

6.7 Generator Building Floor

Observations during the ESA I and subsequent discussions with multiple people identified the potential for petroleum contamination beneath the slab of the Generator Building. While direct discharge of fluids to the environment was not suspected, leaks and spills of lubrication oil and coolant were known to have occurred on the concrete floor in the vicinity the two generators located in the Generator Building at the facility. The thick concrete pedestal that each generator was located on appeared to have been poured first and then the remainder of the generator building floor was poured later, requiring an expansion joint that created a potential pathway for contaminants to reach the subsurface. The joint appeared to have been reasonably constructed by concrete standards, but did not appear to have caulking or other treatment to reduce/prevent penetration of potential contamination.

The generators and Generator Building were sold at auction in 2010, but were not removed by the purchaser within the appropriate timeframe. These items were sold again at second auction in early 2011 and were removed during the spring of that year.

Mr. Richards indicated that lubrication oil and coolant were released to the concrete pedestal and floor while the central generator was being moved onto a trailer for transport off the site. Mr. Richards indicated that the purchaser of the generators retained Emerald Alaska to clean up the release to the concrete and remove remaining fluids from the generator reservoirs. This work was confirmed by Emerald.

2010 Work Completed

A limited assessment was undertaken in 2010 to evaluate the potential contamination beneath the Generator Building slab. The two generators and the building remained in place, significantly limiting access for the assessment. The most likely area for a significant release of oil was determined to be the oil drain area near the northeast corner of each of the two generators. This area also had piping that made both visual inspection and jackhammer access difficult, so the penetration of the concrete slab and soil assessment was located approximately 5 feet northeast of each generator. Access to the subsurface was through a jackhammer hole of approximately one square foot. The concrete floor in this location was approximately 4 to 6 inches thick and reinforcement consisted of rebar in one location and steel mesh in the other location.

The environmental assessment consisted of advancing a hand auger to a depth of approximately 16 inches below the bottom of the concrete. Field screening samples were collected every 4 to 6 inches at both locations. The soil beneath the slab at these locations appeared to be native silt with only traces of gravel observed. Visual inspection indicated natural color variation and stratigraphy, including a darker layer that may have represented an older organic horizon. No visual or olfactory evidence of contamination was observed at either location and each field screening result was within the background range.

These observations indicated that contamination most likely did not extend more than 5 feet horizontally from the joint at the base of each of the two used generator pads. This observation was consistent with the expected limited migration of heavier oils, such as the oil that would reasonably be expected to be encountered near the generators. The visual inspection of the expansion joint material indicated that petroleum contamination could be present at any location along the joint, but could not be assessed with the generators and concrete floor in place next to the pedestals. A total of approximately 50 cubic yards of contaminated soil was assumed to be located in the vicinity of the two generator pedestal joints for cost estimating purposes.

2012 Characterization and Remediation Activities

Characterization around the two generator pedestals (referred to as the north pedestal and central pedestal) was completed during final cleanup activities in 2012 following removal of the generators and building in 2011. The southern pedestal had not had an operating generator and was not considered a suspect location. Approximately 24 inches of the concrete floor slab was removed around the perimeter of the two generator pedestals and the exposed soil surface was inspected. Multiple areas with visible staining and the odor of weathered lubrication oil were observed around the perimeter of the pedestals.

Initial assessment of these stained areas was undertaken with hand tools. Field observations and field screening indicated that most of these areas were consistent with lubrication oil and the extent of contamination was relatively minor, with surface areas of less than two square feet and depths of less than 12 inches. In addition to these minor areas, each generator also appeared to have more extensive contamination near the southeast corner of the pedestal. The observed odor and field screening results at these locations were more consistent with diesel fuel. Initial hand auger borings indicated that the contamination extended at least four feet below the top of the concrete floor slab elevation. The vertical soil profile consisted largely of silts and silty sand. Further review of the generator operations indicated that the fuel filter for each generator was located near the southeast corner of each pedestal.

The larger areas with suspected diesel fuel contamination required the removal of additional concrete floor slab on the east side of the generator pedestals. Remedial excavation of these areas began after the removal of the floor slab. This work was undertaken in several phases based on field observations, including interim characterization samples confirming DRO contamination. At the completion of the remedial excavation of the eastern ends of the northern and central pedestals, approximately 50 cubic yards of contaminated soil had been placed in the temporary stockpiles. Field screening results were used to guide the remedial excavation down the side of the pedestals and a few feet below and underneath the pedestals. The final excavations extended to a depth of approximately seven feet below the top of the slab and approximately 10 feet east of each pedestal. Figure 7 details the extent of excavation at this site.

The other shallow stained areas around the perimeter of the two pedestals were identified as RRO, most likely old lubrication oil, through laboratory characterization. These locations were hand excavated and a cumulative total of approximately 2-3 cubic yards of this soil was stockpiled for disposal.

Waste characterization testing of the contaminated stockpile included GRO, DRO, RRO, VOCs, RCRA 8 metals, PCBs, and ethylene and propylene glycol based on the potential concerns associated with the generators. The results of these samples indicated DRO and RRO were the COCs associated with the releases around the generator pedestals. Based on the laboratory results, the stockpiles were determined to be non-hazardous petroleum contaminated soil and were transported in bulk with other petroleum contaminated soil for off-site thermal remediation.

Based on field screening results, 14 samples (12 primary samples and 2 duplicates) were collected for closure of the excavations. Laboratory analyses for the closure samples were limited to DRO and RRO based on the waste characterization results. Laboratory results indicate the samples the cleanup levels and clean closure was achieved. No further assessment or remedial action is necessary around the generator pedestals.

The concrete surfaces of the generator pedestals were cleaned to remove petroleum staining to the extent possible. Following scrubbing and sandblasting, only slight discoloration was observed and no residue was observed during wiping with a rag. The concrete foundation items that remain in place are shown in Figure 7. Gravel backfill was used to create a slope from the top of the generator pedestals to the concrete floor slab to make the site more level.

6.8 Driveway/Parking Area Surface Stains

In addition to the concerns at the Generator Building, two surface stains were identified and remediated from the driveway/parking area south of the Generator Building. Each of these is discussed below.

Parts Generator Stain

A parts generator was stored on the edge of the built-up pad south of the Generator Building, approximately midway between the Generator Building and the Transmitter Pad. A release of lubrication oil was observed during cleanup activities in 2010. A contractor at the site cleaned up the visible oil and contaminated soil, but could not reach the limited amount of contaminated soil that was expected to have gone beneath the generator.

The generator and ancillary components were sold at auction and removed by the purchasers in 2011. An inspection of the surface indicated an area of stained soil of approximately 30 square feet was present following removal of the generator and hand excavation showed that the contamination extended less than a foot below the ground surface.

On September 14, 2012, hand excavation, directed by field screening and visual observation, resulted in the excavation of less than one cubic yard of contaminated soil. The results from the Generator Building stockpile were used to characterize this material because the source was generator lubrication oil. The highest field screening results at the limits of the excavation were used to identify two locations for closure laboratory samples. The samples were submitted for DRO and RRO analyses based on the known source of contamination. Each closure sample was below the cleanup level for each COC. Based on these results, clean closure for this location was achieved and no further assessment or remedial action is considered necessary.

Heavy Equipment Drips

Approximately 10 square feet with intermittent stained surface soil was identified near the southern edge of the built-up pad, approximately 85 feet south of the southeast corner of the Generator Building pad. Heavy equipment had been parked at this location by the individuals that removed the Generator Building in 2011. The staining was consistent with drips from stored heavy equipment. Visual inspection and field screening indicated contamination was limited to no more than six inches below the ground surface.

On September 14, 2012, hand excavation, directed by field screening and visual observation, resulted in the excavation of about one cubic yard of contaminated soil. This material was disposed of as non-hazardous petroleum contaminated soil based on the known source of the release. The highest field screening results at the limits of the excavation were used to identify two locations for closure laboratory samples. The samples were submitted for DRO and RRO analyses. Each closure sample was below the cleanup level for each COC. Based on these results, clean closure for this location was achieved and no further assessment or remedial action is considered necessary.

7.0 DECOMMISSIONING ACTIVITIES: OTHER CONTAMINATION

7.1 LIDAR Building Mercury Contamination

The ESA I conducted by ***NORTECH*** in 2008 identified the potential for mercury contamination around the southern end of the LIDAR Building. This portion of the building was a two story structure and contained the Liquid Mirror Telescope (LMT) and associated hardware. The LMT utilized mercury as a reflecting surface on a 2.7-meter rotating dish which was used in conjunction with lasers for research conducted at the facility. The LMT was located on the ground floor of the building and had support equipment on a second floor mezzanine below a roof that opened during research activities. The second floor also had a room containing control and support equipment. Collectively, the LMT room and second floor were referred to as the LIDAR Tower.

The LIDAR Tower was equipped with a mercury vapor monitoring system and was sealed and isolated from the laser control room and the northern portion(s) of the building. At the time of the 2008 ESA I inspection, the mercury monitoring system was not operational and the LMT room had been locked and sealed. Approximately 20 sealed containers of elemental mercury were observed inside the LMT room. Numerous small containers of dyes and other chemicals related to the LMT research were located in the control room on the second floor.

2009 Work Completed
In 2009, Emerald Alaska characterized and disposed of the elemental mercury, dyes, and other liquid materials from inside the LIDAR Tower. During mercury collection, "beads" of mercury were observed on the floor within the LMT room. Limited wipe samples confirmed mercury residue was present on the interior surfaces of the LMT room and mezzanine, but not the remainder of the LIDAR Tower. Based on these results, the northern, one-story portion of the LIDAR Building was placed in the 2010 auction. Disposal records can be found in Appendix 8.

2010 Work Completed
In 2010, ***NORTECH*** completed assessment and cleaning of the LIDAR Tower. At the time of the assessment, the northern portion of the LIDAR Building was present and had been prepared for removal from the site. During cleaning of the LIDAR Tower, approximately three-quarters of a gallon of mercury was identified in a five-gallon bucket and repackaged for disposal. Other free mercury identified during cleaning was also collected and packaged for disposal. During this effort, six cubic yards of porous items and building materials (including the LMT table) were also collected and packaged as mercury contaminated waste. Disposal records can be found in Appendix 8. The remaining nonporous surfaces and the entire LIDAR Tower were scrubbed multiple times with mercury reactive detergent to evaluate the potential to remove the mercury residue.

Mercury vapor monitoring was conducted throughout the cleaning and waste removal process, as well as on several occasions in the months following completion of this work. Mercury vapor levels on the second floor of the structure were at background levels while vapor levels on the first floor were elevated slightly above background. The elevated levels indicated that the LMT room was not safe for unprotected entry and/or occupation for sale or other users prior to or during demolition.

A representative sample of each building material from each floor was collected for mercury vapor analysis, including the concrete floor and the expansion joint material within the floor. Mercury vapor analysis indicated that the building materials had only low levels of mercury vapor. Based on these results, a single composite TCLP sample of the entire building and concrete floor was appropriate for disposal characterization of the structure. The TCLP sample results confirmed that the building material waste stream met the TCLP criteria as non-hazardous waste.

The results of the assessment and cleaning activities indicate that controlled access and mechanical demolition were more appropriate than trying to clean the facility to the point that unprotected occupation or standard demolition was safe. The building materials could then be disposed of as construction and demolition waste at the FNSB Landfill.

A draft Work Plan submitted to ADEC identified field analysis using an XRF as the preferred method of field screening and laboratory testing for mercury contaminated soil. ADEC indicated that this would not be acceptable and required laboratory testing without approving a field screening methodology. Based on previous experience with the building materials, the revised work plan included headspace field screening using a mercury vapor monitor in a manner similar to field screening for petroleum with a PID.

2011 Building Demolition and Soil Characterization
The LIDAR Tower was mechanically demolished in December 2011 by R&D Environmental. The building materials above the foundation were transported to the FNSB Landfill for disposal. Mercury vapor monitoring was conducted throughout the demolition activities and during the loading of the building materials for disposal. Monitoring did not detect any elevated mercury in or around the demolition project area.

Upon removal of the building structure, the concrete foundation pad was visually inspected for cracks and elemental mercury. The remaining materials were also inspected with the mercury vapor monitor prior to removal. The cracks and expansion joints were mapped for sub-slab monitoring following removal of the foundation. No free elemental mercury was observed within the concrete or expansion joint material and no elevated vapor monitoring results were observed. The cracks and expansion joints that were observed are shown in Figure 9.

During demolition, the floor of the building was found to have been poured as a “mono-slab” instead of the expected perimeter footing with a stem wall and slab floor. The concrete thickness ranged from 18-24 inches and required demolition with a hydraulic hammer to break up the concrete for disposal. Since this work was completed in the winter, the small concrete fragments and dust generated during the demolition were obscured by snow. The material was also disposed of as part of the building waste stream at the FNSB Landfill as planned.

The soil beneath the LIDAR Towner footprint was assessed for potential mercury contamination following demolition. Based on the known past use of the LIDAR Tower, the COC at this location was mercury. This assessment included visual inspections for elemental mercury and other remaining building material, but was limited by snow and winter conditions. Specific attention was focused on any areas with mapped cracks or expansion joints that could have provided a preferential pathway for contaminant migration. In addition to the inspection, more than 15 locations were field screened with the mercury vapor monitoring following headspace methodology as described in Appendix 6.

Based on these results, five laboratory samples (4 plus 1 duplicate) were collected. The laboratory results indicated mercury concentrations above the cleanup level of 1.4 mg/kg at two of the four laboratory sample locations. One of these samples was located below the edge of remaining LIDAR Building slab, while the other came from beneath a crack in the southeast portion of the building footprint. The laboratory results confirmed mercury was present in the soil beneath the slab along seams and cracks. This data was also used to evaluate the field screening methodology. Based on these results, the methodology appeared to be effective and any soil with a detectable mercury vapor concentration was likely to exceed the cleanup level.

2012 Characterization and Remedial Efforts

Once snow melted in May 2012, a site inspection identified the demolition dust and rubble as a potential source of mercury in the soil samples. The debris seemed to be largely from the painted surface of the slab, which was considered the most likely material to be contaminated with mercury due to the relative impermeability of concrete. Additional site characterization samples were collected in July 2012 from below the visible surface debris to confirm the December 2011 sampling event. These results generally confirmed the previous results, suggesting that mercury had penetrated through the cracks and joints in the concrete. The laboratory also confirmed the field screening methodology a mercury vapor analyzer with was appropriate for the material at the site.

Based on these results, additional investigation was considered necessary to determine the limits of the mercury contamination. Hand excavation of the concrete debris and soil beneath the expansion joints and cracks was completed from August 27 through

August 29, 2012. Initial excavation was limited to removing the visible concrete debris from the excavation perimeter and extents. Mercury headspace field screening was conducted of the post excavation surface and the monitoring results indicated detectable mercury vapor concentrations remained at several locations. Additional suspect soil was removed from these locations until no mercury vapors were detected with the instrument. Approximately ten cubic yards of gravel and debris were excavated and containerized in cubic yard boxes during these activities.

Six samples (including one field duplicate) were collected to characterize the remaining soil surface once no elevated field screening results were observed. Mercury was detected in these samples, but each sample was below the mercury cleanup level of 1.4 mg/kg. An additional four samples were collected from around the exterior of the building footprint to verify that demolition dust had not impacted those areas. No mercury was detected in these samples, confirming the potential mercury contamination was limited to beneath the footprint of the building. Based on the sample results, the contaminated soil associated with the LIDAR Tower had been removed and no additional characterization or remedial action was considered necessary.

