KENO VALLEY/DUBLIN GULCH ENVIRONMENTAL BASELINE ASSESSMENT

VOLUME V: Keno Valley Sites #71 to #73, #75 to #81
Dublin Gulch Sites #85 to #86, #88 to #94, and #96

Prepared for
Waste Management Program
Indian and Northern Affairs Canada

By
Environmental Services
Public Works and Government Services Canada

March, 2000

At the request of the client, there has been no interpretation of data compiled and gathered for this assessment. Therefore, this report does not draw comparisons or make references to environmental quality criteria, guidelines, or codes of practice, and makes no recommendations for future action.

TABLE OF CONTENTS

VOLUME I (cont.)

LIST OF FIGURES –

LIST OF TABLES –

VOLUME II – Keno Valley Sites #1 to #20
Figures, photos and analytical results attached to individual site reports.

VOLUME III – Keno Valley Sites #21 to #40
Figures, photos and analytical results attached to individual site reports.

VOLUME IV – Keno Valley Sites #41 to #66, #68 to #70
Figures, photos and analytical results attached to individual site reports.

VOLUME V – Keno Valley Sites #71 to #73, #75 to #81
Dublin Gulch Sites #85 to #86, #88 to #94, and #96
Figures, photos and analytical results attached to individual site reports.
Site #78 (Elsa Village): figure in pocket.

CHRISTAL (#71)
(MINFILE#105M 061)

1. LOCATION AND ACCESS

The Christal site lies on the western slope of Keno Hill south of Erickson Gulch. It can be accessed on foot by a trail departing from Keno 700 Road about 2.5 km out of Keno City. A camp site is located at the end of the trail. Shafts 1 and 2 lie at the base of a steep slope at the north end of the camp site. The approximate UTM coordinates of Shafts 1 and 2 are 7088540 m N 486780 m E. The elevation of the shafts is approximately 1250 m. Shaft 3 is located about 0.5 km southwest of Shaft 1 down the slope of Keno Hill. Several groups of trenches are located uphill from Shaft 1 about 0.5 km to the east.

2. SITE PHYSIOGRAPHY

The Christal site lies on the western slope of Keno Hill. The site slopes from the uphill trenches down to Shafts 1 and 2 and further down to Shaft 3. The drop in elevation from the trenches to Shaft 3 is about 200 m. The terrain consists of dense forests and fields of moss covered boulders. Surface water drainage from the area drains towards Erickson Creek.

3. GEOLOGY AND MINERALIZATION

The minfile reports that the major rock types at the Christal site include earn group schist and phyllite. Quartzite is also abundant. Veining is reported to consist of galena, sphalerite, tetrahedrite, arsenopyrite and pyrite mineralization in quartz-siderite gangues.

4. SITE HISTORY

According to the minfile a 15 m shaft was developed at the Christal site in 1940. Bulldozer trenching took place in 1965. A total of three shafts and several groups of trenches were found at the site.

5. MINE DEVELOPMENT

5.1 Mine Openings And Excavations

Shaft 1 (photo 71-2)

Collapsed shaft with water accumulated to within 1 m of surface

<u>Location</u>: at the base of a steep north facing slope about 75 m north of the camp site (see Figure 1)
<u>Dimensions (L x W)</u>: 1.5 m x 1.5 m

Supports: timbered shaft

Condition: shaft is collapsed

Accessibility: shaft site can be accessed on foot from camp site

Shaft 2

Shaft under collapsed shed (Building 71B) with water accumulated to within 1 m of surface

Location: at the base of a steep north facing slope about 75 m north of the camp site (see Figure 1)

Dimensions (L x W): unknown

Supports: timbered shaft

Condition: unknown – likely to be collapsed

Accessibility: shaft site can be accessed on foot from camp site

Shaft 3

Shaft 3 was not located

Location: location 500 m southwest of Shaft 1 is taken from Murphy and Roots map (see Figure 1)

Dimensions (L x W): unknown

Supports: unknown

Condition: unknown

Accessibility: poor access

Trench Groups A, B, and C

The trenches located about 500 m east of Shaft 1 can be roughly assembled into three groups based on their location, size, and orientation. Trench Group A is series of 7 trenches located almost due east from Shaft 1 (photos 71-8 and 71-9). The trenches in Group A range in length from 30m to 100 m. Trench Group B, located south of Group A, consists of 8 parallel trenches that follow the contour of Keno Hill at an elevation of about 1350 m (photo 71-10). Another trench in Group B lies perpendicular to the rest. The trenches in Group B range in length from 30 m to 60 m. Trench Group C, located east of Group B is a series of three long, deep trenches about 200 m in length (photo 71-4).

5.2 Waste Rock Disposal Areas

A waste rock pile was found next to Shaft 2 (photo 71-3). It was approximately 10 m long, 5 m wide and of unknown depth. This waste rock pile was almost entirely revegetated.

5.3 Tailings Impoundments

No tailings were observed at the Christal site.

5.4 Minesite Water Treatment

No water treatment occurs at the Christal site.

6. MINE SITE INFRASTRUCTURE

6.1 Buildings

A wooden building (Building 71-1; photo 71-5) is located at the Christal camp site (see figure 1). Wooden debris provides evidence of other structures that used to occupy this site. A collapsed shed (Building 71-2; photo 71-1) is located over Shaft 2.

6.2 Fuel Storage

A number of empty 45 gallon drums were found discarded at the Christal camp site (photo 71-7).

6.3 Rail and Trestle

There was no evidence of a rail and trestle observed at the Christal site.

6.4 Milling and Processing Infrastructure

There was no evidence or record of milling or processing activities occurring at the Christal site.

6.5 Electrical Equipment

There was no electrical equipment observed at the Christal site.

7. SOLID WASTE DUMPS

A dump of cans and other debris was observed at the Christal site about 10 m north of Building 71-1 (photo 71-6).

8. POTENTIAL CONTAMINANTS OF CONCERN

No evidence of potential contamination was found at the Christal site.

9. WATER QUALITY

Water quality sample 71WQ-A01-02 was taken from the water accumulated in Shaft 1. Laboratory analysis data from this sample is provided in Attachment B. Surface water runoff from the Christal site area drains towards Erickson Gulch.

10. RECLAMATION

The disturbed areas of the Christal site have been mostly overgrown. There have been no known reclamation measures carried out by past or present operators of the site.

Sample Number		Detection Limit	Units	71-WQ-A01-02 - Christal - 20/09/99
pH (field)		N/A	pH	not measured
Conductivity (field)		N/A	µS/cm	not measured
pH (Lab)		0.01	pH	7.16
Conductivity (Lab)		0.01	µS/cm	92
Total Alkalinity		5	mg $CaCO_3$/L	45
Chloride		0.01	mg/L	0.07
Hardness (CaCO3 equiv)		5	mg/L	43.9
Nitrate-N		0.05	mg/L	0.06
Nitrite-N		0.003	mg/L	<0.003
Sulphate		1	mg/L	3.1
Total Dissolved Solids		5	mg/L	70
Analysis by ICP-USN				
	Aluminum	0.0008	mg/L	0.265
	Antimony	0.005	mg/L	<0.005
	Arsenic	0.01	mg/L	0.25
	Barium	0.00004	mg/L	0.0113
	Beryllium	0.00001	mg/L	<0.00001
	Bismuth	0.0004	mg/L	<0.0004
	Boron	0.002	mg/L	<0.002
	Cadmium	0.00006	mg/L	0.00039
	Calcium	0.002	mg/L	15.2
	Chromium	0.00006	mg/L	0.00054
	Cobalt	0.00003	mg/L	0.00059
	Copper	0.00003	mg/L	0.00457
	Iron	0.00001	mg/L	1.11
	Lead	0.0003	mg/L	0.014
	Lithium	0.001	mg/L	0.002
	Magnesium	0.0005	mg/L	1.32
	Manganese	0.00002	mg/L	0.103
	Mercury	0.0001	mg/L	<0.0001
	Molybdenum	0.00007	mg/L	0.00026
	Nickel	0.00001	mg/L	0.0018
	Phosphorus	0.03	mg/L	0.08
	Potassium	0.4	mg/L	0.4
	Selenium	0.004	mg/L	<0.004
	Silicon	0.004	mg/L	2.33
	Silver	0.00005	mg/L	0.00299
	Sodium	0.004	mg/L	1
	Strontium	0.00002	mg/L	0.0659
	Sulphur	0.008	mg/L	1.19
	Thallium	0.001	mg/L	<0.001
	Titanium	0.00002	mg/L	0.00686
	Vanadium	0.00003	mg/L	0.00046
	Zinc	0.0002	mg/L	0.0202
Analysis by Hydride AA				
	Arsenic	0.0002	mg/L	0.22
	Selenium	0.0001	mg/L	<0.0001

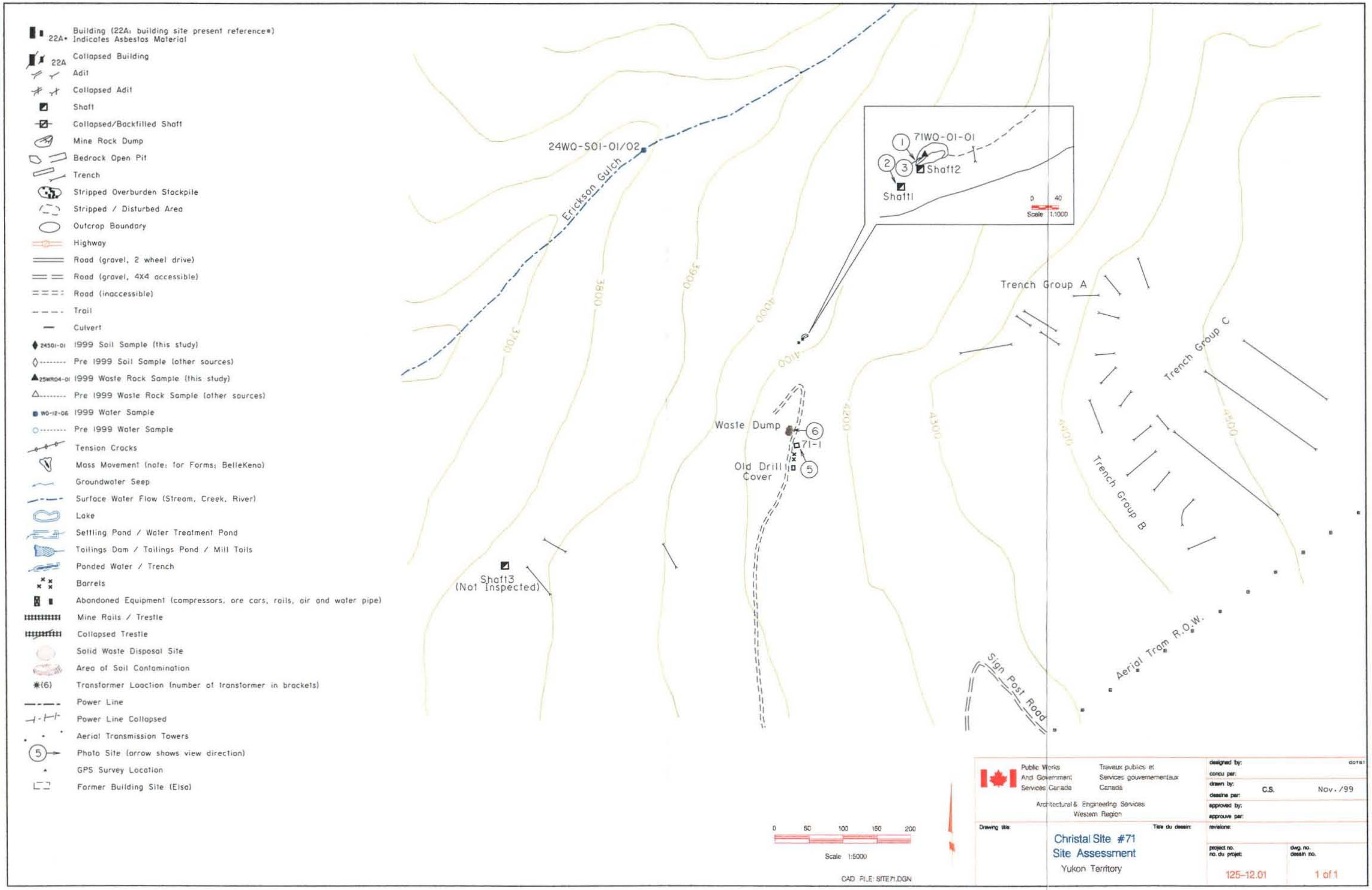

Building (22A: building site present reference*)
22A* Indicates Asbestos Material
Collapsed Building
Adit
Collapsed Adit
Shaft
Collapsed/Backfilled Shaft
Mine Rock Dump
Bedrock Open Pit
Trench
Stripped Overburden Stockpile
Stripped / Disturbed Area
Outcrop Boundary
Highway
Road (gravel, 2 wheel drive)
Road (gravel, 4X4 accessible)
Road (inaccessible)
Trail
Culvert
24S01-01 1999 Soil Sample (this study)
Pre 1999 Soil Sample (other sources)
25WR04-01 1999 Waste Rock Sample (this study)
Pre 1999 Waste Rock Sample (other sources)
WO-12-06 1999 Water Sample
Pre 1999 Water Sample
Tension Cracks
Mass Movement (note: for Forms: BelleKeno)
Groundwater Seep
Surface Water Flow (Stream, Creek, River)
Lake
Settling Pond / Water Treatment Pond
Tailings Dam / Tailings Pond / Mill Tails
Ponded Water / Trench
Barrels
Abandoned Equipment (compressors, ore cars, rails, air and water pipe)
Mine Rails / Trestle
Collapsed Trestle
Solid Waste Disposal Site
Area of Soil Contamination
(6) Transformer Loaction (number of transformer in brackets)
Power Line
Power Line Collapsed
Aerial Transmission Towers
Photo Site (arrow shows view direction)
GPS Survey Location
Former Building Site (Elsa)
24WO-SO1-01/02
Erickson Gulch
71WO-01-01
Shaft2
Shaft1
Scale 1:1000
Trench Group A
Trench Group B
Trench Group C
Waste Dump
71-1
Old Drill Cover
Shaft3
(Not Inspected)
Aerial Tram R.O.W.
Sign Post Road
3700
3800
3900
4000
4100
4200
4300
4400
4500
Scale 1:5000
CAD FILE: SITE71.DGN
Public Works And Government Services Canada
Travaux publics et Services gouvernementaux Canada
Architectural & Engineering Services Western Region
Drawing title:
Titre du dessin:
Christal Site #71
Site Assessment
Yukon Territory
designed by:
concu par:
drawn by:
dessine par:
C.S.
Nov./99
approved by:
approuve par:
revisions:
project no.
no. du projet:
125-12.01
dwg. no.
dessin no.
1 of 1

Photo 71-1: Collapsed shed building (Bldg. 71-2) over shaft A02. Note pully on cross beam. (Azimuth 140°)

Photo 71-2: Shaft A02. (Azimuth 150°)

Photo 71-3: Waste rock dump below shafts A01 and A02. Note natural revegetation. (Azimuth 040°)

Photo 71-4: Recent cat trench; trench length 220m. (Azimuth 130°)

Photo 71-5: Mine shed (Bldg. 71-1). (Azimuth 000°)

Photo 71-6: Camp garbage site; mostly cans and bottles. (Azimuth 280°)

IRONCLAD (#72)
(MINFILE#105M 063)

1. LOCATION AND ACCESS

The Ironclad site lies above and below Keno 700 Road about 2.5 km out of Keno City. 4 trenches (Trenches 2 to 4) lie just above the road. Another trench (Trench 1) lies just below the road. A single adit (Adit 1) lies about 70 m down the slope of Keno Hill from the road. The approximate UTM coordinates for the site are 7087700 m N 486970 m E. The elevation of the site is approximately 1175 m.

2. SITE PHYSIOGRAPHY

The Ironclad site lies on the south slope of Keno Hill. The site slopes from the uphill trenches (Trenches 2 to 4) down to a single adit (Adit 1). Keno 700 Road passes between the uphill trenches and Adit 1. The adit site is built on a large pile of overburden consisting of approximately 60% soil and 40% coarse quartzite. Surface water from the site drains towards Lightening Creek.

3. GEOLOGY AND MINERALIZATION

The minfile reports that he major rock type at the Ironclad site is medium to thick bedded quartzite. Minor rock types consist of carbonaceous phyllite and greenstone lenses. The vein fault is reported to be 1.5 to 3 m wide with narrow lenses of galena, tetrahedrite and sphalerite.

4. SITE HISTORY

According to the minfile a 4.6 m shaft was developed at the Ironclad site in 1931. 152 m of drifting took place from 1952 to 1954.

5. MINE DEVELOPMENT

5.1 Mine Openings And Excavations

Adit 1 (photo 72-1)

Collapsed adit

Location: in the hillside approximately 70 m below Keno 700 Road (see Figure 1)
Dimensions (L x W x H): unknown
Supports: unknown – wooden portal
Condition: adit is collapsed
Accessibility: adit site can be accessed on foot from Keno 700 Road

Trench 1

Location: northeast end of trench lies about 10 m south of Keno 700 Road (see Figure 1)

Dimensions (L x W x H): 70 m x 7 m x 2-3 m - longitudinal bearing AZ 058
Condition: stable

Trench 2

Location: about 10 m north of Keno 700 Road and 30 m northeast of Trench 1 (see Figure 1)

Dimensions (L x W x H): 40 m x 4 m x 1-2 m – longitudinal bearing AZ 320
Condition: stable

Trench 3 (photo 72-5)

Location: about 25 m north of Keno 700 Road and 5 m west of Trench 2 (see Figure 1)

Dimensions (L x W x H): 45 m x 4 m x 1-2 m – longitudinal bearing AZ 334
Condition: stable

Trench 4

Location: about 30 m north of Keno 700 Road and 25 m west of Trench 3 (see Figure 1)

Dimensions (L x W x H): 50 m x 3 m x 1-2 m
Condition: stable

Trench 5

Location: about 15 m north of Trench 2

Dimensions (L x W x H): 32 m x 6 m x 2 m – longitudinal bearing AZ 329
Condition: stable

5.2 Waste Rock Disposal Areas

Two large waste rock piles (Waste rock pile #1 and Waste rock pile #2) are located below the adit at the Ironclad site. Several piles of overburden have been built up at the end of Trenches 1,2 and 3.

Waste rock pile #1 (photo 72-2)

Waste rock pile #1 is located about 30 m south of Adit 1. It lies directly beside Waste rock pile #2 to the west. The pile appears stable at a slope of about 35°. Waste rock pile #1 is primarily fine to blocky rusty and weathered quartzite. It also consists of about 10% phyllite and 5% quartz vein material. Minor siderite veining and greenstone were also observed in this pile. A 47 cm test pit (Test Pit 72WR01) dug at Waste rock pile #1 revealed four distinct layers of material (photo 72-3). The layers consisted of 8 cm of green yellow to green brown sandy quartzite and quartz veining overlaying 2 cm of dark grey graphitic phyllite, 27 cm of leached pale yellow sandy quartzite and quartz veining, and 10 cm of yellow brown to light brown sandy quartzite and quartzite. Waste rock samples were taken from the pale yellow layer (sample 72WR01-01) and the yellow brown to light brown layer (sample 72WR01-02). The field paste pH and conductivity of sample 72WR01-01 were 7.1 and 10 $\mu S/cm$ respectively. The field paste pH and conductivity of sample 72WR01-02 were 7.4 and 20 $\mu S/cm$ respectively. Laboratory analysis data is provided in Attachment B.

Waste rock pile #2 (photo 72-4)

Waste rock pile #2 is located about 30 m south of Adit 1. It lies directly beside Waste rock pile #1 to the east. The pile appears stable at a slope of about 30°. Waste rock pile #2 is primarily fine carbonaceous phyllite with minor graphite. A section of the pile at the southeast edge consists of rusty and weathered blocky quartzite with trace of disseminated pyrite. A 38 cm test pit (Test Pit 72WR02) dug at Waste rock pile #2 revealed a subsurface layer consisting of green brown fine phyllite with some platey and rusty coarse fragments. Waste rock sample 72WR02-01 was taken from the subsurface layer. The field paste pH and conductivity of sample 72WR02-01 were 6.8 and 18 $\mu S/cm$ respectively. Laboratory analysis data is provided in Attachment B.

5.3 Tailings Impoundments

No tailings were observed at the Ironclad site.

5.4 Minesite Water Treatment

No water treatment occurs at the Ironclad site.

6. MINE SITE INFRASTRUCTURE

6.1 Buildings

Evidence was found that a building once stood at the Ironclad site. Metal and wood debris are located in an area about 15 m west of Adit 1 (photo 72-6).

6.2 Fuel Storage

A number of empty 45 gallon drums were found at the Ironclad site. They appear to have been discarded in a location about 40m west of Adit 1.

6.3 Rail and Trestle

Evidence of a rail and trestle system running from the adit to the top of the waste rock piles was found at the Ironclad site. Rails and wooden ties were found running the top of each waste rock pile.

6.4 Milling and Processing Infrastructure

There was no evidence or record of milling or processing activities occurring at the Ironclad site.

6.5 Electrical Equipment

There was no electrical equipment observed at the Ironclad site except for a single discarded battery.

7. SOLID WASTE DUMPS

No solid waste dumps were observed at the Ironclad site.

8. POTENTIAL CONTAMINANTS OF CONCERN

No evidence of potential contamination was found at the Ironclad site.

9. WATER QUALITY

No surface water was observed at the Ironclad site. Runoff from the site drains towards Lightening Creek. No water quality samples were taken.

10. RECLAMATION

The Ironclad site has been mostly overgrown with trees and bushes. The waste rock pile, however, remains largely unvegetated. There have been no known reclamation measures carried out by past or present operators of the site.

Site Number		Detection Limit	Units	72WR01-02 - Sept./99 - Soil
Sample Desciption				Waste rock sample from pile 72WR01 at Ironclad
Paste pH (field)		N/A	pH	7.4
Conductivity (field)		N/A	µS/cm	20
pH in Saturated Paste				
	pH	0.1	pH	7
pH in Soil (1:2 water)				
	pH	0.01	pH	7.8
ICP Semi-Trace Scan				
	Aluminum	5	µg/g	15800
	Antimony	2	µg/g	2
	Arsenic	2	µg/g	600
	Barium	0.05	µg/g	258
	Beryllium	0.1	µg/g	0.6
	Bismuth	5	µg/g	<5
	Cadmium	0.1	µg/g	1.4
	Calcium	5	µg/g	354
	Chromium	0.5	µg/g	21.1
	Cobalt	0.1	µg/g	3.5
	Copper	0.5	µg/g	52.4
	Iron	1	µg/g	32000
	Lead	1	µg/g	37
	Lithium	0.5	µg/g	3.6
	Magnesium	1	µg/g	241
	Manganese	0.5	µg/g	149
	Mercury	0.01	µg/g	<0.01
	Molybdenum	1	µg/g	2
	Nickel	1	µg/g	20.6
	Phosphorus	5	µg/g	915
	Potassium	20	µg/g	4500
	Selenium	2	µg/g	<2
	Silicon	5	µg/g	79
	Silver	0.5	µg/g	0.8
	Sodium	5	µg/g	541
	Strontium	1	µg/g	81
	Sulphur	10	µg/g	230
	Thorium	1	µg/g	4
	Tin	1	µg/g	10
	Titanium	0.2	µg/g	29
	Uranium	5	µg/g	<5
	Vanadium	1	µg/g	25
	Zinc	0.5	µg/g	265
	Zirconium	0.1	µg/g	6.6

ATTACHMENT B: 1999 IRONCLAD WASTE ROCK SAMPLES LABORATORY RESULTS MODIFIED SOBEK METHOD ACID-BASE ACCOUNTING TEST								
SAMPLE	SITE DESCRIPTION	PASTE pH	S(T) %	S(SO4) %	AP	NP	NET NP	NP/AP
72WR01-01 - Sept./99 - Soil	Waste rock sample from pile 72WR01 at Ironclad	7.8	0.03	0.01	0.6	1.3	0.7	2.1
72WR01-01 - Sept./99 - Soil RE	Waste rock sample from pile 72WR01 at Ironclad	7.8	N/D	N/D	0.6	1.3	0.6	2.0

AP = ACID POTENTIAL IN TONNES CaCO3 EQUIVALENT PER 1000 TONNES OF MATERIAL.

NP = NEUTRALIZATION POTENTIAL IN TONNES CaCO3 EQUIVALENT PER 1000 TONNES OF MATERIAL.

NET NP = NET NEUTRALIZATION POTENTIAL = TONNES CaCO3 EQUIVALENT PER 1000 TONNES OF MATERIAL.

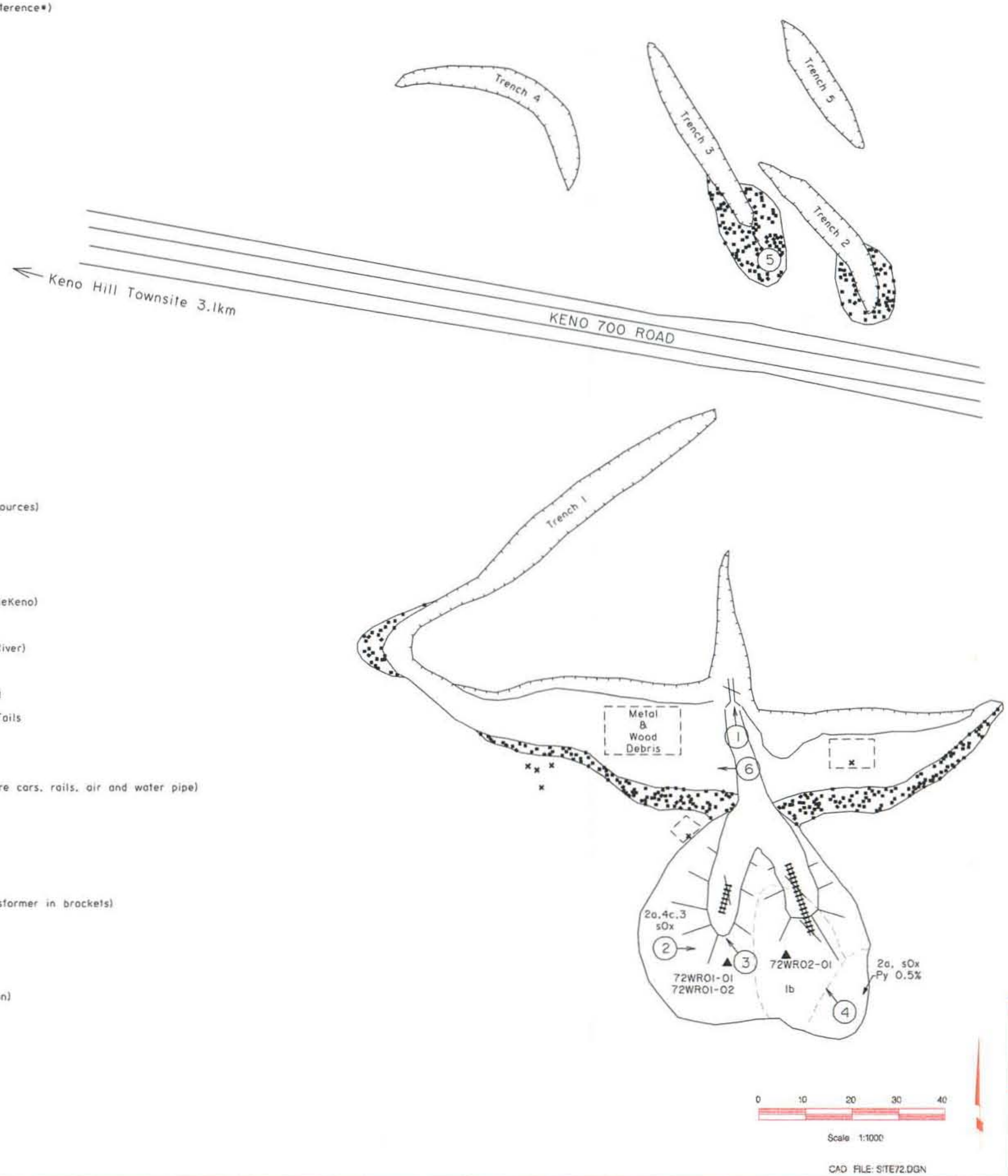
NOTE: WHEN S(T) AND/OR S(SO4) IS REPORTED AS <0.01, IT IS ASSUMED TO BE ZERO FOR THE AP CALCULATION.

N/D = NO DUPLICATE ASSAY. CALCULATIONS ARE BASED ON ASSAY RESULTS OF THE INITIAL SAMPLE.

RE = REPLICATE.

NOTE - A HIGH LEVEL OF SOLUBLE METALS (ESPECIALLY IRON) WERE OBSERVED IN MANY SAMPLES DURING THE ABA TITRATIONS.
SAMPLES WITH A NEGATIVE NET NP SHOULD BE TESTED FOR MOBILE METALS USING STANDARD SHAKE FLASK EXTRACTION TESTS.

Building (22A: building site present reference•)
22A• Indicates Asbestos Material
Collapsed Building
Adit
Collapsed Adit
Shaft
Collapsed/Backfilled Shaft
Mine Rock Dump
Bedrock Open Pit
Trench
Stripped Overburden Stockpile
Stripped / Disturbed Area
Outcrop Boundary
Highway
Road (gravel, 2 wheel drive)
Road (gravel, 4X4 accessible)
Road (inaccessible)
Trail
Culvert
24501-01 1999 Soil Sample (this study)
Pre 1999 Soil Sample (other sources)
25WR04-01 1999 Waste Rock Sample (this study)
Pre 1999 Waste Rock Sample (other sources)
WO-12-06 1999 Water Sample
Pre 1999 Water Sample
Tension Cracks
Mass Movement (note: for Forms: BelleKeno)
Groundwater Seep
Surface Water Flow (Stream, Creek, River)
Lake
Settling Pond / Water Treatment Pond
Tailings Dam / Tailings Pond / Mill Tails
Ponded Water / Trench
Barrels
Abandoned Equipment (compressors, ore cars, rails, air and water pipe)
Mine Rails / Trestle
Collapsed Trestle
Solid Waste Disposal Site
Area of Soil Contamination
*(6) Transformer Loaction (number of transformer in brackets)
Power Line
Power Line Collapsed
Aerial Transmission Towers
Photo Site (arrow shows view direction)
GPS Survey Location
Former Building Site (Elsa)



Waste Rock Geological Legend

This legend intended for use as a key to the observed lithological content of the mine dumps and stockpiles of surficial materials investigated. It does not represent regional stratigraphy and no stratigraphic sequence is implied.

Pyrite content as percent: eg. Py 2%. Occurs as an alteration halo adjacent to vein fault structure.

Oxidation: Weak (wOx), moderate (mOx) and intense (iOx).

Quarternary: (5) Undifferentiated, unconsolidated colluvium, glacial till.

Veins: (4a) Quartz veins;
(4b) Quartz-pyrite veins;
(4c) Quartz-siderite •trace galena-sphalerite veins;
(4d) Siderite-quartz •trace galena-sphalerite veins;

Greenstone: (3) Amphibole-chlorite-plagioclase metadiorite or metagabbro.

Quartzite: (2a) Thick beded, blocky gray quartzite;
(2b) Thin banded, broken, quartzite with carbonaceous phyllite interbeds;
(2c) Calcareous quartzite.

Phyllite: (1a) Broken sericite-chlorite phyllite;
(1b) Carbonaceous phyllite.

Public Works And Government Services Canada	Travaux publics et Services gouvernementaux Canada	designed by: / conçu par:	date:
Architectural & Engineering Services Western Region		drawn by: / dessiné par: C.S.	Nov./99
		approved by: / approuvé par:	
Drawing title: Ironclad Site #72 Site Assessment Yukon Territory	Titre du dessin:	revisions:	
		project no. / no. du projet: 125-12.01	dwg. no. / dessin no.: 1 of 1

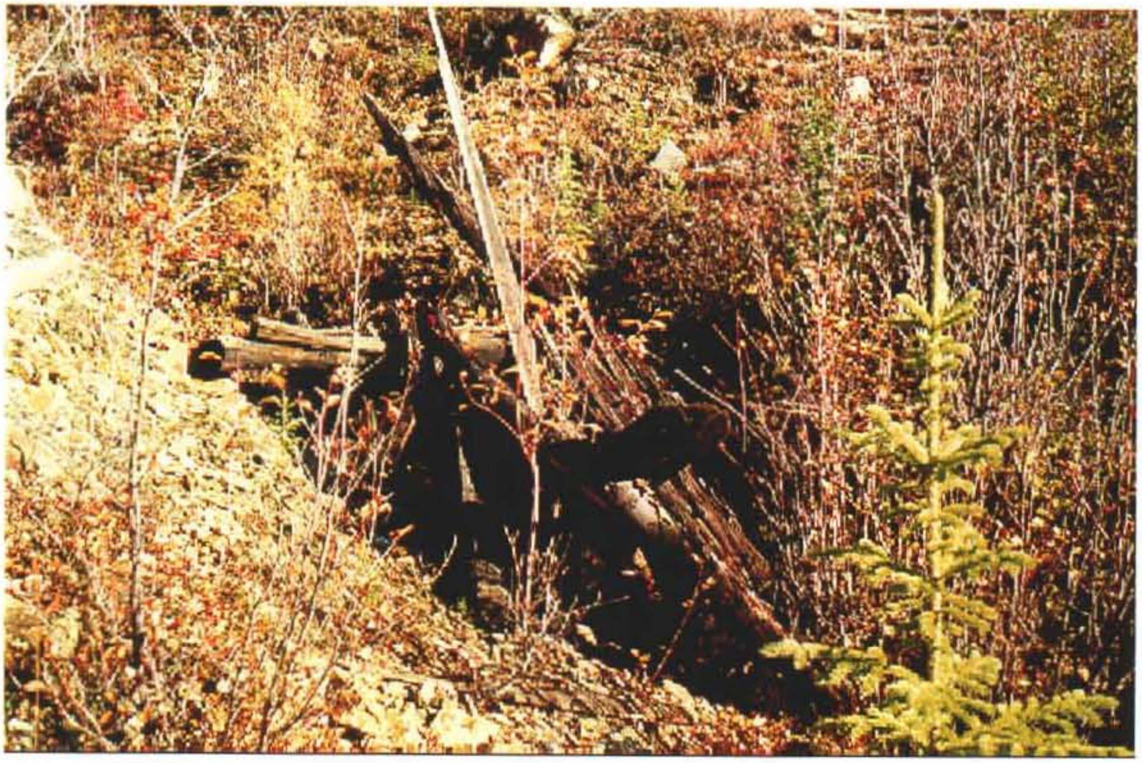


Photo 72-1: Collpased adit Ironclad portal. (Azimuth 000°)

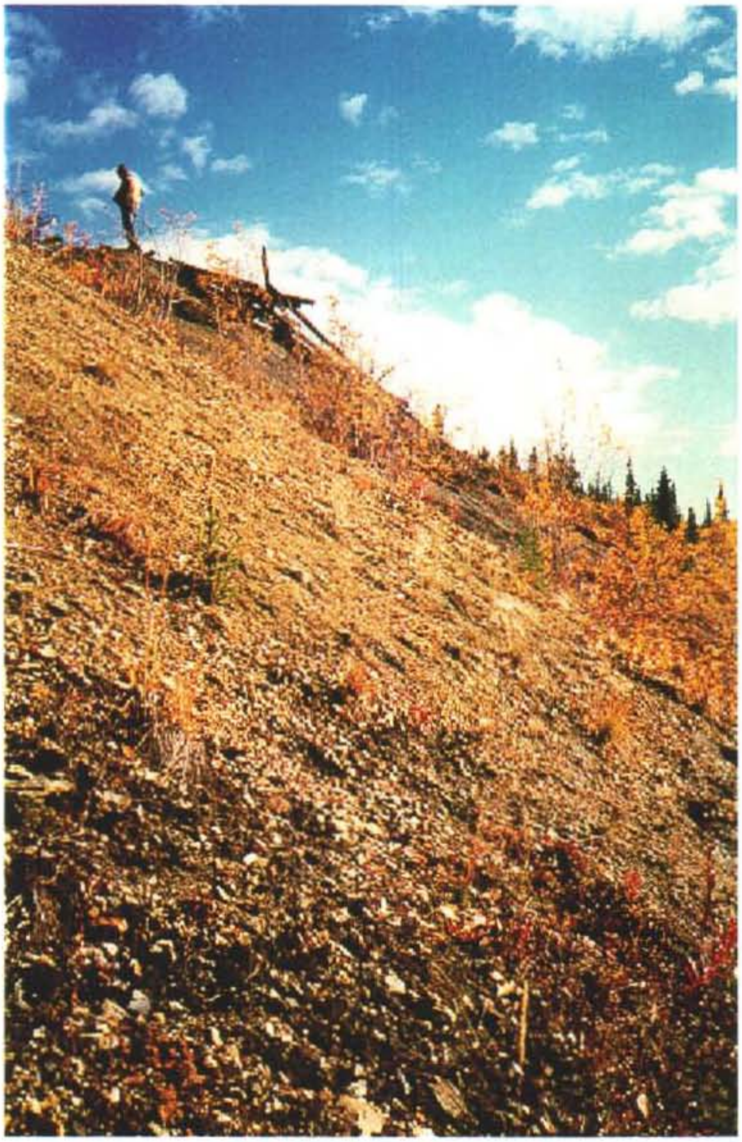


Photo 72-2: Waste Rock pile 72WR01 looking towards tresel structure on WR01. (Azimuth 090°)

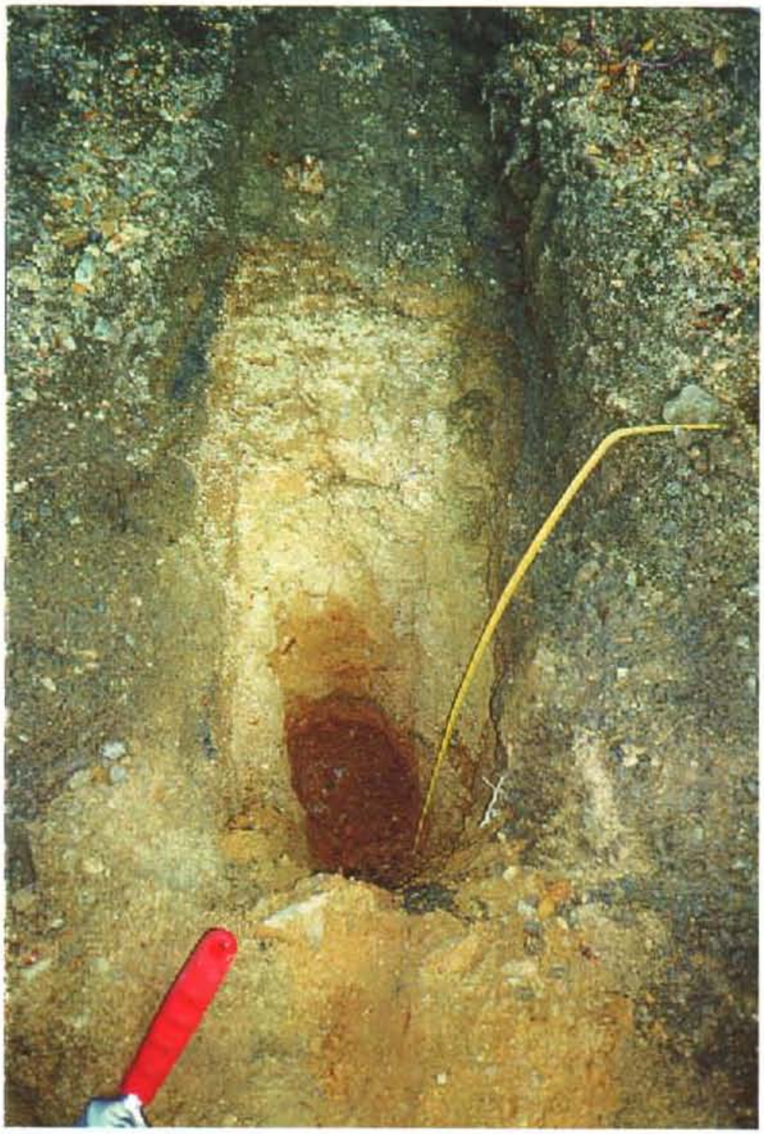


Photo 72-3: Waste rock sample pit for 72WR01-01 and -02. Note distinct colour change.

Photo 72-4: Waste rock pile 72WR02. Note rusty quartzite material and collapsed tressel structure. (Azimuth 340°)

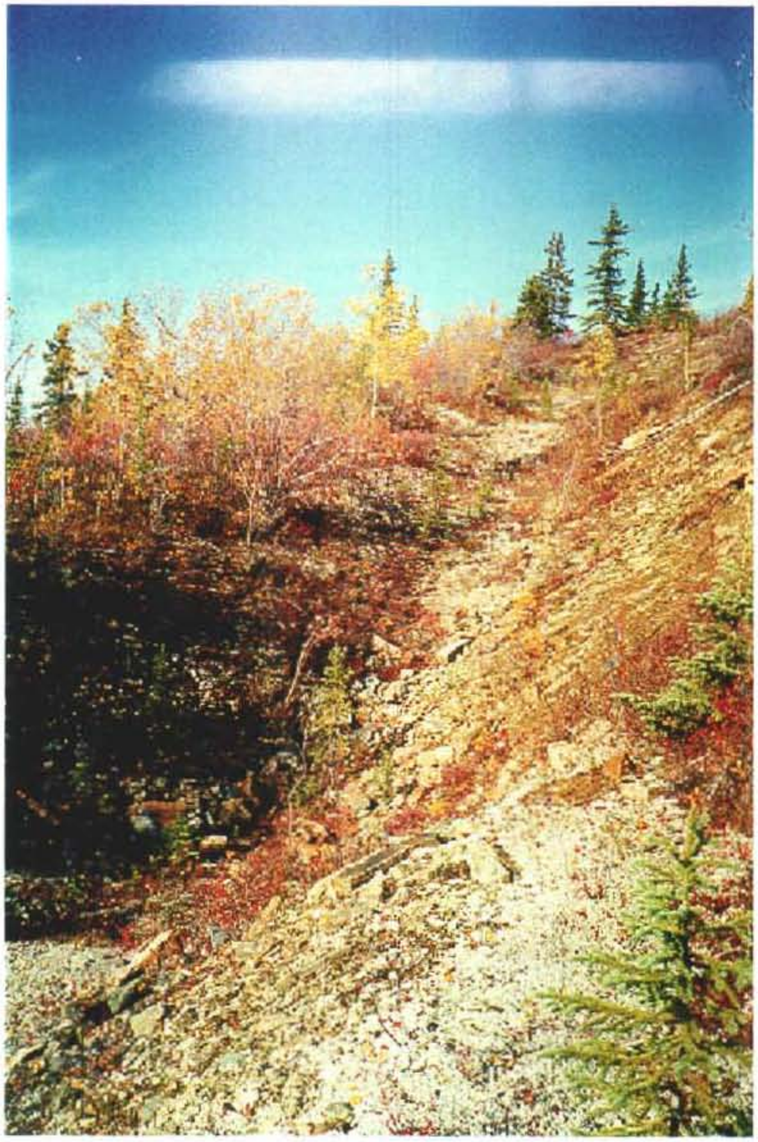


Photo 72-5: Cat trench TR03 above road. (Azimuth 340°)

Photo 72-6: Levelled mine portal area showing metal and wood debris.

GAMBLER

SITE #73

MINFILE #105M 069

1. LOCATION AND ACCESS

Gambler is on the northern slope of Keno Hill, in the Faro Gulch, at an elevation of 1520m (5000 feet). Approximate UTM co-ordinates for the site are 7091 100m N and 489 200m E. Access to the site is possible via the Upper Faro Gulch Trail, a rough road which is part of the Silver Trail Tourism Association's Keno City trail network. The Upper Faro Gulch Trail is a continuation of the Lucky Queen Road and begins at the Lucky Queen site. Four-wheel drive access is possible for the first 1.6km of the Upper Faro Gulch Trail. The site is roughly 300m beyond this point, and can be reached by foot.

2. SITE PHYSIOGRAPHY (Photo 73-1)

The site is on a moderately steep slope located on the northeast headwall of Faro Gulch near the Keno Summit. The site is underlain by permafrost (GSC Bulletin 111; as cited in PWGSC, 1997). Drainage flows from seeps into Faro Gulch, approximately 60m below and 300m east. The site is above tree line and is characterized by subalpine vegetation; shrubs and bushes, willows, stunted spruce trees and a variety of mosses and lichens.

3. GEOLOGY AND MINERALIZATION

Bedrock geology includes thick-bedded quartzite with interbeds of graphite schist and phyllite. The silver-lead-zinc-gold ores strikes 060° and occurs in erratic shoots and lenses lying in vein faults. The Gambler vein dips 60° south and varies in width from 1.5 to 4.6m. The quartz-calcite-siderite vein hosts disseminated to semi-massive pyrite (FeS_2), arsenopyrite (FeAsS), galena (PbS), sphalerite ((Zn, Fe)S) and freibergite ($(Cu, Fe)_{12}Sb_4S_{13}$) (GSC Bulletin 111; as cited PWGSC, 1997).

4. SITE HISTORY

In 1923, two adits were excavated; the upper adit was developed to a length of 15.2m and the lower adit was developed to a length of 12.1m. Between 1951 and 1953, the lower adit was extended an additional 155m and a 12m raise was excavated. Ore was last recovered from the underground workings in 1957. A total of 223 tonnes of silver/lead ore is reported as being produced (PWGSC, 1997). In the 1980s, bulldozer trenching was undertaken 75m southwest of the adits.

Reference maps (Boyle, 1961) indicate the Gambler site to include a shaft and adit located to the west higher on the slope and at the crest of the ridge above. The histories of these workings are unknown. Two large mine waste rock dumps associated with the 9 Vein Open Pit and the 9 Vein Faro Gulch dump shed portal occur to the south and upstream in the Faro Gulch cirque headwall. Although not related to the Gambler site, they influence the Faro Gulch drainage.

This site was the focus of a detailed environmental assessment by PWGSC in 1996 (PWGSC, 1997).

5. MINE DEVELOPMENT (Photo 73-1)

There were two adits and associated waste rock piles investigated during the site visit. The shaft and adit located on the ridge to the west are indicated on Boyle's map as caved were not visited. The trenching located at the base of the slope below is closer to the Lake View site (site #34), but is included as part of the development of the Gambler site. Site details can be found on Figure 1: see Attachment 1 for site photos.

5.1 Mine Openings and Excavations

There are two adits and five trenches at this site. A small flow of water was observed coming from the lower adit.

Lower Adit (Photo 73-2)

The entrance to the adit is collapsed and is buried with waste rock and overburden.

Location: The lower adit is located along the trail approximately 220m south of the mine site buildings. There are rail tracks that lead from the adit to a wooden platform.

Dimensions (L x W x H): The adit is collapsed, so the width and height could not be determined. The adit was driven to a length of 167.1m.

Supports: The original supports for the portal have been buried in the rock debris.

Condition: The adit appeared stable at the time of the site visit.

Accessibility: Due to the collapse, the adit can not be accessed.

Upper Adit (Photo 73-3)

The entrance to the adit has collapsed.

Location: On the south side of the trail, 45m west and 15m higher elevation than the lower adit.

Dimensions (L x W x H): The adit is collapsed, so the width and height could not be measured. The adit was driven to a length of 15.2m.

Supports: The original supports for the portal have been buried in the rock debris.

Condition: The adit appeared stable at the time of the site visit, although intermittent rock fall from excavation is expected.

Accessibility: Due to the collapse, the adit can not be accessed.

Trenches (Photo 73-1)

There are six bulldozer trenches located in a cluster at the base of the slope roughly 250 metres east of the camp buildings. A cat road turns east down the slope from the access trail just past the camp. Three of the trenches are 50m in length and oriented at 045°, 047° and 050°. The other three trenches are 20m in length and oriented at 110°, 110° and 160°. The trenches are easily accessed, shallow and have been partially backfilled.

5.2 Waste Rock Disposal Areas

There are two waste rock piles located at the Gambler site. These piles were to be composed of approximately 5000 tonnes of waste rock (PWGSC, 1997). Four waste rock samples were collect in 1996 (PWGSC, 1997). No waste rock samples were collected during the 1999 site visit.

Waste Rock Pile WR-01

Waste rock pile WR-01 appears to have formed by end dumping from the upper adit by hand car. The slope of the material is approximately the same slope as the surrounding talus and varies from 40° at the crest to 30° near the toe.

The surface waste rock is predominately blocky quartzite. There was no apparent adverse impacts on the vegetation below the dump. There was no surface of subsurface water draining from the waste rock pile at the time of the site visit.

Location: The waste rock pile is directly outside of the upper adit.

Dimensions (L x W x H): 42m x 15m x 1.5m

Sampling: One sample was collected from WR-01 in 1996 (GA/WR/P201; PWGSC, 1997). No samples were collected during the 1999 site visit.

Waste Rock Pile WR-02

Waste rock pile WR-02 appears to have formed by end dumping from the lower adit from a rail line. The waste rock consists predominantly of pebble sized graphitic quartzite material and blocky quartzite. Two kinds of alteration were observed; a layer that was oxidized reddish and a darker graphitic layer (PWGSC, 1997). A small groundwater seep associated with the lower adit was sampled in both 1996 and 1999. In 1996 the waste rock pile was observed to have slump features on the face of the pile near the crest (PWGSC, 1997). Waste rock pile WR-01 appeared to be stable when inspected in 1999.

Location: The waste rock pile is roughly 20m east of the lower adit.

Dimensions (L x W x H): 45m x 30m x 2.5m

Sampling: Three samples were collected from this WR-02 in 1996 (GA/WR/P202, GA/WR/P203-1 and GA/WR/P203-2; PWGSC, 1997). No samples were collected during the 1999 site visit.

5.3 Tailings Impoundments

No ore was processed at the site; no tailings were encountered.

5.4 Minesite Water Treatment

There is no water treatment facility at this site.

6. MINE SITE INFRASTRUCTURE

There are 5 buildings located at the site; a cabin, a shed, a wooden platform, a partially collapsed outhouse, and a wooden tent frame. Railway tracks extend from the lower adit to a wooden platform at the edge of waste pile WR-02. A single powerline (or aerial tram) tower was observed on the slope of the Faro Gulch cirque above the Gambler mine to the south. This was not investigated. Site details can be found on Figure 1: see Attachment 1 for site photos.

6.1 Buildings (Photo 73-4)

There are 5 buildings at the site. Most of the buildings appeared to be in the same condition as they were in 1996 (PWGSC, 1997). Buildings locations are marked on the site map (Figure 1). A pile wooden platforms or collapsed walls occurs adjacent to the lower adit. There could be part of a collapsed

Building 73A: Cabin

Dimensions (L x W x H): The main building measures 6m x 5m x 2.5m; there is a small addition on the southwest corner.

Construction: wooden framed

Paint: none observed

Asbestos: none observed

Foundation: none

Non-Hazardous Contents: table, shelves, kitchen sink, bed frame

Hazardous Contents: none observed

Building 73B: Shed

The shed is fairly unstable: the roof has partially collapsed and the floor is in fair to poor condition.

Dimensions (L x W x H): 5m x 4.5m x 2m

Construction: wooden framed

Paint: none observed

Asbestos: none observed

Foundation: none

Non-Hazardous Contents: none observed

Hazardous Contents: none observed

Building 73C: Wooden Tent Platform

The floor is in fair to poor condition.

Dimensions (L x W x H): 3m x 3m

Construction: wooden framed

Paint: none observed

Asbestos: none observed

Foundation: none

Non-Hazardous Contents: none observed

Hazardous Contents: none observed

Building 73D: Wooden Tent Frame

This open topped structure was designed to be covered by a canvas roof. The walls and floor are in reasonable condition.

Dimensions (L x W x H): 3m x 3m x 2.5m

Construction: wooden framed

Paint: none observed

Asbestos: none observed

Foundation: none

Non-Hazardous Contents: none observed

Hazardous Contents: none observed

Building 73E: Wooden Outhouse

The outhouse leans at angle, but is in stable condition.

6.2 Fuel Storage

There were no fuel tanks or drums still containing fuel encountered at the site. Thirteen empty 205 litre steel barrels were observed below the waste rock from the lower adit. Four were marked as having contained diesel fuel. The labels for the other barrels had worn off.

6.3 Rail and Trestle

Location: Rail extends from the entrance to the lower adit 30m to a wooden platform at the edge of a waste rock pile.

Fabrication: The trestle is made of non-treated timbers and the rail is made of steel.

Amount of materials: There is less than $5m^3$ of trestle and less than $1m^3$ of rail.

Condition: The trestle that extends beyond the waste rock pile has partially collapsed and is now part of the debris sticking out of the waste rock. The tracks are twisted but in reasonable condition.

6.4 Milling and Processing Infrastructure

No ore was processed at this site.

6.5 Electrical Equipment

No electrical equipment was encountered at this site.

7. SOLID WASTE DUMPS

There are two areas where solid waste has been dumped. There is a small garbage debris site containing mostly waste cans and beer cans located behind the outhouse. At least 13 barrels and an ore car have been scattered below waste rock pile WR-02. No samples were collected.

Garbage Debris Site

Dimensions (L x W x H): 3m x 1.5m area

Drainage: No surface drainage or seeps where observed within 100m of the debris site. Site drainage flows into Faro Gulch.

Impacted vegetation: There was no evidence that the solid waste dump have impacted vegetation.

8. POTENTIAL CONTAMINANTS OF CONCERN

No hazardous waste was encountered at the site. Dissolved metals from either mine or waste rock drainage pose the only risk. See discussion below in the water quality section.

9. WATER QUALITY

The only surface water encountered at the site was flowing from the lower adit at a rate of less than 1 L/s (visual determination). The water flowed at the surface for less than 10m before disappearing into the ground at the northern edge of the waste pile. No water was observed flowing from the upper adit.

In 1996, water samples were collected from four locations. Samples for two of these sites were collected for comparison during the 1999 site visit. Two samples (sample plus a duplicate sample) were collected from upstream of the mine as part of the investigation of the Keno #9 Vein site (site #36). A summary of the sites and the field measurements taken in 1996 and in 1999 is presented in Table 1.

Table 1: 1996 and 1999 Field Data for Surface Water Sampling

1996 Sample No.	1999 Sample No.	Location	1996 Flow	1999 Flow	1996 pH	1999 pH	1996 Cond. (µS/cm)	1999 Cond. (µS/cm)
GAWQ/Str001	Not Sampled	Faro Gulch, 1km downstream of mine area	8 L/s	N/A	8	N/A	390	N/A
Not Sampled	73WQ-Str01-01/-02	Seep from toe of slope, 200m below the lower adit.	N/A	1 L/min	N/A	8.1	N/A	140
GAWQ/Str002	Not Sampled	Tributary of Faro Gulch, 400m below camp	2 L/s	N/A	8	N/A	440	N/A
Not Sampled	73WQ-Str02-01/-02	Faro Gulch 400m below camp.	N/A	2 L/min	N/A	8.2	N/A	340
GAWQ/Str003	9Vein(S1)@Waste-Rock-09/18/99	Faro Gulch, upstream of mine and waste rock area	4 L/s	N/A	7	6.2	840	500
GAWQ/S100	73WQ-AD1-01/-02	5m from lower adit on north edge of waste rock	<1 L/s	1 L/min	7	7.9	50	20

10. RECLAMATION

No active reclamation has taken place at the site. Due to the high elevation and aspect, natural revegetation has been slow to grow back.

11. OTHER INFORMATION AND DATA

As part of the 1993 Arctic Environmental Strategy Action on Waste program, DIAND Technical Services completed Phase I environmental assessments of abandoned exploration and mine sites. On the basis of the initial assessments, Gambler was one of the sites selected for further investigation. A Phase II investigation of Gambler was undertaken by SRK in 1996 for Public Works and Government Services Canada (PWGSC, 1997). The results from this investigation can be as an attachment to this report. Personnel investigating the site in 1999 did not observe any physical changes at the site compared to what was reported in 1996.

12. REFERENCES

Public Works and Government Services Canada. 1997. *Phase II Environmental Assessment of the Gambler Abandoned Mine Site*. Report No. P118401, prepared by Steffen Robertson and Kirsten Inc.

Boyle, R.W., 1965. *Lead-Zinc-Silver Deposits, Keno Hill-Galena-Hill Area,* Geological Survey of Canada, Bulletin 111.

