APPENDIX Y-2

DRAFT PRELIMINARY DESIGN REPORT:
HIGHWAY 600 RE-ALIGNMENT DEARLOCK TO BLACKHAWK

PRELIMINARY DESIGN REPORT

Highway 600 Realignment
Dearlock to Blackhawk
11.4 km

Prepared by TBT Engineering and Morrison Hershfield Limited
On Behalf of
Rainy River Resources – Rainy River Gold Project

November 14, 2013 Draft

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Executive Summary

Rainy River Resources (RRR) is developing a world-class gold resource in the Rainy River District of Northwestern Ontario. RRR's key asset is the large, 100%-owned advanced exploration stage Rainy River Gold Project (RRGP) that is being located primarily on private, patented lands owned by RRR. One of the project components in developing this mining project is the relocation of Highway 600 outside of the footprint of the proposed mining operations.

Highway 600 is classified as a rural local undivided (RLU80) facility running northerly from Rainy River for 27 km and easterly 62 km to Kings Highway 71. The primary function of this gravel surfaced highway is to provide for local land access. Highway 600 traverses through a mineral exploration area developed by Rainy River Resources (RRR) near the community of Blackhawk in the Township of Tait in the District of Rainy River. An 11.4 km section of new highway alignment is proposed between Dearlock and Blackhawk to redirect Highway 600 traffic around the mineral exploration/development area.

A Feasibility Study was previously completed to identify alternatives for relocating Highway 600. Extensive consultation was done with the Ministry of Transportation (MTO), other ministries, agencies, utilities and the public. Eight (8) alternate alignments for Highway 600 were evaluated and, on the basis of the findings contained within this Feasibility Study and in consideration of the intentions and perspective of both RRR and the Township of Chapple, Alternative C was determined to be the preferred route.

For the preferred route, six (6) alternatives were further reviewed and evaluated for the North–South portion of the preferred route and these alternatives are influenced by property negotiations initiated by RRR. The relocation of Highway 600 may also affect Municipality of Chapple roads and unopened road allowances, private property, utilities and require a crossing of the Pinewood River.

The relocation of the Highway 600 alignment has been included with the scope of the RRGP EA process, and as such, detail design and construction of this new alignment cannot be completed until EA approval is issued for the project.

The realignment of Highway 600 will be designed and constructed to MTO standards. A legal agreement will be required between MTO and RRR. Once construction is complete, the MTO will need to acquire/assume the new alignment and designate it. Following this, the MTO will have to remove the designation from the bypassed Highway 600 alignment and dispose of it to RRR. The Township of Chapple is in agreement with the transfer of a portion of the bypassed Highway 600 to their jurisdiction.

RRR wishes to commence mine operations along the existing Highway 600 corridor prior to completing the construction of the new Highway 600 alignment. In the interest of public safety, it is proposed to detour traffic via Highways 71, 11 and 617. Mine construction and operations traffic will access the mine site from Highway 71 via existing Korpi Road, a new East Access Road and other municipal roads.

As the MTO will be the ultimate owner of the relocated Highway 600 and as the MTO is expecting that the detail design and construction of the relocated portions of Highway 600 are undertaken in a manner consistent with MTO process, standards and design criteria, this Preliminary Design Report has been prepared to provide a concordance between RRR's EA

process and engineering design for development of the RRGP, including the relocation of the Highway 600 alignment outside of the footprint of the mine development, and that of the MTO Class EA.

1.0 INTRODUCTION

1.1 General Description of Project

The Rainy River Gold Project (RRGP) is being located primarily on private, patented lands owned by RRR in Northwestern Ontario. One of the project components in developing this mining project is the relocation of Highway 600 outside of the footprint of the proposed mining operations.

Highway 600 is classified as a rural local undivided (RLU80) facility running northerly from Rainy River for 27 km and easterly 62 km to Kings Highway 71. Within the study area, Highway 600 has a granular surface with a posted speed limit of 80 km/hr.

The primary function of the highway is to provide for local land access.

1.2 Project History

1.2.1 Feasibility Study

In 2012, RRR completed a Feasibility Study for the relocation of Highway 600 alignment options as well as a new access road to the mine site.

Eight (8) alternative alignments were evaluated for Highway 600 using a quantitative and qualitative method of assessment. On the basis of the findings contained within this Feasibility Study, and in consideration of the intentions and perspective of both RRR and the Township of Chapple, Alternate C was determined to be the preferred route.

Although Alternate C is one of the least economical for construction, it had significant advantages in terms of optimizing the use of existing road allowances. Changes in travel distances for road users and changes in highway maintenance effort and cost will be least affected by the selection of Alternative C as the preferred route. The Township of Chapple agrees with and supports the selection of Alternative C as the preferred route.

MTO commented on the Feasibility Study report and those comments are attached in Appendix D.

1.2.2 Preliminary Design Report

As the MTO will be the ultimate owner of the relocated Highway 600 and as the MTO is expecting that the detail design and construction of the relocated portions of the Highway 600 alignment are undertaken in a manner consistent with MTO process, standards and design criteria, this Preliminary Design Report has been prepared to provide a concordance between RRR's EA process and engineering design for development of the RRGP, including the relocation of the Highway 600 alignment outside of the footprint of the mine development, and that of the MTO Class EA.

This Preliminary Design Report has been prepared to present a preliminary engineering design for the preferred alternative C route selected from the Feasibility Study and to document the evaluation of alternative alignments for the North-South section of the Preferred Route Alternate C.

Contributors to the PDR are:

- Rainy River Resources
- New Gold Inc.
- TBT Engineering Limited
- Morrison Hershfield Limited

2.0 ENVIRONMENTAL ASSESSMENT (EA) PROCESS

The draft Environmental Assessment (EA) Report for the Rainy River Gold Project (RRGP) was developed and structured in a manner that follows the Approved Provincial Terms of Reference and the Federal Environmental Impact Statement (EIS) guidelines, as directed by the Ministry of the Environment (MOE) and the Canadian Environmental Assessment Agency (CEAA), who are respectively, the Provincial and Federal EA leads for the coordinated RRGP EA. The Federal and Provincial government authorities agreed that a single body of knowledge, including the EA Report, would be used for the coordinated EA process. The Ministry of Transportation (MTO) indicated that this process will satisfy MTO Class EA requirements for the relocation of the Highway 600 alignment outside of the footprint of the mine development.

The MTO Class EA process and associated requirements are outlined in the document "Class Environmental Assessment for Provincial Transportation Facilities" (MTO 2000, as amended). It is a "principle-based" document that is intended to help the proponent make sure they have taken all reasonable steps to ensure that the appropriate Class EA study process has been undertaken, consultation and documentation requirements are followed, and Class EA study principles are complied with.

Environmental Protection Principles outlined in the MTO Class EA guidance document are as follows:

- Conduct studies and/or projects with an inherent approach of avoiding or minimizing overall environmental impacts through consideration of alternatives.
- Identify existing environmental conditions and potential impacts relevant to the study and/or project.
- Meet the statutory duties and other requirements of federal and provincial environmental legislation.
- Meet the intent of government-approved policy and inter-ministerial protocols.
- Address the Ministry of Transportation's Statement of Environmental Values.
- Balance environmental protection considerations with transportation engineering considerations during each stage of the study and/or project process, recognizing

that safety and effectiveness of the transportation system is fundamental to such decisions.
- Recognize that it is seldom possible to satisfy all interests when making the tradeoffs necessary in the EA process, and that no single environmental factor is always "paramount."
- Recognize that environmental mitigation measures themselves may have environmental impacts which offset their benefit.
- Provide mitigation effort in proportion to environmental significance and ability to reasonably mitigate.
- Monitor the implementation of environmental protection and mitigation measures during construction.

The document further describes that, for Class EA's, environmental protection during preliminary design typically involves the following steps:

- Identify environmental features that are threatened by project objectives;
- Develop environmental design concepts;
- Develop environmental mitigation concepts; and
- Obtain agreement in principle for formal environmental approvals and permits.

Environmental and socio-economic concerns associated with the design, construction, and maintenance of the recommended Highway 600 realignment alternative are addressed using information obtained from the draft environmental assessment report for the RRGP. The summary table at the end of this section (Table 1) illustrates concordance between the RRGP EA process and the MTO Class EA principles. This table provides an overview of environmental features that may be affected by highway relocation works, as well as a summary of potential environmental concerns, proposed mitigation to minimize potential concerns, and commitments to further work.

In addition to the information supplied in Table 1, further details of concordance with the Class EA process are provided elsewhere in this PDR as these details relate to the engineering aspects of this project component. More specifically, planning alternatives, from the perspective of the RRGP as a whole, including consideration of the Highway 600 relocation component, are described in Section 4.1 of this PDR. Alternatives assessed as part of preliminary design, and evaluation and selection of a preferred alternative, are discussed in Section 4.2 of this PDR.

