Waste Heat/Fuel Line Alignment Assessment
Kaktovik Power Plant
Kaktovik, Alaska 99747

FILE COPY

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APPENDICES

1.0 EXECUTIVE SUMMARY

NORTECH Environmental & Engineering Consultants was retained by Arctic Slope General Contractors to assess a proposed waste heat/fuel line alignment in Kaktovik, Alaska. The project involved excavating test pits and collecting soil samples between the existing ground surface and the gravel pad/tundra permafrost interface along the proposed right of way (ROW) between the new powerhouse under construction and the old power house location. Soils were classified and field screened for volatile organics. Representative samples were laboratory analyzed for hydrocarbon contamination.

A minimum of 250 linear feet or 35-40% of the 700' proposed ROW alignment commencing at the old power house location is impacted with Diesel Range Organics (DRO) above ADEC Method One cleanup criteria from the existing ground surface to the underlying gravel pad/tundra permafrost interface. Soils within 6" and in some locations up to 1' on top of the gravel pad/tundra interface, along the remaining (60-65%) portion of the ROW to the new power house location is contaminated with low level weathered middle distillate DRO from an older spill. Contaminated soils removed from the waste heat/fuel line trench excavation will require handling and remediation in accordance with an ADEC approved plan. The exact quantity of soil requiring treatment will depend on the approved workplan, segregation efforts during excavation as well as the final alignment, width and depth of the required excavation

It is recommended that the preliminary assessment results and historical records be utilized to develop an ADEC approved corrective action workplan for the project prior to commencing trench excavation. Primary objective of the proposed workplan will be to justify a risk based Alternate Cleanup Level (ACL) in accordance with ADEC's recently promulgated Method Two procedures and re-utilize the contaminated soils as backfill. Consideration for relocating the proposed alignment to the south side of Fourth Street South and minimizing depth of burial is recommended to avoid/minimize encountering contaminated soils during excavation. It is further recommended that potential remediation alternatives conceptually identified in this report be further evaluated in order to develop the most cost effective community alternative for petroleum contaminated soils on this project and potentially the scheduled water/wastewater system installation and future community or regional projects.

2.0 PROJECT LOCATION AND HISTORY

Kaktovik is located on Barter Island on the northern coast of Alaska. See Figure One. The topography of the area consists of coastal marshes and low-lying land interspersed with freshwater ponds and streams. The town of Kaktovik is approximately 30 feet above mean sea level and average annual precipitation is less than 10 inches per year. The vegetation in the area is characterized by tundra and underlain by permafrost.

The town road system was built by placing gravel directly on the tundra/permafrost layer. Precipitation in the area does not penetrate the permafrost and either ponds or drains into the

ocean. Spilled liquids, including petroleum products, do not generally penetrate the permafrost either. Instead, they migrate downward through the seasonally active unfrozen layer as well as any porous gravel layers to the permanently frozen fine grained tundra soils. The liquid subsequently ponds and flows along the subsurface frozen contours of the naturally existing frozen layer.

The assessed waste heat/fuel line ROW alignment is along the north side of Fourth Street from the new powerhouse (south of Hula Hula Street) to the old powerhouse at the intersection of Fourth Street and Kaktovik Street. See Figure Two. The new powerhouse is to be located on a gravel pad that was installed in the summer of 1999. The proposed route starts at the SE corner of the new pad and runs east to Fourth Street South where it crosses the street adjacent to the DMS building. There are two above ground fuel storage tanks (ASTs) on the north side of the DMS building. From there the ROW runs eastward along the north side of Fourth Street South towards the old powerhouse parking lot. Adjacent to this proposed ROW is a bulk fuel tank farm consisting of some eight ASTs, four of which are labeled "out of service." This tank farm supplies fuel for the powerhouse. Finally, the ROW alignment swings west at the intersection of Kaktovik Street into the old powerhouse pad and connects to the building.

Individuals on site commented that there have been miscellaneous spills over the life of the tank farm, supposedly the most recent having occurred a few months before this assessment was performed. While completing the assessment report a review of the ADEC's files identified a 1993 assessment report of contamination at the Power Plant Tank Farm. At that time three primary sources of petroleum contamination were identified in the area; 1). The Tank Farm; 2) the washateria day tank and 3) the US post Office day tank. Surface and subsurface contamination was reported throughout the tank farm and power plant site extending from the US Post Office along Fourth Street South to the intersection of Hula Hula Street. The majority of the site sampling completed for this effort was limited to photo-ionization (PID) field screening. Laboratory analysis for Diesel Range Organics (DRO) was reported as high as 7,500 ppm.

3.0 METHODOLOGY

Project workscope undertaken and completed for this project was in accordance with *NORTECH*'s February 26, 1999 letter proposal.

All field sampling efforts were completed in accordance with *NORTECH*'s Alaska Department of Environmental Conservation's (ADEC) Standard Sampling Procedures (SSP) (revised 22 September 1995) and the ADEC's Underground Storage Tank regulations for site assessments (18 AAC 78.090). The information provided in *NORTECH*'s QAPP document includes:

- Organization and Responsibilities

- Field Sampling Procedures
- Analytical Procedure
- Data Reporting
- References

John Hargesheimer, PE, CIH, DEE had overall contractual and project responsibility. *NORTECH* Engineer Peter Beardsley a state of Alaska qualified sampler was responsible for the field sampling. Excavation equipment and operator was subcontracted from SKW Contractors.

4.0 INVESTIGATIVE ACTIVITIES

Field activities were coordinated in advance of the site visit with ASCG and SKW contractors in Kaktovik.

September 7, 1999

Peter Beardsley arrived at Kaktovik Airport the afternoon of September 7 via Frontier Flying Service and met with Les Hostetler of SKW (Kaktovik Contractors). Peter and Les inspected the proposed waste heat/fuel ROW alignment. The following issues were discussed: desired alignment, structures along the alignment, other construction in the area, leaks/spills from nearby tanks, possible buried lines in the area, and what sort of equipment would be necessary to do the work.

The ROW was walked and inspected for specific areas of concern and sampling sites. Seventeen locations were marked for sampling. These were spaced no more than 50' apart along the proposed waste heat ROW.

September 8, 1999

Peter and Les met at 0730,discussed the work plan for the day and drove over to the SKW shop where the operator was preparing the ditchwitch/backhoe contracted to dig the test holes. Test pit excavation commenced at the southern end of the proposed ROW because it was suspected to be less contaminated. After digging BH-1 the operator moved and started digging BH-2 while the BH-1 was sampled. Borings BH-2 through BH-7 were located in a broad road/driveway entrance area used by DMS so each hole was filled before proceeding to the next hole to prevent any mishaps. Borings BH-8 through BH-17 located along the north side of the Fourth Street South were excavated with material placed on the traffic side of the test pit to reduce the risk of accidents. All seventeen test pits and sampling were completed by noon and backfilling was completed shortly after lunch.

Following sampling of the test pits standard OVM PID headspace field screening in accordance with ADEC protocol was completed. The results of the field observations and screening are provided in the field book and summarized in Table 1. All borings were located with swing ties as identified in the field notes.

September 9, 1999

An additional sample and quality assurance duplicate sample was collected from the BH-18, where the waste heat line will enter the old powerhouse. Sampling, field screening, and packing of all the supplies and samples was completed by noon. Peter and the samples returned to Fairbanks on the afternoon Frontier flight

September 10, 1999

Laboratory samples were packaged and delivered to the laboratory for analysis under standard chain of custody.

5.0 SOIL CLEANUP LEVELS

The most restrictive clean up criteria for the site is in accordance with ADEC Method One Cleanup Levels for Arctic Zones (18 AAC 75.341, Table A2). The Method One cleanup value for a diesel spill is DRO level below 200 ppm.

6.0 SAMPLE RESULTS

Field observations and laboratory data are summarized and compiled in Table 1. Complete copies of the original laboratory analysis reports are attached (see Laboratory Report). Test pit, field screening PID readings, DRO laboratory results are depicted on Figure 3.

A total of 18 test pits were completed at intervals no greater than 50' along the 700' waste heat/fuel line proposed ROW. The test pits were excavated to frozen material or the pad/tundra interface and ranged in depth from 2.5' to a maximum of 5.5' below ground surface (bgs). The sidewall of each test pit was inspected and soils logged in accordance with the Uniform Soil Classification (USC) system. Typical soils were Gravel and sandy Gravel underlain with fabric tundra and frozen sandy silt.

Field screening samples were typically collected from each test pit at the top, mid and bottom of hole (boh). A total of 55 field screening samples were collected from the 18 test pits and analyzed with a photoionization detector (PID) in accordance with ADEC headspace protocol. PID readings ranged from a low of 4.4 ppm (background/uncontaminated) to a high of 1500 ppm as isobutylene (contaminated) in BH-18.

A total of six, plus one quality assurance sample, was collected for laboratory analysis from different test pits representative of the qualitative PID readings.

7.0 QUALITY CONTROL SUMMARY

Quality control procedures are useful for estimating and evaluating the information content of analytical data. Some of the means used to evaluate this information content include precision, accuracy, detection limits, and other quantifiable indicators.

In this study, the ADEC's UST quality control procedures were followed and all requirements met. Any deviations or modifications in the procedures applied are discussed below.

Field Quality Control and Calculation of Data Quality Indicators

Completeness is a measure of the amount of valid data obtained compared to the amount expected. Because all of the soil samples collected and analyses performed for this project were "valid" as determined by Section 3.1 of the ADEC's SSP, the "Completeness" is calculated to be 100 %.

Precision, expressed as the relative percentage difference (RPD) between field duplicate sample results, is an indication of the consistency of sampling, sample handling, preservation, and laboratory analysis. Duplicate soil samples were collected from the same location for each of the DRO/RRO and GRO/BTEX analyses. This meets the ADEC requirement for 1 field duplicate per every 10 assessment samples.

Duplicate samples (18 and 19) were collected from the same location and at the same time as each other. The RPD for this single quality assurance sample is presented in Table 2 and has been calculated according to the method described in ***NORTECH***'s QAPP (the difference between the field duplicate results expressed as a percentage of the average of those results). If the analyte was detected in neither the sample nor the field duplicate, then calculation of the RPD is meaningless; however, the precision is acceptable. The RPD was within the limits specified for DRO. The RPD exceeded the specified limits for GRO and total BTEX. Review of the laboratory results for GRO and BTEX analytes did not suggest a laboratory analysis problem for these samples. It is likely that the divergent values for the GRO analyses indicate natural heterogeneity of the soil.

Deviations from *NORTECH*'s QAPP or the ADEC's SSP.

No deviations from the ***NORTECH***'s QAPP or the ADEC's SSP were reported.

8.0 ANALYSIS

A preliminary site investigation was performed along the proposed waste heat and fuel line ROW between the new and old powerhouse in Kaktovik, Alaska. The proposed ROW alignment is along the north side of Fourth Street from the current powerhouse location to the site of the new powerhouse.

Visual, olfactory and headspace PID screening indicated contaminated soils are present at varying locations and depths along the proposed route as depicted in the profile view on Figure Three.

Along the southern part of the proposed route (BH-1 to BH-9), the soils appeared clean from the surface down to within inches above the gravel/tundra interface. This "clean" section ran from the edge of the new powerhouse pad to the vicinity of Tank 2 in the tank farm, approximately 440 feet or about 60-65% of the distance investigated.

The predominantly gravel pad soils along this "clean" section of the ROW were characterized by field screening PID readings in the 8 to 12 ppm range characterized as background by the laboratory results. Laboratory analysis of these soils revealed low level traces of GRO and DRO well below the most restrictive applicable clean up levels.

