1.0 INTRODUCTION, PURPOSE, AND SCOPE

A United States Air Force site remediation project took place during the 2004 summer field season at the North River RRS located just outside of Unalakleet, Alaska. This on-site field project ran from mid June to mid September 2004.

The project consisted of removal of contaminated soil on or adjacent to Air Force property. These adjacent landowners are Emily J. Nanouk who owns the cabin discussed below, and the Unalakleet Native Corporation. This soil was contaminated with either polychlorinated biphenyl transformer oil (PCBs) or petroleum, oil, and lubricant (POL) materials, mostly in the form of used lube oil. This used crankcase oil was identified visually, by aroma, and by chromatographic analysis. The PCB contaminated soil consists of very high levels of contamination (>>40,000 ppm) dissolved in trichlorobenzene lying in the middle of an ATV trail to a remote cabin. Material from here emanated in several directions, obviously mechanically tracked by either ATVs or less likely by foot. This spill area is noted in this report as the Hot Spot (see photographs and Figure 10). The cabin is located on Figure 13. Other named areas are described in Section 8.

This Hot Spot and contiguous evirons are designated as Area C. The contamination appears to have originally arisen as the result of improper disposal of PCB and used lube oil Area B lies on the west edge of the designated camp landfill, and consists of mildly POL contaminated soil, found under several old drums. Area A consists of soil contaminated with lube oils and PCB containing lube oils that were spilled off of the edge of an apron pushed out on the north side of the main site road.

2.0 LOCATION

North River RRS sits on top of a high hill between the Unalakleet and Little North River, which served as a source of water for the facility. It is located at the end of a road, approximately 12 miles from the City of Unalakleet. Figure 1 shows the vicinity map, Figure 2 shows the site map, and Figure 3 shows the location of task areas at North River. Site OT01 is the site designation for the entire facility, which consisted of: barracks and a utility (generator) building, a Quonset garage, a water tank with a pump house at Little North River, four WACS antennae, two 2,000 – barrel aboveground storage tanks (ASTS), and a pump house with piping that connected the ASTs to each antennae; sewer outfall, and a landfill with a designated asbestos cell. All of the facilities have been demolitioned and/or buried, followed by site regrading, so that none of the original site remains.

3.0 PHYSICAL SETTING

3.1 Climate and Weather

Unalakleet has a sub-arctic climate with considerable maritime influence when Norton Sound is ice-free, normally from May to October. The annual freezing of the Sound causes a change to a colder more continental climate accompanied by a reversal of wind direction from west to east. Winter temperatures average between -4º F (-20º C) and 15º F(-9º C) and summer temperatures average from 47º F (8º C) and 62º F (17º C), with a record high of 87º F (30º C). Winters are cold and dry, with an average of 41 inches of snowfall. Summers are cool, with most rainfall occurring from July through September. Average precipitation is 14.2 inches. Winds predominate from the east during the winter when the Bering Sea is ice covered, with an average velocity of 11 knots. Maximum recorded wind speed here was 56 knots.

3.2 Geology

The City of Unalakleet is located on the coastal plain of Norton Sound, adjacent to the Nulato Hills, in which the North River site lies. These hills consist of folded Cretaceous greywacke, slate, mudstone, and some coal-bearing sediments. Greywacke and slate underlie the North River site. The site lies within just a mile or two of the Kaltag Fault, a major tectonic fault that runs through the City of Unalakleet. Arctic soils are well developed on these rocks, although they are thin. Weathered bedrock was encountered at a depth of just two or three feet, although depth to bedrock is variable in this area. For example, soil borings excavated by Air Force contractors in 2004 at the North River RRS were as deep as 15 feet below the ground surface (bgs). Groundwater was encountered in borings near the former Auto Maintenance Yard at approximately 6 feet bgs.

3.3 Geography

The North River RRS was constructed on a topographic high point. Because of a combination of climate, rainfall amounts, and geology and soils formation, large amounts of water do not run off of the site, and water moves downhill by a combination of sheet flow (surface) and groundwater flow. The master stream in the area is the Unalakleet River, lying in a broad alluvial valley with gentle slopes, creating a low gradient and meandering course. Some wells have been driven into the alluvium, but in general this region of the state is permafrost – rich. Permafrost thaw bulbs in the alluvium along streams and wet spots are indicated by greatly increased size of trees (black spruce, cottonwood, and birch).

However, permafrost was not found at a depth of six feet on the trail to the cabin.

4.0 PROJECT HISTORY

In June of 2002, 611 CES was notified of four drums located at the westernmost toe of slope of the North River RRS landfill. A work crew was sent out to remove these drums in August of 2002. While on-site during this time, additional drums along with areas of POL soil contamination were found at a place now designated as Area A (Figure 3), and an area of exceptionally high PCB contamination (designated the 'Hot Spot') was found on the road to the cabin (Area C). These areas were partially delineated in August 2002.

In 2003, a concerted effort was made to remove drums and contaminated soil from Area A, and the heavily contaminated Hot Spot at area C. However, testing at Area C indicated a large area of low – level PCB contamination tracked by ATV activity from the 'Hot Spot' at Area C, as well as the 'Hot Spot' itself of more than 40,000 ppm PCB (Arochlor 1260). Therefore, the major effort was directed toward Area C, but the large volume of soil to be removed as indicated by 193 soil, surface swipe, vegetation, and oil samples overwhelmed the work schedule, so that none of the contaminated soil from Area A was removed. In addition, it was not possible to remove all of the contaminated material from Area C because of time and equipment constraints. Soil PCB testing indicated the PCB 'Hot Spot' on the trail to the cabin had been tracked by ATVs to and away from the cabin, as well as east and west on the main road. It was further indicated that the east track of the ATV trail to the cabin was considerably 'hotter' than the west track.