The mercury contaminated soil waste stream was characterized by collecting a composite sample for TCLP analysis. The results indicated that the soil should be disposed of non-hazardous waste. The stockpiled material was removed from site by Emerald Alaska for disposal. Disposal paperwork can be found in Appendix 8. Following receipt of the laboratory results, the contractor completing the other construction activities at the site filled the building footprint with pit-run gravel to make the area level with the remaining concrete slab.

7.2 Wastewater System Decommissioning

Five wastewater disposal systems were identified during the site assessment and initial site characterization phases. One of these, in the woods near the ATCO Building, did not appear to be associated with any of the buildings at the site. Based on comments from UA and revisions of the work plan approved by UCLA, the liquid and sludge (if present) in each septic tank were sampled for metals.

During sampling, the tank near the ATCO Building did not have any liquids or sludge so no sample was collected. The other septic tanks had very little sludge and no sludge samples were collected. Liquids appeared consistent with the disposal of human waste with no evidence of chemical or petroleum disposal. The results from each tank were below cleanup levels or within the accepted background levels for metals in the Fairbanks area. This confirmed that the wastewater system had not been used for disposal of chemicals and that the other piping and the soil absorption system components of each system could be abandoned in place.

Four septic tanks were exposed, pumped empty, and removed from the Site by the excavation contractor during September 2012. These locations were backfilled with pit-run fill. The fifth location, near the ATCO Building, was found to be a buried wooden crib without a septic tank. No evidence of human waste or other use was present on the soil surface within the crib. The contractor removed the crib structure and spread lime on the ground surface and excavated soil as a precaution. After a few days of exposure to the air, this location was backfilled with the excavated material and a small amount of pit-run gravel.

Based on these results and observations, the wastewater systems have been adequately decommissioned. The locations of remaining piping and soil absorptions systems at the site are shown on Figure 10, along with the location of the former septic tanks and crib. No additional investigation or cleanup activities is considered necessary to decommission these systems.

8.0 LABORATORY DATA QUALITY CONTROL SUMMARY

Seventeen laboratory reports were issued for the Site and copies of these are located in Appendix 4. Data quality objectives for the project were to meet the requirements of the planning documents, which were in generally accordance with the FSG. The goal of the project was to produce data of adequate quality for comparison to 18 AAC 75 cleanup levels and close the environmental concerns at the Site.

The primary tool used to assess the quality of the data was the ADEC LDRC. A LDRC was completed for each individual laboratory work order and is included in Appendix 5. Based on review of the field procedures and the laboratory quality control reviews as indicated by the completed laboratory data review checklists, all of the data may be used for the objectives of this report. No significant concerns were noted with the data used for closure of the multiple contaminated areas at the Site.

A total of ten soil field duplicate pairs and were collected to evaluate field and laboratory quality control during this effort. The primary method to evaluate this is the relative percent difference (RPD) between the results for each detected compound in the duplicate pair. Table 2 in Appendix 2 summarizes the field duplicate sample comparisons. The duplicate pair RPDs are briefly discussed in the LDRCs for each lab report. The RPDs were within the preferred range of +/-50% for soil samples

9.0 CONCLUSIONS AND RECOMMENDATIONS

NORTECH has completed project management, site characterization, and remediation activities required to complete decommissioning of the High Power Aurora Stimulation (HIPAS) Observatory near Fairbanks, Alaska. The facility had been conducting atmospheric research since the early 1980s and had buildings, antennas, and storage areas spread across the 130 acre parcel. At the completion of these decommissioning activities, the buildings have been removed down to the ground surface, surface debris has been removed, and the documented environmental concerns have been remediated. The only remaining improvements are the former building foundations and the subgrade utilities.

Based on the field observations, field screening results, laboratory data, and other information gathered during this project, ***NORTECH*** has the following conclusions and recommendation regarding the Site.

Surface Material Removal

- The physical assets, including structures, generators, tanks, materials and equipment were inventoried and removed from the Site for re-use or disposal
- Exposed wire and large metal debris were removed from the Site for recycling
- Concrete foundations, buried main power cables and buried aluminum grid wire remain at the Site
- Asbestos concerns related to a generator exhaust stack were abated in accordance with EPA regulations
- The Site surface is now in "broom-clean" conditions
- No further action is considered necessary and debris removal is considered complete

Environmental Concerns Identified in the Phase I ESA or other Documents

- Drums and containers of petroleum and glycol have been characterized and removed from the Site for disposal
- The transformers and capacitors have been characterized and removed from the Site for disposal
- No evidence of a release of petroleum or other hazardous substance was observed and no assessment was necessary at the following locations:
    - Transmitter Pad Antenna Array
    - Dipole AST
    - ATCO AST and fuel line
    - Transmitter Building floor drain and crawlspace

- The five drinking water wells have been decommissioned in accordance with ADNR requirements
    - Well casings were cut and sealed with concrete and bentonite at least five feet below the ground surface
    - The former well locations are shown on project documents
- Petroleum contamination at the following locations has been characterized and remediated in accordance with ADEC regulations
    - LIDAR Garage (AST, loader, drum, and surface stains)
    - LIDAR Building Heating Oil Tank
    - LIDAR Area Abandoned Transformer
    - Boneyard Area – Former Transformer Shed
    - Boneyard Area – Equipment-related Surface Stain
    - Generator Building Diesel Storage Tank
    - Generator Building Pedestals and Floor
        - The pedestals, perimeter foundation walls, and most of the concrete floor of the Generator building remain in place
        - Remaining concrete elements that were impacted by petroleum have been cleaned
    - Driveway/Parking Area Surface Stains
- Mercury contamination related to the Liquid Mirror Telescope (LMT) in the LIDAR Towner has been characterized and remediated
    - Elemental mercury and hazardous wastes were collected and removed from the site
    - The LIDAR Tower, including the foundation, were demolished and removed from the site
    - Mercury contaminated soil found beneath the LIDAR Tower was containerized and removed from the site
- The five wastewater disposal systems have been decommissioned
    - Inspection and testing of septic tank contents showed no evidence of improper disposal of chemicals or materials
    - The four septic tanks were pumped and removed from the site
    - The fifth system consisted of a buried crib, which was removed from the site
    - Other buried piping and soil absorption systems were abandoned in place at the site
    - The locations of these former systems are shown on project documents

- No evidence indicates that groundwater beneath the site was impacted by site activities
    - No evidence of contamination was observed on the well casings prior to decommissioning
    - Contaminated soil was at least 15 feet above the water table and has been completely removed
- The laboratory samples and other observations confirm the following:
    - Previously-documented and known hazardous materials have been characterized and removed from the Site
    - Current conditions are expected to be adequate to obtain a No Further Remedial Action Determination letter from ADEC

Administrative Tasks

- This report documents the removal of improvements, personal property, and hazardous materials as requested by UA since 2008
- This report should be provided to ADEC to document the clean closure of the reported releases of petroleum and mercury
- This report should be provided to UA to document
    - The decommissioning activities completed since closure of the facility
    - The locations of former wells and septic systems
    - The locations of foundations and buried utilities that remain in place

10.0 LIMITATIONS AND NOTIFICATIONS

NORTECH provides a level of service that is performed within the standards of care and competence of the environmental engineering profession. However, it must be recognized that limitations exist within any site investigation. This report provides results based on the analysis and observation of a limited number of samples considering the size and scope of work conducted. Therefore, while these limitations are considered reasonable and adequate for the purposes of this report, actual site conditions may differ. Specifically, the unknown nature of exact subsurface physical conditions, sampling locations, the analytical procedures' inherent limitations, as well as financial and time constraints are limiting factors.

The report is a record of observations and measurements made on the subject site as described. The data should be considered representative only of the time the site investigation was completed. No other warranty or presentation, either expressed or implied, is included or intended. If it is made available to others, it should be for information on factual data only, and not as a warranty of conditions, such as those interpreted from the results presented or discussed in the report. The undersigned certify that except as specifically noted in this report, the statements and data appearing in this report are in conformance with ADEC's Standard Sampling Procedures. ***NORTECH*** has performed the work, made the findings, and proposed the recommendations described in this report in accordance with generally accepted environmental engineering practices.

11.0 SIGNATURES OF ENVIRONMENTAL PROFESSIONALS

NORTECH is a Fairbanks-based, professional consulting firm, established in 1981, offering environmental engineering, civil engineering, and industrial hygiene consulting services. ***NORTECH*** has offices in Fairbanks, Anchorage and Juneau and has completed numerous decommissioning projects, site remediation efforts and other property and/or building inspections across Alaska.

Pauline Fusco, EIT, CEA has a B.S. degree in Civil and Environmental Engineering and has been involved in the environmental field for the last five years. She has extensive field experience completing energy audits, environmental assessments and cleanup efforts across Alaska.

Pauline Fusco, EIT, CEA
Civil Engineer

Ronald Pratt, Environmental Scientist for ***NORTECH,*** has a B.S. in Geography and Masters in Environmental Studies. He has extensive experience conducting environmental assessments, hazardous materials investigations, remedial investigations, and other environmental fieldwork throughout California, Washington, and Alaska.

Ronald J. Pratt
Environmental Scientist

Peter Beardsley, PE, Environmental Engineer for ***NORTECH*** has a B.S. degree in Environmental Engineering and has been in responsible charge of ***NORTECH***'s Phase I ESA program for the last seven years. He is a registered professional engineer in Alaska (CE 10934) and has over 15 years of experience as a consulting environmental engineer. He has worked on all aspects of environmental assessments, field investigations, and cleanup efforts.

Peter Beardsley, PE
Environmental Engineer

HIPAS OBSERVATORY DECOMMISSIONING
FAIRBANKS (TWO RIVERS), ALASKA
FEBRUARY 2013

NORTECH

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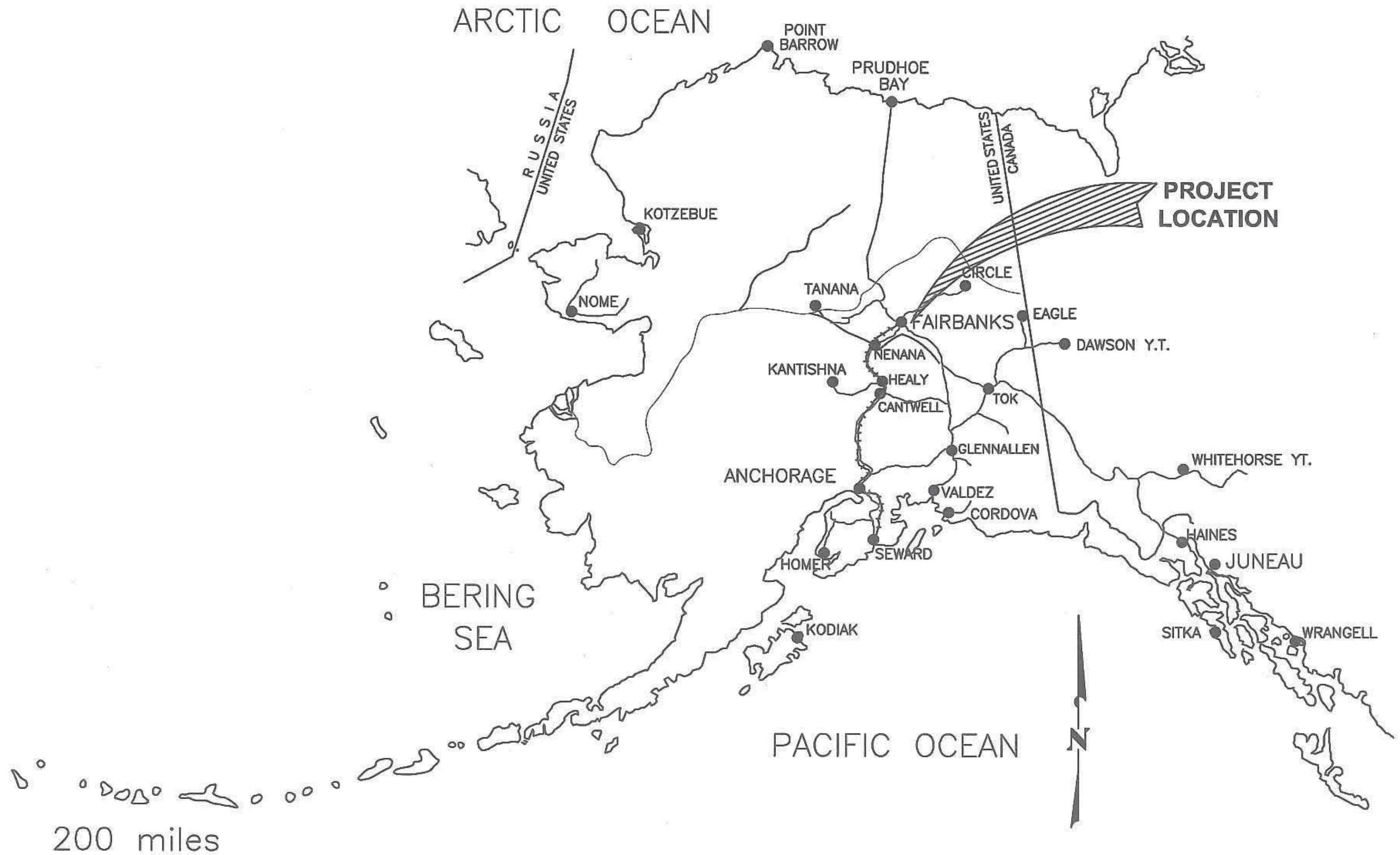

