EXCERPT FROM NRCC BH1 REPORT MARCH 2007.

4 CFS-EUREKA AND SITE LOCATION

Eureka was first established in 1947 as a High Artic Weather Station (HAWS) for the Atmospheric Environment Service (AES). In 1982, DND installed facilities 10 km west of the original weather station as part of the system to improve communication between CFS-Alert and the south. The closest Canadian Inuit community to Eureka is Grise Fjord, almost 450 km away on the southeastern tip of Ellesmere Island. During the summer, CFS-Eureka experiences daily average temperatures in June, July and August of 2.3°C, 5.7°C and 2.6°C, respectively (Environment Canada). The average annual precipitation at CFS-Alert is 75.5 mm.

The main DND facilities at Eureka are "The Fort", an old sewage outfall, fuel bladders, aircraft refueling facilities and a landfill. Construction of a larger accommodations building, a garage and a new grey water outfall were completed in 1999. Some facilities are operated jointly by DND and AES.

The topography in the region is rolling and ridged, with altitudes not exceeding 1,000 m above sea level. The area is underlain by sandstone and shale with large trenches cut out by seasonal drainage paths that curve through the area. Eureka is located within a zone of continuous permafrost, with the active layer extending to a depth of approximately 80 cm. The soils in the general area of Eureka are composed of mostly sand/gravel fill underlain by silty sandy clays.

The main natural source of freshwater at the site is Station Creek which provides the only source of domestic water. Station Creek begins to flow in early June and drains south into Slidre Fjord.

4.1 CFS-Eureka Sites

Figure 47. Aerial view of the AES weather station Eureka (BRI, 2006).

Figure 48. Aerial view of CFS-Eureka (BRI 2006).

4.1.1 S-150 Battery Dump

4.1.1.1 Location and Site Description

The battery dump covers an area of approximately 34 m x 20 m and is located at the east end of the north side of the airstrip. The site has been completely backfilled and there is no visual evidence of the battery dump besides a sign reading "Department of National Defense Battery Disposal Area" (Photograph 60, Appendix A). The batteries from the High Arctic Data Communications System relay towers between CFS-Eureka and CFS-Alert, in addition to those from vehicles and other equipment used on site, are disposed of in this location. The batteries at the relay station are changed annually.

The site is mainly flat and the soils contain clays. Some accumulation of water is possible in lower relief areas, such as toward the south of the site.

4.1.1.2 Potential Receptors and Valued Ecological Components

Some vegetation has been noted in the surrounding area but remains sparse. No wildlife had been recorded in the area and there are no significant drainage channels passing through the site. No human activities are present.

4.1.1.3 Summary of Previous Investigations

Four (4) depth soil samples were collected in 1998. Two (2) of these were analyzed for metals, but none surpassed the applicable criteria. However, both samples showed levels of zinc that were higher than average background levels.

4.1.1.4 Nature and Extent of Contamination

One (1) depth soil sample was collected from the center of the battery dump, northeast of the signpost, in the summer of 2006. The sample was tested for metals and concentrations remained comparable to average background levels (Table LXXXI).

4.1.1.5 Recommendations

Further assessment should be performed on this site, which would include collecting another 2 soil samples adjacent to the bermed area. These should be analyzed for metals in order to identify if any contaminants have migrated from the batteries buried below the backfilled area.

Table LXXXI. (S-150) Battery Dump results.

	PARAMETERS	SOIL			Battery Dump (S-150) SOIL
		UNITS SOIL	INDUSTRIAL GUIDELINES (Coarse)	DETECTION LIMIT SOIL	06BD0111 50 cm 06/30/06
METALS	Arsenic (As)	mg/kg	12	0.27	2.1
	Barium (Ba)	mg/kg	2,000	5	25
	Cadmium (Cd)	mg/kg	22	0.22	<1
	Chromium (Cr)	mg/kg	87	3	6
	Cobalt (Co)	mg/kg	300	1.9	3
	Copper (Cu)	mg/kg	91	2.1	5
	Lead (Pb)	mg/kg	600	1.2	<10
	Manganese (Mn)	mg/kg	---	1.1	126
	Molybdenum (Mo)	mg/kg	40	1.4	<2
	Nickel (Ni)	mg/kg	50	0.6	6
	Selenium (Se)	mg/kg	3.9	0.5	0.5
	Silver (Ag)	mg/kg	40	0.4	<2
	Tin (Sn)	mg/kg	300	0.8	<5
	Zinc (Zn)	mg/kg	360	2.5	16

ND Not detected
NA Not available
Higher than the criteria

Figure 49. (S-150) Eureka Battery Dump map.

