



**ALTERNATE ROUTE FOUNDATION ASSESSMENT REPORT
HIGHWAY 17 FROM 20.5 KM WEST OF HIGHWAY 144
EASTERLY FOR 6.5 KM
TOWN OF WALDEN
G.W.P. NO. 156-98-00
DISTRICT 54, SUDBURY AREA**

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ALTERNATE ROUTE FOUNDATION ASSESSMENT REPORT

for

Highway 17 from 20.5 km West of Highway 144

Easterly for 6.5 Km

Town of Walden

G.W.P. No. 156-98-00

District 54, Sudbury Area

1. INTRODUCTION

This report provides the alternate route foundation assessment for a section of Highway 17 that extends from 20.5 km west of Highway 144 easterly for 6.5 km in the Sudbury Area. The study was carried out for the Ministry of Transportation of Ontario (MTO) on behalf of Stantec Consulting Ltd. (Stantec).

The Study Corridor extends from Sta. 11+100, about 600 m west of Fen Road, to Sta. 19+100 at Sudbury Municipal Road (SMR) 3 in the Townships of Dension and Louise.

The proposed construction will involve the future ultimate four-laning of Highway 17, including the construction of new embankments, interchanges and grade separation structures. Twelve different Alternative Alignments and interchange options were initially considered for the study.

In response to the input from stakeholders, MTO and Stantec considered a new eastern interchange alternative located about 400 m east of SMR 3. This new interchange alternative involves the realignment of SMR 55, SMR 3, Lockerby Mine Road and new associated ramps and structures.

Upon completion of the preliminary reviews including site reconnaissance visits, Stantec selected the six Alternate Routes for assessment of the Highway 17 mainline listed below:

- Alternate Route 1 – North Side New Alignment
- Alternate Route 2 – North Side Twinning
- Alternate Route 3 – South Side Twinning
- Alternate Route 4 – South Side New Alignment
- Alternate Route 5 – South Side New Alignment (southerly route)
- Alternate Route 6 – North Side New Alignment (northerly route)



In addition to above listed alternate routes, Stantec selected four interchange alternatives for a supplementary foundation assessment. Three of the interchanges are located along Alternate Route 4 and the additional interchange location is on the Highway 17, about 400 m east of the SMR 3 underpass. The interchange alternatives were identified as follows:

- Interchange Alternative 6 – Interchange West of Den-Lou Road
- Interchange Alternative 10 – Interchange East of Den-Lou Road
- Interchange Alternative 11 – Interchange at SMR 3
- Eastern Interchange Alternative 13 – Interchange 400 m East of SMR 3

Stantec provided drawings of the Study Corridor including the six Alternate Routes and four interchange alternatives. A list of the Alternative Alignments is provided in Section 3.3 Site Reconnaissance of this report.

The purpose of this alternate route foundation assessment was to identify the geologic features and hydrogeology along the four-laning corridor to assess the potential impact of these features on the design and construction of the six Alternate Routes selected for future four-lane highway. The three alternative structure locations on the Preferred Route (Route 4) and the eastern interchange on Highway 17 east of SMR 3 were also evaluated in this report.

2. SITE DESCRIPTION

The study area is located to the south west of Sudbury in the Geographic Townships of Dension and Louise. The various alternate alignments of the new Highway 17 start west of Fen Road and end at SMR 3.

Residential land use includes the residential centre of the former Town of Walden, which is located near the Sudbury Municipal Road 4 junction at Den-Lou Road, and a number of other residences and farmhouses located along the existing Highway 17 and sideroads. Farming activity occurs west of Den-Lou Road. Mining/industrial activity and recreational facilities exist near SMR 3, SMR 4 and SMR 55.

A Key Plan showing the crossroads is attached as Drawing A.



The study area is located on the Huronian Area of the Canadian Shield where the typical geology comprises of bedrock outcrops alternating with swamps and glaciolacustrine deposits. As such, the highway corridor extends along undulating terrain in rock outcrop areas and over relatively level topography in swampy areas, outwash glacial plains and glaciolacustrine deposit sections. Exposed rock outcrops and ridges, and numerous rock cuts up to 8 m high are noted along the existing Highway 17 alignment.

Major swamps are present on the western sections of the corridor west of the current St. Pothier Road intersection and in the east where the alignment crosses the Fairbank Creek flood plain.

Currently the Highway 17 includes the following at-grade intersections and structures along the study corridor:

INTERSECTING ROAD	STATION	STRUCTURE	STATION
Fen Road	11+700	Fairbank Creek Culvert	17+710
Hamersveld Road	12+970	Huron Central Railway Overhead	18+060
St. Pothier Road	13+300	SMR 3 Underpass	19+060
SMR 4 / Den-Lou Road	15+600		
SMR 55	17+620		

Note: Stations refer to Alternate Route 4

3. INVESTIGATION PROCEDURES

3.1 General

The foundation evaluation involved a review of the available geological, topographical and hydrogeological mapping, existing geotechnical reports, studies, aerial photographs and construction drawings for the existing highway. A field visual reconnaissance was carried out to verify the inferred data. Preliminary exploratory geotechnical boreholes, in situ testing and sampling were carried out along the Preferred Route. These results were reviewed for this report and reported separately.



We note that full access to the properties to carry out the site reconnaissance surveys was hindered by difficulties and delays in obtaining the required permissions to enter from various landowners. Consequently, some of the site reviews had to be accomplished from the public roads and highways.

3.2 Reference Documents and Literature Review

The general physiographic conditions along the corridor and the six Alternate Routes were obtained primarily from existing geological maps and reports from MTO GEOCRES library. In particular, a Preliminary report carried out by others in 2002 for a previously contemplated interchange at the west junction of Highway 17 and SMR 55 was reviewed. Well records obtained from the Ministry of the Environment (MOE) supplemented the data.

The documents and literature reviewed in whole or in part for this study are listed in Appendix A. The list reflects the selected data that contains geotechnical content relevant to the assessment. The list of the wells considered for the project is included in Appendix B.

The delineation of swamps and water courses/bodies as well as the location of significant earth deposits (silt/sand) and rock outcrops along the study corridor were interpreted from maps including Ministry of Natural Resources Ontario Base Maps and 1989 aerial photographs.

3.3 Site Reconnaissance

Reconnaissance visits of the existing alignment and the adjacent lands within the study corridor were carried out on May 1 and September 12, 2006. For the new eastern interchange alternative 13, the site reconnaissance visit was carried out on December 6, 2007. The site reconnaissance visits consisted of a drive-by and walk-through of selected sections of Highway 17 and adjacent lands.

A total of eleven alternatives designated Alternatives 1 through 11 were initially investigated on May 1, 2006. The most northerly Alternative Alignment 13 was added after the May 1 site reconnaissance visit and was surveyed on September 12, 2006. Stantec reduced these



twelve Alternative Alignments to six Alternate Routes for final consideration and assessment. The following table provides the related numbering for each of the Alternative Alignments and Alternative Routes and should be referred when viewing the photographs.

INITIAL ALTERNATIVE ALIGNMENTS	FINAL ALTERNATE ROUTES
Alternative 1 – North Side New Alignment	Route 1 – North Side New Alignment
Alternative 2 – North Side Twinning	Route 2 – North Side Twinning
Alternative 3 – South Side Twinning	Route 3 – South Side Twinning
Alternative 4 – South Side New Alignment, Parclo A I/C east of Den-Lou Road	Route 5 – South Side New Alignment (Southerly route)
Alternative 5 – South Side New Alignment, Diamond I/C east of Den-Lou Road	–
Alternative 6 – Middle New Alignment, I/C west of Den-Lou Road	–
Alternative 7 – Middle New Alignment, Parclo A I/C on Den-Lou Road	–
Alternative 8 – Middle New Alignment, Parclo B I/C on Den-Lou Road	–
Alternative 9 – Middle New Alignment, Diamond I/C on Den-Lou Road	–
Alternative 10 – Middle New Alignment, Parclo A I/C across from Microwave Tower	Route 4 – South Side New Alignment (*)
Alternative 11 – Middle New Alignment with Button Hook and Parclo A I/C	–
Alternative 13 – North Side New Alignment (Northerly Route)	Route 6 – North Side New Alignment (Northerly Route)

Notes: Alternative 12 not provided

(*) With realigned SMR 55 connection

The ground truth checks verified the surficial geology and drainage conditions inferred from the literature and map reviews. A comprehensive commentary and notes from the site reconnaissance visits including inferred swamp, earth and rock knob/outcrop occurrences, geology at the creek crossing and topography is presented in Appendix C.



Relevant natural features in selected areas of the corridor were photographed. The locations of one-hundred representative site photographs are indicated on Drawings 1 to 9 and the photographs are included in Appendix C.

The locations of thirty representative site photographs (101 to 130) of the eastern interchange alternative 13 are shown on Drawings 10 and 11. The photographs are included in Appendix C.

3.4 Preliminary Subsurface Investigations

A preliminary subsurface investigation was carried out for the study of the preferred alignment. The results of the investigation were reported separately in the Preliminary Geotechnical Investigation Report, PML Ref. 05TF059G1.

Preliminary Foundation Investigation and Design Reports are being prepared for the following structures:

- Den-Lou Road Underpass
- SMR 55 and Highway 17 I/C Underpass
- Huron Central Railway Overhead at Realigned SMR 55
- Fairbank Creek Bridge at Realigned SMR 55

These results were reported separately and considered for the preparation of this Foundation Assessment Report.

4. INFERRED SUBSURFACE CONDITIONS

4.1 General

The Highway 17 corridor under investigation is situated in the "Huronian Area" comprising rocks of middle Precambrian Age, belonging to the Huronian Supergroup and Elliot Lake Group. The Region is characterised by extensive faults from several distinct periods of deformation events.



The Worthington-Murray Fault has been mapped for a distance of 230 km from south of Sudbury to Bruce Mines. This major fault runs about 200 to 500 m north and roughly parallel to the section of Highway 17 under investigation, intersecting the corridor at the Huron Central Railway (HCR) overhead and SMR 3 underpass locations.

The site is located in the area of the Canadian Shield where extensive glaciation has occurred. The alignment traverses several different geological deposits, which include:

- Bedrock outcrops, knobs and ridges where the bedrock is exposed or under a relatively thin soil veneer
- Glaciolacustrine plains comprising sands and clays, generally wet
- Outwash glacial plains of sands and silts and containing localized sand and gravel deposits where commercial gravel pits have been in exploration
- Wetland areas containing peat, silt, sand and clay deposits, typical of Northern Ontario Region

The McKim bedrock formation was encountered along much of the local Highway 17 corridor comprises principally argillite, siltstone and greywacke.

The anticipated extent of the major physiographic units and geology along the study corridor is shown on the enclosed Inferred Geological Conditions, Drawings 1 to 11. The legends and symbols used are provided on the Legend Drawing B.

4.2 Southern Routes

The most westerly section of the south side corridor traverses alternating bedrock outcrops and wetland areas. The bedrock is covered by shallow drift of organic soils and sandy soils. Wetlands occur between these bedrock plains and are relatively deep, most notably between Fen Road and St. Pothier Road. Preliminary subsurface investigation results indicates that the mineral soil cover in bedrock areas is typically about 5 m deep but may vary greatly over short distance. The depth of soil cover in the swamps may extend to depths up to 20 m.



In particular, there are four major longer than 250 m and/or deep swamps located between Fen Road and 350 m east of St. Pothier Road on the South Side Alignments. The flood plain swamp at the Fairbank Creek is also considered a major swamp. These swamps contain compressible clayey soils overlain typically by muskeg/peat deposits. It is anticipated that competent material in some areas of the swamps is found at levels up to 15 m deep. The approximate locations of these swamps in Alternate Routes 3, 4 and 5 are listed below:

LOCATION OF SWAMP *	APPROXIMATE LENGTH (m)
Sta. 11+680 to 11+980	300
Sta. 12+220 to 12+580	360
Sta. 12+800 to 12+970	170
Sta. 13+100 to 13+600	500
Sta. 17+300 to 18+000 (Fairbank Creek)	700

(*) Chainage refers to existing Highway 17

Outwash glacial deposits comprise the middle section of the south side corridor from east of St. Pothier Road to east of Den-Lou Road. These deposits primarily consist of sandy/silty soils under relatively shallow clayey and organic soils. However the depth of the clayey soils may vary significantly in low-lying areas particularly near creeks.

4.3 Northern Routes

The extensive bedrock plain that comprises most of the corridors north of Highway 17 consists of various types of Metasedimentary and Gabbroic rocks of the middle Precambrian Age.

Swampy areas are noticed between these rock outcrops, particularly within the inferred sections of the old silted-in extension of the St. Pothier Lake (Bass Lake). These swamps occur along Alternate Routes 1, 2 and 6 as listed below.



LOCATION OF SWAMP	APPROXIMATE LENGTH (m)
Sta. 11+500 to 11+980*	480
Sta. 12+300 to 12+580*	280
Sta. 13+000 to 13+300*	300
Sta. 14+600 to 15+400 **	800
Sta. 15+580 to 15+780 **	200
Sta. 15+820 to 16+020 **	200 (Left Side)
Sta. 17+560 to 18+120 ** (Fairbank Creek)	560
Sta. 12+700 to 12+880 ***	180
Sta. 15+980 to 16+300 ***	320
Sta. 16+800 to 17+150 ***	350
Sta. 18+350 to 18+800 *** (Fairbank Creek)	450

(*) Chainage refers to existing Highway 17

(**) Route 1 chainage

(***) Route 6 chainage

Wetlands of organic deposits and flood plain alluvium have also been deposited and/or accumulated in poorly drained depressions on and between bedrock outcrops.

The eastern limit of the Highway 17 study corridor ends east of the Fairbank Creek flood plain where wetlands consist of up to 22 m deep lacustrine silt, sand and soft clay deposits. These wetland deposits are typically overlain by a muskeg deposit in the low-lying areas.

4.4 Eastern Interchange Alternative 13

The eastern interchange alternative 13 located 400 m east of SMR 3 includes a 3 km long realignment of SMR 55 and SMR 3 and alterations to Lockerby Mine Road.

The most southerly section of the realigned SMR 55 and SMR 3 traverses the Fairbank Creek flood plain and outwash deposits. The Fairbank Creek flood plain includes swamp areas over 20 m deep. Bedrock outcrops were noticed on the south ditch of SMR 55. The remaining section of the realigned roads passes through alternating bedrock outcrops and low lying wetlands. The approximate locations of swamps in the eastern interchange alternative are listed below.



LOCATION OF SWAMP	APPROXIMATE LENGTH (m)
Sta. 10+070 to 10+140 *	70
Sta. 10+770 to 11+070 (Fairbank Creek) *	300
Sta. 9+450 to 9+600 **	150

(*) Chainage refers to realignment of SMR 55

(**) Realignment of the SMR 3 chainage

4.5 Drainage

Generally, surface water run off along the study corridor drains into streams, swamps and scattered ponds. Groundwater is inferred typically near ground surface (less than 1 m deep) in the low-lying areas. It is noted that an artesian water condition exists within the Fairbank Creek flood plain areas.

5. FOUNDATION ASSESSMENT AND RANKING

Stantec developed six Alternate Routes for a future four-lane highway based on the initially considered 13 alternatives within the study corridor.

For the purpose of this assessment, Stantec subdivided five of the six Routes into two subsections designated A-B and B-C. The nodes at A and C were taken at the west and east limits of the project and the middle node B at about Sta. 13+800 located east of the St. Pothier Road intersection. The following Route subsections were to be considered between the A, B and C nodes.

A to B	B to C
Route 1	Route 1
Route 2	Route 4
Route 3	Route 5
Route 4	
Route 6 (*)	

Note: (*) Alternate Route 6 was considered as single A-C subsection.



To evaluate the Alternate Route subsections and to identify a Preferred Route combination from a foundation perspective, a ranking system was used.

The Route subsections were combined to arrive at continuous alignments as listed on the Alternate Routes table provided below.

ALTERNATE ROUTES

ALTERNATE ROUTE DESCRIPTION		SUBSECTION LIMITS	ALTERNATE ROUTE LENGTH (km)	NEW EMBANKMENT LENGTH (m) (*)	
				SUBTOTAL	TOTAL
1-1	A-B: Route 1 North Side New Alignment	Sta. 11+100 to 13+770	7.07	4,420	13,540
	B-C: Route 1 North Side New Alignment	Sta. 13+770 to 18+170		9,120	
2-1	A-B: Route 2 North Side Twining	Sta. 11+100 to 13+770	7.07	3,690	12,770
	B-C: Route 1 North Side New Alignment	Sta. 13+770 to 18+170		9,080	
3-4	A-B: Route 3 South Side Twining	Sta. 11+100 to 13+780	7.05	3,200	11,590
	B-C: Route 4 South Side New Alignment	Sta. 13+780 to 18+150		8,390	
3-5	A-B: Route 3 South Side Twining	Sta. 11+100 to 13+780	7.12	3,200	11,760
	B-C: Route 5 South Side New Alignment	Sta. 13+780 to 18+220		8,560	
4-4	A-B: Route 4 South Side New Alignment	Sta. 11+100 to 13+780	7.05	4,920	13,310
	B-C: Route 4 South Side New Alignment	Sta. 13+780 to 18+150		8,390	
4-5	A-B: Route 4 South Side New Alignment	Sta. 11+100 to 13+780	7.12	4,920	13,480
	B-C: Route 5 South Side New Alignment	Sta. 13+780 to 18+220		8,560	
6	A-C: Route 6 North Side New Alignment	Sta. 11+100 to 18+860	7.76	16,760	16,760

Note: (*) New embankment construction includes new service roads, extensions of existing sideroads, etc. as indicated for each Alternate Route.

Alternate Route 1-1 originated by combining the Alternate Route 1 subsection A-B and the Alternate Route 1 subsection B-C; Alternate Route 2-1 combined Alternate Route 2 subsection A-B and Alternate Route 1 subsection B-C; etc. The most northerly Alternate Route 6



was considered to be only one subsection A-C and was compared to the other subsections B-C for the purpose of assessment of the favourability of the Alternate Route.

The lengths of new embankment construction used for the assessment computations along Alternate Route subsection A-B for Alternate Routes 1, 2, 3 and 4 are about 3.2 to 4.9 km and for subsection B-C for Alternate Routes 1, 4 and 5 are 8.4 to 9.1 km long. The total length of the new embankment construction ranged from about 11.6 km for the combination of Alternate Routes 3 and 4 (3-4) to 16.8 km for Route 6.

The chainages in the Table refer to the alignment for each of the Alternate Routes. The variation of the route lengths reflects the varying lengths of the sections of new highway between the limits of the study.

5.1 Criteria Used In Assessing Alternatives

The terms of reference for this project identified six criteria to be considered from a foundation perspective, as follows:

- Extent of Soft Ground
- Groundwater Conditions
- Structure Foundations
- Embankment Settlement
- Embankment Stability
- Construction Considerations

A rationale for what each criterion represents and a method for measuring and evaluating each criterion was developed. The results of the evaluation are provided in Tables F-1 to F-6 for the future embankments and S-1 to S-6 for the structure alternatives. A discussion of the assessment criteria follows.



5.1.1 Extent of Soft Ground/Swamps (Table F-1 and S -1)

The potential impact of soft ground and/or swamps along each alternative route was evaluated on the basis of the total length of the route with inferred soft ground/swamps between 0 and 3 m deep; 3 and 10 m deep; and over 10 m deep.

Soft ground/swamps less than 3 m deep that may be excavated with conventional backhoe equipment were considered the most favourable. Soft ground/swamp ground that is between 3 and 10 m deep typically requires a long-stick excavator and are of intermediate favourability. The treatment of areas with soft ground/swamps over 10 m deep need special equipment such as drag lines or require non-conventional treatment (wick drains, preloading) and are the least favourable.

5.1.2 Groundwater Conditions (Table F-2 and S -2)

The extent of each route alternative with inferred groundwater at depths greater than 5 m (most favourable condition); between 1 and 5 m deep; and between 0 and 1 m deep (least favourable condition) were employed to assess the potential impact of this criterion.

The greater the groundwater depth the easier structures and embankments are to construct and the better the performance of embankments.

5.1.3 Structure Foundations (Table F-3 and S-3)

The type of foundation required to support bridges, interchange structures and major culverts was employed to assess the potential impact of this criterion. Shallow foundations were considered to be the most favourable and deep foundations the least favourable. The favourability of integral abutment foundations was considered the same for spread footings. The potential foundation type was estimated based on the inferred type and quality of founding subgrade materials along each route alternative.



5.1.4 Embankment Settlement (Table F-4 and S-4)

Evaluation of embankment settlement was based on the total length of route alternatives over compressible materials. For evaluation purposes, the compressible soils were grouped into less than 3 m deep areas; 3 to 10 m deep zones; and more than 10 m deep zones. Each of these groups was further divided into potentially sandy or clayey deposits.

The most favourable condition was defined as the swamp areas containing less than 3 m of compressible deposits of a sandy nature (for example, loose sand), and the least favourable conditions are in areas with compressible deposits of soft clayey soils deeper than 10 m.

5.1.5 Embankment Stability (Table F-5 and S-5)

The potential impact of embankment stability was evaluated on the basis of the total length of embankment and composition of the founding material. Conventional embankments that require little or no excavation and use conventional slope configurations were considered the most favourable, followed in decreasing favourability by embankments that require significant subexcavation, embankments that may require toe-stabilizing berms and (the least favourable) sections that may contain deeper than 10 m soft clays or sections with twinning of high embankments requiring pre-loading and wick drains.

5.1.6 Construction Feasibility (Table F-6 and S-6)

The impact of construction feasibility was considered on the basis of the number and type of bridge and major culvert structures and number of major swamp sections, in conjunction with the inferred founding conditions. In addition, embankments in swamps requiring conventional construction were considered most favourable and those requiring special construction were considered least favourable.



5.2 Weighting of Evaluation Criteria for Alternate Routes and Interchange Alternatives (Tables F-1 to F-7A and Tables S-1 to S-7)

A weighting system was developed to enable selection of the Preferred Route. The weighting system involved two factors:

- A favourability factor F to score the assessment for each of the evaluation criteria based on the foregoing discussion. The F values ranged from 5 for the most favourable to 1 for the least favourable.
- An impact weight B_i to reflect the significance of each of the six criteria on the design and construction of the highway. The impact weight for all criteria totals 1.00. The six evaluation criteria were compared in terms of relative importance and impact and assigned an individual impact weight as presented below:

EVALUATION CRITERION	IMPACT WEIGHT, B_i
Soft Ground/Swamp	0.25
Groundwater Conditions	0.10
Structure Foundations	0.15
Embankment Settlement	0.25
Embankment Stability	0.10
Construction Feasibility	0.15
TOTAL	1.00

- The more important the individual evaluation criterion was considered for the design and/or construction of the highway, the higher the impact weight assigned. A value of 0 would be assigned if the criteria were deemed to have no impact on alternative route selection.

The favourability factors, F , and used in Tables F-1 to F-6 and Tables S-1 to S-6, respectively and the impact weights, B_i , used in the summary Table F-7 and S-7 are summarized in the following table.



EVALUATION CRITERION	IMPACT WEIGHT, B _i	FAVOURABILITY FACTOR, F						TABLE	
		MOST		AVERAGE		LEAST			
Soft Ground/ Swamps	0.25	Based on relative length and depth of soft ground (SG) and/or swamps (SWP):						F-1 and S-1	
		SG or SWP 0 to 3 m Deep		SG or SWP 3 to 10 m Deep		SG or SWP Over 10 m Deep			
		F=5		F=3		F=1			
Groundwater Conditions	0.10	Based on inferred groundwater (G/W) depth:						F-2 and S-2	
		G/W Deeper than 5 m		G/W 1 to 5 m		G/W 0 to 1 m			
		F=5		F=3		F=1			
Structure Foundations	0.15	Based on estimated type of foundation requirements:						F-3 and S-3	
		Shallow Foundation			Deep Foundation				
		F=5			F=3				
Embankment Settlement	0.25	Based on length of sections with compressible soil within three depth ranges:						F-4 and S-4	
		Less than 3 m deep		3 to 5 m deep		Deeper than 5 m			
		Silty	Clayey	Silty	Clayey	Silty	Clayey		
		F=5	F=4	F=4	F=3	F=2	F=1		
Embankment Stability	0.10	Based on estimated type of construction required to establish embankment on competent ground:						F-5 and S-5	
		Conventional Embankment		Significant Subexcavation		Toe-Stabilizing Berms Required			Potential Pre-Loading/ Wick Drains
		F=5		F=3		F=2			F=1
Construction Feasibility	0.15	Based on combined assessment of structure foundations, and embankment construction over major swamps						F-6 and S-6	
		Conventional Structure Foundation	Special Structure Foundation	Conventional Culvert	Special Culvert	Conventional Embankment Construction	Special Embankment Construction		
		F=5	F=1	F=5	F=1	F=5	F=1		

The computations provide Weighted Favourability Values A_i for each subsection. With reference to Table F-1, Soft Ground/Swamps Evaluation Criterion, the weighted favourability value A_3 for the subsection 3 A-B was obtained by multiplying the Favourability factor F by the length of



alignment for which the condition is applicable and dividing by the total length of the soft ground or swamp in the subsection, as presented below:

DEPTH RANGE (m)	LENGTH (m)	FAVOURABILITY FACTOR, F
0 - 3	100	5
3 - 10	1410	3
>10	370	1

$$A_3 = \text{Weighted Favourability Value} = \frac{(100 \times 5) + (1410 \times 3) + (370 \times 1)}{100 + 1410 + 370} = 2.71$$

The weighted favourability value, A_i , computed for each subsection is provided on Tables F-1 to F-6.

5.3 Scoring of Foundation Criteria (Table F-7 and F-7A)

For the scoring of the foundation criteria, each of the Favourability Values A_i was normalized to ratios of 1.0. The Normalized Favourability Values, N_i , shown next to each A_i on the Table eliminate the effect of unrelated A_i numbers on the Scores and provide a meaningful input of the Impact Weights on the final rankings. This is achieved by dividing each Weighted Favourability Value A_i by the highest A_i amongst all Alternatives for the criterion, and thus making all Normalized Favourability Values less than 1.00. The Alternative Route subsections were scored by adding the N_i for each of the evaluation criteria multiplied by the Impact Weight, B_i for the criterion. The Normalized Scores based on the N_i values (multiplied by 5 to produce values higher than 1.00 for ease of comparison) are shown on Table F-7.

An example of the computation of the Normalized Scores is provided below, for reference. The example is the calculation of the Normalized Score of **3.66** for the subsection 3 A-B which was obtained as follows.

EVALUATION CRITERIA		SOFT GROUND/ SWAMPS	GROUNDWATER CONDITIONS	STRUCTURE FOUNDATIONS	EMBANKMENT SETTLEMENT	EMBANKMENT STABILITY	CONSTRUCTION FEASIBILITY
TABLE NO.		F-1	F-2	F-3	F-4	F-5	F-6
IMPACT WEIGHT, B _i		0.25	0.10	0.15	0.25	0.10	0.15
3 A-B	A3	2.71	2.28	0.00	3.09	3.59	4.75
	N3	0.81	0.80	0.00	0.98	0.93	0.74

Notes:

Highest A_i	3.35	2.83	0.00	3.14	3.87	6.42
---------------	------	------	------	------	------	------



$$\text{Normalized Score 3 A-B} = 5[(2.71/3.35) \times 0.25 + (2.28/2.83) \times 0.10 + (\text{N/A}) + (3.09/3.14) \times 0.25 + (3.59/3.87) \times 0.10 + (4.75/6.42) \times 0.15]$$

Normalized Score 3 A-B = 3.66

[The ratios in brackets represent each of the N_i values, such as $(2.71/3.35) = 0.81$]

These normalized scores are averaged to obtain Final scores and Final Rankings of the foundation evaluation provided in Table F-7A and the results are summarized below:

ALTERNATE ROUTE DESCRIPTION		FINAL SCORE	RANKING
1-1	A-B: Route 1 North Side New Alignment	3.96	5
	B-C: Route 1 North Side New Alignment		
2-1	A-B: Route 2 North Side Twining	3.94	5
	B-C: Route 1 North Side New Alignment		
3-4	A-B: Route 3 South Side Twining	4.24	1
	B-C: Route 4 South Side New Alignment		
3-5	A-B: Route 3 South Side Twining	4.25	1
	B-C: Route 5 South side New Alignment (Southerly Route)		
4-4	A-B: Route 4 South Side New Alignment	4.21	1
	B-C: Route 4 South Side New Alignment		
4-5	A-B: Route 4 South Side New Alignment	4.22	1
	B-C: Route 5 South Side New Alignment (Southerly Route)		
6	A-C: Route 6 North Side New Alignment (Northerly Route)	3.44	7

The results indicated that Alternate Route 3-5 comprising the Alternate Route 3 South Twining subsection A-B and Alternate Route 5 South Side New Alignment (Southerly Route) subsection B-C has the highest final score 4.25. The Final Scores of 4.24, 4.21 and 4.22 for Alternate Routes 3-4, 4-4, 4-5 are very close to the highest score of 4.25 and are practically equivalent in terms of foundation favourability. These alignments are preferred over the Alternate Routes 1-1, 2-1 and 6 and which have lower Final Scores of 3.96, 3.94 and 3.44, respectively.



The selection of the Preferred Route also depends on other parameters or facets that are being analysed by Stantec.

5.4 Scoring of Foundation Criteria for Interchange Alternatives (Table S-7 and S-7)

The alternate route assessment procedure was followed for the assessment of the three interchange alternatives. The obtained normalized score and ranking are shown Table S-7 and are summarized below.

INTERCHANGE ALTERNATIVES		NORMALIZED SCORE	NORMALIZED RANKING
6	Interchange West of Den-Lou Road *	4.72	1
10	Interchange East of Den-Lou Road *	4.75	1
11	Interchange at SMR 3 *	4.22	3
13	Interchange East of SMR 3	3.71	4

* On Route 4

The results indicated that Interchange Alternatives 10, which is located East of Den-Lou Road has the highest final score 4.75. The Final Scores of 4.72 for Alternative 6 (interchange west of Den-Lou) is very close to the highest score of 4.75 and the two alternatives are practically equivalent in terms of foundation favourability. These interchange alternatives are preferred over the interchanges located at SMR 3 and east of SMR 3 which has lower Final Scores of 4.22 and 3.71, respectively.

The selection of the interchange alternative location also depends on other parameters or facets that are being analysed by Stantec.

6. OPTION REVIEW AND RECOMMENDATIONS

6.1 General

From the embankment foundation design perspective, the Alternate Route that incorporates the highest scoring subsections is preferred. It is considered that four of the seven routes [3-4 (4.24), 3-5 (4.25), 4-4 (4.21) and 4-5 (4.22)] have relatively close Final Scores between 4.21 and 4.25 as



reported on Table F-7A. Consequently, either of those four routes is preferable routes over the other three routes 1-1 (3.96), 2-1 (3.94) and 6 (3.44).

Since the Alternate Routes cross the various rock formations and wetlands (swamps) in a relatively wide (North - South) corridor, the number and length of swamp crossings have a major influence on the scores and selection of each route. Therefore, the preferred alignment should be selected to achieve bedrock or competent soil subgrades and avoid swamp areas, while minimizing the length of new construction that would be required for the future four-laning of the highway. Embankments constructed over bedrock or competent soil subgrade will be easier to drain; will be relatively easier to construct; will perform better; and will be subjected to only minimal postconstruction settlements and therefore will require less maintenance.

From the structure foundation design perspective, the interchange alternatives that incorporates the highest scoring is preferred. It is considered that two of the four interchange alternatives have very close Final Scores 4.72 (Alternative 6) and 4.75 (Alternative 10) as shown on Table S-7. Therefore, either of those two interchange alternatives is preferable over the Interchange Alternative 11 (4.22) and Interchange Alternative 13 (3.71).

6.2 Embankment Design

The embankments should comprise of rockfill in sections requiring construction below the water table. Elsewhere embankments could be constructed of earth fill, including the zones above the rockfill. Conventional embankment design and construction procedures for rockfill and earth fill embankments should be suitable. Embankment geometry through swamps should include a minimum 2 m platform widening both sides according to Northern Region Directive 98-200.

For preliminary evaluation purposes the design of embankments through swamps should allow for subexcavation of soft compressible soils to depths of about 10 to 12 m using long stick excavators. Below these depths drag-line excavations should be considered. At these locations the slope of the rockfill below existing grade should be taken as 1.25H:1V. Also as a guideline for preliminary design, the rockfill line should be carried at least 2.0 m above the water level in the swamps where earth fill is used in combination with rockfill to construct the embankments. Above



grade, the embankments constructed with earth fill will be stable at 2H: 1V slopes or flatter. Rockfill embankments should also be stable at 1.25H: 1V slopes or flatter above the water table.

Where alignments cross swamps located near the existing highway, special consideration should be given to increase the median width, provide a temporary detour or use wick drain design (based on the actual depth of soft soils) to ensure that the new construction does not affect the stability of the existing embankment.

Along the highway section between Sta. 11+680 and 13+600 the Alternate Route South Side Twinning would be preferred to minimize the length of new construction. However, a new alignment alternative constructed at least 50 m away from the existing embankment is a possibly better alternative from the constructability point of view to preserve the stability of the existing Highway 17 embankment.

The embankment design should also consider the stability and settlement constraints noted on the following sections of this report.

6.3 Embankment Stability

All Alternative Routes cross swamps that may contain very soft to firm clayey soils of varying depths, in the 5 to 24 m range. Typically, these weak soils will not provide adequately stable foundations for embankment construction. It is anticipated that subexcavation of soft soils will be required for construction of the road embankments.

The requirement to use non-standard slope configurations such as toe-stabilizing berms or preloading with wick drains and/or wider median width depends on the embankment height and depth of soft ground.

Between Sta. 17+300 and 18+000 (Fairbank Creek swamp) the highway has currently a four-lane cross-section. From the foundation perspective, it is recommended to maintain the alignment without widenings or realignment to avoid extensive earthworks and/or traffic staging related to maintaining the stability of the existing embankment.



Other swamps that also occur along other routes, namely the (extension of Bass Lake) swamps along Alternate Route 1 and Alternate Route 6 are not located near existing highway embankments. Consequently, construction through these swamps is expected to follow standard MTO procedures although staged construction of the new SMR 4 may be required.

6.4 Embankment Settlements

It is anticipated that settlement of embankments founded on bedrock or competent non-swamp outwash soil deposits will be minimal.

The swamp soils are typically not considered suitable for supporting the highway embankments due to their high compressibility and low strength. The magnitude and rate of the settlements will depend on the thickness and nature of the soils in each of the swamps and may exceed MTO criteria if placed on very soft to firm clayey soils to depths exceeding 15 m and/or may affect existing embankments/structures which are in close proximity.

Non-conventional construction procedures should be required to reduce postconstruction settlements to tolerable levels or to twin embankments through deep soft deposits without negative effects on the existing embankment. Special construction methods may include the use of lightweight fill, wick drains and/or preloading.

6.5 Structure Foundations

The type of foundations of the interchange structures for all Alternate Routes is likely to comprise shallow foundations (spread footings) or integral abutments except for Route 6. It is anticipated that the Route 6 interchange structure is located over a swamp and would require a pile foundation or could be selected over bedrock outcrops.

The type of foundation (shallow or deep) will depend ultimately on the road grades at the structures and structural design concepts. However, foundation material for both spread footings or pile foundations is expected to comprise bedrock.



Foundations for culverts are expected to comprise rock or rockfill. Alternate Routes 1-1 and 6 and the realigned SMR 55 would likely require special culvert design or new bridges for the Fairbank Creek crossing. The foundation located within the Fairbank Creek Flood plain should also consider the problems associated with artesian ground water conditions.

Special foundation design considerations involving deep foundations may be required where the embankments crossing swamps are placed directly on the compressible materials and preloaded/surcharged to reduce post-construction settlements. This condition may occur with the twinning route alternatives west of St. Pothier Road, for instance.

6.6 Construction Considerations

The Alternate Routes run through bedrock plains and swamps north of the existing Highway 17 alignment. The Alternate Routes also cross outwash plains of silts/sandy silts south of the highway.

It is anticipated that the typical embankment construction will be accomplished with conventional methods through these deposits where the swamps are less than 10 m deep. Where deeper swamp deposits are anticipated between Fen Road and St. Pothier Road the new embankments adjacent to the existing Highway 17 will require special construction considerations to prevent instability of the existing embankment fill. These methods comprise widening the median to at least 50 m for twinning options (Alternate Routes 2 and 3), carry out partial excavation of soft deposits (to about 5 to 6 m maximum depth) or install wick drains to accelerate consolidation of the soft cohesive materials. These methods may require preloading or surcharging and staged construction.

Particular attention should be paid to the construction staging of the new highway embankments where an adjacent new service road is also planned, such as immediately west of the current St. Pothier Road intersection. Along this section it may be difficult and costly to excavate between two embankments in the future to install a new EBL embankment while preserving the stability of the then existing embankments. It is recommended that the three embankments be constructed simultaneously for these roads to avoid this future potential stability problems. In addition, placing



the tie-ins to the existing embankment at rock outcrop locations facilitates the construction through deep swamps.

6.7 Assessment of Advantages and Disadvantages

The following table presents to overview assessments of advantages and disadvantages, costs and risk/consequences for alternate routes from the foundation perspective.

ALTERNATE ROUTE DESCRIPTION	ADVANTAGES	DISADVANTAGES
ROUTE 1-1	<ul style="list-style-type: none"> Inferred favourable subgrade conditions along 70% of Route Inferred favourable groundwater conditions along 76% of Route Structure foundation for I/C location may be placed with spread footing /Integral abutments. Moderate cost for structure foundation 	<ul style="list-style-type: none"> Embankment construction along 30% route require subexcavation or wick drains. Groundwater conditions along 24% requires unwatering during construction Culvert at Fairbank Creek requires special design and construction procedures
ROUTE 2-1	<ul style="list-style-type: none"> Inferred favourable subgrade conditions along 67% of Route Inferred favourable groundwater conditions along 72% of Route Structure foundation for I/C location may be placed with spread footing /Integral abutments. Moderate cost for structure foundation 	<ul style="list-style-type: none"> Embankment construction along 33% of route require s subexcavation or wick drains. Groundwater conditions along 28% requires unwatering during construction Culvert at Fairbank Creek requires special design and construction procedures
ROUTE 3-4	<ul style="list-style-type: none"> Inferred favourable subgrade conditions along 72% of Route Inferred favourable groundwater conditions along 71% of Route Structure foundation for I/C location may be placed with spread footing /Integral abutments. Low cost for structure foundation 	<ul style="list-style-type: none"> Embankment stability and settlements problems anticipated East of St. Pothier Road Embankment construction along 28% route require subexcavation or wick drains. Groundwater conditions along 29% requires unwatering during construction
ROUTE 3-5	<ul style="list-style-type: none"> Inferred favourable subgrade conditions East of St. Pothier Road Inferred favourable groundwater conditions along 61% of Route Structure foundation for I/C location may be placed with spread footing /Integral abutments. Low cost for structure foundation 	<ul style="list-style-type: none"> Embankment stability and settlements problems anticipated East of St. Pothier Road Embankment construction require subexcavation or wick drains. Groundwater conditions along 39% requires unwatering during construction



ALTERNATE ROUTE DESCRIPTION	ADVANTAGES	DISADVANTAGES
ROUTE 4-4	<ul style="list-style-type: none"> Inferred favourable subgrade conditions East of St. Pothier Road Inferred favourable groundwater conditions along 61% of Route Structure foundation for I/C location may be placed with spread footing /Integral abutments. Low cost for structure foundation 	<ul style="list-style-type: none"> Embankment stability and settlements problems anticipated alignment between East of Fen road to East of St. Pothier Road Embankment construction requires subexcavation or wick drains. Groundwater conditions along 39% requires unwatering during construction
ROUTE 4-5	<ul style="list-style-type: none"> Inferred favourable subgrade conditions East of St. Pothier Road Inferred favourable groundwater conditions along 61% of Route Structure foundation for I/C location may be constructed with spread footing /Integral abutments. Low cost for structure foundation 	<ul style="list-style-type: none"> Embankment stability and settlements problems anticipated alignment between East of Fen road to East of St. Pothier Road Embankment construction requires conventional and special treatment such as wick drains. Groundwater conditions along 39% requires unwatering during construction
ROUTE 6	<ul style="list-style-type: none"> Inferred favourable conditions 72% of route alignment Inferred favourable groundwater conditions along 70% of Route Moderate to High cost for structure foundation 	<ul style="list-style-type: none"> Embankment stability and settlements problems anticipated at Fairbank Creek Area Embankment construction requires subexcavation or wick drains. Groundwater conditions along 30% requires unwatering during construction Interchange structure requires deep foundation design Culvert at Fairbank Creek requires special design and construction procedures

7. PREFERRED ROUTE AND INTERCHANGE ALTERNATIVE LOCATION

7.1 Preferred Route Overview

Stantec indicated that Alternate Route 4 (South Side New Alignment) was the Preferred Route for the highway improvements. The Preferred Route applies to the Alternate Route combination 4-4 assessed in this report.