Gray and then black discolored sand and gravel typically characterized the material directly above the gravel/tundra interface along the southern portion of the proposed line. These soils appeared visually contaminated and had an odor. Field screening readings ranged from 35 to 222 ppm for the section from BH-1 to BH-7. Laboratory analysis reported one DRO result (211 ppm) from the BOH, along the tundra interface, slightly above ADEC's 200 ppm North Slope most restrictive cleanup criteria for DRO. The majority of PID field screening and laboratory analyses indicate that the bulk of soils between BH-1 and BH-9 are suitable to leave in place or use as clean backfill. The laboratory indicated that the hydrocarbon pattern from the reported levels along the pad/tundra interface was consistent with that of a weathered middle distillate. The elevated presence along the pad/tundra interface is consistent with the supposition that spilled fuel would vertically migrate to the gravel/tundra interface, subsequently pond and gravity flow along the pad/tundra permafrost interface contours. While the majority of this contamination appears to be below applicable clean up levels it is recommended that waste heat/fuel line depth of burial design be evaluated to avoid encountering and having to excavate this contaminated gravel pad/tundra interface layer if at all possible.

A few field-screening samples were collected below the liner and organic layer of the tundra. The organic layer appeared black and was underlain by fine sand and silt. Field screening of these materials resulted in measurements of 10 to 60 ppm indicative of low level contamination, which may be partially attributable to natural organic decay of the tundra. None of these samples were laboratory analyzed. As noted above the waste heat/fuel line depth of burial should be

further evaluated to avoid disturbance of the gravel pad liner and underlying tundra organic layer if at all possible.

The remaining portion of the proposed route to the north was significantly contaminated, at all depths, from the vicinity of Tank 2 to the current powerhouse (BH-10 to BH-18). This "contaminated" section represents about 250 feet or 35-40% of the total distance investigated. In addition, field screening of the BOH samples from BH-8 and BH-9 revealed significant contamination with PID readings over 300 ppm.

With the exception of BH-10 the contaminated portion of the proposed route (BH-10 to BH-18) was contaminated from the ground surface throughout the seasonally active zone to the gravel pad/tundra permafrost interface. Field screening of BH-10 resulted in PID readings of 137 ppm at the surface, 23 ppm at 2' below grade, and 68.3 ppm at the gravel/tundra interface. Laboratory results indicate relatively clean conditions (24.2 ppm DRO) at a 2' bgs mid depth at indicating BH-10 is the approximate transition zone between the southern "clean" and northern contaminated portion of the proposed alignment.

The surface gravels along the proposed route were not visibly stained, except near BH-12 where a rusty spot and visible surface sheen was observed. Top of hole surface samples from BH-12, BH-16, BH-17, and BH-18 each field screened below 20 ppm near the surface. However, this cleaner top layer is only a few inches thick with significant contamination throughout the majority of the gravel pad depth. Most likely the upper reaches of soils along the proposed alignment which were contaminated have been remediated by natural processes including volatilization, photo-oxidation, bioremediation and enhanced aerobic conditions.

The gravel at 2' below grade in BH-11 – BH-18 was consistently contaminated with PID readings above 460 ppm. The gravel had a strong odor and laboratory analysis of a representative sample with a PID reading of 783 ppm reported a DRO of 3,780 ppm. The laboratory indicated that the hydrocarbon pattern was consistent with that of a non-weathered middle distillate. The samples near the gravel/tundra permafrost interface were gray and black with a strong odor. Field screening resulted in elevated PID readings in excess of 500 ppm representative of DRO levels in the thousands.

The extent of contamination determined by the waste heat/fuel line assessment results are consistent with the findings reported in a 1993 assessment of the Power Plant Tank Farm. In addition, unconfirmed reports and the presence of unweathered "fresh" middle distillate gas chromatogram patterns from the laboratory analysis indicate that spills in the area have continued to occur since 1993. Based on available information excavation of the waste heat/fuel line should be expected to encounter DRO contaminated soils with concentrations ranging from non-detect to 10,000 ppm. Higher concentrations may be encountered in close proximity of a source or recent spill.

Based on the results of this investigation and the 1993 assessment consideration should be given to re-evaluating the waste heat/fuel alignment to the south side of Fourth Street South. Instead of crossing Fourth Street South in front of the new power plant location west of Hula Hula Street it is recommended the alignment cross Fourth Street South immediately in front of the Old Power House site upon leaving the parking area at the intersection of Kaktovik Avenue. While no assessment of this recommended alignment was included in the project work scope historical information and common sense suggests that contamination encountered along the south side of Fourth Street South should be significantly less than the currently proposed alignment adjacent to the Tank Farm, which is the primary source of the contamination encountered. The revised alignment would not increase the overall length or associated construction difficulty; to the contrary, if the quantity of contaminated material encountered is greatly reduced the altered alignment may provide significant cost savings.

The mixture of clean and contaminated soils throughout the alignments under consideration will require accurate segregation by an unbiased qualified third party contractor during excavation to minimize remediation costs. Proper planning and careful field screening during excavation will permit proper segregation and characterization of excavated soils into pre-approved workplan categories of clean and low level contamination for reuse as backfill further minimizing quantities of contaminated soils requiring costly remediation.

In summary the northwestern 60-65% of the proposed ROW is predominantly clean of hydrocarbon contamination with the exception of a thin layer along the pad/tundra interface of weathered middle distillate diesel range organics. However, the majority of the northeastern 35-40% portion of the proposed ROW from BH-10 to BH-19 is contaminated above ADEC's most restrictive Method One cleanup criteria throughout the gravel pad depth to the tundra interface with middle distillate diesel range organics. While contamination source identification was not included in the project workscope historical records and common sense suggests that spills, overfills and leaks associated with the existing bulk fuel tank farm located immediately adjacent to the investigated alignment from BH-8 northeast is the most likely suspected source of the observed contamination. It is therefore recommended that the design considered relocating the alignment to the south side of Fourth Street South. It is further recommended that the depth of burial be limited to avoid encountering/disturbing the gravel pad liner and contaminated layer along the tundra interface.

Contaminated soils removed during the excavation and installation of the proposed waste heat/fuel line will require handling and/or remediation in accordance with an ADEC approved workplan. It is therefore recommended that an ADEC approved workplan be developed requiring third party segregation of excavated soils into pre-approved handling categories for reuse of clean and low contaminated soils as backfill. The actual quantity of contaminated soils requiring remediation will be significantly dependent on the proposed workplan as well as the final alignment, width and depth of trench as well as the level of field effort to segregate clean soils during excavation.

9.0 REMEDIATION STRATEGIES

Remediation options on the North Slope are limited and typically costly. *In-situ* remediation approaches are not feasible for this project because the soil is part of a much larger contaminated area and the contaminated soils will require excavation for the installation of the waste heat line. The following is a brief summary of potential remediation alternatives of the contaminated soils removed during the excavation of the waste heat ROW.

Backfill

Returning low level contaminated soils as excavation backfill will be feasible and dependent on the development of an associated risk based, ADEC regulatory approved site specific cleanup criteria and workplan for the project. Careful segregation and stockpiling of clean, low level and contaminated soils will be required during excavation to minimize associate remediation costs and segregate low level and clean soils suitable for backfill in accordance with the negotiated definitions in the approved workplan. Backfilling of contaminated soils may be limited to subsurface locations, involve long-term monitoring and/or require a 6-12" cap of "clean" material to limit environmental and ecological risk. At a minimum, soils below the ADEC Table A2 Method One (18 AAC 75) clean up criteria of 200 ppm for DRO may be used as backfill. However, this "off the shelf" cleanup criteria is footnoted as follows:

> "if a responsible party demonstrates that contamination is due to a diesel spill, that levels of benzene, toluene, ethylebenzene, and total xylene isomers (BTEX) are less than 15 mg/kg, that benzene levels are less than 0.5 mg/kg, and that other site conditions are favorable, and if the department determines that a less stringent level is protective of human health, safety, and welfare, and of the environment, the department will allow a cleanup level of 500 mg/kg for diesel range petroleum hydrocarbons."

Currently all samples analyzed for theses analytes meet these criteria with the exception of total xylene isomers (BTEX) for Sample BH-18 which reported 15.8 mg/kg slightly in excess of the 15 mg/kg criteria. However, the duplicate quality assurance sample (BH-19) reported only 10 mg/kg total xylene isomers well below the criteria for approval of a clean up level of 500 ppm DRO.

Furthermore, Table B2 Method Two, permits the approval of site-specific alternate cleanup levels as high as 12,500 mg/kg DRO based on risk assessment. It is expected that DRO contamination on this order of magnitude will be encountered on this project. Under these recently promulgated (January 1999) regulations a responsible party may propose alternate cleanup levels based on site specific risk assessment protective of migration to groundwater, inhalation and ingestion based criteria.

Considering the larger contaminated site issue not addressed by this waste heat line project it is reasonable to assume that with adequate interim institutional controls (protective capping layer, etc) it may be possible to utilize all or the majority of excavated material as backfill.

Stockpile

It is apparent from the ROW preliminary assessment efforts that a larger area of contamination exists throughout the gravel pad area associated with the old powerhouse, bulk fuel storage and portions of the roadway from BH-10 to BH-18. If there are efforts underway to address this larger problem the contaminated soil excavated during installation of the waste heat and fuel lines may be further justification for use of the material as backfill or stockpiled for the interim and included in the larger remediation effort in the future. In addition it is understood that a water and wastewater system is being planned for Kaktovik in the next year or two. Utility line excavation/installation will inevitably involve removal, handling and/or remediation of some contaminated soils. It may be worthwhile to create temporary and/or longterm stockpiles to cost-effectively coordinate the combined handling of contaminated soils for multiple projects and/or the community as a whole. At a minimum, temporary or long-term stockpiles in accordance with ADEC requirements will be required for storage of contaminated soils segregated during excavation in preparation of backfill and/or remediation.

Thermal Remediation

Thermal remediation either in Kaktovik or elsewhere is feasible but expensive. Given the expected amount of contaminated soil, containerizing the soil and shipping it to a treatment facility is probably a more cost effective option than bringing a portable treatment facility to Kaktovik for this single project. An on-site thermal remediation unit may be feasible if the larger associated contaminated site issue or other sites in the Kaktovik area are to be addressed. Considering the continuing community need for fuel products and the realities of spill and leakage problems associated with long term handling of petroleum products a permanent thermal unit may be a viable community or private operation.

Land Farming

Land farming during the summer period is another option for remediation in Kaktovik. The volatilization, bioremediation and photo-oxidation principles of landfarming are straightforward and apparent in the upper reaches of the existing gravel pad. However the short summer season limits operation time while increasing seasonal handling requirements and overall cost. In addition, an acceptable secure site would be required and may involve winter stockpiling and summer tilling as well as fertilizing and leachate protection efforts. Winter stockpile and summer landfarming locations would likely require liners and routine monitoring. The construction and operational costs of land farming may be significant. Depending on the quantity, contaminant

concentration, and availability of land and seasonal restraints the land farming option may be feasible for remediation of low level contamination (1 or 2 season).

Pad Construction Cap and Containment

A potential option would be to use the contaminated soil as the part of the required pad materials for a new facility or roadway. The contaminated soils would have to be contained and capped in a suitable liner adequately protected from causing additional human exposure and environmental or ecological damage. This approach was apparently used in Nuiqsut when contaminated soils were encountered during construction of the new powerhouse. The contaminated soil is placed in an appropriate liner in the middle of a new gravel pad. In Nuiqsut, the new powerhouse was built on the pad. A pad in Kaktovik could probably be used for a similar industrial use. Proposed plan would require ADEC approval.