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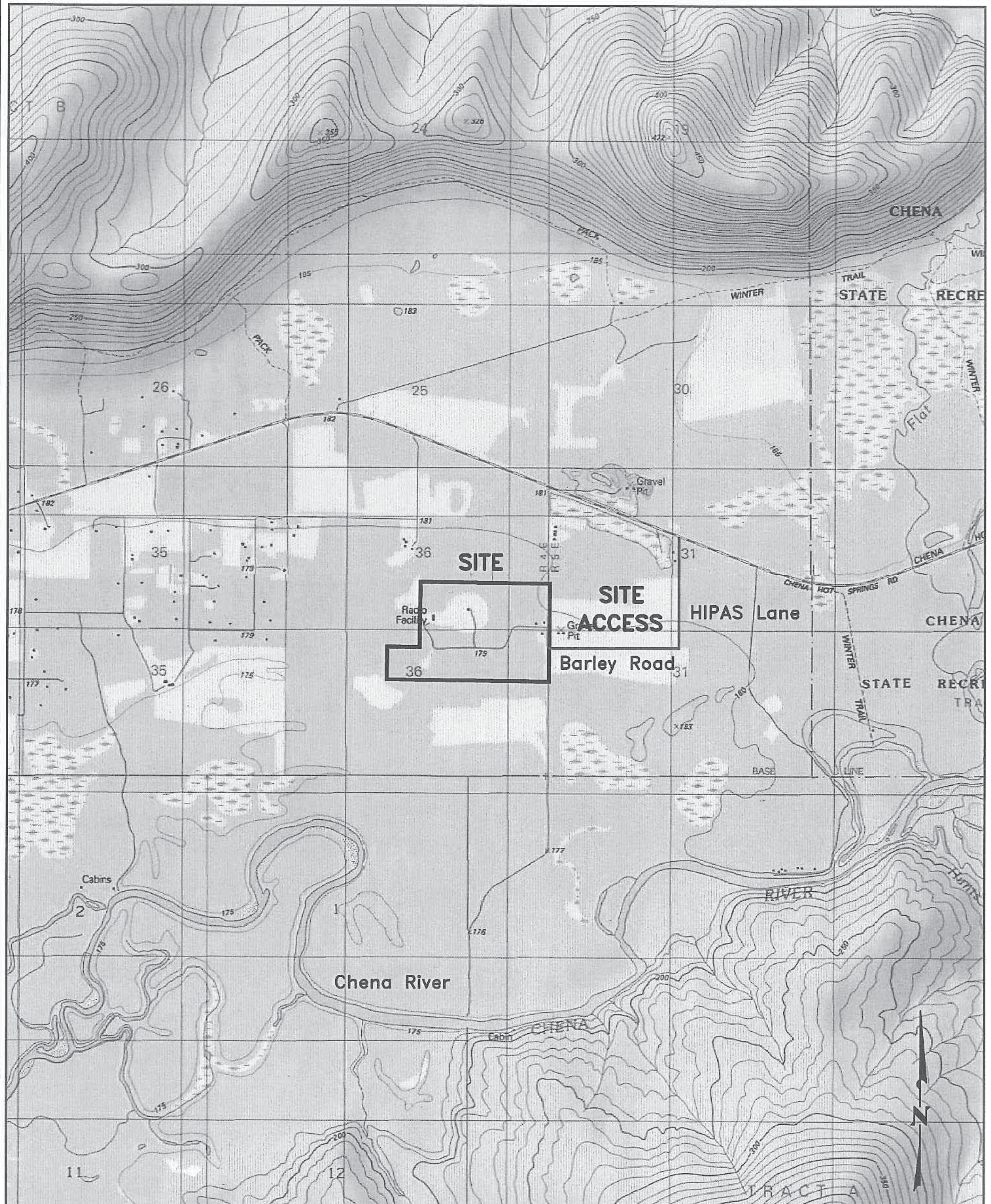


FIGURE 2A
Contour Vicinity Map

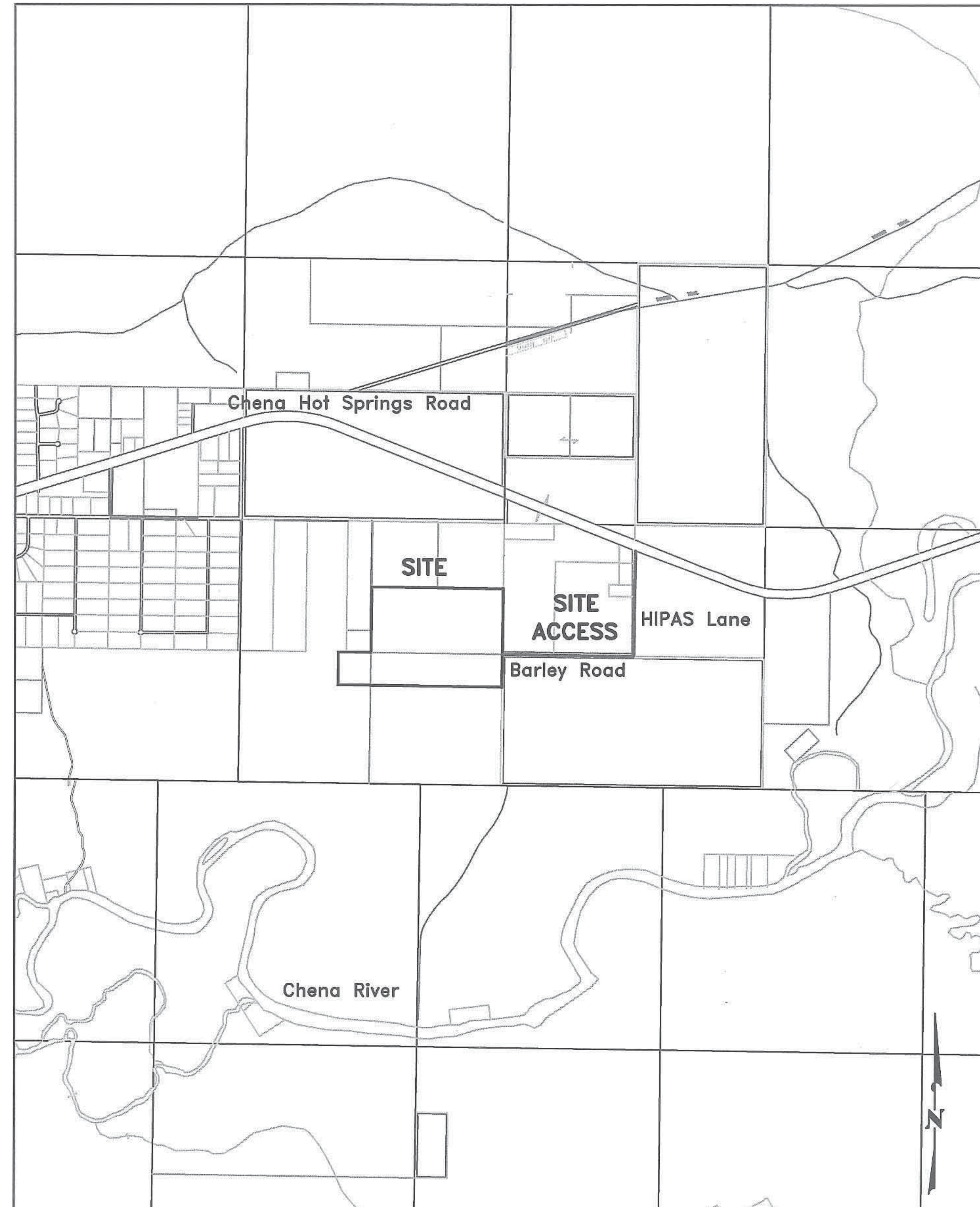


FIGURE 2B
Property Vicinity Map

NORTECH ENVIRONMENT, ENERGY, HEALTH & SAFETY 2400 College Road, Fairbanks, AK. 99709, 907-452-5688 3105 Lakeshore Dr., Anchorage, AK. 99517 907-222-2445 5438 Shaune Dr., Suite B, Juneau, AK. 99801, 907-586-6813	Vicinity Maps Former HIPAS Observatory Decommissioning Fairbanks (Two Rivers), Alaska	DATE: 02/14/13 PROJ MGR: PLB DRAWN: PEF	SCALE: 1"=1/2 mile PROJECT: 08-1091 DWG. NO.: 081091p(02)

FIGURE 02

GENERAL NOTES

1. General notes apply to all sheets related to environmental cleanup and remediation.

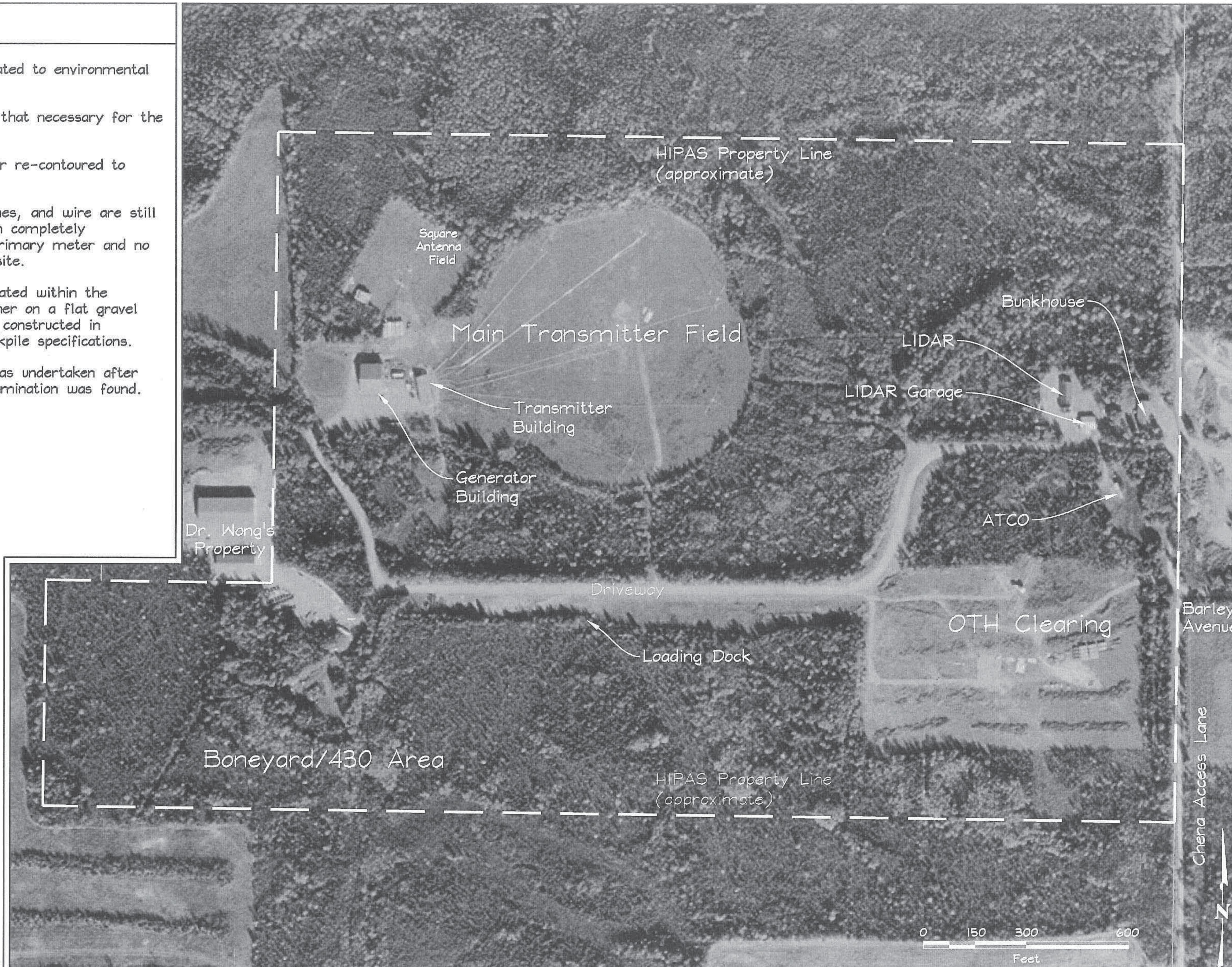
2. Foundation demolition was limited to that necessary for the removal of contaminated soil.

3. Remediation excavations were filled or re-contoured to match existing grade.

4. Buried communication lines, power lines, and wire are still present. Power to the facility has been completely disconnected by GVEA at the off-site primary meter and no line of any type remains active at the site.

5. Contaminated soil stockpiles were located within the equipment reach at each excavation, either on a flat gravel area or concrete slab. Stockpiles were constructed in accordance with ADEC Short-term Stockpile specifications.

6. Field inspection and field screening was undertaken after stockpile removal. No evidence of contamination was found.



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Site Map (2007 Aerial Photo)
Former HIPAS Observatory Decommissioning
Fairbanks (Two Rivers), Alaska

DATE: 02/14/13	SCALE: 1" = 300'
PROJ MGR: PLB	PROJECT: 08-1091
DRAWN: PEF	DWG. NO.: 081091m(03)

FIGURE 03

KEYED NOTES

P1 LIDAR Garage AST, Loader and Drum
-Clean closure achieved for this site.
-See Figure 05c for details.

P2 LIDAR Heating Oil Tank
-Clean closure achieved for this site.
-See Figure 05a for details.

P3 LIDAR Abandoned Transformer
-Clean closure achieved for this site.
-See Figure 05b for details.

P4 Boneyard Transformer Shed
-Clean closure achieved for this site.
-See Figure 06b for details.

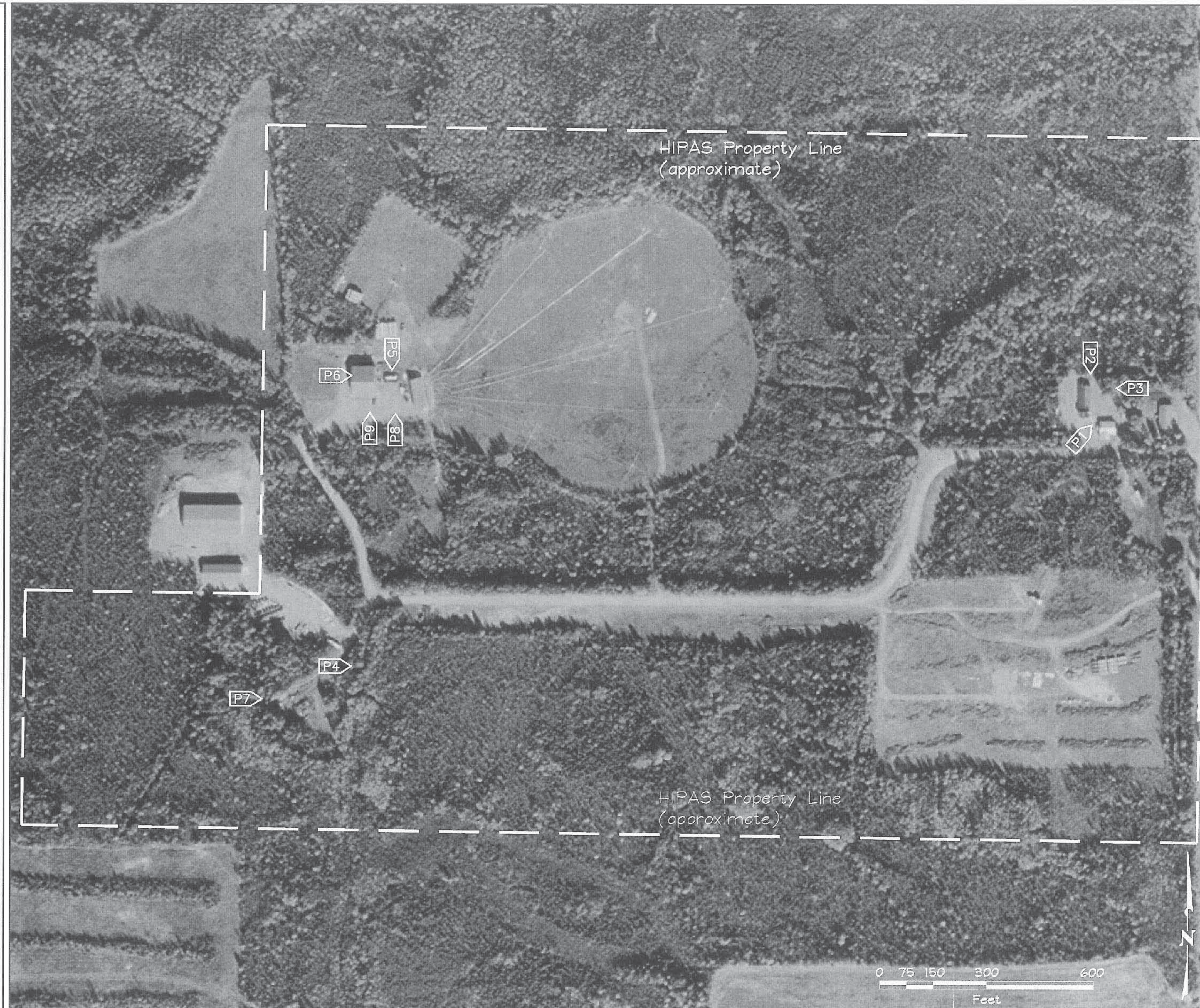
P5 Generator Diesel AST
-Clean closure achieved for this site.
-See Figure 08a for details.