The most westerly section for the Preferred Route from Sta. 11+100 to 12+400 primarily twins the existing alignment to the south. The Preferred Route follows a new alignment to the south of the existing Highway 17 east of Sta. 12+400.

The Final Score for the Alternate Route 4 (4-4 combination) was 4.21, tying for first with three other Alternate Route subsection combinations from a foundation perspective.

7.2 Preferred Structure Locations

Stantec indicated that Interchange Alternative 10 (Interchange east of Den-Lou Road) was the preferred structure location on Preferred Route (Alternate Route 4).

This preferred interchange alternative comprises an underpass at Den-Lou Road and interchange location east of Den-Lou Road carrying SMR 55 extension over the new Highway 17 (Route 4), and associated ramps.

The Final Score for the preferred interchange location (Interchange Alternative 10) was 4.75, being the highest of the four interchange alternatives from a foundation perspective.

7.3 Additional Studies

A preliminary geotechnical investigation is being carried out by PML along the Preferred Route. This borehole information will be reported separately in a Preliminary Geotechnical Investigation Report (PML Ref. 05TF059G1). Preliminary Foundation Investigation and Design Reports are also being prepared for the possible structures listed previously in Section 3.4. The data should be referred to during the preliminary and detailed design.

The embankment section limits along the Preferred Route identified for additional foundation investigation are listed on Table 1.

It is recommended that the selected interchange location, underpass structures and major culvert locations be investigated. A preliminary list of structures from the Preferred Route Plan is compiled in Table 2.



8. CLOSURE

This report was prepared by Mr. C.M.P. Nascimento, P. Eng., Senior Project Engineer and reviewed by Mr. B.R. Gray, MEng, P.Eng., MTO Designated Principal Contact.

Yours very truly,

Peto MacCallum Ltd.

**NOTE: Hard copies signed
and stamped**

Carlos M. P. Nascimento, P. Eng.
Senior Project Engineer

**NOTE: Hard copies signed
and stamped**

Brian R. Gray, MEng, P. Eng.
MTO Designated Principal Contact

CN/BRG:cn-lnr



TABLE 1
RECOMMENDED LOCATIONS FOR FOUNDATION INVESTIGATIONS
HIGH FILLS AND EMBANKMENTS OVER SWAMPS
PREFERRED ROUTE - SOUTH SIDE NEW ALIGNMENT

STATIONS	PROPOSED WORKS
Fill Area/Swamp Crossing Highway 17 (Mainline)	
11+150 to 11+470	Embankment fill up to 6 m high, swamp area
11+600 to 11+820	Embankment fill up to 2 m high, swamp area
12+220 to 12+580	Embankment fill up to 6 m high, swamp area
12+780 to 12+970	Embankment fill up to 2 m high, swamp area
13+130 to 13+440	Embankment fill up to 6 m high, swamp area
14+100 to 14+280	Embankment fill up to 3 m high, swamp area
14+810 to 14+850	Embankment fill up to 2 m high, culvert, swamp area
14+990 to 15+050	Embankment fill up to 5 m high, culvert, swamp area
15+790 to 16+200	Embankment fill up to 2 m high, swamp area
16+840 to 17+960	Embankment fill up to 8 m high, culvert, swamp area
17+320 to 17+400	Embankment fill up to 5 m high
17+400 to 17+600	Embankment fill up to 4 m high, swamp area
SMR 55 Extension	
9+720 to 9+960	Embankment fill 4 to 12 m high
10+100 to 10+400	Embankment fill 4 to 13 m high
10+400 to 10+480	Embankment fill 17 m high, culvert, swamp area
10+480 to 10+520	Embankment fill 4 m high
10+900 to 11+320	Embankment fill 2 m high, swamp area

NOTES:

1. Chainages are approximate and may vary for eastbound and westbound mainlines to be confirmed/refined during detailed design.
2. Preliminary geotechnical subsurface investigation was carried out for Preferred Route. Details of subsurface strata are presented in a preliminary geotechnical report, PML Ref. 05TF59-G1.
3. Assumed embankment through the Fairbank Creek flood plain swamp will not be changed east of Sta. 17+600.
4. Conditions through Sta. 15+200 to 15+600 and Sta. 16+480 to 17+020 were not assessed in detail due to lack of permission to enter the properties.



TABLE 2
RECOMMENDED LOCATIONS FOR FOUNDATION INVESTIGATIONS
STRUCTURES AND CULVERTS
PREFERRED ROUTE - SOUTH SIDE NEW ALIGNMENT

STATIONS	PROPOSED WORKS
Highway 17 (Mainline)	
12+460	Culvert at unnamed swamp
12+880	Culvert at unnamed swamp
13+150	Culvert at unnamed swamp
14+200	Culvert at water course
14+840	Culvert at water course
15+030	Culvert at water course
15+600	Den-Lou Road Underpass
16+700	SMR 55 Extension Underpass
16+900	Culvert at water course
SMR 55 Extension	
10+440	Culvert at water course

NOTE:

1. Chainages refer to Alternate Route 4 and SMR 55.
2. Chainages are approximate and may vary for eastbound and westbound mainlines to be confirmed/refined during Detail Design.



TABLE F-1– SOFT GROUND/SWAMPS

ALTERNATE ROUTES		ALTERNATE ROUTE SUBSECTION	SOFT GROUND/SWAMPS DEPTHS AND FAVOURABILITY						WEIGHTED FAVOURABILITY VALUE(Ai)	
			L1	F1	L2	F2	L3	F3		
			Depth Range (0 - 3m)		Depth Range (3 - 10m)		Depth Range (>10 m)			
1	North Side New Alignment	A - B	910	5	390	3	600	1	3.33	A ₁
2	North Side Twinning	A - B	810	5	850	3	440	1	3.35	A ₂
3	South Side Twinning	A - B	100	5	1410	3	370	1	2.71	A ₃
4	South Side New Alignment	A - B	100	5	1190	3	1160	1	2.13	A ₄
1	North Side New Alignment	B - C	320	5	850	3	930	1	2.42	A ₅
4	South Side New Alignment	B - C	1020	5	0	3	440	1	3.79	A ₆
5	South Side New Alignment (Southerly Route)	B - C	1290	5	0	3	540	1	3.82	A ₇
6	North Side New Alignment (Northerly Route)	A -C	330	5	2150	3	2380	1	2.16	A ₈

NOTE: Enter weighted favourability value A_i in Table F-7.



TABLE F-2- GROUNDWATER CONDITIONS

ALTERNATE ROUTES		ALTERNATE ROUTE SUBSECTION	GROUNDWATER DEPTHS AND FAVOURABILITY						WEIGHTED FAVOURABILITY VALUE(Ai)	
			L1	F1	L2	F2	L3	F3		
			Depth Range (>5m)		Depth Range (1 - 5m)		Depth Range (0 -1 m)			
1	North Side New Alignment	A - B	1320	5	1410	3	1690	1	2.83	A ₁
2	North Side Twinning	A - B	820	5	770	3	2100	1	2.31	A ₂
3	South Side Twinning	A - B	720	5	600	3	1880	1	2.28	A ₃
4	South Side New Alignment	A - B	1180	5	1290	3	2450	1	2.48	A ₄
1	North Side New Alignment	B - C	4280	5	3250	3	1550	1	3.60	A ₅
4	South Side New Alignment	B - C	900	5	6030	3	1460	1	2.87	A ₆
5	South Side New Alignment (Southerly Route)	B - C	1060	5	4750	3	2750	1	2.61	A ₇
6	North Side New Alignment (Northerly Route)	A - C	10150	5	1830	3	4780	1	3.64	A ₈

NOTE: Enter weighted favourability value A_i in Table F-7.



TABLE F-3— STRUCTURE FOUNDATIONS

ALTERNATE ROUTES		ALTERNATE ROUTE SUBSECTION	CONTEMPLATED STRUCTURE/INTERCHANGE SITE				WEIGHTED FAVOURABILITY VALUE(Ai)	
			INTERCHANGE SITE		DEN-LOU/HWY 17(NEW) UNDERPASS			
			Type	F1	Type	F2		
1	North Side New Alignment	A - B	-	-	-	-	-	A ₁
2	North Side Twinning	A - B	-	-	-	-	-	A ₂
3	South Side Twinning	A - B	-	-	-	-	-	A ₃
4	South Side New Alignment	A - B	-	-	-	-	-	A ₄
1	North Side New Alignment	B - C	A	5	-	-	5.00	A ₅
4	South Side New Alignment	B - C	A	5	A	5	5.00	A ₆
5	South Side New Alignment (Southerly Route)	B - C	A	5	A	5	5.00	A ₇
6	North Side New Alignment (Northerly Route)	A - C	B	3	-	-	3.00	A ₈

NOTE: Interchange at SMR 4 for Routes 1 and 6 and Interchange East of Den-Lou (Interchange Alternative 10, Alternative 4) for Routes 4 and 5 were considered for foundation assessment.

A: Shallow Foundation/Integral Abutments, F = 5

B: Deep Foundation, F = 3

Enter weighted favourability value A_i in Table F-7.



TABLE F-4- EMBANKMENT SETTLEMENT

ALTERNATE ROUTES		ALTERNATE ROUTE SUBSECTION	SUBSOIL TYPE AND FAVOURABILITY FACTOR						WEIGHTED FAVOURABILITY VALUE(Ai)	
			Less than 3m Deep		3-10m Deep		Deeper than 10 m			
			L1	L2	L3	L4	L5	L6		
			Silty (F1=5)	Clayey (F2 =4)	Silty (F3=4)	Clayey (F4 =3)	Silty (F5=2)	Clayey (F6 =1)		
1	North Side New Alignment	A - B	80	910	-	390	-	600	2.93	A ₁
2	North Side Twinning	A - B	190	810	-	850	-	440	3.14	A ₂
3	South Side Twinning	A - B	420	100	-	1410	-	370	3.09	A ₃
4	South Side New Alignment	A - B	990	100	-	1190	-	1160	2.93	A ₄
1	North Side New Alignment	B - C	1700	310	-	850	-	930	3.49	A ₅
4	South Side New Alignment	B - C	1050	1020	4310	0	-	440	3.96	A ₆
5	South Side New Alignment (Southerly Route)	B - C	2650	1290	2500	0	-	540	4.15	A ₇
6	North Side New Alignment (Northerly Route)	A - C	250	330	-	2150	-	2380	2.23	A ₈

NOTE: Enter weighted favourability value A_i in Table F-7.



TABLE F-5- EMBANKMENT STABILITY

ALTERNATE ROUTES		ALTERNATE ROUTE SUBSECTION	EMBANKMENT REQUIRING SPECIAL OR CONVENTIONAL DESIGN				WEIGHTED FAVOURABILITY VALUE(A _i)	
			L1	L2	L3	L4		
			Conventional Embankment (F1 = 5)	Embankment Requiring Subexcavation (F2 = 3)	Embankment Requiring Toe- Stabilizing Berms (F3 = 2)	Embankment Requiring pre- loading/ Wick Drains (F4 = 1)		
1	North Side New Alignment	A - B	2520	1300	-	600	3.87	A ₁
2	North Side Twinning	A - B	1600	1650	-	450	3.62	A ₂
3	South Side Twinning	A - B	1320	1510	-	370	3.59	A ₃
4	South Side New Alignment	A - B	2500	1260	-	1160	3.54	A ₄
1	North Side New Alignment	B - C	7020	1170	-	930	4.34	A ₅
4	South Side New Alignment	B - C	6930	1020	-	440	4.55	A ₆
5	South Side New Alignment (Southerly Route)	B - C	6730	1290	-	540	4.45	A ₇
6	North Side New Alignment (Northerly Route)	A - C	11900	2480	-	2380	4.66	A ₈

NOTE: Enter weighted favourability value A_i in Table F-7.



TABLE F-6- CONSTRUCTION FEASIBILITY

ALTERNATE ROUTES		ALTERNATE ROUTE SUBSECTION	EMBANKMENT REQUIRING SPECIAL CONSTRUCTION						WEIGHTED FAVOURABILITY VALUE(Ai)	
			No of Structure Foundations		No of Major Culvert Foundations		No. of Major Swamps			
			S1	S1	C1	C2	L1	L2		
			Convent. (F1=5)	Special. (F2=1)	Convent. (F1=5)	Special. (F2=1)	Convent. (F1=5)	Special. (F2=1)		
1	North Side New Alignment	A - B			3			2	4.42	A ₁
2	North Side Twinning	A - B			3			2	4.42	A ₂
3	South Side Twinning	A - B			3			3	4.75	A ₃
4	South Side New Alignment	A - B			3		1	3	6.42	A ₄
1	North Side New Alignment	B - C	1		2	1		2	5.92	A ₅
4	South Side New Alignment	B - C	2		4				10.00	A ₆
5	South Side New Alignment (Southerly Route)	B - C	2		4				10.00	A ₇
6	North Side New Alignment (Northerly Route)	A - C		1	3	1	2	1	8.17	A ₈

Special Designation Applied to Following Conditions

A - Foundations with piers in water or deep foundations

B - Culverts in Lakes

C - Embankments through deep (> 10 m) swamps

(Only the ratio of conventional length to the length considered for ranking).

Enter weighted favourability value A_i in Table F-7.



TABLE F-7 – SCORING OF FOUNDATION CRITERIA

EVALUATION CRITERIA			SOFT GROUND/ SWAMPS		GW CONDITIONS		STRUCTURE FOUNDATIONS		EMBANKMENT SETTLEMENT		EMBANKMENT STABILITY		COSTUCTION FEASIBILTY		NORMALIZED SCORE
TABLE NO			F1		F2		F3		F4		F5		F6		
IMPACT WEIGHT			0.25		0.10		0.15		0.25		0.10		0.15		
ALTERNATE ROUTES			Ai	Ni	Ai	Ni	Ai	Ni	Ai	Ni	Ai	Ni	Ai	Ni	
1	North Side New Alignment	A - B	3.33	0.99	2.83	1.00			2.93	0.94	3.87	1.00	4.42	0.69	3.93
2	North Side Twinning	A - B	3.35	1.00	2.31	0.81			3.14	1.00	3.62	0.94	4.42	0.69	3.89
3	South Side Twinning	A - B	2.71	0.81	2.28	0.80			3.09	0.98	3.59	0.93	4.75	0.74	3.66
4	South Side New Alignment	A - B	2.13	0.64	2.48	0.88			2.93	0.93	3.54	0.92	6.42	1.00	3.61
1	North Side New Alignment	B - C	2.42	0.63	3.60	0.99	5.00	1.00	3.49	0.84	4.34	0.93	5.92	0.59	4.00
4	South Side New Alignment	B - C	3.79	0.99	2.87	0.79	5.00	1.00	3.96	0.95	4.55	0.98	10.00	1.00	4.82
5	South Side New Alignment (Southerly Route)	B - C	3.82	1.00	2.61	0.72	5.00	1.00	4.15	1.00	4.45	0.96	10.00	1.00	4.84
6	North Side New Alignment (Northerly Route)	A - C	2.16	0.56	3.64	1.00	3.00	0.60	2.23	0.54	4.66	1.00	8.17	0.82	3.44
NOTES															

NOTES:

Ai - Weighted Favourability Value
 Ni - Normalized Favourability Value



TABLE F-7A – FINAL SCORING OF FOUNDATION CRITERIA

ALTERNATE ROUTE DESCRIPTION		ROUTE SUBSECTION	NORMALIZED SCORE	FINAL SCORE	RANKING
1-1	A - B : Route 1 North Side New Alignment	1 A - B	3.93	3.96	5
	B - C : Route 1 North Side New Alignment	1 B - C	4.00		
2-1	A - B : Route 2 North Side Twinning	2 A - B	3.89	3.94	5
	B - C : Route 1 North Side New Alignment	1 B - C	4.00		
3-4	A - B : Route 3 South Side Twinning	3 A - B	3.66	4.24	1
	B - C : Route 4 South Side New Alignment	4 B - C	4.82		
3-5	A - B : Route 3 South Side Twinning	3 A - B	3.66	4.25	1
	B - C : Route 5 South Side New Alignment (Southerly Route)	5 B - C	4.84		
4-4	A - B : Route 4:South Side New Alignment	4 A - B	3.61	4.21	1
	B - C : Route 4 South Side New Alignment	4 B - C	4.82		
4-5	A - B : Route 4 South Side New Alignment	4 A - B	3.61	4.22	1
	B - C : Route 5 South Side New Alignment (Southerly Route)	5 B - C	4.84		
6	A - C : Route 6 North Side New Alignment (Notherly Route)	6 A - C	3.44	3.44	7



TABLE S -1 – SOFT GROUND/SWAMPS

INTERCHANGE ALTERNATIVES		SOFT GROUND/SWAMPS DEPTHS AND FAVOURABILITY						WEIGHTED FAVOURABILITY VALUE(Ai)	
		L1	F1	L2	F2	L3	F3		
		Depth Range (0 - 3m)		Depth Range (3 - 10m)		Depth Range (>10 m)			
6	Interchange West of Den-Lou Road	1370	5	210	3	0	1	4.73	A ₁
10	Interchange East of Den-Lou Road	460	5	0	3	0	1	5.00	A ₂
11	Interchange at SMR 3	500	5	0	3	200	1	3.86	A ₃
13	Interchange East of SMR 3	500	5	2140	3	600	1	2.94	A ₄

NOTE: Enter weighted favourability value A_i in Table S-7.



TABLE S-2 – GROUNDWATER CONDITIONS

INTERCHANGE ALTERNATIVES		GROUNDWATER DEPTHS AND FAVOURABILITY						WEIGHTED FAVOURABILITY VALUE(Ai)	
		L1	F1	L2	F2	L3	F3		
		Depth Range (>5m)		Depth Range (1 - 5m)		Depth Range (0 -1 m)			
6	Interchange West of Den-Lou Road	0	5	6040	3	2280	1	2.45	A ₁
10	Interchange East of Den-Lou Road	2110	5	3110	3	1320	1	3.24	A ₂
11	Interchange at SMR 3	2950	5	2100	3	1150	1	3.58	A ₃
13	Interchange East of SMR 3	4620	5	1985	3	3240	1	3.28	A ₄

NOTE: Enter weighted favourability value A_i in Table S-7.

TABLE S-3 – STRUCTURE FOUNDATIONS

INTERCHANGE ALTERNATIVES		CONTEMPLATED STRUCTURE/INTERCHANGE SITE										WEIGHTED FAVOURABILITY VALUE(Ai)	
		INTERCHANGE SITE		DEN-LOU ROAD/HWY 17(NEW) UNDERPASS		SMR 55 EXTENSION/ HWY 17 (EXISTING) UNDERPASS		SMR 55 EXTENSION OVERHEAD AT HCR		FAIRBANK CREEK BRIDGE			
		Type	F1	Type	F2	Type	F3	Type	F4	Type	F4		
6	Interchange West of Den-Lou Road	A	5	-	-	A	5	-	-	-	-	5.00	A ₁
10	Interchange East of Den-Lou Road	A	5	A	5	-	-	-	-	-	-	5.00	A ₂
11	Interchange at SMR 3	A*	5	-	-	A	5	B	3	-	-	4.33	A ₃
13	Interchange East of SMR 3	A	5	-	-	-	-	A	5	B	3	4.33	A ₄

NOTE:

A: Shallow Foundation/Integral Abutments, F = 5

B: Deep Foundation, F = 3

* Possible Widening of the Structure

Enter weighted favourability value A_i in Table S-7.



TABLE S-4 – EMBANKMENT SETTLEMENT

INTERCHANGE ALTERNATIVES		SUBSOIL TYPE AND FAVOURABILITY FACTOR						WEIGHTED FAVOURABILITY VALUE(Ai)	
		Less than 3m Deep		3m to 10m Deep		Deeper than 10m			
		L1	L2	L3	L4	L5	L6		
		Silty (F1=5)	Clayey (F2 =4)	Silty (F3=4)	Clayey (F4 =3)	Silty (F5=2)	Clayey (F6 =1)		
6	Interchange West of Den-Lou Road	6740	1370		210			4.78	A ₁
10	Interchange East of Den-Lou Road	3750	460					4.89	A ₂
11	Interchange at SMR 3	2350	500				200	4.57	A ₃
13	Interchange East of SMR 3	1985	500		2140		600	3.63	A ₄

NOTE: Enter weighted favourability value A_i in Table S-7.



TABLE S-5- EMBANKMENT STABILITY

INTERCHANGE ALTERNATIVES		CONVENTIONAL OR SPECIAL DESIGN REQUIREMENTS				WEIGHTED FAVOURABILITY VALUE(A _i)	
		L1	L2	L3	L4		
		Conventional Embankment (F1 = 5)	Embankment Requiring Subexcavation (F2 = 3)	Embankment Requiring Toe- Stabilizing Berms (F3 = 2)	Embankment Requiring pre- loading/ Wick Drains(F4 = 1)		
6	Interchange West of Den-Lou Road	6740	1580			4.62	A ₁
10	Interchange East of Den-Lou Road	6060	460			4.86	A ₂
11	Interchange at SMR 3	5500	500		200	4.71	A ₃
13	Interchange East of SMR 3	6605	2540		600	4.23	A ₄

NOTE: Enter weighted favourability value A_i in Table S-7.



TABLE S-6 – CONSTRUCTION FEASIBILITY

INTERCHANGE ALTERNATIVES		STRUCTURE/EMBANKMENT REQUIRING SPECIAL CONSTRUCTION						WEIGHTED FAVOURABILITY VALUE(Ai)	
		No of Structure Foundations		No of Major Culvert Foundations		Deep Swamps L(m)			
		S1 Convent. (F1=5)	S1 Special. (F2=1)	C1 Convent. (F1=5)	C2 Special. (F2=1)	L1 Convent. (F1=5)	L2 Special. (F2=1)		
6	Interchange West of Den-Lou Road	2	-	-	-	-	-	5.00	A ₁
10	Interchange East of Den-Lou Road	2	-	-	1	-	-	3.67	A ₂
11	Interchange at SMR 3	2	1	-	-	-	200	3.00	A ₃
13	Interchange East of SMR 3	2	1	1	-		700	3.40	A ₄

Special Designation Applied to Following Conditions

- Foundations with piers in water or deep foundations other than integral abutments
- Culverts in Lakes
- Embankments through deep (> 10 m) swamps

Enter weighted favourability value A_i in Table S-7.



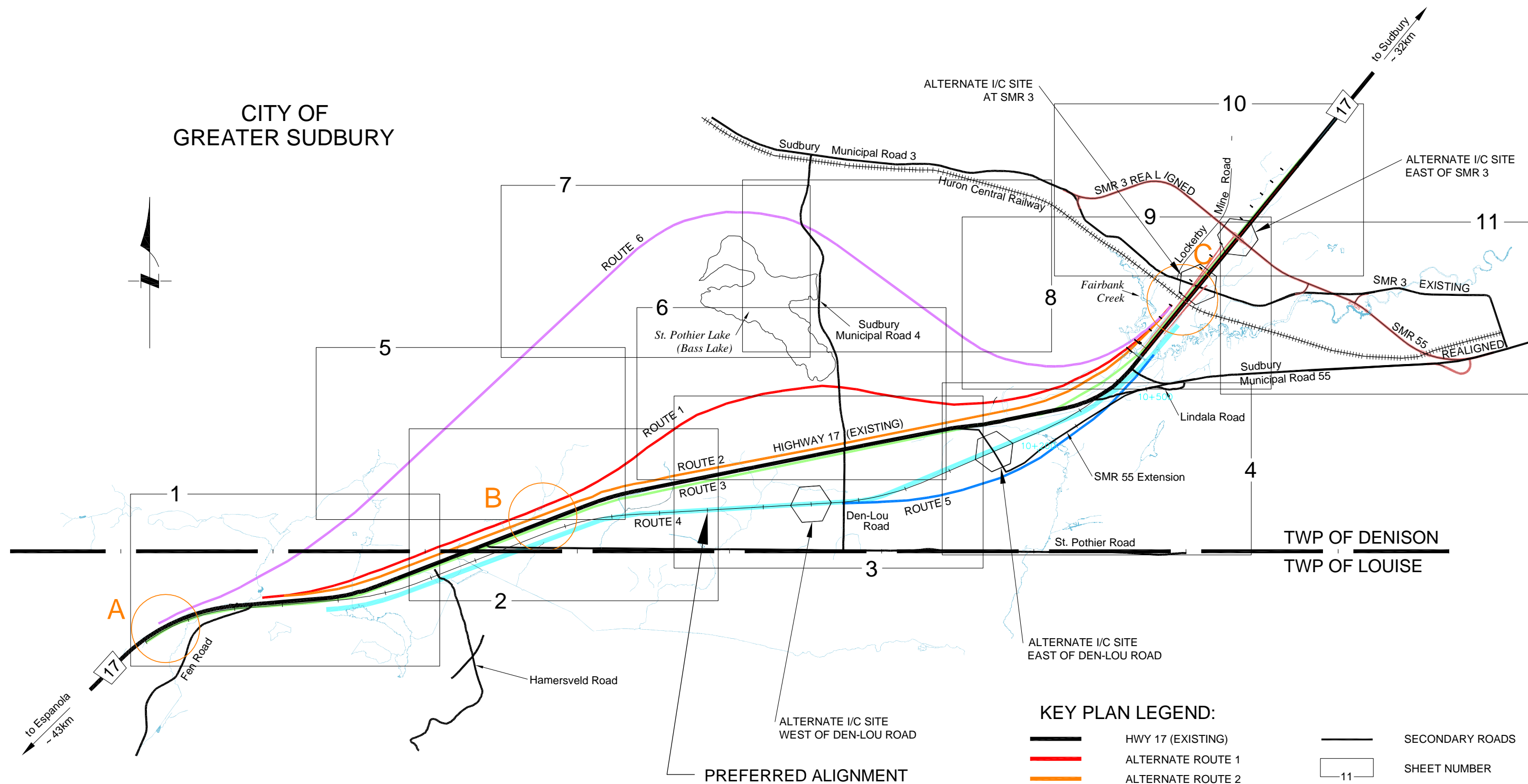
TABLE S-7 – SCORING OF FOUNDATION CRITERIA

EVALUATION CRITERIA		SOFT GROUND/ SWAMPS		GW CONDITIONS		STRUCTURE FOUNDATIONS		EMBANKMENT SETTLEMENT		EMBANKMENT STABILITY		CONSTRUCTION FEASIBILITY		NORMALIZED SCORE	NORMALIZED RANKING
TABLE NO		S1		S2		S3		S4		S5		S6			
IMPACT WEIGHT		0.25		0.10		0.15		0.25		0.10		0.15			
INTERCHANGE ALTERNATIVE		Ai	Ni	Ai	Ni	Ai	Ni	Ai	Ni	Ai	Ni	Ai	Ni		
6	Interchange West of Den-Lou Road	4.73	0.95	2.45	0.68	5.00	1.00	4.78	0.98	4.62	0.95	5.00	1.00	4.72	1
10	Interchange East of Den-Lou Road	5.00	1.00	3.24	0.91	5.00	1.00	4.89	1.00	4.86	1.00	3.67	0.73	4.75	1
11	Interchange at SMR 3	3.86	0.77	3.58	1.00	4.33	0.87	4.57	0.94	4.71	0.97	3.00	0.60	4.22	3
13	Interchange East of SMR 3	2.94	0.59	3.28	0.92	4.33	0.87	3.63	0.74	4.23	0.87	3.40	0.68	3.71	4

NOTES:

Ai - Weighted Favourability Value
 Ni - Normalized Favourability Value

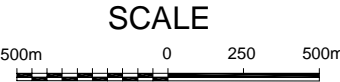
CITY OF
GREATER SUDBURY



KEY PLAN LEGEND:

- | | | | |
|--|------------------------|--|------------------------------------|
| | HWY 17 (EXISTING) | | SECONDARY ROADS |
| | ALTERNATE ROUTE 1 | | SHEET NUMBER |
| | ALTERNATE ROUTE 2 | | ASSESSMENT NODE |
| | ALTERNATE ROUTE 3 | | PROPOSED LOCATIONS OF INTERCHANGES |
| | ALTERNATE ROUTE 4 | | |
| | ALTERNATE ROUTE 5 | | |
| | ALTERNATE ROUTE 6 | | |
| | EASTERN INTERCHANGE 13 | | |

KEY PLAN
PRELIMINARY DESIGN SERVICES
HIGHWAY 17 FROM 20.5 km WEST OF
HIGHWAY 144 EASTERLY FOR 6.5 km
TOWN OF WALDEN, ONTARIO



HIGHWAY 17
HIGHWAY 17 Four Lining From 20.5 km
West of Highway 144, Easterly for 6.5 km
G.W.P. 156 - 98 - 00



SHEET
A

METRIC

NOTES:

- 1. BEDROCK CUTS AND OUTCROPS SHOWN ON PLANS ARE BASED ON EXISTING CONSTRUCTION DATA, SITE RECONNAISSANCE AND AERIAL PHOTOGRAPHS. THE SYMBOLS ON THE PLANS INDICATE THE LOCAL PRESENCE OF THE BEDROCK UNIT AND DO NOT REPRESENT THE FULL EXTENT OF EACH ROCK OUTCROP.
- 2. THE EXTENT OF SWAMPS, WATER BODIES AND FILL AREAS IS AS INTERPRETED FROM SITE RECONNAISSANCE AND AERIAL PHOTOGRAPHS. THE AREAL EXTENTS SHOWN ON THE PLANS REPRESENT ESTIMATES ONLY AND ACTUAL AREAS MAY VARY FROM THOSE SHOWN.
- 3. ESTIMATED DEPTH TO COMPETENT GROUND AND OR BEDROCK IN SWAMPS IS BASED ON GEOLOGICAL EVIDENCE, DESKTOP LITERATURE SEARCH DATA AND LIMITED SITE RECONNAISSANCE INFORMATION.
- 4. THE GEOLOGIC UNIT SYMBOLS SHOWN ON THE PLANS REPRODUCE THOSE SHOWN ON GEOLOGIC MAPPING OF THE AREA AND ARE ONLY A GENERAL REPRESENTATION OF BEDROCK AND SOIL UNITS.
- 5. THE PLANS ARE AN ENCLOSURE TO THE ROUTE SELECTION STUDY PREPARED BY PETO MACCALLUM LTD. THE DATA ON THESE PLANS MUST BE READ IN CONJUNCTION WITH THE REPORT.
- 6. THE DETAIL SHOWN ON THE PLAN IS CONSIDERED APPROPRIATE FOR ROUTE SELECTION PURPOSES. WHEN THE PREFERRED ROUTE HAS BEEN SELECTED, A SUBSURFACE INVESTIGATION SHOULD BE UNDERTAKEN TO DELINEATE THE STRATIGRAPHIC CONDITIONS ON A SITE SPECIFIC BASIS FOR PRELIMINARY AND DETAILED DESIGN PURPOSES.
- 7. THE CHAINAGES SHOWN ON THE DRAWINGS ARE APPROXIMATE.

LEGEND:

ALTERNATE ROUTE

ROUTE 1 (NORTH SIDE NEW ALIGNMENT)

ROUTE 2 (NORTH SIDE TWINNING)

ROUTE 3 (SOUTH SIDE TWINNING)

ROUTE 4 (SOUTH SIDE NEW ALIGNMENT)

ROUTE 5 (SOUTH SIDE NEW ALIGNMENT)
(SOUTHERLY ROUTE)

ROUTE 6 (NORTH SIDE NEW ALIGNMENT)
(NORTHERLY ROUTE)

4.5m R/C

ROCK CUT (R/C)

ROCK CUT HEIGHT FROM RECORDS

BEDROCK OUTCROP (R O/C)

OUTWASH PLAIN DEPOSITS
(SILTS AND SILTY SANDS)

SWAMP AREA

15m

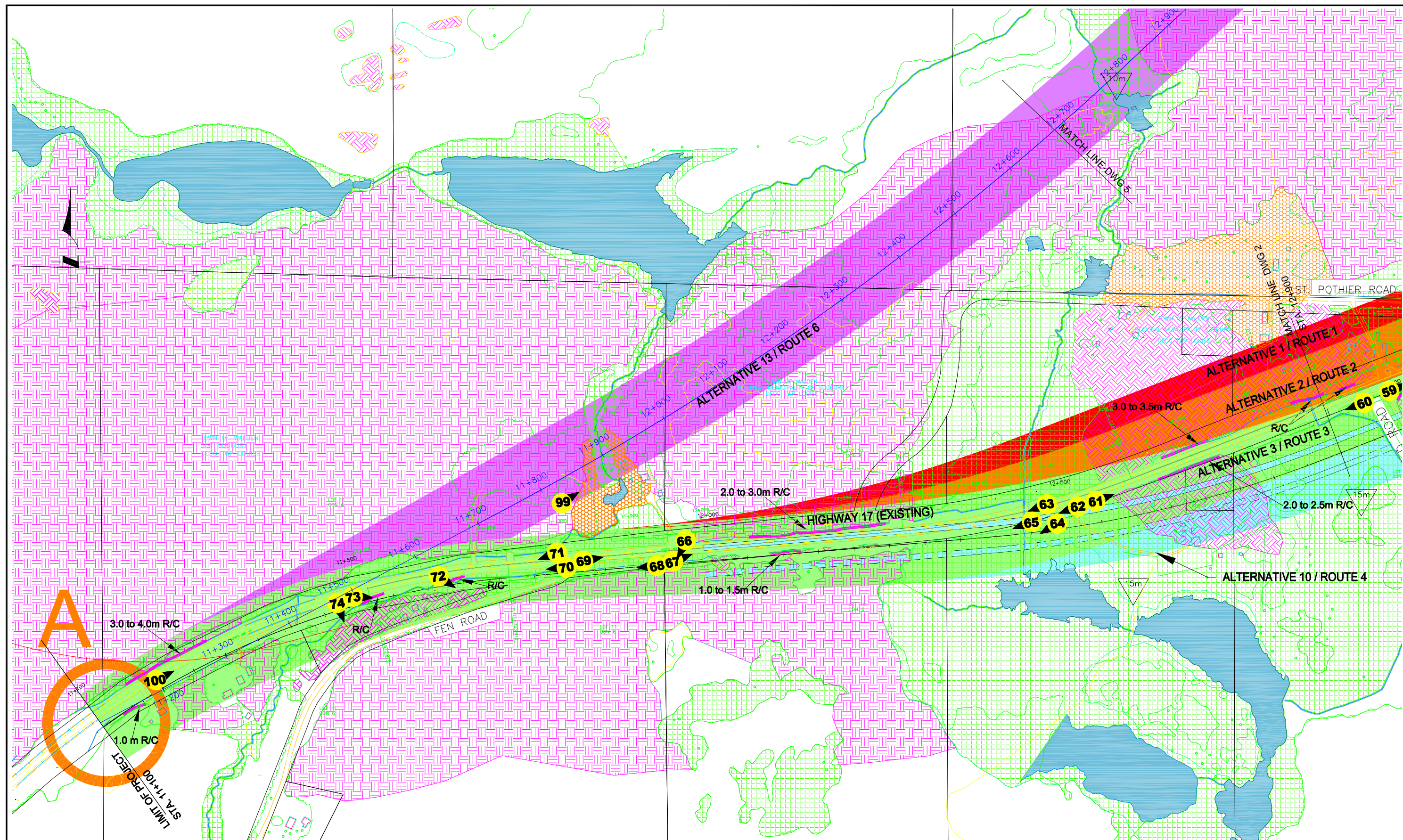
ANTICIPATED DEPTH TO
COMPETENT MATERIAL/BEDROCK

WATER BODY

FILL AREA

121

PHOTOGRAPH NUMBER
(ARROW SHOWS DIRECTION OF VIEW)



STA. 11+100 TO 12+900 (HIGHWAY 17 STUDY CORRIDOR)



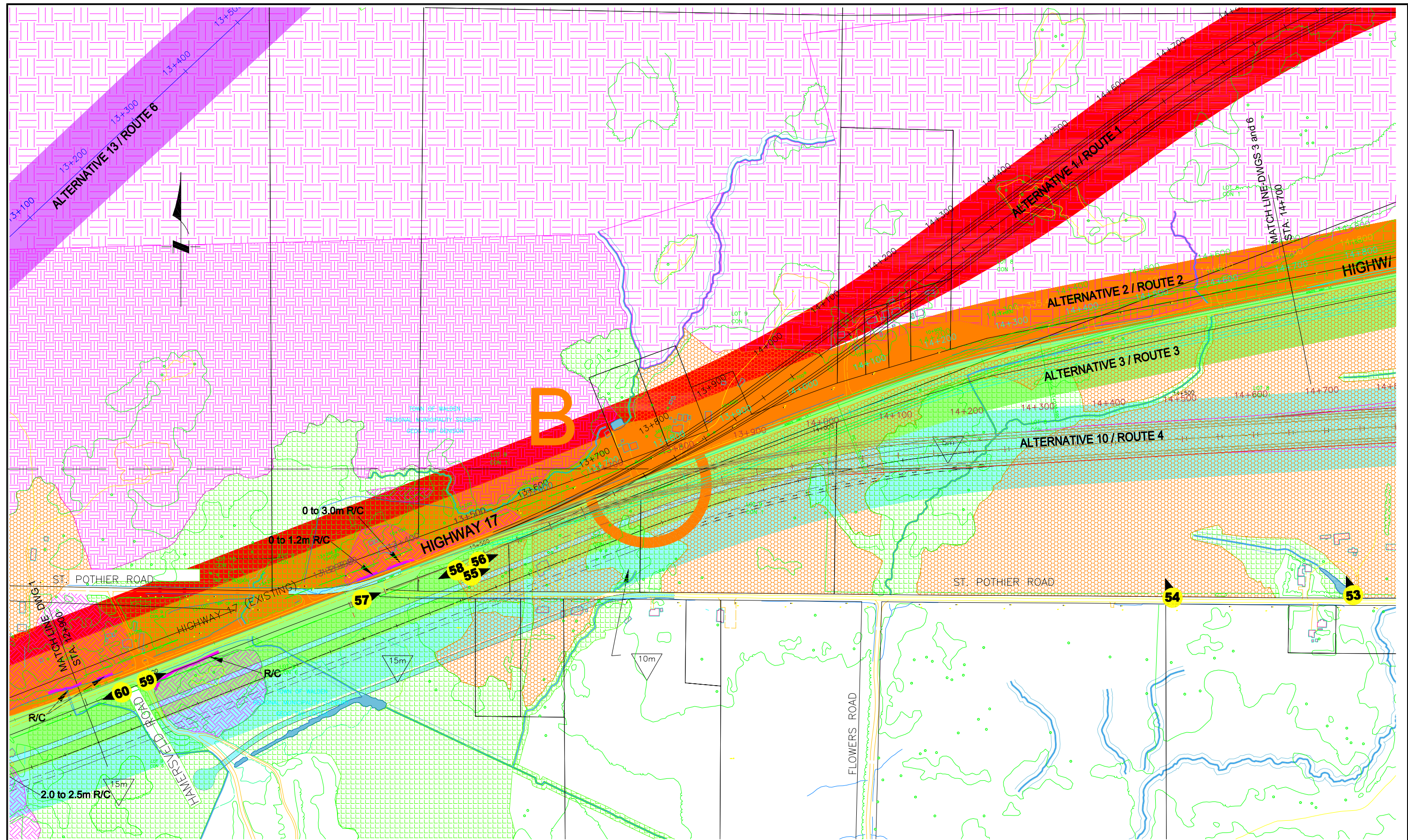
METRIC



HIGHWAY 17
HIGHWAY 17 Four Lining From 20.5 km
West of Highway 144, Easterly for 6.5 km
G.W.P. 156 - 98 - 00