Thin Spreading

Another modifying landfarming option previously permitted by ADEC under restricted conditions would involve the application of a thin layer of contaminated gravel on an industrial site, runway or roadway. The thinly spread layer rapidly remediates by the natural processes of volatilization, photo-oxidation and enhanced aerobic bioremediation. A risk assessment would be required to determine levels and acceptable conditions for human exposure and ecological and environmental impacts. In addition monitoring would likely be required. This option is more likely for smaller quantities of gravel with lower concentrations of contamination at remote/secure locations without significant rainfall and adequate (early on) summer season application to successfully accomplish remediation in a single season. Risk assessment and monitoring expenses would increase costs, however reduced transportation and long-term remediation costs would be lower.

Recommended Remediation Alternative

Combinations of these approaches are also possible and more than likely the preferred recommendation. A community or regional North Slope approach would be to develop an areawide program solution for contaminated soils that would address the needs on this project as well as other projects and Arctic communities. This community or regional approach would require interim stockpile storage, seasonal and/or thermal remediation techniques and final disposal alternatives. Overall, a key ingredient to cost effectively addressing contaminated soil needs, on this or any project, is accurate segregation during excavation into established categories (clean, low level and high etc.) to fulfill pre-approved workplan remediation/disposal handling alternatives (backfill, land farming, thin spreading etc) thereby minimizing quantities requiring expensive treatment and/or handling. Pre planning and accurate segregation will permit the use of multiple contaminated soil handling strategies including maximum reuse of excavated soils as backfill and minimizing long term remediation. Without additional understanding of

other project requirements and community needs beyond the scope of this effort we suggest the following for the installation of the waste heat/fuel line.

Based on the preliminary assessment results develop a workplan and obtain ADEC approval prior to commencing trench excavation of the preferred alignment. Primary objective of the proposed workplan should be to utilize the contaminated soils as backfill. This may be accomplished by completing a risk assessment in accordance with 18 AAC 75.340 and demonstrating the proposed workplan, excavation engineering controls, work practices and soil handling and disposal techniques to justify a Table B2, alternative clean up level and utilization as backfill. This effort will require accurate segregation of contaminated soils by qualified personnel during excavation. Identification and development of a location for temporary stockpiling and/or interim seasonal landfarming of contaminated soils prior to backfill. The proposed workplan will require secondary "fallback" alternatives for handling, long term storage, treatment and disposal of highly contaminated soils and/or unexpected conditions encountered during excavation which do not meet workplan limitations for backfill. A source of clean fill will be required to address make up quantities and/or surface/capping requirements. Contaminated soil workplan will require coordination with the waste heat line excavation/installation contractor as well as the short construction season window in order to accommodate assessment monitoring and take advantage of interim seasonal treatment potential, minimize overall project cost and avoid construction delays.

10.0 CONCLUSIONS AND RECOMMENDATIONS

On September 8, 1999, ***NORTECH*** Environmental and Engineering Consultants conducted a site investigation along the proposed waste heat and fuel line alignment (along the north side of Fourth Street South) between the old and new powerhouse in Kaktovik, Alaska. Based on the analysis of available historical records, field and laboratory data, ***NORTECH*** arrived at the following conclusions and recommendations

- A minimum of 250 feet (35–40%) of the proposed route from the existing powerhouse is contaminated with Diesel Range Organics (DRO) above applicable cleanup criteria. Laboratory analysis confirmed levels as high as 3,780 mg/kg in the proposed alignment. Soils in this zone are impacted with DRO throughout the 4-5'gravel pad depth to the gravel pad/tundra permafrost interface.
- Soils within 6" and in some locations up to 1' on top of the gravel pad/tundra interface, along the remaining (60-65%) portion of the ROW to the new power house location is contaminated with low level weathered middle distillate DRO from an older spill. Laboratory analysis confirmed levels on the order of 24-211 mg/kg.
- Historical records (1993 Tank Farm assessment) indicate DRO contamination consistent with these assessment results throughout the Old Power Plant and bulk fuel tank farm site on the north side of Fourth Street South from Hula Hula Street to the US Post Office.

Spills and leaks associated wit the tank farm is identified as the primary source of the contamination.

- Contaminated soils removed from the waste heat/fuel line trench excavation will require handling and remediation in accordance with a plan approved by ADEC. The exact quantity of soil requiring treatment will depend on the final alignment, width and depth of the required excavation

In accordance with recently promulgated ADEC regulations permitting risk based alternative clean up levels (ACL) it is recommended that the preliminary assessment results and historical records be utilized to develop an ADEC approved corrective action workplan for the project prior to commencing trench excavation. Primary objective of the proposed workplan will be to justify an elevated ACL to re-utilize the contaminated soils as backfill. The following components should be considered and/or included in the workplan:

- Field screening and segregation of soils removed during excavation by qualified third party consultant is recommended to accurately delineate and segregate contaminated soils and minimize the total quantity of soils requiring treatment.
- Develop more than one category (clean, low level, high etc.) of soil contamination as necessary to address environmental and ecological risk factors and cost effectively implement multiple treatment and/or disposal strategies (backfill, landfarm/backfill, stockpile etc.) to meet project and environmental requirements.
- Re-evaluate ROW alignment to the south side of Fourth Street South where historical records and field results suggest the excavation will encounter significantly less contamination.
- Re-evaluate and modify if necessary and feasible waste heat/fuel line burial depth in order to avoid encountering contamination present along pad/tundra interface.
- Further evaluate remediation alternatives and other planned Kaktovik projects (water/wastewater) and develop a more cost-effective multi-project, community and/or regional program approach to the handling, treatment and disposal of hydrocarbon contaminated soils.

11.0 LIMITATIONS AND NOTIFICATIONS

NORTECH provides a level of service that is performed within the standards of care and competence of the environmental engineering profession. However, it must be recognized that limitations exist within any site investigation. This report provides results based on 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 owner. 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.

It is recommended that the owner or operator of the property maintain a copy of this report as a record and that a copy of this report be submitted to the ADEC.

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.

Karen Milne for Peter Beardsley
Peter Beardsley
Environmental Engineer

John Hargesheimer
John Hargesheimer, PE, CIH, DEE
Principal

TABLE

Table 1
Field and Laboratory Data Summary

Sample #	Hole #	Depth feet	Depth relative	PID ppm	Temp deg F	GRO ppm	DRO ppm	RRO ppm	B ppm	T ppm	E ppm	X ppm	Comments
1	**1**	**0.5**	**top**	**7.9**	**61.0**	**2.3**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**Background**
	1	2.0	mid	10.7	64.5								clean looking gravel
	1	5.5	boh	10.4	57.4								organic, newly buried tundra
	2	0.5	top	7.4	59.2								clean looking gravel
	2	2.0	mid	8.7	58.8								clean looking gravel
2	**2**	**5.0**	**boh**	**123**	**62.2**	**4.2**	**27.4**	**31.9**	**ND**	**0.045**	**ND**	**ND**	**black sand/gravel above fabric**
3	3	0.5	top	6.7	72.8								Background
	3	2.0	mid	10.5	68.3								clean looking gravel
	3	5.0	boh	35.1	59.5								tundra beneath textile
	4	0.5	top	8.2	63.6								clean looking gravel
	4	2.5	mid	6.9	62.1								clean looking gravel
4	**4**	**5.0**	**boh**	**222**	**60.9**	**5.5**	**211**	**ND**	**ND**	**0.12**	**0.043**	**0.25**	**grey/black gravel just above fabric**
	5	0.5	top	8.1	62.5								clean looking gravel
5	5	2.0	mid	11.6	66.6								slightly elevated, prob background
	5	5.0	boh	62.7	64.9								silt/clay beneath tundra, textile, 2" stained gravel
	6	0.5	top	4.4	59.1								clean looking gravel
	6	2.0	mid	8.1	64.2								clean looking gravel
6	**6**	**3.5**	**boh**	**68.1**	**61.5**	**2.1**	**ND**	**ND**	**ND**	**0.034**	**ND**	**ND**	**dark grey/black, sandier than other**
	7	0.5	top	7.5	59.3								clean looking gravel
7	7	2.5	mid	8.9	65.0								gravel, background
	7	4.0	boh	40.7	69.7								stained gravel above fabric
	8	0.5	top	8.2	57.7								clean looking gravel
8	8	2.5	mid	58.5	60.9								traces of grey
	8	4.0	boh	817	69.1								lower edge of tundra, black
9	9	0.5	top	10.7	58.5								just below fabric @0.5ft
	9	2.0	mid	23	62.0								gravel
	9	3.5	boh	399	69.0								dark stained gravel above fabric
	10	0.5	top	137	46.5								gravel
10	**10**	**2.0**	**mid**	**23**	**51.2**	**5.1**	**24.2**	**ND**	**ND**	**ND**	**0.025**	**0.053**	**gravel, prob background**
	10	4.0	boh	68.3	55.9								gravel, very few fines
11	11	0.5	top	394	48.0								grey gravel, odor
	11	2.0	mid	710	53.9								grey gravel
	11	4.0	boh	1100	58.3								tundra just below fabric

Table 1
Field and Laboratory Data Summary

Sample #	Hole #	Depth feet	Depth relative	PID ppm	Temp deg F	GRO ppm	DRO ppm	RRO ppm	B ppm	T ppm	E ppm	X ppm	Comments
	12	0.5	top	13.8	51.5								near sheen/rusty area on surface
12	12	2.0	mid	602	58.5								grey gravel, strong odor
	12	3.5	boh	1100	60.1								tundra below fabric
	13	0.5	top	834	60.9								gravel
	13	2.0	mid	800	55.6								gravel
13	13	3.5	boh	950	61.4								sample just above fabric
	14	0.5	top	250	50.5								gravel
	14	2.0	mid	850	62.4								gravel
	14	4.0	boh	850	64.7								above fabric, below gw@3.5'
15	15	0.5	top	307	57.0								reg looking gravel
	15	2.0	mid	550	57.8								gravel
	15	3.5	boh	1200	58.4								wet sandy, gw@3.0'
	16	0.5	top	8.5	55.8								clean looking gravel
	16	2.0	mid	460	58.6								moderate stained gravel
16	16	3.0	boh	825	54.9								sample just above fabric
	17	0.5	top	20.1	62.9								gravel
	17	1.5	mid	1200	65.4								gravel, odor
17	17	2.5	boh	675	60.5								sample just above fabric, strong odor
	18	0.5	top	8.2	57.7								gravel, no odor
18	**18**	**2.0**	**mid**	**783**	**57.6**	**210**	**3780**	**ND**	**ND**	**ND**	**0.56**	**15.8**	**grey gravel, strong odor**
19	**18**	**2.0**	**mid**	**783**	**57.6**	**84**	**2390**	**ND**	**ND**	**ND**	**0.31**	**10**	**grey gravel, strong odor**
	18	3.0	boh	1500	62.6								strong odor, just above tundra

Table 2
QA/QC Summary

Sample #	Hole #	Depth (ft)	PID	Temp	GRO	DRO	RRO	B	T	E	X
18	18	2	783	57.6	210	3780	ND	<0.54	ND	0.56	15.8
19	18	2	783	57.6	84	2390	ND	<0.21	ND	0.31	10

	Sample 18	Sample 19	Average	Difference	**RPD**
Analyte	ppm	ppm	ppm	ppm	**%**
GRO	210	84	147	126	**86%**
DRO	3780	2390	3085	1390	**45%**
RRO	ND	ND	NA	NA	**NA**
B	<0.54	<0.21	NA	NA	**NA**
T	ND	ND	NA	NA	**NA**
E	0.56	0.31	0.435	0.25	**57%**
X	15.8	10	12.9	5.8	**45%**
Tot BTEX	16.36	10.31	13.335	6.05	**45%**