4.1.2 S-10185 HADCS (High Arctic Data Communications System) Vehicle Maintenance Garage

4.1.2.1 Location and Site Description

The HADCS Vehicle Maintenance Garage (Photograph 61, appendix A) is located within the complex that makes up the AES Weather Station, between the incinerator building and the POL tank farm (Figure 50). DND vehicles are repaired and maintained here. There is 1 diesel fuel day tank on the west side of the building, which is connected by a pipe to the interior. In 1998, the observation was made that there existed the regular occurrence of small spills in and around the garage due to the lack of use of drip pans. As a result, many small stains were in observed around the site, particularly to the north. During the investigation, debris and old barrels were found to be temporarily stored around the building. The land slopes gently to the southeast and towards the bay. The soil in the area is comprised mostly of sand and silt with big stones.

4.1.2.2 Potential Receptors and Valued Ecological Components

The presence of vegetation and wildlife have not been noted in this area. There were no active drainage channels passing directly through the site during the most recent field visit. Human activities are present on site, but the majority of the time are confined to the building interior.

4.1.2.3 Summary of Previous Investigations

Twelve (12) soil samples were collected around the circumference of the building in 1998, these being concentrated on visibly stained areas. The main contaminant of concern was TPH (Table LXXXII). Four (4) of the 12 samples contained TPH exceeding the 2,500 mg/kg criterion. The mean concentration was 35,000 mg/kg, ranging from below detection limits to 65,000 mg/kg. Of these, 2 were characterized as lubricating oil and 1 (98-11609) was found to be 100% fuel oil, which was collected from under 1 of the diesel fuel day tanks. The samples tested for metals and PAHs all contained

concentrations below the applicable criteria and no PCBs were detected. In 1998, ESG noted several black and dark brown stains on the soil around the building, particularly at the north end of the building.

The HADCS garage was fully delineated in 1999, which involved the collection of 159 soil samples, including 10 depth samples and 15 duplicate pairs. These were collected on a 3 m x 3 m grid that covered approximately 1,000 m^2. Of the samples collected, 137 were tested for TPH and 7 were found to exceed the criterion (Table LXXXII). TPH was not detected in 120 (88%) of the samples. The maximum concentration was 22,000 mg/kg, from surface soil sample 99-07148. Glycol was not found in any of the 3 samples for which it was tested. The estimated area of TPH contamination exceeding the 2,500 mg/kg criterion is roughly 47 m^2, with an estimated volume of 14 m^3.

Table LXXXII. (S-10185) Previous contaminated soil samples.

Samples	Depth (cm)	Contaminant	Criterion (mg/kg)	Concentration (mg/kg)
98-11605	0	TPH	2,500	23,000
98-11606	0	TPH	2,500	65,000
98-11607	0	TPH	2,500	49,000
98-11609	0	TPH	2,500	4,900
99-07058	0	TPH	2,500	2,500
99-07072	0	TPH	2,500	6,200
99-07079	0	TPH	2,500	5,100
99-07118	0	TPH	2,500	4,600
99-07119	0	TPH	2,500	16,000
99-07148	0	TPH	2,500	22,000

4.1.2.4 Nature and Extent of Contamination

Three (3) soil samples were collected from between 30-50 cm below surface in 3 different test pits during the summer of 2006, and analyzed for TPH (Table LXXXIII).

None of the samples exceeded the criterion and concentrations were low. Small amounts of fraction 2 and 3 hydrocarbons were found in samples 06HD0125 and 06HD0126. These were collected from the southwest and northwest corners of the garage, respectively.

4.1.2.5 Recommendations

BRI did not discover any contamination in the collected depth samples from 2006. In fact, the contamination is probably located only on the surface of the soil and probably limited to stained areas. During the next field visit, a total of approximately 5 additional surface soil samples should be collected to verify if any contamination remains. The soil could eventually be excavated permitting closure of the site.

Table LXXXIII. (S-10185) HADCS Vehicle Maintenance Garage results.

					HADCS Vehicule Maintenance Garage (S-10185)		
		SOIL			SOIL		
	PARAMETERS	UNITS	INDUSTRIAL GUIDELINES (Coarse)	DETECTION LIMIT	06HD0125 30-50 cm 06/30/06	06HD0126 30-50 cm 06/30/06	06HD0127 30-50 cm 06/30/06
PETROLEUM HYDROCARBONS	Benzene	mg/kg	0.030	0.02	ND	ND	ND
	Toluene	mg/kg	0.37	0.02	ND	ND	ND
	Ethylbenzene	mg/kg	0.082	0.02	ND	ND	ND
	o-Xylene	mg/kg	---	0.02	ND	ND	ND
	p+m-Xylene	mg/kg	---	0.04	ND	ND	ND
	Total Xylene	mg/kg	11	0.04	ND	ND	ND
	F1 (C6-C10 Hydrocarbons)	mg/kg	310	10	ND	ND	ND
	F1 (C6-C10) -BTEX	mg/kg	310	10	ND	ND	ND
	F2 (C10-C16 Hydrocarbons)	mg/kg	760	10	170	24	ND
	F3 (C16-C34 Hydrocarbons)	mg/kg	1,700	10	21	320	ND
	F4(C34-C50 Hydrocarbons)	mg/kg	3,300	10	ND	ND	ND

ND Not detected
NA Not available
Higher than the criteria

Figure 50. (S-10185) Eureka HADCS Vehicle Maintenance Garage map.

