POINT DESCRIPTION AT CREEK CROSSING

APPENDIX 4

STREAM Prairie Creek

WATERSHED AREA South Nahanni - Liard - Mackenzie

DATE OF INVENTORY 22/July

ACCESS Cadillac minesite

PREPARED BY G. Rosberg, C. Gilmore

TOPO MAP SHEETS

AVERAGE WIDTH (m): VALLEY FLAT 1000 NO. CHANNELS 1 to 3 SLOPE (%) 1-2

AVERAGE DEPTH (m): RIFFLE .3 CHANNEL 200 WETTED 20

WINTER CONDITIONS: SNOW COVER (m) POOL 1.0 MAXIMUM DEPTH 1.5

ICE DEPTH (m) FREE WATER (m)

BAR PRESENCE extensive side, transverse and mid channel bar development

ISLAND PRESENCE very few vegetated islands

LATERAL CHANNEL MOVEMENT FEATURES moderate occurance of abandoned channels during high water, new channels formed in valley flat.

BANK STABILITY stable gravels and bedrock

CHANNEL STABILITY stable

BED MATERIALS (%)

FINES: SILT/CLAY (<0.062 mm) 5 SAND (0.062-2.0 mm) 5

GRAVEL: SMALL (2-16 mm) 10 LARGE (16-64 mm) 20

ROCK: COBBLE (64-250 mm) 50 BOULDER (>250 mm) 10

BEDROCK

CHANNEL COVER

% AREA: CROWN 0% cover OVERHANG 0% cover

BANKS gravel and cobble, flat except when bedrock present

HYDRAULICS

DISCHARGE (m^3/sec) FLOW STAGE medium

FLOW CHARACTER rolling, broken FLOOD SIGNS extensive bar development

STREAMFORM

CONFINEMENT occasionally confined PATTERN sinuous

VERTICAL STABILITY degrading, high bedload movement, extensive delta at mouth

SIDE CHANNEL DEVELOPMENT

POOL/RIFFLE RATIO 10/90 BEDROCK CONTROL POOLS (%) 100

DEBRIS

FLOODPLAIN low

CHANNEL low

STABLE DEBRIS (%) 0

OBSTRUCTIONS TO FISH MIGRATION nil

COMMENTS

Winter road route parallels creek, but does not cross it. No streamside cover

D.O.: 11 ppm

Temperature: 6.5°C

pH: 7.8

Conductivity: 245 umhos

Watercolor: colorless

POINT DESCRIPTION AT CREEK CROSSING

APPENDIX 4 - Cont'd.

STREAM Harrison Creek

WATERSHED AREA Prairie Creek - South
Nahanni - Liard

DATE OF INVENTORY 22/July
ACCESS Cadillac mine site
PREPARED BY G. Rosberg, C. Gilmore
TOPO MAP SHEETS

NO. CHANNELS 1 SLOPE (%) .5%

AVERAGE WIDTH (m): VALLEY FLAT 100 m CHANNEL 20 WETTED 2
AVERAGE DEPTH (m): RIFFLE .1 POOL .3 MAXIMUM DEPTH .3
WINTER CONDITIONS: SNOW COVER (m) N/A ICE DEPTH (m) N/A FREE WATER (m) N/A

BAR PRESENCE limited side bar development
ISLAND PRESENCE nil

LATERAL CHANNEL MOVEMENT FEATURES none visible

BANK STABILITY stable
CHANNEL STABILITY stable

BED MATERIALS (%)
FINES: SILT/CLAY (<0.062 mm) 10 SAND (0.062-2.0 mm) 10
GRAVEL: SMALL (2-16 mm) 10 LARGE (16-64 mm) 30
ROCK: COBBLE (64-250 mm) 40 BOULDER (>250 mm)
BEDROCK

CHANNEL COVER
% AREA: CROWN 0 OVERHANG 0
BANKS repose except where confined, gravel, stable
HYDRAULICS
DISCHARGE (m^3/sec) less than 0.1 FLOW STAGE low
FLOW CHARACTER broken FLOOD SIGNS nil
STREAMFORM
CONFINEMENT confined except at mouth PATTERN straight
VERTICAL STABILITY stable
SIDE CHANNEL DEVELOPMENT nil
POOL/RIFFLE RATIO 10/90 BEDROCK CONTROL POOLS (%) 0
DEBRIS
FLOODPLAIN low
CHANNEL low
STABLE DEBRIS (%) 0
OBSTRUCTIONS TO FISH MIGRATION steep gradient

COMMENTS

Steep gradient and small flows. No cover or deep water present. Part of creek is subterranean. Mine water from Cadillac portal enters creek near mouth.

D.O.: 11 ppm Conductivity: 410 umhos/cm
Temperature: 6.5°C Watercolor: colorless
pH: 7.7

POINT DESCRIPTION AT CREEK CROSSING

STREAM Unnamed Creek R1
WATERSHED AREA Prairie Creek - south Nahanni, Liard-Mackenzie

DATE OF INVENTORY 23 July 1980
ACCESS road from Cadillac mine site
PREPARED BY G.E. Rosberg
TOPO MAP SHEETS

NO. CHANNELS 1 SLOPE (%) 5-10
AVERAGE WIDTH (m): VALLEY FLAT 30 CHANNEL 30 WETTED 5
AVERAGE DEPTH (m): RIFFLE 0.2 POOL 0.5 MAXIMUM DEPTH 0.5
WINTER CONDITIONS: SNOW COVER (m) N/A ICE DEPTH (m) N/A FREE WATER (m) N/A

BAR PRESENCE nil
ISLAND PRESENCE nil

LATERAL CHANNEL MOVEMENT FEATURES nil, channel confined and entrenched

BANK STABILITY unstable angular shales
CHANNEL STABILITY stable

BED MATERIALS (%)
FINES: SILT/CLAY (<0.062 mm) SAND (0.062-2.0 mm) 5
GRAVEL: SMALL (2-16 mm) 10 LARGE (16-64 mm) 30
ROCK: COBBLE (64-250 mm) 30 BOULDER (>250 mm) 20
BEDROCK 5

CHANNEL COVER
% AREA: CROWN 0 OVERHANG 0
BANKS steep both sides, silt to 6" angular shale, unstable, slumping
HYDRAULICS
DISCHARGE (m^3/sec) 0.2 FLOW STAGE low
FLOW CHARACTER tumbling FLOOD SIGNS
STREAMFORM
CONFINEMENT totally confined, entrenched PATTERN straight
VERTICAL STABILITY unstable
SIDE CHANNEL DEVELOPMENT nil
POOL/RIFFLE RATIO 0/100 BEDROCK CONTROL POOLS (%) 0
DEBRIS
FLOODPLAIN no floodplain debris
CHANNEL low
STABLE DEBRIS (%) 0
OBSTRUCTIONS TO FISH MIGRATION steep gradient prevents fish utilization of this creek

COMMENTS

This creek has no potential as fish habitat. Winter road parallels and crosses creek frequently.

D.O.: 9.0 ppm
Temperature: 7.0°C
Conductivity: 310 umhos/cm
pH: 7.8
watercolor: colorless

POINT DESCRIPTION AT CREEK CROSSING

APPENDIX 4 - Cont'd.

STREAM Unnamed Creek R2
WATERSHED AREA Ram River - North Nahanni - Mackenzie

DATE OF INVENTORY 24 July 1980
ACCESS helicopter
PREPARED BY G. Rosberg, C. Gilmore
TOPO MAP SHEETS

NO. CHANNELS 1 - 2 SLOPE (%) 0.5 - 1.0
AVERAGE WIDTH (m): VALLEY FLAT 1 km CHANNEL 20 WETTED 5
AVERAGE DEPTH (m): RIFFLE 0.2 POOL 0.6 MAXIMUM DEPTH 1.0
WINTER CONDITIONS: SNOW COVER (m) N/A ICE DEPTH (m) N/A FREE WATER (m) N/A

BAR PRESENCE lateral bar developments extensive
ISLAND PRESENCE nil

LATERAL CHANNEL MOVEMENT FEATURES nil

BANK STABILITY unstable shales and gravels, some slumping
CHANNEL STABILITY stable

BED MATERIALS (%)
FINES: SILT/CLAY (<0.062 mm) 0 SAND (0.062-2.0 mm) 10
GRAVEL: SMALL (2-16 mm) 10 LARGE (16-64 mm) 70
ROCK: COBBLE (64-250 mm) 10 BOULDER (>250 mm) 0
BEDROCK 0

CHANNEL COVER
% AREA: CROWN 10 OVERHANG 40
BANKS left bank - 1 m, flat, right bank 10 m, steep, rounded gravels, shale
HYDRAULICS bedrock
DISCHARGE (m^3/sec) 0.2 FLOW STAGE low
FLOW CHARACTER placid, rolling FLOOD SIGNS nil
STREAMFORM
CONFINEMENT frequently confined PATTERN sinuous
VERTICAL STABILITY stable
SIDE CHANNEL DEVELOPMENT nil, perhaps at higher water levels
POOL/RIFFLE RATIO 50/50 BEDROCK CONTROL POOLS (%) 0
DEBRIS
FLOODPLAIN low
CHANNEL low
STABLE DEBRIS (%) 0
OBSTRUCTIONS TO FISH MIGRATION nil

COMMENTS

- angular shale substrate moderately compacted, high lag deposits
- grayling fry captured, blackfly larvae abundant on substrate
- air temperature 23°C
- water temperature - 14.5°C
- D.O. - 8 ppm
- pH - 7.7

POINT DESCRIPTION AT CREEK CROSSING

STREAM Unnamed Creek R3
WATERSHED AREA Ram River - North Nahanni - Mackenzie

DATE OF INVENTORY 24 July 1980
ACCESS helicopter
PREPARED BY G. Rosberg, C. Gilmore
TOPO MAP SHEETS

NO. CHANNELS 1 SLOPE (%) 2-5
AVERAGE WIDTH (m): VALLEY FLAT 250 CHANNEL 50 WETTED 10
AVERAGE DEPTH (m): RIFFLE 0.3 POOL 1.0 MAXIMUM DEPTH 2.0
WINTER CONDITIONS: SNOW COVER (m) N/A ICE DEPTH (m) N/A FREE WATER (m) N/A

BAR PRESENCE nil
ISLAND PRESENCE nil

LATERAL CHANNEL MOVEMENT FEATURES nil

BANK STABILITY stable bedrock, banks vegetated with lichen
CHANNEL STABILITY stable, may erode at high water

BED MATERIALS (%)
FINES: SILT/CLAY (<0.062 mm) 0 SAND (0.062-2.0 mm) 20
GRAVEL: SMALL (2-16 mm) 20 LARGE (16-64 mm) 40
ROCK: COBBLE (64-250 mm) 10 BOULDER (>250 mm) 5
BEDROCK 5

CHANNEL COVER
% AREA: CROWN 0 OVERHANG 0
BANKS bedrock, 1 m high - boulder to bedrock, sand steep repose
HYDRAULICS
DISCHARGE (m^3/sec) 1.4 FLOW STAGE medium
FLOW CHARACTER broken FLOOD SIGNS nil
STREAMFORM
CONFINEMENT confined PATTERN straight to sinuous
VERTICAL STABILITY stable at point location, degrading downstream
SIDE CHANNEL DEVELOPMENT 0
POOL/RIFFLE RATIO 30/70 BEDROCK CONTROL POOLS (%) 30
DEBRIS
FLOODPLAIN nil
CHANNEL nil
STABLE DEBRIS (%) 0
OBSTRUCTIONS TO FISH MIGRATION steep gradient

COMMENTS

- site located downstream of lower falls
- medium compaction, high lag
- no fish captured
- Temperature - 7.0°C
- D.O. - 9.0 ppm
- pH - 7.8

POINT DESCRIPTION AT CREEK CROSSING

APPENDIX 4 - Cont'd.

STREAM Tetcela River
R4
WATERSHED AREA North Nahanni - Mackenzie

DATE OF INVENTORY 23 July 1980
ACCESS helicopter
PREPARED BY G.E. Rosberg, C. Gilmore
TOPO MAP SHEETS

West crossing location

AVERAGE WIDTH (m): VALLEY FLAT
AVERAGE DEPTH (m): RIFFLE 0.2
WINTER CONDITIONS: SNOW COVER (m) N/A

NO. CHANNELS 1
CHANNEL 10
POOL 0.4
ICE DEPTH (m) N/A

SLOPE (%) .1-3
WETTED 3
MAXIMUM DEPTH 0.5
FREE WATER (m) N/A

BAR PRESENCE no bar developments, heavy boulder lag deposits
ISLAND PRESENCE nil

LATERAL CHANNEL MOVEMENT FEATURES nil

BANK STABILITY very stable
CHANNEL STABILITY very stable

BED MATERIALS (%)
FINES: SILT/CLAY (<0.062 mm) 5
SAND (0.062-2.0 mm) 15
GRAVEL: SMALL (2-16 mm) 0
LARGE (16-64 mm) 10
ROCK: COBBLE (64-250 mm) 60
BOULDER (>250 mm) 10
BEDROCK 0

CHANNEL COVER
% AREA: CROWN 5
OVERHANG 30

BANKS flat, sand to boulder texture on both sides, 1 meter high

HYDRAULICS
DISCHARGE (m^3/sec) 0.4
FLOW STAGE medium
FLOW CHARACTER rolling, broken
FLOOD SIGNS nil

STREAMFORM
CONFINEMENT unconfined
PATTERN sinuous to straight
VERTICAL STABILITY stable, boulder substrate
SIDE CHANNEL DEVELOPMENT low, minor occurrance at observed water level
POOL/RIFFLE RATIO 30/70
BEDROCK CONTROL POOLS (%) 0

DEBRIS
FLOODPLAIN low
CHANNEL high
STABLE DEBRIS (%) 50

OBSTRUCTIONS TO FISH MIGRATION no hinderance to fish migration

COMMENTS

- heavy silt layer in slow water areas along channel sides
- high substrate compaction
- turbid water - secchi of approximately 0.3 m

D.O.: 10 ppm
Conductivity: 290 umhos/cm
Temperature: 11°C
Watercolor: light grey
pH: 7.9

POINT DESCRIPTION AT CREEK CROSSING

STREAM Tetcela River
R5
WATERSHED AREA North Nahanni - Mackenzie

DATE OF INVENTORY 23 July 1980
ACCESS helicopter
PREPARED BY G. Rosberg, C. Gilmore
TOPO MAP SHEETS

East crossing location

		NO. CHANNELS 1 - 2	SLOPE (%) 0 - 0.5
AVERAGE WIDTH (m): VALLEY FLAT		CHANNEL 200	WETTED 10
AVERAGE DEPTH (m): RIFFLE	0.3	POOL 1.0	MAXIMUM DEPTH 1.5
WINTER CONDITIONS: SNOW COVER (m)	N/A	ICE DEPTH (m) N/A	FREE WATER (m) N/A

BAR PRESENCE extensive lateral bar development
ISLAND PRESENCE nil

LATERAL CHANNEL MOVEMENT FEATURES nil

BANK STABILITY stable, minor undercutting on right bank
CHANNEL STABILITY stable, gentle gradient, established old channel

BED MATERIALS (%)

FINES:	SILT/CLAY (<0.062 mm) 10	SAND (0.062-2.0 mm)	40
GRAVEL:	SMALL (2-16 mm) 10	LARGE (16-64 mm)	30
ROCK:	COBBLE (64-250 mm) 10	BOULDER (>250 mm)	0
	BEDROCK 0		

CHANNEL COVER

% AREA:	CROWN 10	OVERHANG	15

BANKS silt and sand to small gravel, 1 meter high both sides undercut and slumping

HYDRAULICS

DISCHARGE (m^3/sec)	2.0	FLOW STAGE	medium
FLOW CHARACTER	placid, swirling	FLOOD SIGNS	nil

STREAMFORM

CONFINEMENT	unconfined	PATTERN	meandering

VERTICAL STABILITY stable
SIDE CHANNEL DEVELOPMENT low, side channels may occur at high water

POOL/RIFFLE RATIO	50/50	BEDROCK CONTROL POOLS (%)	0

DEBRIS
FLOODPLAIN medium
CHANNEL high, sweeper jams, fallen trees
STABLE DEBRIS (%) 50

OBSTRUCTIONS TO FISH MIGRATION nil - easy access for fish from North Nahanni

COMMENTS

- low compaction to substrate
- gentle velocity riffles, good cover, grayling adults and juveniles present, northern pike, cyprinids, mountain whitefish, slimy sculpins
- vegetated undercut banks provide good summer fish habitat
- adult grayling captured - males, stomachs full of terrestrial invertebrates

D.O.: 9 ppm
Conductivity: 350 umhos/cm
Temperature: 11°C
Watercolor: pale yellow
pH: 17.9

POINT DESCRIPTION AT CREEK CROSSING

APPENDIX 4 - Cont'd.

STREAM Fishtrap Creek
R6
WATERSHED AREA South Nahanni - Liard - Mackenzie

DATE OF INVENTORY 24 July 1980
ACCESS helicopter
PREPARED BY G.E. Rosberg, C. Gilmore
TOPO MAP SHEETS

NO. CHANNELS 1 SLOPE (%) 0.
AVERAGE WIDTH (m): VALLEY FLAT ~5 km CHANNEL 100 WETTED 10
AVERAGE DEPTH (m): RIFFLE N/A POOL 1.0 MAXIMUM DEPTH 1.5
WINTER CONDITIONS: SNOW COVER (m) N/A ICE DEPTH (m) N/A FREE WATER (m) N/A

BAR PRESENCE nil
ISLAND PRESENCE nil

LATERAL CHANNEL MOVEMENT FEATURES nil, very old stream channel, no gradient, aquatic vegetation abundant
BANK STABILITY stable
CHANNEL STABILITY

BED MATERIALS (%)
FINES: SILT/CLAY (<0.062 mm) 100 SAND (0.062-2.0 mm) 0
GRAVEL: SMALL (2-16 mm) 0 LARGE (16-64 mm) 0
ROCK: COBBLE (64-250 mm) 0 BOULDER (>250 mm) 0
BEDROCK 0

CHANNEL COVER
% AREA: CROWN 10 OVERHANG 20
BANKS silt, vegetated, flat, same evaluation as water level observed
HYDRAULICS
DISCHARGE (m^3/sec) - FLOW STAGE medium
FLOW CHARACTER placid FLOOD SIGNS nil
STREAMFORM
CONFINEMENT unconfined PATTERN torturous meander
VERTICAL STABILITY stable
SIDE CHANNEL DEVELOPMENT nil, some abandoned ox-bow development
POOL/RIFFLE RATIO 100/0 BEDROCK CONTROL POOLS (%) 0
DEBRIS
FLOODPLAIN high
CHANNEL high occurrance, channel clogged with debris
STABLE DEBRIS (%) 100
OBSTRUCTIONS TO FISH MIGRATION debris, beaver dams throughout its length

COMMENTS

- virtually a swamp, very little visible flow, marshy perimeter
- no flow visible, weedy
- very poor fish habitat
- no fish captured
- D.O. - 9 ppm
- Temperature - 20°C
- pH - 7.9

POINT DESCRIPTION AT CREEK CROSSING

APPENDIX 4 - Cont'd.

STREAM Grainger River
P7
WATERSHED AREA Liard River - Mackenzie River

DATE OF INVENTORY 24 July 1980
ACCESS helicopter
PREPARED BY G. Rosberg, C. Gilmore
TOPO MAP SHEETS

NO. CHANNELS 1 SLOPE (%) 0 - 0.5
AVERAGE WIDTH (m): VALLEY FLAT N/A CHANNEL 50 WETTED 40
AVERAGE DEPTH (m): RIFFLE 0.4 POOL 1.5 MAXIMUM DEPTH 2.0
WINTER CONDITIONS: SNOW COVER (m) N/A ICE DEPTH (m) N/A FREE WATER (m) N/A

BAR PRESENCE minor lateral bar development, high boulder log deposits
ISLAND PRESENCE nil

LATERAL CHANNEL MOVEMENT FEATURES nil, old established channel

BANK STABILITY very stable
CHANNEL STABILITY very stable, no evidence of abandoned channels, gentle velocities

BED MATERIALS (%)
FINES: SILT/CLAY (<0.062 mm) 0 SAND (0.062-2.0 mm) 30
GRAVEL: SMALL (2-16 mm) 10 LARGE (16-64 mm) 10
ROCK: COBBLE (64-250 mm) 40 BOULDER (>250 mm) 10
BEDROCK 0

CHANNEL COVER
% AREA: CROWN 0 OVERHANG 5
BANKS sand to boulders, flat, 0.5 m
HYDRAULICS
DISCHARGE (m^3/sec) 4.0 FLOW STAGE medium
FLOW CHARACTER placid, swirling, rolling FLOOD SIGNS nil
STREAMFORM
CONFINEMENT unconfined PATTERN sinuous
VERTICAL STABILITY stable
SIDE CHANNEL DEVELOPMENT nil
POOL/RIFFLE RATIO 70/30 BEDROCK CONTROL POOLS (%) 0
DEBRIS
FLOODPLAIN low
CHANNEL low
STABLE DEBRIS (%) 0
OBSTRUCTIONS TO FISH MIGRATION nil

COMMENTS

- substrate heavily compacted, high imbrication and lag

D.O.: 9 ppm
Temperature: 14°C
pH: 7.7
Watercolor: pale amber

POINT DESCRIPTION AT CREEK CROSSING

STREAM Unnamed Creek R8
WATERSHED AREA Fishtrap Creek - S. Nahanni -Liard-Mackenzie

DATE OF INVENTORY 24 July 1980
ACCESS aerial examination by helicopter
PREPARED BY G. Rosberg, C. Gilmore
TOPO MAP SHEETS

NO. CHANNELS 1 SLOPE (%) 0
AVERAGE WIDTH (m): VALLEY FLAT N/A CHANNEL 1.0 WETTED 1.0
AVERAGE DEPTH (m): RIFFLE N/A POOL 0.5 MAXIMUM DEPTH 0.75
WINTER CONDITIONS: SNOW COVER (m) N/A ICE DEPTH (m) N/A FREE WATER (m) N/A

BAR PRESENCE none
ISLAND PRESENCE none

LATERAL CHANNEL MOVEMENT FEATURES nil

BANK STABILITY very stable
CHANNEL STABILITY very stable

BED MATERIALS (%)
FINES: SILT/CLAY (<0.062 mm) 80 SAND (0.062-2.0 mm) 0
GRAVEL: SMALL (2-16 mm) 10 LARGE (16-64 mm) 10
ROCK: COBBLE (64-250 mm) 0 BOULDER (>250 mm) 0
BEDROCK 0

CHANNEL COVER
% AREA: CROWN 10 OVERHANG 20
BANKS flat, less than 1 meter high, vegetated, stable
HYDRAULICS
DISCHARGE (m^3/sec) less than 0.1 FLOW STAGE low
FLOW CHARACTER placid FLOOD SIGNS nil
STREAMFORM
CONFINEMENT unconfined PATTERN meandering
VERTICAL STABILITY stable
SIDE CHANNEL DEVELOPMENT nil
POOL/RIFFLE RATIO 90/10 BEDROCK CONTROL POOLS (%) 0
DEBRIS
FLOODPLAIN low
CHANNEL low
STABLE DEBRIS (%) 100
OBSTRUCTIONS TO FISH MIGRATION beaver dams throughout

COMMENTS

This creek has only very low potential as fish habitat for summer use. No overwintering potential. Brown water color. Swampy throughout.

POINT DESCRIPTION AT CREEK CROSSING

STREAM Unnamed Creek R9
WATERSHED AREA Grainger-Liard-Mackenzie

DATE OF INVENTORY 24 July 1980
ACCESS aerial examination by helicopter
PREPARED BY G. Rosberg, C. Gilmore
TOPO MAP SHEETS

AVERAGE WIDTH (m): VALLEY FLAT N/A
AVERAGE DEPTH (m): RIFFLE 0.2
WINTER CONDITIONS: SNOW COVER (m) N/A

NO. CHANNELS 1
CHANNEL 8
POOL 0.5
ICE DEPTH (m) N/A

SLOPE (%) 0-0.5
WETTED 3
MAXIMUM DEPTH 0.5
FREE WATER (m) N/A

BAR PRESENCE no bar development
ISLAND PRESENCE nil

LATERAL CHANNEL MOVEMENT FEATURES occasional old meadner scar visible from air

BANK STABILITY very stable
CHANNEL STABILITY very stable, no evidence of recent channel realignments

BED MATERIALS (%)
FINES: SILT/CLAY (<0.062 mm) 10
SAND (0.062-2.0 mm) 40
GRAVEL: SMALL (2-16 mm) 0
LARGE (16-64 mm) 20
ROCK: COBBLE (64-250 mm) 20
BOULDER (>250 mm) 10
BEDROCK 0

CHANNEL COVER
% AREA: CROWN 10
OVERHANG 20

BANKS probably similar to the Grainger River, flat, less than 1 meter high

HYDRAULICS
DISCHARGE (m^3/sec) 0.2
FLOW STAGE medium
FLOW CHARACTER placid
FLOOD SIGNS nil

STREAMFORM
CONFINEMENT unconfined
PATTERN meandering
VERTICAL STABILITY very stable
SIDE CHANNEL DEVELOPMENT none
POOL/RIFFLE RATIO 70/30
BEDROCK CONTROL POOLS (%) 0

DEBRIS
FLOODPLAIN low
CHANNEL medium
STABLE DEBRIS (%) 100

OBSTRUCTIONS TO FISH MIGRATION beaver dams

COMMENTS

This Grainger tributary probably provides some limited habitat for summer rearing. Potential is limited by low flows, and access by fish to the crossing location may be hindered by beaver dams. Tea colored water. No overwintering potential.

POINT DESCRIPTION AT CREEK CROSSING

STREAM Unnamed Creeks R10 & R11
WATERSHED AREA Grainger-Liard-Mackenzie

DATE OF INVENTORY 24 July 1980
ACCESS aerial assessment by helicopter
PREPARED BY G. Rosberg, C. Gilmore
TOPO MAP SHEETS

NO. CHANNELS 1 SLOPE (%) 0 - 0.5
AVERAGE WIDTH (m): VALLEY FLAT N/A CHANNEL 6 WETTED 3
AVERAGE DEPTH (m): RIFFLE 0.2 POOL 0.5 MAXIMUM DEPTH 0.5
WINTER CONDITIONS: SNOW COVER (m) N/A ICE DEPTH (m) N/A FREE WATER (m) N/A

BAR PRESENCE no bar developments
ISLAND PRESENCE nil

LATERAL CHANNEL MOVEMENT FEATURES occasional meander scar visible from air

BANK STABILITY stable
CHANNEL STABILITY stable

BED MATERIALS (%)
FINES: SILT/CLAY (<0.062 mm) 10 SAND (0.062-2.0 mm) 40
GRAVEL: SMALL (2-16 mm) 0 LARGE (16-64 mm) 20
ROCK: COBBLE (64-250 mm) 20 BOULDER (>250 mm) 10
BEDROCK 0

CHANNEL COVER
% AREA: CROWN 10 OVERHANG 20
BANKS probably similar to Grainger River, flat, less than 1 m high
HYDRAULICS
DISCHARGE (m^3/sec) 0.1 FLOW STAGE medium
FLOW CHARACTER placid FLOOD SIGNS nil
STREAMFORM
CONFINEMENT unconfined PATTERN meandering
VERTICAL STABILITY stable, old established channels
SIDE CHANNEL DEVELOPMENT none
POOL/RIFFLE RATIO 70/30 BEDROCK CONTROL POOLS (%) 0
DEBRIS
FLOODPLAIN low
CHANNEL medium
STABLE DEBRIS (%) 100
OBSTRUCTIONS TO FISH MIGRATION beaver dams

COMMENTS

These two small creeks may support small numbers of fish, however their potential is limited by small size and low flows. Both creeks have extensive beaver workings downstream of the proposed crossing location that may hinder or prevent fish movements to upstream habitats. Tea colored water. No overwintering potential.

APPENDIX 5
Fish Catches at Selected Watercourses

STREAM Prairie Creek — Date of Inventory July 22, 1980

LOCATION M1 — Watershed Area South Nahanni - Liard

FISHERY SAMPLING EFFORT

Electrofishing

Seconds :	600
Distance(m) :	300
Man hours :	0.5

Gillnetting

Mesh size (cm) :	7.6
Length of net (m):	25
Hours set :	71

Fishery Sampling Results

Prominent Species:

Dolly Varden char - 2 juvenile

Other Species:

slimy sculpin - 11

Other Species Reported:

round whitefish, burbot, white sucker, Arctic grayling, lake trout (L. Comin pers. comm., R.D. Wickstrom 1977)

Catch Per Unit Effort

Electrofishing:	1.30
Gillnetting:	0

Comments

STREAM Prairie Creek — Date of Inventory July 22, 1980

LOCATION M2 — Watershed Area South Nahanni - Liard

FISHERY SAMPLING EFFORT

Electrofishing

Seconds :	330
Distance(m) :	200
Man hours :	0.4

Gillnetting

Mesh size (cm) :	
Length of net (m):	
Hours set :	

Fishery Sampling Results

Prominent Species:

Dolly Varden char - 1 juvenile

Other Species:

slimy sculpin - 11

Other Species Reported:

Arctic grayling, round whitefish, burbot, white sucker, lake trout. (L. Comin pers. comm. R.D. Wickstrom 1977)

Catch Per Unit Effort

Electrofishing: 2.18

Gillnetting:

Comments

STREAM Harrison Creek

Date of Inventory July 22, 1980

LOCATION M3

Watershed Area Prairie Creek - South Nahanni

FISHERY SAMPLING EFFORT

Electrofishing

Seconds :	216
Distance(m) :	100
Man hours :	0.3

Gillnetting

Mesh size (cm) :	
Length of net (m):	
Hours set :	

Fishery Sampling Results

Prominent Species:

Other Species:

slimy sculpin

Other Species Reported:

Catch Per Unit Effort

Electrofishing: 1.94

Gillnetting:

Comments

Sampling was conducted in mouth region
Upper reaches of watercourse exhibit no habitat potential

STREAM Prairie Creek — Date of Inventory July 22, 1980

LOCATION M4 — Watershed Area South Nahanni - Liard

FISHERY SAMPLING EFFORT

Electrofishing

Seconds :	239
Distance(m) :	175
Man hours :	0.3

Gillnetting

Mesh size (cm) :	
Length of net (m):	
Hours set :	

Fishery Sampling Results

Prominent Species:

Dolly Varden char - 1 juvenile

Other Species:

slimy sculpin - 16

Other Species Reported:

Arctic grayling, round whitefish, burbot, whitesucker, lake trout. (L. Comin pers. comm., R.D. Wickstrom 1977)

Catch Per Unit Effort

Electrofishing:	4.27
Gillnetting:	

Comments

STREAM Prairie Creek — Date of Inventory July 22, 1980

LOCATION M5 — Watershed Area South Nahanni - Liard

FISHERY SAMPLING EFFORT

Electrofishing	
Seconds :	324
Distance(m) :	200
Man hours :	0.4
Gillnetting	
Mesh size (cm) :	5.1
Length of net (m):	11
Hours set :	16

Fishery Sampling Results

Prominent Species:

Dolly Varden char - 2 adult

Other Species:

slimy sculpin - 13

Other Species Reported:

Arctic grayling. round whitefish, burbot, white sucker, lake trout. (L. Comin pers. comm. R.D. Wickstrom 1977)

Catch Per Unit Effort

Electrofishing:	2.41
Gillnetting:	0.01

Comments

STREAM Prairie Creek — Date of Inventory July 25, 1980

LOCATION M6 — Watershed Area South Nahanni - Liard

FISHERY SAMPLING EFFORT

Electrofishing

Seconds :	414
Distance(m) :	350
Man hours :	0.5

Gillnetting

Mesh size (cm) :	
Length of net (m):	
Hours set :	

Fishery Sampling Results

Prominent Species:

Arctic grayling - 2 fry

Other Species:

round whitefish - 2
whitefish sp. - 2
slimy sculpin - 9

Other Species Reported:

Dolly Varden char, burbot, white sucker, lake trout
(L. Comin pers. comm. R.D. Wickstrom 1977)

Catch Per Unit Effort

Electrofishing: 2.17
Gillnetting:

Comments

Site M6 is located downstream of the mine site area near the Nahanni National Park border.

