Errata

The references to “Thomas Creek Forest Service Road” and “Thomas Creek FSR” on the first, second and third pages of the executive summary, pages 5 and 21 of the main document text and the first page of the Bridge and Major Culvert Summary should read “Devil Creek Forest Service Road” and “Devil Creek FSR,” respectively.

NOVAGOLD RESOURCES INC.

FEASIBILITY STUDY

GALORE CREEK MINE ACCESS ROAD

2005 Study Report - Final

VOLUME 1

Prepared by:

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Smithers BC V0J 2N0

April 2006

File: 2331 00518-2

Executive Summary

NovaGold Canada Inc. is proposing to develop the Galore Creek project, a major gold-copper deposit located in remote North West British Columbia, approximately 100 km west of Bob Quinn Lake on Hwy 37 south of Dease Lake. McElhanney Consulting Services Ltd. as part of the NovaGold project team, was involved in preparing a Scoping Level Study and Pre-feasibility Study for the Galore access road and are submitting the road design and construction cost estimate in this Feasibility Study report.

The objectives of this study were to:

- Complete the final route selection
- Locate and survey the preliminary road centerline
- Complete site surveys for all fish bearing streams and major creek crossings
- Perform hydrology analysis for bridge and culvert installations
- Arrange for geophysical survey of major bridge crossings
- Design the road horizontal and vertical alignment to avoid or mitigate impact of geohazards,
- Incorporate mitigation measures in the road design
- Generate earthwork quantities and prepare a construction cost estimate and schedule of activities.

The final route selected starts at the junction of Hwy 37 and the Thomas Creek Forest Service Road and proceeds west across the Iskut River, up More Creek to Round Lake, then down Sphaler Creek to the Porcupine River before climbing up to the south tunnel portal at the headwaters of ScottSimpson Creek.

A single lane (6m wide) resource access road is planned to support construction of the slurry pipeline, and the power transmission line and provide supplies, equipment, and crew transport during construction and operation of the mine. With 15% grades and an average design speed of 40 km/hr this is intended to be a low impact road within the utilities corridor.

Bridges and culverts are designed for the 200 year and 100 year instantaneous flood respectively, with a minimum 1.5m clearance to the underside of the bridge girders unless additional clearance is required for navigable waters or geotechnical requirements. Seismic refraction surveys were conducted by Frontier Geosciences Inc. on the following major bridge crossings:

Iskut River	km 15.5	107m span
Muskwie Creek	km 30.4	97.5m span
Lower More Creek	km 39.2	91.4m span
Eros Creek	km 82.6	48.8m span
Yurie Creek	km 84.0	88.4m span
Saddle Creek	km 89.4	76.2m span
Maurer Creek	km 90.2	73m span
Sphaler #1	km 96.9	67m span
Porcupine River	km 0.0	84m span (Porcupine Connector)

In total, there are 130.6 km of road construction required to access the south tunnel portal. Included in this are 11 km of upgrade to the Thomas Creek FSR and 2.1 km of new construction of the Porcupine connector road. There are 50 bridge crossings, and 11 open bottom arches plus a range of round elliptical, corrugated steel culverts. The estimated total road construction cost is $84 million (Canadian). This on average works out to $650,000 per kilometer.

In order to meet the proposed construction schedule, three construction camps are planned:

Bob Quinn Camp at 3 km on the Thomas Creek FSR.

Roca Camp near 73 km of the access road

Porcupine Camp on the south side of the Porcupine River

Both Roca Camp and Porcupine Camp are remote locations requiring air support for mobilization and operation.

The cost to monitor and control geohazards is outlined in BGC's Geohazard Assessment Report. In addition, there are special mitigation structures such as no-post barriers, lock block walls, earth berms and snow sheds, required to protect the road and pipeline. These have been included in the cost estimate in the order of $8 million.

The construction of the Galore Creek access road is a major undertaking requiring the falling of 80,000 m^3 of timber; clearing 400 hectares of right-of way; moving 3.0 million m^3 of rock and earthwork, and placing over 300,000 m^3 of surfacing material.

Volume 1

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Volume 1

1.0 INTRODUCTION

1.1 OVERVIEW OF PROJECT

NovaGold's proposed Galore Creek project involves the development of a major gold-copper deposit located in remote North West British Columbia, approximately 100 km west of Bob Quinn Lake, which is located on the Stewart-Cassier Highway approximately 160 kilometers south of Dease Lake. The mountainous terrain surrounding the deposit makes access to the site a particularly difficult challenge.

The open pit mine is expected to become operational 2 to 3 years after receipt of approval from the regulatory authorities for the road construction and mine development.

1.2 CURRENT STATUS

McElhanney Consulting Services Ltd. (McElhanney), as part of the NovaGold project team, was previously involved in preparing both a Scoping Study and a Pre-feasibility Study for the mine access road. The Scoping Study assessed possible access routes. The Pre-feasibility Study compared the More Creek (North Route) and Iskut-Stikine (South Route) and provided order of magnitude construction costs based on field reconnaissance.

The Pre-feasibility Study concluded that both the North and South Routes were technically feasible access routes to the mine site. Subsequently, it was determined that the North Route in conjunction with a concentrate slurry pipeline would be more practical and NovaGold decided to advance this route to the feasibility study stage

The results of the Feasibility Study and Road Design are submitted in this report for regulatory approval along with the environmental assessment.

In addition, this Feasibility Study includes a "Bankable Feasibility Cost Estimate" for the access portion of the overall project.

Figure 1

LOCATION MAP

No.	Date	Revision	Initials

Plan Key

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Drawn: FV/RAO | Checked: RWP | QC REVIEW: CDA | Date: JANUARY 2006

Horiz. 1:12,500

0 10 Km

Drawing Scale

Approved Sealed

NovaGold Resources Inc.

GALORE CREEK MINE ACCESS ROAD LOCATION MAP

Project No. 2331-00518-2

Drawing No.

Revision

Plotted Full Size on 22 x 34 Sheet

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1.3 ASSIGNMENT OBJECTIVES

The primary objective of this year's program was to establish the preferred route on the ground, conduct a P-Line survey and complete a preliminary design for the road and bridge crossings.

This preliminary design has been incorporated into a (Bankable) Feasibility Study suitable for applications for approval to the appropriate Government agencies, including the Ministry of Forests, Ministry of Energy and Mines, Department of Fisheries and Oceans, Navigable Waters Protection Branch, and Ministry of Water Land and Air Protection.

Other Objectives included:

- Investigate possible alternative alignments
- Complete site surveys for all fish bearing streams and major creek crossings
- Perform hydrology analysis for all bridge and major culvert installations
- Arrange for geophysical survey of major bridge crossings
- Re-align road centerline to avoid or mitigate geohazards, archaeological sites, and sensitive environmental values
- Incorporate mitigative measures in preliminary design
- Generate earthworks and produce a "bankable feasibility cost estimate"

2.0 ROAD ENGINEERING

2.1 ROUTE SELECTION

Aerial photographs at 1:20,000 and 1:30,000 scales along with 1:20,000 TRIM mapping and 1:50,000 topographic maps were used to identify potential access routes to the Galore deposit. A comprehensive review of these resources, complemented by selective air reconnaissance provided important guidance for the ground reconnaissance work, which followed.

The following road corridors were closely examined in the Scoping Level Study and eliminated from further investigation based on these findings.

A route down Galore Creek, west on the Scud River then north along the Stikine River valley to Glenora at the termination of the Telegraph Creek road was flown and is feasible from an engineering perspective but does not meet operational constraints as this route adds over 200 km to the haul distance to Stewart BC.

Major terrain features along this route include a deeply incised rock canyon on the lower Galore creek, the flat broad floodplain of the Scud River, ancient river terraces along the Stikine River valley and several major bridge crossings including the Scud River, Oksa Creek, Dokdaon Creek and the Stikine River near Glenora.

Similarly, a road down Galore Creek, east on the Scud River to the upper Scud drainage would reduce the tunnel length required from Round Lake (12 km), but the road is not feasible due to near vertical rock bluffs and deep ravines that would have to be crossed.in order to gain access to the Galore Creek valley.

An alternative to the More Creek route was to climb up to the Arctic Lake plateau just east of the Mess Creek drainage and cross through the south east corner of Mount Edziza Park before following down a tributary of Ball Creek to Hwy 37 near Burrage Creek. This option avoids the More Creek canyon and short tunnel but adds 17 km of new construction, 10 km of which is inside a provincial park.

The Arctic Lake plateau is a relatively flat barren expanse, which is highly exposed due to minimal vegetation. Lower Ball Creek is potentially unstable with several small landslides observed. The Iskut River crossing at Burrage is straightforward with rock abutments on both sides.

On the Iskut-Stikine route an option of crossing the Porcupine River near its confluence and then continuing north along the Stikine River and up Jack Wilson Creek was considered. The additional 10 km of construction along the environmentally sensitive Stikine River plus the impact on fisheries habitat and high geohazard frequency in Jack Wilson Creek were sufficient reason to eliminate this route.

The Iskut-Stikine (South route) and More Creek (North route) were marked on air photos and maps as part of the Pre-feasibility Study. A detailed ground reconnaissance was conducted which involved walking each route using hand held GPS units and recording control points, terrain features and major creek crossings. Often several preliminary lines were investigated in order to achieve a feasible road location. The Sphaler Creek canyon was selected as a feasible construction access route for a low volume road, a slurry pipeline and a power transmission line. A low order ground survey of the final P-line was then conducted to record the ground surface features to be used in the Road Design.

2.2 ROUTE DESCRIPTION

2.2.1 Proposed Alignment (More Creek Route)

The Lower More section (km 0-40.9) commences at Hwy 37, 15 km north of Bob Quinn Lake and follows the existing Thomas Forest Service Road for 11 km. New construction begins here and the route continues south to km 15.5 before crossing the Iskut River (100m span) immediately upstream of the More Creek confluence.

From here, the proposed road location does a switchback and climbs up and over a rock nose above the lower More Creek canyon. Steep sideslopes of 80-100%, rock bluffs and talus slopes dominate the terrain requiring maximum road gradients of 15% and large rock cuts to achieve road access beyond km 20. Before leaving the canyon, the route passes under potentially unstable rock falls and along the toe of an active rockslide at km 21.5.

The proposed road corridor moves further away from the More Creek floodplain from km 22-km 24 and passes behind a hill at km 23 before dropping down past two avalanche chutes at km 23.5 and km 24.5. A 30m span bridge is required on the creek south of Swamp Lake and extensive rock work (drilling & blasting) between km 25 and km 27. The route then follows the flat river terrace composed of washed

gravel and covered with immature Cottonwood through to Muskwie Creek (95m span). A potential gravel source was identified east of Muskwie Creek on the fluvial fan.

More Creek valley eventually widens beyond km 30 and the route traverses the north side of the flood plain up to the More Creek Bridge Crossing (92m span) km 39.5. The terrain is relatively flat throughout this section and a series of swamps and small fish bearing streams are crossed between km 33 and km 36.

The P-line then climbs steadily at a 10%-15% grade to the upper More Creek (200m span) crossing at km 49. Two potential gravel sources were identified at km 40 and km 41.5 Gentle 15-20% sideslopes, and moist deep glacial till deposits are encountered up to km 45 where a rock outcrop extends for 300m. Unstable Class IV terrain exists below the road corridor from km 45.5 to km 48 forcing the route higher and across two active avalanche paths requiring mitigative measures.

Once across to the north side of More Creek the terrain is less steep and the road alignment follows the contour of the land climbing gently towards the summit above Round Lake. Major land features along this section of the route include; avalanche runout paths at km 50 and km 53; riprap sources from tallus slopes near km 54, 58 and 61; and a series of small lakes and wetlands near the headwaters to Mess Creek. Roca Minerals has an exploration camp just south of the P-Line at km 69, which is the beginning of sub-alpine terrain with Mountain Hemlock and Sub-alpine Fir forest cover.

The upper More Creek valley is a wide outwash plain from the Andrei Glacier. Soils are a mixture of washed gravel and colluvium with the proposed road alignment crossing a 25m high lateral moraine at km 76. As the route climbs to the summit at approximately 1200m elevation the rock formation changes and limestone scree slope is encountered

Beyond Round Lake, the proposed route is located down the upper Sphaler Creek drainage. This section is primarily alpine and sub-alpine terrain with several unnamed creek crossings at the bottom of deep wide gullies and outflows from the glacier between large medial and lateral moraines. Significant rockwork is required to achieve a 15% gradeline from km 78-km 80 then a major 80m bridge span at km 83

to follow a narrow bench through to km 85. Outflows from the glaciers are crossed at km 86 and km 90 and the P-Line skirts the edge of the Great Moraine between km 90 and km 91.

The Sphaler Creek canyon runs for 25 km before its confluence with the Porcupine River. The proposed road corridor stays on the south side to km 97.5, taking advantage of stable rock benches wherever possible. Avalanche sheds are required in a 150m section near km 93 and extensive drilling and blasting of full bench cuts will be necessary. The first Sphaler Creek crossing is estimated to be 67m bank to bank and 20m above the creek bed to allow for any catastrophic rock and debris flows.

From km 97.5 to km 105 the route is on the north side of Sphaler Creek traversing 60-80% sideslopes and crossing the bottom edge of avalanche runouts near km 99.5 and again km 102. Most of the canyon except for the slide areas have mature Hemlock stands as the predominant forest cover.

The next Sphaler Creek crossing is lower and approximately a 49m span is required to access a flat bench on the south side which runs for two kilometers.. Sideslopes are relatively gentle (30-50%) up to a pass in behind a hill at km 110. The route manages to avoid several rock slides and tallus slopes but has to cross the toe of a rock fall at km 110.5 before dropping down to the final Sphaler Creek (50m span) crossing at km 111.5.

Avalanche prone terrain is crossed at km 112 and again at km 114 but the P-Line has to climb constantly to reach the top of a tallus slope and the narrow gap allowing access through to the Porcupine River valley. The North Route then angles away from the Porcupine River into the ScotSimpson Creek drainage.

The upper ScotSimpson Creek from km 122 is open alpine terrain with numerous avalanche chutes extending to the valley bottom. The proposed road ends at the south tunnel portal near the toe of a glacier at approximately 1030m elevation.

2.2.2 Alternative Alignments

Road layout is an iterative process, as the best location is not always readily apparent. Supplementary requirements to the road design contained in

Archaeological and Environmental studies and Terrain Stability Mapping and Geotechnical Assessments may override construction criteria.

Alternate alignments were investigated and chosen for the following sections:

1. km 21 to km 22 - moved road centerline out away from base of the hill to avoid high-risk rockslide area.
2. km 24 to km 25 - moved road right-of-way over away from an avalanche run-out path and potential rock falls
3. km 48 to km 51 - two routes located and surveyed with the option of staying on the south side of More creek and traversing high-risk avalanche paths and debris flows was rejected in favor of a 200m bridge crossing over the More Creek canyon onto more stable terrain along the north slope.
4. km 72.5, km 79 and km 81.5 - road was re-aligned to protect identified archaeological sites.
5. km 110 to km112.5 - moved bridge crossing to obtain better clearance over Sphaler Creek and avoid rock falls and avalanche hazards.

Geohazards along the route have already been documented by BGC Engineering Inc. (BGC).

2.3 ROAD DESIGN

2.3.1 Design Requirements

The Galore Creek access road is classified as a resource development road and the Design Criteria (Table 1) approved by the Project Team specifies a single lane (6m) radio controlled road capable of carrying the legal axle loading for trucks on British Columbia Highways. An average design speed of 40 km/hr and maximum grades of 15% are meant to allow vehicle traffic year round for construction of the tunnel, power transmission line and slurry pipeline, which will utilize the same road corridor. Once the mine is operational, the road will be used to provide supplies and equipment, and crew transport but is not intended for continuous concentrate hauling.

The preliminary design for the More Creek (north) Route generates a horizontal and vertical alignment, which match the widely varying terrain. Special design parameters are present for unique sections such as the Lower More Creek Canyon, Round Lake, Sphaler Creek Canyon, and Upper ScotSimpson Creek. The challenge was to optimize earthwork quantities while dealing with physical constraints, and incorporating Archaeological, Environmental and Geotechnical requirements.

2.3.2 Design Specifications

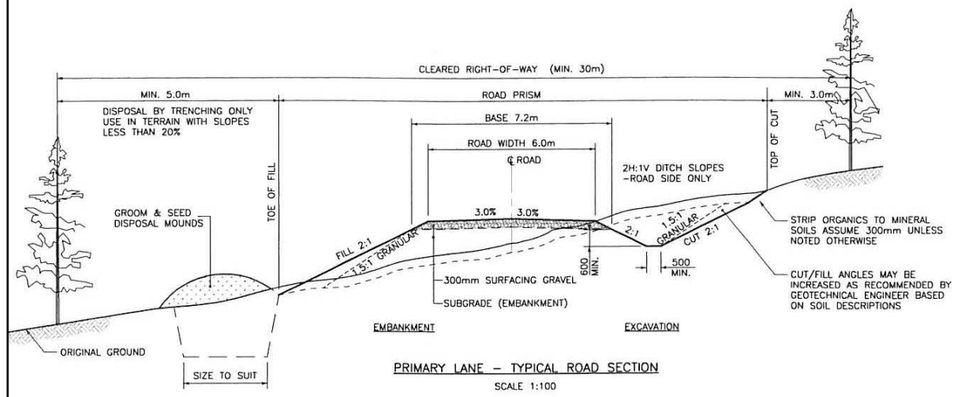
The typical road templates (Figure 2) and approved Design Criteria (Table 1) form the basis for P-line location decisions and road design parameters for both the Horizontal and Vertical Alignments. The P-line location is a critical function as it leads directly to the actual design, which in turn impacts the construction cost, safety, cycle times, operating cost and maintenance requirements. Our design is based on the P-line survey and has been adjusted to account for environmental and safety constraints and the approximate earthwork volumes optimized.

Initial design drawings were prepared for alternate alignments showing approximate quantities and relevant notes on environmental and geotechnical constraints. Following discussions with the Novagold project team the options were reduced to a single preferred alignment. The design submitted in this report includes the following:

- Plan and profile drawings (Appendix 3) showing road widths, terrain features, timber and soil types, archaeological sites, road grades, cut/fill ratios, construction details, waste/borrow sites, mitigative structures and safety features.
- Reports summarizing earthworks and mass haul (Appendix 4)
- Typical Cross Sections
- Bridge and Culvert General Arrangements

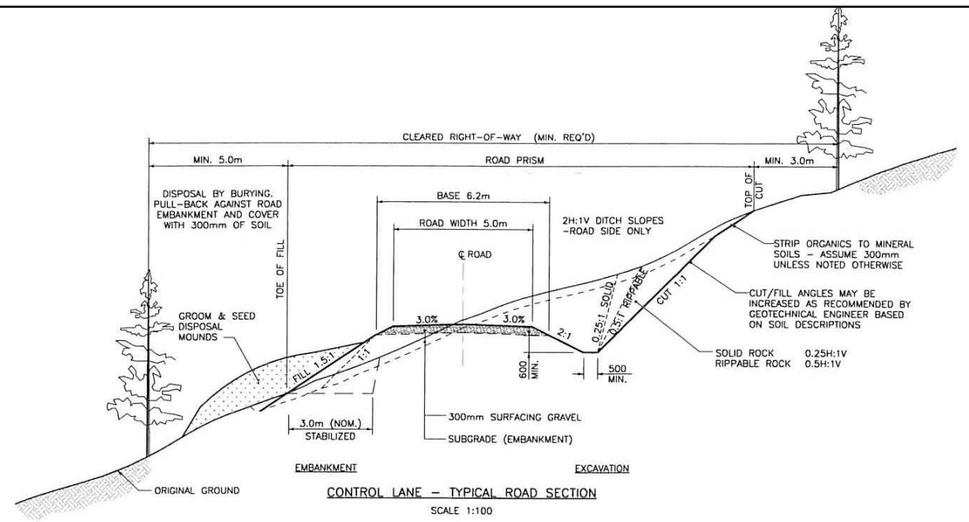
Figure 2

Typical Road Sections



PRIMARY LANE – TYPICAL ROAD SECTION

SCALE 1:100



CONTROL LANE – TYPICAL ROAD SECTION

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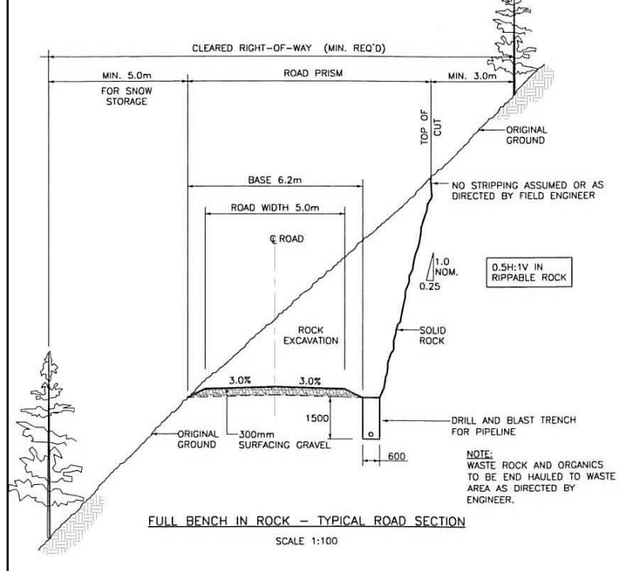
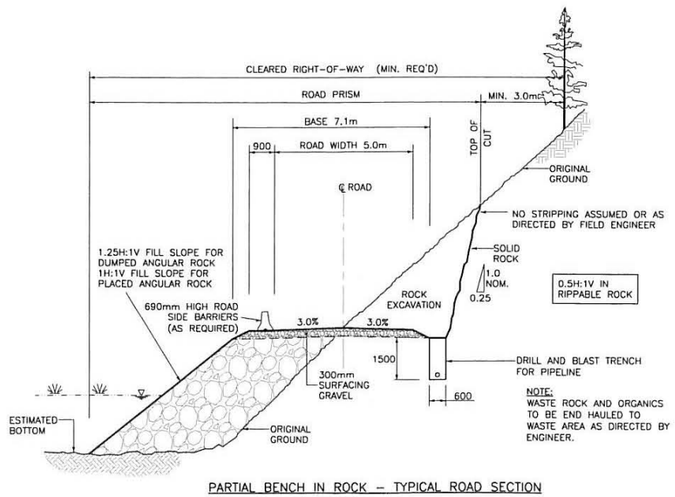


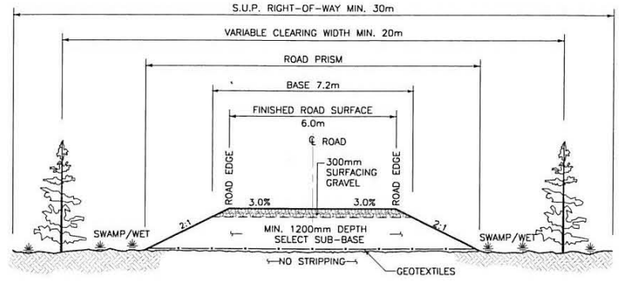
FULL BENCH IN ROCK – TYPICAL ROAD SECTION

SCALE 1:100



PARTIAL BENCH IN ROCK – TYPICAL ROAD SECTION

SCALE 1:100



OVERLAND – TYPICAL ROAD SECTION

SCALE 1:100

Date	Revision	Initials	Plan Key

McElhanney

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Drawn: FV/BL	Date: OCTOBER 2005	

AS SHOWN

Drawing Scale

Plotted Full Size on 22 x 34 Sheet

Approved Sealed

NovaGold Resources Inc.

