GEOTECHNICAL OVERVIEW

INDUSTRIAL LAND USE PLAN
PRINCE GEORGE AIRPORT WEST

Prepared for

0743999 BC LTD.,
AND THE CITY OF PRINCE GEORGE
C/O L&M ENGINEERING LIMITED

Prepared by

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PROJECT No. K-2517

JULY 18, 2008

TABLE OF CONTENTS

Page No.

APPENDICES

1.0 INTRODUCTION

On behalf of 0743999 BC Ltd. and the City of Prince George (the land owners), L&M Engineering Limited (L&M) is preparing an Industrial Land Use Plan (ILUP) for the Prince George Airport West area. L&M, on behalf of the land owners, commissioned GeoNorth Engineering Ltd. to carry out a geotechnical overview assessment of the proposed development area. Our assessment follows the format outlined in our proposal dated January 14, 2008. Authorization to proceed with the assessment was provided in an email dated January 30, 2008 from Ms. Rebecca Goodenough, BA, BPI of L&M. The location of the ILUP is shown on Drawing 2517-A1, in Appendix A. A site plan showing the ILUP area is on Drawing 2517-A2, also in Appendix A.

As described in our proposal, the geotechnical overview assessment includes the following:

1. A review of existing geotechnical reports, surficial and bedrock geology reports and maps, and air photos of the study area.

2. An assessment of probable soil types, based on the results of the desk study.

3. A general assessment of the potential for subsurface disposal of storm water.

4. A preliminary assessment of potential geotechnical issues that will require further investigation.

The ILUP area is currently within the Agricultural Land Reserve and is designated as a Rural Resource by the Official Prince George Community Plan. We understand the area is currently subject to an Agricultural Land Reserve Exclusion application for consideration by the Agricultural Land Commission.

The proposed ILUP area is bordered by the Prince George Regional Airport and developed and undeveloped private property to the east, by Highway 16, the Prince George Youth Containment Centre and steep slopes above Highway 16 to the north, by steep slopes that overlook the CN Rail mainline, Fraser River and the BCR Industrial Park to the west and by Highway 97 to the south. The site is presently undeveloped except for several residences and light industrial businesses in the Boeing Road area, in the northeast corner. Past logging activities have left several rough trails across the area. Most of the site is tree covered with occasional grassy areas. There are several ponds and incised steam draws that generally drain west and south towards Fraser River.

Our assessment is based on a review of published surficial and bedrock geology reports, historic and recent aerial photos, and existing geotechnical drill hole information from investigations at the perimeter of the development area.

2.0 GEOLOGICAL BACKGROUND

2.1 Surficial Geology

Background to the surficial geology of the area is provided in research papers by H.W. Tipper, in Bulletin 196, 1971, and accompanying Map 1288A, Surficial Geology, Prince George, published by Geological Survey of Canada (GSC) and in a paper titled “Multiple Glaciation in Central British Columbia”, 1971, published by Canadian Journal of Earth Sciences. During the Pleistocene Era, between about 8,000 and 2 million years ago, the interior of British Columbia was covered by a series of glaciations, the most recent being the Fraser Glaciation, generally taken to have ended between 10,000 and 12,000 years before present.

The geological evidence indicates that each glaciation was typically preceded by a period of cooling that caused the development of valley glaciers that disrupted drainage and resulted in the development of short-lived glacial lakes. Silt and clay sediments typically blanketed the area covered by the lakes. As the glaciers grew, they coalesced into an ice sheet that flowed from the areas of highest ice accumulation, eroding some areas and depositing till across others. Till is typically a mixture of materials the glaciers picked up and redeposited, and often consists of sand, gravel and cobbles in a silt or clay matrix. Till deposited below the glacial ice as the glaciers were advancing, called basal till, has been compacted by the weight of the glacial ice and typically has properties of relatively high shear strength and low compressibility. Till that was carried within the glacial ice and deposited as the ice stagnated, called ablation till, can have properties of variable gradation and shear strength.

The glaciers created drumlins, which are rounded, elongate ridges, as they crossed the landscape. Drumlins identified on the geological maps indicate the glacial ice flowed in a northeasterly direction across the Prince George area. The maps also show that drumlins extended to about 1200 m (4000 ft) elevation on the flanks of Mount George, located about 20 km south of the site. Drumlins from an earlier glaciation that flowed in a westerly direction are identified on the top of the mountain.

At the end of the last glacial period, higher elevation areas melted first, resulting in a large, regional glacial lake due to unmelted glacial ice and glacial drift in the present Fraser River channel. The lake, called Glacial Lake Prince George, existed for several hundred years generally at a maximum elevation of about 760 m. Silt, clay and fine grained sand sediments from the glacial lake were deposited over the existing topography, filling in the lows and mantling the higher ground. These glaciolacustrine deposits are typically varved showing the seasonal nature of the deposition with the coarser silt sized particles carried into the lake and deposited during spring and summer, and the finer grained clay varves being deposited during winter periods.

When the ice dam melted, rapid drainage of the glacial lake occurred southward down the Fraser River Valley, establishing the present day drainage patterns. The meltwater cut through the glaciolacustrine silt and clay, and deposited granular soils in the valley bottom. Much of the surficial deposits along the present day Fraser River consist of minor amounts of recent sand and gravel over glaciofluvial sand and gravel, deposited over an eroded till or fine grained glaciolacustrine surface.

Within the proposed ILUP area, the ground surface is generally between elevations 675 and 720 m, except where steep slopes extend below the plateau along the north and west boundaries. The area was, therefore, covered by glacial ice and was below the level of Glacial Lake Prince George. GSC Map 1288A identifies the area as being covered by glaciolacustrine silt and clay sediments. Higher elevation areas about 9 km west of the airport are mapped as being underlain by till, with drumlins oriented in a northeasterly direction. The Fraser and Nechako River Valleys are mapped as being large glacial meltwater channels. They would have carried large flows as Glacial Lake Prince George and glacial lakes further west drained.

2.2 Bedrock Geology

To our knowledge, there are no bedrock outcrops in the area and groundwater wells in the area rarely encounter bedrock. Geological mapping available on a website maintained by B.C. Ministry of Energy, Mines and Petroleum Resources indicates there are two bedrock types that underlie the area. Approximately the southeast half of the site is reported to be underlain by middle to upper Triassic (about 200 million years old) mudstone, siltstone, shale and fine clastic (sandstone) sedimentary rocks. The approximately northwest half of the site if reported to be underlain by Oligocene to Pliocene (50 to 30 million years old) conglomerate, coarse clastic sedimentary rocks. We understand conglomerate sedimentary rock was encountered in drill holes for the twinning of the Simon Fraser Bridge project, currently under construction. This matches the bedrock geology mapping by the B.C. Geological Survey.