ATTACHMENT 2: 1999 GAMBLER WATER SAMPLES LABORATORY RESULTS						
Sample Number	**Detection Limit**	**Units**	**73WQ-A01-01/02 - Gambler - 99/09/16**	**73 WQ-A01-03/04 - Gambler - 99/09/16**	**73WQ-Str01-01/02 - Gambler - 16/09/99**	**73WQ-Str02-01/02 - Gambler - 16/09/99**
Site Description			5m from Lower Adit on north edge of waste rock	5m from Lower Adit on north edge of waste rock: Duplicate	Seep from toe of slope 200m below Lower Adit	Faro Gulch, downstream of mine and waste rock drainage
pH (field)	na	pH	7.9	na	8.1	8.2
Conductivity (field)	na	µS/cm	20	na	140	340
pH (Lab)	0.01	pH	6.71	6.23	7.78	7.24
Conductivity (Lab)	0.01	µS/cm	59	58	520	360
Total Alkalinity	5	mg CaCO3/L	6	6	82	25
Chloride	0.25	mg/L	na	na	<0.25	<0.25
Chloride	0.01	mg/L	0.07	0.06	na	na
Hardness (CaCO3 equiv)	5	mg/L	22	23	251	158
Nitrate-N	0.05	mg/L	0.32	0.32	0.17	0.3
Nitrite-N	0.003	mg/L	<0.003	<0.003	<0.003	<0.003
Sulphate	1	mg/L	18	17.8	177	137
Total Dissolved Solids	5	mg/L	38	45	354	249
Analysis by ICP-USN						
Aluminum	0.0008	mg/L	0.01	0.0098	0.139	0.0371
Antimony	0.005	mg/L	<0.005	<0.005	<0.005	<0.005
Arsenic	0.01	mg/L	0.01	<0.01	<0.01	<0.01
Barium	0.00004	mg/L	0.00474	0.00437	0.0285	0.027
Beryllium	0.00001	mg/L	<0.00001	<0.00001	<0.00001	<0.00001
Bismuth	0.0004	mg/L	<0.0004	<0.0004	<0.0004	<0.0004
Boron	0.002	mg/L	<0.002	<0.002	<0.002	<0.002
Cadmium	0.00006	mg/L	0.0134	0.0129	0.00219	0.00659
Calcium	0.002	mg/L	6.3	6.16	73.4	42.6
Chromium	0.00006	mg/L	<0.00006	<0.00006	0.0004	0.00031
Cobalt	0.00003	mg/L	<0.00003	<0.00003	0.00016	0.00061
Copper	0.00003	mg/L	0.00041	0.00242	0.00198	0.00193
Iron	0.00001	mg/L	0.105	0.114	0.331	0.152
Lead	0.0003	mg/L	0.0278	0.0241	0.0045	0.019
Lithium	0.001	mg/L	<0.001	<0.001	0.002	<0.001
Magnesium	0.0005	mg/L	1.06	1.05	16.9	12.7
Manganese	0.00002	mg/L	0.00638	0.00829	0.0326	0.364
Mercury	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001
Molybdenum	0.00007	mg/L	<0.00007	<0.00007	0.00051	0.00012
Nickel	0.00001	mg/L	0.0039	0.0039	0.002	0.0109
Phosphorus	0.03	mg/L	<0.03	0.43	<0.03	<0.03
Potassium	0.4	mg/L	<0.4	<0.4	<0.4	<0.4
Selenium	0.004	mg/L	<0.004	<0.004	<0.004	<0.004
Silicon	0.004	mg/L	1.86	1.83	2.73	1.53
Silver	0.00005	mg/L	<0.00005	<0.00005	<0.00005	0.00014
Sodium	0.004	mg/L	0.4	<0.4	1.2	0.5
Strontium	0.00002	mg/L	0.0214	0.0201	0.279	0.12
Sulphur	0.008	mg/L	5.71	5.58	53.6	44
Thallium	0.001	mg/L	<0.001	<0.001	<0.001	<0.001
Titanium	0.00002	mg/L	<0.00002	<0.00002	0.00462	0.00066
Vanadium	0.00003	mg/L	<0.00003	<0.00003	0.00017	<0.00003
Zinc	0.0002	mg/L	1.12	1.15	0.234	0.551
Zirconium	0.00004	mg/L				
Analysis by Hydide AA						
Arsenic	0.0002	mg/L	0.01	0.0038	0.0013	0.0008
Selenium	0.0001	mg/L	<0.0001	<0.0001	0.0003	0.0002

Water Quality Results - Gambler Site

Sample ID. / Sample Date	GA/WQ/ Str001 18-Sep-96	GA/WQ/ Str002 18-Sep-96	GA/WQ/ Str003 18-Sep-96	GA/WQ/ S100 18-Sep-96	CCME Freshwater Aquatic Life
Physical Tests					
Conductivity (umhos/cm)	371	456	792	79.2	NA
Hardness (as $CaCO_3$)	166	228	396	26	NA
pH	7.69	7.95	6.99	6.99	6.5 - 9.0
Dissolved Anions					
Acidity (as $CaCO_3$)	2.0	2.0	7.1	3.1	NA
Alkalinity - Total (as $CaCO_3$)	42.5	73.2	12.7	4.9	NA
Sulphate (as SO_4)	131	143	403	22.4	NA
Total Metals					
Aluminum T-Al	**0.111**	**0.337**	**0.138**	**0.14**	0.005 to 0.1 *
Arsenic T-As	0.0048	0.0009	0.0113	**0.0738**	0.05
Barium T-Ba	0.03	0.05	0.02	<0.01	NA
Beryllium T-Be	<0.005	<0.005	<0.005	<0.005	NA
Boron T-B	<0.1	<0.1	<0.1	<0.1	NA
Cadmium T-Cd	0.004	<0.0002	**0.0238**	**0.0114**	0.002 to 0.018 *
Calcium T-Ca	46.5	70.9	88.6	7.94	NA
Chromium T-Cr	<0.001	<0.001	<0.001	<0.001	NA
Cobalt T-Co	<0.02	<0.02	<0.02	<0.02	NA
Copper T-Cu	0.003	<0.001	0.003	**0.014**	0.002 to 0.004 *
Iron T-Fe	**0.32**	0.04	0.23	**1.08**	0.3
Lead T-Pb	**0.091**	<0.001	**0.074**	**0.805**	0.001 to 0.007
Lithium T-Li	<0.02	0.05	<0.02	<0.02	NA
Magnesium T-Mg	12	12.3	42.6	1.5	NA
Manganese T-Mn	0.142	<0.005	1.43	0.275	NA
Mercury T-Hg	<0.00005	<0.00005	<0.00005	<0.00005	0.0001
Molybdenum T-Mo	<0.03	<0.03	<0.03	<0.03	NA
Nickel T-Ni	<0.02	<0.02	0.03	<0.02	0.025 to 0.150
Selenium T-Se	**0.0012**	**0.0014**	**0.002**	0.0006	0.001
Silver T-Ag	**0.0005**	<0.0001	**0.0008**	**0.004**	0.0001
Sodium T-NA	<2	<2	<2	<2	NA
Vanadium T-V	<0.03	<0.03	<0.03	<0.03	NA
Zinc T-Zn	**0.35**	0.008	**3.58**	**1.05**	0.03

NOTES:

CCME = Canadian Council of Resource and Environmental Ministers
All concentrations are in mg/L unless stated otherwise.
0.004 = number in bold exceeds CCME criteria for parameter listed

str = stream sample
S = seep (groundwater) sample
A = adit sample

Aluminum: 0.1 mg/L if pH >6.5, Ca^{2+} >4.0 mg/L, and DOC >2.0 mg/L
Cadmium: 0.008 mg/L if hardness is 60 - 120 mg/L $CaCO_3$
0.018 mg/L if hardness is >180 mg/L $CaCO_3$
Chromium: 0.02 mg/L to protect fish and 0.002 mg/L to protect aquatic life, including zooplankton and phytoplankton.

Copper: 0.002 mg/L if hardness is 0 - 120 mg/L $CaCO_3$
0.004 mg/L if hardness is >180 mg/L $CaCO_3$
Lead: 0.002 mg/L if hardness is 60 - 120 mg/L $CaCO_3$
0.004 mg/L if hardness is 120 - 180 mg/L $CaCO_3$
0.007mg/L if hardness is >180 mg/L $CaCO_3$
Nickel: 0.065 mg/L if hardness is 60 - 120 mg/L $CaCO_3$
0.150mg/L if hardness is >180 mg/L $CaCO_3$

Waste Rock Test Results

Parameter	Units	Sample Number GAWR/			
		P201	P202	P203/1	P203/2
Field Paste pH		6.62	4.78	3.47	3.02
Field Cond	μS/cm	10	330	350	470
Lab Paste pH		7.62	5.71	5.74	4.30
Total Sulfur	%	0.07	3.75	1.37	1.11
Sulfate	%	0.05	0.24	0.28	0.17
AP		0.6	109.7	34.1	29.4
NP		-1.6	7.8	9.1	2.0
NET NP		-2.2	-101.9	-24.9	-27.4
NP/AP		<0.1	<0.1	0.30	<0.1
Aluminum	%	0.22	0.23	0.16	0.46
Antimony	ppm	9	614	127	28
Arsenic	ppm	1357	905	1135	1836
Barium	ppm	60	36	39	45
Beryllium	ppm	<0.1	<0.1	<0.1	<0.1
Bismuth	ppm	<1	8	<1	<1
Cadmium	ppm	<0.1	>100	33.9	27.6
Calcium	%	0.09	0.30	0.54	0.26
Chromium	ppm	142	84	92	114
Cobalt	ppm	6	9	6	3
Copper	ppm	16	635	101	20
Gallium	ppm	<1	<1	<1	<1
Iron	%	1.62	4.64	3.95	2.00
Lead	ppm	547	>10000	>10000	1142
Lithium	ppm	2	<1	<1	<1
Magnesium	%	0.04	0.19	0.10	0.04
Manganese	ppm	372	9792	4399	940
Molybdenum	ppm	6	21	11	6
Nickel	ppm	18	57	33	12
Potassium	%	0.05	0.05	0.06	0.07
Phosphate	ppm	420	450	650	500
Silver	ppm	2.7	>200	108.3	17.3
Sodium	%	<0.01	<0.01	<0.01	<0.01
Strontium	ppm	17	14	13	11
Thorium	ppm	<1	<1	<1	<1
Tin	ppm	2	8	5	2
Titanium	%	<0.01	<0.01	<0.01	<0.01
Tungsten	ppm	8	97	14	10
Uranium	ppm	<1	<1	<1	<1
Vanadium	ppm	6.4	5.8	6.2	3.6
Zinc	ppm	214	>10000	5383	2088

AP = Acid Potential in tonnes $CaCO_3$ equivalent per 100 tonnes of material
NP = Neutralization Potential in tonnes $CaCO_3$ equivalent per 1000 tonnes of material
Net NP = Net Neutralization Potential = tonnes $CaCO_3$ equivalent per 1000 tonnes of material
na = no assay / analysis
< = lower detection limit
> = upper detection limit

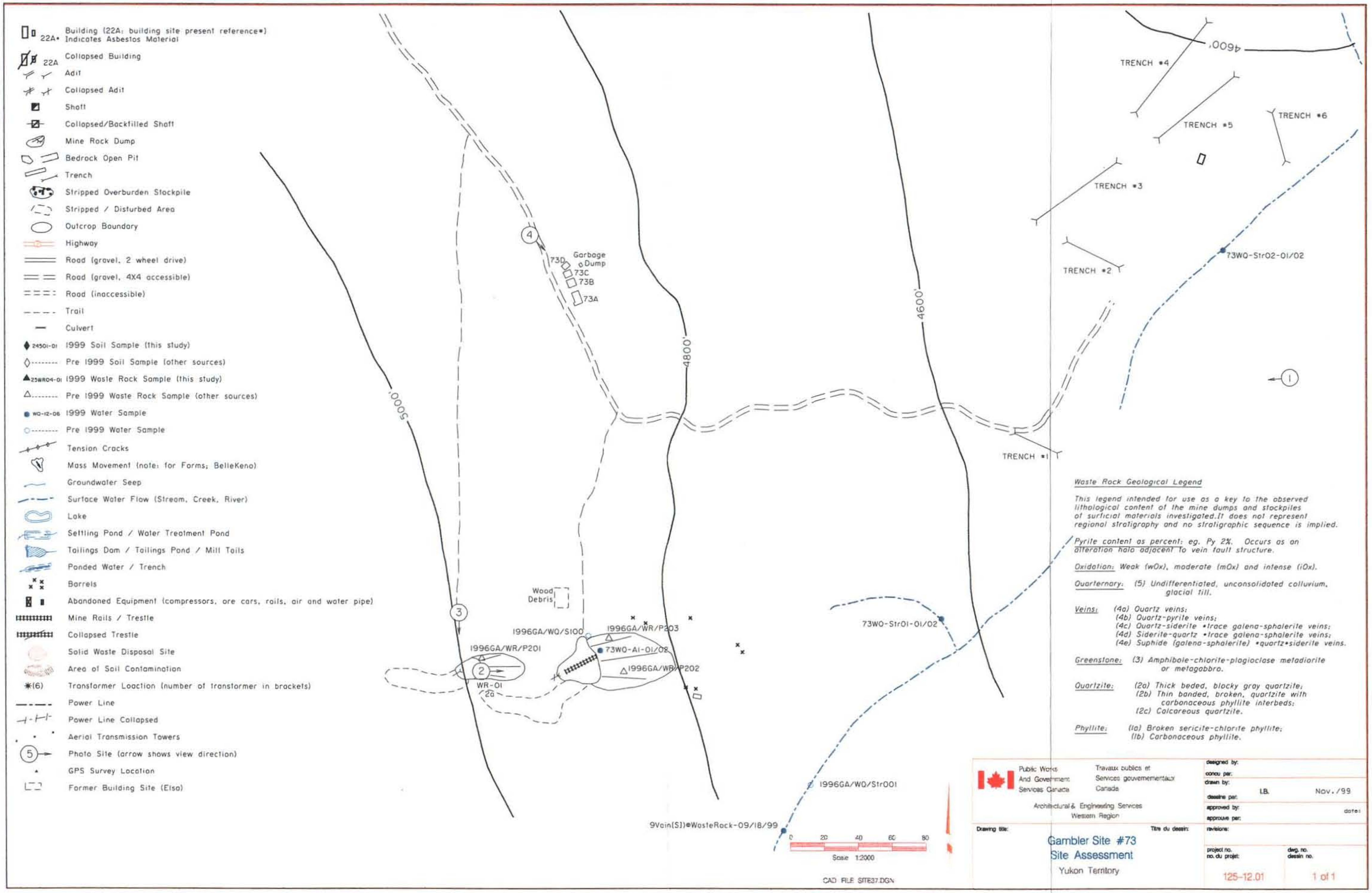
CLIENT : ASL LTD.
PROJECT : PWGSC
PROJECT # : P118041
TEST : MODIFIED SOBEK METHOD ACID-BASE ACCOUNTING

SAMPLE #	PASTE pH	S(T) %	S(SO4) %	AP	NP	NET NP	NP/AP
CL/WR/P201	8.79	0.20	0.05	4.7	36.5	31.8	7.8
CL/WR/P202	7.90	1.40	0.56	26.3	370.6	344.4	14.1
CL/WR/P203	9.39	0.09	0.05	1.3	4.9	3.7	4.0
GA/WR/P201	7.62	0.07	0.05	0.6	-1.6	-2.2	<0.1
GA/WR/P202	5.71	3.75	0.24	109.7	7.8	-101.9	<0.1
GA/WR/P203/1	5.74	1.37	0.28	34.1	9.1	-24.9	0.3
GA/WR/P203/2	4.30	1.11	0.17	29.4	2.0	-27.4	<0.1
GA/WR/P204	6.68	0.11	0.05	1.9	3.4	1.6	1.8
GA/WR/P205	7.83	0.71	0.18	16.6	111.3	94.7	6.7
GA/WR/P206	8.47	0.30	0.17	4.1	103.9	99.8	25.6
GA/WR/P207	8.46	0.70	0.16	16.9	109.0	92.1	6.5
TI/WR/P1-1	8.65	0.82	0.57	7.8	669.5	661.7	85.7

AP = ACID POTENTIAL IN TONNES CaCO3 EQUIVALENT PER 1000 TONNES OF MATERIAL.

NP = NEUTRALIZATION POTENTIAL IN TONNES CaCO3 EQUIVALENT PER 1000 TONNES OF MATERIAL.

NET NP = NET NEUTRALIZATION POTENTIAL = TONNES CaCO3 EQUIVALENT PER 1000 TONNES OF MATERIAL.



Building (22A: building site present reference*)
22A* Indicates Asbestos Material
22A Collapsed Building
Adit
Collapsed Adit
Shaft
Collapsed/Backfilled Shaft
Mine Rock Dump
Bedrock Open Pit
Trench
Stripped Overburden Stockpile
Stripped / Disturbed Area
Outcrop Boundary
Highway
Road (gravel, 2 wheel drive)
Road (gravel, 4X4 accessible)
Road (inaccessible)
Trail
Culvert
24501-01 1999 Soil Sample (this study)
Pre 1999 Soil Sample (other sources)
25WR04-01 1999 Waste Rock Sample (this study)
Pre 1999 Waste Rock Sample (other sources)
WO-12-06 1999 Water Sample
Pre 1999 Water Sample
Tension Cracks
Mass Movement (note: for Forms; BelleKeno)
Groundwater Seep
Surface Water Flow (Stream, Creek, River)
Lake
Settling Pond / Water Treatment Pond
Tailings Dam / Tailings Pond / Mill Tails
Ponded Water / Trench
Barrels
Abandoned Equipment (compressors, ore cars, rails, air and water pipe)
Mine Rails / Trestle
Collapsed Trestle
Solid Waste Disposal Site
Area of Soil Contamination
*(6) Transformer Loaction (number of transformer in brackets)
Power Line
Power Line Collapsed
Aerial Transmission Towers
5 Photo Site (arrow shows view direction)
GPS Survey Location
Former Building Site (Elsa)
5000'
4800'
4600'
4600'
TRENCH #1
TRENCH #2
TRENCH #3
TRENCH #4
TRENCH #5
TRENCH #6
73WO-StrO2-01/02
73WO-StrO1-01/02
1996GA/WO/StrOO1
9Vein(S1)@WasteRock-09/18/99
Garbage Dump
73D
73C
73B
73A
Wood Debris
1996GA/WO/S100
1996GA/WR/P203
1996GA/WR/P201
73WO-A1-01/02
1996GA/WR/P202
WR-01
2a
1
2
3
4
Waste Rock Geological Legend
This legend intended for use as a key to the observed lithological content of the mine dumps and stockpiles of surficial materials investigated. It does not represent regional stratigraphy and no stratigraphic sequence is implied.
Pyrite content as percent; eg. Py 2%. Occurs as an alteration halo adjacent to vein fault structure.
Oxidation: Weak (wOx), moderate (mOx) and intense (iOx).
Quarternary: (5) Undifferentiated, unconsolidated colluvium, glacial till.
Veins: (4a) Quartz veins;
(4b) Quartz-pyrite veins;
(4c) Quartz-siderite +trace galena-sphalerite veins;
(4d) Siderite-quartz +trace galena-sphalerite veins;
(4e) Suphide (galena-sphalerite) +quartz+siderite veins.
Greenstone: (3) Amphibole-chlorite-plagioclase metadiorite or metagabbro.
Quartzite: (2a) Thick beded, blocky gray quartzite;
(2b) Thin banded, broken, quartzite with carbonaceous phyllite interbeds;
(2c) Calcareous quartzite.
Phyllite: (1a) Broken sericite-chlorite phyllite;
(1b) Carbonaceous phyllite.
0 20 40 60 80
Scale 1:2000
CAD FILE SITE37.DGN
Public Works And Government Services Canada
Travaux publics et Services gouvernementaux Canada
Architectural & Engineering Services
Western Region
Drawing title:
Titre du dessin:
Gambler Site #73
Site Assessment
Yukon Territory
designed by:
concu par:
drawn by:
I.B.
Nov./99
dessine par:
approved by:
approuve par:
date:
revisions:
project no.
no. du projet:
125-12.01
dwg. no.
dessin no.
1 of 1

Photo 73-1: Overview of Gambler site showing mine workings to left, camp buildings left of middle, and more recent surface cat trenches at bottom.

Photo 73-2: Overview of lower adit level from upper adit level. Photo Direction (Azimuth 060°)

Photo 73-3: Upper Gambler adit level. (Azimuth 170°)

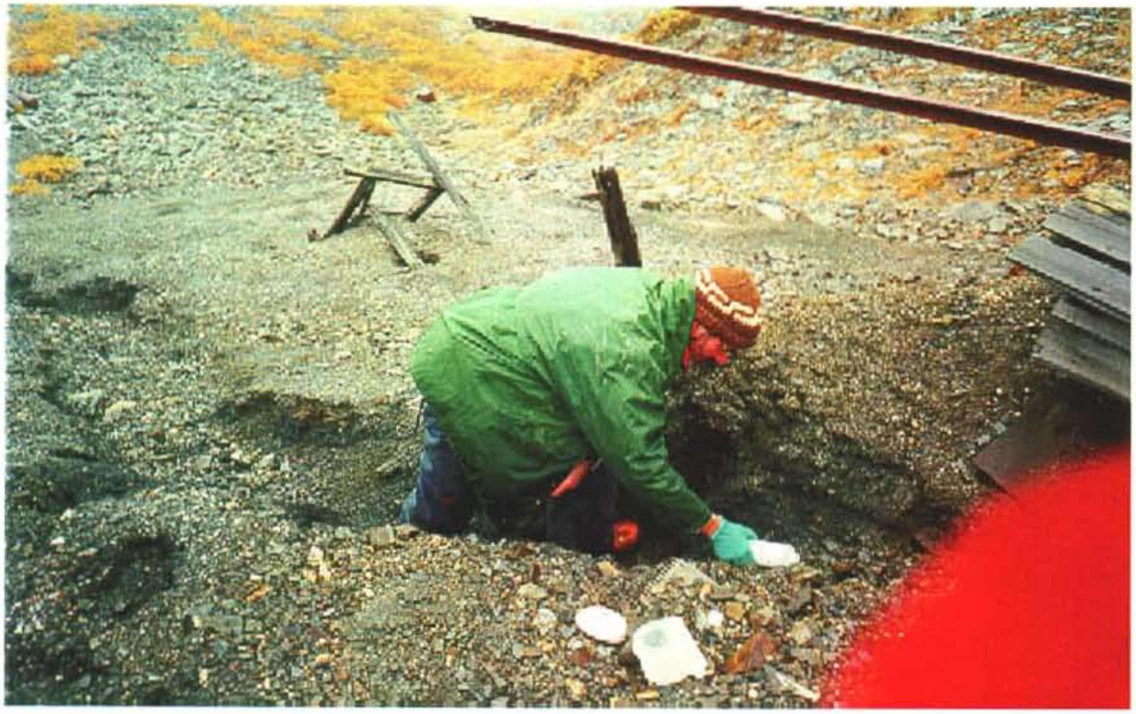


Photo 73-4: Lower Gambler adit drainage sample site (73-WQ-A01-01/-02). (Azimuth 070°)

Photo 73-5: Overview of Gambler camp buildings. No changes noted since 1996 inspection. (Azimuth 130°)

BEMA (#75)
(MINFILE# 105M 073)

1. LOCATION AND ACCESS

The Bema site is located on the side of the southwest slope of McMillan Gulch. It is about 10 km east of Keno and accessible by helicopter. The UTM coordinates for the Bema site are 7087360 m N 494960 m E. Its elevation is about 1375 m.

2. SITE PHYSIOGRAPHY

The Bema site consists of a single trench dug along the contour of a hill. The overburden at the site is composed of boulders about 20 cm in diameter. Water runoff drains towards McMillan Gulch.

3. GEOLOGY AND MINERALIZATION

The major rock type observed at the Bema site was grey quartzite. The mineralization observed included white quartz veining and minor limonite. The minfile reports 3 zones of quartz veining at the site. Two of these veins are reported to contain disseminated galena with Ag; the third is reported to contain minor disseminated arsenopyrite with Ag and Au.

4. SITE HISTORY

The minfile reports that work at the site from 1979 to 1981 was restricted to geochemistry.

5. MINE DEVELOPMENT

5.1 Mine Openings and Excavations

Trench 1 (photo 75-1)

Trench 1 is the only development at the Bema site. It is an exploratory bulldozer trench cut along the contour of the hill. A ripper slot extends about 150 m north down a spur from the trench.

Dimensions: 118 m x 3 m x 1.5 m
Condition: stable

5.2 Waste Rock Disposal Areas

A small pile of overburden is located on the downhill side of the trench. There were no waste rock piles containing mineralization observed at the site.

5.3 Tailings Impoundments

No tailings were observed at the Bema site.

5.4 Minesite Water Treatment

No water treatment occurs at the Bema site.

6. MINE SITE INFRASTRUCTURE

No infrastructure was observed at the Bema site

7. SOLID WASTE DUMPS

No solid waste dumps were observed at the Bema site.

8. POTENTIAL CONTAMINANTS OF CONCERN

No potential contaminants of concern were observed at the Bema site.

9. WATER QUALITY

No surface water was observed at the Bema site. Surface water runoff from the area drains towards McMillan Gulch. No water quality samples were taken at this site.

10. RECLAMATION

The Bema site is naturally sparse in vegetation due to poor soil conditions. The development at the Bema site has not disturbed the existing vegetation significantly.

Photo 75-1: View along length of trench cut into side of hill (Trench1) at Bema site.

TOWNSITE MINE # 76
(MINFILE # omitted from minfile)

1. LOCATION AND ACCESS

Site access from the Elsa Townsite is at the junction of Calumet Drive and Wernecke Road travel 6.2 km along Calumet Drive to the Townsite Portal. This road is two wheel-drive accessible. The Townsite mine is located at an approximate elevation of 1365m. UTM co ordinates for the site are 7,087,800m N 479,500m E.

2. SITE PHYSIOGRAPHY

The site is on a Northwest facing slope, dipping @ ~20% overlooking the McQuesten Valley. Above and below the site are areas of frost heaved Quartzite boulders. There are very minimal soils present. The site drains into Sandy Creek, although the drainage pattern is not very well developed.

The surrounding vegetation consists of well spaced, stunted black spruce, willows, and alder with a floor covering of mosses, indicative of a permafrost environment.

3. GEOLOGY AND MINERALIZATION

The site is situated in thick bedded quartzites and there are no indications of any mineralized surface outcrops(see section 5.2 re: waste dump).

4. SITE HISTORY

In 1972 a 350m adit was driven through thick bedded quartzites to intersect the faulted offsets of the Hector-Calumet vein system. From 1972 through 1975 16,846 tonnes of ore were produced from two vein systems.

5. MINE DEVELOPMENT

5.1 Mine Openings and Excavations

Adit

The portal is caved and totally blocked. There is no sign of any drainage from the adit. All rail and services appear to have been removed prior to the cave in. The estimated dimensions of the drift are 2m wide x 2.5m high. The adit is reported to be 350m in length with over 650m of crosscuts and drifts on the 50(·evel. The adit is inaccessible and the portal area constitutes a minor hazard of rock fall from the walls of the excavation.

Shafts

No raises were observed. The raise shown on the mine drawings is reported to have been back filled and sealed.

Open Pits

There are no open pits associated with this site.

Trenches

No trenches were observed at this site.

5.2 Waste Rock Disposal Areas

Underground Dump and Loadout Area

Comprised of development waste rock, vein material and the quartzite excavated to collar the portal. (~ 13,000 tonnes). The dump consists of barren quartzite, schist and quartz veining. It exhibits moderate limonite staining (Oct. 1 F05-P09). There is a small kill zone directly below the dump (~30 m down slope x ~10 m Wide), which does not appear to be regenerating vegetation. There is no sign of any appreciable surface drainage through the dump. Two samples were reported in the literature. These samples consisted of ABA testing conducted in 1995 on two samples, one indicating that it had the potential to produce acid.

LOCATION	SAMPLE ID	PASTE PH	S (tot.) %	S (SO4) %	AP	NP	NET NP	NP/AP
Adit Dump	95UKHTD01	6.33	1.16	0.11	32.81	0.00	-32.8	<0.10
Adit Dump	95UKHTD02	6.78	0.33	0.26	2.19	0.00	-2.2	<0.10

Note: AP and NP are calculated in kg CaCO3/tonne

5.3 Tailings Impoundments

No tailings impoundments were noted at the site.

5.4 Tailings Ponds

No tailings ponds were noted at the site.

5.5 Minesite Water Treatment

There is no minesite water treatment being conducted at this site.

6. MINE SITE INFRASTRUCTURE

6.1 Buildings

There are two buildings at the site. Building 76A serves as a workshop and office accommodations on two separate levels. Building 76B is the portal entranceway. There was building debris scattered around the site, however, there was no visual sign of staining on the surrounding soils. Wood cribbing and some wood sheathing (photo 76-1) is located to the west of the road to reinforce a waste rock dump that was used as a loading area (photo 76-2).

Building 76A – Office/Workshop (photo 76-3)

Office and workshop combined. Flooring is dirt on the lower level that has sustained some staining due to the nature of operations. Fibreglass insulation was used in the office area.
Location: Listed as Building 76A on the Townsite mine location map.
Dimensions (L x W x H): 3m x 3m x 3m
Construction: Wood frame construction with tarpaper exterior and asphalt shingle roofing.
Paint: White paint was applied to the interior, however, most of the paint had worn off.
Asbestos: There is the possibility of the office floor tiles having asbestos (see samples below).
Foundation: Raised wood foundation.
Non-Hazardous Contents: No non-hazardous contents were found in the building.
Hazardous Contents: No hazardous contents were found in the building.
Samples: No samples were taken at building 76A. The tile flooring in the building was similar in nature to the tiles found at the Dixie Mine in Building 4A. Analyses completed on the sample indicated that there was some asbestos fiber in the sample, however, it tested between 1-10% indicating that there is very little asbestos in the tiles.

Building 76B - Adit Entrance (photo 76-4)

The portal structure was collapsed, there is timber cribbing visible, however, the rock overhang has caved in and the structure is considered a safety hazard. No services were noted at the portal. There was no drainage evident from the structure. No samples were taken at building 76B.

6.2 Fuel Storage

There was no indication of above ground storage tanks at the site. No surficial staining was noted around the exterior of the buildings. There was minor staining on the floor in the interior of the workshop.

6.3 Rail and Trestle

There had historically been a rail structure at the site however, there was only the cross timber infrastructure remaining.

6.4 Milling and Processing Infrastructure

There was no milling or processing infrastructure at the site.

6.5 Electrical Equipment

There were no power lines associated with the site.

7. SOLID WASTE DUMPS

There is a landfill (~60 m x 25 m x 4 m) situated approximately 150 meters west of the Townsite site (photo 76-5). The landfill reportedly contains metal debris (rails, bed frames, pipe & discarded machinery), empty drums and lumber capped with mine waste rock. This site was used by the Calumet town and nearby mines as their garbage dump (Personal Communication - M. Phillips) and may contain other unidentified wastes. There is no sign of any appreciable drainage through the dump. There is no sign of any vegetation stress around the toe of the landfill and the surface of the landfill is revegetating. No sampling was conducted.

8. POTENTIAL CONTAMINANTS OF CONCERN

8.1 Out-of-Service Transformers

No transformers were noted at the site.

8.2 Metals and Hydrocarbons in Soil

There was no evidence of surface staining at the site.

8.3 Solid Hazardous Materials

No solid hazardous waste was noted at the site.

9. WATER QUALITY

No water samples were taken at the site as there was no indication of water draining from the adit. There were no streams located nearby and no seepage was noted at the toe of the dump.

10. RECLAMATION

The site does not appear to be greatly disturbed by historical mining practices. There is one kill zone associated with the waste rock area that is not revegetating. Those areas associated with solid waste disposal do not appear to have produced any kill zones.

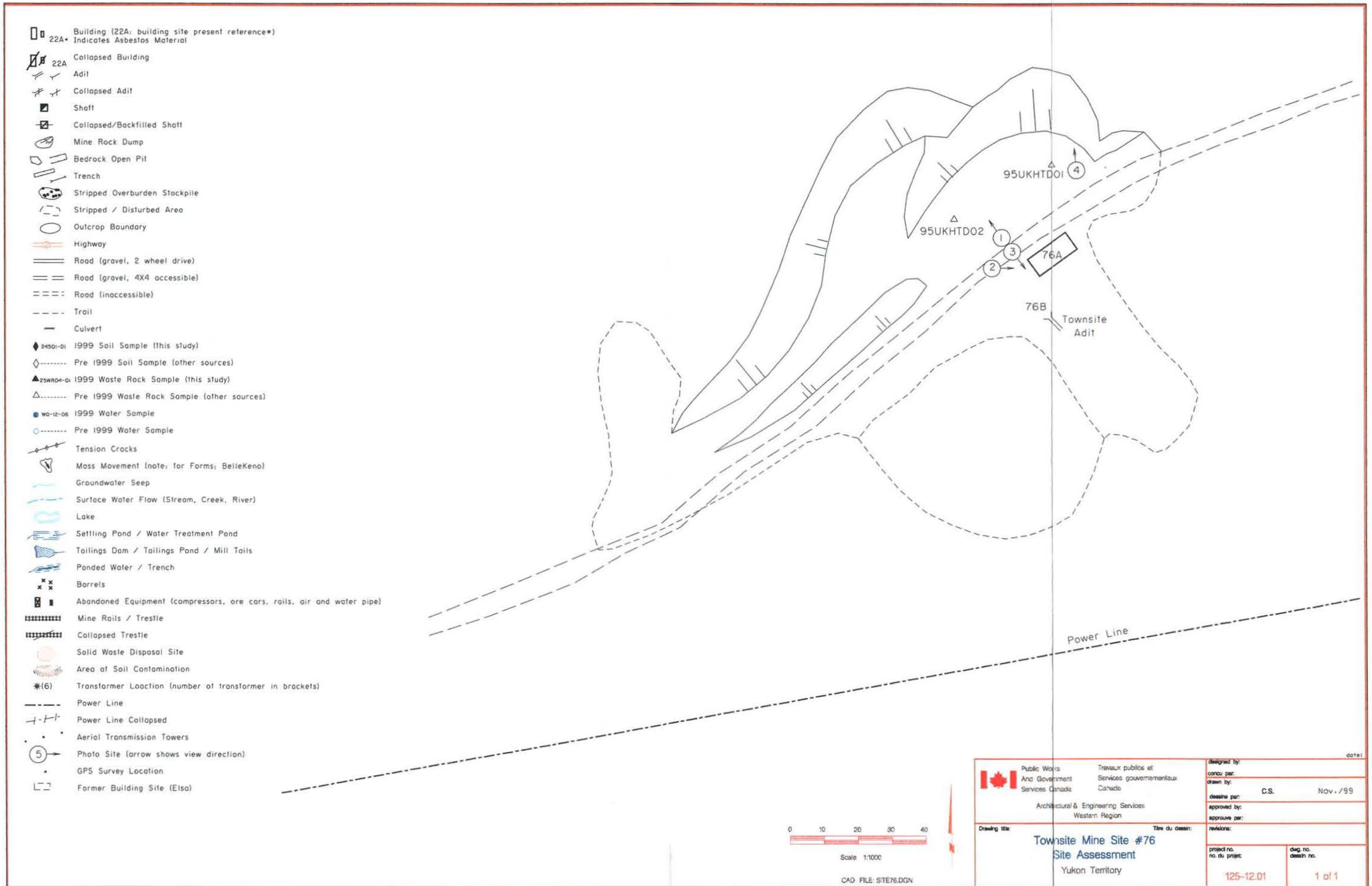
11. OTHER SOURCES OF INFORMATION AND DATA

No other sources of information and data were identified.

12. REFERENCES AND PERSONAL COMMUNICATIONS

United Keno Hill Mines Limited. 1996. *United Keno Hill Mines Limited – Site Characterization.* Report No. UKH/96/01, prepared by Access Mining Consultants Limited.

United Keno Hill Mines Limited. 1996. *United Keno Hill Mines Limited – Site Characterization, Technical Appendices I-VI.* Report No. UKH/96/01, prepared by Access Mining Consultants Limited.



22A• Building (22A: building site present reference*) Indicates Asbestos Material
22A Collapsed Building
Adit
Collapsed Adit
Shaft
Collapsed/Backfilled Shaft
Mine Rock Dump
Bedrock Open Pit
Trench
Stripped Overburden Stockpile
Stripped / Disturbed Area
Outcrop Boundary
Highway
Road (gravel, 2 wheel drive)
Road (gravel, 4X4 accessible)
Road (inaccessible)
Trail
Culvert
24501-01 1999 Soil Sample (this study)
Pre 1999 Soil Sample (other sources)
25WR04-01 1999 Waste Rock Sample (this study)
Pre 1999 Waste Rock Sample (other sources)
WO-12-06 1999 Water Sample
Pre 1999 Water Sample
Tension Cracks
Mass Movement (note: for Forms; BelleKeno)
Groundwater Seep
Surface Water Flow (Stream, Creek, River)
Lake
Settling Pond / Water Treatment Pond
Tailings Dam / Tailings Pond / Mill Tails
Ponded Water / Trench
Barrels
Abandoned Equipment (compressors, ore cars, rails, air and water pipe)
Mine Rails / Trestle
Collapsed Trestle
Solid Waste Disposal Site
Area of Soil Contamination
(6) Transformer Loaction (number of transformer in brackets)
Power Line
Power Line Collapsed
Aerial Transmission Towers
5 Photo Site (arrow shows view direction)
GPS Survey Location
Former Building Site (Elsa)
95UKHTD01
4
95UKHTD02
1
3
2
76A
76B
Townsite Adit
Power Line
0 10 20 30 40
Scale 1:1000
CAD FILE: STE76.DGN
Public Works And Government Services Canada
Travaux publics et Services gouvernementaux Canada
Architectural & Engineering Services Western Region
Drawing title: Titre du dessin:
Townsite Mine Site #76
Site Assessment
Yukon Territory
designed by: concu par:
drawn by: dessine par: C.S.
date: Nov./99
approved by: approuve par:
revisions:
project no. no. du projet 125-12.01
dwg. no. dessin no. 1 of 1

Photo 76-1: Facing north from the adit across loading area and dump site.

Photo 76-2: Timber retaining structure for the loading area.

Photo 76-3: Timber frame structure to the northeast of the adit.

Photo 76-4: Tcollapsed adit in the background.

Photo 76-5: Photo taken 150m below the Townsite mine waste dump of the solid waste dump.

SADIE LADUE 600 ADIT (#77)
(NO MINFILE)

1. LOCATION AND ACCESS

The Sadie Ladue 600 adit is 6 km north of the community of Keno City at an approximate elevation of 1115 metres above sea level (Figure 1). It is located at the approximate UTM co-ordinates 7 092 700m N and 485 950m E. Access to the property is by a 1-km trail leading north from the abandoned mining community of Wemecke. An alternate route is from Keno City along Wernecke Road to the Sadie Ladue 600 Adit trail; the latter is washed out in several places but can be driven with a four-wheel drive in dry weather.

2. SITE PHYSIOGRAPHY

The site is on the northwest slope of Keno Hill, and is covered by silt and gravel till overlying bedrock. Sadie Ladue 600 adit is in an area of discontinuous permafrost, although no surface indications of permafrost were observed during the site visit. Dominant vegetation is willow with substantial (30%) black spruce cover.

A mine water discharge of about 600-800 liters/minute flows out of the adit into a vertical shaft beside the adit. The mine water is directed via a 40 cm bolted steel culvert beneath the site and the waste rock pile, finally discharging to a gully below the site. The untreated water drains to an unnamed stream flowing into the small unnamed lake west of Gambler Lake. Upslope of the site, a poorly-defined gully channels snowmelt and runoff water onto the site; surface water then flows past the waste rock dump into a gully below the site. Vegetation stress above and below the site was evident.

3. GEOLOGY AND MINERALIZATION

The commodities of interest at the Sadie Ladue 600 adit site are silver, lead and zinc. The Keno Hill - Galena Hill silver-lead ores occur in erratic shoots and lenses lying in vein-faults that cut fine-bedded to massive quartzite, intercalated greenstone sills and lenses, and various schistose rocks (GSC Paper 68-68, p.21). The wall rocks are highly shattered greenstone (chlorite schists) and phyllite, and the ore body consists of a stockwork of veinlets containing principally siderite, galena, sphalerite, freibergite, pyrite and a small amount of quartz (GSC Bulletin I 11, p. 33). Pyroxenite was also observed on the surface of the Sadie Ladue 600 waste rock dump.

4. SITE HISTORY

The adit and waste rock pile was created between 1921 and 1933 when a drainage tunnel over 900 meters in length, the 600 Ladue tunnel, and over 275 meters of drifting on the ore zone occurred (GSC Summary Report, 1929, Part A, p. 4A). The Ladue No. 2 shaft joins the drainage tunnel 730 meters from the adit entrance. Production from the Ladue Mine ceased in 1933. During the period 1955 to 1957 the 600 Ladue tunnel was rehabilitated and minor development work was completed. In 1968 the 600 Ladue tunnel and the Ladue No. 2 shaft were rehabilitated to their junction point (GSC Paper 68-68, p. 22-23). A limited amount of waste rock was likely generated during the rehabilitation and subsequent underground exploration program. A camp was established at the 600 Ladue portal for the most recent rehabilitation and exploration program.

5. MINE DEVELOPMENT

Mine development at the Sadie Ladue 600 adit site includes collapsed powerhouse and mechanic's shop buildings, a collapsed adit, one waste rock pile with loadout structure, and a log cabin 80 m north of the adit. Site details can be found on Figure 1; see Attachment A for site photos.

5.1 Mine Openings and Excavations

Adit (photo 77-6)

Location: East end of site on northwest facing slope.

Dimensions (L x W x H): N/A

Supports: N/A

Condition: Adit is collapsed.

Accessibility: Adit is still open and accessible.

5.2 Waste Rock Disposal Areas

The waste rock pile at the Sadie Ladue 600 mine site was created with the development of a drainage tunnel over 900 meters in length, the 600 Ladue tunnel, and over 275 meters of drifting on the Ladue vein on the 600 level. A raise connects the 600 Ladue tunnel to the Ladue No. 2 shaft (GSC Summary Report 1929, Part A, p. 4A). Approximately 22,000 tonnes of waste rock from underground development covers an area 3800 m^2 at Sadie Ladue 600. The surface of the waste rock pile is covered with 20% moderately carbonitized rock, 15% moderately chloritized greenstone and pyroxenite and 6% graphitic schist. The remaining surface area is covered with a mixture of greenstone, quartzite, and various schistose rocks (SRK 1997).

In 1996, six waste rock samples were gathered from five test pits. Samples SGWR/P301 and SGWR/P305 were collected from waste rock that exhibited iron carbonate staining on the surface. Sample SGWR/P304 was collected from an area mineralized graphite schist that exhibited whitish secondary mineralization on the surface. Sample SGWR/P303 was collected from the chlorite schist rich portion of the dump. Sample SGWR/P302/1 was collected from the mixed waste rock material on the south side of the pile. Sample SGWR/P302/2 was collected from the iron carbonate stained soil beneath the waste rock. The samples were submitted for Acid Base Accounting (ABA) test and deten-nination of metals by Inductively Coupled Plasma -Atomic Emission Spectrophotometry (ICP-AES). Descriptions of waste rock samples are summarized in Table 2; results of the ABA tests are presented in Attachment B and summarized in Table 1.

All rock samples collected had field and laboratory paste pH values near between 7.5 and 8.5, indicating that the material is not currently generating acid. The Neutralization Potential to Acid Potential (NP:AP) ratios in SGWR/P302/1 and SGWR/P304 were 2.6 and 1.3, indicating that the material is potentially acid generating. Sample P301 has low acid generating potential. It has a NP:AP ratio of 3.0. The remaining samples had NP:AP ratios above 3, indicated a low potential for acid generation.

All the rock samples contained elevated concentrations of silver, iron, and manganese. Sample SGWR/P304 contained elevated concentrations of cadmium, lead, and zinc. Samples SGWR/P301 and SGWR/P305 also contained elevated concentrations of lead and zinc.

Table 1. Summary of 1996 Acid/Base Accounting Test Results

Sample ID	Paste pH	Total S (%)	SO_4 (%)	AP	NP	Net NP	NP/AP
SGWR/P301	8.01	1.22	0.21	31.56	95.94	64.38	3.04
SGWR/P302/1	7.92	1.41	0.18	38.44	101.44	63.00	2.64
SGWR/P302/2	8.28	0.47	n/a	14.69	225.88	211.19	15.38
SGWR/P303	8.08	0.40	n/a	12.50	82.75	70.25	6.62
SGWR/P304	7.46	2.36	0.27	65.31	86.38	21.06	1.32
SGWR/P305	8.12	0.57	0.21	11.25	105.38	94.13	9.37

Table 2. 1996 Waste Rock Sample Descriptions

Sample ID	Sample Description
SGWR/P301	Sample collected at the crest of the rock pile's northern edge in material that exhibited iron carbonate staining on the surface. Sample was collected over a thickness of 20 cm in dark grey/brown silt, sand and gravel size material that included chlorite schist and pyroxenite with minor galena and sphalerite.
SGWR/P302/1	Sample collected from mixed waste rock material at southern edge of the rock pile over a thickness of 30 cm. Material consisted of graphite schist with <1% of the surface exhibiting staining.
SGWR/P302/2	Sample collected over a thickness of 20 cm in sand and silt sized brown soil below P302/1.
SGWR/P303	Sample collected in chlorite schist and greenstone below the load out facility. The sample was collected over a thickness of 40 cm in grey/green in coloured sand and gravel size material.
SGWR/P304	Sample collected from mineralized graphitic schist on the northwest edge of the rock pile. The surface had a whitish precipitate. The sand and gravel size material was collected over a thickness of 30 cm. 1% of the material was cobble size up to 8 cm.
SGWR/P305	Sample collected at the toe of the rock pile northwest comer in material similar to P301. The sample was collected over a thickness of 35 cm in moist dark grey/brown sand and gravel size material.

A confirmatory rock sample (77-WR-01) was collected from the northwest edge of the waste rock pile near the position of SGWR/304, but was not analyzed.

Waste rock pile:

There is approximately 22,000 tonnes in the waste rock pile. The rock is unsorted and the slopes appear to be stable.

<u>Location</u>: Northwest corner of site; loadout structure is at southern edge of waste rock disposal area

<u>Dimensions (L x W x H)</u>: 65m x 20m x 4m

<u>Stability</u>: There is no evidence of the waste rock pile slumping. The waste rock pile appears stable, although the wooden loadout structure is deteriorating and could fail at any time.

5.3 Tailings Impoundments

No milling was reported at the Sadie Ladue 600 adit site, and no tailings were encountered.

6. MINE SITE INFRASTRUCTURE

Infrastructure at the Sadie Ladue 600 adit site is limited to collapsed remnants of two wooden buildings and remnants of a loadout structure. Site details can be found on Figure 1; see Attachment A for site photos.

6.1 Buildings

There are two collapsed buildings at Sadie Ladue 600 adit (remnants of a former powerhouse and mechanic's workshop) and a small log cabin associated with this site.

Building 77A: Log cabin

Location: 80m north of adit entrance

Dimensions (L x W x H): 4m x 3m x 2.5m

Construction: log walls; corrugated steel sheet roof

Paint: none observed

Asbestos: none observed

Contents: none

Foundation: none

Hazardous products: none

6.2 Fuel Storage

There were no fuel drums or storage tanks encountered at this site.

6.3 Rail Infrastructure

Fabrication: steel

Amount of materials: approximately 20m total length of rail and one ore car

Condition: The rails and ore car are rusted, but pose no safety hazard

6.4 Milling and Processing Infrastructure

No signs of milling or ore processing are evident at the Sadie Ladue 600 adit site.

6.5 Electrical Equipment

None identified.

7. SOLID WASTE DUMPS

There were no solid waste dumps observed at this site.

8. POTENTIAL CONTAMINANTS OF CONCERN

No contaminants of concern were observed at the site.

9. WATER QUALITY

Mine water from this mine and the Ladue mill and mine site at Wemecke flows through the adit and is directed into a 0.5 m corrugated steel culvert. The culvert passes directly beneath the waste rock dump and discharges at the northwest end of the site, 85m downslope of the adit entrance. The estimated flow of the mine seepage at the time of site assessment was 4 - 5 liters/second. Discharged water flows along an unnamed stream channel toward the unnamed lake west of Gambler Lake. No discoloration or precipitated oxides were observed in the mine water or discharge stream channel.

Three water quality samples were collected:

1. 77-WQ-01-01 (routines), 77-WQ-01-02 (metals) and duplicates 77-WQ-02-01 (routines)and 77-WQ-02-02 (metals), all taken from the box culvert mine water flow near the adit; and
2. 77-WQ-03-01 (routines) and 77-WQ-03-02 (metals) collected 40m downstream from the culvert discharge point.

A list of water quality samples, field tests and laboratory results is given in Attachment B.

10. RECLAMATION

Some grass and short willows have grown on the site pad and sides of the waste rock piles; however, natural reclamation overall has been minimal.

11. OTHER SOURCES OF INFORMATION AND DATA

Further information on this site can be found in the SRK (1997) Phase II assessment report. This report provides a detailed discussion of water quality and waste rock analyses from the 1996 field program; these analytical results are also summarized in Attachment B.

12. REFERENCES

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Table B2. Sadie Ladue 600 ("South Gambler") 1996 Water Quality Results

Sample ID	SG/WQ/Str 202	SG/WQ/201	SG/WQ/S T001
Physical Tests			
Conductivity	561	565	638
(umhos/cm)	307	307	340
Hardness (as CaC03)	8.12	7.92	8.22
pH			
Dissolved Anions			
Acidity (as CaCO3)	5.2	6.5	1.5
Alkalinity - Total (as			
CaCO3)	169	170	185
Sulphate (as S04)	136	137	166
Total Metals			
Aluminum T-Al	0.184	0.416	0.095
Arsenic T-As	0.0044	0.0049	0.0011
Barium T-Ba	0.02	0.03	0.05
Beryllium T-Be	<0.005	<0.005	<0.005
Boron T-B	<0. 1	<0. I	<0. 1
Cadmium T-Cd	0.0033	0.0033	0.0054
Calcium T-Ca	77.8	77.8	92.7
Chromium T-Cr	<0.001	<0.001	<0.001
Cobalt T-Co	<0.02	<0.02	<0.02
Copper T-Cu	0.003	0.005	0.001
Iron T-Fe	0.57	1.02	0.22
Lead T-Pb	<0.001	0.007	0.002
Lithium T-Li	<0.02	<0.02	<0.02
Magnesium T-Mg	27.4	27.3	26.3
Manganese T-Mn	0.058	0.081	0.029
MercuryT-Hg	<0.00005	<0.00005	<0.00005
Molybdenum T-Mo	<0.03	<0.03	<0.03
Nickel T-Ni	<0.02	<0.02	<0.02
Selenium T-Se	0.001	0.0008	0.0022
Silver T-Ag	0.0002	0.0002	0.0001
Sodium T-NA	2	2	<2
Vanadium T-V	<0.03	<0.03	<0.03
Zinc T-Zn	0.459	0.462	0.543

Table B3. Sadie Ladue 600 Adit 1996 Waste Rock Test Results

Parameter	Units	SG/WR/P301	SG/WR/P302/1	SG/WR/P302/2	SG/WR/P303	SG/WR/P304	SG/WR/P305
Field Paste	pH	8.01	7.92	8.28	8.08	7.46	8.12
Field Cond		110	280	310	60	>1990	40
Lab Paste	pH	8.31	8.25	8.41	8.49	8.07	8.38
Total Sulfur		1.22	1.41	0.47	0.40	2.36	0.57
Sulfate		0.21	0.18	na	na	0.27	0.21
AP		31.56	38.44	14.69	12.50	65.31	11.25
NP		95.94	101.44	225.88	82.75	86.38	105.38
NET NP		64.38	63.00	211.19	70.25	.21.06	94.13
NP/AP		3.04	2.64	15.38	6.62	1.32	9.37
Aluminum		0.19	0.54	0.10	1.66	0.55	0.64
Antimony		129	43	30	32	287	211
Arsenic		<1	<1	<1	<1	<1	61
Barium		444	78	343	454	69	86
Beryllium		<0. I	<0. I	<0. I	<0. I	<0. I	<0. I
Bismuth		<1	<1	<1	<1	<1	<1
Cadmium		<0. I	<0. I	<0. I	<0. I	>100	9.1
Calcium	%	2.20	3.56	5.53	3.00	2.89	3.22
Chromium	ppm	58	63	47	53	67	75
Cobalt	ppm	14	15	15	25	15	9
Copper	ppm	168	78	63	193	379	255
Gallium	ppm	<1	<1	<1	<1	<1	<1
Iron	%	10.75	4.77	12.31	6.71	4.29	3.49
Lead	ppm	6186	1190	418	834	>10000	6259
Lithium	ppm	<1	4	<1	19	6	8
Magnesium	%	1.34	1.18	2.19	1.74	1.02	1.40
Manganese	ppm	>10000	8389	>10000	8311	5817	6304
Molybdenum	ppm	28	19	30	20	20	15
Nickel	ppm	114	66	144	63	55	46
Potassium	%	0.10	0.10	0.07	0.19	0.11	0.13
Phosphate	ppm	570	1170	340	1020	1090	1310
Silver	ppm	140.5	61.4	48.2	27.2	>200	>200
Sodium	%	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Strontium	ppm	9	46	7	81	55	68
Thorium	ppm	<1	<1	<1	<1	<1	<1
Tin	ppm	9	4	11	6	4	3
Titanium	%	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Tungsten	ppm	11	<1	<1	<1	18	6
Uranium	ppm	<1	<1	<1	<1	<1	<1
Vanadium	ppm	8.0	13.0	12.9	73.2	13.2	13.6
Zinc	ppm	8678	1802	237	1300	>10000	3521

AP = Acid Potential in tonnes CaC03 equivalent per 100 tonnes of material
NP = Neutralization Potential in tonnes CaC03 equivalent per 1000 tonnes of material
Net NP = Net Neutralization Potential = tonnes CaC03 equivalent per 1000 tonnes of material
na = no assay / analysis

Table B4. 1999 Water Quality Results, Sadie Ladue 600 Adit Site

Sample Number		Detection Limit	Units	77-WQ-01-01/02 17/09/99	77-WQ-02-01/02 17/09/99	77-WQ-03-01/02 17/09/99
pH (field)		N/A	pH	7.8	8	8.2
Conductivity (field)		N/A	µS/cm	150	230	390
pH (Lab)		0.01	pH	7.79	8.02	7.98
Conductivity (Lab)		0.01	µS/cm	690	700	710
Total Alkalinity		5	mg CaCO3/L	168	176	189
Chloride		0.25	mg/L	<0.25	<0.25	<0.25
Hardness (CaCO3 equiv)		5	mg/L	357	363	365
Nitrate-N		0.05	mg/L	0.13	0.13	0.12
Nitrate-N		0.003	mg/L	<0.003	<0.003	
Nitrite-N		0.003	mg/L	<0.003	<0.003	<0.003
Sulphate		1	mg/L	196	196	195
Total Dissolved Solids		5	mg/L	483	465	497
Analysis by ICP-USN						
	Aluminum	0.0008	mg/L	0.0423	0.0529	0.0389
	Antimony	0.005	mg/L	0.006	0.005	0.006
	Arsenic	0.01	mg/L	<0.01	<0.01	<0.01
	Barium	0.00004	mg/L	0.0158	0.0168	0.0171
	Beryllium	0.00001	mg/L	<0.00001	<0.00001	<0.00001
	Bismuth	0.0004	mg/L	<0.0004	<0.0004	<0.0004
	Boron	0.002	mg/L	<0.002	<0.002	<0.002
	Cadmium	0.00006	mg/L	0.00519	0.00557	0.0054
	Calcium	0.002	mg/L	93.8	99.5	96.3
	Chromium	0.00006	mg/L	0.00051	0.00044	0.00037
	Cobalt	0.00003	mg/L	0.00024	0.00031	0.00026
	Copper	0.00003	mg/L	0.00304	0.00586	0.00301
	Iron	0.00001	mg/L	0.16	0.022	0.188
	Lead	0.0003	mg/L	0.002	0.0033	0.0036
	Lithium	0.001	mg/L	0.004	0.006	0.005
	Magnesium	0.0005	mg/L	32.8	34.6	33.2
	Manganese	0.00002	mg/L	0.0452	0.0547	0.0703
	Mercury	0.0001	mg/L	<0.0001	<0.0001	<0.0001
	Molybdenum	0.00007	mg/L	0.00392	0.00373	0.00347
	Nickel	0.00001	mg/L	0.0175	0.0201	0.0155

	Phosphorus	0.03	mg/L	<0.03	0.04	<0.03
Sample Number		**Detection Limit**	**Units**	**77-WQ-01-01/02 17/09/99**	**77-WQ-02-01/02 17/09/99**	**77-WQ-03-01/02 17/09/99**
	Potassium	0.4	mg/L	0.6	0.6	0.6
	Selenium	0.004	mg/L	<0.004	<0.004	<0.004
	Silicon	0.004	mg/L	3.02	3.22	3.07
	Silver	0.00005	mg/L	<0.00005	<0.00005	<0.00005
	Sodium	0.004	mg/L	2.2	2.4	2.3
	Strontium	0.00002	mg/L	0.424	0.437	0.412
	Sulphur	0.008	mg/L	59.3	63.7	60.6
	Thallium	0.001	mg/L	<0.001	<0.001	<0.001
	Titanium	0.00002	mg/L	0.00104	0.0016	0.00119
	Vanadium	0.00003	mg/L	na	na	<0.00003
	Zinc	0.0002	mg/L	0.746	0.766	0.748
	Zirconium	0.00004	mg/L	<0.00004	na	na
Analysis by Hydride AA						
	Arsenic	0.0002	mg/L	0.0016	0.002	0.0012
	Selenium	0.0001	mg/L	0.0002	<0.0001	<0.0001

Photo 77-1: Mine water from portal (right) draining down culvert opening (left).