GALORE CREEK MINE ACCESS ROAD

NORTH ROUTE

DETAILS - TYPICAL ROAD SECTIONS

Project No. 2331-00518-2

Drawing No. **518-2-601**

Revision

Destroy all prints bearing previous number

Table 1

Design Criteria

Classification	Single Lane
Average Daily Traffic (ADT)	≥ 50
Design Speed (km/hr)	≤ 30 ≥ 60
Min. SSD (m)	65
Min. Radius (m)	35
Switch-Backs – Min. Radius (m)	15
Switch-Backs – Max. Grade %	10
Min. K. Factor – Sag	5.1
Min. K Factor – Crest	3.1
Max. Grades	15%
Road Width (m)	≤ 5.0 ≥ 6.0
Pull-out width	Add 4.0m
Right-of-way (m)	≤ 30

The design and drafting is in accordance with Ministry of Forests Standards as described in the Forest Road Engineering Guidebook.

2.4 STREAM CROSSINGS AND BRIDGE DESIGN

2.4.1 Hydrology

Environmental and Hydrology studies for the culvert and bridge crossings were undertaken by Rescan Environmental Services Ltd. (Rescan). McElhanney performed an independent check of the hydrology and performed hydraulic calculations for each of the bridge and major culvert crossings. The 100-year design flood flows (Q100) were calculated for all bridge crossings and culvert installations., In addition, the Q200 was calculated for the major watersheds, consisting of the Iskut River, More Creek, Mushwie Creek, Sphaler Creek, and the Porcupine River. Standard debris clearance from high water to the underside of the girders of 1.5m was used whenever possible, except where conditions did not allow it.For all bridges in excess of 40 m in length, a minimum of 1.7 meters above the Q100 or Q200 was provided, except where additional clearance was specified in the BGC Debris Flow Assessment report.

It should be noted that some of the recommended clearances in the BGC report were not possible to achieve due to the road location in steep mountain sideslopes. It should be expected that these locations may not survive a debris flow event, and measures will need to be taken to mitigate the risk to the public, such as frequent inspections.

METHODOLOGY

The hydrology for the project has been developed using a variety of resources to find values that are reasonable for design, while still being valid under scientific scrutiny. Once the waterscourses were identified using BC TRIM topographic map sheets, the drainage areas were analyzed and design flood flows were calculated. The streams were then divided by classifying them as either culvert, minor bridge or major bridge depending on the size of the expected crossing and the estimated design flood flow.

Using several different methods, McElhanney estimated the preliminary 100-year flood flow for each of the bridge crossing sites. The methods used by McElhanney included the Rational formula, the Beaumont Method, the Community Watershed

formula, the BC Stream Inventory method, and the Log Pearson Type III method. Not all these methods are applicable for all sizes of drainages, so engineering judgement was used to arrive at a design flow value for each site.

McElhanney's values were compared to the values derived by Rescan Environmental Services Ltd. in their report dated August 2005. Rescan's values were generally higher for all of the crossings, partially because they included steam gauge stations encompassing a wider regional area than those considered by McElhanney, resulting in more conservative assumptions in the flow calculations.

Following the recommendation of our Senior Hydrotechnical Engineer, Rescan's 100 year flood flows were selected for the smaller watersheds. For the major watersheds (Iskut, More, Muskwie, Sphaler, and Porcupine), McElhanney calculated slightly lower design flow values to allow for more feasible bridge designs.

It should be noted that since the road alignment was still being refined, several crossings were not included in the Rescan report, and the hydrology calculations were performed by McElhanney. These crossings included Blurry Creek, Alexander Creek, Hickman Creek, Three Creek Junction, Round Lake, Saddle Creek, Reed Creek, Hiscock Creek and O'Driscoll Creek amongst others. In order to select a 100-year flood flow for these creeks that was consistent with the flows in the Rescan report, Rescan's values for nearby watersheds were compared to the McElhanney's calculated values for same nearby watersheds, and an appropriate factor was applied to the new calculated values to bring them in line with the rest of the crossings.

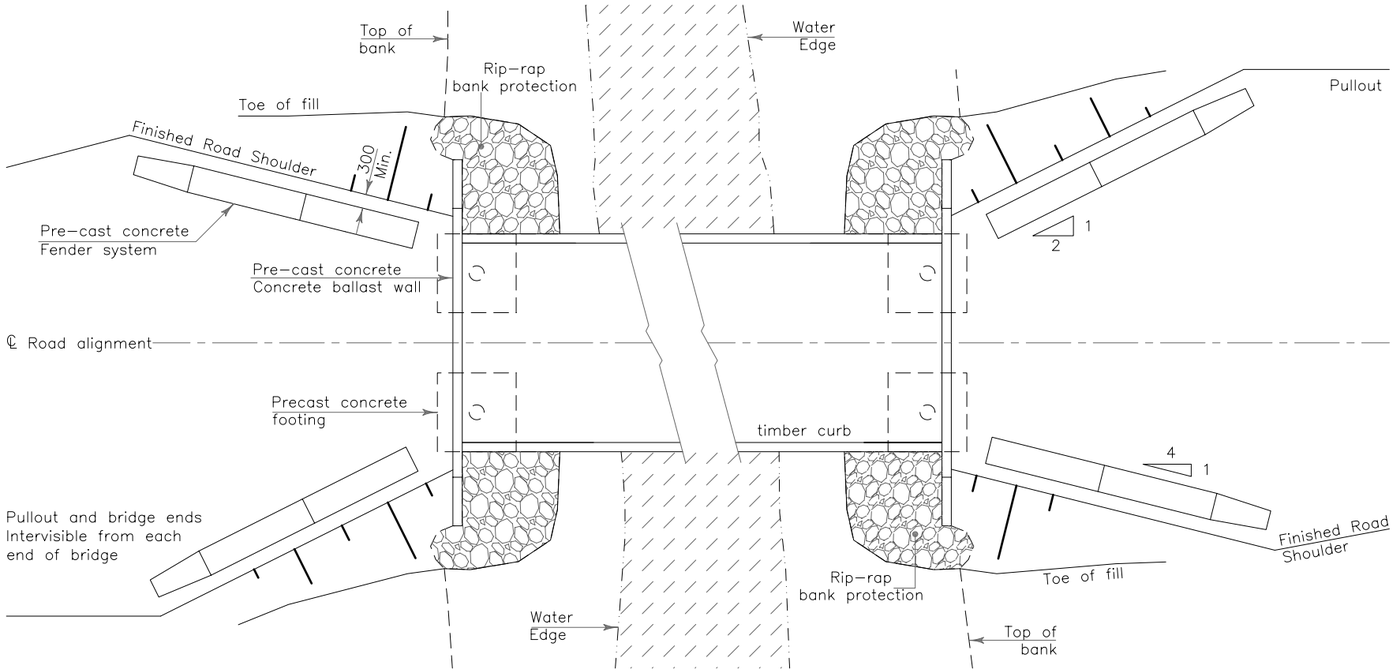
Although we feel that Rescan's design flows are somewhat conservative, for a large majority of the crossings, the span length is governed by the road alignment rather than the hydrology. For the major watersheds where the flows dictate the bridge span and elevation requirements, the analysis was refined to achieve a more realistic design flow.

2.4.2 Drainage Structures

Stream classification was carried out by Rescan for all watercourses along the route. Fish bearing streams were identified and either bridges or special open bottom arch type culverts were designed for these crossings. (Figure 3)

Typically, all structures past approximately km 43 were not classified as having fish values.

Culverts are designed for a 50-year life and to pass the 100-year flood event (Q100). To reduce the risk of blockage from infilling, snow, and ice the minimum specified cross drain is a 600mm diameter corrugated steel pipe. The inlet and outlet to all culverts are protected from scouring with class 25 kg riprap. Ditch blocks will be installed immediately down slope from cross drain culverts.



PLAN VIEW
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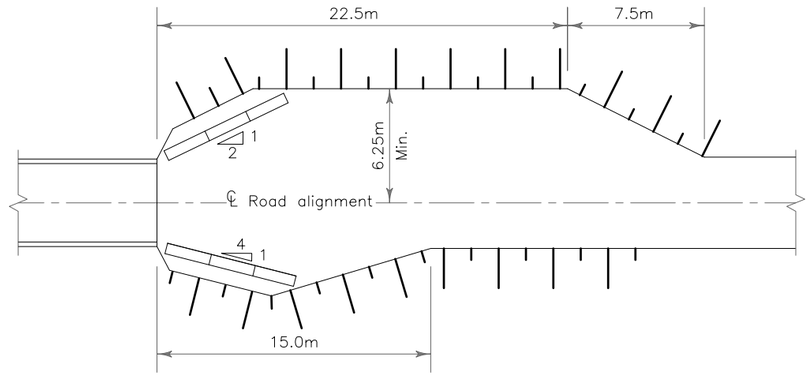

TYPICAL PULLOUT APPROACH
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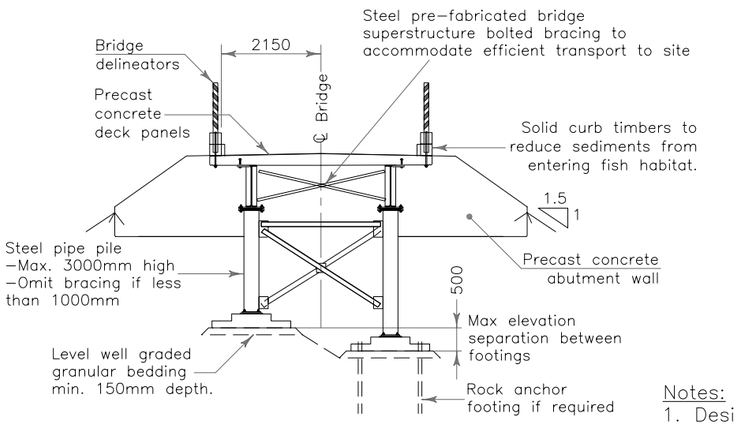
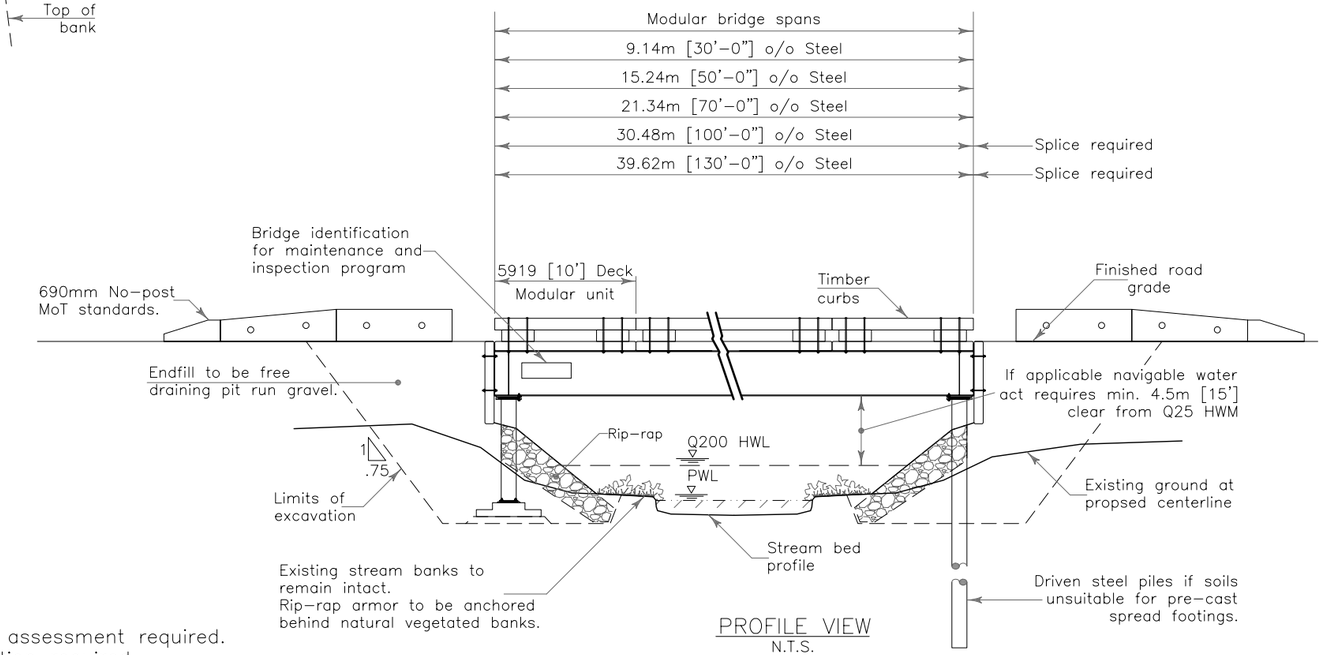


ABUTMENT VIEW
N.T.S.

Notes:
1. Design load: BCFS L100
2. Design life: 50 years.
3. Engineering site survey & assessment required.
4. Geotechnical site investigation required.



PROFILE VIEW
N.T.S.

No.	Date	Revision	Dr.

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Designed: B. Parolin	Checked: J.Paquette	Date: Nov. 2004
Drawn: F.V.	Surveyed: –	

BRIDGE CROSSINGS

Approved Sealed

Plotted Full Size on 11 x 17 Sheet

NOVAGOLD RESOURCES INC.
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GALORE CREEK MINE
TYPICAL BRIDGES
PRE-FEASIBILITY STUDY
GENERAL ARRANGEMENT

CLIENT_PROJECT_NO
CLIENT_DRAWING_NO
MCSL Project No. 2331–00518–0
Drawing No. 518-GA-01
Sheet 1 of 6
Revision 0
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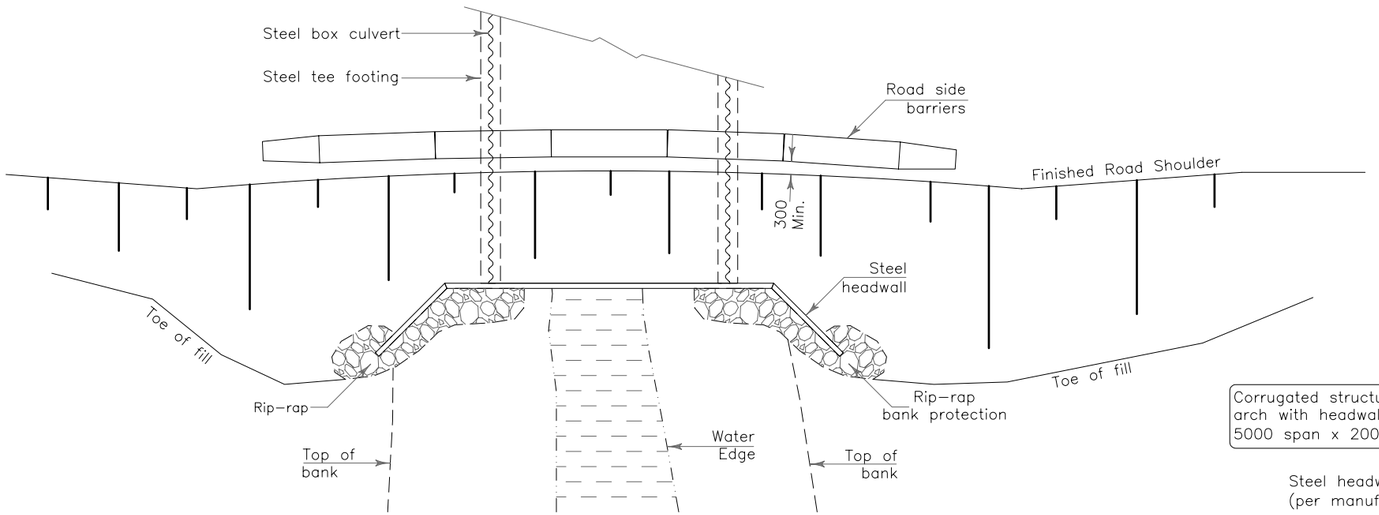

PLAN VIEW
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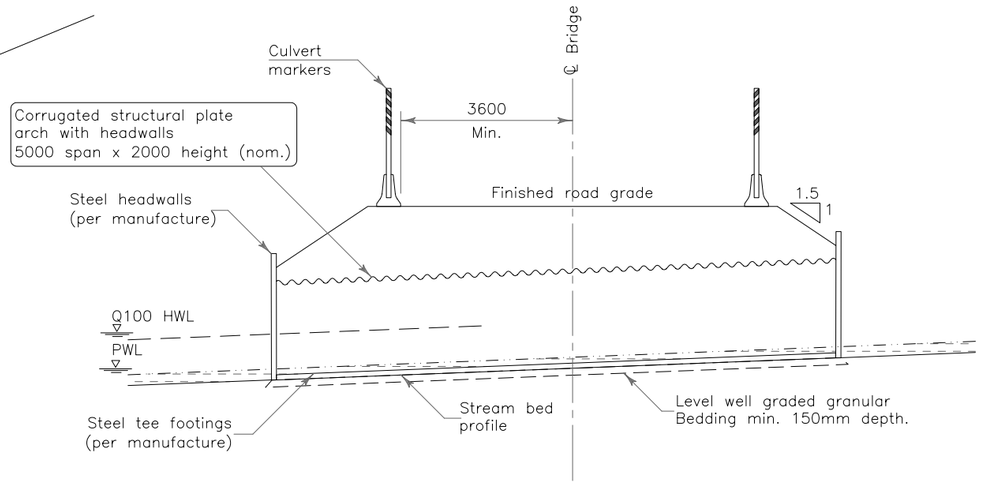
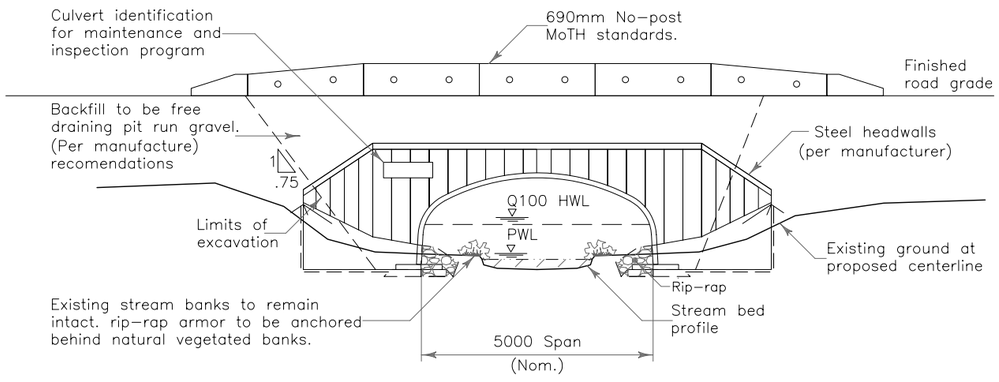


SECTION VIEW
N.T.S.



PROFILE VIEW
N.T.S.

Notes:
1. Design loading: BCFS L100.
2. Design life: 50 years.
3. Engineering site survey & assessment required.
4. Geotechnical site investigation required.
5. Headwall optional to reduce environmental compensation.
6. Road side barriers included to reduce silt/gravel from entering fish habitat.
7. Box culvert installation shall not alter (divert) existing stream channel.

No.	Date	Revision	Dr.

McElhanney
McElhanney Consulting Services Ltd.
3578 Victoria Drive, Smithers
BC, Canada, V0J 2N0
www.mcelhanney.com
Telephone (250) 847-4040
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Toll Free (866) 416-7352

Designed: B. Parolin	Checked: J.Paquette	Date: Nov. 2004	
Drawn: F.V.	Surveyed: –		

FISH PASSAGE CROSSINGS

Approved Sealed

Plotted Full Size on 11 x 17 Sheet

NOVAGOLD RESOURCES INC.
3454-1055 DUNSMUIR STREET, VANCOUVER, BC

GALORE CREEK MINE

TYPICAL BOX CULVERT
PRE-FEASIBILITY STUDY
GENERAL ARRANGEMENT

CLIENT_PROJECT_NO
CLIENT_DRAWING_NO
MCSL Project No. 2331-00518-0
Drawing No. 518-GA-02
Sheet 2 of 6 Revision 0
Destroy all prints bearing previous number

2.4.3 Seismic Refraction Surveys

Frontier Geosciences Inc. conducted a geophysical investigation of the geological conditions at the major bridge crossings. Utilizing the seismic refraction method an accurate bedrock profile was recorded for each of the crossings. Each geophone/hydrophone spread recorded shots located at several positions along the seismic cables. These shots enabled layer thicknesses and bedrock depth calculations at each detector location. Line locations and positions were recorded with reference to GPS coordinates and survey stations.

The seismic refraction data was used for the preliminary design of the bridge foundations by providing depth to bedrock and/or soil horizons to help determine whether piled foundations or spread footings would be required.designing the bridge abutments; depth to bedrock and bearing capacity of different soil horizons; determining size of spread footings and /or length of pipe piles required. Sample seismic refraction data is contained in Appendix 5.

Major Bridges include:

- Iskut River
- Muskwie Creek
- Lower More Creek
- Saddle Creek
- Eros Creek km 82.6
- Yurie Creek km 84.2
- Sphaler Creek #1
- Maurer Creek
- Porcupine River

2.4.4 Bridge Design

Bridge designs are in general accordance with standard resource road industry practice consisting of CAN/CSA-S6-2000 Design Specifications modified to BCFS L100 Loading (90,680 kg GVW) and the Ministry of Forests and Range Bridge Design Manual. A General Arrangement drawing (GA) has been prepared for each of the bridge and major culvert crossings. (Appendix 4) Each GA shows:

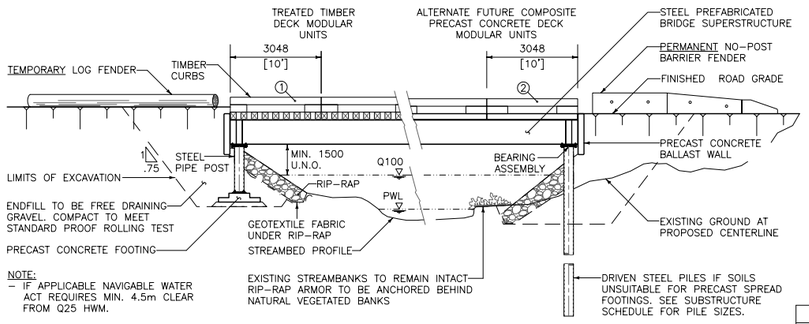
- The Watercourse
- The bridge alignment
- The abutment configuration
- The bridge length and clearance
- The deck gradient; and
- The bridge approaches and turnouts

Typical bridge details specifications will supplement the GA to provide a Design for cost estimating and permitting purposes. Bridge structures shown typically consist of a steel girder superstructure with treated timber deck panels. Treated timber deck panels should, with minor maintenance, meet the 25 year life expectancy of the mine and are relatively simple to replace, if the need arises. Concrete deck panels would provide a longer service life but would be much more costly and time consuming to construct, given the remote nature of most of the bridge sites.

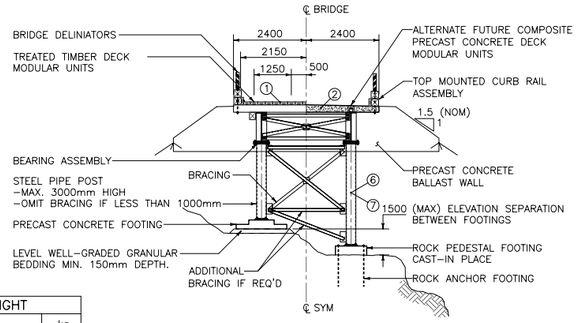
Standard debris clearance of 1.5m from the Q100 flood elevation to the underside of the girders is specified for all bridges except for those requiring additional clearnance to meet Navigable Waters and/or geotechnical requirements. Some exceptions are made for small flows with roadway clearance constraints.