3.0 AIR PHOTO REVIEW

We reviewed aerial photographs taken over the last 50 years to identify changes in land use and previous development, to review the geomorphology of the site and to check slope stability conditions in and adjacent to the ILUP. A list of the photos we reviewed is in Table 1, below.

Table 1, List of Available Air Photos used for Overview Study

Year	Flight Line	Photo Numbers
2002	15BCC02010	65-67
2000	30BCB00040	46, 47, 120 and 121
1996	15BCB96007	56 and 57
1977	BC77089	157-160
1963	BC5070	32-34
1955	BC1890	2-4

On the photos from 1996, we outlined terrain units, or polygons, that have similar geomorphology (landform types), slope, drainage and stability characteristics. The terrain attributes of each of the polygons are described using a terrain classification system by Howes and Kenk, 1988, titled "Terrain Classification System for British Columbia", sponsored by B.C. Ministry of Environment. We also described preliminary stability conditions of each polygon using a reconnaissance level system. The stability classifications are 'S', 'P' and 'U', corresponding to stable, potentially unstable and unstable, respectively. Stable areas have a very low likelihood of instability and show no signs of instability. Potentially unstable areas do not show signs of instability but have characteristics similar to adjacent areas that are unstable. Unstable areas show signs of active or relict landsliding.

The set of photos used for mapping (F.L. 30BCB96007 #56 and 57) show site topography clearly and are at a relatively large scale. A scanned copy of the mapped air photo is shown on

Drawing 2517-B1, in Appendix B. A legend describing the symbols used in the air photo mapping is also in Appendix B. Features visible on photos from other years are incorporated on the mapped 1996 photo.

The 1955 photos show that development in parts of the ILUP and surrounding area was underway, and show:

- The south part of the ILUP is partly logged.
- There are cleared areas extending west into the ILUP from the east-west airport runway, similar to present conditions.
- Gunn Road is in place and accesses a cleared, cultivated field in the centre of the site. The shape of the field is very similar to its present shape.
- The Regional Gaol (original jail) is in place, adjacent to location of the present day Regional Correctional Centre.
- Boeing Road is constructed and there are several buildings near the present intersection with Highway 16 and further south.

The 1963 photos show more development along Boeing Road and a cleared powerline extending east from a crossing over Fraser River to the Regional Gaol. The Simon Fraser Bridge and Highway 97 past the BCR Industrial Park are under construction.

The 1977 photos show more logging of the west and south parts of the ILUP, a race track located south of the intersection of Boeing and Gunn Roads, and a right-of-way for a City of Prince George water line to the present water reservoir east of the Prince George Youth Containment Centre. The 1985 photos do not show significant changes within the ILUP but there is significant residential development along the south edge, and light industrial development along Continental Way below the west edge of the site.

The 1988 photos show the following changes:

- The Prince George Youth Containment Centre is built.

- Highway 16 is built at its present location .
- A slide has developed in the highway cut across from Pickering Road that is still visible today.
- There are several small clearings, possibly related to radio tower equipment, in the ILUP.

Conditions are little changed in the 1996 and 2002 photos. In general, the area defined by the ILUP appears to have not been previously developed other than for logging and for agriculture at the present location south of Gunn Road.

The aerial photos show that the ILUP area has several rounded, elongate drumlins in the centre to north end of the site. The drumlins are oriented southwest to northeast, in the direction of the glacial ice flow across the area. The cleared fields to the east and in the centre of the ILUP area have a uniform tone indicative of fine grained, glacial lake sediments. Streams along the west edge of the proposed development area are incised and have a dendritic drainage pattern. These characteristics are typical of fine grained sediments. Based on the surficial geology information and on the features visible on the air photos, we interpret the drumlinized areas to consist of a veneer of silt and clay, glacial lake sediments, over glacial till. Areas between drumlins are likely underlain by a blanket of glacial lake sediments over till. In the west and south parts of the site, the incised streams, dendritic drainage patterns and less indications of drumlins suggests the glacial lake sediments are thicker in these directions. These terrain features are outlined on an aerial photo on Drawing 2517-B1, as noted above.

With the exception of the steep slopes at the north and west edges of the ILUP, and the steep slopes along the incised stream channels in the west and south parts of the site, the slopes in the ILUP are stable, with no signs of significant instability. The slope below the north edge has two known slides, and below the northeast corner the slopes are irregular and heavily gullied. This indicates these slopes are at least potentially unstable, and unstable at the locations of the existing slides. Along the west boundary, there are no signs of previous instability but the slopes are steep and gullied in some areas, making them potentially unstable. Fine grained sediments on moderate to steep gradient slopes will have a high potential for surface soil erosion. On gentle gradient slopes, silt, clay and fine grained sand deposits will have a moderate potential for surface soil erosion.

4.0 EXISTING SUBSURFACE INFORMATION

To provide context to the aerial photo interpretation, and in addition to our review of geology reports and maps by B.C. Geological Survey and Geological Survey of Canada, we reviewed water well logs available online from the B.C. Water Resource Atlas, and drill hole and test pit logs from previous investigations carried out by our firm.

Drill hole logs for the Prince George Airport air terminal building additions typically encountered fine grained, glaciolacustrine silt and clay to more than 10 m depth, over dense, layered gravel and sand, likely a glaciofluvial deposit, over silty clay from an earlier glacial lake deposit. The maximum depth of these geotechnical holes was about 35 m. Drill holes and test pits for the airport runway extension and related facilities also encountered layered and laminated silt and clay, but also encountered up to about 1 m of peat in a poorly drained area at the north end of the airport. Similarly, investigations for various hangars and the B.C. Ministry of Forests Air Tanker Base also encountered silt and clay.

Two drill holes for a communications tower located south of the airport and east of Ellis Road encountered varved silt and clay to between 4 and 6.4 m depth, over hard silty clay with some sand and gravel, a till deposit.

An investigation for the City of Prince George water reservoir near the Prince George Youth Containment Facility encountered between 0.9 and 2.4 m of silty clay over hard silty clay with some sand and some gravel, a till deposit.