STREAM Unnamed Creek

Date of Inventory July 24, 1980

LOCATION R2

Watershed Area Ram River - North Nahanni

FISHERY SAMPLING EFFORT

Electrofishing

Seconds :	535
Distance(m) :	400
Man hours :	0.5

Gillnetting

Mesh size (cm) :	
Length of net (m):	
Hours set :	

Fishery Sampling Results

Prominent Species:

Other Species:

Other Species Reported:

Catch Per Unit Effort

Electrofishing: Nil

Gillnetting:

Comments

limited instream cover
steep gradient

STREAM Unnamed Creek — Date of Inventory July 24, 1980

LOCATION R3 — Watershed Area Ram River - North Nahanni

FISHERY SAMPLING EFFORT

Electrofishing

Seconds :	337
Distance(m) :	300
Man hours :	0.5

Gillnetting

Mesh size (cm) :	
Length of net (m):	
Hours set :	

Fishery Sampling Results

Prominent Species:

Arctic grayling - 2 fry, 2 juvenile

Other Species:

Other Species Reported:

Catch Per Unit Effort

Electrofishing: 0.89

Gillnetting:

Comments

Arctic grayling nursery and suspected spawning area

STREAM Tetcela River — Date of Inventory July 23, 1980

LOCATION R4 — Watershed Area North Nahanni

FISHERY SAMPLING EFFORT

Electrofishing

Seconds :	300
Distance(m) :	275
Man hours :	0.5

Gillnetting

Mesh size (cm) :	
Length of net (m):	
Hours set :	

Fishery Sampling Results

Prominent Species:

Arctic grayling - 4 fry, 1 juvenile, 1 adult

Other Species:

lake chub - 15
slimy sculpin - 13

Other Species Reported:

longnose sucker, longnose dace, (Land, Use Info. Ser. 95G)

Catch Per Unit Effort

Electrofishing: 6.80
Gillnetting:

Comments

Suspected Arctic grayling spawning area
Arctic grayling nursery area

STREAM Tetcela River — Date of Inventory July 22, 1980

LOCATION R5 — Watershed Area North Nahanni

FISHERY SAMPLING EFFORT

Electrofishing

Seconds :	308
Distance(m) :	300
Man hours :	0.5

Gillnetting

Mesh size (cm) :	
Length of net (m):	
Hours set :	

Fishery Sampling Results

Prominent Species:

Arctic grayling - 5 fry, 12 juvenile, 1 adult
northern pike - 1 juvenile, 1 juvenile, 1 adult

Other Species:

lake chub - 7
whitefish sp. - 1 fry
slimy sculpin - 22

Other Species Reported:

northern pike, longnose sucker, longnose dace
(Land Use Info. Ser. 95G)

Catch Per Unit Effort

Electrofishing: 7.79
Gillnetting:

Comments

STREAM Fishtrap Creek Date of Inventory July 24, 1980

LOCATION R6 Watershed Area South Nahanni - Liard

FISHERY SAMPLING EFFORT

Electrofishing

Seconds :	150
Distance(m) :	100
Man hours :	0.4

Gillnetting

Mesh size (cm) :	
Length of net (m):	
Hours set :	

Fishery Sampling Results

Prominent Species:

Other Species:

Other Species Reported:

Catch Per Unit Effort

Electrofishing: 0

Gillnetting:

Comments

Very low habitat potential

STREAM Grainger River

Date of Inventory July 24, 1980

LOCATION R7

Watershed Area Liard

FISHERY SAMPLING EFFORT

Electrofishing

Seconds :	547
Distance(m) :	300
Man hours :	0.5

Gillnetting

Mesh size (cm) :	
Length of net (m):	
Hours set :	

Fishery Sampling Results

Prominent Species:

Arctic grayling - 3 juvenile

Other Species:

slimy sculpin - 24

Other Species Reported:

northern pike, longnose duce, walleye, longnose sucker
(Hatfield et al 1972, L. Comin pers. comm.)

Catch Per Unit Effort

Electrofishing: 2.96

Gillnetting:

Comments

APPENDIX 6

DIAND Water Quality Data - 1975

All Units in mg/l unless otherwise stated | E=Extractable L=less than | D=Dissolved

Sampling Station G1 *

Prairie Creek - at airstrip

NAQUADAT NO:			
Date of Sampling	27/05/75	05/07/75	06/08/75
Temp. at Testing °C	22.7	25.0	19.6
Temp. at Sampling °C	6.0	12.5	5.8
pH at Sampling	8.2	--	--
pH at Testing	8.1	8.2	8.3
Turbidity (Turb. Units)	12.0	4.1	79.
Colour (Rel. Units)	30.	5.	10.
Sp. Cond. at testing (umho/cm)	225.0	323.0	283.0
Sp. Cond. at Sampling (umho/cm)	140.0	--	--
Alkalinity: Total, $CaCO_3$	98.5	146.0	155.0
Hardness: Total, $CaCO_3$	204.0	173.0	192.0
Calcium (Ca):D	33.0	46.6	40.2
Sodium (Na): D	0.6	1.4	1.2
Potassium (K):D	0.3	0.41	0.4
Chloride (Cl):D	0.3	0.3	0.30
Sulphate (SO_4):D	16.5	29.4	22.0
Nitrogen: NO_2 - NO_3	0.10	0.438	0.12
Phosphorous (P): Total	.035	L.005	.012
Silica: Reactive SiO_2	2.3	3.3	3.2
Iron (Fe):E	.115	L.05	1.64
Manganese (Mn):E	.014	L.01	0.05
Cadmium (Cd):E	L.001	L.01	L.001
Chromium (Cr):E	L.01	L.01	L.01
Cobalt (Co):E	.003	L.01	L.001
Copper (Cu):E	L.001	L.001	.002
Zinc (Zn):E	.007	.012	.020
Lead (Pb):E	L.004	L.005	L.005
Molybdenum (Mo):E	L.05	L.05	L.05
Nickel (Ni):E	L.002	L.005	.005
Arsenic (As):D	L.01	--	L.01

* Location shown on Figure 21

DIAND WATER QUALITY DATA

All Units in mg/l unless otherwise stated E=Extractable D=Dissolved L=less than

Sampling Station G2 *

Prairie Creek - ¼mile (.4 km) downstream of junction of Harrison Creek and Prairie Creek

NAQUADAT NO:

Date of Sampling	27/05/75	05/07/75	06/08/75
Temp. at Testing °C	22.5	25.0	19.5
Temp. at Sampling °C	6.0	12.0	5.8
pH at Sampling	8.3	--	--
pH at Testing	8.2	8.3	8.3
Turbidity (Turb. Units)	34.0	6.0	88.0
Colour (Rel. Units)	30.	20.	5.
Sp. Cond. at testing (umho/cm)	235.0	334.0	295.0
Sp. Cond. at Sampling (umho/cm)	150.0	--	--
Alkalinity: Total, $CaCO_3$	105.0	152.0	137.0
Hardness: Total, $CaCO_3$	123.0	174.0	165.0
Calcium (Ca):D	34.9	48.2	39.5
Sodium (Na): D	0.6	1.4	1.2
Potassium (K):D	0.3	0.38	0.4
Chloride (Cl):D	0.3	0.3	0.3
Sulphate (SO_4):D	17.5	31.3	24.0
Nitrogen: NO_2 - NO_3	0.13	0.23	0.16
Phosphorous (P): Total	.085	L.005	.017
Silica: Reactive SiO_2	2.7	3.6	3.24
Iron (Fe):E	.270	0.11	2.06
Manganese (Mn):E	.025	L.01	.093
Cadmium (Cd):E	L.001	L.01	L.001
Chromium (Cr):E	L.01	L.01	L.01
Cobalt (Co):E	.002	L.01	L.001
Copper (Cu):E	L.001	L.001	.005
Zinc (Zn):E	.010	.006	.034
Lead (Pb):E	L.004	L.005	.008
Molybdenum (Mo):E	L.05	L.05	L.05
Nickel (Ni):E	L.002	L.005	.010
Arsenic (As):D	L.01	--	L.01

* Location shown on Figure 21

DIAND WATER QUALITY DATA

All Units in mg/l unless otherwise stated E=Extractable D=Dissolved L=less than

Sampling Station G 3 *

Harrison Creek - at Cadillac camp

NAQUADAT NO:			
Date of Sampling	27/05/75	05/07/75	06/08/75
Temp. at Testing °C	22.3	24.6	19.3
Temp. at Sampling °C	5.0	5.5	4.0
pH at Sampling	8.5	--	--
pH at Testing	8.2	8.1	8.3
Turbidity (Turb. Units)	1.8	5.0	5.3
Colour (Rel. Units)	10.	5.	10.
Sp. Cond. at testing (umho/cm)	371.0	446.0	389.0
Sp. Cond. at Sampling (umho/cm)	200.0	--	--
Alkalinity: Total, $CaCO_3$	148.0	180.0	162.0
Hardness: Total, $CaCO_3$	202.0	244.0	218.0
Calcium (Ca):D	48.3	51.9	51.6
Sodium (Na): D	0.5	0.5	0.5
Potassium (K):D	0.5	0.75	0.6
Chloride (Cl):D	0.3	0.5	0.4
Sulphate (SO_4):D	42.5	73.5	57.0
Nitrogen: $NO_2 - NO_3$	0.41	0.812	0.54
Phosphorous (P): Total	0.01	L.005	.024
Silica: Reactive SiO_2	3.1	3.7	3.6
Iron (Fe):E	.028	L.05	0.08
Manganese (Mn):E	L.01	L.01	L.01
Cadmium (Cd):E	L.001	L.01	L.001
Chromium (Cr):E	L.01	L.01	L.01
Cobalt (Co):E	.002	L.01	L.001
Copper (Cu):E	L.001	.014	.004
Zinc (Zn):E	.007	L.001	.007
Lead (Pb):E	L.004	L.005	L.005
Molybdenum (Mo):E	L.05	L.05	L.05
Nickel (Ni):E	L.002	L.005	L.005
Arsenic (As):D	L.01	--	L.01

* Location shown on Figure 21

DIAND WATER QUALITY DATA

All Units in mg/l unless otherwise stated E=Extractable D=Dissolved
L=less than

Sampling Station G4 *

Harrison Creek - 50 yards (45 m) downstream of junction of North and South Forks.

NAQUADAT NO:

Date of Sampling	27/05/75	05/07/75	06/08/75
Temp. at Testing °C	22.4	24.9	19.4
Temp. at Sampling °C	5.0	6.5	34.5
pH at Sampling	8.3	--	--
pH at Testing	8.2	8.1	8.3
Turbidity (Turb. Units)	1.3	4.7	5.2
Colour (Rel. Units)	7.	5.	20.
Sp. Cond. at testing (umho/cm)	397.0	443.0	388.0
Sp. Cond. at Sampling (umho/cm)	215.0	--	--
Alkalinity: Total, $CaCO_3$	156.0	181.0	163.0
Hardness: Total, $CaCO_3$	208.0	246.0	204.0
Calcium (Ca):D	48.3	54.4	54.1
Sodium (Na): D	0.5	1.0	0.5
Potassium (K):D	0.5	0.6	0.5
Chloride (Cl):D	0.3	0.7	0.4
Sulphate (SO_4):D	46.5	90.0	58.0
Nitrogen: $NO_2 - NO_3$	0.46	1.28	.545
Phosphorous (P): Total	L.01	L.005	L.005
Silica: Reactive SiO_2	3.1	4.0	3.62
Iron (Fe):E	0.02	L.05	0.09
Manganese (Mn):E	L.01	L.01	L.01
Cadmium (Cd):E	L.001	L.01	L.001
Chromium (Cr):E	L.01	L.01	L.01
Cobalt (Co):E	.002	L.01	L.001
Copper (Cu):E	L.001	.003	.001
Zinc (Zn):E	.006	0.25	.008
Lead (Pb):E	L.004	L.005	L.005
Molybdenum (Mo):E	L.05	L.05	L.05
Nickel (Ni):E	L.002	L.005	L.005
Arsenic (As):D	L.01	--	L.01

* Location shown on Figure 21

DIAND WATER QUALITY DATA

All Units in mg/l unless otherwise stated E=Extractable L=less than D=Dissolved

Sampling Station G5 *

Galena Creek - 50 yards (45 m) upstream of mouth.

NAQUADAT NO:

Date of Sampling	27/05/75	05/07/75	06/08/75
Temp. at Testing °C	22.5	24.9	19.2
Temp. at Sampling °C	4.0	6.5	3.0
pH at Sampling	8.2	--	--
pH at Testing	8.1	7.9	8.3
Turbidity (Turb. Units)	3.8	4.8	8.0
Colour (Rel. Units)	20.	5.	10.
Sp. Cond. at testing (umho/cm)	247.0	486.0	280.0
Sp. Cond. at Sampling (umho/cm)	145.0	--	--
Alkalinity: Total, $CaCO_3$	108.0	143.0	131.0
Hardness: Total, $CaCO_3$	132.0	175.0	157.0
Calcium (Ca):D	34.0	40.8	40.0
Sodium (Na): D	0.6	1.25	0.8
Potassium (K):D	0.3	0.4	0.25
Chloride (Cl):D	0.3	0.4	0.24
Sulphate (SO_4):D	17.0	32.8	25.0
Nitrogen: NO_2 - NO_3	0.17	0.17	.238
Phosphorous (P): Total	0.02	L.005	L.005
Silica: Reactive SiO_2	2.8	3.55	3.5
Iron (Fe):E	0.13	L.05	0.16
Manganese (Mn):E	0.20	L.01	0.01
Cadmium (Cd):E	L.001	L.001	L.001
Chromium (Cr):E	L.01	L.01	L.01
Cobalt (Co):E	.003	L.001	L.001
Copper (Cu):E	L.001	L.001	L.001
Zinc (Zn):E	.001	.001	.013
Lead (Pb):E	L.004	L.005	.006
Molyodenum (Mo):E	L.05	L.05	L.05
Nickel (Ni):E	L.002	L.005	L.005
Arsenic (As):D	L.01	--	L.01

* Location shown on Figure 21

DIAND WATER QUALITY DATA

All Units in mg/l unless otherwise stated E=Extractable D=Dissolved L=less than

Sampling Station G6 *

Big Quartz Creek - 50 yards (45 m) upstream of mouth.

NAQUADAT NO:

Date of Sampling	27/05/75	05/07/75	06/08/75
Temp. at Testing °C	22.3	24.8	19.4
Temp. at Sampling °C	2.0	8.0	2.8
pH at Sampling	8.5	--	--
pH at Testing	8.2	8.1	8.3
Turbidity (Turb. Units)	2.2	5.2	8.9
Colour (Rel. Units)	20.	30.	20.
Sp. Cond. at testing (umho/cm)	315.0	324.0	279.0
Sp. Cond. at Sampling (umho/cm)	150.0	--	--
Alkalinity: Total, $CaCO_3$	128.0	167.0	130.0
Hardness: Total, $CaCO_3$	169.0	209.0	153.0
Calcium (Ca):D	40.9	49.9	40.5
Sodium (Na): D	0.5	0.75	0.8
Potassium (K):D	0.4	0.75	0.25
Chloride (Cl):D	0.5	0.5	0.3
Sulphate (SO_4):D	30.5	56.4	25.0
Nitrogen: NO_2 - NO_3	0.17	0.192	0.18
Phosphorous (P): Total	.010	L.005	L.005
Silica: Reactive SiO_2	3.1	3.85	3.24
Iron (Fe):E	0.025	L.05	0.18
Manganese (Mn):E	L.01	L.01	L.01
Cadmium (Cd):E	L.001	L.001	L.001
Chromium (Cr):E	L.01	L.01	L.01
Cobalt (Co):E	.001	L.001	L.001
Copper (Cu):E	L.001	L.001	.003
Zinc (Zn):E	.015	.006	.010
Lead (Pb):E	L.004	L.005	L.005
Molybdenum (Mo):E	L.05	L.05	L.05
Nickel (Ni):E	L.002	L.005	L.005
Arsenic (As):D	L.01	--	L.01

* Location shown on Figure 21

DIAND WATER QUALITY DATA

All Units in mg/l unless otherwise stated E=Extractable D=Dissolved
L=less than

Sampling Station G7 *

Big Quartz Creek - 3.7 miles (5.9 km) upstream of mouth

NAQUADAT NO:

Date of Sampling	27/05/75	05/07/75	06/08/75
Temp. at Testing °C	22.3	24.7	19.5
Temp. at Sampling °C	2.0	7.5	2.5
pH at Sampling	8.5	--	--
pH at Testing	8.1	8.1	8.2
Turbidity (Turb. Units)	1.1	4.7	1.6
Colour (Rel. Units)	20.	20.	5.
Sp. Cond. at testing (umho/cm)	254.0	430.0	456.0
Sp. Cond. at Sampling (umho/cm)	110.0	--	--
Alkalinity: Total, $CaCO_3$	116.0	172.0	187.0
Hardness: Total, $CaCO_3$	137.0	220.0	261.0
Calcium (Ca):D	35.4	52.8	66.5
Sodium (Na): D	0.5	0.61	1.2
Potassium (K):D	0.4	0.38	0.55
Chloride (Cl):D	0.2	0.4	0.3
ulphate (SO_4):D	17.0	67.6	80.0
Nitrogen: $NO_2 - NO_3$	0.19	0.206	0.16
Phosphorous (P): Total	L.01	L.005	0.02
Silica: Reactive SiO_2	2.7	3.8	3.8
Iron (Fe):E	0.02	L.05	L.05
Manganese (Mn):E	L.01	L.01	L.01
Cadmium (Cd):E	L.001	L.001	L.001
Chromium (Cr):E	L.01	L.01	L.01
Cobalt (Co):E	.002	L.001	L.001
Copper (Cu):E	L.001	L.001	L.001
Zinc (Zn):E	.003	.005	.018
Lead (Pb):E	L.004	L.005	L.005
Molybdenum (Mo):E	L.05	L.05	L.04
Nickel (Ni):E	L.002	L.005	L.005
Arsenic (As):D	L.01	--	L.01

* Location shown on Figure 21

DIAND WATER QUALITY DATA

All Units in mg/l unless otherwise stated E=Extractable D=Dissolved L=less than

Station G8 *	Prairie Creek 1,000 feet (305 m) downstream of junction of Prairie Creek and Big Quartz Creek		
NAQUADAT NO:			
Date of Sampling	27/05/75	05/07/75	06/08/75
Temp. at Testing °C	22.5	24.6	19.8
Temp. at Sampling °C	2.0	12.5	5.2
pH at Sampling	8.2	--	--
pH at Testing	8.2	8.3	8.3
Turbidity (Turb. Units)	28.0	7.4	91.0
Colour (Rel. Units)	40.	10.	5.
Sp. Cond. at testing (umho/cm)	237.0	326.0	293.0
Sp. Cond. at Sampling (umho/cm)	105.0	--	--
Alkalinity: Total, $CaCO_3$	103.0	150.0	132.0
Hardness: Total, $CaCO_3$	125.0	180.0	159.0
Calcium (Ca):D	34.2	44.2	43.8
Sodium (Na): D	0.6	1.10	1.2
Potassium (K):D	0.3	0.33	0.25
Chloride (Cl):D	0.4	0.4	0.30
Sulphate (SO_4):D	17.5	29.5	25.0
Nitrogen: $NO_2 - NO_3$	0.13	0.237	1.39
Phosphorous (P): Total	0.06	L.005	.021
Silica: Reactive SiO_2	2.5	3.6	3.33
Iron (Fe):E	0.21	0.12	2.3
Manganese (Mn):E	.018	L.01	.063
Cadmium (Cd):E	L.001	L.001	L.001
Chromium (Cr):E	L.01	L.01	L.01
Cobalt (Co):E	.002	L.001	L.001
Copper (Cu):E	L.001	.002	.003
Zinc (Zn):E	.008	.011	.033
Lead (Pb):E	L.004	L.005	L.005
Molybdenum (Mo):E	L.05	L.05	L.05
Nickel (Ni):E	L.002	L.005	.010
Arsenic (As):D	L.01	--	L.01

* Location shown on Figure 21

APPENDIX 7

Transportation Emergency Assistance Plan

T E A P

T RANSPORTATION
E MERGENCY
A SSISTANCE
P LAN

For any transportation emergency involving chemicals, phone the nearest of the following 24 hour-per-day emergency numbers:

SHAWINIGAN, QUEBEC	819-537-1123
VALLEYFIELD, QUEBEC	514-373-8330
MAITLAND, ONTARIO	613-348-3616
NIAGARA FALLS, ONT.	416-356-8310
SARNIA, ONTARIO	519-339-3711
COPPER CLIFF, ONTARIO	705-682-2881
EDMONTON, ALBERTA	403-477-8339
VANCOUVER, B.C.	604-929-3441

TEAP is operated by:

THE CANADIAN CHEMICAL PRODUCERS' ASSOCIATION

Suite 2121, Tower "A", Place de Ville, Ottawa K1R 5A3

VANCAL - 2988

T E A P

What It Is

TEAP is the Transportation Emergency Assistance Plan operated as a public service by the Canadian Chemical Producers' Association through the co-operation of the member companies who operate the Regional Control Centres (RCC's).

TEAP provides immediate advice to those at the scene of a transportation emergency, then contacts the shipper of the chemical involved for their more detailed assistance and follow-up. If the shipper cannot be contacted, on-scene assistance may be provided from the RCC.

TEAP provides complete coverage 24 hours per day, 7 days per week, at the RCC's operated by the following companies:

Company	RCC Location
Allied Chemical Canada Limited	Valleyfield, Quebec 514-373-8330
Canadian Industries Limited	Copper Cliff, Ontario 705-682-2881
Celanese Canada Limited	Edmonton, Alberta 403-477-8339
Cyanamid of Canada Limited	Niagara Falls, Ontario 416-356-8310
Dow Chemical of Canada Limited	Sarnia, Ontario 519-339-3711
Du Pont of Canada Limited	Maitland, Ontario 613-348-3616
Gulf Oil Canada Limited	Shawinigan, Quebec 819-537-1123
Hooker Chemicals Division	Vancouver, B.C. 604-929-3441

TEAP provides notification to shippers, many of whom are CCPA members, through pre-established phone contacts with 24 hour accessibility in most cases.

What It Is Not

Because chemicals find so many uses and have such a wide range of characteristics, there is much need for information about them—composition and purity, physical and chemical properties, effects on people and the environment, sources of supply, etc. It is important to understand that TEAP *is not* intended and *is not* equipped to function as a general information source. By design it is confined to dealing with chemical transportation emergencies.

Operation

Information about TEAP and the listing of the emergency numbers has been widely distributed to emergency service personnel, carriers, and to the chemical industry. Information has also been circulated in bulletins of government agencies as well as other associations. TEAP is an integral part of a number of government contingency plans dealing with hazardous materials.

A person phoning one of these emergency numbers should preface the message by the statement, "This is a transportation emergency". The call-receiver at the RCC will record basic information on the emergency, obtain a call-back phone number and request that the call-back phone be attended until all emergency communications are complete. The call-receiver will notify one of the RCC Technical Advisers who will immediately respond to the original caller and obtain as much information as possible, e.g. the exact location of the emergency; the nature and status of the emergency—spill, fire, fumes, etc.; the name of the carrier; the name of the chemical involved and the name of the shipper, manufacturer or receiver.

If the field situation at the accident scene is urgent, the RCC Technical Adviser will provide preliminary information based on standard references for the protection of personnel and property.

The RCC Technical Adviser will communicate with the manufacturer or shipper of the chemical involved, briefing him on the emergency situation and request the manufacturer to have his expert call immediately to the authorities at the scene, using the call-back phone number. Through this means technical advice is provided rapidly.

If direct contact cannot be made with the manufacturer or shipper, the RCC Technical Adviser will contact other manufacturers or users of that chemical to obtain expert assistance. If none of these is available, the RCC Technical Adviser will himself take action to provide additional technical assistance by telephone or at the scene. In addition, the RCC may be able to arrange emergency assistance in the form of trained men and special equipment.

After the emergency report has been turned over to the manufacturer or shipper, the RCC Technical Adviser will check back with the authorities at the emergency scene to confirm that direct communications have been established between them and the chemical producer's representative. Having established this, he will cease active involvement in the emergency unless later requested to provide supplementary assistance.

General Information

The RCC Technical Advisers are all management and/or technical personnel of chemical manufacturers. As such, they have had extensive experience in the safety aspects of chemicals as well as in handling emergency situations.

All Technical Advisers are provided with extensive technical reference materials, as well as information on the name, location and telephone number of all Canadian chemical manufacturers.

Many of the CCPA member companies have an emergency assistance plan designed for their own products. Notification from TEAP activates these plans.

Co-operative arrangements have been made with other emergency assistance plans to provide specialized assistance. Such arrangements have been made with the Chlorine Institute, the Canadian Agricultural Chemicals Association, the Propane Gas Association, and in the U.S.A. — "CHEMTREC".

In the U.S.A. the Manufacturing Chemists Association provides, through their operation of "CHEMTREC", a 24 hour-per-day emergency information and communication service.

Background

CCPA is a trade association of chemical manufacturers, large and small, representing more than 90% of the production capacity for basic industrial chemicals in Canada. It has been active in programmes to improve the safety of chemicals during shipping. Despite precautions taken, train derailments, truck upsets and collisions occur. Such emergencies must be handled well to minimize the consequences to life and property. Emergency services—fire and police—are normally well prepared to cope with common materials, including certain flammables such as fuel oil and gasoline. Often they are at a disadvantage when chemicals are encountered, specially since "what should be done"—and of equal importance, "what should *not* be done"—in the early stages may bear so heavily on the outcome. Emergency services need accurate and understandable information to help them evaluate hazardous situations and act with proper precautions for their own safety, as well as for the protection of the general public.

In the case of chemical products, this information can best be provided by experienced personnel from the chemical producers.

APPENDIX 8

HAZCHEM Action Code

As per the Action Code Column in the Numerical and Alphabetical Indexes

HAZCHEM Action Code

For fire or spillage control

Action	Comments on the action
1. Straight stream 2. Fog 3. Foam 4. Dry extinguishant	**Fog** – In the absence of fog equipment a fine spray may be used. **Dry extinguishant** – Water must not come in contact with the chemical involved.
P V Full / R — Dilute S V BA / T — Dilute W V Full / X — Contain Y V BA / Z — Contain	**V** – Can be violently or explosively reactive. **Full** – Full protective clothing with BA. **BA** – Breathing apparatus and protective gloves. **Dilute** – May be washed to drains and sewers with large volumes of water. **Contain** – By any means available, prevent spillage from entering drains, sewers or water sources.
E Consider evacuation	**Consider evacuation** – This is the first priority in case of doubt. Evacuate immediate vicinity and request police assistance.

	Examples
Anhydrous Ammonia	2PE – Use fog, or in the absence of fog equipment, a fine spray may be used; can be violently or explosively reactive; wear full protective clothing with breathing apparatus and protective gloves; may be washed to drains and sewers with large volumes of water; consider evacuation.
Chlorine	2XE – Use fog, or in the absence of fog equipment, a fine spray may be used; wear full protective clothing with breathing apparatus and protective gloves; by any means available, prevent spillage from entering drains, sewers or water sources; consider evacuation.
Propane	2WE – Use fog, or in the absence of fog equipment, a fine spray may be used; can be violently or explosively reactive; wear full protective clothing with breathing apparatus and protective gloves; by any means available, prevent spillage from entering drains, sewers or water sources; consider evacuation.

	Pollution Control
	Seek environmental protection advice prior to flushing area with water and/or undertaking disposal.

VANCAL - 2988

from Transport Canada, "Emergency Response Guide for Dangerous Goods"

APPENDIX 9A

Response Action for Diesel Fuel, Gasoline, Aviation Fuel and MIBC

Inflammable liquid
Self-reactive or thermally unstable

Potential hazards

Fire or explosion

May be ignited by heat, sparks, flames.
Most liquids lighter than water.
Most vapours heavier than air.
Inflammable vapours may spread away from spill.
Container may explode in air.
Vapours may explode in air.
Gas explosion hazard indoors, outdoors or in sewers.
Runoff to sewer may create fire or explosion hazard.

Health

Vapour in confined spaces may cause dizziness or suffocation.
Fire may produce irritating or poisonous gases.
Some of these products may be poisonous.
Runoff from fire control or dilution water may pollute streams, lakes or drinking water supplies.

Emergency action information

- Keep unnecessary people away.
- Keep upwind.
- Isolate hazard area.
- Wear full protective clothing.

Do this

Fire

Small Fires: dry chemical or CO_2.
Large Fires: water spray, fog or foam. No water jet.
Move containers from fire area if without risk.
Stay away from ends of tanks.
Cool containers with water from maximum distance until well after fire is out.
For massive fire in cargo area, use unmanned hose holder or monitor nozzles.
If this is impossible, withdraw from area and let fire burn.
Withdraw immediately in case of rising sound from venting safety device or discoloration of tank.

Spill or leak

Eliminate all ignition sources.
No flares, smoking or flames in hazard area.
Stop leak if without risk.
Use water spray to reduce vapours.
Small Spills: take up with sand, earth, or other non-combustible absorbent material, then flush area with water.
Large Spills: dike for later disposal.

First Aid

Remove to fresh air.
Call emergency medical care.
Remove contaminated clothing and shoes.
If not breathing, give artificial respiration.
If breathing is difficult, give oxygen.
In case of contact with material, immediately flush skin or eyes with running water for at least 15 min.
Effects of contact or inhalation may be delayed.

(from Transport Canada, "Emergency Response Guide for Dangerous Goods"

VANCAL - 2988

APPENDIX 9B

Response Action for Propane

Compressed gas
Inflammable – Self reactive or thermally unstable

Potential hazards

Fire or explosion

May be ignited by heat, sparks, flames.
Most vapours heavier than air.
Most liquids lighter than water.
Inflammable vapours may spread away from spill.
Container may explode in heat of fire.
Gas explosion hazard indoors, outdoors or in sewers.

Health

No health hazard in well ventilated areas.
Vapour in confined spaces may cause dizziness or suffocation.
Fire may produce irritating or poisonous gases.

Emergency action information

- Keep unnecessary people away.
- Keep upwind.
- Isolate hazard area.
- Wear full protective clothing.

Do this

Fire

Small Fires: dry chemical or CO_2.
Large Fires: water spray, fog or foam.
Move containers from fire area if without risk.
Stay away from ends of tanks.
Cool containers with water from maximum distance until well after fire is out.
Let burn unless leak can be stopped immediately.
For massive fire in cargo area, use unmanned hose holder or monitor nozzles.
If this is impossible, withdraw from area and let fire burn.
Withdraw immediately in case of rising sound from venting safety device or discoloration of tank.

Spill or leak

Eliminate all ignition sources.
No flares, smoking or flames in hazard area.
Stop leak if without risk.
Isolate area until gas has dispersed.
Use water spray to reduce vapours.
Small Spills: take up with sand, earth, or other non-combustible absorbent material, then flush area with water.
Large Spills: dilute with large amounts of water and dike for later disposal.

First Aid

Remove to fresh air.
If not breathing, give artificial respiration.
If breathing is difficult, give oxygen.
Remove contaminated clothing and shoes.
In case of contact with material, immediately flush skin or eyes with running water for at least 15 min.
Keep patient warm and quiet.
Effects of contact or inhalation may be delayed.

VANCAL - 2988

APPENDIX 9C

Response Action for Ammonium Nitrate

Oxidizer
Containing ammonium nitrate

Potential hazards

Fire or explosion

In a fire, ammonium nitrate or ammonium nitrate fertilizers may detonate in a **mass explosion**, particularly if confined.

Health

Fire may produce highly poisonous reddish-brown fumes (oxides of nitrogen).

Emergency action information

- Keep unnecessary people away.
- Keep upwind.
- Isolate hazard area.
- Wear self-contained breathing apparatus and full protective clothing.
- Evacuate area endangered by poison gas.

Do this

Fire

Allow maximum possible ventilation.
Do **not** use fire extinguishers or sprinklers on burning material.
All Fires: flood with water.
Always Evacuate from a raging fire involving ammonium nitrate and, if possible without risk, use unmanned hoses.
Evacuate for a radius of 800 m or more.

Spill or leak

Eliminate all ignition sources.
No flares, smoking or flames in hazard area.
All Spills: shovel into dry, clean containers, then flush area with water.

First Aid

Call emergency medical care.
If fume inhalation from fire is suspected, insist upon complete and immediate rest for patient.
Effects of contact or inhalation may be delayed.

VANCAL - 2988

Response Action for Explosives

Explosives

Potential hazards

Fire or explosion

May burn violently and detonate in mass explosion at any time.
May detonate in mass explosion if subjected to heat, flame, friction or shock.
Probability of explosion increases when heated.

Health

Fire may produce irritating or poisonous gases.
Detonation could cause casualties due to blast shock and/or flying debris.

Caution

- Do not fight fire if it has reached the cargo.
- **Withdraw.** If time permits, leave unmanned hoses and evacuate the area as per table on the inside back cover. See Class 1.1.
- If explosive cargo is subjected to heat and/or flames, keep personnel away.

Emergency action information

- Keep unnecessary people away.
- Keep upwind.
- Isolate hazard area.

Do this

Fire

Never fight fire in immediate area of the explosives where the packages/articles are subjected to the heat of the fire.
Evacuate surrounding area and, if possible without risk, use unmanned hoses.
Do not move packages/articles after exposure to fire and heat, except under supervision of an expert.

Spill or leak

Eliminate all ignition sources.
No flares, smoking or flames in hazard area.
Clean up and disposal only under supervision of an expert.