P6 Generator Pedestal and Floor
-Clean closure achieved for this site.
-See Figure 07 for details.

P7 Boneyard Hydraulic Stain
-Clean closure achieved for this site.
-See Figure 06a for details.

P8 Parts Generator Surface Stain
-Clean closure achieved for this site.
-See Figure 08b for details.

P9 Heavy Equipment Surface Stain
-Clean closure achieved for this site.
-See Figure 08c for details.



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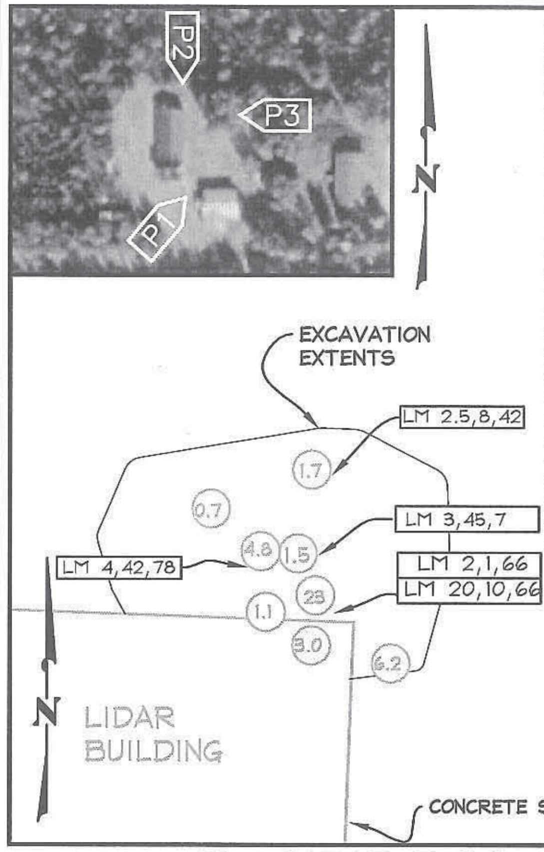
Petroleum Contaminated Sites
Former HIPAS Observatory Decommissioning
Fairbanks (Two Rivers), Alaska

DATE: 02/14/13	SCALE: 1" = 300'
PROJ MGR: PLB	PROJECT: 08-1091
DRAWN: PEF	DWG. NO.: 081091p(04)

FIGURE 04



LIDAR Building AST Laboratory Sample Results Summary (P2)						
Sample ID	ADEC Cleanup Limit	LM 2,1,66 Dup3	LM 20,10,66 Dup3	LM 3,45,7	LM 2.5,8,42	LM 4,42,78
Sample Type		closure	closure	closure	closure	closure
PID Field Screen (ppm)		23.4	23.4	1.5	1.7	4.8
Lab Report W.O.		1128468	1128468	1128468	1128468	1128468
Analyte	Units	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Petroleum Fractions (AK 101, AK 102, AK 103 and 8021B)						
GRO	300	NA	NA	NA	NA	NA
DRO	250	20.9U	20.7U	21U	20.7U	21.4U
RRO	11,000	NA	NA	NA	NA	NA
Benzene	0.025	0.0123U	0.0119U	0.0114U	0.0103U	0.0116U
Ethylbenzene	6.9	0.0247U	0.0238U	0.0228U	0.0206U	0.0232U
Toluene	6.5	0.0247U	0.0238U	0.0228U	0.0206U	0.0232U
Total Xylenes	63	0.0740U	0.0714U	0.0685U	0.0618U	0.0697U
Volatile Organic Compounds (8260)						
		No VOC Analysis performed on any samples				
RCRA 8 Metals (6010/7421)						
		No Metals Analysis performed on any samples				
PCBs (8020)						
	1	No PCB Analysis performed on any samples				
Glycols (8015)						
	190	No Glycol Analysis performed on any samples				

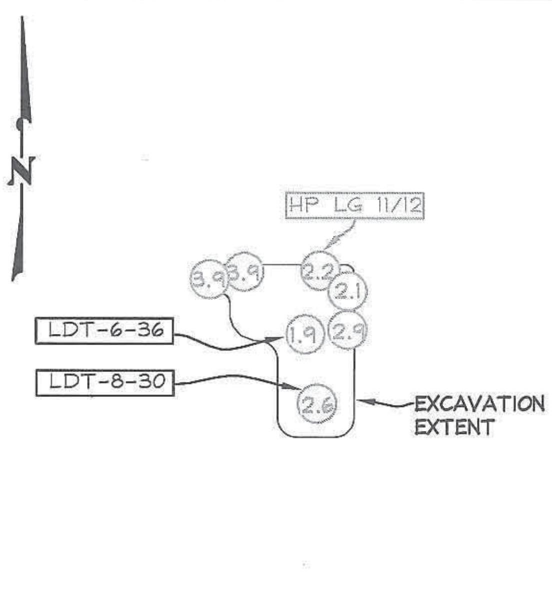
U	Analyte not detected at the listed detection limit
Shade	Analyte detected in concentration below the ADEC Cleanup level
Bold	Analyte detected in concentration exceeding the ADEC Cleanup level
NA	Analyte not analyzed for
NE	No established cleanup limit for analyte
#Dup	Denotes duplicate sample pair

LEGEND

CLOSURE FIELD SCREENING (PPM)

LDT-x-xx CLOSURE SAMPLE LOCATIONS

05a: LIDAR Building AST (P2)



LIDAR Transformer Laboratory Sample Results Summary (P3)						
Sample ID	ADEC Cleanup Limits	HP T3-92861	HP LG 11 Dup4	HP LG 12 Dup4	LDT-8-30	LDT-6-36
Sample Type		Transformer oil	characterize	characterize	closure	closure
PID Field Screen (ppm)		NA	5.3	5.3	2.6	1.9
Lab Report W.O.		1104930	1104930	1104930	1128472	1128472
Analyte	Units	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Petroleum Fractions (AK 101, AK 102, AK 103 and 8021B)						
GRO	300	NA	3.72U	3.22U	NA	NA
DRO	250	NA	66,800	68,900	20.6U	20.4U
RRO	11,000	NA	10,300	10,100	20.6U	20.4U
Benzene	0.025	NA	0.0186U	0.0161U	NA	NA
Ethylbenzene	6.9	NA	0.0745U	0.0644U	NA	NA
Toluene	6.5	NA	0.0745U	0.0644U	NA	NA
Total Xylenes	63	NA	0.1490U	0.1328U	NA	NA
Volatile Organic Compounds (8260)						
		No VOC Analysis performed on any samples				
RCRA 8 Metals (6010/7421)						
		No Metals Analysis performed on any samples				
PCBs (8020)						
Aroclor-1016	1.0	0.997U	NA	NA	NA	NA
Aroclor-1221	1.0	0.997U	NA	NA	NA	NA
Aroclor-1232	1.0	0.997U	NA	NA	NA	NA
Aroclor-1242	1.0	0.997U	NA	NA	NA	NA
Aroclor-1248	1.0	0.997U	NA	NA	NA	NA
Aroclor-1254	1.0	0.997U	NA	NA	NA	NA
Aroclor-1260	1.0	0.997U	NA	NA	NA	NA
Glycols (8015)						
	190	No Glycol Analysis performed on any samples				

U	Analyte not detected at the listed detection limit
Shade	Analyte detected in concentration below the ADEC Cleanup level
Bold	Analyte detected in concentration exceeding the ADEC Cleanup level
NA	Analyte not analyzed for
NE	No established cleanup limit for analyte
#Dup	Denotes duplicate sample pair

LEGEND

CLOSURE FIELD SCREENING (PPM)

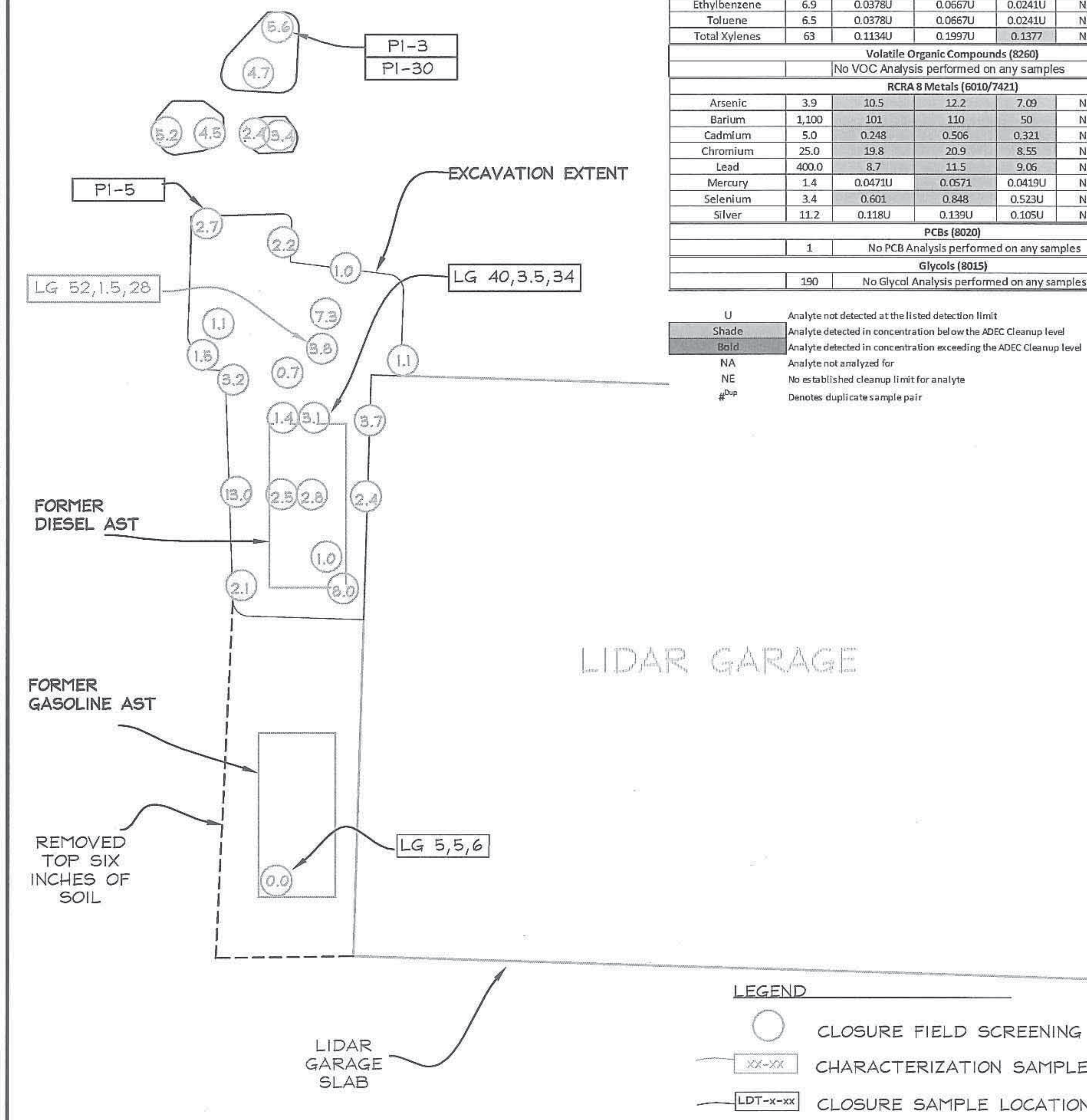
XX-XX CHARACTERIZATION SAMPLE LOCATION

LDT-x-xx CLOSURE SAMPLE LOCATIONS

05b: LIDAR Transformer Stain (P3)

LIDAR Garage ASTs Laboratory Sample Results Summary (P1)							
Sample ID	ADEC Cleanup Limit	LG 52,1.5,28	LG 40,3.5,34	LG 5,5,6	P1-3 Dup2	P1-30 Dup2	P1-5
Sample Type		characterize	closure	closure	closure	closure	closure
PID Field Screen (ppm)		11.4	3.8	3.4	7.3	7.3	2.7
Lab Report W.O.		1128468	1128468	1128468	1124506	1124506	1124506
Analyte	Units	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Petroleum Fractions (AK 101, AK 102, AK 103 and 8021B)							
GRO	300	NA	NA	NA	NA	NA	NA
DRO	250	432	181	21.2U	43.6	53.7	25.2U
RRO	11,000	145	457	21.5	NA	NA	21.6U
Benzene	0.025	0.0189U	0.0334U	0.0121U	NA	NA	NA
Ethylbenzene	6.9	0.0378U	0.0667U	0.0241U	NA	NA	NA
Toluene	6.5	0.0378U	0.0667U	0.0241U	NA	NA	NA
Total Xylenes	63	0.1134U	0.1997U	0.1377	NA	NA	NA
Volatile Organic Compounds (8260)							
		No VOC Analysis performed on any samples					
RCRA 8 Metals (6010/7421)							
Arsenic	3.9	10.5	12.2	7.09	NA	NA	NA
Barium	1,100	101	110	50	NA	NA	NA
Cadmium	5.0	0.248	0.506	0.321	NA	NA	NA
Chromium	25.0	19.8	20.9	8.55	NA	NA	NA
Lead	400.0	8.7	11.5	9.06	NA	NA	NA
Mercury	1.4	0.0471U	0.0571	0.0419U	NA	NA	NA
Selenium	3.4	0.601	0.848	0.523U	NA	NA	NA
Silver	11.2	0.118U	0.139U	0.105U	NA	NA	NA
PCBs (8020)							
	1	No PCB Analysis performed on any samples					
Glycols (8015)							
	190	No Glycol Analysis performed on any samples					

U	Analyte not detected at the listed detection limit
Shade	Analyte detected in concentration below the ADEC Cleanup level
Bold	Analyte detected in concentration exceeding the ADEC Cleanup level
NA	Analyte not analyzed for
NE	No established cleanup limit for analyte
#Dup	Denotes duplicate sample pair



LEGEND

CLOSURE FIELD SCREENING (μg/m3)

XX-XX CHARACTERIZATION SAMPLE LOCATION

LDT-x-xx CLOSURE SAMPLE LOCATIONS

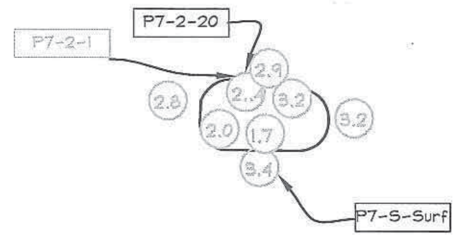
05c: LIDAR Garage AST and Heavy Equipment Stain (P1)

NORTECH
ENVIRONMENT, ENERGY, HEALTH & SAFETY
2400 College Road, Fairbanks, AK. 99709, 907-452-5688
3105 Lakeshore Dr., Anchorage, AK. 99517 907-222-2445
5438 Shaune Dr., Juneau, Alaska 99801 907-586-6813

LIDAR Area ASTs and Transformer Stain
Former HIPAS Observatory Decommissioning
Fairbanks (Two Rivers), Alaska

DATE: 02/14/13	SCALE: 1" = 10'
PROJ MGR: PLB	PROJECT: 08-1091
DRAWN: PEF	DWG. NO.: 081091p(05)

