100.38.119
rec'd via email on Sept. 12, 2007
logged in
gpm

Site Characterization

Air North / Ben Lomond Metro Field Property
Block 6, Metro Industrial Park
Fairbanks, Alaska

September 12, 2007

Prepared for:

Ben Lomond, Inc
1630 Washington Drive
Fairbanks, Alaska 99709

Prepared by:

NORTECH

Environmental Engineering & Industrial Hygiene Consultants

Managing Office
2400 College Road
Fairbanks, Alaska 99709
p. 907.452.5688
f. 907.452.5694

206 E. Fireweed Lane, Suite 200
Anchorage, Alaska 99503
p. 907.222.2445
f. 907.222.0915

119 Seward Street #10
Juneau, Alaska 99801
p: 907.586.6813
f: 907.586.6819

www.nortechengr.com

www.nortechengr.com

NORTECH
ENVIRONMENTAL ENGINEERING, HEALTH & SAFETY
Anchorage: 206 E. Fireweed Ln, Suite 200, 99503 907.222.2445 Fax: 222.0915
Juneau: 119 Seward Street #10, 99801, 907.586.6813 Fax: 586-6819
Fairbanks: 2400 College Rd, 99709 907.452.5688 Fax: 452.5694
info@nortechengr.com www.nortechengr.com

TABLE OF CONTENTS

APPENDICES

1.0 EXECUTIVE SUMMARY

NORTECH has completed the initial groundwater and soil characterization associated with the former Air North operation at Metro Field. The site is currently owned and operated by Ben Lomond and most of the materials stored at the site have been removed in the last several years. This work has included installation of direct push groundwater monitoring wells on and off the site, identification and testing of drinking water wells on properties in the area, and test pits and buried piping removal activities.

The Air North operation ceased in the mid-1980s and Ben Lomond has used the site for storage since that time. No as-built records of the Air North aviation fuel (AVGAS) system were identified, but field observations and anecdotal evidence indicates that the system consisted of below ground piping connecting aboveground storage and pumping devices. Most aboveground features of the system were removed in the 1980s and the buried components that have been identified at the site were removed in 2005. No known features of the Air North fuel system remain on the site. Field screening indicated that approximately 75% of the 1,400 feet of buried piping system identified and removed is contaminated. The volume of contaminated secondary source soil is estimated at approximately 1,500 cubic yards.

Ben Lomond also had an aboveground tank farm for storing used oil for a used oil heat recovery system. The tank farm was bermed and had a liner and most of these tanks were never used. These tanks have been removed from the site and field screening is planned after removal of the liner.

Soil and groundwater contamination is consistent with aviation gasoline. Soil characterization has identified gasoline range organics (GRO), benzene, and diesel range organics (DRO) at concentrations exceeding the ADEC cleanup levels. Concentrations are less than an order of magnitude above the cleanup levels. Residual range organics (RRO), toluene, ethylbenzene, xylenes, and lead concentrations are below ADEC cleanup levels. The relatively low levels of volatile contaminants indicate that landfarming with fertilizer addition and periodic tilling would be an effective remediation strategy. A pilot landfarming project of about 300 to 500 cubic yards is recommended to evaluate this treatment methodology. The area around the former dispenser island would probably be a good location for this type of pilot project. If this type of pilot project is undertaken, a work plan outlining specific details should be submitted to ADEC for approval.

Groundwater characterization has identified gasoline range organics, benzene, toluene, ethylbenzene, and ethylene dibromide above the ADEC cleanup level in the groundwater in the source areas of the site. Total xylenes results were below the ADEC cleanup levels in these areas. Recoverable free product has not been observed regularly in any of the wells. Free product appears to accumulate in DP-26 over time, but does not recharge when purged. Benzene is the only contaminant of concern that has been identified above the ADEC cleanup levels in off-site monitoring wells and nearby drinking water wells. GRO, toluene, ethylbenzene, xylenes, and ethylene dibromide have not exceeded the ADEC cleanup levels at or beyond the perimeter of the site. Drinking water wells have also been tested for the full range of VOCs reported under EPA Method 524.2 and EPA Method 504.1 (including EDB) and these were not detected in drinking water wells in the area.

Groundwater contamination is present beneath approximately 4.1 acres of the site and approximately 6.9 acres off-site. The regional hydraulic gradient is generally northwest during both high and low water events and the measured hydraulic gradient on the site is also to the northwest. Groundwater flow in the area may have been impacted by periodic dewatering activities at the Great Northwest gravel pit since the 1990s. Groundwater flow may also be impacted by intermittent, localized shallow permafrost that is thought to extend from the surface to a depth of less than 20 feet. Vertical groundwater mixing may be limited by a deeper permafrost layer between approximately 50 and 100 feet below the surface. This layer has been reported along the Peger Road corridor and was encountered in the one drinking water well that has been extended to that depth. While the effect of the dewatering and permafrost is not clearly defined, the dissolved contaminant plume is consistent with the northwestern trending hydraulic gradient. Three more sampling points are recommended on the west side of Peger Road to complete the delineation of the shallow groundwater contamination in this area.

Monitored natural attenuation is expected to be effective at remediation of contaminated groundwater at the edges of the plume. Active remediation may be effective in significantly reducing groundwater contaminant concentration in the source areas. A preliminary evaluation of natural attenuation parameters is recommended in five on-site wells and two off-site wells. This evaluation should include a new background well upgradient of the source area and collection of field parameters including temperature, pH, DO, and ORP during sampling of all monitoring wells. In addition to the contaminants of concern, field kit analysis for nitrate, total iron, ferrous iron, sulfate and sulfide and laboratory analysis for methane is recommended.

A pilot groundwater remediation study may be beneficial to evaluate the effectiveness of active remediation in the source areas. Ben Lomond already has some of the equipment necessary to perform a pilot study of a pump and treat system, including pumps, storage tanks, and an air stripping unit. Public utilities are not available at this location for disposal of the treated water and reinjection of the treated groundwater at an upgradient location is recommended. Due to the short duration of the pilot study in a known contaminated site, ADEC and EPA permitting requirements should be minimal. This pilot study could be in same general location as the landfarming pilot study location or in the contaminated area near the air stripping unit to minimize the surface transfer of contaminated water. A brief groundwater monitoring and/or remediation pilot project work plan should be submitted to ADEC for approval before undertaking the pilot study.

Ingestion of contaminated drinking water is the primary off-site exposure pathway of concern. Carbon filtration has been effective at removing benzene at one location and a monitoring and maintenance program should be implemented for any filtration system that is installed. The drinking water well at that location has since been extended below the deep permafrost to approximately 100 feet and this deeper source meets the ADEC drinking water standards. Both the carbon filtration and well extension are effective at providing safe drinking water to impacted properties. Periodic testing of the drinking water at these locations will be necessary to verify the safety of the drinking water at impacted locations. No additional testing is recommended at locations that have been tested and are clean due to the age and stability of the contamination.

Vapor intrusion to indoor air is the other significant potential exposure pathway to off-site receptors. This pathway has not been specifically evaluated at this time. Ben Lomond has buildings constructed substantially similar to other buildings in the area that can be used to evaluate this pathway. The on-site buildings should be used to evaluate the vapor intrusion pathway before investigating off-site buildings due to the substantially higher concentrations on the site. Sub-slab, crawlspace, and background air samples may be necessary to fully evaluate this pathway and a work plan should be submitted to ADEC for approval prior to completing a vapor intrusion evaluation.

2.0 PROJECT LOCATION AND HISTORY

2.1 Site Location and History

The Ben Lomond Metro Field property (the Site) is located in the SW ¼ of Section 21, Township 1 South, Range 1 West, Fairbanks Meridian (see Figure 1). The property is located in the Metro Industrial Park and consists of three lots (2, 3, and 14) on Block 5 and eight lots on Block 6 (1, 2, 3, 4, 13, 14, 15, and 16) as shown in Figure 2. Access to the properties is from Donald Avenue with Block 5 lots on the north side and Block 6 lots on the south side. Air North formerly operated on the Block 6 lots and used the air strip south of Block 6.

Two buildings are present on the property, a shop with a residential apartment on Lot 3 and a cold storage building on Lot 2. The concrete pad of a former hangar is present on Lot 1. The remainder of the lots have been used for storage of miscellaneous scrap materials, primarily metal, for the last 20 years. Ben Lomond has been recycling or disposing of these materials and the volume of stored materials has decreased significantly since 2005.

Documents in the ADEC file indicate a release was reported by Air North on May 3, 1984 as a small spill of aviation gasoline (AVGAS) on or about February 25, 1984. The release was attributed to a crack in an underground pipe fitting approximately 30 feet south of the main refueling island. The release was reportedly identified through periodic pressure testing of the fuel system. Less than 25 gallons was reportedly released, however more than 40 gallons of fuel were recovered by May 25, 1984. Photographs in the file show the area to be near a round concrete pad. An undated hand sketch has a round object labeled "Fuel Island" located south of the eastern building.

Air North went bankrupt sometime around 1985 and Ben Lomond obtained the property from the Alaska Industrial Development Authority (AIDA) in 1986. Transaction documents indicate that Ben Lomond assumed the Air North loan and that no specific disclosures regarding the potential environmental concerns at the site were included in these documents. Another transaction occurred around 1991 that involved Ben Lomond transferring ownership to a subsidiary. AIDA documents from this time include several pages that generally indicate that AIDA is not responsible for environmental contamination that may be encountered on the property. However, these documents do not outline specific concerns that may be present.

Sporadic testing of two deep water wells (installed as drinking water wells) that are located on the property has occurred since 1984. This testing appears to be related to the use of the wells as a public water source. A lab report from 1987 indicates the benzene concentration was more than 300 times the cleanup level. A number of documents in the early 1990s refer to violations and poor environmental conditions at a used oil/heat recovery operation that occurred on this or a neighboring property. The elevated benzene in the wells predates the used oil operation. The ADEC file was closed in the mid-1990s because of a lack of information. However, the site was reopened because it had never been adequately characterized. A sample collected by Ben Lomond personnel in November 2004 exceeded the benzene cleanup level in the western well.

Additionally, a large groundwater drawdown (greater than 40 feet, approximately 10 million gallons a day) has been occurring at the Great Northwest, Inc gravel pit west of the site for several years. This permit renewal process has been ongoing for several years and a number of concerns have been raised by adjacent property owners, including the potential for movement of the contamination from the Ben Lomond property towards the gravel pit. ADEC has requested additional site characterization to document the conditions on the property as well as the potential for contaminant migration from the property.

2.2 Area Wide Geology and Groundwater Conditions

The elevation of the property is approximately 440 feet above mean sea level, based on topographic maps of the area. There is little topographic relief across most of the Site and surrounding area, except for water filled gravel pits. The surface water elevation of the gravel pits is typically five to ten feet below the surrounding ground surface. Except for buildings, the site and surrounding properties are graveled. Site drainage appears to be primarily through infiltration and evaporation.

The Fairbanks area is in the physiographic province termed the Tanana Lowlands, which is an arcuate band between the Alaska Range to the south and the Tanana upland to the north. The present day lowland consists of vegetated floodplain, and low benches of the Tanana and Chena Rivers. Typical soils in the Tanana 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.

Runoff from spring snow melt and summer storms causes periodic flooding over parts of the floodplain, typically near creeks and sloughs. A series of levees about one-half mile south of the site channels the Tanana River and protects the south Fairbanks area from flooding. The water table throughout the Tanana floodplain is shallow and usually 10 to 20 feet below the surface, depending on ground elevations and groundwater stage. Water table fluctuations on the order of 2 to 4 feet are not uncommon during rapid recharge events. Below flood stages, the Tanana typically acts as a source of recharge for the area while the Chena River, located several miles to the north and west of the site, acts as a drain. Other sources of recharge to the groundwater are snowmelt and precipitation. Groundwater in this area was shown to flow generally northwest during a multi-year study performed by the USGS in the 1990s. Some transient effects are likely during periods of rapid water level elevation change. Groundwater elevation changes should be substantially similar to the water level changes in the water filled gravel pit located to the south.

Permafrost is known to exist throughout the Fairbanks area and is considered discontinuous. Permafrost has been documented in a number of deep drinking water wells at a depth of 50 to 100 feet deep along Peger Road and in the south Fairbanks area. Shallow permafrost has been observed at depths up to 15 feet during development at several locations. Shallow permafrost is often thawed naturally by removing the vegetative mat and the deeper permafrost is generally not penetrated. New shallow permafrost growth can be grown in heavily used and plowed driveways.

2.3 Previous Investigations in the Area

A number of known contaminated sites are present in the south Fairbanks area. Many of these are industrial or commercial sites that had underground fuel storage tanks. ADEC considered an area-wide study in the South Fairbanks area in the mid-1990s, but the study was not pursued at that time

As part of the dewatering permit process, Great Northwest was required to install several groundwater monitoring wells. These were reportedly primarily intended to be used to evaluate the drawdown of the aquifer. Two of these wells (GNI-03 and GNI-05) are situated within or near the edges of the benzene contaminated groundwater and have been incorporated into the Air North investigation area.

2.4 Investigation Objectives

As outlined in our discussions and proposal, the immediate concern of ADEC was the potential for impacts to the drinking water wells at the neighboring properties north and west of the Site. The objective of the initial characterization was to identify the conditions in the area of the suspected release and the potential for off-site impacts from the suspected contamination. To address these concerns, ***NORTECH*** and Ben Lomond agreed to install a limited number of groundwater monitoring wells, conduct a well search in the area, and excavate test pits in accessible areas of the property. Specific field activities that were executed to meet these objectives included:

- Review ADEC files and other sources to identify the location of the reported spill and other relevant details concerning the release and the property
- Install shallow direct push wells on the north and west edges of the property
- Collect limited construction details of two existing water wells
- Sample the three new and two existing wells for GRO/BTEX compounds
- Conduct a well search to identify nearby water systems
- Excavate and assess test pits in the suspected source area

3.0 METHODOLOGY

3.1 Direct Push Technology

NORTECH arranged for a drilling contractor to install three direct push monitoring wells as shown in Figure 1 to evaluate the potential for off-site groundwater contaminant migration. The wells are located on the north and western perimeter of the property to evaluate the potential for off-site migration of the suspected contamination. Prepacked

¾-inch PVC wells were installed in accordance with standard direct push methods. The proposed direct push microwells have similar construction to standard monitoring wells, including a sand packed screen and bentonite seal. These wells were covered and left in place on the site for future monitoring activities.

In addition to the prepacked monitoring wells, galvanized direct push wells have also been used at the site. This consists of a 10-foot long, 1.25-inch diameter slotted galvanized screen with steel riser welded on in the field. These wells were advanced until the screen was at the appropriate depth. Since these are driven directly with no drive casing, the pipe is directly sealed by the soil. Approximately 10 of these wells remain in place on the site and one remains in place on the east side of Peger Road. Three temporary wells of this type were advanced off site, sampled, and removed after sampling.