First Aid

Use standard First Aid procedures.

VANCAL - 2988

APPENDIX 9E

Response Action for Sodium Cyanide

Poison, inhalation

Potential hazards

Fire or explosion

Some of these materials may burn, but do not ignite readily.

Health

If inhaled, may be fatal.
Contact may cause burns to skin and eyes.
Runoff from fire control or dilution water may pollute streams, lakes or drinking water supplies.

Emergency action information

- Keep unnecessary people away.
- Keep upwind.
- Isolate hazard area.
- Wear self-contained breathing apparatus and full protective clothing.

Do this

Fire

Small Fires: dry chemical or CO_2.
Large Fires: water spray, fog or foam.
Move containers from fire area if without risk.

Spill or leak

Eliminate all ignition sources.
Do not touch spilled material.
Stop leak if without risk.
Use water spray to reduce vapours.
Small Spills: take up with sand, earth, or other non-combustible absorbent material, then flush area with water.
Small Dry Spills: shovel into dry containers and cover, then flush area with water.
Large Spills: dike for later disposal.

First Aid

Remove to fresh air.
Call emergency medical care.
Remove contaminated clothing and shoes.
If not breathing, give artificial respiration.
If breathing is difficult, give oxygen.
In case of contact with material, immediately flush skin or eyes with running water for at least 15 min.
Keep patient warm and quiet.
Effects of contact or inhalation may be delayed.

VANCAL - 2988

APPENDIX 9F

Response Action for Copper Sulphate
and Sodium Dichromate

Environmental hazard

Potential hazards

Fire or explosion

May be ignited by heat, sparks, flames.
Dust explosion is possible.

Health

Little health hazard.
If inhaled, may be harmful.
Runoff from fire control or dilution water may pollute streams, lakes or drinking water supplies.
Toxic to aquatic life.

Emergency action information

- Keep unnecessary people away.
- Notify nearest EPS office of Environment Canada.

Do this

Fire

Small Fires: dry chemical or CO_2.
Large Fires: water spray, fog or foam.

Spill or leak

Stop leak if without risk.
Small Dry Spills: shovel into dry containers and cover, then flush area with water.
Large Spills: dike for later disposal.

First Aid

Use standard First Aid procedures.

VANCAL - 2988

APPENDIX 9G

Response Action for Chlorine Gas

Compressed gas
Oxidizer – Poison

Potential hazards

Fire or explosion

May ignite combustibles (wood, paper, oil, clothing, etc.).
Most vapours heavier than air.
Mixtures with fuels may explode.
Container may explode in heat of fire.
Gas explosion and poison hazard indoors, outdoors or in sewers.

Health

If inhaled may be fatal.
Contact may irritate or burn skin and eyes.
Runoff from fire control or dilution water may pollute streams, lakes or drinking water supplies.

Emergency action information

- Keep unnecessary people away.
- Keep upwind.
- Isolate hazard area.
- Wear self-contained breathing apparatus and full protective clothing.
- Evacuate area endangered by poison gas.

Do this

Fire

Small Fires: dry chemical or CO_2.
Large Fires: water spray, fog or foam.
Move containers from fire area if without risk.
Stay away from ends of tanks.
Cool containers with water from maximum distance until well after fire is out.
For massive fire in cargo area, use unmanned hose holder or monitor nozzles.
If this is impossible, withdraw from area and let fire burn.

Spill or leak

Eliminate all ignition sources.
Do not touch spilled material.
Stop leak if without risk.
Large Spills: dike for later disposal.
Use water spray to reduce vapours.
Keep combustibles (wood, paper, oil, clothing, etc.) away from spilled material.
Isolate area until gas has dispersed.

First Aid

Remove to fresh air.
Call emergency medical care.
If not breathing, give artificial respiration.
If breathing is difficult, give oxygen.
Remove contaminated clothing and shoes.
In case of contact with material, immediately flush skin or eyes with running water for at least 15 min.
Keep patient warm and quiet.
Effects of contact or inhalation may be delayed.

VANCAL - 2988

APPENDIX 911

Response Action for Calcium Hypochlorite

Oxidizer
Self-reactive or thermally unstable
Poison – Corrosive

Potential hazards

Fire or explosion

May ignite combustibles (wood, paper, oil, clothing, etc.).
Mixtures with fuels may explode.
Container may explode in heat of fire.
May explode from friction, shock, heat or contamination.

Health

Contact may cause burns to skin and eyes.
Fire may produce irritating or poisonous gases.
Runoff from fire control or dilution water may pollute streams, lakes or drinking water supplies.

Emergency action information

- Keep unnecessary people away.
- Keep upwind.
- Isolate hazard area.
- Wear self-contained breathing apparatus and full protective clothing.

Do this

Fire

Small Fires: dry chemical or CO_2.
Large Fires: water spray, fog or foam.
Move containers from fire area if without risk.
Cool containers with water from maximum distance until well after fire is out.
For massive fire in cargo area, use unmanned hose holder or monitor nozzles.
If this is impossible, withdraw from area and let fire burn.

Spill or leak

Eliminate all ignition sources.
Do not touch spilled material.
Stop leak if without risk.
Keep combustibles (wood, paper, oil, clothing, etc.) away from spilled material.
Use water spray to reduce vapours.
Small Spills: take up with sand, earth, or other non-combustible absorbent material, then flush area with water.
Large Spills: dilute with large amounts of water and dike for later disposal.

First Aid

Remove to fresh air.
Call emergency medical care.
Remove contaminated clothing and shoes.
If not breathing, give artificial respiration.
If breathing is difficult, give oxygen.
In case of contact with material, immediately flush skin or eyes with running water for at least 15 min.
Keep patient warm and quiet.
Effects of contact or inhalation may be delayed.

VANCAL - 2988

APPENDIX 10

Golder Associates
CONSULTING GEOTECHNICAL ENGINEERS

PROGRESS REPORT TO
KER PRIESTMAN & ASSOCIATES LTD.
RE:
CADILLAC EXPLORATIONS LTD.
PRAIRIE CREEK PROJECT
MINE ACCESS ROUTE

NORTHWEST TERRITORIES

DISTRIBUTION:

6 copies - Ker Priestman & Associates Ltd.
Victoria, British Columbia

2 copies - Kilborn Engineering (B.C.) Ltd.
Vancouver, British Columbia

2 copies - Golder Associates
Vancouver, British Columbia

October 1980

802-1073

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1.0 INTRODUCTION

Golder Associates (GA) were retained by Ker Priestman & Associates (KPA) to select and lay out a route alignment for a winter road between the Prairie Creek property of Cadillac Explorations Ltd. (CEL) and the Liard River, in the Northwest Territies. A preliminary study to establish feasible route alignments was presented in GA Report 802-1073, dated May 1980.

This report presents details of the final route selected and surveyed to approximately Mile 54. The report also outlines construction progress to September 1st, 1980 and provides design and construction recommendations for the remainder of the finalized route. Details concerning alignment selection and construction for the section of the route from Mile 54 to the terminus at the Liard River are as outlined in GA Report 802-1073, dated May 1980, and are not discussed further in this report.

The location of the mine site, the original winter road and the proposed winter road corridor are shown on the Location Plan, Figure 1. Details of the final surveyed route alignment to approximately Mile 54, as well as the proposed alignment identified in the preliminary report, are shown on the topographic maps, Figures 2 and 3.

Mileages discussed in this report refer to the survey traverse and differ slightly from those used in the preliminary report.

2.0 ALTERNATE ALIGNMENTS

There are two feasible access corridors between the Prairie Creek property of CEL and the MacKenzie/Liard Rivers. One of these has been used in the past as a winter road for access to the mine site, and is identified on Figure 1 as the "Original Winter Road". The second corridor travels in a generally easterly direction from the mine site, through the eastern sec-

tion of the MacKenzie Mountains, across the Ram River plateau, and through Grainger Pass in the Nahanni range to the Liard River. This second corridor was selected for detailed study by Kilborn Engineering Ltd. and it is this corridor which is discussed in this report.

3.0 ROUTE SELECTION

3.1 Introduction

The final surveyed route to approximately Mile 54, as shown on the topographic maps, Figures 1 and 2, has been selected and laid out in the field on the following basis. A preliminary route alignment was identified by office studies of available air photographs (scale approximately 1:60,000) and topographic maps (scale 1:50,000) and by low level air reconnaissance of the corridor by experienced geotechnical personnel. The final route alignment was simultaneously selected and surveyed in the field under the supervision of a geotechnical engineer with input concerning construction feasibility from CEL personnel. No pre-construction subsurface investigation along the route was undertaken.

3.2 Criteria for Route Selection

The following major criteria were used as guidelines for route selection.

(a) It is understood that mine access requirements can be met by a winter road for at least the first several years of mine operation before upgrading to all weather status is, or may be, required.

(b) Construction of the roadway in difficult terrain to allow for only one-way traffic will be adequate.

(c) Maximum grades should not exceed 8 per cent in steepness.

(d) Final alignment and construction should be such that cuts and fills are minimized.

(e) South aspect slopes should be used where possible to minimize the effects of excavation in permafrost.

(f) Roadway construction in areas where disturbance can lead to degradation of permafrost and consequent ground subsidence should be minimized.

(g) No permanent stream or river crossings are to be constructed.

(h) Existing seismic lines and/or winter roads are to be used where possible.

(i) The roadway is to be constructed using existing equipment located at the mine site (2 Caterpillar D-8 bulldozers, 1 Caterpillar 921 Traxcavator, 2 Kenworth 6WD dump trucks).

3.3 Final Alignment

The recommended final winter road alignment is shown on Figures 2 and 3. The alignment on the figures is annotated with mileages along the survey traverse. The actual centerline length of the road will probably be slightly greater than that shown on the figures due to the effect of curves not included in the straight line traverse. The survey traverse closed to identifiable topographic features with an error of approximately 240 ft. over the length of the survey. This indicates that a precision ratio of about 1:1,200, roughly three times more accurate than required, was achieved. The locations of the 40 stream crossings and/or sections where travel over frozen stream courses will occur, from Mile 0 to Mile 54, are also indicated on the figures.

Table 1 is a summary of route mileages, grades, stream crossings and general comments for the surveyed alignment. Table 2 is a breakdown of the relative proportions of the route within various grade intervals.

There are two sections, Miles 4 to 9 and Miles 31 to 38, where the final surveyed road alignment deviates substantially from the preliminary route selected. In both these cases, it was determined by field reconnaissance that changes to the preliminary alignment were justified on the basis of lower construction costs, lower maintenance costs and less disturbance to the existing terrain.

4.0 CONSTRUCTION

4.1 Introduction

The access route between the Prairie Creek property of CEL and the Liard River is to be a winter road and as such will be limited with respect to construction effort and, properly executed, will have a minimal impact on the physical environment. The following paragraphs provide details of the construction completed as at September 1st, 1980 (Mile 0.0 to Mile 14.5), as well as comments concerning construction of the remainder of the final surveyed alignment (Mile 14.5 to Mile 53.9).

4.2 Construction Details

(a) Mile 0.0 to Mile 4.5 (approximately)

This section of the route is constructed on the eastern edge of the Prairie Creek sand and gravel floodplain deposits with several small cuts into weathered shale to avoid meanders of the creek channel. There is one stream crossing in this section. Maintenance to repair wash-out damage will be required only after periods of exceptionally high run-off.

(b) Mile 4.5 to Mile 7.2 (approximately)

The alignment runs up the bottom of the "North" valley with grades approximately equal to the natural gradient of the valley bottom over this section of the route. There are 13 crossings of the "North" valley water course as the alignment crosses the valley to avoid steep bedrock walls which are encountered frequently in the south facing slope of the valley. In three areas where the alignment was restricted to the north facing slope, permafrost was encountered and these areas were treated with a 3 ft. insulating layer of locally borrowed weathered shale material shortly after the road cut was completed. This treatment, combined with the free draining nature of the coarse grained talus slope deposits, resulted in stable cuts showing no evidence of any continuing degradation, immediately following construction. Wash-outs, after periods of high stream flows, may necessitate a certain amount of maintenance in this portion of the route.

(c) Mile 7.2 to 10.3 (approximately)

In this section of the route, the alignment climbs a sidehill cut in the north facing slope of the valley to Mile 9.9 and subsequently in the south facing slope at a maximum grade of 8 per cent to reach the summit of the route at Mile 10.3 (elevation 4,994 ft.). Road construction in the south facing slope of the valley from Mile 7.2 to Mile 9.9 was not considered feasible. An extensive area of permafrost was encountered from Mile 7.2 to 8.3 which was treated in a manner similar to that outlined in the previous section, with similar results. This section of the alignment includes four stream crossings. Some maintenance due to occasional snow avalanche damage and/or small stability failures along this portion of the route should be anticipated.

(d) Mile 10.3 to Mile 19.0 (approximately)

Over this portion of the alignment, the roadway is, or will be, constructed in the gently sloping valley bottom or, where necessary, in shallow sidehill cuts. The alignment is constructed on the south facing valley slope to Mile 12.6 where it crosses to the north to avoid steeply sloping bedrock walls. After crossing the creek at Mile 14.5, which includes a short stretch with a grade of 10 per cent, the alignment returns to the south facing slope at Mile 15.5 and continues there to Mile 19.0. No permafrost was encountered or is expected in this section of the route. There are six stream crossings in this section of the alignment. Maintenance will be limited to repair of snow avalanche damage and/or minor stability failures.

(e) Mile 19.0 to Mile 25.0 (approximately)

This portion of the route involves travel over the sand and gravel floodplain deposits of the Sundog Creek tributary. No difficulties with respect to construction of this section of the route are anticipated. However, annual maintenance due to washouts will almost certainly be required.

(f) Mile 25.0 to Mile 53.9 (approximately)

Upon exiting the Sundog Creek tributary at Mile 25.0, the entire route to Mile 53.9 is through bush of varying density. Due to extremely limited visibility on the ground in areas of dense bush during the survey, minor local adjustments of the surveyed alignment may be required during construction to obtain a maximum grade of 8 per cent, specifically in the sections from Mile 35 to 40 and Mile 43 to 45. In addition, switchbacks not included in the survey, will be required during construction to eliminate short, oversteep gradients at Mile 30.5 and 51.5.

While no serious difficulties with respect to construction are anticipated for this section of the route, there are several areas where the existence of permafrost or muskeg may be anticipated. Permafrost can be expected to occur intermittently in the section from Mile 28.5 to Mile 31.5 where the alignment ascends a north facing slope and also in the area of Mile 42.5 where the alignment traverses a short north facing slope. In both cases, treatment similar to that used in construction to date (as outlined previously), should be sufficient to eliminate any problems. Construction in the sections where muskeg is likely to be encountered, including Miles 38.0 to 38.5 and a small area at Mile 43, should be preferably be carried out after freeze-up. However, should it be required by scheduling constraints, construction in these areas prior to freeze-up with minimal terrain disturbance, could be made feasible through the use of geotextiles.

There are 14 stream crossings in this portion of the route, most of which involve minor water courses. Annual maintenance over this section of the alignment will probably be limited to the repair of small washouts and minor stability failures.

4.3 General Construction Comments and Recommendations

A significant portion of the proposed route involves cut and/or fill construction. As a general rule, in the interests of stability, the roadway should not be placed on sidehill fills if the natural gradient transverse to the roadway alignment is in excess of approximately 3 horizontal to 1 vertical. Fill slopes, where they are used, should be no steeper than 2 horizontal to 1 vertical transverse to the roadway. In areas where the excavated materials contain excess water or ice these criteria will, of necessity, be made more conservative.

Measures must be taken to assure that rain and melt walter have access to the downslope side of the roadway so that stability of cuts and fills is not reduced by a build-up of pore water pressures due to ponding of water on the road surface or at the toes of road cut backslopes. We, therefore, recommend that all cut and/or fill sections be graded to a minimum crossfall of 2 per cent and that ditches be excavated at the backslope edge of all sidehill cuts. These ditches should drain to cross-road culverts with outfalls constructed so as not to erode the fill slope and subsequently undercut the roadway.

Roadway construction over muskeg areas or areas which are underlain by highly frost susceptible soils should be undertaken during the winter season after freeze-up so that the risk of environmental damage due to roadway construction are minimized. Construction could, if necessary, be carried out prior to freeze-up without adverse environmental effects using geotextile support media to separate the road fill from the subsoil and reinforce the road base.

Overall supervision of roadway construction throughout its length should be carried out by a geotechnical engineer experineced with construction in permafrost soils.

We trust that this report provides the information you require at this time. If you have any questions, please do not hesitate to contact us.

Yours very truly,

GOLDER ASSOCIATES

E.B. Fletcher, P. Eng.

D.J. Shirley

EBF/DJS/ba

802-1073

TABLE 1

FINAL SURVEYED ROUTE DETAILS

Mile[1]	Elevation[2] (ft.)	Average Grade[3] (%)	Stream Crossings	Comments
0	2877			Mine Site.
		+0.9	0	Road on Prairie Creek flood-plain to Mile 4.5.
1	2975			
		+0.7	0	
2	2961			
		+0.8	0	
3	3003			
		+0.8	1	
4	3043			
		+1.9	0	Mile 4.5 - road enters "North" valley, road on valley bottom to Mile 7.2.
5	3143			
		+3.4	6	
6	3323			
		+3.7	7	
7	3519			
		+7.8	3	Mile 7.2 - road on sidehill cut on south valley wall to Mile 9.9.
8	3929			
		+8.4	2	
9	4370			
		+8.4	1	Mile 9.9 - road on sidehill cut on north valley wall to Mile 10.3.
10	4816			
		+8.0/-7.3	0	Mile 10.3 - road summit at 4,994 ft. road on north side valley bottom to Mile 12.6.
11	4771			
		-7.1	0	
12	4395			
		-4.7	1	Mile 12.6 - road on south side valley bottom to Mile 15.5.
13	4147			
		-4.8	0	
14	3895			
		-6.2/+3.2/-6.0	1	
15	3726			
		-4.1/+5.9/-8.2	2	Mile 15.5 - road on sidehill cut on north valley wall to Mile 19.0.

TABLE 1 (Cont'd)

FINAL SURVEYED ROUTE DETAILS

Mile[1]	Elevation[2] (ft.)	Average Grade[3] (%)	Stream Crossings	Comments
16	3587			
		-4.5	0	
17	3349			
		-2.5	0	
18	3215			
		-2.4	2	
19	3090			
		-2.1	0	Mile 19.0 - road on Sundog Creek tributary floodplain to Mile 25.0.
20	2977			
		-1.9	0	
21	2875			
		-2.0	2	
22	2768			
		-1.5	0	
23	2690			
		-1.3	1	
24	2624			
		-1.2	1	
25	2561			
		+3.5	0	Mile 25.0 - road in bush to Mile 53.9.
26	2746			
		-0.3	1	
27	2731			
		+0.9	0	
28	2779			
		-3.8	1	Mile 28.5 to 31.5 - permafrost area.
29	2577			
		-1.4	1	
30	2502			
		-0.9/+8.3	1	Mile 30.5 - switchback required.
31	2829			
		+3.1	0	
32	2993			
		+1.2	0	
33	3054			
		+0.5/-3.9	0	
34	3021			
		-4.3	0	
35	2795			
		-5.3	0	

TABLE 1 (Cont'd)

FINAL SURVEYED ROUTE DETAILS

Mile[1]	Elevation[2] (ft.)	Average Grade[3] (%)	Stream Crossings	Comments
36	2513			
		+7.0	0	
37	2884			
		-0.4	0	
38	2862			
		+5.5	2	Mile 38.0 to 38.5 - muskeg area.
39	3150			
		+4.6/-2.7	0	
40	3109			
		-5.8/+3.1	1	
41	3156			
		-0.1	0	
42	3152			
		0.0	0	Mile 42.5 - permafrost area.
43	3151			
		+2.9/-5.4	0	Mile 43.0 - muskeg area.
44	3122			
		-3.1	0	
45	2960			
		+1.9	0	
46	3059			
		-2.3	0	
47	2936			
		-3.6	0	
48	2744			
		-1.4	0	
49	2671			
		-5.4	0	
50	2386			
		-3.6	0	
51	2195			
		-13.7	0	Mile 51.5 - switchback required.
52	1474			
		-4.4	0	
53	1243			
		-6.4	3	
53.9	934			Mile 53.9 - end of survey traverse.

(1) Mileages along survey traverse.
(2) Elevations at survey station nearest to mileage point.
(3) Grade along survey traverse averaged over mile.

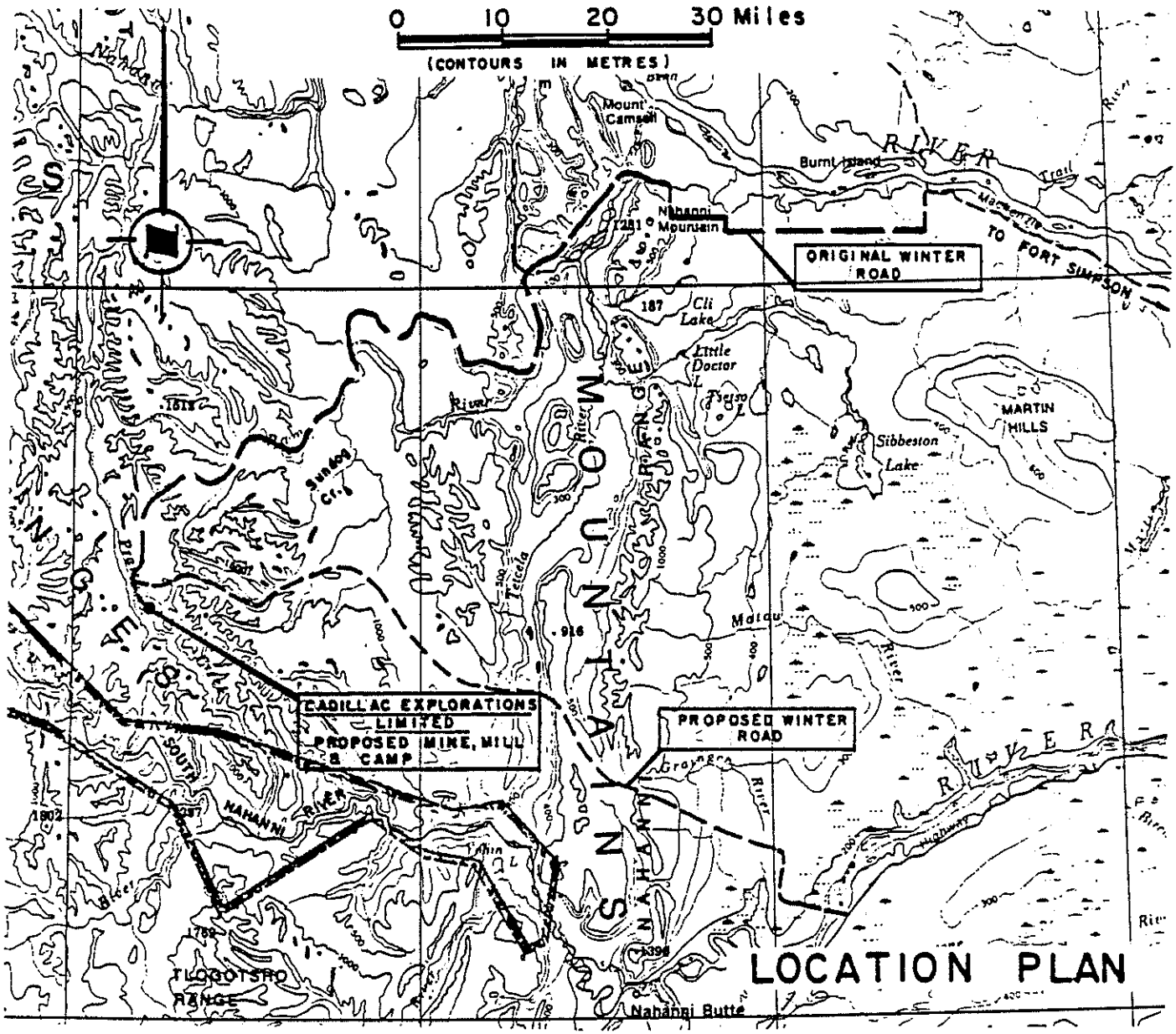
TABLE 2

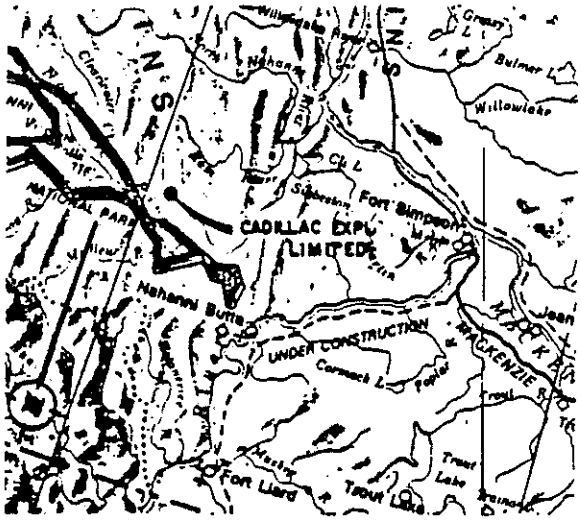
GRADE BREAKDOWN FOR FINAL SURVEYED ROUTE (MILE 0.0 TO MILE 53.9)
(MEASURED FROM MINE SITE)

Grade	Per Cent of Route	Comments
over +5%	11.9%	Upgrade for loaded trucks from mine.
+5% to +2%	11.0%	
+2% to -2%	37.0%	
-2% to -5%	27.1%	Upgrade for empty trucks to mine.
over -5%	13.0%	

LOCATION PLAN AND KEY PLAN

Figure 1





KEY PLAN

Golder Associates

PROJECT No. 802-1023 DRAWN BY [illegible] DATE May/80

Figure 4: Looking east, Mile 7.2 to Mile 9.0 under construction (27/07/80). Km 11.5 - 14.5

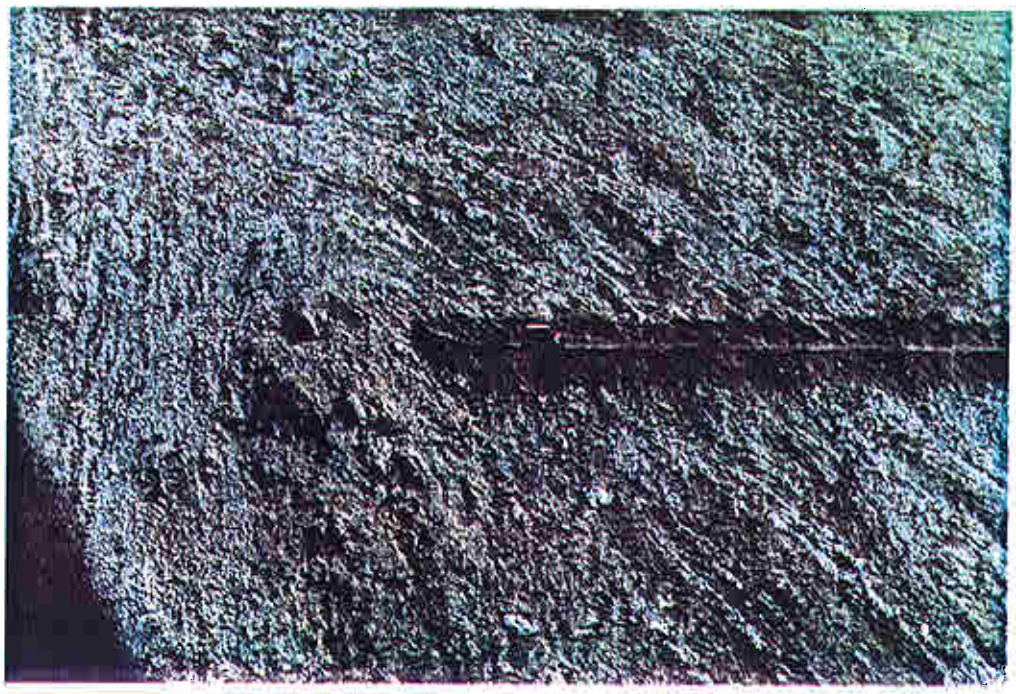


Figure 5: Looking south, Mile 9.0 under construction (27/07/80). Km 14.5

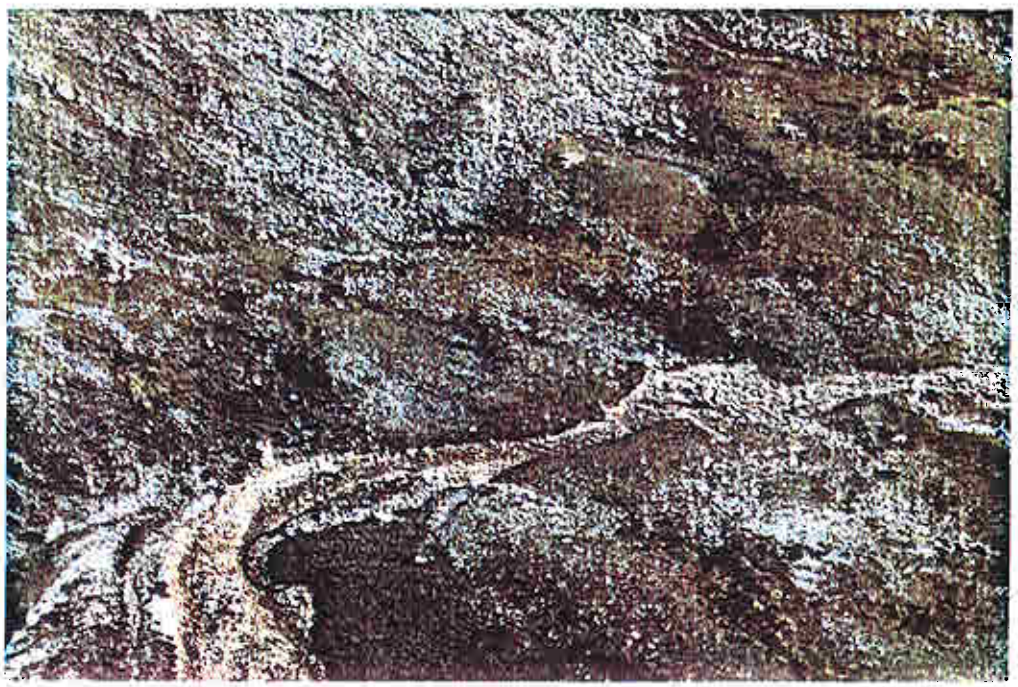


Figure 6: Looking south, Mile 9.9 before road construction (27/07/80). Km 15.8

Figure 7: Looking south, Mile 9.9 after road consutruction (26/08/80). Note point of reference.

Figure 8: Looking west, Mile 10.3 before road construction (27/07/80). Km 16.5

Figure 9: Looking west, Mile 10.3 after road construction (26/08/80). Note point of reference. Km 16.5

Figure 10: Looking northwest, stream crossing at Mile 12.6 (26/08/80).

Km 20.2

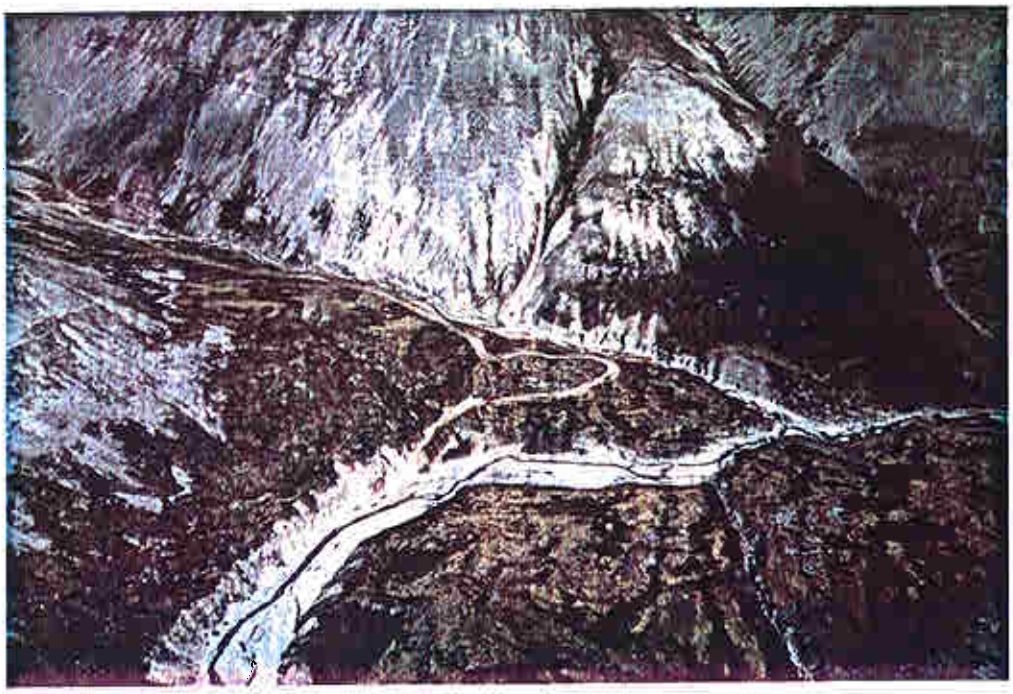


Figure 11: Looking north, Mile 14 to Mile 14.5 under construction (28/08/80).