Environmental Component	MTO Principles	Illustration of Concordance between RRGP EA and MTO Class EA Principles		
		Background Conditions	Environmental Concerns Identified for Highway 600 Realignment	Mitigations and Commitments to Further Work
Soils	Identify soils features that may be affected by Highway 600 re-alignment objectives. Develop environmental design and mitigation concepts as necessary for minimizing erosion and sedimentation, loss of soils or soil contamination as a result of Highway 600 realignment works.	▪ The dominant landforms of the RRGP study area are glaciolucastrine plains and bedrock plains with discontinuous peat/organic deposits situated on isolated bedrock knobs. ▪ The area in the vicinity of the Highway 600 realignment is lower-lying and poorly drained, with very little topographic relief. Wetlands occur in low-lying areas. ▪ Native soil types in the RRGP study area are primarily black organics and brown silty clays. ▪ Tait Road, the municipal roadway incorporated into the new alignment consists primarily of shallow lifts of brown fine to coarse sands with gravel atop organics and clays. ▪ The Pinewood River system occupies a broad lacustrine plain. Recent alluvial deposits are expected to occur along the Pinewood River and its tributaries. The alluvium likely consists of silt, clay, sand and some organics. ▪ No permafrost at or close to the RRGP site. ▪ Further soils baseline information is provided in Section 3 of this PDR.	None identified.	RRR will conduct ongoing monitoring during design and construction and, using adaptive management techniques, address any concerns that may arise.
Groundwater	Identify groundwater features (quantity and quality) that may be affected by Highway 600 realignment objectives. Develop environmental design and mitigation measures to minimize impacts to groundwater quality (increased pollutants) and quantity (fluctuation on groundwater levels); runoff (water quantity) to groundwater recharge areas; and well water	▪ Groundwater flow is generally towards the west in the Pinewood River watershed, but locally is towards the Pinewood River corridor. ▪ Groundwater discharge from the deeper groundwater system to the Pinewood River and its tributaries does occur but is very distributed and the overall flows are very low. ▪ The majority of watercourses and wetlands are considered weak discharge areas for the deep groundwater system. ▪ Further geotechnical and groundwater baseline information are provided in Section 3.9 and Section 4.2.8, respectively, of	Groundwater within the upper overburden has been estimated to exist within 1 m of ground surface. The groundwater levels can be expected to reach ground surface and will vary seasonally and in response to precipitation.	▪ Further investigations, and testing and preparation of a Geotechnical Design Report, will be completed for the recommended alignment. ▪ To prevent groundwater contamination, a spill prevention plan will be developed and implemented during construction, and contingency plans and procedures will be in place to respond to any spills. ▪ RRR will conduct ongoing monitoring during construction and, using adaptive

Environmental Component	MTO Principles	Illustration of Concordance between RRGP EA and MTO Class EA Principles		
		Background Conditions	Environmental Concerns Identified for Highway 600 Realignment	Mitigations and Commitments to Further Work
	levels and quality due to the proposed design. Avoid contamination of groundwater.	this PDR.		management techniques, address any concerns that may arise.
Fisheries and Aquatic Habitat	Identify fisheries and aquatic habitat features that may be affected by Highway 600 realignment objectives. Develop environmental design and mitigation concepts for minimizing erosion and sedimentation (including erosion and sedimentation into watercourses). Develop environmental design and mitigation measures to minimize direct or indirect loss of aquatic habitat, changes to water quality / quantity, inhibiting fish passage or reduced fish productivity.	▪ A wide variety of fish species have been captured in the Pinewood River. ▪ Aquatic habitat of the Pinewood River in the vicinity of the proposed crossing primarily consists of a relatively deep and wide channel mostly comprised of flat morphology with some pools. It is characterized by relatively narrow floodplain widths with variable composition of riparian vegetation. ▪ Specialized habitat areas (spawning and/or nursery habitat for various species) were not found in the vicinity of Pinewood River crossing. ▪ Tributaries in the vicinity of the Highway 600 realignment (e.g. Un-named tributary 3 and Tait Creek Tributary 2) are generally low gradient, low energy systems characterized by single to braided diffuse channels with wide, densely vegetated grass and sedge-dominated flood plains, with frequent naturally impounded water bodies such as beaver ponds. Fish in these small creeks are typically baitfish and other small-bodied species that are common and widespread in the region. ▪ Sampling in the RRGP study area between 2008 and 2012 did not provide evidence of any aquatic species at risk either under Federal or Provincial legislation. ▪ Benthic invertebrate community within the Pinewood River was generally indicative of a low gradient system with variability in descriptive benthic invertebrate community metrics being a result of differences in habitat availability (i.e. substrates) as opposed to sediment or water quality impairments.	▪ The preferred route, Alternate C, includes a crossing of the Pinewood River. Potential effects are anticipated to be minor, given that more sensitive habitats of Pinewood River will be avoided, and given that a clear-span structure will be constructed. Impacts to fish passage concerns and alteration or destruction of existing fish habitat will be avoided. ▪ No direct or indirect effects are expected to local watercourses along the remainder of the alignment.	▪ A fisheries working group consisting of RRGP team, Department of Fisheries and Oceans (DFO) and Ministry of Natural Resources (MNR) was formed in mid-2012 to develop a No Net Loss Plan and compensation strategy to offset unavoidable effects to Fish Habitat. The final No Net Loss Plan developed for the RRGP will ensure that an appropriate level of habitat restoration is implemented to offset unavoidable effects of the RRGP on fish habitat and achieve a condition of no net loss to fisheries. ▪ RRR will conduct ongoing monitoring during design and construction and, using adaptive management techniques, address any concerns that may arise.

Environmental Component	MTO Principles	Illustration of Concordance between RRGP EA and MTO Class EA Principles		
		Background Conditions	**Environmental Concerns Identified for Highway 600 Realignment**	**Mitigations and Commitments to Further Work**
Vegetation and Ecosystems	Identify rare plants or sensitive ecosystems that may be affected by Highway 600 re-alignment objectives. Develop environmental design and mitigation concepts as necessary for minimizing severance of / encroachment on sensitive ecosystems. Develop environmental design and mitigation concepts as necessary that minimize effects on ANSI's, ESA's, Provincially significant wetlands, provincially rare species, NEC "Natural Areas", cultural / heritage, social / economic landscape features, and woodland resources.	▪ No rare or locally significant vegetation communities were identified during any of the baseline surveys. ▪ Although two provincially rare plant species were noted during field surveys in habitat associated with the Pinewood River (Horned Clubtail and Arrowhead Spiketail), no plant species at risk were recorded in the RRGP study area during any of the baseline surveys. ▪ The main vegetation cover types associated with the Highway 600 re-alignment preferred alignment are: 1) fresh, clayey: Aspen – Birch Hardwood, 2) Organic Poor Conifer Swamp, and 3) Organic Intermediate Conifer Swamp. ▪ 11 ha of woodland habitat will need to be removed for Highway 600 re-alignment works.	▪ Vegetation removal will be required along the planned corridor. However, potential effects are anticipated to be minor, given the narrow width (20m) and short length (11.4km) of the new section of roadway. Furthermore, no rare or locally significant vegetation communities were identified along the route or at the crossing to warrant additional concern. ▪ Potential habitat disruption will be avoided.	RRR has developed a habitat management program that will address impacts to vegetation removed as a result of the RRGP.
Wildlife	Identify wildlife or habitat features that are affected by Highway 600 realignment objectives. Develop environmental design and mitigation concepts as necessary for minimizing the destruction of wildlife habitat; barrier effects on travel corridor(s); adverse impacts on rare, threatened or endangered Species; and wildlife – vehicle accidents.	▪ Two mammalian species at risk (Little Brown Bat and Northern Bat) were observed in 2012 field investigations. Little Brown Bat were identified at all five detector locations established for the RRGP (including one station established along the Highway 600 realignment location). Northern Bat was identified at two locations. No bat hibernacula or bat maternity colonies were found during field investigations, although mature trees suitable for bat roosting may be found in small isolated patches in the vicinity of the Highway 600 realignment. ▪ The realignment of Highway 600 will run 6.4 km of road through natural amphibian habitat. An adult snapping turtle was observed within the NLSA in 2010, in the Pinewood River	Potential effects of the new corridor on wildlife existing in the area are anticipated to be minor, given the narrow width (20m) and short length (11.4km) of the new section of roadway, and the current extent of residential, commercial, and infrastructure development in the general area.	▪ RRR has developed a habitat management program that will address potential concerns to wildlife and wildlife habitat as a result of the RRGP, including migratory birds, mammals and amphibians. ▪ RRR is completing permitting under the *Endangered Species Act* for the entire RRGP, which will include any areas affected by the Highway 600 realignment. ▪ RRR will conduct ongoing monitoring