4.1.3 S-10186 East Airstrip Landfill

4.1.3.1 Location and Site Description

The East Airstrip Landfill is located on the south side of the eastern part of the airstrip (Figure 51). It covers approximately 7,500 m² in a ravine, where drainage from the landfill runs into Slidre Fjord, approximately 1 km to the south (Photograph 62, Appendix A). The landfill has been in operation since the inception of the AES Weather Station and contains both hazardous and non-hazardous materials (Photograph 63, Appendix A). Some of the contents, including partly filled barrels, have become exposed due to erosion. The site is still active, with both CFS-Eureka and the AES Weather Station using the site for dumping and burning waste materials. Additionally, a cut-open container that the ESG refers to as the "incineration bin", was still present on the site.
The substrate here contains mainly silt and clay with small stones in some areas. Topographically, the site slopes abruptly to the southeast, and levels out as it approaches the fjord.

4.1.3.2 Potential Receptors and Valued Ecological Components

"The area around the landfill is partially vegetated with approximately 40% cover in most areas. The vegetation is composed primarily of grasses including foxtail grass (*Alopecurus alpinus*) and bluegrass (*Poa alpigena*), and some willows (*Salix arctica*)." (ESG 1998). Wildlife that has been noted in the area include muskoxen and wolves that rummage on partially burnt kitchen wastes, in addition to other scavengers such as seagulls and ravens. Arctic hares are frequently seen in the surrounding area. Drainage channels from this site are most active during spring freshet, leading directly into Slidre Fjord (Photograph 64, Appendix A). Human activity is not common in this area.

4.1.3.3 Summary of Previous Investigations

This landfill was partially remediated in 1995, in which a mixture of sand and soil was

placed on top of the landfill. However, erosion of the granular material negated the positive impacts of the remediation efforts. ESG had proposed the closure of the site because of the probem of instability and high erosion.

The assessment performed in 1998 included the collection of 30 soil samples and 3 plant samples. The soils were collected where stains or ash were observed on-site or directly in the drainage pathway. PCBs, PAHs, TPH and pesticides were analyzed for in several soil samples (Table LXXXIV). The main contaminants found were TPH, copper, zinc and chromium. Of the 4 soil samples analyzed for TPH, 98-11542 and 98-11545 contained 64,000 mg/kg and 80,000 mg/kg of TPH, respectively, consisting of lubricating oil. Of the 11 soil samples evaluated for inorganic elements, none exceeded the Tier II criteria but 1 sample (98-11552) had a high concentration of zinc (470 mg/kg). No PCBs, PAHs or pesticides approached the applicable guidelines.

Three (3) assessment soil samples were collected in 1999 from along the active drainage channel in order to determine the extent of contamination migrating down the channel and into the fjord. The samples were tested for metals and PCBs and 1 was tested for TPH. Despite continuous erosion exposing vehicles and barrels, all of the samples showed concentrations comparable to the average background levels.

Table LXXXIV. (S-10186) Previous contaminated soil samples.

Samples	Depth (cm)	Contaminant	Criterion (mg/kg)	Concentration (mg/kg)
98-11542	0	TPH	2,500	64,000
98-11545	0	TPH	2,500	80,000

4.1.3.4 Nature and Extent of Contamination

Two (2) soil samples were collected in the summer of 2006 at the bottom of the drainage channel and were analyzed for metals and TPH (Table LXXXV). All of the metals analyzed for were found in small amounts in both samples, and none approached the

applicable criteria. Most hydrocarbons were not detected in either sample, with the exception of fraction 3, at concentrations below the guideline criteria.

4.1.3.5 Recommendations

The contamination in this site is confined to 2 small areas around the incinerator bin and in the dump, where a black stain was found (99-11545). As a result, because the East Airstrip Landfill is still active, no more characterization work is necessary until the closure of the dump. After that, delineation should be performed, followed by either in situ treatment or excavation.

For the next field visit, 3 soil samples and 2 surface water samples should be collected at the bottom of the slope, directly in the drainage channel to evaluate if the contaminants are migrating into Slidre Fjord. The samples should be evaluated for inorganic elements and petroleum hydrocarbons.

Table LXXXV. (S-10186) East Airstrip Landfill results.