FIGURES

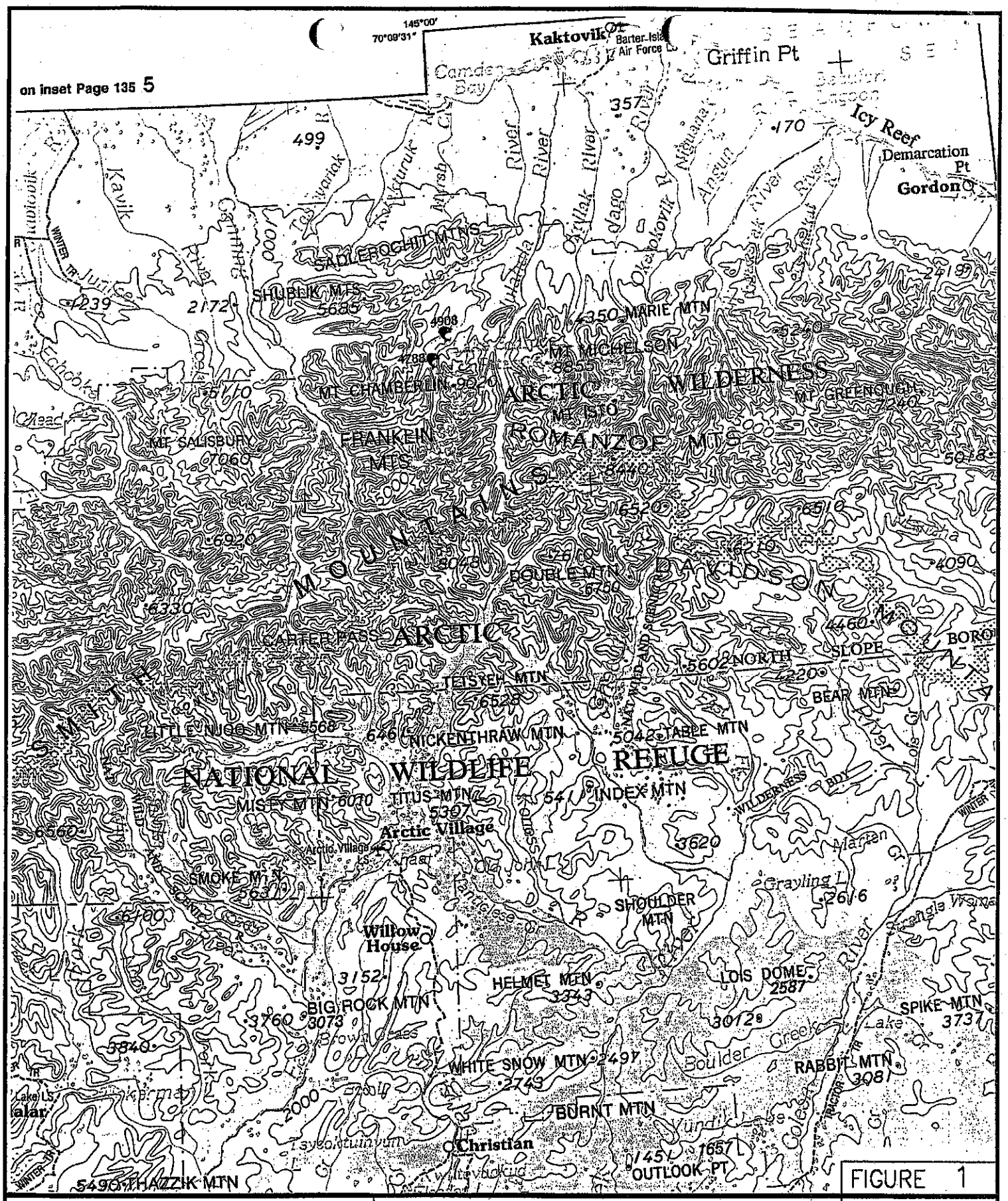
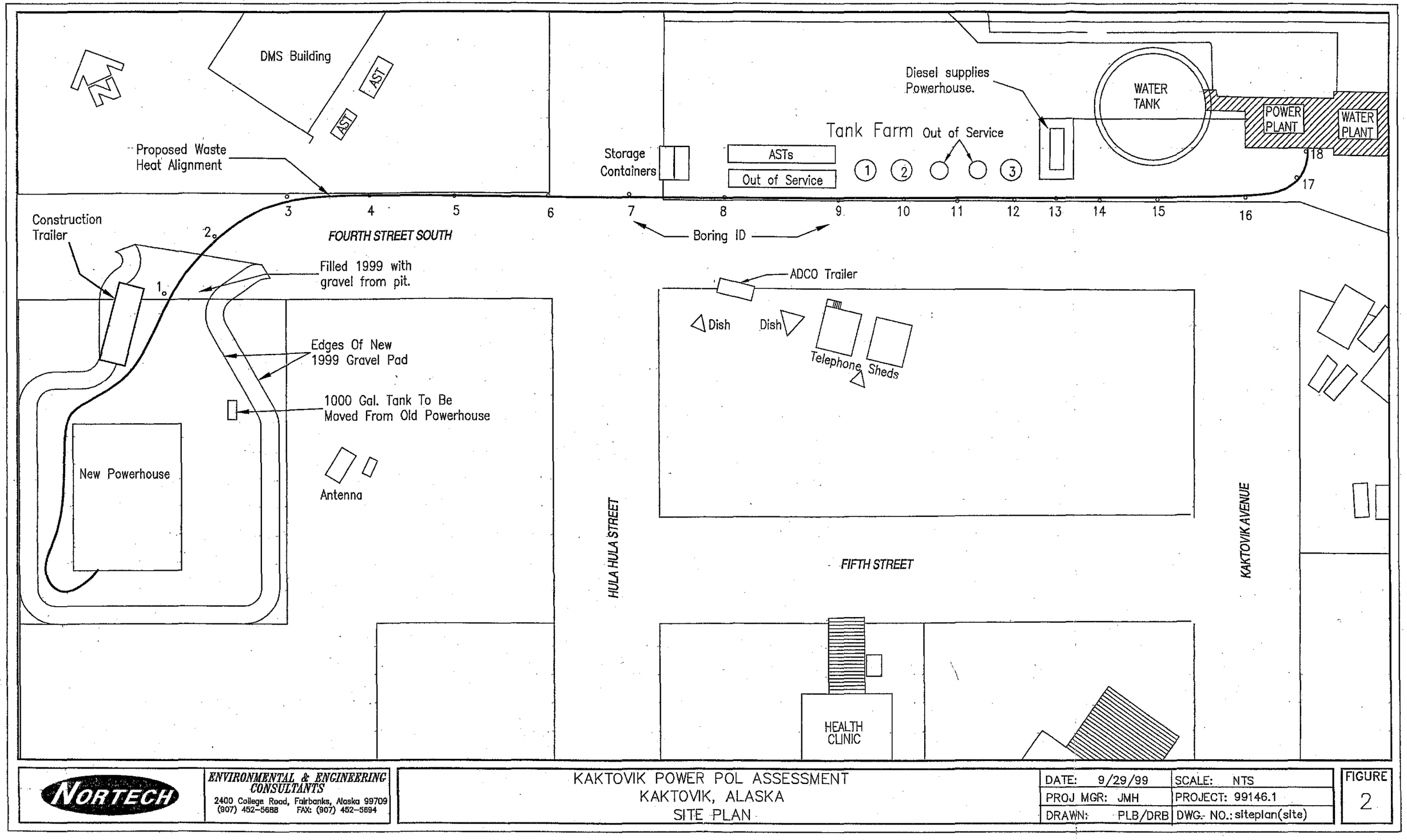


FIGURE 1

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

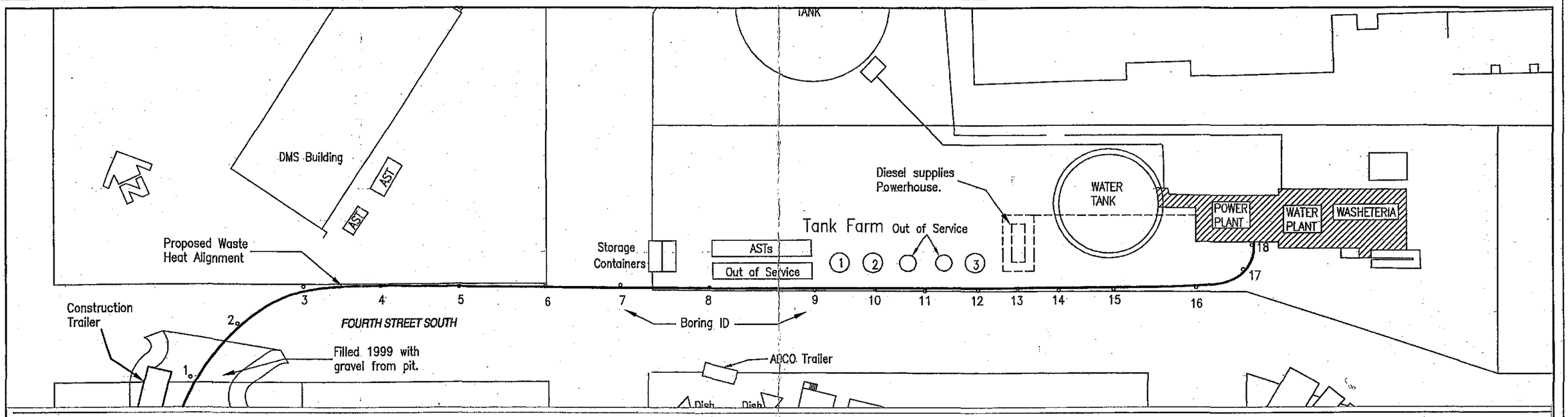
Proposed Waste Heat Line
Kaktovik Power Plant
Site Location Map

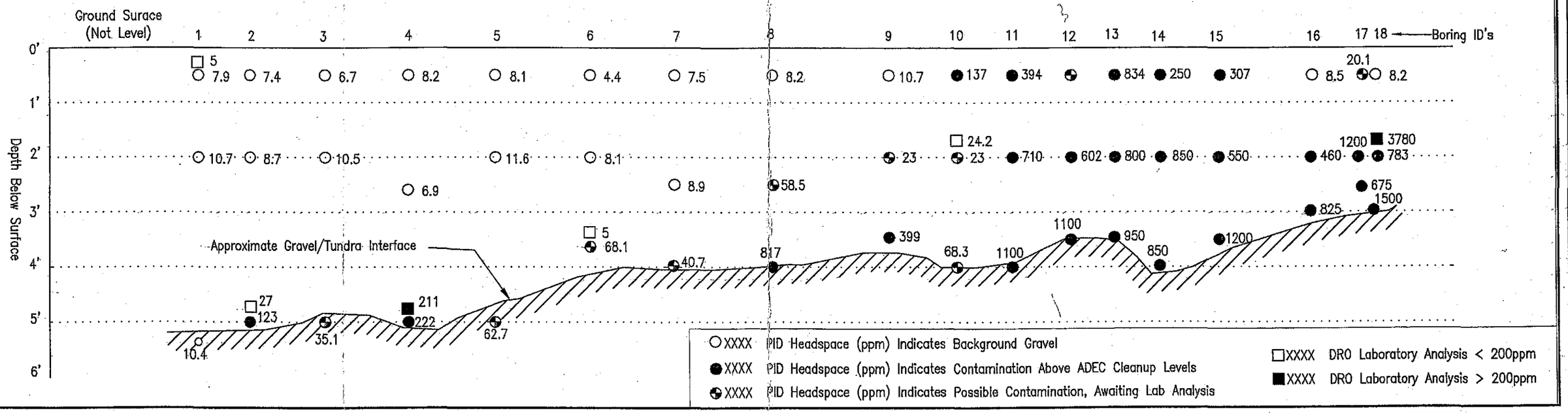
DATE:	10/13/99
DESIGN:	JMH
DRAWN:	PLB
PROJECT NO:	99146.1
DWG:	siteloc
SCALE:	1" = 22 mi