Photo 77-2:Load out area.

Photo 77-3: Drainage from culvert downslope of waste rock dumps.

ELSA VILLAGE

SITE #78

MINFILE#: Not Applicable

1. LOCATION AND ACCESS

Elsa Village is located on the south side of Hwy #2, roughly 11.5km by road west of Keno City. The village is roughly 2km by 0.5km in size and is situated on a hillside between 790m and 850m elevation. The mill in Elsa is located at UTM coordinates 7 087 000m N, 476 000m E. Entrances off the highway are located at both the east and west ends of the village. Almost all of the roads can be accessed by vehicle; however, the road to the sawmill is blocked by a locked gate.

2. SITE PHYSIOGRAPHY

Elsa village is located on the northwestern toe of Galena Hill. The village was built on several flat terraces (essentially cut/fill areas connected by roadways). The natural slope of the area is to the northwest, towards the Elsa tailings and Husky mine site. The village site is clear of bush/vegetation within its boundaries.

Porcupine Gulch, Brefalt Creek and Flat Creek all flow northwestward through the village. Porcupine Gulch drains into the Elsa tailings, and tailings drainage flows a short distance before joining with Brefalt Creek. Both Porcupine Gulch and Flat Creek enter the eastern end of a large marsh, which drains into a tributary of the McQuesten River, located four kilometers to the west at 200m lower elevation. Porcupine Gulch was dry at the time of the site visit.

A small creek also flows past the Elsa Dump (see Attachment 4, Solid Waste Dump Area #1 (Elsa Dump).

3. SITE HISTORY

The village of Elsa originated in association with the 1929 opening of the Elsa mine (the vein was discovered in 1925). The village expanded in 1935 with the relocation of the Wernecke Mill to Elsa. Since then, the population has fluctuated in response to a variety of events, including the mine closure from 1942 to 1947 (due to World War 2 and the death of mine director Wernecke), the 1949 mill fire, and the current mill closure (which began in 1989 due to world market conditions). Over 400 people lived in Elsa just before the village's recent shutdown.

Today, the village is largely comprised of closed industrial and commercial buildings near the village centre. Several buildings are relatively new and appear to be in good condition, including the addition to the school, a recreation (curling) centre, swimming pool building, and a new bunkhouse at the east end of Elsa.

5. MINE DEVELOPMENT

The Elsa mine, including all openings, waste rock piles and mine water, is discussed in the Elsa Mine (Site #3) report.

6. VILLAGE INFRASTRUCTURE

The village infrastructure section includes information regarding domestic water supply, buildings, fuel storage, electrical equipment and other related information. Village site details are presented in Figure 1; see Attachment 5 (Photographs) for site photos.

6.1 Domestic Water Supply

Elsa's community domestic water supply is provided from the Flat Creek water pump system located on the western side of the community. It includes a secondary stage pump system.

The water for the system is collected from a small lake in the South McQuesten River valley, roughly 4.5km northeast of Elsa. The village's domestic water supply system was not subjected to a detailed inspection; however, no potable water quality issues were reported by any of the remaining residents.

6.2 Onsite Buildings

A total of 57 buildings were inventoried and inspected in the village. Visual inspections found 21 of the buildings to have asbestos siding or floor materials. For details on each building, refer to Figure 1 and to the Attachment 1 (Site Buildings).

6.3 Fuel Storage

Eight areas in Elsa have fuel (product) storage tanks and/or drums (see Attachment 2 (Fuel Storage Areas)), and waste oil storage containers and/or waste oil spills were found in another three areas. Fuel storage and spill locations are shown on Figure 1.

6.4 Milling and Processing Infrastructure

The Elsa floatation mill is described in Attachment 1 (Site Buildings). Permission to enter the mill was not given by site personnel because of safety concerns; therefore, the interior of the mill and associated buildings could not be inspected. Descriptions of interior contents in Attachment 1 are based upon observations from outside the building.

Elsa water treatment plant personnel stated that the mill operated with cyanidation circuit up to 1978; cyanide circuit machinery was removed from the mill in 1980. From 1980 until mine operations shutdown in 1989, the mill operated with a flotation recovery circuit.

6.5 Electrical Equipment

There are five areas of Elsa in which inactive and active electrical equipment are located. Details of these areas are provided in Attachment 3 (Electrical Equipment). Details on each inactive electrical transformer are given in Section 8.1, and analytical results for samples from suspected PCB transformers near the saw mill are provided in Attachment 6.

6.6 Roads and Utiladors

Elsa roads are almost all constructed from gravel; the likely gravel source is waste rock from the main Elsa mill. Some roads, such as the road leading to the Elsa Dump, show signs of oxidation.

Steam heating lines, potable water piping and electrical lines were aligned in aboveground utilidors attached to each home and building. Utiladors throughout the village were abandoned and destroyed or showing signs of disrepair. Some pipelines were wrapped with insulation (possibly asbestos) inside the wooden utilidor housing.

7. SOLID WASTE DUMPS AND SCRAP PILES

Eight waste dump areas were discovered in Elsa. Industrial metal debris and wood debris was found at most sites; residential wastes were found primarily at the Elsa community dump. Bone yards are categorized as solid waste dumps for the purpose of this report. Three samples (Elsa Dump-01-0-30cm, Elsa Dump-02-0-30cm, and Elsa Dump-03-0-30cm) were collected from the Elsa dump; analytical results are provided in Attachment 6. Descriptions of solid waste dumps are given in Attachment 4 (Solid Waste Dumps), and dump locations are shown on Figure 1.

8. POTENTIAL CONTAMINANTS OF CONCERN

8.1 Out-of-Service Transformers

There were two areas where out-of-service transformers were observed: the first was near the new bunkhouse (Building #7) and the second was on the northwest side of the road leading into the saw mill area, west of the carpentry shop (Building #5).

Two transformers were found across the road from the new bunkhouse. The first transformer (serial number 213260) weighs 140.6 kg (310 lbs) and contains 38.6 l (8.5 gals) of oil; the second transformer (serial number 15-219), weighs 225.4 kg (497 lbs) and contains 52 l (11.5 gals) of oil.

There are 32 pole-type transformers placed on pallets a short distance off the road leading to the sawmill. Most of the transformers were manufactured by General Electric, some were manufactured by English Electric, Moloney, Pioneer Electric, Packard Electric and Westinghouse. All were field-tested for PCBs, and oil samples with over 50 ppm of PCBs (according to field screen tests) were submitted for confirmatory lab analyses. Field screening test results are summarized in Attachment 3; lab analytical results are provided in Attachment 6.

8.2 Metals and Hydrocarbons in Soil

Soil contamination was observed at the following fuel and waste oil storage areas. The following lists the suspect areas. Details on spill information are in Attachment 2.

Fuel Storage Area #2: Diesel Service Station
Fuel Storage Area #3: Oil Storage Tank
Fuel Storage Area #4: Oil Storage Tank
Fuel Storage Area #6: Oil Storage Tank, School
Waste Fuel Storage Area #1
Waste Fuel Storage Area #2
Waste Fuel Storage Area #3: Oil Change Dump

More detailed information regarding the stained areas is provided in Attachment 2. No samples were collected from these areas.

8.3 Liquid Hazardous Materials

Liquid hazardous wastes were observed at Waste Fuel Storage Areas #1, #2, and #3. Smaller waste containers were noted in some of the accessible buildings (see Attachments 1 and 2 for more information).

8.4 Solid Hazardous Materials

Solid hazardous materials are described in Attachment 4 (Solid Waste Dumps and Scrap Piles). Specifically, areas #1, #2, #4a, #6 and #7 are most notable. Other specific hazards are mentioned in the building descriptions (Attachment 1).

9. WATER QUALITY

Village site water quality is discussed in Section 6.1. Other relevant mine operation water quality information is discussed in the Elsa Mine report (site #3) and the Elsa tailings (site #79) report.

10. RECLAMATION

Since the 1989 mine operations closure, United Keno Hill Mines (UKHM) has undertaken progressive reclamation of the village, involving removal and re-grading of most housing sites at the southwest end of the village.

11. REFERENCES

United Keno Hill Mines Limited. 1996. *United Keno Hill Mines Limited – Site Characterization.* Report No. UKH/96/01, prepared by Access Mining Consultants Limited.

United Keno Hill Mines Limited. 1996. *United Keno Hill Mines Limited – Site Characterization, Technical Appendices I-VI.* Report No. UKH/96/01, prepared by Access Mining Consultants Limited.

Personal Communications

Bill Dunn, former UKHM mine engineer.
Mike Phillips, former UKHM mine geologist.

Acknowledgement

The inspection of Elsa Village was greatly aided by permission from United Keno Hill Mines Limited to access certain buildings and to access and copy the Village site plan and other map information. PWGSC Environmental Services is grateful for the cooperation and assistance provided by UKHM.

ATTACHMENT 1

SITE BUILDING DETAILS

The following list provides more detailed information about each building inspected during the site visit. Building footprints and locations are shown on Figure 1.

Building # 1: Green Shack (photos 78-1, 78-2)

This single story sheet-wood framed shack measures 6m by 6m and is currently used as a storage shack. The building is open, although vehicular access to the sawmill area is restricted. Building has fiberglass insulation.

Asbestos: No asbestos was observed.

Hazardous Contents: The building currently stores more than 140 45kg pails of calcium hypochlorite.

Building # 2: Shack #2 beside the Sawmill

This shack is of similar construction and size as shack #1 but does not have fiberglass insulation. Building was open and accessible.

Asbestos: The exterior is clad with asbestos wallboard.

Hazardous Contents: No hazardous contents were observed.

Building # 3: Shack #1 beside the Sawmill

This wood-framed 7m by 5m shack is insulated with fiberglass. Building was open and accessible.

Asbestos: The exterior is clad with asbestos wallboard.

Hazardous Contents: No hazardous contents were observed.

Building # 4: Sawmill (photo 78-3)

This one and a half story building measures 40m by 7m. It is constructed with wood framing and corrugated metal exterior siding. Interior contents include typical sawmill machinery. Building was open and accessible.

Asbestos: No asbestos was observed.

Hazardous Contents: No hazardous contents were observed.

Building #5: Carpentry Shop

This 2-story building is irregular in shape and has a maximum length of 23m and a maximum width of 17m. It is constructed with a steel frame and concrete floor foundation. The exterior walls are clad in metal sheeting and there is fiberglass insulation throughout. Building was open and accessible.

Asbestos: No asbestos was observed.

Hazardous Contents: 15 interior fluorescent lights with possible PCB ballasts.

Building # 6: Wood Storage (photo 78-4)

Building measures 11m by 7m. The building is constructed with wood framing and siding and has a corrugated metal roof. Building was locked and not accessible.

Asbestos: The exterior walls are clad in asbestos wallboard.

Hazardous Contents: Unknown.

Building # 7: New Bunkhouse (photo 78-5)

This is a relatively new building, likely built in the 1980's. It is of wood frame construction with painted green metal and wood cladding. The building was not accessible.

Asbestos: No asbestos materials were observed.

Hazardous Contents: Unknown.

Building # 8: Geology and Engineering Office (photo 78-6)

This one story, wood exterior and frame building has a metal roof and measures 46m by 9m. It was likely built in the mid-1970's. The building is in use, and was not entered for inspection.

Asbestos: Given the age, asbestos containing materials are likely. No asbestos materials were observed.

Hazardous Contents: Unknown.

Building # 9: Main Shop (photo 78-7)

Two-story shop measures 73m by 23m. Building features steel frame construction on a concrete foundation and has metal exterior cladding. Machinery maintenance equipment is being used on a limited basis within the building. Access is available during the day.

Asbestos: No asbestos was observed.

Hazardous Contents: No hazardous contents were observed based on a limited site inspection and an interview of water treatment plant personnel.

Building # 10: No. 5 Bunkhouse (photo 78-8)

This two-story bunkhouse was likely built in the 1950's or 60's. It has a wood frame and base with blue metal siding on a concrete foundation. The building was accessible and there is vinyl flooring in most rooms. Many of the rooms contain old appliances, beds and household debris. The building measures 7.6m by 45.7m.

Asbestos: Given the age, asbestos containing materials are likely. No asbestos was observed.

Hazardous Contents: No hazardous contents were observed.

Building #11: Utility Building

Several power lines enter and exit this one and a half story building. The building is relatively recent in age with post and beam construction and metal siding and roofing. The building was locked and inaccessible.

Asbestos: No asbestos was observed.

Hazardous Contents: Unknown.

Building #12: Pink and White Bunkhouse (photo 78-9)

This is a smaller bunkhouse measuring only 24m by 9m. It has two stories, wood framing, corrugated metal roofing and no foundation. The building was locked and could not be accessed.

Asbestos: Exterior walls were clad with asbestos wallboard.

Hazardous Contents: Unknown.

Building # 13: No. 1 Bunkhouse (photo 78-9)

This two-story bunkhouse was likely built in the 1950's or 60's. It has a wood frame and base with green metal siding on a concrete foundation. The building was not accessible. The building measures 44m by 9m.

Asbestos: Given the buildings age, asbestos containing materials are likely. No asbestos was observed.

Hazardous Contents: No hazardous contents were observed.

Building # 14: Union Shop (photo 78-10)

The shop is in poor condition but still intact. It is 15m by 8m and is of wood construction with metal siding and roof. There is no concrete foundation (building is set upon wooden blocks). The building is accessible.

Asbestos: The interior walls have asbestos material.

Hazardous Contents: There are approximately 20 interior fluorescent lights that possibly contain PCB ballasts.

Building # 15: Snack Bar (photo 78-11)

This one story building measures 8m by 30m and is of wood construction with a metal roof. The building is boarded up but access is possible through a back door. Interior contents include old food, discarded equipment, tables, and a pool table.

Asbestos: Exterior cladding containing asbestos was found along the base of the building.

Hazardous Contents: No hazardous contents were observed.

Building # 16: Dining Hall (photo 78-12)

This one story building measures 36m by 24m and was likely built around 1965-70. It has a wood frame with yellow vinyl siding and no visible insulation. The building was unlocked and accessible.

Asbestos: No asbestos inside or outside was observed.

Hazardous Contents: No hazardous contents were observed.

Building # 17: Dry/Change Building (photos 78-12, 78-13)

This is one of the newest buildings in Elsa, likely built in the mid-to-late 1980's. It measures 24m by 32m, and has a wood foundation, a wood and white painted metal clad exterior, and metal roof. There is a small first aid station inside. The building was locked and could not be accessed.

Asbestos: No asbestos material was observed.

Hazardous Contents: Unknown.

Building # 18: Norwest Tel Hut (photo 78-13)

The hut belongs to Norwest Tel and is currently in use. It is a newer building measuring 5m by 5m. The frame is wood and the roof and sides are covered in corrugated metal. The building was locked and could not be accessed.

Asbestos: No asbestos material was observed.

Hazardous Contents: Unknown.

Building #19: Fire Assay Office

Due to time constraints, this building was not inspected.

Building #20: Floatation Mill/Crusher House (photos 78-14, 78-15)

The crusher house/floatation mill building is located near the village centre. The northern half of the mill is 3 stories high and features post and beam construction on a concrete wall and floor foundation. There are 3 bay doors on the west side, 2 of which were open. The interior and exterior of the mill's west side appeared structurally sound.

Water treatment plant personnel did not recommend access to the mill/crusher building due to concerns regarding building stability, unsecured building contents, and the lack of interior lighting.

Within the mill building complex is a room enclosing a 50,000 litre welded steel reagent vessel and two diesel-powered pumps. The concrete floor is heavily stained with spilled oil or fuel. Heavy oil staining is visible outside and immediately north of this room; staining is approximately 6 x 8 m in area and extends onto a vehicle turnaround area (fresh gravel obscured much of the underlying stained soil).

Overhead utilidor supports at westernmost edge of mill appear structurally sound. Timber cribbing supporting a 10 m waste rock embankment in the same area appears sound, although sloughing of waste rock over the cribbing is evident.

A conveyor belt and rock dump area is located on the east side of the mill. Dumped rock does not appear oxidized.

The mill's south side is metal-clad. One transformer is mounted near the top southeast corner of the building. Two doors at the southeast corner were locked. Wooden walkways over a 2 – 3m wide ditch along the south side are in fair to poor condition. A utilidor along the southern side of the building is collapsing, and a retaining wall holding back a waste rock embankment is in fair to poor condition. The southwest corner of the mill is two stories high; the first story is next to a timbered void space between the building wall and an adjacent roadway to the south (the roadbed lies atop of 4m high timber cribbing filled with waste rock). Two doors to the grizzly bay were partially closed but still allowed access.

Asbestos: The exterior walls of the mill are clad with approximately 1600 m^2 of asbestos shingles.

Hazardous Contents: Inside one of the open bays on the west side were four pallets of lime packed in supersacks, more than 10 pallets of sodium sulphide and more than 10 drums of cresylic acid.

Building # 21: Boiler Plant (photos 78-16, 78-17)

This large (23m by 20m) two-story plant has unpainted metal exterior walls and a metal roof. The building is locked and inaccessible. There are three pressure vessels located on the northeastern wall.

Asbestos: No asbestos materials were observed.

Hazardous Contents: Unknown.

Building #22: No. 1 Garage / Truck Garage

This one and a half story building is wood framed with metal siding and has an open bay door. The building was not entered as it is still in use.

Asbestos: No asbestos was observed.

Hazardous Contents: Unknown.

Building # 23: No. 2 Garage (photo 78-18)

The single story garage with wood frame and siding is in fair to poor condition. Floor is part concrete slab and part compacted dirt. At the time of the site visit, two of the three garage doors were open and a number of pallets of cement bags were stored inside. There is large machinery at the front and sides of the shop.

Asbestos: Three of the exterior walls and the ceiling are covered with an asbestos material.

Hazardous Contents: No hazardous contents were observed.

Building # 24: Machine Shop (photo 78-19)

The shop is two stories high and measures 22m by 12m. The building is steel framed on a concrete floor with turquoise corrugated metal siding. There is fiberglass insulation throughout. The building was accessible; inside there is a water truck, machinery workings and containers of oil. Large machinery is parked around the shop.

Asbestos: No asbestos materials were observed.

Hazardous Contents: The building contains about five to ten 20 litre pails of oil/waste oil. There were a number of small spills on the concrete floors near the doors.

Building # 25: Light Vehicle Shop (photo 78-20)

The shop is one and a half stories high and measures 27m by 10m. The building is wood framed on a concrete floor. Seven green wooden garage doors open into the building. The building was accessible; some of the bays contained parked vehicles.

Asbestos: The exterior walls are clad with an asbestos material.

Hazardous Contents: None observed.

Building # 26: Rescue Building (photo 78-21)

This building, likely over 40 years old, has corrugated steel roofing and siding over a wood frame. It is one story and measures approximately 40m by 7m. The building is unlocked and contains piping and old tires on a dirt floor. The building is not insulated.

Asbestos: No asbestos materials were observed.

Hazardous Contents: No hazardous contents were observed.

Building # 27: Recreation Centre (photo 78-22)

The Recreation Centre is a relatively new building, likely constructed in the early 1980's. It is irregular in shape with maximum dimensions of 54m length and 20m width. The exterior is clad in corrugated steel and the base of the building is concrete. The interior is accessible and contains a curling rink. Sand and gravel has been backfilled around the base of the building.

Asbestos: No asbestos material was observed.

Hazardous Contents: The fluorescent lighting inside possibly contains PCB ballasts.

Building #28: Skating Rink (photo 78-23)

The outdoor rink is next to the recreation centre. There is a covered bench on the south side of the skating rink. The wood boards around the rink are still in place. No fuel stains from the upgradient fuel dispenser were observed within the rink area.

Asbestos: There are no asbestos materials at the skating rink.

Hazardous Contents: No hazardous materials were observed.

Building #29: Swimming Pool Building (photo 78-24)

This is a relatively new building, likely built in the 1980's. It is constructed with a steel frame and metal siding on a concrete foundation. The building is accessible. The interior walls are gyprock and there is fiberglass insulation throughout.

Asbestos: No asbestos materials were observed.

Hazardous Contents: No hazardous contents were observed.

Building # 30: Yellow Exploration Building (photo 78-25)

This 5m by 4m building has wood frame and siding construction and a corrugated metal roof. The exterior walls are clad in asbestos and have been painted yellow. Access into the building was not available.

Asbestos: The exterior walls are clad in asbestos.

Hazardous Contents: Since the interior of the building could not be accessed, the building's contents are unknown.

Building # 31: Medical Building (photo 78-26)

The medical building is two stories and measures 19m by 12m. It was likely built in the 1980's. The framing and siding are constructed of wood and the exterior has metal siding. Access to the building was possible even though the doors are locked: the doors cannot be shut properly due to building settlement. The building contains medical equipment as well as personal medical files.

Asbestos: No asbestos material was observed.

Hazardous Contents: No hazardous contents were observed.

Building # 32: Elsa Market (photo 78-26)

The building is two stories high and measures 35m by 14m. It has a wood frame and base with vinyl siding. The building was accessible through the freezer door. Ceiling tiles appear to be cellulose. The building is currently being used as a storage facility for rock and soil samples.

Asbestos: Asbestos tiles are suspected to be beneath the linoleum flooring .

Hazardous Contents: There are possible PCB ballasts in the fluorescent lighting.

Building # 33: Fire Hall (photo 78-27)

This one and a half story building measures 19m by 12m, and is wood-framed with corrugated metal cladding. The two wooden garage doors could not be opened, and therefore the inside of the building could not be accessed.

Asbestos: Approximately 30m^2 of asbestos sheet cladding exists beneath the metal siding.

Hazardous Contents: Unknown.

Building # 34 (photo 78-27)

This building is located immediately to the east of the Fire Hall and is of similar size and construction. Fiberglass insulation partially covers the windows. It is likely that the building was used as a dry change for mineworkers.

Asbestos: There is asbestos wallboard underneath the metal siding.

Hazardous Contents: The contents of the building are not known as the inside of the building could not be accessed.

Building #35: Generator Building (photo 78-28)

This two-story, metal-clad building is on a concrete foundation. It measures 30m long, 10m wide and 7m high. All doors into the building were locked. Exhausts from three diesel generators are located on the north side.

Asbestos: No asbestos materials were observed.

Hazardous Contents: No hazardous contents were observed.

Building #36: Vehicle and Heavy Equipment Warehouse (photo 78-28)

This two-story high building measures 40m long, 10m wide and 7m high. It is post and beam construction with yellow aluminum siding on a concrete foundation. There is a pair of large, dark-green, steel doors at one end and a pair of unpainted wooden doors at the other. The building was accessible through an unlocked door on the north side. There were 66 full and partially full drums of milling balls stored immediately east of the building.

Asbestos: No asbestos materials were observed.

Hazardous Contents: No hazardous contents were observed.

Building #37: Assay Laboratory (photo 78-15)

The assay laboratory is a two-story building and is clad in metal siding and roofing. The building measures 10m long, 10m wide and 5m high. All the doors were locked.

Asbestos: No asbestos materials were observed.

Hazardous Contents: No hazardous contents were observed.

Building # 38: Administration Building (photo 78-29)

This building is in very good condition. It is two stories and measures 10m by 15m. It is wood frame construction with a corrugated tin roof. The asbestos wallboard is painted yellow. The building is locked and could not be accessed.

Asbestos: All four exterior walls are clad in asbestos wallboard.

Hazardous Contents: No hazardous contents were observed.

Building #39: Men's Staffhouse (photo 78-30)

This two-story, wood frame building measures 20m by 10m by 8m. Access was available. Inside there are 15 rooms, all carpeted. The foundation is made of concrete and the roof is corrugated tin.

Asbestos: Suspect asbestos tiles were observed on the roof and inside in the kitchen ($25m^3$) and bathroom ($15m^3$). The exterior walls are clad in asbestos.

Hazardous Contents: No hazardous contents were observed.

Building #40: Garage

This wood frame construction garage roughly 3m by 7m, and one-story. It was not examined in detail due to time constraints.

Building #41: Apartment Building (photo 78-31)

This two-story building measures roughly 15m by 10m. It is wood frame construction and is in fair to poor condition. Access was available.

Asbestos: The interior floors, the exterior walls and the tar roof all contain suspect asbestos.

Hazardous Contents: No hazardous materials were observed.

Building # 42: Garage (photo 78-32)

This wooden garage measures 9m by 5m and has a corrugated metal roof. The inside can easily be accessed.

Asbestos: No asbestos was observed.

Hazardous Contents: No hazardous materials were observed.

Building #43: Roman Catholic Church (photo 78-33)

This one story with basement building measures 10m by 10m. It is wood frame construction with a concrete foundation. The building is in poor condition.

Asbestos: The exterior walls are clad in asbestos and the floor is covered in asbestos tile.

Hazardous contents: No hazardous contents were observed.

Aurora Height Residential Area, Buildings #44-51: Occupied Residences (photo 78-34)

There are eight newer residences in Aurora Heights that are currently occupied. They are all two stories high with vinyl siding. The residences were not entered. Aurora Heights is located on the west side of Elsa Village. The area includes the occupied residences, a storage shed and the pump house.

Building #52: Storage Shed (photo 78-35)

Across the street from the occupied residences is a pale pink storage shed. The shed has wood framing and siding and an asphalt-sheeting roof. The shed is built on a concrete pad. It measures 5m in length, 3m wide and 3m high. Access was not available.

Asbestos: No asbestos materials were observed.

Hazardous Contents: Waste oil pails and associated spills were noted. No other hazardous contents were observed.

Building #53: Pump House (photo 78-36)

A wood framed, corrugated steel-sided building contains a water pump which currently supplies water to the occupied uphill residences. The building is on a concrete foundation and measures roughly 7m in length by 5m wide by 6m high. There is a latch for a padlock, however the door was not locked at the time of the site visit.

Asbestos: No asbestos materials were observed.

Hazardous Contents: No hazardous contents were observed.

Building #54: Elsa School (photo 78-37)

The original school building is two stories high, wood frame with stucco exterior on a concrete foundation. The roof is covered in asphalt shingles. On the west side of the original building is a newer addition that contains the gymnasium. The addition is wood frame construction with a wood slat exterior, on a concrete foundation. The roof is corrugated steel. The building could be accessed through an unlocked door. The maximum dimensions of the building are 80m long by 35m wide by 8m high.

Asbestos: No asbestos materials were observed.

Hazardous Contents: No hazardous contents were observed.

Flat Creek Residential Area, Building #55: Flat Creek Pump House (photo 78-38)

This post and beam construction building has metal-clad siding and roofing. It measures 4m long by 3m wide and 3m high. There is a small pump and a 10,000-gallon tank inside. The pump was not operating at the time of the site visit. Access was available to the building.

Asbestos: No asbestos materials were observed.

Hazardous Contents: No hazardous contents were observed.

Flat Creek Residential Area, Building #56: Flat Creek Residence #1 (photo 78-38)

This one and a half story building is constructed out of wood with a tar roof. The doors on the house are not locked.

Asbestos: The residence has asbestos siding on the exterior walls.

Hazardous Contents: A 5-gallon pail of a solvent was noted inside the residence.

Flat Creek Residential Area, Building #57: Flat Creek Residence #2

This 8m long, 6m wide one-story house has a basement. The building is of wood-frame construction and has roll asphalt siding. The residence is unlocked and appears stable.

Asbestos: No asbestos materials were observed.

Hazardous Contents: No hazardous contents were observed.

ATTACHMENT 2

FUEL AND WASTE OIL STORAGE AREAS

Fuel (Product) Storage Areas

Fuel Storage Area #1 (photo 78-1)

Location: The fuel storage is at the sawmill area, north of Hwy #2 and west of the carpentry shop (Building #5). The drums are in the same area as the green shack (Building #1).

Drum Storage Area(s): One half-full 25 litre kerosene pail was found near the west side of the carpentry shop. There are 17 full drums of lube oil and one empty drum immediately southwest of the green shack. No obvious stains were noted near the drums; no secondary containment berms for spill control were observed.

Fuel Storage Area #2: Diesel Fuel Pump Station (photo 78-23, photo 78-39)

Location: A single diesel fuel dispenser pump is located to the south of the skating rink, at the top of a bank. The pump is on a wooden base under a roofed wood frame.

Underground Storage Tank: The underground storage tank is designed to hold 1000 gallons of diesel fuel. Fuel stains were noted on the down side of the bank and some impact was noted in a shallow test pit immediately downgradient of the dispenser (on bank slope). No spill controls were noted on the dispenser pump. The tank is likely over 20 years old, with single-wall steel and no secondary containment or spill monitoring system.

Fuel Storage Area #3: Oil Storage Tank (photo 78-40)

Location: The large tank is near the rescue building (Building #26) on the northeast side.

Above Ground Storage Tank: The tank is roughly 7m high and 8m in diameter. The steel tank is single-wall steel and over 25 years old. There are small patches of rust on the outside of the tank and a number of dents around an access ladder. There is a small wooden shack used for re-fueling beside the tank. Fuel stains from spills were observed around the shack. A low wooden fence and a shallow (60cm) gravel berm have been built around the tank.

A large fuel spill (unknown volume) apparently occurred from this tank. An investigation by Environment Canada indicated the fuel spill did not impact downgradient areas offsite (on Highway #2). Limited cleanup work was completed.

Fuel Storage Area #4: Diesel and Stove Oil Storage Tanks (photo 78-41)

Location: Two storage tanks are located across from the fire hall (Building #33). There is a small wooden fuel dispensary shed located beside the southwest tank. The shack is clad with asbestos material and was locked. Above Ground Storage Tanks: The single-wall steel tanks are both 6m in height and 2.4m in diameter (each tank volume estimated at 85,000 litres). No secondary containment was found around either AST.

A slight dent was observed in the diesel tank (marked with a spray-painted numeral "II" on the north side of the tank); otherwise, there are no visible signs of rust or denting on the tank. A small patch of stained soil lies beneath the bottom drain valve of the diesel tank. The bottom drain valve piping goes underground with no readily-apparent point of re-surfacing.

The second AST is marked with a spray-painted numeral "I" and the words "Stove Oil" printed with adhesive tape. A 3" steel fuel line connects the base valve of this tank to the fuel dispensary shed. A large, heavy fuel stain (10m x 3 m) was noted in the gravel/cobble soil beside the shed and between the shed and tank "I". Heavy staining was also evident next to the bottom valve of this tank and beneath pipe joints near the bottom valve. Gravel beneath the bottom valve is saturated with fuel oil.

Fuel Storage Area #5: AST beside Main Shop (photo 78-42)

Location: The tank is near the main doors of the main shop (Building #9) at the south end.
Above Ground Storage Tanks: A wooden crib supports the 5m by 1.5m single-wall steel tank. There is a small pipe and two valves at one end of the tank. Neither the pipe connections nor the valves appeared to be leaking. However, there are some minor spillage noted around the tank. The tank is in good condition and it has some minor rust on the outside. No secondary containment for the tank was observed.

Fuel Storage Area #6: USTs for the School (photo 78-37, photo 78-43)

Location: Two suspect underground tanks were noted based on vent pipes at the school. One tank was near the northeast corner of the east school building; the second was near the north side of the gymnasium building.
Above Ground Storage Tanks: The heating oil tanks were of unknown size. Based on the age of the building (1980s), the tanks are likely single-walled steel and no secondary containment was noted. Some minor stains were observed near the gymnasium building.

Fuel Storage Area #7: Gas and Diesel ASTs (photo 78-44)

Location: The two tanks are located on the north side of the floatation mill (Building #20).
Above Ground Storage Tanks: A wooden crib supports the two 200-gallon tanks. No staining was observed.

Fuel Storage Area #8: Generator AST (photo 78-49)

Location: The one tank is located next to the Norwest Tel Hut (#18).
Above Ground Storage Tanks: The mobile generator supports the 250-gallon tank. No signs of spills were noted near the single-wall steel tank.

Waste Oil Storage Areas

Waste Oil Storage Area #1 (photos 78-45, 78-46)

Location: The storage area is at the bottom of the hill below the flotation mill (Building #20), near the gravel pit. The area is less than 5m south of Hwy #2. The drums are next to solid waste dump #5.

Drum Storage Area: There are about sixty full drums of waste oil and five empty drums. The area has been cleared of vegetation and there is a 40cm gravel base under the drum area. A 25m by 20m area of gravel is saturated with spilled waste oil, likely to a depth of between 0.5m and 1m. Some of the drums were lying on their sides. A test pit in the heavily stained area directly southwest of the drums found significant staining and odor at 0.40m below ground surface. No secondary containment berm for the area is present.

Waste Oil Storage Area #2 (photo 78-35)

Location: Waste oil is stored behind storage shed (Building #52) located across the road from the existing residences on the village sites west side (Aurora Heights).

Drum Storage Area: The seven pails full of waste oil are standing up on a concrete pad, beside the storage shed. One of the pails has overflowed on to the concrete pad. There is no containment berm.

Waste Oil Storage Area #3: Oil Change Ramp (photo 78-61)

Location: The oil change ramp is located across the road from the No. 1 Bunkhouse (Building #13), on the north side of the road.

Drum Storage Area: Vehicle waste oil may have been dumped on the ground underneath the ramp.

ATTACHMENT 3: ELECTRICAL EQUIPMENT

Electrical Equipment Area #1: Transformers near Carpentry Building (photo 78-47)

Location: The out-of-service transformers are in a bushy area southwest of the carpentry shop (#5), about 15m northwest of the access road leading to the shop.

Out-of-Service Transformers: 32 disused transformers, filled with oil, have been seated on wooden palettes. PCB field screening indicated four of the transformers contained PCBs and oil samples were sent for confirmatory laboratory analyses (see Attachment 6 for results). Oil stains were noted around two transformers (#23 and #24) that had fallen over. No signage for PCB storage or restricted access was noted.

Electrical Equipment Area #2: Electrical Substation (photo 78-17)

Location: The electrical substation is to the west of the boiler plant (#21). There is a chain link fence around the transformer area (no access).

In-Service Transformers: All seven of the various sized transformers are active and may contain PCBs. There is a concrete pad under the four larger transformers. The four larger transformers have oil stains on their drain plugs.

Electrical Equipment Area #3: Transformers outside of Bunkhouse #7 (photo 78-5)

Location: Four transformers on an elevated wooden platform are attached to two poles located on the south side of the bunkhouse (Building #7). Two disused transformers are located across the road.

In-Service/Out-Of-Service Transformers: The two transformers beside the bunkhouse on poles are currently in use, and may contain PCBs. No signs of spills were noted. The two transformers across the road were field tested and did not contain PCBs. No signs of leaks were observed.

Electrical Equipment Areas #4a and #4b: Generators (photo 78-48, photo 78-49)

Location: One mobile generator is parked near the west wall behind the Elsa Market (#32) and the second is located beside the Norwest Tel building (#18). No impact/staining was noted near these areas.

Electrical Equipment Area #5: Inactive Transformers (photo 78-50)

Location: The transformers are located roughly 12m east of the Elsa Mine portal.

Out-Of-Service Transformers: These three large transformers appear to contain oil, possibly contaminated with PCBs. Metal scaffolding and signage around the transformers indicated access is restricted.

Table 1: Testing for PCBs in Transformers near the Sawmill

Transformer No.	Capacity (gallons)	Weight (pounds)	Serial No.	Field Screen Test Results, PCBs in Oil (ppm)
1	11	460	504865244MX79	<50
2	11	460	514664244MX79	<50
3	8	326	258342SN	YES
4	8	326	249215SN	<50
5	13	600	150987	<50
6	11	408	A24306	<50
7	22	700	267704	<50
8	11	410	871441	<50
9	11	410	973632	YES
10	11	410	1148124	YES
11	13	455	47510	<50
12	11	445	148631	<50
13	8.5	387	597912	<50
14	11	420	554393	<50
15	8.5	387	597912	<50
16	8.5	397	632101	<50
17	13	?	4134017	<50
18	?	?	?	<50
19	13	660	31458	<50
20	12	125	7232815496/2501A	<50
21	13	600	146284	<50
22	25	?	84649	<50
23	25	?	87648	no oil
24	7.5	340	119301	no oil
25	7.5	315	224174	<50
26	8.5	397	652100	YES
27	20	760	54721	<50
28	186	?	?	<50
29	186	?	1099547	<50
30	120	3320	3183	<50
31	?	?	3320	<50
32	7.5	?	93647	<50

ATTACHMENT 4: SOLID WASTE DUMPS AND SCRAP PILES

Solid Waste Dump Area #1: Elsa Dump (photos 78-51, 78-52, 78-62)

This is the main dump for the municipal waste from Elsa and is still in use. Over the years, wastes have been dumped down an embankment, and the upper level covered with gravel to form a flat surface. Three surface soil samples (Elsa Dump-01-0-30cm, Elsa Dump-02-0-30cm, and Elsa Dump-03-0-30cm) were analyzed; analytical results are provided Attachment 6.

Location & access: The dump is accessed via a short road on the north side of Hwy #2, east of Elsa.

Dimensions (L x W x H): The slope of the dump is 45°; it is approximately 20m high at the open face, is about 66m wide and extends 44m from the dump access road.

Drainage: A small stream flows roughly north to south along the access road and sweeps by the east side of the dump. The stream disappears into gravel located on the east side of the dump and reappears roughly 5m downgradient. A water sample (Elsa Dump-24/09/99) was collected 2m downstream from the point where the stream reappears. Water quality further downstream of the dump was not investigated.

General composition: Visible waste is comprised roughly of 20% municipal waste, 20% vehicles and drums, 30% other metal debris, and 30% dirt and overburden. A ball mill with asbestos lining is located on the east edge of the dump. Anecdotal information suggests hazardous materials may have been dumped in the past.

Impacted vegetation: A 66m by 44m area of has been cleared of trees. At the rim of the dump, some clearing has taken place, but small bushes and grasses have re-established themselves.

% covered: Some of the earlier dump material has been covered by dirt, however, most of the more recently-deposited wastes are still visible.

Solid Waste Dump Area #2: Battery and Drum Dump (photo 78-53, photo 78-54)

Location and Access: The dump is located on the north side of the road leading to the Elsa dump. Area #2 is 117m southeast of the Elsa dump.

Dimensions: The dump measures about 20m by 40m.

Drainage: The site has the same drainage as the Elsa dump.

General Composition: There are roughly 15-25 crushed vehicle batteries and about 150 rusted 45-gallon drums.

Impacted Vegetation: The drums are partially buried and there is large second growth vegetation growing around them. There are signs that battery acid has leaked out. There is very little vegetation growing underneath.

Solid Waste Dump Area #3: Bone Yard (photo 78-55)

Location & access: The bone yard is located to the west of the sawmill (Building #4), just north of Hwy #2, at the end of the road. There is a locked gate across the access road.

Dimensions (L x W x H): The material is widely spread over a 70m by 35m area.

Drainage: No surface water was observed and no water seeps were observed. The nearest drainage is Porcupine Gulch.

General composition: Most of the waste materials are portable buildings, motors, old appliances and vehicles. The yard also contains wood debris, empty fuel drums, 5 gallon pails of HCl, and a battery pile.

Impacted vegetation: The vegetation around the bone yard appears healthy and to be growing back.

% covered: Most of the material is at surface. The fuel drums have been partially buried.

Solid Waste Dump Areas #4a and #4b: Small Dumps near Bunkhouse #7 (photo 78-56, photo 78-57)

Location & access: The dumps are easily accessible by foot. One dump (#3a) is on the slope behind bunkhouse #214, on the south side of Hwy #2. The second dump is on the south side of access road leading into the village site.

Dimensions (L x W x H): Sizes are as follows: 4a – roughly 10m by 15m area; 4b – 5m by 5m area.

Drainage: No surface water was observed and no water seeps were observed. The nearest drainage is Porcupine Gulch.

General composition: The dump next to the building is composed of 60-100 drums and other metal debris. The second dump contains large wooden spools and six drums. Four of the drums were partially filled with unidentified liquids.

Impacted vegetation: The dump areas are overgrown with bush.

% covered: Bush obscures most of the dump materials.

Solid Waste Dump Area #5: Small Bone Yard (photo 78-58)

Location & access: The bone yard is located behind a garage (building #42), in the southeastern end of Elsa. It can be accessed by vehicle.

Dimensions (L x W x H): The bone yard is about 5m by 5m in size.

General composition: The bone yard is composed mostly of kitchen appliances and a small amount of metal and wood debris.

Impacted vegetation: A small area is cleared of vegetation. Healthy bushes grow around the perimeter of the cleared area.

% covered: Small bushes are starting to grow between the appliances.

Solid Waste Dump Area #6: Scrap Metal Dump (photo 78-59, photo 78-45)

Location & access: At the bottom of the hill below the flotation mill, less than 5m from the south of Hwy #2.

Dimensions (L x W x H): 16m x 10m x 1m

Drainage: Site drainage reports to Porcupine Creek, located about 5m to the east. Porcupine Creek flows into Elsa tailings. At the time of the site visit, Porcupine Creek was dry. No surface water or seeps were observed at the site.

General composition: The dump is composed of mainly scrap metal; piping, water tanks, old machinery parts etc.

Impacted vegetation: The area has been cleared of vegetation around the scrap metal pile.

% covered: Grasses and small bushed grow in and around the scrap metal pile.

Solid Waste Dump #7: Storage and Solid Waste Dump (photo 78-35)

Location and Access: The storage and solid waste area dump is located in the village sites west side (Aurora Heights), across the street from the occupied residences, behind the shed.

Dimensions: The dumped material is spread out over a 40m by 20m area.

Drainage: The nearest drainage is Flat Creek, located to the west.

General Composition: There is a large volume of steel piping. The dump also contains empty 45-gallon fuel drums, wood debris, old appliances, shower stalls, rubber tires and sinks.

Impacted Vegetation: The old appliances, shower stalls, rubber tires and sinks are all on a concrete pad beside the storage shed. The piping, drums and wood debris have large second-growth vegetation growing around them.

% covered: All of the material off of the concrete pad has second-growth vegetation growing around it.

Solid Waste Dump #8: Main Shop Dump (photo 78-60)

Location and Access: The dump is locate on the north-east side of the main shop (building #9)

Dimensions: The debris is spread over a 20m by 20m area.

Drainage: The nearest drainage is Porcupine Gulch. No surface water or seeps were observed near the dump.

General Composition: The dump is composed of mainly metal and wood debris.

Impacted Vegetation: There is a large grassy area in the centre of the dump and second growth vegetation grows around the periphery of the dump area.

% covered: Most of the debris is not covered in vegetation.

ATTACHMENT 6: 1999 ELSA VILLAGE SOIL SAMPLES LABORATORY RESULTS					
Sample Number	**Detection Limit**	**Units**	**Elsa Dump-01 - 0-30cm**	**Elsa Dump-02 - 0-30cm**	**Elsa Dump-03 - 0-30cm**
Site Description			On the northwest side of the dump, 20m from the bluff edge	On the north side of the dump, 20m from the bluff edge	On the northeast side of the dump, 20m from the bluff edge
LEPM					
Arsenic	0.2	mg/L	<0.2	<0.2	<0.2
Barium	0.005	mg/L	0.339	0.146	0.128
Boron	0.1	mg/L	<0.1	<0.1	<0.1
Cadmium	0.01	mg/L	0.04	0.02	<0.01
Chromium	0.05	mg/L	<0.05	<0.05	<0.05
Copper	0.05	mg/L	<0.05	0.12	<0.05
Lead	0.1	mg/L	<0.1	<0.1	<0.1
Mercury	0.001	mg/L	<0.001	<0.001	<0.001
Selenium	0.2	mg/L	<0.2	<0.2	<0.2
Silver	0.05	mg/L	<0.05	<0.05	<0.05
Uranium	0.5	mg/L	<0.5	<0.5	<0.5
Zinc	0.01	mg/L	25.2	3.05	1.65

ATTACHMENT 6: 1999 ELSA VILLAGE WATER SAMPLES LABORATORY RESULTS			
Sample Number	**Detection Limit**	**Units**	**Elsa Dump - 24/09/99**
Site Desciption			At the north end of the Elsa dump, just past where the water seeps back out of the ground
Analysis by ICP-USN			
Aluminum	0.0008	mg/L	0.026
Antimony	0.005	mg/L	<0.005
Arsenic	0.01	mg/L	<0.01
Barium	0.00004	mg/L	0.0255
Beryllium	0.00001	mg/L	<0.00001
Bismuth	0.0004	mg/L	<0.0004
Boron	0.002	mg/L	<0.002
Cadmium	0.00006	mg/L	0.00111
Calcium	0.002	mg/L	109
Chromium	0.00006	mg/L	0.00204
Cobalt	0.00003	mg/L	<0.00003
Copper	0.00003	mg/L	0.0065
Iron	0.00001	mg/L	0.027
Lead	0.0003	mg/L	0.0076
Lithium	0.001	mg/L	0.003
Magnesium	0.0005	mg/L	24.7
Manganese	0.00002	mg/L	0.00463
Mercury	0.0001	mg/L	<0.0001
Molybdenum	0.00007	mg/L	<0.00007
Nickel	0.00001	mg/L	0.0024
Phosphorus	0.03	mg/L	<0.03
Potassium	0.4	mg/L	<0.4
Selenium	0.004	mg/L	<0.004
Silicon	0.004	mg/L	2.68
Silver	0.00005	mg/L	<0.00005
Sodium	0.004	mg/L	1.7
Strontium	0.00002	mg/L	0.193
Sulphur	0.008	mg/L	76.7
Thallium	0.001	mg/L	<0.001
Titanium	0.00002	mg/L	<0.00002
Vanadium	0.00003	mg/L	<0.00003
Zinc	0.0002	mg/L	0.0469
Analysis by Hydride AA			
Arsenic	0.0002	mg/L	<0.0002
Selenium	0.0001	mg/L	<0.0001
LEPM			
Arsenic	0.2	mg/L	<0.2
Barium	0.005	mg/L	0.028
Boron	0.1	mg/L	<0.1
Cadmium	0.01	mg/L	<0.01
Chromium	0.05	mg/L	<0.05
Copper	0.05	mg/L	<0.05
Lead	0.1	mg/L	1.9
Mercury	0.001	mg/L	<0.001
Selenium	0.2	mg/L	<0.2
Silver	0.05	mg/L	<0.05
Uranium	0.5	mg/L	<0.5
Zinc	0.01	mg/L	0.08
Dissolved Cyanide			
Cyanide	0.001	mg/L	<0.001
Fluoride in Water			
Fluoride	0.5	mg/L	<0.5
Nitrate + Nitrite Nitrogen			
Nitrate-N (+ Nitrite-N)	0.05	mg/L	0.64

ATTACHMENT 6: 1999 ELSA VILLAGE TRANSFORMER SAMPLES LABORATORY RESULTS										
Sample Number	**Detection Limit**	**Units**	**TSS 1**	**TSS 2**	**T3**	**T9**	**T13**	**T10**	**T26**	**T26A**
Sample Description with Transformer Serial Number			Electrical Equipment Area #1: #87648	Electrical Equipment Area #1: #119361	Electrical Equipment Area #1: #258342SN	Electrical Equipment Area #1: #973632	Electrical Equipment Area #1: #597912	Electrical Equipment Area #1: #1148124	Electrical Equipment Area #1: #652100	Duplicate of T26
PCBs in Oil										
Total PCBs	0.1	ppm	na	na	3.82	<0.1	<0.1	<0.1	3.19	3.18
PCBs in Soil										
Total PCBs	0.1	mg/kg	<0.1	<0.1					na	na

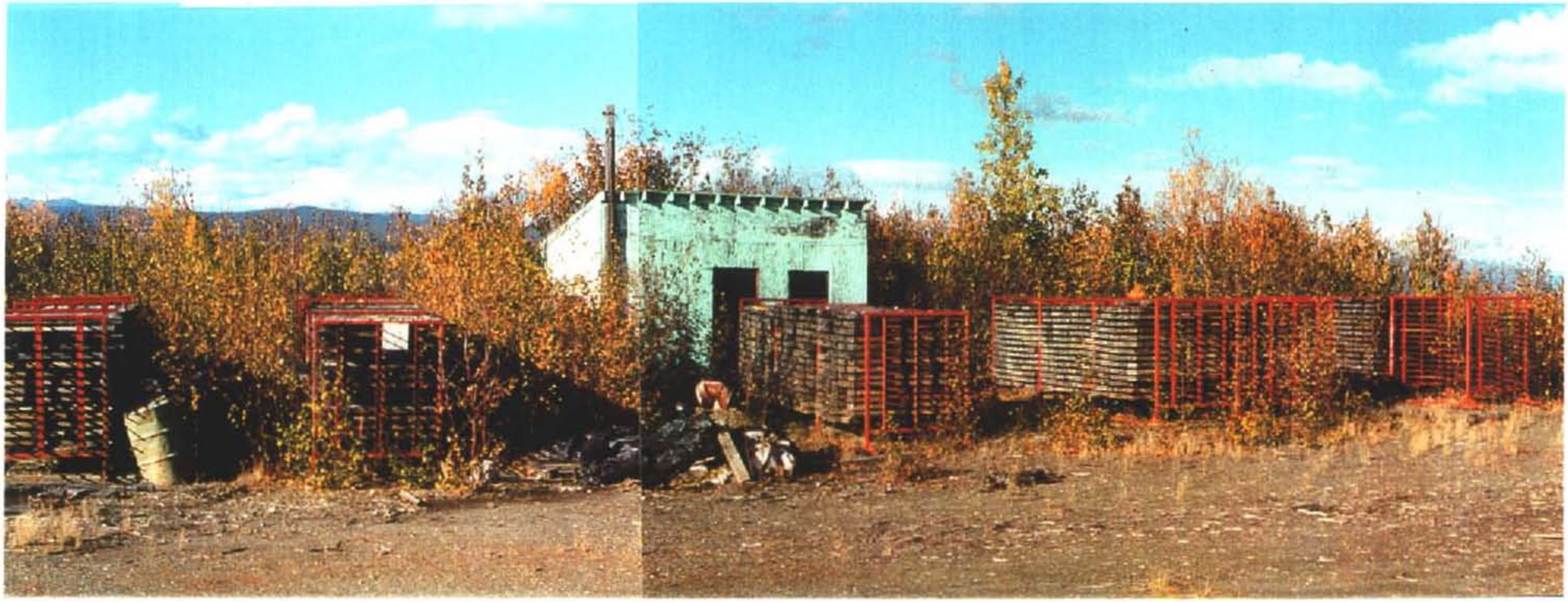


Photo 78-1 : Elsa. Core racks in the sawmill area, with Building #1 (Green shack) in background. Drums with fuel are stored between the core racks to the left of the Green shack area. (Azimuth 360°)

Photo 78-2 : Elsa. Building #1 is being used to store pails of calcium hypochlorite. (Azimuth 360°)

Photo 78-3 : Elsa. View of Building #4, the sawmill. (Azimuth 030°)

Photo 78-4 : Elsa. Building #6, building purpose not known, but guessed to be used for construction or storage of large objects. (Azimuth 110°)

Photo 78-5 : Elsa. Building #7 is one of the newer bunkhouses. Note transformers in the foreground. (Azimuth 010°)

Photo 78-6 : Elsa. Building #8 is the geology and engineering offices. (Azimuth 340°)

Photo 78-7 : Elsa. Building #9 is the Main Shop. (Azimuth 040°)

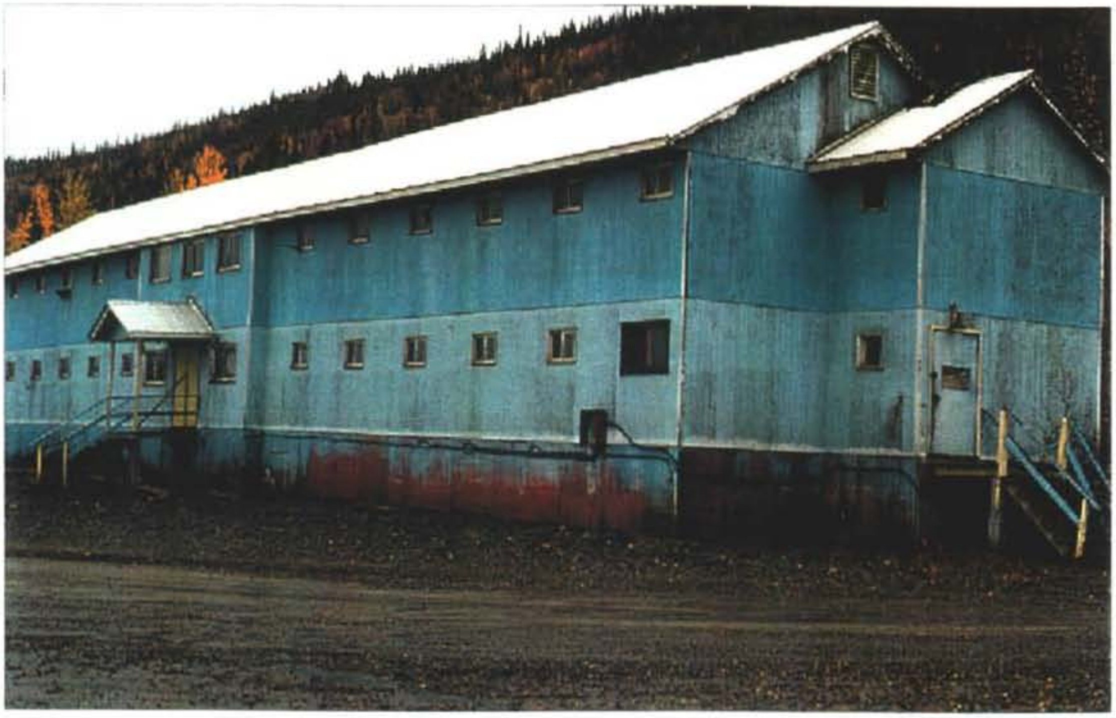


Photo 78-8 : Elsa. Building #10, the No.5 Bunkhouse. (Azimuth 090°)

Photo 78-9 : Elsa. The pink building on the left is a bunkhouse (Building #12), the green building on the right is the No.1 Bunkhouse (Building #13). (Azimuth 075°)

Photo 78-10 : Elsa. Building #14, the Union Shop. (Azimuth 200°)

Photo 78-11 : Elsa. Building #15 is the Snack Bar. (Azimuth 110°)

Photo 78-12 : Elsa. Building #17, the new Dry /Change Building, is on the left; and Building #16, the Dining Hall, is on the right. (Azimuth 275°)

Photo 78-13 : Elsa. Building #18, the Norwest Tel Hut, is the corrugated steel building on the left, and the Dry / Change Building is on the right. (Azimuth 350°)

Photo 78-14 : Elsa. View of the western side of the floatation mill (Building #20).
The yellow sided part of the building is the crusherhouse.

Photo 78-15 : Elsa. The yellow building on the left is the crusherhouse, (Building #20);
the light brown building on the right is the assay lab (Building #37).

Photo 78-16 : Elsa. View of the vessels on the north end of the boiler plant (Building #21). (Azimuth 200°)

Photo 78-17 : Elsa. The boiler plant with an electrical substation beside it, the mill in the background. (Azimuth 020°)

Photo 78-18 : Elsa. Building #23, the No.2 Garage, is in the foreground, the Machine Shop (Building #24) is in the background. (Azimuth 260°)

Photo 78-19 : Elsa. The large aqua-coloured building is the Machine Shop (Building #24), the light machine shop is to the left. (Azimuth 170°)

Photo 78-20 : Elsa. Building #25, Light Vehicle Shop is in the foreground, with Building #51, the crusherhouse, in the background. (Azimuth 060^{o})

Photo 78-21 : Elsa. Building #26, the rescue building. (Azimuth 270°)

Photo 78-22 : Elsa. Building #27 is the Recreation Centre. (Azimuth 360°)

Photo 78-23 : Elsa. Fuel Storage Area #2, a single Chevron pump, located uphill from the skating rink. (Azimuth 030°)

Photo 78-24 : Elsa. Building #29, the swimming pool building. (Azimuth 085^{o})

Photo 78-25 : Elsa. The blue building on the right is the old exploration office, the yellow building (Building #30) on the left is the new exploration building. (Azimuth 080^{o})

Photo 78-26 : Elsa. The Elsa Market (Building #32) is on the right, and the medical building (Building # 31) is on the left. (Azimuth 270°)

Photo 78-27 : Elsa. Building #33, the Fire Hall is on the left of the photo and Building #34, possibly the dry change house, is on the right. (Azimuth 260°)

Photo 78-28 : Elsa. The generator building is on the right, the vehicle & heavy equipment warehouse is in the centre, and the building in the background is the crusher house. The 3 diesel exhaust stacks are visible on the left side of the generator building.