3.2 Groundwater Sampling

NORTECH sampled both the on site and off site monitoring wells (shown in Figure 4) in accordance with the ADEC UST Procedures Manual and Standard Sampling Procedures (the SSP). Samples were collected using low-flow techniques and analyzed for gasoline range organics (GRO) and benzene, toluene, ethylbenzene, and xylenes (BTEX) compounds in accordance with ADEC SSP requirements for a release of aviation gasoline.

3.3 Soil Field Screening and Excavation

A PhotoVac 2020 Hand Held Air Monitor/Photoionization Detector (PID) was used to field screen the soils for POL contamination. ***NORTECH*** used the headspace method of field screening in general accordance with Section 4 of the ADEC SSP and the approved project documents. Headspace screening consists of partially (33%-50%) filling a clean resealable bag with freshly uncovered soils to be field screened. The resealable bag was closed and headspace vapors were allowed to develop for at least 10 minutes and not more than one hour. The bag was agitated at the beginning and end of the headspace development period. In accordance with the SSP, the highest PID reading from each sample was recorded. The frequency of field screening was adequate to delineate contamination within five horizontal feet and two vertical feet in excavations and pipe trenches.

Test pits were excavated by Ben Lomond personnel at locations recommended by ***NORTECH***. A combination backhoe/loader unit was used with a telescoping arm that allowed excavation up to 15 feet below the ground surface and test pits were excavated to groundwater. Material excavated from the test pits was stored on the ground surface adjacent to each test pit. Groundwater in the bottom of each test pit was visually inspected. Laboratory samples of soil or groundwater from these test pits were not collected and the material was returned to the approximate location from which it was excavated in each test pit.

NORTECH also directed Ben Lomond personnel during identification and removal of buried piping at the site. A pipe locator was used to identify the location of the pipe and the backhoe was used to remove soil above the pipe. The pipe was inspected and then removed. Liquids remaining in piping were collected using absorbent materials. Field screening was completed at pipe fittings (unions, elbows, tees, etc) and at any location that appeared to be potentially contaminated. The extent of the identified piping system is shown in Figure 3.

3.4 Analytical Soil Sampling

The number and type of laboratory samples was intended to confirm field screening results and preliminarily characterize the highest field screening results and most suspect locations identified at the site. Closure samples were not collected. Surface and subsurface soil samples were collected using the backhoe, hand equipment (such as shovels and picks), and disposable sampling equipment (such as gloves). Samples were containerized, stored, and transported in accordance with the ADEC SSP for each analytical method. Samples were analyzed for gasoline range organics (GRO) and benzene, toluene, ethylbenzene, and xylenes (BTEX) compounds in accordance with ADEC SSP requirements for a release of AVGAS. Sample locations are shown in Figure 3.

3.5 Well Search

ADEC provided some limited information regarding water systems and private wells located north and west of the Site. ***NORTECH*** personnel visited and inspected adjacent properties to identify other potential water systems and wells in the area. The first phase, completed in 2005, included adjacent properties to the north and properties to Peger Road on the west. A second phase in 2006 included properties farther north and west, including properties on the west side of Peger Road. ***NORTECH*** contacted each property owner either by phone or in person to determine if a well was present at each property. In the event that a well was present, the well was purged until fresh water (as determined by temperature) was encountered and then the well was sampled. Drinking water wells were sampled for BTEX following EPA Method 524.2 for drinking water. The well search area and known wells are shown in Figure 7.

3.6 Contaminants of Concern and Soil and Groundwater Cleanup Levels

The initial site cleanup goals for this project have been determined using ADEC's Method 2 for soil and ADEC drinking water standards for groundwater, as outlined in

ADEC regulations (18 AAC 75.341, Tables B2 and C). The reported release at the site was of aviation gasoline, which has contaminants of concern that include gasoline range organics (GRO) and benzene, toluene, ethylbenzene, and xylenes (BTEX). Both the soil and groundwater cleanup goals of the GRO and BTEX contaminants are shown in the table below. These are also shown in the analytical summary tables.

Soil and Groundwater Cleanup Levels

	ADEC Method 2 Soil (mg/kg)	ADEC Drinking Water (mg/L)
Benzene (B)	0.02	0.005
Toluene (T)	5.5	1.0
Ethylbenzene (E)	5.4	0.7
Total Xylenes (X)	78	10.0
Gasoline Range Organics (GRO)	300	1.3

AVGAS uses lead as an antiknock agent and lead is also a contaminant of concern at the site. Since lead was used, lead scavengers were also present in AVGAS. According to several sources, including a study of lead scavengers in Groundwater Monitoring and Remediation (Summer 2004, Page 76), AVGAS used twice as much ethylene dibromide (EDB) as automotive gasoline and did not use 1,2-Dichloroethane (1,2-DCA). Cleanup levels for lead, PAHs, and EDB are listed in the summary tables for these analytical results.

4.0 FIELD ACTIVITIES

4.1 On-Site

4.1.1 Groundwater Monitoring

May 2005
Peter Beardsley of ***NORTECH*** inspected the Site with Robert Hull and James Cushman of Ben Lomond, Inc. The two existing wells were identified, as were locations for the three direct push monitoring wells. Additionally, the former Air North fuel island was identified, with the dispenser and hose still in place, although severely deteriorated. Much of the ground surface of the property was observed to be covered or obstructed by vehicles, construction materials, and other objects during the site visit. Robert indicated that Ben Lomond's goal was to have up to 50% of the stored materials removed by the end of 2005.

Peter and Dennis Shepard of ***NORTECH*** mobilized to the site with Homestead Drilling to install the three direct push monitoring wells on May 18 and 19, 2005. Ben Lomond personnel had started moving stored materials on the Site and the area around the former fuel island was readily accessible.

The three new wells and two existing wells were sampled and the samples were delivered to the laboratory under a standard chain of custody. The water sample from DP-2 had a trace odor and slightly elevated PID reading compared to water samples from other wells. All three direct push wells had low recharge rates.

The depth of the existing West well was measured at approximately 70 feet. This well was sampled using low flow techniques and approximately 15 gallons of water were purged. During depth to water measurements in the existing East well, the equipment came back from the water surface with a strong septic odor and a greasy appearance. The total depth was not measured to avoid contaminating the equipment. Sampling of the east well was complicated by heat trace and other material in the well which hindered the installation of low-flow sampling tubing in the well. Once sampling finally began, the water had a strong septic odor and grease and fur were pulled to the surface when the tubing crossed the water surface in the well. Several additional feet of tubing was installed to collect a sample below this surface impact. This well has reportedly not been used in 15 to 20 years and the top of the casing was partially exposed. Based on these observations, ***NORTECH*** hypothesizes that a small animal (such as a vole) fell down the well casing and has rotted, as this would produce the strong odor, and greasy appearance, and apparent animal hair at the water surface within the well.

August and September 2005

Ten galvanized direct-push sampling points were installed on August 16, 2005. These were developed shortly after installation and allow to equilibrate with the surrounding aquifer for about three weeks. These new wells, along with the other wells on the site were surveyed and sampled on September 5 and 6, 2005. The horizontal location of each well was recorded using a hand-held GPS and relative vertical elevations were collected through surveying. A trace of free product was observed in DP-22, near the former fuel island, and DP-26 had an extremely strong odor, although no free product was detected. DP-2 and DP-29 had very low recharge rates. Samples from each well were submitted for GRO/BTEX analysis and samples from four wells were submitted for EDB analysis.

April through June 2006

Levelloggers were installed in three locations: DP23, DP-27, and DP-29. Several attempts to install these levelloggers were unsuccessful due to ice in the monitoring wells. One well was thawed for installation of the device and then refroze. Depth to water was measured a few times, but the ice persisted in the well.

During these sampling events, the possible presence of free product in the two most contaminated wells was also evaluated. No evidence of free product was observed in DP-21, the original reported source area. Several feet of free product were observed during the first measurement in DP-26, near the cold storage building. This free product was purged and collected. The product had a green tint and the odor was substantially similar to the contaminated soil and water found throughout the site. Approximately one-half liter of free product was purged. The well recharged with water and free product was not observed in subsequent events, suggesting that the slots of the direct push well was acting like a one-way filter for free product during the winter and a large volume of free product is not present in the area.

July 2006
The shallow groundwater sampling program was continued on the site with sampling of eight of the direct push sampling points and the addition of one new direct push well on the western side of the site. The sampling program was also expanded west with two temporary galvanized direct push sampling points along Peger Road. One point was removed from along Peger Road after sampling while one well along Peger Road and the well at the site (DP-30) remains in place.

Additional direct push wells were attempted on the Badger Towing property and Geraghty Brothers property between Tibor and Peger Road. Four locations along and in Frank Avenue and three locations at Badger Towing were attempted and refusal was encountered between 3 and 10 feet below the ground surface. The driller reported that this was consistent with permafrost. The probable presence of permafrost was supported by the vegetation and standing water observed throughout the recently cleared Geraghty Brothers parcels.

Groundwater elevations were collected, but the wells were not resurveyed. Several geochemical parameters were collected at the wells that had sufficient recovery to conduct flow through sampling. The only readily discernable trend was that the dissolved oxygen (DO) and oxidation/reduction potential (ORP) were higher in DP-28 and DP-29, which continue to be relatively clean on the northern edge of the contaminant plume.

4.1.2 Piping Excavation and Soil Sampling

May 2005
Field investigation of the contaminated soil at the site began at the former fuel island and reported release location south of the former fuel island. The dispenser and approximately 30 feet of degraded fuel hose was present and appeared to have been out of use for many years. Ben Lomond personnel excavated test pits on the south and west sides of the former fuel island to evaluate subsurface conditions. Two test pits

were excavated near the former fuel island (south and west sides). Contamination was observed from the ground surface to the water table and a slight sheen was observed on the water table. Groundwater was observed to be between 5 and 8 feet below the ground surface in the test pits.

A pipe was encountered about one foot below the ground surface approximately 30 feet south of the fuel island. The pipe ran roughly parallel to the southern property boundary. Exploratory trenching indicated this pipe extended beneath surface debris in both directions and Ben Lomond personnel indicated they would start removing debris in these areas so the pipe could be excavated and removed.

A third test pit was excavated near the northwest corner of the property between the cold storage building and the former hangar based on the contamination observed in the two test pits and in the new well located on the northwest corner of the property. This test pit was also northwest of the former bulk petroleum storage area located east of the cold storage building. This test pit was excavated to 15 feet below grade with minimal groundwater encountered. Field screening indicated it was not contaminated. Soil in this area was significantly harder than the other two test pits. While it was possible to excavate in this area, the soil conditions and lack of groundwater at the depth observed in other location indicated the potential for permafrost in this area.

August 2005
Ben Lomond personnel moved most of the scrap metal and vehicles located in the vicinity of the former fuel island, as well as the concrete fuel island itself. Excavation of the buried piping began at the fuel island. A pungent odor and elevated field screening readings were present beneath the former concrete pad and a soil sample was colleted beneath the elbow in the piping underneath the fuel island. A trench was excavated to groundwater in this location and field screening readings generally decreased with depth.

Piping from the fuel island extended to the east towards another concrete pad with a grounding cable, but ended before it reached this pad. The concrete pad was removed and buried piping extended back towards the fuel island and then turned north and extended most of the distance to the building. Both pipes ended with elbows to the surface and no buried tanks were found. Field screening had intermittent elevated readings at some, but not all fittings. Additional removal of debris was completed and this piping was removed.

The piping located south of the former fuel island was also excavated. The piping extended to the east and turned towards the former concrete pad described above. This pipe was determined to reach the former concrete pad and elbow to the surface after additional debris relocation. Field screening indicated contaminated soil was present at most fittings.

This piping extended to the west underneath a variety of debris and a large soil berm. A valve assembly was found inside a buried drum with piping going north under the berm and also continuing west under the berm. Field screening indicated contamination was present beneath the pipe at most locations. A pipe locator was used to track the piping beneath the berm. An elbow to the surface was found on the west side of the berm near another debris pile. The piping ran along beneath the berm to the north and had an elbow and capped riser to the surface about 75 feet from the cold storage building. Field screening indicated contamination was present near the elbows. Ben Lomond personnel removed the piping after the removal of the berm and other debris.

October 2005
Ben Lomond personnel indicated that two additional piping stubs to the surface had been discovered during debris removal. One of these extended about 30 feet southeast from the approximate north end of the pipe under the berm and turned south towards the buried valve pit. The pipe then turned east before reaching the valve pit and elbowed to the surface. Field screening indicated intermittent contamination along this run of piping.

The second run of buried piping began at piping that began near the surface near the north end of the piping close to the shop building. This piping extended to the east, turned south, and then to the southeast. This pipe also ended with an elbow to the surface. A total of four soil samples were collected to characterize the soil contamination. These samples were collected in the visibly stained soils near the primary junctions and ends of the piping system.

4.2 Well Search and Drinking Water Sampling

2005
NORTECH completed a visual inspection of properties adjacent to the north and west of the Ben Lomond property during 2005. Most properties in the area were determined to be business ventures with a residential component. The businesses do not provide water to the public and are not considered public water supplies. Several occupants indicated that the water in this area is terrible and that they do not drink the water due to high mineralization and poor taste. These individuals indicated they use the water wells only for flushing toilets and washing vehicles.

A total of 6 wells were identified within the 2005 well search north and west of the site, including two on Lisa Peger's property, one at Badger Towing, one at the Dave Bridges/Altrol property, one at Borealis Towing, and one at Arctic Thunder Towing. The Badger Towing well was located directly downgradient of the contamination and was tested in September 2005. Due to the benzene detected in this well, the well sampling program was expanded in October 2005 and included each of the six previously identified wells, except for the well used at Lisa Peger's apartments for which permission to sample was not granted.

These results indicated that the wells at Badger Towing and Dave Bridges exceeded the maximum contaminant level (MCL) for benzene. Ben Lomond was directed to contact these owners and install a carbon filter system to remove the benzene. A system was installed at Badger Towing in early 2006 and periodic sampling has been undertaken since that time. Dave Bridges indicated that he was planning to upgrade the water system in the next few months and would work with Ben Lomond to address the concerns at that time.

2006
Based on the observed benzene concentrations in some drinking water wells in 2005, the well search area was expanded to the north and west in 2006. Interviews with property owners in this area identified five additional wells, including two newly installed wells inside the previous well search area. The owner of one well indicated that his well had not been used for over 20 years due to poor water quality and the well could not be accessed. Most commercial enterprises haul water. Lisa Peger provided access to her second well for this sampling event. A total of eight wells were sampled during late May and early June 2006.

The first periodic sampling event occurred at Badger Towing in May 2006 during the sampling described above. The filter was reducing the benzene concentration, but the benzene concentration after the filter exceeded the MCL. The carbon media was replaced and the water was tested again in August and met the ADEC MCL.