NORTECH	ENVIRONMENTAL & ENGINEERING CONSULTANTS 2400 College Road, Fairbanks, Alaska 99709 (907) 452-5688 FAX: (907) 452-5694	KAKTOVIK POWER POL ASSESSMENT KAKTOVIK, ALASKA SITE PLAN	DATE: 9/29/99 PROJ MGR: JMH DRAWN: PLB/DRB	SCALE: NTS PROJECT: 99146.1 DWG. NO.: siteplan(site)

FIGURE 2





NORTECH

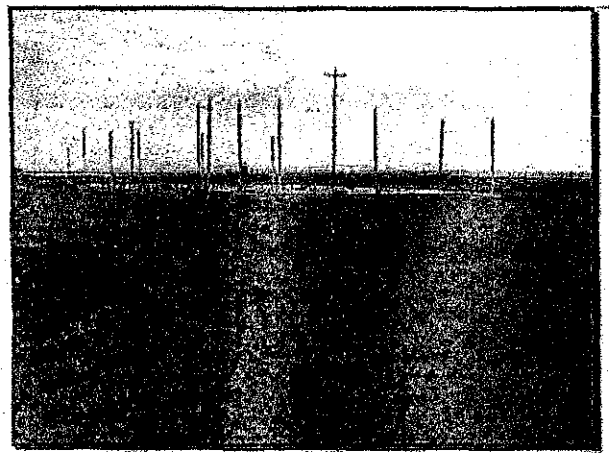
ENVIRONMENTAL & ENGINEERING CONSULTANTS
2400 College Road, Fairbanks, Alaska 99709
(907) 452-5688 FAX: (907) 452-5694

PROPOSED WAST HEAT LINE
KAKTOVIK, ALASKA
PLAN AND SOIL PROFILE ALONG PROPOSED ROUT

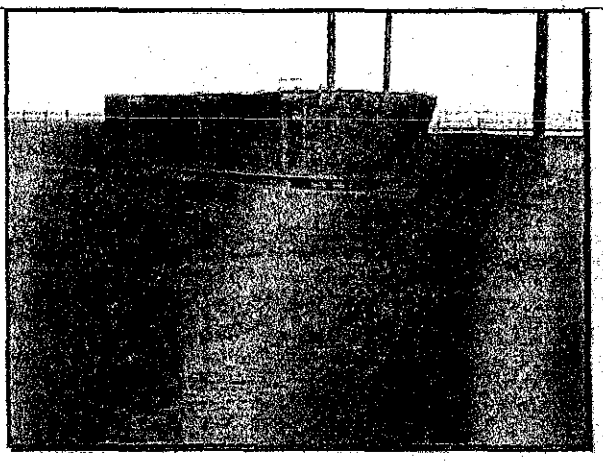
DATE: 10/29/99	SCALE: NTS
PROJ MGR: JMH	PROJECT: 99146.1
DRAWN: PLB/DRB	DWG. NO.: SITEPLAN(XS)

FIGURE 3

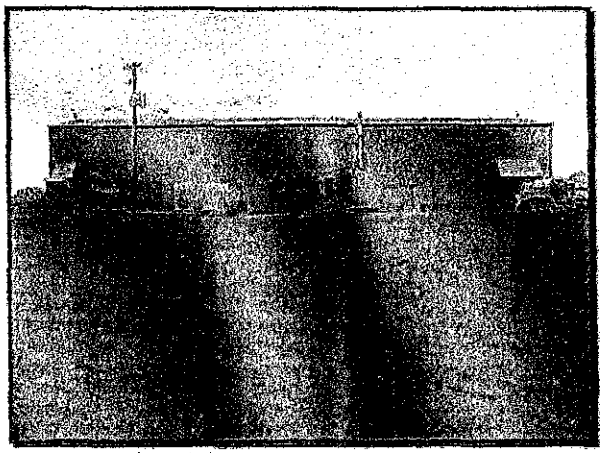
PHOTOS



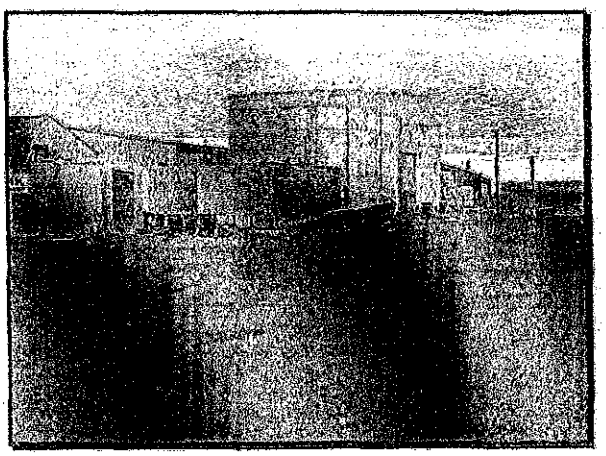
New powerhouse location, gravel pad constructed Summer 1999



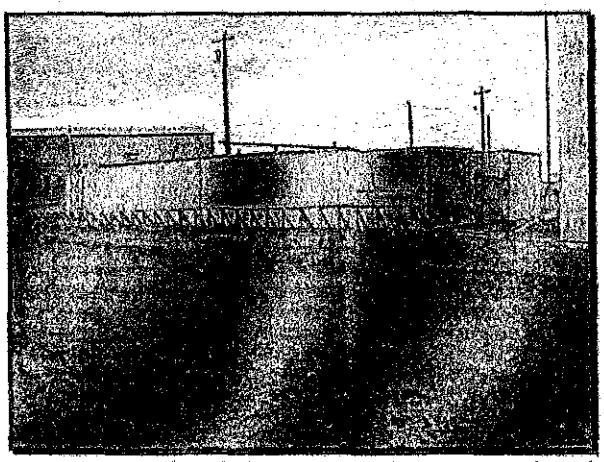
Boundary of new gravel pad and existing road. BH-1 in new pad, BH-2 in existing road.



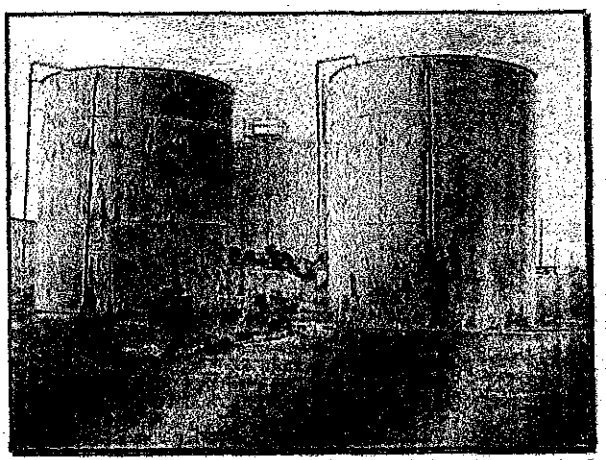
DMS maintenance shop viewed from the north. The two ASTs on left hand side used to fuel equipment.



View of tank farm, looking north. Cargo boxes in foreground contain spill control equipment.



Two rectangular ASTs on southern part of tank farm. Labelled "out of service."



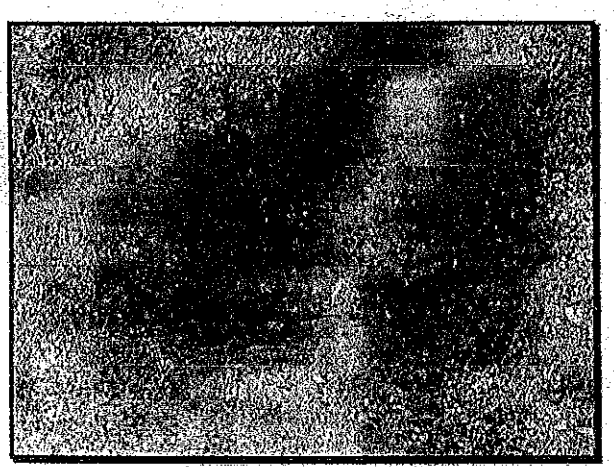
ASTs #1 (on left) and #2 (on right). Currently in use as feed tanks for blue 1000 gallon tank.

BH-12 located in front of Tank 2. Stained soil visible to the right (north) of boring.

Two ASTs in between Tank 2 and Tank 3, marked "out of service." Large water tank in background.

Tank 3 and blue 1000 gallon diesel tank. Blue tank fuctions similiar to a day tank for powerhouse.

Powerhouse, water plant, and washeteria structure. Lines to enter powerhouse near far end of wood.



BH-16. Example of boring with brown gravel near surface and gray gravel near tundra interface. Most gravel here is contaminated, regardless of color.

BH-16 excavation pile. Gravel from bottom of hole (on top of pile) PIDs 825 ppm, gravel at 2' deep PIDs at 460 ppm.

LABORATORY

CTE Environmental Services
Alaska Division
Laboratory Data Report

Project: Kaktovic Power House

Client: Nortech

CTE Work Order: 994359

Contents:

Chain of Custody
Quality Control Summary Forms

Note:

Unless otherwise noted, all quality assurance/quality control criteria is in compliance with the proper regulatory authority and/or CTE's Quality Assurance Program Plan.

CT&E Environmental Services Inc.

Case Narrative

Customer: NOR Nortech
Project: 3991839 Kaktovic Power House

3991839002

DRO/RRO – Pattern consistent with weathered middle distillate.

3991839003

DRO – Pattern consistent with weathered middle distillate.

3991839006

DRO – Pattern consistent with weathered middle distillate.
DRO/RRO – Surrogate diluted below the PQL, recoveries present due to matrix interference.

3991839007

DRO – Pattern consistent with weathered middle distillate.
DRO/RRO – Surrogate diluted below the PQL, recoveries present due to matrix interference.

BTEX LCS

The LCS for p+m-Xylene is above the QC limits, the LCSD is acceptable.

CHAIN OF CUSTODY RECORD

994359

CT&E Environmental Services Inc. Pit #3991839
Laboratory Division

(1)

CLIENT: NORTECH
CONTACT: Peter Beardsley PHONE NO: (907) 452 5688 X8
PROJECT: Kakivak SITE: Power House
REPORTS TO: Nortech FAX NO: 907) 452 5694
INVOICE TO: Nortech P.O. NUMBER: 99146.1

CT&E Reference:

PAGE 1 OF 1

(2)

LAB NO.	SAMPLE IDENTIFICATION	DATE	TIME	MATRIX	No. CONTAINERS	SAMPLE TYPE C=COMP G=GRAB	Preservatives Used: HCl / HCl	(3) Analysis Required: GRO/BTEX / DRO/RRO	REMARKS
1	KAK-01 ✓	8Sept99	0815	Soil	2	G	X	X	
2	KAK-02 ✓	8Sept99	0820	Soil	2	G	X	X	
3	KAK-04 ✓	8Sept99	0845	Soil	2	G	X	X	
4	KAK-06 ✓	8Sept99	0927	Soil	2	G	X	X	
5	KAK-10 ✓	8Sept99	1020	Soil	2	G	X	X	
6	KAK-18 ✓	8Sept99	0940	Soil	2	G	X	X	
7	KAK-19 ✓	9Sept	0945	Soil	2	G	X	X	
8	Trip Blank ✓						X		

(5)

	Date	Time	
Collected/Relinquished By: (1)	9/10/99	1010	Received By: Rhonda Strucker
Relinquished By: (2) Rhonda Strucker	9/10/99	1140 UPS	Received By: to Anatech
Relinquished By: (3)	Date	Time	Received By:
Relinquished By: (4)	9-14-99	9:00	Received For Laboratory By:

(4)

Shipping Carrier:
Shipping Ticket No:
Samples Received Cold? (Circle) YES NO
Temperature °C: 6.0°C
Data Deliverables Required
Level I Level II Level III
Chain of Custody Seal: (Circle)
INTACT BROKEN ABSENT
Requested Turnaround Time and Special Instructions:

Regular 5 day

200 W. Potter Drive **Anchorage, AK 99518-1605** Tel: (907) 562-2343 Fax: (907) 561-5301
3180 Peger Road **Fairbanks, AK 99701-5471** Tel: (907) 474-8656 Fax: (907) 474-9685

White - Retained by Lab (Project File) Yellow - Returned with Report Pink - Retained by Sampler

.5°9

.) 720

CT&E Environmental Services Inc.