Photo 78-29 : Elsa. The Administration Building (Building #38) is located to the southeast of the floatation mill. (Azimuth 190^{o})

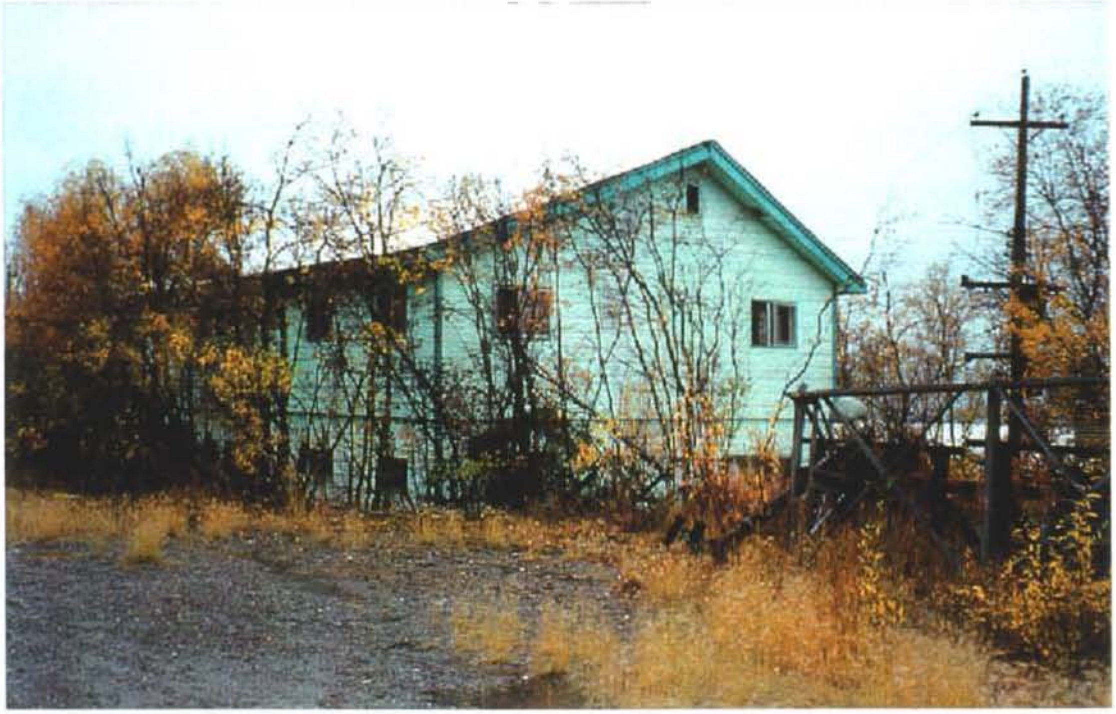


Photo 78-30 : Elsa. Looking west at the Men's Staffhouse (Building #39). (Azimuth ~270°)

Photo 78-31 : Elsa. Building #41, a two-story apartment complex. (Azimuth 360°)

Photo 78-32 : Elsa. Building #42, a one car gragage. (Azimuth 190^{o})

Photo 78-33 : Elsa. Building #43 is the Roman Catholic church.

Photo 78-34 : Elsa. Occupied mine houses. (Buildings #44 - 51)

Photo 78-35 : Elsa. Storage shed below mine houses. Note pails full of waste oil. (Building # 52)

Photo 78-36 : Elsa. Town water supply pump house. (Building #53)

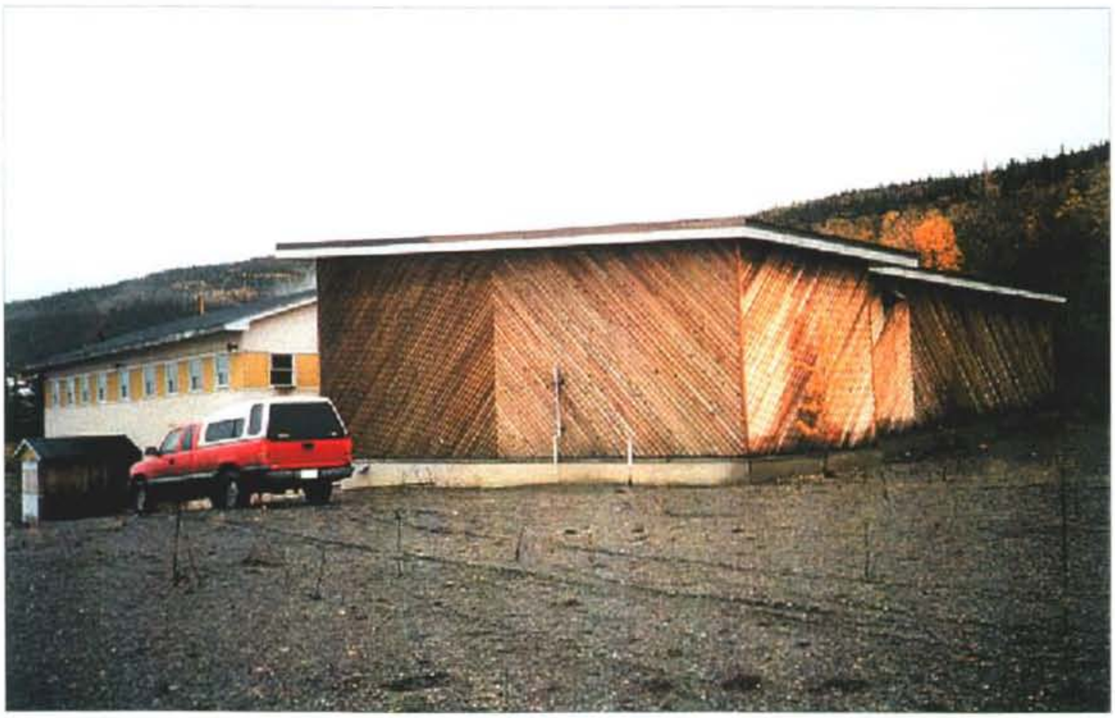


Photo 78-37 : Elsa. Elsa school. Note white probable underground fuel storage tank stand pipes at nearest corner. (Azimuth 090o)

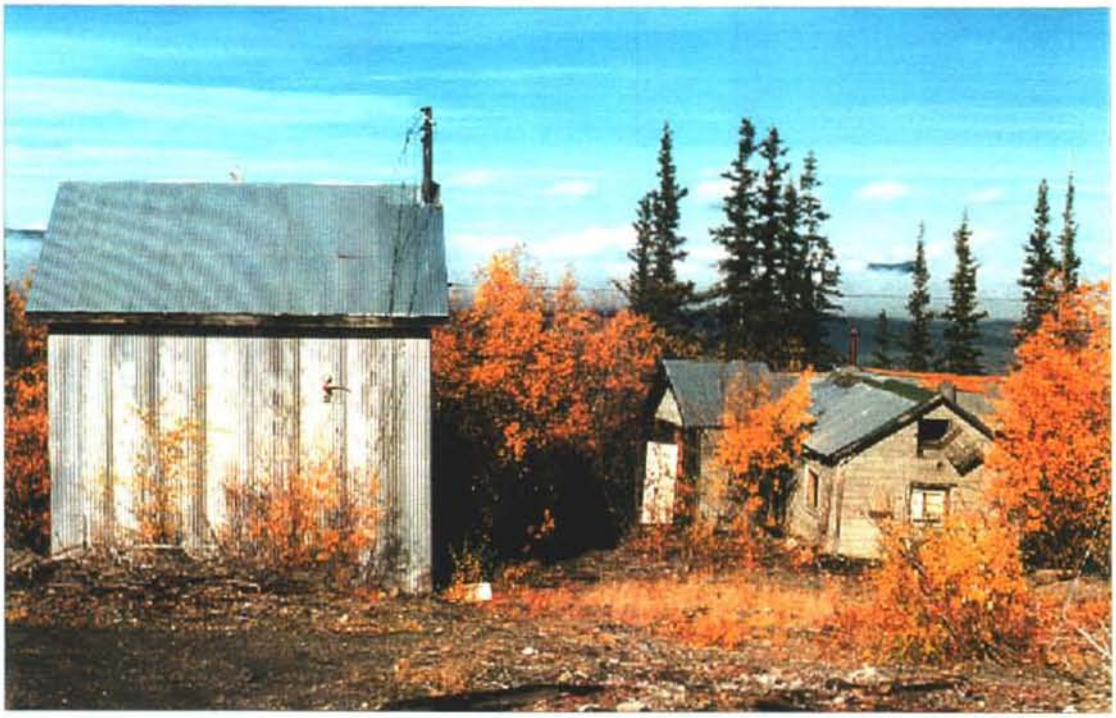


Photo 78-38 : Elsa. View of buildings in the Flat Creek area, the water pump building (Building #55) is on the left and residence #1 (Building #56) is on the right. (Azimuth 350°)

Photo 78-39 : Elsa. View of Fuel Storage Area #2, a single Chevron pump, looking uphill from the skating rink. (Azimuth 210°)

Photo 78-40 : Elsa. Fuel Storage Area #3 - an oil storage tank located beside the rescue building. There are numerous oil stains around the tank. (Azimuth 290°)

Photo 78-41 : Elsa. A pair of diesel oil storage tanks at Fuel Storage Area #4, located across from the Fire Hall. (Azimuth 060°)

Photo 78-42 : Elsa. Fuel Storage Area #5. Above-ground storage tank beside the Main Shop. (Azimuth 100°)

Photo 78-43 : Elsa. Elsa school. Note black underground fuel storage tank stand pipe at right side corner. (Azimuth 210°)

Photo 78-44 : Elsa. Fuel Storage Area #7, these two ASTs are located on the north side of the Mill (Building #20).

Photo 78-45 : Elsa. Waste Fuel Storage Area #1 is on the right and the Solid Waste Dump Area #6 is on the left. The gravel area in front of the truck is saturated with oil. Hwy #2 is in the background. (Azimuth 290°)

Photo 78-46 : Elsa. At Waste Fuel Storage Area #1 a small test pit revealed that the gravel was saturated with oil to at least 40cm. (Azimuth 350^{o})

Photo 78-47 : Elsa. Electrical Equipment Area #1 : transformers near Carpentry Building (Building #5).

Photo 78-48 : Elsa. Electrical Equipment Area #4a - a mobile generator parked behind the Elsa Market. (Azimuth 230°)

Photo 78-49 : Elsa. Electrical Equipment Area #4b - a mobile generator beside the Norwest Tel Building. (Azimuth 200^{o})

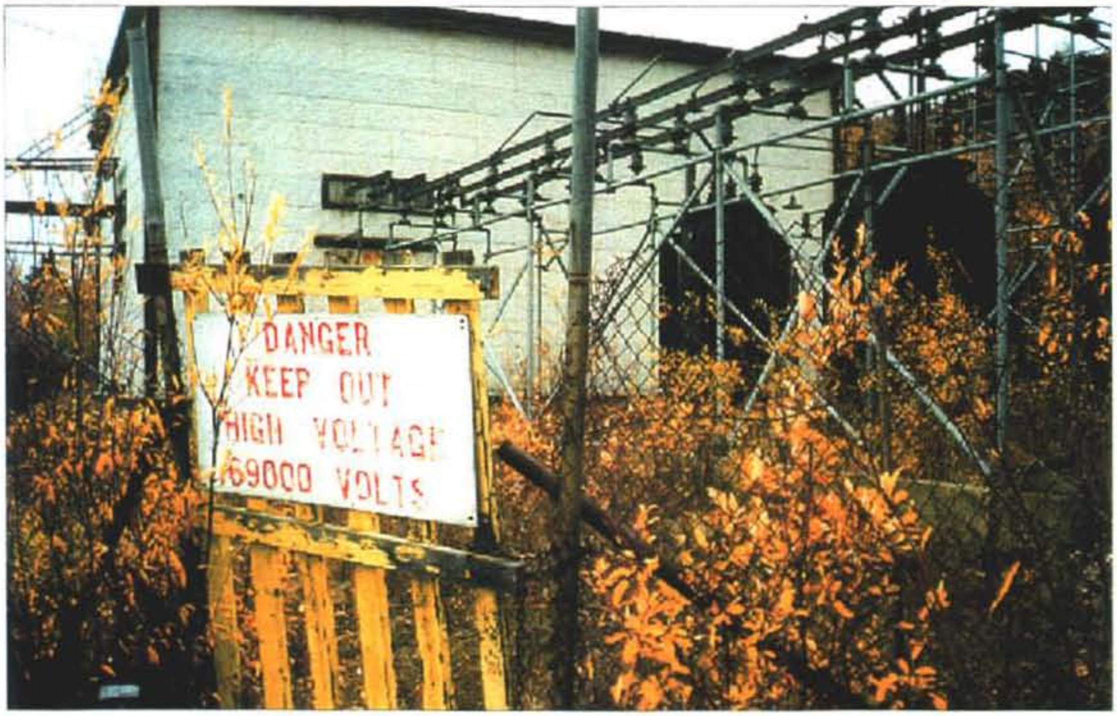


Photo 78-50 : Elsa. Electrical Equipment Area #5, transformers beside the adit portal.

Photo 78-51 : Elsa. Solid Waste Dump Area #1 - Municipal waste from Elsa was dumped at a site just east of Elsa, north of Hwy #2. (Azimuth 275°)

Photo 78-52 : Elsa. Solid Waste Dump Area #1, metal debris pile. (Azimuth 130°)

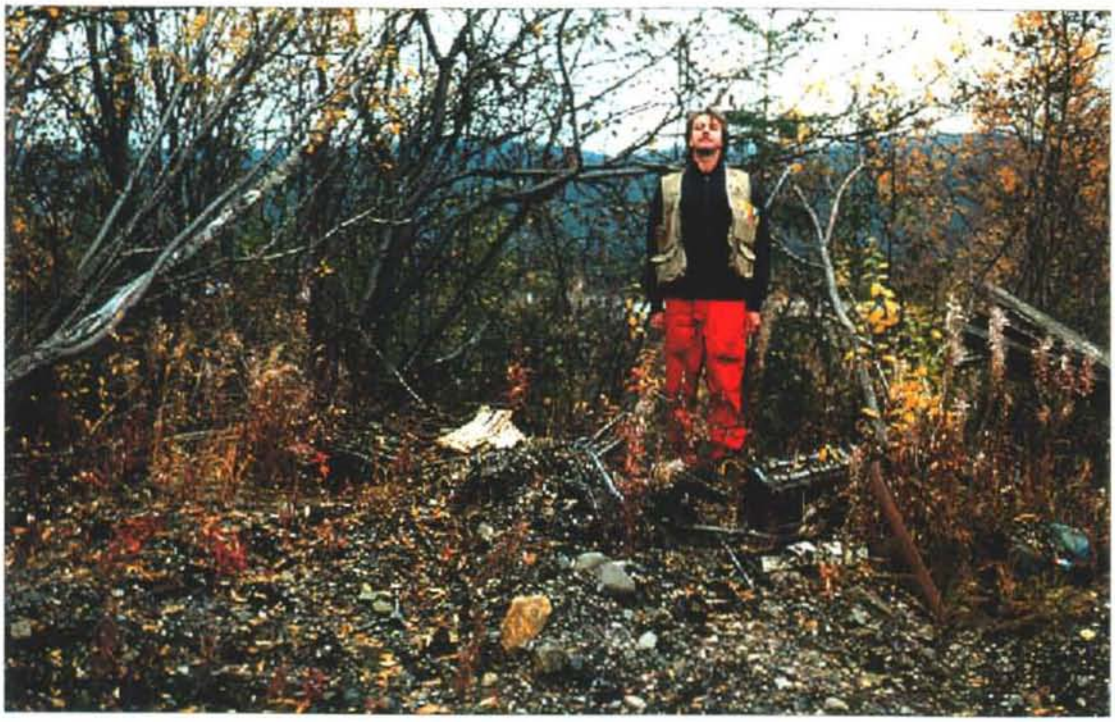


Photo 78-53 : Elsa. Solid Waste Dump Area #2 : Battery pile. (Azimuth 260°)

Photo 78-54 : Elsa. Solid Waste Dump Area #2 : empty 45-gallon drums and other metal debris. (Azimuth 310°)

Photo 78-55 : Elsa. Solid Waste Dump Area #3, this bone yard is just west of the sawmill, on the north side of Hwy #2. (Azimuth 140°)

Photo 78-56 : Elsa. Solid Waste Dump Area #4a. A dump containing mainly 45-gallon drums is located on the slope behind Bunkhouse #7.(Azimuth 270^{o})

Photo 78-57 : Elsa. Solid Waste Dump Area #4b. Large wooden spools and drums are dumped across the road from Building #7. (Azimuth 180^{o})

Photo 78-58 : Elsa. Solid Waste Dump Area #5. This small bone yard is located behind a garage (Building #42), in the southeastern part of Elsa. (Azimuth 170°)

Photo 78-59 : Elsa. Solid Waste Dump Area #6. This dump is mostly scrap metal and Is located just downhill of the Mill, beside Hwy #2. (Azimuth 040°)

Photo 78-60 : Elsa. Solid Waste Dump Area #8 : Metal and wood debris beside the Main Shop (Building #9) (Azimuth 050°)

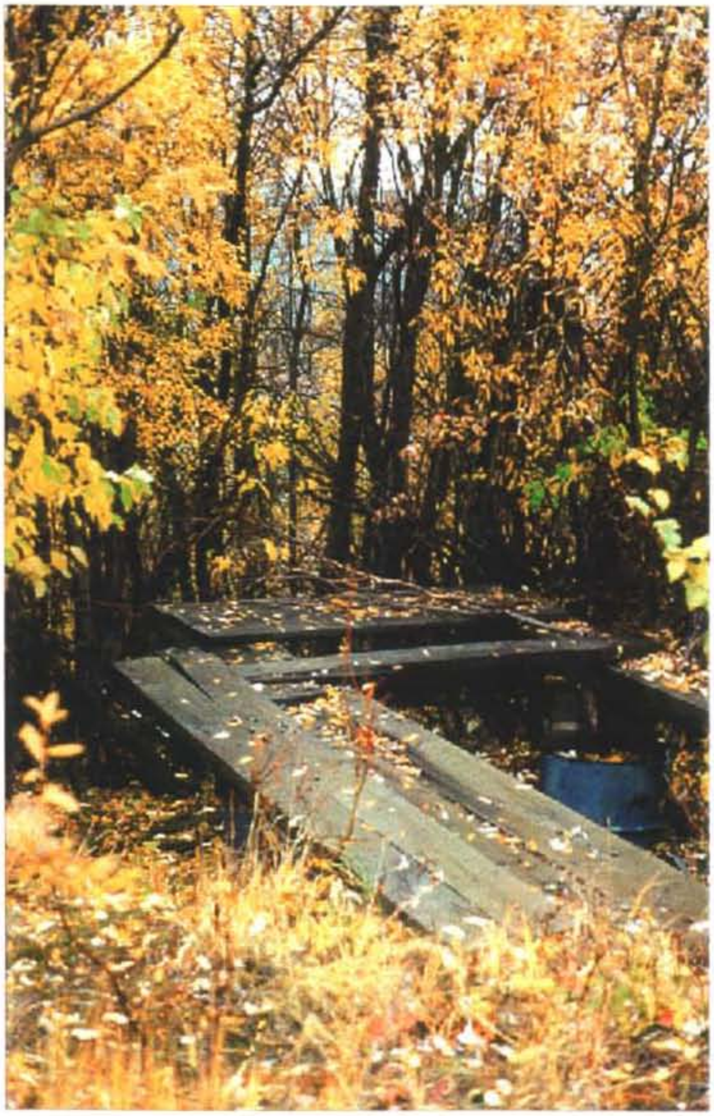


Photo 78-61 : Elsa. Waste Fuel Storage Area #3 : Oil
Change ramp. (Azimuth 340°)

Photo 78-62 : Elsa. Ball Mill at the East side of Solid Waste Dump #1. (Azimuth 110°)

ELSA TAILINGS
SITE 79

1. LOCATION AND ACCESS

The Elsa tailings impoundment is located in the South McQyesten River valley to the northwest of Galena Hill, near the head of Flat Creek site (site #79, Figure 1). Flat Creek is a tributary to the South McQuesten River from the south. The elevation of the tailings is approximately 2250 feet (686m). The NTS coordinates for the site are 7 088 500N 475 100E.

Access to the site from Keno City is via Highway 2 to the town of Elsa. A gravel road located just west of Porcupine Creek leads downhill into the valley and to the tailings dams. The same road leads to the small lake that is the Elsa City water supply (Figure 2). The roads are all-weather gravel roads that are passable by 4WD and possibly 2WD vehicles.

2. SITE PHYSIOGRAPHY

The tailings were deposited in a bog in the headwaters of the Flat Creek drainage. Flat Creek is separated from the South McQuesten River by a low hill, and separated from Star, Sandy, and Christal Creeks to the northwest, by a low ridge. The Elsa mine and townsite are drained by Porcupine Gulch and Brefalt Creek, tributaries to Flat Creek. Flow from Porcupine Creek has been diverted around the bulk of the tailings by the Porcupine diversion ditch, although it still cuts through some tails.

The tailings form two lobes. Older tailings are deposited near Porcupine Creek, in the area behind Dam No. 3, and the more recent tailings are located behind Dam No. 1.

3. GEOLOGY AND MINERALIZATION

The Elsa tailings were derived from ore mined from at least 35 different deposits in the Keno area so that there is great variability in the composition of the tailings. There were also changes in the mill process over time, which added to the variability. At times, zinc was not recovered because of low head grades. Between 1952-1967 and 1979-1982, cyanide was added to the floatation tailings to recover about 50% of the silver. A good overview of the district geology and geochemistry is given in UKHM (1996).

There has been no recent study of the tailings to determine their mineralogical composition. However, the milling records and metallurgical testing for the Elsa mill were reviewed as part of the United Keno Hill Mining companies' 1996 pre-feasibility study. This review concluded that (UKHM, 1996):

- A mineralogical study in the 1970's indicated lead to be present as cerrusite (lead carbonate) and anglesite (lead sulphate);

- Prior to 1970, most of the ore was sulphide-rich material derived from underground mines. After 1970, the ore was a blend of "non-sulphide" material from the open pits and sulphide material from the underground mines.

4. SITE HISTORY

Mining and processing began at Elsa about 1920 (Hawthorn, 1996). In 1936, the Wernecke Mill was moved to Elsa where it operated until 19 42. Operation resumed after the war until 1949 when the mill was destroyed by fire. During operation, tailings were piped about 500 m from the mill and discharged south down the hillside to form an alluvial fan in the valley bottom. Most of the tailings deposited in the Flat Creek bog, but some were washed downstream.

A second, larger mill was built in 1949 and mining continued until 1989. Tailings continued to be discharged down Porcupine Creek until 1962 when the first tailings dam was built. At this time the tailings discharge point was moved east of Porcupine Creek. Dam No. 1 was breached several times during the 1960's, and in 1972 a second dam was built downstream of Dam No. 1, primarily as a settling pond for lime-treated water from Dam No.1. In 1979, Dam No. 3 was built further downstream. All three dams are constructed of local gravel and development waste from the underground mines (principally the Husky mine) on variably frozen peat and silty till.

In 1979, the Porcupine diversion ditch was constructed to divert the flow of Porcupine Creek around most of the tailings, reducing erosion, and to limit the amount of water impacted by the tailings.

The total amount of tailings deposited is estimated to be about 4.6 million tons (Hawthorn, 1996) and most are held behind Dam No. 1. A small quantity of tailings was reportedly used as underground backfill, and some has been washed downstream. Tailings have been reported as much as 20 km downstream at the log jam on the McQuesten River. These tailings were probably deposited before construction of Dam No.1, or as a result of breaches of that dam. There have been reports of seepage of pond water through the peat below the tailings, but this has not been investigated (B.Dunn, pers.comm.).

In 1996, a toe berm was placed to reinforce Dam No. 1 (Photo 79-1). Five tailings cells were also constructed behind Dam No. 1 to hold future tailings, however, these cells have not been used (Photo 79-2). During this time, work was done on the Porcupine diversion ditch, and active lime treatment of the pre-1960 tailings decant was begun.

The Elsa mill and townsite are currently mothballed but are in working order (B.Dunn, pers.comm.).

5. MINE DEVELOPMENT

5.1 Mine Openings and Excavations

This report discusses only the Elsa tailings impoundment. No mine openings are associated with the impoundment.

5.2 Waste Rock Disposal Areas

No waste rock disposal areas are associated with the tailings. However, waste rock, primarily from the Husky Mine, was used as fill to raise Dams No. 1 and 2 after they had subsided. The rock samples collected on the surface of Dam No. 3 is likely composed of Husky waste that was used as fill on the dam. Results of analysis of these sample are provided in Table 1.

5.3 Tailings Impoundments

There are three tailings dams at the Elsa site with associated tailings and ponds (Figure 2). The total surface area of the tailings is approximately 185 acres (75 ha) but the depth is uncertain (UKHM, 1996). Dams No. 1 and 2 are earthen filled structures built with unzoned construction on frozen peat-rich soils. Dam No. 3 was reportedly constructed with a glacial till upstream core and extended banket, and a downstream body of waste rock separated from the glacial till by a graded filter (B.Dunn, pers.comm.). The soils have thawed since construction, causing portions of the dams to subside. UKHM has continued to add mine rock to the low points in the dams every few years.

Eleven test pits were excavated by backhoe in 1996 by UKHM (1996). Therefore, only one additional pit was dug in 1999. The 1996 data is provided in Appendix I. The 1999 data is listed in Table 2.

Tailings Dam No. 1 and Pond

Dam dimensions (L x W x H): 300 m x ~6m roadway x ~6m

Description: The dam is composed of gravel and glacial till. In 1972, additional gravel was added to the center section of this dam which failed around a decant structure. Since this time gravel or mine waste rock was added to the upper surface of the dam every few years as warranted by the continuing subsidence of the structure.

Pond area (L x W x Depth): 1150 m x 625 m x 1m. Depth of tailings varies from ~5m against the dam to ~ 2 m at the east edge near the valley slopes Photo 79-3.

Oxidation: Most of the tailings behind Dam No. 1 are unsaturated. The surface of the tailings are dark brown (Photo 79-4). UKHM (1996) did not report iron staining in pits 1, 8 , 10 and 11 but did report "orange brown sands in pit 11" at a depth of 100cm.

Locations and area of saturated tailings: An area of approximately 26,000 m^2 is saturated.

Breakthroughs: The dam was breached several times from 1962 to 1972. A toe berm was placed on the downstream side of Dam No. 1 in 1996 (Photo 79-1). The toe berm extends about halfway up the dam and is approximately 5 m wide. It is constructed of gravel underlain by a layer of synthetic mesh added to limit piping of the dam. The mesh is porous but keeps the fines from being washed away with any seepage through the dam. No evidence of erosion of Dam No. 1 or the toeberm was seen.

Decant structures and piping: The decant structure on Dam No. 1 consists of a ~1.2m diameter galvanised, corregated pipe with a stop log weir on the upstream end and a lime addition mixing box at the discharge.

Pump house: There is no pump house associated with Tailings Pond No. 1

Tailings Dam No. 2 and Pond (Photo 79-5)

Dimensions (L x W x H): 400 m x 5 m x 4 m

Surface composition: Gravel, glacial till and mine waste rock.

Some tension cracks were seen in the dam (Photo 79-6). Ponding immediately below the dam has abundant red iron oxide precipitate (Photo 79-7). Grasses are growing in this ponded water.

Pond area (L x W x Depth): 320 m x 150 m x 1m. Depth of tailings is unknown, but is probably less than a meter, as the only tailings deposited here would have come from the failure events (Photo 11-25).

Oxidation: All of the tailings behind Dam No. 2 are saturated (Photo 79-8). UKHM (1996) reported no evidence of oxidation in this material.

Locations and area of saturated tailings: The full area of the tailings, approximately 48,000 m^2, are saturated.

Breakthrough: No evidence of breakthrough was seen.

Decant structures and piping: The decant structure is shown in Photos 79-9 (upstream) and 79-10 (downstream). The decant structure is constructed of wood and measures approximately 2.5 m high by 2 m wide. The decant is in poor condition.
Pump house: There is no pump house associated with Tailings Pond No. 2

One sample was collected of the Pond Water (79-WQ-07) and one other seepage at the base of the dam (79-WQ-08). Results of the analyses are presented in Table 3.

Tailings Dam No. 3 (Photo 79-11)

Dimensions (L x W x H): 375 m x 8 m x 3 m
Surface composition: Gravel and glacial till. Some tension cracks were seen in the dam (Photo 79-12). Tension cracks can also be seen on areas of the dam. There is some iron oxidation at a depth of about 10 cm in the gravel that composes the dam.
Pond area (L x W x Depth): Approximately 360,000 m^2. Depth of tailings is unknown, but is probably less than half a meter, as estimated from the test pits downstream of the structure.
Oxidation: UKHM (1996) test pits were dug near the original tailings discharge point. All of these pits showed oxidation to a maximum depth of 120cm.
Locations and area of saturated tailings: Approximately 72, 000m^2 of the tailings are saturated.
Breakthroughs: No evidence of breakthroughs was seen.
Decant structures and piping: The decant structure is composed of a wooden v-notch weir on the upstream side (Photo 79-13) and a metal pipe on the downstream side (Photo 79-14). Some subsidence can be seen around the weir in Photo 79-13. The decant is in fair condition. There is an emergencey overflow ~ 50 m south of the decant structure, this consists of an open 1.2m diameter corregated, galvanized pipe whose invert is ~0.3 m above the water level.
Pump house: There is no pump house associated with Tailings Pond No. 3

Minesite Water Treatment

There are two lime treatment plants on site, one at Dam No. 1 and one at Dam No. 3. The plants are operated when zinc concentrations in the ponds are above a target level. This is generally in the spring when runoff is highest. Neither plant was operating at the time of the site visit.

Dam No. 1 Treatment Plant (Photo 79-15)

Tank Dimensions:8 m Long x 2 m diameter

Location: At southeast end of Dam No. 1

Drainage: Inflow to pond No. 1 is from a catchment area of ~ 4 sq. km hillside with diversion ditches catching any areas above the highway.

Description and type: 1000 gal propane tank (8m long x $2m^2$). Tank is insulated and has a recirculating pump to keep lime in a slurry and unfrozen. A V-notch weir helps regulate flow.

Impacted vegetation: Vegetation does not appear impacted, except in the pre-1960 depositional area and the areas of coarse tailings on the valley slopes were there is little indication of any revegetation.

Dam No. 2 Treatment Plant (Photo 79-16)

Tank Dimensions: 8 m Long x 2 m diameter

Location: Near the southern end of Dam No. 2.

Purpose: To treat the seepage from the pre-1960 tailings depositional area

Drainage: ~ 1 sq. km

Description and type: 1000 gal propane tank (8m long x $2m^2$). Tank is insulated and has a recirculating pump to keep lime in a slurry and unfrozen. A V-notch weir helps regulate flow.

Impacted vegetation: Vegetation does not appear impacted.

6. MINE SITE INFRASTRUCTURE

6.1 Buildings

There are several small buildings on site, which are discussed below. There is also a pump house and pressure pump house related to the Elsa townsite freshwater supply located to the northwest of the tailings.

Building 79A and 79B - Transmission Buildings and Satellite Dishes

Each of these stations has a small, wooden building measuring 2m x 2 m x 3 m (L x W x H) with a large satellite dish adjacent to it. 79A is located on the road to the freshwater supply and has a door painted green (Photo 79-17). 79B is located at the northwest end of tailings pond No. 2 and is entirely painted green. The contents of the buildings were not examined. No asbestos was seen but the buildings were not opened.

Building 79C - Northwestel Building and Satellite Dish

This fiberglass building measures approximately 3 m x 2 m x 5 m and is located near Building 79B, at the northwest end of tailings pond No. 2 (Photo 79-18). It also has a large satellite dish next to it. The building was not opened but there appears to be no hazardous material associated with it.

Building 79D - PCB Storage

Building is also located at the northwest side of the tailings pond No. 2. It is a composed of a wooden frame with metal sheeting on the sides and roof, and measures 8 m x 5 m x 3 m. It has a wooden fence around it measuring 10 m x 7 m x 2 m. Building was locked.

Buildings 79E and 79F - Explosive Magazines

The two explosive magazines measuring 7 m x 2 m x 3 m and have metal siding and roofs. Building 79E is located near the southern end of tailings Dam No.1 and 79 F is located nearly due east of 79E approximately 150m. Both are locked and the contents unknown.

6.2 Fuel Storage (Photo 79-19)

Drum Storage Area(s): Approximately 20 empty barrels are stored in the "boneyard" (spare parts area).

6.3 Rail and Trestle

There were no rails or trestles seen associated with the tailings.

6.4 Milling and Processing Infrastructure

There was no mine infrastructure seen associated with the tailings impoundment.

6.5 Electrical Equipment

Transformers: A 6,900 volt transformer is in use on the site. It is located on the west side of the water pressure house. The transformer was locked behind a wooden fenced area 8m x 5m , the transformer is sitting on a wooden foundation. Three other transformers are also stored in this enclosure. These transformers are on a wooden platform, and surrounded by a wooden fence measuring 8 m x 5 m x 2.5 m.

7. SOLID WASTE DUMPS

There are no solid was dumps associated with the tailings impoundment. However, there is a "boneyard" (spare parts area) located east of the road from Elsa townsite to the tailings (Figure 2). The site has 8 abandoned vehicles (Photo 79-20) with batteries located near them, and several household appliances (Photo 79-21). Empty barrels are also stored in this area.

8. POTENTIAL CONTAMINANTS OF CONCERN

Contaminants of concern include metals from the tailings.

9. WATER QUALITY

9.1 Tailings Impoundment

Six surface water sampled and three groundwater samples were collected around the tailings area. Surface water samples were collected from the Dam No. 2 pond (79-WQ-07) and from the seepage at the base of Dan No. 2 (79-WQ-02). Samples 79-WQ-05 and 79-WQ-06 were collected from the Porcupine Creek diversion ditch and Flat Creek, respectively.

The groundwater samples were collected from piezometers installed by UKHM in 1996. No upstream water sample was collected because there was no flow in Porcupine Creek above the tailings area.

9.2 Elsa Freshwater Supply

The fresh water supply for the town of Elsa is a small unnamed lake in the South McQuesten River valley to the northwest of the tailings impoundment (Figure 2). The lake is located in a separate drainage from the tailings impoundment, and therefore, should not be in danger of contamination from the tailings. However, the lake water is monitored on a quarterly basis by UKHM & Public Health. Also, sample 79-WQ-01 was collected from the lake.

Lake water is pumped from the lake by a 25 hp electric power pump. The pump is housed in a small shed (L x W x D = 4 m x 4 m x 3 m) constructed with a wood frame and corrugated metal walls and roof (Photo 79-22). Electric lines connect with the pump. The water supply pipe is approximately 15 cm in diameter and is insulated with metal-wrapped fiberglass.

The piping carries water approximately 100 m to the pressure pump house which contains a 75 hp electric pump (Photo 79-23). This pump is large enough to pump the water to the Elsa townsite a distance of 5 km with an elevation gain of 150 meters. The pressure pump house is 16 m x 8 m x 8 m, wood frame construction with corrugated aluminum sheet walls and roof. The foundation is concrete. On the west side of the house is a transformer that was described in Section 6.5.

The insulated pipeline continues from the pressure pump house over the low ridge to the tailings area. It parallels Dam No. 3 and then continues up the hill to the townsite.

10. RECLAMATION

There has been no active reclamation of any of the tailings. Efforts to control erosion of the tailings include construction and maintenance of the diversion ditch, and maintenance of the three tailings dams. One section of the ditch still cuts through the tailings, however, causing some erosion.

In some areas the tailings have begun to revegetate naturally. Revegetation is directly related to the amount of water available. For example, in the bog area downstream of Dam No. 3, tailings are covered with thick moss and bushes. In contrast, most of the tailings behind Dam No. 1 are relatively dry and remain unvegetated. Dispersion of these tailings by wind is a concern.

Approximately, 100,000 m^2 of all the tailings behind the three dams has revegetated.

11. REFERENCES AND PERSONAL COMMUNICATIONS

Hawthorn, 1996. Investigation into the reprocessing of Elsa Tailings, for United Keno Hill Mines Limited. DIAND Open File 1996-3(T).

United Keno Hill Mines Limited. 1996. United Keno Hill Mines Limited – Site Characterization. Report No. UKH/96/01, prepared by Access Mining Consultants Limited.

United Keno Hill Mines Limited. 1996. United Keno Hill Mines Limited – Site Characterization, Technical Appendices I-VI. Report No. UKH/96/01, prepared by Access Mining Consultants Limited.

Table 1. Samples of Material on Dam No. 3.				
Parameter	**Detection Limit**	**Units**	**79-WST-01-01**	**79-WST-01-02**
Paste pH			8.1	5.8
S(T)		%	0.11	0.81
S(SO4)		%	0.06	0.64
AP		tonne CaCO3 eq./tonne	1.6	5.3
NP		tonne CaCO3 eq./tonne	114.8	19.5
Net NP		tonne CaCO3 eq./tonne	113.2	14.2
NP/AP			73.4	3.7
pH in Saturated Paste				
pH	0.1	pH	7.1	4.4
pH in Soil (1:2 water)				
pH	0.01	pH	8	5
ICP Semi-Trace Scan - Metals				
Aluminum	5	µg/g wet	15500	34100
Antimony	2	µg/g wet	<2	57
Arsenic	2	µg/g wet	22	1140
Barium	0.05	µg/g wet	433	635
Beryllium	0.1	µg/g wet	0.4	0.8
Bismuth	5	µg/g wet	<5	<5
Cadmium	0.1	µg/g wet	1.7	11.8
Calcium	5	µg/g wet	34700	12600
Chromium	0.5	µg/g wet	21	44.6
Cobalt	0.1	µg/g wet	7.4	6
Copper	0.5	µg/g wet	32	88.8
Iron	1	µg/g wet	21000	39000
Lead	1	µg/g wet	92	3180
Lithium	0.5	µg/g wet	12.8	15
Magnesium	1	µg/g wet	13300	3530
Manganese	0.5	µg/g wet	999	2760
Mercury	0.01	µg/g wet	<0.01	0.14
Molybdenum	1	µg/g wet	1	2
Nickel	0.2	µg/g wet	20.3	19.2
Phosphorus	5	µg/g wet	577	572
Potassium	20	µg/g wet	3800	9400
Selenium	2	µg/g wet	<2	<2
Silicon	5	µg/g wet	4220	457
Silver	0.5	µg/g wet	2.6	119
Sodium	5	µg/g wet	1140	1310
Strontium	1	µg/g wet	54	52
Sulphur	10	µg/g wet	1070	15200
Thorium	1	µg/g wet	<1	<1
Tin	1	µg/g wet	2	6
Titanium	0.2	µg/g wet	497	218
Uranium	5	µg/g wet	<5	<5
Vanadium	1	µg/g wet	46	68
Zinc	0.5	µg/g wet	155	1040
Zirconium	0.1	µg/g wet	10.2	13.9

Table 2. Elsa Tailings Solids Samples							
Parameter	**Detection Limit**	**Units**	**79-Tails-01**	**79-Tails-02**	**79-Tails-03**	**79-tails-04**	**79-tails-05**
Depth		**cm**	**3-20**	**20-50**	**35-60**	**0-10**	**0-10**
Paste pH			7.1	7.7	6.1	6.4	6.7
S(T)		%	2.36	2.23	0.14	3.62	2.56
S(SO4)		%	0.05	0.03	0.06	0.27	0.07
AP		tonne CaCO3 eq./tonne	72.2	68.8	2.5	104.7	77.8
NP		tonne CaCO3 eq./tonne	11.9	22.0	0.5	17.3	28.8
Net NP		tonne CaCO3 eq./tonne	-60.3	-46.8	-2.0	-87.4	-49.1
NP/AP			0.2	0.3	0.2	0.2	0.4
pH in Saturated Paste							
pH	0.1	pH	6.6	7.1	5.7	6.2	6.4
pH in Soil (1:2 water)							
pH	0.01	pH	7	7.3	6.4	6.3	6.6
ICP Semi-Trace Scan - Metals							
Aluminum	5	µg/g wet	3250	6110	27800	6140	5850
Antimony	2	µg/g wet	140	150	<2	230	230
Arsenic	2	µg/g wet	1210	1200	22	1800	1100
Barium	0.05	µg/g wet	80	89.6	606	87.3	63.4
Beryllium	0.1	µg/g wet	<0.1	<0.1	0.6	<0.1	<0.1
Bismuth	5	µg/g wet	<5	<5	<5	<5	<5
Cadmium	0.1	µg/g wet	55.4	68.5	0.6	149	174
Calcium	5	µg/g wet	3050	4010	9480	2500	2990
Chromium	0.5	µg/g wet	6.1	9	35.1	8.9	10
Cobalt	0.1	µg/g wet	3.4	4.2	9.5	5.5	3.9
Copper	0.5	µg/g wet	113	105	<0.5	149	135
Iron	1	µg/g wet	107000	100000	24000	130000	100000
Lead	1	µg/g wet	6300	6500	43	7900	8100
Lithium	0.5	µg/g wet	2.1	2	19.7	2	2.2
Magnesium	1	µg/g wet	3940	3380	6280	3300	3830
Manganese	0.5	µg/g wet	40900	38700	507	50100	46900
Mercury	0.01	µg/g wet	0.38	0.26	0.09	1	0.36
Molybdenum	1	µg/g wet	3	3	1	4	4
Nickel	0.2	µg/g wet	10.7	11.4	23.5	15.4	11.2
Phosphorus	5	µg/g wet	231	185	858	177	265
Potassium	20	µg/g wet	930	2120	6700	2060	1810
Selenium	2	µg/g wet	<2	<2	<2	<2	<2
Silicon	5	µg/g wet	197	297	581	209	311
Silver	0.5	µg/g wet	79.8	63.9	0.6	149	72
Sodium	5	µg/g wet	171	189	1310	166	112
Strontium	1	µg/g wet	<1	<1	51	<1	<1
Sulphur	10	µg/g wet	28100	28300	1310	46700	27400
Thorium	1	µg/g wet	<1	<1	<1	<1	<1
Tin	1	µg/g wet	4	6	1	4	5
Titanium	0.2	µg/g wet	34.6	26.9	802	26.1	21
Uranium	5	µg/g wet	<5	<5	<5	<5	<5
Vanadium	1	µg/g wet	7	10	63	10	10
Zinc	0.5	µg/g wet	4960	6260	119	9250	9960
Zirconium	0.1	µg/g wet	7.3	6.9	17.3	6.7	7.6

Table 3. Water Quality Analyses

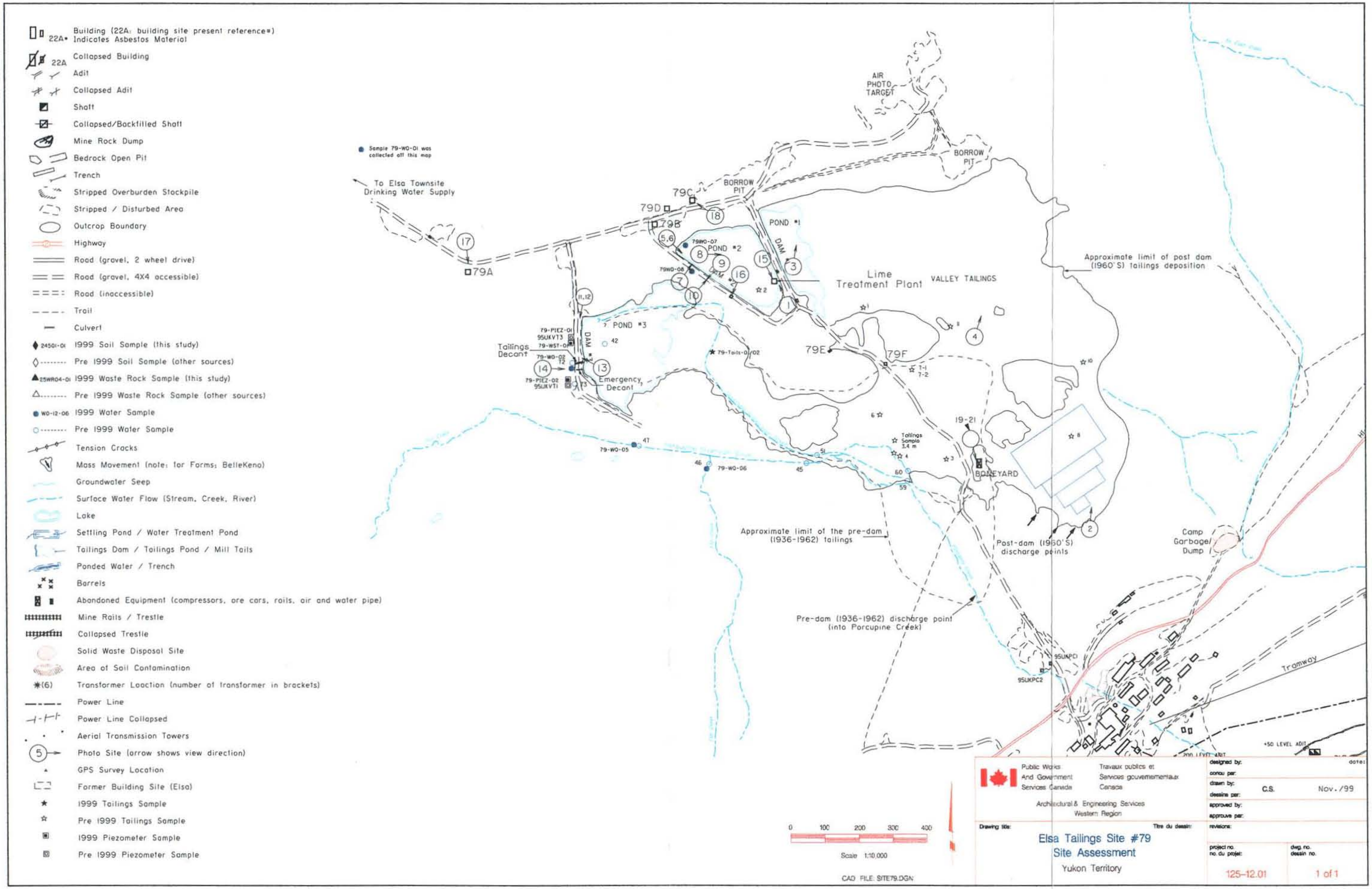
Parameter	Detection Limit	Units	Surface Water Samples			
			79-WQ-01 - 47899-1	79-WQ-02 - 47899-2	79-WQ-03 - 47899-3	79-WQ-05 - 47899-4
ICP-USN Total Metals Scan in Water						
Aluminum	0.0008	mg/L	0.0183	0.0061	0.126	0.0175
Antimony	0.005	mg/L	<0.005	0.007	<0.005	<0.005
Arsenic	0.01	mg/L	0.02	<0.01	<0.01	<0.01
Barium	0.00004	mg/L	0.0792	0.0176	0.0444	0.0522
Beryllium	0.00001	mg/L	<0.00001	<0.00001	<0.00001	<0.00001
Bismuth	0.0004	mg/L	<0.0004	<0.0004	<0.0004	<0.0004
Boron	0.002	mg/L	<0.002	<0.002	<0.002	<0.002
Cadmium	0.00006	mg/L	0.00026	0.00032	0.00134	0.00029
Calcium	0.002	mg/L	63	82.7	135	98.9
Chromium	0.00006	mg/L	0.00021	<0.00006	0.00016	0.0002
Cobalt	0.00003	mg/L	0.00016	0.00024	0.00063	0.00049
Copper	0.00003	mg/L	0.00184	0.00324	0.00192	0.00126
Iron	0.00001	mg/L	0.152	0.168	0.709	0.152
Lead	0.0003	mg/L	0.0041	0.0261	0.0038	<0.0003
Lithium	0.001	mg/L	0.007	0.013	0.01	0.004
Magnesium	0.0005	mg/L	21.8	45.4	32.9	22.7
Manganese	0.00002	mg/L	0.396	0.0496	0.703	0.407
Molybdenum	0.00007	mg/L	0.00438	0.00026	0.00066	0.00016
Nickel	0.00001	mg/L	0.0023	0.003	0.002	0.0021
Phosphorus	0.03	mg/L	0.06	<0.03	<0.03	<0.03
Potassium	0.4	mg/L	1.2	0.9	0.7	0.5
Selenium	0.004	mg/L	0.005	<0.004	0.006	0.004
Silicon	0.004	mg/L	1.97	0.087	2.95	2.94
Silver	0.00005	mg/L	<0.00005	<0.00005	<0.00005	<0.00005
Sodium	0.004	mg/L	6.1	12.7	3.4	1.4
Strontium	0.00002	mg/L	0.307	0.272	0.298	0.276
Sulphur	0.008	mg/L	32.2	104	92.7	47.7
Thallium	0.001	mg/L	<0.001	<0.001	<0.001	<0.001
Titanium	0.00002	mg/L	0.00026	<0.00002	0.0038	0.00017
Vanadium	0.00003	mg/L	<0.00003	<0.00003	0.00019	<0.00003
Zinc	0.0002	mg/L	0.007	0.0224	0.151	0.0394
Zirconium	0.00004	mg/L				
Mercury	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001
Arsenic	0.0002	mg/L	0.0106	0.0037	0.0036	0.0019
Selenium	0.0001	mg/L	0.0005	<0.0001	<0.0001	<0.0001
Total Alkalinity	5	mg CaCO3/L	152	70	70	166
Chloride	0.1	mg/L	1	2.4	2.4	1.2
Electrical Conductivity	0.01	μS/cm	500	780	780	850
Hardness (CaCO3 equiv)	5	mg/L	247	396	391	456
Nitrate-N	0.05	mg/L	<0.05	0.06	<0.05	0.05
Nitrate-N	0.2	mg/L	na	na	na	na
Nitrite-N	0.003	mg/L	<0.003	<0.003	<0.003	<0.003
pH	0.01	pH	7.88	7.83	7.53	7.78
Sulphate	1	mg/L	95.7	320	320	290
Total Dissolved Solids	5	mg/L	316	596	577	621

Table 3. Water Quality Analyses

Parameter	Detection Limit	Units	Surface Water Samples		
			79-WQ-06 - 47899-5	79-WQ-07 - 47899-6	79-WQ-08 - 47899-9
ICP-USN Total Metals Scan in Water					
Aluminum	0.0008	mg/L	0.0175	0.0278	0.0256
Antimony	0.005	mg/L	<0.005	0.015	<0.005
Arsenic	0.01	mg/L	<0.01	<0.01	0.02
Barium	0.00004	mg/L	0.0521	0.0172	0.043
Beryllium	0.00001	mg/L	<0.00001	<0.00001	<0.00001
Bismuth	0.0004	mg/L	<0.0004	<0.0004	0.0006
Boron	0.002	mg/L	<0.002	0.003	0.013
Cadmium	0.00006	mg/L	0.00028	0.00126	0.00089
Calcium	0.002	mg/L	99	130	140
Chromium	0.00006	mg/L	0.0001	0.0001	<0.00006
Cobalt	0.00003	mg/L	0.00047	0.00096	0.0043
Copper	0.00003	mg/L	0.00111	0.00738	0.00288
Iron	0.00001	mg/L	0.168	0.208	29.2
Lead	0.0003	mg/L	<0.0003	0.0543	0.0124
Lithium	0.001	mg/L	0.005	0.014	0.012
Magnesium	0.0005	mg/L	22.8	35.3	38.2
Manganese	0.00002	mg/L	0.406	0.388	6.24
Molybdenum	0.00007	mg/L	0.00013	0.00053	0.0001
Nickel	0.00001	mg/L	0.0019	0.0091	0.0121
Phosphorus	0.03	mg/L	<0.03	<0.03	0.05
Potassium	0.4	mg/L	0.5	2.2	2.9
Selenium	0.004	mg/L	0.007	<0.004	<0.004
Silicon	0.004	mg/L	2.93	0.32	4.46
Silver	0.00005	mg/L	<0.00005	0.00113	0.00118
Sodium	0.004	mg/L	1.4	13	12.2
Strontium	0.00002	mg/L	0.275	0.321	0.261
Sulphur	0.008	mg/L	47.6	134	137
Thallium	0.001	mg/L	<0.001	0.001	0.008
Titanium	0.00002	mg/L	0.00022	0.00037	0.00023
Vanadium	0.00003	mg/L	<0.00003	<0.00003	<0.00003
Zinc	0.0002	mg/L	0.04	0.111	0.0918
Zirconium	0.00004	mg/L			
Mercury	0.0001	mg/L	<0.0001	<0.0001	<0.0001
Arsenic	0.0002	mg/L	0.0011	0.0047	0.021
Selenium	0.0001	mg/L	<0.0001	<0.0001	<0.0001
Total Alkalinity	5	mg CaCO3/L	180	47	150
Chloride	0.1	mg/L	0.4	2.8	3
Electrical Conductivity	0.01	μS/cm	630	900	1050
Hardness (CaCO3 equiv)	5	mg/L	347	477	503
Nitrate-N	0.05	mg/L	0.07	<0.05	na
Nitrate-N	0.2	mg/L	na	na	<0.2
Nitrite-N	0.003	mg/L	<0.003	<0.003	0.007
pH	0.01	pH	7.85	7.67	6.63
Sulphate	1	mg/L	145	400	480
Total Dissolved Solids	5	mg/L	406	713	851

Table 3. Water Quality Analyses

Parameter	Detection Limit	Units	Groundwater Samples	
			79-PIEZ-01 - 47899-7	79-PIEZ-02 - 47899-8
ICP-USN Total Metals Scan in Water				
Aluminum	0.0008	mg/L	56.4	1.07
Antimony	0.005	mg/L	0.301	<0.005
Arsenic	0.01	mg/L	2.69	0.12
Barium	0.00004	mg/L	3.12	0.552
Beryllium	0.00001	mg/L	0.00511	<0.00001
Bismuth	0.0004	mg/L	0.0332	0.0011
Boron	0.002	mg/L	0.31	0.024
Cadmium	0.00006	mg/L	0.254	0.00042
Calcium	0.002	mg/L	460	273
Chromium	0.00006	mg/L	0.133	0.00183
Cobalt	0.00003	mg/L	0.0543	0.0264
Copper	0.00003	mg/L	1.14	0.0104
Iron	0.00001	mg/L	429	52.4
Lead	0.0003	mg/L	39.5	0.0151
Lithium	0.001	mg/L	0.103	0.015
Magnesium	0.0005	mg/L	272	140
Manganese	0.00002	mg/L	53.7	4.3
Molybdenum	0.00007	mg/L	<0.00007	0.00588
Nickel	0.00001	mg/L	0.193	0.0156
Phosphorus	0.03	mg/L	5.36	0.49
Potassium	0.4	mg/L	5.8	5.4
Selenium	0.004	mg/L	<0.004	<0.004
Silicon	0.004	mg/L	50.7	15
Silver	0.00005	mg/L	0.536	0.00071
Sodium	0.004	mg/L	21.9	8.9
Strontium	0.00002	mg/L	1.2	0.558
Sulphur	0.008	mg/L	535	5.86
Thallium	0.001	mg/L	<0.001	<0.001
Titanium	0.00002	mg/L	1.01	0.0285
Vanadium	0.00003	mg/L	0.0279	0.00377
Zinc	0.0002	mg/L	11.2	0.0197
Zirconium	0.00004	mg/L		
Mercury	0.0001	mg/L	<0.0001	<0.0001
Arsenic	0.0002	mg/L	2.81	0.167
Selenium	0.0001	mg/L	0.0068	0.0025
Total Alkalinity	5	mg CaCO3/L	314	878
Chloride	0.1	mg/L	5.3	6.5
Electrical Conductivity	0.01	µS/cm	2800	1650
Hardness (CaCO3 equiv)	5	mg/L	1990	1090
Nitrate-N	0.05	mg/L	<0.05	0.2
Nitrate-N	0.2	mg/L	na	na
Nitrite-N	0.003	mg/L	0.008	<0.003
pH	0.01	pH	6.82	7.37
Sulphate	1	mg/L	1600	21.7
Total Dissolved Solids	5	mg/L	2900	1250



Building (22A: building site present reference#)
22A* Indicates Asbestos Material
Collapsed Building
Adit
Collapsed Adit
Shaft
Collapsed/Backfilled Shaft
Mine Rock Dump
Bedrock Open Pit
Trench
Stripped Overburden Stockpile
Stripped / Disturbed Area
Outcrop Boundary
Highway
Road (gravel, 2 wheel drive)
Road (gravel, 4X4 accessible)
Road (inaccessible)
Trail
Culvert
1999 Soil Sample (this study)
Pre 1999 Soil Sample (other sources)
1999 Waste Rock Sample (this study)
Pre 1999 Waste Rock Sample (other sources)
1999 Water Sample
Pre 1999 Water Sample
Tension Cracks
Mass Movement (note: for Forms: BelleKeno)
Groundwater Seep
Surface Water Flow (Stream, Creek, River)
Lake
Settling Pond / Water Treatment Pond
Tailings Dam / Tailings Pond / Mill Tails
Ponded Water / Trench
Barrels
Abandoned Equipment (compressors, ore cars, rails, air and water pipe)
Mine Rails / Trestle
Collapsed Trestle
Solid Waste Disposal Site
Area of Soil Contamination
Transformer Loaction (number of transformer in brackets)
Power Line
Power Line Collapsed
Aerial Transmission Towers
Photo Site (arrow shows view direction)
GPS Survey Location
Former Building Site (Elsa)
1999 Tailings Sample
Pre 1999 Tailings Sample
1999 Piezometer Sample
Pre 1999 Piezometer Sample
Sample 79-WO-01 was collected off this map
To Elsa Townsite Drinking Water Supply
AIR PHOTO TARGET
BORROW PIT
BORROW PIT
79A
79B
79C
79D
79E
79F
POND #1
POND #2
POND #3
DAM
Lime Treatment Plant
VALLEY TAILINGS
Approximate limit of post dam (1960'S) tailings deposition
Tailings Decant
Emergency Decant
79-PIEZ-01
95UKVT3
79-WST-01
79-WO-02
79-PIEZ-02
95UKVT1
79WO-07
79WO-08
79-Tails-01/02
79-WO-05
79-WO-06
Tailings Sample 3.4 m
BONEYARD
19-21
Approximate limit of the pre-dam (1936-1962) tailings
Post-dam (1960'S) discharge points
Pre-dam (1936-1962) discharge point (into Porcupine Creek)
Camp Garbage/ Dump
Tramway
+50 LEVEL ADIT
95UKPC1
95UKPC2
0 100 200 300 400
Scale 1:10,000
CAD FILE: SITE79.DGN
Public Works And Government Services Canada
Travaux publics et Services gouvernementaux Canada
Architectural & Engineering Services Western Region
Drawing title:
Titre du dessin:
Elsa Tailings Site #79
Site Assessment
Yukon Territory
designed by: concu par:
drawn by: dessine par: C.S.
date: Nov./99
approved by: approuve par:
revisions:
project no. no. du projet: 125-12.01
dwg. no. dessin no. 1 of 1

Photo 79-1. Toe berm (light-colored material) at the base of Dam No. 1, looking northwestward.