Figure 4

TYPICAL BRIDGE DETAILS



GENERAL ARRANGEMENT PROFILE
SCALE 1:100



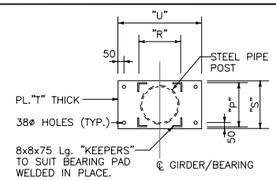
GENERAL ARRANGEMENT ABUTMENT
SCALE 1:100

BEARING PLATE

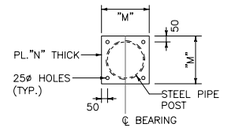
FOOTING TYPE	WEIGHT (kg)
F1	31
F2	40
F3	64
F4	70

FOOTING PLATE

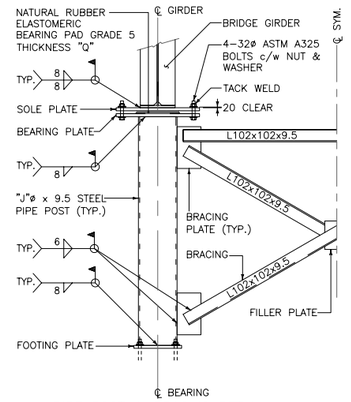
FOOTING TYPE	WEIGHT (kg)
S1	24
S2	31
S3	49
S4	59



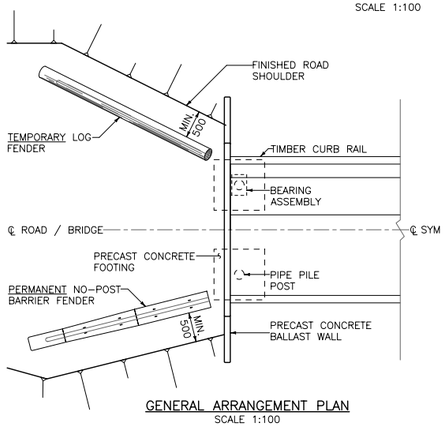
BEARING PLATE
SCALE 1:25



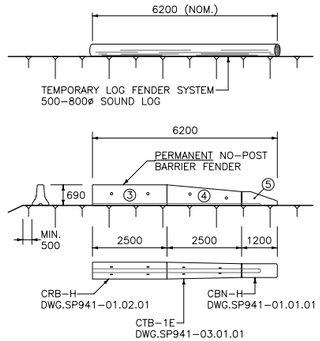
FOOTING PLATE
SCALE 1:25



PIPE POST & BRACING DETAIL
SCALE 1:25



GENERAL ARRANGEMENT PLAN
SCALE 1:100

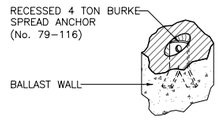


1) REFER TO MoT STANDARD DRAWINGS

BARRIERS FENDER SYSTEM
SCALE 1:100

ESTIMATED WEIGHT

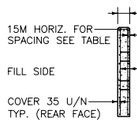
#	UNIT / ITEM	kg
①	TIMBER DECK 10'	4652
②	CONCRETE DECK 10'	7639
③	CRB-H	1338
④	CTB-1E	966
⑤	CBN-H	228
⑥	0.323 PIPE POST / m	71
⑦	0.406 PIPE POST / m	86



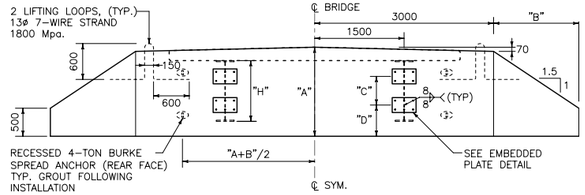
ALTERNATE LIFTING POINT DETAIL
N.T.S.

BALLAST WALL SCHEDULE

BRIDGE	"H"	"A"	"B"	"C"	"D"	"T"	WEIGHT (kg)
30'	568	1118	930	380	394	200	3900
40'	798	1348	1280	540	429	200	4900
50'	908	1458	1440	610	449	200	5500
60'	1228	1778	1920	820	504	250	8900
70'	1428	1978	2220	960	534	250	10300
80'	1471	2021	2290	990	541	250	10600
90'	1481	2031	2300	990	546	250	10600
100'	1544	2094	2400	1030	557	250	11100
110'	1474	2024	2290	990	542	250	10600
120'	1744	2294	2700	1170	587	300	15100
130'	1814	2364	2800	1210	602	300	15700



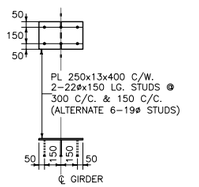
REINFORCEMENT DETAIL
SCALE 1:100



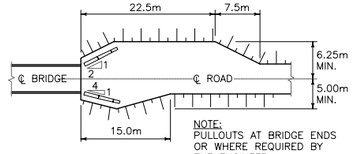
BALLAST WALL DETAILS
SCALE 1:100

BALLAST WALL REINFORCING

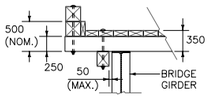
DIMENSIONS	SPACING	
	REAR FACE	FRONT FACE
A <= 1600	150	300
1600 < A <= 2100	125	250
2100 < A <= 2400	100	200



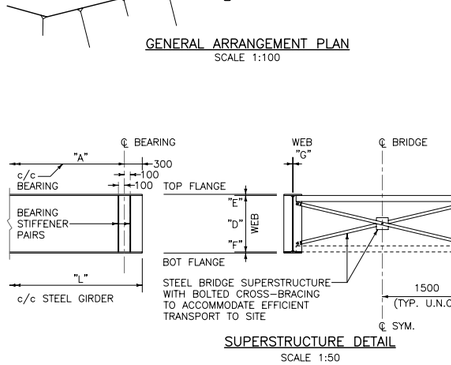
EMBEDDED PLATE DETAIL
SCALE 1:25



PULLOUT DETAIL
Scale 1:500



TREATED TIMBER DECK
SCALE 1:50



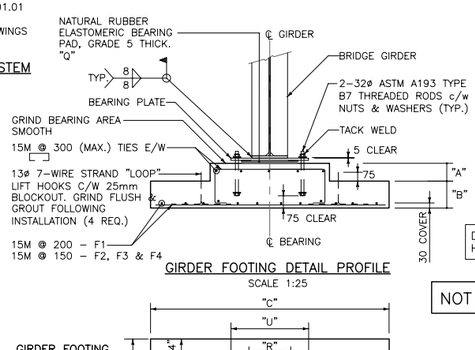
SUPERSTRUCTURE DETAIL
SCALE 1:50

SUPERSTRUCTURE SCHEDULE (L100 LOADING)

BRIDGE	SIZE "L"	"A"	"B"	"C"	"D"	"E"	"F"	"G"	"H"	SINGLE GIRDER COMPONENT SPLICE	WEIGHT (kg)	PIPE POST FOOTING	GIRDER FOOTING
30'	9144	8544	300	300	530	19.1	19.1	9.5	568	NO	1300	S2	F2
40'	12192	11592	300	300	760	19.1	19.1	9.5	798	NO	1900	S2	F2
50'	15240	14640	340	340	870	19.1	19.1	12.7	908	NO	3100	S3	F3
60'	18288	17688	350	350	1190	19.1	19.1	12.7	1228	NO	4300	S3	F3
70'	21336	20736	400	400	1390	19.1	19.1	12.7	1428	NO	5800	S3	F4
80' *	24384	23784	300	430	1400	25.4	25.4	12.7	1451	YES	7400	S4	F4
90' *	27432	26832	300	540	1430	25.4	25.4	12.7	1481	YES	9000	S4	F4
100' *	30480	29880	300	500	1480	31.8	31.8	12.7	1544	YES	11200	S4	F5
110' *	33528	32928	300	500	1410	31.8	31.8	15.9	1474	YES	13300	S4	F5
120' *	36576	35976	300	550	1680	31.8	31.8	15.9	1744	YES	16300	S4	F5
130' *	39624	39024	350	600	1750	31.8	31.8	15.9	1814	YES	19000	S4	F6

* FLANGE WIDTH VARIES LINEARLY BETWEEN "B" AND "C". AVERAGE FLANGE WIDTH USED TO CALCULATE WEIGHT

FOR GENERAL NOTES SEE DRAWING 518-2-0605
ALL DIMENSIONS IN MILLIMETERS UNLESS OTHERWISE NOTED.

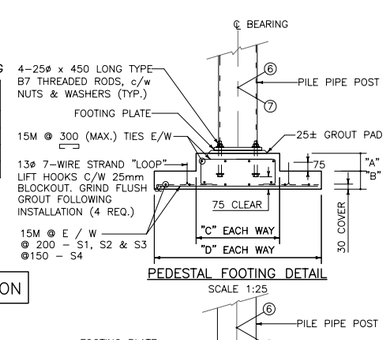


GIRDER FOOTING DETAIL PROFILE
SCALE 1:25

DRAWING REDUCED TO HALF ORIGINAL SCALE

PEDESTAL FOOTING

FOOTING TYPE	WEIGHT (kg)
S1	882
S2	1517
S3	2400
S4	3808

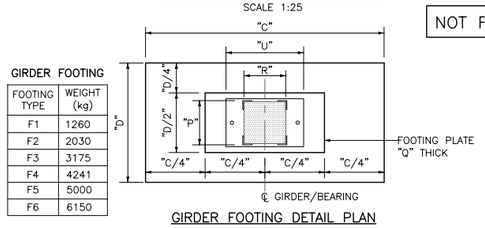


PEDESTAL FOOTING DETAIL
SCALE 1:25

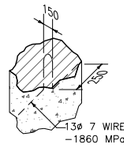
NOT FOR CONSTRUCTION

GIRDER FOOTING

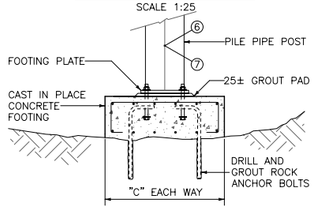
FOOTING TYPE	WEIGHT (kg)
F1	1260
F2	2030
F3	3175
F4	4241
F5	5000
F6	6150



GIRDER FOOTING DETAIL PLAN
SCALE 1:25



LIFTING LOOP DETAIL
N.T.S.



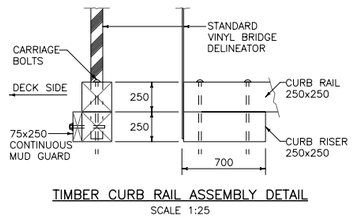
ROCK PEDESTAL FOUNDATION DETAIL
SCALE 1:25

SUBSTRUCTURE SCHEDULE (GIRDER FOOTING)

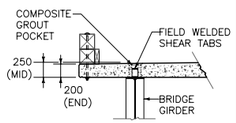
FOOTING TYPE	FOOTINGS FOOTING SIZE "A"	"B"	"C"	"D"	BEARINGS BEARING PAD "P"	"Q"	"R"	U. BRG. PL. "S"	"T"	SP. "U"
F1	150	225	2000	1000	466	20	450	400	19	550
F2	175	250	2400	1200	466	20	450	450	25	600
F3	200	300	2700	1400	516	25	500	500	25	650
F4	225	350	2900	1500	516	25	500	500	25	650
F5	225	350	3200	1600	500	25	550	550	25	650
F6	225	350	3500	1800	550	25	600	600	32	700

SUBSTRUCTURE SCHEDULE (PIPE POST, FOOTING)

FOOTING TYPE	FOOTINGS FOOTING SIZE "A"	"B"	"C"	"D"	PIPE POST PIPE SIZE "J"	"K"	BEARINGS FOOTING PL. "M"	"N"	BEARING PAD "P"	"Q"	"R"	SP. "U"
S1	150	150	700	1400	323	9.5	400	19	350	20	350	600
S2	175	175	850	1700	323	9.5	400	19	350	20	450	600
S3	200	200	1000	2000	323	9.5	500	25	450	25	500	650
S4	200	250	1150	2300	406	9.5	550	25	500	25	550	650



TIMBER CURB RAIL ASSEMBLY DETAIL
SCALE 1:25



ALTERNATE L100 PRECAST COMPOSITE CONCRETE DECK
SCALE 1:50

No.	Date	Revision	Initials
A		ENGINEERS REVIEW	RWP

Plan Key

McElhanney
McElhanney Consulting Services Ltd.
P.O. BOX 787, 3907 - 4th AVENUE SMITHERS B.C. CANADA V0J 2N0
PH (250) 847-4040 FAX (250) 847-4160

Designed: SAL	Checked: JPP	QC REVIEW: CDA
Drawn: FV	Date: JAN 2006	
AS SHOWN		
Drawing Scale		Approved Sealed

NovaGold Resources Inc.

GALORE CREEK MINE ACCESS ROAD
NORTH ROUTE
DETAILS - BRIDGES (MINOR CROSSINGS)

Project No. 2331-00518-2
Drawing No. **518-2-604**
Revision

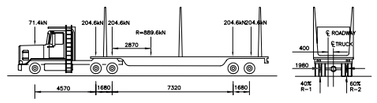
Destroy all prints bearing previous number

Figure 4

TYPICAL BRIDGE DETAILS

DESIGN

- DESIGN IN GENERAL ACCORDANCE WITH CAN/CSA S6-00 DESIGN SPECIFICATIONS MODIFIED TO BCFS L100 LOADING (90,680 kg. G.V.W.) E=400, DISTRIBUTION = 60/40, AND THE FOREST SERVICE BRIDGE DESIGN & CONSTRUCTION MANUAL.



STEEL

- FABRICATORS RESPONSIBLE FOR WELDED CONSTRUCTION MUST BE CERTIFIED FOR DIVISION 1 OR DIVISION 2.1 TO CURRENT VERSION OF CSA W47.1, CERTIFICATION OF COMPANIES FOR FUSION WELDING OF STEEL STRUCTURES.
- WHERE PIPE WELDING IS REQUIRED, WELDING MUST BE UNDERTAKEN BY A COMPANY CERTIFIED TO DIVISION 3 OR BETTER TO CURRENT VERSION OF CSA W47.1.
- SHOP AND FIELD WELDING TO CURRENT VERSION OF CSA W59. ELECTRODES TO BE COMPATIBLE WITH BASE METAL. MINIMUM 6 mm FILLET WELDS UNLESS NOTED OTHERWISE.
- STRUCTURAL STEEL PLATE TO CURRENT VERSION OF CSA G40.20/G40.21, GRADE 350AT, CATEGORY 3. GRADE 350A FOR STOCK SECTIONS.
- MISCELLANEOUS STEELWORK TO CURRENT VERSION OF CSA G40.20/G40.21 GRADE 350A.
- STEEL PIPES TO ASTM A252, Grade 2, 12.5 mm MINIMUM THICKNESS.
- STRUCTURAL BOLTS FOR STEELWORK TO ASTM A 325M, Type 3, UNLESS NOTED OTHERWISE.
- ANCHOR BOLTS TO ASTM A 193 TYPE B7 THREADED RODS c/w HEX NUTS AND WASHERS, UNLESS NOTED OTHERWISE.

CONCRETE

- CONCRETE DESIGNED TO CURRENT VERSION OF CSA A23.1 AND TESTED TO CURRENT VERSION OF CSA A23.2.
- PRECAST CONCRETE TO CURRENT VERSION OF CSA A23 BY CSA CERTIFIED PRECAST CONCRETE PLANT.
- REINFORCING STEEL TO BE DEFORMED BARS TO CURRENT VERSION OF CSA G30.18 GRADE 400R.
- CONCRETE COVER 50mm UNLESS NOTED OTHERWISE.
- ALL EXPOSED FACES TO HAVE 20 mm CHAMFER UNLESS NOTED OTHERWISE.
- PRECAST CONCRETE MIX AS FOLLOWS:
  MINIMUM COMPRESSIVE STRENGTH @ 28 DAYS = 35 MPa.
  MAXIMUM AGGREGATE SIZE 20 mm
  5% (± 1%) ENTRAINED AIR
  MAXIMUM WATER/CEMENT RATIO 0.38
  SLUMP 50 mm (± 20 mm)

BEARINGS

- NATURAL RUBBER ELASTOMERIC BEARING PADS TO HAVE A NOMINAL SHORE A DUROMETER HARDNESS BETWEEN 50 AND 60, GRADE 5, TO THE REQUIREMENTS OF CAN/CSA S6-00 SECTION 11.6.6.

GROUTING

- GROUT TO BE TARGET PORTLAND EXPANDING GROUT OR APPROVED EQUAL. GROUT SHALL BE MIXED AND PLACED IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS AND SHALL ACHIEVE A MINIMUM COMPRESSIVE STRENGTH OF 35 MPa @ 28 DAYS. FOR LOW TEMPERATURE APPLICATION USE CAPPAR LT GROUT, OR APPROVED EQUAL.
- BASE MATERIALS AND GROUT SHALL BE KEPT AT TEMPERATURES IN ACCORDANCE WITH MANUFACTURERS SPECIFICATIONS.

TIMBER

- ALL TIMBER BOLTS TO ASTM A-307, HOT-DIPPED GALVANIZED (TO CSA G164) c/w MALLEABLE IRON WASHERS AND GALVANIZED HEX NUTS.
- DECK (ROUGH SAWN)
  - TIMBER TIES SHALL BE #2 & BTR, COAST D.FIR (TREATED);
  - TIMBER CURBS SHALL BE #2 & BTR, ANY SPIECIES (UNTREATED);
  - PLANK SUB-DECK SHALL BE #2 & BTR, COAST D.FIR (TREATED);
  - PLANK WEAR DECK , #2 & BTR, ANY SPECIES (UNTREATED)
- ALL TREATED TIMBER SHALL BE COAST DOUGLAS FIR, #2 & BTR, & SHALL BE PRESSURE TREATED WITH A SUITABLE OIL-BORNE PRESERVATIVE AS PER C.S.A. 080; WHEREVER POSSIBLE, TREATED TIMBER SHALL BE CORRECTLY FRAMED PRIOR TO TREATMENT, FIELD FABRICATION SHALL BE KEPT TO A MINIMUM & SHALL NOT BE A SUBSTITUTE FOR PROPER PLANNING AND PLANT FABRICATION; PLANNED FIELD FABRICATION SHALL BE NOTED ON THE DRAWING & SUBSEQUENT FIELD TREATMENT SHALL BE PROVIDED.
- LUMBER GRADES AS PER CANADIAN LUMBER STANDARDS ADMINISTRATIVE BOARD (C.L.S.A.B.) REQUIREMENTS.
- LUMBER GRADES AS PER NATIONAL LUMBER GRADES AUTHORITY (NLGA) STANDARD RULES FOR CANADIAN LUMBER.
- FIELD TREATMENT OF, DRILLHOLES AND CUTS TO CONSIST OF A COPPER NAPHTHENATE PRESERVATIVE PREPARED WITH A SOLVENT CONFORMING TO CSA 080.
- NAILING PATTERN FOR DECKS: REFER TO BC MINISTRY OF FORESTS AND RANGE STANDARD DRAWING STD-E-020-02 REV A.

FOUNDATION

- GEOTECHNICAL SITE INVESTIGATION WAS NOT INCLUDED IN THE SCOPE OF SERVICES PROVIDED FOR THE DESIGN OF THESE STANDARD STRUCTURES. GROUND CONDITIONS MAY VARY. THE FOUNDATION REQUIREMENTS AND STRUCTURE CONCEPT MAY NEED TO BE MODIFIED BY THE ENGINEER TO ACCOMMODATE ACTUAL SITE CONDITIONS ENCOUNTERED DURING CONSTRUCTION.
- THE BEARING PRESSURES (IF SPECIFIED) ON THE DRAWINGS ARE MINIMUMS ACCEPTABLE. FOR SOIL BEARING PRESSURES LOWER THAN THOSE SPECIFIED, CONTACT THE ENGINEER PRIOR TO FOUNDATION CONSTRUCTION.

BACKFILL AND COMPACTION

- THE ZONE OF COMPACTION SHALL BE AS SHOWN ON THE DRAWING AND COMPACTED TO 95% OF STANDARD PROCTOR DENSITY, AT OPTIMUM MOISTURE CONTENT. MATERIAL COMPACTION TESTING MAY BE REQUIRED BY THE ENGINEERS REPRESENTATIVE.
- BACKFILLING MATERIAL TO BE FREE DRAINING PIT RUN GRAVEL THAT IS APPROVED BY THE ENGINEERS REPRESENTATIVE PRIOR TO ALL BACKFILLING OPERATIONS, OR OTHER MATERIAL AS APPROVED BY THE ENGINEER.

ENVIRONMENTAL

- SEDIMENT MUST BE PREVENTED FROM ENTERING THE NEARBY WATERCOURSES, AS IT IS A VIOLATION UNDER THE FISHERIES ACT.
- ALL WORK SHALL BE DONE IN A MANNER THAT WILL NOT RESULT IN DEPOSITION OF LOGGING DEBRIS, SOIL, OR OTHER MATERIAL DELETERIOUS TO FISH, IN ANY WATERCOURSE.
- CROSSING OF CREEKS BY MACHINERY, WITHIN APPROVED WINDOW, TO CONFORM TO THE FOREST PRACTICES CODE OF BRITISH COLUMBIA ACT.
- ENSURE RIPRAP TO BE USED IS CLEAN, IS OF SUITABLE QUALITY AND IS KEYED INTO THE BANK SUCH THAT IT DOES NOT CONSTRICT THE CHANNEL BY EXTENDING INSIDE THE EXISTING BANK CONFIGURATION.
- DISTURBANCE TO THE STREAMBANKS MUST BE MINIMIZED. BANK STABILITY AND EROSION PREVENTION IS CRITICAL. RECONSTRUCT AND REVEGETATE DISTURBED BANKS TO THEIR ORIGINAL CONDITION AS SOON AS ACTIVITY IS COMPLETED.
- FISH SALVAGE TO BE COMPLETED AND THE SITE ISOLATED DURING CONSTRUCTION WHERE REQUIRED.

RIP-RAP

- GEOTEXTILE FABRIC TO BE NON-WOVEN HAVING A MINIMUM MULLEN BURST STRENGTH OF 2700 kPa.
- CLASS 2000 RIPRAP PLACED TO A NOMINAL DEPTH OF 2000 mm. ROCK SHALL BE HARD, DURABLE ANGULAR QUARRY ROCK GRADED AS FOLLOWS:

  CLASS 2000 – 85% OF ROCK > 200 kg
  – 50% OF ROCK > 2000 kg
  – 15% OF ROCK > 6000 kg

  FOR VISUAL COMPREHENSION ONLY THE APPROXIMATE AVERAGE DIMENSION OF ANGULAR ROCK OF CLASS 2000 IS 1200 mm.
- CLASS 1000 RIPRAP PLACED TO A NOMINAL DEPTH OF 1500 mm. ROCK SHALL BE HARD, DURABLE ANGULAR QUARRY ROCK GRADED AS FOLLOWS:

  CLASS 1000 – 85% OF ROCK > 100 kg
  – 50% OF ROCK > 1000 kg
  – 15% OF ROCK > 3000 kg

  FOR VISUAL COMPREHENSION ONLY THE APPROXIMATE AVERAGE DIMENSION OF ANGULAR ROCK OF CLASS 1000 IS 1000 mm.
- CLASS 500 RIPRAP PLACED TO A NOMINAL DEPTH OF 1200 mm. ROCK SHALL BE HARD, DURABLE ANGULAR QUARRY ROCK GRADED AS FOLLOWS:

  CLASS 500 – 85% OF ROCK > 50 kg
  – 50% OF ROCK > 500 kg
  – 15% OF ROCK > 1500 kg

  FOR VISUAL COMPREHENSION ONLY THE APPROXIMATE AVERAGE DIMENSION OF ANGULAR ROCK OF CLASS 500 IS 800 mm.
- CLASS 250 RIPRAP PLACED TO A NOMINAL DEPTH OF 1000 mm. ROCK SHALL BE HARD, DURABLE ANGULAR QUARRY ROCK GRADED AS FOLLOWS:

  CLASS 250 – 85% OF ROCK > 25 kg
  – 50% OF ROCK > 250 kg
  – 15% OF ROCK > 750 kg

  FOR VISUAL COMPREHENSION ONLY THE APPROXIMATE AVERAGE DIMENSION OF ANGULAR ROCK OF CLASS 250 IS 600 mm.
- CLASS 100 RIPRAP PLACED TO A NOMINAL DEPTH OF 700 mm. ROCK SHALL BE HARD, DURABLE ANGULAR QUARRY ROCK GRADED AS FOLLOWS:

  CLASS 100 – 85% OF ROCK > 10 kg
  – 50% OF ROCK > 100 kg
  – 15% OF ROCK > 300 kg

  FOR VISUAL COMPREHENSION ONLY THE APPROXIMATE AVERAGE DIMENSION OF ANGULAR ROCK OF CLASS 100 IS 450 mm.
- CLASS 50 RIPRAP PLACED TO A NOMINAL DEPTH OF 550 mm. ROCK SHALL BE HARD, DURABLE ANGULAR QUARRY ROCK GRADED AS FOLLOWS:

  CLASS 50 – 85% OF ROCK > 5 kg
  – 50% OF ROCK > 50 kg
  – 15% OF ROCK > 150 kg

  FOR VISUAL COMPREHENSION ONLY THE APPROXIMATE AVERAGE DIMENSION OF ANGULAR ROCK OF CLASS 50 IS 350 mm.
- CLASS 25 RIPRAP PLACED TO A NOMINAL DEPTH OF 450 mm. ROCK SHALL BE HARD, DURABLE ANGULAR QUARRY ROCK GRADED AS FOLLOWS:

  CLASS 25 – 85% OF ROCK > 2.5 kg
  – 50% OF ROCK > 25 kg
  – 15% OF ROCK > 75 kg

  FOR VISUAL COMPREHENSION ONLY THE APPROXIMATE AVERAGE DIMENSION OF ANGULAR ROCK OF CLASS 25 IS 300 mm.
- CLASS 10 RIPRAP PLACED TO A NOMINAL DEPTH OF 350 mm. ROCK SHALL BE HARD, DURABLE ANGULAR QUARRY ROCK GRADED AS FOLLOWS:

  CLASS 10 – 85% OF ROCK > 1 kg
  – 50% OF ROCK > 10 kg
  – 15% OF ROCK > 30 kg

  FOR VISUAL COMPREHENSION ONLY THE APPROXIMATE AVERAGE DIMENSION OF ANGULAR ROCK OF CLASS 10 IS 200 mm.