SHEET
1



STA. 12+900 TO 14+700 (HIGHWAY 17 STUDY CORRIDOR)

METRIC



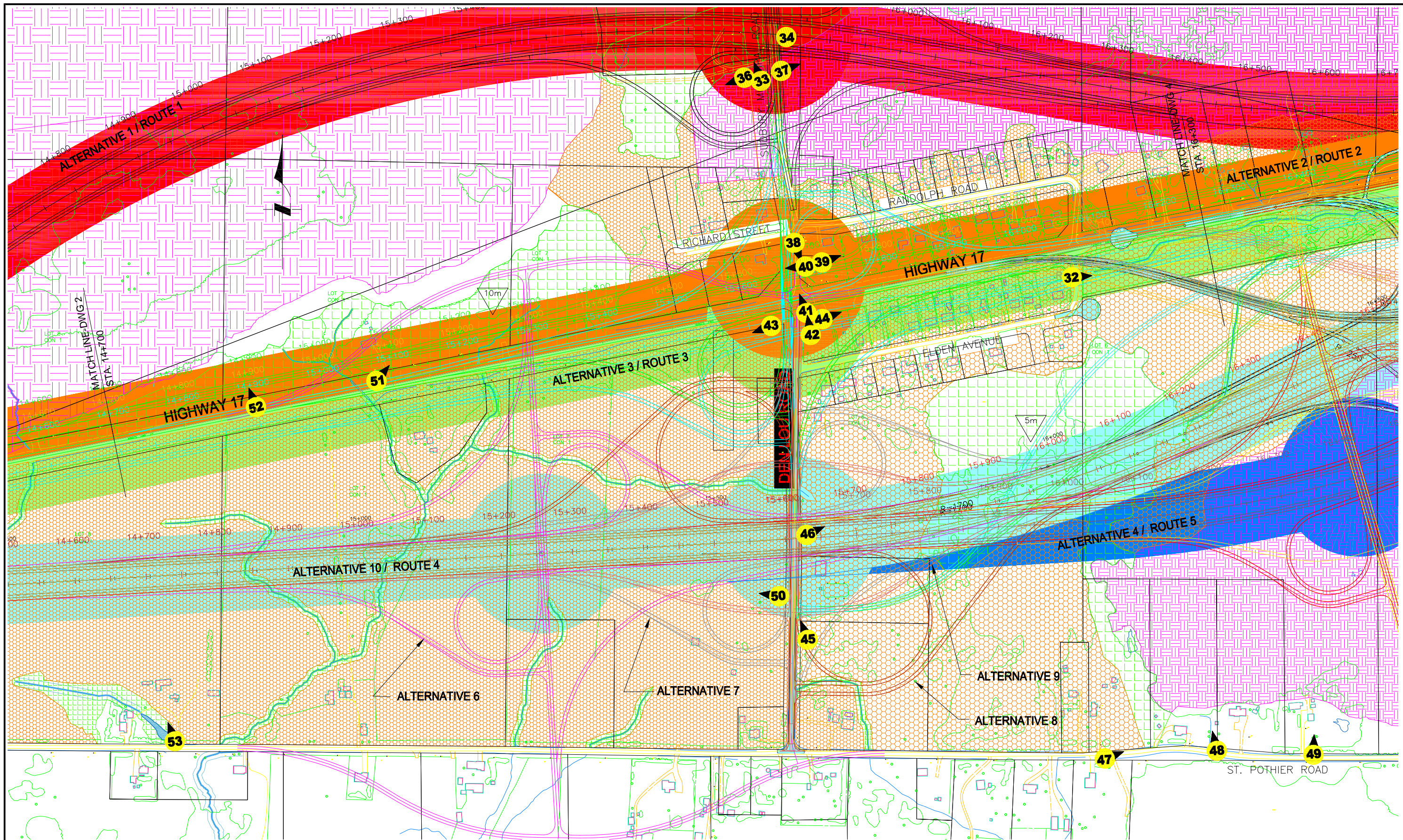
Peto MacCallum Ltd.
CONSULTING ENGINEERS



HIGHWAY 17
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West of Highway 144, Easterly for 6.5 km
G.W.P. 156 - 98 - 00

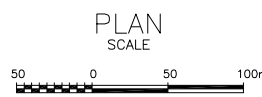


SHEET
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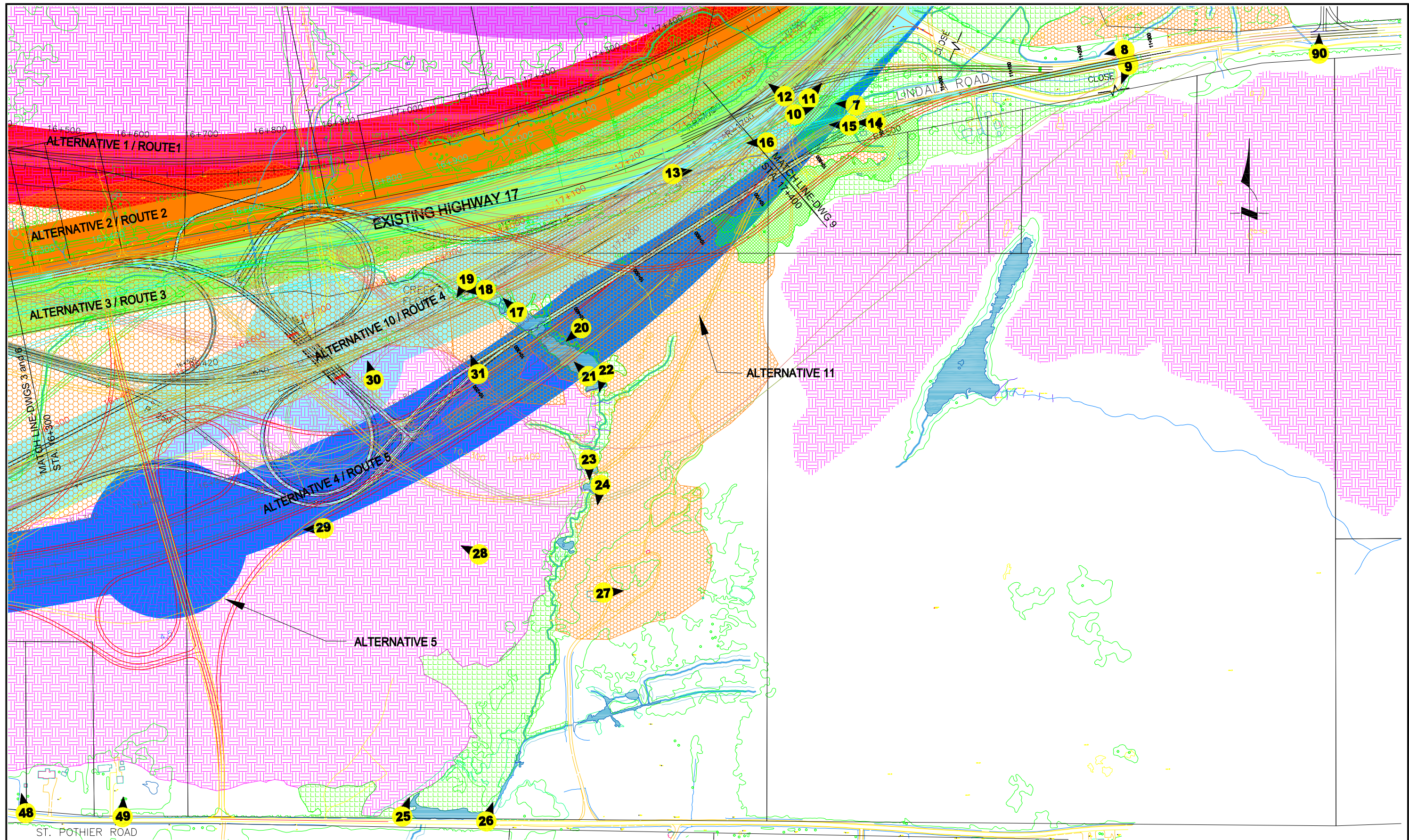


STA. 14+700 TO 16+300 (HIGHWAY 17 STUDY CORRIDOR)

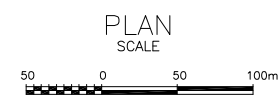
METRIC



 Ministry of Transportation	 Stantec Consulting Ltd.	



STA. 16+300 TO 17+400 (HIGHWAY 17 STUDY CORRIDOR)



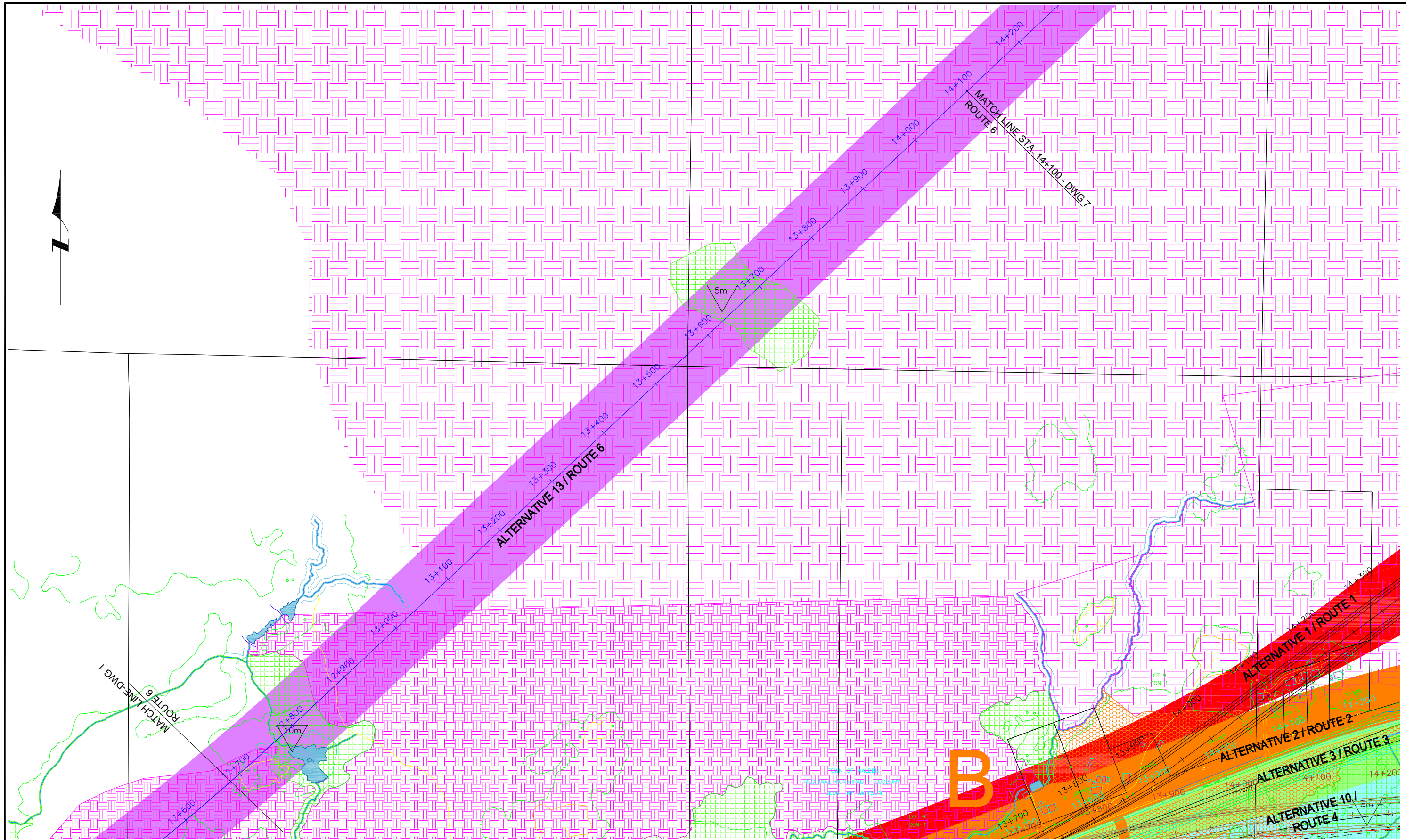
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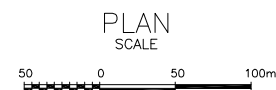
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HIGHWAY 17 Four Lining From 20.5 km
West of Highway 144, Easterly for 6.5 km
G.W.P. 156 - 98 - 00



SHEET
4



STA. 12+700 TO 14+100 (ROUTE 6 CORRIDOR)



METRIC



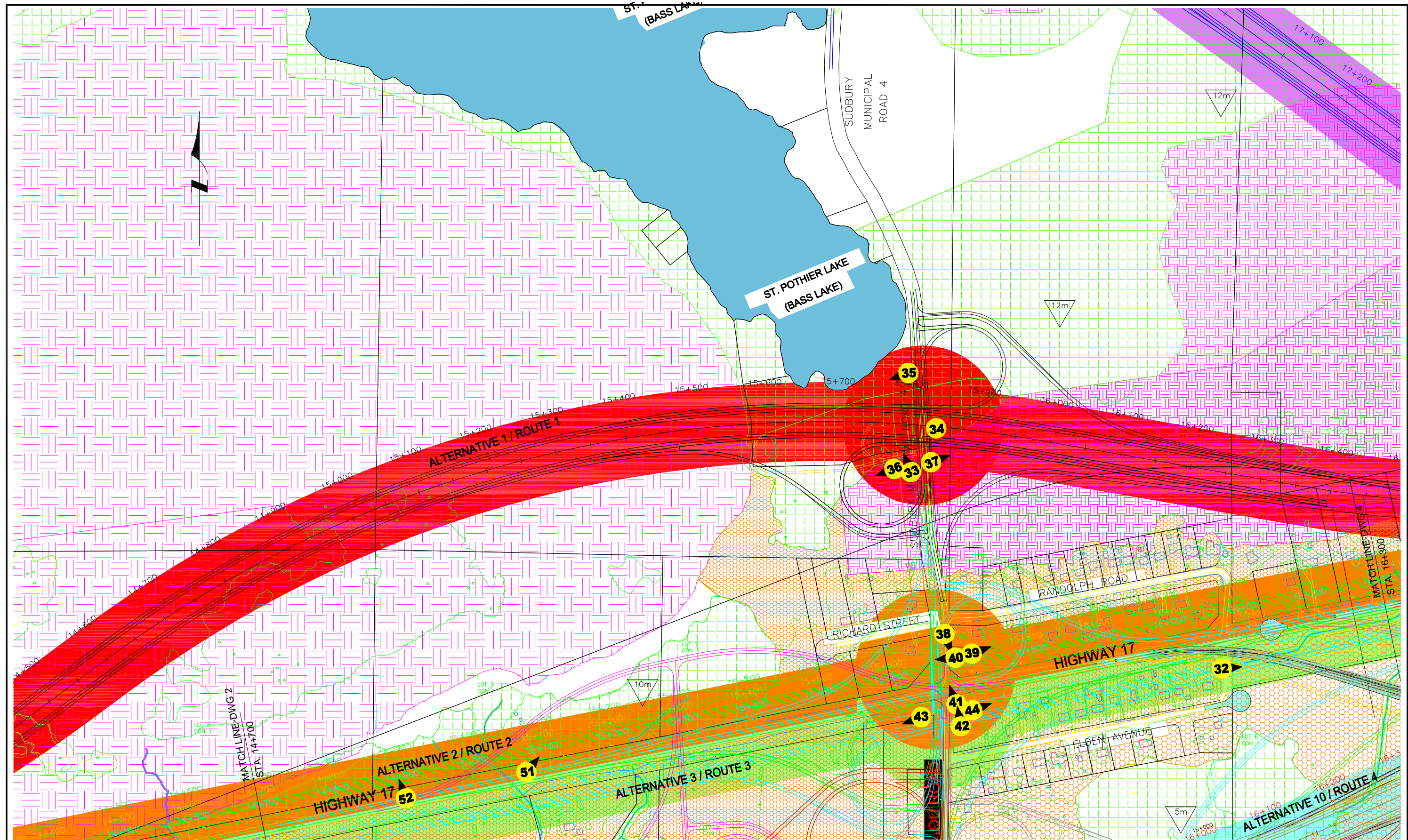
Peto MacCallum Ltd.
CONSULTING ENGINEERS



HIGHWAY 17
HIGHWAY 17 Four Lining From 20.5 km
West of Highway 144, Easterly for 6.5 km
G.W.P. 156 - 98 - 00



SHEET
5



STA. 14+700 TO 16+300 (HIGHWAY 17 STUDY CORRIDOR)

METRIC



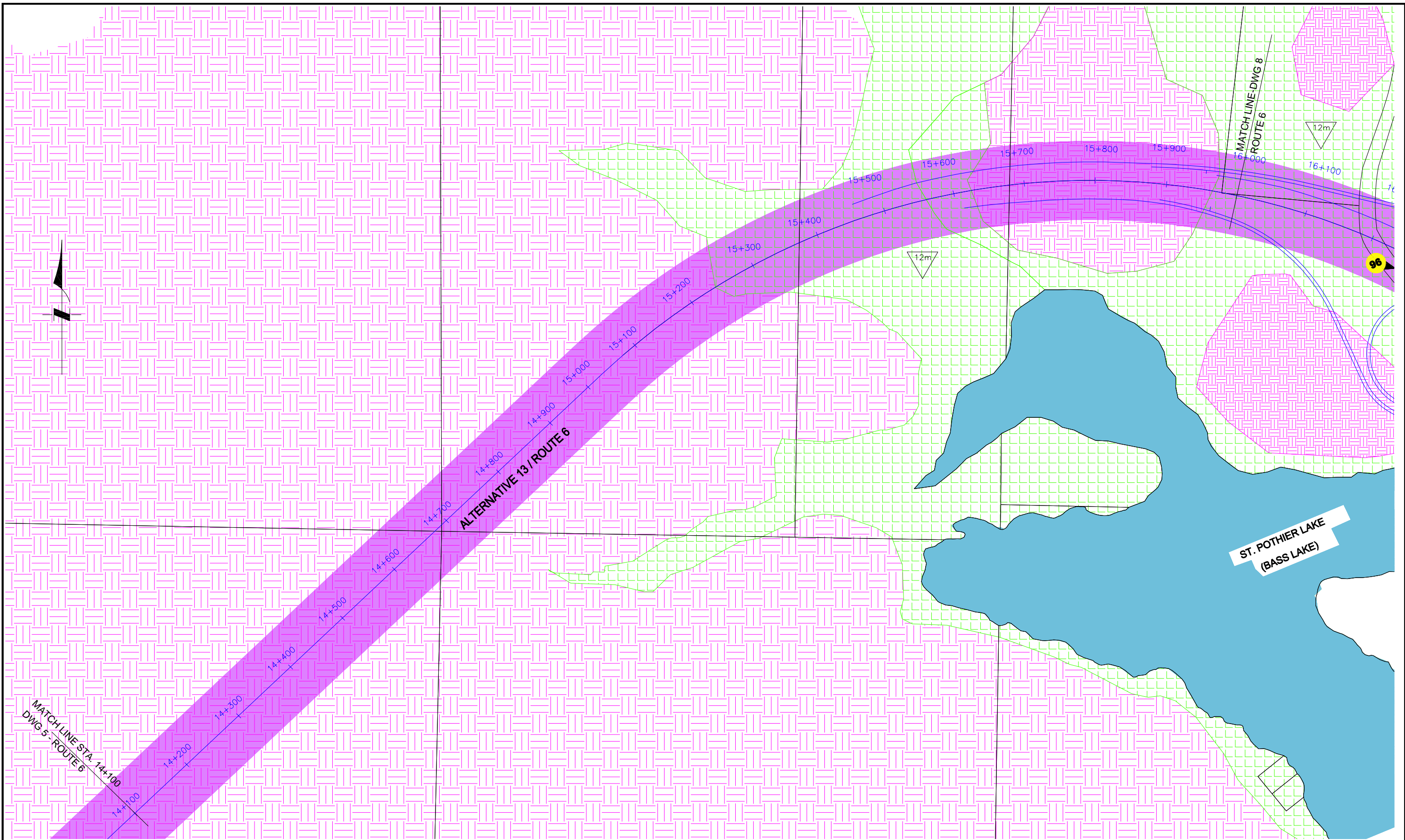
Peto MacCallum Ltd.
CONSULTING ENGINEERS



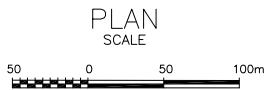
HIGHWAY 17
HIGHWAY 17 Four Laning From 20.5 km
West of Highway 144, Easterly for 6.5 km
G.W.P. 156 - 98 - 00



SHEET
6

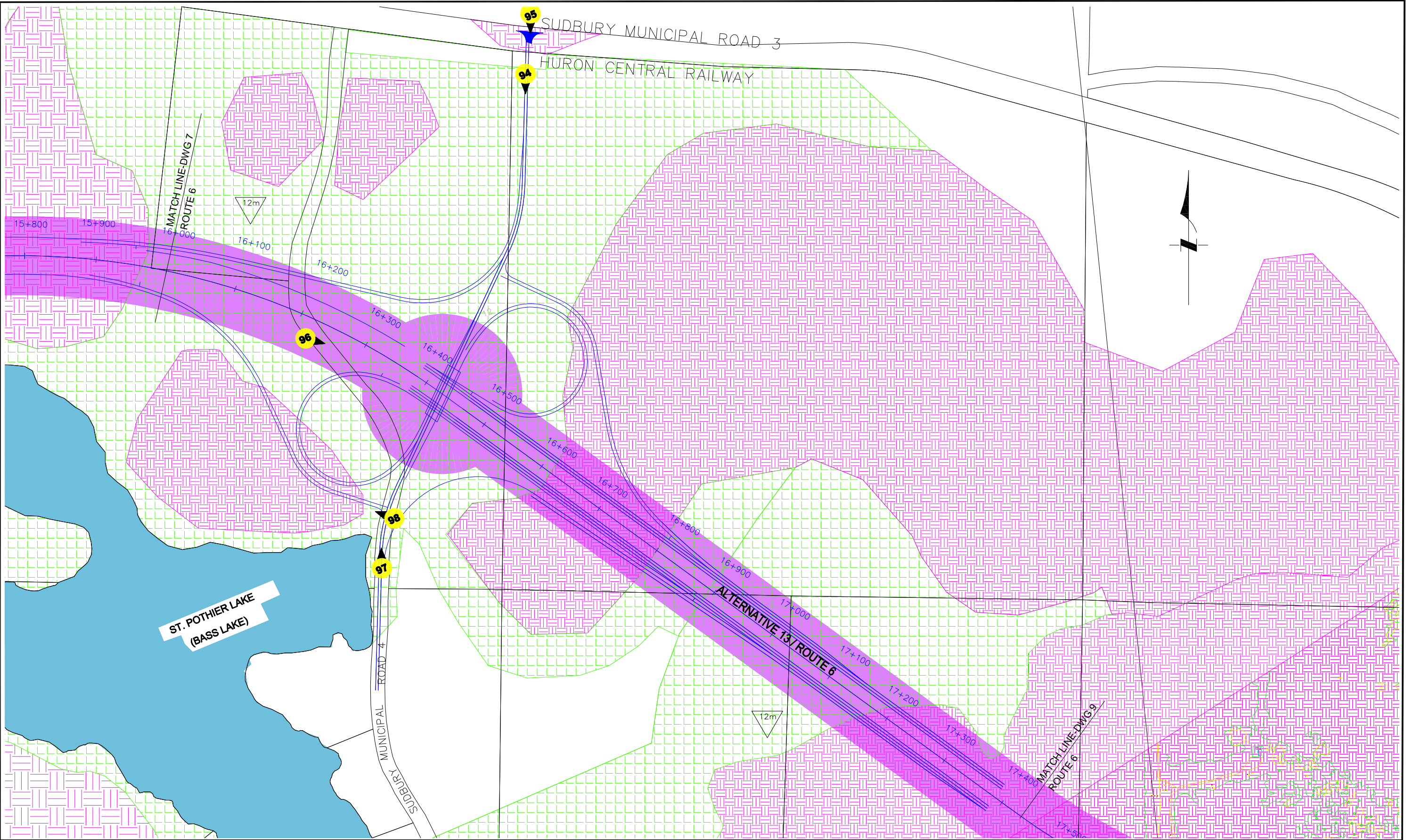


STA. 14+100 TO 16+000 (ROUTE 6 CORRIDOR)



METRIC





 Ministry of Transportation	 Stantec Consulting Ltd.	
 Peto MacCallum Ltd. CONSULTING ENGINEERS	HIGHWAY 17 HIGHWAY 17 Four Lining From 20.5 km West of Highway 144, Easterly for 6.5 km G.W.P. 156 - 98 - 00	SHEET 7

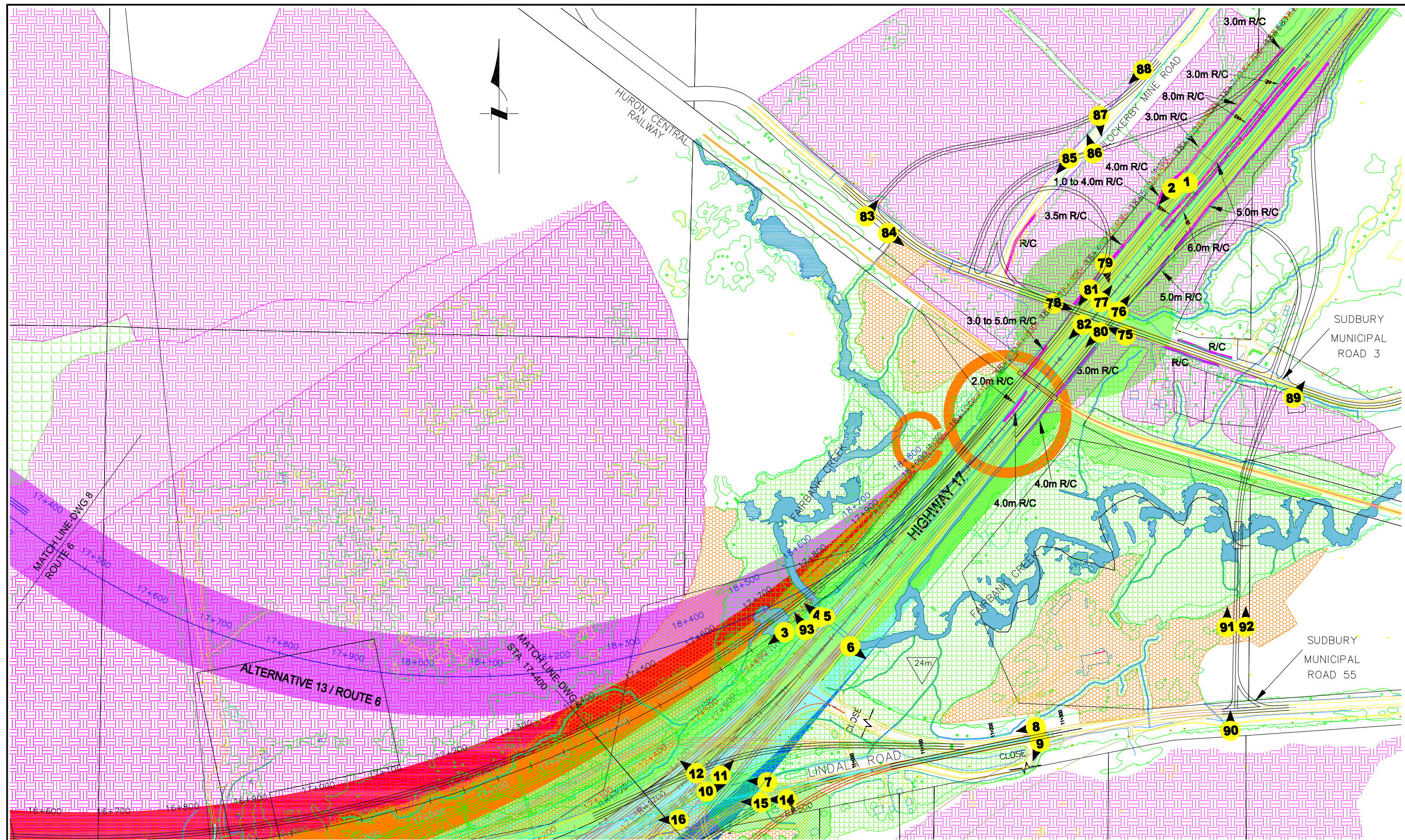


STA. 16+000 TO 17+400 (ROUTE 6 CORRIDOR)

METRIC



 Ministry of Transportation 	 Stantec Consulting Ltd. Peto MacCallum Ltd. CONSULTING ENGINEERS	 SHEET 8



STA. 17+400 TO 18+900 (HIGHWAY 17 STUDY CORRIDOR)

METRIC



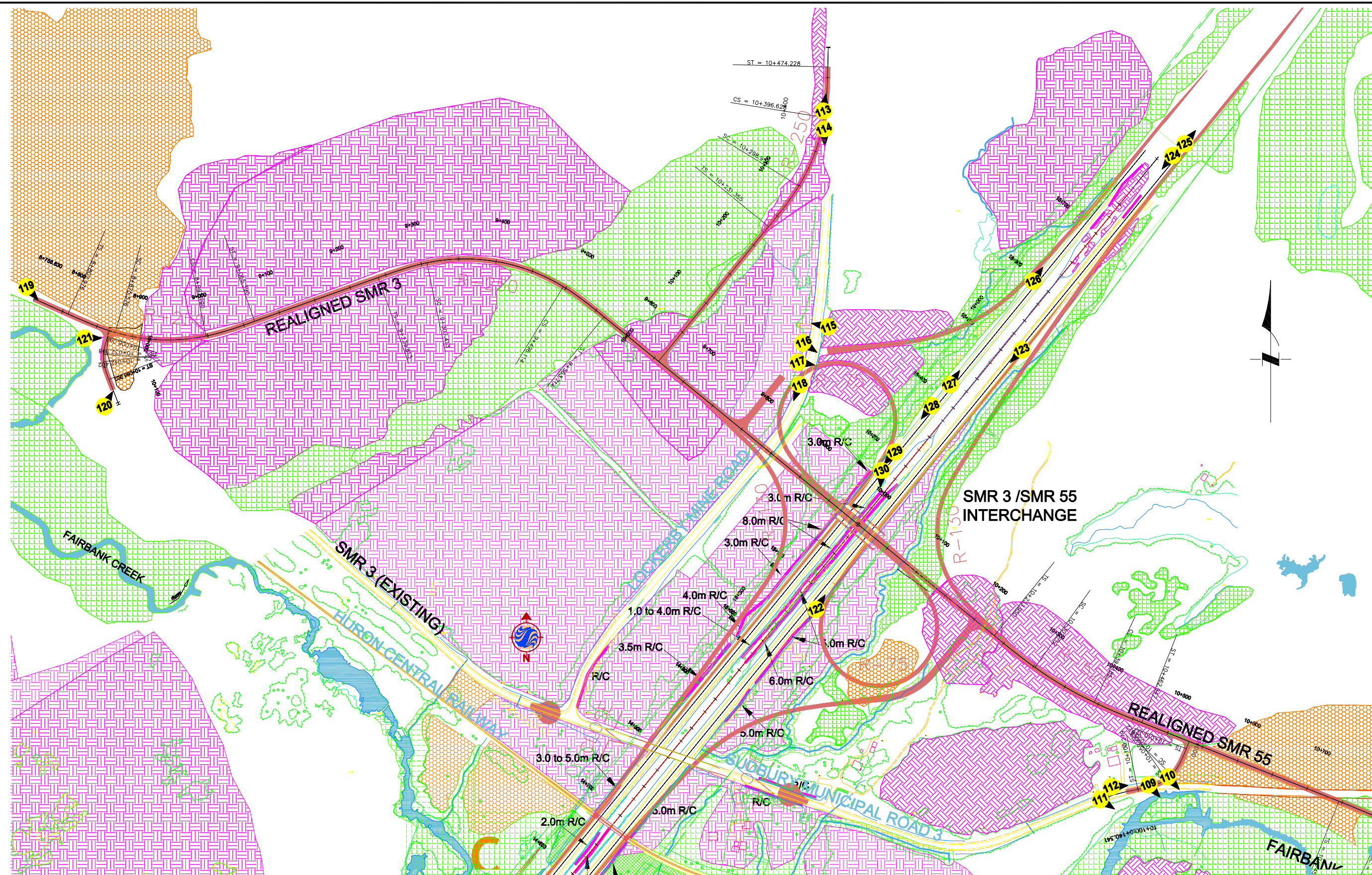
Peto MacCallum Ltd.
CONSULTING ENGINEERS



HIGHWAY 17
HIGHWAY 17 Four Lining From 20.5 km
West of Highway 144, Easterly for 6.5 km
G.W.P. 156 - 98 - 00



SHEET
9



SUDDBURY MUNICIPAL ROAD 3 AND SUDDBURY MUNICIPAL ROAD 55
REALIGNMENTS AND INTERCHANGE
(EASTERN INTERCHANGE ALTERNATIVE 13)



METRIC



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CONSULTING ENGINEERS

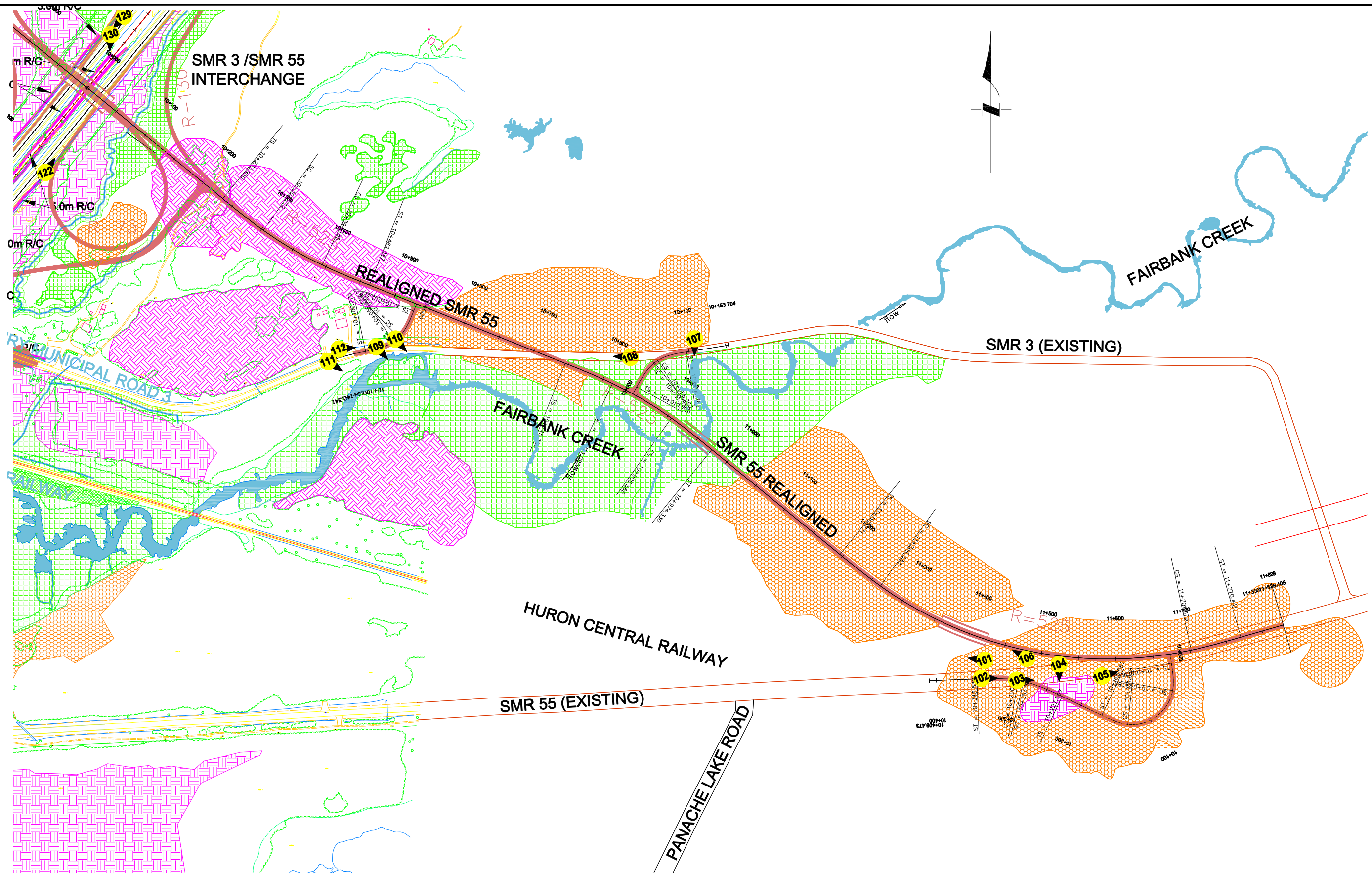


Stantec Consulting Ltd.

HIGHWAY 17
HIGHWAY 17 Four Laning From 20.5 km
West of Highway 144, Easterly for 6.5 km
G.V.P. 156 - 98 - 00



SHEET
10



METRIC

HIGHWAY 17
SUDBURY MUNICIPAL ROAD 55 REALIGNMENT
(EASTERN INTERCHANGE ALTERNATIVE 13)



HIGHWAY 17
HIGHWAY 17 Four Lining From 20.5 km
West of Highway 144, Easterly for 6.5 km
G.W.P. 156 - 98 - 00



SHEET
11



APPENDIX A

List of Reference Documents



APPENDIX A

LIST OF REFERENCE DOCUMENTS

HIGHWAY 17 FROM 20.5 KM WEST OF HIGHWAY 144
EASTERLY FOR 6.5 KM
TOWN OF WALDEN, ONTARIO
PURCHASE ORDER NO. 5004-E-0037
GWP NO. 156-98-00

A. Geological Maps

- Bedrock geology of the Panache Lake Area (East Part) Districts of Sudbury and Manitoulin, Preliminary Map P. 669 Geological Series, from the Ontario Department of Mines, issued 1971, Scale: 1 inch to 1 mile.

B. Resource Documents

- Sudbury Mining Area, Sudbury District Map 2170, from the Ontario Department of Mines, published 1969, Scale 1:63,360 or 1 inch to 1 mile.
- Aggregate Resources Inventory Paper 140 and Map 1B West of Sudbury Regional Municipality of Sudbury and District of Sudbury from the Ontario Geological Survey, Ministry of Development and Mines, issued 1987.

C. MTO Reports

- Preliminary Foundation Investigation Report for the Feasibility Study of the Proposed Interchange at Highway 17 Line 'D' (4 lanes) and the Existing Highway 17, Township of Denison, Regional Municipality of Sudbury, WP No. 61-74-01, Geocres No. 411-96A (September 1976 noted on Margin).
- Preliminary Foundation Investigation report for the Fairbank Creek structures, Highway 17, Line 'D', District 17 (Sudbury) Township of Denison, Regional Municipality of Sudbury, WP 61-74-02 and 03, Site 46-298A & B, Geocres No. 411 92 (September 1976 noted on Margin).
- Preliminary Foundation Investigation Report for Proposed Improvements, West Junction of Highway 17 and Sudbury Regional Road 55, District 54, Sudbury, GWP 156-98-00 prepared by Shaheen & Peaker Limited, Ref. No. SPT1057 Geocres No. 411-155 dated May 2, 2002.
- Foundation Investigation Report for stability of Fill Slopes, Highway 17 Line 'D' Stations 240 to 270, District 17 (Sudbury), WP 61-74-01, Geocres No. 411096 dated 11 June 1975.