A new well was installed at Badger Towing and sampled by Ben Lomond personnel in September. The new well went to 58 feet below the ground surface to the top of a layer of permafrost. The benzene concentration in the raw water met the ADEC MCL. The new well was plumbed through the carbon filter and follow-up testing of the raw water was completed in November.

A property owner located north of Ben Lomond contacted ADEC and indicated that a well was present on the property. This property was on the eastern side of the 2005 well search area and no well had been identified at that time. This well was sampled in November and the benzene concentration met the ADEC MCL.

2007
Ben Lomond extended the Badger Towing well through the permafrost layer to a depth of approximately 100 feet. The water was tested before and after the carbon filter in June 2007. Dave Bridges' well was also tested again in June 2007. Dave Bridges has installed a water softener and the system was sampled prior to the water softener.

5.0 RESULTS

5.1 Shallow Groundwater

5.1.1 2005 Initial Sampling

One set of six groundwater samples (including a field duplicate) was collected from the three new direct push wells (DP-01, 02, and 03) and two existing water wells on the property. The locations of the wells are shown in Figure 4 and the results are summarized in Table 1. A copy of the laboratory report is also located on the CD attached as Appendix 4.

The results indicate that contaminants of concern are present in the groundwater near the northwestern edge of the property. The highest concentrations of contamination were observed in the direct push well at the northwest corner of the property. The benzene concentration was 0.0164 mg/L which exceeds the ADEC cleanup level of 0.005 mg/L. GRO, ethylbenzene, and xylenes were also detected, but at concentrations below the ADEC cleanup level. BTEX compounds were detected below the ADEC cleanup levels in the east well and benzene was detected below the ADEC cleanup level in the west well. Contaminants of concern were not detected in DP 1 (between the east and west wells) or in DP-3 on the western edge of the property.

5.1.2 2005 Expanded Characterization

Fourteen shallow groundwater monitoring wells (DP-01 through DP-29) on the Ben Lomond site were sampled in early September 2005 for a total of 16 samples, including two field duplicates. Each sample was analyzed for GRO and BTEX and four samples were analyzed for EDB. These results are summarized in Table 2 and shown in Figure 5. A copy of the laboratory report is included on the attached CD.

GRO concentrations ranged from non-detect to 56.3 mg/L, with eight of the 14 wells exceeding the ADEC cleanup level of 1.5 mg/L. Benzene concentrations ranged from non-detect to 7.86 mg/L, with 11 of the 14 locations exceeding the ADEC cleanup level of 0.005 mg/L. Toluene concentrations were primarily non-detect, with two locations exceeding the ADEC cleanup level of 1 mg/L. Ethylbenzene concentrations ranged from non-detect to 1.98 mg/L, with two locations exceeding the ADEC cleanup level of 0.7 mg/L. Total xylenes were detected in nine of 14 locations with a maximum of 5.58 mg/L, below the ADEC cleanup level of 10 mg/L. EDB was detected above the ADEC cleanup level (0.00005 mg/L) in three of the four samples with a maximum concentration of 0.0429 mg/L.

5.1.3 2006 Expanded Characterization

Thirteen shallow groundwater monitoring wells were sampled on July 25 and 26, 2006 for a total of 15 samples, including two field duplicates. Nine of the thirteen locations were on the Ben Lomond property, three were on the Geraghty Brothers property, and one was located in the Peger Road right-of-way. Each sample was analyzed for GRO and BTEX. Sample locations and results are summarized in Table 3 and shown in Figure 6. A summary table of the 2005 and 2006 results is included as Table 5. A copy of the laboratory report is included on the attached CD.

GRO was detected in eight of the 13 locations with a maximum concentration of 63.8 mg/L and four of the locations exceeding the ADEC cleanup level. Benzene was detected in all 13 locations and exceeded the ADEC cleanup level in eight locations with a maximum concentration of 9.12 mg/L. Toluene and ethlybenzene were detected in five locations and exceeded the ADEC cleanup level in two locations. Xylenes were detected in five locations, but did not exceed the cleanup level.

In addition to the characterization work completed by Ben Lomond, Great Northwest has been responsible for periodic monitoring of two monitoring wells. GNI-03 is located on the east side of Peger Road near the south edge of the Geraghty Brothers property and GNI-05 is located on the west side of Peger Road on the property of Leif Ostnes. These well were sampled three times in 2006 and two times in 2007 and the results are summarized in Table 4. Benzene has typically been about 0.095 mg/L in GNI-03, above the ADEC cleanup level of 0.005 mg/L. Benzene has been detected twice in GNI-05, but both times have been below the ADEC cleanup level. Other BTEX contaminants have not been detected in these wells.

5.2 On Site Soil

Five soil samples were collected from the site at the most suspect and/or contaminated areas associated with the buried piping system, typically at the ends where elbows went to the surface (see Figure 3). Laboratory analysis was for petroleum fractions and lead. The laboratory results and ADEC Method 2 cleanup levels are summarized in Table 6. Toluene, ethylbenzene, total xylenes, and lead are all at least an order of magnitude below the respective cleanup levels. GRO ranges from 48.4 to 393 mg/kg, with only one sample exceeding the cleanup level. Benzene was detected in two samples and both slightly exceeded the cleanup level. DRO concentrations ranged from 53.2 to 614 mg/kg with four of the five samples exceeding the cleanup level.

5.3 Drinking Water Wells

A total of 12 drinking water wells were sampled between 2005 and 2007 within the well search area shown in Figure 7. All drinking water well results are summarized in Table

7. This table includes the date of the sampling event and the SGS work order number for reference purposes. Each laboratory report is included on the attached CD.

Four drinking water wells have had detectable concentrations of benzene. The highest concentration was in the Badger Towing well west of the site. Sampling events have occurred periodically to evaluate changes to the system. These include the installation and functionality of a carbon filter that was installed on the plumbing system, a new deeper well that was installed to replace the existing well, and an extension of the new well of approximately 50 feet to reach water below a layer of permafrost. Dave Bridges well has been tested three times and now is below the ADEC MCL. Lisa Peger's shallow well and the Ben Lomond West well were below the MCL during the 2005 sampling event and were not tested again.

5.4 Quality Control Summary

Table 8 is a summary of the laboratory work orders that are discussed in this report. Field duplicates have been collected for the groundwater characterization efforts and the field duplicate quality control summary is shown in Table 9. Field duplicate precision is acceptable for each duplicate pair. A laboratory quality review checklist has been completed for each of these laboratory reports and a discussion of each of the concerns is contained in the laboratory checklist. No significant quality control issues were noted, although most of the laboratory reports contain a few minor quality control issues, such as method blank or surrogate recovery concerns. All data was considered usable for the purposes described in this report.

5.5 Conceptual Site Model

A draft conceptual site model (CSM) scoping form has been completed for this site. The CSM scoping form and graphic are included in Appendix 3. This scoping form indicates that most exposure pathways are complete from the soil and shallow groundwater contamination to residents and visitors at the site, including direct contact, ingestion of groundwater, and inhalation of indoor and outdoor air. Exposure pathways complete for residents and visitors at nearby properties include ingestion of groundwater and inhalation of indoor and outdoor air.

6.0 ANALYSIS

6.1 Sources and Source Control

The only reported release at the property was in the early 1980s from a buried pipe located south of the fuel island. This was reported to be less than 25 gallons, although more than 40 gallons of free product were recovered. Additional site characterization was not reported at the time.

Excavation in the location of the former leak identified buried piping and soil contamination, consistent with the previous report. Based on the soil delineation completed to date, approximately 1,400 linear feet of piping has been removed and field screening indicated that approximately 75% of this was contaminated. All piping ended in buried elbows pointing to the surface. This generally confirms Ben Lomond's understanding that the former Air North fuel storage tanks were located above ground. Ben Lomond personnel reported that no aboveground tanks were present on the site when Ben Lomond occupied the property and the piping locations are the only evidence of the probable locations. At this time, no tanks are present and all known piping has been excavated and removed.

As indicated above, most buried elbow locations and many buried fitting locations appear to have leaked. Contaminated soil related to this distribution system had a foul odor and significantly elevated PID reading, often above the range of the instrument. Laboratory results from the most contaminated locations indicate that the soil contamination is primarily DRO and benzene, although GRO and other BTEX compounds are present in most samples. The highest concentrations of DRO and benzene are less than one order of magnitude above the respective cleanup levels, indicating that the highly volatile nature of the AVGAS contamination is resulting in field screening results that are well above normal. Overall, this suggests that the overall mass of contaminants in the soil is substantially lower than would be expected from the field screening results. Additionally, the more mobile contaminants may have already migrated to the groundwater.

In addition to the known Air North sources, Ben Lomond has also had bulk petroleum storage tanks on the site. The primary storage facility was located adjacent to the cold storage building and consisted of about six large aboveground tanks of various vintages and styles. These tanks were installed primarily for use as used oil storage when Ben Lomond operated a used oil collection and heat recovery business. The tanks were in a lined and bermed containment. At this time, the tanks have been removed and no large scale staining was observed within the containment. Based on the contaminants of concern in the groundwater and the locations of the clean and contaminated areas, this bulk fuel storage does not appear to be contributing to the groundwater plume at this time. The liner is still in place and field screening and laboratory sampling are planned for the area once the liner has been removed to determine if this bulk storage area is a potential source area.

In addition to the bulk tanks, numerous vehicles and equipment with petroleum reservoirs were present throughout the property. Most of the vehicles and equipment have been moved since the initial inspection and only minimal, if any, surface soil staining was observed beneath these items. Field screening and laboratory sampling was not considered necessary at any of these locations and they are not considered a potential source of the groundwater contamination.

Overall, the primary sources of the contamination are the former Air North storage tanks and buried distribution system. Additional primary sources from Ben Lomond operation include additional storage tanks and vehicles. Tanks and most vehicles have been removed from the site. All identified buried piping runs have been removed and the extent of this piping system (and therefore the approximate locations of the original tanks) coincides reasonably well with the groundwater contamination. Based the data available, the sources are documented adequately and are no longer contributing to the groundwater contamination. No aboveground sources remain on the site and additional investigation for buried sources is not considered necessary.

Secondary source soil associated with the buried piping system is widespread across the site and remains in place. The concentrations of the primary contaminants of concern are less than one order of magnitude above the ADEC cleanup levels. Due to the large area of the piping system, a relatively large volume of secondary source soil is present, but the low concentration indicates these secondary sources soils are currently a relatively minor concern in relation to the groundwater issues.

6.2 Contaminants of Concern

The most recent ADEC guidance indicates that the potential contaminations of concern for a release aviation fuel are gasoline range organics (GRO), benzene, ethylbenzene, toluene, and xylenes (BTEX), polycyclic aromatic hydrocarbons (PAHs), and lead. In addition to these compounds, ADEC also requires analysis for the lead scavenger ethylene dibromide (EDB) if leaded gasoline is suspected of having been released. Soil, groundwater, and drinking water media have been combinations of these contaminants of concern and this section describes the contaminants of concern that may present a risk through each media.

6.2.1 Soil

Soil results at the five most contaminated locations encountered indicate that benzene, GRO, and DRO are the only contaminants of concern that exceed the ADEC cleanup levels. Benzene was exceeded the cleanup level in one of the five locations and was not detected in the other four locations, although the detection limit exceeding the cleanup level in one of these locations. GRO was detected in all five locations, but only exceeded the cleanup level in one location. DRO was detected in all five locations and exceeded the cleanup level in four of the locations. Of these exceedances, the highest proportional exceedance was benzene at slightly less than four times the cleanup level.

Toluene and ethyl benzene were detected below the cleanup levels in three locations, lead was detected below the cleanup level in the four locations tested, and xylenes and RRO were detected below the cleanup levels in all five locations. Each of these detections was at least an order of magnitude below the cleanup level and these compounds are not considered contaminants of concern at the site.

6.2.2 Groundwater

The initial characterization for the groundwater at the perimeter of the property in May 2005 was for GRO and BTEX. In these samples, only benzene exceeded the ADEC cleanup level in a single sample. Trace levels of GRO and other BTEX compounds were also detected in two of the samples.

The groundwater characterization of the full property in September 2005 was expanded to include the source areas and analysis for EDB. GRO and benzene exceeded the ADEC cleanup levels throughout the site. Toluene and ethylbenzene exceeded the ADEC cleanup levels in the source areas, but not across the remainder of the site. Xylenes were detected in most samples, but were below the cleanup level. EDB was analyzed in four samples and detected above the cleanup level in the source areas. EDB was not detected at the downgradient edge of the property. Based on these results, GRO, BTEX, and EDB are considered contaminants of concern on the site. Benzene is the only contaminant of concern that appeared to be migrating offsite.

The July 2006 sampling event that expanded the offsite sampling program was limited to GRO and BTEX. These results indicate that GRO and BTEX remain the contaminants of concern on the site. GRO was detected offsite, but below the ADEC cleanup levels. Benzene concentrations exceeding the cleanup level were found offsite and benzene remains the offsite contaminant of concern.

6.2.3 Drinking Water

Each drinking water well in the area has been tested at least once since 2005. The original round of drinking water testing was for the full suite of volatile organic compounds (VOCs), including BTEX compounds, by EPA Method 524.2. Benzene was the only compound detected in the drinking water wells and exceeded the cleanup level in the closest offsite well. Subsequent testing of drinking water wells continued to utilize EPA Method 524.2, but was limited to BTEX analysis. Benzene has been detected in one other offsite well and is the only contaminant of concern in the drinking water in the area.

6.3 Free Phase Petroleum

Four test pits have been excavated and 17 monitoring wells have been installed at the site. Petroleum sheen has been observed on the groundwater in some test pits and monitoring wells, but recoverable free phase petroleum has not normally been observed. Occasionally a trace amount (~0.01 feet) of free product has been observed in DP-26, which also has the highest contaminant concentrations. During spring monitoring, DP-26 has been observed to have several feet of free product, but does not recharge with free product after purging, suggesting the slots are acting like a one way filter for free product.

6.4 Contaminant Migration and Flow Direction

As described in more detail in Section 6.1, the sources of the contamination at the site appear to be a relatively extensive buried distribution piping and the aboveground storage locations related to the former Air North AVGAS system. Contaminants were released to the subsurface, and potentially the surface, and then migrated to the groundwater. Contaminants then migrated through the subsurface to the groundwater. Remaining surface and subsurface soil contaminant concentrations suggest that a large percentage of the contamination has already migrated to the groundwater in the 20+ years since Air North left the site.

6.4.1 Area-wide and Site Studies

Area-wide groundwater studies completed by USGS indicate the groundwater flow direction in the Fairbanks area is generally to the northwest with the Tanana River acting as to recharge the aquifer and the Chena River acting as a drain. Deviations from this area-wide trend are typically to the west. In this specific area, near the Tanana River, the study showed a general northwest trend during both high and low groundwater events during the USGS study.

A groundwater elevation survey was completed during the September 2005 sampling event at the site. This data indicated the hydraulic gradient was to the northwest, consistent with the area wide trend. Benzene concentrations in the groundwater also show a trend to the northwest, including the off-site locations along Peger Road.