MISCELLANEOUS

- ALL DIMENSIONS IN mm UNLESS NOTED OTHERWISE.

CLASS OF RIPRAP (kg)	NOMINAL THICKNESS OF RIPRAP (mm)	ROCK GRADATION: PERCENTAGE LARGER THAN GIVEN ROCK MASS (kg)			APPROXIMATE AVERAGE DIMENSION (mm)
		85%	50%	15%	
10	350	1	10	30	200
25	450	2.5	25	75	300
50	550	5	50	150	350
100	700	10	100	300	450
250	1000	25	250	750	600
500	1200	50	500	1500	800
1000	1500	100	1000	3000	1000
2000	2000	200	2000	6000	1200

DRAWING REDUCED TO HALF ORIGINAL SCALE

NOT FOR CONSTRUCTION

H:\PROJ\2331\00518-2 2005 Galore North\Admin\Feasibility Report Jan2006\518-2-0604 & 0605 011306.dwg

April 13, 2006 , 15:07:21

No.	Date	Revision	Initials
A	Date	ENGINEERS REVIEW	RWP

Plan Key

McElhanney

McElhanney Consulting Services Ltd.
P.O. BOX 787, 3907 - 4th AVENUE
SMITHERS B.C. CANADA V0J 2N0
PH (250) 847-4040
FAX (250) 847-4160

Designed: SAL | Checked: RWP | QC REVIEW: CDA
Drawn: FV | Date: JAN 2006
Drawing Scale

Approved Sealed

NovaGold Resources Inc.

GALORE CREEK MINE ACCESS ROAD
NORTH ROUTE
GENERAL NOTES - BRIDGES (MINOR CROSSINGS)

Project No. 2331-00518-2
Drawing No. **518-2-0605**
Revision

Plotted Full Size on 22 x 34 Sheet

Destroy all prints bearing previous number

3.0 CONSTRUCTION, OPERATION AND MAINTENANCE

3.1 CONSTRUCTION REQUIREMENTS

The proposed road construction schedule calls for completion of 130 km of access road from Hwy 37 through to the south tunnel portal over an 18-month period. This accelerated time line necessitates the setup and operation of remote (fly-in) camps and multiple construction headings with helicopter support. The primary goal is to establish road access as quickly as possible to provide for the slurry pipeline and power transmission line construction as well as mine-site development.

Three construction camps are proposed as follows:

- Bob Quinn Camp a 30-person camp located at km 3 on the Thomas Forest Service Road 15 km north of Bob Quinn Lake off Hwy 37.
- Roca Camp a 25 person remote camp located west of the site of Roca Minerals exploration camp near km 73 on the access road.
- Porcupine Camp a 50 person remote camp located on the south side of the Porcupine River near the abandoned airstrip and 2.3 km from km 117 of the Galore access road.

In addition, a number of 0.5-hectare staging areas are proposed along the route. These are located at Muskwie Creek (Km 31), Upper Sphaler Creek (Km 91), and Lower Sphaler Creek (Km 105). Each staging area will provide fuel and supplies through helicopter support for multiple construction headings. Heavy equipment will be flown in and re-assembled on site.

Each construction heading require the following capabilities:

- Hand Falling
- Right-of-Way Clearing and Stripping
- Drilling and Blasting
- Rock Excavation
- End Haul
- Bridge and Culvert installation
- Gravelling

Support services include supervision, first aid, and environmental monitoring.

Table 2

Schedule of Activities

February 2007 to January 2008

North Route Construction

BOB QUINN CAMP

*

	February 2007				March				April					May				June				July					August				September					October				November				December					January 2008			
	4	11	18	25	4	11	18	25	1	8	15	22	29	5	13	20	27	3	10	17	24	1	8	15	22	29	5	12	19	26	2	9	16	23	30	7	14	21	28	4	11	18	25	2	9	16	23	30	6	13	20	27
1.0 Bob Quinn Camp																																																			
Mobilization																																																			
Snow Removal																																																		
Site Clearing																																																		
Camp Set-up		km3																																																
B1 km0-km 21																																																		
R/W Logging																																																		
Pioneering Trail																																																		
Drilling & Blasting																																																		
Subgrade																																																		
Bridges									Iskut River																																										
Gravelling																																																		
Special Structures																																																		
B2 Muskwie East (km 31-km21)																																																		
R/W Logging																																																		
Pioneering Trail																																																		
Drilling & Blasting																																																		
Subgrade																																																		
Bridges																																																		
Gravelling																																																		
Special Structures																																																		
B3 Muskwie West (km31-km49)																																																		
R/W Logging																																																		
Pioneering Trail																																																		
Drilling & Blasting																																																		
Subgrade																																																		
Bridges																																																		
Gravelling																																																		
Special Structures																																																		

Muskwie

Lower More & Upper More Creek

February 2007 to January 2008

North Route Construction

ROCA CAMP

		Feb 2007				March				April					May				June				July					August				September					October				November				December					January 2008			
		4	11	18	25	4	11	18	25	1	8	15	22	29	5	13	20	27	3	10	17	24	1	8	15	22	29	5	12	19	26	2	9	16	23	30	7	14	21	28	4	11	18	25	2	9	16	23	30	6	13	20	27
2.0	**Roca Camp**																																																			
	Mobilization																																																			
	Snow Removal																																																		
	Site Clearing																																																		
	Camp Set-up																																																		
R1	**East km69-km49**																																																		
	R/W Logging																																																		
	Pioneering Trail																																																	
	Drilling & Blasting																																																	
	Subgrade																																																	
	Bridges																												Unnamed Creeks																						
	Gravelling																																																	
	Special Structures																																																	
R2	**West km69-km83**																																																	
	R/W Logging																																																		
	Pioneering Trail																																																	
	Drilling & Blasting																																																	
	Subgrade																																																	
	Bridges																																Unnamed Creeks																				
	Gravelling																																																	
	Special Structures																																																	

February 2007 to January 2008

North Route Construction

PORCUPINE CAMP

*	February 2007				March				April					May				June				July					August				September				October				November				December					January 2008			
	4	11	18	25	4	11	18	25	1	8	15	22	29	5	13	20	27	3	10	17	24	1	8	15	22	29	5	12	19	26	2	9	16	23	30	7	14	21	28	4	11	18	25	2	9	16	23	30	6	13	20	27
3.0 Porcupine Camp																																																		
Mobilization																																																		
Snow Removal																																																	
Site Clearing																																																	
Camp Set-up																																																	
P1 North km117-km129 (2km Connector)																																																	
R/W Logging																																																	
Pioneering Trail		winter road																																															
Drilling & Blasting																																																	
Subgrade																																																	
Bridges	Porcupine R.																																																
Gravelling																																																	
Special Structures																																																	
P2 East km117-km105																																																	
R/W Logging																																																	
Pioneering Trail																																																	
Drilling & Blasting																																																	
Subgrade																																																	
Bridges																			Sphaler #3										Sphaler #2																						
Gravelling																																																	
Special Structures																																																	
P3 East km105-km97.5																																																	
R/W Logging																																																	
Pioneering Trail																																																	
Drilling & Blasting																																																	
Subgrade																																																	
Bridges																													Sphaler #1																					
Gravelling																																																	
Special Structures																																																	
P4 West km91-km97.5																																																	
R/W Logging																																																	
Pioneering Trail																																																	
Drilling & Blasting																																																	
Subgrade																																																	
Bridges																																																	
Gravelling																																																	
Special Structures																																																	
P5 East km91-km83																																																	
R/W Logging																																																	
Pioneering Trail																																																	
Drilling & Blasting																																																	
Subgrade																																																	
Bridges																							6-Unnamed Creeks																													
Gravelling																																																	
Special Structures																																																	

3.2 OPERATION AND MAINTENANCE REQUIREMENTS

The Galore Creek access road will be a year round, radio controlled, single lane road with pullouts able to provide equipment and supplies to the operating mine and crew transport during shift changes. It is also critical that road access be available for repair and maintenance of the slurry pipeline and power transmission line.

Regular scheduled maintenance activities such as:

- Snow removal
- Sanding
- Ditch clearing
- Rock scaling
- Spot gravelling and grading

are to be planned in advance and carried out to ensure road safety and ensure that the road surface and drainage structures function properly and can carry the design loads and flood flows respectively.

A significant portion of the road operation and maintenance budget will be dedicated to the protection of the road, pipeline and transmission line from the impact of geohazards, such as debris flows, landslides, rock falls and avalanches. BGC Engineering Inc have assessed the route, identified the geohazards and recommended mitigation measures. In order to minimize road closures an active avalanche monitoring and control strategy will be implemented along with the design and installation of special mitigation structures.

Full time maintenance yards will be established at Roca Camp, km 69 and Porcupine Camp. This will enable regular scheduled maintenance to be carried out and immediate response to geohazards and/or emergency situations.

3.3 SPECIAL STRUCTURES

The type and size of special mitigation structures depends on the class and frequency of the geohazard and the risk to road user safety and/or damage to the road or bridge structure. Many of the risks associated with debris flows, rock falls and snow slides can be mitigated by

increasing the clearance on bridges, raising the road subgrade and/or moving the road away from the slope and widening the ditches.

Where the Geohazard reaches or crosses the road and is likely to cause damage to or closure of the road then special structures have been recommended by BGC in their Geohazard Assessment Report. The following special structures have been incorporated in the road design and included in the construction cost estimate:

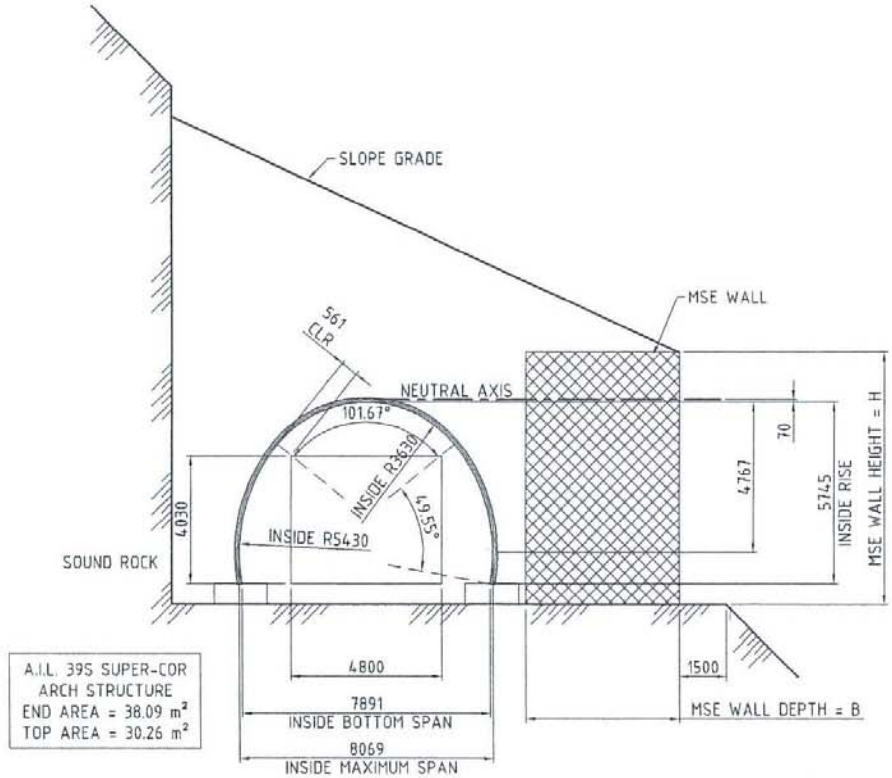
- No-post barriers
- Lock Block or Gabion walls (barricades)
- Earth or Rock berms
- Snow sheds (Figure 5)

Figure 5

Snow Sheds

NOTES

1. ALL SUPER-COR MATERIALS IN ACCORDANCE WITH CAN/CSA G401-01 AND ASTM A761.
2. STRUCTURE DESIGN AND CONSTRUCTION IN ACCORDANCE WITH CAN/CSA-S6-00 (CHBDC).
3. ASSUMED BACKFILL DENSITY FOR DESIGN = 22 kN/m³.
4. ASSUMED SEISMIC ACCELERATION COEFFICIENT A=0.05 (10% PROBABILITY OF EXCEEDANCE IN 50 YEARS) IN ACCORDANCE WITH CAN/CSA-S6-00 (CHBDC).
5. SUPER-COR DESIGN THICKNESS AND BOLT ARRANGEMENT ARE BASED ON THE LIVE LOAD AND COVERS SHOWN ON THIS DRAWING. VEHICLES WITH AXLE LOADS HEAVIER THAN THOSE SHOWN ON THIS DRAWING OR COVERS WHICH ARE OUTSIDE THE LIMITS SHOWN ON THIS DRAWING SHOULD NOT BE USED WITHOUT REFERENCE TO DESIGN CODES SPECIFIED ON THIS DRAWING.
6. STRUCTURAL BACKFILL SELECTED FOR THIS DESIGN SHALL MEET THE REQUIREMENTS LISTED IN THE SOIL PARAMETER TABLE AND BE COMPACTED TO GREATER THAN 98% STANDARD PROCTOR DENSITY IN ACCORDANCE WITH ASTM D698-91. THE EXTENT OF SELECT STRUCTURAL BACKFILL SHALL COMPLY WITH INSTALLATION CODES SPECIFIED ON THIS DRAWING.
7. CONSTRUCTION LOADS TO BE PROVIDED BY OTHERS BEFORE FINAL DESIGN. SOIL PARAMETERS, FOUNDATION CONDITIONS AND ELEVATIONS TO BE CONFIRMED BEFORE FINAL DESIGN.
8. NOT FOR CONSTRUCTION. THIS PRELIMINARY DRAWING IS FOR ESTIMATING USE ONLY. STRUCTURAL DETAILS ARE SUBJECT TO REVIEW ON FINAL DESIGN.



A.I.L. 39S SUPER-COR ARCH STRUCTURE
END AREA = 38.09 m²
TOP AREA = 30.26 m²

REV	DESCRIPTION	BY	DD/MM/YY
E			
D			
C			
B			
A	INITIAL ISSUE	RJ	20/12/05

Atlantic Industries Limited
CALL TOLL FREE IN CANADA OR IN THE US
1-877-AIL-PIPE

www.ail.ca www.atlanticindustries.us

CUSTOMER AND PROJECT DETAILS:
McELHANNEY CONSULTING, GALORE CREEK, STEWART, BC
SUPER-COR STRUCTURE
PROPOSED ARRANGEMENT

SCALE: 1:150 (letter)
DATE: 14 DEC 05
DRAWING NUMBER: 05-SC-102-02

DRAWN BY: RJ | DWG CHECK: KBW | DESIGN BY: KBW | DESIGN CHECK: DE | REVISION: A

3.4 SAFETY REQUIREMENTS

Road user safety is a prime consideration in the design construction and maintenance of the Galore Creek access road. As a single lane radio controlled road with no alternate access, the communication via the repeater system must be continuous throughout the route for all vehicle traffic.

Design considerations include strategic placement of turnouts, double laning of blind corners and sharp crest curves, runout lanes on sustained 15% grades and special mitigation structures as described in Sect 3.3. Construction safety concerns will deal with stable cut/fill slopes, rock scaling and/or rock bolting, no-post barriers on the outside edge of steep fills and sharp corners, proper crowning and superelevation on curves, crushed gravel surfacing and dust abatement measures as and when needed.

A commitment to regular maintenance is required to maintain road safety. Grading, sanding snow removal and avalanche monitoring and control are ongoing and an immediate response to snow slides, rockfalls and washouts blocking the road will be needed. In the event of an emergency helicopter support to rescue and transport stranded or injured persons shall be available.

3.5 AUTHORIZED ACCESS

Public access will be prohibited during construction and restricted to authorized personnel only once operational. Access beyond the filtration plant at km 3.3, will be controlled by a full time security gate. Controlled access is required to provide for the health and safety of company personnel and the public and to ensure the protection of the environment.

4.0 CONSTRUCTION COST ESTIMATE

4.1 QUANTITY ESTIMATES

Estimated road construction costs in the Pre-feasibility Study were based on like sections of terrain and average construction costs for each category. The road design completed for this Feasibility Study (Appendices 1-6) provides an estimate of right-of-way clearing, earthwork volumes, drainage structures and bridges, and special mitigation structures. and allows a more accurate cost estimate to be calculated. The Pre-feasibility estimates are order of magnitude. The estimating for this Feasibility Study is supported by substantial engineering.

Based on the Preliminary design the following quantities have been calculated as shown on Table 3 below.

Table 3

Quantity Estimates

Description	Work	Estimated Quantity
Right-of-Way	Falling	81,200m^3
	Clearing	384ha
	Stripping	360,500m^3
Earthworks	OM (Other material)	1,159,600m^3
	Borrow	444,200m^3
	Rippable Rock	886,600m^3
	Solid Rock	611,800 m^3
	Rock Scaling & Bolting	8,800m
	Geotextiles	5,400 m^3

Description	Work	Estimated Quantity
Surfacing	Gravel	268,800m^3
	Geotextiles	5,000m^2
	75mm Crush	78,400 m^3
Culverts	600mm	7129lm
	800mm	1410lm
	1000mm	402lm
	1200mm	325lm
	1400mm	150lm
	1600mm	193lm
	1800mm	135lm
Arches	4m-6m open bottom arches	10 crossings
Riprap	25kg	16,350 m^3
	250kg	600 m^3
Avalanche Protection (Special Structures)		
	No post barriers	200m
	Lock block (gabions)	1620m
	Earth Berm	1200m
	Snow Sheds	500m

Description	Work	Estimated Quantity
Bridges:	9m – 60m spans	43 crossings
	Iskut River	107m span
	Muskwie Creek	97m span
	Lower More Creek	92m span
	More Creek Canyon	201m span
	Eros Creek	49m span
	Yurie Creek	89m span
	Porcupine River	84m span

4.2 UNIT PRICES

The unit prices used in the cost estimate do not include any allowance for Goods and Services Tax and all dollar values are in Canadian funds unless otherwise noted.

Unit rates are derived from 2005-2006 BC Government Equipment Rental Rate Guide and average production rates for road building equipment on resource road construction projects. All found equipment rental rates include all costs, expenses, and profit allowance for the project work being undertaken. Rates include insurance and WCB costs and operator wages include benefits.

Mobilization and de-mobilization, camp costs and helicopter support services are not included in hourly rates and are costed separately. Production and unit rates were also compared to recent contracts and verified by local contractors familiar with the project area.

4.2.1 Site Preparation

Right-of-way Falling is based on hand falling 120m^3 of timber per day at $500/day all found. Unit rate= $500/120$m^3$ = $4.20/ m^3 rounded up.

Clearing and Grubbing is the removal of the merchantable and non-merchantable timber and the stumps and debris within the right-of-way. A 300 series excavator at $170/hr should clear and grub 275m per 11 hour shift. Unit rate=$170/hrx11hr/.275km =$6800/km or $2250/ha.

Stripping of organics and unsuitable material is normally based on pushing all material to the low side of the right-of–way. Unit rate=$200/hrx11hr/900 m^3/hr =$2.50/ m^3 rounded up.

4.2.2 Subgrade Construction

Subgrade construction involves earthwork and utilizes a combination of heavy equipment . Production and costs vary with quantities and push distance and type of material. For this cost estimate the following equipment rental rates were used in determining unit rates for material movement.

D8N size dozer	$200/hour
D5G size dozer	$120/hour
300 series excavator	$170/hour
750 cfm Tank Drill	$210/hour
OM(other material)	unit rate $3.50/ m^3
Borrow material	unit rate $5.00/ m^3
Rippable Rock	unit rate $6.50/ m^3

Solid Rock Drill & Blast unit rate $8.00/ m^3 End Haul (500m) unit rate $4.00/ m^3

Geotextiles (overland construction) unit rate $2.50/m2 installed

Rock Scaling & Rock Bolting unit rate $50/lineal meter

4.2.3 Road Base & Surfacing

Road surfacing includes 30cm of select granular base material and 10cm of 75mm crushed gravel wearing surface. Unit prices are based on an average haul distance of 5km at \$0.60/ m^3/km and a fixed cost of \$2.50/ m^3 to load dump and spread.

Pit run Gravel unit rate \$6.00/ m^3

Crushed Gravel unit rate \$8.50/ m^3

4.2.4 Drainage Culverts

Unit prices for culverts are based on material costs delivered to Bob Quinn provided by Atlantic Industries Ltd. A multiplier of 1.6 for round pipe and 1.8 for arches is applied to the material cost to obtain the installed price per meter of length.

Example:

600mm diameter culvert is \$70/m delivered x 1.6 = \$112/m installed (includes couplers)

4890mm x 1610mm x 32m arch is \$101,564.00 delivered x 1.8 = \$5713/m installed

Riprap protection at the inlet and outlet of culverts has to be drilled and blasted, delivered and placed.

Culverts require 30 m^3/installation of Class 25kg at \$18/ m^3

Arches require 60 m^3/installation of Class 250kg at \$20/ m^3

4.2.5 Avalanche Protection

Special structures for protection of the road and pipeline from avalanches, rock falls and slides are priced per meter of length.

No-Post Barriers unit rate \$240/m installed

Lock Blocks (Gabions)2 high unit rate \$335/m installed

Earth Berm 3m high, unit rate \$135/m installed

Snow shed (AIL concept) unit rate \$15,000/m installed

4.2.6 Bridges

Each bridge crossing is site specific but for average unit rates to supply and install standard bridge components local bridge contractors, Majestic Bridge and Formula Contractors Ltd., confirmed the following unit rates:

Bridge spans 0 – 60m unit rate = $8000/m length installed

Bridge spans 80 – 100m unit rate = $10000/m installed

More Creek Canyon Bridge 201m span = $15000/m installed

4.3 SCHEDULE OF QUANTITIES AND UNIT PRICES

In addition to the direct costs of road and bridge construction, there are support services and indirect costs that must be carried by the contractor or NovaGold. These lump sum costs are calculated for the duration of the road construction project.