Environmental Component	MTO Principles	Illustration of Concordance between RRGP EA and MTO Class EA Principles		
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		just north of Tait Road, near Back Hawk Road. ▪ A relatively high level of avian species diversity was noted in the area, which reflects the mosaic of mixed, deciduous-dominated forest, shrubby wetlands, and open field habitats. The vast majority of bird species observed in the vicinity of the RRGP are migratory. ▪ Bald eagles have regularly been recorded during various RRGP inventories in proximity to the Pinewood River. It is likely that eagles use the Pinewood River as a feeding area. A bald eagle nest was noted during survey work in close proximity to the preferred location for the Highway 600 realignment. ▪ Thirteen avian species at risk protected under the provincial *Endangered Species Act*, including four Threatened species and nine Species of Special Concern, were observed in the RRGP study area. Six provincially rare bird species were observed in the RRGP study area. Of these, three Threatened species (Bobolink, Eastern Whip-poor-will, and Barn Swallow), six species of Special Concern (Canada Warbler, Red-headed Woodpecker, Common Nighthawk, Olive-sided Flycatcher, Golden-winged Warbler, and Bald Eagle), and two provincially rare bird species (Black-billed Magpie and Redhead) are expected to breed in the RRGP study area.		during design and construction and, using adaptive management techniques, address any concerns that may arise.
Air Quality and Sound	Identify potential exceedances of relevant air quality or noise guidelines in relation to Highway 600 realignment works. Develop environmental design and mitigation concepts as necessary for minimizing impacts to sensitive receptors as a result of air emissions and noise from road construction works.	▪ Background air quality is expected to be good, given the absence of nearby large urban centres and industrial sources. Local anthropogenic air emission sources include road traffic, agriculture activities and drilling associated with exploration activities, and an oriented strandboard mill in Barkwick. ▪ The RRGP site is regarded as a Class 3 area – i.e. rural area with an acoustical environment that is dominated by natural sounds having little or no road traffic. ▪ Sound monitoring stations were established in 2012 in several locations, including one near Dearlock (intersection of	None identified.	▪ RRR will conduct ongoing monitoring during design and construction and, using adaptive management techniques, address any concerns that may arise.

Environmental Component	MTO Principles	Illustration of Concordance between RRGP EA and MTO Class EA Principles		
		Background Conditions	**Environmental Concerns Identified for Highway 600 Realignment**	**Mitigations and Commitments to Further Work**
		Highway 600 and Pine River Road), and another a few hundred metres north of Tait Road.		
Surface Water (Hydrology and Water Quality)	Identify surface water features (quantity and quality) that may be affected by highway realignment objectives Develop environmental design and mitigation measures as necessary to avoid increased water quantity to receiving watercourses (flood levels and erosion), surface erosion/runoff to receiving watercourses, and/or pollutants to receiving watercourses (water quality).	▪ Year-to-year trend hydrologic analysis for the Pinewood River shows no developing long-term trends over the period of record. ▪ Pinewood River estimated annual runoff values for a 5th percentile low flow year and a 95th percentile high flow year are 66 mm and 394 mm, respectively. ▪ Very limited groundwater infiltration was noted into the Pinewood River. ▪ Water quality typically met the majority of provincial and federal guidelines; however, aluminum, iron, and phosphorus were consistently present at elevated concentrations, and did not meet water quality objectives in numerous samples. Cobalt and arsenic were present above objective/guidelines values at the water quality station nearest the proposed crossing location.	▪ The preferred route, Alternate C, includes a crossing of the Pinewood River. ▪ Drainage associated with the realigned highway will be managed by open ditches and culverts (as noted in Section 5.5.1 and 5.5.2 of this PDR).	▪ Refer to mitigation measures/ commitments identified above for fisheries and aquatic habitat. ▪ Best practices will be used to manage stormwater, and a Drainage and Hydrology Report will be completed during Detail Design (as noted in Section 5.5.1 and Section 5.5.3 of this PDR). ▪ To prevent groundwater contamination, a spill prevention plan will be developed and implemented during construction, and contingency plans and procedures will be in place to respond to any spills. ▪ RRR will conduct ongoing monitoring during design and construction and, using adaptive management techniques, address any concerns that may arise.
Aboriginal Traditional Land Use	Identify traditional land use that may be threatened by highway realignment objectives Develop environmental design and mitigation measures as necessary to minimize impacts	▪ RRGP lands have been in private ownership for homesteads and farms for several generations, dating back to early 1800s. ▪ Traditional uses of the area identified through interviews with Anishinaabeg of Naongashiing First Nation, Naicatchewenin First Nation, Big Grassy River First Nation and Rainy River First Nation members include trapping, fishing, berry picking,	None identified.	▪ TK/TLU information will be considered in the management of the RRGP for the life of the mine.

Environmental Component	MTO Principles	Illustration of Concordance between RRGP EA and MTO Class EA Principles		
		Background Conditions	**Environmental Concerns Identified for Highway 600 Realignment**	**Mitigations and Commitments to Further Work**
	from Highway 600 realignment works on traditional land uses.	hunting, harvesting of poplar trees, and collection of medicinal plants. ▪ Interviewees expressed an interest in identifying medicinal plants in the area and transplanting them elsewhere, although they are not currently collecting plants in the RRGP area. ▪ Rainy River First Nations members identified that there were Moose and Caribou in the RRGP area. ▪ The preferred route alternative C for the relocation of Highway 600 has been vetted and discussed with the local First Nations during the development and approval of the EA Terms of Reference.		
Non-Traditional Land and Resource Use (including Community/ Recreation, Agriculture, and Commercial/ Industrial)	Identify non-traditional land use that may be threatened by highway realignment objectives Develop environmental design and mitigation measures as necessary to minimize impacts from Highway 600 realignment works on non-traditional land uses.	▪ The principal existing or past land uses in the RRGP study area are agriculture and forestry. Agriculture is an important component of the regional economy in the Rainy River District. Livestock production is the most important commodity (beef cattle and dairy). The Sustainable Forest License for the Crossroute Forest Management Unit is held by Resolute Forest Products. The current Forest Management Plan shows no planned harvesting in the area overlapping the RRGP study area. ▪ Section 6 of the Township of Chapple's Official Plan (updated March 2013) defines the transportation policies, and Section 6.2(12) specifically acknowledges a conceptual preferred realignment of Highway 600 which is based on their approval and support for route alternative C. ▪ No provincially significant features such as wetlands or protected areas are located in the RRGP study area. However, one Conservation Environmental Protection Area designation (Township of Chapple, Official Plan) is found in	There are two baitfish license areas that will be impacted by the Highway 600 realignment. There could be possible temporary interruption to harvesting in a localized area while the new Pinewood River crossing is constructed. Thereafter there would be a positive benefit provided by improved access to the license area as a result of the Highway 600 realignment. Access to forestry companies as a result of	▪ Development in proximity to a provincial highway shall be subject to applicable transportation policies of the Official Plan. ▪ Meetings with Resolute have been held to discuss access to any Crown timber which is harvested for any of the proposed RRGP facilities/uses for use by local mills, as was suggested by Resolute. ▪ With respect to changes to access to forestry resources, the proposed Highway 600 realignment uses existing road allowances and is designed to mimic existing Highway 600 connectivity for general area road network.

Environmental Component	MTO Principles	Illustration of Concordance between RRGP EA and MTO Class EA Principles		
		Background Conditions	**Environmental Concerns Identified for Highway 600 Realignment**	**Mitigations and Commitments to Further Work**
		the RRGP study area, generally following the Pinewood River. ▪ Trapping, hunting, fishing and snowmobiling also occur in the vicinity of the RRGP site.	Highway 600 realignment may be temporarily disrupted during realignment construction works, but is expected to be enhanced over the longer-term (once the realignment works are complete and the road is available for use).	
Archaeological and Cultural Heritage Resources	Identify archaeological and cultural heritage features that may be threatened by Highway 600 realignment objectives. Develop environmental design and mitigation measures as necessary to avoid the loss of archaeological and cultural heritage resources.	▪ Eight pre-contact archaeological sites and four homestead sites were located and recorded in the RRGP study area as a result of Stage 1 and 2 Archaeological investigations. ▪ A field built heritage sites baseline study was completed.	None identified. Highway 600 realignment works are not associated with any pre-contact or historic, nor any built heritage sites.	▪ RRR will conduct ongoing monitoring during design and construction and, using adaptive management techniques, address any concerns that may arise.
Consultation	Consultation will be used to assist in the identification of data requirements. The proponent will constructively address input received during the consultation process. During later planning and design phases, the proponent will show how the input received in earlier stages affected the project.	▪ RRR has identified several stakeholders and groups, including but not limited to the Township of Chapple, government agencies (MNR, MOE, MTO, DFO), aboriginal groups, and local residents with an interest in Highway 600 realignment works. ▪ Public Information Centres, Open Houses, as well as direct communication and consultation with interested groups have been undertaken in conjunction with consultation for the entire RRGP. ▪ Comments provided by MTO on the Highway 600 realignment Feasibility Report are appended to this PDR (Appendix D).	The Township of Chapple has endorsed and support the preferred route (Alternate C), given that this alternative optimizes the use of the existing road allowances and will better accommodate local traffic	▪ Specific concerns have been addressed through mitigations and commitments identified above.