This volume of additional material to be removed from Area C resulted in the end of 2003 work year with projected goals for the 2004 work season of removal of all delineated PCB and POL containing soil, continuing soil and vegetation sampling to document and verify cleanup, and backfilling of excavated areas to original grade with clean fill. The 2004 project was funded as a Time Critical Removal.

The continuing 2004 objectives of the planned site work done by 611 CES/CEVO as described in this report were as follows:

1. Cleanup of the 'Hot Spot', an area of gross PCB spillage near the middle of the trail to the cabin.
2. Further definition and location of areas of known (and unknown) PCB contamination
3. Cleanup and removal of contaminated soil that had been tracked away from the Hot Spot, both to and along the Main Road
4. Removal of contaminated soil from along the trail to the cabin
5. Removal and proper disposal of all contaminated materials from the site.

5.0 CURRENT PROJECT

5.1 General

The objective of this project was to mitigate the potential for spread of contamination from soil loaded with PCB and POL. Each major task is described below. Provisions for safety, PPE, and other health and personnel issues are included in the Site Health and Safety Plan. The 611 CES/CEVO constructed and maintained a temporary storage facility for excavated soil, PPE materials such as used Tyvex suits, gloves, booties and waste and decontamination water.

All activities were planned and implemented in such a way as to protect existing utilities and structures, the environment, public and private property, and to maintain excellent health and safety criteria for workers and the public, as well as maintaining good public relations with the community as a whole. This included the protection of trees and other vegetation not in the excavation zone from fugitive dust, tracking of mud, or mechanical damage, and keeping the work environment clean and neat. Any and all reasonable measures were taken to minimize and suppress fugitive dust, spread of decontamination water, and other materials during excavation, drum filling, and transportation. For the most part, the summer had adequate rainfall to keep excavated soil moist and thus negate fugitive emissions. Excavation and drum loading was never halted due to dust emissions. Arrival at project locale was on 15 June. Approximately one week was taken to get equipment to the site, set up equipment and personnel tents on site, as well as construct a bermed decontamination pit as well as the decontamination tent.

5.2 Decontamination

A lined and bermed decontamination pit was constructed prior to commencement of excavation operations. It was planned to retain equipment decontamination waters in the pit, with recycling after passing through an activated charcoal filter and holding the cleaned liquids from which detergents and POL compounds had been removed in tanks on site for further use until end of project. As discussed below, a field expedient alternative (solvent cleaning and rag wiping) was demonstrated on site, so that excess waste waters were never generated.

Drums were placed on wooden pallets and banded together prior to transport.

The work plan called for the removal of POL and PCB contaminated soil from Areas A and C (see Figure 3). Excavated materials containing more than 50 ppm PCB were placed in either 55 – or 85 – gallon open top drums. Excavated materials whose field laboratory analysis indicated contamination at less than 50 ppm PCB were placed in one cubic yard super-sacks.

5.3 Waste Management and Shipping

Drum and sack containers were weighed prior to shipment off site. Drums were shipped out as air freight, and sacks were loaded into sea vans for subsequent shipping to designated disposal sites. A total of 808 drums were shipped off site by air, and approximately 600 super sacks, whose weight average is estimated at 2100 lbs each, were shipped by barge in 38 sea vans. These sea vans were shipped for disposal to the Columbia Ridge Landfill, at 18177 Cedar Springs Lane, Arlington, Oregon 97812. The drums containing contaminated soil of more than 50 ppm PCB were transferred to DRMO-UAAB, 12737 Vandenburg Ave, Elmendorf AFB, AK 99506.

5.4 Field Laboratory

An Air Force - contracted laboratory (SGS Environmental Services, 200 West Potter, Anchorage, AK 99518) furnished a gas chromatograph as well as a chromatographer so that real time analysis could be furnished for the excavation portions of the project. ADEC mandated cleanup levels for PCB is 1.0 ppm . Just as anticipated, the field lab greatly improved the project by giving an under – 24 hour turnover of sample results, indicating locations where additional excavation was needed, as well as areas where laboratory confirmation samples could be collected.

The general operating goal was to dig from areas of low level PCB contamination toward high levels of known contamination. This would help minimize bucket decon time, as well as Investigation Derived Waste (IDW). This plan entailed roadway excavation first, followed by the trail to the cabin, followed by excavation at the Hot Spot in the middle of this trail.

6.0 CONTAMINATION THEORY

The initial discovery of PCB contaminated soil at Area C in 2003 was actually done by odor. A complaint was received of a strange odor in the driveway to the cabin. Investigation discerned the odor was due to trichlorobenzene, a PCB solvent (PCBs have no odor in themselves). It was also noted that this spot was devoid of vegetation.

Further soil investigation revealed the ground surface on trails radiating away from the Hot Spot had a thin coating of PCBs, which were evidently tracked away from the Hot Spot by foot or ATV. In the ruts going to the cabin, the higher PCB values were in the western rut, resulting from ATV wheels would go right through the Hot Spot. Thus, PCBs were imprinted on the soil from the wheels, much as a printing press would work. Cleanup could thus proceed with a minimum of soil removal because the contamination zone was only surficial. In practice, a backhoe bucket operates by removing a minimum of four inches of soil.