Mobilization & De-mobilization

Mob & Demob is based on moving personnel and equipment from Prince George to and from the project site. As much local hiring as possible will be done in Dease Lake, Terrace and Smithers but some equipment will be brought in from further centers such as Fort St John, Kamloops and Vancouver.

Bob Quinn Camp (Airstrip)

Truck Haul at $170/hour and 20hours return trip.

Estimate 60 loads at $3400/load = $204,000

Roca Camp

Airlift with Sikorsky S-61L at $4750/hour

Estimate 675,000 lb at a cost of $0.70/lb = $472,500

Porcupine Camp

Airlift with Sikorsky

Estimate 450,000 lb at a cost of $0.90/lb =$405,000

Demob by truck 60 loads at $4080/load = $244,800

Mob & Demob Total = $1,326,300

Crew Transportation based on NT Air Prince George to Bob Quinn return at $600 per employee each shift. Estimate 25 2 week shifts for 75 employees = $1,125,000.

Camp Costs vary on number of employees' location and whether the camps are leased or purchased outright. Assuming leased units the cost of set-up, sewer and water and catering results in a day-rate of approximately $150/day in Roca and Porcupine camps and $80/day at Bob Quinn.

Camp Costs = $150/day x 15000 mandays + $80/day x 9000 mandays = $2,970,000

Helicopter support is required for remote camps, and staging areas for crew transport, fuel and supplies and emergency evacuation.

Bell 206 Jet Ranger $950/hour ,4hr/day for 200days	= $760,000
Bell 206 Long Ranger $1200/hour, 4hr/day for 200days	= $960,000
Bell 205 Freight & Fuel $2900/hr, 6hr/day for 200 days	= $3,480,000
VIH Sikorsky S-61L $5100/hr, 4hr/day for 120 days	= $2,448,000
Helicopter Support Total	= $7,648,000

First Aid and Supervision

Each construction heading will require a qualified industrial First Aid attendant and a construction supervisor. Daily costs include wages, a vehicle and mileage and supplies.

Additional First Aid facilities will be available at each camp.

Estimate cost at $1200/day x 300 days x 15 persons = $5,400,000

Construction Surveys

Construction surveys are required throughout the project including gradestaking, slopestaking, and cross sectioning to confirm quantities.

Estimated cost is $2100 per crewday for 300 days = $630,000

Table 4

SCHEDULE OF QUANTITIES AND UNIT PRICES

Galore Creek Mine Access Road - Feasibility Study, November 2005

Cost Estimate Summary

Item No.	Description of Work	Unit of Measure	Approx. Quantity	Unit Price $	Extended Amount $	Total $
	Part A - Road Construction					
1.0	***SITE PREPARATION***					
1.1	Right-of-Way Falling	m^3	81,201	4.20	341,044.20	
1.2	Clearing & Grubbing	ha	384.0	2,250.00	864,000.00	
1.3	Stripping	m^3	360,545	2.50	901,362.50	2,106,406.70
2.0	***SUBGRADE CONSTRUCTION***					
2.1	O.M.	m^3	1,159,634	3.45	4,002,535.00	
2.2	Borrow	m^3	444,200	5.00	2,221,000.00	
2.3						
2.4						
2.5	Rippable Rock	m^3	886584	6.50	5,762,796.00	
2.6	Solid Rock/End Haul/Drill & Blast	m^3	611789	12.00	7,341,468.00	
2.7	Wetland/Overland Construction/Geotextiles	m^2	5400	2.50	13,500.00	
2.8	Rock Scaling & Rock Bolting	m	8785	50.00	439,250.00	
2.9	Rock Trench (Pipeline Placement)	m^3	17570	12.00	210,840.00	19,991,389.00
3.0	***ROAD BASE & SURFACING (Secondary)***					
3.1	Select Granular Base (surfacing)	m^3	268605	6.00	1,438,607.70	
3.2	Geotextiles	m^2	5000	2.50	12,500.00	
3.3	Crush & Gravel Surface	m^3	78363	8.50	666,085.50	2,117,193.20
4.0	***DRAINAGE CULVERTS***					
4.1	600 mm dia. CSP	lin m	7129	112.00	798,448.00	
4.2	800 mm dia. CSP	lin m	1410	173.00	243,930.00	
4.3	1000 mm dia. CSP	lin m	402	216.00	86,832.00	
4.4	1200 mm dia. CSP	lin m	325	259.00	84,175.00	
4.5	1400mm dia CSP	lin m	150	300.00	45,000.00	
4.6	1600mm dia CSP	lin m	193	385.00	74,305.00	
4.7	1800mm dia CSP	lin m	135	450.00	60,750.00	
4.8	Open Bottom Arches	m	274	5,696.00	1,555,012.00	
4.9			0			
	Riprap 25kg Class	m^3	17,730	18.00	319,140.00	
	Riprap 250kg class	m^3	600	20.00	12,000.00	3,279,592.00
5.0	***AVALANCE PROTECTION***					
5.1	No-Post Barriers	m	200	240.00	48,000.00	
5.2	Lock Blocks (Gabions)	m	1,620	335.00	542,700.00	
5.3	Earth Berm	m	1,200	135.00	162,000.00	
5.4	Snow Sheds	m	500	15,000.00	7,500,000.00	8,252,700.00
	PART A - TOTAL					35,747,280.90
	PART B - Bridge Construction					
6.0	***BRIDGES***					
6.1	10m - 60m spans	m	1,188	8,000.00	9,504,800.00	
6.2	80m - 110m spans	m	564	10,000.00	5,640,000.00	
6.3	More Creek Canyon 200mspan	m	201	15,000.00	3,015,000.00	18,159,800.00
	PART B - TOTAL					18,159,800.00
	ESTIMATE SUB-TOTAL PARTS A & B					53,907,080.90
	PART C - Support Services					
	Mobilization & Demobilization	LS			1,326,300.00	
	Crew Transportation	shift	25	45,000.00	1,125,000.00	
	Camp Cost	manday	24,000	123.75	2,970,000.00	
	Helicopter Support	LS			7,648,000.00	
	First Aid & Supervision	manday	4,500	1,200.00	5,400,000.00	
	Construction Surveys	crewday	300	2,100.00	630,000.00	
	PART C - TOTAL					19,099,300.00
	ESTIMATED SUB-TOTAL					73,006,380.90
	Contingency 15% of Sub-Total					10,950,957.14
	ROAD CONSTRUCTION TOTAL BUDGET ESTIMATE					83,957,338.04

5.0 RECOMMENDATIONS AND FUTURE WORK

The route selection and preliminary centerline (p-line) survey were completed in August 2005 based on the best information available at the time. As more data was received, it was incorporated into the road design. Wherever the horizontal or vertical alignment can be modified to better meet the environmental, geotechnical and archaeological requirements this should be considered and field changes initiated if necessary.

Detailed site surveys and final designs for special structures to protect the road and pipeline from avalanches and rock falls are required to prepare construction drawings. Earth berms at km 19.3 and km 86.5, and snow sheds through Sphaler Canyon from km 99.2 to km 113.8 need to be located on the ground, surveyed, and unique designs achieved to mitigate risks.

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Approximately 80,000 m^3 of timber must be cleared from 350 hectares of road right-of-way based on cruise plots established along the road centerline. A License to Cut application to the Ministry of Forests must be submitted. Clearing boundaries need to be marked in the field for the road right-of way, construction campsites, gravel pits, and waste and borrow sites. The quality and quantity of gravel and riprap should also be confirmed at each proposed location.

The road design shows the proposed horizontal and vertical alignment; itemizes the earthworks, waste and borrow quantities, and drainage structures, and locates special structures, runout lanes, and other safety features. A 12 month construction schedule is proposed with an allowance for up to 18 months to complete road access through to the south tunnel portal. A review of construction activities and scheduling should be conducted to verify the practicality of certain assumptions with regards to access and productivity.

An $84 million road construction budget is estimated based on 2005 costs. This should be reviewed annually in light of scheduling, economic activity within the province of BC and the availability of labour and equipment.

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This report has been prepared by McElhanney Consulting Services Ltd. (MCSL) for the benefit of NovaGold Canada Inc. The information contained herein represents MCSL's best professional judgment in light of the knowledge and information available to MCSL at the time of preparation of the road design and construction cost estimate. If you have any questions or comments regarding this report or require clarification of any of the contents, please feel free to contact the undersigned.

Yours truly,

McElhanney Consulting Services Ltd.

Robert Parolin PEng

Senior Project Engineer

3.4 SAFETY REQUIREMENTS

Road user safety is a prime consideration in the design construction and maintenance of the Galore Creek access road. As a single lane radio controlled road with no alternate access, the communication via the repeater system must be continuous throughout the route for all vehicle traffic.

Design considerations include strategic placement of turnouts, double laning of blind corners and sharp crest curves, runout lanes on sustained 15% grades and special mitigation structures as described in Sect 3.3. Construction safety concerns will deal with stable cut/fill slopes, rock scaling and/or rock bolting, no-post barriers on the outside edge of steep fills and sharp corners, proper crowning and superelevation on curves, crushed gravel surfacing and dust abatement measures as and when needed.

A commitment to regular maintenance is required to maintain road safety. Grading, sanding snow removal and avalanche monitoring and control are ongoing and an immediate response to snow slides, rockfalls and washouts blocking the road will be needed. In the event of an emergency helicopter support to rescue and transport stranded or injured persons shall be available.

3.5 AUTHORIZED ACCESS

Public access will be prohibited during construction and restricted to authorized personnel only once operational. Access beyond the filtration plant at km 3.3, will be controlled by a full time security gate. Controlled access is required to provide for the health and safety of company personnel and the public and to ensure the protection of the environment.

4.0 CONSTRUCTION COST ESTIMATE

4.1 QUANTITY ESTIMATES

Estimated road construction costs in the Pre-feasibility Study were based on like sections of terrain and average construction costs for each category. The road design completed for this Feasibility Study (Appendices 1-6) provides an estimate of right-of-way clearing, earthwork volumes, drainage structures and bridges, and special mitigation structures. and allows a more accurate cost estimate to be calculated. The Pre-feasibility estimates are order of magnitude. The estimating for this Feasibility Study is supported by substantial engineering.

Based on the Preliminary design the following quantities have been calculated as shown on Table 3 below.

Table 3

Quantity Estimates

Description	Work	Estimated Quantity
Right-of-Way	Falling	81,200m^3
	Clearing	384ha
	Stripping	360,500m^3
Earthworks	OM (Other material)	1,159,600m^3
	Borrow	444,200m^3
	Rippable Rock	886,600m^3
	Solid Rock	611,800 m^3
	Rock Scaling & Bolting	8,800m
	Geotextiles	5,400 m^3

Description	Work	Estimated Quantity
Surfacing	Gravel	268,800m^3
	Geotextiles	5,000m^2
	75mm Crush	78,400 m^3
Culverts	600mm	7129lm
	800mm	1410lm
	1000mm	402lm
	1200mm	325lm
	1400mm	150lm
	1600mm	193lm
	1800mm	135lm
Arches	4m-6m open bottom arches	10 crossings
Riprap	25kg	16,350 m^3
	250kg	600 m^3
Avalanche Protection (Special Structures)		
	No post barriers	200m
	Lock block (gabions)	1620m
	Earth Berm	1200m
	Snow Sheds	500m

Description	Work	Estimated Quantity
Bridges:	9m – 60m spans	43 crossings
	Iskut River	107m span
	Muskwie Creek	97m span
	Lower More Creek	92m span
	More Creek Canyon	201m span
	Eros Creek	49m span
	Yurie Creek	89m span
	Porcupine River	84m span

4.2 UNIT PRICES

The unit prices used in the cost estimate do not include any allowance for Goods and Services Tax and all dollar values are in Canadian funds unless otherwise noted.

Unit rates are derived from 2005-2006 BC Government Equipment Rental Rate Guide and average production rates for road building equipment on resource road construction projects. All found equipment rental rates include all costs, expenses, and profit allowance for the project work being undertaken. Rates include insurance and WCB costs and operator wages include benefits.

Mobilization and de-mobilization, camp costs and helicopter support services are not included in hourly rates and are costed separately. Production and unit rates were also compared to recent contracts and verified by local contractors familiar with the project area.

4.2.1 Site Preparation

Right-of-way Falling is based on hand falling 120m^3 of timber per day at $500/day all found. Unit rate= $500/120$m^3$ = $4.20/ m^3 rounded up.

Clearing and Grubbing is the removal of the merchantable and non-merchantable timber and the stumps and debris within the right-of-way. A 300 series excavator at $170/hr should clear and grub 275m per 11 hour shift. Unit rate=$170/hrx11hr/.275km =$6800/km or $2250/ha.

Stripping of organics and unsuitable material is normally based on pushing all material to the low side of the right-of–way. Unit rate=$200/hrx11hr/900 m^3/hr =$2.50/ m^3 rounded up.

4.2.2 Subgrade Construction

Subgrade construction involves earthwork and utilizes a combination of heavy equipment . Production and costs vary with quantities and push distance and type of material. For this cost estimate the following equipment rental rates were used in determining unit rates for material movement.

D8N size dozer	$200/hour
D5G size dozer	$120/hour
300 series excavator	$170/hour
750 cfm Tank Drill	$210/hour
OM(other material)	unit rate $3.50/ m^3
Borrow material	unit rate $5.00/ m^3
Rippable Rock	unit rate $6.50/ m^3

Solid Rock Drill & Blast unit rate $8.00/ m^3 End Haul (500m) unit rate $4.00/ m^3

Geotextiles (overland construction) unit rate $2.50/m2 installed

Rock Scaling & Rock Bolting unit rate $50/lineal meter

4.2.3 Road Base & Surfacing

Road surfacing includes 30cm of select granular base material and 10cm of 75mm crushed gravel wearing surface. Unit prices are based on an average haul distance of 5km at \$0.60/ m^3/km and a fixed cost of \$2.50/ m^3 to load dump and spread.

Pit run Gravel unit rate \$6.00/ m^3

Crushed Gravel unit rate \$8.50/ m^3

4.2.4 Drainage Culverts

Unit prices for culverts are based on material costs delivered to Bob Quinn provided by Atlantic Industries Ltd. A multiplier of 1.6 for round pipe and 1.8 for arches is applied to the material cost to obtain the installed price per meter of length.

Example:

600mm diameter culvert is \$70/m delivered x 1.6 = \$112/m installed (includes couplers)

4890mm x 1610mm x 32m arch is \$101,564.00 delivered x 1.8 = \$5713/m installed

Riprap protection at the inlet and outlet of culverts has to be drilled and blasted, delivered and placed.

Culverts require 30 m^3/installation of Class 25kg at \$18/ m^3

Arches require 60 m^3/installation of Class 250kg at \$20/ m^3

4.2.5 Avalanche Protection

Special structures for protection of the road and pipeline from avalanches, rock falls and slides are priced per meter of length.

No-Post Barriers unit rate \$240/m installed

Lock Blocks (Gabions)2 high unit rate \$335/m installed

Earth Berm 3m high, unit rate \$135/m installed

Snow shed (AIL concept) unit rate \$15,000/m installed

4.2.6 Bridges

Each bridge crossing is site specific but for average unit rates to supply and install standard bridge components local bridge contractors, Majestic Bridge and Formula Contractors Ltd., confirmed the following unit rates:

Bridge spans 0 – 60m unit rate = $8000/m length installed

Bridge spans 80 – 100m unit rate = $10000/m installed

More Creek Canyon Bridge 201m span = $15000/m installed

4.3 SCHEDULE OF QUANTITIES AND UNIT PRICES

In addition to the direct costs of road and bridge construction, there are support services and indirect costs that must be carried by the contractor or NovaGold. These lump sum costs are calculated for the duration of the road construction project.

Mobilization & De-mobilization

Mob & Demob is based on moving personnel and equipment from Prince George to and from the project site. As much local hiring as possible will be done in Dease Lake, Terrace and Smithers but some equipment will be brought in from further centers such as Fort St John, Kamloops and Vancouver.

Bob Quinn Camp (Airstrip)

Truck Haul at $170/hour and 20hours return trip.

Estimate 60 loads at $3400/load = $204,000

Roca Camp

Airlift with Sikorsky S-61L at $4750/hour

Estimate 675,000 lb at a cost of $0.70/lb = $472,500

Porcupine Camp

Airlift with Sikorsky

Estimate 450,000 lb at a cost of $0.90/lb =$405,000

Demob by truck 60 loads at $4080/load = $244,800

Mob & Demob Total = $1,326,300

Crew Transportation based on NT Air Prince George to Bob Quinn return at $600 per employee each shift. Estimate 25 2 week shifts for 75 employees = $1,125,000.

Camp Costs vary on number of employees' location and whether the camps are leased or purchased outright. Assuming leased units the cost of set-up, sewer and water and catering results in a day-rate of approximately $150/day in Roca and Porcupine camps and $80/day at Bob Quinn.

Camp Costs = $150/day x 15000 mandays + $80/day x 9000 mandays = $2,970,000

Helicopter support is required for remote camps, and staging areas for crew transport, fuel and supplies and emergency evacuation.

Bell 206 Jet Ranger $950/hour ,4hr/day for 200days	= $760,000
Bell 206 Long Ranger $1200/hour, 4hr/day for 200days	= $960,000
Bell 205 Freight & Fuel $2900/hr, 6hr/day for 200 days	= $3,480,000
VIH Sikorsky S-61L $5100/hr, 4hr/day for 120 days	= $2,448,000
Helicopter Support Total	= $7,648,000

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Additional First Aid facilities will be available at each camp.

Estimate cost at $1200/day x 300 days x 15 persons = $5,400,000

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Construction surveys are required throughout the project including gradestaking, slopestaking, and cross sectioning to confirm quantities.

Estimated cost is $2100 per crewday for 300 days = $630,000

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2.7	Wetland/Overland Construction/Geotextiles	m^2	5400	2.50	13,500.00	
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2.9	Rock Trench (Pipeline Placement)	m^3	17570	12.00	210,840.00	19,991,389.00
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Yours truly,

McElhanney Consulting Services Ltd.

Robert Parolin PEng

Senior Project Engineer

GALORE CREEK MINE ACCESS ROAD

NORTH ROUTE – KM 0 TO KM 128

BRIDGE AND MAJOR CULVERT SUMMARY

McElhanney

NovaGold RESOURCES INC.

Galore Creek North Route Feasibility Study Stream Crossing Summary

Bridge #	McElhanney Drawing No.	P-Line Chainage	Approx. L-Line Chainage	Survey File	Crossing Name	Structure Type
	N/A	4+107			THOMAS FSR (existing)	Steel Girder Bridge
1	518-2-4001	9+626	15+560	B1-0601	ISKUT	Steel Girder Bridge
2	518-2-4002	25+033	25+655	B1-0604	SWAMP	Steel Girder Bridge
3	518-2-4003	25+982	26+595	B2-0604	MOOSE	Steel Girder Bridge
4	518-2-4004	29+300	30+390	B1-0602	MUSKWIE	Steel Girder Bridge
5	518-2-4005	38+053	39+160	B1-0603	MORE	Steel Girder Bridge
6	518-2-4006	39+056	40+345	B1-0608	BLURRY	Steel Girder Bridge
7	518-2-4007	42+930	44+227	B1-0606	ALEXANDER	Steel Girder Bridge
8	518-2-4008	43+047	44+350	B2-0605	SNOW	Steel Girder Bridge
9	518-2-4009	43+986	45+287	B1-0605	HANKIN	Steel Girder Bridge
10	518-2-4010	44+823	46+118	B2-0606	GLOVE	Steel Girder Bridge
11	518-2-4011	45+121	46+400	B3-0606	NATAVAS	Steel Girder Bridge
12	518-2-4012	45+472	46+767	B1-0607	SCHUSS	Pipe-Arch Culvert
13	518-2-4013	45+952	47+257	B2-0607	MATHEW	Pipe-Arch Culvert
14	518-2-4014A/B	47+026	48+420	B1-0628	MORE CANYON	Steel Truss Bridge
15	518-2-4015	46+913	48+815	B1-0627	DEBRIS	Pipe-Arch Culvert
16	518-2-4016	49+230	51+130	B1-0614	ALIGNMENT	Steel Girder Bridge
17	518-2-4017	50+469	52+365	B1-0613	TAHLTAN	Steel Girder Bridge
18	518-2-4018	52+509	54+435	B2-0614	WETALTH	Steel Girder Bridge
19	518-2-4019	53+390	55+308	B2-0615	RUN-OUT	Steel Girder Bridge
20	518-2-4020	53+621	55+525	B1-0615	NAHTA	Steel Girder Bridge
21	518-2-4021	54+144	56+070	B1-0616	BACCHUS	Steel Girder Bridge
22	518-2-4022	55+509	57+415	B2-0616	BENT TREE	Concrete Slab Bridge
23	518-2-4023	57+637	59+545	B1-0617	WINDFALL	Steel Girder Bridge
24	518-2-4024	59+821	61+725	B2-0617	STUMP	Steel Girder Bridge
25	518-2-4025	61+873	63+790	B1-0618	ARCTIC	Steel Girder Bridge
26	518-2-4026	63+948	65+850	B1-0619	SPRUCE	Steel Girder Bridge
27	518-2-4027	64+775	66+680	B2-0619	ROCA	Steel Girder Bridge
28	518-2-4028	66+021	68+580	B1-0620	BLUFF	Steel Girder Bridge
29	518-2-4029	68+093	70+585	B2-0620	HICKMAN	Steel Girder Bridge
30	518-2-4030	70+895	73+350	B1-0621	THREE CREEK JUNCTION	Steel Girder Bridge
31	518-2-4031	73+275	75+805	B1-0701	ROUND-LAKE	Steel Girder Bridge
32	518-2-4032	77+307	79+792	B1-0727	SAM	Round Pipe Culvert
33	518-2-4033	78+966	81+460	B1-0702	HOOLY	Steel Girder Bridge
34	518-2-4034	80+199	82+610	B2-0702	EROS	Steel Girder Bridge
35	518-2-4035	81+501	84+030	B3-0702	YURI	Steel Girder Bridge
36	518-2-4036	83+196	85+700	B1-0703	PHENO	Steel Girder Bridge
37	518-2-4037	86+097	88+565	B1-0705	HAROLD	Steel Girder Bridge
38	518-2-4038	88+529	89+450	B2-0705	SADDLE	Steel Girder Bridge
39	518-2-4039	89+337	90+240	B1-0706	MAURER	Steel Girder Bridge
40	518-2-4040	92+878	94+040	B1-0711	ELLIOTT	Steel Girder Bridge
41	518-2-4041	94+133	95+350	B1-0712	GLACIER	Steel Girder Bridge
42	(Formerly Glacier #2 - Combined into a single Glacier site)					
43	518-2-4043	95+715	96+930	B1-0704	SPHALER #1	Steel Girder Bridge
44	518-2-4044	96+418	79+780	B1-0713	ADEMA	Steel Girder Bridge
45	518-2-4045	99+057	100+363	B1-0714	DANIELS	Steel Girder Bridge
46	518-2-4046	99+355	100+656	B2-0714	HARDY	Steel Girder Bridge
47	518-2-4047	100+256	101+550	B1-0716	MASSON	Steel Girder Bridge
48	518-2-4048	100+386	101+690	B2-0716	PAROLIN	Steel Girder Bridge
49	518-2-4049	103+033	104+430	B2-0713	SPHALER #2	Steel Girder Bridge