Photo 79-2. Tailings cells for future tailings, looking northward.

Photo 79-3. View of tailings pond No. 1, taken from Dam No. 1.

Photo 79-4. Exposed tailings behind Dam No. 1.

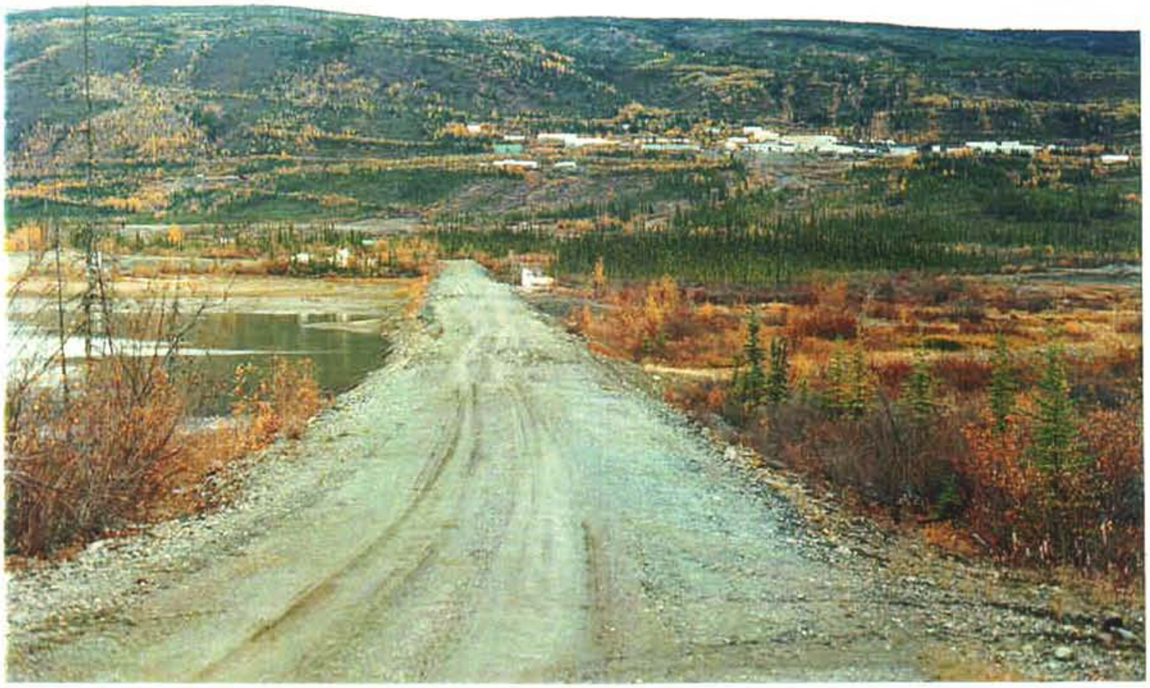


Photo 79-5. Tailings Dam No. 2, looking southeastward. The lime treatment plant can be seen at the far end of the dam. The Elsa townsite is in background on the hill.

Photo 79-6. Tension cracks in tailings Dam No. 2.

Photo 79-7. Ponded water below Dam No. 2. Note red iron-oxide precipitate in water.

Photo 79-8. Tailings pond No. 2, taken looking eastward from Dam No. 2.

Photo 79-9. Decant in Dam No. 2, upstream side.

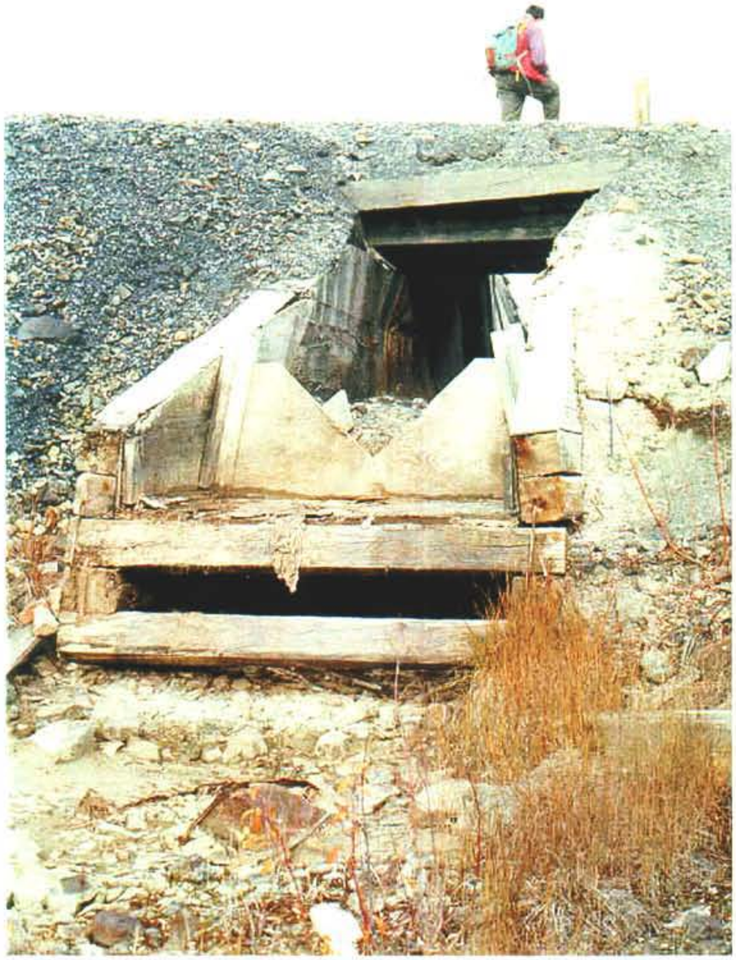


Photo 79-10. Decant in Dam No. 2, downstream side. Note lime precipitate around decant.

Photo 79-11. Tailings Dam No. 3, looking south.

Photo 79-12. Tension cracks in Dam No. 3.

Photo 79-13. Wooden decant and v-notch weir in Dam No. 3. Note subsidence around decant.

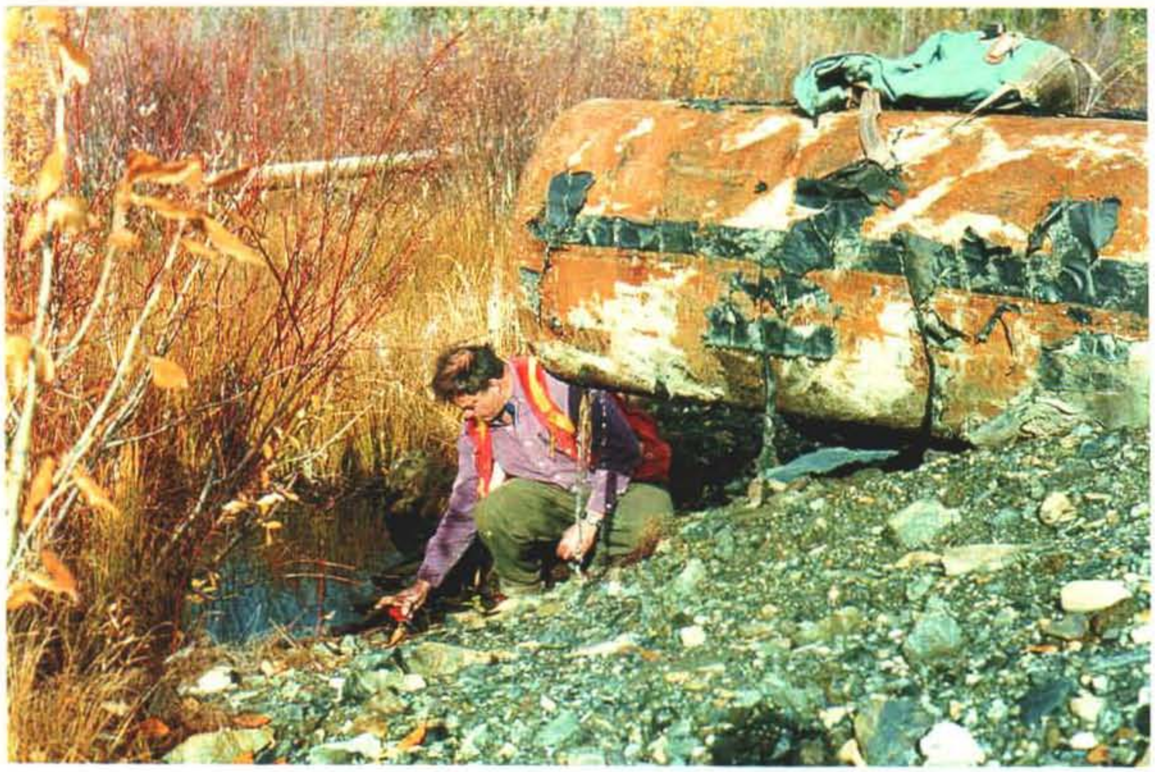


Photo 79-14. Pipe on downstream side of decant on Dam No. 3. This is also sampling site 79-WQ-02.

Photo 79-15. Lime treatment plant on Dam No. 1.

Photo 79-16. Lime treatment plant on Dam No. 2.

Photo 79-17. Transmission building (79A) and satellite dish.

Photo 79-18. Northwestel building and satellite dish (Building 79C).

Photo 79-19. Barrels stored in boneyard.

Photo 79-20. Old vehicles stored in boneyard.

Photo 79-21. Old household appliances stored at boneyard.

Photo 79-22. Pump house on unnamed lake that is the fresh water supply for the Elsa townsite.

Photo 79-23. Pressure pump house that pumps the fresh lake water to the Elsa townsite. Note picket fence to the right of the house that contains the transformer that is in use.

WERNECKE TAILINGS
Site #80
(not a MINFILE site)

1. LOCATION AND ACCESS

The bulk of the Wernecke tailings are located in an unnamed lake on the northwest side of Keno Hill, below the Wernecke Mill site (Site #100, Figure 1). The lake is situated at the head of Ladue Creek, just below 2500 feet (762 m) elevation. To the west of the lake is a low saddle which separates the Ladue Creek drainage from the McQuesten River drainage.

There is an old road to the site but its accessibility was not investigated. This site visit was conducted by helicopter. The NTS coordinates for the site are 7 095 400N 484 400E.

2. SITE PHYSIOGRAPHY

The lake is in the valley bottom on the north side of Keno Hill. Water from the unnamed lake discharges into Ladue Creek which enters Gambler Lake before continuing downstream. The tailings are from the Wernecke Mill situated 2.5 km to the south-southeast at an elevation of 3600 feet (1097m). The tailings were discharged into a small creek that drains the mine site, and empties into the lake (Photo 100-1). The creek contains some tailings and a small portion of tailings remain at Wernecke Mine site. The tailings have formed an alluvial fan in the lake, as can be seen in Photo 100-2.

3. GEOLOGY AND MINERALIZATION

The Wernecke Mill processed ore from the Sadie-Friendship and Ladue mines, and the Lucky Queen mine as well as other minor sources. These veins were generally rich in siderite and low in pyrite (Minfile report). The Lucky Queen was reported to also have pyrargyite (silver antimony sulphide) occuring as fine-grained stringers associated with quartz, siderite and pyrite.

No mineralogical study has been conducted of the tailings so the exact mineralogy is unknown.

4. SITE HISTORY

According to the Minfile Report, the Wernecke Mill operated from 1925 to 1931, and milled about 200,000 tons of ore. The method of processing is unknown, but bulk sulphide flotation is likely.

The mill was dismantled and moved to Elsa in 1936.

5. MINE DEVELOPMENT

5.1 Mine Openings And Excavations

There are no mine openings and excvations associated with the tailings deposit itself.

5.2 Waste Rock Disposal Areas

There is no waste rock associated with the tailings deposit.

5.3 Tailings Impoundments

Tailings Dams

There is no dam associated with the Wernecke tailings.

Tailings Ponds

Area: The exact extent of the the tailings within the lake is unclear because water covers much of the pile. However, it is likely that tailings cover the entire floor of the lake. The lake is approximately 800 m long and 500 m wide, giving a surface area of 400,000 m^2. The depth of the tailings is greater than one meter.

Oxidation: Most the the tailings sampled with the auger had iron oxide in mottles in the top 5 to 20 cm.

Slope of tailings: The slope of the exposed tailings at the stream output is gentle (<10 degrees).

Locations and area of saturated tailings: Most of the tailings are below the level of the lake. However, the tailings near the top of the alluvial fan (~1000m^2) are unsaturated.

Sampling: The tailings were sampled using a hand auger to a depth of 1 meter. Sampling to a greater depth was not possible given the difficulty in augering. Two grab samples of tailings were collected in the creek that carried the tailings from the Wernecke Mill site.

One sample of the tailings was also collected from the Wernecke Mill site during the 1996 Phase II study (WS2). Results of field paste pH and conductivity are listed in Table 1. Laboratory analyses are listed in Table 2.

5.5 Mine Site Water Treatment

There is no water treatment facility on site.

6. MINE SITE INFRASTRUCTURE

No mine infrastructure was encountered on site.

7. SOLID WASTE DUMPS

There are no solid waste dumps on site.

8. POTENTIAL CONTAMINANTS OF CONCERN

No industrial contaminants of concern were encountered at the site. However, it is likely that metal contamination of the local surface and groundwater, and of local vegetation has occurred as a result of the tailings deposition.

9. WATER QUALITY

Four water quality samples were collected. They are located on two creeks that flow into the lake from the southeast, the outflow of the lake on the west, and one lake water sample from the north side of the lake. Water quality sample locations are shown in Figure 2. The results of immediate parameters (pH, conductivity, acidity, alkalinity) and metals analyses (ICP) are listed in Table 2.

TABLE 1

Geochemistry of Tailings Solid Samples

Sample No.	Location	Field pH	Field Conductivity (µS)
WS2 (UKHM, 1996)			
100-01-84	Tailings pile	7.4	274
100-01-100	Tailings pile	7.5	129
100-02-50	Tailings pile	6.40	242
100-02-100	Tailings pile		
100-03-30	Tailings pile	5.49	332
100-03-100	Tailings pile	6.28	1005
100-04-25	Tailings pile	7.4	4
100-04-100	Tailings pile	6.9	
100-05-25	Tailings pile	7.1	
100-05-100	Tailings pile	6.9	
100-06-10	Tailings pile	6.8	
100-06-100	Tailings pile	6.8	
100-07-40	Tailings pile	6.54	405
100-07-100	Tailings pile		
100-08-25	Tailings pile	7.3	
100-08-100	Tailings pile	7.2	
100-10-01	Stream sediment	7.4	
100-10-02	Sand bar	6.42	171

Table 2. Water Quality Analyses

Parameter	Detection Limit	Units	99-100-WQ-03 (47699-1)	99-100-WQ-04 (47699-2)	99-100-WQ-02 (47699-3)	99-100-WQ-01 (47699-4)
Field pH			8.23	6.7	4.93	7.45
Field conductivity		µS	566	549	83.2	720
Aluminum	0.0008	mg/L	0.137	0.0141	0.0987	0.0093
Antimony	0.005	mg/L	<0.005	<0.005	0.015	0.01
Arsenic	0.01	mg/L	<0.01	<0.01	<0.01	<0.01
Barium	0.00004	mg/L	0.0185	0.0469	0.0455	0.0406
Beryllium	0.00001	mg/L	<0.00001	<0.00001	<0.00001	<0.00001
Bismuth	0.0004	mg/L	<0.0004	<0.0004	<0.0004	<0.0004
Boron	0.002	mg/L	<0.002	<0.002	<0.002	<0.002
Cadmium	0.00006	mg/L	0.00013	0.00489	0.00099	0.00027
Calcium	0.002	mg/L	7.73	108	80.8	78.9
Chromium	0.00006	mg/L	0.00032	<0.00006	0.00016	0.00014
Cobalt	0.00003	mg/L	0.00028	0.00014	0.00011	<0.00003
Copper	0.00003	mg/L	0.00208	0.00054	0.00184	0.0042
Iron	0.00001	mg/L	0.597	0.148	0.365	0.04
Lead	0.0003	mg/L	<0.0003	0.0009	0.035	0.0032
Lithium	0.001	mg/L	<0.001	0.005	0.004	0.003
Magnesium	0.0005	mg/L	2.34	25.6	23.6	22.4
Manganese	0.00002	mg/L	0.0291	0.119	0.0711	0.0103
Molybdenum	0.00007	mg/L	<0.00007	0.00087	0.00137	0.00118
Nickel	0.00001	mg/L	0.0028	<0.0001	<0.0001	<0.0001
Phosphorus	0.03	mg/L	<0.03	<0.03	<0.03	<0.03
Potassium	0.4	mg/L	<0.4	0.4	<0.4	<0.4
Selenium	0.004	mg/L	0.005	<0.004	<0.004	0.008
Silicon	0.004	mg/L	2.09	2.88	0.802	1.02
Silver	0.00005	mg/L	<0.00005	<0.00005	0.00101	<0.00005
Sodium	0.004	mg/L	<0.4	1.9	1.5	1.6
Strontium	0.00002	mg/L	0.0207	0.29	0.244	0.233
Sulphur	0.008	mg/L	0.895	67.5	62.1	58.3
Thallium	0.001	mg/L	<0.001	<0.001	<0.001	<0.001
Titanium	0.00002	mg/L	0.00088	0.00026	0.00243	0.00012
Vanadium	0.00003	mg/L	0.00011	<0.00003	<0.00003	<0.00003
Zinc	0.0002	mg/L	0.0142	0.555	0.103	0.0788
Zirconium	0.00004	mg/L				
Mercury	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001
Arsenic (hydride AA)	0.0002	mg/L	<0.0002	<0.0002	<0.0002	<0.0002
Selenium (hydride AA)	0.0001	mg/L	0.0005	0.0004	<0.0001	<0.0001
Total Alkalinity	5	mg CaCO3/	10	170	103	113
Chloride	2.5	mg/L	na	<0.25	<0.25	<0.25
Chloride	0.5	mg/L	<0.5	na	na	na
Electrical Conductivity	0.01	µS/cm	49	710	550	570
Hardness (CaCO3 equiv	5	mg/L	35	438	314	324
Nitrate-N	0.05	mg/L	na	0.09	<0.05	<0.05
Nitrate-N	0.1	mg/L	<0.1	na	na	na
Nitrite-N	0.003	mg/L	<0.003	<0.003	<0.003	<0.003
pH	0.01	pH	6.19	7.97	8.08	8.36
Sulphate	1	mg/L	1.4	204	175	180
Total Dissolved Solids	5	mg/L	103	487	388	434

10. RECLAMATION

Most of the approximatly 45,000m^2 area of the tailings that is exposed has revegetated naturally with some type of grass or moss, and up to 8 cm of organic matter has accumulated beneath the grasses. It is only an area of approximately 10,000 m^2, near the top of the alluvial fan, that has no vegetation cover. The reason for the exposed tailings in the alluvial fan is thought to be twofold. First, the tailings at the top of the fan are above the water level and are, therefore, dryer. Secondly, tailings are likely re-deposited in this area during each spring freshet, distrubing any vegetation that tries to take hold.

No active reclamation has taken place.

11. REFERENCES AND PERSONAL COMMUNICATIONS

Norecol, Dames and Moore, 1996. Final Report - Site Assessment Report, Wernecke Camp, Keno Hill, Yukon. For Public Works and Government Services. Job No. 20749-013-310, March 7, 1997.

Table 2. Tailings Solids Analysis

Parameter	Detection Limit	Unit	100-01-84 - Wernt	100-01-100 - Wernt	100-02-50 - Wernt	100-02-100 - Wernt
Sample Depth		**cm**	**84**	**100**	**50**	**100**
Paste pH			7.8	7.5	6.9	7.6
S(T)		%	1.47	1.75	1.12	1.99
S(SO4)		%	0.01	0.06	0.03	0.02
AP		tonne CaCO3 eq./ tonne	45.6	52.8	34.1	61.6
NP		tonne CaCO3 eq./ tonne	74.1	84.4	23.1	65.0
Net NP		tonne CaCO3 eq./ tonne	28.4	31.6	-10.9	3.4
NP/AP			1.6	1.6	0.7	1.1
pH in Saturated Paste						
pH	0.1	pH	6.7	6.5	6.1	6.6
pH in Soil (1:2 water)						
pH	0.01	pH	6.4	7	6.8	7.2
ICP Semi-Trace Scan - Metals						
Aluminum	5	µg/g wet	9070	3700	4370	6970
Antimony	2	µg/g wet	57	74	180	83
Arsenic	2	µg/g wet	75	70	77	121
Barium	0.05	µg/g wet	86.7	52.6	59	69.9
Beryllium	0.1	µg/g wet	<0.1	<0.1	<0.1	<0.1
Bismuth	5	µg/g wet	<5	<5	<5	<5
Cadmium	0.1	µg/g wet	447	456	390	515
Calcium	5	µg/g wet	14600	16000	4120	10500
Chromium	0.5	µg/g wet	8.3	5.4	6.9	9.1
Cobalt	0.1	µg/g wet	3.9	4.3	4.3	5.4
Copper	0.5	µg/g wet	88.6	106	127	98.2
Iron	1	µg/g wet	160000	190000	120000	140000
Lead	1	µg/g wet	1620	1620	3670	1970
Lithium	0.5	µg/g wet	3.1	2.4	1.8	2.9
Magnesium	1	µg/g wet	18300	19200	10600	15500
Manganese	0.5	µg/g wet	53600	55300	44200	49500
Mercury	0.01	µg/g wet	1.5	2.1	1	1.7
Molybdenum	1	µg/g wet	7	7	5	6
Nickel	0.2	µg/g wet	7.9	7.2	8.3	8.6
Phosphorus	5	µg/g wet	224	160	220	221
Potassium	20	µg/g wet	3440	2000	1590	3050
Selenium	2	µg/g wet	<2	<2	<2	<2
Silicon	5	µg/g wet	19	26	192	287
Silver	0.5	µg/g wet	73.9	76.5	293	89.8
Sodium	5	µg/g wet	240	156	169	209
Strontium	1	µg/g wet	<1	<1	<1	<1
Sulphur	10	µg/g wet	19500	22300	145	21000
Thorium	1	µg/g wet	<1	<1	<1	<1
Tin	1	µg/g wet	2	<1	1	3
Titanium	0.2	µg/g wet	86.5	39.1	48.3	51.8
Uranium	5	µg/g wet	<5	<5	<5	<5
Vanadium	1	µg/g wet	19	14	11	17
Zinc	0.5	µg/g wet	32000	37700	26200	36900
Zirconium	0.1	µg/g wet	5.9	5.7	7.4	7.9

Table 2. Tailings Solids Analysis

Parameter	Detection Limit	Unit	100-03-30 - Wernt	100-03-100 - Wernt	100-04-25 - Wernt	100-04-100 - Wernt
Sample Depth		**cm**	**30**	**100**	**25**	**100**
Paste pH			7.1	7.7	7.0	7.4
S(T)		%	0.87	1.19	0.81	1.50
S(SO4)		%	0.03	0.03	0.09	0.04
AP		tonne CaCO3 eq./ tonne	26.3	36.3	22.5	45.6
NP		tonne CaCO3 eq./ tonne	15.0	53.8	25.0	48.1
Net NP		tonne CaCO3 eq./ tonne	-11.3	17.5	2.5	2.5
NP/AP			0.6	1.5	1.1	1.1
pH in Saturated Paste						
pH	0.1	pH	6.3	6.7	6.4	6.6
pH in Soil (1:2 water)						
pH	0.01	pH	6.9	7.4	6.9	7.2
ICP Semi-Trace Scan - Metals						
Aluminum	5	µg/g wet	4040	6550	4800	6930
Antimony	2	µg/g wet	200	96	220	120
Arsenic	2	µg/g wet	58	71	69	73
Barium	0.05	µg/g wet	55.8	59	76.1	84.9
Beryllium	0.1	µg/g wet	<0.1	<0.1	<0.1	<0.1
Bismuth	5	µg/g wet	<5	<5	<5	<5
Cadmium	0.1	µg/g wet	246	333	211	323
Calcium	5	µg/g wet	3550	13400	3560	7720
Chromium	0.5	µg/g wet	7.4	9.1	9.7	10.2
Cobalt	0.1	µg/g wet	2.8	4.5	3.3	3
Copper	0.5	µg/g wet	155	73.2	175	88.5
Iron	1	µg/g wet	98000	120000	100000	100000
Lead	1	µg/g wet	3550	2340	3730	3070
Lithium	0.5	µg/g wet	1.7	2.6	2.2	1.9
Magnesium	1	µg/g wet	7080	12800	8440	9770
Manganese	0.5	µg/g wet	31400	41200	33700	34400
Mercury	0.01	µg/g wet	0.69	1.3	1	1.1
Molybdenum	1	µg/g wet	4	5	4	4
Nickel	0.2	µg/g wet	7.2	9.7	8.5	7.4
Phosphorus	5	µg/g wet	209	318	208	249
Potassium	20	µg/g wet	1460	2340	2020	2690
Selenium	2	µg/g wet	<2	<2	<2	<2
Silicon	5	µg/g wet	666	5550	349	6130
Silver	0.5	µg/g wet	261	82.2	335	130
Sodium	5	µg/g wet	140	190	198	187
Strontium	1	µg/g wet	<1	4	3	3
Sulphur	10	µg/g wet	9700	13400	9400	12400
Thorium	1	µg/g wet	<1	<1	<1	<1
Tin	1	µg/g wet	4	2	3	1
Titanium	0.2	µg/g wet	34.3	41.7	56	37.4
Uranium	5	µg/g wet	<5	<5	<5	<5
Vanadium	1	µg/g wet	10	14	13	14
Zinc	0.5	µg/g wet	16700	23500	16300	20800
Zirconium	0.1	µg/g wet	6.7	10	8.6	7.1

Table 2. Tailings Solids Analysis

Parameter	Detection Limit	Unit	100-05-25 - Wernt	100-05-100 - Wernt	100-06-60 - Wernt	100-06-100 - Wernt
Sample Depth		**cm**	**25**	**100**	**60**	**100**
Paste pH			7.2	7.3	7.3	7.6
S(T)		%	1.48	0.98	0.75	0.52
S(SO4)		%	0.03	0.02	0.03	0.02
AP		tonne CaCO3 eq./ tonne	45.3	30.0	22.5	15.6
NP		tonne CaCO3 eq./ tonne	39.8	26.8	29.3	18.8
Net NP		tonne CaCO3 eq./ tonne	-5.6	-3.2	6.8	3.1
NP/AP			0.9	0.9	1.3	1.2
pH in Saturated Paste						
pH	0.1	pH	6.4	6.3	6.7	7.1
pH in Soil (1:2 water)						
pH	0.01	pH	6.86	7.2	7.3	7.5
ICP Semi-Trace Scan - Metals						
Aluminum	5	μg/g wet	7010	4790	6250	6540
Antimony	2	μg/g wet	91	190	170	220
Arsenic	2	μg/g wet	66	48	47	36
Barium	0.05	μg/g wet	88.4	71	87	175
Beryllium	0.1	μg/g wet	<0.1	<0.1	<0.1	<0.1
Bismuth	5	μg/g wet	<5	<5	<5	<5
Cadmium	0.1	μg/g wet	402	276	219	98.2
Calcium	5	μg/g wet	11800	4260	6770	3900
Chromium	0.5	μg/g wet	8.1	8.6	9.6	12
Cobalt	0.1	μg/g wet	2.9	2.9	2.6	2.1
Copper	0.5	μg/g wet	88.9	114	105	108
Iron	1	μg/g wet	130000	100000	95000	80000
Lead	1	μg/g wet	3780	3950	4150	5100
Lithium	0.5	μg/g wet	2.6	1.3	1.5	1.7
Magnesium	1	μg/g wet	14200	7970	7650	4380
Manganese	0.5	μg/g wet	43300	35400	30400	24800
Mercury	0.01	μg/g wet	1.4	0.9	0.8	0.5
Molybdenum	1	μg/g wet	6	4	5	2
Nickel	0.2	μg/g wet	6	7.3	6.7	6.3
Phosphorus	5	μg/g wet	221	171	230	249
Potassium	20	μg/g wet	2070	1810	2200	2880
Selenium	2	μg/g wet	<2	<2	<2	<2
Silicon	5	μg/g wet	6260	966	6420	170
Silver	0.5	μg/g wet	146	235	159	157
Sodium	5	μg/g wet	291	147	220	226
Strontium	1	μg/g wet	<1	<1	4	5
Sulphur	10	μg/g wet	17400	11300	9100	6100
Thorium	1	μg/g wet	<1	<1	<1	<1
Tin	1	μg/g wet	<1	3	2	4
Titanium	0.2	μg/g wet	59.8	38.7	41	36.9
Uranium	5	μg/g wet	<5	<5	<5	<5
Vanadium	1	μg/g wet	14	11	13	14
Zinc	0.5	μg/g wet	29800	18800	15800	9520
Zirconium	0.1	μg/g wet	7.5	8.2	7.9	7.2

Table 2. Tailings Solids Analysis

Parameter	Detection Limit	Unit	100-07-40 - Wernt	100-07-100 - Wernt	100-08-25 - Wernt	100-08-100 - Wernt
Sample Depth		**cm**	**40**	**100**	**25**	**100**
Paste pH			7.3	7.7	7.5	7.7
S(T)		%	1.34	1.37	0.96	1.06
S(SO4)		%	0.03	0.01	0.06	0.01
AP		tonne CaCO3 eq./ tonne	40.9	42.5	28.1	32.8
NP		tonne CaCO3 eq./ tonne	45.8	52.3	31.8	43.8
Net NP		tonne CaCO3 eq./ tonne	4.8	9.8	3.6	10.9
NP/AP			1.1	1.2	1.1	1.3
pH in Saturated Paste						
pH	0.1	pH	6.6	6.7	6.8	7.4
pH in Soil (1:2 water)						
pH	0.01	pH	7.2	6.7	7.1	7
ICP Semi-Trace Scan - Metals						
Aluminum	5	µg/g wet	8870	10500	21100	6640
Antimony	2	µg/g wet	43	75	33	76
Arsenic	2	µg/g wet	64	80	47	59
Barium	0.05	µg/g wet	143	130	440	99.3
Beryllium	0.1	µg/g wet	<0.1	<0.1	<0.1	<0.1
Bismuth	5	µg/g wet	<5	<5	<5	<5
Cadmium	0.1	µg/g wet	332	320	207	217
Calcium	5	µg/g wet	13600	11900	14900	8820
Chromium	0.5	µg/g wet	11.5	10.5	23.8	8.8
Cobalt	0.1	µg/g wet	4	3.2	6	3.2
Copper	0.5	µg/g wet	65.8	80.3	69.1	62.5
Iron	1	µg/g wet	120000	130000	94000	94000
Lead	1	µg/g wet	1470	2170	1460	1980
Lithium	0.5	µg/g wet	3.7	3.2	11.9	2.7
Magnesium	1	µg/g wet	13500	13000	11900	8750
Manganese	0.5	µg/g wet	36300	43600	22800	30400
Mercury	0.01	µg/g wet	0.25	1.4	0.67	0.02
Molybdenum	1	µg/g wet	5	6	5	5
Nickel	0.2	µg/g wet	9.4	7.4	18.9	8.6
Phosphorus	5	µg/g wet	323	338	686	326
Potassium	20	µg/g wet	2660	4080	5800	2370
Selenium	2	µg/g wet	<2	<2	<2	<2
Silicon	5	µg/g wet	761	286	278	434
Silver	0.5	µg/g wet	54.9	82.4	48.6	73.9
Sodium	5	µg/g wet	567	308	1300	323
Strontium	1	µg/g wet	9	1	29	5
Sulphur	10	µg/g wet	13700	14900	10200	9900
Thorium	1	µg/g wet	<1	<1	<1	<1
Tin	1	µg/g wet	<1	2	3	4
Titanium	0.2	µg/g wet	110	68.3	345	55.5
Uranium	5	µg/g wet	<5	<5	<5	<5
Vanadium	1	µg/g wet	21	18	44	13
Zinc	0.5	µg/g wet	24100	26100	15100	16600
Zirconium	0.1	µg/g wet	9.2	6.3	13.3	7.2

Table 2. Tailings Solids Analysis

Parameter	Detection Limit	Unit	100-10-01 - Wernt	100-10-02 - Wernt
Sample Depth		**cm**	**0**	**0**
Paste pH			7.3	7.2
S(T)		%	0.77	0.36
S(SO4)		%	<0.01	0.02
AP		tonne CaCO3 eq./ tonne	24.1	10.6
NP		tonne CaCO3 eq./ tonne	35.8	22.5
Net NP		tonne CaCO3 eq./ tonne	11.7	11.9
NP/AP			1.5	2.1
pH in Saturated Paste				
pH	0.1	pH	6.7	6.8
pH in Soil (1:2 water)				
pH	0.01	pH	6.7	6.9
ICP Semi-Trace Scan - Metals				
Aluminum	5	µg/g wet	4260	5260
Antimony	2	µg/g wet	96	71
Arsenic	2	µg/g wet	69	44
Barium	0.05	µg/g wet	49.3	84.8
Beryllium	0.1	µg/g wet	<0.1	<0.1
Bismuth	5	µg/g wet	<5	<5
Cadmium	0.1	µg/g wet	180	57.7
Calcium	5	µg/g wet	7590	3640
Chromium	0.5	µg/g wet	6.4	8.1
Cobalt	0.1	µg/g wet	3.3	1.6
Copper	0.5	µg/g wet	77.9	38.1
Iron	1	µg/g wet	100000	84000
Lead	1	µg/g wet	2040	1960
Lithium	0.5	µg/g wet	1.8	1.6
Magnesium	1	µg/g wet	9810	6510
Manganese	0.5	µg/g wet	35000	28000
Mercury	0.01	µg/g wet	0.08	0.35
Molybdenum	1	µg/g wet	3	1
Nickel	0.2	µg/g wet	6.8	5.6
Phosphorus	5	µg/g wet	220	207
Potassium	20	µg/g wet	1500	1970
Selenium	2	µg/g wet	<2	<2
Silicon	5	µg/g wet	247	363
Silver	0.5	µg/g wet	84.8	57
Sodium	5	µg/g wet	160	130
Strontium	1	µg/g wet	<1	<1
Sulphur	10	µg/g wet	7400	2930
Thorium	1	µg/g wet	<1	<1
Tin	1	µg/g wet	2	3
Titanium	0.2	µg/g wet	42.7	29
Uranium	5	µg/g wet	<5	<5
Vanadium	1	µg/g wet	10	10
Zinc	0.5	µg/g wet	14200	5450
Zirconium	0.1	µg/g wet	5.5	5.6

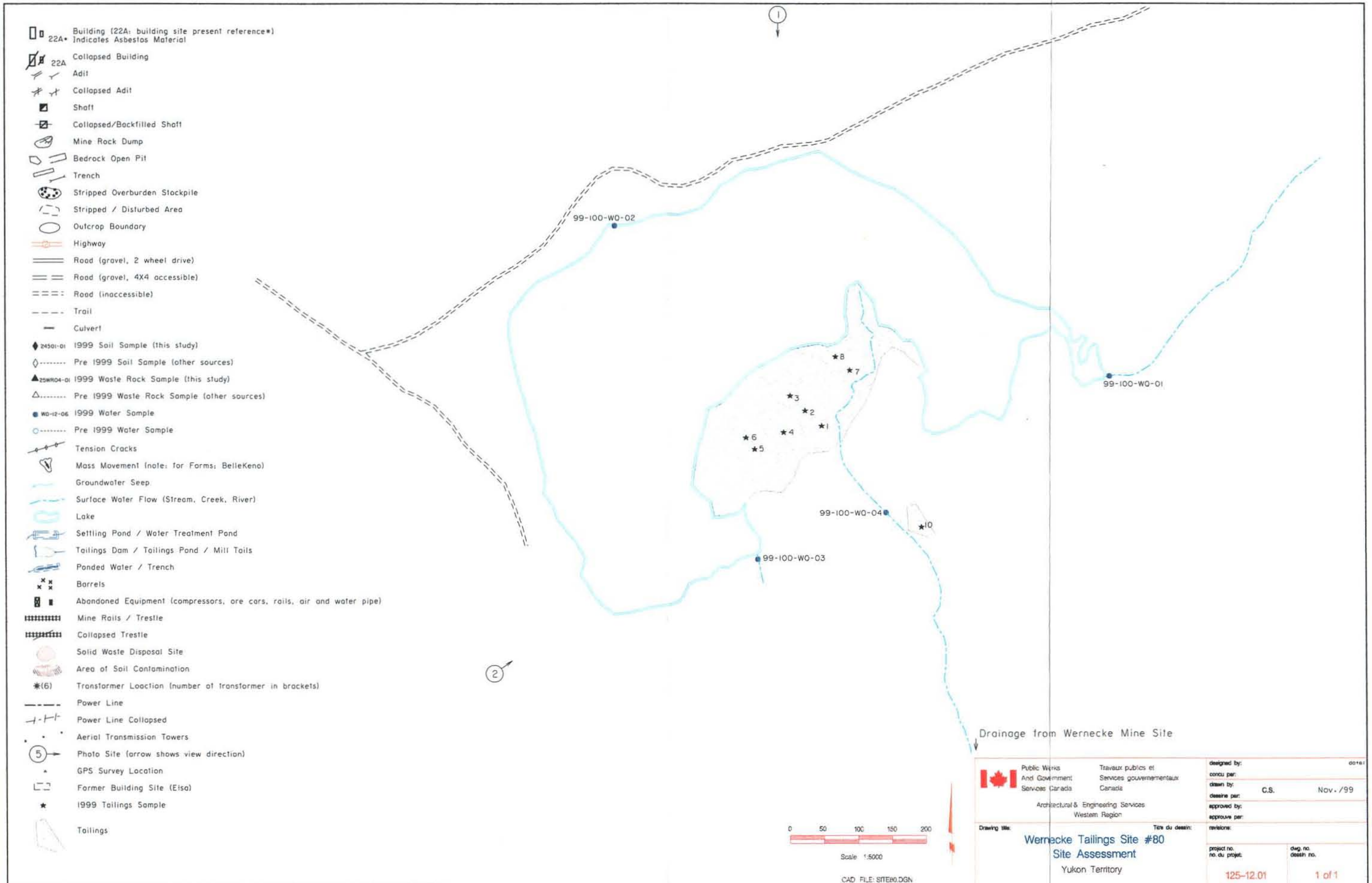

Building (22A: building site present reference*)
22A* Indicates Asbestos Material
Collapsed Building
Adit
Collapsed Adit
Shaft
Collapsed/Backfilled Shaft
Mine Rock Dump
Bedrock Open Pit
Trench
Stripped Overburden Stockpile
Stripped / Disturbed Area
Outcrop Boundary
Highway
Road (gravel, 2 wheel drive)
Road (gravel, 4X4 accessible)
Road (inaccessible)
Trail
Culvert
24501-01 1999 Soil Sample (this study)
Pre 1999 Soil Sample (other sources)
25WR04-01 1999 Waste Rock Sample (this study)
Pre 1999 Waste Rock Sample (other sources)
WO-12-06 1999 Water Sample
Pre 1999 Water Sample
Tension Cracks
Mass Movement (note: for Forms: BelleKeno)
Groundwater Seep
Surface Water Flow (Stream, Creek, River)
Lake
Settling Pond / Water Treatment Pond
Tailings Dam / Tailings Pond / Mill Tails
Ponded Water / Trench
Barrels
Abandoned Equipment (compressors, ore cars, rails, air and water pipe)
Mine Rails / Trestle
Collapsed Trestle
Solid Waste Disposal Site
Area of Soil Contamination
(6) Transformer Loaction (number of transformer in brackets)
Power Line
Power Line Collapsed
Aerial Transmission Towers
5 Photo Site (arrow shows view direction)
GPS Survey Location
Former Building Site (Elsa)
1999 Tailings Sample
Tailings
1
2
99-100-WO-01
99-100-WO-02
99-100-WO-03
99-100-WO-04
1
2
3
4
5
6
7
8
10
Drainage from Wernecke Mine Site
0 50 100 150 200
Scale 1:5000
CAD FILE: SITE80.DGN
Public Works And Government Services Canada
Travaux publics et Services gouvernementaux Canada
Architectural & Engineering Services Western Region
Drawing title:
Titre du dessin:
Wernecke Tailings Site #80
Site Assessment
Yukon Territory
designed by:
concu par:
drawn by:
dessine par:
C.S.
Nov./99
approved by:
approuve par:
revisions:
date:
project no.
no. du projet
125-12.01
dwg. no.
dessin no.
1 of 1

Photo 80-1. View of small creek (visible by line of yellow willows) which carried tailings into the lake.

Photo 80-2. Aerial view of tailings, looking eastward. Note that much of the tailings fan is submerged or has naturally revegetated.

MACKENO (#81)
(NO MINFILE)

1. LOCATION AND ACCESS

The site is accessible along a gravel road stemming off of the main highway approximately 2 km north west of Keno City. The gravel road enters the south portion of the millsite (Figure 1) from the east and the north portion is accessible via one of two access points from the south portion of the site. The tailings area is not accessible by vehicle but can be visited through the primary forest from the millsite or by walking east along the lakeshore from the Galkeno mine site (Figure 2). Mackeno is at 63°54'57"N and 135°19'28"W and an approximate elevation of 870 m above sea level. UTM co ordinates are 7087675.770m N 484083.054m E.

2. SITE PHYSIOGRAPHY

The site is located on the east and north east shore of Christal Lake (photo 81-1). The site slopes gradually to the west and south west down to the lake. The millsite itself consists of two adjacent cleared areas separated by a steep embankment approximately 3 m high running east-west (photo 81-2) and the tailings area, approximately 200 m to the north of the main site through a primary forest. South and south west of the millsite, much of the property is forested with considerable areas of second growth willow saplings. Further south, the forest is dominated by mature spruce forest and the area is relatively flat, sloping down towards Christal Lake to the west.

The tailings area abuts directly on the lakeshore, with some tailings noted in the lake (photos 81-3 & 81-4). A portion of the tailings also forms a fan at the mouth of Christal Creek at the north end of the site (photo 81-5). The site slopes gradually down to the lakeshore to the west. East and south of the tailings area is a mature spruce forest. A seasonal creek flows through the forest, entering the lake immediately south of the tailings area (photos 81-1 & 81-6).

3. GEOLOGY AND MINERALIZATION

The millsite is underlain by thin-bedded quartzite & phyllite, cut by narrow, weakly mineralized veins. Some of the bulldozing at the site may have been to expose these veins.

The tailings are medium sand size and smaller, with quartz, siderite and pyrite easily identified with a hand lens. Pyrite commonly constitutes about 10% of the tailings, with sulphide sulphur assaying between 3 and 19%. The carbonate content is relatively low, therefore the NP/AP ratios are very low. Metal contents are generally very high. The ore milled was not mined at the site, but was hauled from the Galkeno and Bellekeno mines (Minfile).

4. SITE HISTORY

Milling began in the spring of 1952 at the site, with most of the ore from the Galkeno mine, and about 10% from the Bellekeno mine. From the spring of 1952 until at least July 1954 the tailings were deposited directly into Christal Creek (McLaren & Lucas, 1954). The mill produced an average of about 55 tonnes per day of tailings during this period, which would indicate a total of over 40,000 tonnes deposited here. About 2700 to 4500 tonnes were deposited in an undammed pile beside the lake (United Keno Hill Mines Limited, 1996). Additional tailings are thought to have been deposited into the lake. Total production is roughly estimated at about 102,000 tonnes milled (Yukon Minfile).

5. MINE DEVELOPMENT

The site was essentially used to mill ore and dispose of the resulting tailings. Development was limited to small trenches and a small test pit at the south end of the site.

5.1 Mine Openings and Excavations

Open Pits (photo 81-7)

One small test pit was found near the millsite.

Location: See attached site location map. Test pit is situated south east of the millsite in second growth willow forest.
Dimensions (L x W x H): 1.5 m x 1.5 m x 1.5 m.
Supports: Wooden timber-lined shaft.
Condition: Timbers are rotten, site is revegetated.
Accessibility: Easy access by foot, but low risk to public due to shallow depth.

Trenches (photo 81-8)

Exploration trenches are present to the south of the millsite. They cut overburden for the most part.

Location: See attached site location map. Trenches are located immediately south of old truck weigh scale.
Dimensions (L x W x H): 35 m x 5 m x 3 m.

Condition: Fairly stable; partially revegetated.
Accessibility: Easy access by vehicle from the adjacent highway.

5.2 Waste Rock Disposal Areas

Very minor volumes of waste rock were noted at the site. The site has been extensively disturbed, however, most of the disturbances are associated with millsite not mining.

5.3 Tailings Impoundments

Tailings Dam

Tailings are present in a pile on the lakeshore, however no dam was built to contain the tailings. A beaver dam now serves the purpose of impounding the tailings along the lakeshore between two islands. The dam should not be considered permanent but appears to have been in place for a number of years allowing a small wetlands area to form between the dam and the on-shore tailings.

Location: Beaver dam is located between two islands approximately 20 m off-shore to the west of tailings area.
Dimensions (L x W x H): Approximately 30 m x 1 m x 1 m.
Surface composition: Beaver dam; wood and vegetative matter.

Tailings Ponds (photo 81-4)

Tailings were deposited in a depression near the lakeshore, and overflowed into the lake. A wetland (sedge) area has formed between the tailings and the lake. A small portion of the impounded area immediately off-shore remains unvegetated.

Location: See map in Figure 2. Located at north end of Christal Lake immediately adjacent to effluent into Christal Creek. Delineated by beaver dam between two islands to the west, however, tailings are also probably present under sediments in the lake and creek.
Area (L x W x Depth): 80 m x 40 m x 2m.
Oxidation: Discoloration (orange) of tailings (on surface and at depth).
Slope of tailings: Less than 5° towards lake.
Locations and area of saturated tailings: The surface of most of the tailings are dry, but become saturated near the lake and at depth. The clay rich tailings at depth in the auger hole are saturated.
Breakthroughs: No breakthroughs were noted, however, the beaver dam is not an engineered structure and some tailings probably escape the impoundment area. As well, the dam is not a permanent structure but appears to have been present for some time.
Decant structures and piping: No decant structures were observed.
Pump house: Small wood frame structure straddling small unnamed creek (photo 81-9); used to pump both tailings and water to adjacent tailings area.

Piping between tailings pumphouse and pond: 4 and 6 inch; approximately 150 m in length; still in place through wooded area running directly along ground and through pumphouse (photo 81-6).
Samples: The main pile was tested by auger to a depth of 200 cm. Gravel was intersected at 195 cm. Tailings data and laboratory and field sample analysis data are provided in Attachment B.

5.4 Minesite Water Treatment

No water treatment facilities were observed.

6. MINE SITE INFRASTRUCTURE

6.1 Buildings

Building 81A- Pumphouse (photo 81-9)

Pumphouse consists of a small deteriorated wood building positioned over a small creek.

Location: Approximately 80 m north of millsite and 50 m south of tailings area. Pumphouse has been constructed over a small unnamed creek along the pipeline (photo 81-6).
Dimensions (L x W x H): 2 m x 2.5 m x 1.5 m.
Construction: Wood frame with asphalt roofing and asbestos tarpaper siding.
Paint: None.
Asbestos: Asbestos-impregnated tarpaper was present on the building exterior and was not sampled. Asbestos wallboard is present on the interior walls. Asbestos is considered non-friable in both of these forms.
Non-hazardous contents: None.
Foundation: None.
Hazardous contents: None.
Pipeline in description passes through building from millsite to tailings area to the north.

Building 81B – Weigh Scale (photo 81-10)

All that remains of the scale is concrete foundation and scale well.

Location: South end of millsite adjacent to test trench.
Dimensions (L x W x H): 10 m x 7 m.
Construction: Concrete foundation well covered with timbers.
Paint: None.
Asbestos: None.
Non-hazardous contents: None (scale removed).
Foundation: Concrete.
Hazardous contents: None.

Building 81C – Shack (photo 81-11)

Demolished shack probably used for living quarters.

Location: South west of millsite in area of second growth willow forest.

Dimensions (L x W x H): Approximately 3 m x 2 m x 3 m (demolished).

Construction: Wood frame; demolished.

Paint: None.

Asbestos: None.

Non-hazardous contents: None.

Foundation: None.
Hazardous contents: None.

6.2 Fuel Storage

All barrels noted at the site were empty. No fuel is currently stored at this site.

6.3 Rail and Trestle

No rail or trestle is present at the site.

6.4 Milling and Processing Infrastructure

Mill facility: The mill has been removed or buried onsite since it discontinued use in 1954. Evidence of the former mill facility are indicated by the weigh scale at the south end of the site as well as a large volume of assorted debris on the surface and partially buried throughout the site. A concrete foundation was noted protruding from the north end of the upper millsite. A cogged wheel (debris from former heavy equipment) was also noted protruding from the northwest corner of the site.

Grizzly: None remaining at surface.

Assay lab: None remaining at surface.

Core storage: None remaining at surface.
Samples: Due to the fact that almost all the previous infrastructure at the site has either been removed or buried, no samples were collected from this location.

6.5 Electrical Equipment

No electrical equipment was noted during the site visit, however, a large volume of debris is believed to have been buried at the site.

7. SOLID WASTE DUMPS

No solid waste dumps were noted at the site, however, most of the site has been extensively disturbed and it is believed that a large volume of debris has been buried at the former millsite. Debris noted on the site surface was characterized as follows:

Location & access: Throughout site (photo 81-12 & 81-13).

Dimensions (L x W x H): Not applicable.

Drainage: Site is directly adjacent to the east shore of Christal Lake.

General composition: Non-friable asbestos wallboard; approximately 10 empty barrels; large volume of wood (timber and other) and metal debris; large cogged wheel; loader bucket; lengths of various sizes of pipe (>100 m); and victaulic piping lengths (<20 m).

Impacted vegetation: Site is essentially devegetated, however, this may be partially due to surface disturbances throughout the property and a general lack of organic soils throughout.

% covered: Difficult to determine. Wastes noted throughout site but particularly notable near edge of bulldozed surfaces and at near west side of property where less cover material is available.

Sampling: No samples were collected to determine impacts from this site. Christal Lake and Creek are the main downstream receptors. These water bodies were sampled and data is included in Section 9.

8.0 POTENTIAL CONTAMINANTS OF CONCERN

8.1 Out-of-Service Transformers

No transformers were identified at the site.

8.2 Metals and Hydrocarbons in Soil

Six very small surface stains with a total area of approximately 1 m^3 were noted immediately north of the weigh scale foundation. Stains may be the result of waste oil leakage and had a faint hydrocarbon odour. Staining was not present below 0.10 m below grade. This portion of the site is a considerable distance from the nearest water body and no samples were collected.

8.3 Liquid Hazardous Materials

No liquid hazardous materials were identified at the site.

8.4 Solid Hazardous Materials

No solid hazardous materials were identified at the site.

9. WATER QUALITY

An unnamed creek flows from the east into Christal Lake, approximately 80 m south of the Christal Creek effluent through the forested area between the millsite and tailings (photos 81-1 & 81-6). The creek was sampled (81-WQ-Str-CD-04) upstream of the pumphouse. Christal Lake and Christal Creek (photo 81-3) are immediately downstream of the site and both were sampled adjacent to the tailings area. A water sample (81-WQ-Str-CD-02) was collected from the lake immediately west of the beaver dam enclosing the tailings pond. Another water sample (81-WQ-Str-CD-03) was collected from Christal Creek immediately downstream of the small tailings fan where tailings were reportedly pumped directly into the creek.

A tailings pond has formed immediately west of the main tailings area where the tailings have entered Christal Lake (photo 81-4). The outer edge of the pond has been contained by a (temporary) beaver dam, however, water in the tailings pond is obviously hydraulically connected to the lake. A single water sample (81-WQ-Str-CD-01) was collected from this location.

Laboratory sample analysis and field data is provided in Attachment B.

10. RECLAMATION

There has been extensive reclamation of the former mill facility. The concrete foundation of the former truck weigh scale and another partially uncovered unidentified concrete foundation are the only structures remaining at the millsite. It appears that most of the equipment and infrastructure was either removed or buried at the site. This is supported by the large amount of small debris either strewn throughout the site or protruding from the surface. Most of the site remains unvegetated and will probably remain as such for the foreseeable future since there has been no attempt to either seed or spread topsoil over the site.

There has been no attempt to reclaim the old tailings site. The pumphouse and associated pipeline are present within the wooded area. The onshore tailings remain uncovered and unvegetated.

11. OTHER INFORMATION AND DATA

Mill chemicals used in 1954 by MacKeno include: NaCN, Soda Ash, ZnSO4, Z-5 Xanthate, Dow Froth, "A-31", Cresylic Acid, "208", CuSO4, Z-9 Xanthate.

12. REFERENCES AND PERSONAL COMMUNICATIONS

United Keno Hill Mines Limited. 1996. *United Keno Hill Mines Limited – Site Characterization.* Report No. UKH/96/01, prepared by Access Mining Consultants Limited.

Table B1. Tailings Field Data

Location	Sample ID	paste pH	Description
main pile, 0-40cm	81_T_TPBM_01	6.8	grey-brown, sandy
main pile, 40-80cm	81_T_TPBM_02	6.4	grey-brown, sandy
main pile, 80-120cm	81_T_TPBM_03	6.0	yellow-brown, silty
main pile, 120-160cm	81_T_TPBM_04	5.4	yellow-brown, silty
main pile, 160-195cm	81_T_TPBM_05	5.5	stiff, grey clay w/ pyrite @170cm, gravel/till at 195cm
wetland	81_T_TPBM_06	7.1	saturated pyrite-rich mud
creek, 10-90cm deep	81_T_TPBM_07	7.0	saturated clay-silt-sand, dark grey, pyrite-rich; top 2 cm rusty.