Km 22.4 - 23.0

TABLE 1

can test ltd.

1650 PANDORA STREET, VANCOUVER, B.C. V5L 1L6 • TELEPHONE 254-7278
Telex 04-54210

To:

B. C. Research,

3650 Wesbrook Mall,

Vancouver, B. C.

Attention: Mr. Stu Ballentyne.

SEMI QUANTITATIVE SPECTROGRAPHIC ANALYSIS CERTIFICATE

File No. 5789 D-2

P.O. 4261
CC: Ker Priestman

Date June 2,1980

We hereby Certify that the following are the results of semi quantitative spectrographic analysis made on tailings samples submitted.

		1	2			1	2
Aluminum	Al	2.		Cerium	Ce	ND	
Antimony	Sb	ND		Cesium	Cs	ND	
Arsenic	As	ND		Dysprosium	Dy	ND	
Barium	Ba	TRACE		Erbium	Er	ND	
Beryllium	Be	ND		Europium	Eu	ND	
Bismuth	Bi	ND		Gadolinium	Gd	ND	
Boron	B	ND		Hafnium	Hf	ND	
Cadmium	Cd	ND		Holmium	Ho	ND	
Calcium	Ca	2.+		Indium	In	ND	
Chromium	Cr	ND		Lanthanum	La	ND	
Cobalt	Co	ND		Lithium	Li	ND	
Copper	Cu	0.1		Lutetium	Lu	ND	
Gallium	Ga	ND		Neodynium	Nd	ND	
Gold	Au	TRACE		Praseodymium	Pr	ND	
Iron	Fe	1.		Rubidium	Rb	ND	
Lead	Pb	*		Samarium	Sm	ND	
Magnesium	Mg	2.+		Scandium	Sc	ND	
Manganese	Mn	0.07		Selenium	Se	ND	
Molybdenum	Mo	ND		Tellurium	Te	ND	
Niobium	Nb	ND		Terbium	Tb	ND	
Nickel	Ni	ND		Thallium	Tl	ND	
Potassium	K	ND		Thullium	Tm	ND	
Silicon	Si	MATRIX		Ytterbium	Yb	ND	
Silver	Ag	0.001		Yttrium	Y	ND	
Sodium	Na	ND		Zirconium	Zr	ND	
Strontium	Sr	0.01		Iridium	Ir	ND	
Tantalum	Ta	ND		Osmium	Os	ND	
Thorium	Th	ND		Palladium	Pd	ND	
Tin	Sn	ND		Platinum	Pt	ND	
Titanium	Ti	0.07		Rhenium	Re	ND	
Tungsten	W	ND		Rhodium	Rh	ND	
Uranium	U	ND		Ruthenium	Ru	ND	
Vanadium	V	0.005					
Zinc	Zn	*					

Sample Identification

Sample 1: K.P. Cadillac # 2

Sample 2:

Percentages of the various elements expressed in these analyses may be considered accurate to within plus or minus 35 to 50% of the amount present.

Semi-quantitative spectrographic analytical results for gold and silver are normally not of sufficient degree of precision to enable calculation of the true value of ores. Therefore, should exact values be required, it is recommended that these elements be assayed by the conventional Fire Assay Method. Quantitative and Fire Assays may be carried out on the retained pulp samples.

Silicon, aluminum, magnesium calcium and iron are normal components of complex silicates.

MATRIX — Major constituent
MAJOR — Above normal spectrographic range
TRACE — Detected but minor amounts
N D — Not detected
* — Suggest assay (above 0.3%)

All results expressed as Percent

Note Pulps retained one week

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CAN TEST LTD.

F. R. Burgess

Spectros...

TABLE 2

can test ltd.

1650 PANDORA STREET, VANCOUVER, B.C. V5L 1L6 • TELEPHONE 254-7278
Telex 04-507737

To:

Kamloops Research & Assay Lab.

2095 West Trans Canada Highway

Kamloops, B.C.

V1S 1A7

SEMI QUANTITATIVE SPECTROGRAPHIC ANALYSES CERTIFICATE

File No. 7554D

Note: this table has been modified by addition of chemical analysis results for specific metals (KPA)

Date Sept. 9/8(

We hereby Certify that the following are the results of semi quantitative spectrographic analyses made on ORE samples submitte

		1	Chemical Analysis (%)
Aluminum	Al	3.	
Antimony	Sb	ND	
Arsenic	As	ND	.0292
Barium	Ba	0.05	
Beryllium	Be	ND	
Bismuth	Bi	ND	
Boron	B	ND	
Cadmium	Cd	ND	.0253
Calcium	Ca	2.+	
Chromium	Cr	ND	
Cobalt	Co	ND	.0030
Copper	Cu	0.1	.13
Gallium	Ga	ND	
Gold	Au	TRACE	
Iron	Fe	3.	
Lead	Pb	*	1.85
Magnesium	Mg	2.+	
Manganese	Mn	0.07	.0626
Molybdenum	Mo	ND	
Niobium	Nb	ND	
Nickel	Ni	ND	.0013
Potassium	K	ND	
Silicon	Si	MATRIX	
Silver	Ag	TRACE	
Sodium	Na	ND	
Strontium	Sr	0.01	.0073
Tantalum	Ta	ND	
Thorium	Th	ND	< .0002
Tin	Sn	ND	
Titanium	Ti	0.3	.09
Tungsten	W	ND	
Uranium	U	ND	.00032
Vanadium	V	TRACE	.0049
Zinc	Zn	*	3.30
Phosphorus	P	ND	
Mercury			.0073

Sample Identification

Sample 1: FINAL TAILS COMPOSI
KN 019

Percentages of the various elements expressed in these analyses may be considered accurate to within plus or minus 35 to 50% of the amount present.

Semi-quantitative spectrographic analytical results for gold and silver are normally not of a sufficient degree of precision to enable calculation of the true value of ores. Therefore, should exact values be required, it is recommended that these elements be assayed by the conventional Fire Assay Method. Quantitative and Fire Assays may be carried out on the retained pulp samples.

Silicon, aluminum, magnesium, calcium and iron are normal components of complex silicates.

MATRIX – Major constituent
MAJOR – Above normal spectrographic range
TRACE – Detected but minor amounts
N.D. – Not detected
* – Suggest assay (above 0.3%

All results expressed as PERCENT

Note: Pulps retained one week.

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CAN TEST LTD.

C. F. C. Bruggen

Spectroscopis

Form No 121

Table 3

CLIMATOLOGICAL STATION DATA CATALOGUE

Station Number	Station Name (+ Indicates part of record under another name.)	Province	Latitude ° '	Longitude ° '	Elevation (feet)	Periods with no change in program, location or name (*indicates summer only) Began year mo.	Ended year mo.	OBSERVING PROGRAMME: Synoptic Report	Hourly Weather	Temperature	Precipitation	Rate of Rainfall	Wind Mileage	Soil Temperatures	Evaporation	Sunshine	Radiation	Ozone	Upper Air	Snow Survey	Tower	Air Quality	1	2	3	4	Agency
2100610	FRANCES LAKE	YT	61 17	129 24	2425	1941 10	1947 09	X	P	X	X		B														MW
2100610	FRANCES LAKE	YT	61 17	129 24	2425	1947 10	1948 05	X	P	X	X																MW
2100610	FRANCES LAKE	YT	61 17	129 24	2425	1948 09	1949 05			X	X																MW
2100612	FRANCES RIVER	YT	60 29	129 08	2274	1973 10						S															W
2101200	WATSON LAKE A	YT	60 07	128 49	2248	1938 10	1938 10	X	P	X	X																MW
2101200	WATSON LAKE A	YT	60 07	128 49	2248	1938 11	1942 02	X	P	X	X		B														MW
2101200	WATSON LAKE A	YT	60 07	128 49	2249	1942 04	1964 11	X	X	X	X		B														MW
2101200	WATSON LAKE A	YT	60 07	128 49	2248	1964 12	1966 12	X	X	X	X		D							V							MW
2101200	WATSON LAKE A	YT	60 07	128 49	2248	1967 01	1969 05	X	X	X	X									V							MW
2101200	WATSON LAKE A	YT	60 07	128 49	2248	1969 06	1969 09	X	X	X	X					S				V							MW
2101200	WATSON LAKE A	YT	60 07	128 49	2240	1969 10		X	X	X	X	X		D		S				V							MW
2200597	CADILLAC MINE	NWT	61 32	124 45	2850	1970 01	1970 11			X	X																MW
2200620	CAN-TUNG	NWT	62 01	128 21	6000	1973 10						S															W
2202098	FORT SIMPSON	NWT	61 52	121 13	572	1943 03	1943 07	X	P	X	X																MW
2202098	FORT SIMPSON	NWT	61 52	121 13	572	1944 02	1946 07	X	P	X	X																MW
2202099	FORT SIMPSON	NWT	61 52	121 35		1875 05	1875 11			X																	MW
2202099	FORT SIMPSON	NWT	61 52	121 35		1876 11	1877 03			X																	MW
2202099	FORT SIMPSON	NWT	61 52	121 35		1877 12	1878 03			X																	MW
2202099	FORT SIMPSON	NWT	61 52	121 35		1878 10	1879 05			X																	MW
2202099	FORT SIMPSON	NWT	61 52	121 35		1895 11	1895 12			X	X																MW
2202099	FORT SIMPSON	NWT	61 52	121 35		1897 03	1902 12			X	X																MW
2202099	FORT SIMPSON	NWT	61 52	121 35		1903 05	1904 06			X	X																MW
2202099	FORT SIMPSON	NWT	61 52	121 35		1905 01	1908 06			X	X																MW
2202099	FORT SIMPSON	NWT	61 52	121 35		1908 07	1921 06	X	P	X	X																MW
2202099	FORT SIMPSON	NWT	61 52	121 35		1922 09	1927 10	X	P	X	X																MW

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(Table 3 - cont'd)

CLIMATOLOGICAL STATION DATA CATALOGUE

Station Number	Station Name (+ Indicates part of record under another name.)	Province	Latitude ° ′	Longitude ° ′	Elevation (feet)	Periods with no change in program, location or name (*indicates summer only) Began year mo.	Ended year mo.	OBSERVING PROGRAMME: Synoptic Report	Hourly Weather	Temperature	Precipitation	Rate of Rainfall	Wind Mileage	Soil Temperature	Evaporation	Sunshine	Radiation	Ozone	Upper Air	Snow Survey	Tower	Air Quality	1	2	3	4	Region
2202100	FORT SIMPSON	NWT	61 52	121 21	422	1927 06	1952 01	X	B	X	X																W
2202100	FORT SIMPSON	NWT	61 52	121 21	422	1952 02	1952 08	X	B	X	X					S											W
2202100	FORT SIMPSON	NWT	61 52	121 21	422	1952 09	1952 12	X	B	X	X		B			S											W
2202100	FORT SIMPSON	NWT	61 52	121 21	422	1953 01	1954 02	X	B	X	X		B														W
2202100	FORT SIMPSON	NWT	61 52	121 21	422	1954 03	1955 03	X	B	X	X		B				A										W
2202100	FORT SIMPSON	NWT	61 52	121 21	422	1955 04	1963 10	X	X	X	X		B			S	A										W
2202100	FORT SIMPSON	NWT	61 52	121 21	432	1963 11	1964 05									S	A										W
2202100	FORT SIMPSON	NWT	61 52	121 21	432	1964 06										S											W
2202101	FORT SIMPSON A	NWT	61 45	121 14	576	1963 11	1966 10	X	X	X	X		B														W
2202101	FORT SIMPSON A	NWT	61 45	121 14	576	1966 10	1966 12	X	X	X	X		B							V							W
2202101	FORT SIMPSON A	NWT	61 45	121 14	576	1967 01	1969 05	X	X	X	X									V							W
2202101	FORT SIMPSON A	NWT	61 45	121 14	576	1969 05		X	X	X	X	X								V		B					W
2202723	NAHANNI BUTTE	NWT	61 05	123 23	4500	1974 06 *				X	X																W
2202725	NAHANNI HOT SPRINGS	NWT	61 15	124 02	2000	1973 08						S															W
2202727	NAHANNI VALLEY	NWT	61 03	123 22	700	1974 05				X	X																W
2203922	TUNGSTEN	NWT	61 57	128 15	3750	1966 10	1975 06			X	X																W
2203922	TUNGSTEN	NWT	61 57	128 15	3750	1975 06				X	X	X	B														W
2203943	VIRGINIA FALLS	NWT	61 38	125 48	2000	1973 08						S															W
2204000	WRIGLEY A	NWT	63 12	123 25	511	1943 08	1946 09	X	P	X	X																W
2204000	WRIGLEY A	NWT	63 12	123 25	511	1946 10	1946 10		P																		W
2204000	WRIGLEY A	NWT	63 12	123 25	511	1947 06	1947 10	X	P	X	X																W
2204000	WRIGLEY A	NWT	63 12	123 25	511	1948 07	1950 09	X	P	X	X																W
2204000	WRIGLEY A	NWT	63 12	123 25	511	1950 10	1952 10			X	X																W
2204000	WRIGLEY A	NWT	63 12	123 25	511	1953 03	1955 09			X	X																W
2204000	WRIGLEY A	NWT	63 12	123 25	511	1955 10	1956 12		D	X	X																W
2204000	WRIGLEY A	NWT	63 12	123 25	511	1957 01	1957 06		D	X	X		B														W
2204000	WRIGLEY A	NWT	63 12	123 25	511	1957 07	1958 04		D	X	X																W
2204000	WRIGLEY A	NWT	63 12	123 25	511	1958 05			D	X	X		B														W

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TABLE 4

CLIMATIC SUMMARIES

Station		Month												Year
		J	F	M	A	M	J	J	A	S	O	N	D	
Cadillac*	T	-14	-3	8	25	40	51	55	52	41	24	2	-5	23
	R	0	0	0	.1	1.0	2.3	3.4	2.8	1.9	.3	0	0	11.8
	P	.9	.9	.8	1.0	1.6	2.3	3.4	2.8	2.3	1.9	1.2	.9	20.0
	E	-	-	-	-	< 1	3	4	3	2	< 1	-	-	13
Tungsten	T	-14	0	8	22	37	49	51	48	38	23	4	-4	22
	R	0	0	0	0	1.1	2.3	3.4	2.8	2.0	.2	0	0	11.8
	P	1.3	1.2	1.1	1.6	1.7	2.3	3.4	2.8	2.4	2.4	1.8	1.1	23.1
Fort Simpson	T	-21	-10	5	29	47	58	62	58	45	28	3	-12	24
	R	0	0	0	.1	.9	1.6	1.8	2.1	1.0	.3	0	0	6.8
	P	.8	.7	.7	.6	1.2	1.6	1.8	2.1	1.2	1.1	1.0	.8	13.6
Watson Lake	T	-17	-5	11	30	44	54	58	55	45	32	4	-9	25
	R	0	0	0	.1	.8	1.9	2.1	1.8	1.6	.6	.1	0	9
	P	1.4	1.1	.9	.7	.9	1.9	2.1	1.8	1.7	1.4	1.5	1.6	17

Legend

T - Mean daily temperature ^{o}F

R - Monthly rainfall, inches

P - Monthly total precipitation, inches

E - Monthly lake evaporation, inches

* Estimated or derived.

Table 5 Surface Water Data - Reference Index

NORTHWEST TERRITORIES

STATION NO.		DRAINAGE AREA (km^2)	GAUGE LOCATION	DISCHARGE RECORDS (*-STAGE ONLY #-MISC.MEAS.) TYPE OF GAUGE . OPERATION	REMAR
10FA002	. TROUT RIVER AT FORT SIMPSON HIGHWAY	9 090	61 08 00 119 49 30	69-79 RC	6 N
10FB005	. JEAN-MARIE RIVER AT FORT SIMPSON HIGHWAY	1 310	61 27 00 121 15 00	72-73 MR 74-79 MC	N
10ED001	. LIARD RIVER AT FORT LIARD	222 000	60 14 35 123 28 45	42-58*MS 59 MS 60-62 MC 63-64 MS 65 MC 66-79 RC	7 5 N
10ED002	. LIARD RIVER NEAR THE MOUTH	277 000	61 44 50 121 13 25	72-79 RC	6 N
10ED004	. . RABBIT CREEK AT FORT LIARD HIGHWAY	120	60 27 45 123 28 15	78-79 RC	N
10EB001	. . SOUTH NAHANNI RIVER ABOVE VIRGINIA FALLS	14 600	61 38 00 125 48 00	60-63 RS 64-65 RC 66-67 RS 68-79 RC	7 N
10EC001	. .-SOUTH NAHANNI RIVER NEAR HOT SPRINGS	33 400	61 15 10 124 02 10	59-62 RS 63-79 RC	5 N
10EB002	. . . . MAC CREEK NEAR THE MOUTH	214	62 12 00 128 45 10	78-79 RC	N
10EA002	. . . FLAT RIVER AT CANTUNG CAMP	152	61 57 40 128 13 00	59 # 60-62 MS 63 # 73-79 RC	5 N
10EA003	. . . FLAT RIVER NEAR THE MOUTH	8 500	61 32 00 125 24 20	60-65 RC 66-71 RS 72-79 RC	5 N
10EC002	. . . PRAIRIE CREEK AT CADILLAC MINE	495	61 33 40 124 48 25	74-79 RC	N
10ED003	. . BIRCH RIVER AT FORT LIARD HIGHWAY	505	61 20 10 122 05 20	74-79 RC	N
10GC002	. HARRIS RIVER NEAR THE MOUTH	570	61 52 41 121 17 36	72 R# 73-79 RC	6 N
10GC003	. MARTIN RIVER NEAR THE MOUTH	2 040	61 53 10 121 37 05	72-79 RC	6 N
10GA001	. ROOT RIVER NEAR THE MOUTH	9 840	62 28 40 123 25 45	74 RS 75-79 RC	7 N
10HB003	. WRIGLEY RIVER NEAR THE MOUTH	1 260	63 14 15 123 36 20	76-79 RC	N
10HB001	. REDSTONE RIVER NEAR THE MOUTH	15 400	63 55 37 125 18 07	63-64 RC 65-70 RS 71-79 RC	5 N
10HA002	. . TSICHU RIVER AT CANOL ROAD	222	63 18 10 129 47 30	75-79 RC	N
10AA001	. LIARD RIVER AT UPPER CROSSING	33 400	60 03 00 128 54 00	60-76 MC 77-79 RC	5 N
10AB001	. . FRANCES RIVER NEAR WATSON LAKE	12 800	60 28 26 129 07 08	62 MR 63-79 RC	5 N
10AD003	. . . KING CREEK AT KILOMETRE 20.9 NAHANNI RANGE ROAD	13.7	60 56 50 128 55 40	75-79 RC	N
10AA002	. . TOM CREEK AT KILOMETRE 34.9 ROBERT CAMPBELL HIGHWAY	435	60 17 26 129 01 14	74-79 RC	N
10AD002	. . HYLAND RIVER AT KILOMETRE 108.5 NAHANNI RANGE ROAD	2 150	61 29 00 128 14 10	76-79 MC	N
10RD001	. . BEAVER RIVER BELOW WHITEFISH RIVER	7 280	60 07 52 124 53 21	77-79 RC	N

M - MANUAL GAUGE
R - RECORDING GAUGE

C - CONTINUOUS OPERATION
S - SEASONAL OPERATION

5 - WATER QUALITY DATA AVAILABLE

7 - SATELLITE DATA COLLECTION PLATFORM INSTALLED

NAT - NATURAL FLOW
REG - REGULATED SINCE 19 . (YEAR SHOWN IF KNOWN

TABLE 6

1980 SURFACE WATER QUALITY DATA

Station	Station No. 1 Prairie Creek Near Airstrip						Station No. 2 Prairie Creek Below Harrison Creek						Station No. 3 Harrison Creek Near Mouth					
Date of Sampling (mg/l unless noted)	18/4/80		22/7/80				18/4/80		22/7/80				18/4/80		22/7/80			
Total Alkalinity	199		161				199		193				133		189			
Conductivity	476		354				487		360				405		472			
pH	8.1		8.4				8.1		8.4				7.9		8.5			
Filtrable Residue	301		221				320		218				267		313			
Nonfiltrable Residue	4		3				2		<1				13		<1			
Sulfate	60	D	35				68	D	37				75	D	77			
Arsenic	T <0.005	T	<0.005	D	<0.005		T <0.005	T	<0.005	D	<0.005		T <0.005	T	<0.005	D	<0.005	
Cadmium	T <0.005	T	<0.005	D	<0.005		T <0.005	T	<0.005	D	<0.005		T <0.005	T	<0.005	D	<0.005	
Calcium	T 36			D	47		39			D	48		32			D	56	
Chromium	T <0.01	T	<0.01	D	<0.01		T <0.01	T	<0.01	D	<0.01		T <0.01	T	<0.01	D	<0.01	
Copper	T 0.005	T	0.006	D	<0.005		T <0.005	T	0.005	D	<0.005		T <0.005	T	<0.005	D	<0.005	
Iron	T 0.065	T	0.030	D	0.021		T 0.055	T	0.016	D	0.012		T 0.42	T	0.010	D	0.010	
Lead	T <0.01	T	0.039	D	0.042		T <0.01	T	0.034	D	0.035		T 0.011	T	0.042	D	0.040	
Magnesium	T 26			D	17		T 25			D	17		T 21			D	28	
Nickel	T 0.015	T	0.011	D	<0.010		T 0.015	T	<0.010	D	<0.010		T 0.015	T	0.010	D	<0.010	
Potassium	T 0.71			D	0.61		T 0.50			D	0.45		T 0.91			D	0.73	
Sodium	T 1.7			D	1.8		T 1.6			D	1.1		T 0.78			D	0.06	
Zinc	T <0.005	T	0.024	D	0.009		T 0.031	T	0.010	D	0.005		T 0.14	T	0.009	D	0.006	
Molybdenum	T <0.05	T	0.002	D	0.002		T <0.05	T	0.002	D	0.002		T <0.05	T	0.002	D	0.003	
Nitrate	-		0.16				-		0.18				-		0.37			
Mercury	-	T	<0.00025	D	<0.00025		-	T	<0.00025	D	<0.00025		-	T	<0.00025	D	<0.00025	

T = Total D = Dissolved

TABLE 7

1980 GROUND WATER QUALITY DATA

Station	Station No. W1	Station No. 3		Station No.7	Station No.10
	Mine Camp Well	Bore Hole #3 Surface Gravel	Bore Hole #3 Gravel Below Clay	Bore Hole #7	Bore Hole #10
Date of Sampling (mg/l unless noted)	22/7/80	28/8/80	28/8/80	28/8/80	28/8/80
Total Alkalinity	162	167	192	383	214
Conductivity	362	367	460	883	625
pH	8.2	7.8	7.7	7.2	7.4
Filterable Residue	-	245	293	611	443
Sulfate D	39	48	34	140	140
Arsenic D	<0.005	<0.005	<0.005	<0.005	<0.005
Cadmium D	<0.005	<0.005	<0.005	<0.005	0.005
Calcium D	46	55	76	130	81
Chromium D	<0.01	<0.01	<0.01	<0.01	<0.01
Copper D	<0.029	<0.005	<0.008	<0.005	<0.005
Iron D	<0.024	0.040	0.030	1.3	0.040
Lead D	<0.039	<0.010	0.010	0.029	0.010
Magnesium D	18	19	21	49	35
Nickel D	<0.010	0.021	0.015	0.029	0.021
Potassium D	0.57	1.1	1.1	1.2	0.9
Sodium D	1.3	3.7	2.2	1.7	0.9
Zinc D	0.023	0.020	0.078	0.17	0.76
Molybdenum D	0.002	0.0032	0.0033	0.0022	0.0023
Nitrate D	0.28	0.13	0.15	<0.05	0.75
Mercury D	<0.00025	0.00082	0.00061	0.00075	0.00078

D = Dissolved

TABLE 8

1980 MINE WATER QUALITY DATA

Station	Station No. 1 Portal @ 3050 Ft. Level			Station No. 2 Portal @ 2850 Ft. Level		
Date of Sampling	18/4/80			22/7/80		
Total Alkalinity	262			262		
Conductivity	752			831		
pH	8.3			8.0		
Filtrable Residue	540			629		
Nonfiltrable Residue	4			386		
Sulfate	180			220		
Arsenic	T	0.024	T	0.002	D	0.008
Cadmium	T	<0.005	T	0.031	D	0.012
Calcium	T	65			D	88
Chromium	T	<0.01	T	<0.01	D	<0.01
Copper	T	0.005	T	0.086	D	0.025
Iron	T	<0.01	T	4.2	D	0.044
Lead	T	<0.01	T	0.27	D	0.10
Magnesium	T	43			D	44
Nickel	T	0.007	T	0.057	D	0.028
Potassium	T	1.2			D	1.87
Sodium	T	0.38			D	2.1
Zinc	T	0.15	T	7.7	D	4.0
Molybdenum	T	<0.05	T	<0.020	D	0.002
Nitrate		-				1.9
Mercury		-	T	0.0035	D	<0.00025

T = Total D = Dissolved

TABLE 9

1980 STREAM SEDIMENT ANALYSIS

Station	Station No. 1 Prairie Creek Near Airstrip	Station No. 2 Prairie Creek Downstream
Date of Sampling	22/7/80	22/7/80
Micrograms per gram (Dry Basis)*		
Total Arsenic	5.6	5.2
Total Calcium	160,000	160,000
Total Cadmium	3.8	3.8
Total Chromium	11	11
Total Copper	14	14
Total Iron	8,000	9,700
Total Lead	56	48
Total Magnesium	28,000	30,000
Total Mercury	<0.050	0.058
Total Molybdenum	<5.0	<4.5
Total Nickel	29	32
Total Sodium	220	200
Total Zinc	93	120

* Analyses performed on the Minus 16 Mesh size fraction.

TABLE 10 Summary, Benthic Invertebrate Data, July, 1980 (near minesite).

Parameter	STATION*				
	Prairie Crk. M1	Prairie Crk. M2	Harrison Crk. M3	Prairie Crk. M4	Prairie Crk. M5
% Group 3	86	86	63	35	41
% Group 2	14	14	34	64	59
% Group 1	0	0	3	1	0
Mean No./m^2					
Group 3	134	81	210	75	142
Group 2	22	13	113	137	207
Group 1	0	0	11	3	0
Total	156	94	334	215	349
Dominance	0.76	0.76	0.51	0.53	0.52
Diversity (*H*)	2.44	2.13	3.49	2.38	1.70
Total No. Taxa	14	8	20	12	7
Richness	2.57	1.54	3.27	2.05	1.02
Equitability	0.64	0.71	0.81	0.66	0.61
TU Data:					
TU Index	0.6703	0.6684	0.8791	0.7539	0.5987
Variance	0.2376	0.2013	0.0242	0.0409	0.1751

* See Figure 21. All stations sampled with Surber Sampler.

TABLE 11 Summary, Benthic Invertebrate Data, July, 1980 (Prairie Ck. & Ram River tributaries)

Parameter	STATION* Prairie Creek Tributary	Ram River Tributary 1	Ram River Tributary 2
% Group 3	51	5	61
% Group 2	49	95	39
% Group 1	0	0	0
Mean No./m^2			
Group 3	301	56	59
Group 2	288	1148	38
Group 1	0	0	0
Total	589	1204	97
Dominance	0.50	0.91	0.52
Diversity (*H*)	2.02	0.60	2.60
Total No. Taxa	13	13	9
Richness	1.88	1.69	1.75
Equitability	0.54	0.16	0.82
TU Data:			
TU Index	0.6496	0.1332	0.8015
Variance	0.0982	0.2199	0.0445

* Prairie Creek Tributary - Site R1
Ram River Tributary 1 - Site R2
Ram River Tributary 2 - Site R3

All stations sampled with Surber Sampler.

TABLE 12 Summary, Benthic Invertebrate Data, July, 1980 (Tetcela River)

Parameter	STATION* Tetcela R. 1	Tetcela R. 2	Tetcela R. 3	Tetcela R. 4
% Group 3	84	67	35	64
% Group 2	16	33	65	18
% Group 1	0	0	0	18
Mean No./m^2				
Group 3	43	22	16	11
Group 2	8	11	30	3
Group 1	0	0	0	3
Total	51	33	46	17
Dominance	0.74	0.56	0.55	0.48
Diversity (*H*)	1.78	1.55	2.46	2.25
Total No. Taxa	5	4	8	5
Richness	1.02	0.86	1.83	1.44
Equitability	0.77	0.78	0.82	0.97
TU Data:				
TU Index	0.6499	0.6021	0.7713	0.8292
Variance	0.1351	0.1665	0.0948	0.0247

* Tetcela River 1 - Site R4 ; upstream of confluence with tributary and upstream of road crossing;

Tetcela River 2 - Site R4 ; upstream of confluence with tributary and downstream of road crossing;

Tetcela River 3 - Site R5 ; downstream of confluence with tributary and upstream of road crossing;

Tetcela River 4 - Site R5 ; downstream of confluence with tributary and downstream of road crossing;

All stations sampled with Surber Sampler

TABLE 13 Summary, Benthic Invertebrate Data, July, 1980 (Fishtrap Creek & Grainger River)

Parameter	STATION* Fish Trap Creek	Grainger River 1	Grainger River 2
% Group 3	6	50	24
% Group 2	60	43	75
% Group 1	34	7	1
Mean No./m^2			
Group 3	217	54	97
Group 2	2359	46	304
Group 1	1348	8	3
Total	3924	108	404
Dominance	0.48	0.44	0.62
Diversity (*H*)	3.57	3.78	3.05
Total No. Taxa	37	18	22
Richness	4.35	3.63	3.50
Equitability	0.69	0.91	0.68
TU Data:			
TU Index	0.8395	0.9173	0.7691
Variance	0.0581	0.0116	0.1582

* Fish Trap Creek - downstream of road crossing; Site R6

Grainger River 1 - upstream of road crossing ; Site R7

Grainger River 2 - downstream of road crossing ; Site R7

Fish Trap Creek sampled with Ekman grab;
Other stations sampled with Surber sampler.

TABLE 14 Summary of Trace Metal Analyses On Dorsal Musculature Excised From Fish Collected In Prairie Creek On 23 July, 1980.

	STATION & SAMPLE			
	M1*	M5		
Parameter		1*	2	3
Fish Species	6 Slimy Sculpin	5 Slimy Sculpin	Dolly Varden Char	Dolly Varden Char
Fork Length (mm)	55 - 75	50 - 73	162	301
Weight (gm)	1.6 - 6.0	1.4 - 5.8	60	300
% Moisture	82	81	80	81
Metals (µg/g wet wt.)				
Cadmium	<2.2	<2.4	<2.5	<1.6
Copper	2.2	<2.4	<2.5	<1.6
Arsenic	<0.18	<0.20	<0.21	<0.14
Lead	<4.3	<4.8	<4.9	<3.2
Mercury	<0.050	<0.050	0.076	0.12
Zinc	4.7	7.5	<2.5	<1.6

* Sample for analyses consisted of a homogenate of all the muscle tissue excised from each of the sample groups.

Note: Detection limits varied as a result of variations in the amount of tissue available for analysis.

TABLE 15

VASCULAR PLANTS IDENTIFIED IN THE VICINITY OF THE PROPOSED MINE AND WINTER ROAD[1]

COMMON NAME[2]	SCIENTIFIC NAME
Alder	Alnus spp.
Alder sp.	Alnus rugosa
Alpine bearberry	Arctostaphylos rubra
Aspen	Populus tremuloides
Balsam poplar	Populus balsamifera
Bastard toad-flax	Geocaulon lividum
Bearberry	Arctostaphylos uva-ursi
Bistort	Polygonum viviparum
Black spruce	Picea mariana
Blue-eyed grass	Sisyrinchium montanum
Bluejoint	Calamagrostis canadensis
Bog bilberry	Vaccinium uliginosum L. ssp. alpinum
Bog cranberry	Vaccinium vitis-idaea L. ssp. minus
Bog rosemary	Andromeda polifolia
Bronze-bells	Stenanthium occidentale
Bunchberry	Cornus canadensis
Canada anemone	Anemone canadensis
Canadian buffalo-berry	Shepherdia canadensis
Cloudberry	Rubus chamaemorus
Common butterwort	Pinguicula vulgaris
Common pink wintergreen	Pyrola asarifolia
Common wild rose	Rosa woodsii
Cotton grass sp.	Eriophorum scheuchzeri
Crowberry	Empetrum nigrum
Cut-leaved anemone	Anemone multifida
Dandelion	Taraxicum sp.
Dogwood	Cornus stolonifera
Dwarf birch	Betula glandulosa
Elephant head	Pedicularis groenlandica
Eyebright	Euphrasia disjuncta
False asphodel sp.	Tofieldia glutinosa
False asphodel sp.	Tofieldia pusilla
Fescue sp.	Festuca altaica
Fireweed	Epilobium angustifolium

1 A more complete listing of vascular plants which may occur in the area is found in Scotter and Cody (1974) and Porsild and Cody (1968).