Drill holes along Highway 16 encountered variable conditions, but generally clay till with occasional layers of clay to 11 m depth in two drill holes, over layered gravelly sand that extends to more than 30 m depth.

B.C. Buildings Corporation previously operated a gravel pit opposite Guay Road immediately north of the site. An exposure in this face exposed about 4 m of glaciolacustrine silt and clay, over about 3 m of sand, gravel and cobbles in a clayey silt matrix, a till deposit, over dense, layered gravel and sand, likely an inter-glacial fluvial deposit.

Drill holes, test pits and water well logs adjacent to the south and south east parts of the site encountered silt and clay. The deeper water well logs typically encountered complex stratigraphy, consisting of glaciolacustrine silt and clay layered with gravel clay till deposits. Water well records indicate that the quality and quantity of groundwater are variable. Conceptual cross sections that summarize subsurface conditions are on Drawing 2517-A4 and A5 in Appendix A.

5.0 ENGINEERING ASSESSMENT

The following assessment and conclusions are based on the existing, available information as described above. The recommendations are preliminary, and we recommend detailed, project specific geotechnical investigations be carried out for each stage of development that involves construction or ground disturbance.

5.1 Probable Soil Types

The available surficial geology maps, aerial photos and existing subsurface information indicate that soil conditions across the ILUP area are likely to consist of laminated and layered, glaciolacustrine silt and clay of variable thickness covering silty clay with some sand and gravel, a till deposit. There also appears to be extensive deposits of sand and gravel below the glaciolacustrine silt and clay. Glaciofluvial sand and gravel were encountered in drill holes east of the ILUP area at the airport air terminal building, and at the north and west edges in steep cut slopes. Landform features that might identify the sand and gravel are obscured by the thick covering of silt and clay, however, and the extent of the glaciofluvial deposits are unknown.

There are likely to be extensive surficial deposits of organic silt and peat associated with the ponds in the area. These deposits are likely to be soft, very compressible and generally unsuitable for engineering applications.

Glaciolacustrine Sediments

The thickness of this soil type is likely to vary, being thinnest over drumlins in the centre and northern parts of the site, possibly less than 1 m thick, and becoming thicker to the south, likely more than 10 m thick. Based on the existing drill hole and test pit results, the properties of the silt and clay are likely to vary. In well drained areas, the silt and clay are very stiff to hard, and over-consolidated due to dessication, whereas in localized wet, swampy areas the deposit can be soft to firm and normally consolidated. Normally consolidated soil has only experienced overburden pressure equal to its self-weight. Soil that is over-consolidated typically has higher shear strength and is less susceptible to consolidation settlements. If practicable, we recommend that low, wet areas be avoided.

The over-consolidated silt and clay deposits are successfully used to provide support for buildings on conventional strip and pad spread footings. These soil types are sensitive to moisture, and in some cases must be covered by a layer of lean mix concrete to present softening due to water and construction activities. Allowable bearing capacities depend on site-specific conditions but are typically between 100 and 200 kPa for conventional low-rise structures without heavy, concentrated loads.

The glaciolacustrine silt and clay are moderately to highly susceptible to the development of ice lenses which cause frost heave during winter months. Foundations for buildings and other structures that are sensitive to movement will require protection against frost heave. The silt and clay have properties of low permeability. Basements and crawl spaces will require perimeter drainage systems to prevent a buildup of hydrostatic pressures and water ingress.

Some of the clay deposits have properties of high plasticity which indicates they could have a propensity for volume change with changes in moisture content. Grade-supported slabs and lightly loaded foundations on swelling clay can heave and settle as the moisture content of the foundation clay increases and dries. We are not aware of significant problems with swelling clay in the area.

The fine grained deposits have been used as fill in trenches and as subgrade fill for road embankments. In general the deposits are wet of optimum moisture content for compaction and need to be moisture conditioned before they can be compacted to the specified density. These materials are sensitive to moisture, typically resulting in construction with these materials being shut down during wet weather.

Glacial Till

Where it has been observed in exposures and existing drill holes at the perimeter of the site, the till is usually a mixture of sand, gravel and cobbles in a silty clay matrix. It typically has properties of relatively high shear strength and low compressibility. The drumlins are deposited below advancing glacial ice and are therefore highly over-consolidated due to compaction by the weight of the ice. This material is suitable for support of conventional spread footings with typical allowable bearing pressures of 200 to 350 kPa.

The till is usually at a moisture content that is close to optimum for compaction and can be used for embankment and site grading fill. As with the glaciolacustrine silt and clay, the till is sensitive to moisture conditions and typically requires dry weather for placement for engineering applications. The till is also moderately to highly susceptible to frost heave.

5.2 Subsurface Disposal of Storm Water

The glaciolacustrine silt and clay and the glacial till deposits both have properties of low permeability and are therefore not suitable for disposal of storm water through ground infiltration. Sand and gravel deposits might underlie parts of the site, as discussed above, and if encountered, might be suitable for ground infiltration.

5.3 Slope Stability Conditions

As noted above, there are slope stability hazards associated with steep and gullied slopes at the north and west edges of the proposed ILUP area, and into the incised stream draws. Due to the presence of existing slides and very steep slopes along the north and east boundaries, we recommend a preliminary setback of at least 50 m from slope crests.

In the northeast corner of the proposed development area, slope gradients are less steep but there are frequent steeply incised draws. This area is east of existing slides affecting Highway 16 cut slopes and west of Boeing Road at Highway 16. We recommend more detailed assessments of slope stability and erosion potential before this part of the area is developed.

Recommended setback areas from the crest of these slopes are shown on Drawing 2517-A3 in Appendix A.

We also recommend a setback at least 30 m wide from the crest of the incised stream draws that cross the west and southern parts of the site. Following detailed assessments of drainage, slope stability and surface soil erosion characteristics, some of these areas may be suitable for development. Mitigative work might include measures to control erosion such as installation of rip rap or storm sewers, and filling suitably drained and prepared draws.

Assessments to determine the soil erosion potential and measures to control runoff and erosion will be required prior to development.

Development will result in an increase in the volume and rate of runoff. We recommend the use of landscaping, where practicable, and storm water detention ponds, to reduce and control the rate of storm water runoff from the area. We recommend against discharging runoff over the slope below the north edge of the development, and only in existing drainage paths along the west and south sides of the development area.

6.0 CLOSURE

As noted above, the recommendations and design parameters in this report are preliminary. Design parameters for building foundations and slope setbacks require project-specific geotechnical analyses.