7.0 SAMPLING

In general, two numbering systems were used for soil samples collected at North River. For field samples to be taken back to the trailer-based laboratory in Unalakleet at end of shift, sample numbers consisted of the month, day, and sequence number, all duly logged into the field book. Thus, 82003 would be the third sample collected on the twentieth of August and its description or composition was logged into the field book. These samples were analyzed only for Arochlor 1260, since that was the only mixture known to be present. This permitted a single column analysis which increased the speed of analysis so that data could be available to the work crew the next morning.

If these field samples revealed a PCB value of less that 1.0-ppm Arochlor 1260, an official confirmation sample from the same spot was bottled and sent to town for an EPA accepted analysis at the SGS address given above. These confirmation samples were given sequential numbers, 1, 2, 3, 252, 301…etc. The analyses performed on these samples were primarily SW 8082 for PCB, SW 8260 B for occasional volatile analysis, and AK 102/103 for Diesel and Residual Range Organics.

For clarity and ease of following data, field laboratory samples are shown on even Figure numbers, and laboratory confirmation samples are shown of figures ending with A. For example, Figure 9 shows daily field lab samples from the Rock Pile and Contamination Reduction Zone excavations, and Figure 9A shows confirmation sample locations collected in the same area.

The general procedure for 611 CES/CEVO sampling is to attempt to take the worst possible (most highly contaminated) sample. This was accomplished in conjunction with contamination theory by taking very shallow (0 – ½ inch) samples. Where gross contamination is present, as at an area of mass soil saturation, surface samples are not collected, but can be collected at a depth of 6 inches, or at the bottom of the hole.

Field sampling notes are shown in Appendix IV, and the surveyed sample locations are shown in Appendix V.

8.0 EXCAVATION SITES AT AREA C

8.1 Excavation of the Main Road (Figures 4 – 7A)

Initial excavation was done on the lined and bermed road to the White Alice site, which had had PCBs tracked on to it from the Hot Spot. This excavated portion of the main road is shown as a northeast-southwest trending road segment outlined in red on Figure 3. To prevent further migration of PCB, in late 2003 the roadway was protected with a liner, upon which a thin layer of crushed stone was placed. The clean backfill which had previously been placed in the Fall of 2003 was scrapped off of the Hypalon liner. The liner was then hauled up and placed in a soil bag for disposal, along with the rest of the excavated PCB contaminated soil. The edges of the road as well as the top surface were then scraped down about 4 inches (see Contamination Theory, Section 6.0), and this material was then also bagged for shipment off site for disposal. The average width of the road excavation was about 10 feet.

In addition, a greater road length than originally anticipated to be dug was found because additional sampling (samples 26 and 27), located at the west end of the road excavation shown in Figure 4A revealed additional contaminated sections of road than found in 2003. This mandated additional excavation westward along the road surface for a distance of very nearly 150 feet. Two problem areas at the western end of the road excavation were discovered at this time. One small spot had to be dug out at least twice before PCB concentrations finally got below 1.0 ppm (see Figure 4, sample 80410). Redigging for this spot was finally completed on 4 Aug, with sample 136 at 0.0524 ppm PCB.

The second spot was discovered after the excavation crew and equipment moved out of this area when a field sample result showed a PCB containing POL spill in the middle of the Main Road This is shown on Figures 3 and 4A at an area called the Grease Spot. This was excavated to a depth of 2 feet, at which point a visible oil staining was still visible, but was shown to be free of PCB by samples 73009, 10,11. However, confirmation sample 128 showed excessive levels of PCB after the work crew moved to a different area, so that the Grease Spot remains to be excavated.

8.2 Beginning of Trail to Cabin (Figure 8)

Work at the initial portion of the Trail to Cabin began about 22 July, before beginning excavation at the cabin with its subsequent excavation northward toward the Hot Spot.

A small area near the junction with the main road had to be excavated twice (shown in black on Figure 8) to remove PCB contaminated peat that had been covered with clean fill. The final depth of this hole was about 2' deep, and was cleared with samples 293 and 294.

8.3 Rock Pile and Contamination Reduction Zone (CRZ) Digs (Figure 9)

In addition to the 150 extra linear feet dug along the main road, another unplanned area requiring excavation was encountered in mid July, as shown on Figure 8, 8A, and 9 and 9A.

At about the same time that the excavation at the Main Road was being completed, sampling was begun on the trail to the cabin to determine the edges of this trail to be excavated, beginning at the Main Road and going south. Within a day or two, it became evident that 611 CES/CEVO was in the process of discovering a new area of previously undiscovered contamination. This additional area of contamination eventually developed into three finger-like projections as shown on Sheet 6, two of which are shown on Figure 3 in blue. The easternmost finger has been described in the field notes as the CRZ (Contamination Reduction Zone) dig, and is shown in Figure 3 in black.

This area of soil containing more than 1.0 ppm PCB was apparently created when ATVs crossed the Hot Spot and turned nearly due north to travel to the White Alice Site, first going past an alder hedge and then turning north and east. The area of this former alder hedge lies in Figure 9, just east of the easternmost of the Rock Pile Digs.

Sampling and excavation in this area began about 14 July, and consumed three weeks of valuable summer work time. Over 100 field samples were collected from here and analyzed at the field laboratory in Unalakleet.