6.4.2 Great Northwest Dewatering

Great Northwest, Inc. has a series of large gravel pits located west of the site on the west side of Peger Road. In an effort to produce more gravel, Great Northwest has conducted extensive dewatering in one or more of these gravel pits during the summer months for several years. Reports indicated that the groundwater elevation in the gravel pits were at least 30 feet below the natural groundwater level. While groundwater monitoring at the site or surrounding area was not completed at the time, but anecdotal evidence suggests that the dewatering may have depressed the water table halfway to the site.

Based on the location of the gravel pit relative to the site, the groundwater flow may have been pulled more towards the west due to the dewatering. This dewatering may also have increased the velocity and/or total flow of groundwater through the aquifer regardless of the water table elevation. However, the dewatering activities were less than half of each year and occurred during less than half of the years that the contamination is thought to have been present at the site. While the dewatering has probably had some impact on the local groundwater, the overall impact of the dewatering on contaminant migration can not be quantified.

6.4.3 Frozen Soil

Seasonally and permanently frozen soils may present barriers to groundwater flow and/or change the direction of groundwater flow across an area. Generally, seasonal frost does not have much effect on the groundwater flow because the frozen soil does not extend more than a short distance into the groundwater, if it reaches the groundwater at all. The removal of the snow insulation by plowing and heavy traffic can act to drive seasonal frost deeper and/or grow shallow permafrost beneath driveways, particularly on the north side of large structures.

Naturally occurring shallow permafrost is known to be intermittent throughout south Fairbanks. Most development in the area consists of clearing the site of vegetation and allowing the site to warm up and thaw for several years prior to construction. Deeper permafrost is also known to be present intermittently within the Fairbanks area, particularly in this area of south Fairbanks.

A comprehensive study of frozen soils has not been completed in this vicinity. The following discussion is based entirely on observations during installation of shallow direct push wells, comments made by drillers during drinking water well installation, observations of other well users in the area, and the few available well logs that have been located.

<u>On Site</u>
The site has been cleared for at least 40 years, which is thought to be more than adequate for thawing of any shallow permafrost that may have been present on the site prior to development. Permafrost was not noted on the one well log that is available for an on-site drinking water well. The presence of several large structures and cleared driveways may be generating several small pockets of permafrost on the northern edges of the site or in the general vicinity of the cold storage building. Excavations

northwest of the cold storage building in early summer 2005 suggested that groundwater flow was impeded by dense silt and/or frozen soils.

Subsequent installation of groundwater elevation dataloggers at the site in 2006 suggested that seasonal frost extended below the top of the water table well into the summer months at the site. Each well with a datalogger, including the well near the cold storage building, did eventually thaw to a depth of at least 15 feet below the ground surface. Overall, this data suggests that seasonal frost and/or relatively cold penetrates deeper than expected across the site and may impact the top of the water table. Additionally, the steel well points may be acting as a conduit for seasonal frost penetration to the top of the water table and creating localized pockets of frozen soil around some of these wells.

Off Site

Frozen soil was encountered between 3 and 10 feet below grade around the Geraghty Brothers property and on the Badger Towing property during attempted direct push well sampling in July 2006. This frozen soil could not be penetrated by the direct push rig at four locations along the northern edge of the property and within Frank Avenue. Visual inspection of the Geraghty Brothers property suggests that shallow permafrost is present beneath most of this site. The site has been cleared and is expected to thaw in the next several years. Thawed soil was found in the right-of-way and ditch line along Peger Road on the Geraghty Brothers property and to the south adjacent to the Peger property. The GNI-03 well located in this area extends to a depth of 30 feet with no permafrost reported. This provides some evidence that the remaining shallow permafrost in the area will probably melt now that the area has been cleared.

The frozen soil on the Badger Towing property was intermittent to a depth of 10 feet, where the driller indicated that refusal was encountered at three locations. This suggests that frozen soil in this area may be related to either residual shallow permafrost that was present prior to clearing or new permafrost growth related to plowing of the area. The extent of shallow frozen soil in this area was not delineated. Two drinking water wells are located on the property. No well log is available for the original well, which was reported to extend to a depth of approximately 40 feet. The replacement well stopped at permafrost, approximately 60 feet below grade. When this water still contained benzene, the well was advanced through the permafrost which ended at approximately 100 feet below grade.

A few other sources have reported deeper permafrost in the area, generally between about 40 and 100 feet below the ground surface. Lisa Peger reports that one of her wells is more than 100 feet deep and extends through the deeper level of permafrost. A well log across Peger Road at Penny Watson's (the former massage parlor) indicates no permafrost to a depth of 58 feet. No frozen soil was reported in the shallow wells GNI-03 and GNI-05. ADEC research farther north along Peger Road indicates that several drinking water wells penetrate the deep layer of permafrost in the area of Davis Road and monitoring wells in this area have reached permafrost in the 30 to 60 foot range.

Summary

Overall, the intermittent nature of both the shallow and deeper zones of frozen soil is expected to create localized barriers to groundwater flow. Clearing and development activities in the area are probably thawing more shallow frozen soil than is being created through plowing. The shallow frozen soil may be creating channels that allow the contamination to extend farther than would be expected in an aquifer with no frozen soil. The shallow frozen soil may also be creating greater vertical distribution of the contaminants in the aquifer. However, the overall pattern of contamination is consistent with the regional groundwater flow suggesting that the shallow frozen soil is not have a significant effect on the overall area of pattern of groundwater contamination. Additional efforts specifically focused on the extents of shallow permafrost are not considered cost effective or necessary to characterize the off-site concerns at this site.

Only two known wells penetrate the deeper layer of permafrost that has been reported in the area. Contamination has not been detected in either of these wells, suggesting that the deeper permafrost may be a barrier to vertical migration of contaminants below the top of this layer. Sampling of the drinking water well at Badger Towing suggests that benzene is present at the top of this frozen layer. Periodic sampling of the Badger Towing well is planned and will provide additional information about the potential contaminant migration below this layer. Additional investigation of the horizontal and/or vertical extents of the deeper permafrost layer is not considered necessary at this time.

6.5 Remediation Strategies and Risk Reduction

Air North operated the site as a commercial air center for approximately 15 years until going bankrupt in 1986. The source of contamination at the site is the former aviation gasoline (AVGAS) storage and distribution system that was used by Air North. No as-built documentation of the fuel system has been found and most aboveground hardware was removed in the mid to late 1980s. Exploratory excavations have indicated that the system used a series of aboveground storage tanks, pressurization pumps, and dispensers linked together by a network of underground piping. Field observations indicate each component of the system leaked or failed and the extent of the contamination indicates that many buried components may have been leaking since shortly after installation.

The AVGAS contamination has impacted both the site and surrounding properties. No estimation of the quantity of fuel that was release is possible, but the size of the plume is consistent with a large scale release of fuel over several decades. At this point, the contamination appears to be generally stable in the groundwater both on and off the site, consistent with the age of the contamination. The environmental concerns at the site can be divided into three major categories: on-site soil contamination, on-site groundwater contamination, and off-site groundwater contamination. Each of these three concerns requires a different long-term strategy as further discussed below.

6.5.1 On-Site Soil Contamination

The on-site soil contamination is defined as soil located between the surface and the top of the groundwater smear zone (approximately eight to ten feet below the surface). The primary source of this contamination was a leaking piping system that was buried 6" to 18" below the surface. Assessment has confirmed the most extensive contamination is at pipe joints and where piping rose vertically towards the ground surface and probable former tank, dispenser, and/or transfer locations. Since the actual surface and subsurface sources have been removed, the environmental concern is that these remaining on-site contaminated soils may act as secondary sources and continue leaching contaminants to the groundwater from normal infiltration due to precipitation. In addition, these on-site soils present potential concerns for future buildings from vapor intrusion.

Based on the soil delineation completed to date, approximately 1,400 linear feet of piping has been removed and approximately 75% of this field screened as contaminated. Assuming the average depth of contamination is 9 feet and the average width is 4 feet, approximately 1,400 cubic yards of contaminated soil is estimated to remain above the water table at the site. An additional 350 square feet of contaminated soil near the former fuel island brings the total volume of contaminated soil remaining on the site to approximately 1,500 cubic yards.

Exploratory excavations have shown that the subsurface soil is extremely loose and sidewalls will require significant sloping in any excavation that exceeds four feet deep. Additionally, the former vegetative mat, including larger trees, appears to be present beneath the gravel pad and excavation through this layer causes further sloughing during excavation. The geometry of the contaminated soil and the excavation required to safely remove this soil suggests that overburden removal will be in the range of two to four times the volume of contaminated soil removed. The total excavation volume to remove the contaminated soil is therefore estimated at 4,500 to 7,500 cubic yards.

Laboratory results from the most contaminated field screening locations, typically located beneath the elbows to the surface, suggest that the remaining soil contamination is not extremely high. GRO and BTEX, the primary contaminants of concern in the water, exceeded the cleanup levels in only two of five locations sampled during the preliminary excavation. DRO exceeded the cleanup level in more locations, but the highest levels of contamination were less than five times the migration to groundwater cleanup level.

Soil remediation methods are generally divided into two categories: in-situ and ex-situ. In-situ treatments leave the soil in place and treat the contaminants through chemical of microbial oxidation. These typically require drilling or excavation into the contaminated soil followed by application of the oxidation agent. Follow-up drilling or excavation is required to verify the success of the remediation effort. Ex-situ remediation consists of excavating the contaminated soil and treating it on the ground surface. Typical treatment methods include thermal, biological, and chemical oxidation. The treatment can be controlled and monitored more effectively because the soil is readily accessible on the ground surface. The treatment cell must be sampled to verify the remediation is complete prior to disposal of the contaminated soil.

Most soil remediation projects in the Fairbanks area use ex-situ remediation techniques because the process is easier to control and the cold ground temperatures tend to slow in-situ techniques. Thermal remediation at OIT in Moose Creek is the typical remediation choice for small volumes of soil, heavily contaminated soil, and/or sites that do not have a suitable location for the onsite treatment cells that may be present for several years. On site treatment through landfarming is more common for sites with the available long-term space and soil contaminants that are more volatile and/or present in lower concentrations. In general, off-site thermal treatment is more expensive than on-site landfarming.

The current configuration and soil contaminant concentrations indicate that this site would be suitable for ex-situ landfarming. While permafrost does not appear to be present at the site, the depth and extent of seasonal frost indicates that the ground remains cold well into the summer and may limit in-situ treatment. The relatively low concentrations of relatively volatile contaminants in the soil indicate that landfarming would probably be successful in a period of one to two years. In addition, the site will generate a relatively high volume of contaminated soil, the owner has equipment resources available, and most debris has been removed from the site and space is available for treatment cells

A pilot landfarming project is recommended for 2007/2008 to determine the potential effectiveness of this treatment method. A pilot project of 300 to 500 yards would be adequate to determine the effectiveness of the treatment method at the site. Field observations indicate that this volume of soil is probably present in the vicinity of the former dispenser island. The recommended treatment methodology is to aerate the soil, add fertilizer, and place it in a treatment cell approximately 18 inches thick. Regular watering and tilling will be necessary to facilitate the oxidation of the contaminants and can also be completed by the owner. If this soil treatment pilot project is undertaken, the location, construction, and other specifications of the treatment cell will be further detailed in a corrective action work plan.

6.5.2 On-Site Groundwater Contamination

Groundwater benzene concentrations exceeding the ADEC cleanup level have been identified beneath approximately 4.1 acres (50%) of the site (as shown in Figure 4). The age of this release (more than 20 years since termination of the leaks) and the groundwater monitoring in 2005 and 2006 indicate the contamination is relatively stable within the groundwater. The existing groundwater data indicate the former fuel dispensing island area and the near DP-26 are the most contaminated and active remediation in these two areas may expedite the cleanup of the whole site.

Several alternatives for active remediation have been successful at treating this type of groundwater contamination in the Fairbanks area. As with the soil contamination, the groundwater can be treated in place or pumped out and treated on the surface. In-situ treatment methods include stimulating natural biological degradation through addition of oxygen by air sparging or oxygen injection techniques and nutrient addition to facilitate biological activity. These systems also usually have a soil vapor extraction system that removes volatilized contaminants and/or degradation byproducts. Ex-situ techniques consist of pumping the water out, treating it using air stripping or other technology and then disposing of the water. With proper permitting, the treated water can be reinjected into the aquifer and provide an additional oxygen source.

Systems that pump and treat water aboveground have limited success in Fairbanks in the winter due to freezing problems. Several locations in Fairbanks have shown significant improvement over several years using these systems only the summer months. Air sparging and soil vapor extraction systems are generally operated all year and have had similar results over a period of several years. These systems are generally energy intensive and expensive to operate and maintain. Ben Lomond currently has an air stripping system at the site that was intended for a different purpose, but is expected that this system could be utilized successfully for treating the contaminated groundwater at the site.

Active introduction of oxygen into the groundwater to directly oxidize contaminants or stimulate biological degradation has not been tested as well as the air sparging or pumping types of remediation. The cold subsurface temperatures limit biological activity, particularly during parts of the year when seasonal frost penetrates close to the top of the water table.

Monitored natural attenuation has been chosen as the remediation strategy at a large number of sites in Fairbanks. This involves a detailed study of groundwater geochemistry for approximately two years (four monitoring events) to evaluate the effectiveness of the natural subsurface biodegradation regime. If effective, natural attenuation generally requires several decades and requires long-term monitoring to verify the effectiveness of the process.

Due to the size of the on-site groundwater plume, natural attenuation is expected to be the primary mechanism of remediation across the site. Focused active remediation may be appropriate at the most contaminated source areas to facilitate the eventual natural biodegradation. Both of these types of remediation can be evaluated on a pilot basis. Sampling and analysis of geochemical parameters to evaluate natural attenuation in up to five wells is recommended. The goal would be to evaluate both the center and the edges of the plume, as well as a background location. Specific locations and parameters would be specified in a brief work plan. In addition to the geochemical parameters, pilot testing of a pumping system and air stripping in the Ben Lomond equipment is recommended for up to 30 days. This could be undertaken at the same time and location as the pilot landfarming project to take advantage of the excavation to install remediation system hardware as well as equipment and personnel availability. However, the air stripper is at a fixed location and a pilot study near the air stripper would significantly reduce the need for transfer of contaminated water across the surface of the site. Reinjection of treated water on site may be acceptable on a pilot study basis with minimal or no engineering plan reviews by ADEC and/or inventory of injection wells with EPA.

6.5.3 Off-Site Groundwater Contamination

The presence of groundwater contamination from this Site on neighboring properties presents the largest exposure risk to potential receptors as well as the largest financial liability to the owner of the Site. Off-site contamination is currently estimated to involve approximately 6.9 acres (see Figure 4) and impact two drinking water wells. These concentrations are significantly lower than on-site concentrations and active remediation to treat the groundwater is not expected to be cost effective over this large area. Reduction of risk to current individual receptors and cooperation with future individual receptors is expected to be necessary to manage this risk.