- Engineering & Title Records for King's Highway 17 Geographic Township of Denison, Town of Walden Regional, Municipality of Sudbury, W.P. No. 192-92-00, 1997-06 survey and W.P. No. 110-88-00, 1991-12 survey.
- Engineering & Title Records for King's Highway 17, Geographic Township of Louise, Town of Walden, Regional Municipality of Sudbury, W.P. 192-92-00.

D. Well Records (See Appendix B)

- Water Well Records from the Drury Denison and Graham Townships (Denison) provided by the Ministry of Natural Resources on February 8, 2007 (62 wells).
- Water Well Records from the Louise Township provided by the Ministry of Natural Resources on February 8, 2007 (4 wells).

E. Air Photo

- Air photos from 1989, Roll 3 Flight 4612, Photos 159 to 163 and Roll 18, Flight 4613, Photos 132 to 137.
- Photo mosaic of oblique colored aerial photographs taken along the study corridor provided by Stantec Consulting Ltd.



APPENDIX B

MOE Well Records

**WATER WELL RECORDS
FROM THE DRURY DENISON AND GRAHAM TOWNSHIPS (DENISON)**

TABLE
WATER WELL RECORDS

WELLS																	
TOTAL	ENDING IN		KIND OF WATER						WATER USE, ETC.								
WELLS	OVER-	BED-															
DRILLED	BURDEN	ROCK	FRESH	SALT	SULPH	MIN-ERAL	DRY HOLE	DOM. OR STOCK	IRRIG-ATION	INDUS-TRIAL	COMM-ERCIAL	MUNI-CIPAL	PUBLIC SUPPLY	COOL/AIR COND	NOT USED	TEST HOLE	ABAN-DONED
62	18	44	52	0	0	0	4	55	0	0	0	0	2	0	1	1	5
- The location of these wells are either estimated from the centroid of the lot or they are uncertain																	

- The location of these wells are either estimated from the centroid of the lot or they are uncertain

MUNICIPALITY CONCESSION ETC	UTM WELL NO	EASTING NORTHING	ELEV FEET	DATE	DRILLER	CSG DIA	KIND OF WATER	STAT FOUND	PUMP LVL	TEST LVL	TEST RATE	TEST TIME	SCREEN WATER	DEPTH FEET	LENGTH FEET	OWNER DEPTHS IN FEET TO WHICH FORMATIONS EXTEND
DRURY DENISON & GRAHAM TOWNSHIP (DENISON)																
	01 007	59- 471321 08572 5135378		2005/07 7023	06 FR	0039	0031	0036	0005	1 : 0	DO					---
																BRWN CLAY STNS 0008 BRWN SAND STNS 0015 GRVL 0039
CON	01 004	59- 473400 03683 5135500	870	1976/10 5210	06											---
CON	01 004	59- 473200 04816 5135400	850	1983/09 5210				0015	0390	0000	3 : 0	DO				SAND BLDR 0025 GREY GRNT 0215
CON	01 004	59- 473700 02613 5135800	850	1971/07 3613	DRY											---
CON	01 004	59- 473500 04819 5135500	850	1983/08 5210	06 FR	0185	0015	0225	0001	2 : 0	DO					CLAY 0020 SAND BLDR 0028 GREY GRNT 0390
CON	01 006	59- 471590 02301 5135100	920	1969/12 5435	05 FR	0046	0037	0039	0004	3 : 0	DO					---
CON	01 006	59- 471875 02584 5135250	900	1971/07 4507	05 FR	0038	0024	0030	0001	2 : 0	DO					RED CLAY 0018
CON	01 006	59- 471782 03212 5135384	900	1974/02 5210	06 FR	0058	0025	0030	0010	1 : 0	DO					---
CON	01 006	59- 471690 02166 5135120	900	1969/09 4507	05 FR	0048	0032	0075	0001	3 : 0	DO					SAND 0008 GREY GRNT 0225
CON	01 006	59- 471650 03726 5135350	900	1977/04 4817	06 FR	0078	0022	0022	0001	1 : 0	DO					BRWN CLAY 0006 BRWN MSND CLAY 0023 BRWN MSND CSND GRVL 0025 BLUE ROCK 0047
CON	01 006	59- 471640 00886 5135220	900	1968/05 4507	02 FR	0041	0024	0030	0003	1 : 0	DO					---
CON	01 006	59- 471700 03728 5135450	900	1977/04 4817	06 FR	0082	0022	0022	0004	1 : 0	DO					BRWN LOAM 0003 BRWN CLAY 0016 MSND 0028 GRVL BLDR 0034 GRVL 0038
CON	01 006	59- 471700 03729 5135400	900	1977/05 4817	06 DRY											---
CON	01 006	59- 471700 03730 5135350	900	1977/05 4817	06 FR	0094	0020	0020	0002	1 : 0	DO					CLAY BLDR 0015 GREY GRNT 0065
CON	01 006	59- 471770 03731 5134990	890	1977/05 4817	06 FR	0096	0038	0038	0003	1 : 0	DO					BRWN CLAY 0012 MSND 0018 HPAN 0019 BLUE ROCK 0083
CON	01 006	59- 471620 00875 5134810	900	1956/06 3627	05 FR	0055	0029	0040	0006	4 : 0	PS					---
CON	01 006	59- 471693 03588 5135095	900	1975/09 4862	02 FR	0037	0032				DO					YLLW SAND CLAY 0072 GREY SAND GRVL 0078
CON	01 006	59- 471550 03846 5134950	900	1977/09 5210	06 FR	0086	0030	0095	0002	1 : 30	DO					---
CON	01 006	59- 471730 00890 5135200	900	1965/09 4507	02 FR	0047	0035	0035	0001	2 : 0	DO	0044 03				CLAY 0016 FSND 0030 GRVL 0041
CON	01 006	59- 471700 03854 5134990	900	1977/09 5210	06 FR	0105	0025	0115	0001	1 : 0	DO					---
CON	01 006	59- 471570 00885 5135050	900	1967/11 4507	02 FR	0119	0035	0080	0001		DO					YLLW CLAY SAND 0012 GREY ROCK 0086
CON	01 006	59- 471580 00884 5135150	900	1967/07 4507	02 FR	0106	0038	0065	0001		DO					---
CON	01 006	59- 471510 00883 5134880	900	1965/07 4507	02 FR	0041	0028	0028	0060	1 : 0	DO	0038 03				YLLW CLAY 0012 GREY ROCK 0170
CON	01 006	59- 472000 00882 5135280	890	1963/07 4507	02 FR	0038	0015	0020	0002	5 : 0	DO					---
CON	01 006	59- 471630 00881 5135360	900	1961/06 4507	02 FR	0040	0038				NU					CLAY 0010 SAND 0044 GREY GRNT 0115
																BRWN CLAY 0010 GRVL 0016 WHIT ROCK 0146

																RED CLAY MSND 0022 BLDR 0025 BLUE ROCK 0116

																CLAY 0016 MSND CLAY 0036 GRVL 0041

																RED CLAY 0028 GRVL 0038

																RED CLAY 0040 FSND 0042

MUNICIPALITY CONCESSION ETC	LOT	UTM WELL NO	EASTING	ELEV FEET	DATE	DRILLER	CSG DIA	KIND OF INS WATER	WATER FOUNDT	STAT LVL	PUMP LVL	TEST RATE	TEST TIME	WATER USE	SCREEN DEPTH	LENGTH FEET	OWNER DEPTHS IN FEET TO WHICH FORMATIONS EXTEND
CONTINUING... DRURY DENISON & GRAHAM TOWNSHIP (DENISON)																	
CON	01	006	59- 471830~ 00880 5135350	900	1958/10 3624	02	FR		0127	0022				DO			--- CLAY 0012 HPAN MSND CLAY 0020 GRVL 0022 GREN SLTE 0131 ---
CON	01	006	59- 471880 00879 5135470	900	1959/06 5511		DRY										PRDR 0131 GREY ROCK 0200 ---
CON	01	006	59- 471680~ 00878 5135220	900	1958/09 3624	02	FR		0045	0034				DO			PRDG 0030 CLAY MSND GRVL 0045 GREN SLTE 0054 ---
CON	01	006	59- 471570~ 00877 5135090	900	1957/09 3624	03	FR		0037	0037				DO			CLAY 0012 HPAN MSND GRVL 0037 GREN SLTE 0096 ---
CON	01	006	59- 471840~ 00876 5135250	900	1956/06 3627	05	FR		0043	0034	0036	0056	3 : 0	DO			BRWN MSND 0012 GRVL 0045 ---
CON	01	006	59- 471590 02107 5135150	915	1969/05 3909	02	FR		0054	0023	0035	0002	3 : 0	DO			BRWN CLAY 0023 HPAN 0054 ---
CON	01	006	59- 471600 04658 5135400	900	1981/10 5516	06	FR		0254	0018	0286	0006	2 : 0	DO			GREY CLAY STNS SAND 0045 BLCK GRNT 0286 ---
CON	01	006	59- 999999~ 07613 9999999		1998/06 5210	06	FR		0042	0020	0038	0003	1 : 0	DO			SAND 0030 SAND GRVL 0042 ---
CON	01	006	59- 471904~ 07326 5135430		1996/08 1462	06								DO			GREY CLAY 0010 SAND BLDR 0025 SAND 0034 GREY GRNT 0230 BLCK GRNT 0302 ---
CON	01	006	59- 471904~ 07325 5135430		1996/09 1462	06	FR		0210	0030		0001	4 : 0	DO			GREY CLAY 0015 GREY SAND 0043 GREY GRNT 0200 BLCK GRNT 0282 ---
CON	01	006	59- 471904~ 06232 5135430		1990/09 1462	06	FR		0185	0015		0002	1 : 0	DO			SAND CLAY BLDR 0029 GREY GRNT 0209 ---
CON	01	006	59- 471904~ 05975 5135430		1989/10 5210	06	FR		0170	0015	0185	0001	1 : 0	DO			CLAY 0028 GREY GRNT 0185 ---
CON	01	006	59- 472100 04981 5135500	850	1984/10 5210	06	FR		0216		0010	0001	1 : 0	DO			CLAY 0020 SAND 0045 GREY GRNT 0225 ---
CON	01	006	59- 471500 04980 5135400	800	1984/10 5210	06	FR		0188	0010	0205	0001	1 : 0	DO			CLAY 0018 SAND 0039 GREY GRNT 0205 ---
CON	01	006	59- 471500 04979 5135700	800	1984/09 5210	06	FR		0050	0028	0125	0001	1 : 0	DO			GRVL BLDR 0030 SAND 0035 SAND GRVL 0044 GREY GRNT 0125 ---
CON	01	006	59- 471200 04817 5135400	850	1983/09 5210	06	FR		0105	0015	0125	0001	1 : 0	DO			CLAY 0015 QSDND 0035 SAND GRVL 0052 GREY GRNT 0125 ---
CON	01	006	59- 471900 04706 5134800	850	1982/09 5210	06	FR		0082	0030	0105	0007	1 : 30	DO			SAND GRVL 0009 GREY GRNT 0105 ---
CON	01	006	59- 471850 03771 5134980	890	1977/06 4817	06	FR		0033	0033	0033	0003	1 : 0	DO			YLLW SAND CLAY 0026 GRVL 0038 ---
CON	01	006	59- 472600 04694 5135500	900	1982/10 5210	06	FR		0165	0025	0205	0001	2 : 0	DO			LOAM 0003 CLAY 0012 SAND 0030 GREY GRNT 0205 ---
CON	01	006	59- 471650 04445 5135400	900	1981/05 5210	06	FR		0205	0022	0125	0001	4 : 0	DO			GREY CLAY 0015 GREY FSND 0046 GREY GRNT DKCL 0290 ---
CON	01	006	59- 471850 04189 5134650	890	1979/09 5210	06	FR		0075	0020	0135	0001	1 : 0	DO			CLAY 0008 GREY GRNT 0135 ---
CON	01	006	59- 471500 04190 5135190	900	1979/10 5210	06	FR		0045	0015	0055	0005	1 : 30	DO			BRWN SAND 0038 GRVL 0045 GREY GRNT 0055 ---
CON	01	006	59- 472100 04193 5134650	800	1979/08 5210	06	FR		0105	FLW	0115	0001	1 : 30	DO			SAND GRVL 0013 GREY GRNT 0115 ---
CON	01	006	59- 471650 04194 5135400	900	1979/11 5210	06	FR		0142	0020	0155	0001	1 : 0	DO			SAND 0015 QSDND 0030 CLAY 0047 GREY GRNT 0155 ---
CON	01	006	59- 471600 04326 5135050	850	1980/05 5210	06	FR		0100	0030	0105	0003	1 : 0	DO			YLLW SAND 0005 GREY CLAY 0019 GREY GRNT 0105 ---
CON	01	006	59- 471650 04657 5135400	900	1981/10 5516	06				0014	0400	0001	2 : 0	DO			GREY CLAY SAND STNS 0076 BLCK GRNT LYRD 0400

MUNICIPALITY CONCESSION ETC	UTM WELL EASTING LOT NO	ELEV ELEV NORTHING	CSG KIND DIA OF INS WATER	WATER FOUND	STAT LVL	PUMP LVL	TEST RATE	TEST TIME	SCREEN WATER DEPTH	OWNER LENGTH	DEPTHS IN FEET TO WHICH FORMATIONS EXTEND
CONTINUING... DRURY DENISON & GRAHAM TOWNSHIP (DENISON)											
CON	01 006	59- 471950 04537 5135500	800	1981/11 5210	06	FR	0060	0015 0065 0005 4 :0	DO	---	SAND 0010 SAND BLDR 0020 SAND GRVL 0028 GREY GRNT 0065
CON	01 006	59- 471600 04552 5135500	800	1981/09 5210	06	FR	0145	0020 0165 0001 1 :30	DO	---	BRWN CLAY 0010 SAND 0028 GRVL 0032 GREY GRNT 0165
CON	01 006	59- 471550 04612 5135400	900	1982/05 5210	06	FR	0055	0020 0065 0010 1 :0	DO	---	SAND GRVL 0045 GREY GRNT 0065
CON	01 006	59- 471850 04310 5135500	850	1980/08 5210	06	FR	0050	0012 0065 0050 1 :0	DO	---	SAND GRVL 0045 GREY GRNT 0065
CON	01 007	59- 471180 03169 5135290	885	1973/11 3652	02	FR	0082	0030 0034 0003 3 :0	DO	---	PRDR 0032 STNS GRVL BLDR 0083
CON	01 007	59- 470975 00887 5134650	920	1963/10 1721	02	DRY				---	BRWN CLAY 0013 GREY ROCK 0173
CON	01 007	59- 471093 06585 5135438		1992/05 5210	06	FR	0055	0020 0045 0010 2 :0	DO	---	CLAY 0015 QSND 0045 GRVL 0055
CON	01 007	59- 471387 08691 5135363		2006/06 7023	06	FR	0064	0028 0030 0010 1 :	DO	---	BRWN CLAY 0012 GRVL FSND 0063
CON	01 007	59- 470800 03954 5136500	850	1978/06 3652	02	FR	0176	0022 0024 0002 1 :30	PS	---	GREY CLAY 0008 GREY STNS 0193
CON	01 008	59- 469950 04692 5135050	850	1982/10 5210	06	UK	0085	0015 0220 0000 1 :30	DO	---	BRWN CLAY 0019 GREY GRNT 0220
CON	01 009	59- 469280 00889 5134700	850	1961/09 4817	02	UK	0223	0012 0055 0001 2 :0	DO	---	GREY GRNT ROCK 0236

WATER WELL RECORDS

WELLS																	
TOTAL	ENDING IN		KIND OF WATER						WATER USE, ETC.								
WELLS	OVER-	BED-	FRESH	SALT	SULPH	MIN- ERAL	DRY HOLE	DOM. OR STOCK	IRRIG- ATION	INDUS- TRIAL	COMM- ERCIAL	MUNI- CIPAL	PUBLIC SUPPLY	COOL/ AIR COND	NOT USED	TEST HOLE	ABAN- DONED
DRILLED	BURDEN	ROCK															
4	0	4	4	0	0	0	0	3	0	0	0	1	0	0	0	0	0
- The location of these wells are either estimated from the centroid of the lot or they are uncertain																	

**WATER WELL RECORDS
FROM THE LOUISE TOWNSHIP**

MUNICIPALITY	UTM	CONCESSION	WELL	EASTING	ELEV	DATE	DRILLER	INS	WATER	FEET	FEET	FEET	GPM	HR:MN	USE	FEET	FEET	OWNER	DEPTHS IN FEET TO WHICH FORMATIONS EXTEND
--------------	-----	------------	------	---------	------	------	---------	-----	-------	------	------	------	-----	-------	-----	------	------	-------	---

LOUISE TOWNSHIP

CON	06	009	59-	469137-		1990/07	5210	06	FR	0040	0015	0065	0020	1 : 0	DO				
			06147	5133810															
CON	06	009	59-	468930	840	1970/08	4507	06	FR	0043	0000	0028	0003	2 : 0	CO				
			02358	5134450															
CON	06	010	59-	468700	850	1962/07	4507	02	FR	0118	0000	0060	0001	3 : 0	DO				
			01282	5134360															
CON	06	011	59-	999999-		2000/10	1462	06	FR	0313	0020	0342	0010	1 :	DO				
			07840	9999999															

CLAY 0010 GRNT 0065

GREY CLAY MSND 0037 MSND GRVL 0043 BLUE ROCK 0053

GREY CLAY 0021 FSND 0030 GRVL 0032 WHIT SLTE 0126

GREY CLAY SAND 0020 GREY GRNT HARD 0280 BLCK GRNT QTZ 0342



APPENDIX C

Site Reconnaissance Observations and

Site Photographs 1 to 130



APPENDIX C

SITE RECONNAISSANCE OBSERVATIONS AND SITE PHOTOGRAPHS

PML carried out Site Reconnaissance Surveys (SRS) of the existing alignment and adjacent lands within various alternate alignments/routes. The SRS consisted of a drive-by and walk-through of selected sections of Highway 17 and adjacent lands. The ground truth checks verified the surficial geology and drainage conditions inferred from the literature and map reviews as summarized below.

A total of eleven alternatives designated Alternatives 1 through 11 were initially investigated on May 1, 2006. Alternative Alignment 13 was added after the initial SRS and was surveyed in September 12, 2006. Stantec reduced these 12 Alternative Alignments to six Alternate Routes for final consideration and assessment. The following table provides the related numbering for each of the Alternative Alignments and Alternative Routes and should be referred when viewing the photographs.

INITIAL ALTERNATIVE ALIGNMENTS	FINAL ALTERNATE ROUTES
Alignment 1 – North Side New Alignment	Route 1 – North Side New Alignment
Alignment 2 – North Side Twinning	Route 2 – North Side Twinning
Alignment 3 – South Side Twinning	Route 3 – South Side Twinning
Alignment 4 – South Side New Alignment, Parclo A I/C east of Den-Lou Road	Route 5 – South Side New Alignment (Southerly Route)
Alignment 5 – South Side New Alignment, Diamond I/C east of Den-Lou Road	–
Alignment 6 – Middle New Alignment, I/C west of Den-Lou Road	–
Alignment 7 – Middle New Alignment, Parclo A I/C on Den-Lou Road	–
Alignment 8 – Middle New Alignment, Parclo B I/C on Den-Lou Road	–
Alignment 9 – Middle New Alignment, Diamond I/C on Den-Lou Road	–
Alignment 10 – Middle New Alignment, Parclo A I/C across from Microwave Tower	Route 4 – South Side New Alignment (*)
Alignment 11 – Middle New Alignment with Button Hook and Parclo A I/C	–
Alignment 13 – North Side New Alignment (Northerly Route)	Route 6 – North Side New Alignment (Northerly Route)

Notes: Alignment 12 not provided

(*) With realigned SMR 55 connection



The photographs were numbered from east to west to reflect the most likely direction of the construction of the Highway 17 improvements and future four-laning programs.

As indicated previously, the new SMR 55 / SMR 3 realignment and associated interchange photographs were added to this report (photographs 101 to 130). The SRS was carried out on December 6, 2007.

A. East Project Limits to Huron Central Railway Overhead (Photographs 1 and 2)

- The terrain consists of bedrock outcrops.
- The existing Highway 17 was cut into the bedrock. The Sudbury Municipal Road (SMR) 3 underpass and Huron Central Railway (HCR) overhead cross over the highway.

B. From HCR to SMR 55 Area (Photographs 3 to 16 and 93)

- An extensive open water swamp was found within the Fairbank Creek floodplain (Photographs 3 to 6). Depths to competent soil vary across swamp (up to 19 m noted on the photographs).
- A culvert over 3 m span crossed the Highway 17 from north to south (Photographs 4, 5 and 93).
- The swamp was locally covered by the road embankments of the existing and previous Highway 17, Lindala Road and SMR 55 (Photographs 7, 10 to 16).
- Prominent bedrock outcrops occurred north of the SMR 55 intersection (Photograph 8) and south of the Lindala Road / SMR 55 intersection (Photograph 9).

C. Crossing of Creek Floodplain West of SMR 55 Area (Photographs 17 to 27)

- A floodplain of variable width was encountered west of the existing SMR 55 intersection (Photographs 17 to 24).
- Exposed bedrock was found along the west of the creek bed and rising steeply on a westerly direction (Photographs 18 and 19).
- An extensive network of beaver dams restrict water flow along the creek (Photographs 20 to 24).
- Earth (silts, clayey silts) occur along the creek floodplain rising above the creek bed (Photographs 20, 23 and 27).
- Open water swamps occurred where the creek meets with St. Pothier Road (Photographs 25 and 26).

D. West of Creek (Rocha's Property) to Den-Lou Road (Photographs 28 to 32, 47, 48 and 49)

- Massive rock outcrops were found west of the creek on M. Rocha's property and extending northerly (Photographs 28 to 31, 48 and 49).
- South of existing Highway 17 and to the west of the rock outcrops, flat terrain containing outwash deposits and wetland was encountered - southeast of Elden Avenue (Photograph 32).
- Bedrock outcrops and rolling terrain noted on St. Pothier Road (Photograph 47).

E. SMR 4 and Den-Lou Road (Photographs 33 to 46 and 50)

- St. Pothier Lake (Bass Lake) and associated SMR 4 embankment was noted (Photographs 33 and 34).
- Low rock outcrops and shallow soil cover were noted to the south of the lake on both sides and beyond of the SMR 4 alignment (Photographs 35 to 37).
- A prominent rock ridge was noted beyond the west margin of the lake (Photographs 35 and 36).
- Extensive flat earth terrain noted in the area of the intersection of the existing Highway 17 and SMR 4/Den-Lou Road. Bedrock in the area is at 12 to 15 m depths based on water well records (Photographs 38 to 46).
- Open flat to rolling terrain noted at Den-Lou Road and to the east (Photographs 45 and 46) and west (Photograph 50). Tree lines demark location of possible creeks and swamp areas (Photograph 50).

F. Den-Lou Road to St. Pothier Road / Highway 17 Intersection (Photographs 51 to 58)

- Wetlands are present north of existing Highway 17 with a massive rock ridge (also noted previously beyond Bass Lake) in the distance (Photographs 51 and 52).
- Small water courses with potential associated wetlands and flat terrain inferred outwash deposits of silts/sandy silts occur between Highway 17 and St. Pothier Road (Photographs 53, 54 and 56).
- Rock outcrops and swampy terrain are present at/near the intersection of Highway 17 and St. Pothier Road (Photographs 55, 57 and 58).

G. St. Pothier Road to West of Fen Road (Photographs 59 to 74)

- Prominent rock outcrops partially cut for the existing Highway 17 embankment construction were noted along this alignment (Photographs 59 to 63, 65 to 73).
- Swamp areas with open water were noted between the outcrops (Photographs 60, 62 to 64, 68, 69 and 74).
- Estimated height of embankment through swamps is 2 to 5 m (Photographs 60, 63 and 70).

H. SMR 3 and Lockerby Mine Road Areas Near Highway 17 (Photographs 75 to 89)

- Extensive rock outcrops and rock cuts were noted along Highway 17 at the SMR 3 underpass (Photographs 75 to 82 and 89) and along/near the Lockerby Mine Road (Photographs 83 to 88).
- Treed terrain beyond roadways indicated presence of soil cover beyond the visible bedrock (Photographs 83 to 89).

I. SMR 55 and Fairbank Creek Areas South of Highway 17 (Photographs 90 to 93)

- Potentially shallow soil cover over bedrock noted beyond the east shoulder of SMR 55 (Photograph 90).
- Beyond potential shallow bedrock, the estimated 150 m wide floodplain of the Fairbank Creek was noted towards the east (SMR 3 and HCR embankments) (Photographs 91 and 92) with competent soil estimated at 10 to 12 m depth.

J. SMR 3 / SMR 4 Intersection Area North of Bass Lake (Photographs 94 to 98)

- Bedrock outcrops bordering extensive swamp lands were found on the south side of the HCR (Photographs 94 to 96).
- Bedrock outcrops border the existing SMR 4 with forested areas beyond indicating potentially variable soil cover thickness (Photographs 97 and 98).

K. Area North of Highway 17 West of Fen Road (Photographs 99 and 100)

- Massive rock ridge noted in the distance and in foreground north of Highway 17 (Photographs 99 and 100).
- Treed terrain and farm field indicated the presence of local deep soil cover over the bedrock (Photographs 99 and 100).

L. SMR 55 and Area south of Huron Central Railway (Photographs 101 to 106)

- Extensive low-lying terrain occurs north of the existing SMR 55 (Photographs 101 and 106).
- Bedrock outcrops were noted on the south ditch of the SMR 55 (Photographs 102 and 103).
- Treed terrain indicated the presence of soils covering the bedrock (Photographs 102, 104 and 105).
- Estimated height of embankment for possible Huron Central Railway (HCR) overhead is over 8 m (Photograph 106).



M. Area of SMR 3 (Existing) / SMR 55 (Realigned) (Photographs 107 to 112)

- Extensive Fairbank Creek flood plain was noted south of SMR 3 and possible creek crossing structure site (Photographs 107, 109, 110 and 111).
- Sloping farm field and treed terrain indicated the presence of local deep soil cover over the bedrock. To the north and west, beyond the farmland, rock ridges were noted. (Photographs 108 and 112).

N. Realigned SMR 55 / SMR 3 and Lockerby Mine Road Areas Near Highway 17 (Photographs 113 to 118 and 122 to 130)

- Shallow bedrock / bedrock outcrops were noted along Lockerby Mine Road proposed E-N/S Ramp and S-W Ramp (Photographs 113, 115 to 118).
- Swamp areas were present north of the existing and realigned Lockerby Mine Road (Photograph 114).
- Rock cuts and shallow bedrock were noted at the proposed Realigned SMR 3 / SMR 55 I/C underpass. It is noted that the grade of Highway 17 WBL is at a higher level than the EBL (Photographs 122 and 123).
- Low-lying swampy areas were found south and north of Highway 17 and to the east of the possible underpass site (Photographs 125, 127 and 130).

O. Area of Realigned SMR 3 and Existing SMR 3 (Photographs 119 to 121)

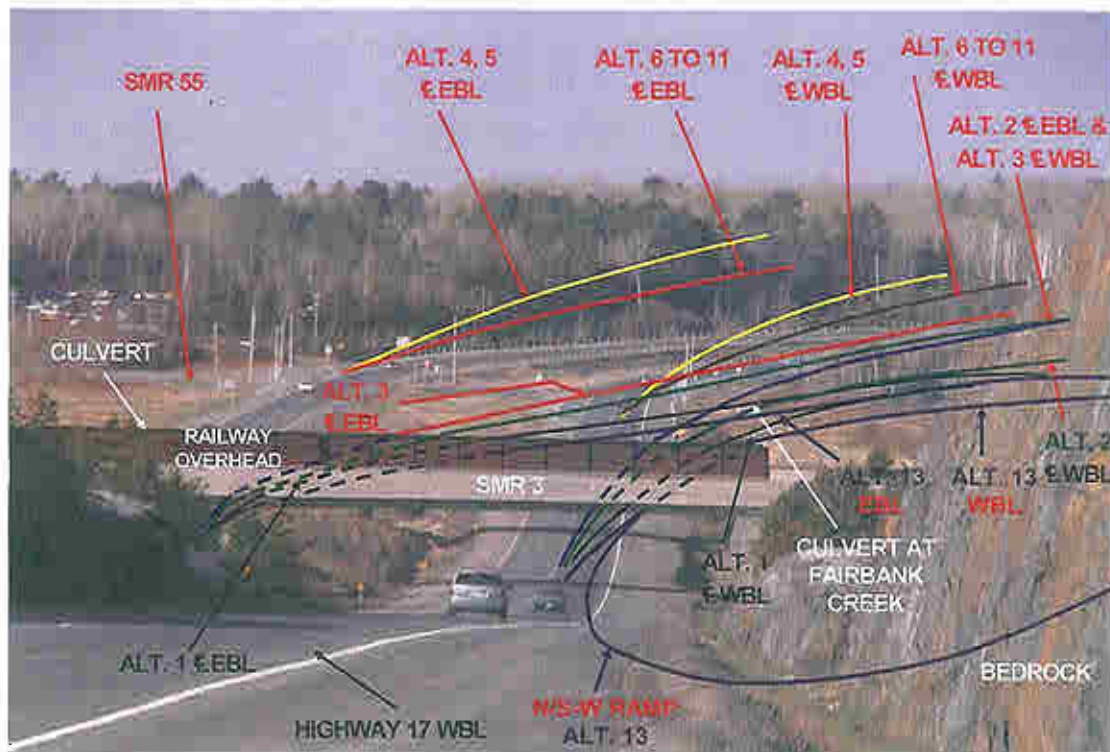
- The Fairbank Creek flood plain was noted south of SMR 3 (Photographs 119 and 120)
- Farmland and treed terrain indicated soil cover over bedrock north of SMR 3 (Photographs 119 to 121).
- Extensive rock ridge area was present beyond visible treed terrain (Photograph 119).



Photograph 1 VIEW: Highway 17 looking west from north shoulder of WBL about 350 m east of railway overhead. (Limit of project). Note 6 m high rock cut, low laying terrain beyond in Fairbank Creek floodplain. (May 1, 2006)

GWP156-98-00

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Photograph 2 ZOOM VIEW (Revised October 2006): Looking westerly at Highway 17 from 350 m east of railway overhead to intersection with SMR 55. Eastern sections of alignment alternatives 1 to 11 are shown across Fairbank Creek floodplain. (May 1, 2006).



Photograph 3 VIEW: Highway 17 Sta. 17+700 (Alt. 1). Looking westerly from north shoulder of westbound lanes. Note ditch and swamp beyond embankment. Alternatives 2 and 3 (not shown) are located between Alternative 1 and existing Highway WBL. Depth to bedrock is over 24 m, about 15 m to firm bottom in Fairbank Creek floodplain. (May 1, 2006)

GWP156-98-00

Peto MacCallum Ltd.



Photograph 4 VIEW: Highway 17 Sta. 17+750 (Alt. 1). Looking north across top of Fairbank Creek culvert. Note open water and swamp. Depth to firm bottom is about 15 m, Artesian conditions exist. (May 1, 2006)

GWP156-98-00

Peto MacCallum Ltd.



Photograph 5 VIEW: Looking west along Alternative 1 of Highway 17 (Sta. 17+750) along top of Fairbank Creek culvert. Note open water and swamp. Depth to firm bottom 15 m in foreground, 12 m at tree line. (May 1, 2006)

GWP156-98-00

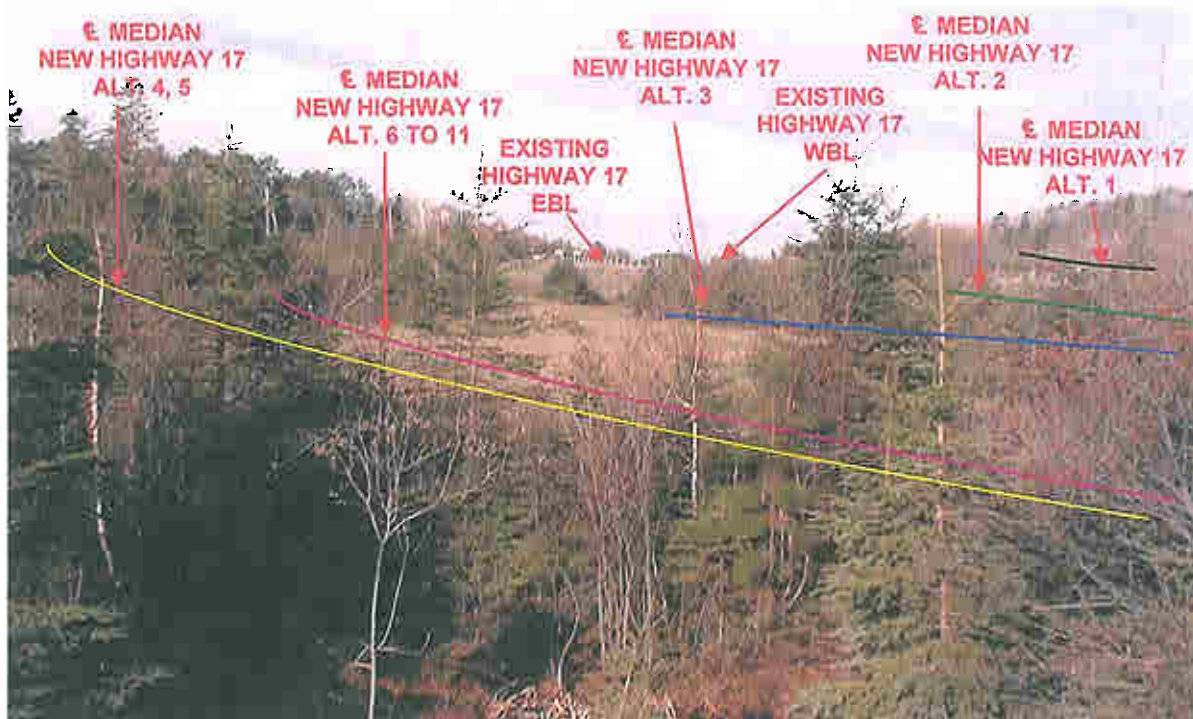
Peto MacCallum Ltd



Photograph 6 VIEW: Looking south to Fairbank Creek across top of culvert from south shoulder of existing Highway 17 EBL. Depth to firm bottom in Fairbank Creek is about 19 m. (May 1, 2006)

GWP156-98-00

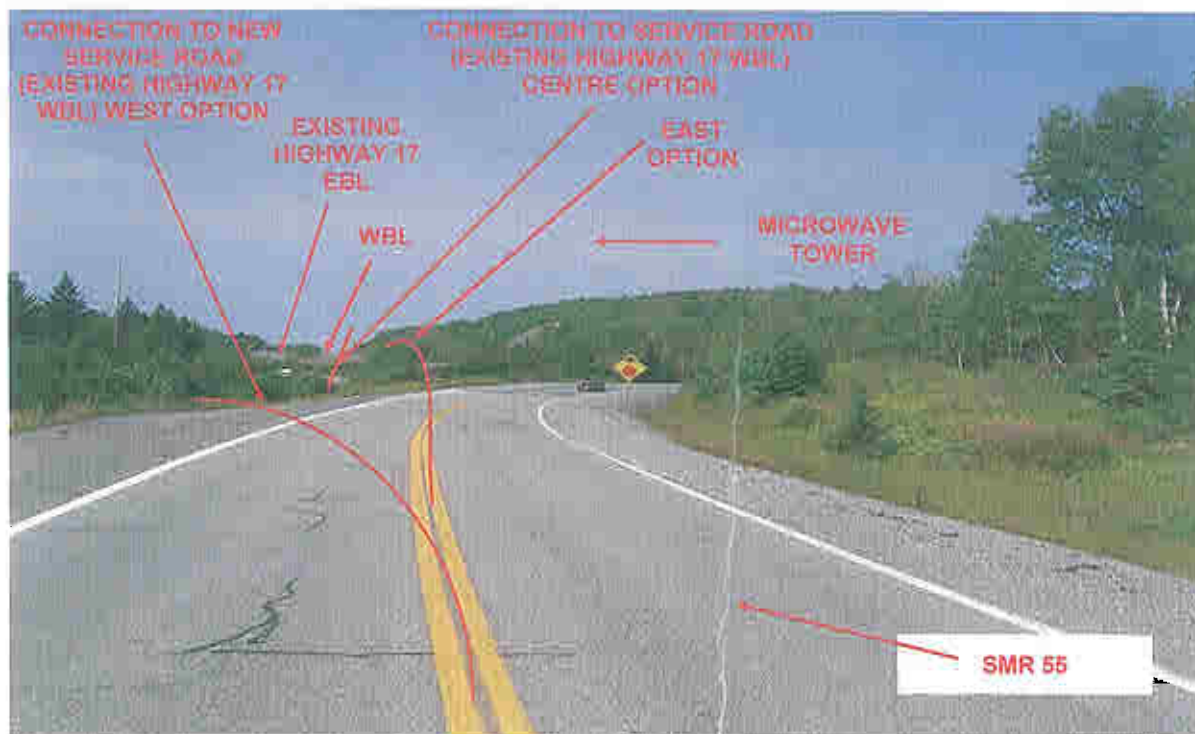
Peto MacCallum Ltd.



Photograph 7 VIEW: Looking westerly from end of Lindala Road at alternative alignments. Ground to the right of photograph is swamp. Depth to firm bottom is about 14 m below the embankment. (May 1, 2006)

GWP156-98-00

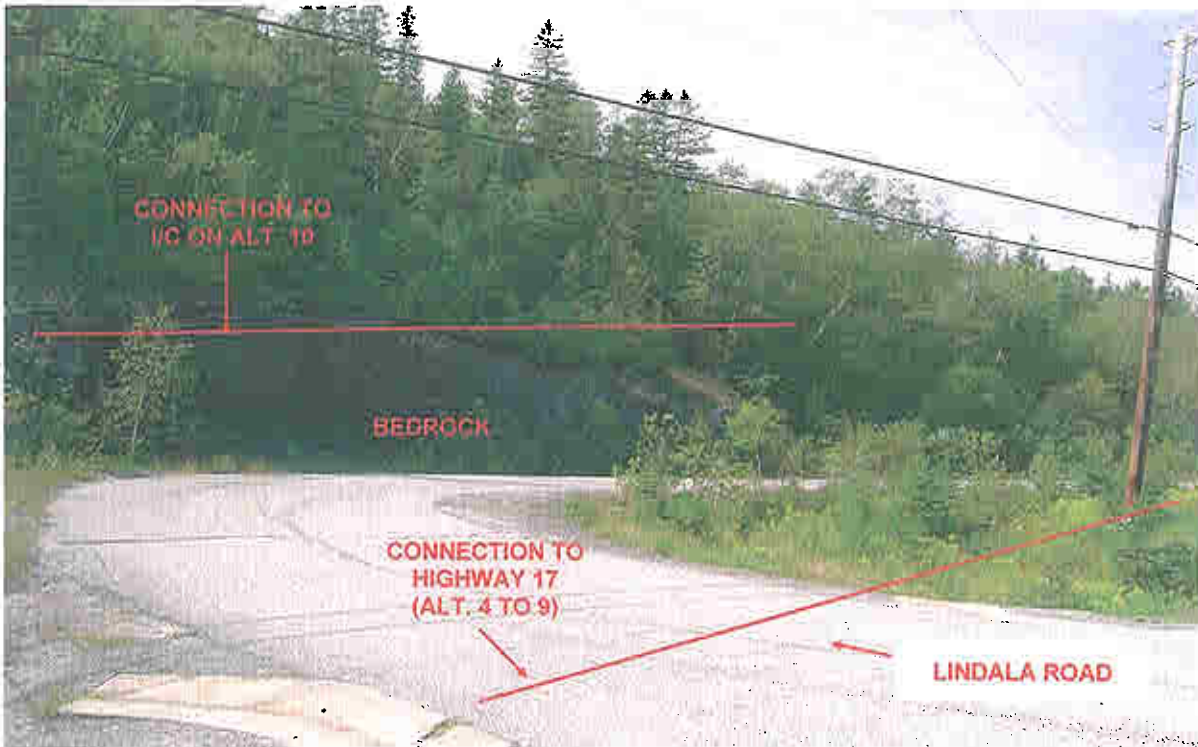
Peto MacCallum Ltd.