Upon discovery of this north and east trending contamination plume, samples were collected on a daily basis to delineate the plume. Samples were taken at intervals 10 feet apart, so that each day an additional 10 feet of plume was excavated. The 10 feet sample spacing essentially results in on sample per 100 square feet. In actuality, the total square footage was 4300 ft^2, and about 111 field chromatography samples taken, for a field sampling density of one field sample for every 39 ft^2.

In addition, two more small redigs are located in the west central portion of Figures 9 and 9A, where they are outlined in black. The westernmost redig was confirmed as clean with samples 140 and 142. However, the other, adjacent redig has not had a final confirmation sampled collected. This will be accomplished when the large area, located south and east of confirmation samples 138 and 142 and also along the road between here and the Hot Spot is finally excavated. This will be accomplished during ensuing excavation and final cleanup of the large area south and east of samples 138 and 140, as well as the unexcavated portion of the trail between here and the Hot Spot.

Portions of the easternmost finger (CRZ) had analyses that failed twice, resulting in an overall excavation of as much as three times. At the northern end of this excavation, field samples 80602 and 80603 failed the ADEC limit of 1.0 ppm PCB. Reexcavation here permitted samples 82010, 11, and 12 to be recollected. These samples passed the ADEC standard, permitting collection of confirmation samples 239 and 240, which also passed. The southernmost redig located at sample 241 will be reexcavated during future completion of the project. In addition, the small diamond shaped area from which samples 71906 and 73109 were taken needs to have a confirmation sample collected and analyzed.

8.4 Turnaround Area (Figure 12)

The Turn – Around area is shown in Figure 12, and consists of an enlarged apron along the western side of the Trail to the Cabin, 250 feet northwest of the cabin. The name was given because the location and shape of this apron suggests this area may have been used as a turn-around for ATVs or ATV trailers (it is the first brush free area north of the cabin). Confirmation samples were collected here (after scalping the top 4 inches of soil and tundra peat off of the top of the trail and the turnaround section) between the 23^{d} and 28^{th} of July. Again, samples were taken at 10 foot intervals. Samples collected at the Turnaround area were taken from only the topmost layer of peat, to reflect the manner of contamination and ensure the hottest samples were taken. Contamination removal here consisted of removing only the peat which overlaid the underlying clay, and no secondary excavation was required after the limits of contamination were reached.

Excavation commenced at the cabin and proceeded to the Turn Around in keeping with the goal of working from low PCB concentrations upward (at the Hot Spot), so as to minimize decontamination time as well as decon fluids.

8.5 South End of Road to Cabin and Cabin Area (Figure 13)

Other than the Hot Spot, the road to the cabin was the most heavily contaminated area, but PCB was solely entrained on the surface of the road.

Excavation along the Road to Cabin proceeded quickly; Contamination here consisted of wheel-tracked ruts in the soil, with the west rut soils having a heavier PCB coating (80 ppm, low being 1.7 ppm) than the East rut (52 ppm, with a low value of 0.3 ppm). Excavation here consisted of scalping soil top layers from underneath track ruts to a depth of 4" – 6" to clear the rut surfaces of PCB contamination. Width of excavation varied, from just under 10' wide along the roadway, but at the Turnaround Area the excavation was widened to about 35' wide (Sheets 12 and 12A). Field screening located a small spot which needed to be reexcavated (original excavated value was given as 2.8 ppm by field sample 72704, reexcavated to <0.11 ppm as field sample 72801) on Figure 13, and cleared by samples 125 and 126 on Figure 13A.

8.6 Finger Dig on West Side of Hot Spot (Figure 10)

In addition to ATV movement through the Three Finger Area, with trail contamination at that area, vehicle movement also occurred southwest of the Hot Spot, shown in red on Figure 3. This area was suspected as contaminated because of ATV tracks through thick tundra moss and sedges. Excavation commenced here in mid August, immediately prior to moving into the Hot Spot area. This area was cleared by confirmation samples 233-237 and 248 and 249.

8.7 Hot Spot (Figure 10)

The Hot Spot was the site of the original PCB spill that was responsible for contamination of Area C. It had been excavated in to a depth of about 1-½ feet and a circular width of nearly 20 feet. This excavation was accomplished in 2003, but not all of the contaminated material was removed at that time: PCB containing soil remained at the bottom of the hole and at the end of the 2003 work season immediately prior to crew departure the hole bottom was covered with a Hypalon liner and then backfilled with clean crushed rock.

Due to excessive consumption of shipping materials and proximity of end of work season, a decision was made in August 2004 to halt excavation on the unexcavated areas of the Road to the Cabin and to commence digging at the Hot Spot. This remaining unexcavated portion of the road lies just south of samples 140 and 142 (Figure 9A) and extends for some 70 feet toward the Hot Spot.

The liner was disposed and the clean crushed rock was taken out of the hole, about 45 yd^3 of which are currently lying on the unexcavated portion of the Road to the Cabin.