Environmental Component	MTO Principles	Illustration of Concordance between RRGP EA and MTO Class EA Principles		
		Background Conditions	Environmental Concerns Identified for Highway 600 Realignment	Mitigations and Commitments to Further Work
	The amount, extent and timing of consultation will vary according to the complexity of a specific project, the nature of the specific environmental issues, and the concerns expressed by the public and external agencies. The proponent will make reasonable efforts to resolve concerns.	▪ The preferred realignment alternative C has been vetted with the local First Nations, the general public and the local Municipal and Provincial Governments as part of the public Terms of Reference development process.	Specific concerns raised by other interested stakeholders were related to protection of fisheries resources, as well as access for forest companies and local baitfish license areas. Concern in relation to redirection of public traffic was also identified (addressed in Traffic Impact Study – Appendix C of this PDR).	

3.0 EXISTING HIGHWAY CONDITIONS

3.1 Traffic

Highway 600 annual average daily traffic volume (AADT) is 110. It is anticipated that traffic volumes on Highway 600 within the study area will not increase in the near future.

3.2 Posted Speed

The posted speed of Highway 600 is 80 km/h.

3.3 Horizontal Alignment

The 11 km of Highway 600 (Bypassed Loop) is primarily tangential with approximately 8% of the road system comprised of short curvilinear alignment at six locations of bedrock outcrops.

3.4 Vertical Alignment

Highway 600 is fairly flat with a few areas of rolling profile. An inventory of existing conditions was not undertaken.

3.5 Cross-Section/Crossfall

Highway 600

Roadway platform consists of two 3.0 m lanes, a 1.0 m shoulder and 0.5 m rounding.

Tait Road

This section consists of a 5.0 m gravel surface with typical tangent crossfall.

3.6 Sideroads/Entrances

The MTO District Corridor Management Officer and the Township of Chapple will be contacted for information regarding sideroads and entrances.

The Bypassed Loop of Highway 600 has numerous sideroads and entrances for which direct access to the new highway is not required.

3.6.1 Sideroads

There are three existing municipal roads that will intersect with the new highway alignment. They are the Sheppard Road/Tait Road cross-intersection and the McMillan Road 'T' Intersection

All intersecting sideroads are under the jurisdiction of the Township of Chapple.

3.6.2 Entrances

There are five farm, residential or field entrances.

3.7 Roadside Hazards

Highway 600 consists of numerous minor water crossings. Guide rail is non-existent. There are no known roadway hazards.

3.8 Drainage

Existing Highway 600 roadway drainage systems consist of open ditches and culverts.

The presence of any agricultural drainage tile along Tait Road is unknown and requires investigation.

The Pinewood River traverses the new highway alignment approximately 2.1 km south of Dearlock.

3.9 Geotechnical/Foundations

3.9.1 Geotechnical

In general, the proposed Highway 600 alignment traverses low relief terrain with discontinuous organic deposits accumulated in low-lying areas, several bedrock plateaus adjacent, and overburden units comprised predominantly of silty clay soils with occasional silty sand or sandy silt strata.

TBT Engineering Limited (TBTE) was retained to provide geotechnical/pavement engineering services. Feasibility Study and Preliminary Design stage geotechnical investigations were conducted. The work consisted of pedo and power auger boreholes.

Local soil deposits are primarily black organics overlying brown silty clays. Tait Road, the municipal roadway incorporated into the new alignment, consisted primarily of shallow lifts of brown fine to coarse sands with gravel atop a discontinuous layer of buried organics and clays.

The predominant overburden unit along the proposed alignment consists of a silty clay lacustrine deposit. The silty clay soils have a firm to stiff consistency, exhibit moderate plasticity (liquid limit ~ 30 – 35 %) with plasticity indexes in the order of 14 to 18, and an average natural moisture content of 22 %.

Beyond swamp/muskeg deposits, the organic topsoil horizon typically ranges from 150 mm to 300 mm in thickness and is generally consistent along the proposed alignment. Areas of thicker organic swamp/muskeg deposits were present near the Pinewood River and extending southerly for approximately 1.0 km. These muskeg deposits ranged from 1.2 to 3.0 m in depth and are underlain by silty clay soils.

Preliminary investigations indicate that the water table may be present within 1.5 m of original ground and will be at or near surface through low-lying muskeg areas.

Further investigations and testing and preparation of a Geotechnical Design Report will be completed for the recommended alignment.

3.9.2 Foundations

Preliminary foundations investigations and testing were completed in June 2013 for three proposed alternative crossings of the Pinewood River. In addition, a total of 24 shallow hand-operated pedo holes were advanced along the proposed highway approaches.

The surficial soils were found to consist of a thin layer of organic soil overlying clay. See Preliminary Foundations Report in Appendix.

A detailed foundation investigation will be carried out once the preferred alignment and structure configuration is established.

3.10 Utilities

Utilities were contacted in order to complete geotechnical investigations on Pine River Road and Tait Road. Hydro One and Bell provided field locates and sketches of the existing plant.

Pine River Road/Highway 600 Intersection

Hydro One overhead primary exists in the southeast quadrant with a west-east pole line along Highway 600 and one pole or anchor south on Pine River Road.

Bell

Underground telephone plant is located in the northwest quadrant on the west side of Highway 600 with a W-E highway crossing.

Tait Road

Hydro One overhead primary is situated on the north side of Tait Road between Highway 600 and McMillan Road.

Bell

Buried telephone cable is situated on the north side of Tait Road between Highway 600 and McMillan Road. In addition, there appears to be three (3) buried roadway crossings, one located 900 m west of the Highway 600 intersection and two (2) at the intersection.

Highway 600 Bypassed Loop

Existing Bell telephone and Hydro One plant is situated within the highway right-of-way.

3.11 Right-of-Way

MTO provided Engineering Title Records for Hwy 600 in the vicinity of the project site

Highway 600

The existing highway (Bypassed Loop), as well as the majority of Highway 600 has a typical 20 m right-of-way with selective areas of 30 m width.

Tait Road (Existing Municipal Road)

The West-East portion of Tait Road (to be incorporated in the new alignment) is situated within a 20 m road allowance.

Unopened Road Allowances

There is an unopened 20 m wide municipal road allowance running near North-South from the Pinewood River southerly and West-East to the Tait Road/Sheppard Road intersection. These road allowances were surveyed by J.D. Barnes and legal plans will be provided to TBTE.

4.0 ALTERNATIVES AND EVALUATION

4.1 Route Planning

4.1.1 Feasibility Study Report

At the onset of this Feasibility Study, RRR identified four (4) proposed alternative alignments (Alternatives A, B, C, D) all in the southern area of the study. It was noted that all four (4) alternatives involved a crossing of the Pinewood River, and as such three (3) northern alternatives were identified (Alternatives E, F, G) to avoid this significant

river crossing. Ultimately, one additional southern alternative was identified as an extended combination of previous Alternatives B and D (Alternative H).

See Figure 1 for a plan of the Highway 600 Route Planning Alternatives.

External consultation with the Council and Public Works Department for the Corporation of the Township of Chapple was also undertaken. The Township subsequently provided a ranking of alternate alignments indicating that Alternative C was their preferred alignment option when considering the impact on local traffic routes and property owners.

The MTO also provided comments to RRR and was receptive to the highway realignment. The Ministry advised that the project would need to adhere to Ministry design standards and be fully funded by RRR.

Comparative evaluations were developed and applied against each alternative alignment to assist in the selection of a preferred route. A qualitative analysis was a component of those evaluations. Factors considered in this analysis were major water crossings, travel distances, additional highway maintenance, utilization of existing municipal road/road allowances and proximity to aggregate resources.

The findings of the qualitative analysis from the Feasibility Study have been further summarized as part of this report. See Table 2 - Highway 600 Route Planning Alternatives Qualitative Evaluation.

Based on the findings of the Feasibility Study, Alternate C was identified as the Preferred Route for provision of enhanced public safety for the realignment of Highway 600 around the active mineral exploration area.