Photograph 8 VIEW: Looking north along Sudbury Municipal Road 55 about 350 m south of Highway 17 intersection. Bedrock outcrop visible in centre of photograph. (August 2005)

GWP156-98-00

Peto MacCallum Ltd.



Photograph 9 VIEW: Looking south along Lindala Road at shoulder south of Sudbury Municipal Road 55. Bedrock cut (6 m) readily visible at road bend. (August 2005)

GWP156-98-00

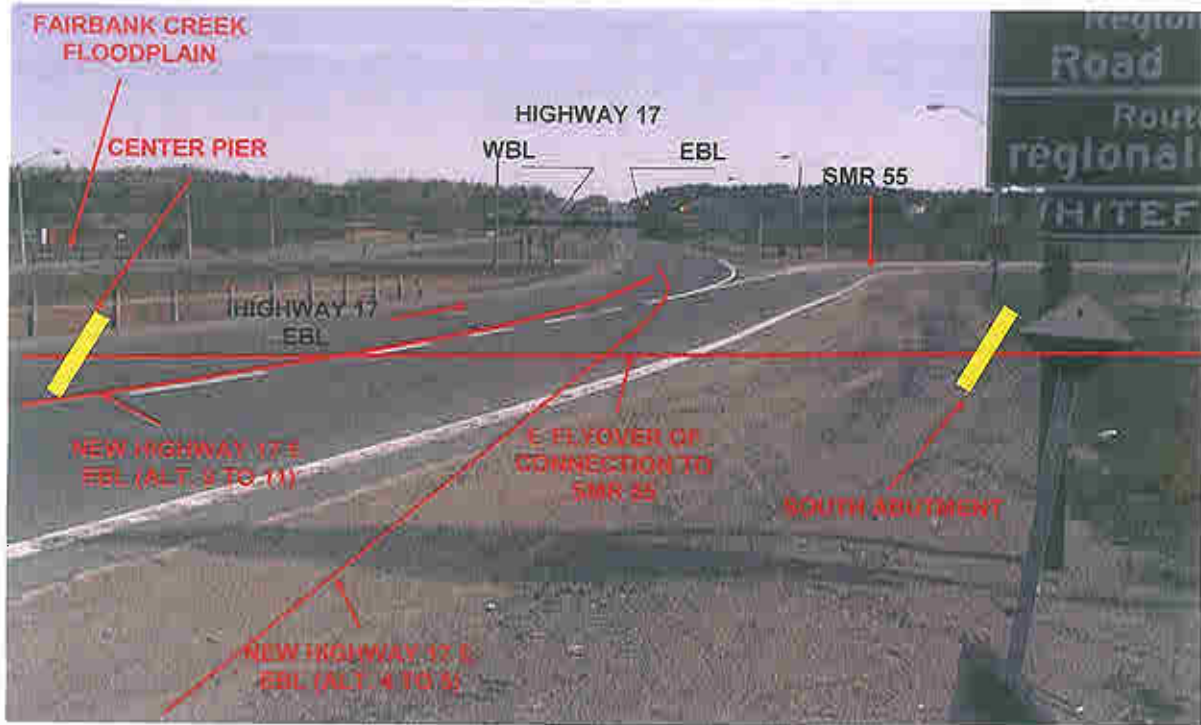
Peto MacCallum Ltd.



Photograph 10 VIEW: Looking southerly along alignment of alternative connection to SMR 55. Embankment on wet swamp between Highway 17 eastbound embankment in foreground and SMR 55 in background. Depth to firm bottom is about 14 to 17 m. (May 1, 2006)

GWP156-98-00

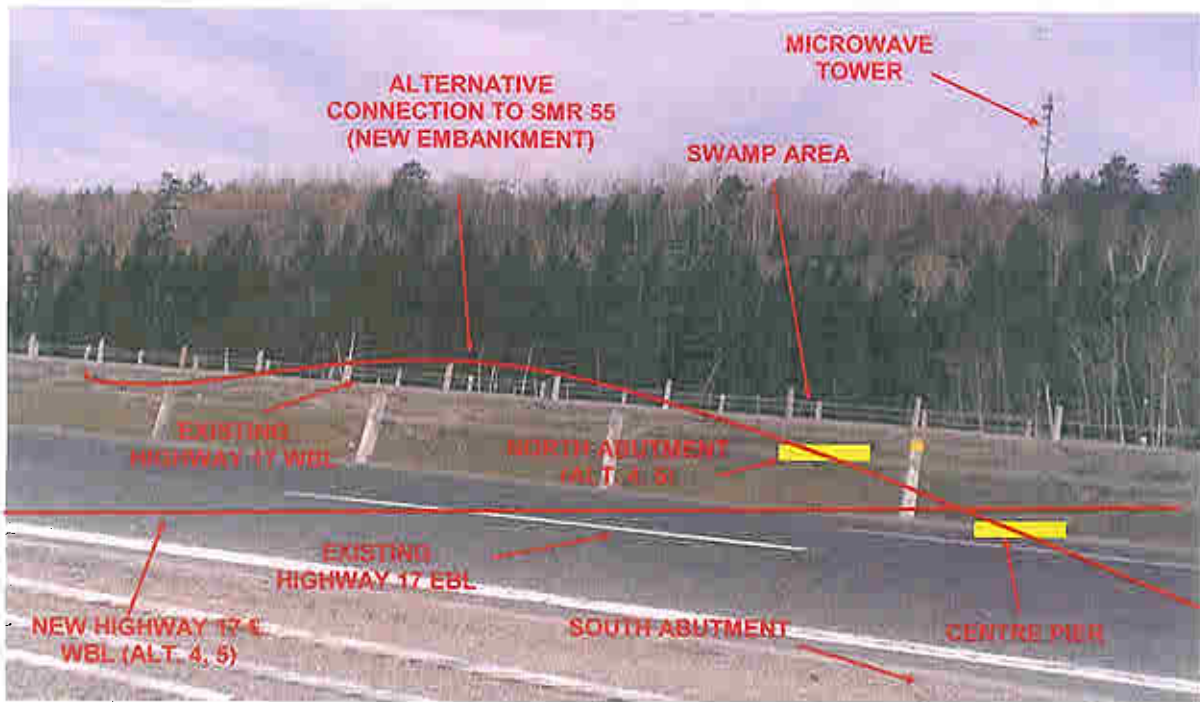
Peto MacCallum Ltd.



Photograph 11 VIEW: Looking east at intersection of SMR 55 centre pier and south abutment of connecting flyover structure (about Sta. 17+550 - Alt. 4). Depth to bedrock about 30 m. Railway overhead in background across existing Highway 17 at east project limit. (May 1, 2006).

GWP156-98-00

Peto MacCallum Ltd.



Photograph 12 VIEW: Looking northerly from south shoulder of Highway 17 EBL (Sta. 17+550 Alt. 4). Embankment and structure alignment (East Option) are applicable to Alternatives 4 to 9. North abutment located north of WBL for Alternatives 6 to 9. Note alignment through swamp area north of WBL. Depth to firm bottom 12 to 15 m. Depth to bedrock 20 to 24 m. (May 1, 2006).

GWP156-98-00

Peto MacCallum Ltd.



Photograph 13 VIEW: Looking southeasterly at Lindala Road from shoulder of Highway 17 EBL. Alignment of centreline for alternative connection using flyover. Former Highway 17 embankment in foreground right. Depth to bedrock over 19 m. Applicable to Alternatives 4 to 9. (May 1, 2006)

GWP156-98-00

Peto MacCallum Ltd



Photograph 14 VIEW: Looking west from end of Lindala Road. Bus travelling on EBL of Highway 17. New structure alternative to connect New Service Road (existing Highway 17 WBL) to Lindala Road. Applicable to Alternatives 4 to 9. Old Highway 17 constructed on swamp lands. Depth to bedrock over 19 m. Depth to firm bottom 14 to 17 m. (May 1, 2006)

GWP156-98-00

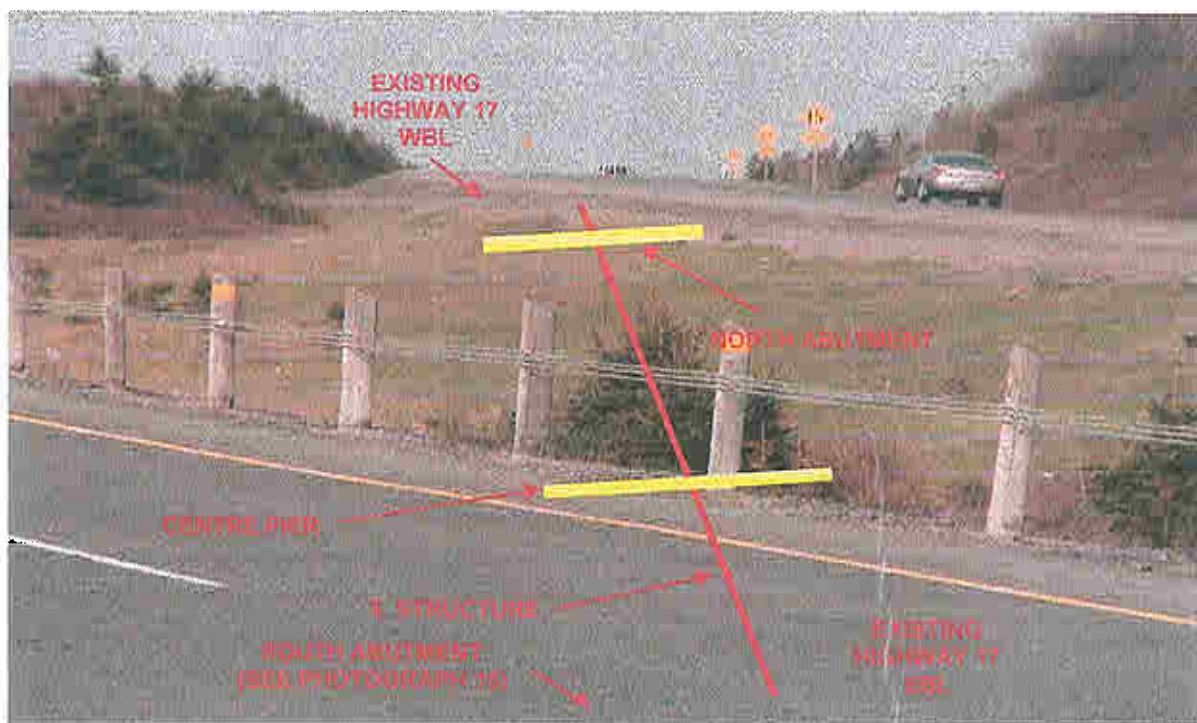
Peto MacCallum Ltd



Photograph 15 VIEW: At end of Lindala Road looking westerly from west end of Lindala Road along centreline of alternative flyover structure to connect to new Service Road (existing Highway 17 WBL). Applicable to Alternatives 4 to 9. Depth to rock is over 19 m. Depth to firm bottom 14 to 17 m. Foreground is former Highway 17 embankment. (May 1, 2006)

GWP156-98-00

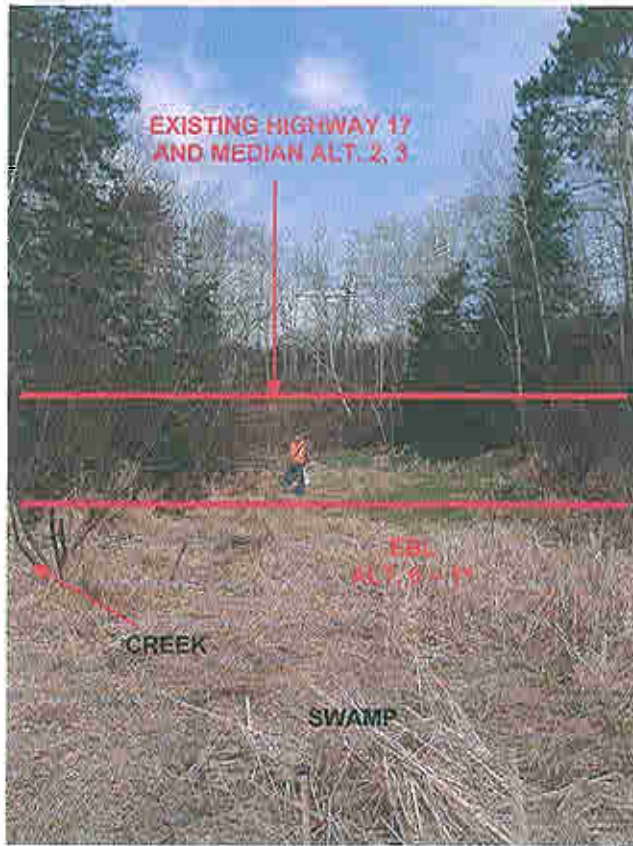
Peto MacCallum Ltd.



Photograph 16 VIEW: Looking westerly at Highway 17 about Sta. 17+250 (Alt. 6). Alternative structure for connection from New Service Road (Highway 17 WBL) to Lindala Road (Alternatives 4 to 9). Depth to bedrock over 19 m. (May 1, 2006)

GWP156-98-00

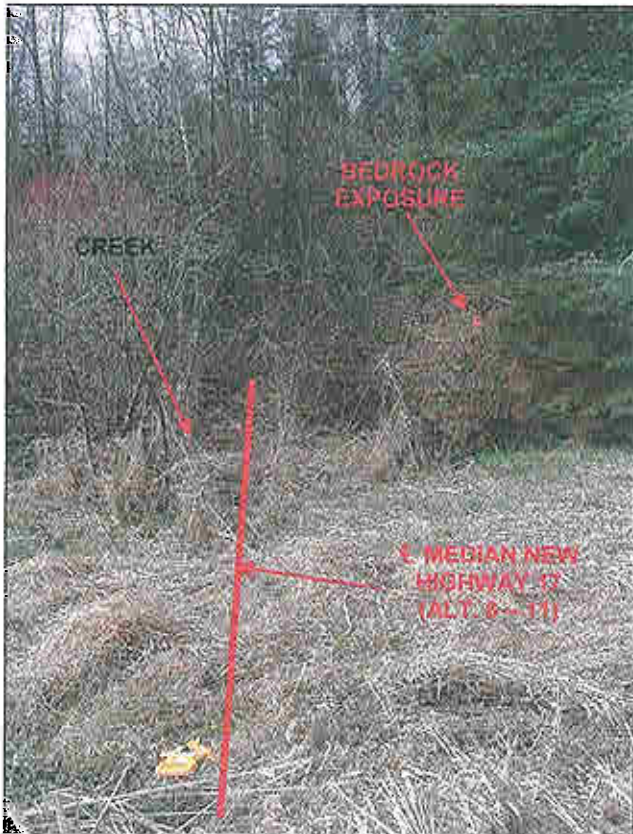
Peto MacCallum Ltd.



GWP156-98-00

Photograph 17 VIEW: Looking north from swamp in creek valley at station 16+920 through Rocha's property Denison Con. 1, Lot 5, PCL 6778, 716 St. Pothier Road. C. Nascimento standing on New Highway 17 EBL of Alt. 6 to 11. (May 1, 2006)

Peto MacCallum Ltd.



GWP156-98-00

Photograph 18 VIEW: Looking westerly across valley of creek in Rocha's property. Potential culvert required at about Sta. 16+900 for New Highway 17 (Alt. 6 to 9) or Sta. 16+880 (Alt. 10 and 11). Rock exposure in creek bank is marked with red cap. (May 1, 2006)

Peto MacCallum Ltd.



Photograph 19 VIEW: Looking west at rock exposure in creek through Rocha's property. Potential culvert location is at about Sta. 16+900 (Alt. 6 to 9) and Sta. 16+880 (Alt. 10 and 11) for New Highway 17. Wet area of crossing is about 20 to 30 m wide. (May 1, 2006)

GWP156-88-00

Peto MacCallum Ltd.



Photograph 20 VIEW: Looking west along new Highway 17 alignment of Alt. 4 and 5 (Sta. 17+020) through pond of beaver dam on Rocha's property. Side slopes of ponded water consist of clayey silt. B.R. Gray standing on centreline median. Potential culverts required through 30 to 40 m wide crossing. (May 1, 2006)

GWP156-98-00

Peto MacCallum Ltd.



Photograph 21 VIEW: Looking northerly across beaver dams on creek through Rocha's property. Potential culvert required at about Sta. 17+020 (Alt. 4 and 5) New Highway 17. Pond created by beaver dam is about 30 to 40 m across. (May 1, 2006)

GWP156-98-00

Peto MacCallum Ltd.



Photograph 22 VIEW: Looking south across pond of beaver dam immediately north of potential connecting road from St. Pothier Road to Lindala Road, approximately south of Sta. 17+050 (Alt. 4). Swamp crossing is about 40 m wide, culvert required. (May 1, 2006)

GWP156-98-00

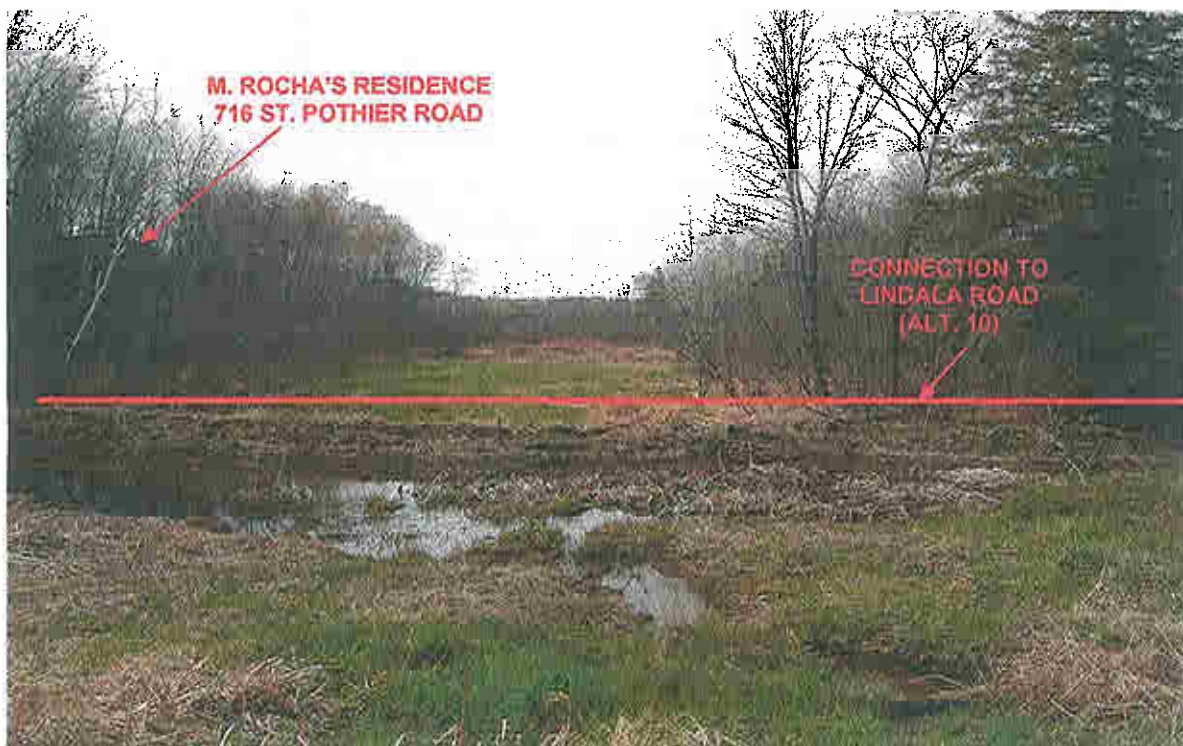
Peto MacCallum Ltd.



Photograph 23 VIEW: Looking south at connecting roads to Lindala Road for Alternatives 10 and 11 through swamp and creek of Rocha's land. Swamp is about 40 m wide. Culverts are required. (May 1, 2006)

GWP156-98-00

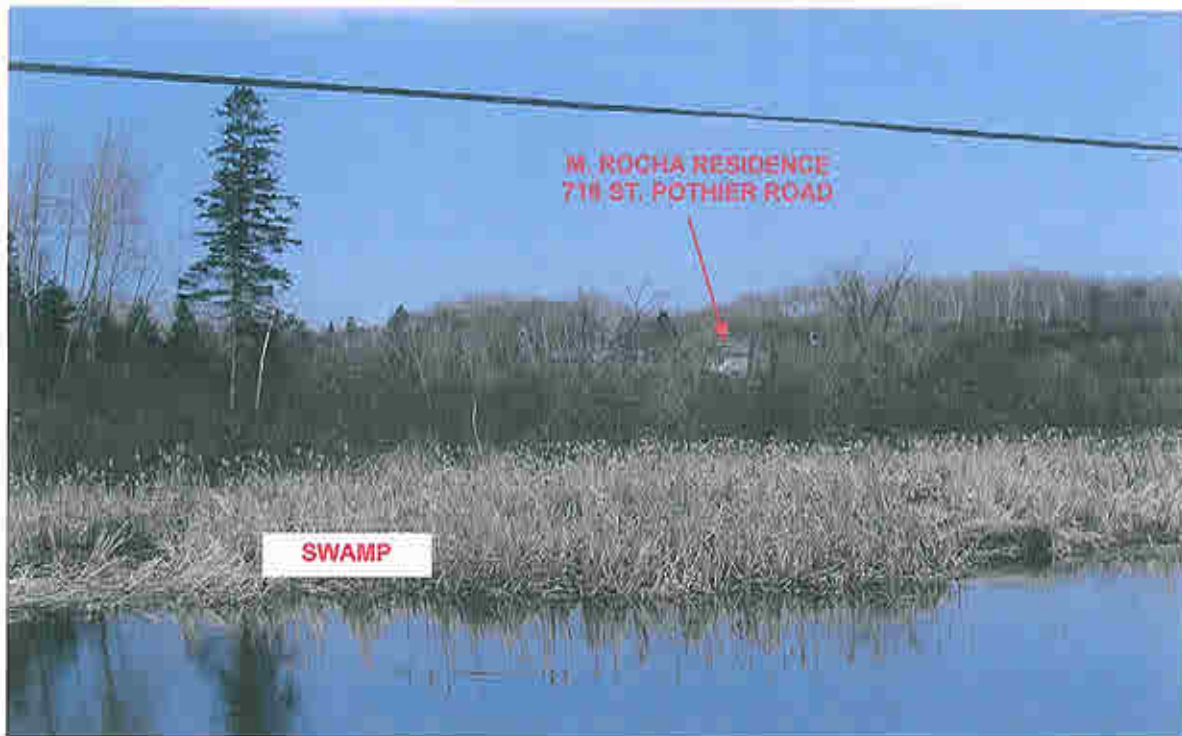
Peto MacCallum Ltd.



Photograph 24 VIEW: Looking south at connecting road to Lindala Road for Alt. 10 New Highway 17. Embankment through swamp will require a culvert. (May 1, 2006)

GWP156-98-00

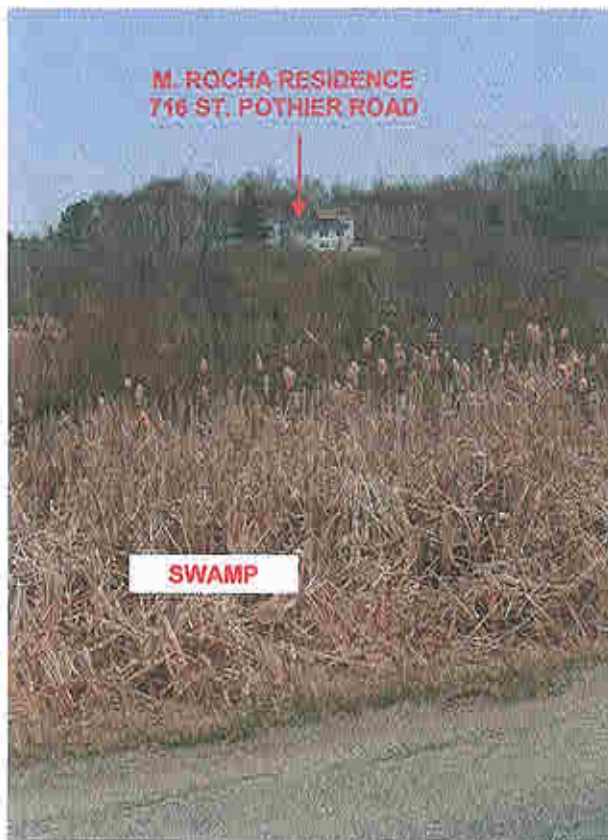
Peto MacCallum Ltd.



Photograph 25 VIEW: Looking north from eastbound St. Pothier Road at about 1100 m east of Den/Lou Road. Possible new connection of Sudbury Municipal Road 55, just west of swamp area. (May 1, 2006)

GWP156-98-00

Peto MacCallum Ltd.



Photograph 26 VIEW: Looking north from north shoulder St. Pothier Road about 1250 m east of Den/Lou Road. (May 1, 2006)

GWP156-98-00

Peto MacCallum Ltd.



Photograph 27 VIEW: Looking east at exposed 2 m overburden slope at rear of M. Rocha residence, 716 St. Pothier Road. Soil profile comprised upper 1 m of reddish brown fine sandy silt over dense grey silt. (May 1, 2006)

GWP156-98-00

Peto MacCallum Ltd.



Photograph 28 VIEW: Typical outcrops/ridges west section, Rocha property, Denison Con. 1, Lot 5, PCL 6778, 716 St. Pothier Road. (May 1, 2006)

GWP156-98-00

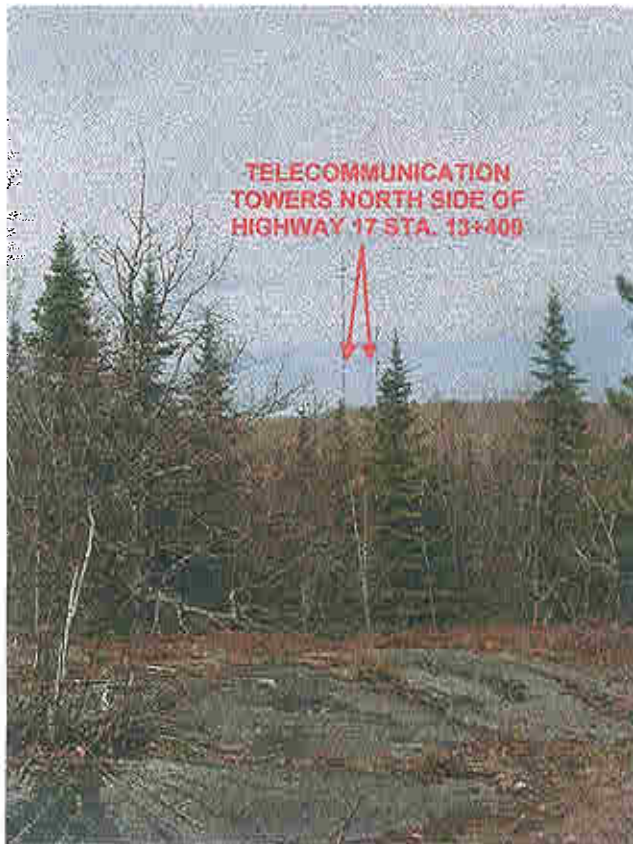
Peto MacCallum Ltd.



Photograph 29 VIEW: Typical outcrops/ridges west section, M. Rocha property, Denison Con. 1, Lot 5, PCL 6778, 716 St. Pothier Road. (May 1, 2006)

GWP156-98-00

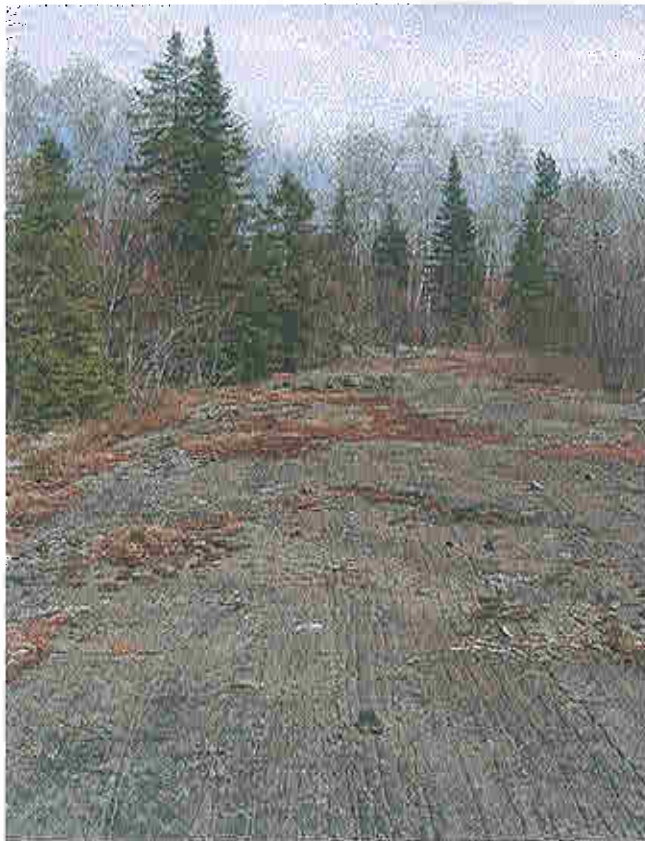
Peto MacCallum Ltd.



Photograph 30 VIEW: Typical outcrops/ridges west section, M. Rocha property, Denison Con. 1, Lot 5, PCL 6778, 716 St. Pothier Road. (May 1, 2006)

GWP156-98-00

Peto MacCallum Ltd.



Photograph 31 VIEW: Typical outcrops/ridges west section, M. Rocha property, Denison Con. 1, Lot 5, PCL 6778, 716 St. Pothier Road. Note striation of rock surface from glacial action. (May 1, 2006)

GWP156-98-00

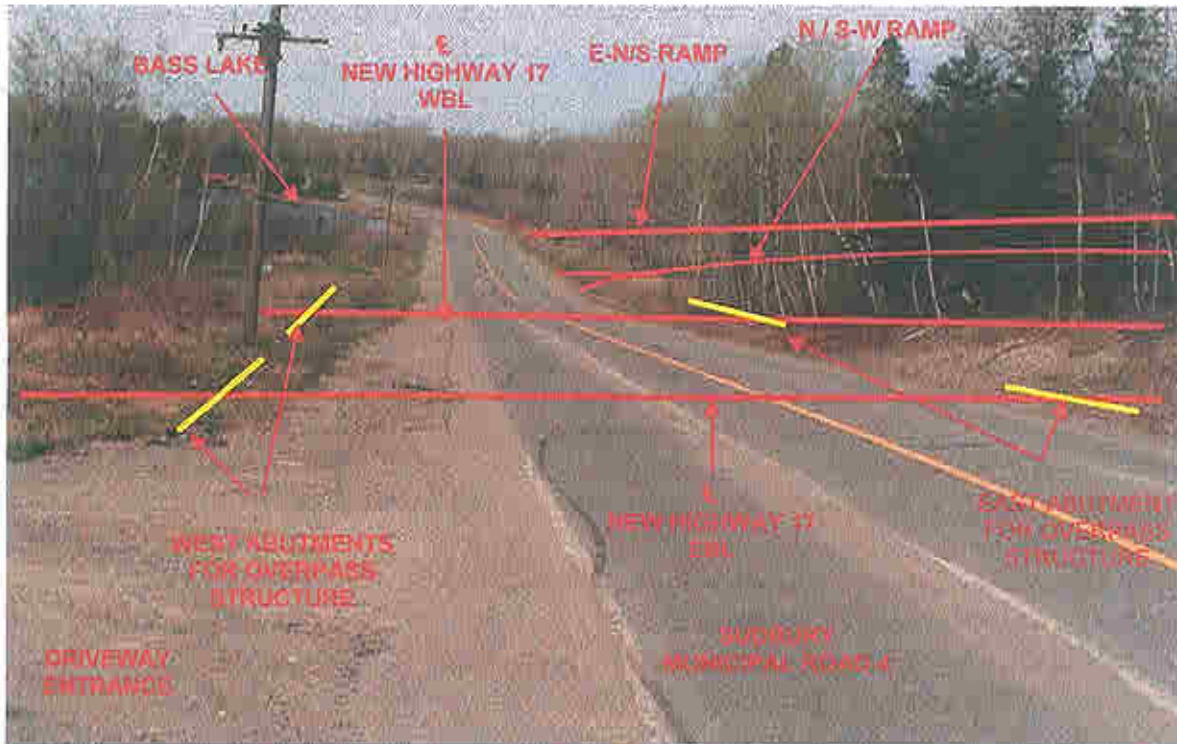
Peto MacCallum Ltd.



Photograph 32 VIEW: Looking southeast from roadway to cul-de-sac off Elden Avenue south of Highway 17. New Highway 17 EBL centreline (Alt 3) to left of photograph. Tie-in for Alt. 10 to centre right. Alignment for Alt. 9 to 11 in distance right. Flat open field to rolling terrain at bush line. Massive rock outcrop on M. Rocha property in distance. (August 2005)

GWP156-98-00

Peto MacCallum Ltd.



Photograph 33 VIEW: Looking north from west shoulder of Sudbury Municipal Road 4 (SMR 4) about 350 m north of Highway 17. Alternative 1 New Highway 17 north alignment. Bass Lake on west side SMR 4 in distance. (May 1, 2006)

GWP156-98-00

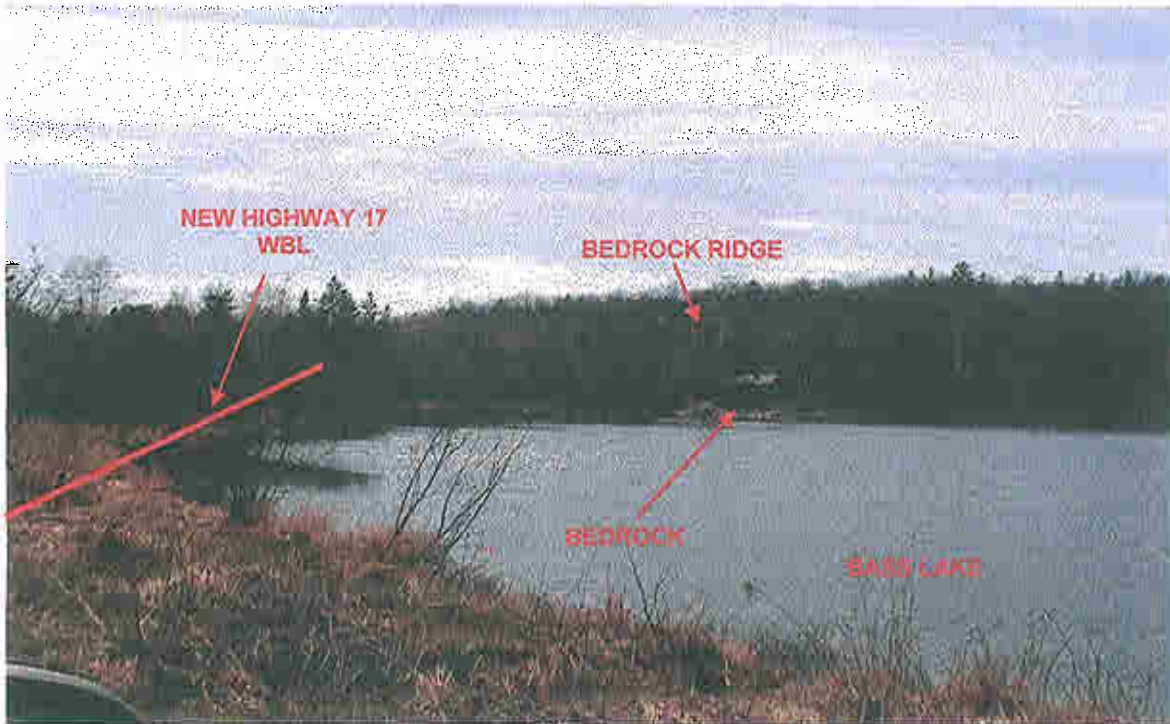
Peto MacCallum Ltd.



Photograph 34 VIEW: Looking north from east shoulder of SMR 4 about 450 m north of existing Highway 17. Alternative 1 – New Highway 17 north alignment. (May 1, 2006)

GWP156-98-00

Peto MacCallum Ltd.



Photograph 35 VIEW: Looking west across Bass Lake from west shoulder of SMR 4 about 500 m north of existing Highway 17. Alternative 1 – New Highway 17 north alignment. (May 1, 2006)

GWP156-98-00

Peto MacCallum Ltd.



Photograph 36 VIEW: Looking west from west shoulder of SMR 4 about 350 m north of Highway 17. Bedrock outcrop in foreground. Rock ridge in the distance. Alternative 1 – New Highway 17 north alignment. (May 1, 2006)

GWP156-98-00

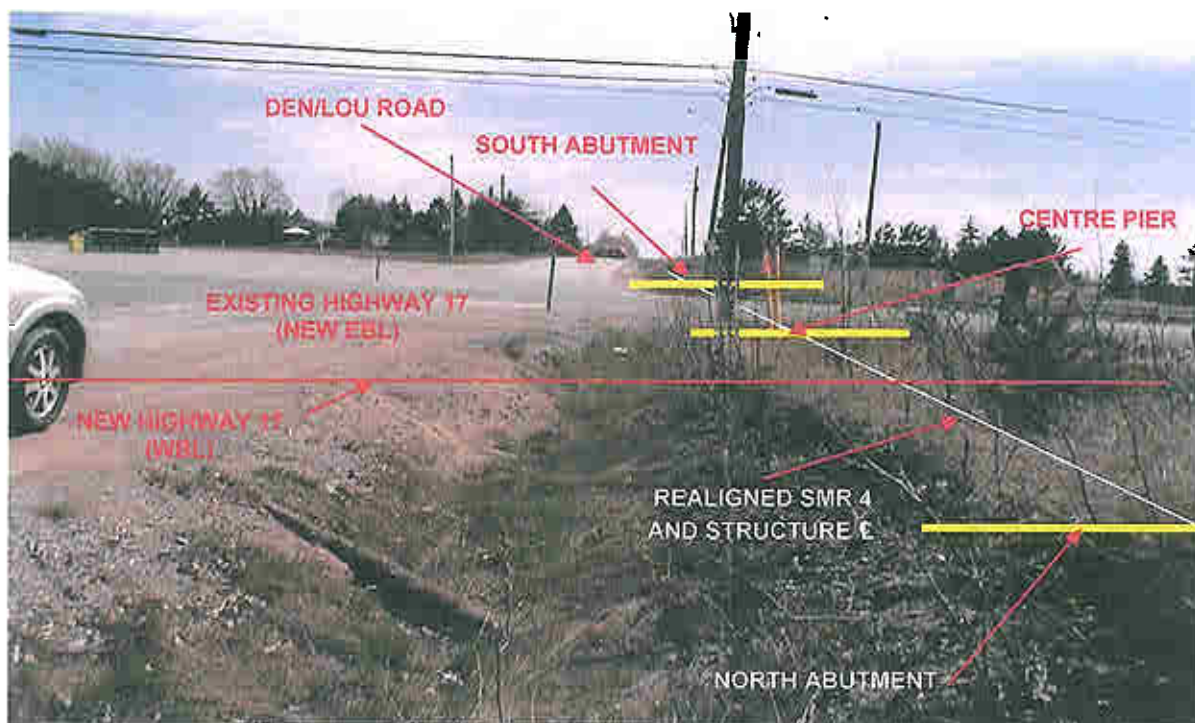
Peto MacCallum Ltd.



Photograph 37 VIEW: Looking east from west shoulder of SMR 4 about 350 m north of Highway 17. Rock ridge behind tree line. Alternative 1: New Highway 17 north alignment. (May 1, 2006)

GWP156-98-00

Peto MacCallum Ltd.



Photograph 38 VIEW: Looking south from west ditch of SMR 4 about 50 m north of Highway 17. Alternative 2 – New Highway 17 Twinning North. Bedrock at 12 to 15 m at new structure. (May 1, 2006)

GWP156-98-00

Peto MacCallum Ltd.