FIGURE 05



Boneyard Hydraulic Stain Laboratory Sample Results Summary (P7)						
Sample ID		BY-HYD-1	P7-2-1	P7-5-Surf	P7-2-20[Dup9]	P7-20-20[Dup9]
Sample Type	ADEC Cleanup Limit	characterize	characterize	closure	closure	closure
PID Field Screen (ppm)		2.6	5.9	3.4	2.2	2.2
Lab Report W.O.		1128448	1128472	1128472	1128516	1128516
Analyte	Units	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Petroleum Fractions (AK 101, AK 102, AK 103 and 8021B)						
GRO	300	NA	NA	NA	NA	NA
DRO	250	33.7U	251	110	24.0U	23.8U
RRO	11,000	101	718	625	NA	NA
Benzene	0.025	NA	NA	NA	NA	NA
Ethylbenzene	6.9	NA	NA	NA	NA	NA
Toluene	6.5	NA	NA	NA	NA	NA
Total Xylenes	63	NA	NA	NA	NA	NA
Volatile Organic Compounds (8260)						
		No VOC Analysis performed on any samples				
RCRA 8 Metals (6010/7421)						
		No Metals Analysis performed on any samples				
PCBs (8020)						
	1.0	No PCB Analysis performed on any samples				
Glycols (8015)						
	190	No Glycol Analysis performed on any samples				

U	Analyte not detected at the listed detection limit
Shade	Analyte detected in concentration below the ADEC Cleanup level
Bold	Analyte detected in concentration exceeding the ADEC Cleanup level
NA	Analyte not analyzed for
NE	No established cleanup limit for analyte
#[Dup]	Denotes duplicate sample pair

LEGEND

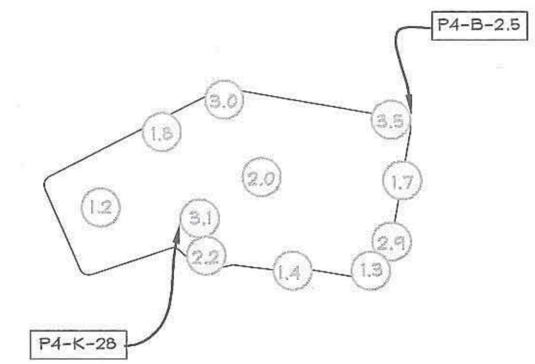
P7-x-x RE-EXCAVATED CLOSURE SAMPLE

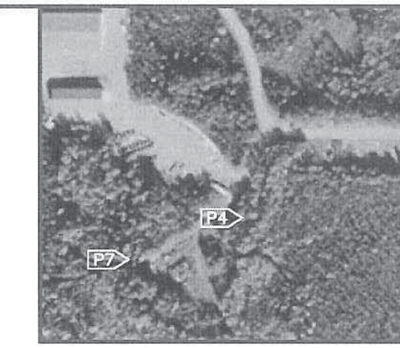
P7-x-x CLOSURE SAMPLE

3.4 CLOSURE FIELD SCREENING

N

06a: Boneyard Hydraulic Stain (P7)





Boneyard Abandoned Transformer Laboratory Sample Results Summary (P4)									
Sample ID	ADEC Cleanup Limit	HP T2-4114166	HP BY 5	HP BY 8	430T-SW-2	430T-EC-1	P4-B-2.5	P4-K-28[Dup5]	P40-K-28[Dup5]
Sample Type		Transformer oil	characterize	characterize	characterize	characterize	closure	closure	closure
PID Field Screen (ppm)		NA	24.1	24.3	3.1	12.6	3.5	2.7	2.7
Lab Report W.O.		1104930	1104930	1104930	1128448	1128448	1128472	1128472	1128472
Analyte	Units	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Petroleum Fractions (AK 101, AK 102, AK 103 and 8021B)									
GRO	300	NA	NA	NA	NA	NA	NA	NA	NA
DRO	250	NA	2,710	3,940	33.2U	4,580	28	24.0U	24.1U
RRO	11,000	NA	397	477	33.2U	499	42.5	27.8	33.8
Benzene	0.025	NA	0.0186U	NA	NA	NA	NA	NA	NA
Ethylbenzene	6.9	NA	0.0745U	NA	NA	NA	NA	NA	NA
Toluene	6.5	NA	0.0745U	NA	NA	NA	NA	NA	NA
Total Xylenes	63	NA	0.1490U	NA	NA	NA	NA	NA	NA
Volatile Organic Compounds (8260)									
		No VOC Analysis performed on any samples							
RCRA 8 Metals (6010/7421)									
		No Metals Analysis performed on any samples							
PCBs (8020)									
Aroclor-1016	1.0	0.997U	0.0669U	0.0642U	NA	NA	NA	NA	NA
Aroclor-1221	1.0	0.997U	0.0669U	0.0642U	NA	NA	NA	NA	NA
Aroclor-1232	1.0	0.997U	0.0669U	0.0642U	NA	NA	NA	NA	NA
Aroclor-1242	1.0	0.997U	0.0669U	0.0642U	NA	NA	NA	NA	NA
Aroclor-1248	1.0	0.997U	0.0669U	0.0642U	NA	NA	NA	NA	NA
Aroclor-1254	1.0	0.997U	0.0669U	0.0642U	NA	NA	NA	NA	NA
Aroclor-1260	1.0	8.68	0.0669U	0.0642U	NA	NA	NA	NA	NA
Glycols (8015)									
	190	No Glycol Analysis performed on any samples							

U	Analyte not detected at the listed detection limit
Shade	Analyte detected in concentration below the ADEC Cleanup level
Bold	Analyte detected in concentration exceeding the ADEC Cleanup level
NA	Analyte not analyzed for
NE	No established cleanup limit for analyte
#[Dup]	Denotes duplicate sample pair

LEGEND

P7-x-x CLOSURE SAMPLE

3.4 CLOSURE FIELD SCREENING

N

06b: Boneyard Transformer Shed Stain (P4)

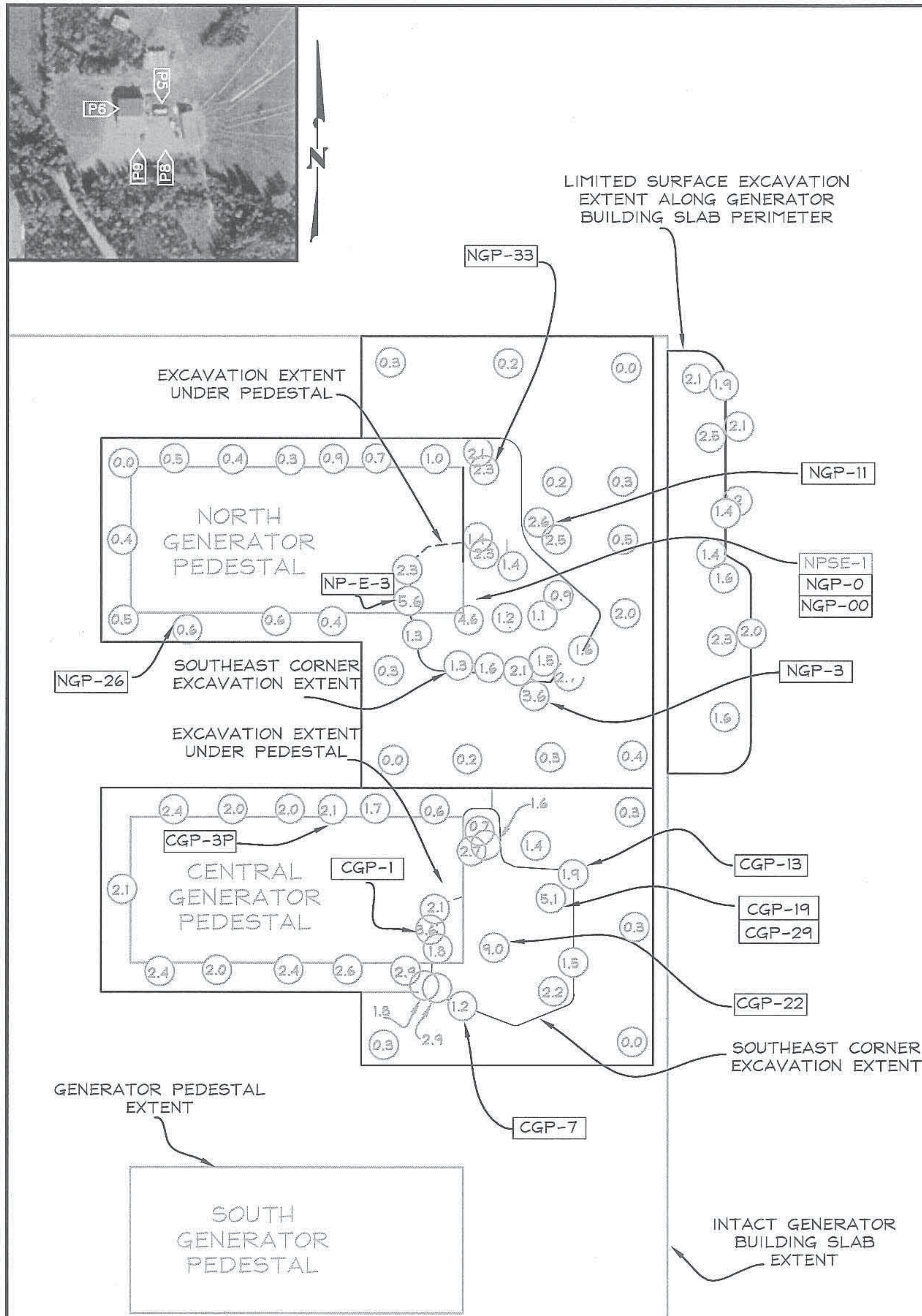
NORTECH

ENVIRONMENT, ENERGY, HEALTH & SAFETY
2400 College Road, Fairbanks, AK. 99709, 907-452-5688
3105 Lakeshore Dr., Anchorage, AK. 99517 907-222-2445
5438 Shaune Dr., Juneau, Alaska 99801 907-586-6813

Boneyard Hydraulic Stain and Transformer Shed Stain
Former HIPAS Observatory Decommissioning
Fairbanks (Two Rivers), Alaska

DATE: 02/14/13	SCALE: 1" = 10'
PROJ MGR: PLB	PROJECT: 08-1091
DRAWN: PF	DWG. NO.: 081091p(06)

FIGURE 06



Generator Building Generator Pedestal Laboratory Sample Results Summary (P6)

Sample ID	ADEC Cleanup Limit	GP-C1	NPSE-1-51	GPC-2	GPC-3	GPCS1-1	GPCS2-3	CGS-1	NGS-2
		Characterization Samples							
Sample Type		Char NP	Char NP	Char CP	Char NP	SP Char	SP Char	SP-Char CP	SP char NP
PID Field Screen (ppm)			133	composite	composite	4.2	8.1	3.1	3.5
Lab Report W.O.		1128478	1128448	1128520	1128520	1128508	1128508	1128520	1128520
Analyte	Units	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Petroleum Fractions (AK 101, AK 102, AK 103 and 8021B)									
GRO	300	NA	NA	2.79U	4.56U	NA	NA	5.36U	3.94
DRO	250	NA	**465**	**327**	NA	23.7U	75.2	113	NA
RRO	11,000	NA	587	5190	NA	91.8	227	272	NA
Benzene	0.025	NA	NA	0.0140U*	0.0228U*	NA	NA	0.0268U*	0.0175U*
Ethylbenzene	6.9	NA	NA	0.0279U*	0.0456U*	NA	NA	0.0536U*	0.0351U*
Toluene	6.5	NA	NA	0.0279U*	0.0456U*	NA	NA	0.0536U*	0.0351U*
Total Xylenes	63	NA	NA	0.112U*	0.182U*	NA	NA	0.214U*	0.140U*
Detected Volatile Organic Compounds (8260)									
1,3,5-Tri-methylbenzene	23	NA	NA	0.0279U	0.176	NA	NA	0.0536U	0.153
4-Isopropyl-toluene	NE	NA	NA	0.0279U	0.0524	NA	NA	0.0536U	0.0575
RCRA 8 Metals (6010/7421)									
Arsenic	3.9	**8.3**	NA	**8.03**	NA	NA	NA	**7.43**	NA
Barium	1,100	113	NA	94.6	NA	NA	NA	90.2	NA
Cadmium	5.0	0.198U	NA	0.719	NA	NA	NA	0.225U	NA
Chromium	25.0	19.1	NA	18	NA	NA	NA	16.3	NA
Lead	400.0	7.03	NA	9.08	NA	NA	NA	5.69	NA
Mercury	1.4	0.0397U	NA	0.0447U	NA	NA	NA	0.0450U	NA
Selenium	3.4	0.496U	NA	0.559U	NA	NA	NA	0.562U	NA
Silver	11.2	0.0992U	NA	0.112U	NA	NA	NA	0.112U	NA
PCBs (8020)									
Aroclor-1016	1.0	0.0534U	NA	0.0566U	NA	NA	NA	0.0563U	NA
Aroclor-1221	1.0	0.0534U	NA	0.0566U	NA	NA	NA	0.0563U	NA
Aroclor-1232	1.0	0.0534U	NA	0.0566U	NA	NA	NA	0.0563U	NA
Aroclor-1242	1.0	0.0534U	NA	0.0566U	NA	NA	NA	0.0563U	NA
Aroclor-1248	1.0	0.0534U	NA	0.0566U	NA	NA	NA	0.0563U	NA
Aroclor-1254	1.0	0.0534U	NA	0.0566U	NA	NA	NA	0.0563U	NA
Aroclor-1260	1.0	0.0534U	NA	0.0566U	NA	NA	NA	0.0563U	NA
Glycols (8015)									
Ethylene	190	NA	NA	2.0U	2.0U	NA	NA	2.0U	2.0U
Propylene	1900	NA	NA	2.0U	2.0U	NA	NA	2.0U	2.0U

		Center Pedestal Excavation Closure							North Pedestal Excavation Closure						
Sample ID	ADEC Cleanup Limit	CGP1	CGP7	CGP13	CGP19[dup7]	CGP29[dup7]	CGP22	CGP-3P	NGP-0[dup8]	NGP-00[dup8]	NGP-3	NGP-33	NGP-26	NGP-11	NP-E-3
Sample Type		closure	closure	closure	closure	closure	closure	closure	closure	closure	closure	closure	closure	closure	closure
PID Field Screen (ppm)		1.8	1.6	2.3	4.9	4.9	7.9	2.1	4.6	4.4	3.6	5.2	0.6	2.4	5.6
Lab Report W.O.		1124506	1124506	1124506	1124506	1124506	1124506	1124506	1124506	1124506	1124506	1124506	1124506	1124506	1124516
Analyte	Units	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Petroleum Fractions (AK 101, AK 102, AK 103 and 8021B)															
GRO	300	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
DRO	250	21.6U	22.5U	21.7U	21.5U	21.5U	21.9	23.0U	21.3U	21.2U	21.8U	20.5U	23.2U	24.0U	22.7U
RRO	11,000	21.6U	22.5U	21.7U	21.5U	21.5U	27.1	34.9	21.3U	21.2U	21.8U	20.5U	23.2U	63.5	NA
Benzene	0.025	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	6.9	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	6.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Xylenes	63	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Detected Volatile Organic Compounds (8260)															
1,3,5-Tri-methylbenzene	23	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Isopropyl-toluene	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
RCRA 8 Metals (6010/7421)															
Arsenic	3.9	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium	1,100	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	5.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	25.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	400.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury	1.4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	3.4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver	11.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCBs (8020)															
Aroclor-1016	1.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor-1221	1.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor-1232	1.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor-1242	1.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor-1248	1.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor-1254	1.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor-1260	1.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Glycols (8015)															
Ethylene	190	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Propylene	1900	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

U	Analyte not detected at the listed detection limit
Shade	Analyte detected in concentration below the ADEC Cleanup level
Bold	Analyte detected in concentration exceeding the ADEC Cleanup level
NA	Analyte not analyzed for
NE	No established cleanup limit for analyte
#[Dup]	Denotes duplicate sample pair
*	BETX analysis on listed samples performed by method 8260

NOTE: SOUTHEAST CORNER INITIAL FIELD SCREENING RESULTS RANGED FROM 96.7 TO 436 PPM.