Table B2. 1999 Mackeno Water Quality Results

Sample Number	Detection Limit	Units	81-StrCD-01 - Mackeno Tailings	81-StrCD-02 - Mackeno Tailings	81-StrCD-03 - Mackeno Tailings	81-StrCD-04 - Mackeno Tailings
pH (field)	N/A	pH	6.1	7.7	6.9	7.1
Conductivity (field)	0.01	μS/cm	1550	570	740	430
pH (Lab)	0.01	pH	6.52	7.57	7.63	7.56
Conductivity (Lab)	0.01	μS/cm	2300	800	850	630
Total Alkalinity	5	mg CaCO3/L	86	118	103	117
Chloride	0.25	mg/L	na	0.46	na	na
Chloride	0.5	mg/L	<0.5	na	0.51	0.66
Hardness (CaCO3 equiv)	5	mg/L	973	443	435	326
Nitrate-N	0.05	mg/L	na	0.07	0.28	0.27
Nitrate-N	0.1	mg/L	<0.1	na	na	na
Nitrite-N	0.003	mg/L	0.003	<0.003	<0.003	<0.003
Sulphate	1	mg/L	1440	293	360	210
Total Dissolved Solids	5	mg/L	2370	587	651	453
Analysis by ICP-USN						
Aluminum	0.0008	mg/L	<0.0008	0.0418	0.0612	0.0112
Antimony	0.005	mg/L	<0.005	<0.005	<0.005	<0.005
Arsenic	0.01	mg/L	0.26	<0.01	0.02	<0.01
Barium	0.00004	mg/L	0.0136	0.0639	0.0649	0.114
Beryllium	0.00001	mg/L	<0.00001	<0.00001	<0.00001	<0.00001
Bismuth	0.0004	mg/L	<0.0004	<0.0004	<0.0004	<0.0004
Boron	0.002	mg/L	0.038	<0.002	<0.002	<0.002
Cadmium	0.00001	mg/L	0.925	0.00273	0.00894	0.00062
Calcium	0.002	mg/L	274	135	132	101
Chromium	0.00006	mg/L	0.00957	0.00031	<0.00006	0.00022
Cobalt	0.00003	mg/L	0.0547	0.00043	0.00466	<0.00003
Copper	0.00003	mg/L	0.00166	0.0022	0.00263	0.00141
Iron	0.00001	mg/L	18.3	0.431	0.779	0.048
Lead	0.0003	mg/L	0.0737	0.014	0.0814	<0.0003

Sample Number	Detection Limit	Units	81-StrCD-01 - Mackeno Tailings	81-StrCD-02 - Mackeno Tailings	81-StrCD-03 - Mackeno Tailings	81-StrCD-04 - Mackeno Tailings
Lithium	0.001	mg/L	0.023	0.012	0.01	0.004
Magnesium	0.0005	mg/L	64.8	21.7	20.6	20.2
Manganese	0.00002	mg/L	6.45	0.458	4.02	0.0104
Mercury	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001
Molybdenum	0.00007	mg/L	<0.00007	0.00033	0.00029	0.00014
Nickel	0.00001	mg/L	0.128	0.004	0.0133	0.0017
Phosphorus	0.03	mg/L	<0.03	0.04	<0.03	<0.03
Potassium	0.4	mg/L	1.6	<0.4	0.4	<0.4
Selenium	0.004	mg/L	0.042	<0.004	0.006	<0.004
Silicon	0.004	mg/L	6.82	1.88	2.31	3.43
Silver	0.00005	mg/L	0.014	0.00017	0.00086	<0.00005
Sodium	0.004	mg/L	4.2	1.5	1.5	1.4
Strontium	0.00002	mg/L	0.467	0.21	0.233	0.173
Sulphur	0.008	mg/L	478	98.7	111	66.7
Thallium	0.001	mg/L	0.167	<0.001	0.006	<0.001
Titanium	0.00002	mg/L	<0.00002	0.00123	0.00152	0.00059
Vanadium	0.00003	mg/L	<0.00003	<0.00003	<0.00003	<0.00003
Zinc	0.0002	mg/L	25.4	0.182	6	0.029
Total Arsenic by Hydride AA						
Arsenic	0.0002	mg/L	0.234	0.0043	0.0139	0.001
Total Selenium by Hydride AA						
Selenium	0.0001	mg/L	<0.0001	0.0001	0.0007	<0.0001

Table B3. 1999 Mackeno Tailings Sampling Results

Sample Number	Detection Limit	Units	81_T_TPBM_01 - Tailings	81_T_TPBM_02 - Tailings	81_T_TPBM_03 - Tailings	81_T_TPBM_04 - Tailings	81_T_TPBM_05 - Tailings	81_T_TPBM_06 - Tailings	81_T_TPBM_07 - Tailings
pH in Saturated Paste									
pH	0.1	pH	5.6	5.7	5.5	5.1	5.3	6.1	6.3
pH in Soil (1:2 water)									
pH	0.01	pH	6.4	6.4	6.3	5.9	6	6.9	7.2
ICP Semi-Trace Scan - Metals in Soil									
Aluminum	5	µg/g	2760	4420	6510	8600	9810	13400	11300
Antimony	2	µg/g	1700	2800	530	350	430	140	140
Arsenic	2	µg/g	3990	14900	3290	2640	2710	1150	2610
Barium	0.05	µg/g	30.9	0.46	121	153	138	280	0.82
Beryllium	0.1	µg/g	<0.1	<0.1	0.3	<0.1	0.2	0.3	0.4
Bismuth	5	µg/g	<5	<5	<5	<5	<5	<5	<5
Cadmium	0.1	µg/g	1030	1960	944	454	516	378	604
Calcium	5	µg/g	1660	1650	1320	1880	2130	4430	3810
Chromium	0.5	µg/g	10.4	11.8	10.1	14.5	18.2	20.4	14.8
Cobalt	0.1	µg/g	10.1	25.6	7	2.4	4.4	6.5	10
Copper	0.5	µg/g	296	675	262	160	202	102	283
Iron	1	µg/g	140000	320000	110000	87000	93000	58000	100000
Lead	1	µg/g	21300	7900	10700	10200	14000	4100	5400
Lithium	0.5	µg/g	2.1	2.4	2.6	3.3	4.9	10.5	4.6
Magnesium	1	µg/g	2310	2380	1830	1120	1830	3790	3470
Manganese	0.5	µg/g	42900	57900	33300	14100	18000	14400	40200
Mercury	0.01	µg/g	0.54	2.52	0.99	0.17	0.02	0.16	0.6
Molybdenum	1	µg/g	5	9	5	5	7	3	6
Nickel	1	µg/g	22.7	43	19.5	12.9	18.4	20.6	24.2
Phosphorus	5	µg/g	113	121	183	232	392	892	219
Potassium	20	µg/g	710	1360	1970	2440	2080	3100	2940
Selenium	2	µg/g	<2	<2	<2	<2	<2	<2	<2
Silicon	5	µg/g	214	100	166	254	419	325	8
Silver	0.5	µg/g	420	48.3	163	140	225	52.4	240
Sodium	5	µg/g	64	137	180	235	478	996	1360

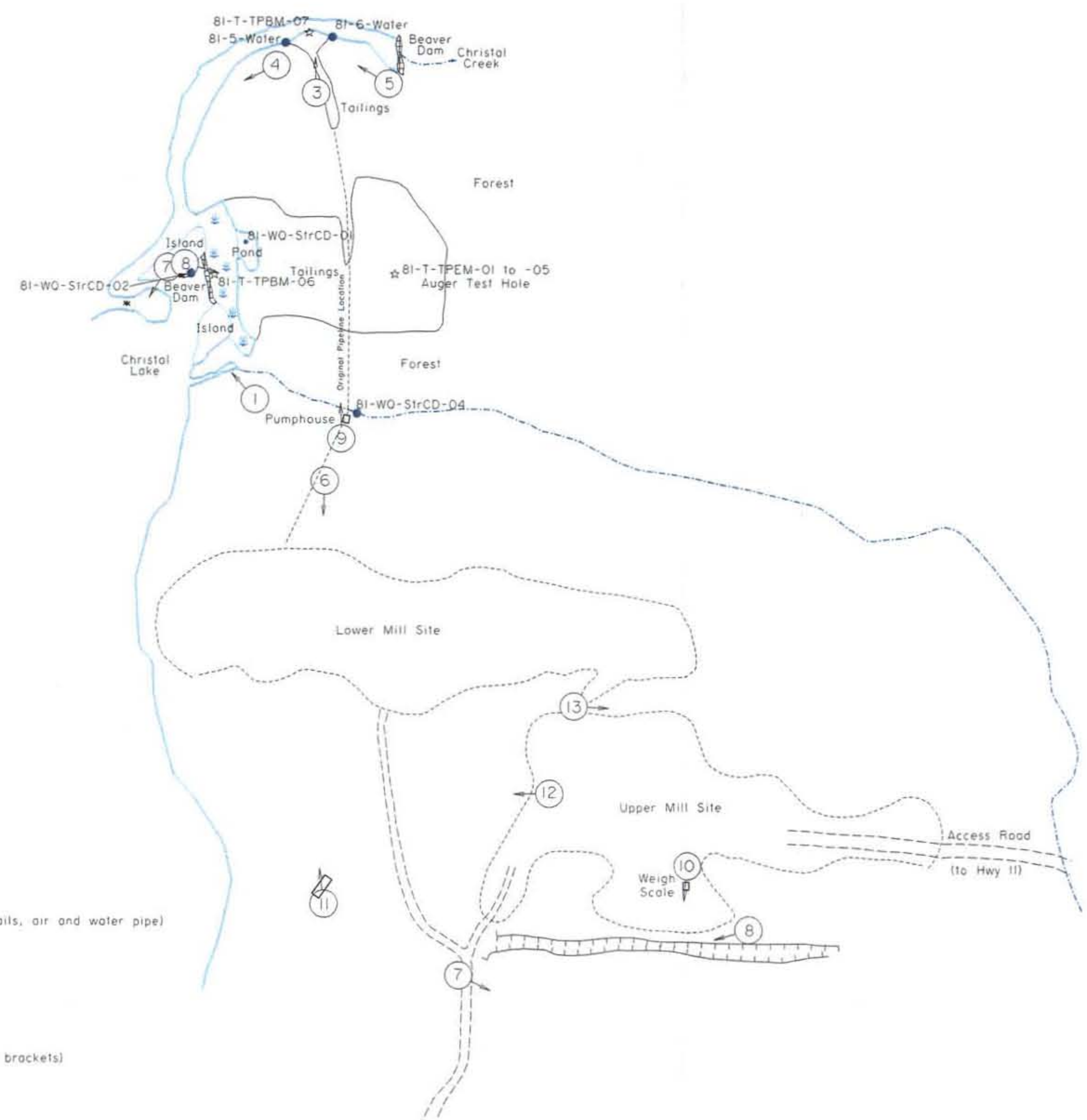
Sample Number	Detection Limit	Units	81_T_TPBM _01 - Tailings	81_T_TPBM _02 - Tailings	81_T_TPBM _03 - Tailings	81_T_TPBM _04 - Tailings	81_T_TPBM _05 - Tailings	81_T_TPBM _06 - Tailings	81_T_TPB M_07 - Tailings
Strontium	1	µg/g	<1	<1	4	10	11	24	8
Sulphur	10	µg/g	88000	268000	70000	36200	42400	25400	44800
Thorium	1	µg/g	<1	<1	<1	<1	<1	<1	<1
Tin	1	µg/g	10	8	9	9	12	5	3
Titanium	0.2	µg/g	7.2	9.4	14.8	27.2	65.4	373	125
Uranium	5	µg/g	21	<5	10	<5	<5	<5	11
Vanadium	1	µg/g	4	6	9	13	15	34	22
Zinc	0.5	µg/g	66100	115000	56600	27600	28300	22600	33900
Zirconium	0.1	µg/g	6.5	5.9	6.7	5.9	9.8	10.9	11.7

Table B4. 1999 Mackeno Waste Rock Sampling Results

Sample Number	Detection Limit	Units	1_WR_TPBM_01 - Rock	1_WR_TPBM_02 - Rock	1_WR_TPBM_03 - Rock	1_WR_TPBM_04 - Rock
pH in Saturated Paste						
pH	0.1	pH	2.1	2.7	2.5	3.6
pH in Soil (1:2 water)						
pH	0.01	pH	3.1	3.5	3.5	4.2
ICP Semi-Trace Scan - Metals in Soil						
Aluminum	5	µg/g	27800	26000	17900	18900
Antimony	2	µg/g	26	120	39	40
Arsenic	2	µg/g	108	162	252	261
Barium	0.05	µg/g	525	632	496	510
Beryllium	0.1	µg/g	0.8	1	0.6	0.6
Bismuth	5	µg/g	<5	<5	<5	<5
Cadmium	0.1	µg/g	0.6	4.8	2.3	2.3
Calcium	5	µg/g	2250	3930	615	587
Chromium	0.5	µg/g	39.8	37.7	28.3	29.7
Cobalt	0.1	µg/g	2.5	8	1.1	1.2
Copper	0.5	µg/g	64.4	118	55.2	59.2
Iron	1	µg/g	28000	34000	21000	22000
Lead	1	µg/g	2350	5540	2320	2480
Lithium	0.5	µg/g	14.8	9.2	9.8	11.2
Magnesium	1	µg/g	1330	1400	1210	1480
Manganese	0.5	µg/g	173	1770	101	105
Mercury	0.01	µg/g	0.22	0.48	0.25	0.33
Molybdenum	1	µg/g	1	3	3	3
Nickel	1	µg/g	19	30.2	6.6	7.4
Phosphorus	5	µg/g	604	574	670	697
Potassium	20	µg/g	6400	7800	5000	5300
Selenium	2	µg/g	<2	<2	<2	<2
Silicon	5	µg/g	219	351	253	626
Silver	0.5	µg/g	217	352	58.6	57.6
Sodium	5	µg/g	658	751	447	451
Strontium	1	µg/g	67	60	68	69
Sulphur	10	µg/g	10200	18900	3420	3390

Sample Number	Detection Limit	Units	1_WR_TPBM_01 - Rock	1_WR_TPBM_02 - Rock	1_WR_TPBM_03 - Rock	1_WR_TPBM_04 - Rock
Thorium	1	µg/g	2	3	8	6
Tin	1	µg/g	3	7	5	52.2
Titanium	0.2	µg/g	40.4	58.8	50.1	<0.2
Uranium	5	µg/g	<5	<5	<5	40
Vanadium	1	µg/g	68	49	39	211
Zinc	0.5	µg/g	108	235	223	25.9
Zirconium	0.1	µg/g	17	22.7	24	<0.1

Building (22A: building site present reference*)
22A* Indicates Asbestos Material
Collapsed Building
Adit
Collapsed Adit
Shaft
Collapsed/Backfilled Shaft
Mine Rock Dump
Bedrock Open Pit
Trench
Stripped Overburden Stockpile
Stripped / Disturbed Area
Outcrop Boundary
Highway
Road (gravel, 2 wheel drive)
Road (gravel, 4X4 accessible)
Road (inaccessible)
Trail
Culvert
24S01-01 1999 Soil Sample (this study)
Pre 1999 Soil Sample (other sources)
25WR04-01 1999 Waste Rock Sample (this study)
Pre 1999 Waste Rock Sample (other sources)
WO-12-06 1999 Water Sample
Pre 1999 Water Sample
Tension Cracks
Mass Movement (note: for Forms, BelleKeno)
Groundwater Seep
Surface Water Flow (Stream, Creek, River)
Lake
Settling Pond / Water Treatment Pond
Tailings Dam / Tailings Pond / Mill Tails
Ponded Water / Trench
Barrels
Abandoned Equipment (compressors, ore cars, rails, air and water pipe)
Mine Rails / Trestle
Collapsed Trestle
Solid Waste Disposal Site
Area of Soil Contamination
(6) Transformer Loaction (number of transformer in brackets)
Power Line
Power Line Collapsed
Aerial Transmission Towers
Photo Site (arrow shows view direction)
GPS Survey Location
Former Building Site (Elsa)
1999 Tailings Sample
Wetlands



0 20 40 60 80
Scale 1:2000

CAD FILE: SITE81.DGN

Waste Rock Geological Legend

This legend intended for use as a key to the observed lithological content of the mine dumps and stockpiles of surficial materials investigated. It does not represent regional stratigraphy and no stratigraphic sequence is implied.

Pyrite content as percent: eg. Py 2%. Occurs as an alteration halo adjacent to vein fault structure.

Oxidation: Weak (wOx), moderate (mOx) and intense (iOx).

Quarternary: (5) Undifferentiated, unconsolidated colluvium, glacial till.

Veins: (4a) Quartz veins;
(4b) Quartz-pyrite veins;
(4c) Quartz-siderite •trace galena-sphalerite veins;
(4d) Siderite-quartz •trace galena-sphalerite veins;
(4e) Suphide (galena-sphalerite) •quartz•siderite veins.

Greenstone: (3) Amphibole-chlorite-plagioclase metadiorite or metagabbro.

Quartzite: (2a) Thick beded, blocky gray quartzite;
(2b) Thin banded, broken, quartzite with carbonaceous phyllite interbeds;
(2c) Calcareous quartzite.

Phyllite: (1a) Broken sericite-chlorite phyllite;
(1b) Carbonaceous phyllite.

Public Works And Government Services Canada	Travaux publics et Services gouvernementaux Canada	designed by: / concu par:
Architectural & Engineering Services Western Region		drawn by: / dessine par: C.S.,I.B. Nov. '99
		approved by: / approuve par:
Drawing title: / Titre du dessin: Makeno Site # 81 Site Assessment Yukon Territory		revisions:
		project no. / no. du projet: 125-12.01 — dwg. no. / dessin no.: 1 of 1

Photo 81-1: Mouth of unnamed creek at Christal Lake.

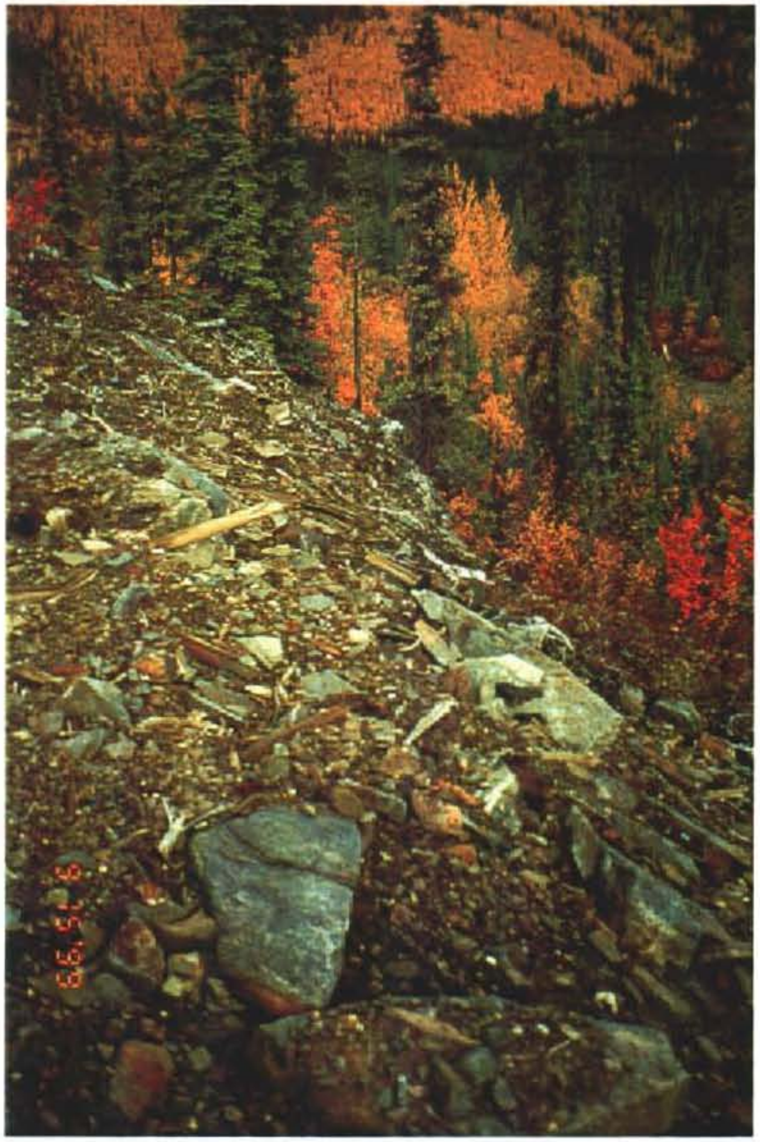


Photo 81-2: North slope south millsite area. Note wood debris.

Photo 81-3: Small tailings fan directly on Christal Creek.

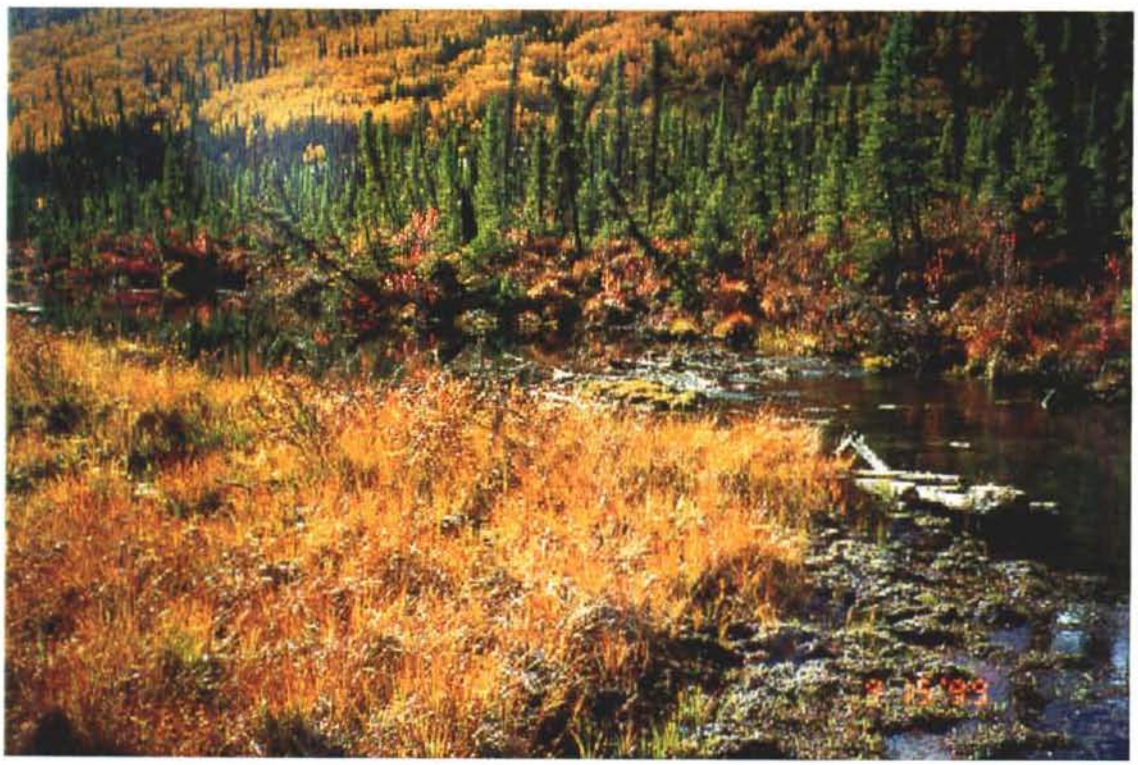


Photo 81-4: Upstream from small tailings to near mouth of Christal Creek.

Photo 81-5: Upstream to small tailings fan on Christal Creek.

Photo 81-6: Tailings pipeline in forested area north of millsite.

Photo 81-7: Small timber-lined test pit south west of millsite.

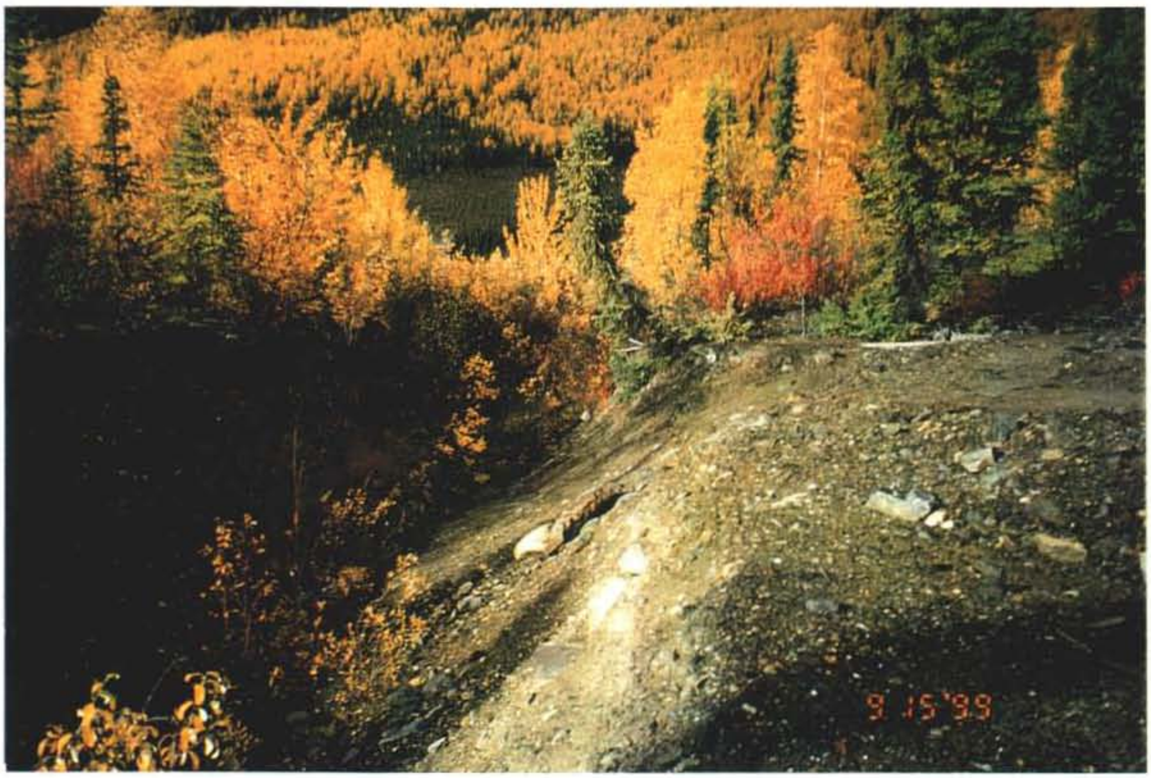


Photo 81-8: Trench directly south of millsite.

Photo 81-9: Tailings pumphouse in forested area north of millsite.

Photo 81-10: Concrete foundation of weigh scale at south end of millsite.

Photo 81-11: Wood debris remaining from former shack south west of millsite.

Photo 81-12: Metal and wood debris at west end of upper millsite area.

Photo 81-13: Concrete foundation protruding from north slope of upper millsite area.

BARKER
SITE #85
(MINFILE #106D 022)

1. LOCATION AND ACCESS

Coordinates 64-01-54 N, 135-51-34 W. Located at the confluence of Dublin Gulch (proper) along Haggart Creek. Elevation approximately 2600 feet asl. Access to Barker is via the South McQuesten Highway (from Highway 11, Silver Trail) to Haggart Creek Road at Dublin Gulch. Roads in this area have been considerably altered, and in some cases washed away, by placer mining activities in Dublin Gulch.

2. SITE PHYSIOGRAPHY

The site has been covered over by overburden from recent placer mining activities in Dublin Gulch. It's original location is believed to have been along the outwash floodplain of Haggart Creek at it's confluence with Gublin Gulch (proper, Photo 85-1) to the east. Over-burden from placer activities have also significantly altered surface hydrology in the area. The presence of permafrost soils could not be ascertained; however, the presence of small trees and the high elevation suggests the possibility of discontinuous permafrost.

3. GEOLOGY AND MINERALIZATION (from original minfile)

Quartz veins with pyrite and jamesonite occur in breccia zones along Haggart Creek. A sulphide-rich grab sample assayed 25.6% lead, 18.2% antimony, 1.7% zinc, 44.6 g/t silver and 1.0 g/t gold. The veins were discovered during placer mining. Drillholes conducted in 1992 failed to intersect significant mineralization.

4. SITE HISTORY (from original minfile)

Staked as Barber cl (59479) in Sept./49 by E.H. Barker, who explored with bulldozer trenching and ground sluicing until 1962. The property was optioned by Conwest in 1952, by Stride E & Dev CL in 1956, BYU Prospectors Airways CL in 1960 and by Peso Silver ML in 1962. The Eleven cl (55381) were staked 1.6 km north on Fisher Creek in Oct./45. The site was restaked as Smoky cl (YA17930) in Apr./78 by a joint venture between Canada Tungsten Mg Corp and Queenstake Res L., which mapped the site in 1981. Some of the Smoky claims were transferred to G. Dickson in Feb./86 and the remained to Queenstake in Aug./86. Queenstake optioned Dickson's claims in Apr./91 and trenched later in the year. In Oct./94, Queenstake transferred its interest in the Smoky and Mole claims to Ivanhoe Goldfields Ltd. Can-Pro Development Ltd. Optioned the Smoky and Mole claims as part of a larger block in the Dublin Gulch area in 1989. Ivanhoe Goldfields Ltd. Optioned Can-Pro's claims in 1991 and subsequently to Amax Gold (B.C.) Ltd., which drilled 2 rotary holes (112.8 m) on the Smoky 5 and 27 claims in 1992. In Aug./94 First Dynasty Mines Ltd.

acquired Ivanhoe Goldfields Ltd. In 1995, First Dynasty and in 1996 its wholly owned subsidiary, New Millenium Mining Ltd. carried out a major drilling program to outline a core resource/reserve on the Eagle Zone (minfile #106D 025). The companies also carried out diamond drilling on Potato Hills (minfile # 106D 026) to test for mineralization under the proposed heap leach pad area. In Apr./88, M.J. Moreau tied on Rex cl (YB2241) to the south and Mole cl (YB22499) to the southwest, and restaked the Rex (YB3271) and Mole (YB03787) claims in Aug./90.

5. MINE DEVELOPMENT

5.1. Mine Openings and Excavations

Adits/Shafts/Portals

No apparent mining development at this site.

Open Pits

No apparent development at this site.

Trenches

No apparent trenches at this site.

5.2. Waste Rock Disposal Areas

No apparent waste rock; some placer mining, however, is evident along the stream.

5.3. Tailings Impoundments

Tailings Dams

No apparent dams.

Tailing Ponds

No apparent tailings ponds.

5.4. Minesite Water Treatment

No apparent treatment facilities.

6. MINE SITE INFRASTRUCTURE

6.1. Buildings

No apparent buildings at this site. Old pump well located along the edge of Haggart Creek.

6.2. Fuel Storage

No apparent fuel storage facilities

6.3. Rail and Tressel

No apparent activity.

6.4. Milling and Processing Infrastructure

No processing facilities apparent.

6.5. Electrical Equipment

No apparent electrical equipment.

7. SOLID WASTE DUMPS

No apparent waste dumps.

8. POTENTIAL CONTAMINANTS OF CONCERN

8.1. Out of Service Transformers

None apparent at site.

8.2. Metals and Hydrocarbons in Soil

No evidence of staining, spills, or odours.

8.3. Liquid Hazardous Materials

None apparent at site.

8.4. Solid Hazardous Materials

None apparent at site.

9. WATER QUALITY

One surface water quality sample was collected just downstream of the confluence of Haggart Creek with Dublin Gulch (proper) (99-85-WQ-01, Photo 85-2). Results of the geochemistry are listed in Attachment 2.

10. RECLAMATION

Natural revegetation is being obscured by on-going placer mining activities along Haggart Creek which are also significantly altering surface drainage throughout the area (see Photo 85-1). There is no evidence of any reclamation measures at this site.

11. OTHER INFORMATION AND DATA

Much of the available information for this area is focused on the exploration activities of New Millenium Mining Ltd., within the Dublin Gulch (proper). Extensive and recent placer mining has occurred at this site and others in the Dublin Gulch area, which has significantly affected surface drainage and topography.

12. REFERENCES AND PERSONAL COMMUNICATIONS

Yukon Geology Program, 1997. Yukon Minfile 106D 022, Whitehorse, Yukon.

Amax Gold (B.C.) Ltd., 1992. Assesssment Report #093049 by A.C. Hitchins. (used in production of minfile)

Can-Pro Development Ltd., 1990. Assessment Report #092841 by D. Philpot. (used in production of minfile)

First Dynasty Mines Ltd., 1995. Annual Report. (used in production of minfile)

First Dynasty Mines Ltd., 1996. Assessment Report #093409 by M. Sieb. (used in production of minfile)

Geological Survey of Canada, Bulletin 111, p.84 (used in production of minfile)

Geological Survey of Canada, Paper 61-3, p.33 (used in production of minfile)

George Cross Newsletter, (Dec.) 1992. (used in production of minfile)

Stride Exploration and Development Co. Ltd. (Aug.) 1956. Prospectus (used in production of minfile)

Whitehorse Star, 1995. June 14 and September 21 Editions (used in production of minfile)

Yukon Mineral Inventory, 1941-59, p.108, 133 (used in production of minfile)

Yukon Exploration and Geology, 1979-80, p.238-240. (used in production of minfile)

Yukon Exploration and Geology, 1992, p.2, 4, 5. (used in production of minfile)

Yukon Exploration and Geology, 1995, p.8, 33 (used in production of minfile)

ATTACHMENT 2: 1999 BARKER WATER SAMPLES LABORATORY RESULTS				
Sample Number	Detection Limit	Units	99-85-WQ-01 Sept. 13/99	99-85-WQ-02 Sept. 13/99
Site Desciption			Confluence of Dublin Gulch with Haggart Creek	2 km south of Confluence of Platinum Gulch with Haggart Creek
Temperature (field)	N/A	oC	7.9	6.9
pH (field)	N/A	pH	7.17	6.96
Conductivity (field)	N/A	µS/cm	289	339
pH (Lab)	0.01	pH	7.82	7.88
Conductivity (Lab)	0.01	µS/cm	300	350
Total Alkalinity	5	mg CaCO3/L	91	100
Chloride	0.25	mg/L	<0.25	<0.25
Hardness (CaCO3 equiv)	5	mg/L	161	190
Nitrate-N	0.05	mg/L	0.09	0.05
Nitrite-N	0.003	mg/L	<0.003	0.003
Sulphate	1	mg/L	59.1	70.3
Total Dissolved Solids	5	mg/L	284	220
Analysis by ICP-USN				
Aluminum	0.0008	mg/L	0.0278	0.0252
Antimony	0.005	mg/L	<0.005	<0.005
Arsenic	0.01	mg/L	<0.01	<0.01
Barium	0.00004	mg/L	0.0347	0.0416
Beryllium	0.00001	mg/L	<0.00001	<0.00001
Bismuth	0.0004	mg/L	<0.0004	<0.0004
Boron	0.002	mg/L	<0.002	<0.002
Cadmium	0.00006	mg/L	0.00001	0.000022
Calcium	0.002	mg/L	34.1	40.3
Chromium	0.00006	mg/L	0.00013	0.00019
Cobalt	0.00003	mg/L	<0.00003	<0.00003
Copper	0.00003	mg/L	0.00119	0.00144
Iron	0.00001	mg/L	0.071	0.062
Lead	0.0003	mg/L	<0.0003	<0.0003
Lithium	0.001	mg/L	0.006	0.007
Magnesium	0.0005	mg/L	12.9	15.4
Manganese	0.00002	mg/L	0.0292	0.0468
Mercury	0.0001	mg/L	<0.0001	<0.0001
Molybdenum	0.00007	mg/L	<0.00007	0.00013
Nickel	0.00001	mg/L	0.0009	0.0011
Phosphorus	0.03	mg/L	<0.03	<0.03
Potassium	0.4	mg/L	0.9	1.1
Selenium	0.004	mg/L	<0.004	<0.004
Silicon	0.004	mg/L	3.44	3.47
Silver	0.00005	mg/L	<0.00005	<0.00005
Sodium	0.004	mg/L	1.6	1.8
Strontium	0.00002	mg/L	0.171	0.203
Sulphur	0.008	mg/L	18.5	21.8
Thallium	0.001	mg/L	<0.001	<0.001
Titanium	0.00002	mg/L	0.00047	0.00077
Vanadium	0.00003	mg/L	<0.00003	<0.00003
Zinc	0.0002	mg/L	<0.0002	<0.0002
Analysis by Hydride AA				
Arsenic	0.0002	mg/L	0.0008	0.0017
Selenium	0.0001	mg/L	<0.0001	0.0003

Photo 85-1 : Barker Site looking N.E. water sample location downstream of Dublin Gulch (general).

Photo 85-2 : Barker Site looking S.W. water sample location downstream of Dublin Gulch (general).

MEILECKE

SITE #86

(MINFILE #106D 023)

1. LOCATION AND ACCESS

Coordinates 64-03-05 N, 135-50-47 W. Located 2 km north of Dublin Gulch (proper) along Haggart Creek. Elevation approximately 2700 feet asl. Access to Meilecke is via the South McQuesten Highway (from Highway 11, Silver Trail) to Haggart Creek Road past Dublin Gulch by (2.5 km north by road). Roads in this area have been considerably altered, and in some cases washed away, by placer mining activities in Dublin Gulch.

2. SITE PHYSIOGRAPHY

The site faces north-northwest along a series of raised shoreline out-wash terraces on the south site of Haggart Creek, approximately 850 m northeast of its confluence with Iron Rust Creek (Photo 86-1). The presence of permafrost soils could not be ascertained; however, the presence of smaller trees and the high elevation suggests the possibility of discontinuous permafrost.

3. GEOLOGY AND MINERALIZATION (from original minfile)

The area is underlain by deformed Upper Proterozoic to Lower Cambrian clastic rocks of the Hyland Group that have been intruded by Cretaceous age Tombstone suite sotcks, dykes and sills. Alterating gold and tungsten mineralization is associated with the intrusions. The early staking of Iron Rust Creek covered a transported limnonite gossan in a creek draining weakly metamorphosed clastic rocks and schist. A galena vein is rumoured to have been exposed on the WM (W. Meilecke) claims.

4. SITE HISTORY (from original minfile)

Staked as Hag cl (62794) in Jun/55 by A Kulan et al., and optioned in Jun/58 to Stride E & Dev CL, which explored with geochem and geophysical surveys, and in Jun/62 to Peso Silver ML. Restaked as Tara cl (82826) in Mar/63 by Canex; as WM cl (Y56061) in Jun/71 by W. Meilecke, who explored with hand trenching; and as WM (Y69422) in Jul/73 by Jan Mandaus; and as DG cl (YA 14944) in Apr/77 by G. Dickson, who bulldozer trenched later in the year before optioning the claims to a joint-venture between Canada Tungsten Mg Corp and Queenstake Res L. The claims were transferred back to Dickson in Jan/86. Can-Pro Development Ltd. optioned the DG claims as part of a larger block in the Dublin Gulch area in 1989. Ivanhoe Goldfields Ltd. optioned Can-Pros claims in 1991 and subsequently optioned them to Amax Gold (B.C.) Ltd. which drilled 2 rotary holes (216.4 m) on the Smoky 52 and DG 9 claims in 1992. Ivanhoe staked the adjacent Sec 1-124 cl (YB29877) in Jun/93. In Aug/94, First Dynasty Mines Ltd. acquired Ivanhoe Goldfields Ltd. In 1995, First Dynasty and in 1996 its wholly owned subsidiary, New Millenium Mining Ltd. carried out a major drilling program to outline a core resource/reserve on the Eagle Zone (minfile #106D 025). The companies also carried out diamond drilling on Potato Hills (minfile # 106D 026) to test for mineralization under the proposed heap leach pad area.

5. MINE DEVELOPMENT

5.1. Mine Openings and Excavations

Adits/Shafts/Portals

No apparent mining development at this site

Open Pits

No apparent development at this site.

Trenches

Possible old trench along terrace on south shore terrace by Haggart Creek running east-west; recently used as camp site (Photos 86-2 and 86-3).
Dimensions (L x W x H): ~ 30 m x 15 m x 0.75 m
Condition: hard-packed and overgrown; appears to be stable
Accessibility: along Haggart Creek Road

5.2. Waste Rock Disposal Areas

No apparent waste rock other than the material removed for camp construction; some placer mining, however, is evident along the stream.

5.3. Tailings Impoundments

Tailings Dams

No apparent dams

Tailing Ponds

No apparent tailings ponds

5.4. Minesite Water Treatment

No apparent treatment facilities.

6. MINE SITE INFRASTRUCTURE

6.1. Buildings

Outhouse (86A) - Wood construction with no roof, dimensions (L x W x D): 0.75 m x 1 m x 2 m (see Photo 86-3).

6.2. Fuel Storage

No apparent fuel storage facilities

6.3. Rail and Tressel

No apparent activity

6.4. Milling and Processing Infrastructure

No processing facilities apparent

6.5. Electrical Equipment

No apparent electrical equipment

7. SOLID WASTE DUMPS

No apparent waste dumps; however, scattered debris over site including core boxes, wood, plastic, appliances (fridge and stove), cans, wooden flowerbox, plastic and metals cans containing ash from camp fire, old mattress and other camp equipment, number of empty 10 gallon cans, old portable generator and car battery (Photo 86-4 and 86-5).

8. POTENTIAL CONTAMINANTS OF CONCERN

8.1. Out of Service Transformers

None apparent at site

8.2. Metals and Hydrocarbons in Soil

No evidence of staining, spills, or odours.

8.3. Liquid Hazardous Materials

None apparent at site.

8.4. Solid Hazardous Materials

Old car battery located 100 m SW of camp above stream bank. No samples taken, given isolated location of material from stream (Photo 86-6).

9. WATER QUALITY

Surface water quality samples were collected 160 m upstream (background) of the site (99-86-WQ-01) and downstream, approximately 50 m east and upstream of the Iron Rust Creek confluence (99-86-WQ-02, Photo 86-7). Results of the geochemistry are listed in Attachment 2.

10. RECLAMATION

Natural revegetation is beginning to occur at the site along the suspected trench area, where the camp site is located, including grasses, forbs (e.g., fireweed) and young trees such as spruce and willow (see Photo 86-3). No evidence of any reclamation measures at this site.

11. OTHER SOURCES OF INFORMATION AND DATA

Much of the available information for this area is focused on the exploration activities of New Millenium Mining Ltd, within the Dublin Gulch (proper). Some recent placer mining has occurred at this site, which was probably used as a camp for this purpose.

12. REFERENCES AND PERSONAL COMMUNICATIONS

Yukon Geology Program, 1997. Yukon Minfile 106D 023, Whitehorse, Yukon.

Can-Pro Development Ltd., 1990. Assessment Report #092841 by D. Philpot. (used in production of minfile)

First Dynasty Mines Ltd., 1995. Annual Report. (used in production of minfile)

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Stride Exploration and Development Co. Ltd. (Aug.) 1956. Prospectus (used in production of minfile)

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Yukon Exploration and Geology, 1992, p.2, 4, 5. (used in production of minfile)

Yukon Exploration and Geology, 1995, p.8, 33 (used in production of minfile)

ATTACHMENT 2: 1999 MEILECKE WATER SAMPLES LABORATORY RESULTS				
Sample Number	Detection Limit	Units	99-86-WQ-01 Sept. 13/99	99-86-WQ-02 Sept. 13/99
Site Desciption			160 m upstream from camp site	50 m east of Haggart Creek confluence with Iron Rust creek
Temperature (field)	N/A	oC	6.9	6.9
pH (field)	N/A	pH	7.68	7.78
Conductivity (field)	N/A	µS/cm	287	276
pH (Lab)	0.01	pH	7.94	7.96
Conductivity (Lab)	0.01	µS/cm	300	300
Total Alkalinity	5	mg CaCO3/L	95	95
Chloride	0.25	mg/L	<0.25	<0.25
Hardness (CaCO3 equiv)	5	mg/L	164	165
Nitrate-N	0.05	mg/L	0.08	<0.05
Nitrite-N	0.003	mg/L	<0.003	0.003
Sulphate	1	mg/L	51	50.7
Total Dissolved Solids	5	mg/L	189	248
Analysis by ICP-USN				
Aluminum	0.0008	mg/L	0.018	0.121
Antimony	0.005	mg/L	<0.005	<0.005
Arsenic	0.01	mg/L	<0.01	<0.01
Barium	0.00004	mg/L	0.0335	0.0335
Beryllium	0.00001	mg/L	<0.00001	<0.00001
Bismuth	0.0004	mg/L	<0.0004	<0.0004
Boron	0.002	mg/L	<0.002	<0.002
Cadmium	0.00006	mg/L	0.00012	0.000066
Calcium	0.002	mg/L	39.6	39.2
Chromium	0.00006	mg/L	0.00021	0.00027
Cobalt	0.00003	mg/L	<0.00003	<0.00003
Copper	0.00003	mg/L	0.00134	0.00131
Iron	0.00001	mg/L	0.026	0.073
Lead	0.0003	mg/L	<0.0003	<0.0003
Lithium	0.001	mg/L	0.004	0.005
Magnesium	0.0005	mg/L	10.2	10.4
Manganese	0.00002	mg/L	0.00272	0.00421
Mercury	0.0001	mg/L	<0.0001	<0.0001
Molybdenum	0.00007	mg/L	<0.00007	<0.00007
Nickel	0.00001	mg/L	0.0008	0.0006
Phosphorus	0.03	mg/L	<0.03	<0.03
Potassium	0.4	mg/L	0.7	0.8
Selenium	0.004	mg/L	<0.004	<0.004
Silicon	0.004	mg/L	2.91	3.07
Silver	0.00005	mg/L	<0.00005	<0.00005
Sodium	0.004	mg/L	1.7	1.7
Strontium	0.00002	mg/L	0.2	0.2
Sulphur	0.008	mg/L	16.1	15.9
Thallium	0.001	mg/L	<0.001	<0.001
Titanium	0.00002	mg/L	0.00034	0.0036
Vanadium	0.00003	mg/L	<0.00003	<0.00003
Zinc	0.0002	mg/L	<0.0002	<0.0002
Analysis by Hydride AA				
Arsenic	0.0002	mg/L	0.001	0.0009
Selenium	0.0001	mg/L	<0.0001	<0.0001

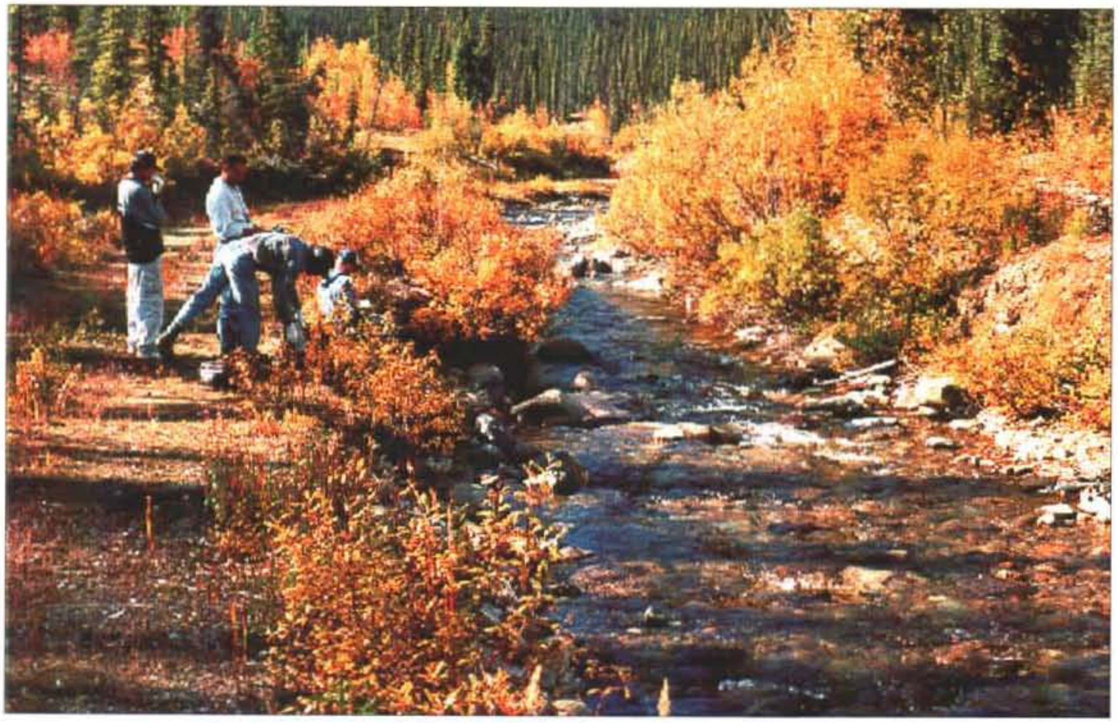

Photo 86-1 : Upstream of Meilecke Site looking west.

Photo 86-2 : Meilecke Site. Camp site located in old trench (looking west).

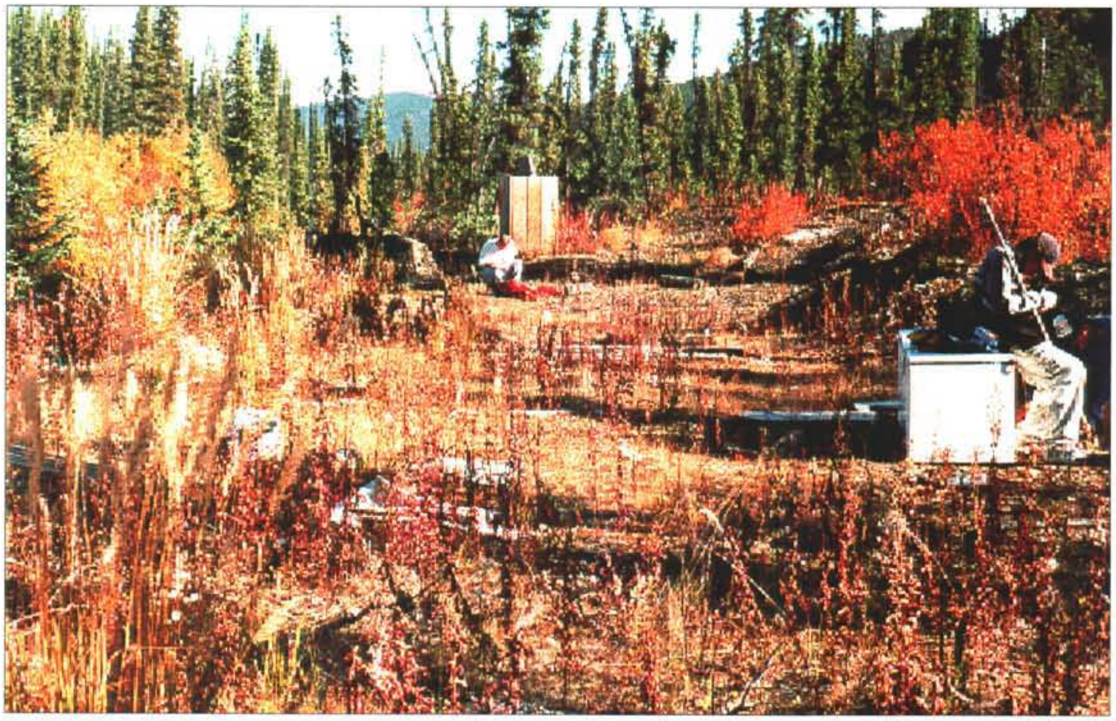

Photo 86-3 : Meilecke Site camp looking east.

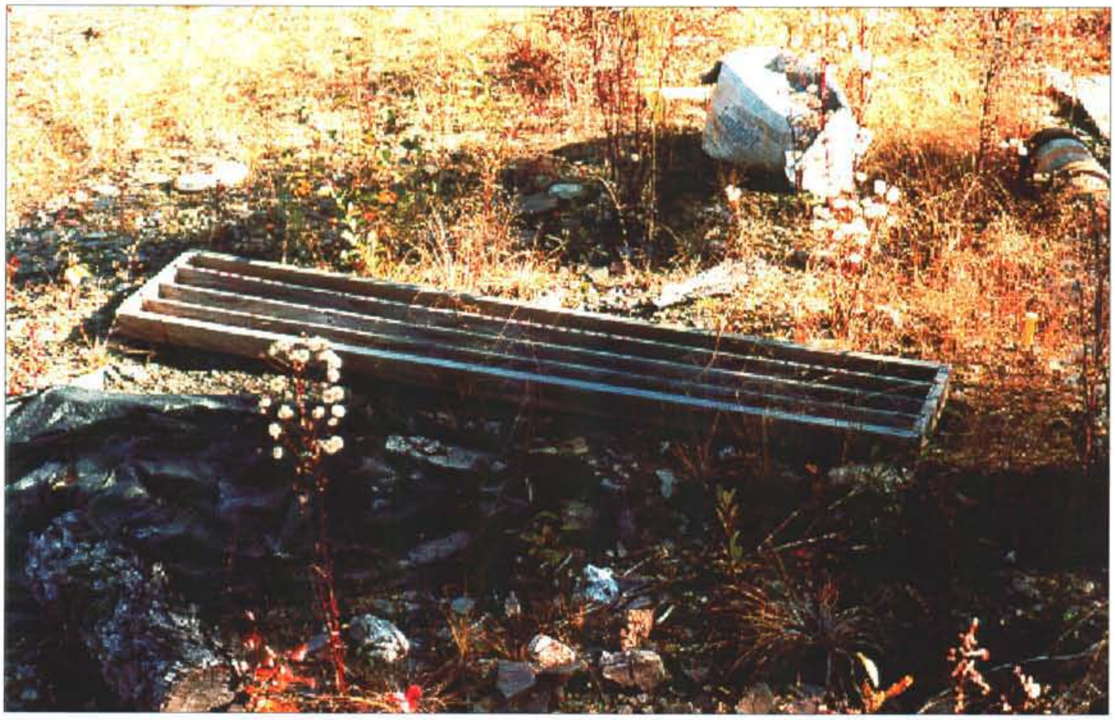

Photo 86-4 : Meilecke Site, core box.

Photo 86-5 : Meilecke Site, generator & debris along creek looking east.

Photo 86-6 : Meilecke Site, battery near stream (100m S.W. of camp site).

Photo 86-7 : Meilecke Site. Downstream water sample location 50m E. of confluence of Haggart & Iron Rust Creeks.

DUBLIN GULCH – EAGLE ZONE
SITE #88
(MINFILE #106D 025a)

1. LOCATION AND ACCESS

Coordinates 64-01-57 N, 135-47-44 W. Located on Eagle Pup, a south bank tributary of Dublin Gulch approximately 1.5 km east of it's confluence with Haggart Creek (Photo 88-1). Elevation approximately 2900 to 3500 feet asl. Access to Eagle Zone is via the South McQuesten Highway (from Highway 11, Silver Trail) to Haggart Creek Road, and follow Dublin Gulch Road for approximately 1.5 km. Existing road access south up to the range directly above Eagle Pup has been blocked.

2. SITE PHYSIOGRAPHY

The main exploration camp is located along the north site of Dublin Gulch along a raised shoreline out-wash terrace approximately 20 m north from the gulch tributary. Over-burden from placer activities in the Gulch have also significantly altered surface hydrology in the area (see Photo 88-1). The presence of permafrost soils could not be ascertained; however, the presence of small trees and the high elevation suggests the possibility of discontinuous permafrost.

3. GEOLOGY AND MINERALIZATION (from original minfile)

The Dublin Gulch area is underlain by deformed Upper Proterozoic to Lower Cambrian clastic rocks of the Hyland Group that have been intruded by Cretaceous age Tombstone suite stocks, dykes and sills. Alteration and gold and tungsten mineralization is directly associated with the intrusions. The north edge of the Potatoe Hills stock, contains quartz-arsenopyrite veins over a length of 3.2 km. Most veins strike northeast and range in width from a few to 2 m and occasionally wider. Arsenopyrite-rich veins usually occur in the centre of this area and range in width from 10-25 cm. Minor amounts of pyrite occur with the arsenopyrite. A vein on the Victoria claims assayed 8.6 g/t gold and 13 g/t silver over a width of 0.6 m for the 23 m length of the drift. Similar assays were obtained from other veins. Rio Plata conducted a turam survey and bulldozing program which reportedly outlined a narrow, silver-rich vein and more arsenopyrite veins. The presence of silver veins in the area is further suggested by the presence of siderite containing sphalerite, galena, and jamesonite in the placer gravels. The 1986 drilling tested 4 of 14 veins outlined by Queenstake. Best results were obtained from the Catto Vein where one hole returned 44.6 g/t gold over 0.4 m, while a second, 91 m to the west, assayed 60.3 g/t gold also over 0.4 m. A hole in the No. 23 vein intersected 74.7 g/t gold over 0.5 m. In 1988, additional drilling on the Catto vein returned up to 11.2 g/t gold across a true thickness of 2.7 m, while work elsewhere on the property located a few veins on the floor of Dublin Gulch. A chip sample from one of these assayed 41.1 g/t gold over 1 m. Trenching on the Smoky 64, R&D 16 and Bob 3 claims in 1989 exposed three new vein systems localized along ENE-trending faults which dip steeply south. Channel samples from the trenches returned values up to 8.61 g/t gold. Hole 91-12 intersected 3 m of granodiorite and clay with 1 cm pyrite-arsenopyrite veins, which graded 17.1 g/t gold. Hole 92-36 on the RD2 claim intersected a quartz-arsenopyritee vein cutting sericite-altered granodiorite, which assayed 13.6 g/t gold. Trenching and drilling of the Dublin Gulch deposit by Amax Gold and Ivanhoe in 1991, outlined a resource of 90 million tonnes grading between 0.93 and 13.6 g/t gold. First Dynasty drilled 12 reverse circulation drill holes and one diamond drill hole (2,909.6 m) within the main Eagle Zone to further define the ore zone's grade and extent. Seven of the 12 reverse circulation drill holes returned above-average ore grades and widths, while the remaining 5 were instrumental in defining the boundary of the deposit. The diamond drill hole returned anomalous assays from the top 145 m, grading 0.24 g/t gold with only three samples grading better than (1.02, 1.29 and 1.59) g/t gold. These results showed that mineralization continues along trend but becomes sub-economic to the northeast. At the end of 1996, mineable reserves (proven & probable) in the Eagle Zone were 50.4 mT grading 0.93 g/t gold.