2 Common names follow Moss (1959) with supplementary information from Hulten (1968) and Anderson (1959).

TABLE 15(Continued)

COMMON NAME	SCIENTIFIC NAME
Fleabane sp.	Erigeron hyssopifolius
Four-parted gentian	Gentianella propinqua
Foxtail barley	Hordeum jubatum
Golden saxifrage	Saxifraga aizoides
Goldenrod sp.	Solidago canadensis L. var. salebrosa
Goldenrod sp.	Solidago decumbens
Grass-of-Parnassus	Parnassia palustris L. var. neogaea
Ground juniper	Juniperus communis
Hair grass	Agrostis scabra
Hairy wild rye	Elymus innovatus
Hedysarum	Hedysarum spp.
Hedysarum sp.	Hedysarum boreale Nutt. var. mackenzii
Horsetail	Equisetum spp.
Horsetail sp.	Equisetum fluviatile
Horsetail sp.	Equisetum palustre
Indian paint-brush sp.	Castilleja raupii
Jack pine	Pinus banksiana
Labrador tea	Ledum groenlandicum
Labrador tea sp.	Ledum palustre
Lapland cassiope	Cassiope tetragona
Lapland rose-bay	Rhododendron lapponicum
Lindley's aster	Aster ciliolatus
Loco-weed sp.	Oxytropis sp.
Low-bush cranberry	Viburnum edule
Meadow rue sp.	Thalictrum sp.
Milk vetch sp.	Astragalus frigidus (L.) Gray var. americanus
Milk vetch sp.	Astragalus Robbinsii var. minor
Mitrewort	Mitella nuda
Narrow-leaved hawkweed	Hieracium scabriusculum
Narrow reed grass	Calamagrostis neglecta
Netted willow	Salix reticulata L. ssp. reticulata
Northern asphodel	Tofieldia coccinea
Northern bedstraw	Galium boreale
Northern goldenrod	Solidago multiradiata
Northern green orchid	Habenaria hyperborea
Northern reed grass	Calamagrostis inexpansa
Northern single-spike sedge	Carex scirpoidea
One-flowered wintergreen	Moneses uniflora
One-sided wintergreen	Pyrola secunda
Prairie gentian	Gentiana affinis
Prickly rose	Rosa acicularis
Purple saxifrage	Saxifraga oppositifolia
Ragwort sp.	Senecio cymbalarioides
Reflexed loco-weed	Oxytropis deflexa (Pall.) D.C. var. sericea
Rose	Rosa sp.
Rough cinquefoil	Potentilla norvegica
Sandwort sp.	Arenaria rubella

TABLE 15(Continued)

COMMON NAME	SCIENTIFIC NAME
Sedge	Carex spp.
Showy everlasting	Antennaria pulcherrima
Shrubby cinquefoil	Potentilla fruticosa
Siberian aster	Aster sibiricus
Siberian yarrow	Achillea sibirica
Silverberry	Elaeagnus commutata
Silverweed	Potentilla anserina
Smooth woodsia	Woodsia glabella
Spike rush sp.	Eleocharis pauciflora
Spike trisetum	Trisetum spicatum
Star-flowered Solomon's-seal	Smilacina stellata
Stonecrop sp.	Sedum sp.
Sweet-flowered androsace	Androsace chamaejasme
Sweet gale	Myrica gale
Sweet grass	Hierochloe odorata
Tamarack	Larix laricina
Timber oat grass	Danthonia intermedia
Twin-flower	Linnaea borealis
Twining honeysuckle	Lonicera dioica
Water birch	Betula occidentalis
Water sedge	Carex aquatilis
Western meadow rue	Thalictrum occidentale
Wheatgrass	Agropyron spp.
Wheatgrass sp.	Agropyron violaceum
White birch	Betula papyrifera
White camas	Zygadenus elegans
White dryad	Dryas integrifolia
White spruce	Picea glauca
Wild chives	Allium schoenoprasum L. var. sibiricum
Wild gooseberry	Ribes oxyacanthoides
Wild red raspberry	Rubus ideaus
Wild strawberry	Fragaria virginiana
Willow	Salix spp.
Willow sp.	Salix myrtillifolia
Willow sp.	Salix subcoerulea (tentative)
Willowherb	Epilobium latifolium
Wintergreen sp.	Pyrola sp.
Yarrow	Achillea millifolium
Yellow dryad	Dryas drummondii

TABLE 16

LICHENS AND BRYOPHYES IDENTIFIED
WITHIN THE STUDY AREA

LICHENS[1]

Alectoria ochroleuca (Hoffm.) Mass.

Cetraria cucculata (Bell) Ach.

Cetraria pinastri (Scop.) S. Gray

Cladina alpestris (L.) Harm.

Dactylina arctica (Hook.) Nyl.

Thamnolia subuliformis (Ehrh.) W. Culb.

BRYOPHYTES[2]

Dicranum sp.

Pleurozium schreberi (Brid.) Mitt.

1 A more complete listing of lichens which may occur in the area is found in Jeffrey (1961).

2 Steere, Scotter and Holman (1977) list bryophytes which occur in the vicinity of Nahanni National Park.

TABLE 17

OBSERVATIONS OF AQUATIC BIRDS AT SPECIFIC WETLANDS
LOCATED ALONG THE PROPOSED WINTER ROAD

Wetland	Birds Observed
Grainger River (approximately 10 km adjacent road)	2 Spotted Sandpipers
Lake #2	1 Scaup sp. 1 American Wigeon 3 Duck sp. 1 Grebe sp.
Lake #3	1 Diving Duck ♀ + 7 (brood) 1 Diving Duck ♀ + 6 (brood) 1 Diving Duck ♀ + 8 (brood) 1 unidentified
Lake #4	1 Scaup ♀ + 9 1 unidentified ♀ + 8
Lake #7	1 Yellowlegs sp.
Lake #8	1 Dabbler ♀ + 7
Lake #10	1 Red-necked Grebe
Lake #11	2 Common Loon 1 Surf Scoter ♀ + 5 3 Duck sp. 1 Bonaparte's Gull 2 Yellowlegs sp. 1 unidentified sp.
Lake #12	3 Mallard 1 Bufflehead 1 Bonaparte's Gull 1 unidentified
Lake #14	1 Bufflehead 1 unidentified ♀ + 2 4 unidentified
Lake #15	1 unidentified ♀ + 4
Lake #16	1 unidentified ♀ + 6 1 Common Nighthawk

TABLE 17 - Cont'd.

Lake #17	1 Greater Scaup 4 Duck sp. 1 Common Nighthawk
Lake #18	-------
Lake #19	3 Teal sp. 1 Bufflehead 1 Bonaparte's Gull
Lake #20	1 unidentified ♀ + 3 1 unidentified ♀ + 4 5 unidentified
Lake #26	6 Trumpeter Swans (moulting) 1 Mallard ♀ + 4 1 Coot

TABLE 18

PROVISIONAL CHECK LIST OF BIRDS IN THE VICINITY OF THE PROPOSED CADILLAC MINES WINTER ROAD, N.W.T.[1]

COMMON NAME	SCIENTIFIC NAME[2]
Common loon	Gavia immer
Yellow-billed loon	Gavia adamsii
Arctic loon	Gavia artica
Red-throated loon	Gavia stellata
Red-necked grebe	Podiceps grisegena
Horned grebe	Podiceps auritus
Pied-billed grebe	Podilymbus podiceps
Trumpeter swan	Olor buccinator
Whistling swan	Olor columbinaus
Canada goose	Branta canadensis
White-fronted goose	Anser albifrons
Snow goose	Chen hyperborea
Mallard	Anas platyrhynchos
Gadwall	Anas strepera
Pintail	Anas acuta
Green-winged teal	Anas carolinensis
Blue-winged teal	Anas discors
American wigeon	Anas americana
Northern shoveler	Anas clypeata
Red head	Aythya americana
Canvasback	Aythya valisineria
Greater scaup	Aythya marila
Lesser scaup	Aythya affinis
Common goldeneye	Bucephala clangula
Barrow's goldeneye	Bucephela islandica
Bufflehead	Bucephala albeola
Oldsquaw	Clangula hyemalis
White-winged scoter	Melanitta deglandi
Surf scoter	Melanitta perspicillata
Common merganser	Mergus merganser
Red-breasted merganser	Mergus serrator
Goshawk	Accipiter gentilis
Sharp-shinned hawk	Accipiter striatus

1 Based on distributional information contained in Godfrey (1966), Scotter et al (1971), Slaney Co. Ltd. (1971), L. Carbyn (pers. comm.), and BEAK sightings.

2 Nomenclature from American Ornithologists Union (1957)and revisions by Eisenmann et al (1973, 1976)).

TABLE 18 - Cont'd.

COMMON NAME	SCIENTIFIC NAME
Red-tailed hawk	Buteo jamaicensis
Swainson's hawk	Buteo swainsoni
Golden eagle	Aquila chrysaetos
Bald eagle	Haliaeetus leucocephalus
Marsh hawk	Circus cyaneus
Osprey	Pandion haliaetus
Gyrfalcon	Falco rusticolus
Peregrine falcon	Falco peregrinus
Merlin	Falco columbarius
American kestrel	Falco sparverius
Blue grouse	Dendragapus obscurus
Spruce grouse	Canachites canadensis
Ruffled grouse	Bonasa umbellus
Willow ptarmigan	Lagopus lagopus
Rock ptarmigan	Lagopus mutus
White-tailed ptarmigan	Lagopus leucurus
Sharp-tailed grouse	Pedioecetes phasianellus
Sandhill crane	Grus canadensis
Sora	Porzana carolina
American coot	Fulica americana
Semi-palmated plover	Charadrius semipalmatus
Killdeer	Charadrius vociferus
American golden plover	Pluvialis dominica
Common snipe	Capella gallinago
Upland sandpiper	Bartramia longicauda
Spotted sandpiper	Actitis macularia
Solitary sandpiper	Tringa solitaria
Wandering tattler	Heteroscelus incanus
Greater yellowlegs	Totanus melanoleucus
Lesser yellowlegs	Tringa flavipes
Pectoral sandpiper	Erolia melanotos
Bairds' sandpiper	Erolia bairdii
Least sandpiper	Erolia minutilla
Semi-palmated sandpiper	Ereunetes pusillus
Stilt sandpiper	Micropalama himantopus
Northern phalarope	Lobipes lobatus
Herring gull	Larus argentatus
Mew gull	Larus canus
Bonaparte's gull	Larus philadelphia
Arctic tern	Sterna paradisaea
Black tern	Chlidoniaw niger
Great horned owl	Bubo virginianus
Hawk owl	Surnia ulula
Barred owl	Strix varia
Great gray owl	Strix nebulosa
Long-eared owl	Asio otus
Short-eared owl	Asio flammeus
Boreal owl	Aegolius funereus
Common nighthawk	Chordeiles minor

TABLE 18 - Cont'd.

COMMON NAME	SCIENTIFIC NAME
Belted kingfisher	Megaceryle alcyon
Common flicker	Colaptes auratus
Pileated woodpecker	Dryocopus pileatus
Yellow-bellied sapsucker	Sphyrapicus varius
Hairy woodpecker	Picoides villosus
Downy woodpecker	Picoides pubescens
Black-backed three-toed woodpecker	Picoides arcticus
Northern three-toed woodpecker	Picoides tridactylis
Eastern kingbird	Tyrannus tyrannus
Eastern phoebe	Sayornis phoebe
Say's phoebe	Sayornis saya
Yellow-bellied flycatcher	Empidonax flaviventris
Alder flycatcher	Empidonax traillii
Least flycatcher	Empidonax minimus
Hammond's flycatcher	Empidonax hammondii
Western wood peewee	Contopus sordidulus
Olive-sided flycatcher	Nuttallornis borealis
Horned lark	Eremophila alpestris
Violet-green swallow	Tachycineata thalassina
Tree swallow	Iridoprocne bicolor
Bank swallow	Riparia riparia
Barn swallow	Hirundo rustica
Cliff swallow	Petrochelidon pyrrhonota
Gray jay	Perisoreus canadensis
Common raven	Corvus corax
Common crow	Corvus brachyrhynchos
Clarke's nutcracker	Nucifraga columbiana
Black-capped chickadee	Parus atricapillus
Boreal chickadee	Parus hudsonicus
Red-breasted nuthatch	Sitaa canadensis
American robin	Turdus migratorius
Varied thrush	Ixoreus naevius
Hermit thrush	Catharus guttatus
Swainson's thrush	Catharus ustulatus
Gray-cheeked thrush	Hylocichla minima
Mountain bluebird	Sialia currucoides
Townsend's solitaire	Myadestes townsendi
Ruby-crowned kinglet	Regulus calendula
Water pipit	Anthus spinoletta
Bohemian waxwing	Bombycilla garrulus
Northern shrike	Lanius excubitor
Starling	Sturnus vulgaris
Red-eyed vireo	Vireo olivaceus
Philadelphia vireo	Vireo philadelphicus
Warbling vireo	Vireo gilvus
Black-and-white warbler	Mniotilita varia
Tennessee warbler	Vermivora peregrina
Orange-crowned warbler	Vermivora celata

TABLE 18 - Cont'd.

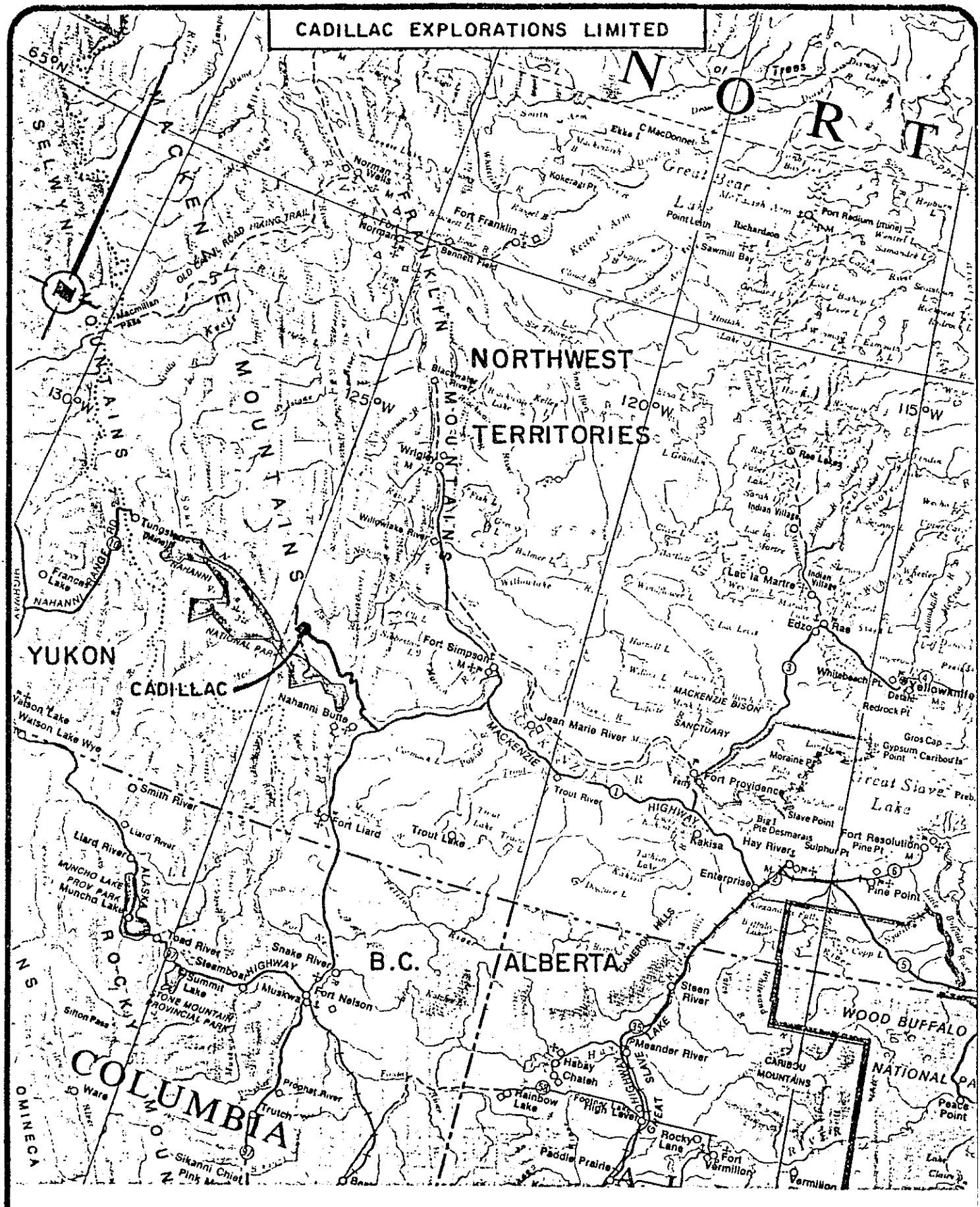
COMMON NAME	SCIENTIFIC NAME
Yellow warbler	Dendroica petechia
Magnolia warbler	Dendroica petechia
Yellow-rumped warbler	Dendroica coronata
Black-throated green warbler	Dendroica virens
Bay-breasted warbler	Dendroica castanea
Blackpoll warbler	Dendroica striata
Palm warbler	Dendroica palmarum
Ovenbird	Seiurus aurocapillus
Northern waterthrush	Seiurus noveboracensis
Mourning warbler	Oporornis philadelphia
Common yellow-throat	Geothlypis trichas
Wilson's warbler	Wilsonia pusilla
American redstart	Setophaga ruticilla
Red-winged blackbird	Agelaius phoeniceus
Rusty blackbird	Euphagus carolinus
Brwon-headed cowbird	Molothrus ater
Western tanager	Piranga ludoviciana
Rose-breasted grosbeak	Pheucticus ludovicianus
Evening grosbeak	Hesperiphona vespertina
Purple finch	Carpodacus purpureus
Pine grosbeak	Pinicola enucleator
Grey-crowned rosy finch	Leucosticte tephrocotis
Hoary redpoll	Acanthis hornemanni
Common redpoll	Acanthis flammea
Pine siskin	Carduelis pinus
Red crossbill	Loxia curvirostra
White-winged crossbill	Loxia leucoptera
Savannah sparrow	Passerculus sandwichensis
Vesper sparrow	Pooecetes gramineus
Dark-eyed junco	Junco hyemalis
Tree sparrow	Spizella arborea
Chipping sparrow	Spizella passerina
Clay-coloured sparrow	Spizella pallida
White-crowned sparrow	Zonotrichia leucophrys
Golden-crowned sparrow	Zonotrichia albicollis
White-throated sparrow	Zonotrichia albicollis
Fox sparrow	Passerella iliaca
Lincoln's sparrow	Melospiza lincolni
Swamp sparrow	Melospiza georgiana
Song sparrow	Melospiza melodia
Lapland longspur	Calcarius lapponicus
Smith's longspur	Calcarius pictus

Table 19

Hunter Return Data* for the Region
of the Proposed Cadillac Explorations Ltd.
Mine & Road Development (1975 - 78), (Zone 12, Area 6).

Hunting Season (Year)	No. of Hunters	No. of Successful Hunters	No. of Game Animals Taken	Sheep	Bear	Moose
1975	14	12	15	12	3	
1976	12	12	10	10		
1977	13	11	9	8	1	
1978	17	14	15	14		1

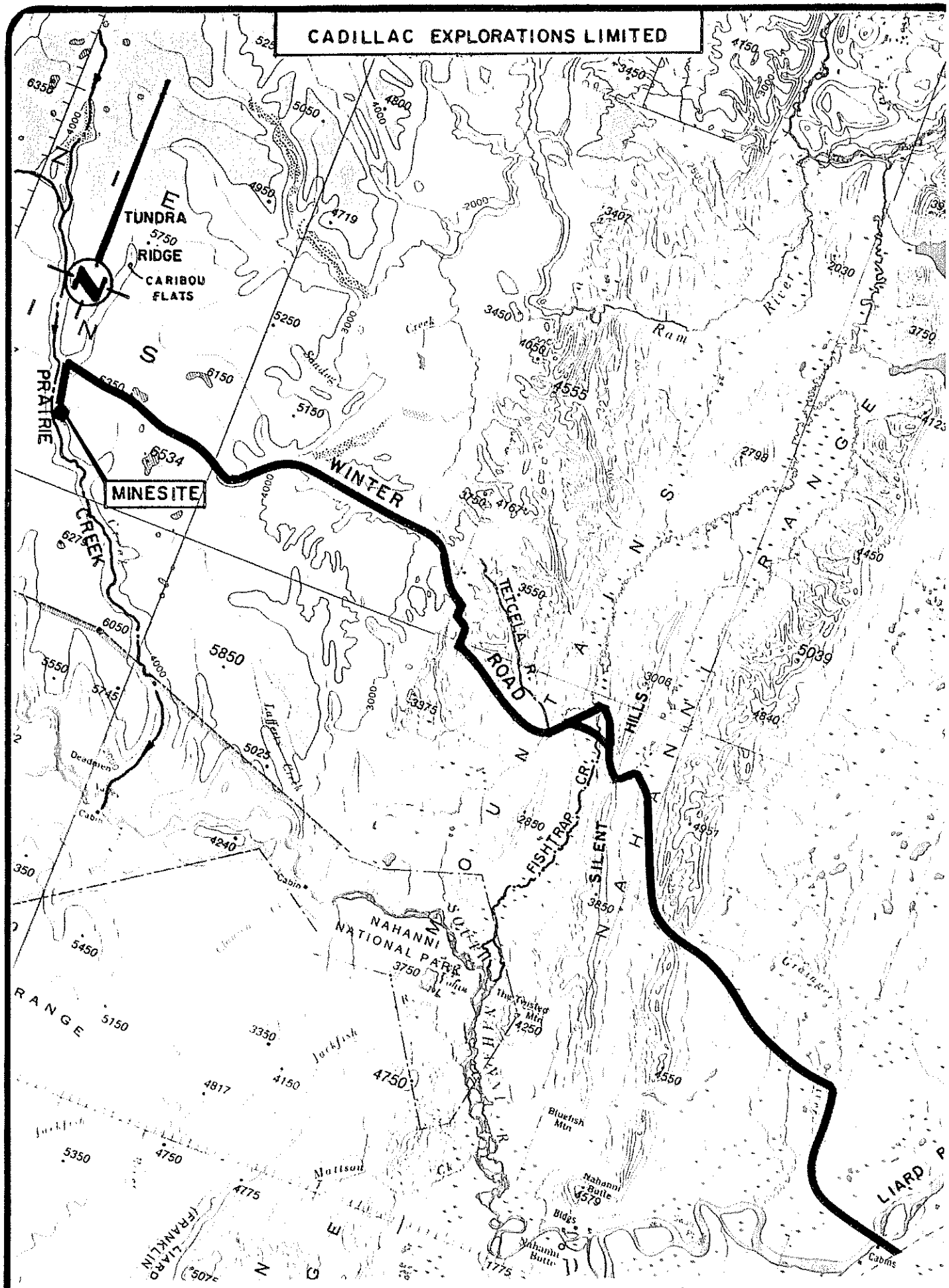
*Data from Department of Renewable Resources



KEY PLAN

FIGURE 1

VANCAL - 2988

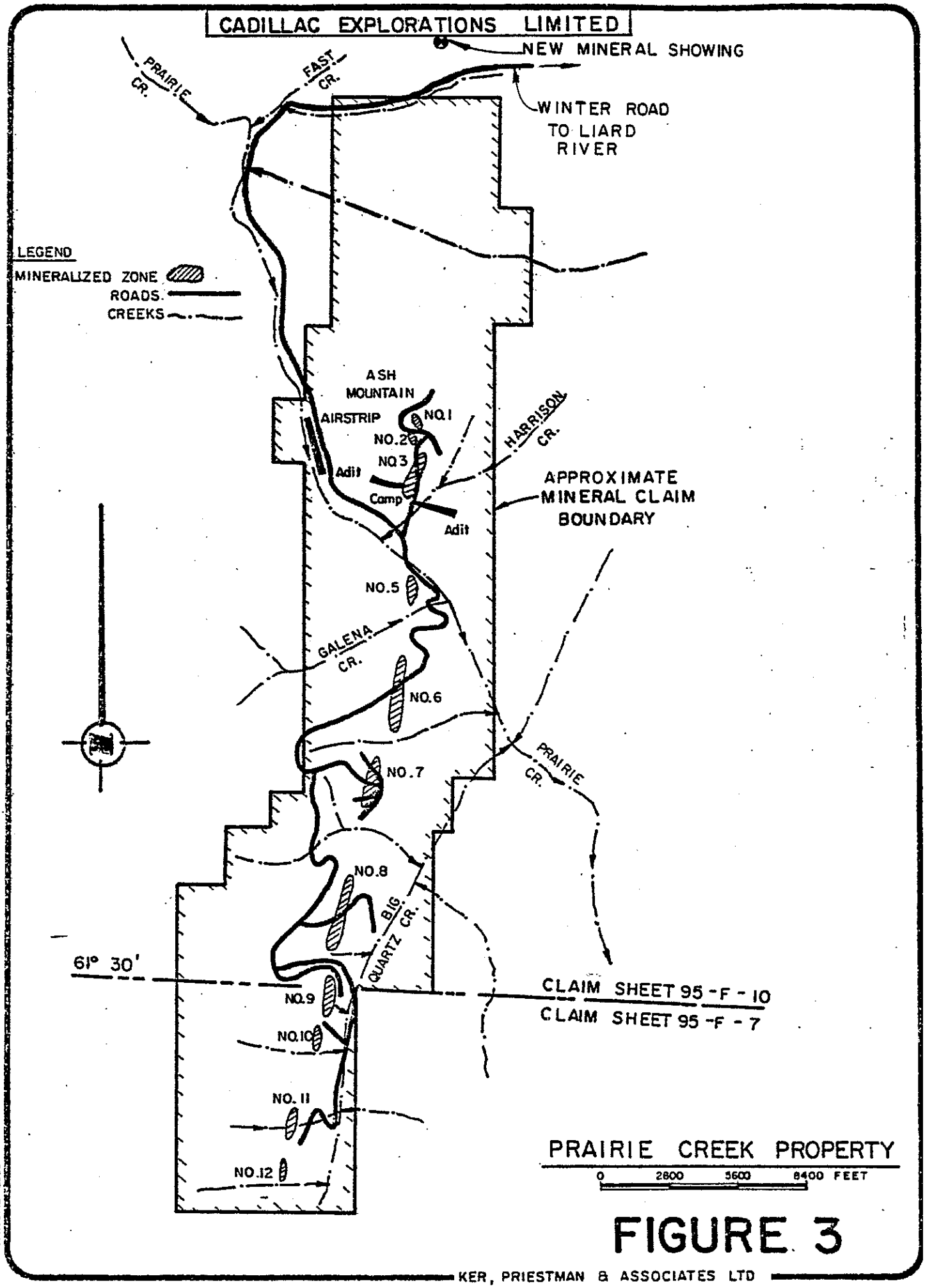


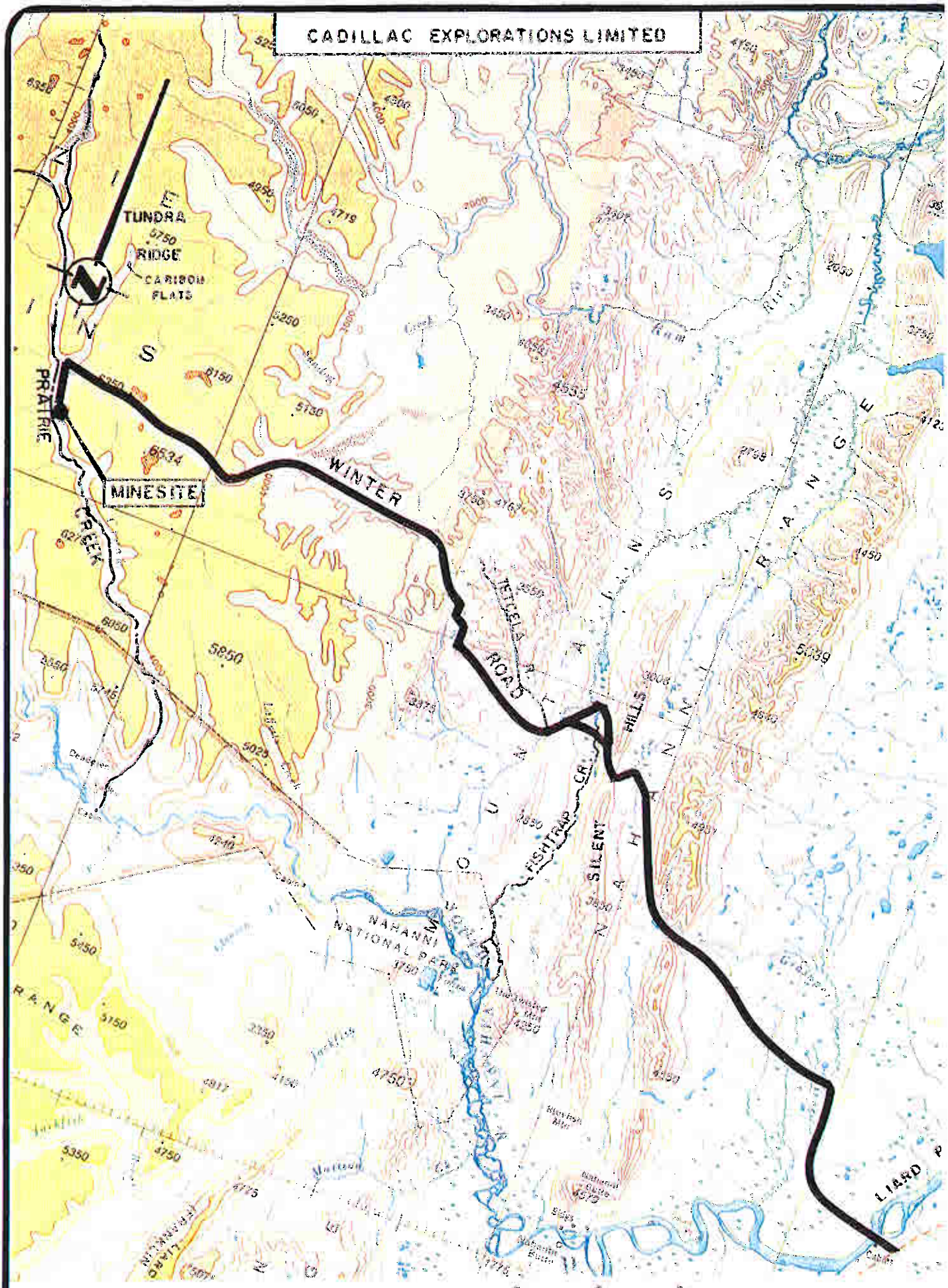
LOCATION PLAN

FIGURE 2

KER, PRIESTMAN & ASSOCIATES LTD

VANCAL - 2988


CADILLAC EXPLORATIONS LIMITED
NEW MINERAL SHOWING
PRAIRIE CR.
FAST CR.
WINTER ROAD TO LIARD RIVER
LEGEND
MINERALIZED ZONE
ROADS
CREEKS
ASH MOUNTAIN AIRSTRIP
NO.1
NO.2
NO.3
Adit
Camp
Adit
HARRISON CR.
APPROXIMATE MINERAL CLAIM BOUNDARY
NO.5
GALENA CR.
NO.6
NO.7
PRAIRIE CR.
NO.8
BIG QUARTZ CR.
61° 30'
NO.9
NO.10
NO.11
NO.12
CLAIM SHEET 95-F-10
CLAIM SHEET 95-F-7
PRAIRIE CREEK PROPERTY
0 2800 5600 8400 FEET
FIGURE 3
KER, PRIESTMAN & ASSOCIATES LTD
VANCAL-2988