This report was prepared by GeoNorth Engineering Ltd. for the use of 0743999 BC Ltd., the City of Prince George and their consultants. The material in it reflects GeoNorth Engineering's judgement in light of the information available to us at the time of preparation. Any use which Third Parties make of this report, or any reliance on decisions to be made based on it, are the responsibility of such Third Parties. GeoNorth Engineering Ltd. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

Please call the writers if any parts of this report need to be clarified or discussed in more detail.

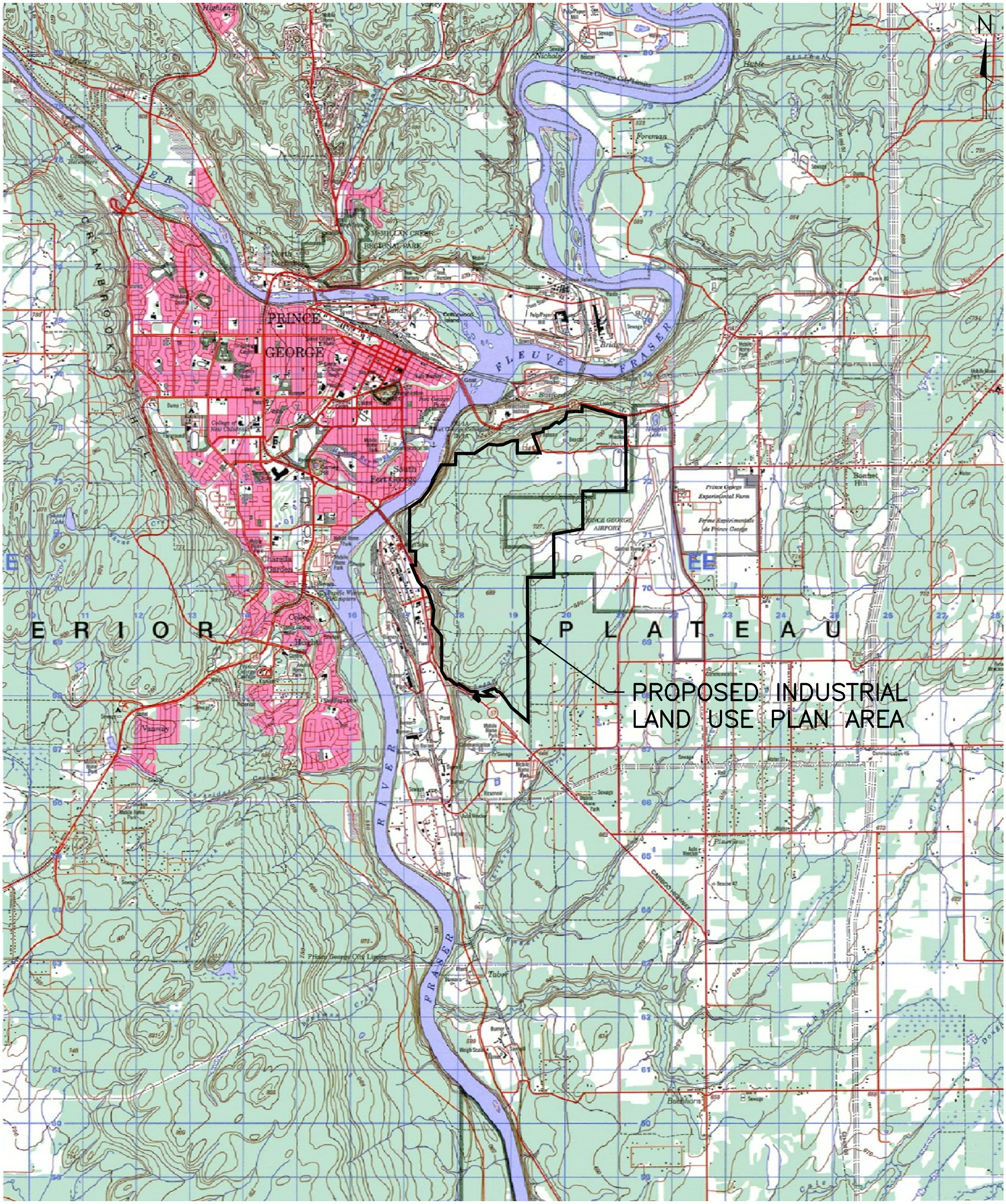
Respectfully submitted,
GeoNorth Engineering Ltd.

Per: M.D. Dresen, E.I.T.

Reviewed by,
GeoNorth Engineering Ltd.

Per: D.J. McDougall, M.Eng., P.Eng.