INITIAL FIELD SCREENING RESULTS OF PEDESTAL PERIMETERS RANGED FROM 0.0 TO 9.0 PPM.

INITIAL FIELD SCREENING RESULTS FOR NORTHEAST PORTIONS OF EXPOSED POWERHOUSE SLAB AREAS FOR EACH GENERATOR PAD WERE UNDER 20 PPM.

LEGEND

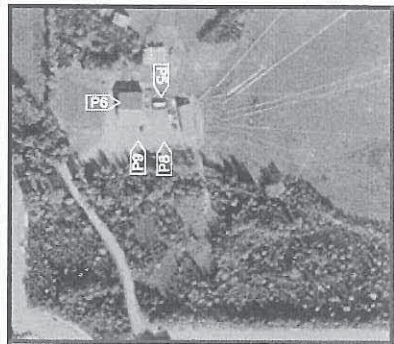
- LID 05 — CHARACTERIZATION SAMPLE
- LID 05 — CLOSURE SAMPLE
- (X.X) — CLOSURE FIELD SCREENING

NORTECH
ENVIRONMENT, ENERGY, HEALTH & SAFETY
2400 College Road, Fairbanks, AK. 99709, 907-452-5688
3105 Lakeshore Dr., Anchorage, AK. 99517 907-222-2445
5438 Shaune Dr., Juneau, Alaska 99801 907-586-6813

Powerhouse Generator Pedestals
Former HIPAS Observatory Decommissioning
Fairbanks (Two Rivers), Alaska

DATE: 02/14/13	SCALE: 1" = 10'
PROJ MGR: PLB	PROJECT: 08-1091
DRAWN: PEF	DWG. NO.: 081091p(07)

FIGURE 07

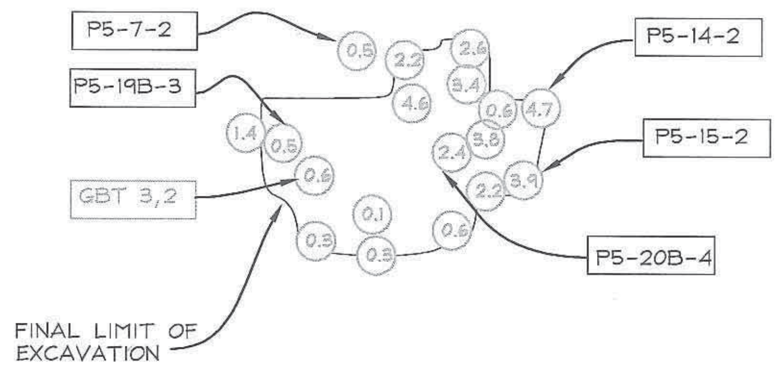


LEGEND

GBT X,X CHARACTERIZATION SAMPLE

P5-X-X CLOSURE SAMPLE

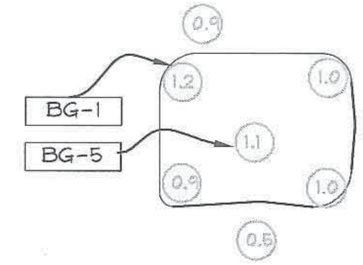
3.1 CLOSURE FIELD SCREENING



Generator Building AST Laboratory Sample Results Summary (P5)										
Sample ID	ADEC Cleanup Limit	GBT 3,2	P5-SP-C1	P5-7-2	P5-14-2 Dup6	P5-24-2 Dup6	P5-15-2	P5-20B-4	P5-19B-3
Sample Type		characterize	stockpile composite characterize	closure	closure	closure	closure	closure	closure
PID Field Screen (ppm)		99.0	24.8	3.1	4.5	4.5	4.4	2.7	0.4
Lab Report W.O.		1104930	1128478	1E+06	1124506	1124506	1E+06	1124506	1124506
Analyte	Units	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Petroleum Fractions (AK 101, AK 102, AK 103 and 8021B)									
GRO	300	3.39U	NA	NA	NA	NA	NA	NA	NA
DRO	250	1,230	NA	22.0U	22.2U	22.2U	23.1U	22.1U	21.9U
RRO	11,000	89.5U	NA	22.0U	22.2U	22.2U	23.1U	22.1U	21.9U
Benzene	0.025	0.0169U	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	6.9	0.0678U	NA	NA	NA	NA	NA	NA	NA
Toluene	6.5	0.0678U	NA	NA	NA	NA	NA	NA	NA
Total Xylenes	63	0.1356U	NA	NA	NA	NA	NA	NA	NA
Volatile Organic Compounds (8260)									
		No VOC Analysis performed on any samples							
RCRA 8 Metals (6010/7421)									
		No Metals Analysis performed on any samples							
PCBs (8020)									
Aroclor-1016	1.0	NA	56.0U	NA	NA	NA	NA	NA	NA
Aroclor-1221	1.0	NA	56.0U	NA	NA	NA	NA	NA	NA
Aroclor-1232	1.0	NA	56.0U	NA	NA	NA	NA	NA	NA
Aroclor-1242	1.0	NA	56.0U	NA	NA	NA	NA	NA	NA
Aroclor-1248	1.0	NA	56.0U	NA	NA	NA	NA	NA	NA
Aroclor-1254	1.0	NA	56.0U	NA	NA	NA	NA	NA	NA
Aroclor-1260	1.0	NA	56.0U	NA	NA	NA	NA	NA	NA
Glycols (8015)									
	190	No Glycol Analysis performed on any samples							

U — Analyte not detected at the listed detection limit
Shade — Analyte detected in concentration below the ADEC Cleanup level
Bold — Analyte detected in concentration exceeding the ADEC Cleanup level
NA — Analyte not analyzed for
NE — No established cleanup limit for analyte
#Dup — Denotes duplicate sample pair

08a: Generator Building AST (P5)



LEGEND

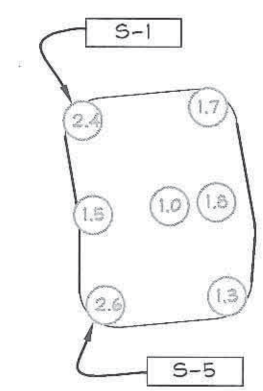
S-X CLOSURE SAMPLE

3.1 CLOSURE FIELD SCREENING

08b: Driveway Parts Generator Stain (P8)

Driveway Surface Equipment Stains Laboratory Sample Results Summary (P8/P9)					
Sample ID	ADEC Cleanup Limit	S-1	S-5	BG-1	BG-5
Sample Type		closure	closure	closure	closure
PID Field Screening (ppm)		2.4	2.6	1.2	1.1
Lab Report W.O.		1124506	1124506	1124506	1124506
Analyte	Units	mg/kg	mg/kg	mg/kg	mg/kg
Petroleum Fractions (AK 101, AK 102, AK 103 and 8021B)					
GRO	300	NA	4.53U	4.87U	NA
DRO	250	25.0U	25.3U	23.9U	95.5
RRO	11,000	42.9	42.7	23.9U	581
Benzene	0.025	NA	0.0227U	0.0244U	NA
Ethylbenzene	6.9	NA	0.0453U	0.0487U	NA
Toluene	6.5	NA	0.0453U	0.0487U	NA
Total Xylenes	63	NA	0.1360U	0.1461U	NA
Volatile Organic Compounds (8260)					
		No VOC Analysis performed on any samples			
RCRA 8 Metals (6010/7421)					
Arsenic	3.9	NA	15.2	9.32	NA
Barium	1,100	NA	200	166	NA
Cadmium	5.0	NA	0.241U	0.226U	NA
Chromium	25.0	NA	34.1	33.7	NA
Lead		NA	12.9	7.58	NA
Mercury	1.4	NA	0.0483	0.0452U	NA
Selenium	3.4	NA	0.604U	0.565U	NA
Silver	11.2	NA	0.121U	0.113U	NA
PCBs (8020)					
		No PCB Analysis performed on any samples			
Glycols (8015)					
		No Glycol Analysis performed on any samples			

U — Analyte not detected at the listed detection limit
Shade — Analyte detected in concentration below the ADEC Cleanup level
Bold — Analyte detected in concentration exceeding the ADEC Cleanup level
NA — Analyte not analyzed for
NE — No established cleanup limit for analyte
#Dup — Denotes duplicate sample pair



LEGEND

S-X CLOSURE SAMPLE

3.1 CLOSURE FIELD SCREENING

08c: Driveway Heavy Equipment Stain (P9)

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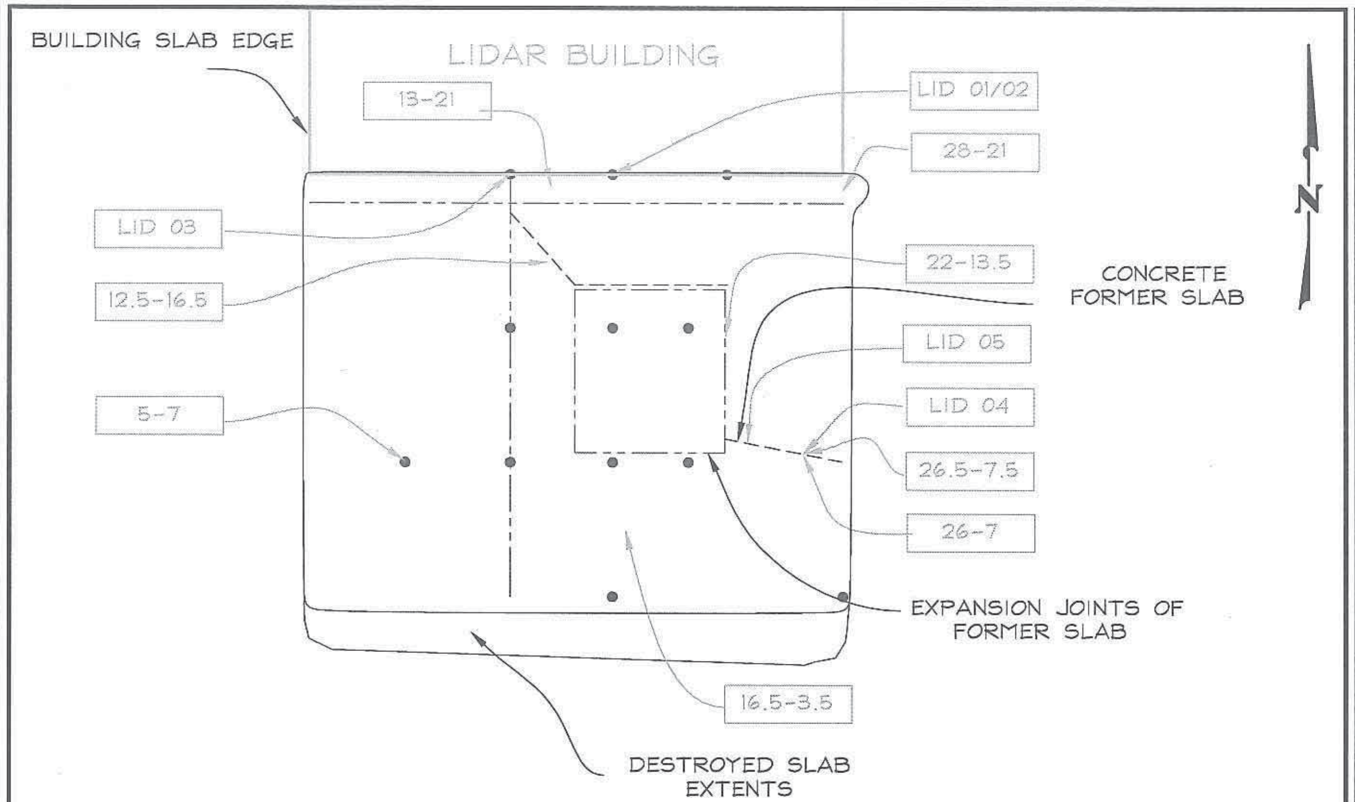
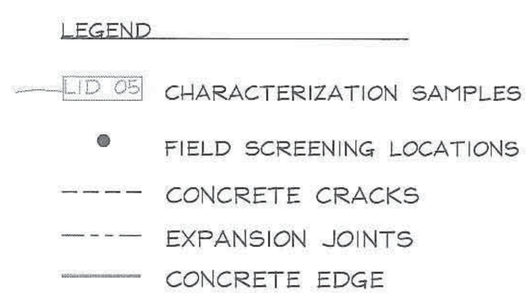
5438 Shaune Dr., Juneau, Alaska 99801 907-586-6813

Generator Building AST and Driveway Surface Stains
Former HIPAS Observatory Decommissioning
Fairbanks (Two Rivers), Alaska