LOCATION PLAN

FIGURE 2

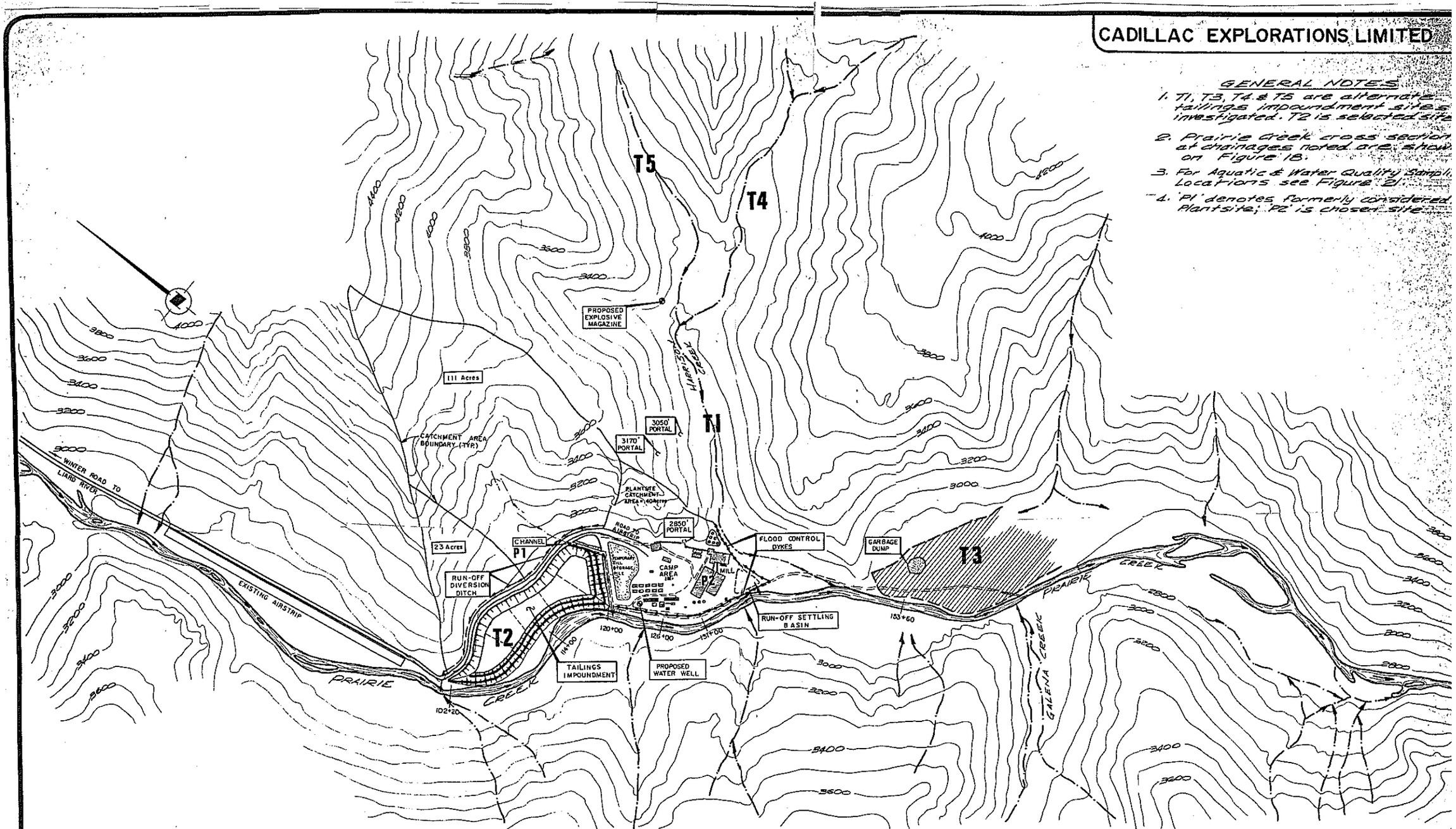
KER, PRIESTMAN & ASSOCIATES LTD

VANCAL - 2988

CADILLAC EXPLORATIONS LIMITED

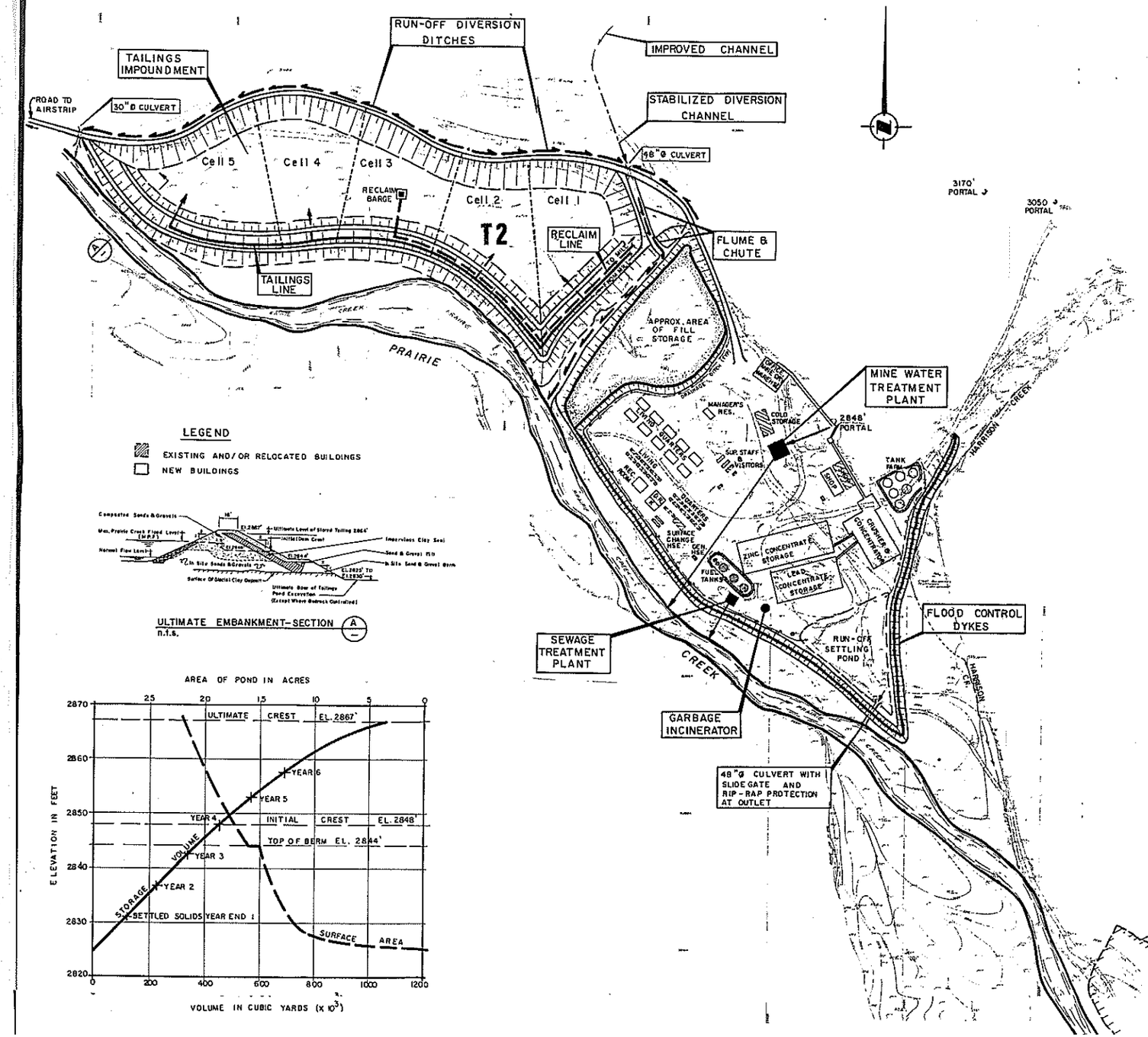
GENERAL NOTES

1. T1, T3, T4 & T5 are alternate tailings impoundment sites investigated. T2 is selected site
2. Prairie Creek cross section at drainages noted are shown on Figure 18.
3. For Aquatic & Water Quality Sampl Locations see Figure 21.
4. 'P1' denotes formerly considered Plantsite; 'P2' is chosen site



SITE PLAN

CADILLAC EXPLORATIONS LIMITED



ULTIMATE EMBANKMENT-SECTION (A)
n.t.s.

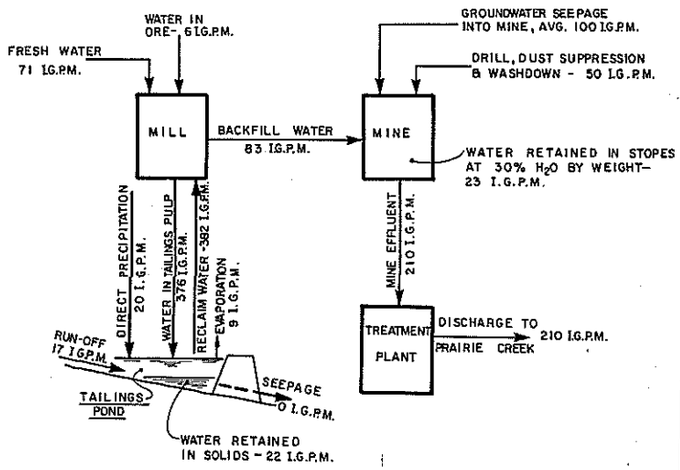
Material Balance - Tailings Pond T2

(Quantities in thousand cubic yards, unless otherwise noted)

Year	Assumed Precipitation (in./year)	(1) Tailings into Pond (2+5) (Note 1)	(2) Water in Tailings Slurry	(3) Solids in Tailings Slurry	(4) Settled Solids & Entrained Water (Note 2)	(5) Cumulative Solids (Note 3) & Entrained Water	(6) Direct Precipitation (Note 4)	(7) Run-off (Note 5)	(8) Evaporation (Note 6)	(9a) Water Pumped From Pond (1·4×7·4·8) Igpm	(9b) Water Pumped From Pond (1·4×7·4·8) 1000 C.Y.	(10) Reclaim to Mill (Note 7)	(11) Elevation of Solids (feet) (Note 8)
0-1	11	1175	1125	50	114	114	33	28	17	369	1105	1105	2831
1-2	20	1175	1125	50	114	228	59	50	23	385	1147	1147	2837
2-5	26	1175	1125	50	114	342	85	71	24	398	1191	1191	2843
3-6	20	3525	3375	150	342	684	177	150	93	381	3417	3417	2857
Total		7050	6750	300	684	684	352	299	157	-	6860	6860	-
Average	20	1175	1125	50	114	-	59	50	26	382	1143	1143	-

Notes:

1. Solids to pond 15 tons/hour, s.g. solids 3.0, water to pond 376 Igpm, production 350 days/year.
2. Settled solids contain 30% moisture by weight.
3. Pond to contain no permanent ice.
4. Snow considered in terms of water equivalent.
5. Run-off area contributory to diversion ditches - 134 acres, diversion of run-off 80% effective, yield ratio 0.7. All other seepage assumed = zero.
6. Evaporation: 13 in./year.
7. All water is reclaimed to mill.
8. Assumes solids are evenly distributed throughout the cells.



WATER BALANCE FLOW SHEET

PLANTSITE PLAN & WATER BALANCE

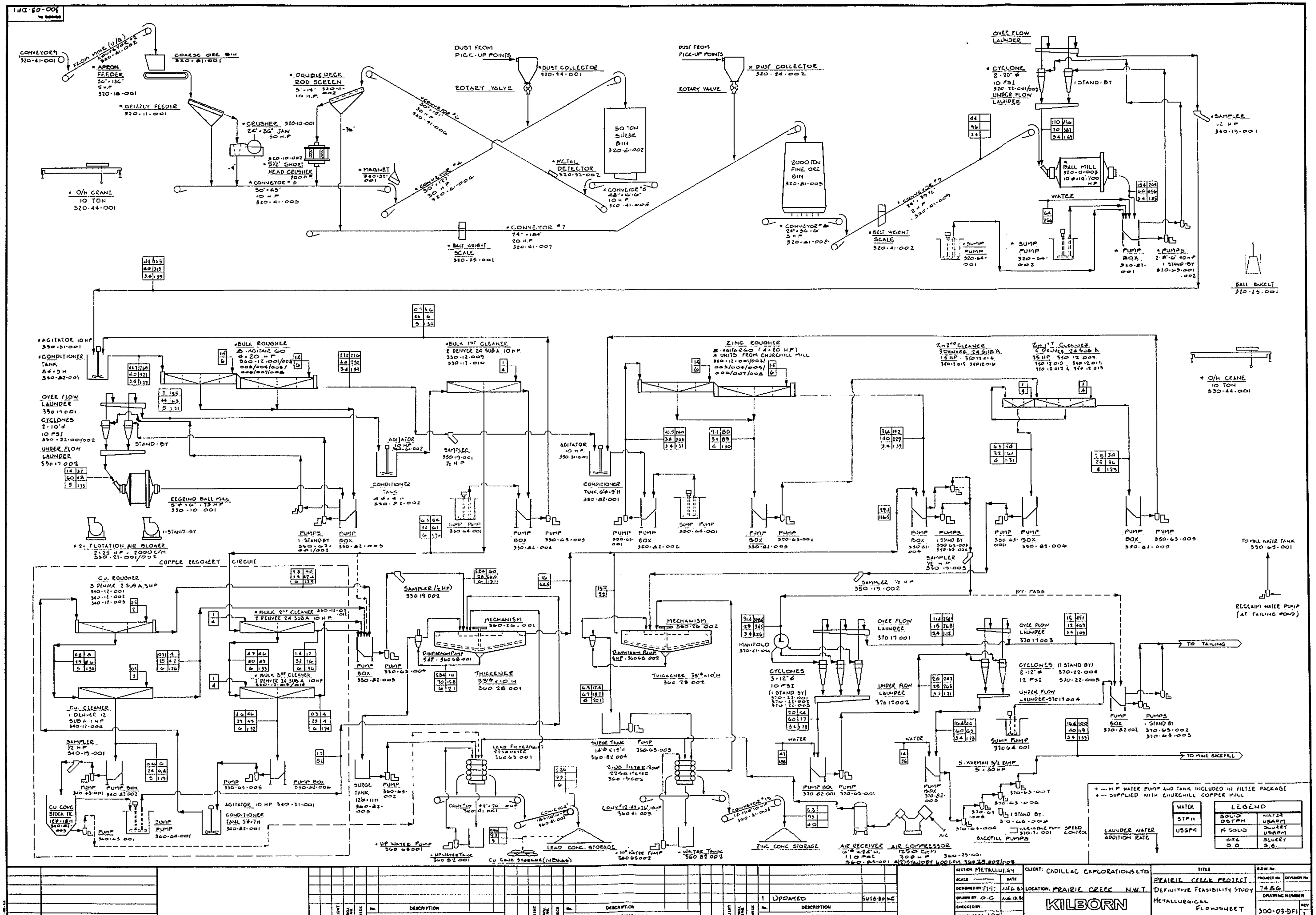
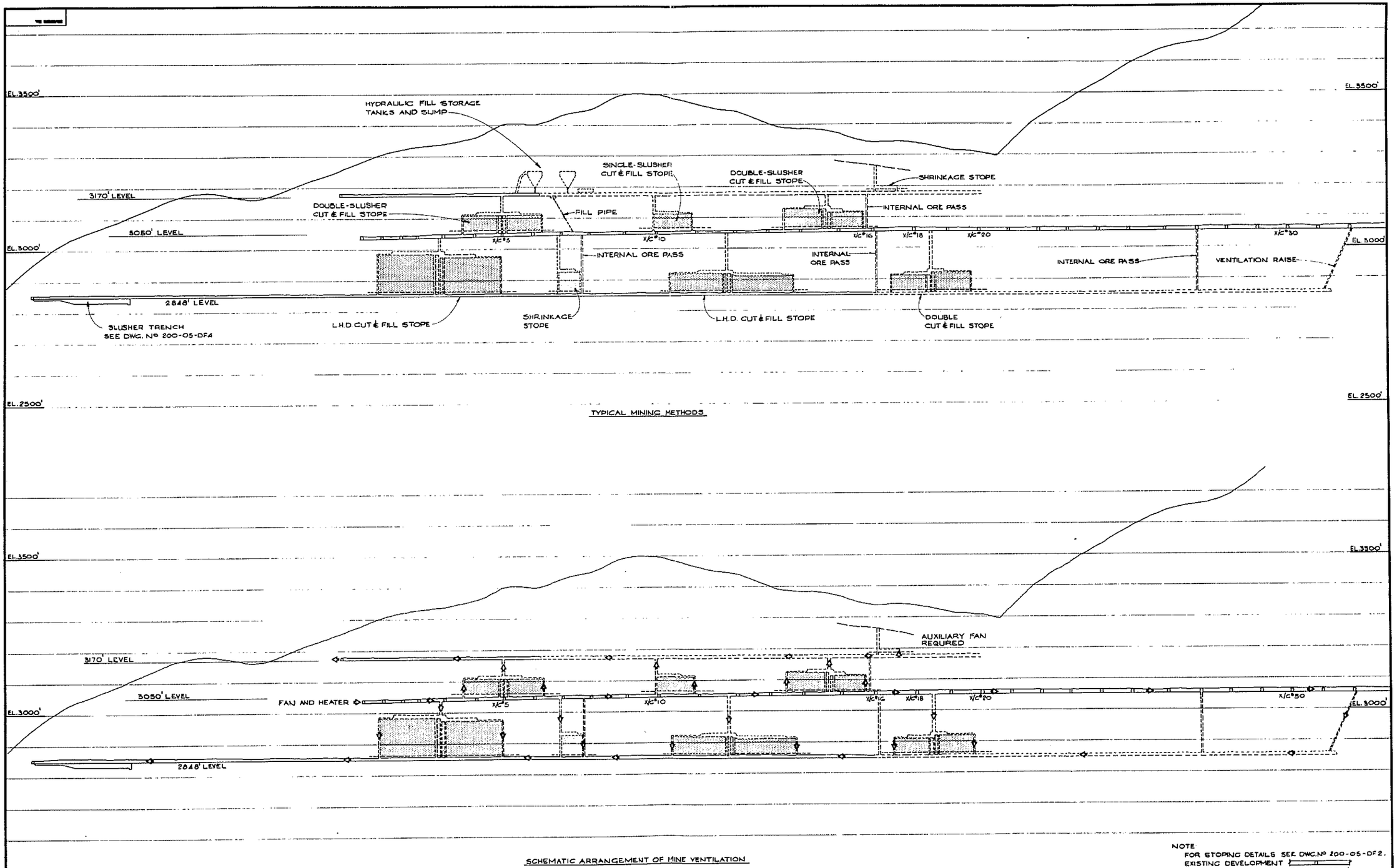

COARSE ORE BIN
APRON FEEDER
GRIZZLY FEEDER
CRUSHER
DOUBLE DECK ROD SCREEN
DUST FROM PICK-UP POINTS
DUST COLLECTOR
ROTARY VALVE
50 TON SURGE BIN
METAL DETECTOR
MAGNET
2000 TON FINE ORE BIN
BELT WEIGHT SCALE
O/H CRANE
10 TON
OVER FLOW LAUNDER
CYCLONE
UNDER FLOW LAUNDER
BALL MILL
WATER
SAMPLER
SUMP PUMP
PUMP BOX
PUMPS
BALL BUCKET
BULK ROUGHER
BULK 1ST CLEANER
ZINC ROUGHER
CONDITIONER TANK
AGITATOR
CYCLONES
REGRIND BALL MILL
FLOTATION AIR BLOWER
COPPER RECOVERY CIRCUIT
CU. ROUGHER
CU. CLEANER
CU CONC STOCK TK.
MECHANISM
THICKENER
SURGE TANK
LEAD FILTER
ZINC FILTER
LEAD CONC. STORAGE
ZINC CONC STORAGE
CU CONC STORAGE
AIR RECEIVER
AIR COMPRESSOR
MANIFOLD
TO TAILING
TO MINE BACKFILL
BACKFILL PUMPS
RECLAIM WATER PUMP (AT TAILING POND)
TO MILL WATER TANK
LEGEND
WATER
STPH
USGPM
LAUNDER WATER ADDITION RATE
CADILLAC EXPLORATIONS LTD
PRAIRIE CREEK PROJECT
DEFINITIVE FEASIBILITY STUDY
METALLURGICAL FLOWSHEET
PRAIRIE CREEK N.W.T.
KILBORN
300-03-DF1
UPDATED
REVISIONS
REFERENCE DRAWINGS

FIGURE 6



TYPICAL MINING METHODS

SCHEMATIC ARRANGEMENT OF MINE VENTILATION

NOTE
FOR STOPING DETAILS SEE DWG. Nº 200-05-DF2.
EXISTING DEVELOPMENT
PROPOSED DEVELOPMENT

DWG. NO.	REFERENCE DRAWINGS

No.	DESCRIPTION	CLIENT	FIELD TIME	CHECK
	REVISIONS			

SECTION	
SCALE 1"= 100'	DATE
DESIGNED BY R.M.S.	AUG. 80
DRAWN BY P.A.H.	AUG. 80
CHECKED BY	
APPROVED BY	

CLIENT CADILLAC EXPLORATIONS LTD
LOCATION PRAIRIE CREEK, N.W.T.
KILBORN

TITLE	PRAIRIE CREEK PROJECT DEFINITIVE FEASIBILITY STUDY Nº 3 ZONE MINING METHODS AND VENTILATION
D.O.M. No.	
PROJECT No.	7486
DIVISION No.	
DRAWING NUMBER	200-05-DF3
REV.	0

FIGURE 7

15 BAYS @ 16'-0" = 240'-0"

150 TON COARSE ORE BIN
APRON FEEDER FEED CHUTE
LIMIT OF CRANE TRAVEL
10 TON CRANE
SCREEN O/S DISCHARGE CHUTE
CONVEYOR # 3 30" BELT 325 FPM
CONV # 3 HEADCHUTE
MAGNET SUSPENSION INSTALLATION
SURGE BIN SLOT FEEDER
CONVEYOR #5 48" BELT 45 FPM
WHEELABRATOR MODEL 1260
CONVEYOR # 8 24" BELT 27-81 FPM
TUBE FEEDER INSTALLATION
CONVEYOR # 9 24" BELT 100 FPM
CONVEYOR #2 42" BELT
SLOPES UP
OPERATORS CONSOLE
CONVEYOR # 4 30" BELT 325 FPM
CONVEYOR # 7 24" BELT 275 FPM
CONVEYOR # 6 30" BELT 348 FPM
CONV #6 HEADCHUTE
6'W x 10' DETACHABLE PANEL
METAL DETECTOR
CONDITIONER TANK 4½x4H
CONDITIONER TANK 8'ø x 9'H
Pb THICKENER 33'ø x 10'H
Zn THICKENER 35'ø x 10'H
CYCLONES 2 x 10'ø
BALL MILL 10'ø x 14' 700 HP
REMOVABLE FLOOR
CYCLONES 2 x 20'ø (1 STANDBY)
BULK 1ST CLEANERS 2 DENVER 24 SUB A
BULK 2ND CLEANERS 2 DENV 24 SUB A
BULK 3RD CLEANERS 2 DENV 24 SUB-A
Cu ROUGHERS 3 DENV 12 SUB A
Cu CLEANER 1 DENV 12 SUB A
Cu CONC STOCK TANK 12'ø x 15'H
Pb SURGE TANK 12'ø x 11'H
Zn SURGE TANK 12'ø x 15'H
BACKFILL CYCLONES (12'ø)
SAMPLE FILTER
REMOV FLOOR
EL TO SLAB 2851'-0"
ELECTRICAL ROOM EL TO SLAB 2858'-0"
OPEN TO GENERATOR ROOM
WASH ROOM
MILL SUPT.
FOREMAN & CLERK
CONTROL ROOM
CONDITIONER TANK 5'ø x 7'H
REAGENT HEAD TANKS 2'ø x 3'H
SAMPLE PREPARATION
METALLURGICAL LABORATORY
HEATER
5 BAYS @ 16'-0" = 80'-0"

150 TON COARSE ORE BIN
REPAIR BAY
LINER INSTALLATION
24" x 36" KUE-KEN JAW CRUSHER
REMOVABLE FLOORING
TO SLAB EL 2866'-8"
TOP OF ELECTRICAL CONTROL ROOM ROOF @ EL 2850'-6
WHEELABRATOR MODEL 1260
5½' SHORT HEAD SYMONS CONE CRUSHER
SCREEN O/S DISCHARGE CHUTE
Cu/Pb PRESSURE FILTER
Zn PRESSURE FILTER
BOTH FILTERS 22 SQ METERS
2 DECK ROD SCREEN 10HP
CONVEYOR # 10 (Zn CONC) 18" BELT
CONVEYOR # 11 (Cu/Pb CONC) 18" BELT

PLAN OF OPERATING FLOORS
CRUSHING AREA
ELEVATIONS AS NOTED

PLAN SECTION
ELEVATIONS AS NOTED

PLAN OF FLOOR @ EL. 2856'-8½"

DWG. NO. | REFERENCE DRAWINGS | REVISIONS

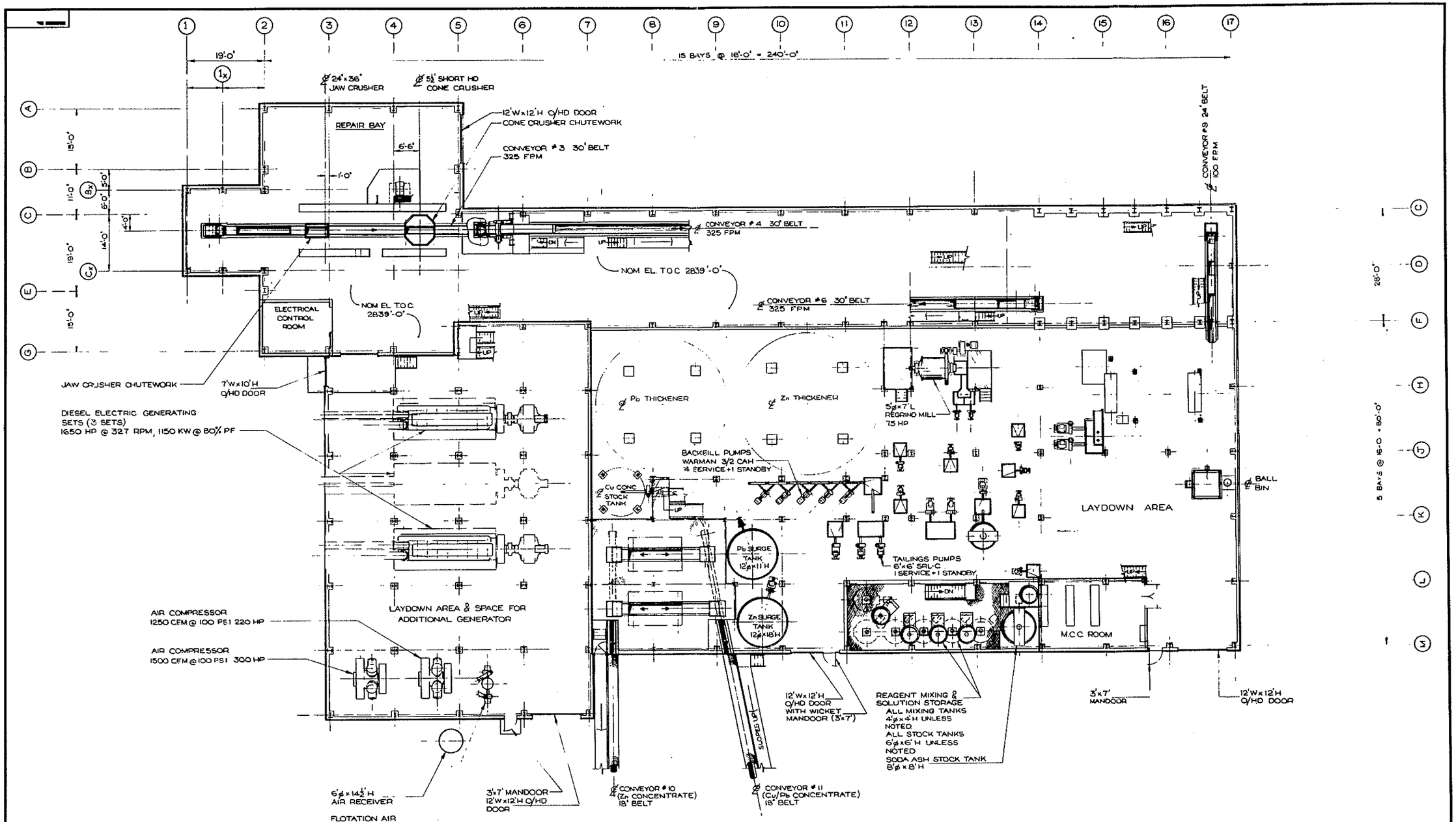
SECTION GENERAL LAYOUT
SCALE 1/8"=1'-0" | DATE
DESIGNED BY
DRAWN BY JB Clapp Aug 22/80
CHECKED BY
APPROVED BY J.B.F

CLIENT: CADILLAC EXPLORATIONS LTD
LOCATION: PRAIRIE CREEK, N.W.T.
KILBORN

TITLE: PRAIRIE CREEK PROJECT
DEFINITIVE FEASIBILITY STUDY
PROCESS PLANT
GENERAL ARRANGEMENT
OPERATING FLOOR PLAN

W.O. No.
PROJECT No. | DIVISION No.
DRAWING NUMBER: 300-10-DF1
REV: 0

FIGURE 2



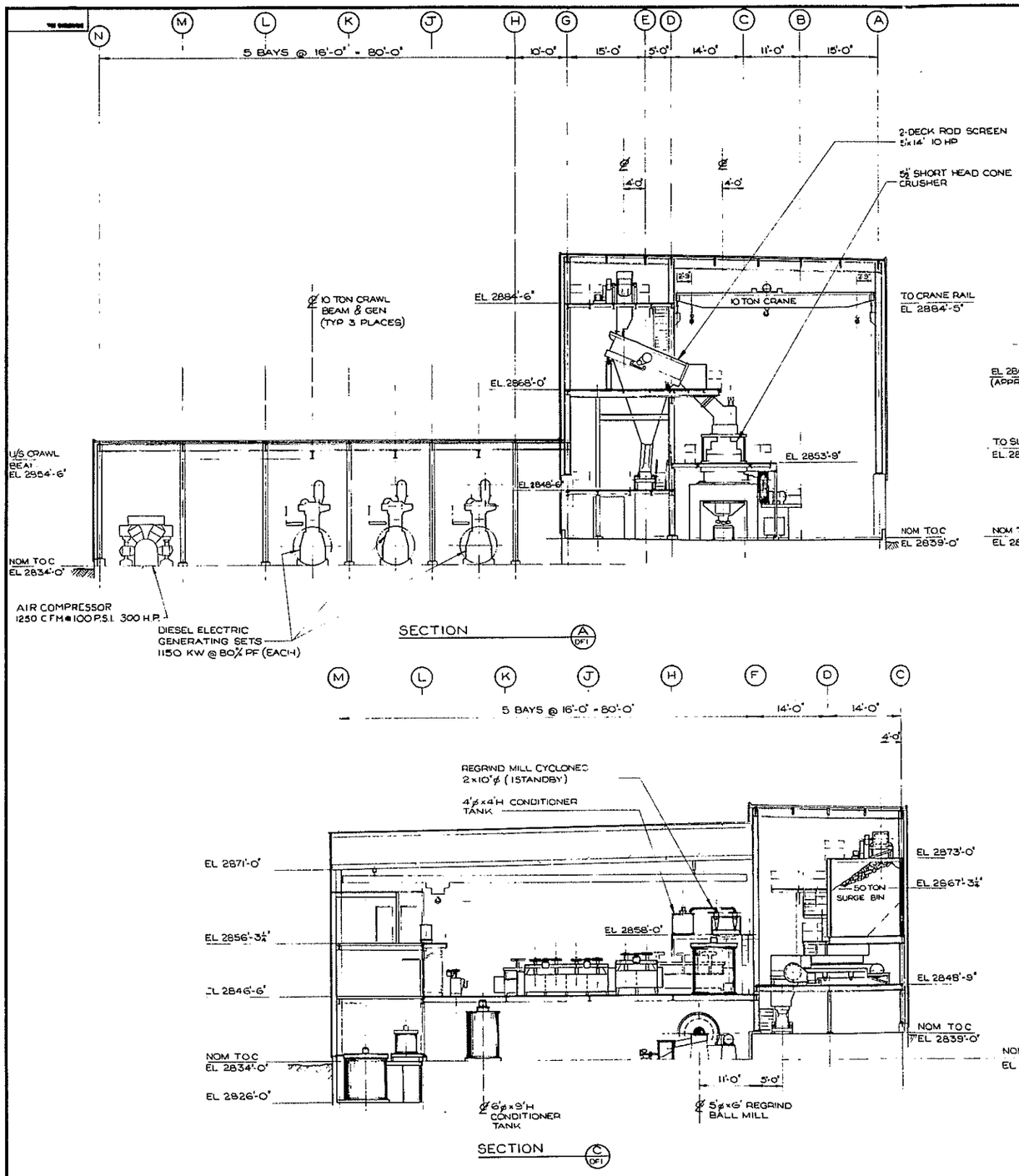
GROUND FLOOR PLAN

NOMINAL ELEVATION TOP OF CONCRETE 2834'-0" UNLESS NOTED

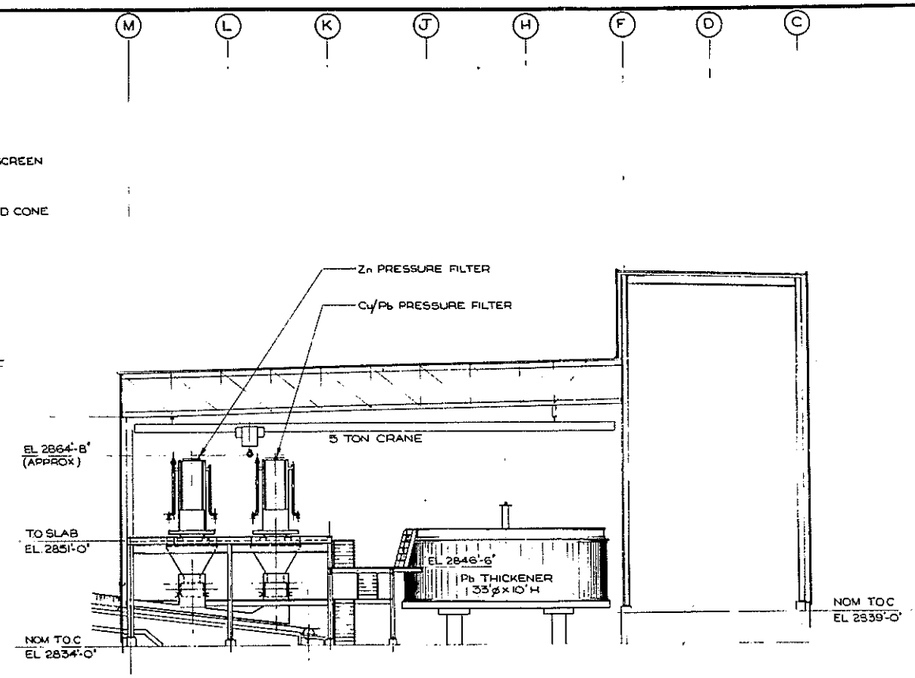
SECTION: GENERAL LAYOUT	CLIENT: CADILLAC EXPLORATIONS LTD.	TITLE	G.O. NO.
SCALE: 1/8" = 1'-0" DATE	LOCATION: PRAIRIE CREEK, N.W.T.	PRAIRIE CREEK PROJECT	PROJECT NO. 7486
DESIGNED BY:	KILBORN	DEFINITIVE FEASIBILITY STUDY	DIVISION NO.
DRAWN BY: JBC/DDP A1621/80		PROCESS PLANT	DRAWING NUMBER 300-10-DF2
CHECKED BY:		GENERAL ARRANGEMENT	REV. 0
APPROVED BY: J.B.F.		GROUND FLOOR PLAN	