Figure 1

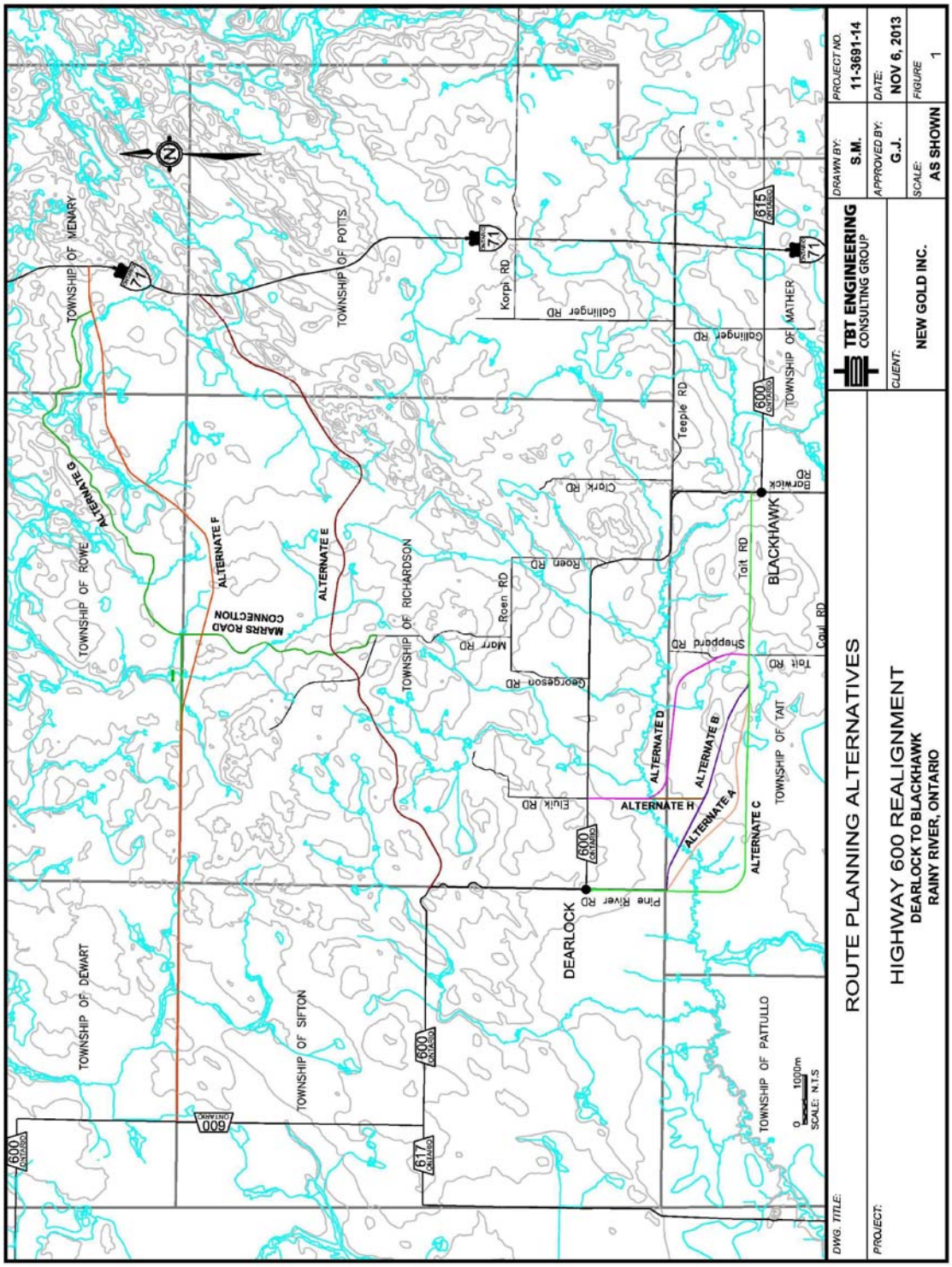

TOWNSHIP OF MENARY
TOWNSHIP OF POTTS
TOWNSHIP OF ROWE
TOWNSHIP OF RICHARDSON
TOWNSHIP OF MATHER
TOWNSHIP OF TAIT
TOWNSHIP OF DEWART
TOWNSHIP OF SIFTON
TOWNSHIP OF PATTULLO
DEARLOCK
BLACKHAWK
ALTERNATE A
ALTERNATE B
ALTERNATE C
ALTERNATE D
ALTERNATE E
ALTERNATE F
ALTERNATE G
ALTERNATE H
MARRS ROAD CONNECTION
Korpi RD
Gallinger RD
Teeple RD
Clark RD
Roen RD
Marr RD
Georgeson RD
Elvik RD
Pine River RD
Dorwick RD
Toit RD
Sheppard RD
Coul RD
SCALE: N.T.S
0 1000m
TBT ENGINEERING
CONSULTING GROUP
CLIENT:
NEW GOLD INC.
DRAWN BY: S.M.
APPROVED BY: G.J.
SCALE: AS SHOWN
PROJECT NO. 11-3691-14
DATE: NOV 6, 2013
FIGURE 1
DWG. TITLE:
ROUTE PLANNING ALTERNATIVES
PROJECT:
HIGHWAY 600 REALIGNMENT
DEARLOCK TO BLACKHAWK
RAINY RIVER, ONTARIO

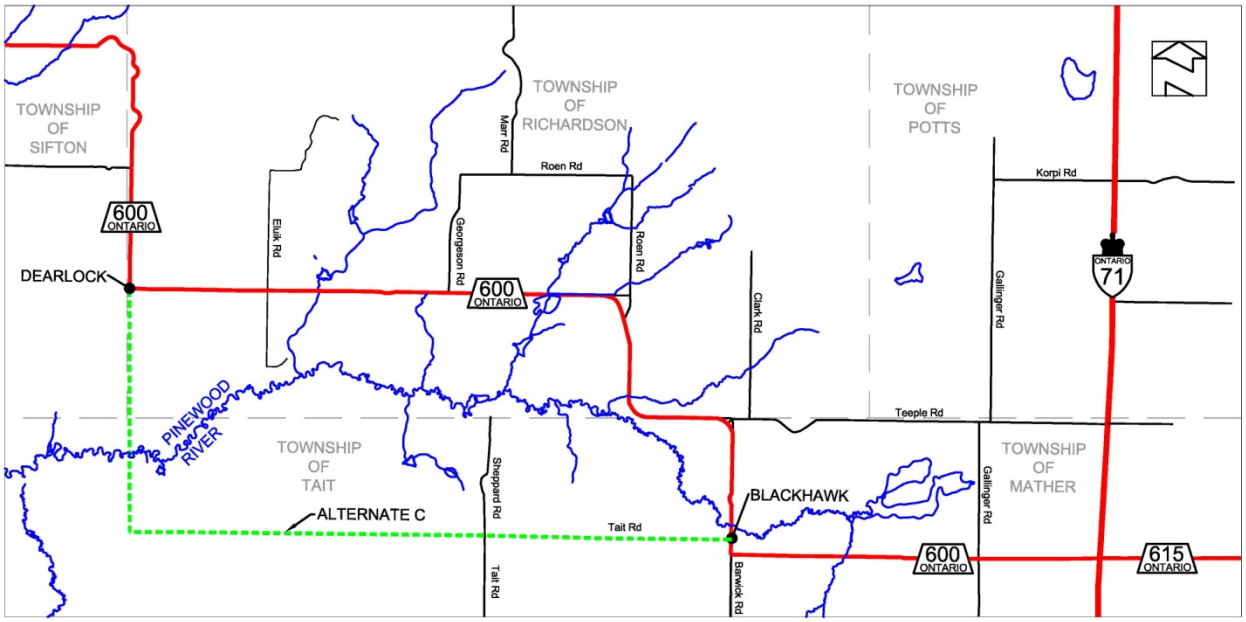
TABLE 2 - HIGHWAY 600 ROUTE PLANNING ALTERNATIVES QUALITATIVE EVALUATION

FACTOR	ALTERNATIVE A 10.2 km	ALTERNATIVE B 10.1 km	ALTERNATIVE C 11.1 km	ALTERNATIVE D 8.6km	ALTERNATIVE E 14.5 km	ALTERNATIVE F 18.2 km	ALTERNATIVE G 19.5 km	ALTERNATIVE H 8.3 km
Major Water Crossings	One (1) Crossing Pinewood River **ACCEPTABLE**	One (1) Crossing Pinewood River **ACCEPTABLE**	One (1) Crossing Pinewood River **ACCEPTABLE**	One (1) Crossing Pinewood River **ACCEPTABLE**	Minor water crossings **PREFERABLE**	Minor water crossings **PREFERABLE**	Minor water crossings **PREFERABLE**	One (1) Crossing Pinewood River **ACCEPTABLE**
Utilization Existing Municipal Road/Road Allowances	Utilizes 5.9 km 5 private properties **ACCEPTABLE**	Utilizes 5.1 km 6 private properties **ACCEPTABLE**	Utilizes 11.1 km No private properties foreseen **PREFERABLE**	Utilizes 3.7 km 6 private properties **ACCEPTABLE**	No municipal roads 12 private properties **ACCEPTABLE**	Utilizes 4.1 km Private properties unknown **ACCEPTABLE**	Utilizes 4.1 km Private properties unknown **ACCEPTABLE**	Utilizes 3.3 km 6 private properties **ACCEPTABLE**
Proximity To Aggregate Resources	Several Centrally located **PREFERABLE**	Several Centrally located **PREFERABLE**	Several Centrally located **PREFERABLE**	One centrally located **ACCEPTABLE**	Two centrally located Prospects at east end **PREFERABLE**	Prospects near east limits **ACCEPTABLE**	Prospects near east limits **ACCEPTABLE**	Several potential south of river **ACCEPTABLE**
Travel Distance (km) Dearlock to Hwy 71 -0.6 **PREFERABLE**	-0.7 **PREFERABLE**	+0.3 **ACCEPTABLE**	-0.4 **PREFERABLE**	+13.3 **UNACCEPTABLE**	+29.5 **UNACCEPTABLE**	+30.8 **UNACCEPTABLE**	-0.3 **PREFERABLE**
Travel Distance (km) Dearlock to Blackhawk -0.6 **PREFERABLE**	-0.7 **PREFERABLE**	+0.3 **ACCEPTABLE**	-0.4 **PREFERABLE**	+35.6 **UNACCEPTABLE**	+56.5 **UNACCEPTABLE**	+57.8 **UNACCEPTABLE**	-0.3 **PREFERABLE**
Additional Highway Maintenance MTO	-0.6 **PREFERABLE**	-0.7 **PREFERABLE**	+0.3 **ACCEPTABLE**	-0.4 **PREFERABLE**	-7.7 **PREFERABLE**	-19.0 **PREFERABLE**	-17.7 **PREFERABLE**	-0.3 **ACCEPTABLE**
Additional Highway Maintenance Municipal	-3.3 **PREFERABLE**	-3.3 **PREFERABLE**	-3.3 **PREFERABLE**	-3.2 **PREFERABLE**	+22.2 **UNACCEPTABLE**	+37.2 **UNACCEPTABLE**	+37.2 **UNACCEPTABLE**	-3.2 **PREFERABLE**