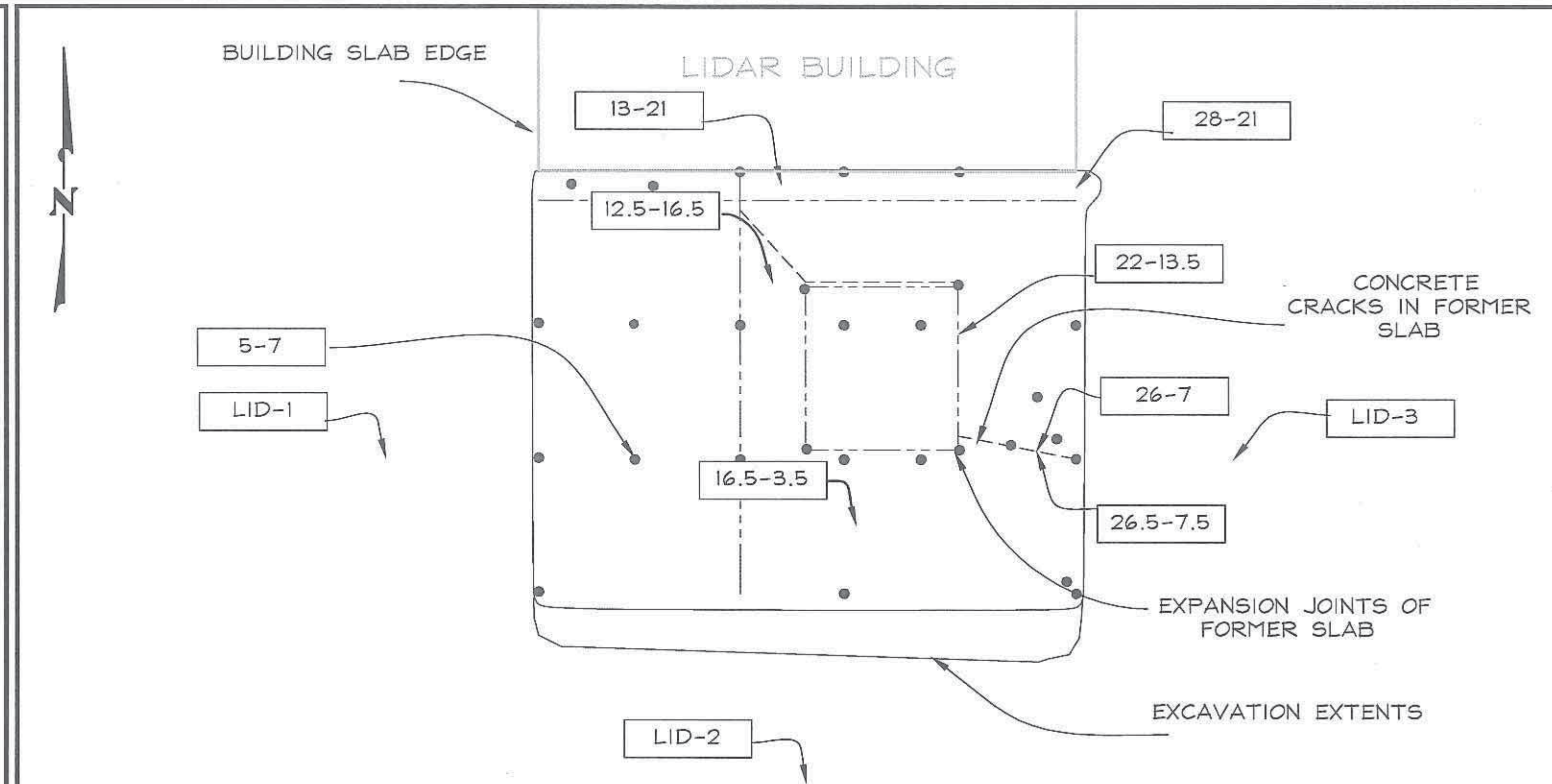
DATE: 02/14/13	SCALE: 1" = 10'
PROJ MGR: PLB	PROJECT: 08-1091
DRAWN: PEF	DWG. NO.: 081091p(08)

FIGURE 08



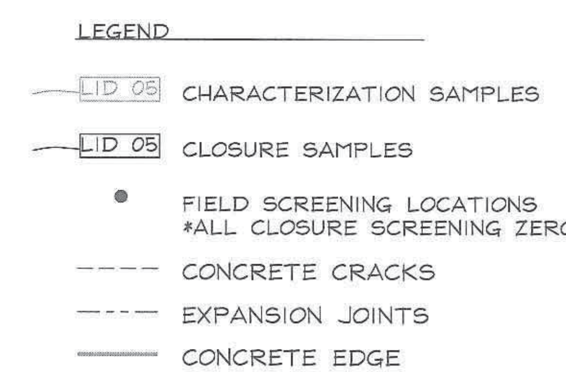


09a LIDAR Tower Characterization



LIDAR Tower Laboratory Soil Sample Results Summary				
Sample ID	Date	Lab W.O.#	Field Screen	Mercury mg/kg
	ADEC Cleanup Limit			1.4
Post-demolition Characterization Samples				
LID 01[Dup10]	14-Dec-11	1119888	0.00	1.2
LID 02[Dup10]	14-Dec-11	1119888	0.76	0.938
LID 03	14-Dec-11	1119888	1.33	**7.13**
LID 04	14-Dec-11	1119888	0.52	**4.32**
LID 05	14-Dec-11	1119888	0.00	0.882
Pre-excavation Characterization Samples				
26-7.5-6	23-Jul-12	1128246	1.30	**4.28**
26-7.5-12	23-Jul-12	1128246	0.00	0.606
10.5-14-6	23-Jul-12	1128246	0.00	0.448
10.5-14-12	23-Jul-12	1128246	0.00	0.206
10.5-22-6	23-Jul-12	1128246	0.00	0.788
10.5-22-12	23-Jul-12	1128246	0.00	0.0421U
5-7-6	23-Jul-12	1128246	0.00	0.426
5-7-12	23-Jul-12	1128246	0.00	0.0421U
Post-excavation Closure Samples				
26-7 [Dup1]	30-Aug-12	1128444	0.00	0.455
26.5-7.5 [Dup1]	30-Aug-12	1128444	0.00	0.391
16.5-3.5	30-Aug-12	1128444	0.00	0.0396U
28-21	30-Aug-12	1128444	0.00	0.0835
5-7	30-Aug-12	1128444	0.00	0.0405U
13-21	30-Aug-12	1128444	0.00	0.132
22-13.5	30-Aug-12	1128444	0.00	0.0433
12.5-16.5	30-Aug-12	1128444	0.00	0.126
Post-excavation Perimeter Closure Samples				
LID-1	18-Sep-12	1124506	NA	0.0409U
LID-2	18-Sep-12	1124506	NA	0.0409U
LID-3	18-Sep-12	1124506	NA	0.0424U

U	Analyte not detected at the listed detection limit
Shade	Analyte detected in concentration below the ADEC Cleanup level
Bold	Analyte detected in concentration exceeding the ADEC Cleanup level
NA	Analyte not analyzed for
NE	No established cleanup limit for analyte
#[Dup]	Denotes duplicate sample pair



09b LIDAR Tower Closure

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5438 Shaune Dr., Suite B, Juneau, AK. 99801, 907-586-6813

LIDAR Tower Mercury Contamination Characterization and Closure
Former HIPAS Observatory Decommissioning
Fairbanks (Two Rivers), Alaska

DATE: 02/14/13	SCALE: 1" = 10'	FIGURE 09
PROJ MGR: PLB	PROJECT: 08-1091	
DRAWN: PEF	DWG. NO.: 081091p(09)	

KEYED NOTES

-REMOVED OR DECOMMISSIONED-

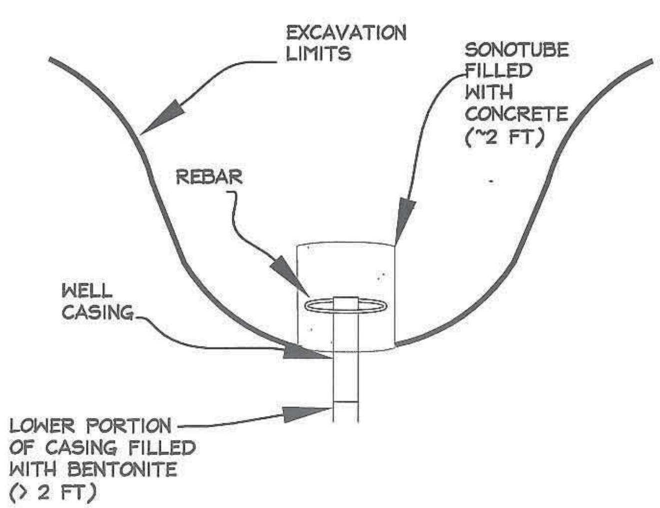
W1 — Water Well
-Decommissioned in accordance with applicable guidance.

W2 — Septic tank and associated components
-Based on clean sampling results, the septic tanks were removed, the soil absorption systems and piping were abandoned in place.
-Soil absorption systems were approximately 10-15 feet past septic tanks. Inspection pipes were removed.

LEGEND

———	Copper Lines
- - - -	Septic Lines
○	Well
□	Septic Tank

DECOMMISSIONING WELL DETAIL



Septic System Fluid/Sludge Characterization Laboratory Sample Results Summary					
Sample ID	ADEC Cleanup Limit	LD-F	GB-F	TB-F	TB-I
Sample Type		Char NP	Char NP	Char CP	Char NP
PID Field Screen (ppm)					
Lab Report W.O.		1128245	1128245	1128245	1128245
Analyte	Units	mg/L	mg/L	mg/L	mg/L
RCRA 8 Metals (6010/7421)					
Arsenic	3.9	0.005U	0.005U	0.005U	0.0141
Barium	1100	0.0194	0.0765	0.0353	0.433
Cadmium	5	0.002U	0.002U	0.002U	0.0259
Chromium	25	0.004U	0.004U	0.00689	0.0635
Lead	400	0.001U	0.001U	0.001U	0.23
Mercury	1.4	0.0002U	0.0002U	0.0002U	0.0002U
Selenium	3.4	0.005U	0.005U	0.005U	0.005U
Silver	11.2	0.002U	0.002U	0.002U	0.00833

U — Analyte not detected at the listed detection limit
Shade — Analyte detected in concentration below the ADEC Cleanup level
Bold — Analyte detected in concentration exceeding the ADEC Cleanup level
NA — Analyte not analyzed for

Well Location	Stickup	Depth to Static Water Level	Total Depth
LIDAR	2.20 ft	21.89 ft	28.00 ft
Bunkhouse	1.20 ft	21.81 ft	32.00 ft
ATCO	0.77 ft	19.91 ft	40.84 ft
Generator Bldg	1.16 ft	26.29 ft	55.00 ft
Transmitter	1.85 ft	27.24 ft	43.55 ft

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5438 Shaune Dr., Suite B, Juneau, AK. 99801, 907-586-6813

Water and Wastewater Systems
Former HIPAS Observatory Decommissioning
Fairbanks (Two Rivers), Alaska

DATE: 02/14/13	SCALE: 1" = 300'
PROJ MGR: PLB	PROJECT: 08-1091
DRAWN: PEF	DWG. NO.: 081091m(10)

FIGURE 10

KEYED NOTES

- REMAINING AT SITE -

E1 — Buried electrical line follows edge of road, buried 2-4'

E2 — High voltage junction boxes; 5 total at intervals along buried electrical lines

E3 — Buried electrical line buried 2-4'

E4 — Power line serving Dr. Wong's property

E5 — Primary power line buried 3-4'

LEGEND

——— Electrical Line (confirmed by exposed trench at locations shown)

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Electrical Lines/Cables - Remaining
Former HIPAS Observatory Decommissioning
Fairbanks (Two Rivers), Alaska

DATE: 02/14/13	SCALE: 1" = 300'
PROJ MGR: PLB	PROJECT: 08-1091
DRAWN: PEF	DWG. NO.: 081091p(11)

FIGURE 11

KEYED NOTES

- REMAINING ON SITE -

C1 Communication lines; at surface and buried 2-3' at this location

C2 3" vertical steel conduit with communication lines at surface and buried

C3 Communication lines at surface and buried

C6 Buried telephone line

C7 Communication lines buried 3-4'

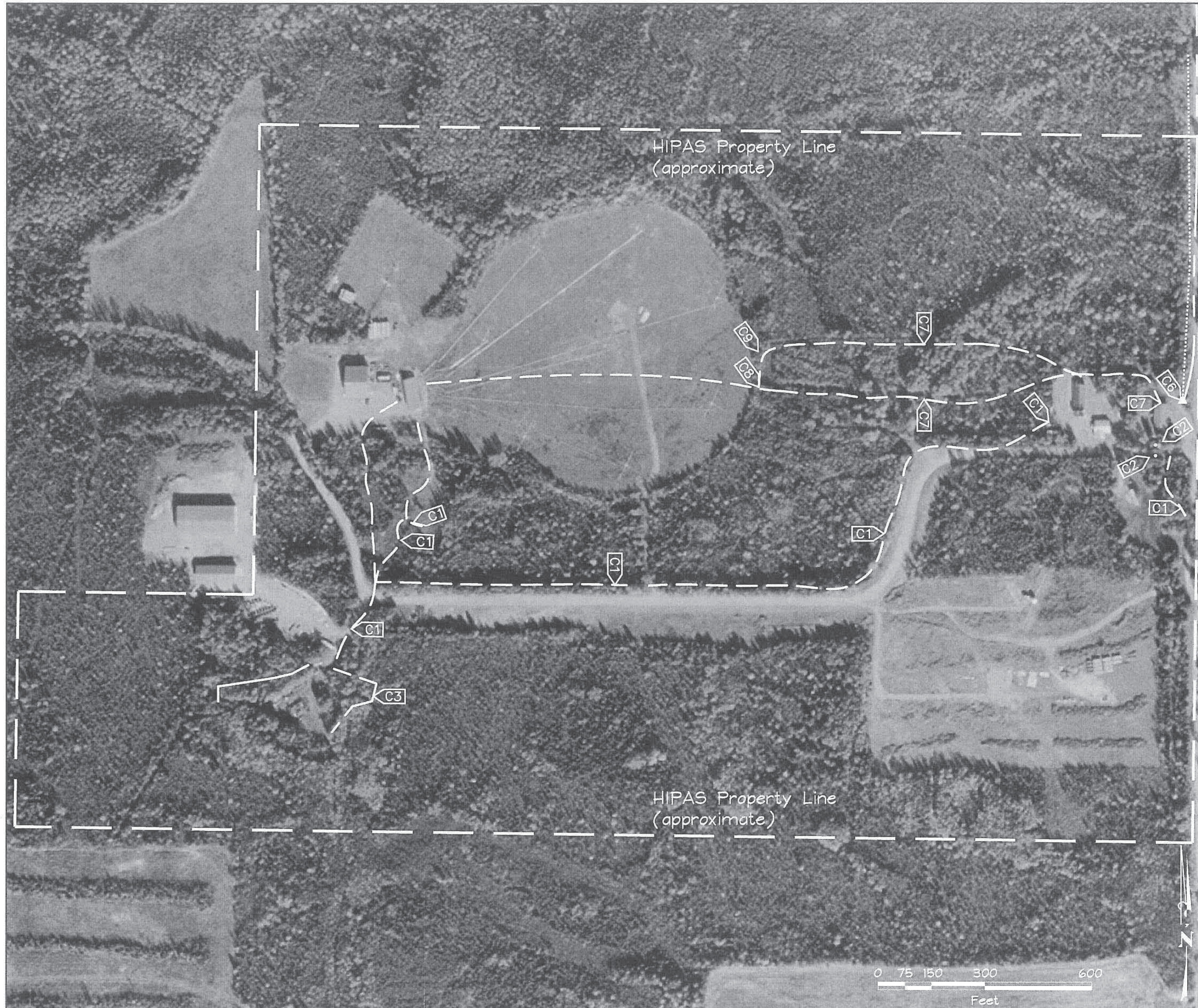
C8 Communication lines buried 4' in visible trail and continues beneath antenna field

C9 Communication lines at surface and buried 2-4' at this location. Lines turn south and do not appear to continue beneath transmitter pad

LEGEND

----- Communication Line (confirmed by exposed trench at locations shown)

.... Phone Line



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Communication Lines/Cables - Remaining
Former HIPAS Observatory Decommissioning
Fairbanks (Two Rivers), Alaska

DATE: 02/14/13	SCALE: 1" = 300'
PROJ MGR: PLB	PROJECT: 08-1091
DRAWN: PEF	DWG. NO.: 081091p(12)

FIGURE 12

KEYED NOTES

-REMOVED and DISPOSED-

F1 Berms leveled and surface debris removed

F3 Structures, antenna components, wires, rebar stakes, anchors, and trash

F6 Switch Gear Shed

F9 LIDAR Towers

-FOUNDATIONS REMAINING-

F7 ATCO:
-350 sqft X 6-12" thick slab and footing
-200 sqft adjacent pad

F8 LIDAR Building:
-1,800 sqft North slab and footing (see Detail 01)
-350 sqft X 48" thick concrete pad

F10 LIDAR Garage:
-350 sqft X 8" concrete slab and footing
-400 sqft adjacent pad

F13 Transmitter Building:
-2,200 sqft slab and footing (see Detail 1)
-500 sqft basement and South end filled with gravel.