Laboratory Analysis Report

September 30, 1999

Peter Beardsley
Nortech

Client Name	**Nortech**
Project ID	Kaktovic Power House (994359)
Printed	September 30, 1999

Enclosed are the analytical results associated with the above project.

As required by the state of Alaska and the USEPA, a formal Quality Assurance/Quality Control Program is maintained by CT&E. A copy of our Quality Control Manual that outlines this program is available at your request.

Except as specifically noted, all statements and data in this report are in conformance to the provisions set forth in our Quality Assurance Program Plan.

If you have any questions regarding this report or if we can be of any other assistance, please call your CT&E Project Manager at (907) 562-2343

The following descriptors may be found on your report which will serve to further qualify the data.

U - Indicates the compound was analyzed for but not detected.
J - Indicates an estimated value that falls below PQL, but is greater than the MDL.
B - Indicates the analyte is found in the blank associated with the sample.
* - The analyte has exceeded allowable limits.
GT - Greater Than
D - Secondary Dilution
LT - Less Than
! - Surrogate out of range

CT&E Environmental Services Inc.

SAMPLE RECEIPT FORM

994359

CT&E WO#:

Yes	No		
	✓	Are samples **RUSH**, priority, or *within 72 hrs* of **hold time**?	
		If yes, have you done *e-mail notification*?	
	✓	Are samples *within 24 hrs* of **hold time** or **due date**?	
		If yes, have you *spoken with* Supervisor?	
	✓	Are there any **problems** (e.g., ids, analyses)?	
		Were samples preserved correctly and pH verified?	
		Has Project Manager been notified of problems?	
		Is this an ACOE/AFCEE/ADEC project?	
✓		Will a **data package** be required?	Level I
		If this is for PWS, provide **PWSID.**	
✓		Is there a **quote** for this project?	4262
	✓	Will **courier** charges apply?	

Due Date: 9/17
Received Date/Time: 9/10/99 1010
Cooler Temperature: 6.0°C
Sample Condition: (Good) Poor

Matrix of each Sample:

2	" "	1-7
	" "	
	" "	
	" "	
2	Trip Blank	8
	MS/MSD	

Additional Sample Remarks:

- ✓ AK101s/_____ 8260s field pres'd?
- _____ Field-filtered for dissolved_____?
- _____ Lab-filter for dissolved_____?
- _____ Ref Lab required?

Completed by (sign): Rhonda Strucka (print): Rhonda Strucher

Notes:
Okay to Send to Anatech per Clark Milne
Shipped UPS 9/10/99

*** The following *must* be completed for *all* ACOE & AFCEE projects: ***

Yes	No		Notes:
		Is cooler temperature 4 ± C?	
		thermometer used:	
		Was there an airbill, etc? note #:	
		Was cooler sealed with custody seals?	
		#/where?	
		Were seals intact upon arrival?	
		Was there a COC with cooler?	
		Was the COC filled out properly?	
		Did the COC indicate ACOE/AFCEE project?	
		Did the COC and samples correspond?	
		Were samples screened with Geiger counter?	
		Were all samples packed to prevent breakage?	
		packing material:	
		Were all samples unbroken and clearly labelled?	
		Were all samples sealed in separate plastic bags?	
		Were all bottles for volatiles free of headspace?	
		Were correct container/sample sizes submitted?	
		Was client notified of problems? (specify below)	

individual contacted:
Date & Time: _____ Phone/Fax #: _____

# of each Container Received:

	950 ml amber	unpres'd
	950 ml amber	w/ HCl
	500 ml amber	w/ H2SO4
	1L cubies	unpres'd
	1L cubies	w/ HNO3
	1L cubies	w/ H2SO4
	1L cubies	w/ NaOH + ZnAc
	120 ml coli	bottles
	60 ml	Nalg
7	8 oz amber	unpres'd
	4 oz amber	unpres'd
8	4 oz w/ septa	w/ MeOH
	40 ml vials	w/ HCl
	Other (specify)	
	Other (specify)	

#/Log In Proofed by: _____

Form Number: F004r2
Printed: 7/12/99

CT&E Environmental Services Inc.

CT&E Ref.#	3991839002	**Client PO#**	
Client Name	NORTECH	**Printed Date/Time**	09/30/99 8:51:21
Project Name/#	Kaktovic Power House	**Collected Date/Time**	09/08/99 8:20:00
Client Sample ID	KAK-02 (994359)	**Received Date/Time**	09/14/99 9:00:00
Matrix	Solid	**Technical Director**	**Jason Asher**
Ordered By		**Released By**	
PWSID			

Sample Remarks:
Analysis performed at CT&E ESI - Michigan Division

Parameter	Results	PQL	Units	Method	Allowable Limits	Prep Date	Analysis Date	Init
PHYSICAL PROPERTY ANALYSIS								
Total Solids	85.6		%	SM18 2540G			09/15/99	JL
DRO/RRO COMBINATION								
Diesel Range Organics	27.4	11.7	mg/Kg	AK102/103		09/15/99	09/21/99	TMJ
Residual Range Organics GC	31.9	19.3	mg/Kg	AK102/103		09/15/99	09/21/99	TMJ
		DRO/RRO - Pattern consistent with weathered middle distillate.						
Surrogates								
d-Triacontane <Surr>	73.2		%	AK102/103	50-150	09/15/99	09/21/99	TMJ
o-Terphenyl <Surr>	99.5		%	AK102/103	50-150	09/15/99	09/21/99	TMJ
GRO/8021 COMBINATION								
Gasoline Range Organics	4.2	2.8	mg/Kg	AK101/8021B		09/08/99	09/15/99	ORY
Benzene	0.028U	0.028	mg/Kg	AK101/8021B		09/08/99	09/15/99	ORY
Ethylbenzene	0.028U	0.028	mg/Kg	AK101/8021B		09/08/99	09/15/99	ORY
o-Xylene	0.028U	0.028	mg/Kg	AK101/8021B		09/08/99	09/15/99	ORY
P & M -Xylene	0.06U	0.06	mg/Kg	AK101/8021B		09/08/99	09/15/99	ORY
Toluene	0.045	0.028	mg/Kg	AK101/8021B		09/08/99	09/15/99	ORY
Surrogates								
1,4-Difluorobenzene <IS/Surr>	87.5		%	AK101/8021B	60-120	09/08/99	09/15/99	ORY
4-Bromofluorobenzene <Surr>	71.2		%	AK101/8021B	50-150	09/08/99	09/15/99	ORY

CT&E Environmental Services Inc.

CT&E Ref.#	3991839001	**Client PO#**	
Client Name	NORTECH	**Printed Date/Time**	09/30/99 8:51:21
Project Name/#	Kaktovic Power House	**Collected Date/Time**	09/08/99 8:15:00
Client Sample ID	KAK-01 (994359)	**Received Date/Time**	09/14/99 9:00:00
Matrix	Solid	**Technical Director**	**Jason Asher**
Ordered By		**Released By**	Jason A Asher
PWSID			

Sample Remarks:
Analysis performed at CT&E ESI - Michigan Division

Parameter	Results	PQL	Units	Method	Allowable Limits	Prep Date	Analysis Date	Init
PHYSICAL PROPERTY ANALYSIS								
Total Solids	93.8		%	SM18 2540G			09/15/99	JL
DRO/RRO COMBINATION								
Diesel Range Organics	10.7U	10.7	mg/Kg	AK102/103		09/15/99	09/21/99	TMJ
Residual Range Organics GC	17.6U	17.6	mg/Kg	AK102/103		09/15/99	09/21/99	TMJ
Surrogates								
d-Triacontane <Surr>	84.6		%	AK102/103	50-150	09/15/99	09/21/99	TMJ
o-Terphenyl <Surr>	122		%	AK102/103	50-150	09/15/99	09/21/99	TMJ
GRO/8021 COMBINATION								
Gasoline Range Organics	2.3	1.5	mg/Kg	AK101/8021B		09/08/99	09/15/99	ORY
Benzene	0.015U	0.015	mg/Kg	AK101/8021B		09/08/99	09/15/99	ORY
Ethylbenzene	0.015U	0.015	mg/Kg	AK101/8021B		09/08/99	09/15/99	ORY
o-Xylene	0.015U	0.015	mg/Kg	AK101/8021B		09/08/99	09/15/99	ORY
P & M -Xylene	0.03U	0.03	mg/Kg	AK101/8021B		09/08/99	09/15/99	ORY
Toluene	0.015U	0.015	mg/Kg	AK101/8021B		09/08/99	09/15/99	ORY
Surrogates								
1,4-Difluorobenzene <IS/Surr>	88.2		%	AK101/8021B	60-120	09/08/99	09/15/99	ORY
4-Bromofluorobenzene <Surr>	74.7		%	AK101/8021B	50-150	09/08/99	09/15/99	ORY

CT&E Environmental Services Inc.

CT&E Ref.#	3991839003	**Client PO#**	
Client Name	NORTECH	**Printed Date/Time**	09/30/99 8:51:21
Project Name/#	Kaktovic Power House	**Collected Date/Time**	09/08/99 8:45:00
Client Sample ID	KAK-04 (994359)	**Received Date/Time**	09/14/99 9:00:00
Matrix	Solid	**Technical Director**	Jason Asher
Ordered By			
PWSID		**Released By**	

Sample Remarks:
Analysis performed at CT&E ESI - Michigan Division

Parameter	Results	PQL	Units	Method	Allowable Limits	Prep Date	Analysis Date	Init
PHYSICAL PROPERTY ANALYSIS								
Total Solids	86.3		%	SM18 2540G			09/15/99	JL
DRO/RRO COMBINATION								
Diesel Range Organics	211	23.2	mg/Kg	AK102/103		09/15/99	09/21/99	TMJ
Residual Range Organics GC	38.2U	38.2	mg/Kg	AK102/103		09/15/99	09/21/99	TMJ
	DRO - Pattern consistent with weathered middle distillate.							
Surrogates								
d-Triacontane <Surr>	60.9		%	AK102/103	50-150	09/15/99	09/21/99	TMJ
o-Terphenyl <Surr>	93.3		%	AK102/103	50-150	09/15/99	09/21/99	TMJ
GRO/8021 COMBINATION								
Gasoline Range Organics	5.5	2.3	mg/Kg	AK101/8021B		09/08/99	09/16/99	ORY
Benzene	0.023U	0.023	mg/Kg	AK101/8021B		09/08/99	09/16/99	ORY
Ethylbenzene	0.043	0.023	mg/Kg	AK101/8021B		09/08/99	09/16/99	ORY
o-Xylene	0.10	0.023	mg/Kg	AK101/8021B		09/08/99	09/16/99	ORY
P & M -Xylene	0.15	0.05	mg/Kg	AK101/8021B		09/08/99	09/16/99	ORY
Toluene	0.12	0.023	mg/Kg	AK101/8021B		09/08/99	09/16/99	ORY
Surrogates								
1,4-Difluorobenzene <IS/Surr>	104		%	AK101/8021B	60-120	09/08/99	09/16/99	ORY
4-Bromofluorobenzene <Surr>	66.1		%	AK101/8021B	50-150	09/08/99	09/16/99	ORY

CT&E Environmental Services Inc.