	PARAMETERS	SOIL			East Airstrip Landfill (S-10186)	
		UNITS	INDUSTRIAL GUIDELINES (Coarse)	DETECTION LIMIT	SOIL	
					06EL0108 0-10 cm 06/29/06	06EL0109 0-10 cm 06/29/06
METALS	Arsenic (As)	mg/kg	12	0.27	9.7	8.9
	Barium (Ba)	mg/kg	2,000	5	63	45
	Cadmium (Cd)	mg/kg	22	0.22	<1	<1
	Chromium (Cr)	mg/kg	87	3	20	18
	Cobalt (Co)	mg/kg	300	1.9	12	10
	Copper (Cu)	mg/kg	91	2.1	24	20
	Lead (Pb)	mg/kg	600	1.2	11	<10
	Manganese (Mn)	mg/kg	---	1.1	279	248
	Molybdenum (Mo)	mg/kg	40	1.4	<2	<2
	Nickel (Ni)	mg/kg	50	0.6	24	21
	Selenium (Se)	mg/kg	3.9	0.5	0.9	0.6
	Silver (Ag)	mg/kg	40	0.4	<2	<2
	Tin (Sn)	mg/kg	300	0.8	<5	<5
	Zinc (Zn)	mg/kg	360	2.5	73	61
PETROLEUM HYDROCARBONS	Benzene	mg/kg	0.03	0.02	ND	ND
	Toluene	mg/kg	0.37	0.02	ND	ND
	Ethylbenzene	mg/kg	0.08	0.02	ND	ND
	o-Xylene	mg/kg	---	0.02	ND	ND
	p+m-Xylene	mg/kg	---	0.04	ND	ND
	Total Xylene	mg/kg	11	0.04	ND	ND
	F1 (C6-C10 Hydrocarbons)	mg/kg	310	10	ND	ND
	F1 (C6-C10) -BTEX	mg/kg	310	10	ND	ND
	F2 (C10-C16 Hydrocarbons)	mg/kg	760	10	ND	ND
	F3 (C16-C34 Hydrocarbons)	mg/kg	1,700	10	73	85
	F4(C34-C50 Hydrocarbons)	mg/kg	3,300	10	ND	ND

ND Not detected
NA Not available
Higher than the criteria

Figure 51. (S-10186) Eureka East Airstrip Landfill map.

4.1.4 S-10187 Sewage Lagoon

4.1.4.1 Location and Site Description

Used by both the AES and DND camps, the Sewage Lagoon is located on the far east end of the AES Weather Station and southeast of the Hydrogen Balloon Release building (Figure 52), on the shores of Slidre Fjord (Photograph 65, Appendix A). The lagoon is approximately 75 m x 14 m and is separated from the fjord by a 3 m wide berm. Grey and black water from the AES Operations building is pumped into the lagoon via an aboveground pipe. Sewage pumped from storage tanks is trucked to the lagoon every day. The lagoon is drained once a year when it reaches capacity, usually in July. Draining is performed by breaching a section of the retaining berm and letting the sewage flow into the fjord. No sampling of the sewage water is performed before it is released into the fjord. A previous environmental audit[5] of the site noted that since the ice-free period of the lagoon is relatively short, the material pumped into the lagoon doesn't have a long enough residency time to allow for sufficient microbial degradation of the organic contents and sedimentation of any suspended solids. Notably, 1999 levels were much lower than 1998 levels, which is a direct result of the installation of a bioreactor at the DND camp.

The land slopes toward the south and the fjord.

4.1.4.2 Potential Receptors and Valued Ecological Components

Vegetation grows in abundance on the north side of the lagoon, most likely the result of high nitrogen levels. Evidence of wolves was noted and hares were seen in the area as well. Additionally, the Sewage Lagoon is located just 2 m away from the bay.

[5] Performed by Public Work and Government Services Canada (PWGSC)

4.1.4.3 Summary of Previous Investigations

Six (6) soil samples, including 1 field duplicate were collected in 1998 and analyzed for metals, PCBs and TPH (Table LXXXVI). The liquid contents of the lagoon were also tested, in addition to 1 plant sample. The water sample was tested for metals, PCBs, total suspended solids (TSS) and biological and chemical oxygen demand (BOD and COD, respectively). The plant sample was tested for metals. Copper was the main contaminant of concern, as it was elevated in 3 of the samples. Its concentration reached as high as 720 mg/kg, collected from bottom of the lagoon where the outflow pipe ends (98-11616). This exceeded the Tier II criterion by 7 times. A sample collected from the northern edge also surpassed the Tier II criterion for copper with a concentration of 180 mg/kg. The plant sample had 100 mg/kg copper, which is 12 times the site specific Impact Criterion. The water sample did not exceed the relevant effluent discharge copper criteria at 27 µg/L. Two (2) sediment samples were tested for petroleum hydrocarbons and sample 98-11616 was found to contain 3,000 mg/kg of TPH, which consisted of 83% lubricating oil. No PCBs were detected above the detection limit and no other contaminants exceeded the applicable criteria in the water sample.