Excavation here proceeded with a slight widening of the original 2003 hole, but additional deepening occurred to a depth of 6 feet at the northeastern corner. In contrast, sampling indicated the opposite (southwest) corner was relatively clean at a depth of two feet. Nonetheless, most of the material removed from the Hot Spot contained high levels of PCB, and was shipped off site in open top drums, until these were consumed and the remaining excavated material was placed directly over the hot, unexcavated portion of the roadway. This northeastern corner of the Hot Spot is underlain by in-place weathered greywacke, so that further excavation here will be limited, since the bottom of the hole here is very close to bedrock. However, it may be possible to dig one - or two - feet deeper at this deep end, and this may indeed be deep enough for clearance, since analytical data shows that in at least on instance, removal of two feet of material from the bottom of the hole resulted in lowering of PCB concentrations from 14,646 ppm (Field Sample 82209) to 36.7 ppm (Lab Sample 283). Samples 275 and 272 on the northwestern corner and western side of the Hot Spot excavation are still nearly 6000 ppm, but the current excavated depth (four feet) should permit easy clearance by excavation of two or three feet more. These are the hottest points remaining in the Hot Spot. Ten out of 24 sample points at the bottom of this excavation are less than 100 ppm PCB, so that a minimum amount of redigging may be enough to complete the cleanup. In contrast, the southwestern corner of the Hot Spot did not need to be dug to so great a depth, and the floor was left at a depth of two feet. The alternate two diagonal corners were dug to intervening elevations.

In the southwestern corner of the 2004 Hot Spot excavation high concentrations of trichlorobenzene were located and identified by the unique odor. Samples 289 and 290 were collected at the southwestern corner and analyzed by EPA method 8260. Trichlorobenzene values were high at 1551 ppm. Because trichlorobenzene has a vapor pressure and is capable of evaporation (unlike PCB), it is apparent that this compound has been moving laterally through the soil under the influence of summertime thermal diffusion, so that the Hot Spot excavation may have to be extended laterally, hopefully only to a shallow depth.

Because of time and material constraints, the project was abandoned in mid September. The Hot Spot excavation was again relined with Hypalon, and some clean crushed rock was put into the hole to hold this liner down. There also remains about 50 yd^3 of excavated soil and rock sitting on the unexcavated portion of the Road to the Cabin that must also be drummed for shipping.

9.0 DECONTAMINATION PROCEDURES

Decontamination planning is used to prevent the spread of PCBs from contaminated zones. Personnel wear disposable clothing, boots, gloves, which is then treated as 'spill residue' and disposed of along with the excavated materials. Equipment is decontaminated by pressure washing in the bermed decontamination area.

An experiment was performed by running a shovel through heavily contaminated soil. One side was wiped with a diesel – soaked rag, and the other side was not. Both were given a hexane swipe which was sent to town for lab testing. The dirty shovel sample yielded a PCB value of 52 µgm/swipe (sample 180), showing heavy contamination. The cleaned (diesel wiped) side yielded nondetect (Sample 179) at a detection level of 1.0 µgm/swipe, indicating diesel wiping as an effective means of decontamination. Hence, no waters were required to be disposed, and final project swipe sampling indicated all equipment was clean.

Only the excavator bucket needed to be decontaminated. The tracks never entered any hot zones.

Sampling items such as spoons were decontaminated with hot soapy (Alconox) water, followed by a deionized water rinse.

10.0 Quality Assurance Data Review

Samples were collected according to the 611 CES/CEVO published sampling plan.

Clean spoons and gloves were used for each sample, which was then capped and chilled immediately to prevent sample alteration by bacterial growth or fugitive emissions. Labeling was done at the end of day, and gel packed coolers were sent to town by air freight on a frequent basis so that the laboratory would be able to complete extractions before the two week holding time expired.

Upon arrival at the laboratory, sample temperatures were checked using a temperature blank (water). Four ice packs were used per cooler, but some of the coolers arrived at a slightly elevated temperature, indicating that in the future six ice packs should be used. Fortunately, the elevated temperatures had minimal effect on the samples, since the primary target analyte (Arochlor 1260) is non volatile. However, at least one trip blank showed contamination with the Arochlor solvent trichlorobenzene.

Samples are immediately transferred to the laboratory Sample Custodian until time of extraction, who completes transferal of samples to an analyst for extraction. Approximately ten percent of samples were extracted as duplicates or matrix spikes.
During proximate analysis of the extract, the EPA instrument procedure mandates specific instrument parameters such as column type, column temperature ramp times, carrier gas flow, and many others. Computational systems of the gas chromatograph integrates the resultant analysis curve and computes analyte concentration. Data quality achievements are shown in Appendix III. Laboratory analytical results are shown in Figure I.

All other things being equal, the most important sample check is the surrogate recovery and the LCS. If the LCS recovery is within mandated ranges, this is a test of good extraction procedures as well as the calibration standards. Where necessary, failed North River samples were reextracted and reanalyzed.

It is important t know that the North River PCB samples were from a spill which is probably very nearly 20 years old. These samples thus went through that many years of leaching and thermal aging. This is stated as an indication of their insolubility and molecular stability. This greatly helps to mitigate possibilities of detrimental effects on samples. For example, for PCB analysis little or no damage to the unalalyzed sample would occur if the bottle cap was accidently left off and the sample became warm. This would not be the case for volaltile constituents, assuming that lab parameters fall into line. PCB analysis should be straight forward and the analysis should represent a direct line to the surveyed sample location.

11.0 CONCLUSION AND RECOMMENDATIONS

A great deal of effort was done to ensure completeness of the project; this is particularly indicated where isolated spots were dug three times. The field lab greatly enhanced project accomplishments – without the lab, 611 CES/CEVO would otherwise have to wait a minimum of two days before information could be received back in the field for determining where to excavate or indeed if further excavation was or was not needed. With the laboratory in the field, excavation information was available the following morning.