Galore Creek North Route Feasibility Study Stream Crossing Summary						
Bridge #	McElhanney Drawing No.	P-Line Chainage	Approx. L-Line Chainage	Survey File	Crossing Name	Structure Type
50	518-2-4050	103+593	104+975	B1-0715	REED	Steel Girder Bridge
51	518-2-4051	104+390	105+770	B2-0715	HISCOK	Super-Cor Box Culvert
52	518-2-4052	106+254	107+630	B1-0717	O'DRISCOLL	Steel Girder Bridge
53	518-2-4053	109+200	111+230	B1-0930	SPHALER #3	Steel Girder Bridge
54	518-2-4054	110+998	113+060	B2-0717	LOPTSON	Steel Girder Bridge
55	518-2-4055	115+105	117+100	B1-0720	HAYDEN	Round Pipe Culvert
56	518-2-4056	116+370	118+382	B1-0719	RIOUX	Round Pipe Culvert
57	518-2-4057	116+507	118+518	B2-0719	SMIT	Round Pipe Culvert
58	518-2-4058	121+647	124+620	B1-0725	OLLENBERGER	Super-Cor Box Culvert
59	518-2-4059	124+800	126+470	B3-0726	MORAINE	Pipe-Arch Culvert
60	518-2-4060	124+986	126+665	B2-0726	ICEFIELD	Pipe-Arch Culvert
61	518-2-4061	125+196	126+860	B1-0726	LAST	Round Pipe Culvert
62	518-2-4062	"Airport"	0+080	B1-0718	PORCUPINE	Steel Girder Bridge
63	518-2-4063	71+713	74+220	P1-0725	GARIEPY	Pipe-Arch Culvert
64	518-2-4064	72+174	74+680	P1-0725	MATYSIAK	Pipe-Arch Culvert
65	518-2-4065	72+616	75+130	P1-0725	DAVIDSON	Round Pipe Culvert
66	518-2-4066	72+772	75+270	P1-0720	VEILLARD	Round Pipe Culvert
67	518-2-4067	90+329	91+160	P2-0728	TK	Pipe-Arch Culvert
68	518-2-4068	90+608	91+450	P1-0728	DEVCIC	Round Pipe Culvert
69	518-2-4069	4+689	4+280	n/a	Un-Named	Pipe-Arch Culvert
70	518-2-4070	6+048	5+590	n/a	Un-Named	Pipe-Arch Culvert
71	518-2-4071	8+545	8+060	n/a	Un-Named	Pipe-Arch Culvert
72	518-2-4072	10+190	9+710	n/a	Un-Named	Pipe-Arch Culvert
73	518-2-4073	24+930	25+540	P1-0616	Un-Named	Pipe-Arch Culvert
74	518-2-4074	32+687	33+780	P2-32+687SP	Un-Named	Pipe-Arch Culvert
75	518-2-4075	32+710	33+810	P2-0617	Un-Named	Pipe-Arch Culvert
76	518-2-4076	32+883	33+980	P2-32+883SP	Un-Named	Steel Girder Bridge
77	518-2-4077	39+120	40+410	P1-0621	Un-Named	Pipe-Arch Culvert
68	518-2-4068	90+608	91+450	P1-0728	DEVCIC	Round Pipe Culvert
69	518-2-4069	4+690	4+283		GARLICK	Pipe-Arch Culvert
70	518-2-4070	6+024	5+591		FANTA	Pipe-Arch Culvert
71	518-2-4071	8+538	8+063	P2-0622	GOAT	Pipe-Arch Culvert
72	518-2-4072	10+174	9+789	P1-0622	BUNIA	Pipe-Arch Culvert
73	518-2-4073	24+931	25+542	P1-0616	AIDEN	Pipe-Arch Culvert
74	518-2-4074	32+687	33+783	P2-0616	EROLAG	Pipe-Arch Culvert
75	518-2-4075	32+706	33+807	P2-0616	BELLS	Pipe-Arch Culvert
76	518-2-4076	32+883	33+979	P2-0616	LEH	Steel Girder Bridge
77	518-2-4077	39+115	40+406	P2-0706	ALYSIAH	Pipe-Arch Culvert
78	518-2-4078	43+030	43+333	P1-0711	O'SULLIVAN	Pipe-Arch Culvert
79	518-2-4079	59+457	61+374	P2-0720	GABBY	Round Pipe Culvert

GALORE CREEK MINE ACCESS ROAD

NORTH ROUTE – KM 0 TO KM 128

CULVERT SUMMARIES

	Diameter							
Station	**600**	**800**	**900**	**1000**	**1200**	**1400**	**1600**	**1800**
0+020	15							
0+291	13							
0+418	13							
0+735	12							
0+820	13							
0+944	14							
1+202	13							
1+360		13						
1+471	14							
1+570	12							
1+770	12							
1+923	14							
2+058	12							
2+162					17			
2+200	13							
2+382	13							
2+528	13							
2+608	13							
2+675	12							
2+755	12							
2+905							15	
3+140	12							
3+470	12							
3+620	12							
3+900	12							
4+085	10							
4+530	11							
4+996	13							
5+180	12							
5+320	10							
5+398	13							
5+520	14							
5+670	16							
5+890	18							
6+008	14							
Total Length (m)	**412**	**13**	**0**	**0**	**17**	**0**	**15**	**0**

	Diameter							
Station	**600**	**800**	**900**	**1000**	**1200**	**1400**	**1600**	**1800**
6+174	12							
6+232	13							
6+270	20							
6+602	12							
6+670	10							
6+726	12							
6+858	11							
7+016	12							
7+176	13							
7+232	16							
7+472	16							
7+645	12							
7+735	15							
7+850	11							
7+970	12							
8+310	11							
8+554	11							
8+682	13							
8+884	10							
9+033	16							
9+220	13							
9+550	16							
9+956	15							
10+100	13							
10+171	11							
10+251	11							
10+315	14							
10+388	11							
10+478	10							
10+534	15							
10+680	11							
10+870	13							
Total Length (m)	**411**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

	Diameter							
Station	**600**	**800**	**900**	**1000**	**1200**	**1400**	**1600**	**1800**
11+082	11							
11+207	15							
11+379	15							
11+555	14							
11+721	8							
11+887	13							
12+035	14							
12+131	15							
12+197	10							
12+222	11							
12+348	12							
12+479	13							
12+805	14							
12+906	16							
13+200	10							
13+338	13							
13+465	18							
13+565	13							
13+642		18						
13+906	14							
14+166	18							
14+324	15							
14+478	12							
14+596	13							
14+711							12	
14+818	14							
15+088	12							
15+254	14							
15+822	22							
16+143	13							
16+380	12							
Total Length (m)	**394**	**18**	**0**	**0**	**0**	**0**	**12**	**0**

Diameter								
Station	**600**	**800**	**900**	**1000**	**1200**	**1400**	**1600**	**1800**
16+600	9							
16+740	11							
16+880	11							
17+130	9							
17+280	8							
17+590	9							
17+790	8							
17+980	11							
18+310	14							
18+380	13							
18+770		19						
19+030	11							
19+330		32						
19+570	16							
19+650	14							
Total Length (m)	**144**	**51**	**0**	**0**	**0**	**0**	**0**	**0**

	Diameter							
Station	**600**	**800**	**900**	**1000**	**1200**	**1400**	**1600**	**1800**
19+838		11						
19+863		12						
19+896	13							
20+090	10							
20+220	10							
20+295		12						
20+370	11							
20+462	8							
20+616	13							
20+670	29							
20+759	23							
20+892		15						
20+986		19						
21+034		15						
21+102	15							
21+222	33							
21+434	14							
21+484	14							
21+670	8							
21+703	7							
21+776	8							
21+910	11							
22+000	14							
22+180	8							
22+250	15							
22+392	9							
22+535	17							
22+626	13							
22+827	11							
22+901	10							
22+989	9							
23+110	8							
Total Length (m)	**341**	**84**	**0**	**0**	**0**	**0**	**0**	**0**

	Diameter							
Station	**600**	**800**	**900**	**1000**	**1200**	**1400**	**1600**	**1800**
23+460	10							
23+660	8							
23+810	10							
23+945	10							
24+070	18							
24+178	10							
24+230	15							
24+315	10							
24+400	16							
24+442	14							
24+506	16							
24+620	15							
24+676	10							
24+804	12							
24+874	14							
24+926	14							
24+960	17							
24+981	13							
25+036	9							
25+100	12							
25+218	13							
25+245	13							
25+310	11							
25+387	10							
25+486	13							
25+820	16							
25+920	20							
26+060	19							
26+123	16							
26+270		11						
26+375		10						
26+510	10							
Total Length (m)	**394**	**21**	**0**	**0**	**0**	**0**	**0**	**0**

	Diameter							
Station	**600**	**800**	**900**	**1000**	**1200**	**1400**	**1600**	**1800**
26+795	16							
27+050					17			
27+270	12							
27+515	12							
27+793	12							
28+050	12							
28+300	12							
28+570	12							
28+775	16							
28+955	8							
29+235	8							
29+404	8							
29+700	12							
29+950	12							
30+485	27							
30+520	29							
30+550	26							
30+652	17							
30+853	19							
31+100	13							
31+350	13							
31+615	12							
Total Length (m)	**308**	**0**	**0**	**0**	**17**	**0**	**0**	**0**

	Diameter							
Station	**600**	**800**	**900**	**1000**	**1200**	**1400**	**1600**	**1800**
31+904	14							
32+128	12							
32+244	17							
32+503	17							
32+650	22							
32+878	31							
33+028	38							
33+360	21							
33+520	20							
34+271								19
34+410						18		
34+608	17							
34+806	14							
35+024	16							
35+318	17							
35+458	18							
35+755	14							
36+072	15							
36+400	14							
36+706	14							
36+892	18							
37+177	12							
Total Length (m)	**361**	**0**	**0**	**0**	**0**	**18**	**0**	**19**

	Diameter							
Station	**600**	**800**	**900**	**1000**	**1200**	**1400**	**1600**	**1800**
37+470	12							
37+990	13							
38+060	13							
38+240	13							
38+483	17							
38+593	19							
38+840		21						
39+004		15						
39+250	9							
39+450	10							
39+680	10							
39+898	15							
40+150	11							
40+466		12						
40+487	14							
40+630	13							
40+720	16							
40+810	12							
41+000	11							
41+150	8							
41+250	14							
41+440	19							
41+596							20	
Total Length (m)	**249**	**48**	**0**	**0**	**0**	**0**	**20**	**0**

	Diameter							
Station	**600**	**800**	**900**	**1000**	**1200**	**1400**	**1600**	**1800**
41+702	12							
41+733					21			
41+756		10						
41+784		10						
41+796		12						
41+821	12							
41+887						18		
41+988	11							
42+012	13							
42+150		12						
42+188	17							
42+259							12	
42+329		16						
42+436	13							
42+535						13		
42+574					18			
42+744	12							
42+911	15							
43+004	15							
43+097	16							
43+285	14							
43+392	13							
43+502	11							
43+630	17							
43+753	16							
43+877	16							
44+056	15							
44+489	12							
44+692	8							
44+897					14			
44+983		15						
45+062	13							
45+087		14						
45+453					14			
45+553	12							
45+585			13					
45+713	17							
45+829							15	
45+945	9							
46+205							13	
Total Length (m)	**309**	**89**	**13**	**0**	**67**	**31**	**40**	**0**

	Diameter							
Station	**600**	**800**	**900**	**1000**	**1200**	**1400**	**1600**	**1800**
46+492	8							
46+660	11							
46+690		11						
46+930				9				
46+940		11						
46+964	12							
46+984		8						
47+074	8							
47+079				8				
47+168							12	
47+449					8			
47+527		8						
47+591	13							
47+707		9						
47+891		11						
48+010	19							
48+180	11							
48+908		13						
48+942		13						
49+060				25				
49+535			12					
49+603						11		
49+638	13							
49+767	11							
49+812	15							
49+844		18						
49+851	17							
49+992	10							
50+030		11						
50+059	8							
50+166		9						
50+225			13					
50+309		8						
50+337	9							
50+356	8							
50+421	12							
Total Length (m)	**185**	**130**	**25**	**42**	**8**	**11**	**12**	**0**

Diameter								
Station	**600**	**800**	**900**	**1000**	**1200**	**1400**	**1600**	**1800**
50+608	11							
50+780	7							
50+953	10							
51+273	20							
51+314	23							
51+365	12							
51+504	8							
51+644	13							
51+733	13							
51+814				12				
51+980	9							
52+066		10						
52+137	9							
52+177		11						
52+223				12				
52+240				16				
52+262			11					
52+284		9						
52+301	7							
52+318	7							
52+608	9							
52+803		17						
52+942	16							
53+148				18				
53+283	11							
53+442		15						
53+738	8							
53+892	11							
54+028	11							
54+145	13							
54+292	16							
Total Length (m)	**244**	**62**	**11**	**58**	**0**	**0**	**0**	**0**

	Diameter							
Station	**600**	**800**	**900**	**1000**	**1200**	**1400**	**1600**	**1800**
54+650	20							
55+030	18							
55+234	20							
55+565	13							
55+755	10							
55+861	10							
56+282	18							
56+497		12						
56+533	12							
56+593		13						
56+825	12							
56+912				13				
56+993	13							
57+212	9							
57+240	8							
57+554	13							
57+606	15							
Total Length (m)	**191**	**25**	**0**	**13**	**0**	**0**	**0**	**0**

	Diameter							
Station	**600**	**800**	**900**	**1000**	**1200**	**1400**	**1600**	**1800**
57+943	9							
57+985	11							
58+073	16							
58+380	12							
58+505		12						
58+606	13							
58+650	13							
58+680				12				
58+850					10			
58+925						10		
59+042	10							
59+152	15							
59+265		12						
59+753						31		
59+967				20				
59+990	20							
60+004	14							
60+125	11							
60+320	9							
60+530	13							
60+545							11	
60+590	12							
60+745					14			
60+860	13							
60+010					10			
61+060	9							
Total Length (m)	**200**	**24**	**0**	**32**	**34**	**41**	**11**	**0**

	Diameter							
Station	**600**	**800**	**900**	**1000**	**1200**	**1400**	**1600**	**1800**
61+230	28							
61+339			11					
61+365	12							
61+375	13							
61+791	11							
62+010		11						
62+081	11							
62+122	14							
62+165					15			
62+303							20	
62+408	12							
62+564	13							
62+780	11							
63+150	12							
63+333	17							
63+938		12						
63+980		18						
64+017	12							
64+057	10							
64+114		12						
Total Length (m)	**176**	**53**	**11**	**0**	**15**	**0**	**20**	**0**

	Diameter							
Station	**600**	**800**	**900**	**1000**	**1200**	**1400**	**1600**	**1800**
64+264	15							
64+271	16							
64+555	11							
64+560	11							
64+836				11				
65+054	13							
65+339			38					
65+378		24						
65+943			22					
66+195		12						
66+287		8						
66+520	11							
66+960	14							
66+975	13							
66+998		15						
67+220	11							
67+482				13				
67+628	12							
67+714							12	
67+830	14							
67+880	11							
67+990	18							
68+076	14							
68+190	19							
68+439				11				
Total Length (m)	**203**	**59**	**60**	**35**	**0**	**0**	**12**	**0**

	Diameter							
Station	**600**	**800**	**900**	**1000**	**1200**	**1400**	**1600**	**1800**
68+678	8							
68+919	13							
69+027		15						
69+118		12						
69+175	13							
69+226	12							
69+393	10							
69+543	13							
69+592	11							
69+686							11	
70+035	11							
70+428						14		
70+742					11			
70+823	11							
70+920							19	
71+024	10							
71+054	12							
71+113	9							
71+243							9	
71+588						10		
71+702	22							
71+855	11							
71+994	11							
72+104	8							
72+182	11							
72+496	11							
72+982	11							
Total Length (m)	**218**	**27**	**0**	**0**	**11**	**24**	**39**	**0**

	Diameter							
Station	**600**	**800**	**900**	**1000**	**1200**	**1400**	**1600**	**1800**
73+768						11		
73+786	9							
74+140	16							
74+163	16							
74+511	13							
74+544	15							
74+572						14		
74+596	15							
74+682	15							
74+810		31						
75+075					12			
75+123	13							
75+278	19							
75+367	27							
75+669	14							
76+010	8							
76+240	8							
76+480	8							
76+790	14							
77+016		22						
77+230	9							
77+408	20							
77+670	9							
77+970	9							
78+170	17							
78+245	12							
78+378	9							
78+570	13							
78+730	11							
78+855	10							
79+064	11							
79+240	10							
79+460	10							
79+630	10							
79+896				12				
80+100	10							
80+310	12							
Total Length (m)	**392**	**53**	**0**	**12**	**12**	**25**	**0**	**0**

Diameter								
Station	**600**	**800**	**900**	**1000**	**1200**	**1400**	**1600**	**1800**
80+800	11							
81+052	13							
81+300	11							
81+730	18							
82+180	11							
82+500	11							
82+970	15							
83+300	13							
83+604	19							
83+682							14	
83+844		32						
84+460	18							
84+789								48
85+130	15							
85+310	10							
85+540	10							
Total Length (m)	**175**	**32**	**0**	**0**	**0**	**0**	**14**	**48**

	Diameter							
Station	**600**	**800**	**900**	**1000**	**1200**	**1400**	**1600**	**1800**
85+930	12							
86+060	16							
86+210	15							
86+350	9							
86+554	25							
86+848		19						
86+936	14							
87+242		13						
89+161	26							
89+700	11							
90+070		25						
Total Length (m)	**128**	**57**	**0**	**0**	**0**	**0**	**0**	**0**

	Diameter							
Station	**600**	**800**	**900**	**1000**	**1200**	**1400**	**1600**	**1800**
90+300		24						
90+687		11						
90+746		13						
91+073	13							
91+168	8							
91+183	8							
91+300	10							
91+447		25						
91+493					12			
91+600	15							
91+790	9							
92+010	13							
92+140	9							
92+340	9							
92+690	9							
92+867		9						
93+210	8							
93+330	9							
Total Length (m)	**120**	**82**	**0**	**0**	**12**	**0**	**0**	**0**

	Diameter							
Station	**600**	**800**	**900**	**1000**	**1200**	**1400**	**1600**	**1800**
93+838	12							
94+217	8							
94+440	10							
94+660	10							
94+787		9						
94+917								14
95+128					20			
95+717	16							
95+764	16							
95+808		9						
95+825	9							
96+100	8							
96+270	8							
96+468	10							
96+782	15							
Total Length (m)	**122**	**18**	**0**	**0**	**20**	**0**	**0**	**14**

	Diameter							
Station	**600**	**800**	**900**	**1000**	**1200**	**1400**	**1600**	**1800**
97+154	8							
97+534	16							
97+816		22						
97+862					16			
98+116	12							
98+290	8							
98+402		14						
98+716	16							
98+740								16
99+222	12							
99+238		12						
99+256	9							
99+280	15							
99+484	13							
99+610				9				
99+636	9							
99+852				9				
100+126	28							
100+220	8							
100+462		9						
100+544	9							
100+558				9				
100+704	9							
100+905	8							
101+006	8							
101+094	8							
101+326	8							
101+510	11							
101+584	11							
Total Length (m)	**226**	**57**	**0**	**27**	**16**	**0**	**0**	**16**

Diameter								
Station	**600**	**800**	**900**	**1000**	**1200**	**1400**	**1600**	**1800**
101+630							13	
101+639				11				
101+805	14							
102+158	8							
102+404	9							
102+600	14							
102+638	11							
102+918	11							
103+138					10			
103+410	13							
103+740	9							
104+300	8							
104+660	19							
104+941		24						
105+530	17							
105+990	8							
106+210	8							
Total Length (m)	**149**	**24**	**0**	**11**	**10**	**0**	**13**	**0**

	Diameter							
Station	**600**	**800**	**900**	**1000**	**1200**	**1400**	**1600**	**1800**
106+595	8							
106+838	8							
107+197		8						
107+488	8							
107+979					28			
108+300	10							
108+650	13							
109+090	9							
109+296	25							
109+478	11							
109+680	9							
109+926	9							
110+071	15							
110+410	12							
110+545	12							
110+566		12						
Total Length (m)	**149**	**20**	**0**	**0**	**28**	**0**	**0**	**0**

	Diameter							
Station	**600**	**800**	**900**	**1000**	**1200**	**1400**	**1600**	**1800**
111+210		33						
111+440	12							
111+630	13							
111+770	12							
111+955				11				
112+060		11						
112+123		10						
112+258	22							
112+410	9							
112+722	11							
112+797	13							
112+806	11							
112+866	11							
112+920	9							
113+245		9						
113+490	9							
113+676	9							
113+854				10				
113+930		8						
114+290	9							
114+918		16						
115+183		10						
115+330	11							
115+488	15							
115+614				16				
115+660	17							
115+799	14							
115+840	17							
116+052				15				
116+268					8			
116+440	18							
Total Length (m)	**242**	**97**	**0**	**52**	**8**	**0**	**0**	**0**

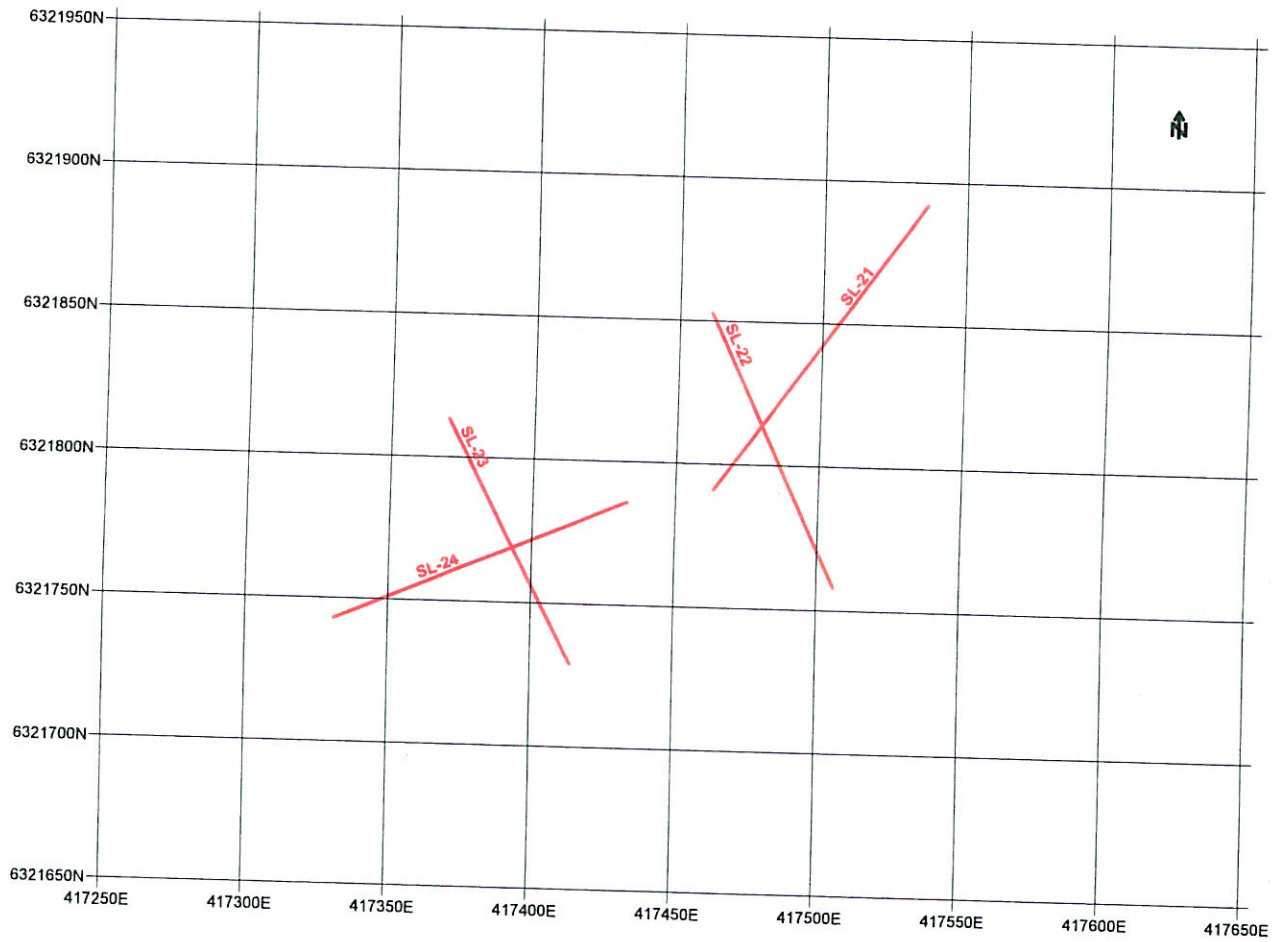
	Diameter							
Station	**600**	**800**	**900**	**1000**	**1200**	**1400**	**1600**	**1800**
116+542		10						
116+630		15						
116+976	8							
117+476	14							
117+737		9						
117+765	8							
118+008	18							
118+048	10							
118+410	17							
118+730	8							
118+880	9							
118+982		14						
119+170	8							
119+378		27						
Total Length (m)	**100**	**75**	**0**	**0**	**0**	**0**	**0**	**0**