CT&E Ref.#	3991839004	**Client PO#**	
Client Name	NORTECH	**Printed Date/Time**	09/30/99 8:51:21
Project Name/#	Kaktovic Power House	**Collected Date/Time**	09/08/99 9:27:00
Client Sample ID	KAK-06 (994359)	**Received Date/Time**	09/14/99 9:00:00
Matrix	Solid	**Technical Director**	**Jason Asher**
Ordered By			
PWSID		**Released By**	

Sample Remarks:
Analysis performed at CT&E ESI - Michigan Division

Parameter	Results	PQL	Units	Method	Allowable Limits	Prep Date	Analysis Date	Init
PHYSICAL PROPERTY ANALYSIS								
Total Solids	88.6		%	SM18 2540G			09/15/99	JL
DRO/RRO COMBINATION								
Diesel Range Organics	11.3U	11.3	mg/Kg	AK102/103		09/15/99	09/21/99	TMJ
Residual Range Organics GC	18.6U	18.6	mg/Kg	AK102/103		09/15/99	09/21/99	TMJ
Surrogates								
d-Triacontane <Surr>	65.2		%	AK102/103	50-150	09/15/99	09/21/99	TMJ
o-Terphenyl <Surr>	92.5		%	AK102/103	50-150	09/15/99	09/21/99	TMJ
GRO/8021 COMBINATION								
Gasoline Range Organics	2.1	1.7	mg/Kg	AK101/8021B		09/08/99	09/15/99	ORY
Benzene	0.017U	0.017	mg/Kg	AK101/8021B		09/08/99	09/15/99	ORY
Ethylbenzene	0.017U	0.017	mg/Kg	AK101/8021B		09/08/99	09/15/99	ORY
o-Xylene	0.017U	0.017	mg/Kg	AK101/8021B		09/08/99	09/15/99	ORY
P & M -Xylene	0.03U	0.03	mg/Kg	AK101/8021B		09/08/99	09/15/99	ORY
Toluene	0.034	0.017	mg/Kg	AK101/8021B		09/08/99	09/15/99	ORY
Surrogates								
1,4-Difluorobenzene <IS/Surr>	85.8		%	AK101/8021B	60-120	09/08/99	09/15/99	ORY
4-Bromofluorobenzene <Surr>	63.5		%	AK101/8021B	50-150	09/08/99	09/15/99	ORY

CT&E Environmental Services Inc.

CT&E Ref.#	3991839005	**Client PO#**	
Client Name	NORTECH	**Printed Date/Time**	09/30/99 8:51:21
Project Name/#	Kaktovic Power House	**Collected Date/Time**	09/08/99 10:30:00
Client Sample ID	KAK-10 (994359)	**Received Date/Time**	09/14/99 9:00:00
Matrix	Solid	**Technical Director**	**Jason Asher**
Ordered By			
PWSID		**Released By**	

Sample Remarks:
Analysis performed at CT&E ESI - Michigan Division

Parameter	Results	PQL	Units	Method	Allowable Limits	Prep Date	Analysis Date	Init
PHYSICAL PROPERTY ANALYSIS								
Total Solids	92.4		%	SM18 2540G			09/15/99	JL
DRO/RRO COMBINATION								
Diesel Range Organics	24.2	10.8	mg/Kg	AK102/103		09/15/99	09/21/99	TMJ
Residual Range Organics GC	17.9U	17.9	mg/Kg	AK102/103		09/15/99	09/21/99	TMJ
	DRO - Pattern consistent with weathered middle distillate.							
Surrogates								
d-Triacontane <Surr>	77.4		%	AK102/103	50-150	09/15/99	09/21/99	TMJ
o-Terphenyl <Surr>	118		%	AK102/103	50-150	09/15/99	09/21/99	TMJ
GRO/8021 COMBINATION								
Gasoline Range Organics	5.1	2.2	mg/Kg	AK101/8021B		09/08/99	09/15/99	ORY
Benzene	0.022U	0.022	mg/Kg	AK101/8021B		09/08/99	09/15/99	ORY
Ethylbenzene	0.025	0.022	mg/Kg	AK101/8021B		09/08/99	09/15/99	ORY
o-Xylene	0.022U	0.022	mg/Kg	AK101/8021B		09/08/99	09/15/99	ORY
P & M -Xylene	0.053	0.04	mg/Kg	AK101/8021B		09/08/99	09/15/99	ORY
Toluene	0.022U	0.022	mg/Kg	AK101/8021B		09/08/99	09/15/99	ORY
Surrogates								
1,4-Difluorobenzene <IS/Surr>	84.8		%	AK101/8021B	60-120	09/08/99	09/15/99	ORY
4-Bromofluorobenzene <Surr>	90.8		%	AK101/8021B	50-150	09/08/99	09/15/99	ORY

CT&E Environmental Services Inc.

CT&E Ref.#	3991839006	**Client PO#**	
Client Name	NORTECH	**Printed Date/Time**	09/30/99 8:51:21
Project Name/#	Kaktovic Power House	**Collected Date/Time**	09/09/99 9:40:00
Client Sample ID	KAK-18 (994359)	**Received Date/Time**	09/14/99 9:00:00
Matrix	Solid	**Technical Director**	**Jason Asher**
Ordered By		**Released By**	
PWSID			

Sample Remarks:
Analysis performed at CT&E ESI - Michigan Division

Parameter		Results	PQL	Units	Method	Allowable Limits	Prep Date	Analysis Date	Init
PHYSICAL PROPERTY ANALYSIS									
Total Solids		88.2		%	SM18 2540G			09/15/99	JL
DRO/RRO COMBINATION									
Diesel Range Organics	D	3780	567	mg/Kg	AK102/103		09/15/99	09/21/99	TMJ
Residual Range Organics GC	D	935U	935	mg/Kg	AK102/103		09/15/99	09/21/99	TMJ
		DRO - Pattern consistent with weathered middle distillate.							
Surrogates									
d-Triacontane <Surr>		68		%	AK102/103	50-150	09/15/99	09/21/99	TMJ
o-Terphenyl <Surr>		61		%	AK102/103	50-150	09/15/99	09/21/99	TMJ
GRO/8021 COMBINATION									
Gasoline Range Organics	D	210	54	mg/Kg	AK101/8021B		09/09/99	09/16/99	ORY
Benzene	D	0.54U	0.54	mg/Kg	AK101/8021B		09/09/99	09/16/99	ORY
Ethylbenzene	D	0.56	0.54	mg/Kg	AK101/8021B		09/09/99	09/16/99	ORY
o-Xylene	D	3.8	0.54	mg/Kg	AK101/8021B		09/09/99	09/16/99	ORY
P & M -Xylene	D	12	1	mg/Kg	AK101/8021B		09/09/99	09/16/99	ORY
Toluene	D	0.54U	0.54	mg/Kg	AK101/8021B		09/09/99	09/16/99	ORY
Surrogates									
1,4-Difluorobenzene <IS/Surr>		106		%	AK101/8021B	60-120	09/09/99	09/16/99	ORY
4-Bromofluorobenzene <Surr>		107		%	AK101/8021B	50-150	09/09/99	09/16/99	ORY

CT&E Environmental Services Inc.

CT&E Ref.#	3991839007	**Client PO#**	
Client Name	NORTECH	**Printed Date/Time**	09/30/99 8:51:21
Project Name/#	Kaktovic Power House	**Collected Date/Time**	09/09/99 9:45:00
Client Sample ID	KAK-19 (994359)	**Received Date/Time**	09/14/99 9:00:00
Matrix	Solid	**Technical Director**	Jason Asher
Ordered By			
PWSID		**Released By**	

Sample Remarks:
Analysis performed at CT&E ESI - Michigan Division

Parameter		Results	PQL	Units	Method	Allowable Limits	Prep Date	Analysis Date	Init
PHYSICAL PROPERTY ANALYSIS									
Total Solids		89.4		%	SM18 2540G			09/15/99	JL
DRO/RRO COMBINATION									
Diesel Range Organics	D	2390	280	mg/Kg	AK102/103		09/15/99	09/21/99	TMJ
Residual Range Organics GC	D	461U	461	mg/Kg	AK102/103		09/15/99	09/21/99	TMJ
		DRO - Pattern consistent with weathered middle distillate.							
Surrogates									
d-Triacontane <Surr>		91		%	AK102/103	50-150	09/15/99	09/21/99	TMJ
o-Terphenyl <Surr>		68		%	AK102/103	50-150	09/15/99	09/21/99	TMJ
GRO/8021 COMBINATION									
Gasoline Range Organics	D	84	21	mg/Kg	AK101/8021B		09/09/99	09/16/99	ORY
Benzene	D	0.21U	0.21	mg/Kg	AK101/8021B		09/09/99	09/16/99	ORY
Ethylbenzene	D	0.31	0.21	mg/Kg	AK101/8021B		09/09/99	09/16/99	ORY
o-Xylene	D	2.9	0.21	mg/Kg	AK101/8021B		09/09/99	09/16/99	ORY
P & M -Xylene	D	6.9	0.4	mg/Kg	AK101/8021B		09/09/99	09/16/99	ORY
Toluene	D	0.21U	0.21	mg/Kg	AK101/8021B		09/09/99	09/16/99	ORY
Surrogates									
1,4-Difluorobenzene <IS/Surr>		102		%	AK101/8021B	60-120	09/09/99	09/16/99	ORY
4-Bromofluorobenzene <Surr>		102		%	AK101/8021B	50-150	09/09/99	09/16/99	ORY

CT&E Environmental Services Inc.

CT&E Ref.#	3991839008	**Client PO#**	
Client Name	NORTECH	**Printed Date/Time**	09/30/99 8:51:21
Project Name/#	Kaktovic Power House	**Collected Date/Time**	
Client Sample ID	Trip Blank (994359)	**Received Date/Time**	09/14/99 9:00:00
Matrix	Solid	**Technical Director**	**Jason Asher**
Ordered By			
PWSID		**Released By**	

Sample Remarks:
Analysis performed at CT&E ESI - Michigan Division

Parameter	Results	PQL	Units	Method	Allowable Limits	Prep Date	Analysis Date	Init
GRO/8021 COMBINATION								
Gasoline Range Organics	4.0	2.5	mg/Kg	AK101/8021B		09/15/99	09/15/99	ORY
Benzene	0.025U	0.025	mg/Kg	AK101/8021B		09/15/99	09/15/99	ORY
Ethylbenzene	0.025U	0.025	mg/Kg	AK101/8021B		09/15/99	09/15/99	ORY
o-Xylene	0.025U	0.025	mg/Kg	AK101/8021B		09/15/99	09/15/99	ORY
P & M -Xylene	0.05U	0.05	mg/Kg	AK101/8021B		09/15/99	09/15/99	ORY
Toluene	0.025U	0.025	mg/Kg	AK101/8021B		09/15/99	09/15/99	ORY
Surrogates								
1,4-Difluorobenzene <IS/Surr>	89.2		%	AK101/8021B	60-120	09/15/99	09/15/99	ORY
4-Bromofluorobenzene <Surr>	94.5		%	AK101/8021B	50-150	09/15/99	09/15/99	ORY

CT&E Environmental Services Inc.

Client Nortech
Workorder Kaktovic Power House

QC Batch 1432
Original
Matrix Soil/Solid

Prep Date
Analysis Method Standard Mth. 2540G

QC results affect the following production samples:

3991839001 3991839002 3991839003 3991839004 3991839005 3991839006 3991839007

QC results for Method Blank

Parameter	Analyzed	Result	PQL	Units
% Solids	09/15/99	100		%

CT&E Environmental Services Inc.

Client Nortech
Workorder Kaktovic Power House

QC Batch 1432
Original 3991839007
Matrix Soil/Solid

Prep Date
Analysis Method Standard Mth. 2540G

QC results affect the following production samples:

3991839001 3991839002 3991839003 3991839004 3991839005 3991839006 3991839007

QC results for Duplicate

Run Instrument: Varian 3400 GC - K

Parameter	Original Result	QC Result	RPD	RPD Limits	Analyzed	Instrument ID
% Solids	89.4	90.8	1.5		09/15/99	

CT&E Environmental Services Inc.