One (1) sample of the liquid contents of the lagoon was collected in 1999 and analyzed for metals, glycol, total phosphorus, nitrate, nitrite, pH and TSS. Concentrations were compared to the Environment Canada Effluent Discharge Criteria (EC 1976). The only analyte to exceed the criteria (52 mg/L) was TSS with a concentration of 76 mg/L.

Table LXXXVI. (S-10187) Previous contaminated soil samples.

Samples	Depth (cm)	Contaminant	Criterion (mg/kg)	Concentration (mg/kg)
98-11616	0	TPH	2,500	>3,000
	0	COPPER (CU)	100	720
98-11617	0	COPPER (CU)	100	180

4.1.4.4 Nature and Extent of Contamination

A total of 7 samples were collected in the summer of 2006. This included 4 sediment samples (including 1 duplicate), 1 soil sample and 2 freshwater samples. The presence of

elevated concentrations of several metals were the only contaminants of concern. The sediment samples were analyzed for metals, PCBs and TPH (Table LXXXVII). PCBs, although present, remained very low and most hydrocarbons were not detected. Fraction 3 and 4 hydrocarbons were found at 2,000 mg/kg each, in sample 06SW0137. Three (3) of the 4 samples exceeded the criteria for arsenic, with the highest concentration being 24 mg/kg in sample 06SW0139, collected from the southwestern edge of the lagoon. All of the sediment samples exceeded the criterion for copper, reaching as high as 303 mg/kg, located at the southern edge of the lagoon. Two (2) sediment samples collected from the south side of the lagoon exceeded the criterion for zinc with concentrations of 126 and 237 mg/kg. The sediment samples were found to contain less than 1 mg/kg cadmium, although this is less specific than the 0.6 mg/kg guideline.

The only soil sample, collected southwest of the lagoon beside the lagoon drainage gap, showed no contaminants exceeding the criteria for metals and PCBs and no TPH was detected.

The 2 water samples were tested for metals and several exceeded the criteria, with all of the highest concentrations being found in sample 06SW0142, collected on the east side of the lagoon. These contaminants included arsenic (41 µg/L), cadmium (2 µg/L), copper (381 µg/L), lead (182 µg/L), nickel (418 µg/L), selenium (1 µg/L) and zinc (1,060 µg/L). This sample also exceeded the Environment Canada Discharge Criteria for chromium and cobalt with concentrations of 68 µg/L and 185 µg/L, respectively (criteria limits of 10 µg/L and 50 µg/L, respectively).

Nitrites, nitrates and orthophosphates were detected when they were analyzed for, but no criteria exist for these parameters.

4.1.4.5 Recommendations

A delineation should be performed at this site during the next field visit. This would include the collection and analysis of approximately 15 more soil/sediment samples and 2 more water samples. The soil should be analyzed for metals and TPH. Metals, nitrites,

nitrates and phosphorus should also be evaluated in 2 surface freshwater samples collected in the lagoon including 1 where sample 06SW0142 was collected.

Ideally, the team should be there during the evacuation of the water to the fjord. In this way, they could sample the bottom of the lagoon with the collection of approximately 4-5 sediment samples. They could also collect soil in the channel created by the evacuation of the water to evaluate if the drainage pathway is contaminated. If this is not possible, the team will have to collect information about the gap to better understand the consequences of draining contaminated water into the fjord. Addition sediment samples (approximately 5-6) should be collected on the shoreline between the lagoon and the fjord (Figure 52).

BRI also recommends the installation of a permanent sewage treatment facility at Eureka to properly treat sewage before it is released into the environment. This would result in the protection of this fragile environment from the introduction of potentially detrimental bacterial contaminants such as coliforms and fecal coliforms.