	Diameter							
Station	**600**	**800**	**900**	**1000**	**1200**	**1400**	**1600**	**1800**
119+608		29						
119+677	20							
119+904		24						
120+059	27							
120+190	9							
120+440	9							
120+741	13							
121+024	9							
121+280	12							
121+302	12							
121+346	12							
121+362	12							
121+444	11							
121+603	11							
121+653	12							
121+683	12							
121+770	13							
121+950	9							
122+186	14							
122+492		8						
122+760	9							
122+872					7			
123+188		8						
123+332					10			
123+469		8						
123+528	9							
123+663	9							
123+703	13							
123+880	9							
124+045								12
124+181								14
124+400		9						
Total Length (m)	**266**	**86**	**0**	**0**	**17**	**0**	**0**	**26**

	Diameter							
Station	**600**	**800**	**900**	**1000**	**1200**	**1400**	**1600**	**1800**
124+714		16						
124+880	10							
125+120	10							
125+290	11							
125+460	9							
125+750	11							
125+890	15							
126+030	9							
126+170	8							
126+341					10			
126+582		26						
126+818		12						
126+888								12
127+050	11							
127+107	11							
127+200	11							
127+350	11							
127+500	11							
127+650	11							
127+800	11							
127+940	11							
128+100	11							
128+250	11							
128+320	13							
Total Length (m)	**206**	**54**	**0**	**0**	**10**	**0**	**0**	**12**

Diameter								
Station	**600**	**800**	**900**	**1000**	**1200**	**1400**	**1600**	**1800**
Porcupine								
0+274	12							
0+450	18							
0+700	12							
0+972	14							
1+082	15							
1+296	15							
1+450	12							
1+624					23			
1+850	16							
1+998		28						
2+034		23						
Total Length (m)	**114**	**51**	**0**	**0**	**23**	**0**	**0**	**0**

Diameter								
Station	**600**	**800**	**900**	**1000**	**1200**	**1400**	**1600**	**1800**
Total Length (m)	**7129**	**1410**	**120**	**282**	**325**	**150**	**208**	**135**

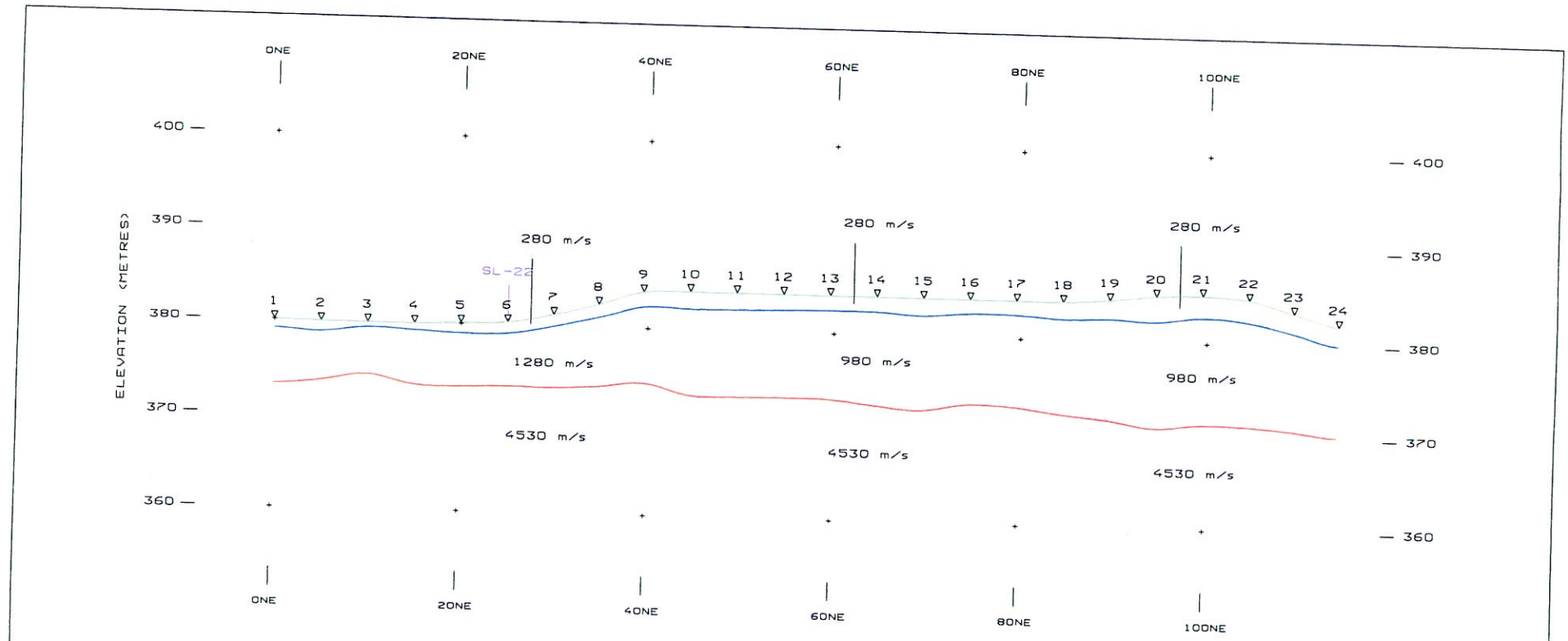


PRELIMINARY

0 20 40 60 80

METRES

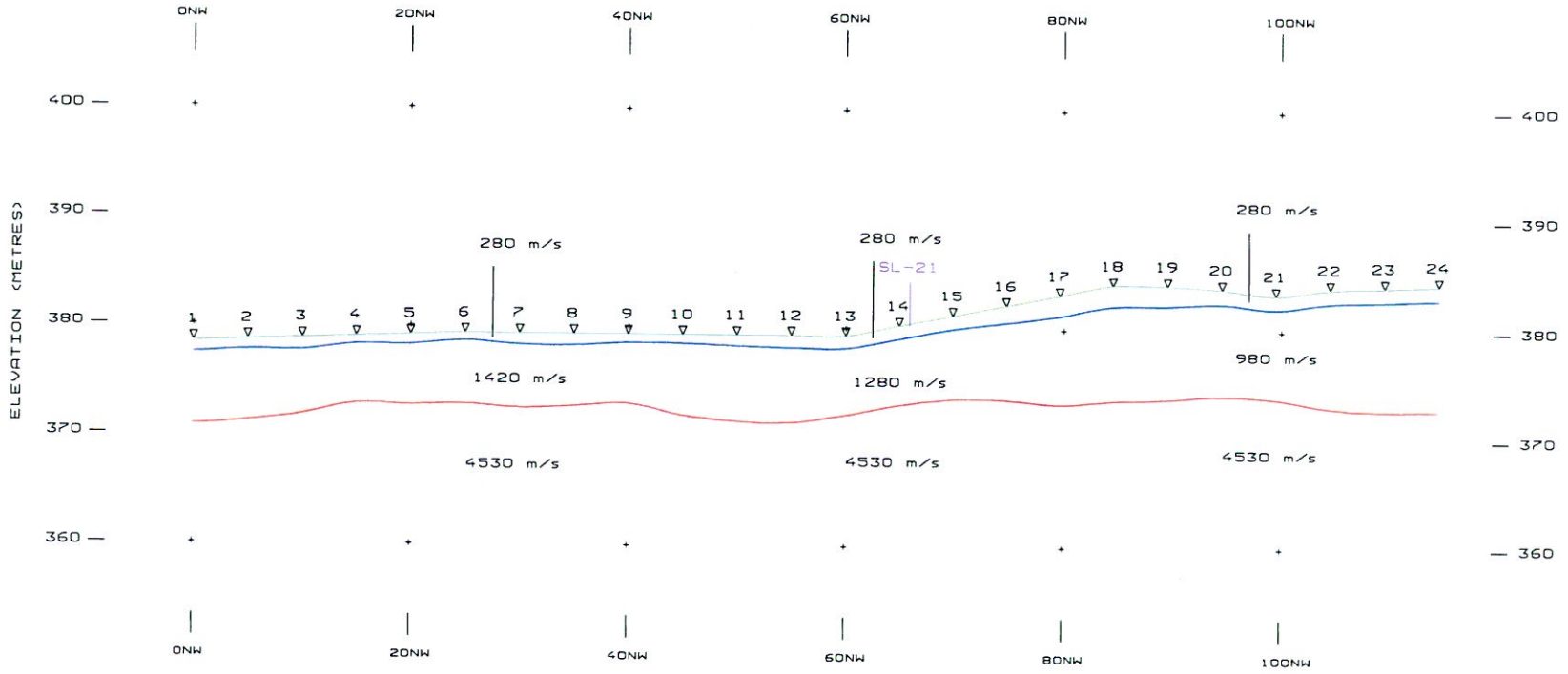
McELHANNEY CONSULTING SERVICES LTD.
GALORE CREEK PROJECT
SEISMIC REFRACTION SURVEY
ISKUT RIVER CROSSING SITEPLAN
FRONTIER GEOSCIENCES INC.
DATE: SEPT. 2005 | SCALE 1:20,000



SEISMIC LINE SL-21

INSTRUMENT: GEOMETRICS GEODE

McELHANNEY CONSULTING SERVICES LTD. GALORE CREEK PROJECT
SEISMIC REFRACTION SURVEY
INTERPRETED DEPTH SECTION SL-21 ISKUT CROSSING
FRONTIER GEOSCIENCES INC.
DATE: SEPT. 2005 | SCALE 1:500 | FIG.

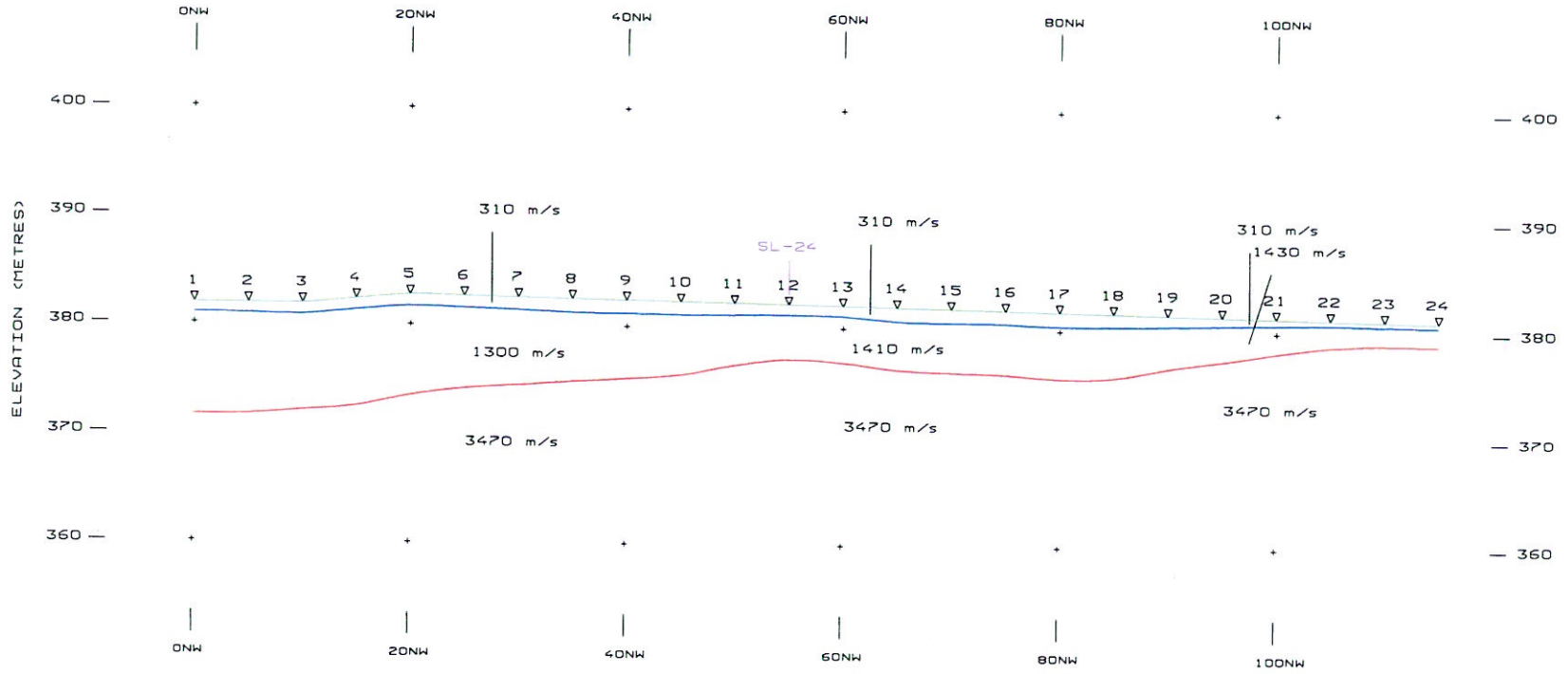


PRELIMINARY

SEISMIC LINE SL-22

INSTRUMENT: GEOMETRICS GEODE

McELHANNEY CONSULTING SERVICES LTD. GALORE CREEK PROJECT		
SEISMIC REFRACTION SURVEY		
INTERPRETED DEPTH SECTION SL-22 ISKUT CROSSING		
FRONTIER GEOSCIENCES INC.		
DATE: SEPT. 2005	SCALE 1:500	FIG.



PRELIMINARY

SEISMIC LINE SL-23

INSTRUMENT: GEOMETRICS GEODE

McELHANNEY CONSULTING SERVICES LTD.
GALORE CREEK PROJECT

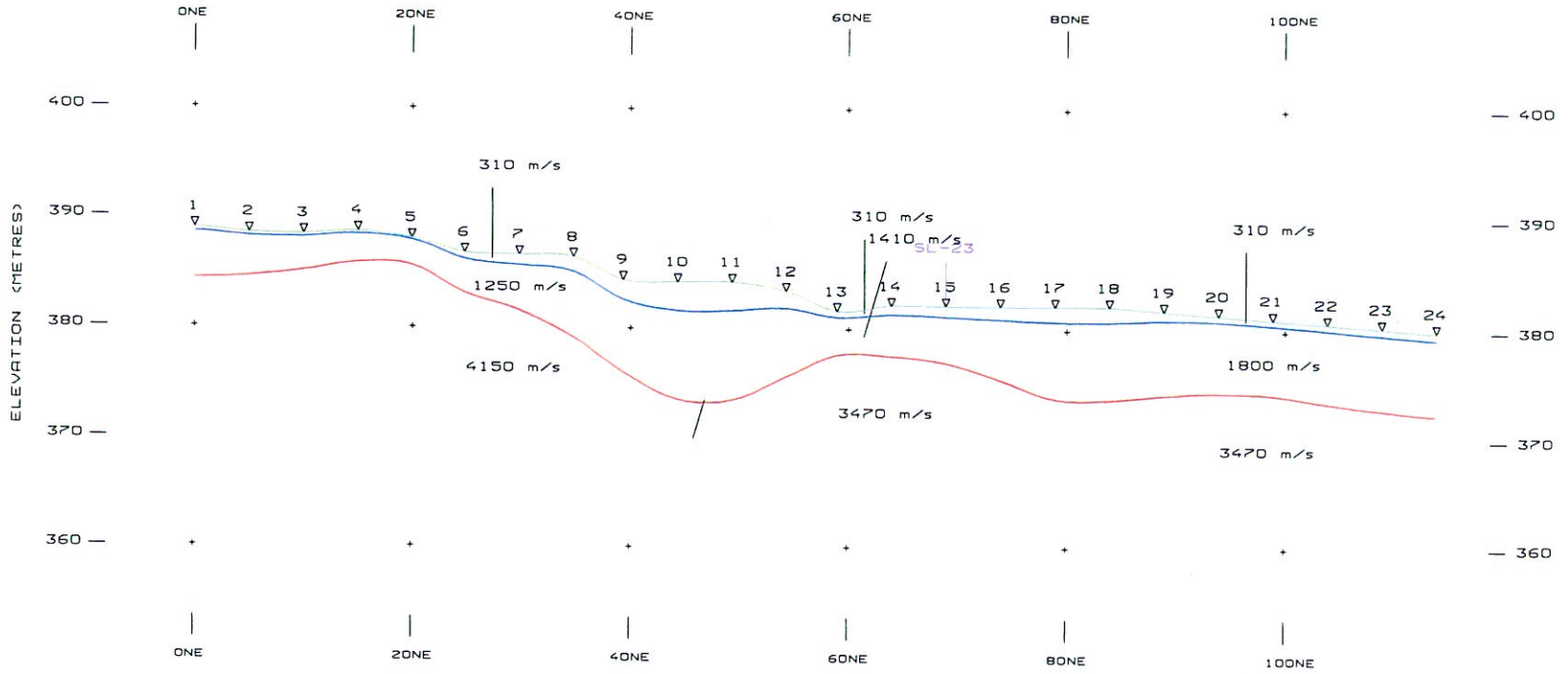
SEISMIC REFRACTION SURVEY

INTERPRETED DEPTH SECTION SL-23
ISKUT CROSSING

FRONTIER GEOSCIENCES INC.

DATE: SEPT. 2005	SCALE 1:500	FIG.

PRELIMINARY
NOT TO SCALE

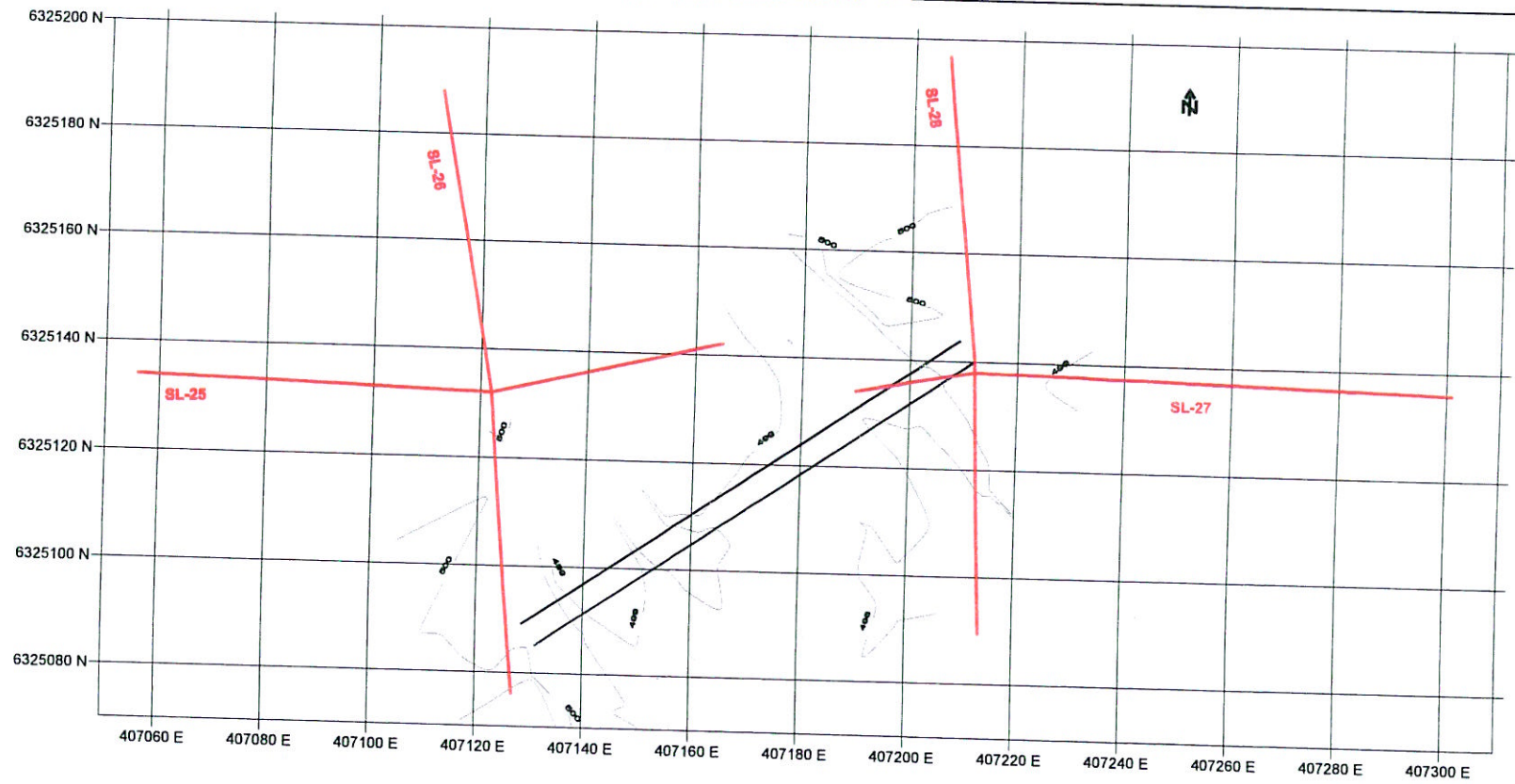


PRELIMINARY

SEISMIC LINE SL-24

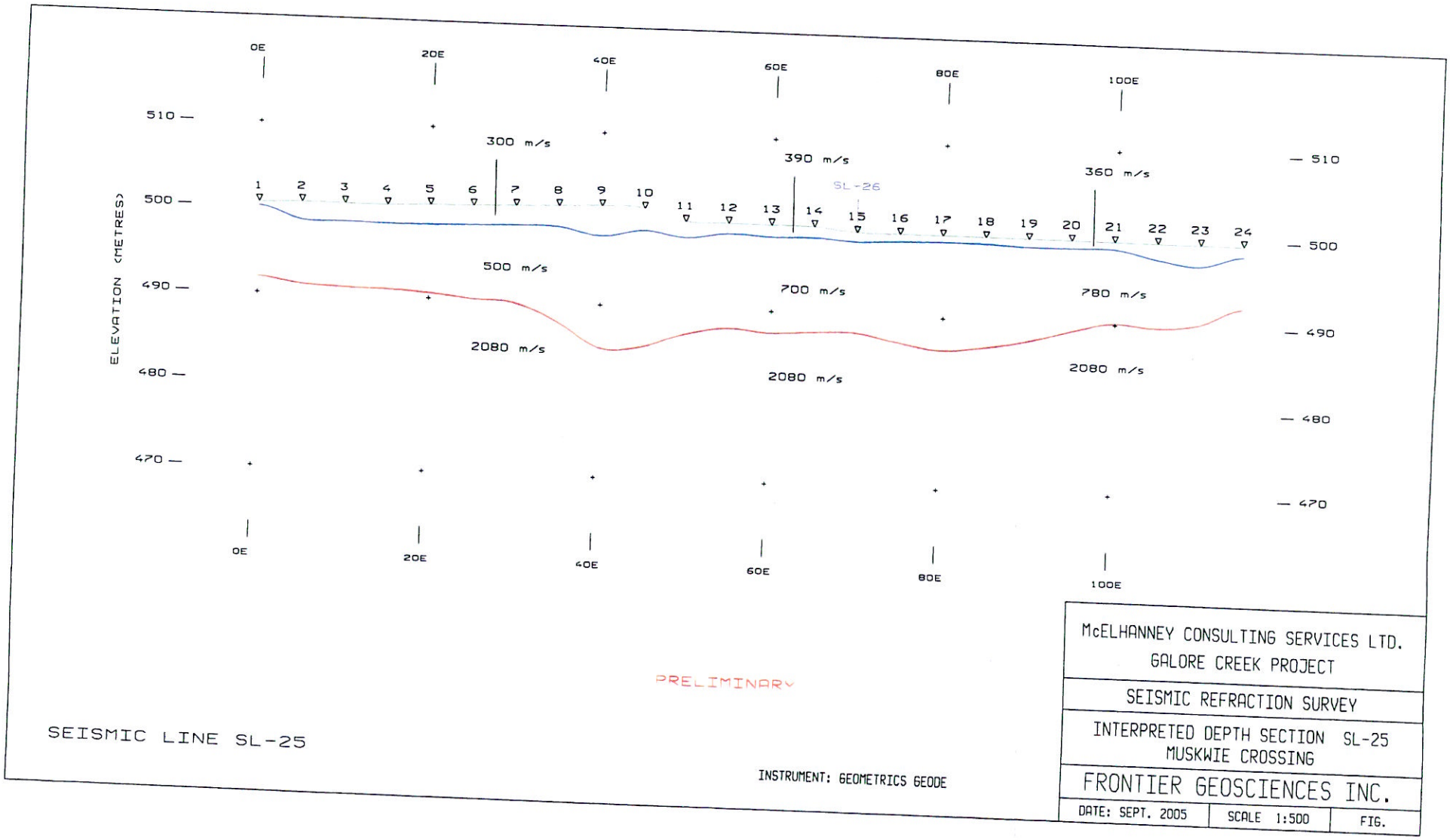
INSTRUMENT: GEOMETRICS GEODE

McELHANNEY CONSULTING SERVICES LTD. GALORE CREEK PROJECT		
SEISMIC REFRACTION SURVEY		
INTERPRETED DEPTH SECTION SL-24 ISKUT CROSSING		
FRONTIER GEOSCIENCES INC.		
DATE: SEPT. 2005	SCALE 1:500	FIG.