4.1.2 Preferred Route

Alternative C between Dearlock and Blackhawk, the Preferred Route consists of 11.4 km of new highway alignment which incorporates the existing municipal roads of Tait Road (3.3 km) and Pine River Road (1.6 km), and unopened road allowances (6.2 km).

Figure 2 – Alternative C Preferred Route



4.2 Preliminary Design

4.2.1 Preliminary Design Alternatives

Specifically for the 3.2 km North-South alignment section of Alternative C from Dearlock southerly to the East-West municipal road allowance, six (6) alternatives C1 to C6 were reviewed and evaluated.

The following technical standards applied to all alternatives:

Structure:

- Two (2) lane clear span modular bridge on tangent
- Minimum longitudinal gradient of 0.5 %
- Not situated in sag or crest vertical curve
- Span length considerate of rock embankment approach fills
- Grade line considerate of hydraulic, hydrologic and navigable clearances

Highway Geometrics 80 km/h Design Speed:

- Horizontal – minimum radius 250 m; minimum curve length of 150 m or 400 – 50 delta
- Vertical Curves – minimum crest k 35 and sag k 30; minimum length 80 m
- Longitudinal Gradient – desirable minimum 0.3% - 0.5%

Future Intersection with Municipal Road to Freshwater Pipeline Pumping Station:

- 90 degree intersection of North-South and East-West highway section alignments is required

All alignment alternatives involve a crossing of the Pinewood River with a clear span and no structural or grading footprint in the river. The alignments are all similar in topography and soil conditions.

Highway alignment alternatives were considerate of these factors:

i) utilization of existing municipal roads/road allowances;
ii) *a single span bridge crossing of the Pinewood River;
iii) *existing soil conditions;
iv) *intersection with the East-West highway alignment;
v) environmental considerations; and
vi) property availability.

* ii, iii and iv were considered as the technical criteria for the purposes of the technical requirements evaluations

A jog between the road allowance and the Pine River Road became evident upon completion of legal surveys. An alternative alignment to join the existing road to the road allowance was evaluated.

The existing road allowance at the Pinewood River crossing did not appear preferable for a single span bridge crossing. Alternate river crossings referenced as West, Centre and East were investigated and evaluated.

The West Crossing situated approximately 40 m to the west of the Centre Crossing consisted of a shorter span. It is located on private property.

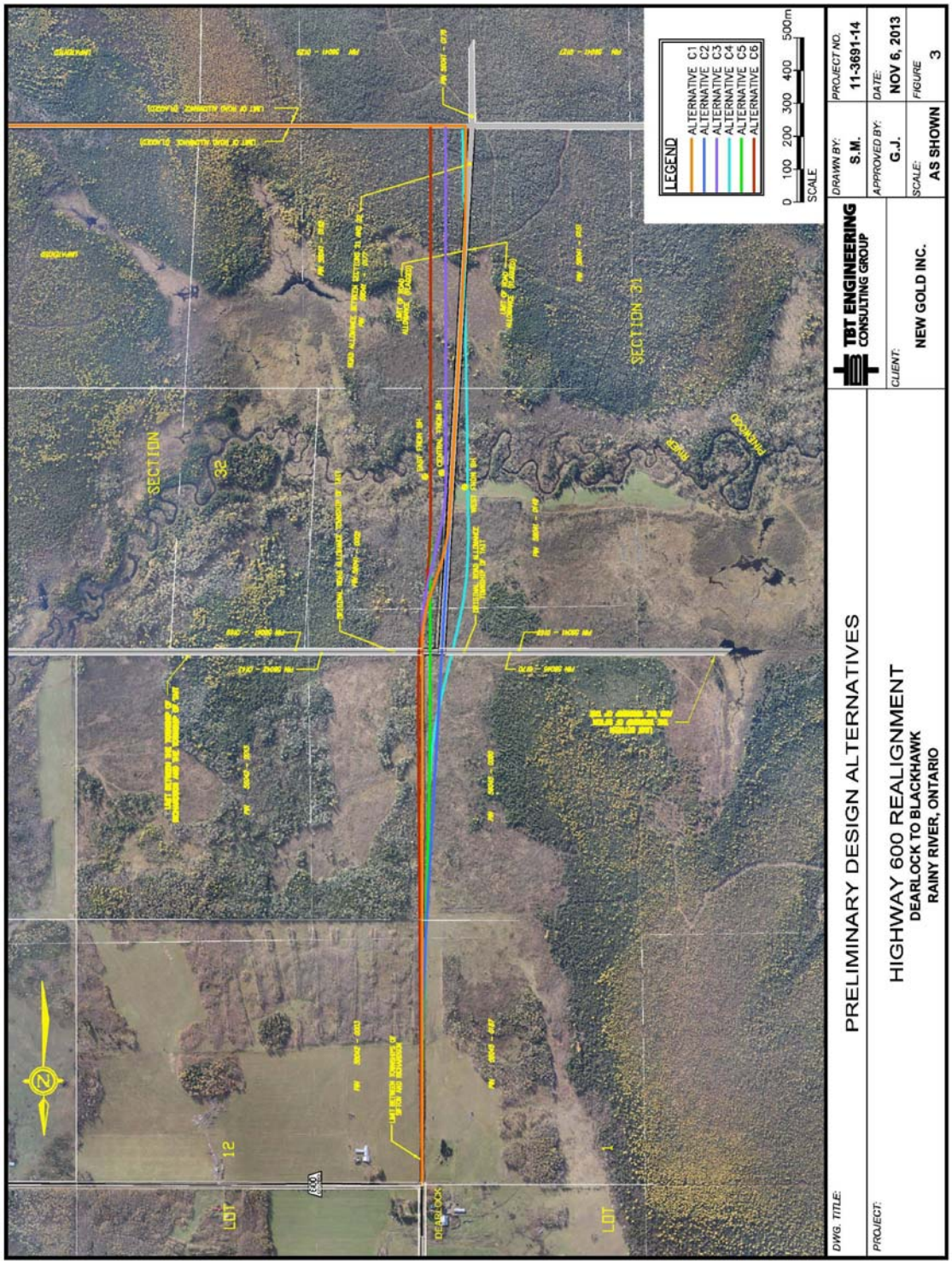
The Centre Crossing is situated within the existing unopened municipal road allowance and required a very long span across an oxbowed section of the river.

The East Crossing was in line with a southerly projection of Pine River Road and is situated approximately 80 m to the east of the Centre Crossing. It is located on private property.

Additional alignment alternatives were also evaluated to mitigate impacts to adjacent private properties. Property acquisition will be a key component in the determination of the Preferred Alignment, as RRR has no expropriation rights.

See Figure 3 - Preliminary Design Alternatives

Figure 3


LEGEND
ALTERNATIVE C1
ALTERNATIVE C2
ALTERNATIVE C3
ALTERNATIVE C4
ALTERNATIVE C5
ALTERNATIVE C6
0 100 200 300 400 500m
SCALE
SECTION 32
SECTION 31
LOT 12
LOT 1
DEARLOCK
600
TBT ENGINEERING CONSULTING GROUP
DRAWN BY: S.M.
PROJECT NO. 11-3691-14
APPROVED BY: G.J.
DATE: NOV 6, 2013
CLIENT: NEW GOLD INC.
SCALE: AS SHOWN
FIGURE 3
DWG. TITLE: PRELIMINARY DESIGN ALTERNATIVES
PROJECT: HIGHWAY 600 REALIGNMENT
DEARLOCK TO BLACKHAWK
RAINY RIVER, ONTARIO

4.2.2 Evaluation of Alternatives

All alignments were evaluated based on the following technical criteria:

i) single span bridge crossing of the Pinewood River;
ii) existing soil conditions; and
iii) intersection with the East-West highway alignment.