The primary risk pathway that is complete at nearby properties is ingestion of contaminated groundwater. Two of the 12 drinking water wells in the area have been identified as contaminated. A carbon filter was successfully used on one well to reduce the contaminant concentrations. A more thorough management program is recommended at locations that carbon filtration will be used in the future. Drinking water results also indicate that the aquifer below the deep permafrost layer is not contaminated. Deepening of the well below the deep permafrost layer has also been successful at providing clean drinking water and reducing the risk from the contamination. Both of these options appear to be effective means of managing this risk to the off-site receptors and cost effective. The installation of public water in the area has been conceptually pursued with the public water provider. The limited number of users and relatively large lots size indicate that this will not be a cost effective solution.

The second major exposure pathway that may be impacting off-site receptors is vapor intrusion from the groundwater. As described above, the delineation of the off-site plume has been limited by both frozen ground and access to private property. An investigation of foundation and building construction has also not been completed. The cold subsurface temperatures are expected to significantly reduce the potential for volatilization of subsurface contaminants. Evaluation of the potential for vapor intrusion utilizing the existing buildings and concrete slabs on the site is recommended because the contaminant concentrations are higher and access will be easier to coordinate. This program is expected to include sub-slab and/or subsurface soil gas sampling and the details of this plan will be specified later if this evaluation is considered necessary. If this evaluation indicates the potential for vapor intrusion at off-site locations, then recommendations for evaluation both the building construction and appropriate testing would be made at that time.

In addition to reducing the specific risks posed to individual receptors, the potential for natural attenuation needs to be evaluated in the off-site areas of the groundwater plume and the limits of the plume on the west side of Peger Road should be delineated more clearly. Additional coordination for access should be focused on one or two land owners, in Block 8 (such as Penny Watson, who has been cooperative in the past) and the right-of-way for Arla Street. Three more direct push wells are recommended in this area. Testing for natural attenuation parameters, in the same manner as for the on-site evaluation, is recommended in GNI-03 and GNI-05.

7.0 CONCLUSIONS & RECOMMENDATIONS

NORTECH has completed the initial groundwater and soil characterization associated with the former Air North operation at Metro Field. The site is currently owned and operated by Ben Lomond and most of the materials stored at the site have been removed in the last several years. This work has included installation of direct push groundwater monitoring wells on and off the site, well search and drinking water testing of properties in the area, and test pits and buried piping removal activities. Based on the field observations and laboratory results, ***NORTECH*** has drawn the following conclusions about the site:

Sources and Source Control

- Soil and groundwater contamination is consistent with aviation gasoline (AVGAS)
- The former Air North fuel storage and distribution system consisted of below ground piping connecting aboveground storage and pumping devices
    - Most aboveground features of the system were removed in the 1980s

  - The buried components that were identified were removed in 2005
  - No known features of the Air North fuel system remain on the site
- Field screening indicated that soil contamination is present adjacent to approximately 75% of the 1,400 feet of the former buried piping system
- Approximately 1,500 cubic yards of secondary source soils are estimated remain on the site
- Ben Lomond had an aboveground tank farm for storing used oil
  - The tank farm was bermed and had a liner
  - Most of these tanks were never used by Ben Lomond
  - These tanks have been removed from the site and field screening is planned after removal of the liner

Soil Contaminants of Concern

- Soil characterization has identified the following contaminants above the ADEC cleanup levels in the soil
  - Gasoline range organics
  - Benzene
  - Diesel range organics
- Residual range organics, toluene, ethylbenzene, xylenes, and lead results were below ADEC cleanup levels
- Polycyclic aromatic hydrocarbon (PAH) and ethylene dibromide (EDB) analyses were not performed on the soil samples

Groundwater Contaminants of Concern – Source Area and On-site Wells

- Groundwater characterization has identified the following contaminants above the ADEC cleanup level in the groundwater in the source areas of the site
  - Gasoline range organics
  - Benzene
  - Toluene
  - Ethylbenzene
  - Ethylene dibromide
- Total xylenes results were below the ADEC cleanup levels in the sources areas on the site

- Diesel range organics, residual range organics, and polycyclic aromatic hydrocarbon (PAH) analyses have not been performed on groundwater within the site

Groundwater Contaminants of Concern – Perimeter and Off-site Wells

- Groundwater characterization has identified the following contaminants of concern at monitoring wells located at or beyond the perimeter of the site:
  - Benzene
- Gasoline range organics, toluene, ethylbenzene, xylenes, and ethylene dibromide have not exceeded the ADEC cleanup levels at or beyond the perimeter of the site
- Diesel range organics, residual range organics, and polycyclic aromatic hydrocarbon (PAH) analyses have not been performed at or beyond the perimeter of the site

Drinking Water Contaminants of Concern

- Drinking water testing has identified the following contaminants of concern in one or more of the drinking water wells in the area
  - Benzene
- Other VOCs reported under EPA Method 524.2 and EPA Method 504.1 (including EDB) were not detected in drinking water wells in the area
- Gasoline range organics, diesel range organics, residual range organics, and polycyclic aromatic hydrocarbon (PAH) analyses have not been performed

Free Phase Petroleum

- Recoverable free product has not been observed regularly in any of the wells
- Free product appears to accumulate in DP-26 over time, but does not recharge when actively pumped

Hydraulic Gradient and Frozen Soil

- Groundwater contamination is present beneath approximately 4.1 acres of the site
- Groundwater contamination is present beneath approximately 6.9 acres off-site
- The regional hydraulic gradient is generally northwest during both high and low water events
- The hydraulic gradient observed on the site is to the northwest

- Groundwater flow in the area may have been impacted by dewatering activities at the Great Northwest gravel pit during the last several years
- Groundwater flow may be impacted by intermittent, localized shallow permafrost (0 to 20 feet below the surface)
- Vertical groundwater mixing may be limited by deeper permafrost (50 to 100 feet below the surface) that has been reported in several drinking water well logs near the site and along Peger Road
- The dissolved contaminant plume is consistent with the northwestern trending hydraulic gradient
- Three more direct push wells or temporary sampling points are recommended to complete delineation of the plume on the west side of Peger Road

Drinking Water Exposure Reduction

- Carbon filtration is effective at removing benzene
- Extending groundwater wells to the top of the deep permafrost (approximately 60 feet below the surface) is not adequate to reach substantially cleaner water
- Extending groundwater wells through the deep permafrost to approximately 100 feet reaches substantially cleaner water
- The age and stability of the plume indicate that drinking water wells that have already been tested clean do not need to be tested again, except the new well

Vapor Intrusion

- Vapor intrusion to indoor air is the is the other primary potential exposure pathway to off-site receptors
- The vapor intrusion pathway has not been specifically evaluated at this time
- Ben Lomond has buildings substantially similar to other buildings in the area that can be used to evaluate this pathway

NORTECH has provided an overview of a number of remediation and risk reduction strategies that have been effective in the Fairbanks area in the last several years. Additionally, Ben Lomond has some equipment and other resources that can be used during some types of remediation. Based on this evaluation, ***NORTECH*** has the following recommendations for remediation and risk reduction related to this site:

Soil Remediation

- Landfarming with fertilizer addition and periodic tilling is expected to be effective

- A pilot landfarming study is recommended to evaluate this treatment methodology and should include
  - Approximately 300 to 500 cubic yards of contaminated soil
  - A treatment cell 12 to 18 inches thick
  - Tilling or turning at least once a month
  - Field screening once every three months
  - Laboratory testing when field screening values are at background or at six months
- The former fuel island area appears to be a good candidate for the recommended landfarming pilot project
- A brief landfarming work plan should be submitted to ADEC for approval prior to beginning excavation

Groundwater Remediation

- Monitored natural attenuation is expected to be effective at remediation contaminated groundwater at the edges of the plume
- A preliminary evaluation of natural attenuation parameters in five on-site wells and two off-site cells is recommended and should include
  - Installation of a background well upgradient of the source area
  - Collection of field parameters including temperature, pH, DO, and ORP during sampling
  - Field kit analysis for nitrate, total iron, ferrous iron, sulfate and sulfide
  - Laboratory samples for methane analysis
- Active remediation may significantly reduce groundwater contaminant concentration in the source areas
- A pilot groundwater remediation study is recommended that includes:
  - Pumping of groundwater to a storage tank
  - Treating pumped groundwater in an air stripping unit
  - Reinjection of the treated groundwater at an upgradient location
- This pilot study could be in same general location as the initial landfarming pilot project location or closer to the fixed location of the air stripping unit
- ADEC and EPA permitting requirements should be minimal for a short term pilot study

- A brief groundwater monitoring and/or remediation pilot project work plan should be submitted to ADEC for approval before undertaking any of these recommended activities

Drinking Water Risk Reduction

- The use of carbon filtration is recommended for treating contaminated drinking water
- Carbon media should be replaced quarterly until BTEX analysis indicates the carbon media is successful for longer periods of time
- The extension of drinking water wells through the deep permafrost layer is also recommended to provide clean drinking water
- Quarterly BTEX analysis of filtered systems and extended drinking water wells is recommended

Vapor Intrusion Risk Evaluation

- Ben Lomond should utilize the buildings present on the site to evaluate the vapor intrusion pathway before investigating off-site buildings
- Subslab, crawlspace, and background air samples may be necessary to fully evaluate this pathway
- A work plan should be submitted to ADEC for approval prior to completing this type of evaluation

8.0 LIMITATIONS

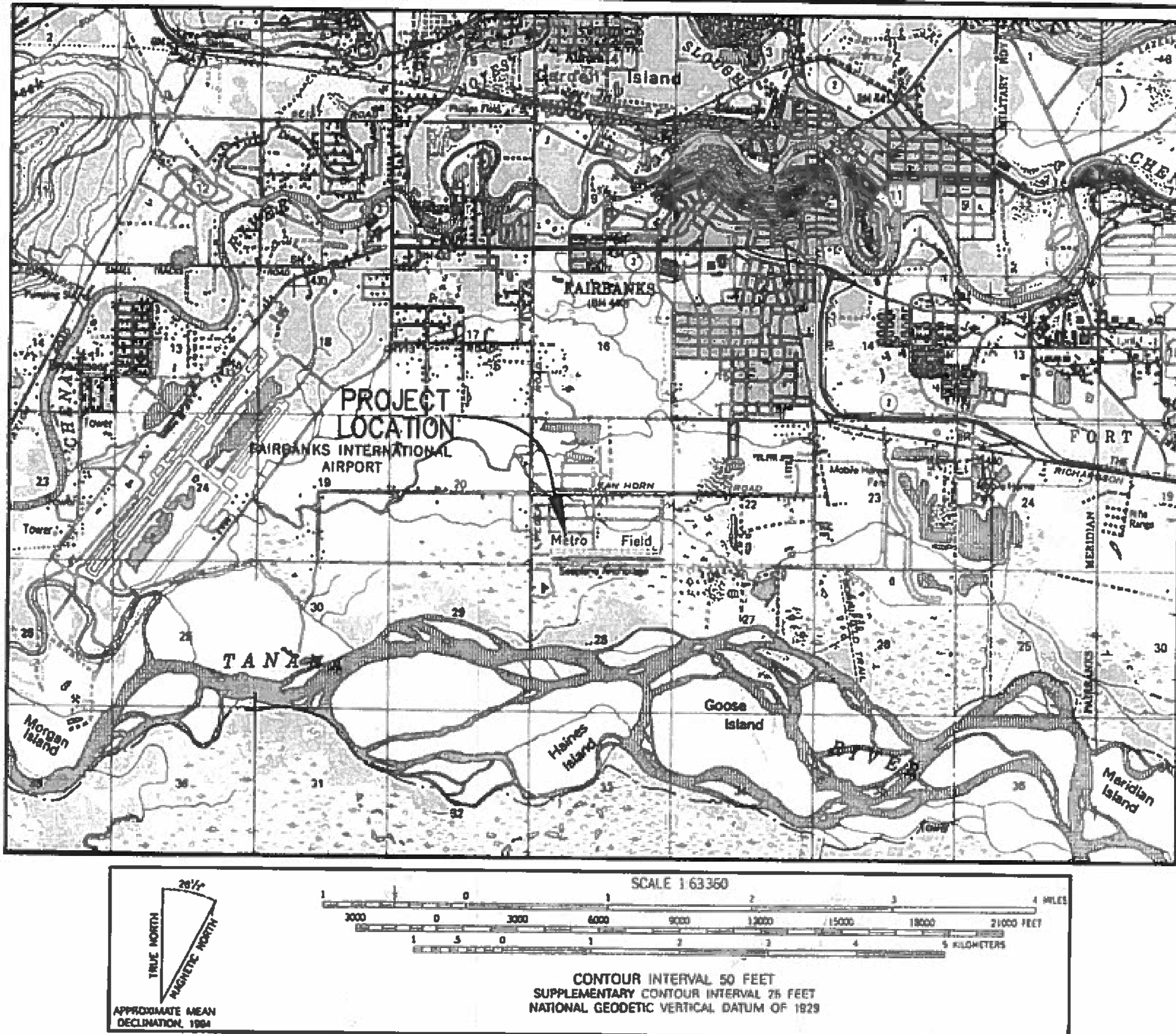
NORTECH provides a level of service that is performed within the standards of care and competence of the environmental engineering profession. However, it must be recognized that limitations exist within any site investigation or assessment. This report provides results based on a restricted work scope and from the analysis and observation of a limited number of samples. Therefore, while it is our opinion that these limitations are 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. This report is prepared for the exclusive use of the Ben Lomond, Inc. 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. We certify that except as specifically noted in this report, all 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.

9.0 SIGNATURES OF ENVIRONMENTAL PROFESSIONALS

Peter Beardsley, PE, Environmental Engineer for ***NORTECH*** has a B.S. degree in Environmental Engineering and is a registered Civil Engineer in Alaska. He has worked on all aspects of environmental investigations and cleanup efforts and is well versed in ESA regulatory requirements.