PRELIMINARY

McELHANNEY CONSULTING SERVICES LTD.		
GALORE CREEK PROJECT		
SEISMIC REFRACTION SURVEY		
MUSKWIE RIVER CROSSING SITEPLAN		
FRONTIER GEOSCIENCES INC.		
DATE: SEPT. 2005	SCALE 1:20 000	

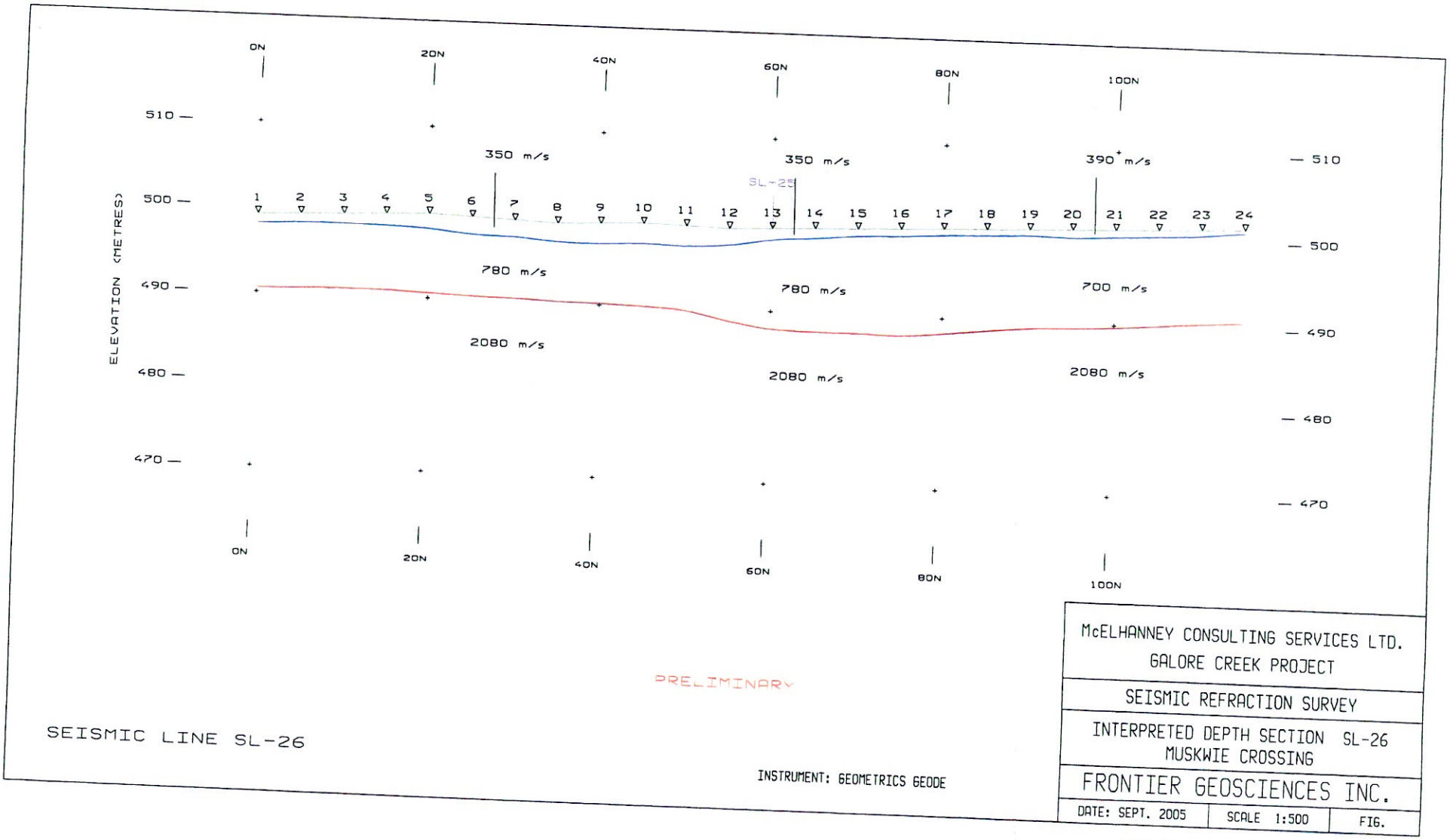


PRELIMINARY

SEISMIC LINE SL-25

INSTRUMENT: GEOMETRICS GEODE

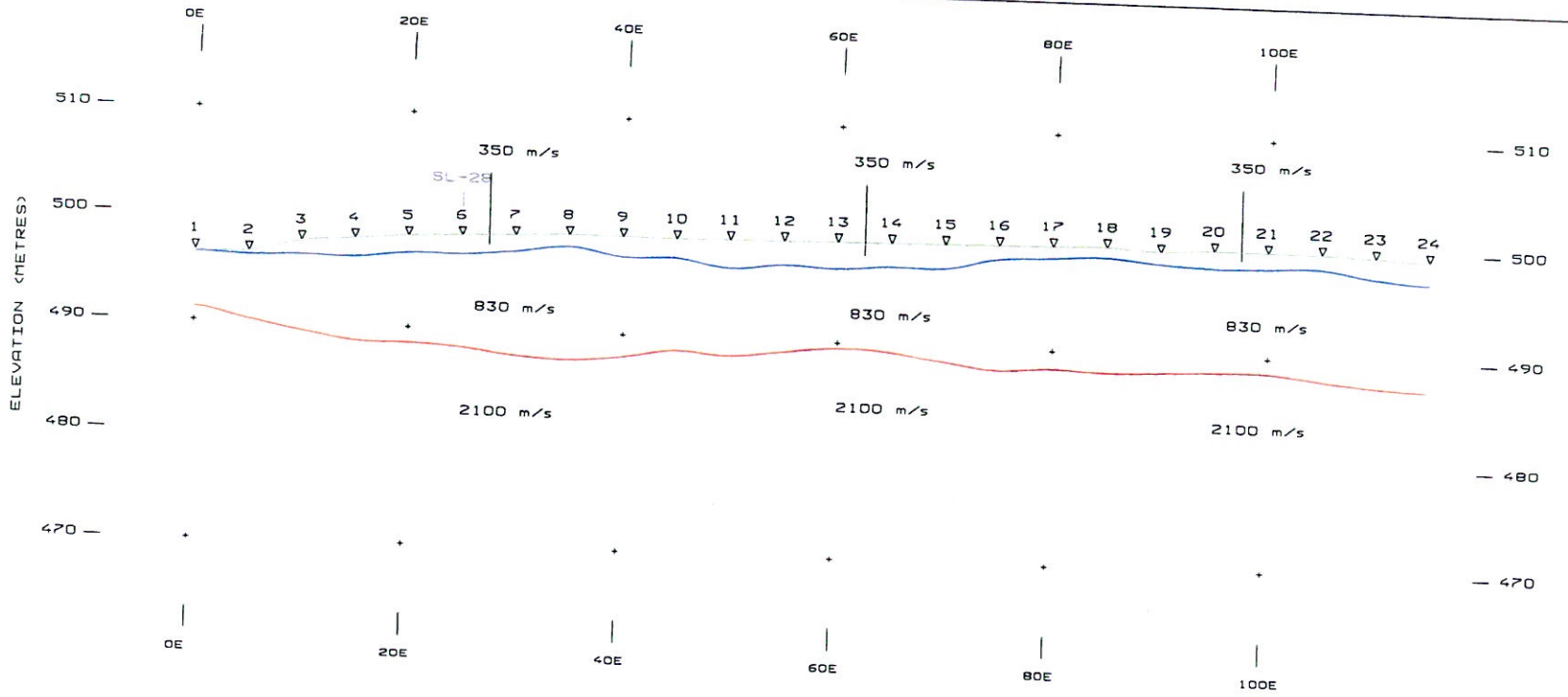
McELHANNEY CONSULTING SERVICES LTD. GALORE CREEK PROJECT		
SEISMIC REFRACTION SURVEY		
INTERPRETED DEPTH SECTION SL-25 MUSKWIE CROSSING		
FRONTIER GEOSCIENCES INC.		
DATE: SEPT. 2005	SCALE 1:500	FIG.



SEISMIC LINE SL-26

INSTRUMENT: GEOMETRICS GEODE

McELHANNEY CONSULTING SERVICES LTD. GALORE CREEK PROJECT		
SEISMIC REFRACTION SURVEY		
INTERPRETED DEPTH SECTION SL-26 MUSKWIE CROSSING		
FRONTIER GEOSCIENCES INC.		
DATE: SEPT. 2005	SCALE 1:500	FIG.

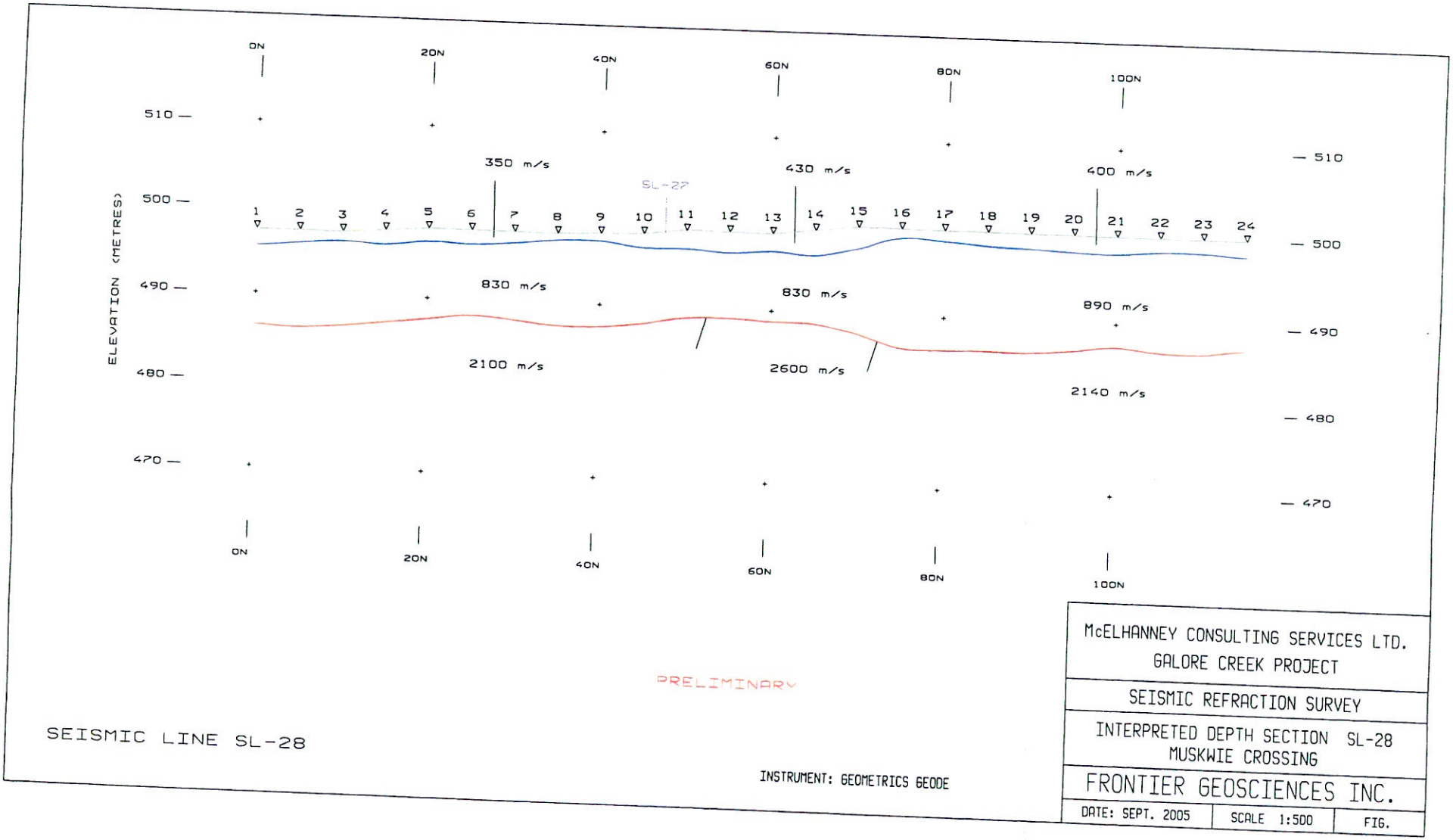


PRELIMINARY

SEISMIC LINE SL-27

INSTRUMENT: GEOMETRICS GEODE

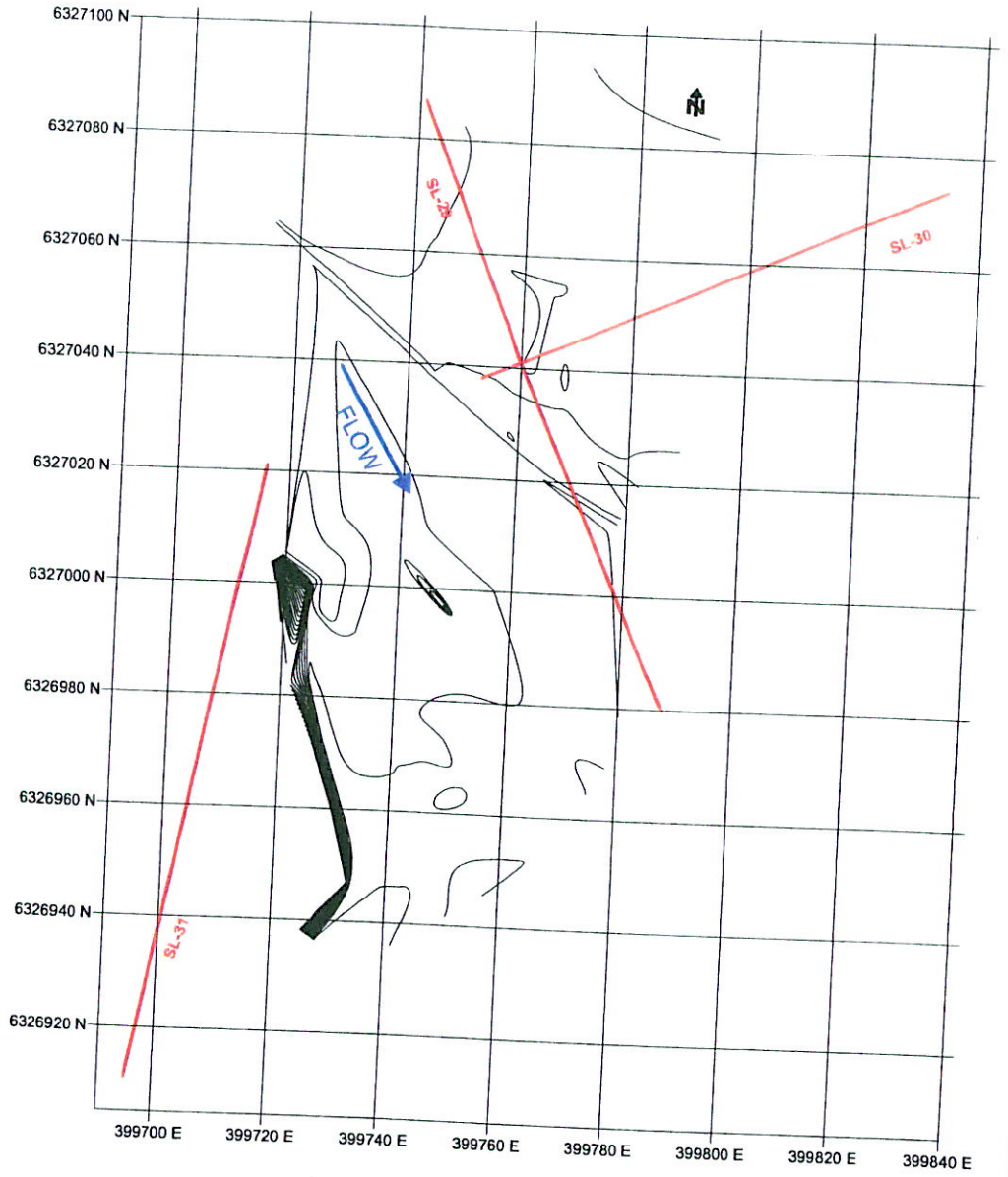
McELHANNEY CONSULTING SERVICES LTD. GALORE CREEK PROJECT		
SEISMIC REFRACTION SURVEY		
INTERPRETED DEPTH SECTION SL-27 MUSKWIE CROSSING		
FRONTIER GEOSCIENCES INC.		
DATE: SEPT. 2005	SCALE 1:500	FIG.



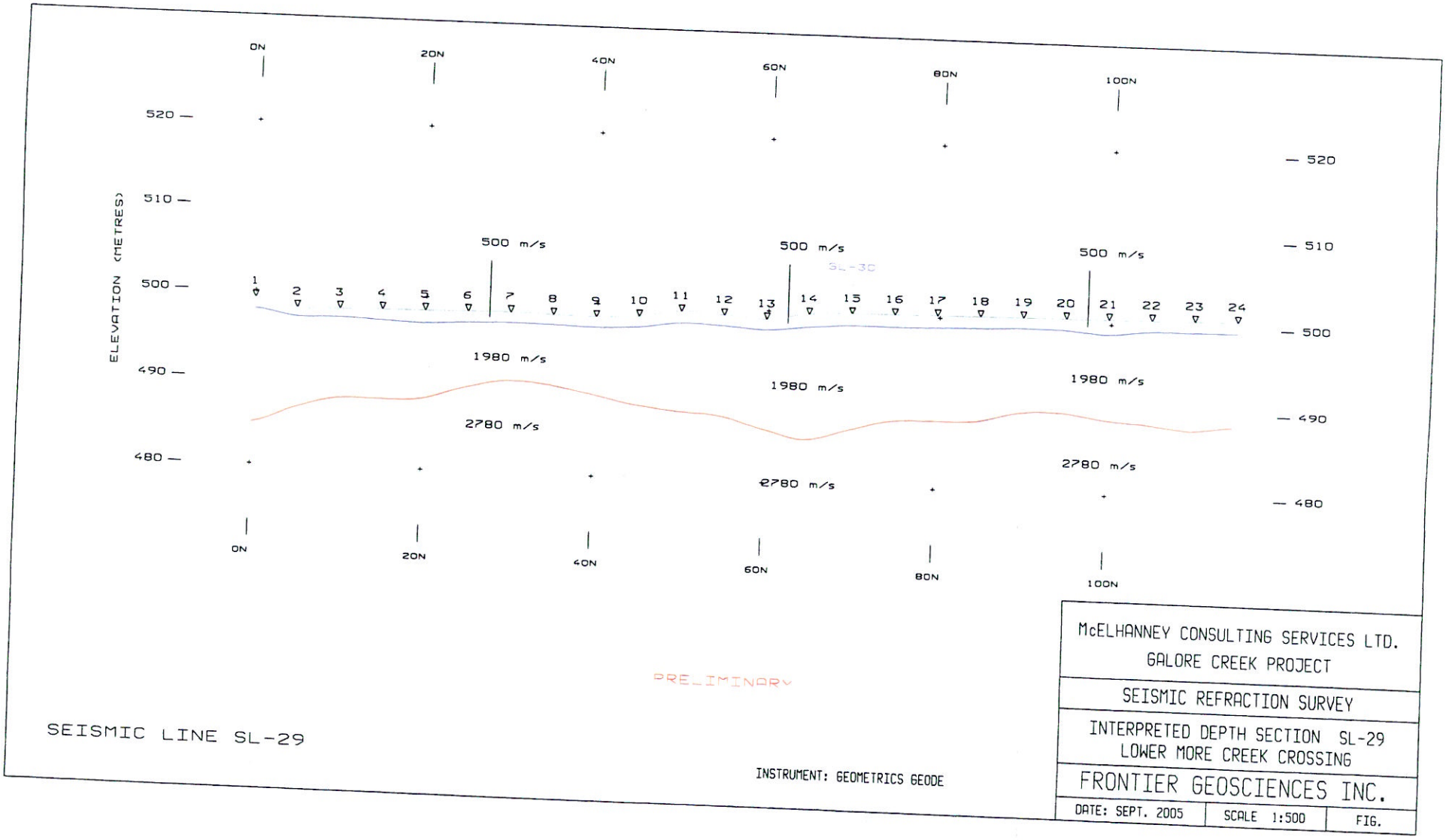
SEISMIC LINE SL-28

INSTRUMENT: GEOMETRICS GEODE

McELHANNEY CONSULTING SERVICES LTD. GALORE CREEK PROJECT		
SEISMIC REFRACTION SURVEY		
INTERPRETED DEPTH SECTION SL-28 MUSKWIE CROSSING		
FRONTIER GEOSCIENCES INC.		
DATE: SEPT. 2005	SCALE 1:500	FIG.



McELHANNEY CONSULTING SERVICES LTD.		
GALORE CREEK PROJECT		
SEISMIC REFRACTION SURVEY		
MORE CREEK CROSSING SITEPLAN		
FRONTIER GEOSCIENCES INC.		
DATE: SEPT. 2005	SCALE 1:20 000	FIG. 12



SEISMIC LINE SL-29

INSTRUMENT: GEOMETRICS GEODE

McELHANNEY CONSULTING SERVICES LTD.
GALORE CREEK PROJECT

SEISMIC REFRACTION SURVEY

INTERPRETED DEPTH SECTION SL-29
LOWER MORE CREEK CROSSING

FRONTIER GEOSCIENCES INC.

DATE: SEPT. 2005	SCALE 1:500	FIG.