F14 Generator Building::
-5,200 sqft slab and footing (see Detail 01)
-1,700 sqft of adjacent pads
-(3) 300 sqft X 48" thick concrete pads
-Northeastern portion of slab removed for remediation.

-SOUTHEASTERN AREA GROUNDING GRID-

LEGEND

5' x 5' Aluminum wire grounding grid
-All visible aluminum removed to 2" below grade
-Steel perimeter cable removed

Fiberglass antenna

F5 Steel tower debris, wooden shed and debris removed

Detail 01
Typical Slab and Footing

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4402 Thane Road, Juneau, AK. 99801, 907-586-6813

Foundation, Antenna, and Surface Materials
Former HIPAS Observatory Decommissioning
Fairbanks (Two Rivers), Alaska

DATE: 02/14/13	SCALE: 1" = 300'	FIGURE 13
PROJ MGR: PLB	PROJECT: 08-1091	
DRAWN: PEF	DWG. NO.: 081091p(13)	

Appendix 2

Table 1
Tranformer Oil Characterization Results Summary

Sample ID	ADEC Cleanup Limit	HP T1-724164	HP T2-4114166	HP T3-92861	HP T4-C100093	HP T5-B100037	HP T6 320GAL
Sample Type		Transformer oil	Transformer oil	Transformer oil	Transformer oil	Transformer oil	Transformer oil
Lab Report W.O.		1104930	1104930	1104930	1104930	1104930	1128244
Analyte	Units	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
PCBs (8020)							
Aroclor-1016	NE	0.997U	0.997U	0.997U	0.997U	0.998U	0.991U
Aroclor-1221	NE	0.997U	0.997U	0.997U	0.997U	0.998U	0.991U
Aroclor-1232	NE	0.997U	0.997U	0.997U	0.997U	0.998U	0.991U
Aroclor-1242	NE	0.997U	0.997U	0.997U	0.997U	0.998U	0.991U
Aroclor-1248	NE	0.997U	0.997U	0.997U	0.997U	0.998U	0.991U
Aroclor-1254	NE	25.3	0.997U	0.997U	0.997U	0.998U	0.991U
Aroclor-1260	NE	0.997U	8.68	0.997U	0.997U	0.998U	10.5

U	Analyte not detected at the listed detection limit
Shade	Analyte detected in concentration below the ADEC Cleanup level
Bold	Analyte detected in concentration exceeding the ADEC Cleanup level
NA	Analyte not analyzed for
NE	No established cleanup limit for analyte
#Dup#	Denotes duplicate sample pair

Table 2
Quality Control Summary

Soil Duplicate Pair 1 WO 1128444

Sample ID	26-7	26.5-7.5	Average	Difference	RPD
Analyte	mg/L	mg/L	mg/L	mg/L	%
Mercury	0.455	0.391	0.423	0.06	15%

Soil Duplicate Pair 2 WO 1124506

Sample ID	P1-3	P1-30	Average	Difference	RPD
Analyte	mg/L	mg/L	mg/L	mg/L	%
DRO	43.6	53.7	49	-10.10	-21%

Soil Duplicate Pair 3 1128468

Sample ID	LM-2-1-66	LM-20-10-66	Average	Difference	RPD
Analyte	mg/L	mg/L	mg/L	mg/L	%
DRO	20.9U	20.7U	NA	NA	NA
Benzene	0.0123U	0.0119U	NA	NA	NA
Ethyl-benzene	0.0247U	0.0238U	NA	NA	NA
Toluene	0.0247U	0.0238U	NA	NA	NA
Total Xylenes	0.0740U	0.0714U	NA	NA	NA

Soil Duplicate Pair 4 WO 1104930

Sample ID	HP LG 11	HP LG 12	Average	Difference	RPD
Analyte	mg/L	mg/L	mg/L	mg/L	%
GRO	3.72U	3.22U	NA	NA	NA
DRO	66,800	68,900	67,850	-2,100.00	-3%
RRO	10,300	10,100	10,200	200.00	2%
Benzene	0.0186U	0.0161U	NA	NA	NA
Ethyl-benzene	0.0745U	0.0644U	NA	NA	NA
Toluene	0.0745U	0.0644U	NA	NA	NA
Total Xylenes	0.1490U	0.1328U	NA	NA	NA

Soil Duplicate Pair 5 WO 1128472

Sample ID	P4 K 28	P40 K 28	Average	Difference	RPD
Analyte	mg/L	mg/L	mg/L	mg/L	%
DRO	24.0U	24.1U	NA	NA	NA
RRO	27.8	33.8	31	-6.00	-19%

Soil Duplicate Pair 6 WO 1124506

Sample ID	P5 14-2	P5 24-2	Average	Difference	RPD
Analyte	mg/L	mg/L	mg/L	mg/L	%
DRO	22.2U	22.2U	NA	NA	NA
RRO	22.2U	22.2U	NA	NA	NA

Soil Duplicate Pair 7 WO 1124506

Sample ID	CGP19	CGP29	Average	Difference	RPD
Analyte	mg/L	mg/L	mg/L	mg/L	%
DRO	21.5U	21.5U	NA	NA	NA
RRO	21.5U	21.5U	NA	NA	NA

Soil Duplicate Pair 8 WO 1124506

Sample ID	NGP-0	NGP-00	Average	Difference	RPD
Analyte	mg/L	mg/L	mg/L	mg/L	%
DRO	21.3U	21.2U	NA	NA	NA
RRO	21.3U	21.2U	NA	NA	NA

Soil Duplicate Pair 9 WO 1128516

Sample ID	P7-2-20	P7-20-20	Average	Difference	RPD
Analyte	mg/L	mg/L	mg/L	mg/L	%
DRO	24.0U	23.8U	NA	NA	NA

Soil Duplicate Pair 10 - WO 1119888

Sample ID	LID-01	LID-02	Average	Difference	RPD
Analyte	mg/L	mg/L	mg/L	mg/L	%
Mercury	1.2	0.938	1.069	0.26	25%

U	Analyte not detected at the laboratory detection limit
NA	The calculation is not applicable
RPD	Relative percent difference

Surface Debris Removal

Photo 1: *Looking east at original Main Transmitter Antenna Array. All piping, antenna, anchors, and ground grid materials have been removed (2008)*

Photo 2: *Looking east across the Main Transmitter Antenna Array area over the former electrical pad and former Transmitter Building Foundation (2012)*

Surface Debris Removal

Photo 3: *Looking southeast across Main Transmitter Array Area after removal of antenna with bundles of grounding grid ready for disposal (2011)*

Photo 4: *Looking east across Main Transmitter Array after removal and disposal of ground grid wires*

Surface Debris Removal

Photo 5: *Looking north at square antenna field with generator building in lower left (2009)*

Photo 6: *Looking north across square antenna field after removal of antenna, anchors, and all other debris (2012)*

Surface Debris Removal

Photo 7: *Looking south at loading dock area south of main driveway (2011)*

Photo 8: *Looking west at loading dock area after removal of all materials and debris (2012)*

Surface Debris Removal

Photo 9: *Looking east at debris pile and storage trailers in Boneyard area (2010)*

Photo 10: *Looking east at former trailer area (left) and dish area in Boneyard following removal of all debris (2012)*

Surface Debris Removal

Photo 11: *Looking east at truck and other debris in Boneyard area (2010)*

Photo 12: *Looking southeast at former truck and debris location on Boneyard area (2012)*

Surface Debris Removal

Photo 13: *Looking north at berms along northern edge of cleared area on eastern portion of site (former dipole area) (2010)*

Photo 14: *Looking east along northern edge of cleared area following spreading of berms and removal of debris (2012)*

Surface Debris Removal

Photo 15: *Debris between berms in central portion of cleared area (2010)*

Photo 16: *Looking southeast across the central and southern portion of the cleared area after berms were spread and debris removed (2012)*

Well and Septic Decommissioning

Photo 1: *Typical septic tank excavation, southeast of Antenna Building.*

Photo 2: *Final grading of site with Generator Building foundation in foreground and former septic tank location in upper left.*

Well and Septic Decommissioning

Photo 3: *Typical well decommissioning, after Sonotube filled with concrete.*

Photo 4: *Typical excavation backfilled, between stockpiles of backfill material and slab.*

LIDAR Garage

Photo 1: *LIDAR Garage on right. Note loader and above-ground gasoline tank. Heating fuel AST is behind the loader. Building, loader and tanks were sold at auction and removed.*

Photo 2: *Photo taken facing south showing staining in the vicinity of the former location of the heating oil AST and to the north.*

LIDAR Garage

Photo 3: *Photo taken facing southeast during LIDAR garage demolition.*

Photo 4: *Photo taken facing north showing LIDAR garage slab.*

LIDAR Garage

Photo 5: *Photo taken facing north showing LIDAR garage soil remediation excavation.*

LIDAR Building AST

Photo 1: *Above ground fuel tank at north end of LIDAR building that was reputedly overfilled (2008).*

Photo 2: *Field screening before removal of building in vicinity of former location of heating fuel AST(2010).*

LIDAR Building AST

Photo 3: *During building removal in vicinity of former location of heating fuel AST.*

Photo 4: *Looking southeast showing LIDAR AST excavation limits with containerized mercury-contaminated soil on slab.*

LIDAR Transformer

Photo 1: *Abandoned transformer in the LIDAR area.*

Photo 2: *Initial assessment at abandoned transformer in LIDAR area.*

LIDAR Transformer

Photo 3: *Photo taken facing northwest. Flagged area is former location of transformer.*

Photo 4: *Final extents of excavation.*

Boneyard Transformer

Photo 1: *The Boneyard area transformer and shed.*

Photo 2: *Looking southeast at limits of hand excavation in 2010.*

Boneyard Transformer

Photo 3: *Looking southeast after September 2012 excavation.*

Photo 4: *Typical stockpile construction with reinforced polyethylene liner and cover.*

Boneyard Hydraulic Stain

Photo 1: *Hydraulic lift (yellow) visible in upper right of image, source of the hydraulic stain in the Boneyard area.*

Photo 2: *Hydraulic stain observed following removal of lift in the Boneyard area.*

Boneyard Hydraulic Stain

Photo 3: *Close up of the hydraulic stain in the Boneyard area.*

Photo 4: *Final excavation limits and stockpile September 2012.*

Generator Building AST

Photo 1: *10,000 gallon Generator Building AST with lined containment berm.*

Photo 2: *Photo taken facing southwest. Preliminary characterization September 2012.*

Generator Building AST

Photo 3: *Looking south at final excavation limits.*

Photo 4: *Excavation backfilled to grade October 2012, typical of each location.*

Generator Building

Photo 1: *Looking southwest at one of two generators. Coolant system in foreground with fuel pump on left.*

Photo 2: *North generator pedestal after removal of generator and Generator Building. Stained concrete from release of fluids during removal.*

Generator Building

Photo 3: *The concrete around the central and north generator pads in the former powerhouse was cut in a two feet wide perimeter around the pads. Typical cut around generator pedestal for assessment.*

Photo 4: *Hydrocarbon odor and evidence of staining on southeast corner of north generator pedestal during initial assessment. Additional concrete removal necessary.*

Generator Building

Photo 5: *Excavating contaminated soils after removal of additional concrete slab.*

Photo 6: *Final limits of excavation between footing perimeter and generator pedestal. Orange markings are 1-foot demarcation lines.*

Generator Building

Photo 7: *Excavation outside footing perimeter on east side of north pedestal.*

Photo 8: *Final limits of excavation on east side of central pedestal. Orange markings are 1-foot demarcation lines.*

Generator Building

Photo 9: *Hand excavation of stained soil on north side of central pedestal, typical of perimeter lubrication oil stains.*

Photo 10: *Looking west at north generator pedestal after surface cleaning with clean fill installed.*

Driveway Surface Stains

Photo 1: *Looking south at the parts generator south of the powerhouse.*

Photo 2: *Looking west southwest at the parts generator stain and excavation.*

Driveway Surface Stains

Photo 3: *Looking west at the hydraulic stain west of the parts generator stain and south of the generator building.*

LIDAR Tower Mercury Remediation

Photo 1: *LIDAR Tower site containing Liquid Mirror Telescope (LMT).*

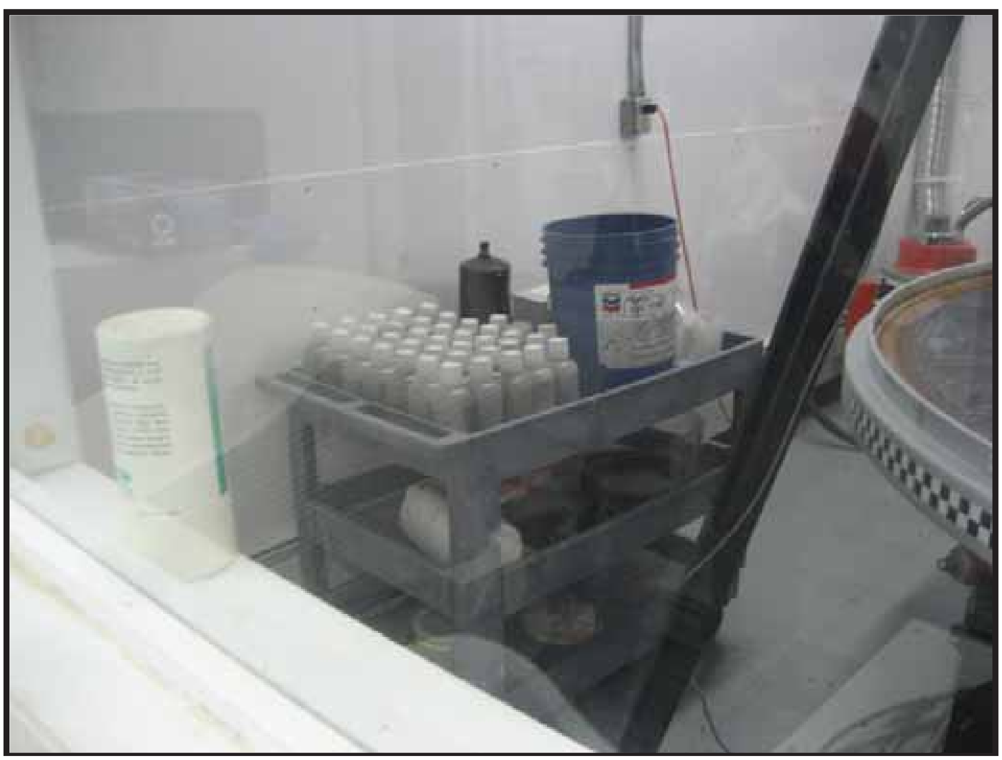

Photo 2: *Containers of mercury in LMT room, LMT table to right.*

LIDAR Tower Mercury Remediation

Photo 3: *LMT room after removal of porous surfaces and cleaning with mercury detergent.*

Photo 4: *Building during mechanical demolition.*

LIDAR Tower Mercury Remediation

Photo 5: *Concrete foundation during mechanical demolition.*

Photo 6: *Typical hand excavation of soil and debris beneath LIDAR Tower with field screening samples visible to left and right.*

LIDAR Tower Mercury Remediation

Photo 7: *Final extents of excavation with field screening samples.*

Photo 8: *Mercury contaminated soils containerized in cubic yard boxes for disposal.*