Photograph 39 VIEW: Looking east from east shoulder of SMR 4 about 20 m north of Highway 17. Alternative 2: New Highway 17 Twinning North. (May 1, 2006)

GWP156-98-00

Peto MacCallum Ltd.



Photograph 40 VIEW: Looking west along north ditch line of existing Highway 17 from east shoulder of SMR 4. Alternative 2 – New Highway 17 Twinning North. (May 1, 2006)

GWP156-98-00

Peto MacCallum Ltd.



Photograph 41 VIEW: Looking north from west shoulder of Den/Lou Road about 10 m south of Highway 17. Depth to rock at new structure is about 12 to 15 m. Alternative 2 – New Highway 17 Twinning North. (May 1, 2006)

GWP156-98-00

Peto MacCallum Ltd.



Photograph 42 VIEW: Looking north from east shoulder of Den/Lou Road about 30 m south of Highway 17. Depth to rock about 12 to 15 m. Alternative 3 – New Highway 17 Twinning South Alignment. (May 1, 2006)

GWP156-98-00

Peto MacCallum Ltd.



Photograph 43 VIEW: Looking west from west side of Den/Lou Road along south ditch line Highway 17. Alternative 3 – New Highway 17 Twinning south alignment. (May 1, 2006)

GWP156-98-00

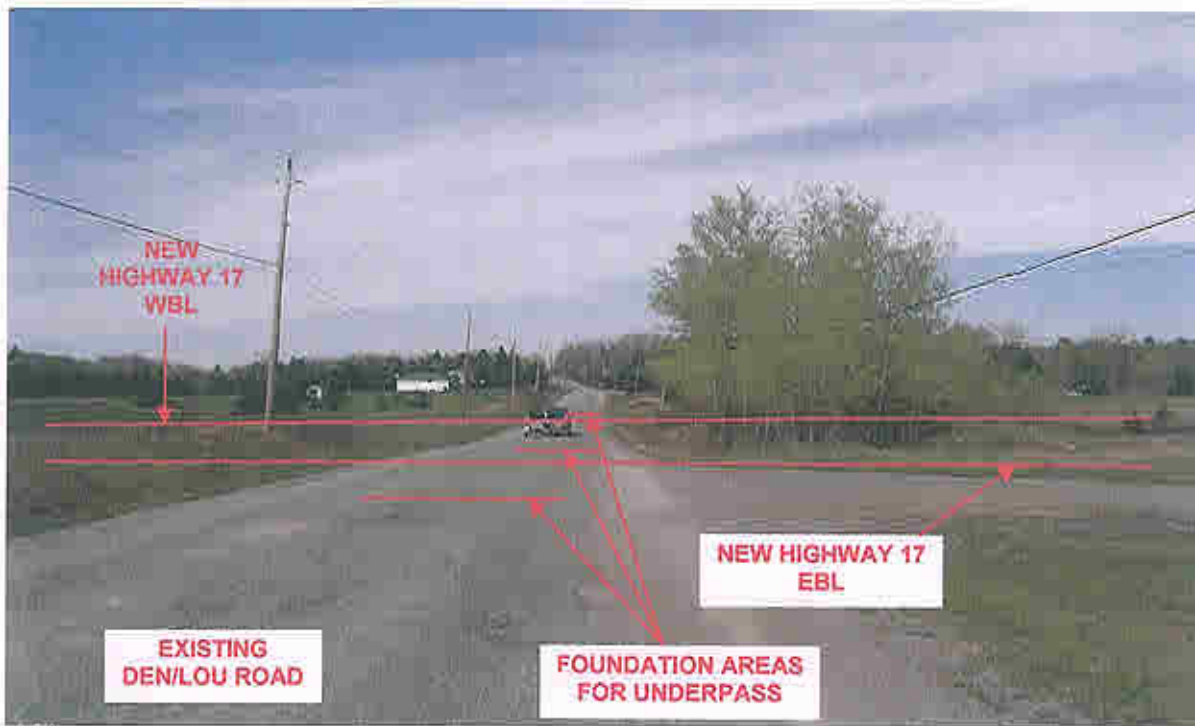
Peto MacCallum Ltd.



Photograph 44 VIEW: Looking east from west shoulder Den/Lou Road about 15 m south of Highway 17. Alternative 3 – New Highway 17 Twinning south alignment. (May 1, 2006)

GWP156-98-00

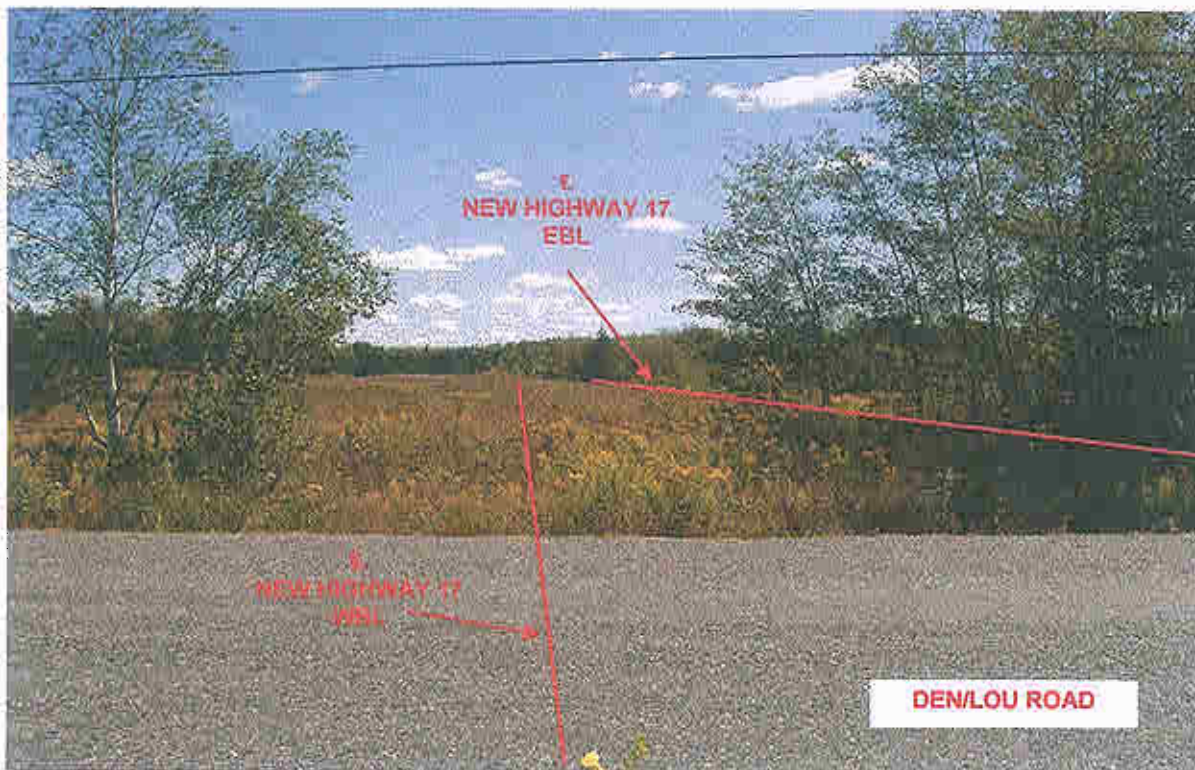
Peto MacCallum Ltd.



Photograph 45 VIEW: Looking north from east shoulder of Den/Lou Road in front of West Walden Library at foundation areas for interchange underpass. New Highway 17 Alternatives 7, 8 and 9 south alignment. (May 1, 2006)

GWP156-98-00

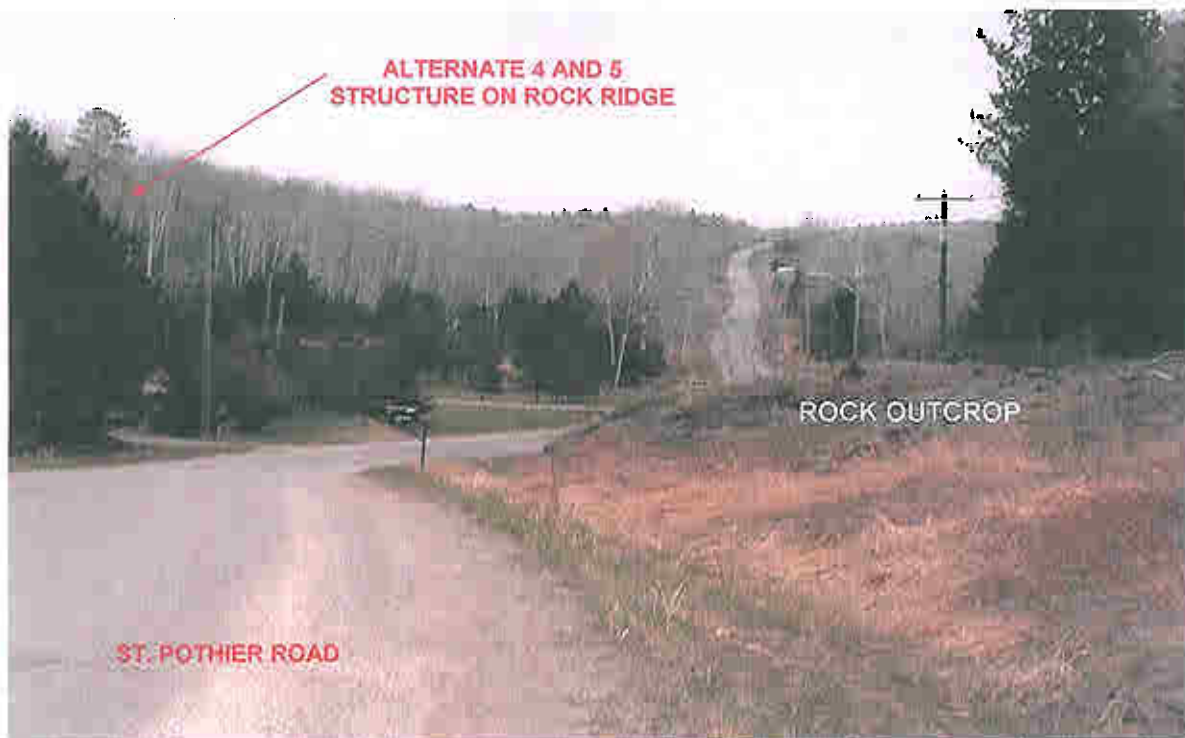
Peto MacCallum Ltd.



Photograph 46 VIEW: Looking east from west shoulder of Den/Lou Road along proposed extension of Highway 17. Flat open field to rolling terrain at bush line. (August 2005)

GWP156-98-00

Peto MacCallum Ltd.



Photograph 47 VIEW: Looking east from south shoulder of St. Pothier Road about 450 m east of Den/Lou Road. Bedrock outcrop on south side of road. (May 1, 2006)

GWP156-98-00

Peto MacCallum Ltd.



Photograph 48 VIEW: Looking north from south shoulder of St. Pothier Road about 630 m east of Den/Lou Road. Massive +10 m bedrock ridge exposed beyond residence at 550 St. Pothier Road. (May 1, 2006)

GWP156-98-00

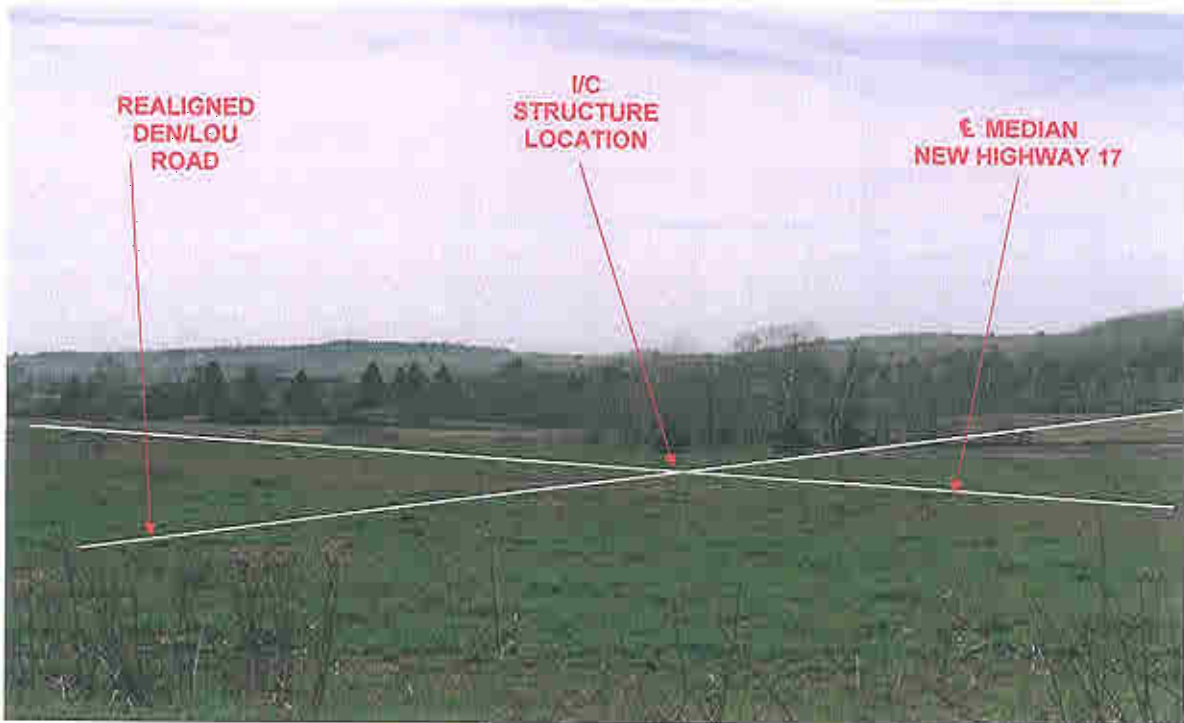
Peto MacCallum Ltd.



Photograph 49 VIEW: Looking north from south shoulder of St. Pothier Road about 720 m east of Den/Lou Road. Massive +10 m bedrock ridge exposed beyond residence at 564 St. Pothier Road. (May 1, 2006)

GWP156-98-00

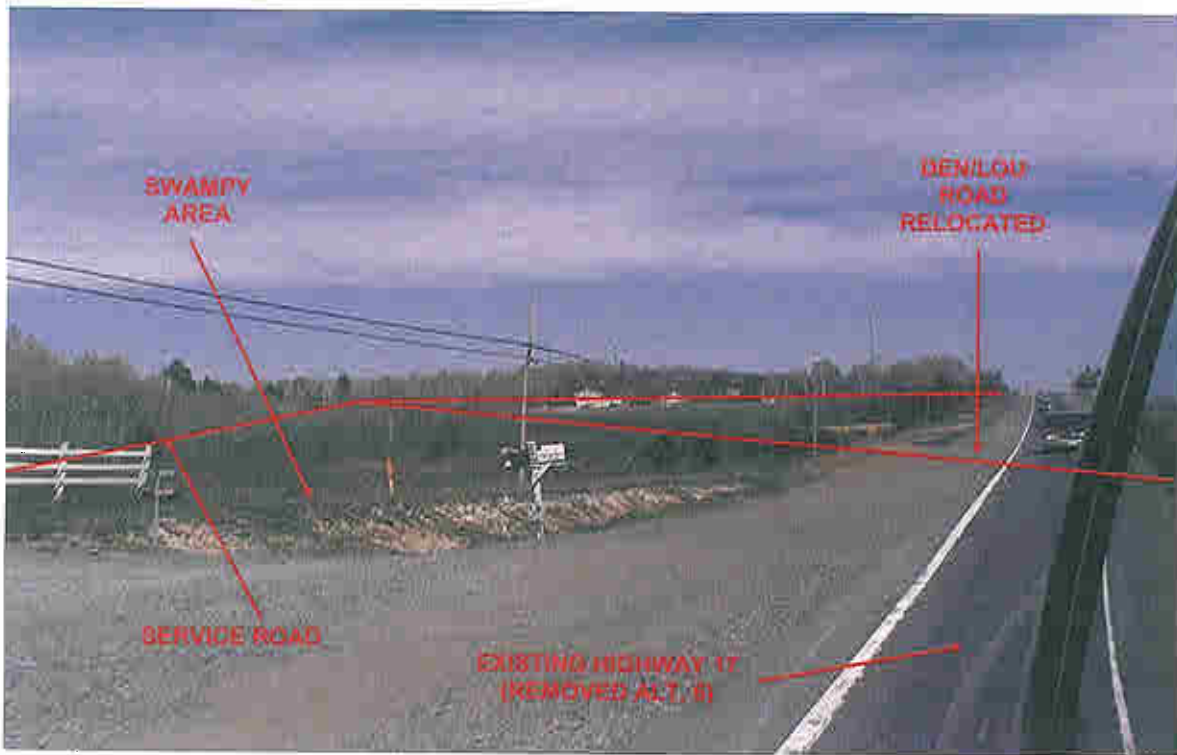
Peto MacCallum Ltd.



Photograph 50 VIEW: Looking west from west shoulder of Den/Lou Road to new Parclo A I/C at 350m in distance at tree line. (Alternative 6) Depth of rock at new structure 9 to 12m (May 1, 2006)

GWP156-98-00

Peto MacCallum Ltd.



Photograph 51 VIEW: Looking east from existing Highway 17 WBL at about station 15+100. Alternative 6 – Parclo A I/C 350 m west of Den/Lou Road. (May 1, 2006)

GWP156-98-00

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Photograph 52 VIEW: Looking north from Highway 17 WBL at about station 14+700. (May 1, 2006)

GWP156-98-00

Peto MacCallum Ltd.



Photograph 53 VIEW: Looking north from north side of St. Pothier Road at about station 14+750. Alternatives 4 to 11 New Highway 17 south alignment. (May 1, 2006)

GWP156-98-00

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Photograph 54 VIEW: Looking north from south side of St. Pothier Road at about station 14+500. Alternatives 4 to 11 New Highway 17 south alignment. (May 1, 2006)

GWP156-98-00

Peto MacCallum Ltd.



Photograph 55 VIEW: Looking west from east shoulder of St. Pothier Road about 30 m south of intersection with Highway 17. New Highway 17 twinning to south across swamp and bedrock area. (May 1, 2006)

GWP156-98-00

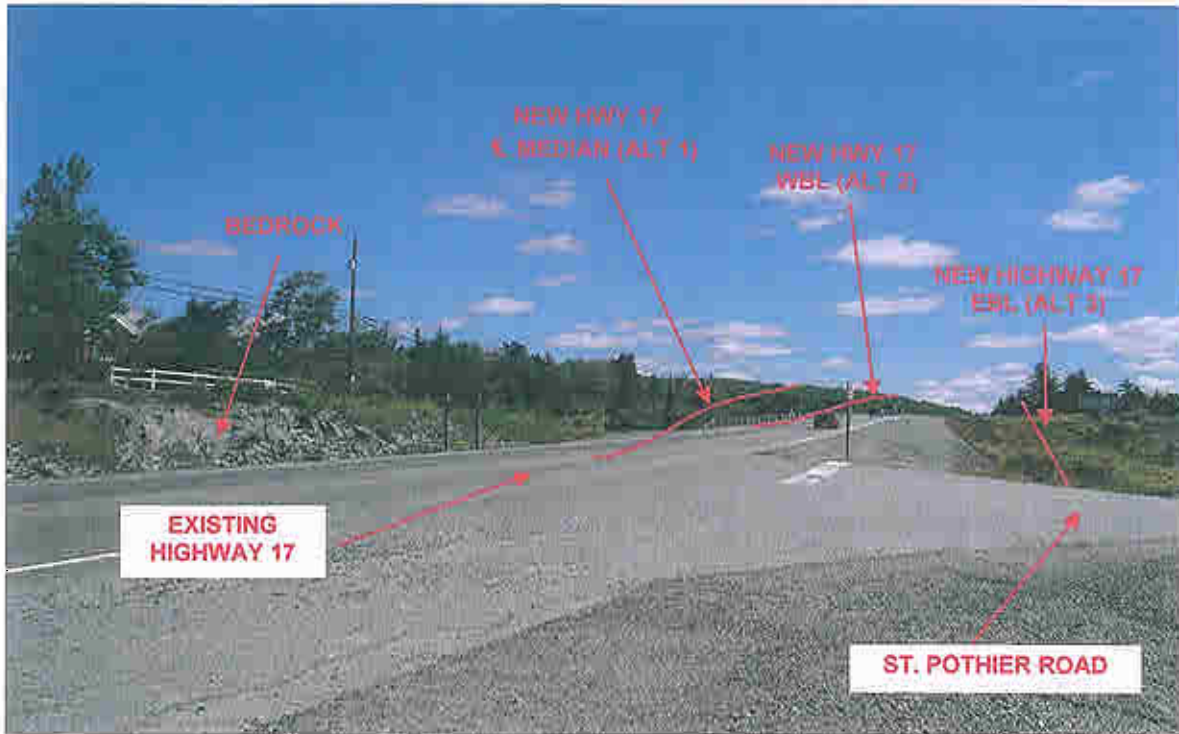
Peto MacCallum Ltd.



Photograph 56 VIEW: Looking east from east shoulder of St. Pothier Road about 40 m south of intersection with Highway 17. New Highway 17 twinning to south across glacialustrine plain. (May 1, 2006)

GWP156-98-00

Peto MacCallum Ltd.



Photograph 57 VIEW: Looking east from south shoulder of Highway 17, just west of St. Pothier Road intersection. Bedrock exposure (1.2 to 3 m) on north (left) side of Highway 17, Sta. 13+360 Denison Township. Private residence (7090) in mid photograph, left. (August 2005)

GWP156-98-00

Peto MacCallum Ltd.



Photograph 58 VIEW: Close up Photograph 55. (May 1, 2006)

GWP156-98-00

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Photograph 59 VIEW: Looking east from east shoulder of Hamersveld Road about 10 m south of Highway 17. New Highway 17 twinning to south through bedrock ridge. (May 1, 2006)

GWP156-98-00

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Photograph 60 VIEW: Looking west from east shoulder of Hamersveld Road about 10 m south of Highway 17. New Highway 17 twinning to south across swamp to bedrock ridge. (May 1, 2006)

GWP156-98-00

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Photograph 61 VIEW: Looking east from south shoulder of Highway 17 about 350 m west of Hamersveld Road. New Highway 17 twinning to south through bedrock ridge. (May 1, 2006)

GWP156-98-00

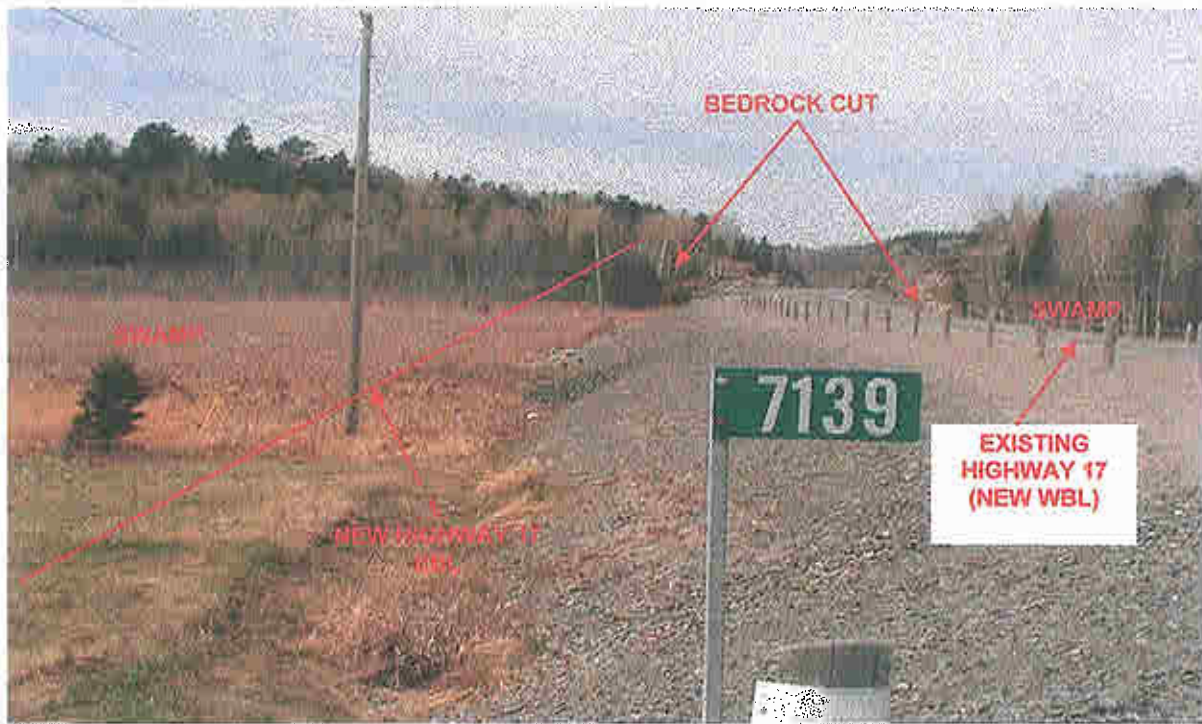
Peto MacCallum Ltd



Photograph 62 VIEW: Looking west from south shoulder of Highway 17 about 350 m west of Hamersveld Road. New Highway 17 twinning to south across 300 m wide deep swamp area. (May 1, 2006)

GWP156-98-00

Peto MacCallum Ltd



Photograph 63 VIEW: Looking west of driveway at 7139 Highway 17 about 500 m west of Hamersveld Road. New Highway 17 twinning to south across 300 m wide deep swamp area. (May 1, 2006)

GWP156-98-00

Peto MacCallum Ltd.



Photograph 64 VIEW: Looking south of driveway at 7139 Highway 17 about 500 m west of Hamersveld Road. New Highway 17 twinning to south across 300 m wide open water deep swamp area. (May 1, 2006)

GWP156-98-00

Peto MacCallum Ltd.



Photograph 65 ZOOM VIEW: Looking west from south shoulder of Highway 17 about 500 m east of Fen Road. New Highway 17 twinning to south through bedrock ridge. (May 1, 2006)

GWP156-98-00

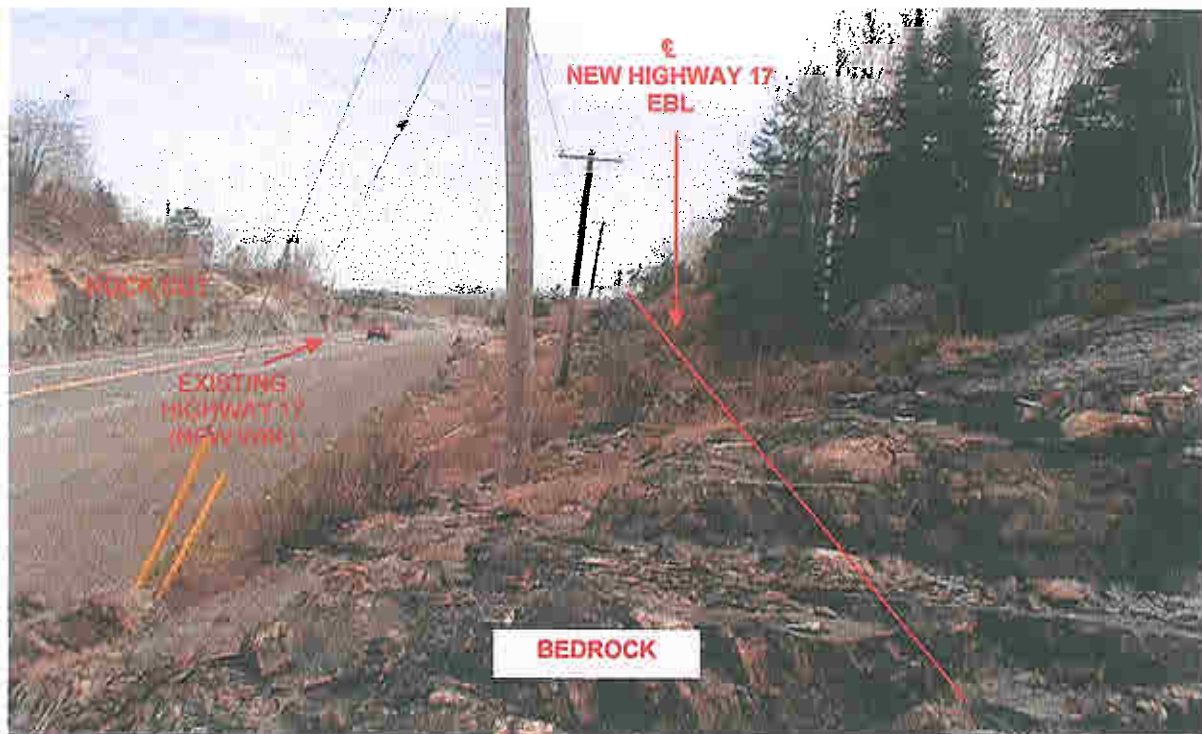
Peto MacCallum Ltd



Photograph 66 VIEW: Looking south from north shoulder of Highway 17 about 200 m east of Fen Road. New Highway 17 twinning to south through bedrock ridge. (May 1, 2006)

GWP156-98-00

Peto MacCallum Ltd



Photograph 67 VIEW: Looking east from south side of existing Highway 17 R.O.W. along extensive bedrock ridge at 200 m east of Fen Road. New Highway 17 twinning to south through bedrock ridge. (May 1, 2006)

GWP156-98-00

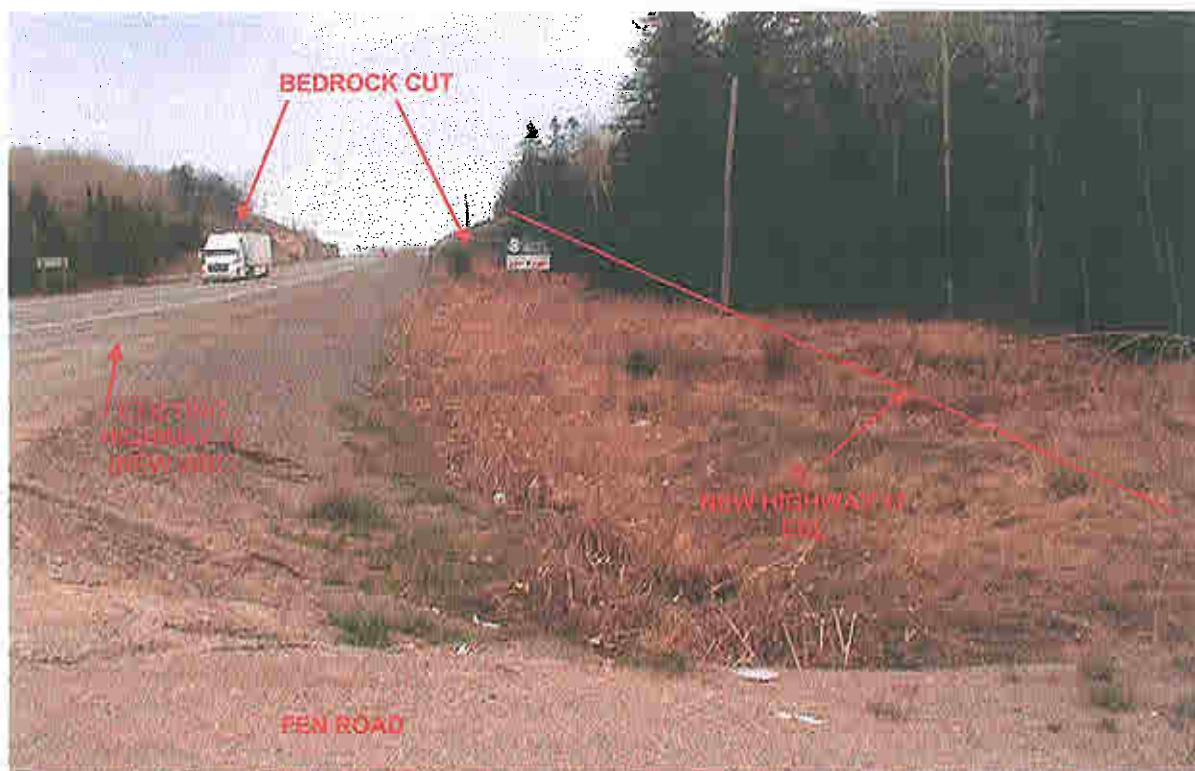
Peto MacCallum Ltd



Photograph 68 VIEW: Looking west from bedrock ridge on south side of existing Highway 17 about 200 m east of Fen Road New Highway 17 twinning to south across swamp area. (May 1, 2006)

GWP156-98-00

Peto MacCallum Ltd



Photograph 69 VIEW: Looking east from east shoulder of Fen Road about 10 m south of Highway 17. New Highway 17 twinning to south across swamp area. (May 1, 2006)

GWP156-98-00

Peto MacCallum Ltd.



Photograph 70 VIEW: Looking west from east shoulder of Fen Road about 10 m south of Highway 17. New Highway 17 twinning to south across swamp area. (May 1, 2006)

GWP156-98-00

Peto MacCallum Ltd.



Photograph 71 ZOOM VIEW: Looking west from south shoulder Highway 17 about 150m west of Fen Road at west project limits. New Highway 17 twinning to south across swamp area and through bedrock ridge. (May 1, 2006)

GWP156-98-00

Peto MacCallum Ltd.



Photograph 72 VIEW: Looking south from EBL of Highway 17 about 250 m west of Fen Road at west project limits. New Highway 17 twinning to south (or transition) through bedrock ridge. (May 1, 2006)

GWP156-98-00

Peto MacCallum Ltd.



Photograph 73 VIEW: Looking east from south shoulder of Highway 17 about 300 m west of Fen Road near west project limits. New Highway 17 twinning to south through bedrock ridge. (May 1, 2006)

GWP156-98-00

Peto MacCallum Ltd.



Photograph 74 VIEW: Looking south west from EBL of Highway 17 about 300 m west of Fen Road near west project limits. New Highway 17 twinning to south across swamp area. (May 1, 2006)

GWP156-98-00

Peto MacCallum Ltd.



Photograph 75 VIEW: Looking north along centreline SMR 3 about 10 m south of south abutment of Highway 17 underpass. (September 12, 2006)



Photograph 76 VIEW: Looking east from east side of existing SMR 3 structure at about Sta.19+040 along existing Highway 17 EB mainline. (September 12, 2006)



Photograph 77 VIEW: Looking east from east side of existing SMR 3 structure at about Sta.19+040 along existing Highway 17 WB mainline. (September 12, 2006)



Photograph 78 VIEW: Looking south along centreline SMR 3 about 10 m north of north abutment of Highway 17 underpass. (September 12, 2006)



Photograph 79 VIEW: Looking south from north side of Highway 17 at about Sta. 19+060, some 20 m east of SMR 3 underpass structure at south abutment founded on bedrock. (September 12, 2006)



Photograph 80 VIEW: Looking west from west side of existing SMR 3 structure at about Sta. 19+030 along existing Highway 17 EB mainline at Huron Central Railway structure. (September 12, 2006)



Photograph 81 VIEW: Looking west from north rock cut beyond ditch line of WB Highway 17 at about Sta. 19+060, some 20 m east of SMR 3 north abutment. (September 12, 2006)



Photograph 82 VIEW: Looking west from west side of existing SMR 3 structure at about Sta. 19+030 along existing Highway 17 WB mainline at Huron Central Railway structure. (September 12, 2006)



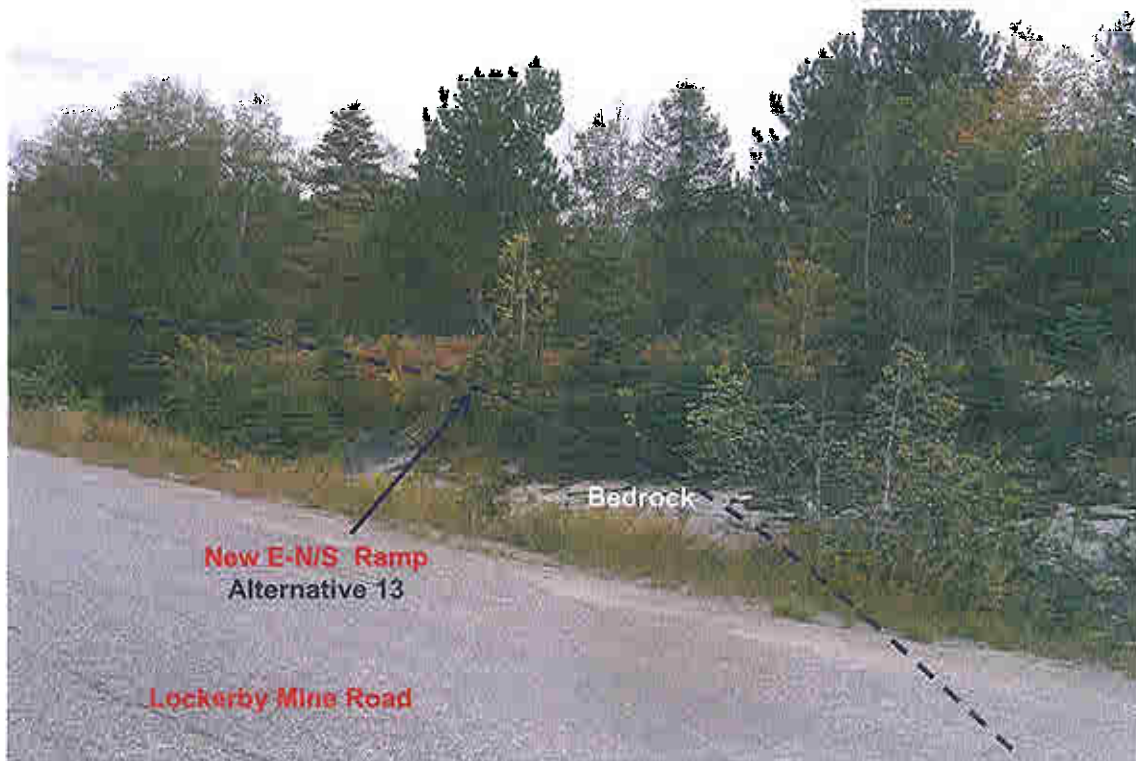
Photograph 83 VIEW: Looking east from west side of SMR 3 about 100 m north of Lockerby Mine Road showing typical shallow bedrock terrain conditions. (September 12, 2006)



Photograph 84 VIEW: Looking south from west shoulder of SMR 3 about 100 m north of Lockerby Mine Road. (September 12, 2006)



Photograph 85 VIEW: Looking west from north shoulder of Lockerby Mine Road about 140 m east of SMR 3. (September 12, 2006)



Photograph 86 VIEW: Looking northwest from south shoulder of Lockerby Mine Road about 200 m east of SMR 3. (September 12, 2006)



Photograph 87 VIEW: Looking southeast from north shoulder of Lockerby Mine Road about 200 m east of SMR 3. Shallow bedrock terrain in bush area across road. (September 12, 2006)



Photograph 88 VIEW: Looking northwest from south shoulder of Lockerby Mine Road about 300 m east of SMR 3. (September 12, 2006)



Photograph 89 VIEW: Looking east from west shoulder of SMR 3 about 230 m south of Highway 17 underpass structure. (September 12, 2006)