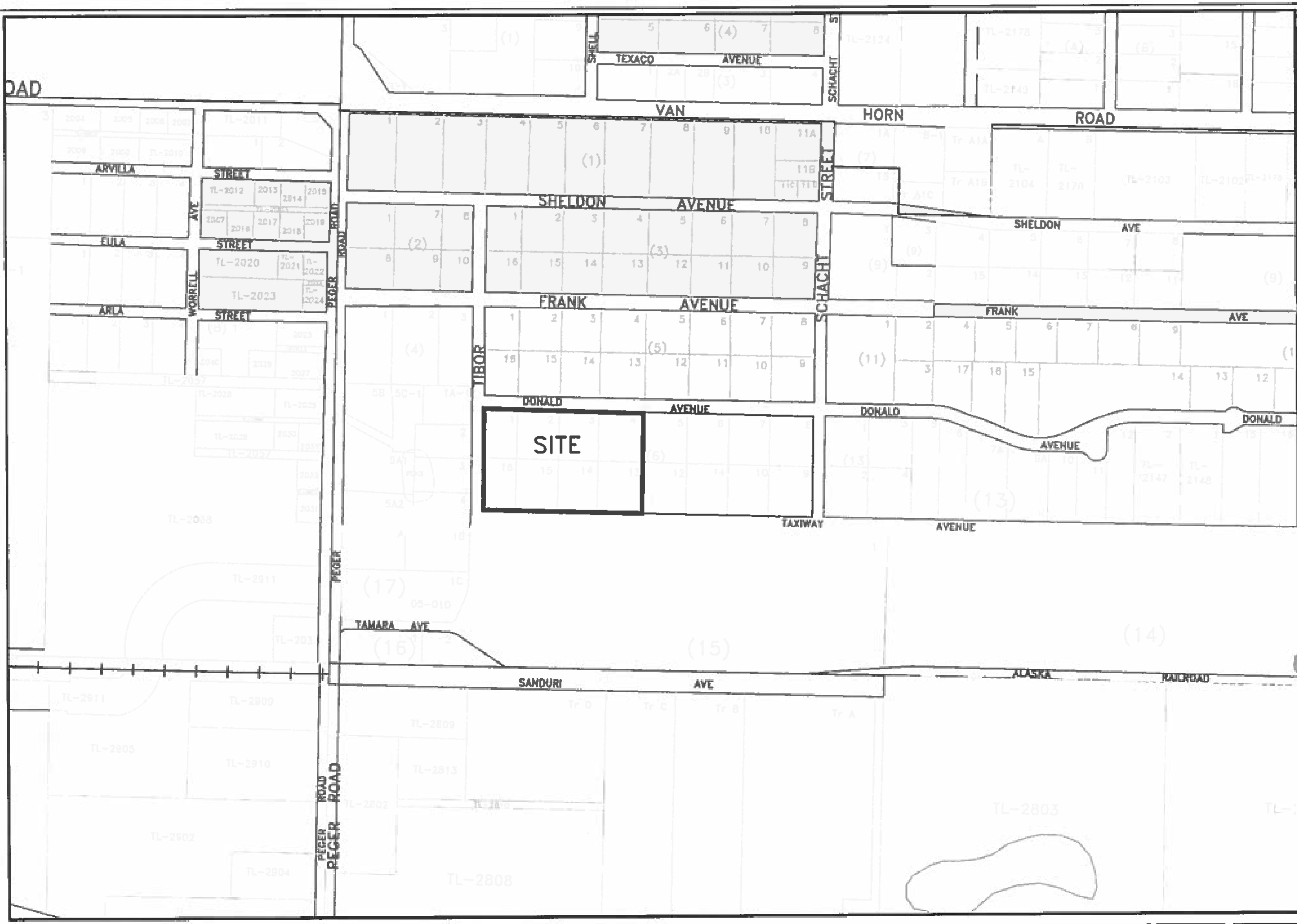
Peter Beardsley, PE
Environmental Engineer



NORTECH
ENVIRONMENTAL & ENGINEERING CONSULTANTS
2400 College Road, Fairbanks, Alaska 99709
(907) 452-5688 FAX: (907) 452-5694

Location Map
Ben Lomond Metro Field Property
Fairbanks, Alaska

DATE: 09/12/07	SCALE: 1" = 1 mi	FIGURE
DESIGN: PLB	PROJECT: 051036	1
DRAWN: PLB	DWG: 051036b(01)	

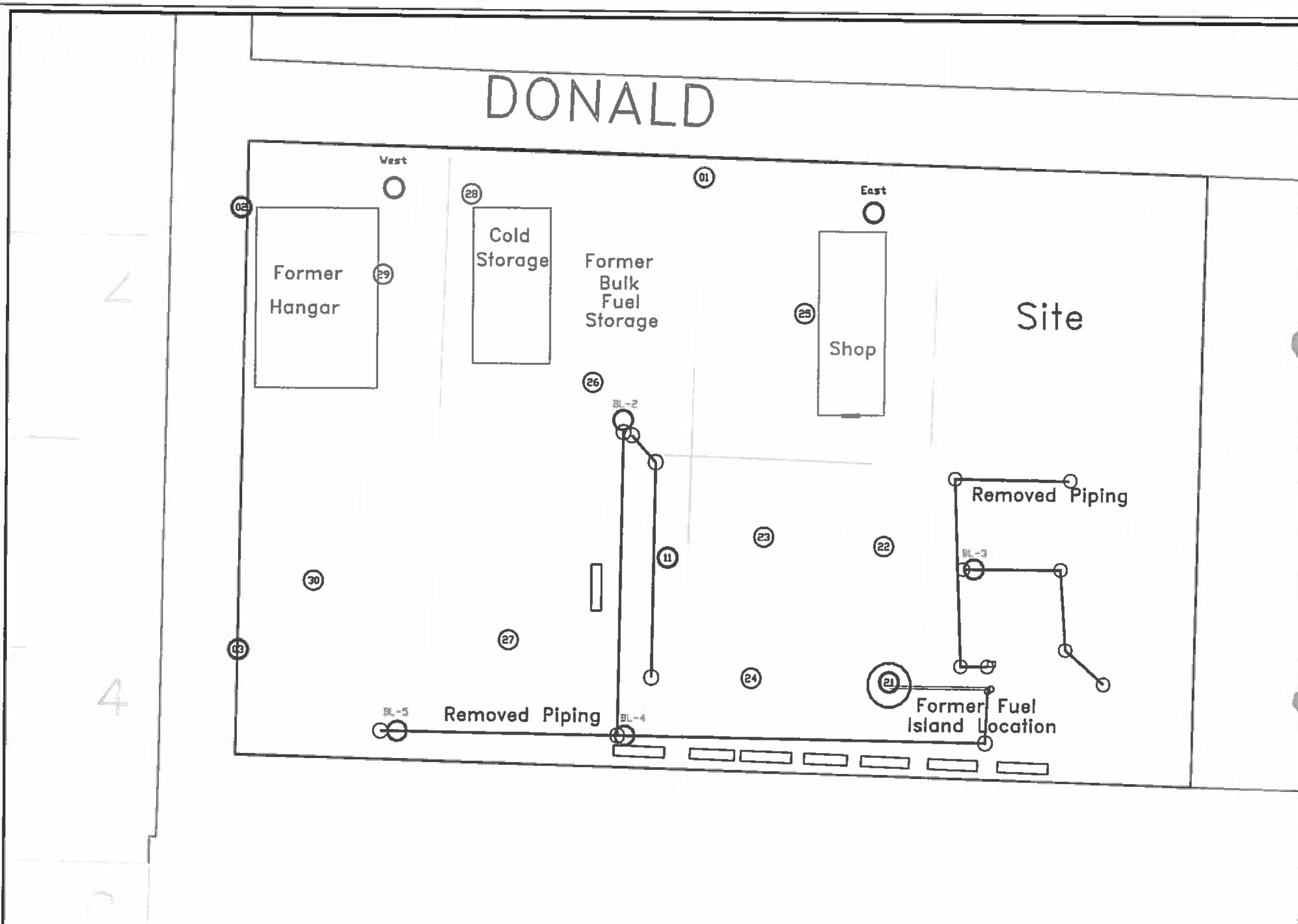


NORTECH
ENVIRONMENTAL & ENGINEERING CONSULTANTS
2400 College Road, Fairbanks, Alaska 99709
(907) 452-5688 FAX: (907) 452-5694

Vicinity Map
Ben Lomond Metro Field Property
Fairbanks, Alaska

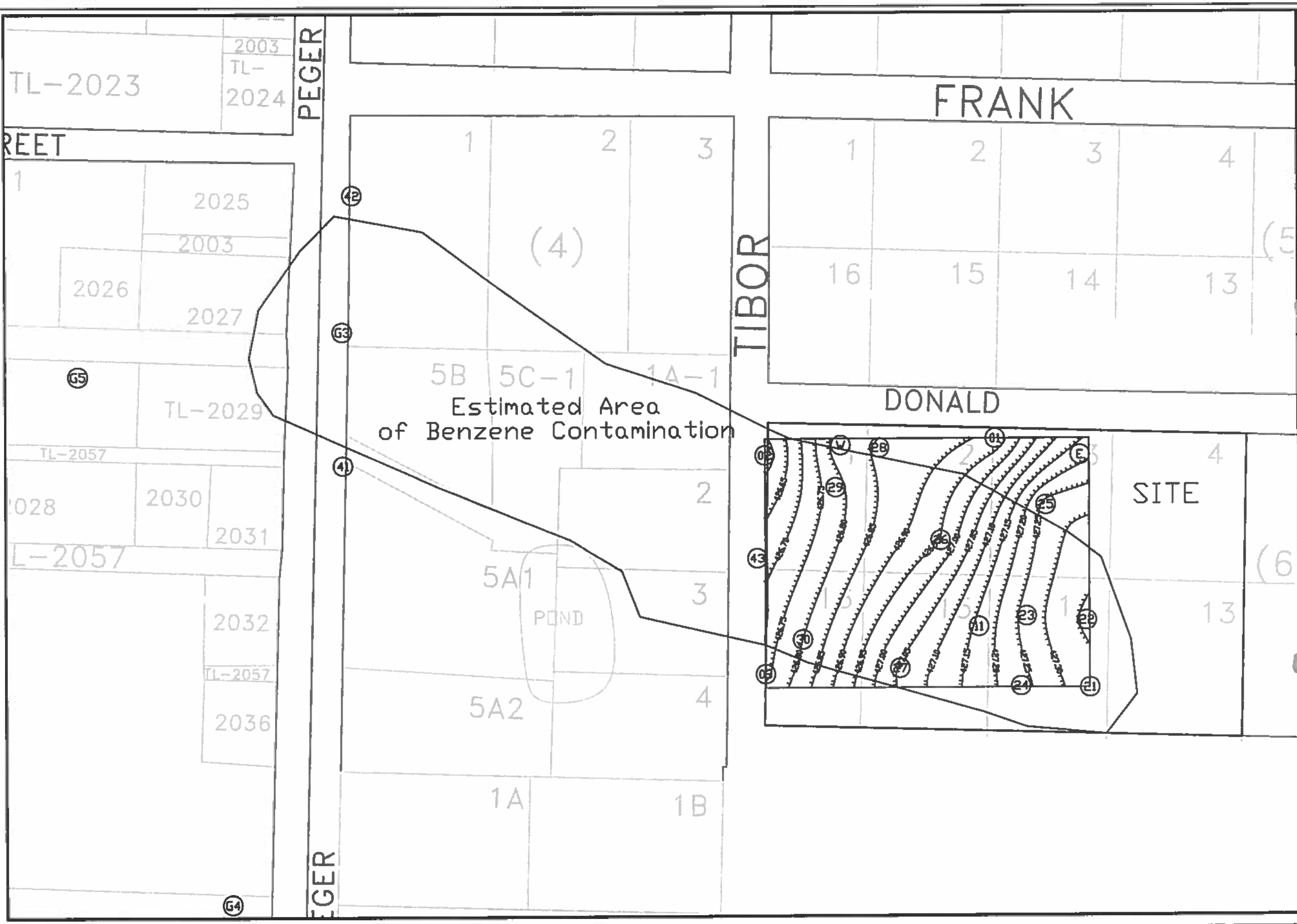
DATE: 09/12/07	SCALE: 1"=600'
DESIGN: PLB	PROJECT: 051036
DRAWN: PLB	DWG: 051036b(02)

FIGURE 2



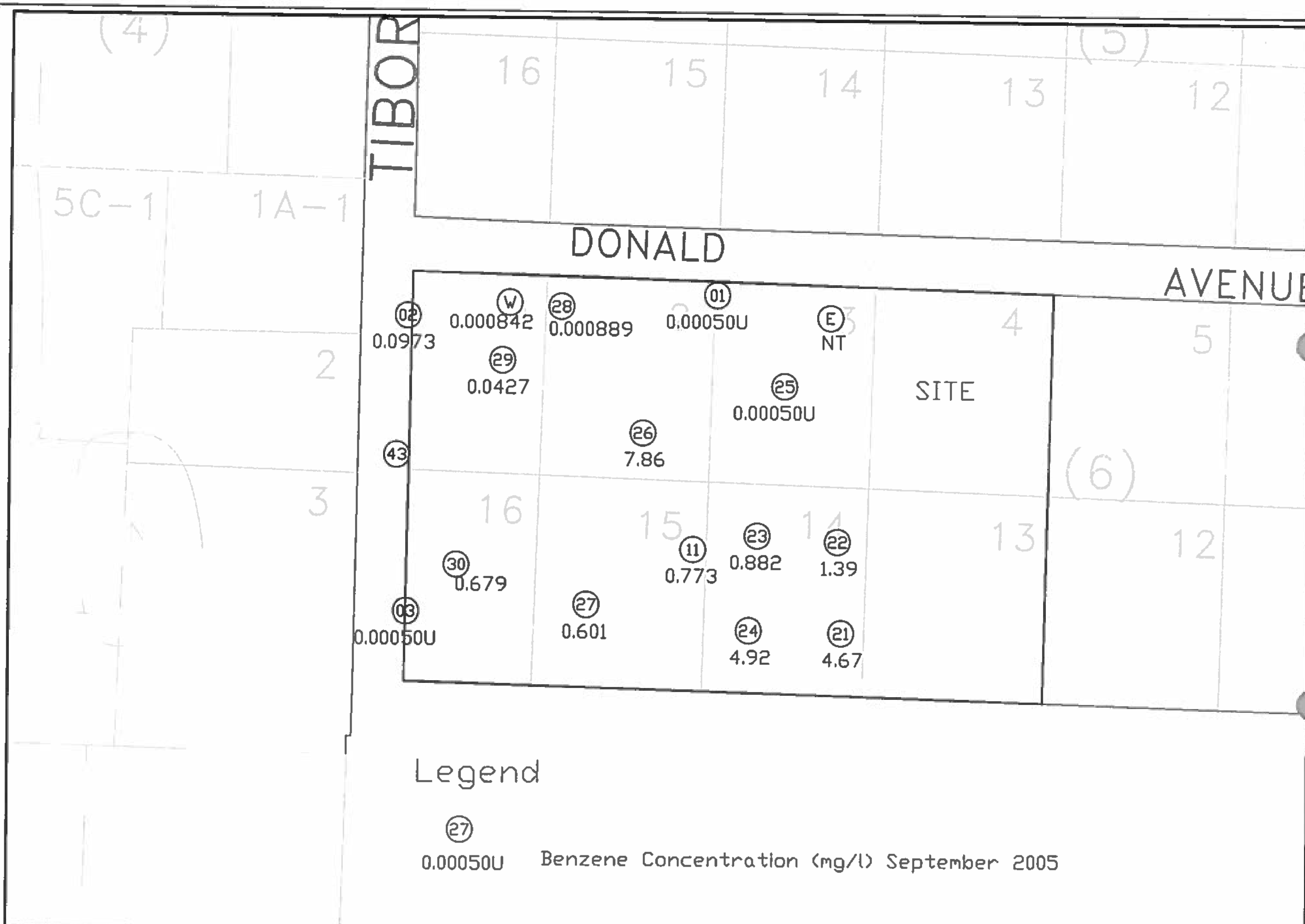
NORTECH ENVIRONMENTAL & ENGINEERING CONSULTANTS 2400 College Road, Fairbanks, Alaska 99709 (907) 452-5688 FAX: (907) 452-5694	Removed Piping System and Soil Samples Ben Lomond Metro Field Property Fairbanks, Alaska	DATE: 09/12/07 DESIGN: PLB DRAWN: PLB	SCALE: 1"=100' PROJECT: 051036 DWG: 051036b(03)