	SOIL		FRESHWATER SEDIMENT				Sewage Lagoon (S-10187)						
							FRESHWATER SEDIMENT				SOIL	FRESHWATER	
ITS	INDUSTRIAL GUIDELINES (Coarse)	DETECTION LIMIT	UNITS	GUIDELINES AQUATIC LIFE (1) ISQG	(2) PEL	DETECTION LIMIT	06SW0136 Surf. Sed. 07/01/06	06SW0137 Surf. Sed. 07/01/06	06SW0138 Dup. of 0137 Surf. Sed. 07/01/06	06SW0139 Surf. Sed. 07/01/06	06SW0140 0-10 cm 07/01/06	06SW0141 Surf. Water 07/01/06	06SW0142 Surf. Water 07/01/06
g/kg	12	0.27	mg/kg	5.9	17	0.27	20.3	5.7	13.8	24	4.3	1	41
g/kg	2,000	5	mg/kg	---	---	5	39	59	23	31	18	20	1,520
g/kg	22	0.22	mg/kg	0.6	3.5	0.22	<1	<1	<1	<1	<1	<1	2
g/kg	87	3	mg/kg	37.3	90	3	16	28	16	15	5	7	68
g/kg	300	1.9	mg/kg	---	---	1.9	11	10	12	9	3	<1	185
g/kg	91	2.1	mg/kg	35.7	197	2.1	82	303	39	48	5	44	381
g/kg	600	1.2	mg/kg	35	91.3	1.2	11	12	<10	14	<10	1	182
g/kg	---	1.1	mg/kg	---	---	1.1	544	319	372	345	92	90	3,720
g/kg	40	1.4	mg/kg	---	---	1.4	<2	<2	<2	<2	<2	<1	<1
g/kg	50	0.6	mg/kg	---	---	0.6	28	24	26	28	6	9	418
g/kg	3.9	0.5	mg/kg	---	---	0.5	1.1	1.8	1.3	0.9	0.6	1	1
g/kg	40	0.4	mg/kg	---	---	0.4	<2	<2	<2	<2	<2	<1	<1
g/kg	300	0.8	mg/kg	---	---	0.8	<5	14	<5	75	<5	3	11
g/kg	360	2.5	mg/kg	123	315	2.5	126	237	71	62	19	90	1,060
g/kg	6-8	---	mg/kg	---	---	---	NA	NA	NA	NA	NA	NA	NA
g/kg	---	2	mg/kg	---	---	2	NA	NA	NA	NA	NA	NA	1.15
g/kg	---	---	mg/kg	---	---	---	NA	NA	NA	NA	NA	5.2	NA
g/kg	---	---	mg/kg	---	---	<0.01	<0.02	<0.06	<0.03	<0.01	<0.01	NA	NA
g/kg	---	---	mg/kg	---	---	<0.01	<0.02	<0.06	<0.03	<0.01	<0.01	NA	NA
g/kg	---	---	mg/kg	---	---	<0.01	<0.02	<0.06	<0.03	<0.01	<0.01	NA	NA
g/kg	---	<0.01	mg/kg	0.06	0.34	<0.01	<0.02	<0.06	<0.03	<0.01	<0.01	NA	NA
g/kg	---	---	mg/kg	---	---	<0.01	<0.02	<0.06	<0.03	<0.01	<0.01	NA	NA
g/kg	33	0.01	mg/kg	0.0341	0.277	0.01	ND	ND	ND	ND	ND	NA	NA
g/kg	0.03	0.02	mg/kg	---	---	0.02	ND	ND	ND	ND	ND	NA	NA
g/kg	0.37	0.02	mg/kg	---	---	0.02	ND	ND	ND	ND	ND	NA	NA
g/kg	0.08	0.02	mg/kg	---	---	0.02	ND	ND	ND	ND	ND	NA	NA
g/kg	---	0.02	mg/kg	---	---	0.02	ND	ND	ND	ND	ND	NA	NA
g/kg	---	0.04	mg/kg	---	---	0.04	ND	ND	ND	ND	ND	NA	NA
g/kg	11	0.04	mg/kg	---	---	0.04	ND	ND	ND	ND	ND	NA	NA
g/kg	310	10	mg/kg	---	---	10	ND	ND	ND	ND	ND	NA	NA
g/kg	310	10	mg/kg	---	---	10	ND	ND	ND	ND	ND	NA	NA
g/kg	760	10	mg/kg	---	---	10	ND	82	26	ND	ND	NA	NA
g/kg	1,700	10	mg/kg	---	---	10	130	2,000	900	230	ND	NA	NA
g/kg	3,300	10	mg/kg	---	---	10	ND	440	190	41	ND	NA	NA
g/kg	---	---	mg/kg	---	---	10	NA	2,000	700	NA	NA	NA	NA

limit.

IG) of the Canadian Sediment Quality Guidelines for the Protection of Aquatic Life of the Canadian Council of Ministers of the Environment. (2002)

Figure 52. (S-10187) Eureka, Sewage Lagoon map.

4.1.5 S-10190 Main Camp "The Fort"

4.1.5.1 Location and Site Description

Eureka's Main Camp area (previously known as "The Fort") is on the south and west side of the landing strip. In 1998 it was undergoing reconstruction and was replaced with a new accommodations building located south of the original structure. The area previously occupied by the Fort is now a parking area. The new accommodations building consists of many small bedrooms, a kitchen, dining room, recreation room, bar, an administrative office and a medical examination room. This area became home to regular military personnel and transient pilots from Resolute and CFS-Alert. Before the inception of the new accommodations building, the Fort made used of 5 aboveground storage tanks that were dispersed around the building. However, these are no longer in evidence.

The new accommodations building has "a grey and black water bioreactor that uses microbial processes to reduce sewage and grey water wastes to a liquid waste that is discharged to an outfall southeast of the new building" (ESG 1999). An old grey water lagoon is located to the south of the accommodations building, and consists of a small outfall stream that leads to the pool of grey water.