Much work remains to be accomplished in Areas A and B. Area A had a minimum of site preparation work done this year, consisting of brush cutting, putting up a fence and signage.. Area B is small, and was untouched. A small section of roadway just north of the Hot Spot needs to be excavated, as well as the bottom of the hole at the Hot Spot, with perhaps some shallow lateral excavation to excavate and remove soil into which trichlorobenzene has migrated. Also to be excavated is the 'grease spot', located 100 feet west of the road to the water house at Little North River.

Before leaving the site, Areas A and the Hot Spot at Area C were fenced in with a 6 foot high chain link fence. Cleaned, excavated areas were backfilled with clean gravel and brought to surface grade at Area C.

Additional work to be done in Area C consists of excavating a small portion of the Trail to the Cabin located immediately north of the Hot Spot.

Also, the area drawn to contain samples 138, 140, and 142 in Figure 9A must be reexcavated and resampled, as well as the so far untouched area going southward down the Trail to the Cabin, from the area of sample 200 to the Hot Spot.

Filling Soil Sacks at the Cabin

Sampling Points at Cabin

Collecting Soil Samples at the Contamination Reduction (Southernmost) Finger

The Original Hot Spot, 2003, on the Trail to the Cabin

Excavating the Main Road

Rockpile dig at the Middle Finger

Reredig at the Contamination Reduction Zone

Redig at Trail to Cabin

Excavated Trail, View Toward Cabin

Excavated Trail, View Toward Cabin

Trail Excavation and Drum Filling

Sampling Soil Excavation at the Turnaround Area, Trail to Cabin

Excavating at the Hot Spot

End of project, mid September, showing Hot Spot, fencing, and excavated materials.

North River 2004 samples

Sample #	Site	Location	Matrix	DRO mg/Kg	RRO mg/Kg	PCB (1260) mg/Kg
Standard				250	11000	1
1		White Ford PU - driver side floor	Wipe	NA	NA	
2		White Ford PU - passgr side floor	Wipe	NA	NA	
3		Flatbed PU - driver side floor	Wipe	NA	NA	
4		Flatbed PU - passgr side floor	Wipe	NA	NA	
5		Bobcat floor	Wipe	NA	NA	
6		Flatbed PU - driver side floor	Wipe	NA	NA	
7		Flatbed PU - passgr side floor	Wipe	NA	NA	
8		Excavator bucket	Wipe	NA	NA	
9	C	N. & So sides of road	Soil	NA	NA	<0.0508
10	C	N. & So sides of road	Soil	NA	NA	<0.0639
11	C	N. & So sides of road	Soil	NA	NA	1.1
12	C	N. & So sides of road	Soil	NA	NA	<0.0546
13	C	N. & So sides of road	Soil	NA	NA	0.397
14	C	N. & So sides of road	Soil	NA	NA	0.786
15	C	N. & So sides of road	Soil	NA	NA	6.81
16	C	N. & So sides of road	Soil	NA	NA	0.152
17	C	N. & So sides of road	Soil	NA	NA	9.71
18	C	N. & So sides of road	Soil	NA	NA	1.12
19	C	N. & So sides of road	Soil	NA	NA	0.0887
20	C	N. & So sides of road	Soil	NA	NA	<0.0536
21	C	N. & So sides of road	Soil	NA	NA	<0.0543
22	C	N. & So sides of road	Soil	NA	NA	4.93
23	C	N. & So sides of road	Soil	NA	NA	0.345
24	C	N. & So sides of road	Soil	NA	NA	0.0725
25	C	N. & So sides of road	Soil	NA	NA	0.436
26	C	N. & So sides of road	Soil	NA	NA	3.54
27	C	N. & So sides of road	Soil	NA	NA	18.6
28	C	E. side trail near intersect.	Soil	NA	NA	1.08
28b	C	NE end of road	Soil	NA	NA	<0.0528
29	C	NE end of road	Soil	NA	NA	0.0890
30	C	NE end of road	Soil	NA	NA	<0.0538
31	C	NE end of road	Soil	NA	NA	0.0991
32	C	SW end of road	Soil	NA	NA	<0.0511
33	C	SW end of road	Soil	NA	NA	<0.0503
34	C	SW end of road	Soil	NA	NA	0.0739
35	C	SW end of road	Soil	NA	NA	0.0698
36	C	SW end of road	Soil	NA	NA	0.0978
37	C	SW end of road	Soil	NA	NA	0.366
38	C	SW end of road	Soil	NA	NA	
39	C	SW end of road	Soil	NA	NA	0.327
40	C	SW end of road	Soil	NA	NA	<0.0520
41	C	SW end of road	Soil	NA	NA	<0.0535
42	C	SW end of road mid intersection	Soil	NA	NA	<0.0508
43	C	SW end of road	Soil	NA	NA	0.673
44	C	SW end of road	Soil	NA	NA	0.855
45	C	SW end of road	Soil	NA	NA	0.212
46	C	SW end of road	Soil	NA	NA	<0.0559
47	C	NE small road dig	Soil	NA	NA	0.123
48	C	SW end of road dig	Soil	NA	NA	0.178
49	C	SW end of road dig	Soil	NA	NA	<0.0534
50	C	SW end of road dig	Soil	NA	NA	<0.0533
51	C	SW end of road dig	Soil	NA	NA	<0.0531
52	C	Tarry spot	Soil	NA	NA	0.0912