FIGURE 3

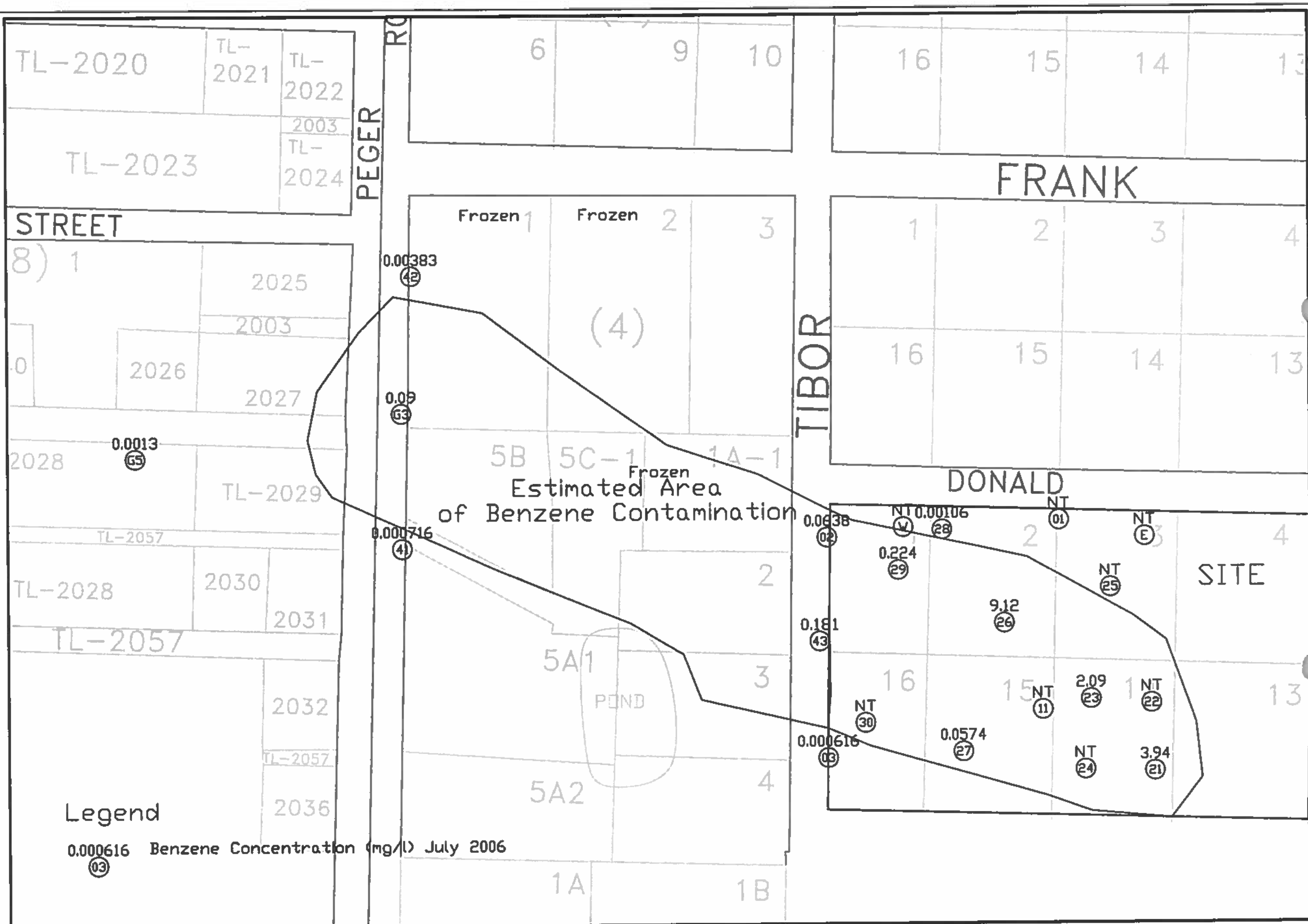


NORTECH ENVIRONMENTAL & ENGINEERING CONSULTANTS 2400 College Road, Fairbanks, Alaska 99709 (907) 452-5688 FAX: (907) 452-5694	Hydraulic Gradient and Estimated GW Contamination Ben Lomond Metro Field Property Fairbanks, Alaska	DATE:09/12/07 DESIGN: PLB DRAWN: PLB	SCALE:1"=200' PROJECT:051036 DWG: 051036b(04)

FIGURE 4



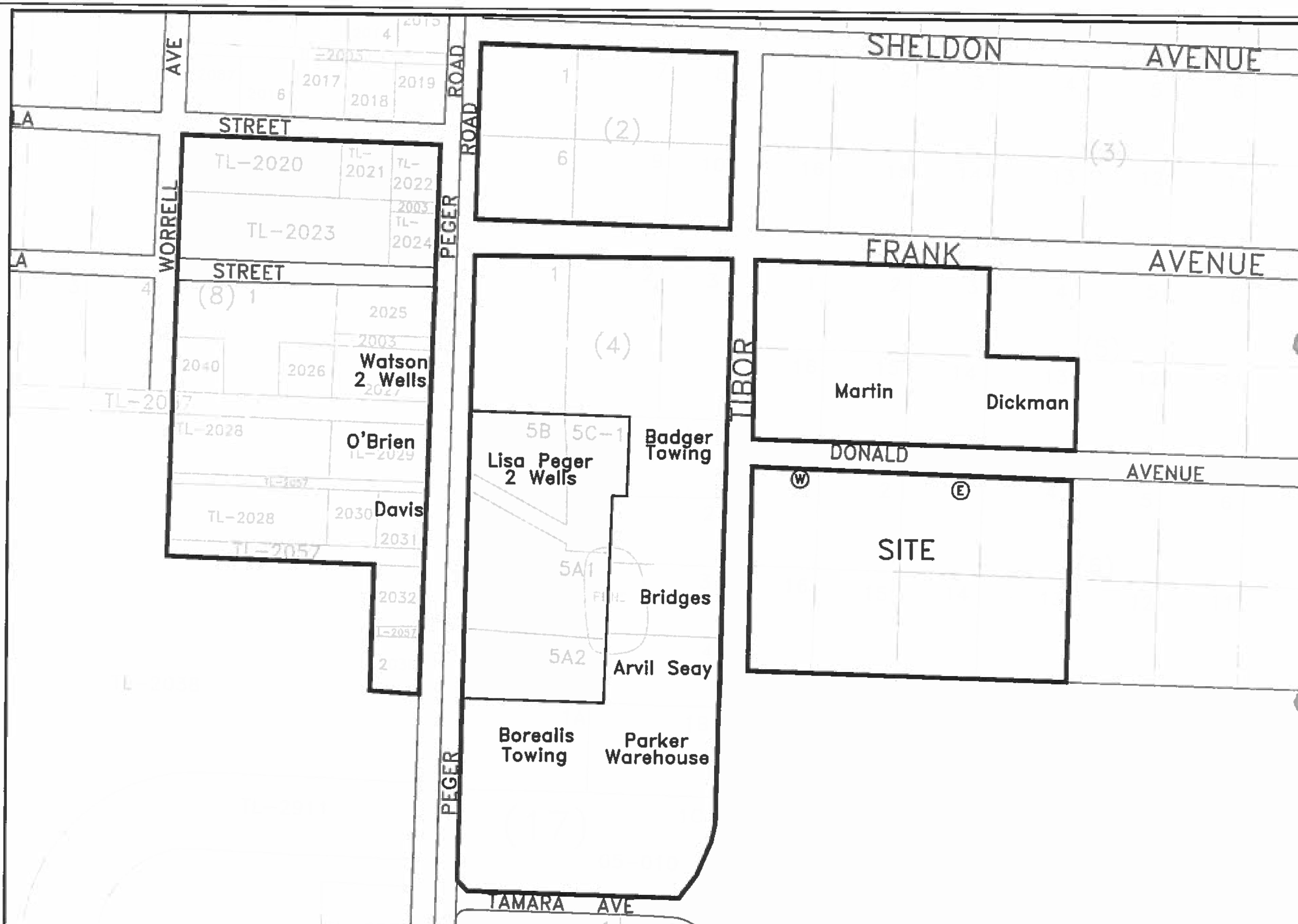
NORTECH ENVIRONMENTAL & ENGINEERING CONSULTANTS 2400 College Road, Fairbanks, Alaska 99709 (907) 452-5688 FAX: (907) 452-5694	2005 Sample Locations and Benzene Results Ben Lomond Metro Field Property Fairbanks, Alaska	DATE: 09/12/07	SCALE: 1"=150'	FIGURE 5
		DESIGN: PLB	PROJECT: 051036	
		DRAWN: PLB	DWG: 051036b(05)	



NORTECH
ENVIRONMENTAL & ENGINEERING CONSULTANTS
2400 College Road, Fairbanks, Alaska 99709
(907) 452-5688 FAX: (907) 452-5694

2006 Sample Locations and Benzene Results
Ben Lomond Metro Field Property
Fairbanks, Alaska

DATE: 09/12/07	SCALE: 1"=200'	FIGURE 6
DESIGN: PLB	PROJECT: 051036	
DRAWN: PLB	DWG: 051036b(06)	



NORTECH ENVIRONMENTAL & ENGINEERING CONSULTANTS
2400 College Road, Fairbanks, Alaska 99709
(907) 452-5688 FAX: (907) 452-5694

Well Search Area with Known Wells
Ben Lomond Metro Field Property
Fairbanks, Alaska

DATE: 09/12/07	SCALE: 1"=300'	FIGURE 7
DESIGN: PLB	PROJECT: 051036	
DRAWN: PLB	DWG: 051036b(07)	

Table 1
Groundwater Laboratory Results
May 19, 2005

Sample ID	GRO	Benzene	Toluene	Ethylbenzene	Tot. Xylene	Lab
Units	mg/L	mg/L	mg/L	mg/L	mg/L	Comments
Reg Limit	1.3	0.005	1	0.7	10	
DP-1	0.090U	0.00050U	0.00200U	0.00200U	0.00200U	
DUP	0.090U	0.00050U	0.00200U	0.00200U	0.00200U	
DP-2	0.277	**0.0164**	0.00200U	0.0132	0.04652	
DP-3	0.090U	0.00050U	0.00200U	0.00200U	0.00200U	
East	0.090U	0.00177	0.00226	0.00296	0.00594	
West	0.090U	0.00168	0.00200U	0.00200U	0.00200U	

U	Compound was not detect at the specified limit
shade	Result is above the detection limit, but below ADEC regulatory limit
bold	Result is above the ADEC regulatory limit

Table 2
Groundwater Laboratory Results
September 6, 2005

Sample ID	GRO	Benzene	Toluene	Ethyl-benzene	Total Xylene	Ethylene dibromide	Lab Comments
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	
Method	AK101	8021B	8021B	8021B	8021B	504.1	
Reg Limit	1.5	0.005	1	0.7	10	0.00005	
DP-01	0.090U	0.00050U	0.00200U	0.00200U	0.00200U		
DP-02	0.900U	**0.0973**	0.020U	0.0323	0.0925	0.0000212U	
DP-03	0.090U	0.00050U	0.00200U	0.00200U	0.00200U		
MW-11	**2.30**	**0.679**	0.020U	0.0248	0.1817		
DP-21	**26.4**	**4.67**	**3.54**	**1.38**	4.073	**0.00145**	
DP-22	**7.46**	**1.39**	0.020U	0.665	0.444		
DP-23	**2.12**	**0.882**	0.0020U	0.00685	0.0422	**0.0429**	
DP-24	**12.6**	**4.92**	0.0369	0.591	0.775		
DP-25	0.090U	0.00050U	0.00200U	0.00200U	0.00200U		
DP-26	**56.3**	**7.86**	**12.70**	**1.98**	5.5800	**0.0314**	
DP-27	9.00U	**0.601**	0.200U	0.200U	0.200U		FOAM
DP-28	0.090U	0.000889	0.00200U	0.00200U	0.00200U		
DP-29	0.136	**0.043**	0.0020U	0.0084	0.0139		
DP-30	**1.870**	**0.773**	0.020U	0.020U	0.0563		FOAM
DUP1	**2.07**	**0.807**	0.0020U	0.0078	0.049		
DUP2	**26.8**	**4.36**	**3.25**	**1.31**	3.818		

Notes:
- U — Compound was not detected
- FOAM — Sample could not be rerun at lower dilution due to foaming during purging
- (blank) — Sample not tested for this analyte
- shade — Result is above detection limit, but below ADEC regulatory limit
- **bold** — Result is above ADEC regulatory limit

Other 504.1 analytes were all below the detection limit

Table 3
Groundwater Laboratory Results
July 25-26, 2006

Sample ID	GRO	Benzene	Toluene	Ethyl-benzene	Total Xylene	Comment
Units	mg/L	mg/L	mg/L	mg/L	mg/L	
Method	AK101	8021B	8021B	8021B	8021B	
Reg Limit	1.5	0.005	1	0.7	10	
DP-02	1.11	**0.0638**	0.00797	0.0312	0.00794	
DUP-01	1.02	**0.0544**	0.00677	0.0295	0.03733	DP-02
DP-03	0.100U	0.000616	0.002U	0.002U	0.002U	
DP-21	**21.30**	**3.94**	**2.11**	**1.37**	7.5	
DP-23	**2.58**	**2.09**	0.002U	0.002U	0.0206	
DP-26	**63.8**	**9.12**	**14.4**	**2.47**	7.07	
DP-27	**1.53**	**0.0574**	0.002U	0.00346	0.002U	BL
DP-28	0.100U	0.00106	0.002U	0.002U	0.002U	
DP-29	0.700	**0.224**	0.002U	0.0278	0.04431	
DUP-02	0.477	**0.155**	0.00212	0.022	0.03575	DP-29
DP-41	0.100U	0.000716	0.002U	0.002U	0.002U	
DP-42	0.100U	0.00383	0.002U	0.002U	0.002U	
DP-43	0.611	**0.181**	0.002U	0.002U	0.002U	
GNI-03	0.230	**0.09**	0.00305	0.002U	0.002U	
GNI-05	0.100U	0.0013	0.002U	0.002U	0.002U	

Notes:

U	Compound was not detected
BL	Biased low due to laboratory internal standard issues
(blank)	Sample not tested for this analyte
shade	Result is above detection limit, but below ADEC regulatory limit
bold	Result is above ADEC regulatory limit

Table 4
Historical Groundwater Summary
Monitoring Wells GNI-03 and GNI-05

Sample ID	Date	GRO	Benzene	Toluene	Ethyl-benzene	Total Xylene
Units		mg/L	mg/L	mg/L	mg/L	mg/L
Method		AK101	8021B	8021B	8021B	8021B
Reg Limit		1.5	0.005	1	0.7	10
GNI-03	7/26/2006	0.230	0.0900	0.00305	0.0020U	0.0020U
	9/6/2006	NT	0.0992	0.0020U	0.0020U	0.0020U
	10/17/2006	NT	0.0923	0.0020U	0.0020U	0.0020U
	2/26/2007	NT	0.0679	0.0020U	0.0020U	0.0020U
	6/25/2007	NT	0.0925	0.0020U	0.0020U	0.0020U
GNI-05	7/26/2006	0.100U	0.0013	0.002U	0.002U	0.002U
	9/6/2006	NT	0.00050U	0.002U	0.002U	0.002U
	10/17/2006	NT	0.00050U	0.002U	0.002U	0.002U
	2/26/2007	NT	0.00050U	0.002U	0.002U	0.002U
	6/25/2007	NT	0.000519	0.002U	0.002U	0.002U

Table 5
Historical Groundwater Summary
Ben Lomond/Air North Wells

Sample ID	Date	GRO	Benzene	Toluene	Ethyl-benzene	Total Xylene	Ethylene dibromide	Lab Comments
Units		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	
Method		AK101	8021B	8021B	8021B	8021B	504.1	
Reg Limit		1.5	0.005	1	0.7	10	0.00005	
DP-01	9/6/2005	0.090U	0.00050U	0.00200U	0.00200U	0.00200U	NT	
DP-02	9/6/2005	0.900U	**0.0973**	0.020U	0.0323	0.0925	0.0000212U	
DP-02	7/26/2006	NT	**0.0688**	0.00797	0.0312	0.00794		
DUP-01	7/26/2006	NT	**0.0544**	0.00677	0.0295	0.03733	NT	DP-02
DP-03	9/6/2005	0.090U	0.00050U	0.00200U	0.00200U	0.00200U	NT	
DP-03	7/26/2006	NT	0.000616	0.002U	0.002U	0.002U	NT	
MW-11	9/6/2005	**2.30**	**0.679**	0.020U	0.0248	0.1817	NT	
DP-21	9/6/2005	**26.4**	**4.67**	**3.54**	**1.38**	4.073	**0.00145**	
DUP2	9/6/2005	**26.8**	**4.36**	**3.25**	**1.31**	3.818	NT	
DP-21	7/26/2006	NT	**3.94**	**2.11**	**1.37**	7.5	NT	
DP-22	9/6/2005	**7.46**	**1.39**	0.020U	0.665	0.444	NT	

Notes:

U	Compound was not detected at indicated detection limit
FOAM	Sample could not be rerun at lower dilution due to foaming during purging
NT	Sample not tested for this analyte
shade	Result is above detection limit, but below ADEC regulatory limit
bold	Result is above ADEC regulatory limit

Other 504.1 analytes were all below the detection limit

Table 5
Historical Groundwater Summary
Ben Lomond/Air North Wells

Sample ID	Date	GRO	Benzene	Toluene	Ethyl-benzene	Total Xylene	Ethylene dibromide	Lab Comments
Units		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	
Method		AK101	8021B	8021B	8021B	8021B	504.1	
Reg Limit		1.5	0.005	1	0.7	10	0.00005	
DP-23	9/6/2005	**2.12**	**0.882**	0.0020U	0.00685	0.0422	**0.0429**	
DUP1	9/6/2005	**2.07**	**0.807**	0.0020U	0.0078	0.049	NT	
DP-23	7/26/2006	NT	**2.09**	0.002U	0.002U	0.0206	NT	
DP-24	9/6/2005	**12.6**	**4.92**	0.0369	0.591	0.775	NT	
DP-25	9/6/2005	0.090U	0.00050U	0.00200U	0.00200U	0.00200U	NT	
DP-26	9/6/2005	**56.3**	**7.86**	**12.70**	**1.98**	5.5800	**0.0314**	
DP-26	7/26/2006	NT	**9.12**	**14.4**	**2.47**	7.07	NT	
DP-27	9/6/2005	9.00U	**0.601**	0.200U	0.200U	0.200U	NT	FOAM
DP-27	7/26/2006	NT	**0.0574**	0.002U	0.00346	0.002U	NT	BL
DP-28	9/6/2005	0.090U	0.000889	0.00200U	0.00200U	0.00200U	NT	
DP-28	7/26/2006	NT	0.00106	0.002U	0.002U	0.002U	NT	

Notes:

U	Compound was not detected at indicated detection limit
FOAM	Sample could not be rerun at lower dilution due to foaming during purging
NT	Sample not tested for this analyte
shade	Result is above detection limit, but below ADEC regulatory limit
bold	Result is above ADEC regulatory limit

Other 504.1 analytes were all below the detection limit

Table 5
Historical Groundwater Summary
Ben Lomond/Air North Wells

Sample ID	Date	GRO	Benzene	Toluene	Ethyl-benzene	Total Xylene	Ethylene dibromide	Lab Comments
Units		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	
Method		AK101	8021B	8021B	8021B	8021B	504.1	
Reg Limit		1.5	0.005	1	0.7	10	0.00005	
DP-29	9/6/2005	0.136	**0.043**	0.0020U	0.0084	0.0139	NT	
DP-29	7/26/2006	NT	**0.224**	0.002U	0.0278	0.04431	NT	
DUP-02	7/26/2006	NT	**0.155**	0.00212	0.022	0.03575	NT	DP-29
DP-30	9/6/2005	**1.870**	**0.773**	0.020U	0.020U	0.0563	NT	FOAM
DP-41	7/26/2006	NT	0.000716	0.002U	0.002U	0.002U	NT	
DP-42	7/26/2006	NT	0.00383	0.002U	0.002U	0.002U	NT	
DP-43	7/26/2006	NT	**0.181**	0.002U	0.002U	0.002U	NT	

Notes:
- U — Compound was not detected at indicated detection limit
- FOAM — Sample could not be rerun at lower dilution due to foaming during purging
- NT — Sample not tested for this analyte
- shade — Result is above detection limit, but below ADEC regulatory limit
- **bold** — Result is above ADEC regulatory limit

Other 504.1 analytes were all below the detection limit

Table 6
Soil Laboratory Results
2005

Sample ID	Location	Field Screening	GRO	Benzene	Toluene	Ethyl-benzene	Total Xylene	DRO	RRO	Lead
Units		ppm	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Method			AK101	8021B	8021B	8021B	8021B	AK102	AK103	6020
Reg Limit			300	0.02	5.4	5.5	78	250	10000	400
FI-P1	Fuel Island	>2000	131	**0.072400**	0.480	0.174	2.204	53.2	120.0	NT
BL-2	Elbow @ DP26	>2000	179	0.00755U	0.0302U	0.0302U	4.100	**499**	40.8	40.40
BL-3	T north of Island	1908	**393**	**0.086U**	0.386	0.334U	3.038	**614**	1780	13.60
BL-4	T west of Island	1653	237	0.00911U	0.194	1.220	4.610	**346**	123	33.30
BL-5	Elbow @ west	1771	48.4	0.00888U	0.035U	0.178	0.828	**360**	107	55.10

Notes:

U	Compound was not detected
WMD	Cotnaimnation is consistent with a weathered middle distillate
NT	Sample not tested for this analyte
shade	Result is above detection limit, but below ADEC regulatory limit
bold	Result is above ADEC regulatory limit

Table 7
Historical Drinking Water Results Summary

Owner/Site Name	Well Info &/or Sample ID	Date	EDB	Benzene	Toluene	Ethyl-benzene	Total Xylenes	SGS W.O. #
Units			mg/L	mg/L	mg/L	mg/L	mg/L	exceptions as noted
ADEC Limit			0.00005	0.005	1.0	0.7	10	
Borealis Towing		10/17/05	0.0000186U	0.0005U	0.0005U	0.0005U	0.001U	1056498
Acrtic Thunder Towing		10/17/05	0.0000198U	0.0005U	0.0005U	0.0005U	0.001U	1056498
Penny Watson	PWW2	6/5/06	NT	0.0005U	0.0005U	0.0005U	0.001U	1062669
Don Davis	PWW1	6/5/06	NT	0.0005U	0.0005U	0.0005U	0.0011	1062669
Arvil Seay	ASW	6/5/06	NT	0.0005U	0.0005U	0.0005U	0.001U	1062669
J. Parker Shop	JPW	5/24/06	NT	0.0005U	0.0005U	0.0005U	0.001U	1062397
Larry Dickman	LD-01	11/16/06	NT	0.0005	0.0005U	0.0005U	0.001U	1066433
Ben Lomond	East	5/19/05	NT	0.00177	0.00226	0.00296	0.00594	1052633
	West	5/19/05	NT	0.00168	0.002U	0.002U	0.002U	1052633
	West	9/5/05	NT	0.00072	0.0005U	0.0005U	0.001U	1055617

Notes:

U	Compound was not detected at listed detection limits
NT	Compound not tested for
shade	Result is below ADEC regulatory limit, but above detection limit
bold	Result is above ADEC regulatory limit

Table 7
Historical Drinking Water Results Summary

Owner/Site Name	Well Info &/or Sample ID	Date	EDB	Benzene	Toluene	Ethyl-benzene	Total Xylenes	SGS W.O. #
Units			mg/L	mg/L	mg/L	mg/L	mg/L	exceptions as noted
ADEC Limit			0.00005	0.005	1.0	0.7	10	
Badger Towing	DW	9/5/05	NT	**0.028**	0.0005U	0.0005U	0.001U	1055617
	DW	10/17/05	0.0000186U	**0.034**	0.0005U	0.0005U	0.001U	1056498
	DW pre-filter	5/24/06	NT	**0.098**	0.0005U	0.0005U	0.001U	1062397
	DW post-filter	5/24/06	NT	**0.041**	0.0005U	0.0005U	0.001U	1062397
	DW pre-filter	8/16/06	NT	**0.100**	0.0005U	0.0005U	0.0005U	1064653
	DW post-filter	8/16/06	NT	0.00071	0.0005U	0.0005U	0.0005U	1064653
	New well	9/14/06	NT	0.00300	0.0005U	0.0005U	0.001U	Analyt.55135
	New Well	11/16/06	NT	**0.01890**	0.0005U	0.0005U	0.0015U	1066433
	Ext Well, pre-filter	6/13/07	NT	0.0005U	0.0005U	0.0005U	0.0015U	1071972
	Ext Well, post-filter	6/13/07	NT	0.0005U	0.0005U	0.0005U	0.0015U	1071972
Lisa Peger	Home	10/17/05	0.0000192U	0.00195	0.0005U	0.0005U	0.001U	1056498
	Home	5/24/06	NT	0.0005U	0.0005U	0.0005U	0.001U	1062397
	Apt.	5/24/06	NT	0.0005U	0.0005U	0.0005U	0.001U	1062397
David Bridges	DBW	10/17/05	0.000187U	**0.027**	0.0005U	0.0005U	0.001U	1056498
	DBW	6/5/06	NT	**0.006**	0.0005U	0.0005U	0.001U	1062669
	DBW pre-filter	6/13/07	NT	0.00354	0.0005U	0.0005U	0.0015U	1071972

Notes:

U	Compound was not detected at listed detection limits
NT	Compound not tested for
shade	Result is below ADEC regulatory limit, but above detection limit
bold	Result is above ADEC regulatory limit

Table 8
Laboratory Work Order Summary

Laboratory	Work Order #	Sample Date	Analytical Description
SGS	1052633	19-May-05	Groundwater Charaterization
SGS	1054591	4-Aug-05	Soil Characterization
SGS	1055617	5-Sep-05	Groundwater Characterization & Drinking Water Analysis
SGS	1056498	17-Oct-05	Drinking Water Analysis
SGS	1056499	18-Oct-05	Soil Characterization
SGS	1062397	24-May-06	Drinking Water Analysis
SGS	1064151	25-Jul-06	Groundwater Characterization
SGS	1064653	16-Aug-06	Drinking Water Analysis
Analytica	55135	14-Sep-06	Drinking Water Analysis
SGS	1066433	16-Nov-06	Drinking Water Analysis
SGS	1071972	13-Jun-07	Drinking Water Analysis

Table 9
Quality Control Summary

May 2005					
Sample ID	DP-1	DUP	Average	Difference	RPD
Analyte	mg/L	mg/L	mg/L	mg/L	%
GRO	0.090U	0.090U	NA	NA	**NA**
B	0.00050U	0.00050U	NA	NA	**NA**
T	0.00200U	0.00200U	NA	NA	**NA**
E	0.00200U	0.00200U	NA	NA	**NA**
X	0.00200U	0.00200U	NA	NA	**NA**

September 2005					
Sample ID	DP-23	DUP1	Average	Difference	RPD
Analyte	mg/L	mg/L	mg/L	mg/L	%
DRO	2.12	2.07	2.095	-0.050	**-2%**
B	0.882000	0.807	0.8445	-0.075	**-9%**
T	0.0020U	0.0020U	NA	NA	**NA**
E	0.007	0.008	0.007	0.001	**13%**
X	0.0422	0.049	0.046	0.007	**15%**
Sample ID	DP-21	DUP2	Average	Difference	RPD
Analyte	mg/L	mg/L	mg/L	mg/L	%
DRO	26.4	26.8	26.60	0.400	**2%**
B	4.67	4.36	4.515	-0.310	**-7%**
T	3.5	3.3	3.395	-0.290	**-9%**
E	1.38	1.31	1.345	-0.070	**-5%**
X	4.073	3.818	3.946	-0.255	**-6%**

July 2006					
Sample ID	DP-02	DUP-01	Average	Difference	RPD
Analyte	mg/L	mg/L	mg/L	mg/L	%
GRO			NA	NA	**NA**
B	0.0638	0.0544	0.0591	-0.009	**-16%**
T	0.00797	0.00677	0.00737	-0.001	**-16%**
E	0.0312	0.0295	0.030	-0.002	**-6%**
X	0.00794	0.03733	0.023	0.029	**130%**
Sample ID	DP-29	DUP-02	Average	Difference	RPD
Analyte	mg/L	mg/L	mg/L	mg/L	%
GRO			NA	NA	**NA**
B	0.22	0.16	0.19	-0.069	**-36%**
T	0.002U	0.0021	NA	NA	**NA**
E	0.03	0.02	0.025	-0.006	**-23%**
X	0.044	0.036	0.040	-0.009	**-21%**

NA The calculation is not applicable.
RPD Relative percent difference as described in Section 7.0 and the SSP