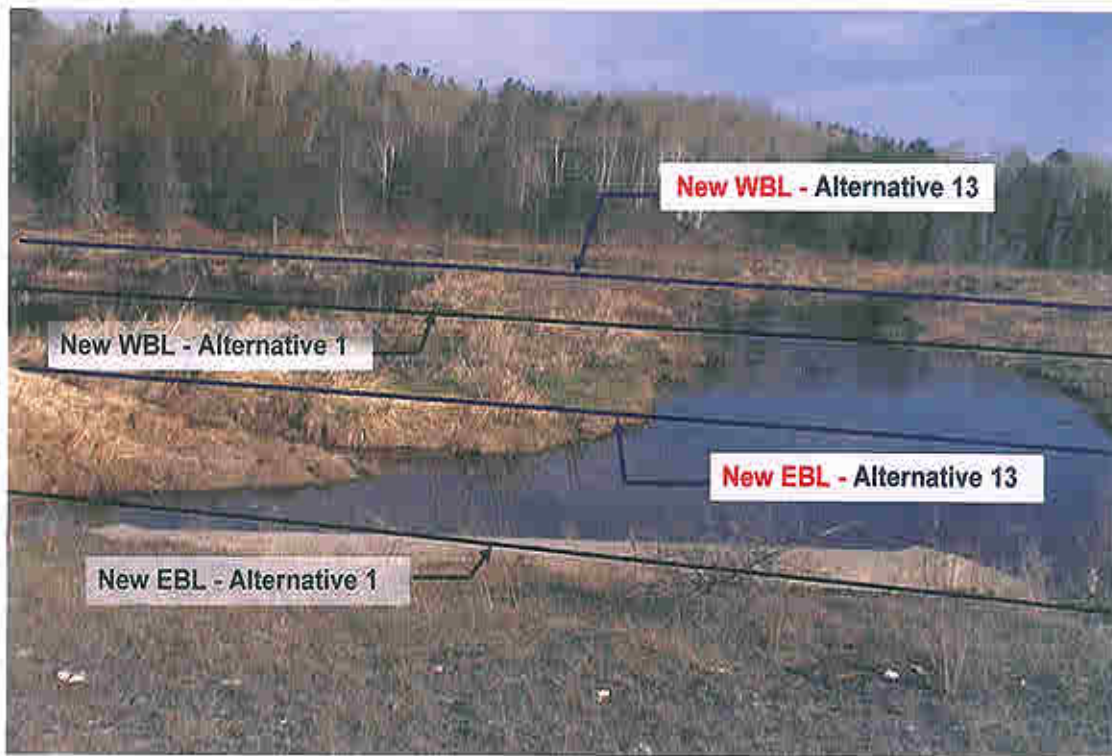
Photograph 90 VIEW: Looking east from west side of SMR 55 at about 300 m south of SMR 55 intersection with Lindala Road. (September 12, 2006)



Photograph 91 VIEW: Looking northeast across Fairbank Creek Floodplain about 150 m east of SMR 55. Estimated depth 10 to 12 m to "firm bottom". (September 12, 2006)



Photograph 92 VIEW: Looking east across Fairbank Creek Floodplain about 150 m east of SMR 55. Estimated depth 10 to 12 m to "firm bottom". (September 12, 2006)



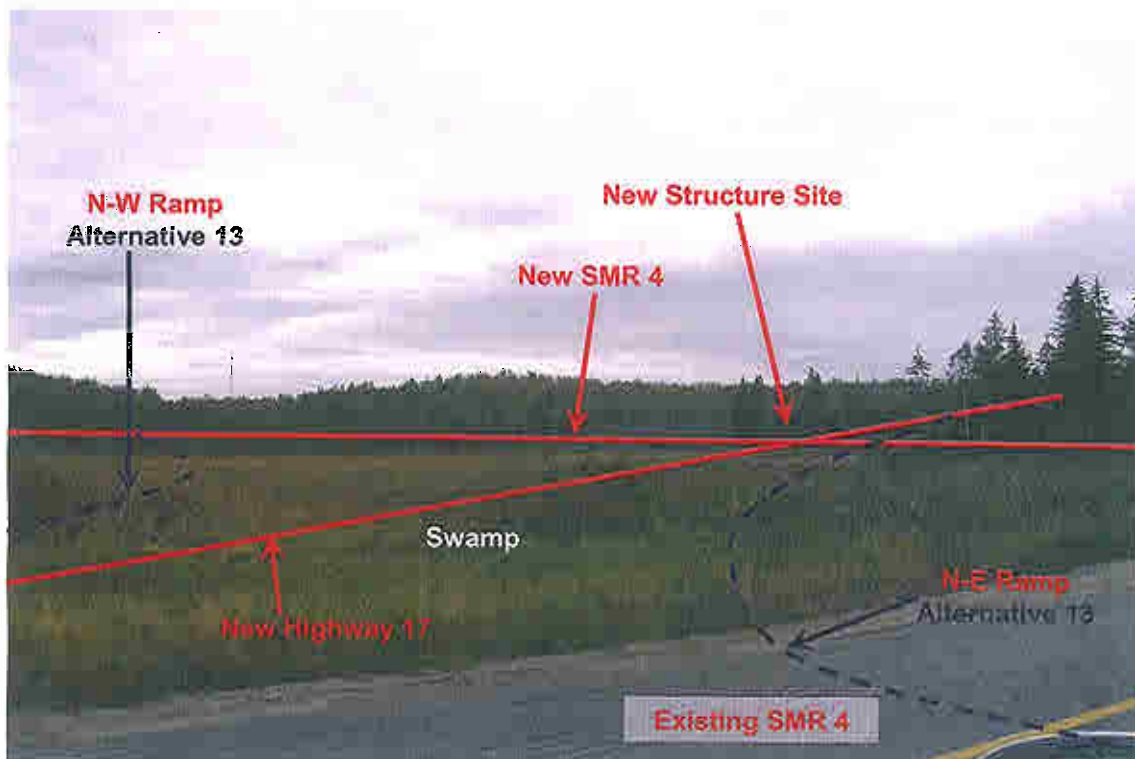
Photograph 93 VIEW: Highway 17 Sta. 17+750 (Alt. 1). Looking north across top of Fairbank Creek culvert. Note open water and swamp. Depth to firm bottom is about 15 m. Artesian conditions exist. (May 1, 2006)



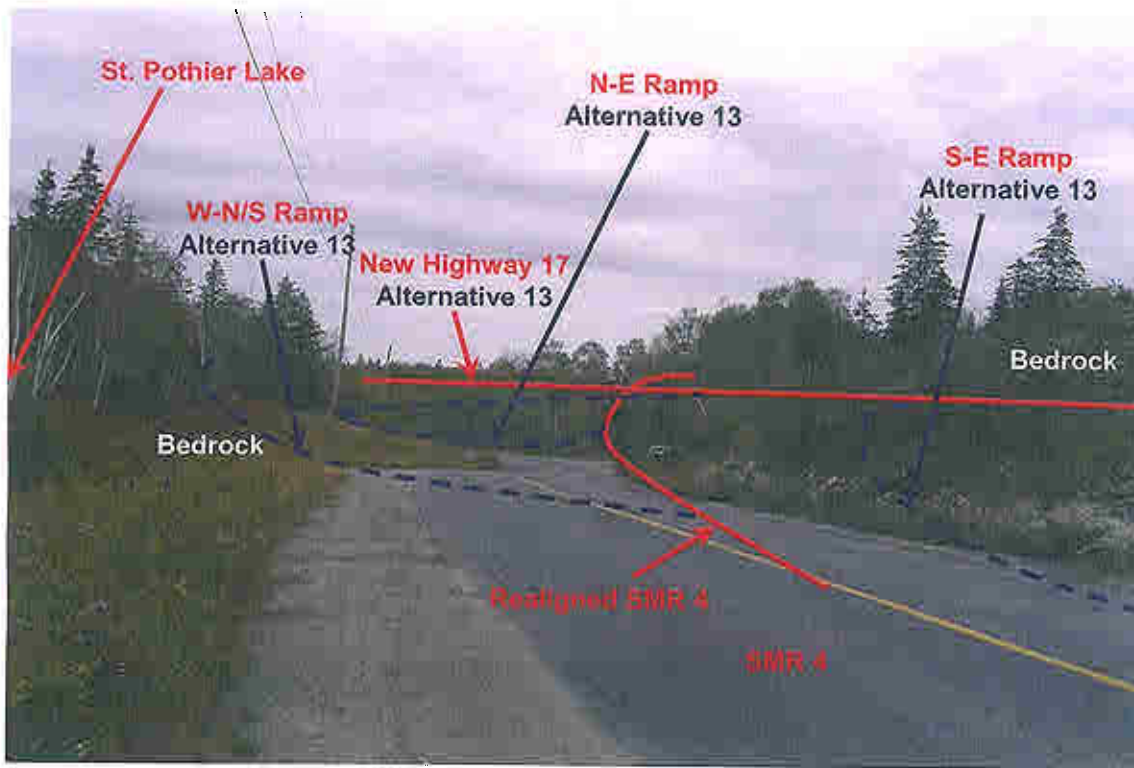
Photograph 94 VIEW: Looking south from bedrock outcrop on south side of Huron Central Railway about 250 m east of existing SMR 3/SMR 4 intersection. (September 12, 2006)



Photograph 95 VIEW: Looking south from north shoulder of SMR 3 about 250 m east of existing intersection with SMR 4. (September 12, 2006)



Photograph 96 VIEW: Looking east from west shoulder SMR 4 about 500 m south of intersection with SMR 3 across major swamp area. (September 12, 2006)



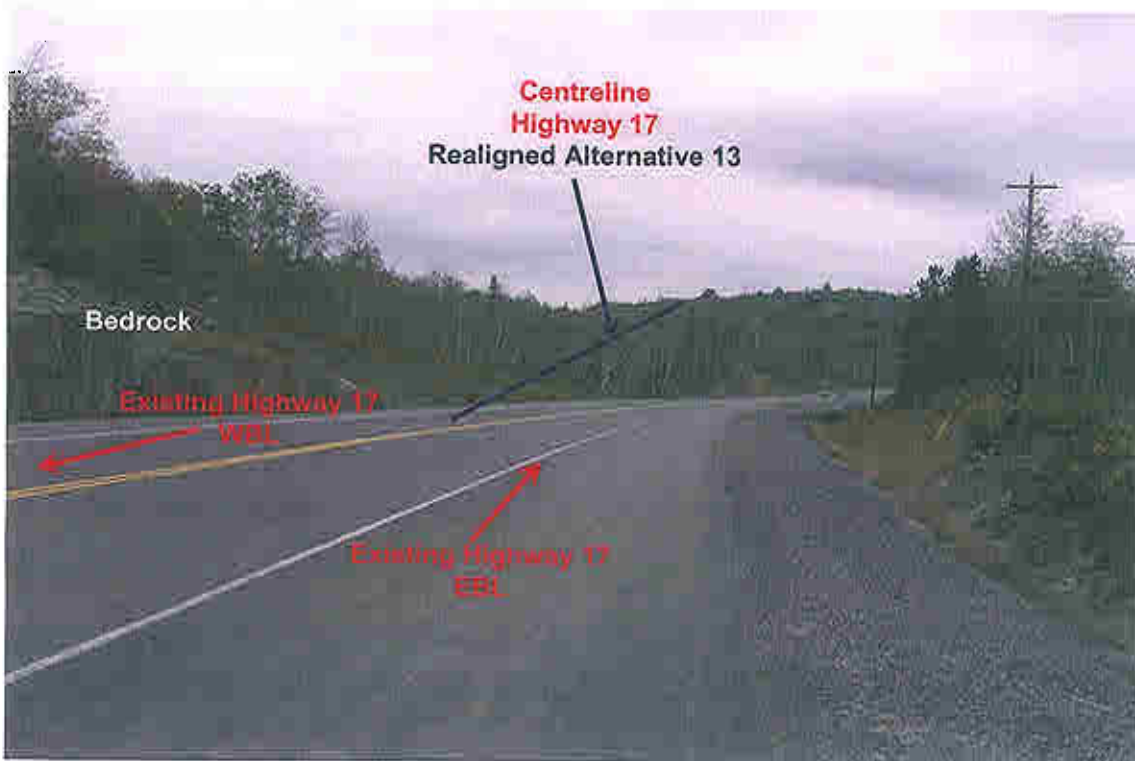
Photograph 97 VIEW: Looking north from west shoulder of SMR 4 about 850 m south of intersection with SMR 3. Bedrock exposures visible at north end of Pothier Road abutting SMR 4. (September 12, 2006)



Photograph 98 VIEW: Looking northwest from east shoulder of SMR 4 about 750 m south of intersection with SMR 3. (September 12, 2006)



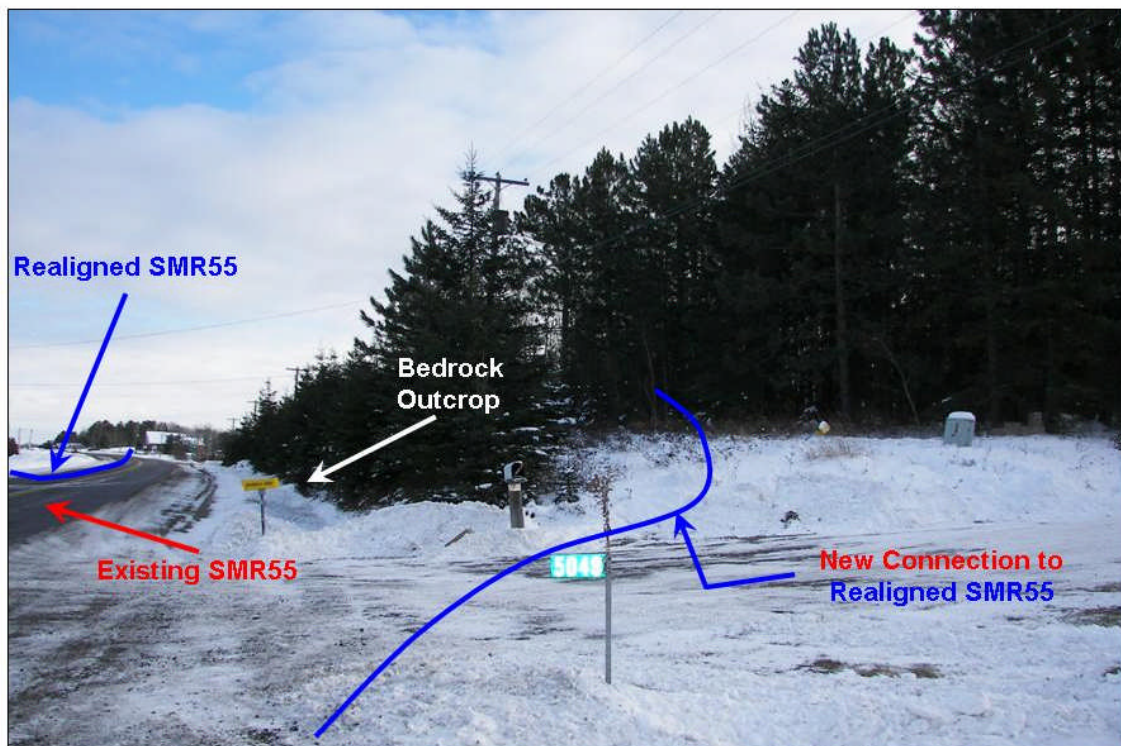
Photograph 99 VIEW: Looking east from about Sta. 11+800 about 50 m north of Highway 17 across open farm field. (September 12, 2006)



Photograph 100 VIEW: Looking east from south shoulder of Highway 17 at about Sta. 11+200, some 600 m west of Fen Road at tie-in with existing highway. (September 12, 2006)



Photograph 101 VIEW: Looking west from north ditch line of SMR55 opposite Jim's Portable Toilets west driveway. Extensive low-lying wet lands on north (right) side of photograph. (Dec. 6, 2007)



Photograph 102 VIEW: Looking east from south shoulder of SMR55 just west of 5049 driveway entrance. (Dec. 6, 2007)



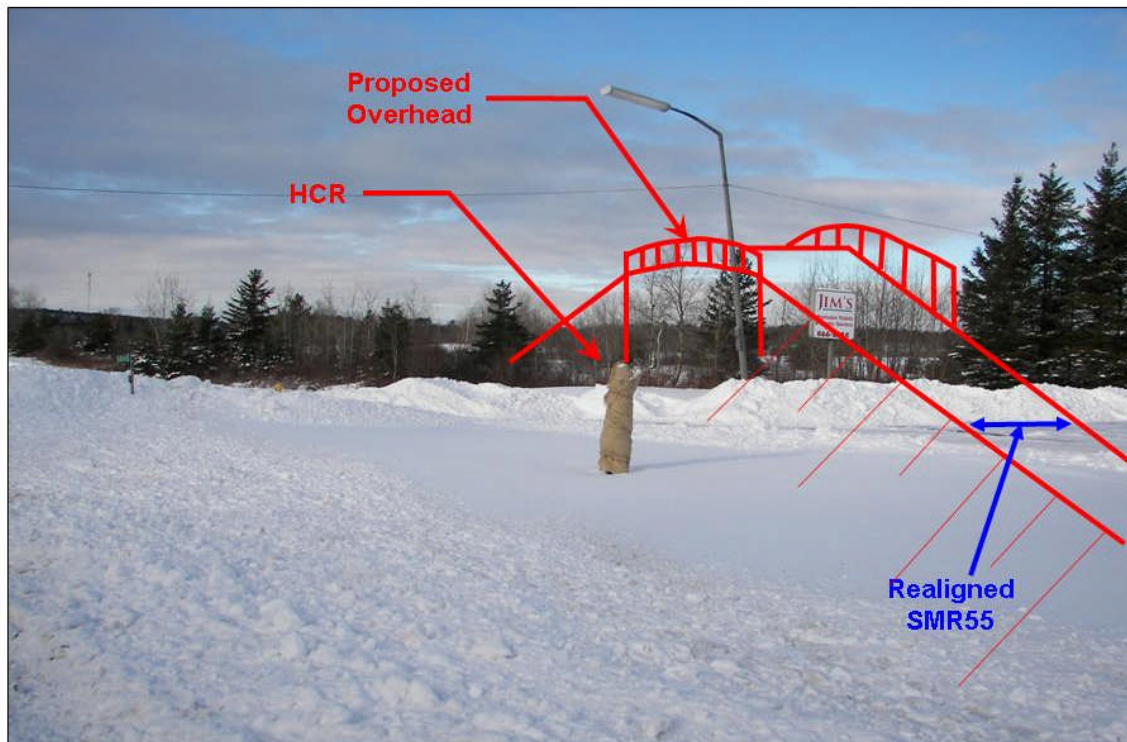
Photograph 103 VIEW: Close up of bedrock in south ditch and slope of SMR55, about 150 m east of 5049 entrance driveway (Photograph 1). (Dec. 6, 2007)



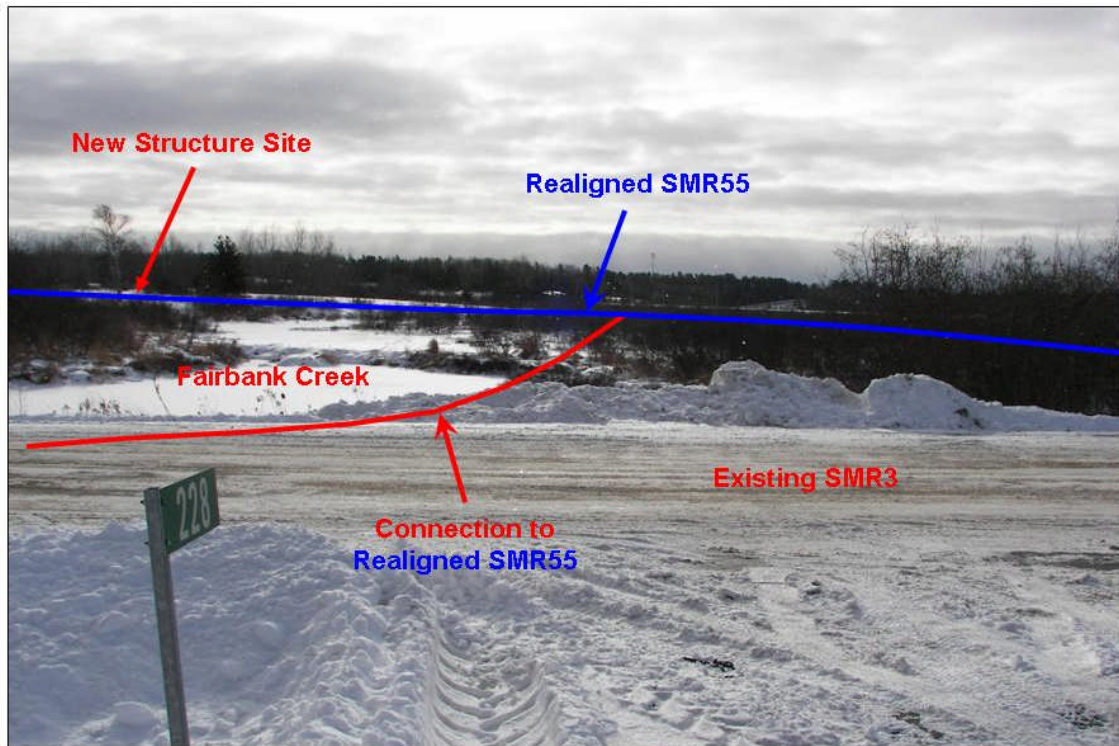
Photograph 104 VIEW: Looking southwest from north shoulder of existing SMR55 at new connection from the Realigned SMR55 to the existing SMR55. (Dec. 6, 2007)



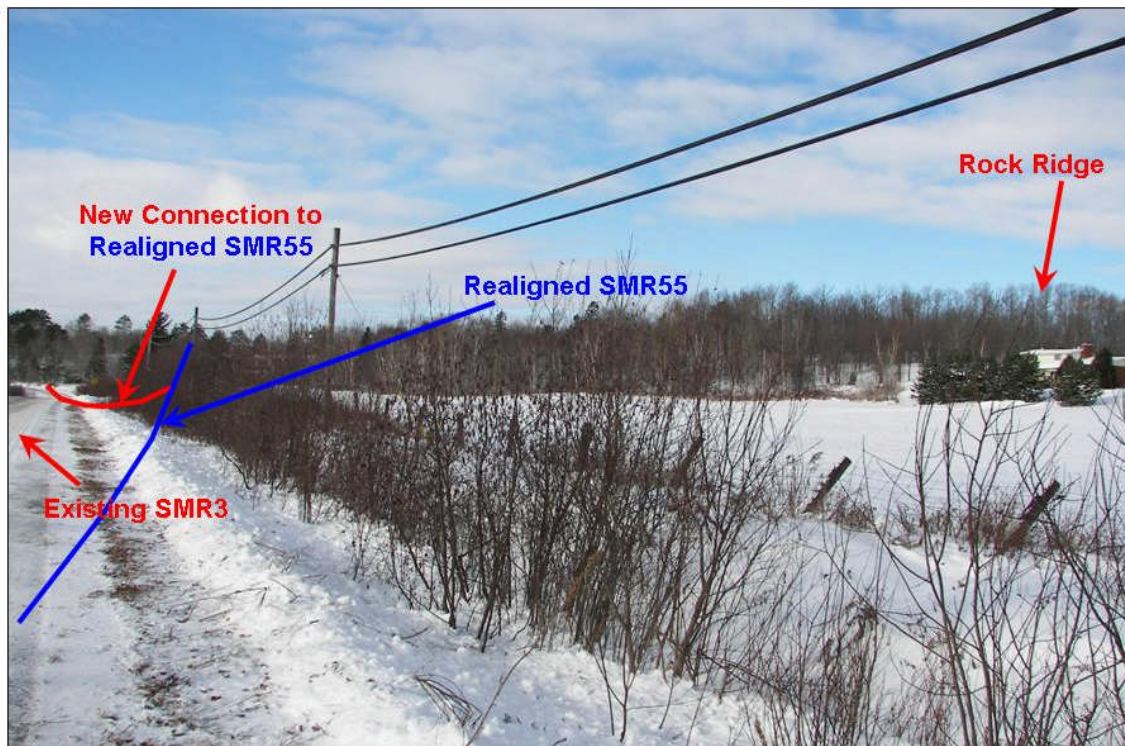
Photograph 105 VIEW: Looking east from south shoulder of SMR55 at new intersection of Realigned SMR55 and connection with existing SMR55. Note commercial and residential structures of Whitefish visible in distance. (Dec. 6, 2007)



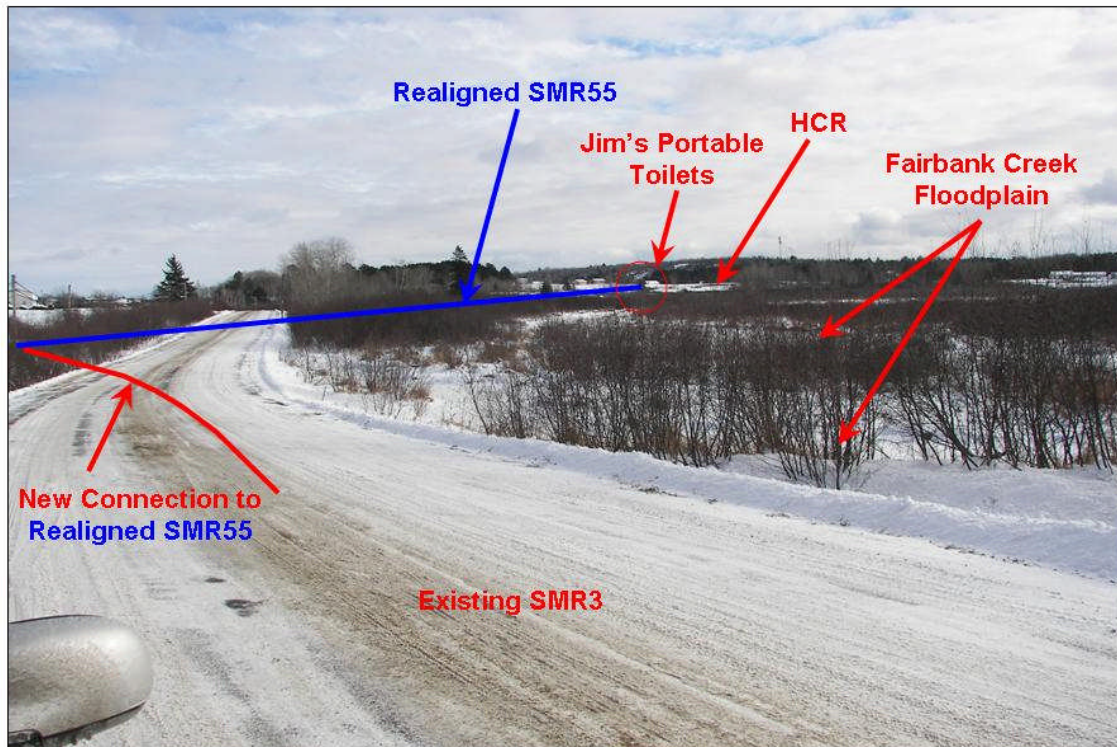
Photograph 106 VIEW: Looking northwest from north side of SMR55 of commercial property No. 5040, Jim's Portable Toilets and Septic Services. High embankment (> 8 m) required to elevate the realigned SMR55 over HCR track. (Dec. 6, 2007)



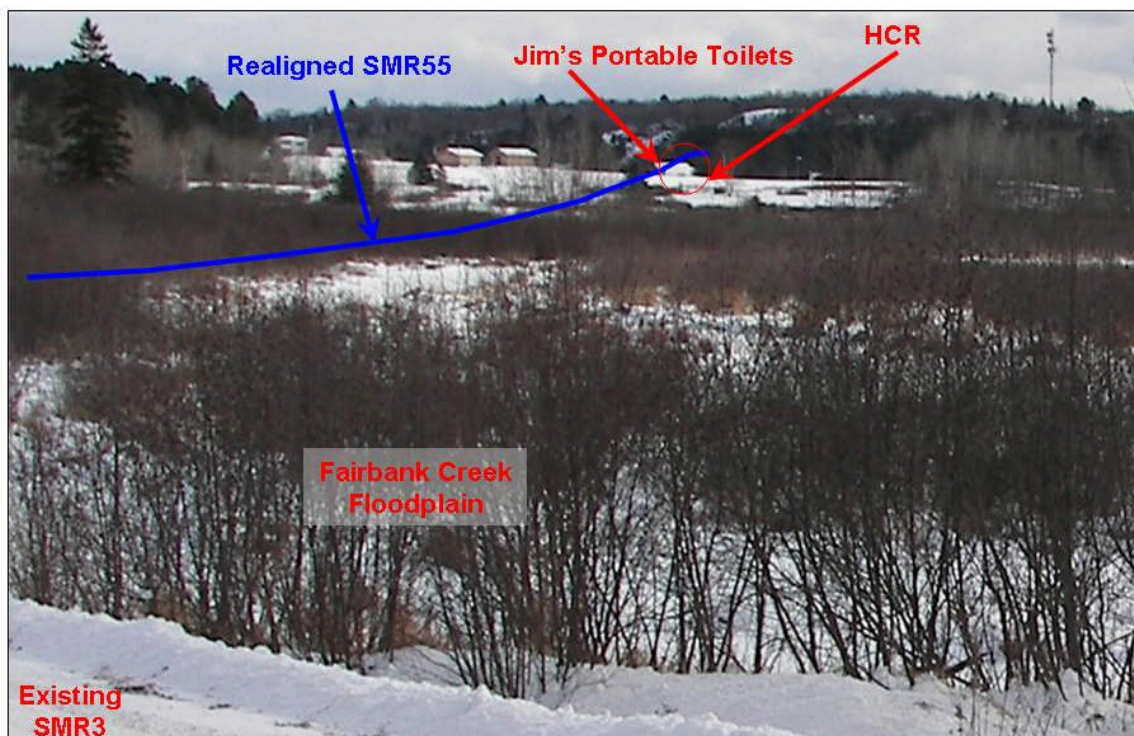
Photograph 107 VIEW: Looking south from driveway of 228 SMR3 across existing Fairbank Creek at site of new structure. Extensive floodplain in midground past road. (Dec. 6, 2007)



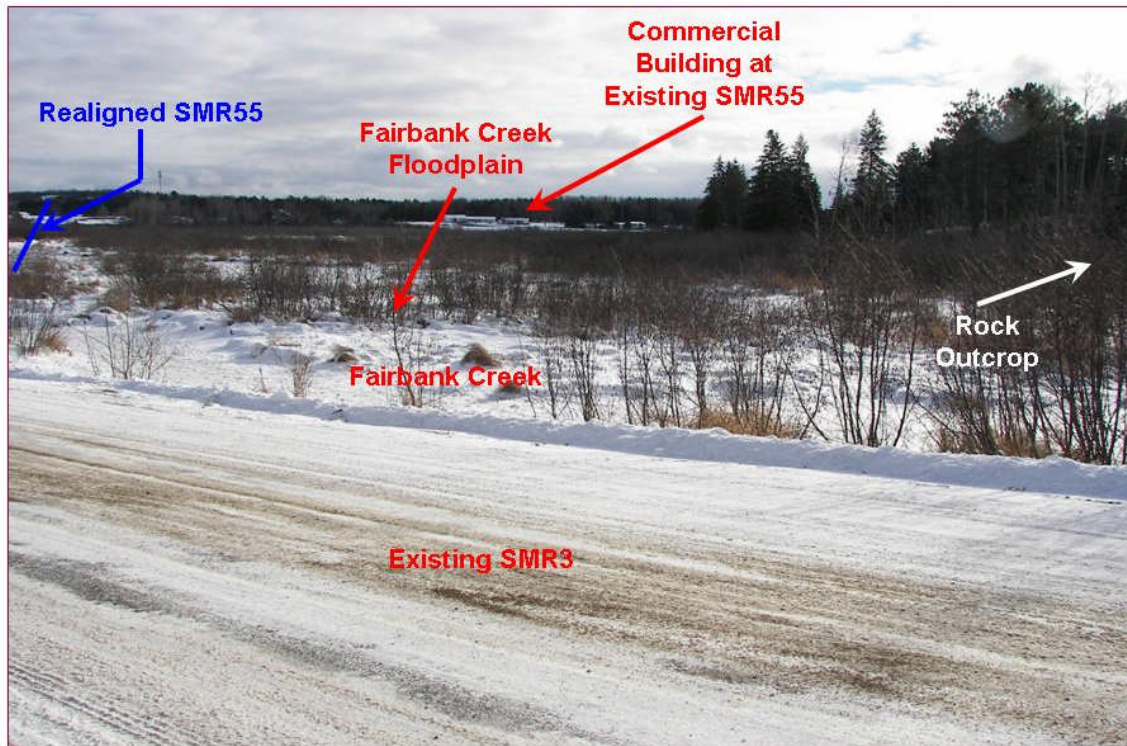
Photograph 108 VIEW: Looking northwest from north shoulder of SMR3 at proposed crossing of existing SMR3 and realigned SMR55. Sloping farmland in foreground with bedrock outcrops in forested bush in distance. (Dec. 6, 2007)



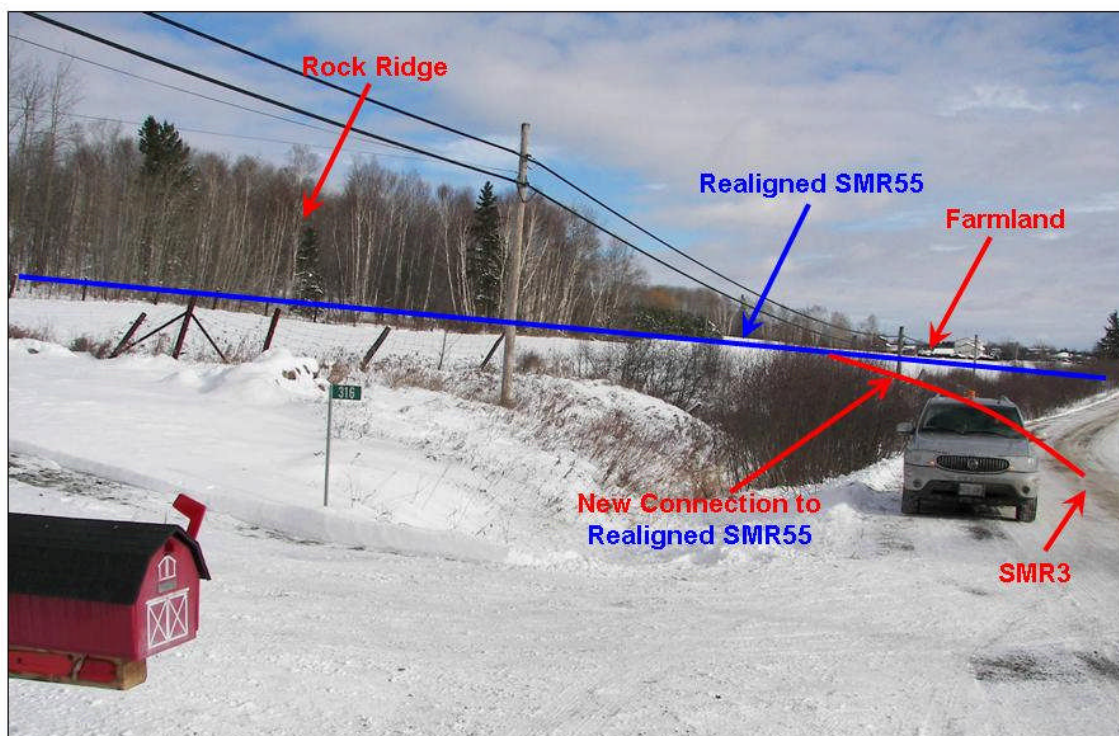
Photograph 109 VIEW: Looking southeast from north shoulder of SMR3 about 300 m west of the crossing of the realigned SMR55 and the existing SMR3. The extensive Fairbank Creek floodplain is visible south of SMR3. (Dec. 6, 2007)



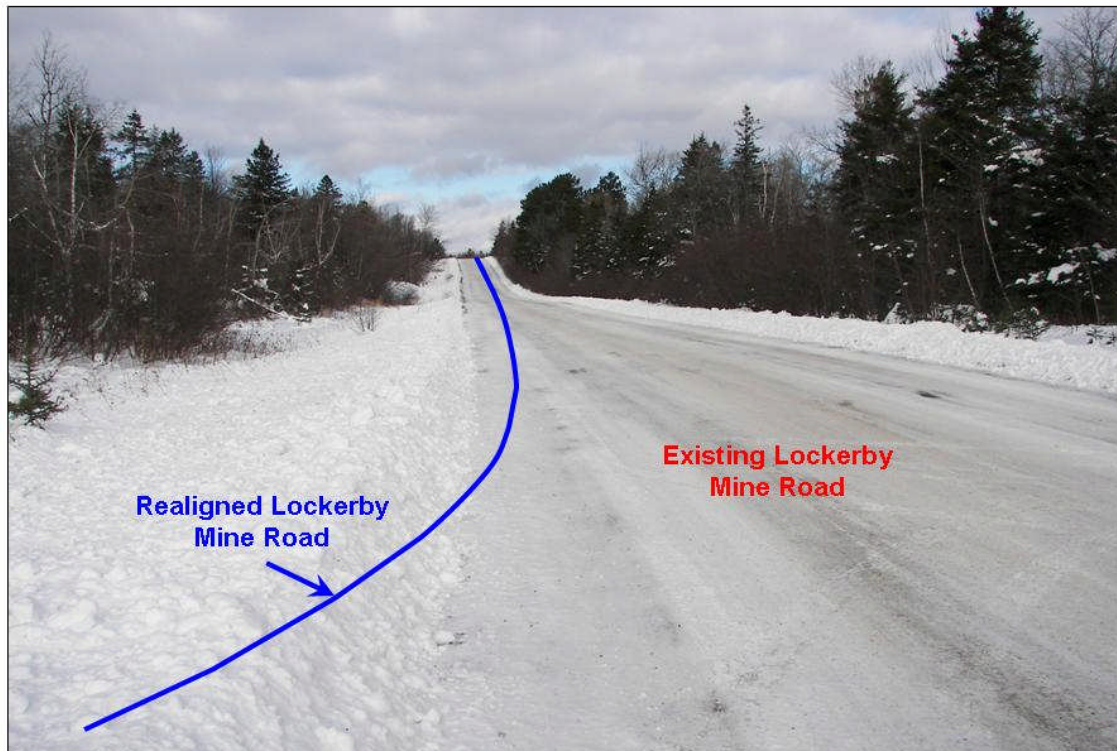
Photograph 110 VIEW: Close up of photograph 109. Looking southeast from north shoulder of SMR3 about 300 m west of the crossing of the realigned SMR55 and the existing SMR3. The extensive Fairbank Creek floodplain is visible south of SMR3. (Dec. 6, 2007)



Photograph 111 VIEW: Looking southeast from north shoulder of SMR3 about 300 m west of the crossing of the realigned SMR55 and the existing SMR3. The extensive Fairbank Creek flood plain is visible south of SMR3. (Dec. 6, 2007)



Photograph 112 VIEW: Looking east from entrance to driveway to house #316. Realigned SMR55 traverses farmland and a rock ridge beyond the end of the driveway. (Dec. 6, 2007)



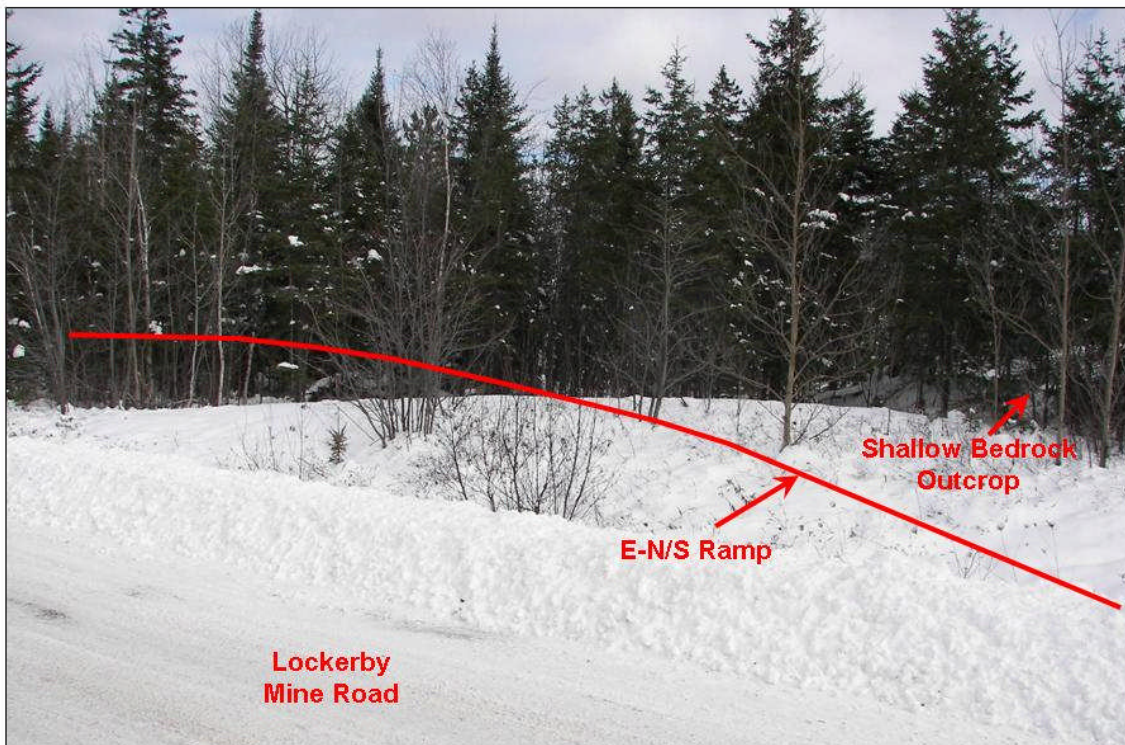
Photograph 113 VIEW: Looking east from north shoulder of the Lockerby Mine Road about 900 m east of intersection with existing SMR3. Existing Lockerby Mine Road starts to swing to north to intersect realigned SMR3. Shallow bedrock in bush areas. (Dec. 6, 2007)