4. SITE HISTORY (from original minfile)

Placer gold was discovered on Haggart Creek in 1895 and on Dublin Gulch in 1898. The first lode staking was Dublin Lode, North Star et. al. (2404) in October, 1901, on which a 14 m adit was driven by 1904. By 1912, development work had been done on five separate properties, including Eagle Zone. An 8 m adit shaft was sunk on the Blue Lead group (8049), just to the east of Eagle Pup, recorded in December 1909. T. McKay and A.H. Martin tied on Bob, Mucking Futch et. al. Cl (55056) to the Olive claim in November, 1937, and prospected with pits and shallow shafts. In 1938, the claims were sold to Treadwell Yukon L, which performed more trenching. The property was transferred to Keno Mg CL in 1946. Restaked as Avoca, et al. Cl (59052) in October/48 by J.B. O'Neill and J.J. Colt, who explored with hand and bulldozer trenching in 1949-54, sold an interest in 1958 to E.H. Barker, who trenched in 1958-61 and sold the property to Peso Silver ML in 1962. Peso performed trenching in 1962. Restaked as part of the Pea, etc. cl (Y59052) in August/73 by Adonis ML in conjunction with nearby placer work; Shal cl (Y95002) in July/74 by J.M. McNulty; Dog cl (Y97149) in Nov/74 by H. Fromme; Pup cl (YA15128) in May/77 by R. Grant; and Smoky, Bob, DG etc. cl (YA17729) in April/78 by Queenstake Res L & Canada Tungsten Mg Corp L, which conducted extensive mapping, and geochemical and geophysical surveyws in 1978 and 1979, backhoe trenching in 1980 and geochem sampling and mapping in 1981. In 1986, Canada Tungsten transferred some of the Smoky and Bob claims to G. Dickson and the remainder to Queenstake, which performed bulldozer trenching and 705m of diamond drilling later that year. The property was optioned to Can Pro Dev L which performed additional diamond drilling later that year and trenched in 1989. Dickson's claims were transferred to Queenstake in April and May, 1991. H-6000 holdings optioned the property in 1991, and joint ventured it to Amax Gold Inc., which explored with mapping, geochemistry, geophysics and 16 diamond drill holes totalling 2500 m. In 1992, Amax explored with rotary percussion drilling which included 1117.7 m on the R.D. 2 and 16, Bob 1, Smoky 64-65 and 74-76 claims and 2 holes on the Smoky 51-52 claims. The property was returned to Ivanhoe Goldfields Ltd. (a successor company of H-6000 Holdings) which conducted reverse-circulation drilling and backhoe trenching on the Smokey 3,4 and 96 Fr. Claims in 1993. In Aug/94 First Dynasty Mines Ltd. acquired Ivanhoe Goldfields Ltd. In Oct/94 Queenstake Resources Ltd. transferred its interest in the Mar, R & D, DG, Jeff, Bob and Smoky claims to First Dynasty. In 1995, First Dynasty and in 1996 its wholly owned subsidiary, New Millenium Ltd. carried out a major drilling program to outline a core resource/reserve on Eagle Zone (minfile occurrence # 106D 025). The companies also carried out diamond drilling on Potato Hills (minfile occurrence #106D 026) to test for mineralization under the proposed heap leach pad area.

5. MINE DEVELOPMENT

5.1. Mine Openings and Excavations

Adits/Shafts/Portals

No apparent openings at this site; however, road access to the south along Eagle Pup was blocked.

Open Pits

No apparent pits at this site; however, road access to the south along Eagle Pup was blocked.

Trenches

No apparent trenches at this site; however, road access to the south along Eagle Pup was blocked.

5.2. Waste Rock Disposal Areas

No apparent waste rock, aside from overburden from placer activities in the Gulch; however, road access to the south along Eagle Pup was blocked.

5.3. Tailings Impoundments

Tailings Dams

No apparent dams

Tailing Ponds

No apparent tailings ponds

5.4. Minesite Water Treatment

No apparent treatment facilities.

6. MINE SITE INFRASTRUCTURE

6.1. Buildings

Buildings at the site were associated with the main and secondary camps located along Dublin Gulch Road, approximately 1.5 km east of Haggart Creek (Map Figure 88-1).

Main Exploration Camp

This site was determined to be the basis of operations for exploration activities of New Millenium Ltd. in Eagle Zone based on the extensive core and rock samples at the site. A layout of the main exploration camp showing the buildings and their relative locations is provided in Figure 88-2.

Building 88-A (Photo 88-2)

Cabin 1 was of stained wood construction (9 m W x 10 m L) with an aluminum metal reinforced roof, trimmed windows and painted interior. The building was stable and in good repair. Non-hazardous contents consisted of corebags, an old drum stove, domestic debris, clothes and mattress. No hazardous materials were found within the building; however, a drum of kerosene along with two other barrels with water and garbage were found outside along the northwest side of the building.

Building 88-B

A drying shack of wood construction (5 m x 5 m) located in bushes to the northwest of Cabin 1 was on the verge of collapse.

Building 88-C

Storage shack of wood construction (2.5 m x 2.5 m) located along the northwest side of Dublin Gulch Road. Non-hazardous contents consisted of old cardboard and other domestic debris. No hazardous materials were found within the shack.

Building 88-D (Photo 88-3)

Cabin 2 was of wood plank construction (5 m W x 8 m L) located on the southeast side of Dublin Gulch Road. The building was in ill-repair and partially collapsed. Non-hazardous contents consisted of full coreboxes, an old stove, packages of quick-gel (~ 12), and wood debris. No hazardous materials were found within the cabin.

Building 88-E (Photo 88-4)

Two-room workshop and core/rock sample storage shack of plywood construction (3 m W x 12 m L) with aluminum metal reinforced roof directly across (southwest) from Cabin 3. The building was stable and in good repair. Non-hazardous contents consisted of a large number of cans of rock samples in plastic bags, storage racks of rock samples (library) and two empty drums. No hazardous materials were found within the shack.

Building 88-F (Photo 88-5)

Cabin 3 was of log wood construction (5 m W x 10 m L) with a combination shingle and aluminum metal reinforced roof and shingles, located immediately southeast of the workshop and core storage shack. The building was stable and in good repair. Non-hazardous contents consisted of core storage in racks and two empty drums. No hazardous materials were found within the cabin.

Building 88-G

Collapsed wood building behind (northeast) of Cabin 3; possibly an old core shack as suggested by associated corebox debris. Other non-hazardous debris included ten 20 L pails scattered here and in the vicinity; four of these contained oil.

Building 88-H (Photo 88-6)

Drill equipment shop and garage of wood plank construction (3 m W x 6 m L) east of Cabin 3. The building was stable and in good repair. Non-hazardous contents consisted of drill bits and equipment; full core boxes were also laid out in front of the garage entrance. Potentially hazardous materials found within the garage included single cans each of antifreeze and oil, a very minor oil stain was also noted on the dirt floor of the structure.

Building Cluster 88-I (Photo 88-7)

Five core shacks of wood construction (3 m W x 7 m L) and aluminum metal reinforced roofs. Three of these were intact and contained core boxes, while another had been previously marked and used for dynamite. The fifth shack, closest to Dublin Gulch Road, had collapsed. Aside from core boxes within some of the structures and scattered in the vicinity, no other non-hazardous materials were noted. No hazardous materials were apparent within or around the structures.

Secondary Exploration Camp

This small camp was located 400 m west of the main exploration camp along Dublin Gulch Road towards Haggart Creek (Figure 88-1) and may have also been used for placer mining as well as exploration activities. A layout of the camp showing the buildings and their relative locations is provided in Figure 88-3.

Building 88-J (Photo 88-8)

Old trailer of aluminum and steel construction (2.5 m W x 13 m L) located along the north side of Dublin Gulch Road. The trailer was in relatively good structural condition. The trailer had been fully equipped and contained non-hazardous domestic debris including a tub and sink, in addition to an old couch and other domestic garbage outside of the trailer. No hazardous materials were apparent within or around the structure.

Building 88-K (Photo 88-9)

Old tent frame of wood construction (4 m W x 5 m L) located northwest of the old trailer along the north side of Dublin Gulch Road. No hazardous or non-hazardous materials were apparent within or around this structure.

Building 88-L (Photo 88-10)

"Watermelon" shack of wood construction (3 m W x 8 m L) located along the south edge of Dublin Gulch Road. Building is stable and well-maintained. Non-hazardous materials within the building consisted of domestic debris. A cluster of corebox piles (Photo 88-11) were also observed to the east of the shack. No hazardous materials were apparent in the vicinity.

6.2. Fuel Storage

No apparent fuel storage facilities; aside from occasional barrels of oil at exploration camp mentioned above.

6.3. Rail and Tressel

No apparent activity

6.4. Milling and Processing Infrastructure

No processing facilities are apparent.

6.5. Electrical Equipment

No apparent electrical equipment

7. SOLID WASTE DUMPS

A small mound of garbage debris (10 x 10 m) was observed at the main exploration camp site in scrub approximately 40 m northwest of Dublin Gulch Road. The dump was well away (> 100 m) from any drainage in the vicinity. The dump consisted of non-hazardous materials including domestic waste. No hazardous materials were observed. Given its distance from any water course in the vicinity, no samples were taken.

8. POTENTIAL CONTAMINANTS OF CONCERN

8.1. Out of Service Transformers

None apparent at site

8.2. Metals and Hydrocarbons in Soil

No evidence of any significant staining, spills, or odours.

8.3. Liquid Hazardous Materials

None apparent at site; aside from hydrocarbon products noted previously in some containers at the site.

8.4. Solid Hazardous Materials

None apparent at site.

9. WATER QUALITY

No samples were taken due to the dry topography of area and distance from any observable water course.

10. RECLAMATION

Natural revegetation is beginning to occur at both the main and secondary camps site (see Photos 88-1 to 88-11). No evidence of any reclamation measures at this site.

11. OTHER SOURCES OF INFORMATION AND DATA

Much of the available information for this area is focused on the exploration activities of New Millenium Mining Ltd. within the Dublin Gulch area.

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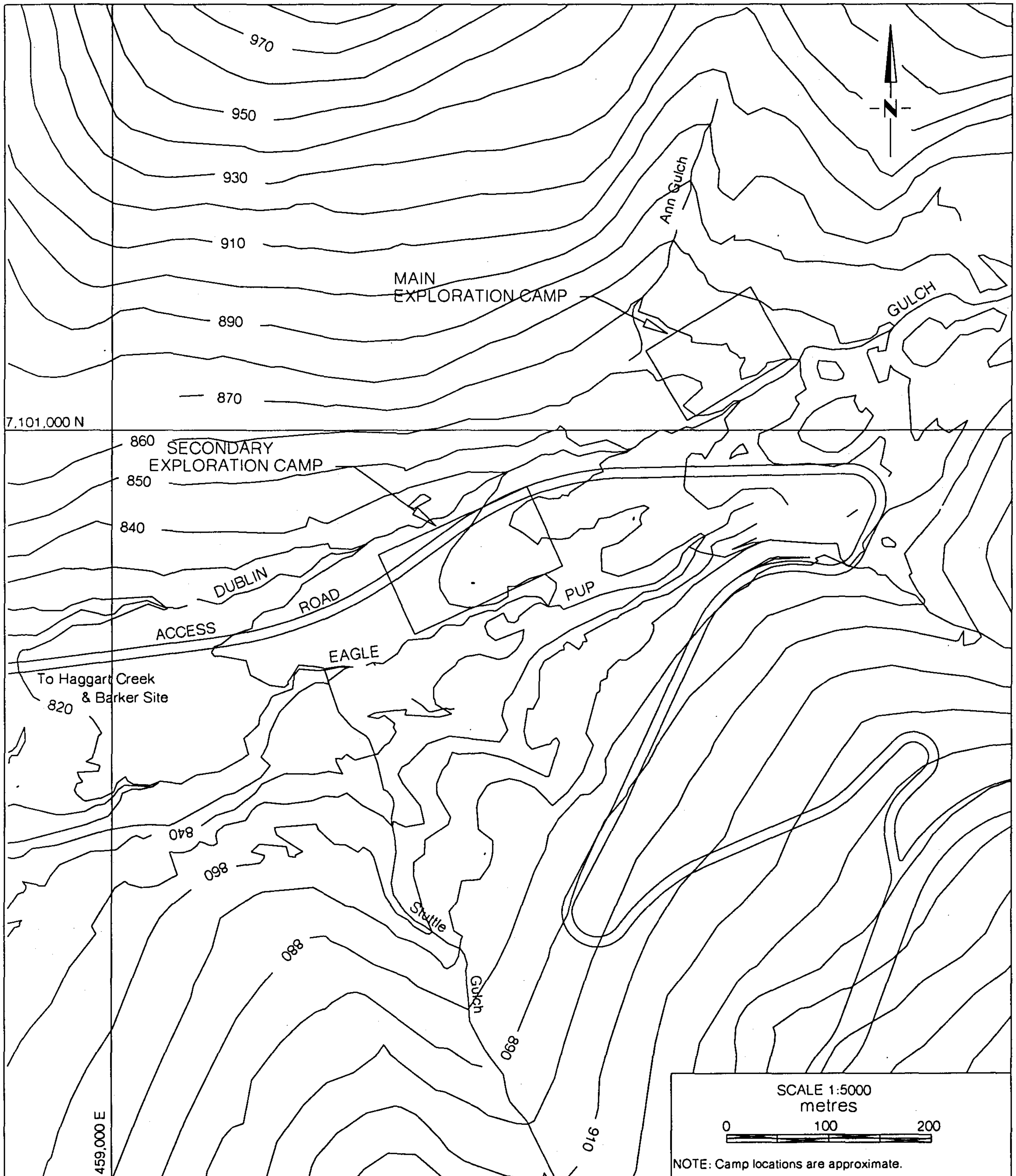

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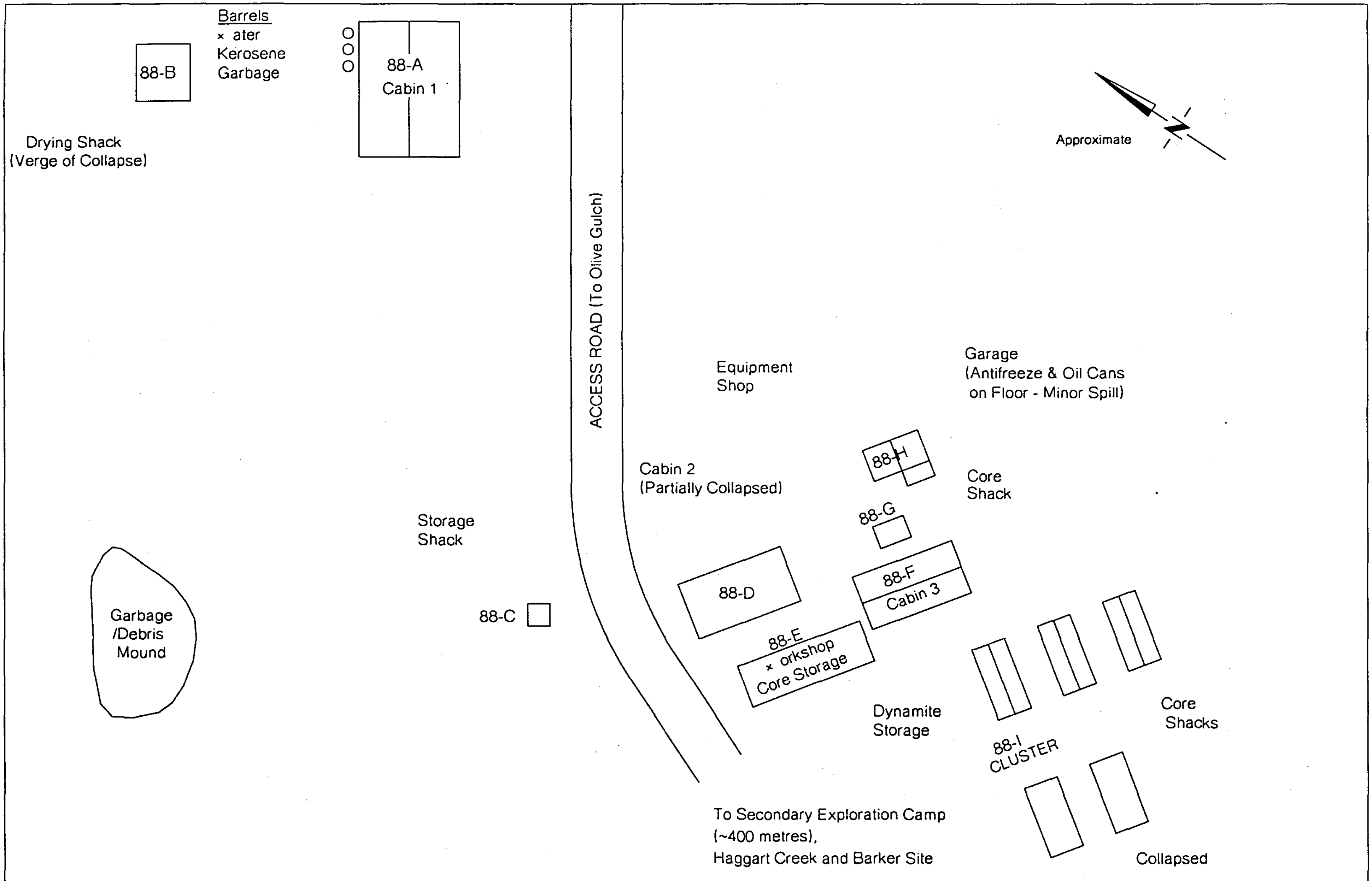
BASELINE STUDY

DUBLIN GULCH
EAGLE ZONE
EXPLORATION SITE LOCATIONS

PROJECT No. 376-007.01/CK200	February 2000	FIGURE 88-1



SCALE 1:500 (Approximate)
metres
0 10 20

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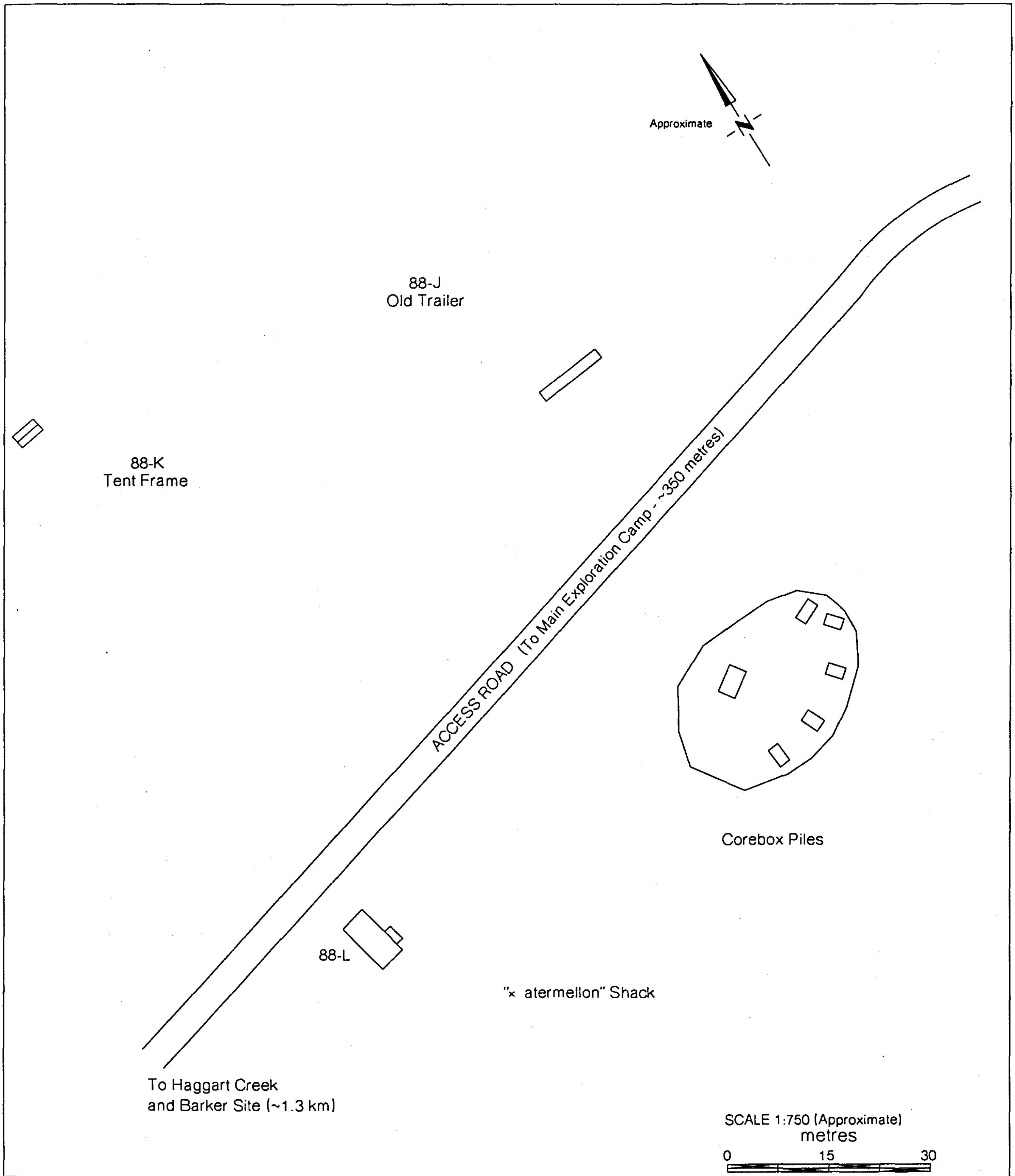
BASELINE STUDY

DUBLIN GULCH
EAGLE ZONE
MAIN EXPLORATION CAMP

PROJECT No.		
376-007.01/DublinGulch	February 2000	FIGURE 88-2



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	DUBLIN GULCH EAGLE ZONE SECONDARY EXPLORATION CAMP
CLIENT:	376-007.01/CK200 | February 2000 | FIGURE 88-3

Photo 88-1 : Dublin Gulch facing N.

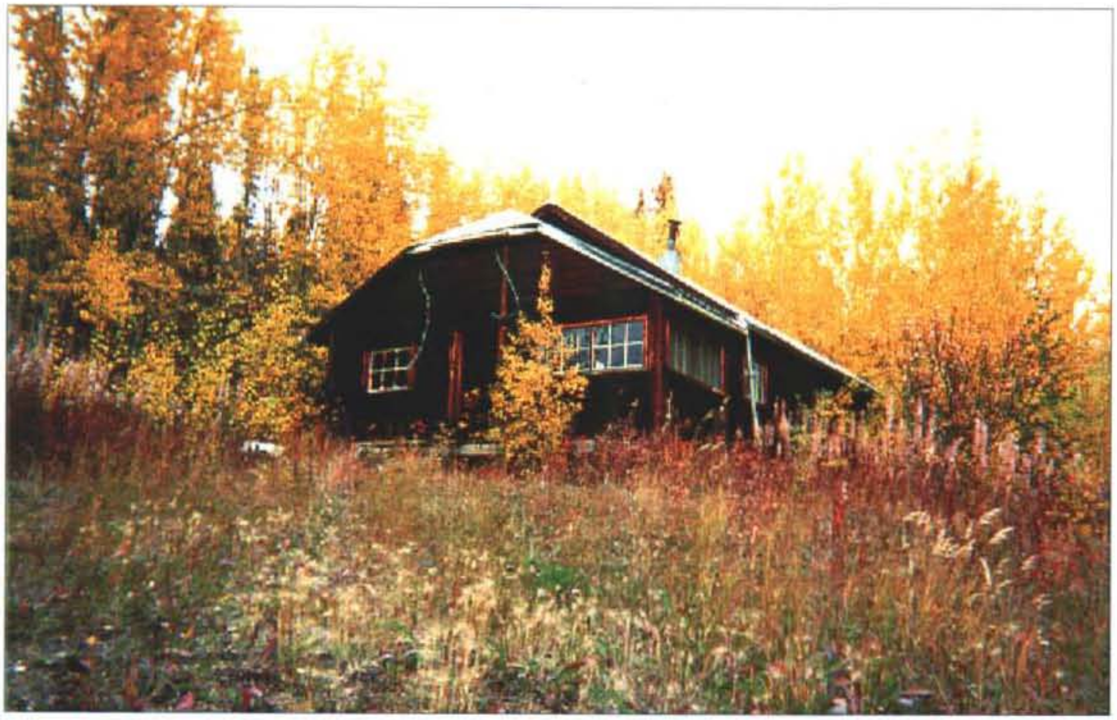

Photo 88-2 : Dublin Gulch. Exploration Camp - cabin 1 looking N.W.

Photo 88-3 : Dublin Gulch. Exploration camp - cabin 2 looking N.W.

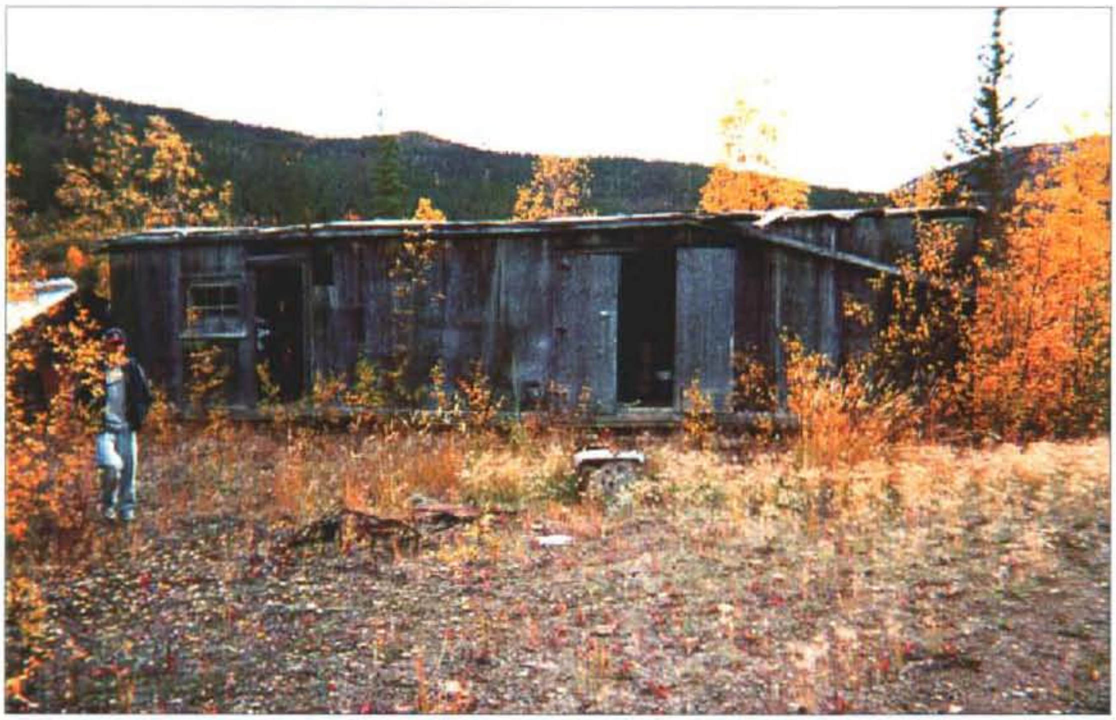

Photo 88-4 : Dublin Gulch. Exploration Camp - workshop & storage looking S.

Photo 88-5 : Dublin Gulch. Exploration Camp - cabin 4 looking S.E.

Photo 88-6 : Dublin Gulch. Exploration Camp - equipment building & garage looking N.E.

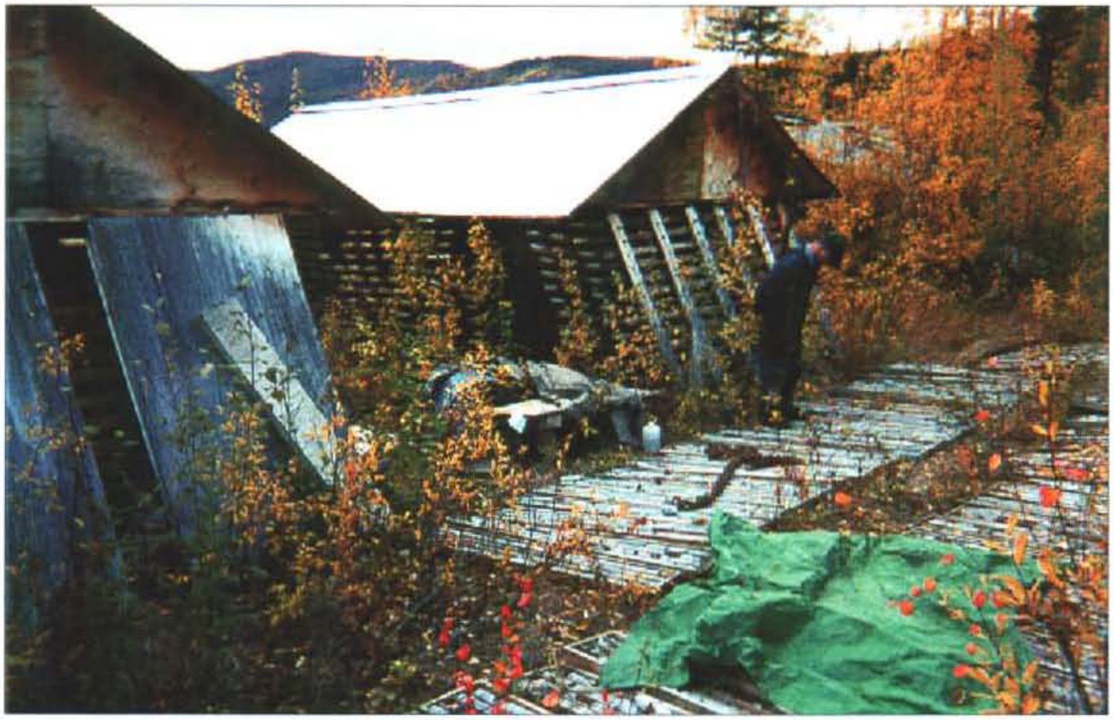

Photo 88-7 : Dublin Gulch. Exploration Camp - core shack looking W.

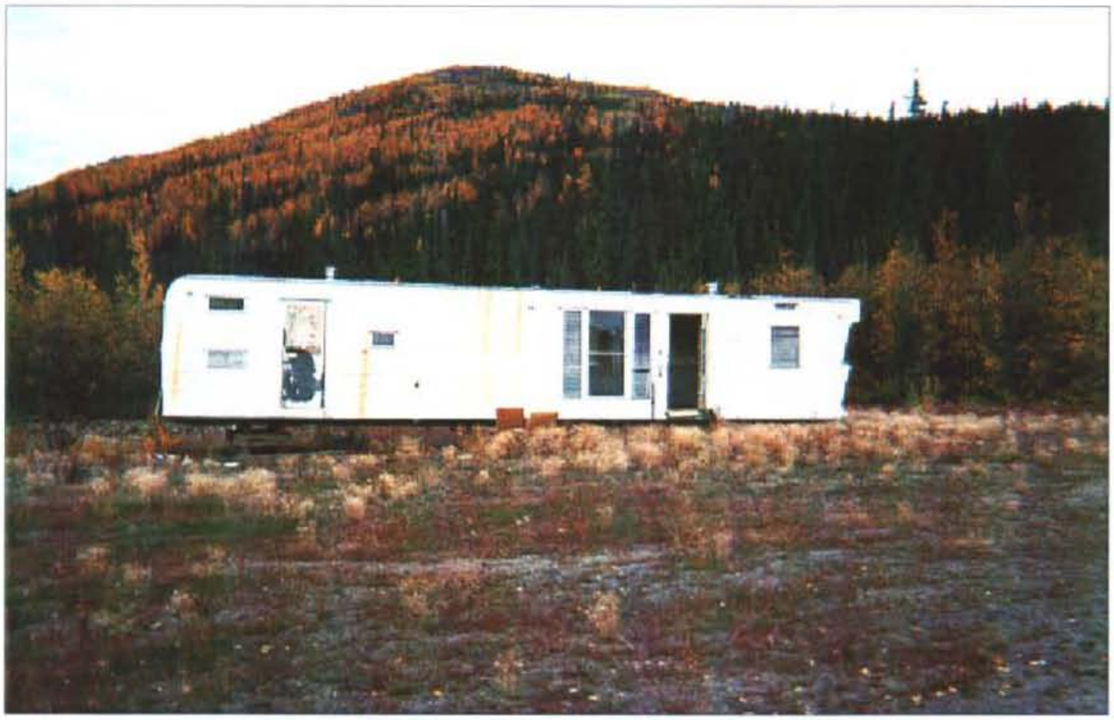

Photo 88-8 : Dublin Gulch. Exploration Camp - trailer along access road
- possibly used for placer mining (looking N.W.)

Photo 88-9 : Dublin Gulch. Exploration Camp- tent frame near access road (looking N.W.).

Photo 88-10 : Dublin Gulch. Exploration Camp - "watermellon" shack along access road (looking S.)

Photo 88-11 : Dublin Gulch. Exploration Camp - core boxes along access road near "watermellon" shack.

DUBLIN GULCH - OLIVE
SITE #89
(MINFILE #106D 025b)

1. LOCATION AND ACCESS

Coordinates 64-01-57 N, 135-47-44 W. Located on the side of a ridge along Dublin Gulch Road, approximately 400 m due northeast of Olive Gulch. Elevation approximately 4100 feet asl. Access to Olive is via the South McQuesten Highway (from Highway 11, Silver Trail) to Haggart Creek Road, and follow Dublin Gulch Road for approximately 3.5 km.

2. SITE PHYSIOGRAPHY

The site is located along the southwest side of a relatively-dry ridge straddling Olive Gulch, 400 m due southwest, and Bawn Bay Gulch, 600 m due northeast. Both gulches join Dublin Gulch to the northwest. The presence of permafrost soils could not be ascertained; however, the presence of smaller trees and the high elevation suggests the possibility of discontinuous permafrost (Photo 89-1).

3. GEOLOGY AND MINERALIZATION (from original minfile)

The Dublin Gulch area is underlain by deformed Upper Proterozoic to Lower Cambrian clastic rocks of the Hyland Group that have been intruded by Cretaceous age Tombstone suite stocks, dykes and sills. Alteration and gold and tungsten mineralization is directly associated with the intrusions. The north edge of the Potatoe Hills stock, contains quartz-arsenopyrite veins over a length of 3.2 km. Most veins strike northeast and range in width from a few cm to 2 m and occasionally wider. Arsenopyrite-rich veins usually occur in the centre of this area and ranges in width from 10-25 cm. Minor amounts of pyrite occur with the arsenopyrite. A vein on the Victoria claims assayed 8.6 g/t gold and 13 g/t silver over a width of 0.6 m for the 23 m length of the drift. Similar assays were obtained from other veins. Rio Plata conducted a turam survey and bulldozing program that reportedly outlined a narrow, silver-rich vein and more arsenopyrite veins. The presence of silver veins in the area is further suggested by the presence of siderite containing sphalerite, galena, and jamesonite in the placer gravels. The 1986 drilling tested 4 of 14 veins outlined by Queenstake. Best results were obtained from the Catto Vein where one hole returned 44.6 g/t gold over 0.4 m, while a second, 91 m to the west, assayed 60.3 g/t gold also over 0.4 m. A hole in the No. 23 vein intersected 74.7 g/t gold over 0.5 m. In 1988, additional drilling on the Catto vein returned up to 11.2 g/t gold across a true thickness of 2.7 m, while work elsewhere on the property located a few veins on the floor of Dublin Gulch. A chip sample from one of these assayed 41.1 g/t gold over 1 m. Trenching on the Smoky 64, R&D 16 and Bob 3 claims in 1989 exposed three new vein systems localized along ENE-trending faults which dip steeply south. Channel samples from the trenches returned values up to 8.61 g/t gold. Hole 91-12 intersected 3 m of granodiorite and clay with 1 cm pyrite-arsenopyrite veins, which graded 17.1 g/t gold. Hole 92-36 on the RD2 claim intersected a quartz-arsenopyrite vein cutting sericite-altered granodiorite, which assayed 13.6 g/t gold. Trenching and drilling of the Dublin Gulch deposit by Amax Gold and Ivanhoe in 1991, outlined a resource of 90 million tonnes grading between 0.93 and 13.6 g/t gold. First Dynasty drilled 12 reverse circulation drill holes and one diamond drill hole (2,909.6 m) within the main Eagle Zone to further define the ore zone's grade and extent. Seven of the 12 reverse circulation drill holes returned above-average ore grades and widths, while the remaining 5 were instrumental in defining the boundary of the deposit. The diamond drill hole returned anomalous assays from the top 145 m, grading 0.24 g/t gold with only three samples grading better than (1.02, 1.29 and 1.59) g/t gold. These results showed that mineralization continues along trend but becomes sub-economic to the northeast. At the end of 1996, mineable reserves (proven & probable) in the Eagle Zone were 50.4 mT grading 0.93 g/t gold. Several gold-bearing arsenopyrite veins are reported in the vicinity of Olive in the early 60's, with widths to 4 feet reported, in addition to scheclite prospects. The vein material at the site is reported to consist of stringers and decomposed granite with auriferous "green paystreak, twenty inches wide".

4. SITE HISTORY (from original minfile)

Placer gold was discovered on Haggart Creek in 1895 and on Dublin Gulch in 1898. The first lode staking was Dublin Lode, North Star et. al. (2404) in October, 1901, on which a 14 m adit was driven by 1904. By 1912, development work had been done on five separate properties, including Olive. A 21 m adit was driven on the Olive claim (8025) recorded in June, 1908; the last metre of this was on a vein. T. McKay and A.H. Martin tied on Bob, Mucking Futch et. al. Cl (55056) to the Olive claim in November, 1937, and prospected with pits and shallow shafts. In 1938, the claims were sold to Treadwell Yukon L, which performed more trenching. The property was transferred to Keno Mg CL in 1946. Restaked as Avoca, et al. Cl (59052) in October/48 by J.B. O'Neill and J.J. Colt, who explored with hand and bulldozer trenching in 1949-54, sold an interest in 1958 to E.H. Barker, who trenched in 1958-61 and sold the property to Peso Silver ML in 1962. Peso performed trenching in 1962. Restaked as part of the Pea, etc. cl (Y59052) in August/73 by Adonis ML in conjunction with nearby placer work; Shal cl (Y95002) in July/74 by J.M. McNulty; Dog cl (Y97149) in Nov/74 by H. Fomme; Pup cl (YA15128) in May/77 by R. Grant; and Smoky, Bob, DG etc. cl (YA17729) in April/78 by Queenstake Res L & Canada Tungsten Mg Corp L, which conducted extensive mapping, and geochemical and geophysical surveys in 1978 and 1979, backhoe trenching in 1980 and geochem sampling and mapping in 1981. In 1986, Canada Tungsten transferred some of the Smoky and Bob claims to G. Dickson and the remainder to Queenstake, which performed bulldozer trenching and 705m of diamond drilling later that year. The property was optioned to Can Pro Dev L which performed additional diamond drilling later that year and trenched in 1989. Dickson's claims were transferred to Queenstake in April and May, 1991. H-6000 holdings optioned the property in 1991, and joint ventured it to Amax Gold Inc., which explored with mapping,

geochemistry, geophysics and 16 diamond drill holes totaling 2500 m. In 1992, Amax explored with rotary percussion drilling which included 1117.7 m on the R.D. 2 and 16, Bob 1, Smoky 64-65 and 74-76 claims and 2 holes on the Smoky 51-52 claims. The property was returned to Ivanhoe Goldfields Ltd. (a successor company of H-6000 Holdings) which conducted reverse-circulation drilling and backhoe trenching on the Smokey 3,4 and 96 Fr. Claims in 1993.
In Aug/94 First Dynasty Mines Ltd. acquired Ivanhoe Goldfields Ltd. In Oct/94 Queeenstake Resources Ltd. transferred its interest in the Mar, R & D, DG, Jeff, Bob and Smoky claims to First Dynasty. In 1995, First Dynasty and in 1996 its wholly owned subsidiary, New Millenium Ltd. carried out a major drilling program to outline a core resource/reserve on Eagle Zone (minfile occurrence # 106D 025). The companies also carried out diamond drilling on Potato Hills (minfile occurrence #106D 026) to test for mineralization under the proposed heap leach pad area.

5. MINE DEVELOPMENT

5.1. Mine Openings and Excavations

Adits/Shafts/Portals

Possible adit site in dugout along side of northwest facing slope of Olive Gulch, approximately 50 m along an old access road from Dublin Gulch Road. The area was covered with large boulders concealing any visible adit opening (Photo 89-2).

Open Pits

No apparent pits at this site.

Trenches

Bulldozer trenching running for a short distance southeast off Dublin Gulch Road along slope, approximately 30 m up-slope from the suspected adit site. (Photos 89-1 and 89-3)
Dimensions: (L x W x H): ~ 70 m x 3 m x 1 m
Condition: loose packed overburden; some natural re-colonization evident (see Photos 89-1,2 and 3); appears to be stable
Accessibility: along Dublin Gulch Road

5.2. Waste Rock Disposal Areas

No apparent waste rock, aside from overburden and large boulders. A sample collected from the auriferous "green paystreak" did not have any visual signs of sulphide minerals.

5.3. Tailings Impoundments

Tailings Dams

No apparent dams

Tailing Ponds

No apparent tailings ponds

5.4. Minesite Water Treatment

No apparent treatment facilities.

6. MINE SITE INFRASTRUCTURE

6.1. Buildings

No apparent buildings.

6.2. Fuel Storage

No apparent fuel storage facilities

6.3. Rail and Tressel

No apparent activity

6.4. Milling and Processing Infrastructure

No processing facilities apparent

6.5. Electrical Equipment

No apparent electrical equipment

7. SOLID WASTE DUMPS

No apparent waste dumps.

8. POTENTIAL CONTAMINANTS OF CONCERN

8.1. Out of Service Transformers

None apparent at site

8.2. Metals and Hydrocarbons in Soil

No evidence of staining, spills, or odours.

8.3. Liquid Hazardous Materials

None apparent at site.

8.4. Solid Hazardous Materials

None apparent at site.

9. WATER QUALITY

No samples were taken due to dry topography of area and distance from any observable watercourse.

10. RECLAMATION

Natural revegetation is beginning to occur both in the trench area and near the suspected adit site (see Photos 89-1, 2 & 3). No evidence of any reclamation measures at this site.

11. OTHER SOURCES OF INFORMATION AND DATA

Much of the available information for this area is focused on the exploration activities of New Millenium Mining Ltd. within the Dublin Gulch area.

12. REFERENCES AND PERSONAL COMMUNICATIONS

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Emond, D.S. and Lynch, T, 1992. Geology, mineralogy and geochemistry of tin and tungsten mineralized veins, breccias and skarns, McQuesten River Region (115P (North) and 105 M 13), Yukon. In: Yukon Geology Vol.3, Exploration and Geological Services Division, DIAND, p. 133-159. (used in production of minfile)

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Yukon Exploration and Geology, 1995, p.8, 33 (used in production of minfile)

Yukon Exploration and Geology, 1979-80, p.238-240. (used in production of minfile)

Photo 89-1 : Olive. Further along trench line from access road (looking S. E.).

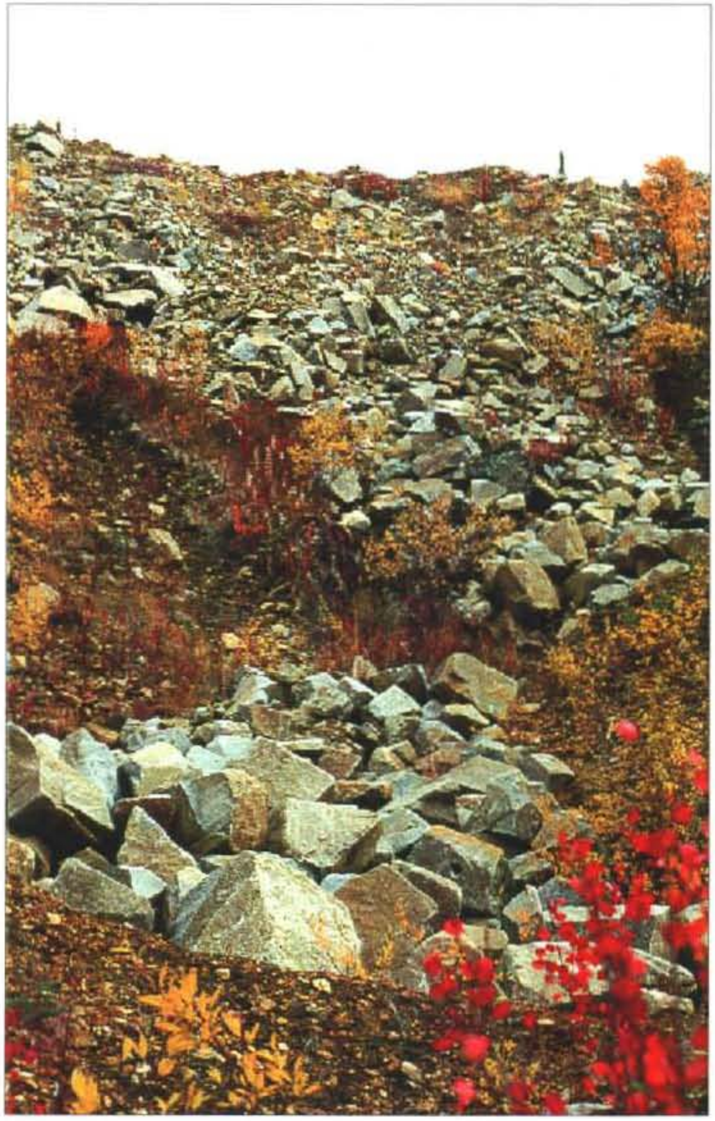

Photo 89-2 : Olive. Possible adit site looking N. E.

Photo 89-3 : Trench line from access road looking S. E.

DUBLIN GULCH – SHAMROCK
SITE #90
(MINFILE #106D 025c)

1. LOCATION AND ACCESS

Coordinates 64-03-00 N, 135-47-00 W. Located along the southern slope of Cascallen Gulch, northeast of its intersection with Bawn Bay and Gublin Gulches. Elevation approximately 3900 feet asl. Access to Shamrock is via the South McQuesten Highway (from Highway 11, Silver Trail) to Haggart Creek Road, 1.5 km northeast off Dublin Gulch Road along an access trail leading to Cascallen Gulch.

2. SITE PHYSIOGRAPHY

Identified site features were located along the south slope of the gulch which leads down into a predominantly boggy area, heavily forested by large black spruce. Drainage through this area is via a braided stream through raised hummock terrain which originates at the top of Cascallen Gulch and meanders southwest down into Dublin Gulch. The presence of permafrost soils could not be ascertained; however, the hummocky nature of the terrain along the floor of the gulch suggests the possibility of discontinuous permafrost.

3. GEOLOGY AND MINERALIZATION (from original minfile)

The Dublin Gulch area is underlain by deformed Upper Proterozoic to Lower Cambrian clastic rocks of the Hyland Group that have been intruded by Cretaceous age Tombstone suite stocks, dykes and sills. Alteration and gold and tungsten mineralization is directly associated with the intrusions. The north edge of the Potatoe Hills stock, contains quartz-arsenopyrite veins over a length of 3.2 km. Most veins strike northeast and range in width from a few to 2 m and occasionally wider. Arsenopyrite-rich veins usually occur in the centre of this area and range in width from 10-25 cm. Minor amounts of pyrite occur with the arsenopyrite. A vein on the Victoria claims assayed 8.6 g/t gold and 13 g/t silver over a width of 0.6 m for the 23 m length of the drift. Similar assays were obtained from other veins. Rio Plata conducted a turam survey and bulldozing program which reportedly outlined a narrow, silver-rich vein and more arsenopyrite veins. The presence of silver veins in the area is further suggested by the presence of siderite contaiiniing sphalerite, galena, and jamesonite in the placer gravels. The 1986 drilling tested 4 of 14 veins outlined by Queenstake. Best results were obtained from the Catto Vein where one hole returned 44.6 g/t gold over 0.4 m, while a second, 91 m to the west, assayed 60.3 g/t gold also over 0.4 m. A hole in the No. 23 vein intersected 74.7 g/t gold over 0.5 m. In 1988, additional drilling on the Catto vein returned up to 11.2 g/t gold across a true thickness of 2.7 m, while work elsewhere on the property located a few veins on the floor of Dublin Gulch. A chip sample from one of these assayed 41.1 g/t gold over 1 m. Trenching on the Smoky 64, R&D 16 and Bob 3 claims in 1989 exposed three new vein systems localized along ENE-trending faults which dip steeply south. Channel samples from the trenches returned values up to 8.61 g/t gold. Hole 91-12 intersected 3 m of granodiorite and clay with 1 cm pyrite-arsenopyrite veins, which graded 17.1 g/t gold. Hole 92-36 on the RD2 claim intersected a quartz-arsenopyritee vein cutting sericite-altered granodiorite, which assayed 13.6 g/t gold. Trenching and drilling of the Dublin Gulch deposit by Amax Gold and Ivanhoe in 1991, outlined a resource of 90 million tonnes grading between 0.93 and 13.6 g/t gold. First Dynasty drilled 12 reverse circulation drill holes and one diamond drill hole (2,909.6 m) within the main Eagle Zone to further define the ore zone's grade and extent. Seven of the 12 reverse circulation drill holes returned above-average ore grades and widths, while the remaining 5 were instrumental in defining the boundary of the deposit. The diamond drill hole returned anomalous assays from the top 145 m, grading 0.24 g/t gold with only three samples grading better than (1.02, 1.29 and 1.59) g/t gold. These results showed that mineralization continues along trend but becomes sub-economic to the northeast. At the end of 1996, mineable reserves (proven & probable) in the Eagle Zone were 50.4 mT grading 0.93 g/t gold. The vein material at the site is reported to consist of auriferous quartz scorodite ranging from 1.2 to 2.1 m wide. Host rocks at the Shamrock site consist of a contact of quartzite of the Hyland Group with Tombstone Suite granodiorite; a 1.2 m quartz vein is identified there including 0.5 m of greenish vein material which is auriferous and contains scorodite.

4. SITE HISTORY (from original minfile)

Placer gold was discovered on Haggart Creek in 1895 and on Dublin Gulch in 1898. The first lode staking was Dublin Lode, North Star et. al. (2404) in October, 1901, on which a 14 m adit was driven by 1904. By 1912, development work had been done on five separate properties, including the Shamrock group where trenching and pitting was conducted and recorded in December 1909. In 1938, the claims were sold to Treadwell Yukon L, which performed more trenching. The property was transferred to Keno Mg CL in 1946. Restaked as Avoca, et al. Cl (59052) in October/48 by J.B. O'Neill and J.J. Colt, who explored with hand and bulldozer trenching in 1949-54, sold an interest in 1958 to E.H. Barker, who trenched in 1958-61 and sold the property to Peso Silver ML in 1962. Peso performed trenching in 1962. Restaked as part of the Pea, etc. cl (Y59052) in August/73 by Adonis ML in conjunction with nearby placer work; Shal cl (Y95002) iin July/74 by J.M. McNulty; Dog cl (Y97149) in Nov/74 by H. Fomme; Pup cl (YA15128) in May/77 by R. Grant; and Smoky, Bob, DG etc. cl (YA17729) in April/78 by Queenstake Res L & Canada Tungsten Mg Corp L, which conducted extensive mapping, and geochemical and geophysical surveyws in 1978 and 1979, backhoe trenching in 1980 and geochem sampling and mapping in 1981. In 1986, Canada Tungsten transferred some of the Smoky and Bob claims to G. Dickson and the remainder to Queenstake, which performed bulldozer trenching and 705m of diamond drilling later that year. The property was optioned to Can Pro Dev L which performed additional diamond drilling later that year and trenched in 1989. Dickson's claims were transferred to Queenstake in April ad May, 1991. H-6000 holdings optioned the property in 1991, and joint ventured it to Amax Gold Inc., which explored with mapping, geochemistry, geophysics and 16 diamond drill holes totalling 2500 m. In 1992, Amax explored with rotary percussion drilling which included 1117.7 m on the R.D. 2 and 16, Bob 1, Smoky 64-65 and 74-76 claims and 2 holes on the Smoky 51-52 claims. The property was returned to Ivanhoe Goldfields Ltd. (a successor company of H-6000 Holdings) which conducted reverse-circulation drilling and backhoe trenching on the Smokey 3,4 and 96 Fr. Claims in 1993. In Aug/94 First Dynasty Mines Ltd. acquired Ivanhoe Goldfields Ltd. In Oct/94 Queenstake Resources Ltd. transferred its interest in the Mar, R & D, DG, Jeff, Bob and Smoky claims to First Dynasty. In 1995, First Dynasty and in 1996 its wholly owned subsidiary, New Millenium Ltd. carried out a major drilling program to outline a core resource/reserve on Eagle Zone (minfile occurrence # 106D 025). The companies also carried out diamond drilling on Potato Hills (minfile occurrence #106D 026) to test for mineralization under the proposed heap leach pad area. In Sept./95 Ivanhoe staked a series of fractional claims (Roni 1-13 – YB64630) in and around the Smokey claims.

5. MINE DEVELOPMENT

5.1. Mine Openings and Excavations

Adits/Shafts/Portals

No apparent openings at this site; however, visibility and mobility within Cascallen Gulch was limited due to heavy spruce forest.

Open Pits

No apparent pits at this site.

Trenches

One large old bulldozer was located at the base of the south slope of Cascalleen Gulch, running southwest, near it's intersection with Bawn Bay Gulch. (Photo 90-1)
Dimensions: (L x W x H): ~ 100 m x 25 m x 7 m
Condition: loose packed overburden; some natural re-colonization evident (see Photo 90-1); appears to be relatively stable and well away from any watercourses.
Accessibility: on foot through heavy forest along Cascallen Gulch.

One small old hand dugout along the top of a ridge above the south slope of Cascallen Gulch (Photo 90-2).
Dimensions: (L x W x H): ~ 10 m x 2.5 m x 1.5 m

Condition: loose packed soil and gravel; relatively stable and in a high, dry area well away from any watercourses.

Accessibility: on foot west of the Cascallen Gulch access trail

5.2. Waste Rock Disposal Areas

No apparent waste rock

5.3. Tailings Impoundments

Tailings Dams

No apparent dams

Tailing Ponds

No apparent tailings ponds

5.4. Minesite Water Treatment

No apparent treatment facilities.

6. MINE SITE INFRASTRUCTURE

6.1. Buildings

No apparent buildings

6.2. Fuel Storage

No apparent fuel storage facilities.

6.3. Rail and Tressel

No apparent activity

6.4. Milling and Processing Infrastructure

No processing facilities apparent.

6.5. Electrical Equipment

No apparent electrical equipment

7. SOLID WASTE DUMPS

No apparent waste dumps.

8. POTENTIAL CONTAMINANTS OF CONCERN

8.1. Out of Service Transformers

None apparent at site

8.2. Metals and Hydrocarbons in Soil

No evidence of staining, spills, or odours.

8.3. Liquid Hazardous Materials

None apparent at site.

8.4. Solid Hazardous Materials

None apparent at site.

9. WATER QUALITY

Surface water quality samples were collected in the watercourse of Cascallen Gulch just downstream of the large trench (99-90-WQ-01) and 200 m upstream of the trench near the geographic centre of the gulch (99-91-WQ-02 and field duplicate 99-91-WQ-03) Results of the geochemistry are listed in Attachment 2.

10. RECLAMATION

Natural revegetation is beginning to occur in the large trench at the bottom and smaller dugout at the top of the gulch (see Photos 90-1 and 90-2). A number of old trails from the early 1900s also occur in Cascallen Gulch, which have been heavily overgrown by forest. No evidence of any reclamation measures at this site.

11. OTHER SOURCES OF INFORMATION AND DATA

Much of the available information for this area is focused on the exploration activities of New Millenium Mining Ltd. within the Dublin Gulch area.

12. REFERENCES AND PERSONAL COMMUNICATIONS

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New Millennium Mining Ltd. (December) 1996. Dublin Gulch Project Initial Environmental Evaluation, Addendum, Volume 1 + Appendices.