APPENDIX A



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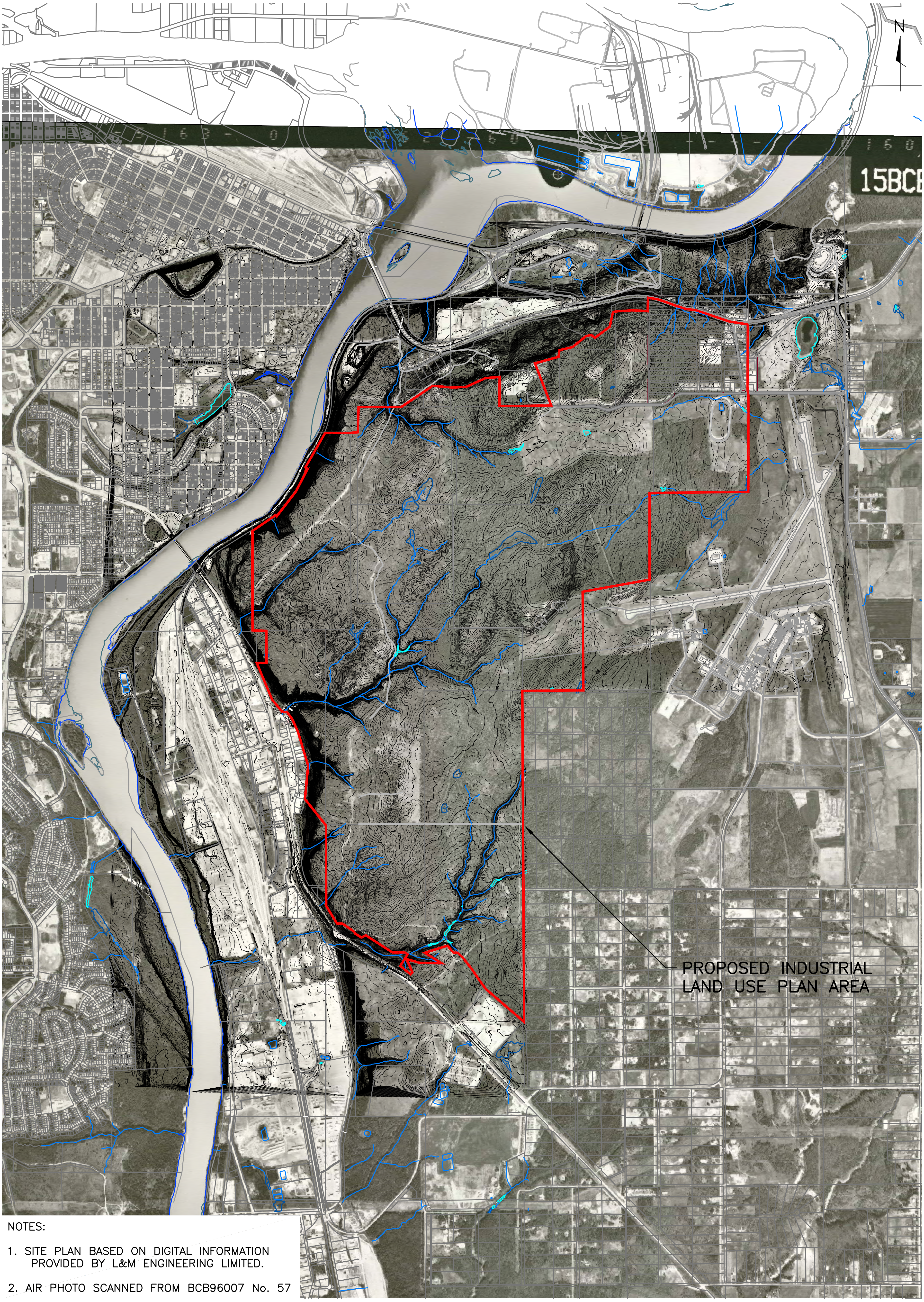
0743999 BC LTD. AND THE CITY OF PRINCE GEORGE
c/o L&M ENGINEERING LIMITED
GEOTECHNICAL OVERVIEW – INDUSTRIAL LAND USE PLAN
PRINCE GEORGE AIRPORT WEST, PRINCE GEORGE, B.C.
SITE LOCATION PLAN

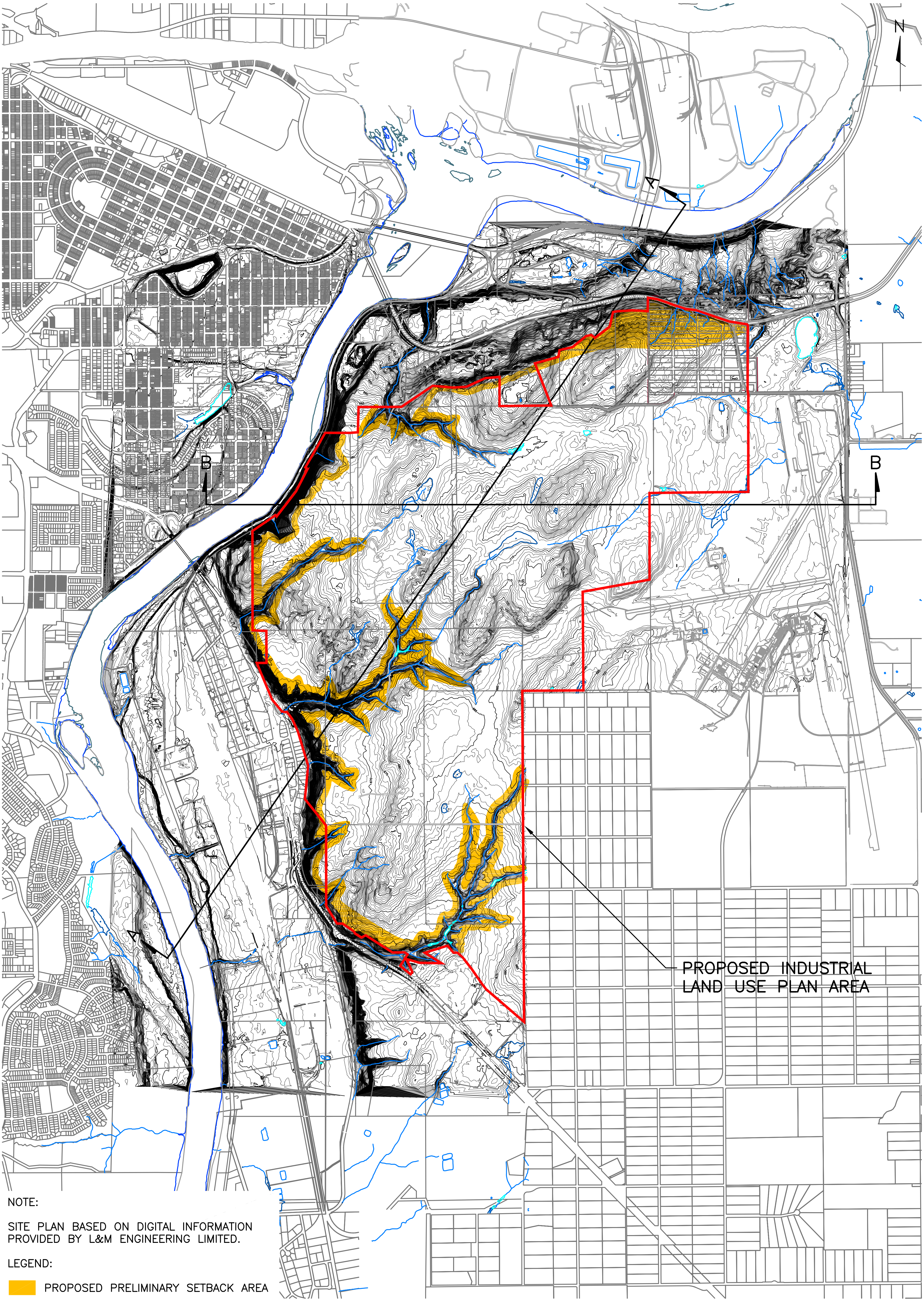
SCALE:	DATE:	DRAWN:	CHKD:	PROJ:	DWG:
~1:100,000	2008/07/18	LU	–	K-2517	2517-A1



NOTES:

1. SITE PLAN BASED ON DIGITAL INFORMATION PROVIDED BY L&M ENGINEERING LIMITED.
2. AIR PHOTO SCANNED FROM BCB96007 No. 57

SCALE: 1:30,000	APPROVED:		0743999 BC LTD. AND THE CITY OF PRINCE GEORGE c/o L&M ENGINEERING LIMITED GEOTECHNICAL OVERVIEW – INDUSTRIAL LAND USE PLAN PRINCE GEORGE AIRPORT WEST, PRINCE GEORGE, B.C. SITE PLAN SHOWING INDUSTRIAL LAND USE PLAN	GEONORTH ENGINEERING LTD. 1301 Kelliher Road Prince George, B.C. V2L 5S8 Tel. (250) 564-4304 Fax (250) 564-9323
DATE: 2008/07/18				
DWN BY: LU				
MAP REF: –				
DWG NO. 2517-A2	REV. –	PROJECT NO: K-2517		



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DWN BY: LU			
MAP REF: –			
DWG NO. 2517–A3	REV. –	PROJECT NO: K–2517	

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GEOTECHNICAL OVERVIEW – INDUSTRIAL LAND USE PLAN
PRINCE GEORGE AIRPORT WEST, PRINCE GEORGE, B.C.
SITE PLAN SHOWING CROSS SECTION LOCATIONS AND PRELIMINARY SLOPE SETBACKS

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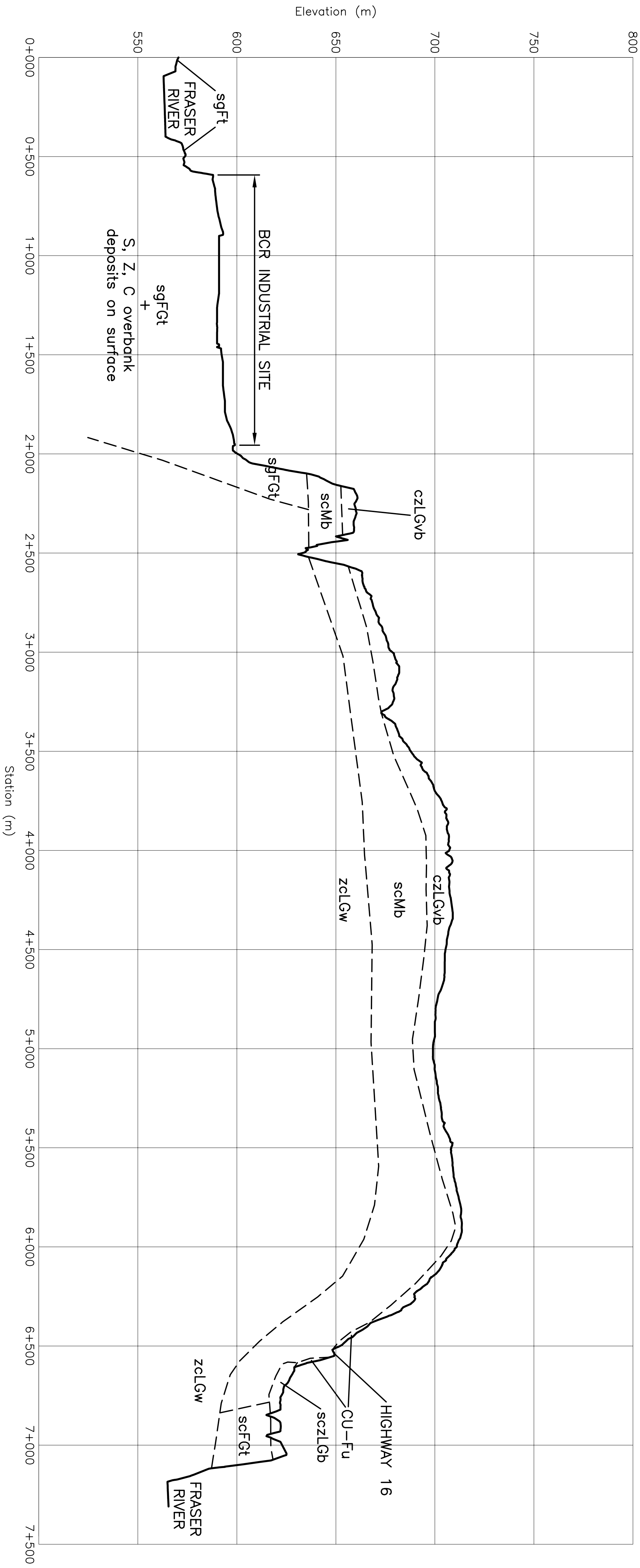

Cross Section A–A

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Horizontal: 1:25,000
Vertical: 1:2500*

*Vertical scale exaggerated 10 times

SCALE: As Shown	APPROVED:	
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DWG NO. 2517–A4	REV. –	PROJECT NO: K–2517

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GEOTECHNICAL OVERVIEW – INDUSTRIAL LAND USE PLAN
PRINCE GEORGE AIRPORT WEST, PRINCE GEORGE, B.C.
CONCEPTUAL CROSS SECTION A–A