The main camp also has a warehouse known as the "Canadian Tire" at the west end of the camp. This building, constructed in 1998, was built to replace the old warehouse that burned down in 1997. At the east end of the camp is the Polar Continent Shelf Project (PCSP) facility, which includes several sheds and trailers for use as accommodations and laboratories. This facility has its own generator, several aboveground storage tanks and also maintains a barrel cache which consists of diesel and aviation fuels.

The drainage in the area heads southward on a light slope towards Slidre Fjord, which is approximately 1.5 km away. The native soils contain clay and silt and the parking area is regularly recovered with gravel.

4.1.5.2 Potential Receptors and Valued Ecological Components

Contaminants in the area may naturally migrate to Slidre Fjord, due to the existing drainage channels in the area. Although vegetation has been recorded in this area, none was evident during the summer, 2006 field visit. No wildlife was in evidence, either.

4.1.5.3 Summary of Previous Investigations

4.1.5.3.1 "The Fort"

Sampling was performed in 1998 around The Fort before it was demolished. This included the collection of 21 soil samples which were concentrated on visibly stained areas, such as doorways. These were analyzed for metals, PCBs, PAHs and TPH (Table LXXXVIII). Only 1 sample (98-11513) exceeded any of the criteria; 29,000 mg/kg TPH was found, consisting of 100% fuel oil. This sample was collected in a visible stain at the southeast of the building under 2 diesel day tanks. This sample also contained 400 mg/kg lead, which surpasses the Tier I criterion. PCB and PAH levels remained below detectable levels and the remaining metals were comparable to average background concentrations. One (1) grass sample was analyzed for metals and none exceeded the normal background levels. A water sample, obtained from the kitchen sink, contained acceptable levels of metals, PCBs, TPH, nitrite, nitrate, total chloride, BOD, COD and TSS, according to the CCME Drinking Water Criteria (1991) and the Canadian Drinking Water Quality Guidelines (CCREM 1996). The pH of the water was 7.7.

In 2001, another 26 soil samples, including 2 field duplicates and 18 depth samples, were collected and analyzed for metals, PCBs and TPH (Table LXXXVIII). The only sample to contain any contamination was sample 01-5646. Taken from 85 cm depth, the sample contained 26,000 mg/kg TPH.

4.1.5.3.2 Warehouse

Five (5) soil samples were collected in 1998 from around the foundation of the warehouse that was currently under construction. The gravel pad had been recently re-graded and therefore no contamination was found in the area.

4.1.5.3.3 Old Grey Water Lagoon

Soil, water and plant samples were obtained from the grey water lagoon in 1998. Nine (9) soil samples, including 4 depth samples, were analyzed for metals and PCBs and all contaminant concentrations remained low. The pH of the water was 6.9 and the plant samples had no detectable contamination.

4.1.5.3.4 General Site Drainage

In 1998, 7 soil samples, including 1 field duplicate, were collected from drainage pathways or catchments. Samples analyzed for metals and PCBs demonstrated no contamination approaching the criteria levels. In 2 samples, zinc levels were slightly above the average background levels. No elevated contamination levels were found in plant samples.

Table LXXXVIII. (S-10190) Previous contaminated soil samples.

Samples	Depth (cm)	Contaminant	Criterion (mg/kg)	Concentration (mg/kg)
98-11513	0	TPH	2,500	29,000
01-5646	85	TPH	2,500	26,000

4.1.5.4 Nature and Extent of Contamination

Two (2) depth samples, taken from a depth of 70 cm, were collected in 2 trenches during the summer of 2006 and analyzed for TPH (Table LXXXIX) (Photograph 66, Appendix A). Sample 06MC0101 was found to contain TPH and exceeded the criteria for ethylbenzene (0.9 mg/kg), fraction 1 and 2 hydrocarbons (350 mg/kg and 3,200 mg/kg,

respectively) and BTEX (340 mg/kg). Small amounts of toluene, total xylenes and fraction 3 hydrocarbons were also detected. No TPH was detected in the other sample.

4.1.5.5 Recommendations

Delineation should be performed around the area of the original Fort where previous contamination was recorded (Figure 53). This should include the collection of roughly 20 more soil samples collected at approximately 1 meter depth because the area is filled with ballast. The samples should be tested for TPH and BTEX. No more work is required for the other areas surrounding the main camp site, including the warehouse, the grey water lagoon and the general site drainage.

Table LXXXIX. (S-10190) Main Camp "The Fort" results.