DWG. NO. | REFERENCE DRAWINGS | REVISIONS: CLIENT / FOR / CHECK / No. / DESCRIPTION

FIGURE 9

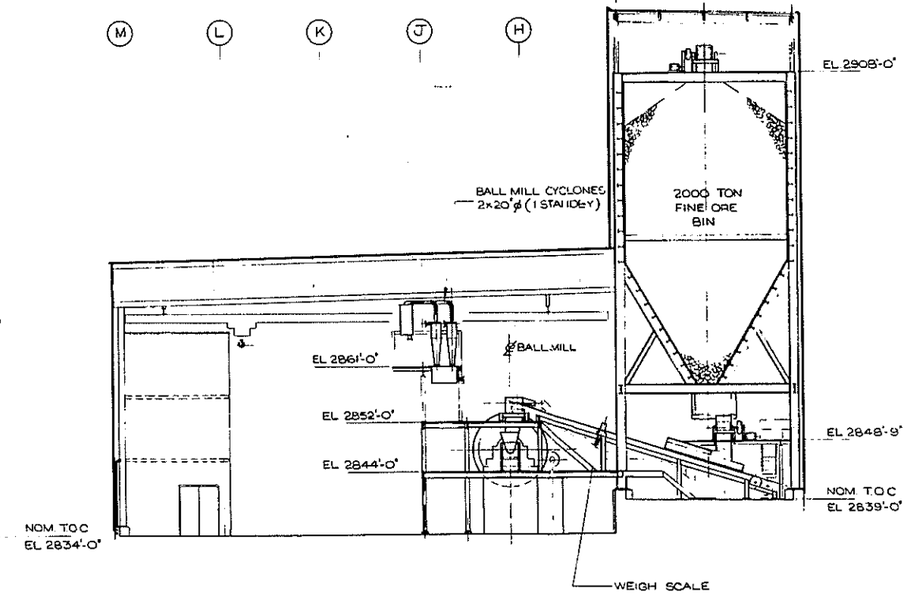


SECTION A DFI



SECTION B DFI

SECTION C DFI



SECTION D DFI

DWG. NO.	REFERENCE DRAWINGS	CLIENT	FINAL ISSUE	CHECK	No.	DESCRIPTION	REVISIONS

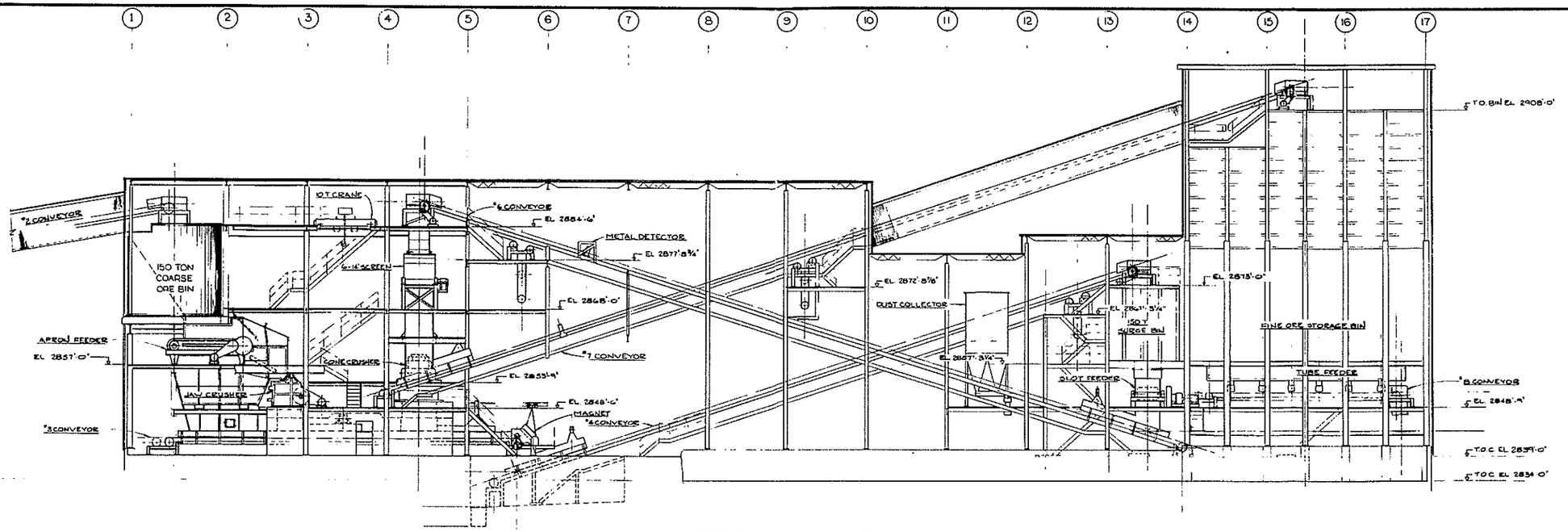
SECTION: GENERAL LAYOUT
SCALE: 1/8"-1'-0" DATE
DESIGNED BY:
DRAWN BY: JB Coop AUG 22/86
CHECKED BY:
APPROVED BY: J.B.F

CLIENT: CADILLAC EXPLORATIONS LTD
LOCATION: PRAIRIE CREEK, N.W.T.
KILBORN

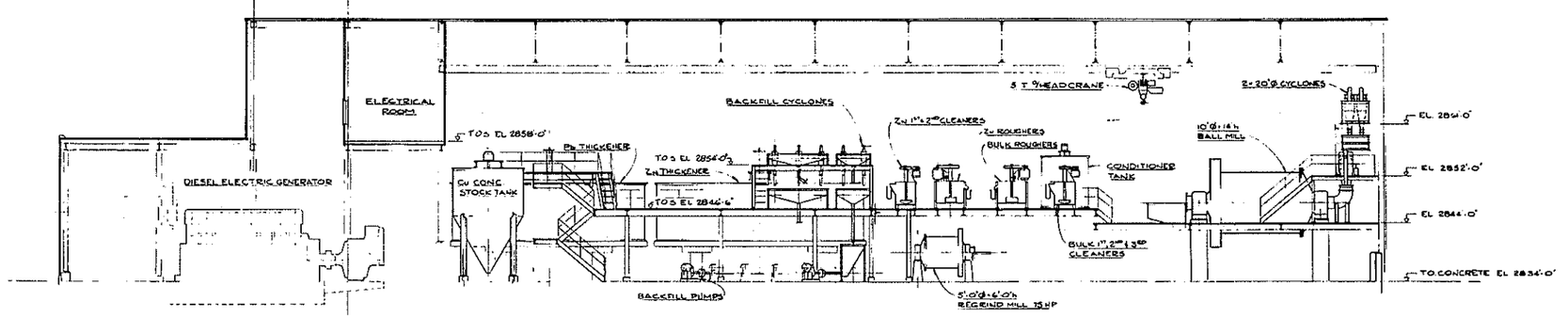
TITLE: PRAIRIE CREEK PROJECT
DEFINITIVE FEASIBILITY STUDY
PROCESS PLANT
GENERAL ARRANGEMENT
CROSS SECTIONS

K.D.M. No.
PROJECT No. 7486 DIVISION No.
DRAWING NUMBER 700-10-DF3 REV. 0

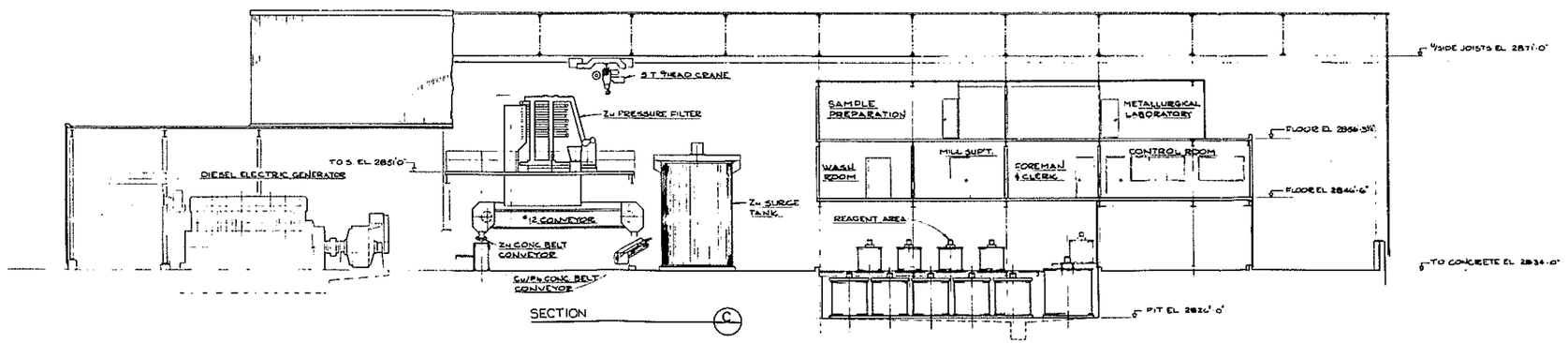
FIGURE 10



SECTION (A)



SECTION (B)



SECTION (C)

DWG. NO. | REFERENCE DRAWINGS

No.	DESCRIPTION	CLIENT	PROJ ENG	CHECK
REVISIONS				

SECTION GENERAL LAYOUT	
SCALE 1/8" = 1'-0"	DATE
DESIGNED BY:	
DRAWN BY JB Coop	AUG 22/80
CHECKED BY	
APPROVED BY J.B.C.	

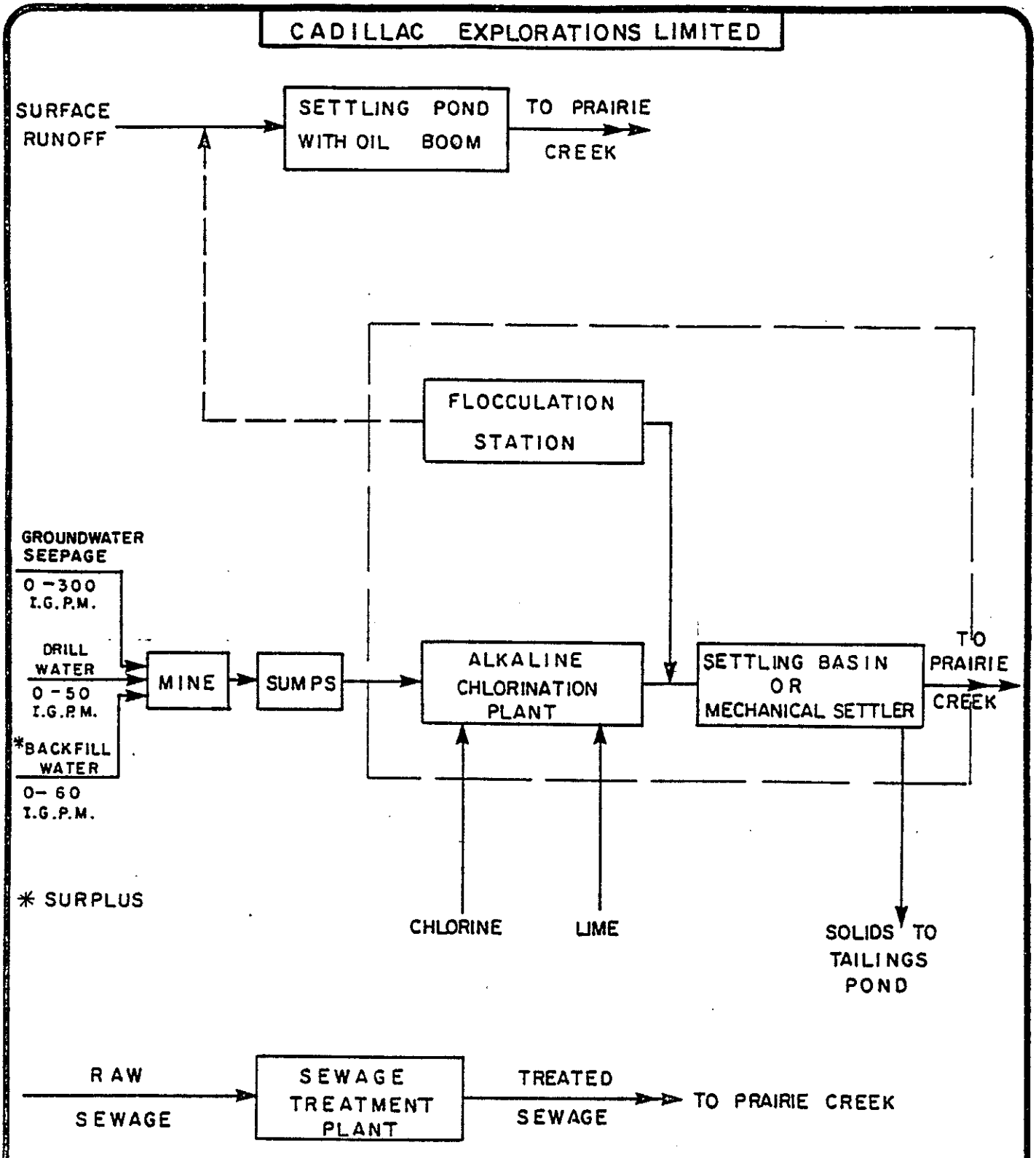
CLIENT: CADILLAC EXPLORATIONS LTD

LOCATION: PRAIRIE CREEK, N.W.T.

KILBORN

TITLE	S.O.W. No.	
PRAIRIE CREEK PROJECT	PROJECT No.	DIVISION No.
DEFINITIVE FEASIBILITY STUDY	7486	
PROCESS PLANT	DRAWING NUMBER	
GENERAL ARRANGEMENT LONGITUDINAL SECTIONS	300-10-DF4	REV 0

FIGURE 11

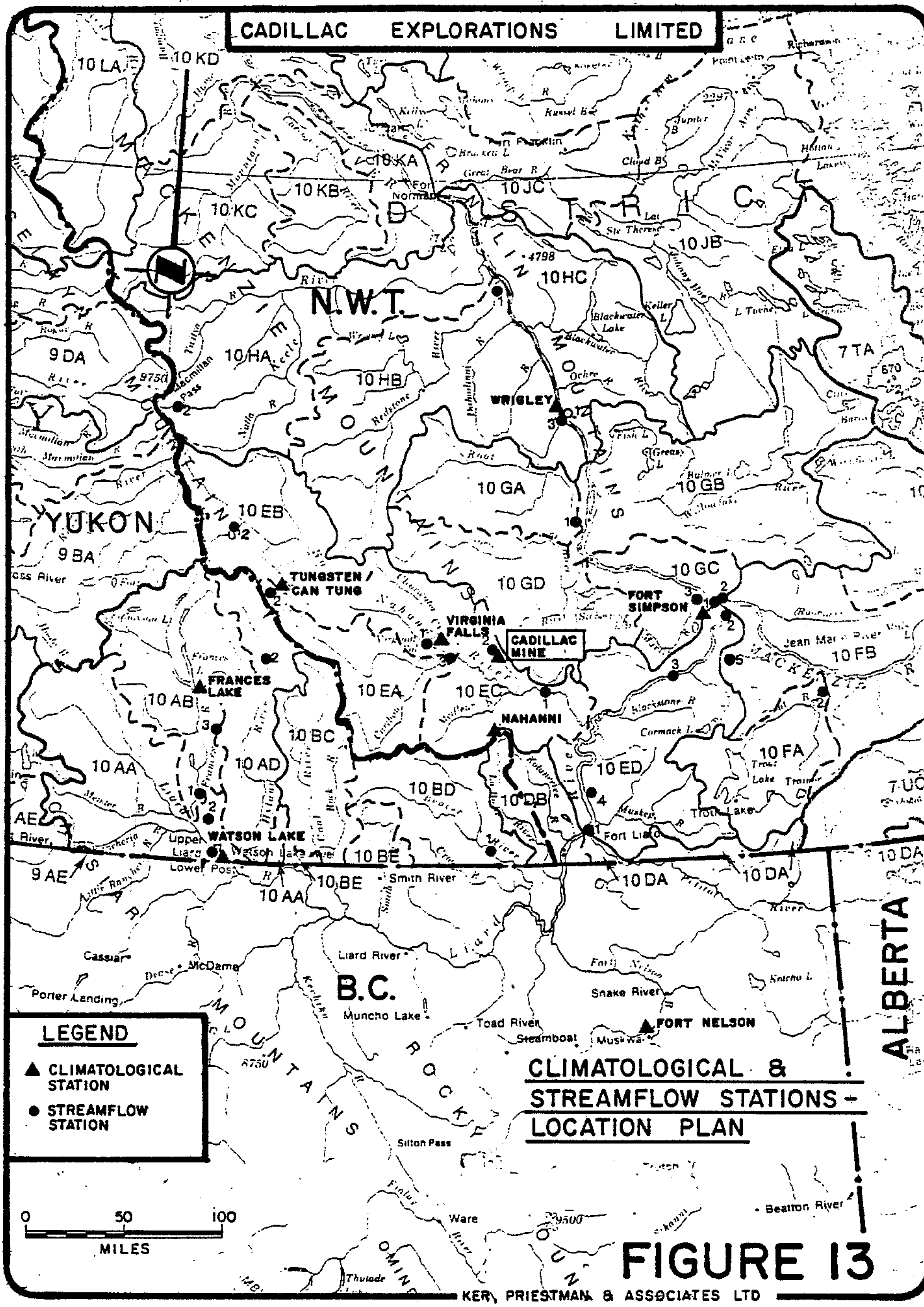


WASTE STREAMS and CONCEPTUAL EFFLUENT TREATMENT PLANT

FIGURE 12

KER, PRIESTMAN & ASSOCIATES LTD

NCI-414 KPA



CLIMATOLOGICAL & STREAMFLOW STATIONS - LOCATION PLAN

FIGURE 13

KER, PRIESTMAN & ASSOCIATES LTD

SHORT DURATION RAINFALL INTENSITY-DURATION FREQUENCY DATA FOR- FORT NELSON A BC

CADILLAC EXPLORATIONS LTD. BASED ON RECORDING RAIN GAUGE DATA FOR THE PERIOD- 1966 - 1977 11 YEARS.

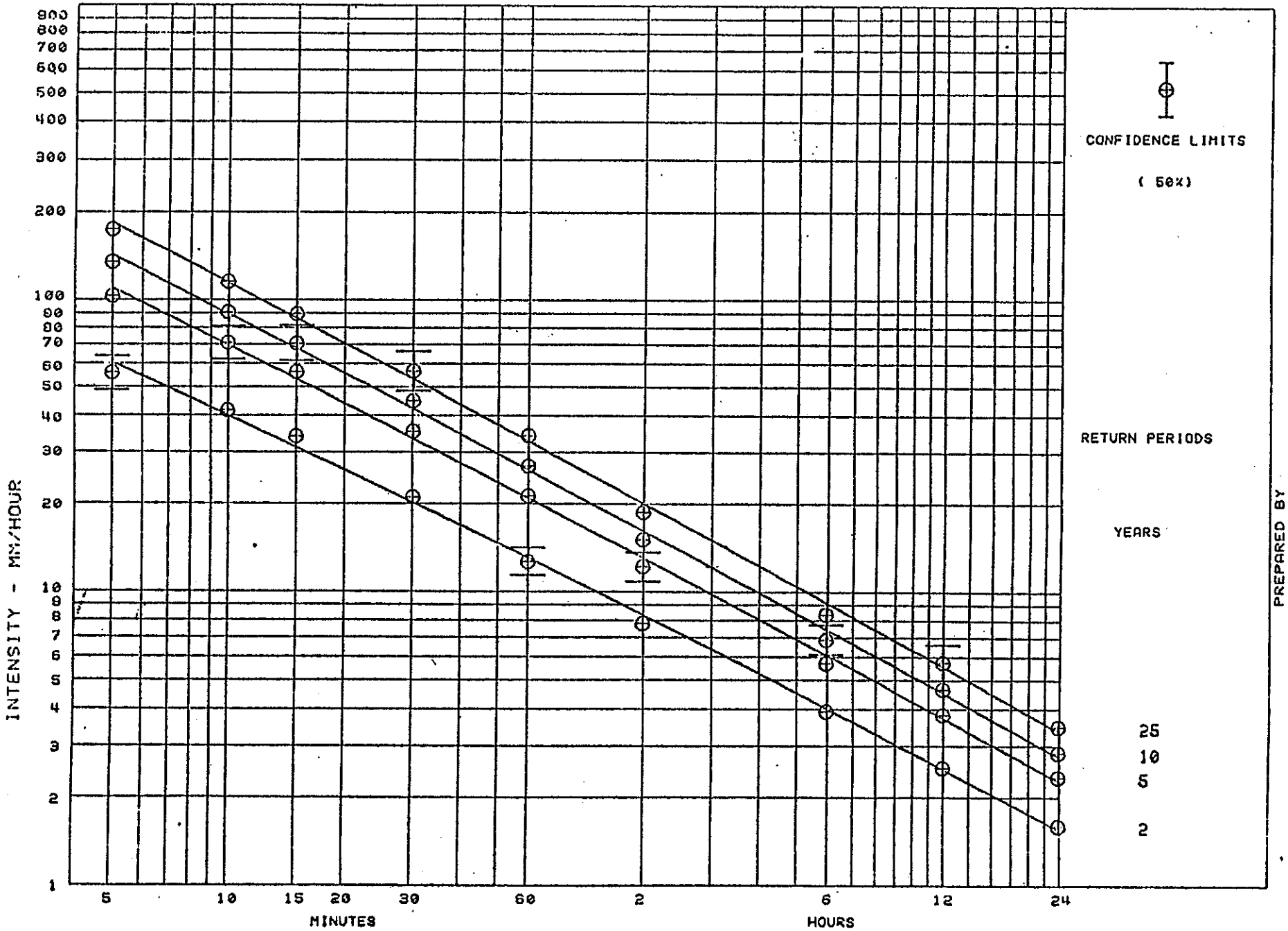
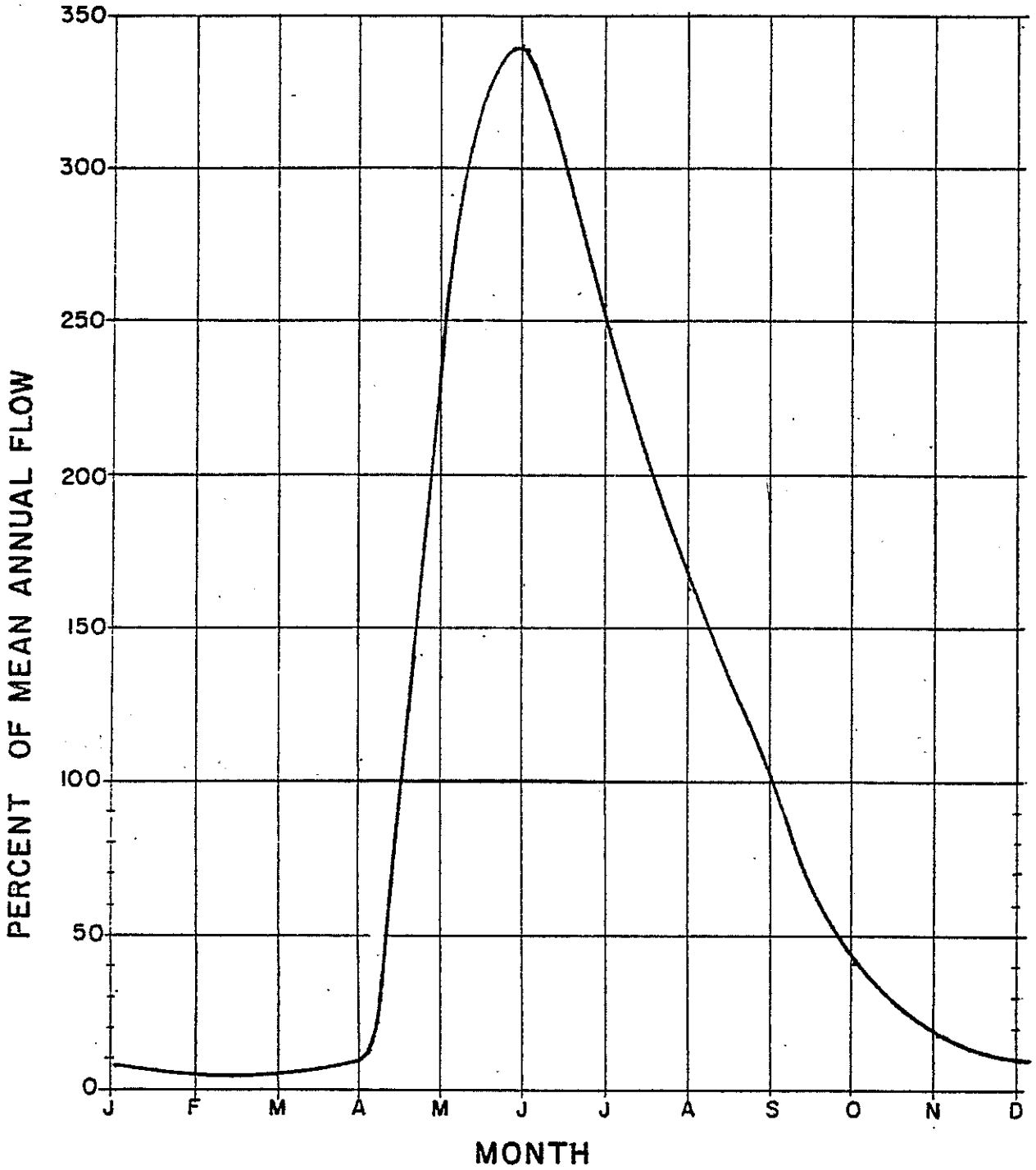


FIGURE 14

CADILLAC EXPLORATIONS LIMITED



MEAN ANNUAL MAXIMUM DAILY FLOW = 970% OF MEAN ANNUAL FLOW
MEAN ANNUAL MAXIMUM INSTANTANEOUS FLOW = 1600% OF MEAN ANNUAL FLOW

NOTE

ICE CONDITIONS PRESENT FROM OCTOBER TO EARLY MAY.

INDEX HYDROGRAPH

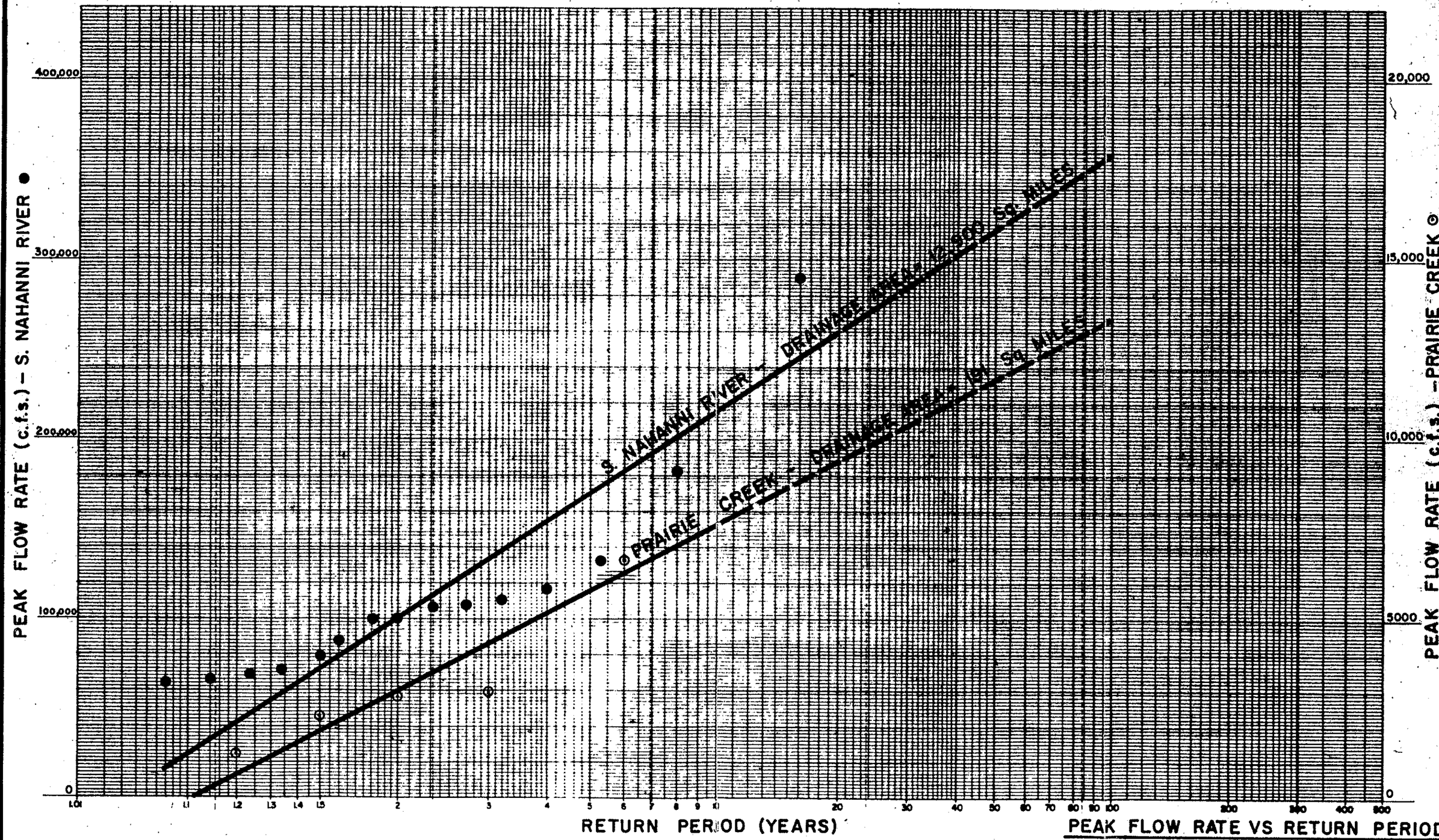
PRAIRIE CREEK AT CADILLAC MINESITE

VANCAL-2988

FIGURE 15

KER, PRIESTMAN & ASSOCIATES LTD

CADILLAC EXPLORATIONS LIMITED



PEAK FLOW RATE VS RETURN PERIOD
S. NAHANNI RIVER & PRAIRIE CREEK

FIGURE 16

KER, PRIESTMAN & ASSOCIATES, LTD.