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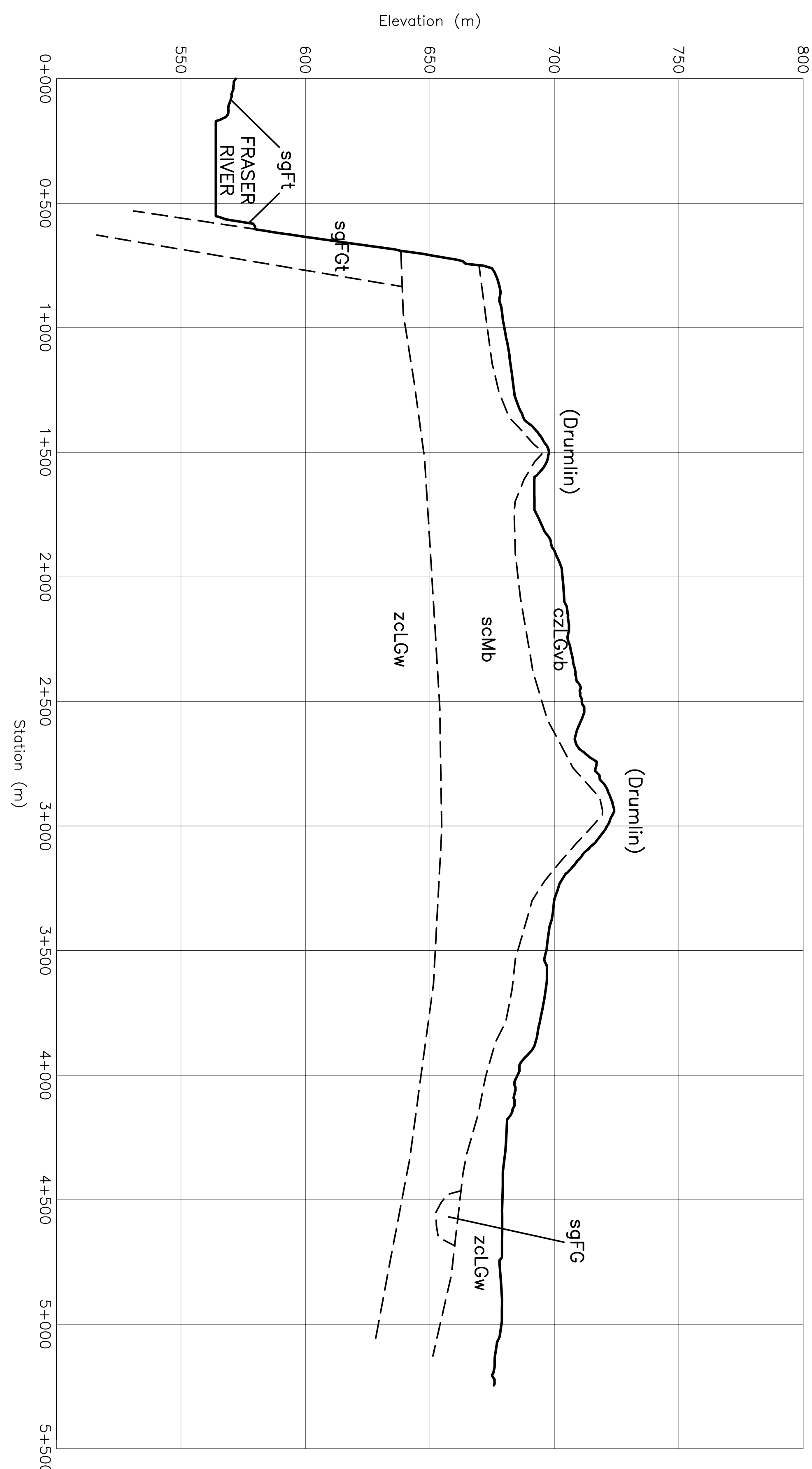

Cross Section B–B

Scale:
Horizontal: 1:25,000
Vertical: 1:2500*
*Vertical scale exaggerated 10 times

SCALE: As Shown	APPROVED:		
DATE: 2008/07/18			
DWN BY: LU			
MAP REF: –			
DWG NO. 2517–A5	REV. –	PROJECT NO: K–2517	

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GEOTECHNICAL OVERVIEW – INDUSTRIAL LAND USE PLAN
PRINCE GEORGE AIRPORT WEST, PRINCE GEORGE, B.C.
CONCEPTUAL CROSS SECTION B–B

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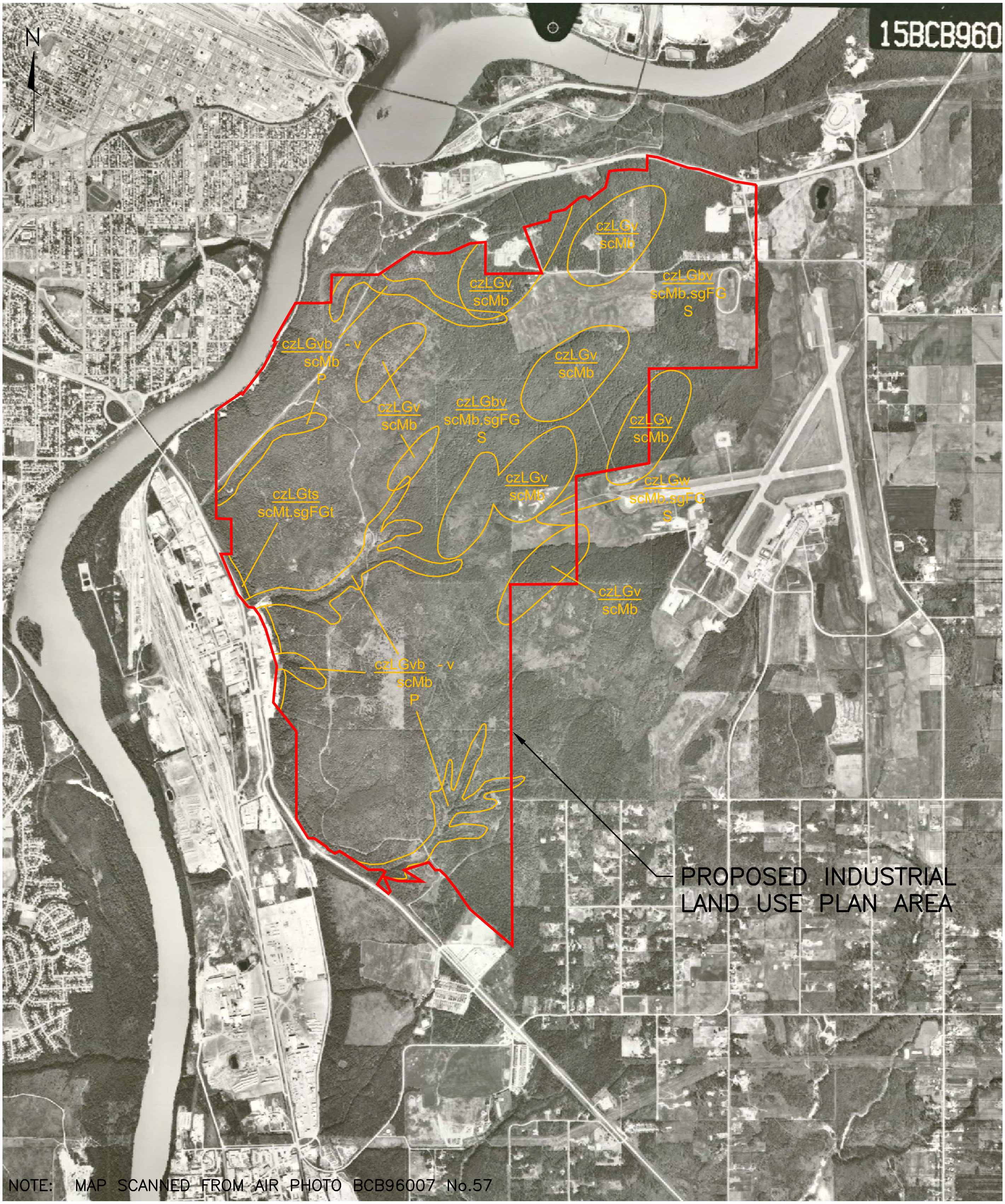
APPENDIX B