North River 2004 samples

Sample #	Site	Location	Matrix	DRO mg/Kg	RRO mg/Kg	PCB (1260) mg/Kg
Standard				250	11000	1
53	C	SW separate dig	Soil	NA	NA	0.503
54	C	SW separate dig	Soil	NA	NA	1.85
55	C	SW separate dig	Soil	NA	NA	0.239
56	C	SW separate dig	Soil	NA	NA	0.237
57	C	N. side road near trail	Soil	NA	NA	0.0623
58	C	N. side road near trail	Soil	NA	NA	0.112
59	C	N. side road near trail	Soil	NA	NA	0.0899
60	C	N. side road near trail	Soil	NA	NA	0.0528
61	C	N. side road near trail	Soil	NA	NA	0.259
62	C	W. side trail	Soil	NA	NA	0.327
63	C	W. side trail	Soil	NA	NA	0.182
64	C	W. side trail	Soil	NA	NA	0.841
65	C	W. side trail	Soil	NA	NA	0.524
66	C	W. side trail	Soil	NA	NA	0.123
67	C	W. side trail	Soil	NA	NA	0.177
68	C	W. side trail	Soil	NA	NA	0.0551
69	C	W. side trail	Soil	NA	NA	0.0757
70	C	W. side trail	Soil	NA	NA	0.0729
71	C	W. side trail	Soil	NA	NA	0.186
72	C	W. side trail	Soil	NA	NA	0.117
73	C	W. side trail	Soil	NA	NA	0.0563
74	C	W. side trail	Soil	NA	NA	0.0631
75	C	W. side trail	Soil	NA	NA	0.136
76	C	W. side trail	Soil	NA	NA	0.527
77	C	E. side trail	Soil	NA	NA	0.0579
78	C	E. side trail	Soil	NA	NA	0.0715
79	C	E. side trail	Soil	NA	NA	0.143
80	C	E. side trail	Soil	NA	NA	0.0923
81	C	E. side trail	Soil	NA	NA	0.0836
82	C	E. side trail	Soil	NA	NA	0.0571
83	C	E. side trail	Soil	NA	NA	0.0689
84	C	E. side trail	Soil	NA	NA	0.0622
85	C	E. side trail	Soil	NA	NA	0.0668
86	C	E. side trail	Soil	NA	NA	0.308
87	C	Mouth of trail	Soil	NA	NA	0.456
88	C	Mouth of trail	Soil	NA	NA	0.191
89	C	Mouth of trail	Soil	NA	NA	0.17
90	C	Mouth of trail	Soil	NA	NA	2
91	C	Mouth of trail	Soil	NA	NA	<0.0154
92	C	Mouth of trail	Soil	NA	NA	0.268
93	C	Mouth of trail	Soil	NA	NA	0.121
94	C	Trail at cabin	Soil	NA	NA	<0.0192
95	C	Trail at cabin	Soil	NA	NA	<0.0177
96	C	Trail at cabin	Soil	NA	NA	0.0672
97	C	Trail at cabin	Soil	NA	NA	<0.0171
98	C	Trail at cabin	Soil	NA	NA	0.0666
99	C	Trail at cabin	Soil	NA	NA	<0.0176
100	C	Trail at cabin	Soil	NA	NA	<0.0177
101	C	Trail at cabin	Soil	NA	NA	<0.018
102	C	Trail at cabin	Soil	NA	NA	0.148
103	C	Trail at cabin	Soil	NA	NA	<0.0176
104	C	Trail at cabin	Soil	NA	NA	<0.0185
105	C	Trail at cabin	Soil	NA	NA	<0.0182