Geometric factors for vertical and horizontal alignment were not part of the technical requirements evaluation. All alternatives meet or exceed the minimum requirements for the RLU80 Design Speed

See Table 3 - Preliminary Design Alternatives Technical Evaluation

TABLE 3 - PRELIMINARY DESIGN ALTERNATIVES TECHNICAL EVALUATION

CRITERIA	ALTERNATIVE C1 CENTRE CROSSING	ALTERNATIVE C2 CENTRE CROSSING	ALTERNATIVE C3 CENTRE CROSSING	ALTERNATIVE C4 WEST CROSSING	ALTERNATIVE C5 EAST CROSSING	ALTERNATIVE C6 EAST CROSSING
Single Span Structure (m)	80 -100 **UNDESIRABLE**	80 - 100 **UNDESIRABLE**	80 - 100 **UNDESIRABLE**	24 **ACCEPTABLE**	34 **ACCEPTABLE**	34 **ACCEPTABLE**
Shallow Foundations (low short span structure with footing)	slightly weaker soils than West and East **ACCEPTABLE**	slightly weaker soils than West and East **ACCEPTABLE**	slightly weaker soils than West and East **ACCEPTABLE**	marginally better soils than Centre **PREFERABLE**	marginally better soils than Centre **PREFERABLE**	marginally better soils than Centre **PREFERABLE**
Deep Foundations (high long span structure with piles to bedrock)	Little difference in foundation performance **ACCEPTABLE**	Little difference in foundation performance **ACCEPTABLE**	Little difference in foundation performance **ACCEPTABLE**	Little difference in foundation performance **ACCEPTABLE**	Little difference in foundation performance **ACCEPTABLE**	Little difference in foundation performance **ACCEPTABLE**
Structure Approaches Settlement Performance Fill heights >3m	should perform **ACCEPTABLE**	should perform **ACCEPTABLE**	should perform **ACCEPTABLE**	should perform marginally better than Centre **PREFERABLE**	should perform marginally better than Centre **PREFERABLE**	should perform marginally better than Centre **PREFERABLE**
Soil Conditions **Constructability**	1 - 3.0 m organics **ACCEPTABLE**	1 - 3.0 m organics **ACCEPTABLE**	1 - 3.0 m organics **ACCEPTABLE**	1 - 3.0 m organics **ACCEPTABLE**	1 - 3.0 m organics **ACCEPTABLE**	1 - 3.0 m organics **ACCEPTABLE**
90 degree intersection with E-W highway	**ACCEPTABLE**	**ACCEPTABLE**	**ACCEPTABLE**	**ACCEPTABLE**	**ACCEPTABLE**	**ACCEPTABLE**

4.2.3 Preferred Alternative

Eight (8) alternate alignments for Highway 600 were evaluated and, in consideration of the evaluation criteria, the intentions and perspectives of both RRR and the Township of Chapple, and comments received from the stakeholder and public consultations, Alternative C was determined to be the preferred route.

For the preferred route, six (6) alternatives will be further reviewed and evaluated for the North–South portion of the preferred route and these alternatives are influenced by property negotiations initiated by RRR.

The horizontal alignment for centreline of construction will be established based upon geometric criteria, property impacts, soil conditions and topographic features. A plan of the proposed horizontal and vertical alignment will be provided to the MTO.

5.0 PROPOSED DESIGN

5.1 Horizontal Alignment

The horizontal alignment will conform to 80 km/h design speed standards per the Geometric Design Standards for Ontario Highways (GDSOH) Table C3-2 with consideration for deflection P.I.s of maximum 0 degrees 30 minutes before the institution of the required horizontal curve. Curve length shall be a minimum of 150 m or the appropriate minimum length for the deflection angle.

TBTE requested MTO's requirements for horizontal curves, particularly considering the existing 90 degree corner at Dearlock; the intersection of Pine River Road with existing Highway 600. TBTE also noted that other 90 degree corners currently exist along Highway 600 and similar minor secondary highways in this area. MTO indicated preference for horizontal curves with the appropriate radii for the required design speed. Exceptions would include 90 degree corner intersection locations. An unopened road allowance location is proposed as a future municipal road connection to service New Gold's freshwater pipeline pumping station.

Thusly, there are no horizontal curves proposed. Two 90 degree corners will be instituted at the westerly intersection with the unopened E-W road allowance and the west terminus of the new alignment at the existing Tait Road/Hwy 600 location

5.2 Vertical Alignment

Vertical alignment will conform to 80 km/h design speed standards as per the GDSOH.
The set Profile Grade will be considerate of soils conditions, longitudinal drainage, intersection approaches, freeboard in wetter areas, depth of cover for drainage features and required clearances for a new structure at Pinewood River.

5.3 Cross Sections

The design highway cross section will be in accordance with GDSOH Table D2-1& D5-1 and will consist of two 3.0 m lanes, 1.0 m shoulders and 0.5 m minimum rounding. This proposed platform width is consistent with the existing platform width on Highway 600.

The 3.0 m lanes are consistent with the existing highway and Table D2-2 Lane Widths for lower volume highways. The type, size and volumes of truck traffic will not be significant as any associated mine traffic will have access via the new East Access Road.

The proposed shoulder of 1.0 m is in conformance with Table D5-1- Shoulder Width for Undivided King's Highways and Secondary Highways.

Shoulder rounding of 0.5 m complies with the GDSOH. In areas of steel beam guide rail, it is recommended that the shoulder rounding be increased to 1.0 m minimum.

See Figures 4 and 5 for typical sections.