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Queenstake Resources Ltd., (May) 1992. Assessment Report # 093028 (drill logs) by C. Orssich et al . (used in production of minfile)

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Yukon Exploration and Geology, 1995, p.8, 33 (used in production of minfile)

Yukon Exploration and Geology, 1979-80, p.238-240. (used in production of minfile)

ATTACHMENT 2: 1999 DUBLIN GULCH - SHAMROCK WATER SAMPLES LABORATORY RESULTS					
Site Number	Detection Limit	Units	99-90-WQ-01 Sept. 17/99	99-90-WQ-02 Sept. 17/99	99-90-WQ-03 Sept. 17/99
Sample Description			Downstream of Trench in Cascallen Gulch	200 m upstream of Trench in Cascallen Gulch	Field Duplicate of WQ-2
Temperature (field)	N/A	oC	3.2	2.3	2.3
pH (field)	N/A	pH	7.25	6.4	6.4
Conductivity (field)	N/A	µS/cm	118	101	101
pH (Lab)	0.01	pH	7.63	7.28	7.37
Conductivity (Lab)	0.01	µS/cm	105	90	88
Total Alkalinity	5	mg CaCO3/L	51	37	31
Chloride	0.05	mg/L	<0.05	0.05	<0.05
Hardness (CaCO3 equiv)	5	mg/L	51.9	46.8	47.7
Nitrate-N	0.05	mg/L	0.07	0.05	0.05
Nitrite-N	0.003	mg/L	<0.003	0.003	0.003
Sulphate	1	mg/L	6.9	5.8	5.9
Total Dissolved Solids	5	mg/L	67	62	56
Analysis by ICP-USN					
Aluminum	0.0008	mg/L	0.232	0.0296	0.0165
Antimony	0.005	mg/L	<0.005	<0.005	<0.005
Arsenic	0.01	mg/L	0.04	0.04	0.04
Barium	0.00004	mg/L	0.036	0.046	0.0474
Beryllium	0.00001	mg/L	<0.00001	<0.00001	<0.00001
Bismuth	0.0004	mg/L	<0.0004	<0.0004	<0.0004
Boron	0.002	mg/L	<0.002	<0.002	<0.002
Cadmium	0.00006	mg/L	0.000042	0.000046	0.00005
Calcium	0.002	mg/L	13.8	12.2	12.1
Chromium	0.00006	mg/L	0.00072	0.00017	0.00018
Cobalt	0.00003	mg/L	0.00028	<0.00003	<0.00003
Copper	0.00003	mg/L	0.00133	0.00101	0.00058
Iron	0.00001	mg/L	0.42	0.035	0.016
Lead	0.0003	mg/L	<0.0003	<0.0003	<0.0003
Lithium	0.001	mg/L	0.003	0.002	0.001
Magnesium	0.0005	mg/L	2.62	1.75	1.75
Manganese	0.00002	mg/L	0.0128	0.00218	0.00122
Mercury	0.0001	mg/L	<0.0001	<0.0001	<0.0001
Molybdenum	0.00007	mg/L	0.00294	0.0024	0.00257
Nickel	0.00001	mg/L	0.001	0.0007	0.0009
Phosphorus	0.03	mg/L	<0.03	<0.03	<0.03
Potassium	0.4	mg/L	0.7	0.6	0.5
Selenium	0.004	mg/L	<0.004	<0.004	<0.004
Silicon	0.004	mg/L	4.85	4.45	4.42
Silver	0.00005	mg/L	<0.00005	<0.00005	<0.00005
Sodium	0.004	mg/L	1.3	1.4	1.4
Strontium	0.00002	mg/L	0.093	0.0852	0.0883
Sulphur	0.008	mg/L	2.36	2.03	2.02
Thallium	0.001	mg/L	<0.001	<0.001	<0.001
Titanium	0.00002	mg/L	0.0165	0.00129	0.00069
Vanadium	0.00003	mg/L	0.00077	0.00019	0.00019
Zinc	0.0002	mg/L	0.001	<0.0002	<0.0002
Analysis by Hydride AA					
Arsenic	0.0002	mg/L	0.0278	0.0363	0.0364
Selenium	0.0001	mg/L	0.0002	0.0001	<0.0001

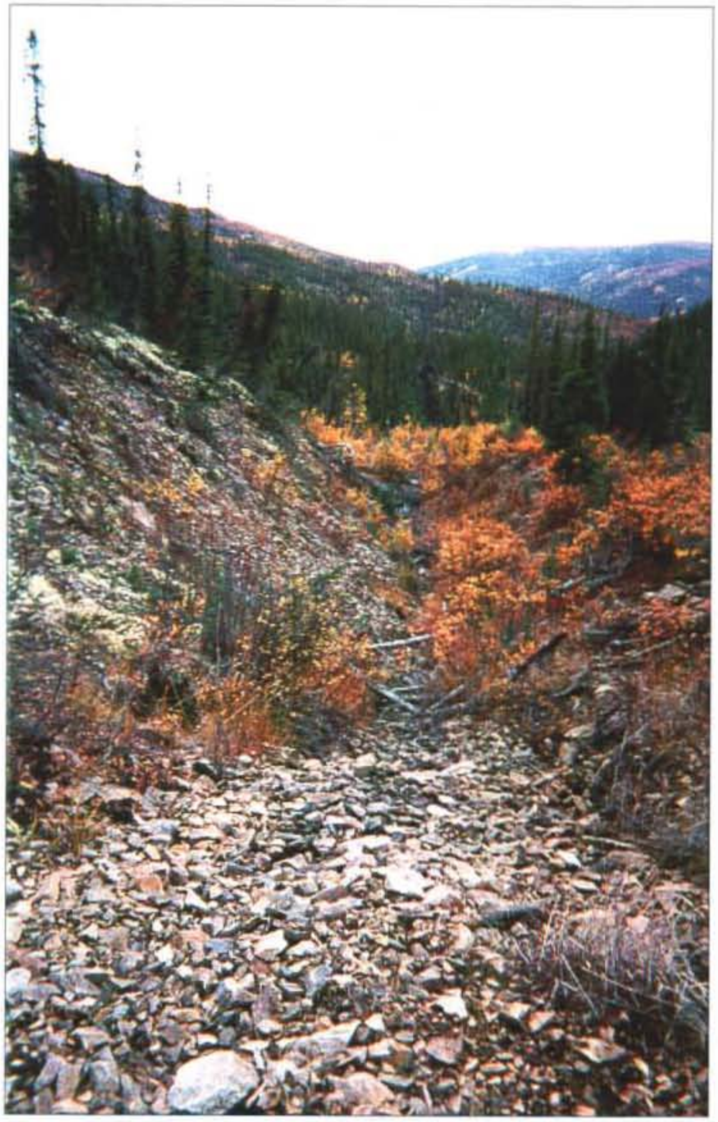

Photo 90-1 : Shamrock. Old trench along W. slope of
Cascellan Gulch.

Photo 90-2 : Shamrock. Old 1914 trench along S. Ridge of Cascellan Gulch.

DUBLIN GULCH – STEWART & CATTO
SITE #91
(MINFILE #106D 025d)

1. LOCATION AND ACCESS

Coordinates 64-02-00 N, 135-47-00 W. Located along Olive Gulch and a ridge straddling this gulch and Stewart Gulch (approximately 1 km due southwest) 800 km from its confluence with Dublin Gulch. Elevation approximately 3800-4000 feet asl. Access to the site is via the South McQuesten Highway (from Highway 11, Silver Trail) to Haggart Creek Road, 200 m southeast off Dublin Gulch Road along the Olive Gulch access road.

2. SITE PHYSIOGRAPHY

The site is located along the northeast side of a relatively-dry ridge leading into Olive Gulch. A small semi-subterranean creek runs down into the gulch under large boulders from the southeast (Photo 91-1), daylighting alongside a small placer mining camp along the site access road (see Photo 91-7). The stream splits into two channels at a small placer campsite located there with one of the forks following into a dugout trench while the other follows the Olive Gulch access road to the northwest. The stream drainage beyond this point has been altered by overburden from placer activities and trenching, resulting in flooding and wet, soggy conditions along Olive Gulch access road (Photo 91-2). This gulch eventually drains into Dublin Gulch to the northwest. The presence of permafrost soils could not be ascertained; however, the sparse cover of smaller trees and the high elevation suggests the possibility of discontinuous permafrost (Photo 91-3).

3. GEOLOGY AND MINERALIZATION (from original minfile)

The Dublin Gulch area is underlain by deformed Upper Proterozoic to Lower Cambrian clastic rocks of the Hyland Group that have been intruded by Cretaceous age Tombstone suite stocks, dykes and sills. Alteration and gold and tungsten mineralization is directly associated with the intrusions. The north edge of the Potatoe Hills stock, contains quartz-arsenopyrite veins over a length of 3.2 km. Most veins strike northeast and range in width from a few cm to 2 m and occasionally wider. Arsenopyrite-rich veins usually occur in the centre of this area and range in width from 10-25 cm. Minor amounts of pyrite occurs with the arsenopyrite. A vein on the Victoria claims assayed 8.6 g/t gold and 13 g/t silver over a width of 0.6 m for the 23 m length of the drift. Similar assays were obtained from other veins. Rio Plata conducted a turam survey and bulldozing program which reportedly outlined a narrow, silver-rich vein and more arsenopyrite veins. The presence of silver veins in the area is further suggested by the presence of siderite containing sphalerite, galena, and jamesonite in the placer gravels. The 1986 drilling tested 4 of 14 veins outlined by Queenstake. Best results were obtained from the Catto Vein where one hole returned 44.6 g/t gold over 0.4 m, while a second, 91 m to the west, assayed 60.3 g/t gold also over 0.4 m. A hole in the No. 23 vein intersected 74.7 g/t gold over 0.5 m. In 1988, additional drilling on the Catto vein returned up to 11.2 g/t gold across a true thickness of 2.7 m, while work elsewhere on the property located a few veins on the floor of Dublin Gulch. A chip sample from one of these assayed 41.1 g/t gold over 1 m. Trenching on the Smoky 64, R&D 16 and Bob 3 claims in 1989 exposed three new vein systems localized along ENE-trending faults which dip steeply south. Channel samples from the trenches returned values up to 8.61 g/t gold. Hole 91-12 intersected 3 m of granodiorite and clay with 1 cm pyrite-arsenopyrite veins, which graded 17.1 g/t gold. Hole 92-36 on the RD2 claim intersected a quartz-arsenopyrite vein cutting sericite-altered granodiorite, which assayed 13.6 g/t gold. Trenching and drilling of the Dublin Gulch deposit by Amax Gold and Ivanhoe in 1991, outlined a resource of 90 million tonnes grading between 0.93 and 13.6 g/t gold. First Dynasty drilled 12 reverse circulation drill holes and one diamond drill hole (2,909.6 m) within the main Eagle Zone to further define the ore zone's grade and extent. Seven of the 12 reverse circulation drill holes returned above-average ore grades and widths, while the remaining 5 were instrumental in defining the boundary of the deposit. The diamond drill hole returned anomalous assays from the top 145 m, grading 0.24 g/t gold with only three samples grading better than (1.02, 1.29 and 1.59) g/t gold. These results showed that mineralization continues along trend but becomes sub-economic to the northeast. At the end of 1996, mineable reserves (proven & probable) in the Eagle Zone were 50.4 mT grading 0.93 g/t gold. The vein material at the site is reported to consist of auriferous quartz scorodite ranging from 1.2 to 2.1 m wide.

4. SITE HISTORY (from original minfile)

Placer gold was discovered on Haggart Creek in 1895 and on Dublin Gulch in 1898. The first lode staking was Dublin Lode, North Star et. al. (2404) in October, 1901, on which a 14 m adit was driven by 1904. By 1912, development work had been done on five separate properties, including the Stewart-Catto group. On the Stewart Catto group (Happy Jack (8029)) and Victoria (8022) cl) recorded in Jun.- Oct., 1908, two adits were driven, the first 38 m long and off the vein, and the second a 600 m crosscut with 23 m of drifting on the vein. T. McKay and A.H. Martin tied on Bob, Mucking Futch et. al. Cl (55056) to the Olive claim in November, 1937, and prospected with pits and shallow shafts. In 1938, the claims were sold to Treadwell Yukon L, which performed more trenching. The property was transferred to Keno Mg CL in 1946. Restaked as Avoca, et al. Cl (59052) in October/48 by J.B. O'Neill and J.J. Colt, who explored with hand and bulldozer trenching in 1949-54, sold an interest in 1958 to E.H. Barker, who trenched in 1958-61 and sold the property to Peso Silver ML in 1962. Peso performed trenching in 1962. Restaked as part of the Pea, etc. cl (Y59052) in August/73 by Adonis ML in conjunction with nearby placer work.; Shal cl (Y95002) iin July/74 by J.M. McNulty; Dog cl (Y97149) in Nov/74 by H. Fomme; Pup cl (YA15128) in May/77 by R. Grant; and Smoky, Bob, DG etc. cl (YA17729) in April/78 by Queenstake Res L & Canada Tungsten Mg Corp L, which conducted extensive mapping, and geochemical and geophysical surveyws in 1978 and 1979, backhoe trenching in 1980 and geochem sampling and mapping in 1981. In 1986, Canada Tungsten transferred some of the Smoky and Bob claims to G. Dickson and the remainder to Queenstake, which performed bulldozer trenching and 705m of diamond drilling later that year. The property was optioned to Can Pro Dev L which performed additional diamond drilling later that year and trenched in 1989. Dickson's claims were transferred to Queenstake in April ad May, 1991. H-6000 holdings optioned the property in 1991, and joint ventured it to Amax Gold Inc., which explored with mapping, geochemistry, geophysics and 16 diamond drill holes totalling 2500 m. In 1992, Amax explored with rotary percussion drilling which included 1117.7 m on the R.D. 2 and 16, Bob 1, Smoky 64-65 and 74-76 claims and 2 holes on the Smoky 51-52 claims. The property was returned to Ivanhoe Goldfields Ltd. (a successor company of H-6000 Holdings) which conducted reverse-circulation drilling and backhoe trenching on the Smokey 3,4 and 96 Fr. Claims in 1993. In Aug/94 First Dynasty Mines Ltd. acquired Ivanhoe Goldfields Ltd. In Oct/94 Queeenstake Resources Ltd. transferred its interest in the Mar, R & D, DG, Jeff, Bob and Smoky claims to First Dynasty. In 1995, First Dynasty and in 1996 its wholly owned subsidiary, New Millenium Ltd. carried out a major drilling program to outline a core resource/reserve on Eagle Zone (minfile occurrence # 106D 025). The companies also carried out diamond drilling on Potato Hills (minfile occurrence #106D 026) to test for mineralization under the proposed heap leach pad area. In Sept./95 Ivanhoe staked a series of fractional claims (Roni 1-13 – YB64630) in and around the Smokey claims.

5. MINE DEVELOPMENT

5.1. Mine Openings and Excavations

Adits/Shafts/Portals

One of the old adits developed between 1908 and 1914, "Victoria" was discovered along the upper access road winding up the northeast-facing slope of Olive Gulch. The opening was located 200m upslope and due southeast from the bottom of the gulch and approximately 80 m down from the top of the ridge. The adit opening was exposed and partially filled with rocks (Photo 91-4). Two drill-casing pipes were also noted sticking out of the ground above the adit at a 45 degree angle, possibly from old drilling activities or for shaft-venting.

Dimensions (L x W x H): ~83 m x 1.5 m x 1.75 m)

Supports: No structural supports in place

Condition: Appears to be stable.

Access: 3 m from edge of upper access road leading up-slope from Olive Gulch to top of ridge.

Sampling: One rock sample (99-91-WR01) was taken from the interior of this adit for acid rock drainage (ARD) analysis. Results of the geochemistry are listed in Attachment 2.

Open Pits

No apparent pits at this site.

Trenches

A number of (40 to 70 m) long bulldozer and backhoe trenches were found near the top of the ridge towards its northwest side, among extensive roadworks, above the adit opening (Photos 91-5 and 91-6).

Dimensions: (L x W x H): ~ 40-70 m x 2-3 m x 1-2 m

Condition: loose packed overburden; some natural re-colonization evident (see Photos 91-5 and 91-6); appear to be relatively stable

Accessibility: upper access road leading up-slope from Olive Gulch to top of ridge, above adit.

Recent, large, flooded bulldozer trench along Olive Gulch water course, opposite placer camp (Photo 91-7, see also Photo 91-2); approximately 100 m from Dublin Gulch Road.

Dimensions: (L x W x H): ~ 40 m x 4 m x 5 m
Condition: loose packed soil and gravel; erosion occurring from surface run-off; potentially unstable during high flow/runoff conditions.
Accessibility: along Olive Gulch access road.

5.2. Waste Rock Disposal Areas

No apparent waste rock, aside from overburden and large boulders. Although no physical indications of Acid Rock Drainage were noted at the Stewart Catto site Victoria adit such as staining, the results of the Acid Base Accounting from the adit sample suggest the potential for acid generation (AP/NP = 0.6). A visual assessment of a rock sample collected at the subject site did not indicate any visual indications of sulphide minerals.

5.3. Tailings Impoundments

Tailings Dams

No apparent dams

Tailing Ponds

No apparent tailings ponds

5.4. Minesite Water Treatment

No apparent treatment facilities.

6. MINE SITE INFRASTRUCTURE

6.1. Buildings

No apparent intact buildings, aside from two trailers being used as a camp for current placer mining and salvage activities (Photos 91-7 and 91-8). Two miners were camping on site at the time of the 1999 investigation. Two old, collapsing burned-out log cabins were located on the opposite side of the watercourse, in addition to an old demolished wood and siding building by the campsite along the southwest side of the watercourse.

6.2. Fuel Storage

No apparent fuel storage facilities, aside from possible propane tanks being used by trailers of placer miners.

6.3. Rail and Tressel

No apparent activity

6.4. Milling and Processing Infrastructure

No processing facilities apparent, aside from an old loader pan located along the south edge of the dugout trench, shelite recovery sieve (used by the miners), and a large sheet sieve (2 x 6 m) towards the north west end of the camp.

6.5. Electrical Equipment

No apparent electrical equipment

7. SOLID WASTE DUMPS

No apparent waste dumps; however, wood and metal debris (pieces of mining equipment and siding) were scattered across the site. Some PVC piping was also recently piled on the opposite side of the watercourse from the camp (Photos 91-7 and 91-8).

8. POTENTIAL CONTAMINANTS OF CONCERN

8.1. Out of Service Transformers

None apparent at site

8.2. Metals and Hydrocarbons in Soil

No evidence of staining, spills, or odours.

8.3. Liquid Hazardous Materials

None apparent at site.

8.4. Solid Hazardous Materials

None apparent at site.

9. WATER QUALITY

Surface water quality samples were collected in the watercourse of Olive Gulch at the campsite (99-91-WQ-01) and 5 m downstream of the base of the dugout trench situated 100 m northwest of the camp (99-91-WQ-02, see Photo 91-2). Results of the geochemistry are listed in Attachment 2.

10. RECLAMATION

Natural revegetation is beginning to occur both in the trench areas above the adit (see Photo 91.5) and less disturbed areas around the camp site (see Photo 91-7). No evidence of any reclamation measures at this site aside from local salvaging operations.

11. OTHER SOURCES OF INFORMATION AND DATA

Much of the available information for this area is focused on the exploration activities of New Millenium Mining Ltd. within the Dublin Gulch area.

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ATTACHMENT 2: 1999 DUBLIN GULCH - STEWART & CATTO WATER SAMPLES LABORATORY RESULTS						
Site Number	**Detection Limit**	**Units**		**99-91-WQ-01 Sept. 17/99**	**99-91-WQ-02 Sept. 17/99**	**99-91-WQ-03 Sept. 17/99**
Sample Description				North side of campsite in stream	5 m downstream of trench in stream	Field duplicate of WQ-2
Temperature (field)	N/A	oC		2	7.3	7.3
pH (field)	N/A	pH		7.12	7.9	7.9
Conductivity (field)	N/A	µS/cm		120	123	123
pH (Lab)	0.01	pH		7.61	7.6	7.6
Conductivity (Lab)	0.01	µS/cm		105	105	105
Total Alkalinity	5	mg CaCO3/L		45	48	41
Chloride	0.05	mg/L		0.07	0.05	0.06
Hardness (CaCO3 equiv)	5	mg/L		53.9	56.1	55.3
Nitrate-N	0.05	mg/L		0.21	0.16	0.16
Nitrite-N	0.003	mg/L		<0.003	0.003	<0.003
Sulphate	1	mg/L		6	7.5	7.6
Total Dissolved Solids	5	mg/L		378	398	128
Analysis by ICP-USN						
Aluminum	0.0008	mg/L		0.0219	1.72	1.28
Antimony	0.005	mg/L		<0.005	0.005	<0.005
Arsenic	0.01	mg/L		0.04	0.08	0.08
Barium	0.00004	mg/L		0.0418	0.0723	0.066
Beryllium	0.00001	mg/L		<0.00001	<0.00001	<0.00001
Bismuth	0.0004	mg/L		<0.0004	<0.0004	<0.0004
Boron	0.002	mg/L		<0.002	<0.002	<0.002
Cadmium	0.00006	mg/L		0.000082	0.00016	0.00014
Calcium	0.002	mg/L		13.9	14.6	14.7
Chromium	0.00006	mg/L		<0.00006	0.00314	0.00244
Cobalt	0.00003	mg/L		<0.00003	0.0014	0.00117
Copper	0.00003	mg/L		0.00072	0.00371	0.00324
Iron	0.00001	mg/L		0.022	2.73	2.11
Lead	0.0003	mg/L		<0.0003	0.0059	0.0054
Lithium	0.001	mg/L		0.002	0.005	0.004
Magnesium	0.0005	mg/L		2.45	3.24	3.12
Manganese	0.00002	mg/L		0.00033	0.0825	0.0701
Mercury	0.0001	mg/L		<0.0001	<0.0001	<0.0001
Molybdenum	0.00007	mg/L		0.0051	0.00548	0.0056
Nickel	0.00001	mg/L		0.0009	0.0036	0.0034
Phosphorus	0.03	mg/L		<0.03	0.12	0.11
Potassium	0.4	mg/L		0.7	1.1	1
Selenium	0.004	mg/L		<0.004	<0.004	<0.004
Silicon	0.004	mg/L		4.24	6.39	5.74
Silver	0.00005	mg/L		<0.00005	<0.00005	<0.00005
Sodium	0.004	mg/L		1.6	1.7	1.7
Strontium	0.00002	mg/L		0.0799	0.0835	0.0835
Sulphur	0.008	mg/L		1.98	2.61	2.6
Thallium	0.001	mg/L		<0.001	<0.001	<0.001
Titanium	0.00002	mg/L		0.00134	0.117	0.0861
Vanadium	0.00003	mg/L		0.00014	0.0043	0.00339
Zinc	0.0002	mg/L		<0.0002	0.0167	0.011
Analysis by Hydride AA						
Arsenic	0.0002	mg/L		0.0359	0.0746	0.0715
Selenium	0.0001	mg/L		<0.0001	0.0002	<0.0001

ATTACHMENT 2: 1999 DUBLIN GULCH - STEWART & CATTO WASTE ROCK SAMPLES LABORATORY RESULTS MODIFIED SOBEK METHOD ACID-BASE ACCOUNTING TEST								
SAMPLE	SITE DESCRIPTION	PASTE pH	S(T) %	S(SO4) %	AP	NP	NET NP	NP/AP
99-91-WR-01 - Sept 15/99	Victoria Adit	6.1	0.07	0.03	1.3	0.7	-0.6	0.6

AP = ACID POTENTIAL IN TONNES CaCO3 EQUIVALENT PER 1000 TONNES OF MATERIAL.
NP = NEUTRALIZATION POTENTIAL IN TONNES CaCO3 EQUIVALENT PER 1000 TONNES OF MATERIAL.
NET NP = NET NEUTRALIZATION POTENTIAL = TONNES CaCO3 EQUIVALENT PER 1000 TONNES OF MATERIAL.
NOTE: WHEN S(T) AND/OR S(SO4) IS REPORTED AS <0.01, IT IS ASSUMED TO BE ZERO FOR THE AP CALCULATION.
N/D = NO DUPLICATE ASSAY. CALCULATIONS ARE BASED ON ASSAY RESULTS OF THE INITIAL SAMPLE.
RE = REPLICATE.

NOTE - A HIGH LEVEL OF SOLUBLE METALS (ESPECIALLY IRON) WERE OBSERVED IN MANY SAMPLES DURING THE ABA TITRATIONS.
SAMPLES WITH A NEGATIVE NET NP SHOULD BE TESTED FOR MOBILE METALS USING STANDARD SHAKE FLASK EXTRACTION TESTS.

Photo 91-1 : Stewart-Catto. View from hill looking at top of gulch upstream & east of site.

Photo 91-2 : Stewart-Catto. Trench N.W. of site looking E.

Photo 91-3 : Stewart-Catto. View from hill looking E. Showing "upstream area" of camp site.

Photo 91-4 : Stewart-Catto. Old1914 mine adit along old access road to top of hill.

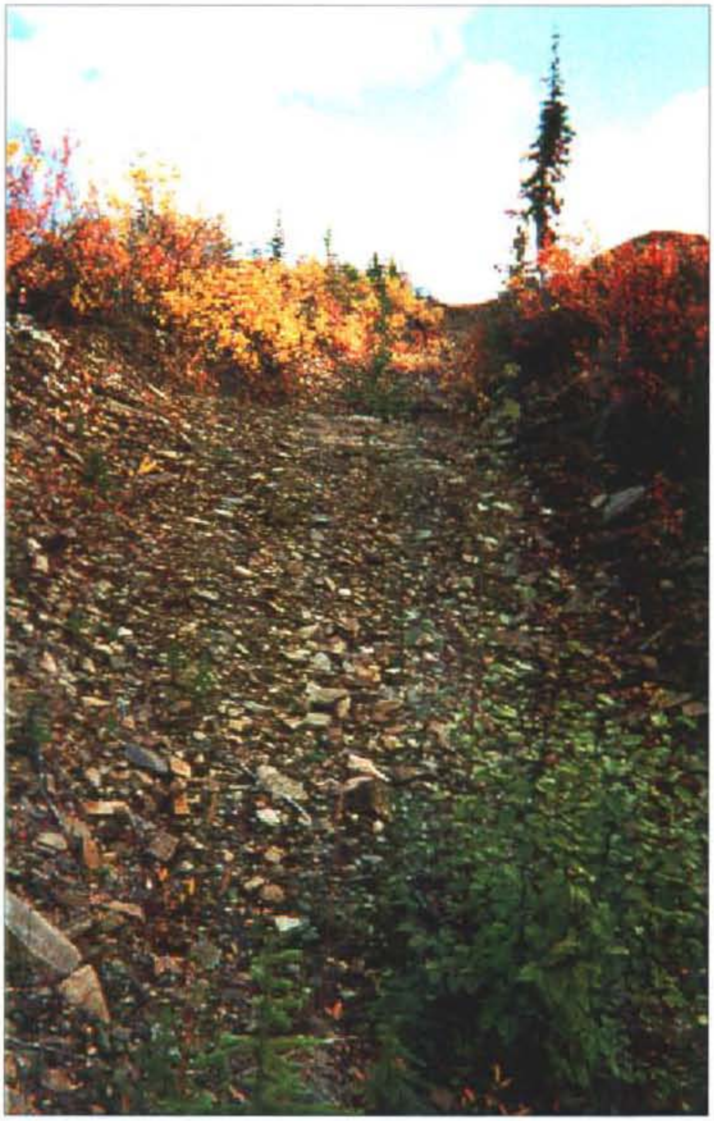

Photo 91-5 : Stewart-Catto. Long trench looking upslope
& S.W. to hill top.

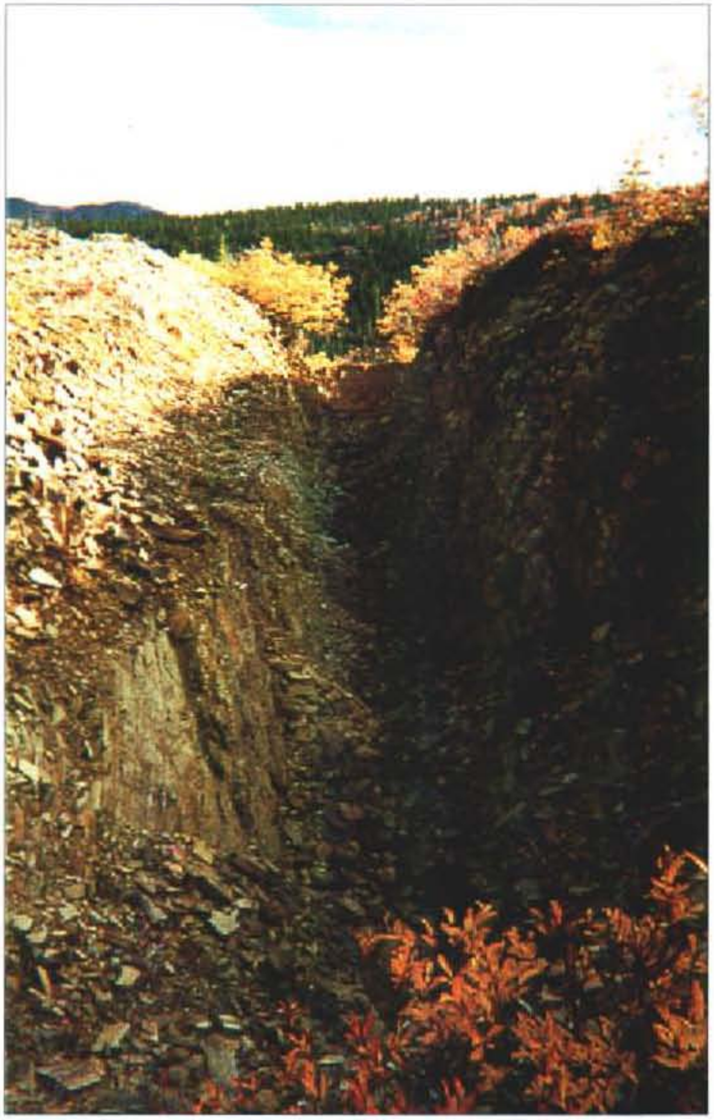

Photo 91-6 : Stewart-Catto. One of many bulldoze
trenches near top of hill looking N.E.

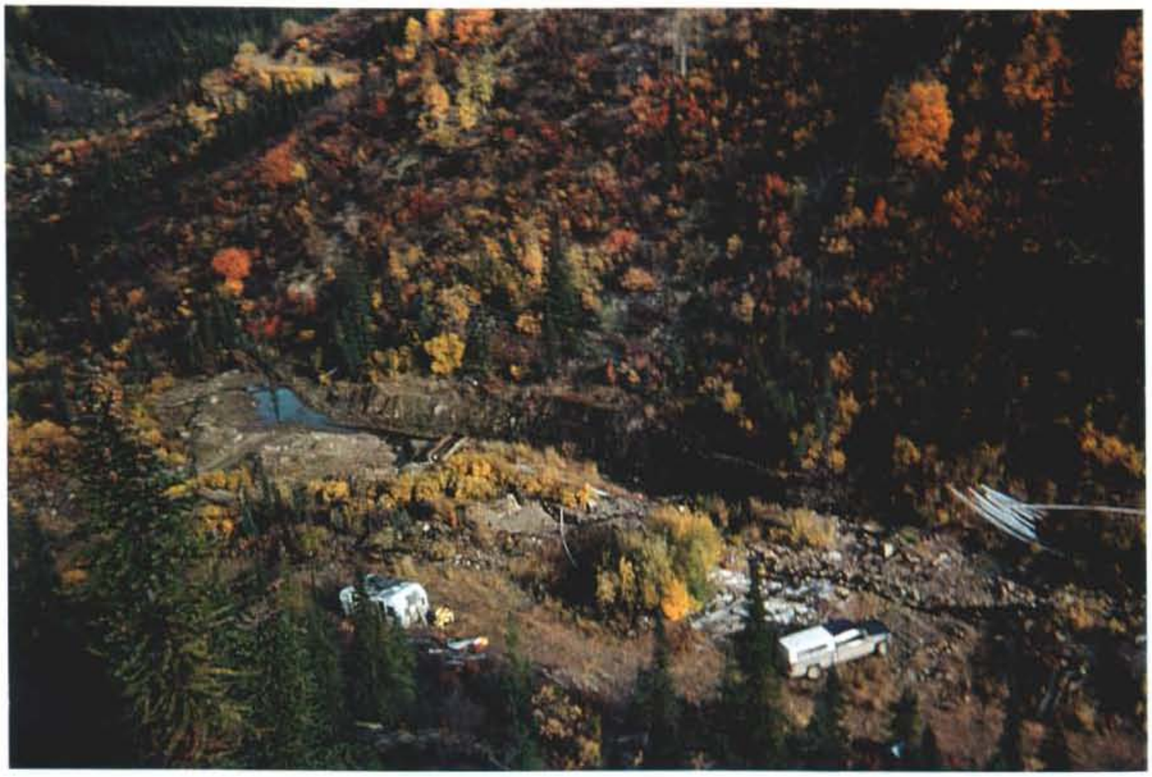

Photo 91-7 : Stewart-Catto. View from hill looking N. showing lower portion of camp site & debris.

Photo 91-8 : Stewart-Catto. View from hill looking N.E. Showing upper portion of camp site & debris.

POTATO HILLS (PAN)
SITE #92
(MINFILE #106D 026)

1. LOCATION AND ACCESS

Coordinates 64-02-26 N, 135-45-08 W. Located on a mountain plateau southwest of Potato Hills proper. Elevation approximately 4500 feet asl. Access to the site is via the South McQuesten Highway (from Highway 11, Silver Trail) to Haggart Creek Road, and along Dublin Gulch Road, 800 m southwest of the Potato Hills peaks.

2. SITE PHYSIOGRAPHY

The site is situated on a mountain plain consisting of a sparce distribution of mature spruce trees, low shrubs (e.g., dwarf birch) and forbs. Moderate disturbance was observed in this area from exploration activities including clearing, trenching and well installations. The topography is relatively high and no watercourses were observed in the area. The site borders the treeline and, although the presence of permafrost soils could not be ascertained; the elevation would suggest the possibility of discontinuous permafrost.

3. GEOLOGY AND MINERALIZATION (from original minfile)

Host rocks consist of clastic sediments of the Hyland Group intruded by stocks, dykes, and sills of Tombstone Putonic Suite. Alteration and gold and tungsten mineralization is directly associated with the intrusions. Scheelite occurs with feldspar, muscovite, pyrite, and small amounts of arsenopyrite in a quartz stockwork and as disseminations near the veins, which cut granite of the Potato Hills stock. Alteration is weak and consists of narrow argillic envelopes around the veins. The mineralized area is approximately 180 m long and 760 m wide and was well outlined by a soil survey. Copper and molybdenum are present in trace amounts. Quartz viens in the stock grade up to 10.1 % WO_3 and adjacent wallrock assays up to 1.3% WO_3 with wallrock grading as high as 3.4% WO_3. A pegmatite vein consisting of quartz and white mecca assayed 6.4% WO_3 across 25 cm. Across large intervals, grades were very low averaging 0.05% WO_3. First Dynasty drilled 9 HQ diamond drill holes near Potato Hills to test for mineralization underneath the proposed heap leach pad area. A total of 376 selective samples were analyzed from the 9 drill holes and 93% assayed below detection limit. One sample returned 40.02 g/t gold. This sample was attributed to a single 40 cm quartz-arsenopyrite vein.

4. SITE HISTORY (from original minfile)

Placer scheelite was noted in Dublin Creek in 1904 by the GSC. Staked as Tungsten King, etc cl (12723) in Sept./18 by W. Steinberg and restaked about 1941 by A.J. Kinsey and R. Fisher and optioned to Treadwell Yukon CL. Claims owned by Mayo Silver ML covered this occurrence in 1961-4 but the tungsten potential was not investigated. The first interest in bulk tonnage tungsten potential commenced in Sept./68 when the Pan & Arpa cl (Y27203) were staked by C. Provencher. The property was optioned in 1968 by Great Plains Dev C of Can L, which conducted bulldozer trenching; Tam ML in 1969; and Connaught ML from 1969 to late 1971. The Connaught option was assigned in 1970 and 1971to canex EL, which carried out an extensive soil geochemical survey in 1970, and bulldozer trenched and drilled three holes (457.2 m) in 1971. The claims reverted early in 1972 to Provencher, who transferred them to a private company, Scheelite Hills Mls L. The west end was restaked as R & D cl (YA1393) in Oct./75 by R. Holway & D. Duensing, who trenched in 1976 and transferred the claims to Dublin Gulch Mg L. The remainder was staked as MAR cl (YA14897) in Mar./77 by Queenstake Res L. which performed mapping and bulldozer trenching later in the year. In 1978, Canada Tungsten Mg Corp L entered a joint venture with Queenstake, optioned the R&D group, enlarged the property and conducted extensive mapping and sampling in 1978 and 1979. Cantung dropped its interest in 1986. Some of the R&D and Mar cl were transferred to Ivanhoe Goldfiels Ltd. in Mar./93. In Sept./93, Ivanhoe dug several test pits in decomposed bedrock on the R & D claims and the Olive Crown Grant. Samples were then screened, gravity concentrated and assayed. In Aug./94, First Dynasty Mines Ltd. acquired Ivanhoe Goldfields Ltd. In 1995, First Dynasty and in 1996 its wholly owned subsidiary, New Millenium Ltd. carried out a major drilling program to outline a core resource/reserve on Eagle Zone (minfile occurrence # 106D 025). The companies also carried out diamond drilling on Potato Hills (minfile occurrence #106D 026) to test for mineralization under the proposed heap leach pad area.

5. MINE DEVELOPMENT

5.1. Mine Openings and Excavations

Adits/Shafts/Portals

No apparent mining development at this site.

Open Pits

No apparent development at this site.

Trenches

Small number of bulldozed trenches along the southwest side of Dublin Gulch Road (Photo 92-1).

Dimensions: (L x W x H): ~ 100 m x 3 m x 0.75 m
Condition: loose packed overburden; appears to be stable; small piles of overburden in the vicinity; no watercourses in area of site.
Accessibility: along Dublin Gulch Road

5.2. Waste Rock Disposal Areas

No apparent waste rock, aside from small piles of overburden near trenches noted above. No evidence of sulphide bearing minerals were observed; no samples, therefore, were taken.

5.3. Tailings Impoundments

Tailings Dams

No apparent dams

Tailing Ponds

No apparent tailings ponds

5.4. Minesite Water Treatment

No apparent treatment facilities.

6. MINE SITE INFRASTRUCTURE

6.1. Buildings

No apparent buildings or campsite.

6.2. Fuel Storage

No apparent fuel storage facilities.

6.3. Rail and Tressel

No apparent activity.

6.4. Milling and Processing Infrastructure

No processing facilities apparent.

6.5. Electrical Equipment

No apparent electrical equipment.

7. SOLID WASTE DUMPS

No apparent waste dumps.

8. POTENTIAL CONTAMINANTS OF CONCERN

8.1. Out of Service Transformers

None apparent at site.

8.2. Metals and Hydrocarbons in Soil

No evidence of staining, spills, or odours.

8.3. Liquid Hazardous Materials

None apparent at site.

8.4. Solid Hazardous Materials

None apparent at site.

9. WATER QUALITY

No samples were taken due to the dry topography and absence of any water course in the area. A few monitoring wells were observed along Dublin Gulch road southwest of the trench area, but were not sampled.

10. RECLAMATION

Natural revegetation is beginning to occur in the trench areas and other disturbed locations of the site along Dublin Gulch Road (see Photo 92-1). No evidence of any reclamation measures at this site.

11. OTHER SOURCES OF INFORMATION AND DATA

Much of the available information for this area is focused on the exploration activities of New Millenium Mining Ltd. in this area. Waste rock from nearby Eagle Zone was determined to have an NP/AP average of 6.95.

12. REFERENCES AND PERSONAL COMMUNICATIONS

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Yukon Exploration 1985-86, p. 293-294. (used in production of minfile)

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Yukon Exploration and Geology, 1995, p.8, 33 (used in production of minfile)

Photo 92-1 : Potato Hill (proper) showing extensive trench work along
access road (over-burden) looking S.

GARNET (RAY GULCH)
SITE #93
(MINFILE #106D 027)

1. LOCATION AND ACCESS

Coordinates 64-01-41 N, 135-44-57 W. Located along the top of the northeast slope of Ray Gulch, along Dublin Gulch Road approximately 1.5 km due south-southeast of Potato Hills (proper). Elevation approximately 4600 feet asl. Access to Garnet is via the South McQuesten Highway (from Highway 11, Silver Trail) to Haggart Creek Road, and follow Dublin Gulch Road.

2. SITE PHYSIOGRAPHY

The site faces north along the edge of a plateau along at the top of the west slope of Ray Gulch, which drops to the south where it eventually meets Lynx Creek. Garnet is above the treeline, located in a relatively dry alpine tundra with characteristic vegetation. Raised frost-heave areas, polygons and the high altitude suggest the presence of continuous permafrost in the area (Photo 93-1).

3. GEOLOGY AND MINERALIZATION (from original minfile)

The Dublin Gulch area is underlain by deformed Upper Proterozoic ot Lower Cambrain clastic rocks of the Hyland Group that have been intruded by Cretaceous age Tombstone suite stocks, dykes and sills. Alteration and gold and tungsten mineralization is directly associated with the intrusions. Ray found large blocks of pale green, coarsely crystalline tremolite skarn float containing 2.7% to 3.3% scheelite. In 1943, the GSC located an outcropping zone 25 m thick in Late Proterozoic Hyland Group quartz-biotite schist, from which grab samples assayed 0.27% to 0.5% WO_3. Mayo Silver ML traced arsenopyrite-quartz to a narrow vein conformable with bedding, which assayed 69.3 g/t silver and 125.1 g/t gold across 0.8 m. The skarn showing was further explored in 1978 and found to average 12 m and reach 25 m in thickness. The skarn is composed of diopside, amphibole, epidote, minor magnetite and no sulphides. This zone, called the Garnet Zone, dips gently northwest towards the Potato Hills Stock. The 1979-80 drilling tested an area 1000 m long and 700 m wide and disclosed the presence of buried tungsten deposit containing 7.26 million tonnes of 0.87% WO_3. At least three of the mineralized horizons outcrop under shallow overburden, but none appear in the Ray Gulch canyon. The 1982 holes cut weak mineralization stratigraphically below the deposit. The best intersection (Hole 82-1) assayed 0.18% WO_3 and 0.34 g/t gold over 0.8 m, as well as a 1.7 section that ran 0.14% WO_3.

4. SITE HISTORY (from original minfile)

Staked as Tip Top cl (55220) in Oct./42 by Harvey Ray, examined by Ventures L in 1942, and investigated by the GSC in 1942-44. Restaked in Aug./51 by R.A. Batty & E. Barker as Batty cl (61878), which were prospected and sampled in 1956 by Stride E & Dev cl. Mayo Silver ML staked claims on the east side of the gulch about 1960 and bulldozer trenched in 1963 or 1964. Restaked as Pan & Arpa cl (YA27203) in Sept./68 by C. Provencher as part of the adjoining Potato Hills property but not explored by the various optionees. Restaked as Mar cl (YA14897) in Mar./77 by Queenstake Res L, which conducted mapping and bulldozer trenching later in the year. In 1978, Canada Tungsten Mg Corp entered a joint venture with Queenstake, optioned the adjoining R & D group from Dublin Gulch Mg L and explored with extensive geochem and geophysical surveys in 1978, 1879 and 1981, 21 holes (2423 m) in 1979, 64 holes (11,278 m) in 1980, and 3 holes (751 m) plus additional mapping, geochem and VLF-EM surveys and trenching in 1982. Cantung dropped its option in 1986. H-6000 Holdings optioned the property in 1991 and subsequently optioned it in Sept./91 to Amax Gold Inc., which explored with mapping, geochemistry, geophysics, and 16 diamond drillholes totaling 2500 m. In 1992, Amax performed 1129.9 m of reverse circulation drilling on the R & D 2 and 16, Bob 1, Smoky 64, 65, 74 and 76 claims. In the late 1992, the property was returned to Ivanhoe Goldfields Ltd. (a successor company of H-6000 Holdings). In Sept./93, Ivanhoe drilled 10 reverse circulation drill holes totaling 2079 m on the Smoky 3 and 4 claims and Smoky 96 fractional claim, and dug several test pits in decomposed bedrock on the R & D claims and the Olive crown grant in Sept/93. Samples were then screened, gravity concentrated and assayed. Ivanhoe also performed a soil survey on the West, Sec and DG claims in Sept./93. In Aug/94 First Dynasty Mines Ltd. acquired Ivanhoe Goldfields Ltd. In Oct/94 Queenstake Resources Ltd. transferred its interest in the Mar, R & D, DG, Jeff, Bob and Smoky claims to First Dynasty. In 1995, First Dynasty and in 1996 its wholly owned subsidiary, New Millenium Ltd. carried out a major drilling program to outline a core resource/reserve on Eagle Zone (minfile occurrence # 106D 025). The companies also carried out diamond drilling on Potato Hills (minfile occurrence #106D 026) to test for mineralization under the proposed heap leach pad area.

5. MINE DEVELOPMENT

5.1. Mine Openings and Excavations

Adits/Shafts/Portals

No apparent mining development at this site

Open Pits

No apparent development at this site.

Trenches

Extensive bulldozer trenching and shallow test-pitting has occurred throughout this site along the access road particularly through the early 1960s. The two largest are located near the surveying peak at the site near the top edge of Ray Gulch. (Photos 93-2 and 93-3).

Dimensions: (L x W x H): ~ 60 m x 3 m x 1 m

Condition: loose packed overburden; some natural re-colonization evident, appear to be stable

Accessibility: along Dublin Gulch Road

5.2. Waste Rock Disposal Areas

Waste Rock Pile # 1

Single rock pile consisting of overburden removed from the trenches. Several core boxes remain at the site. No apparent drainage in the area.

Location: Along Dublin Gulch road approximately 80 m northeast of surveying peak (see Photo 93-1).

Sampling: No visual signs of sulphide minerals. Based on field assessment, no apparent ARD associated with waste rock. No samples collected.

5.3. Tailings Impoundments

Tailings Dams

No apparent dams.

Tailing Ponds

No apparent tailings ponds.

5.4. Minesite Water Treatment

No apparent treatment facilities.

6. MINE SITE INFRASTRUCTURE

6.1. Buildings

No apparent buildings. Evidence of previous campsite including old picnic table, camp fire, and scattered wood debris.

6.2. Fuel Storage

No apparent fuel storage facilities.

6.3. Rail and Tressel

No apparent activity.

6.4. Milling and Processing Infrastructure

No processing facilities apparent.

6.5. Electrical Equipment

No apparent electrical equipment

7. SOLID WASTE DUMPS

No apparent waste dumps; limited amounts of wood debris scattered over site.

8. POTENTIAL CONTAMINANTS OF CONCERN

8.1. Out of Service Transformers

None apparent at site.

8.2. Metals and Hydrocarbons in Soil

No evidence of staining, spills, or odours.

8.3. Liquid Hazardous Materials

None apparent at site.

8.4. Solid Hazardous Materials

None apparent at site.

9. WATER QUALITY

No samples were taken due to dry topography of area and distance from any observable water course.

10. RECLAMATION

Natural re-vegetation is beginning to occur at the site in the trench areas around site (Photo 93-3). The trench area along the east slope of the gulch, however, remains bare (see Photos 93-2 and 93-3). No evidence of any reclamation measures at this site.

11. OTHER SOURCES OF INFORMATION AND DATA

Much of the available information for this area is focused on the exploration activities of New Millenium Mining Ltd. to the south, and within the Dublin Gulch (proper).

12. REFERENCES AND PERSONAL COMMUNICATIONS

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Ivanhoe Goldfields Ltd. (Sept.), 1993. Assessment Report #093141 by C.N. Orssich (used in production of minfile)

Photo 93-1 : Garnet. Looking N. rom peak to camp debris, wash rock pile & Potato Hill (background).

Photo 93-2 : Garnet. One of numerous bulldoze trenches along access road (looking N.E.).

Photo 93-3 : Garnet. Bulldoze trench along access road looking S.E. to peak.

ELLIS

SITE #94

(MINFILE #106D 028)

1. LOCATION AND ACCESS

Coordinates 64-03-00 N, 135-43-22 W. Located on the north side of Potato Hills (proper) along a trail running N.E. from Dublin Gulch Road. Elevation approximately 4700 feet asl. Access to Ellis is via the South McQuesten Highway (from Highway 11, Silver Trail) to Haggart Creek Road, Dublin Gulch Road and a trail running northeast between the Potato Hills peaks.

2. SITE PHYSIOGRAPHY

The site faces north to northwest along the top of a dry, unnamed gulch running north-northwest. This gulch eventually meets the beginning of Haggart Creek further to the north. The site is above the treeline, located in alpine tundra terrain with characteristic vegetation. Raised frost-heave areas, polygons and the high altitude suggest the presence of continuous permafrost in the area (Photo 94-1).

3. GEOLOGY AND MINERALIZATION (from original minfile)

Host rocks consist of clastic sediments of the Hyland Group intruded by stocks, dykes, and sills of Tombstone Putonic Suite. Alteration and gold and tungsten mineralization is directly associated with the intrusions. A small quartz vein (0.5 m) follows a granite dyke along a shear zone and contains scattered arsenopyrite. Nine samples assayed from 0.34 to 48.7 g/t gold.

4. SITE HISTORY (from original minfile)

Staked as Pat, etc. cl (81113) in May/62 by Cross Bow ML and sold to Mayo Silver ML, which explored with bulldozer trenching, mapping and goechemical sampling in 1963 and 1964. Restaked as Jeff cl (YA 17826) in Apr/78 by a joint venture between Canada Tungsten Mg Corp L and Queenstake Res L. Canada tungsten transferred the claims to Queenstake in Aug./86 which optioned them to Can Pro Dev. Inc in 1988. Can Pro staked fractional claims in Nov/89 and optioned all of them to Ivanhoe Goldfields Ltd. in 1991. In Aug./94, First Dynasty Mines Ltd. acquired Ivanhoe. Queenstake Resources Ltd. transferred its interest in the Mar, R&D, DG, Jeff, Bob and Smoky claims to First Dynasty. In 1995, First Dynasty and in 1996 its wholly owned subsidiary, New Millenium Ltd. carried out a major drilling program to outline a core resource/reserve on Eagle Zone (minfile occurrence # 106D 025). The companies also carried out diamond drilling on Potato Hills (minfile occurrence #106D 025). The companies also carried out diamond drilling on Potato Hills (minfile occurrence #106D 026) to test for mineralization under the proposed heap leach pad area.

5. MINE DEVELOPMENT

5.1. Mine Openings and Excavations

Adits/Shafts/Portals

No apparent mining development at this site.

Open Pits

No apparent development at this site.

Trenches

Two old bulldozed trenches from early 60's along the northeast slope of gulch approximately 1500 m down the side of the slope (Photos 94-1 and 94-2).
Dimensions: (L x W x H): ~ 30 m x 15 m x 1 m
Condition: loose packed overburden; appears to be stable
Accessibility: along trail from Dublin Gulch Road

Two old bulldozed trenches from early 60's at top of gulch along access trail at 45 degree angles from each other leading north and north-northeast (Photo 94-3 and 94-4).
Dimensions: (L x W x H): ~ 35 m x 6 m x 0.5 m
Condition: hard-packed overburden; natural revegetation occurring; appears to be stable
Accessibility: along trail from Dublin Gulch Road

5.2. Waste Rock Disposal Areas

Waste rock was associated with trenching along the northeast slope of gulch (see Photo 94-2). This was limited to soil overburden and a limited volume of host rock as well as quartz vein material for the trenches along the northeastern slope. There was no evidence of sulphide mineralization in the associated waste rock.

5.3. Tailings Impoundments

Tailings Dams

No apparent dams

Tailing Ponds

No apparent tailings ponds

5.4. Minesite Water Treatment

No apparent treatment facilities.

6. MINE SITE INFRASTRUCTURE

6.1. Buildings

No apparent buildings or campsite.

6.2. Fuel Storage

No apparent fuel storage facilities

6.3. Rail and Tressel

No apparent activity

6.4. Milling and Processing Infrastructure

No processing facilities apparent

6.5. Electrical Equipment

No apparent electrical equipment

7. SOLID WASTE DUMPS

No apparent waste dumps.

8. POTENTIAL CONTAMINANTS OF CONCERN

8.1. Out of Service Transformers

None apparent at site

8.2. Metals and Hydrocarbons in Soil

No evidence of staining, spills, or odours.

8.3. Liquid Hazardous Materials

None apparent at site.

8.4. Solid Hazardous Materials

None apparent at site.

9. WATER QUALITY

No samples were taken due to dry topography of area.

10. RECLAMATION

Natural revegetation is beginning to occur at the site in the suspected trench areas along the top of the gulch (see Photos 94-3 and 94-4). The trench area along the east slope of the gulch, however, remains bare (see Photos 94-1 and 94-2). No evidence of any reclamation measures at this site.

11. OTHER SOURCES OF INFORMATION AND DATA

Much of the available information for this area is focused on the exploration activities of New Millenium Mining Ltd. on the south side of Potato Hills and within the Dublin Gulch (proper).

12. REFERENCES AND PERSONAL COMMUNICATIONS

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Yukon Exploration and Geology, 1995, p.8, 33 (used in production of minfile)

Photo 94-1 : Potato Hill (Ellis). One of 1964 bulldoze trenches (3) (centre) #1 looking N. - N.W.

Photo 94-2 : Potato Hill. One of 1964 bulldoze trenches (centre) #1 looking N. - N.W. from access trail.

Photo 94-3 : Potato Hill. One of 1964 bulldoze trenches (3) (centre) #2 looking W.

Photo 94-4 : Potato Hill. One of 1964 bulldoze trenches (3) (centre) #3 looking E. (upslope).

HAGGART
SITE #96
106D (NON-MINFILE)

1. LOCATION AND ACCESS

Coordinates 64-01-00 N, 135-51-10 W. Haggart was originally located along Haggart Creek approximately 400 m south of its confluence with Platinum Gulch, and approximately 1.7 m south of Dublin Gulch (proper). Elevation approximately 2500 feet asl. Access to the Haggart is via the South McQuesten Highway (from Highway 11, Silver Trail) and Haggart Creek Road towards Dublin Gulch. Roads in this area have been considerably altered, and in some cases washed away, by placer mining activities in Dublin Gulch.

2. SITE PHYSIOGRAPHY

The site has been covered over by overburden from recent placer mining activities in Dublin Gulch. It's original location is believed to have been along the outwash floodplain in the valley of Haggart Creek. Over-burden from placer activities have also significantly altered surface hydrology in the area. The presence of permafrost soils could not be ascertained; however, the presence of small trees and the high elevation suggests the possibility of discontinuous permafrost.

3. GEOLOGY AND MINERALIZATION

Host rocks in this area consist of altered clastic rocks of the Hyland Group intruded by stocks, dykes and sills of Tombstone Putonic Suite. The area of veins was exposed over 60 m or more, impregnated with pyrite, arsenopyrite and minor chacopyrite (W.D Mann, unpublished).

4. SITE HISTORY (Adapted From Barker Minfile # 106D 022)

Area staked as Barber cl (59479) in Sept./49 by E.H. Barker, who explored with bulldozer trenching and ground sluicing until 1962. The property was optioned by Conwest in 1952, by Stride E & Dev CL in 1956, by Prospectors Airways CL in 1960 and by Peso Silver ML in 1962. The Eleven cl (55381) were staked 1.6 km north on Fisher Creek in Oct./45. The site was restaked as Smoky cl (YA17930) in Apr./78 by a joint venture between Canada Tungsten Mg Corp and Queenstake Res L., which mapped the site in 1981. Some of the Smoky claims were transferred to G. Dickson in Feb./86 and the remainder to Queenstake in Aug./86. Queenstake optioned Dickson's claims in Apr./91 and trenched later in the year. In Oct./94, Queenstake transferred its interest in the Smoky and Mole claims to Ivanhoe Goldfields Ltd. Can-Pro Development Ltd. optioned the Smoky and Mole claims as part of a larger block in the Dublin Gulch area in 1989. Ivanhoe Goldfields Ltd. Optioned Can-Pro's claims in 1991 and subsequently to Amax Gold (B.C.) Ltd, which drilled 2 rotary holes (112.8 m) on the Smoky 5 and 27 claimes in 1992. In Aug./94 First Dynasty Mines Ltd. acquired Ivanhoe Goldfields Ltd. . In 1995, First Dynasty and in 1996 its wholly owned subsidiary, New Millenium Mining Ltd. carried out a major drilling program to outline a core resource/reserve on the Eagle Zone (minfile #106D 025). The companies also carried out diamond drilling on Potato Hills (minfile # 106D 026) to test for mineralization under the proposed heap leach pad area. In Apr./88, M.J. Moreau tied on Rex cl (YB2241) to the south and Mole cl (YB22499) to the southwest, and restaked the Rex (YB3271) and Mole (YB03787) claims in Aug./90.

5. MINE DEVELOPMENT

5.1. Mine Openings and Excavations

Adits/Shafts/Portals

No apparent mining development at this site

Open Pits

No apparent pit development at this site.

Trenches

No apparent trenches at this site.

5.2. Waste Rock Disposal Areas

No apparent waste rock; the original site is covered by more recent placer tailings.

5.3. Tailings Impoundments

Tailings Dams

No apparent dams

Tailing Ponds

No apparent tailings ponds

5.4. Minesite Water Treatment

No apparent treatment facilities.

6. MINE SITE INFRASTRUCTURE

6.1. Buildings

No apparent buildings at this site. Old pump well located along the edge of Haggart Creek.

6.2. Fuel Storage

No apparent fuel storage facilities

6.3. Rail and Tressel

No apparent activity

6.4. Milling and Processing Infrastructure

Old rusted, circular, metal rock-sieve separator just north of site along Dublin Gulch Road, approximately 8 m long x 2 m wide x 3 m high.

6.5. Electrical Equipment

No apparent electrical equipment

7. SOLID WASTE DUMPS

No apparent waste dumps.

8. POTENTIAL CONTAMINANTS OF CONCERN

8.1. Out of Service Transformers

None apparent at site

8.2. Metals and Hydrocarbons in Soil

No evidence of staining, spills, or odours.

8.3. Liquid Hazardous Materials

None apparent at site.

8.4. Solid Hazardous Materials

None apparent at site.

9. WATER QUALITY

One surface water quality sample was collected 2 km downstream of the confluence of Haggart Creek with Platinum Gulch (99-85-WQ-01 – collected as part of the Barker site, 85-series, samples) which received drainage from all of Dublin Gulch area including the Haggart (refer to Barker site report (minfile # 106D 022), Photo 85-2). Results of the geochemistry are listed in Attachment 2.

10. RECLAMATION

Natural revegetation is being obscured by on-going placer mining activities along Haggart Creek which are also significantly altering surface drainage throughout the area (refer to Barker site report (minfile # 106D 022), Photo 85-1). There is no evidence of any reclamation measures at this site.

11. OTHER SOURCES OF INFORMATION AND DATA

Much of the available information for this area is focused on the exploration activities of New Millenium Mining Ltd., within the Dublin Gulch (proper). Extensive and recent placer mining has occurred at this site and others in the Dublin Gulch area, which has significantly affected surface drainage and topography.

12. REFERENCES AND PERSONAL COMMUNICATIONS

Mann, W.D., 1999. Unpublished notes.

Public Works And Government Services Canada / Travaux publics et Services gouvernementaux Canada Architectural & Engineering Services Western Region	designed by: / concu par:	date:
	drawn by: / dessine par: C.S./I.B.	Mar./00
	approved by: / approuve par:	
Drawing title: / Titre du dessin: Elsa Village Site #78 Site Assessment Yukon Territory	revisions:	
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CAD FILE: site78.dgn