CADILLAC EXPLORATIONS LIMITED

C= 0.5

C=0.3

Rational Method Curves

SUGGESTED DESIGN CURVE, 10 YEAR RETURN PERIOD

PRAIRIE CREEK

S. NAHANNI RIVER

PEAK UNIT FLOW (c.f.s./SQUARE MILE)

DRAINAGE AREA (SQUARE MILES)

LEGEND

⊙ BASED ON FREQUENCY ANALYSIS OF STREAMFLOW DATA (SNOWMELT OR RAINFALL)

● BASED ON RATIONAL METHOD (RAINFALL)

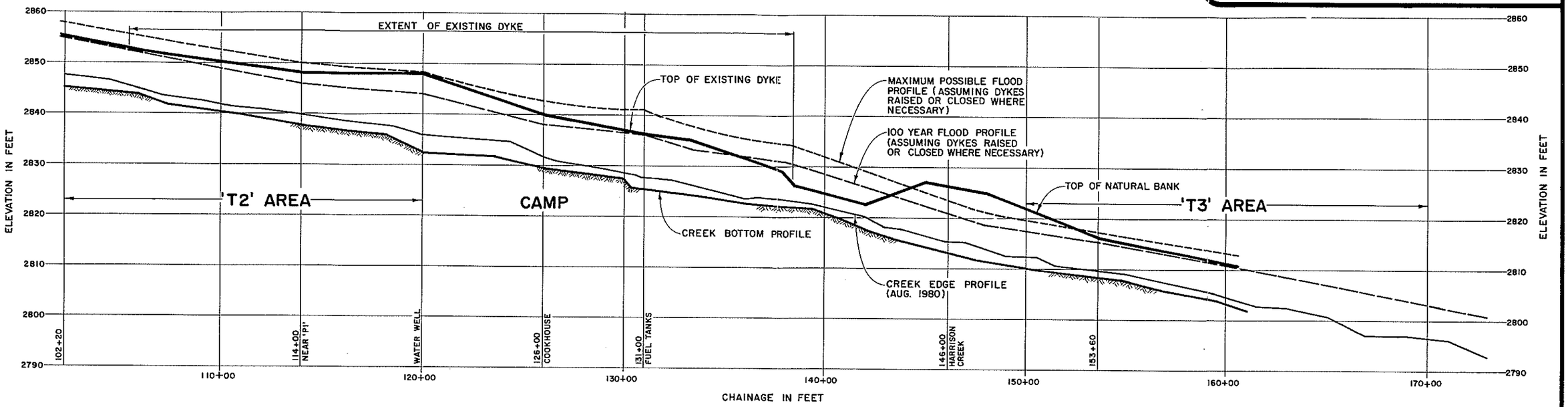
NOTES

1. ON THE BASIS OF THE STREAMFLOW ANALYSIS, THE FACTORS FOR RETURN PERIODS FOR OTHER THAN 10 YEAR ARE:
   $Q_5 = 0.8Q_{10}$; $Q_{50} = 1.5\,Q_{10}$
   $Q_{25} = 1.3Q_{10}$; $Q_{100} = 1.7\,Q_{10}$
2. C= RUNOFF COEFFICIENT FOR RATIONAL METHOD.

PEAK UNIT FLOW VS. DRAINAGE AREA

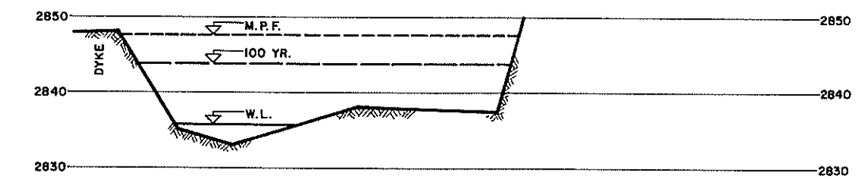
FIGURE 17

CADILLAC EXPLORATIONS LIMITED

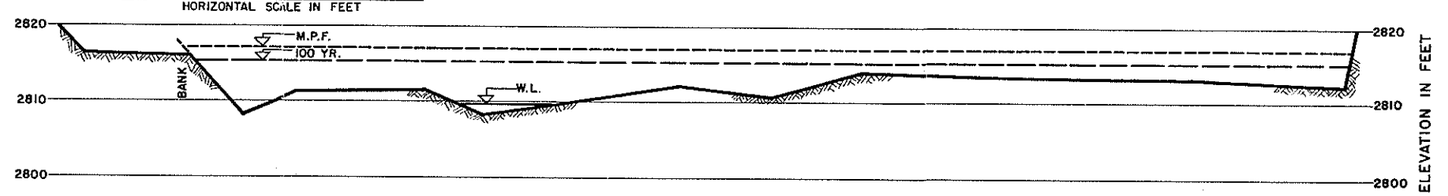


PROFILE - PRAIRIE CREEK

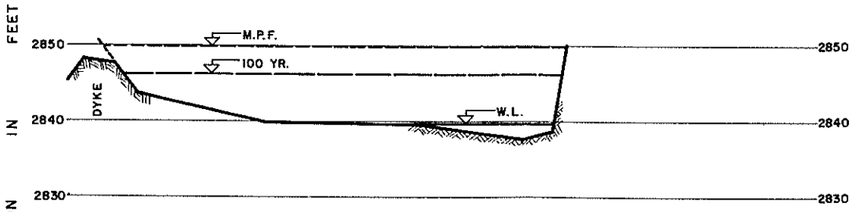
0 500 1000
HORIZONTAL SCALE IN FEET



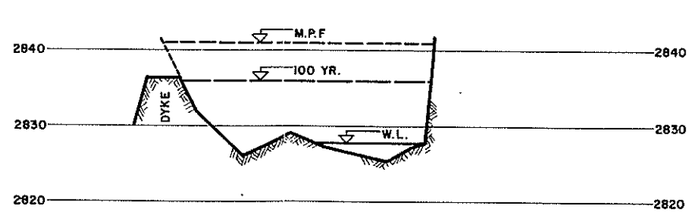
120+00



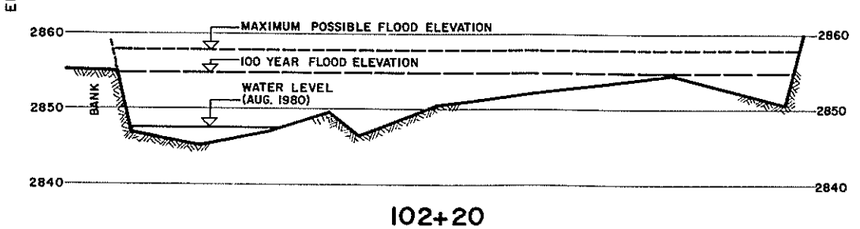
153+60



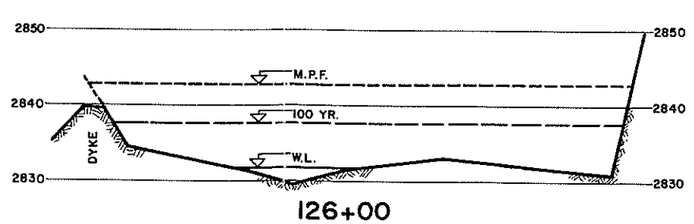
114+00



131+00



102+20



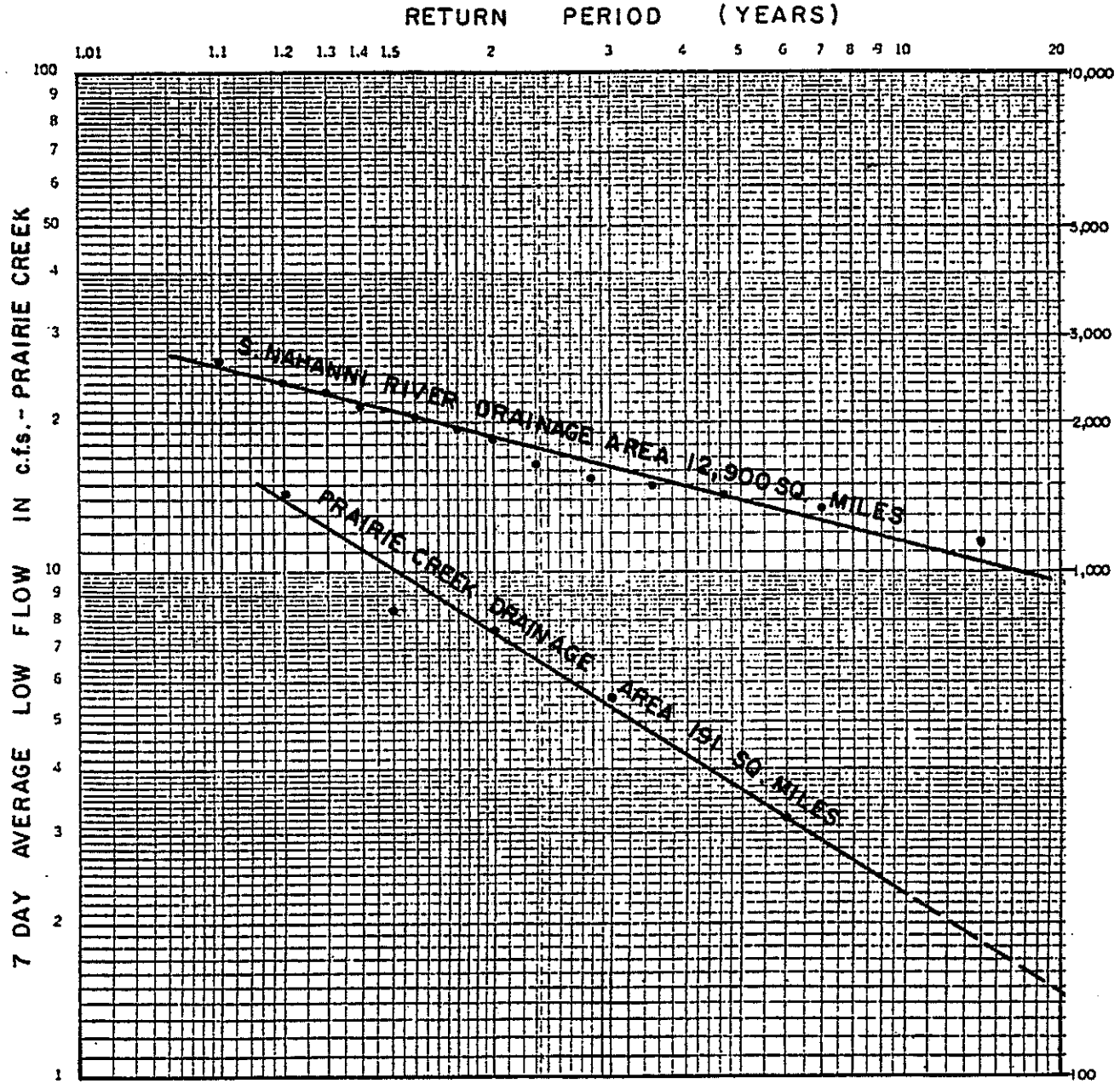
126+00

CROSS SECTIONS

0 50 100 150
HORIZONTAL SCALE IN FEET

PRAIRIE CREEK PROFILE, CROSS SECTIONS AND ESTIMATED FLOOD LEVELS

FIGURE 18



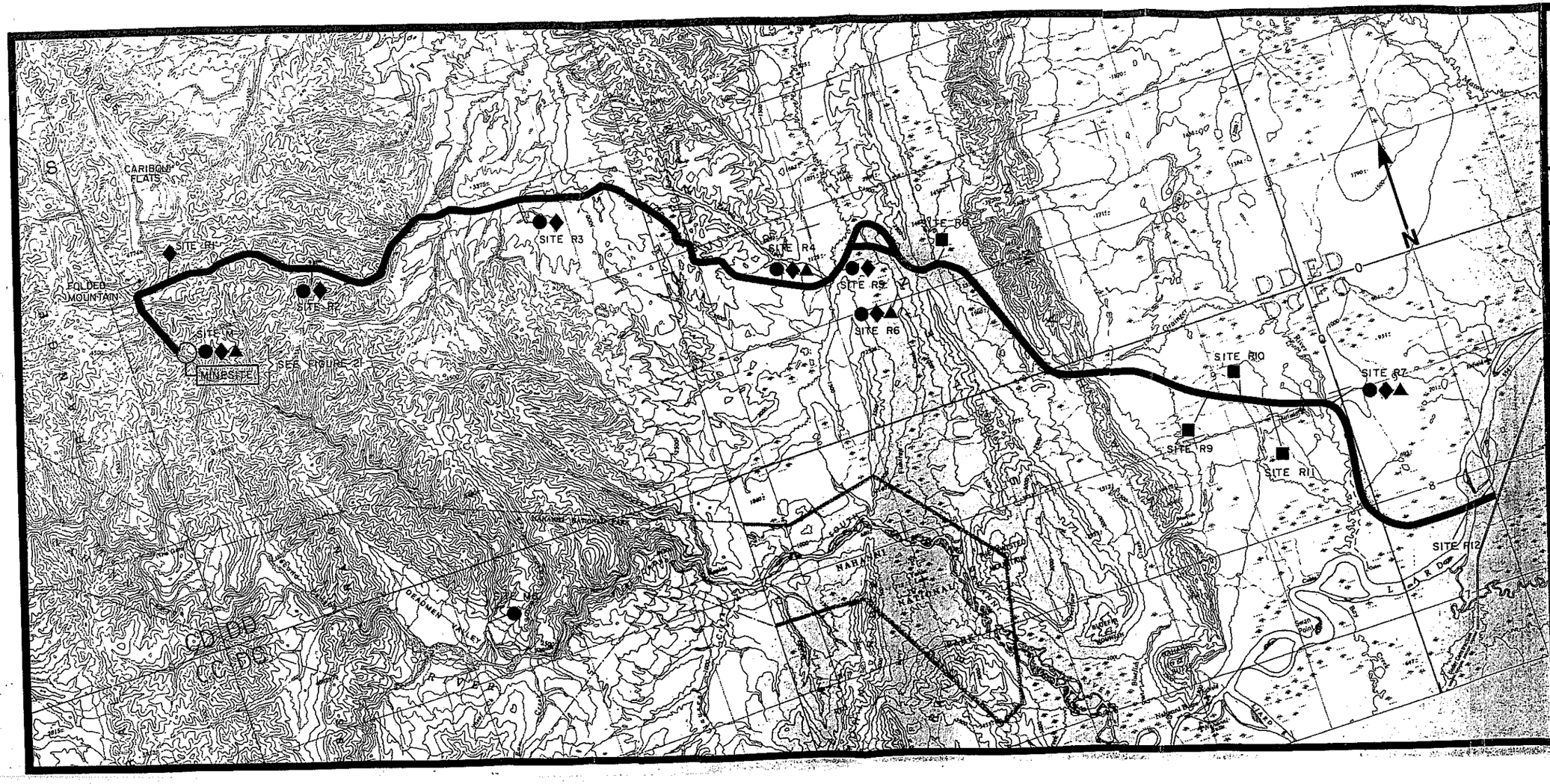
7 DAY AVERAGE LOW FLOWS vs. RETURN PERIOD

S. NAHANNI RIVER & PRAIRIE CREEK

FIGURE 19

KER, PRIESTMAN & ASSOCIATES LTD

VANCAL-2988



CADILLAC EXPLORATIONS LTD.

WINTER ROAD

WATERCOURSE CROSSING LOCATIONS

SAMPLING STATIONS

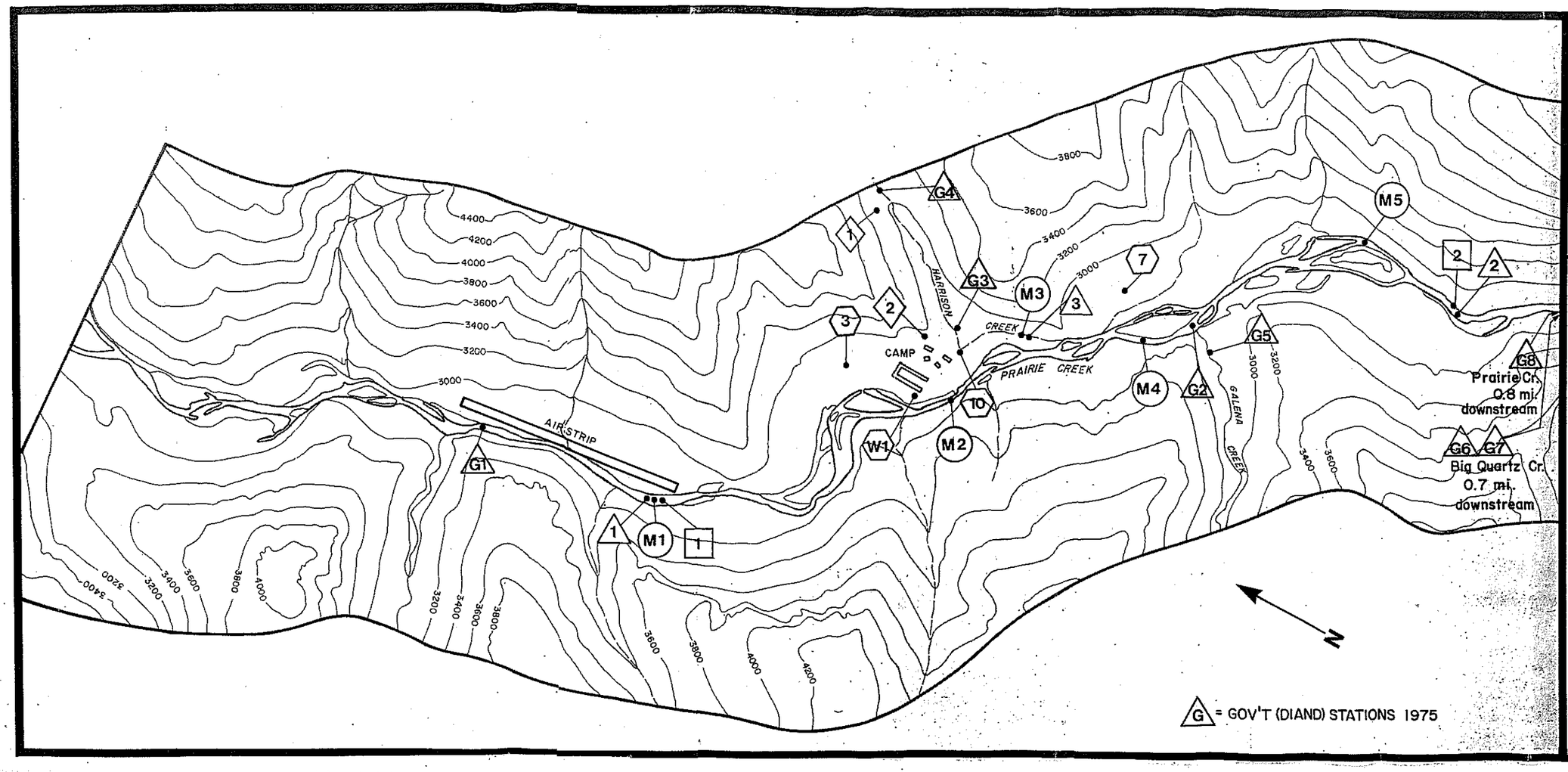
- ● FISHERIES
- ◆ BENTHOS
- ▲ WATER QUALITY
- ■ HELICOPTER RECONNAISANCE ONLY

0 5 10 MILES

0 5 10 15 km

FIGURE 20

beak



CADILLAC EXPLORATIONS LTD.

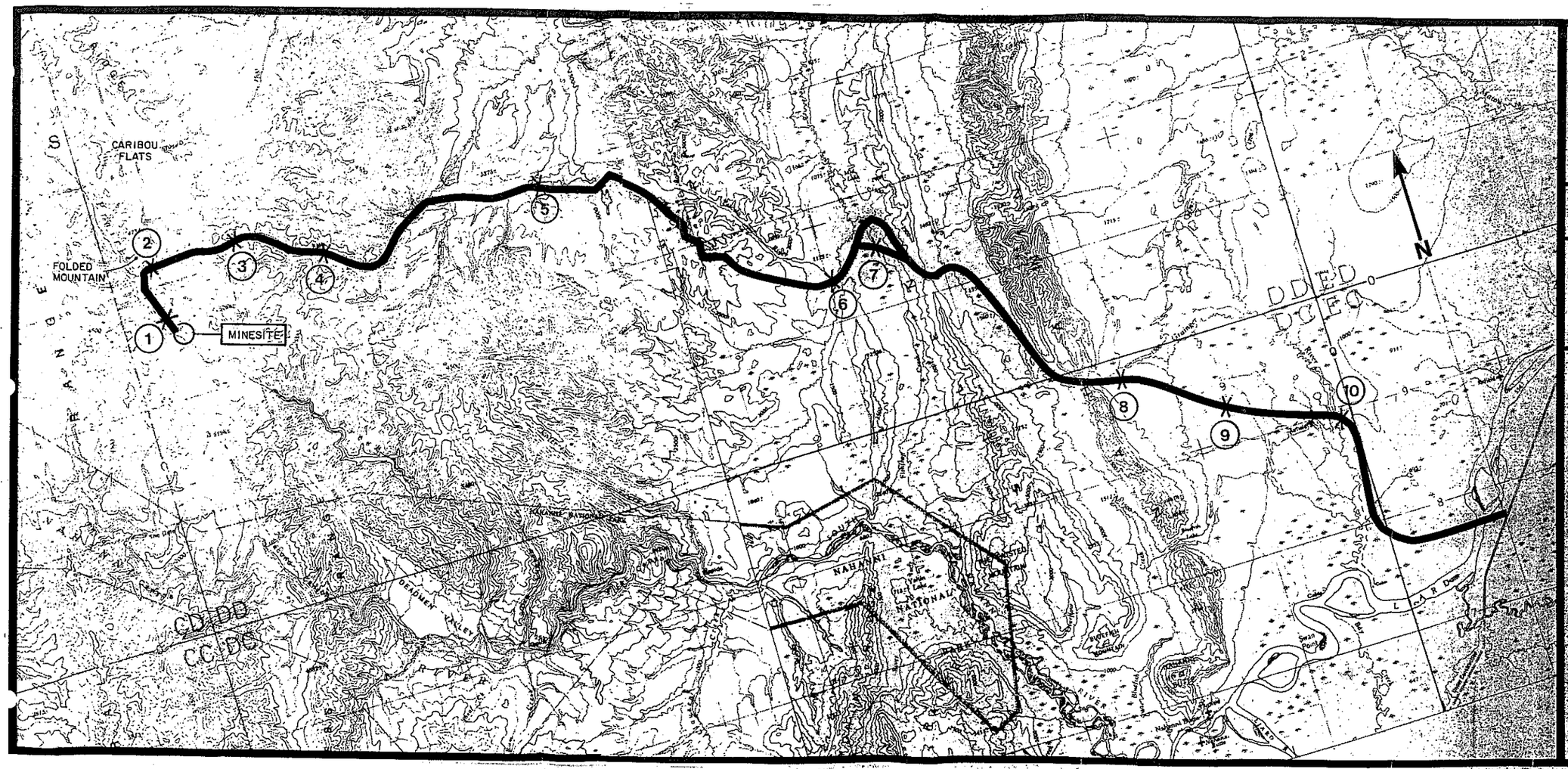
MINE SITE SAMPLING STATIONS

- AQUATIC
- SURFACE WATER QUALITY
- STREAM SEDIMENTS
- MINE WATER
- GROUND WATER

0 1000 2000 FT

0 300 600 m

FIGURE 21 beak



CADILLAC EXPLORATIONS LTD.

WINTER ROAD

LOCATIONS OF GROUND INVESTIGATIONS OF VEGETATION

INVESTIGATION SITE

1. Floodplain community
2. Lichen dominated community
3. Barren area
4. Lichen dominated community
5. Mixed forest community
6. Tetcela River (Mixed forest community)
7. Seasonally waterlogged area
8. Shrub meadow community
9. Shrub meadow community
10. Springer Range area

0 5 10 MILES

0 5 10 15 km

FIGURE 22 beak

CADILLAC EXPLORATIONS LTD. PROPOSED WINTER ROAD

WILDLIFE INFORMATION LEGEND (APRIL 1980)

ROAD ALIGNMENT

RANGE EVALUATION RE: WOOD BISON TRANSPLANT C.W.S6

NOTES.

1) SCOOTER ET AL. 1971
2) MR. R. FAST, PERS. COMM. CADILLAC MINES FOREMAN. 1980
3) BEAK CONSULTANTS LIMITED, FIELD RECONNAISSANCE, APRIL 1980
4) DR. D. FLETCHER & MR. R. H. WILSON. 1980 PERS. COMM. GOLDER ASSOCIATES, VANCOUVER, B.C.
5) DEPARTMENT OF THE ENVIRONMENT, INDIAN & NORTHERN AFFAIRS LAND USE INFORMATION SERIES. 1976
6) CANADIAN WILDLIFE SERVICE PROJECT, MR. H. REYNOLDS, PERS. COMM. 1980

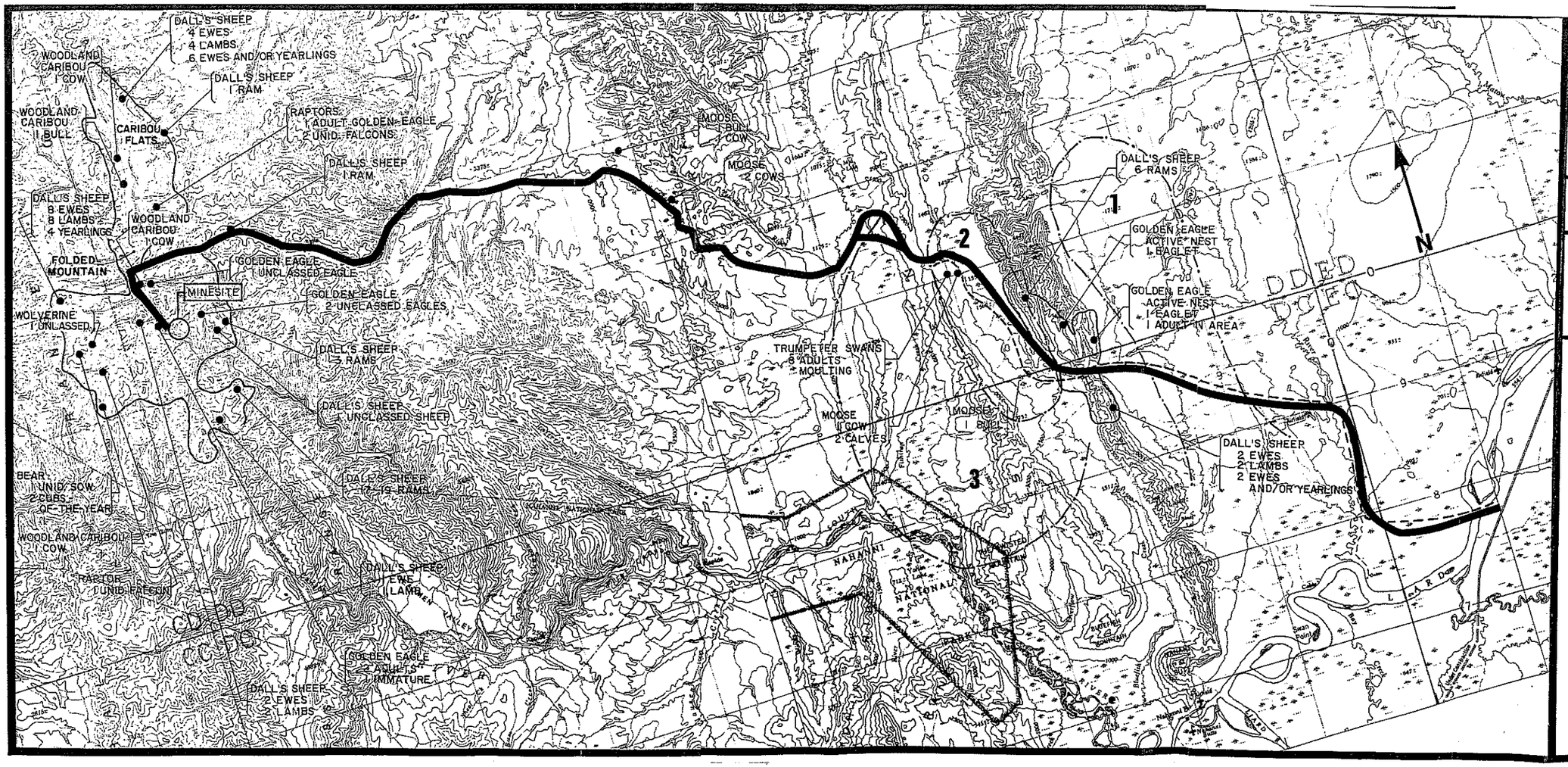
FOR DESCRIPTION OF OBSERVATIONS SEE SECTION 4.5.4 IN PRELIMINARY ENVIRONMENTAL EVALUATION FOR WINTER ROAD, MAY 1980.
AREAS A TO F HAVE PREVIOSLY BEEN DEFINED AS CONTAINING WILDLIFE POPULATIONS.
FOR JULY 1980 OBSERVATIONS SEE FIG. 24.
PROPOSED ROAD ALIGNMENT SHOWN HERE.
SURVEYED OR AS-BUILT ALIGNMENT SHOWN ON FIG. 24.

0 5 10 MILES

0 5 15 KM

FIGURE 23

beak



CADILLAC EXPLORATIONS LTD.

WINTER ROAD

LOCATION OF WILDLIFE OBSERVED JULY 6-9, 1980 & APPROXIMATE TRAPLINE BOUNDARY

NOTE:

FOR LOCATIONS OF WILDLIFE OBSERVED DURING APRIL 1980, OR NOTED BY OTHERS, SEE FIG. 23.

APPROXIMATE LIMIT OF DETAILED UNGULATE/RAPTOR SURVEYS, JULY 6-10 1980

APPROXIMATE WATERFOWL FLIGHT LINES, JULY 6-10 1980

APPROXIMATE TRAPLINE BOUNDARIES

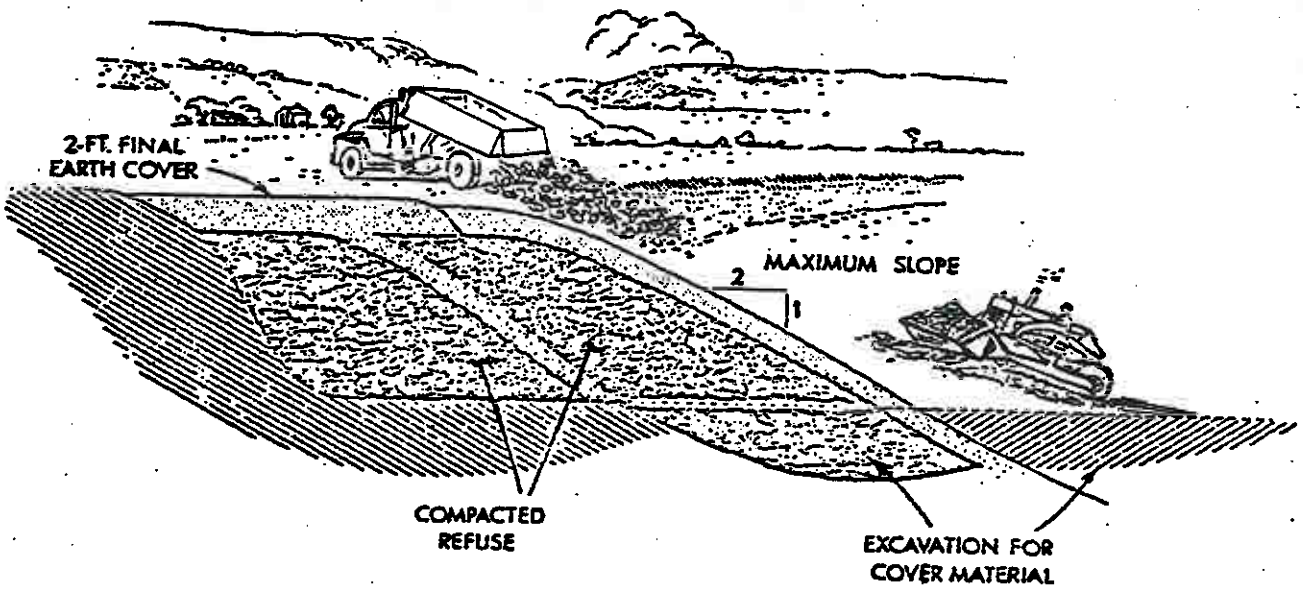
0 5 10 MILES

0 5 10 15 km

FIGURE 24

beak

CADILLAC EXPLORATIONS LIMITED



"AREA" LANDFILL OPERATION

FROM ENVIRONMENTAL DESIGN FOR NORTHERN ROAD DEVELOPMENT, ENVIRONMENT CANADA, 1978.

NCI-414 KPA

FIGURE 25

KER, PRIESTMAN & ASSOCIATES LTD