North River 2004 samples

Sample #	Site	Location	Matrix	DRO mg/Kg	RRO mg/Kg	PCB (1260) mg/Kg
Standard				250	11000	1
106	C	Trail at cabin	Soil	NA	NA	<0.0184
107	C	Trail at cabin	Soil	NA	NA	0.0892
108	C	Trail at cabin	Soil	NA	NA	<0.0172
109	C	Turnaround	Soil	NA	NA	<0.0228
110	C	Turnaround	Soil	NA	NA	<0.0211
111	C	Turnaround	Soil	NA	NA	<0.0197
112	C	Turnaround	Soil	NA	NA	<0.0196
113	C	Turnaround	Soil	NA	NA	0.342
114	C	Turnaround	Soil	NA	NA	<0.0197
115	C	Turnaround	Soil	NA	NA	0.336
116	C	Turnaround	Soil	NA	NA	<0.0174
117	C	Turnaround	Soil	NA	NA	0.847
118	C	Turnaround	Soil	NA	NA	0.119
119	C	Turnaround	Soil	NA	NA	<0.0215
120	C	Turnaround	Soil	NA	NA	<0.02
121	C	Turnaround	Soil	NA	NA	0.0917
122	C	Turnaround	Soil	NA	NA	0.453
123	C	Turnaround	Soil	NA	NA	0.099
124	C	Turnaround	Soil	NA	NA	<0.0201
125	C	Cabin	Soil	NA	NA	<0.0164
126	C	Cabin	Soil	NA	NA	0.138
127	C	Rock pile	Soil	NA	NA	0.219
128	C	Rock pile	Soil	NA	NA	1.33
129	C	Rock pile	Soil	NA	NA	0.166
130	C	Rock pile	Soil	NA	NA	0.116
131	C	Rock pile	Soil	NA	NA	0.532
132	C	Rock pile	Soil	NA	NA	0.101
133	C	Rock pile	Soil	NA	NA	0.399
134	C	Rock pile	Soil	NA	NA	0.281
135	C	Rock pile	Soil	NA	NA	0.0454
136	C	SW separate dig, redig	Soil	NA	NA	0.0524
137	C	Rock pile	Soil	NA	NA	0.0546
138	C	Rock pile	Soil	NA	NA	0.788
139	C	Rock pile	Soil	NA	NA	0.616
140	C	Rock pile	Soil	NA	NA	0.683
141	C	Rock pile	Soil	NA	NA	0.474
142	C	Rock pile	Soil	NA	NA	3.58
142R1	C	Rock pile	Soil	NA	NA	
143	C	55" NE of trail-road intersection	alder leaves	NA	NA	
144	C	Rock pile	Soil	NA	NA	0.572
145	C	Rock pile	Soil	NA	NA	0.0396
146	C	Rock pile	Soil	NA	NA	0.102
147	C	Rock pile	Soil	NA	NA	0.251
148	C	Rock pile	Soil	NA	NA	0.0552
149	C	Rock pile	Soil	NA	NA	0.0734
150	C	W. of trail, S. of road	willow leaves	NA	NA	
151	C	W. of trail near hot spot	willow leaves	NA	NA	
152	C	25' SW of cabin	blueberries	NA	NA	
153	C	Along trail (W. side?)	leaves	NA	NA	
154	C	Along trail (W. side?)	leaves	NA	NA	
155	C	15' SW of cabin	leaves	NA	NA	
156	C	Along trail	alder leaves	NA	NA	
157	C	Along trail (W. side?)	Bolletus mush.	NA	NA	

North River 2004 samples

Sample #	Site	Location	Matrix	DRO mg/Kg	RRO mg/Kg	PCB (1260) mg/Kg
Standard				250	11000	1
158	C	Along trail (W. side?)	Dwarf Birch parts	NA	NA	
159	C	Along trail (W. side?)	Forbs	NA	NA	
160	C	Rock pile	Soil	NA	NA	0.0563
161	C	Rock pile	Soil	NA	NA	0.0572
162	C	Rock pile	Soil	NA	NA	0.0819
163	C	Rock pile	Soil	NA	NA	0.0936
164	C	Rock pile	Soil	NA	NA	0.246
165	C	Rock pile	Soil	NA	NA	0.0544
166	C	Rock pile	Soil	NA	NA	0.109
167	C	Rock pile	Soil	NA	NA	0.0891
168	C	Contam reduct zone	Soil	NA	NA	0.105
169	C	Contam reduct zone	Soil	NA	NA	0.804
170	C	Contam reduct zone	Soil	NA	NA	0.28
171	C	Contam reduct zone	Soil	NA	NA	0.362
172	C	Contam reduct zone	Soil	NA	NA	0.172
173	C	Contam reduct zone	Soil	NA	NA	0.0547
174	C	Contam reduct zone	Soil	NA	NA	0.234
175	C	Contam reduct zone	Soil	NA	NA	0.0784
176	C	Contam reduct zone	Soil	NA	NA	0.0564
177	C	Contam reduct zone	Soil	NA	NA	0.0569
178	C	Contam reduct zone	Soil	NA	NA	0.415
179		Shovel	Wipe	NA	NA	1
180		Shovel	Wipe	NA	NA	52
181		3 spoons after wash	Wipe	NA	NA	
182	C	same tree as 153	root	NA	NA	
183	C	Trail	Soil	NA	NA	
184	C	Trail	Soil	NA	NA	
185	C	Trail	Soil	NA	NA	
186	C	Trail	Soil	NA	NA	
187	C	Trail	Soil	NA	NA	
188	C	Trail	Soil	NA	NA	
189	C	Trail	Soil	NA	NA	
190	C	Trail	Soil	NA	NA	
191	C	Trail	Soil	NA	NA	
192	C	Trail	Soil	NA	NA	
193	C	Trail	Soil	NA	NA	
194	C	Trail	Soil	NA	NA	
195	C	Trail	Soil	NA	NA	
196	C	Trail	Soil	NA	NA	
197	C	Trail	Soil	NA	NA	
198	C	?	Alder leaves, twigs, cones	NA	NA	
199	C	?	Blueberry leaves	NA	NA	
200	C					
201	C					
202	C					
203	C					
204	C					
205	C					
206	C					
207	C					
208	C					
209	C					

North River 2004 samples

Sample #	Site	Location	Matrix	DRO mg/Kg	RRO mg/Kg	PCB (1260) mg/Kg
Standard				250	11000	1
210	C					
211	C					
212	C					
213	C					
214	C					
215	C	E. of hot spot	Alder leaves			
216	C					
217	C					
218	C					
219	C					
220						
221						
222						
223						
224						
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DEPARTMENT OF THE AIR FORCE
611th CIVIL ENGINEER SQUADRON
ELMENDORF AFB ALASKA 99506

NORTH RIVER RRS, ALASKA

2004

GENERAL SITE LAYOUT

PROJECT DATE:	SCALE:	DRAWING DATE:
2004	No Scale	DEC 04
DRAWN BY: JCB	FIELD DATE: JUN–AUG 04	FIGURE No.: 3

FIGURE 3