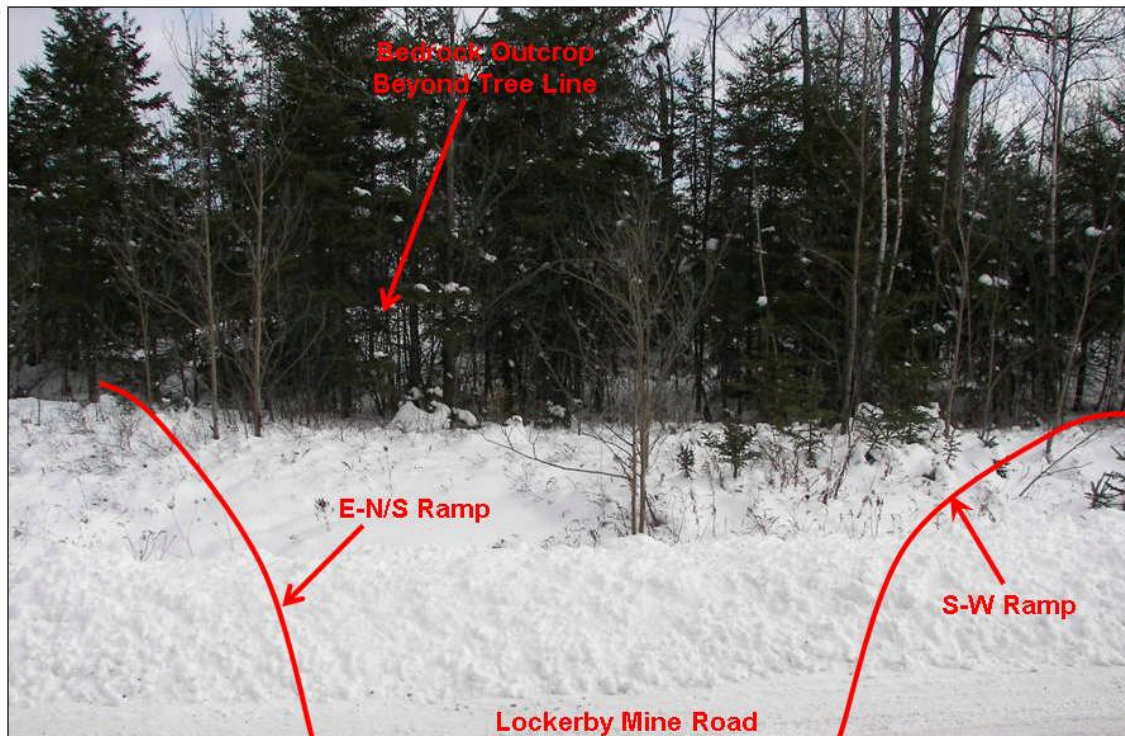
Photograph 114 VIEW: Looking west from north shoulder of the Lockerby Mine Road about 900 m east of intersection with existing SMR3. Existing Lockerby Mine Road starts to swing to north to intersect realigned SMR3. Shallow bedrock in bush areas. Swamp area visible beyond tree line. (Dec. 6, 2007)



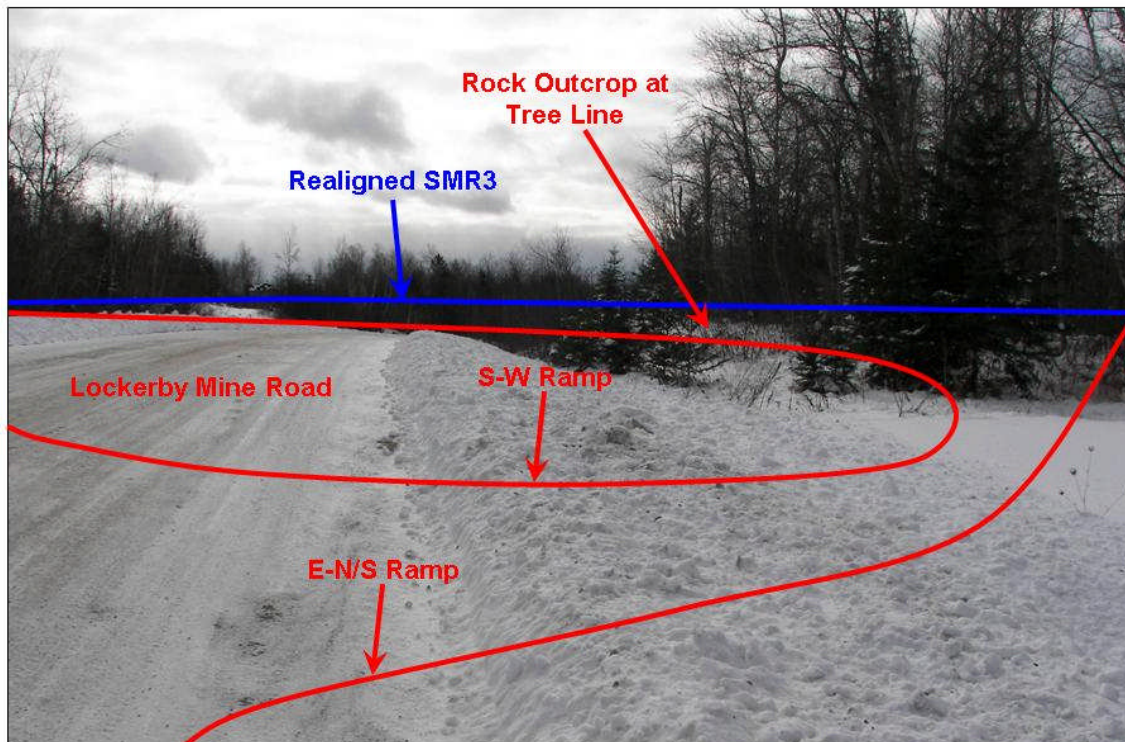
Photograph 115 VIEW: Looking north from north shoulder of Lockerby Mine Road about 600 m east of intersection of existing SMR3. The Realigned SMR55 crosses the existing Lockerby Mine Road about 150 m to the west. The ground raises sharply to north. Shallow bedrock anticipated. Bedrock exposed in north ditch line at numerous locations to the west. (Dec. 6, 2007)



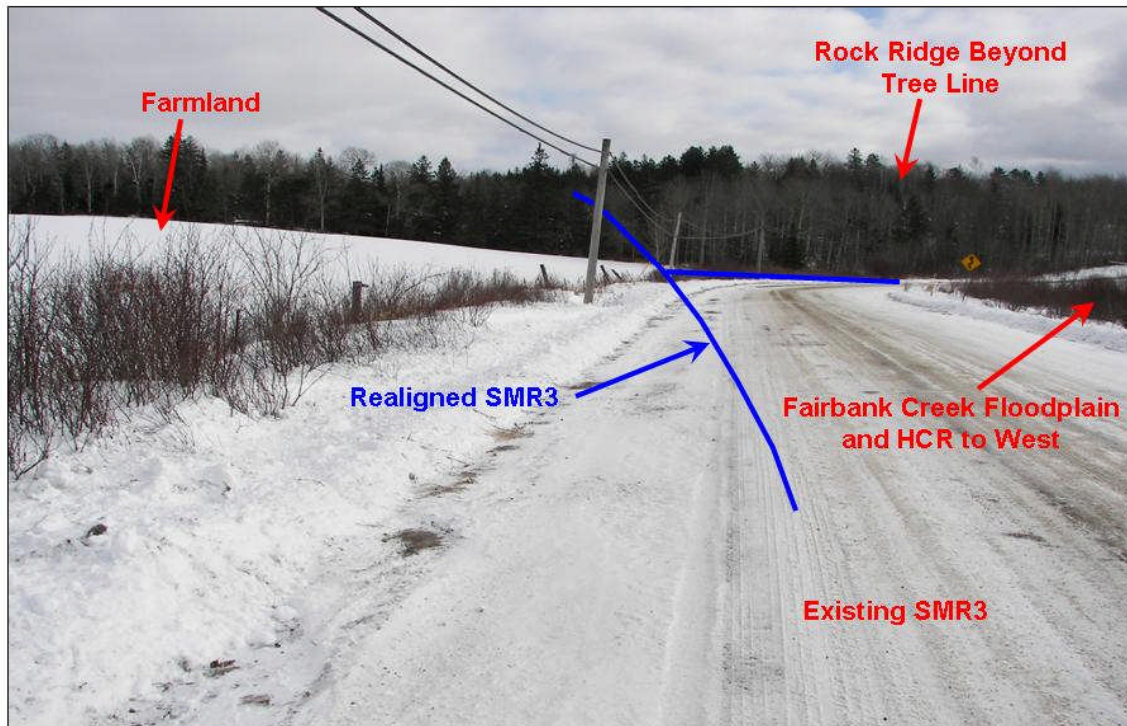
Photograph 116 VIEW: Looking southeast from north shoulder of Lockerby Mine Road about 600 m east of existing SMR3. The E-N/S ramp crosses from a low area at the left of the photograph to a shallow bedrock outcrop near the tree line. (Dec. 6, 2007)



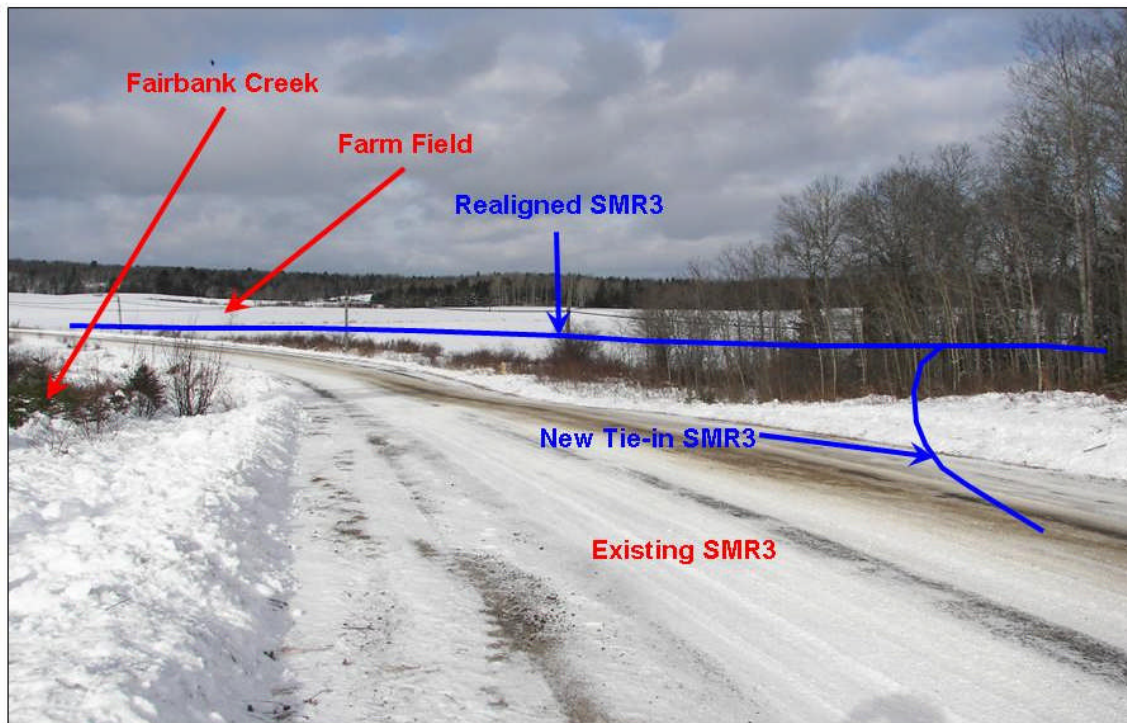
Photograph 117 VIEW: Looking south from north shoulder of Lockerby Mine Road about 600 m east of existing SMR3. Highway 17 is about 130 m south of tree line in view. Sections of E-N/S and S-W ramps in view would cross bedrock outcrops visible immediately beyond the tree line. (Dec. 6, 2007)



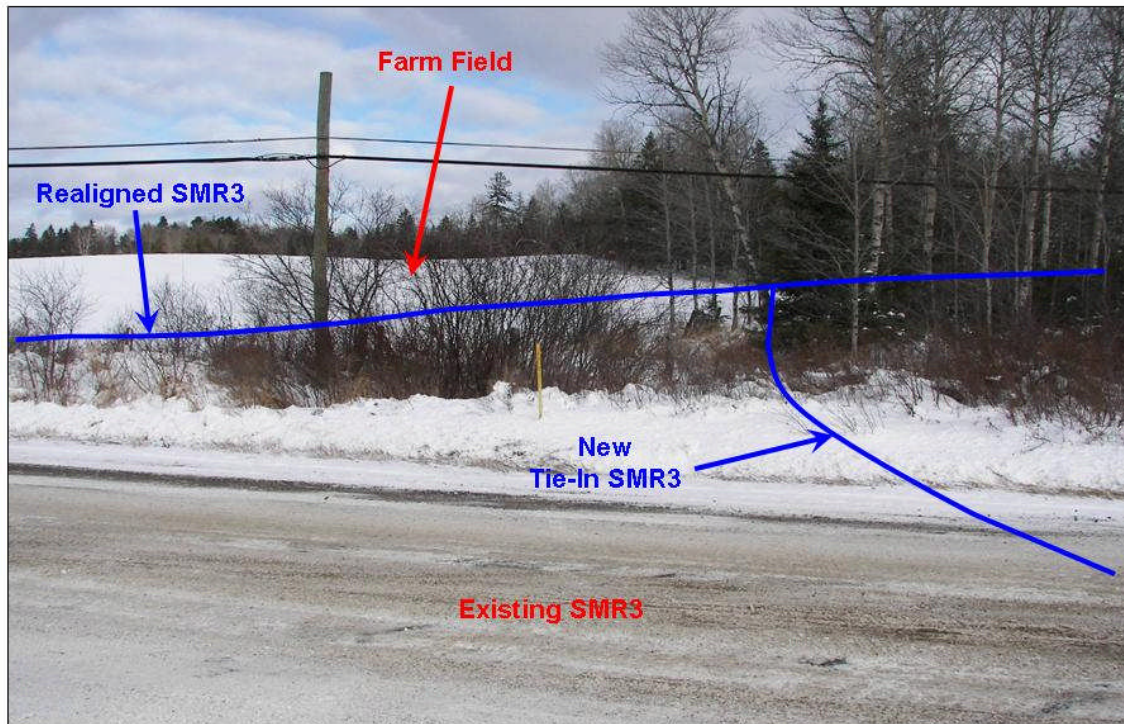
Photograph 118 VIEW: Looking west from north shoulder of Lockerby Mine Road about 500 m east of existing SMR3. View of site for realigned SMR3, E-N/S and S-W ramp sections north of future SMR55 / SMR3 underpass. (Dec. 6, 2007)



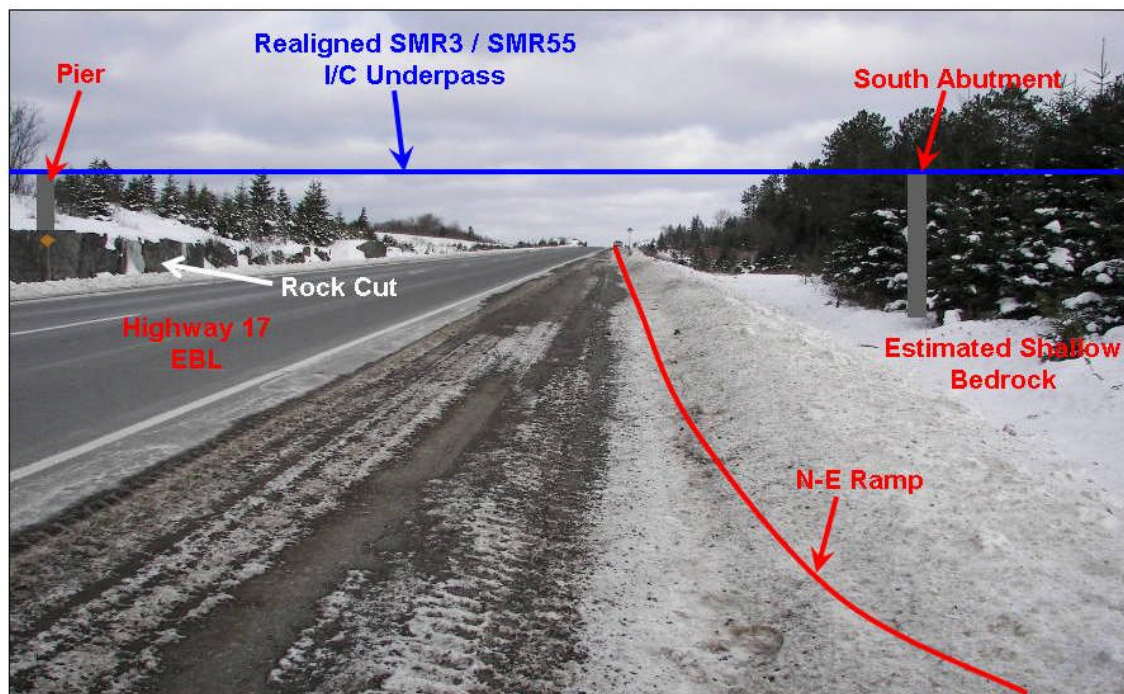
Photograph 119 VIEW: Looking southeast from the east shoulder of SMR3 at the proposed northerly tie of the realigned SMR3 to the existing SMR3, about 1050 m north of the Hwy 17/SMR3 structure. Shallow bedrock with sand till veneer in bush area. (Dec. 6, 2007)



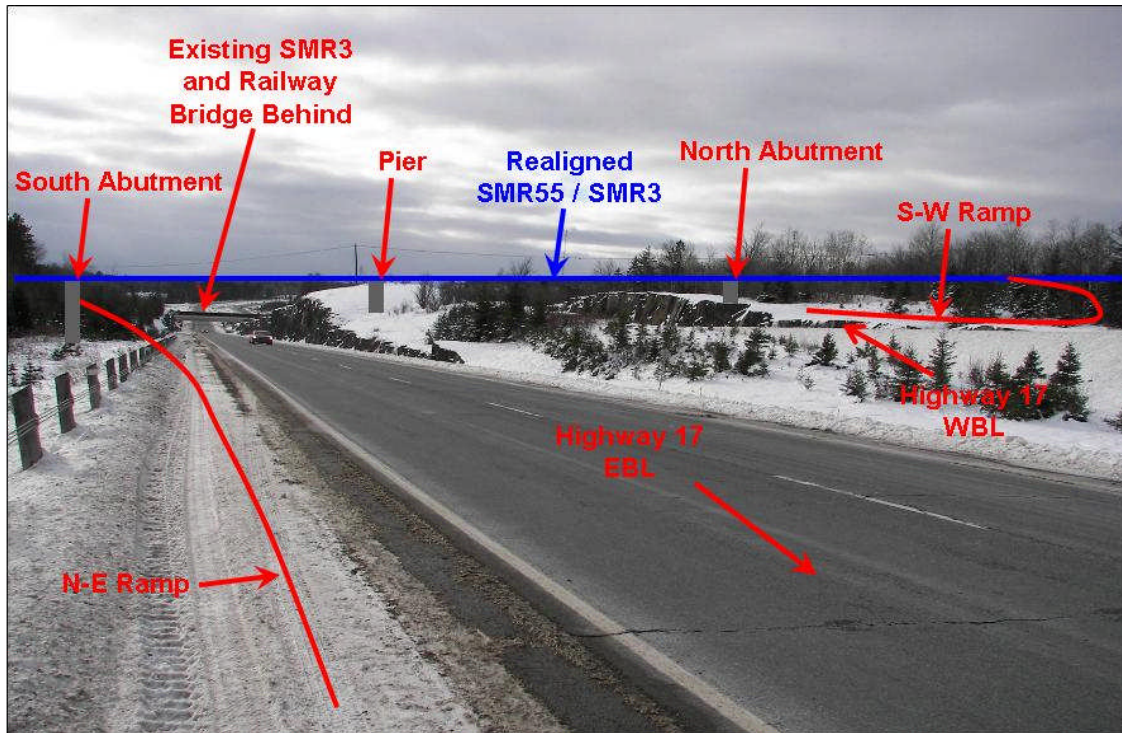
Photograph 120 VIEW: Looking north from west shoulder of existing SMR3 at about the proposed tie-in to the Realigned SMR3, some 900 m north of the Hwy 17/SM3 structure. Fairbank Creek flood plain to west of SMR3. Farm field to north and flood plain beyond. (Dec. 6, 2007)



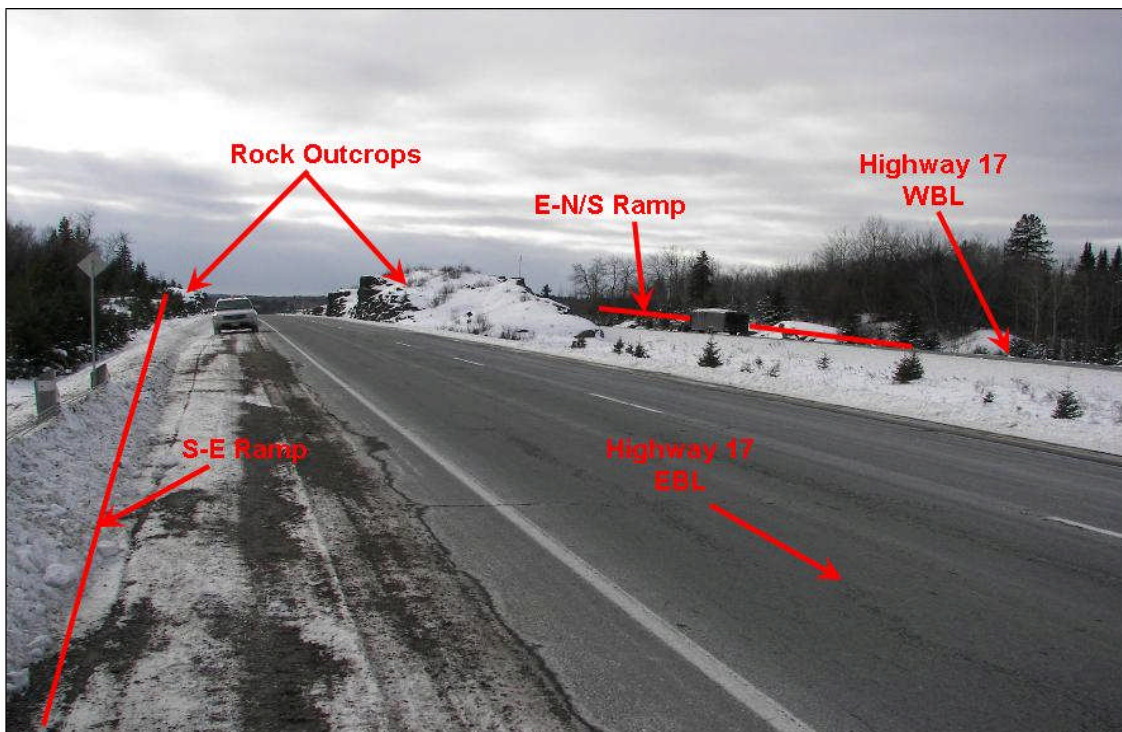
Photograph 121 VIEW: Looking east from west shoulder of SMR3, about 950 m north of existing Hwy 17/SMR3 structure. Existing SMR3 section shown in photo will be abandoned with the tie-in and realigned SMR3. (Dec. 6, 2007)



Photograph 122 VIEW: Looking east from south shoulder of Highway 17 EBL about 250 m east of existing SMR3 underpass at approximate location of new SMR3 / SMR55 I/C underpass. South span illustrated. Widening for N-E ramp required. Rock cut at north shoulder and shallow bedrock beyond south shoulder provide adequate bridge foundation conditions. (Dec. 6, 2007)



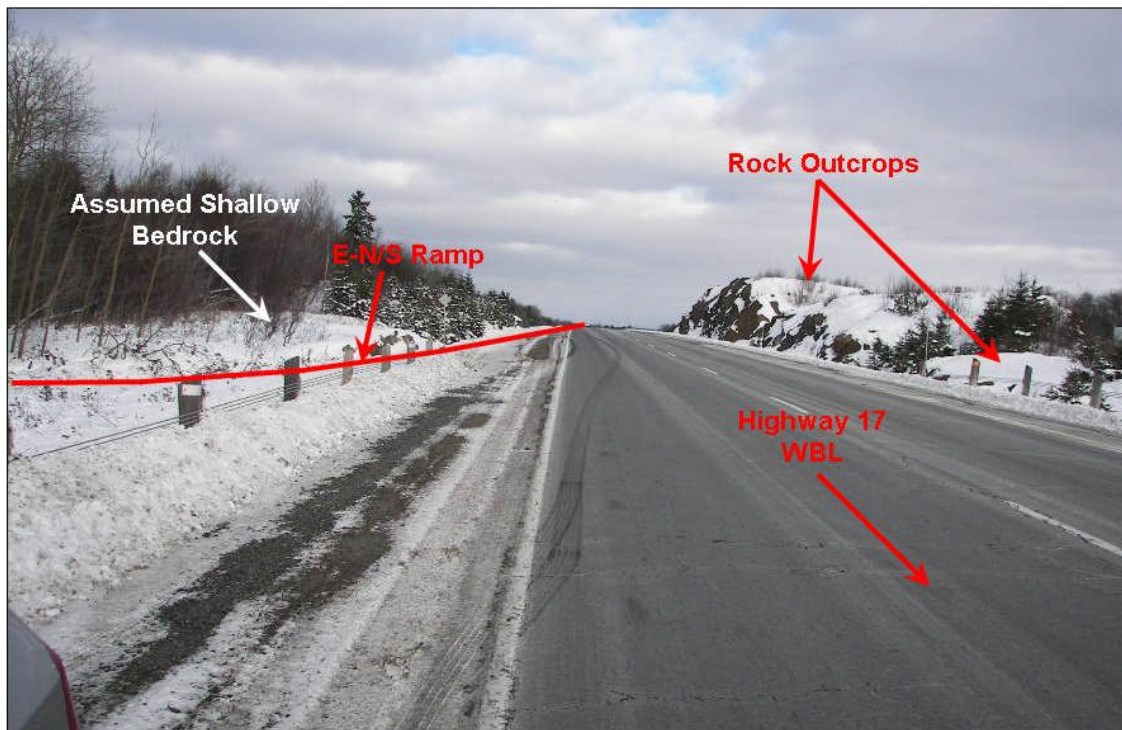
Photograph 123 VIEW: Looking west from south shoulder of Highway 17 EBL about 700 m east of existing SMR3 underpass at approximate location of new SMR3/SMR55 I/C underpass. Widening for N-E ramp required. S-W ramp on rock cut under future north span. Note Highway 17 WBL at higher level than EBL. (Dec. 6, 2007)



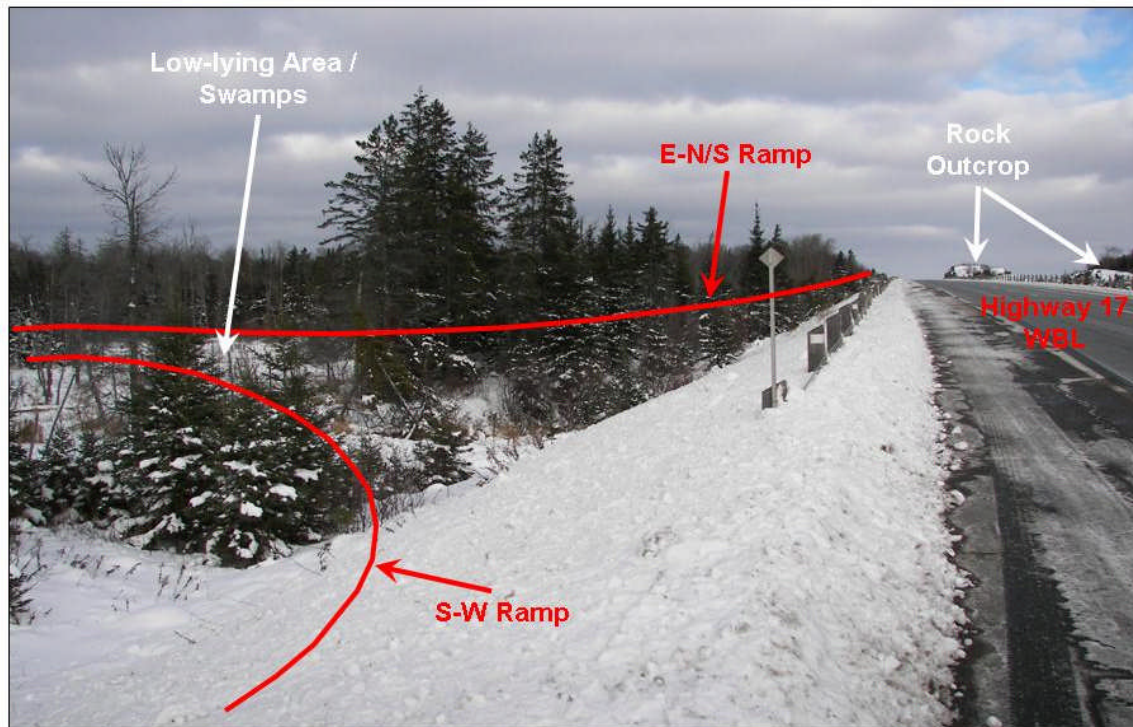
Photograph 124 VIEW: Looking west from south shoulder of Highway 17 EBL about 1,050 m east of existing SMR 3 underpass. Widening for new S-E ramp to require a rock cut beyond the south shoulder. New E-N/S ramp to cross same rock outcrop on north shoulder. (Dec. 6, 2007)



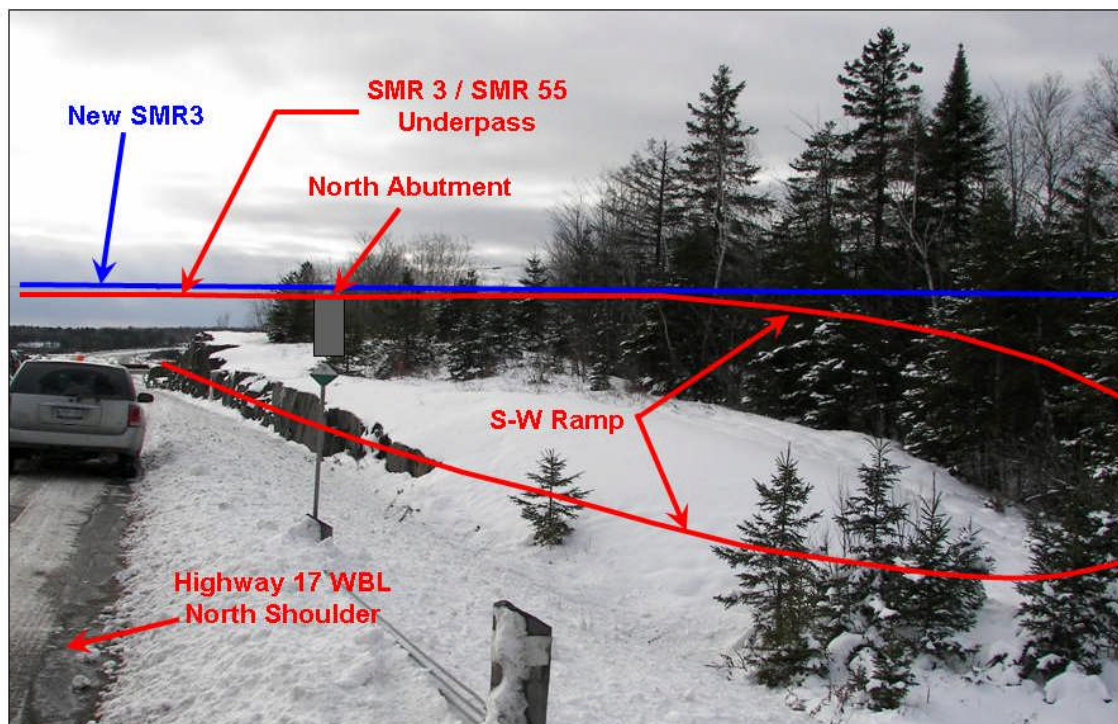
Photograph 125 VIEW: Looking east from south shoulder of Highway 17 EBL about 1,050 m east of existing SMR3 underpass. Note low-lying swampy ground to the south where S-E ramp construction will require widening of the highway embankment. (Dec. 6, 2007)



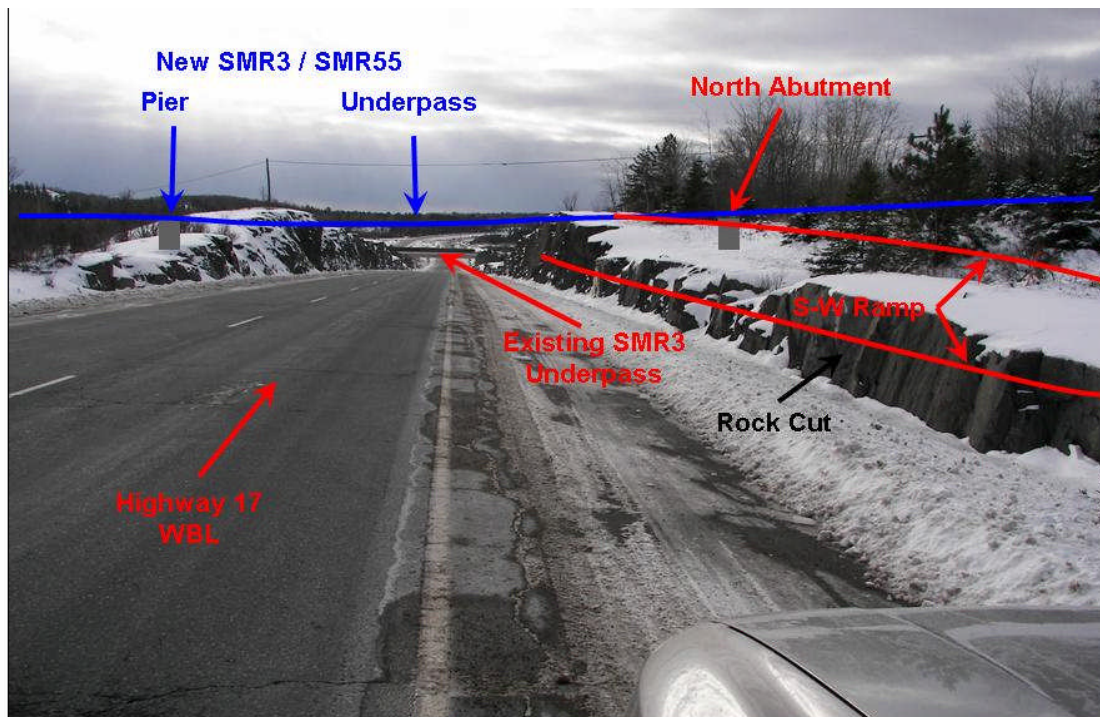
Photograph 126 VIEW: Looking east from north shoulder of Highway 17 WBL about 800 m east of existing SMR3 underpass. New E-N/S ramp will cross a zone of shallow bedrock opposite existing rock cuts in the median. (Dec. 6, 2007)



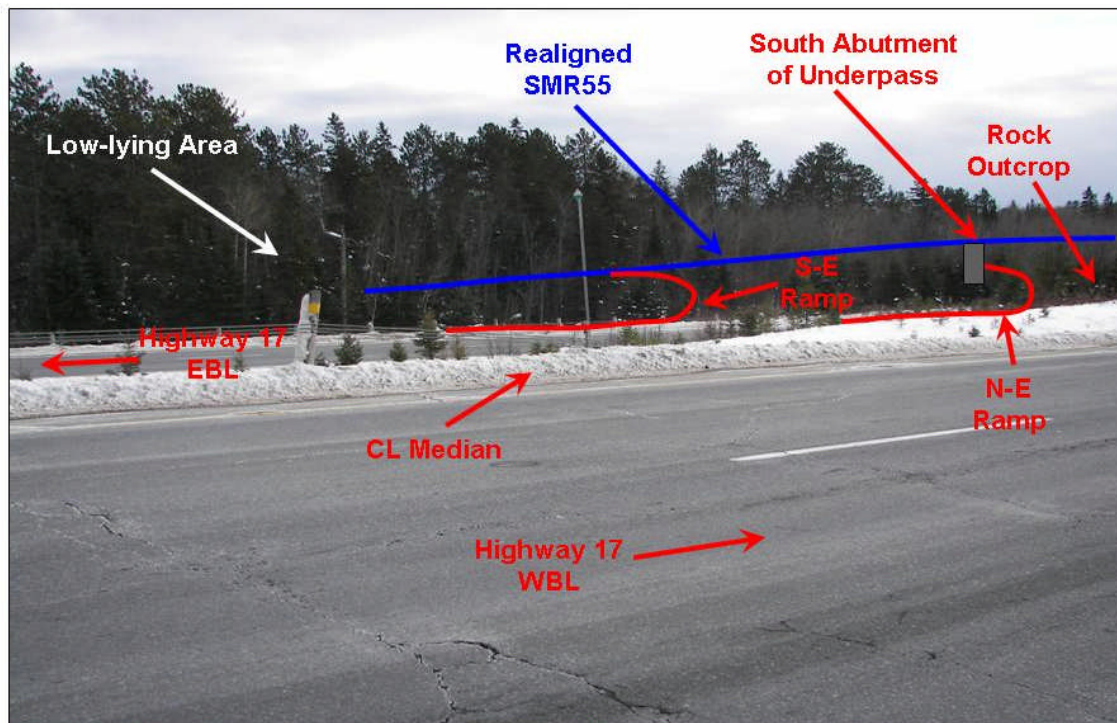
Photograph 127 VIEW: Looking east from north shoulder of Highway 17 WBL about 600 m east of existing SMR3 Underpass. Rock outcrops illustrated in previous photograph are in the distance right of photograph. Foreground left show a low-lying swampy area where sections of the S-W Ramp area E-W/S Ramp will cross. (Dec. 6, 2007)



Photograph 128 VIEW: Looking west from north shoulder of Highway 17 WBL about 600 m east of existing SMR3 Underpass. Rock outcrop on north side of highway will provide foundation for new north abutment and will be cut to allow tie-in for new S-W Ramp. (Dec. 6, 2007)



Photograph 129 VIEW: Looking west from north shoulder of Highway 17 WBL about 580 m east of existing SMR3 Underpass. North abutment and pier to be founded on rock outcrops. The illustrated section of the S-W Ramp will require a rock cut at the north shoulder. (Dec. 6, 2007)



Photograph 130 VIEW: Looking southwest across median of Highway 17 about 500 m east of existing SMR3 Underpass. Note Hwy 17 WBL higher grade than EBL. Sections of realigned SMR55 and of S-E Ramp will cross a low-lying area south of the bedrock outcrop located at the south abutment. (Dec. 6, 2007)