Client Nortech
Workorder Kaktovic Power House

QC Batch I15SEP99
Original
Matrix Soil/Solid

Prep Date 09/15/99
Analysis Method 8021

QC results affect the following production samples:

3991839001 3991839002 3991839003 3991839004 3991839005 3991839006 3991839007 3991839008

QC results for Method Blank

Run Instrument: Varian 3400 GC - K

Parameter	Analyzed	Result	PQL	Units
GRO	09/16/99	1.0 U	1.0	mg/Kg
Benzene	09/16/99	0.050 U	0.050	mg/Kg
Toluene	09/16/99	0.050 U	0.050	mg/Kg
Ethylbenzene	09/16/99	0.050 U	0.050	mg/Kg
P & M -Xylene	09/16/99	0.10 U	0.10	mg/Kg
o-Xylene	09/16/99	0.050 U	0.050	mg/Kg

CT&E Environmental Services Inc.

Client Nortech
Workorder Kaktovic Power House

QC Batch 115SEP99
Original
Matrix Soil/Solid

Prep Date 09/15/99
Analysis Method 8021

QC results affect the following production samples:

3991839001 3991839002 3991839003 3991839004 3991839005 3991839006 3991839007 3991839008

QC results for Lab Check Standard – Lab Check Standard Duplicate

Run Instrument: Varian 3400 GC - K

Parameter		QC Result	Pct Recov	LCS/LCSD Limits	RPD	RPD Limits	Spiked Amount	Analyzed	Inst ID
GRO	LCS	41.36	83	80-120					
	LCSD	42.15	84		2	0-20	50	09/16/99	B
Benzene	LCS	1.08	108	80-120			1.0	09/1699	B
	LCSD	1.02	102		6	0-20	1.0	09/16/99	B
Toluene	LCS	1.10	110	80-120			1.0	09/16/99	B
	LCSD	1.07	107		4	0-20	1.0	09/16/99	B
Ethylbenzene	LCS	1.13	113	80-120			1.0	09/16/99	B
	LCSD	1.10	110		3	0-20	1.0	09/16/99	B
P & M -Xylene	LCS	1.23	123	80-120			2.0	09/16/99	B
	LCSD	1.20	120		3	0-20	2.0	09/16/99	B
o-Xylene	LCS	1.10	110	80-120			1.0	09/16/99	B
	LCSD	1.05	105		4	0-20	1.0	09/16/99	B

CT&E Environmental Services Inc.

Client Nortech
Workorder Kaktovic Power House

QC Batch 1336XXX
Original
Matrix Soil/Solid

Prep Date 09/15/99
Analysis Method AK102/AK103

QC results affect the following production samples:

3991839001 3991839002 3991839003 3991839004 3991839005 3991839006 3991839007

QC results for Method Blank

Run Instrument: Varian 3600 GC - N

Parameter	Analyzed	Result	PQL	Units
Diesel Range Organics	09/17/99	10 U	10	mg/Kg
Residual Range Organics	09/17/99	16.5 U	16.5	mg/Kg

CT&E Environmental Services Inc.

Client Nortech
Workorder Kaktovic Power House

QC Batch 1336XXX
Original
Matrix Soil/Solid

Prep Date 09/15/99
Analysis Method AK102/AK103

QC results affect the following production samples:

3991839001 3991839002 3991839003 3991839004 3991839005 3991839006 3991839007

QC results for Lab Check Standard – Lab Check Standard Duplicate

Run Instrument: Varian 3600 GC - N

Parameter		QC Result	Pct Recov	LCS/LCSD Limits	RPD	RPD Limits	Spiked Amount	Analyzed	Inst ID
Diesel Range Organics	LCS	91	114	75-125			80	09/17/99	N
	LCSD	89	111		2.0	0-20	80	09/17/99	N
Residual Range Organics	LCS	240	120	60-120			200	09/17/99	N
	LCSD	220	110		9.0	0-20	200	09/17/99	N

CT&E Environmental Services Inc.

Client Nortech
Workorder Kaktovic Power House

QC Batch 1336XXX
Original 3991839001
Matrix Soil/Solid

Prep Date 09/15/99
Analysis Method AK102/AK103

QC results affect the following production samples:

3991839001 3991839002 3991839003 3991839004 3991839005 3991839006 3991839007

QC results for Lab Check Standard – Matrix Spike / Matrix Spike Duplicate

Run Instrument: Varian 3600 GC - N

Parameter		QC Result	Pct Recov	LCS/LCSD Limits	RPD	RPD Limits	Spiked Amount	Analyzed	Inst ID
Diesel Range Organics	MS	86	108	60-140			80	09/21/99	N
	MSD	84	105		2.0	0-20	80	09/21/99	N
Residual Range Organics	MS	218	109	60-120			200	09/2199	N
	MSD	212	106		3.0	0-20	200	09/21/99	N

FIELD NOTES

7 Sept 99

Arrived Kaktovic via Frontier Flying Service @ 2Pm. Met by Les Hostetter @ airport.

Drove along proposed side area, looking @ potential problems, issues

8 Sept 99

No mountains in site visibility good @ ground fast. Chilly, close to dumpsite. Lawrence running Ditchwitch which is a hyd dozer, a ditchwitch all @ once.

8 Sept 99

PID Cal 0:0.0 97:96.7

Hole #1 Closest to new powerhouse Put in new gravel this summer, straight from gravel pile south of town where all "new" gravel in town comes from, dug out a few years ago.

Depth	PID	Temp	Comments
6", SAM	7.9	61.0	clean gravel ~~Sample 1~~
2'	10.7	64.5	clean gravel
~~Bot~~(5.5')	10.4	57.4	Organic "freshly burned tundra"

Swing Ties: A-90' B 118

Hole #2 Closer to Borough Building in older gravel Road of 4th street

Depth	PID	Temp	Comments
6"	7.4	59.2	clean looking gravel
2'	8.7	58.8	clean looking gravel
~~Bot~~ 5' SAM	12.3	62.2	black stuff above fine SAND

Swing Ties A-70' B 75'

8 Sept 99

Hole #3 Headed ~~South~~ North along 4th Street fairly close to Borough Building. This is in line with well on down the side of road.

Depth	PID	Temp	Comments
6" SAM	6.7	72.8	gravel
2'	10.5	68.3	gravel
~~Bgtm~~ 5'	35.1	69.5	tundra beneath textile (grey/dark gravel above)

Swing Ties A-60' B 31'

Hole #4 Hea further ~~South~~ North along Rd, approx 50' middle of borough parking lot

Depth	PID	Temp	Comment
5"	8.2	63.6	grey gravel
2.5'	6.9	62.4	grey gravel
~~Bgtm~~ 5' SAM	22.2	60.9	grey/black above fabric

Swing Ties A 60' B 45

8 Sept 99

Hole #5 Par 2 50' NW of last hole still in Borough Parking ~~Lot~~ area

Depth	PID	Temp	Comments
6"	8.1	62.5	gravel
2' SAM	11.6	66.6	gravel
~~Bgtm~~ 5'	62.7	64.9	5' 2" grey/black gravel & rock tundra PID sample

Swing Ties A- 91' B 90'

Hole #6 Further N along 4th St, still in borough parking/Gillaney

Depth	PID	Temp	Comments
6"	4.4	59.1	rocky gravel
2'	8.1	64.2	gravel
~~Bgtm~~ 3.5' SAM	68.1	61.5	dark grey/black sandier than others

Swing ties A- 135 B 139'

8 Sept 99

Hole #7 ≈ 50' [illegible] SSW into Burough Parking lot SSW end of two long ASTs

Depth	PID	Temp	Comments
6"	7.5	59.3	gravel
2.5' SAM	8.9	66.0	gravel
BOH 4'	40.7	68.7	gravel, fabric, (top 1" stone/gravel, tundra, black)

Swing Ties A - 180 B: 184

Hole #8 SW end of two long ASTs, also close to Tank 3

Depth	PID	Temp	Comments
6"	8.2	57.7	
2.5' SAM	68.5	60.9	traces of stain
BOH 4'	8.7	69.1	Below tundra (thawed) Lots of roots, stains black

Swing ties C 105 D 120

Hole #9 Many AST ends of ASTs

Depth	PID	Temp	Comments
6" SAM	10.7	58.5	fabric 6", just below
2'	23.0	62.0	gravel, PID sample
BOH 3.5'	39.7	69.0	tundra, fabric 6" up, gravelly clay, fabric

Swing Ties C 61' D 68
(10' from AST end)

Hole #10 Between two storage tanks Near middle of tank 2

Depth	PID	Temp	
6"	1.37	46.5	
2', SAM	23.0	51.2	
BOH 4'	68.3	55.7	Gravel tundra, obj very few flies

Swing ties C 46' D 35

8

8 Sept 99

Hole #11 In between Harder A&S

Depth	PID	Temp	Comment - odor
6" SAM	394	48.0	
2'	710	53.9	gravel
4'	1100	58.3	tracing clay, fabric, PID sample, gravel, etc

Swing Ties C 63' D 24

Hole #12 out from middle of tank 3 oily rock ground surface

Depth	PID	Temp	Comment - odor
6"	13.8	51.5	
2' SAM	602	58.8	fabric
3½'	71000	60.1	PID-E 6" bentonite clay

Swing Ties C 92 D 56 E-102-5

8 Sept-99 Photos 12 14 13 15

Hole #13 Middle of Blue OK tank

Depth	PID	Temp	Comments
6"	634	60.9	
2'	800	55.6	sample
3½' SAM	950	61.4	bentonite 2" fabric clay

Swing Ties C 111' D 77 E-83-5

Hole #14 Straight out (transect) from edge of water tank

Depth	PID	Temp	Comments
6"	250	50.5	
2'	850	62.4	
4'	850	64.7	GW@3.5' stay, west of tanks

Swing Ties C 127' D-94' E 68-5

E = 151 8 Sept 99

Hole #15 straight from R hand of water two middle water tank posts.

Depth	PID	Temp	Comments (oc15)
6" SAM	307	57.0	
2'	550	57.8	
2½'	7100	58.1	GW @ 3' wet, sandy

Swing ties E 52-6 F-62
(132 a mid H_2O tank)

Hole #16 off step amner in powerhouse In Road line

Depth	PID	Temp	Comment
6"	8.5	55.8	6" clean gravel staining } brown
2'	460	58.6	
3' SAM	825	54.7	sand 2" / 2" tundra / clay — fabric black

swingties E 57.5 F-39

8 Sept 99

Hole 17 ½ way between window & dark door on powerhouse 15' out

Depth	PID	Temp	Comments
6"	20.1	62.9	
1.5'	7100	65.4	moderate odor
BH 2.5' SAM	675	60.5	tundra — fabric stinky?

Swing ties E - 103.5 F - 42'

PID cal 0.0 2.8 97: 91.2
PID cal 0 : 0.0 97: 97.1 9/9/99
Hole #18 5' S of window 4' from building behind dumpster

Depth	PID	Temp	Comments
6"	8.2	57.7	no odor
2' SAM	783	57.6	strong odor (duplicate samples 18 & 19)
BH 3'	71100	62.6	strong odor / tundra

Swing ties - none <5' from building

PID cal 0:0.0 97: 96.5

Swing Tie locations

A ~~Telephone~~ Utility Pole between Antenna & DMS building

B ~~Front~~ Corner of DMS building stairs closest to new powerplant

C. Utility pole in front of telephone steels

D Valving @ tank which is southern of two shorter out of separate tanks

E Utility Pole 751 @ corner of Kaktovik & 4th streets

F Corner of Powerplant nearest to water tank