					Main Camp "The Fort" (S-10190)	
		SOIL			SOIL	
	PARAMETERS	UNITS	INDUSTRIAL GUIDELINES (Coarse)	DETECTION LIMIT	06MC0102 70 cm 06/30/06	06MC0101 70 cm 06/30/06
PETROLEUM HYDROCARBONS	Benzene	mg/kg	0.03	0.02	ND	ND
	Toluene	mg/kg	0.37	0.02	ND	0.30
	Ethylbenzene	mg/kg	0.08	0.02	ND	0.9
	o-Xylene	mg/kg	---	0.02	ND	3.1
	p+m-Xylene	mg/kg	---	0.04	ND	3.7
	Total Xylene	mg/kg	11	0.04	ND	6.8
	F1 (C6-C10 Hydrocarbons)	mg/kg	310	10	ND	350
	F1 (C6-C10) -BTEX	mg/kg	310	10	ND	340
	F2 (C10-C16 Hydrocarbons)	mg/kg	760	10	ND	3,200
	F3 (C16-C34 Hydrocarbons)	mg/kg	1,700	10	ND	150
	F4(C34-C50 Hydrocarbons)	mg/kg	3,300	10	ND	ND

ND Not detected
NA Not available
Higher than the criteria

Figure 53. (S-10190) Eureka Main Camp "The Fort" map.

4.1.6 S-10191 West Airstrip Landfill

4.1.6.1 Location and Site Description

The West Airstrip Landfill is located northwest of the airstrip and west of the Bradley Air Services building, which is on the North Airstrip Apron (Figure 54). The landfill itself consists of a series of lobes which cover an area of roughly 5,000 m² (Photograph 67, Appendix A). These were created when the garbage was backfilled. There are no records to indicate when the landfill operation ceased in this area, although suggestions have been made that the AES previously used this area for disposing noncombustible waste (ESG 1998). The site is no longer active.

The land itself slopes to the north and west, towards the bay and the soil in the area contains clay and small rocks.

4.1.6.2 Potential Receptors and Valued Ecological Components

This area is well vegetated, mostly with Arctic cottongrass. This is a direct result of the various drainage channels in the area. The team also noted muskoxen, wolves and hares on the site. No human activities occur on the site.

4.1.6.3 Summary of Previous Investigations

In 1998, 17 soil samples, including 2 field duplicates were collected and analyzed for metals, PCBs and TPH. Samples were collected in drainage pathways and catchments downslope of the landfill, in order to determine if any contaminants were leaching through the water pathways. The analysis suggested that no contaminants were migrating from the landfill site. Four (4) plant samples were also analyzed for metals and none were found to surpass the criteria.

4.1.6.4 Nature and Extent of Contamination

Two (2) soil samples were collected in 2006, from a depth of 40 cm. These were tested for metals and TPH (Table XC). No contaminants were found to exceed the CCME criteria. The only hydrocarbon to be detected was fraction 3 at low concentrations.

4.1.6.5 Recommendations

No more work is required for this site since no contamination was found in either the previous campaign or the 2006 field work.

Table XC. (S-10191) West Airstrip Landfil results.

					West Airstrip Landfill (S-10191)	
	PARAMETERS	SOIL			SOIL	
		UNITS	INDUSTRIAL GUIDELINES (Coarse)	DETECTION LIMIT	06WL0128 40 cm 06/30/06	06WL0129 40 cm 06/30/06
METALS	Arsenic (As)	mg/kg	12	0.27	9.2	11
	Barium (Ba)	mg/kg	2,000	5	94	56
	Cadmium (Cd)	mg/kg	22	0.22	<1	<1
	Chromium (Cr)	mg/kg	87	3	29	20
	Cobalt (Co)	mg/kg	300	1.9	15	10
	Copper (Cu)	mg/kg	91	2.1	34	17
	Lead (Pb)	mg/kg	600	1.2	13	10
	Manganese (Mn)	mg/kg	---	1.1	396	225
	Molybdenum (Mo)	mg/kg	40	1.4	<2	<2
	Nickel (Ni)	mg/kg	50	0.6	33	19
	Selenium (Se)	mg/kg	3.9	0.5	1.5	1.5
	Silver (Ag)	mg/kg	40	0.4	<2	<2
	Tin (Sn)	mg/kg	300	0.8	<5	<5
	Zinc (Zn)	mg/kg	360	2.5	95	54
PETROLEUM HYDROCARBONS	Benzene	mg/kg	0.03	0.02	ND	ND
	Toluene	mg/kg	0.37	0.02	ND	ND
	Ethylbenzene	mg/kg	0.08	0.02	ND	ND
	o-Xylene	mg/kg	---	0.02	ND	ND
	p+m-Xylene	mg/kg	---	0.04	ND	ND
	Total Xylene	mg/kg	11	0.04	ND	ND
	F1 (C6-C10 Hydrocarbons)	mg/kg	310	10	ND	ND
	F1 (C6-C10) -BTEX	mg/kg	310	10	ND	ND
	F2 (C10-C16 Hydrocarbons)	mg/kg	760	10	ND	ND
	F3 (C16-C34 Hydrocarbons)	mg/kg	1,700	10	52	36
	F4(C34-C50 Hydrocarbons)	mg/kg	3,300	10	ND	ND

ND Not detected
NA Not available
Higher than the criteria

Figure 54. (S-10191) Eureka, West Airstrip landfill map.