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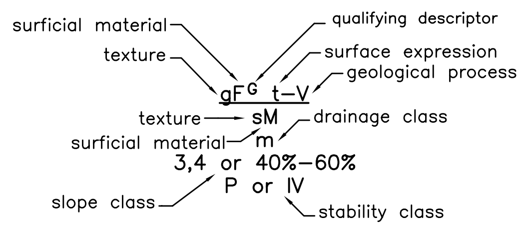
GEOTECHNICAL OVERVIEW – INDUSTRIAL LAND USE PLAN
PRINCE GEORGE AIRPORT WEST, PRINCE GEORGE, B.C.
AIR PHOTO SHOWING TERRAIN STABILITY MAPPING

SCALE: ~1:40,000	DATE: 2008/07/18	DRAWN: LU	CHKD: –	PROJ: K-2517	DWG: 2517-B1

EXPLANATION OF TERRAIN UNIT SYMBOLS USED IN TERRAIN STABILITY ASSESSMENTS

TERRAIN UNIT SYMBOLS



Explanatory Note:

Two letters may be used to describe any characteristic other than surficial material. Letters or symbols may be omitted if information is lacking.

COMPOSITE UNITS

Two or three groups of letters are used to indicate that two or three types of terrain are present within a map unit:

Cv . Rs indicates "Cv" and "Rs" are of roughly equal extent.
Cv/Rs indicates that "Cv" is more extensive than "Rs" (about 2:1 or 3:2).
Cv//Rs indicates that "Cv" is much more extensive than "Rs" (about 3:1 or 4:1).

STRATIGRAPHIC UNITS

Groups of letters are arranged one above the other where one or more kinds of surficial materials overlie a different material or bedrock.

$\frac{Mv}{Rr}$ indicates "Mv" overlies "Rr". $\frac{/Mv}{Rr}$ indicates "Rr" is partially buried by "Mv".

SURFICIAL MATERIALS

A	anthropogenic	L	lacustrine
C	colluvium	L^{G}	glaciolacustrine
D	weathered bedrock	M	moraine (glacial till)
E	eolian	O	organic
F	fluvial	R	bedrock
F^{A}	"Active" fluvial	U	undifferentiated
F^{G}	glaciofluvial	W	marine
I	ice	W^{G}	glaciomarine

TEXTURE

a	angular blocks	g	gravel	s	sand
b	rounded boulders	r	angular rubble	z	silt
d	mixed fragments (g,b,r,a,)	k	cobbles	c	clay
p	pebbles	x	angular fragments	m	mud (silt and clay)

SURFACE EXPRESSION

Simple (unidirectional) Slopes

j	gentle slope(s) 8–27%
a	moderate slope(s) 28–49%
k	moderately steep slope(s) 50–70%
s	steep slope(s) >70%

Complex Slopes

m	rolling
u	undulating
h	hummocky
r	ridged

Material Thickness

b	blanket (greater than 1m)
v	veneer (less than 1m)
w	variable thickness

Shape

c	cone (slope greater than 26%)
f	fan (slope less than 26%)
l	lobe
p	plain
t	terrace
d	depression

EXPLANATION OF TERRAIN UNIT SYMBOLS USED IN TERRAIN STABILITY ASSESSMENTS

GEOLOGICAL PROCESSES

A snow avalanching
A^0 avalanches: old tracks
A^1 avalanches: major tracks
A^2 avalanches: minor tracks
B braiding
C cryoturbation
D deflation
E channelling by glacial meltwater
EV gullying by glacial meltwater
F slow mass movement
F" slow mass movement (inititation zone)
Fc soil creep
Fj lateral spread in surficial materials
Fe earthflow
Fg rock creep
Fp lateral spread in bedrock
Fu slump in surficial materials
Fx slump—earthflow
H kettled
I irregular sinuous channel
J anastomosing channel
K karst processes
L seepage
M meandering channel
N nivation
P piping
R rapid mass movement
R" rapid mass movement (initiation zone)
Rb rock fall
Rd debris flow
Rf debris fall
Rr rockslide
Rs debris slide
Rt debris torrent
S solifluction
U innundated
V gully erosion
W washing
X permafrost processes
Y catastrophic flood
Z periglacial processes

SLOPE DRAINAGE CLASSES

r rapidly drained
w well drained
m moderately well drained
i imperfectly drained
p poorly drained
v very poorly drained

SLOPE STEEPNESS CLASSES

Class	1	2	3	4	5
Degrees	0–3	4–15	16–26	27–35	Over 35
%	0–5	6–27	28–49	50–70	Over 70

TERRAIN STABILITY CLASSES

RECONNAISSANCE CLASSES		DETAILED CLASSES	
		I	No stability problems expected.
		II	No significant stability problems expected.
(Not Marked)	Stable. There is negligible to low likelihood of landslides following timber harvesting or road—building.	III	Minor problems of instability might develop in some areas; treat wet areas with caution.
P	Potentially Unstable. There is moderate likelihood of landslides following timber harvesting or road construction.	IV	Marginally stable ground due to steep slopes, high moisture or weak soil. Special precautions neccesary.
U	Unstable. There is a high likelihood of landslides following timber harvesting or road construction.	V	Areas containing natural landslide scars. Very steep, poorly drained, deeply gullied or weak soil deposits.

ON—SITE SYMBOLS AND BOUNDARY LINES

Ice flow direction indicators:
crag and tail
drumlins
striations
grooves
lineations

Scarps: escarpments, bluffs

Location of Ground Traverse and Field—Check Site —15—

Terrain Unit Boundary Lines:
definite boundary
indefinite, appoximate or gradational boundary
assumed or arbitrary boundary

Mass Movement and Erosion Features:
scar of recent small slide
scar of recent larger slide
scar of old landslide or
recent debris flow or d

Cirque

Glacial meltwater channels (small, large)

Eskers (known, unknown)