Figure 4 – Typical Highway Sections

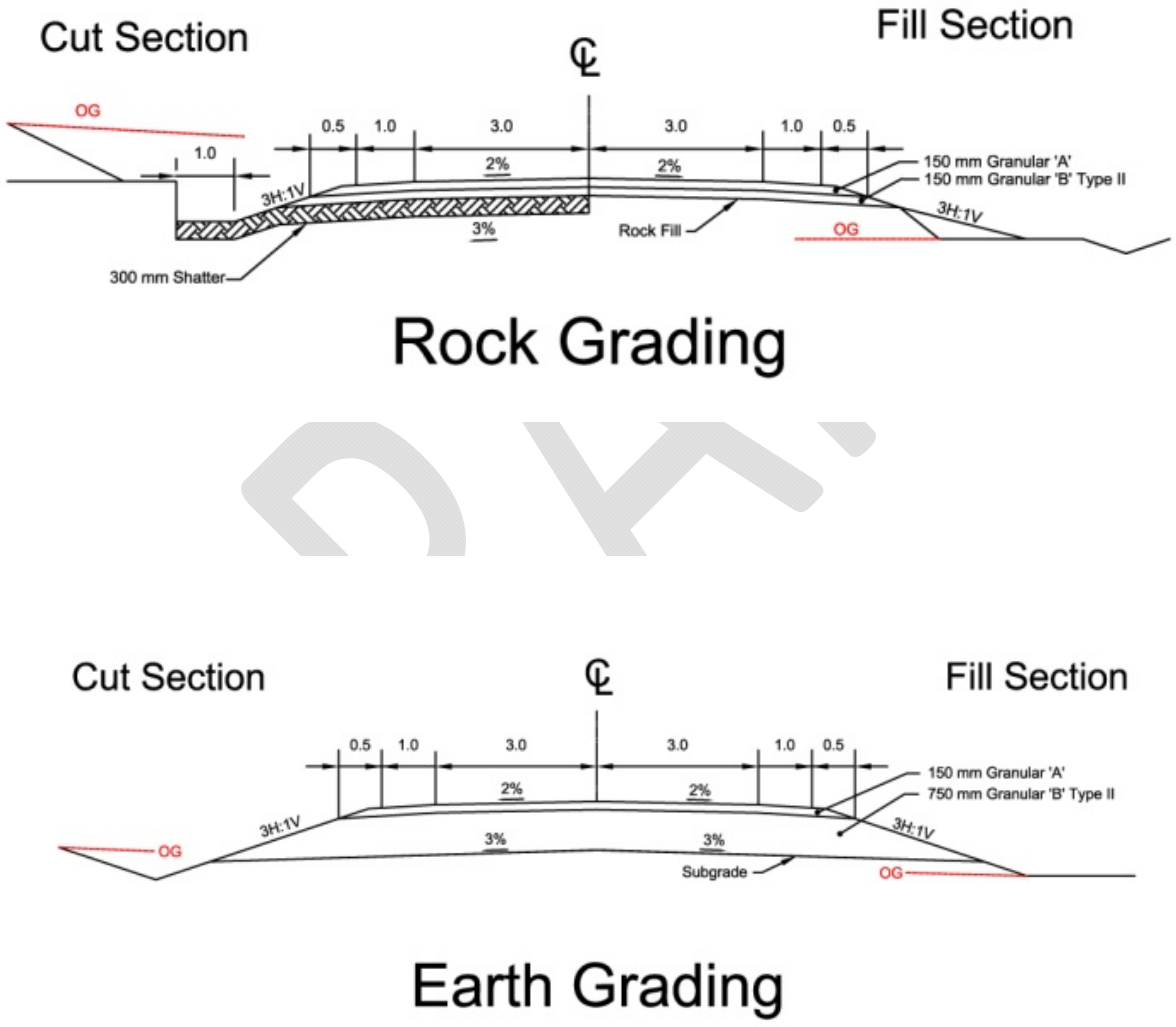
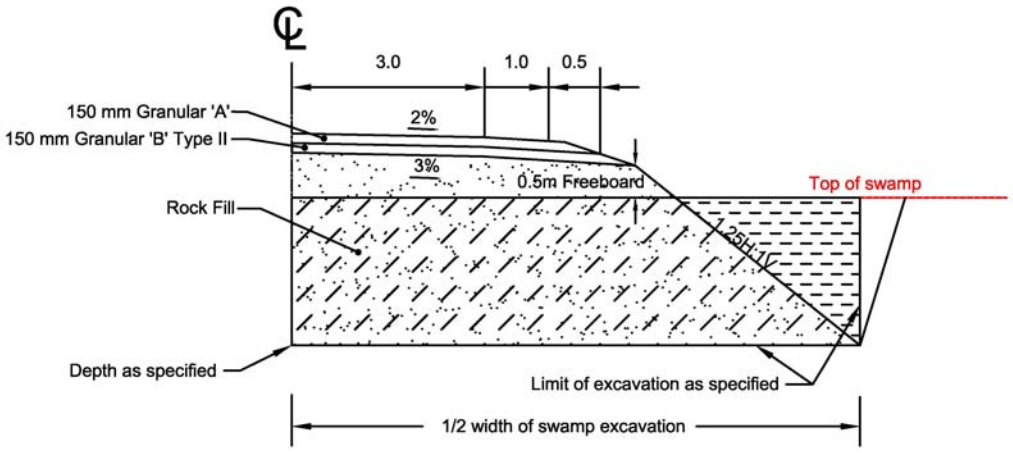
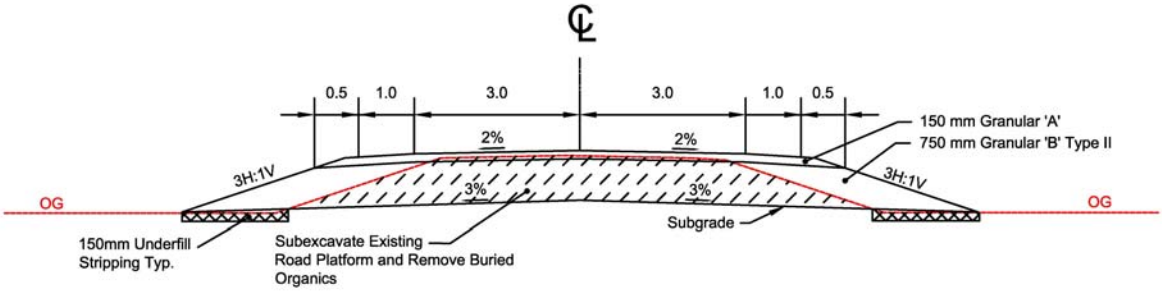


Figure 5 – Typical Highway Sections



Embankment Over Swamp



Existing Road Widening

Tait Road
Pine River Road

5.4 Intersections/Sideroads/Entrances

5.4.1 Sight Distance

Stop Control Intersections

Sight Triangles

Due to low traffic volumes on both the highway and the sideroads, sight triangles are deemed unessential.

Turning Movements

For all stop controlled intersections, sight distance requirements for a design speed of 80 km/h as per Section E.3.2 of the GDSOH and Figure E3-6 will apply. Special considerations for increased sight distance due to truck traffic are not warranted.

Sight distance is based upon height of driver's eye of 1.05 m at the stop block (5 m off edge of lane) to roof of a vehicle of 1.30 m on the main highway. For Cases D and E a distance of 265 m is required.

As all intersections are situated on tangent, there are no horizontal curve restrictions. In the absence of major rock or earth cuts, the vertical alignment should be fairly gentle. The required sight distances should be cost effectively attained.

5.4.2 Geometry

Sideroads

Design will be for Simple Open Throat Intersections for a Rural Stop Condition and OPSD standards 300.01 and 300.02 will apply.

Radius

As per Table E6-1 of the GDSOH, the desirable radius of 15 m should be adopted; however, a 10 m radius is acceptable for minor local roads. Grading requirements to provide positive drainage may dictate the selected radius to avoid encroachment on private lands. Special design consideration for buses and farming equipment is not foreseen.

Width

Municipal sideroad standards will be matched.

Entrances

All entrances are to be designed to suit existing conditions or in accordance with the appropriate OPSD 301.01, 301.02 or 301.03.

Commercial Entrances

There are no commercial entrances anticipated.

5.4.3 Corridor Control

Contact will made with the MTO Corridor Management Office to ensure conformance with sight distance and permit requirements for both existing and new entrances.

The Municipality of Chapple will be contacted regarding existing entrances on Tait and Pine River Road.

5.5 Roadway Drainage and Hydrology

5.5.1 Culvert Design

A Drainage and Hydrology Report will be completed during Detail Design. Using catchment data, the peak flow will be determined using the using the Rational Method and/or the Modified Index Flood Method (MIFM). The Rational Method will be applied to catchments with areas under 100 hectares, and the MIFM for those with areas over 100 hectares.

The following data will be utilized in the drainage study:

- survey plans and profiles
- Aerial photographs (scales: 1:20000, 1:25000, 1:50000)
- Google Earth imagery
- Federal Energy Mines and Resources topographic maps (scale 1:50000)
- Ontario Base Maps (scale 1:20000).

All culverts require detailed hydrology and hydraulic calculations. A 25 year storm return period will be used for the hydrological design of centreline culverts. The minimum highway crossing culvert size will be 800 mm diameter.

5.5.2 Roadside Ditch Design

Drainage will be facilitated by open ditches and culverts.

It is recommended that standard roadside ditching be provided for 0.5 m below subgrade in earth and 0.25 m below subgrade in rock with consideration for 1 m flat bottom widths in flatter and wetter areas. It is recommended that protection of ditches be in the form of seeding and mulching and/or rock protection depending on the steepness of the highway grade. Check dams may be required to control erosion until ground cover has been established, especially in the vicinity of the Pinewood River crossing.

5.5.3 Stormwater Management

Best practices will be used. Specific stormwater management design features are not anticipated due to the rural design features of the highway.

5.6 Geotechnical/Foundation Design

5.6.1 Geotechnical Design Report

Preliminary Design

A design subgrade of silty clay has been chosen to represent the existing conditions.

Based on the traffic volumes and design subgrade, MTO's Northwest Region Pavement Design Thickness Chart recommends the following pavement structure with a resulting design Granular Base Equivalency (GBE) of:

Design Granular Base Equivalency

Pavement Structure	Thickness	Factor	GBE
Granular 'A' Base	150 mm	1.00	150
Granular 'B' – Type II Subbase	750 mm	0.67	503
Total			**653**

The recommended base course is 150 mm of Granular "A".

Granular subbase material will be Granular "B" Type II.

The following subgrade depths should apply:

- Earth cuts - 900 mm in earth cuts (silts and clays) and a ditch depth of 0.5 m below subgrade elevation.
- Rock cuts/fills - 300 mm and ditch depth of 0.3 m below subgrade elevation.

Swamp treatments should be in accordance with OPSD 210.02 dependent upon available right-of-way. Rock fill to a 300 mm subgrade is favoured.

Transitions should be treated as per the appropriate section of OPSD 205, using t=1.2 m, de=900 mm, dr=300 mm; da=200 mm, and y=8 m.

Detail Design

The geotechnical components, including field investigations, data analysis, recommendations and reporting shall be carried out as per the *"Pavement Design and Rehabilitation Manual"* in conjunction with the "*Northwestern Region's Geotechnical Pavements Design Thickness Chart*" and "*NWR Geotechnical Investigation Minimum Requirements dated 1998-06-01."*

The report will be compiled in accordance with Ministry policy and procedures and shall include documentation of field reviews, field investigations and laboratory testing and evaluations in a Ministry acceptable format. Borehole data and laboratory testing results will be included in the contract package.

5.6.2 Foundations Design Report

Preliminary Foundation Design

Three crossings of the Pinewood River were investigated.

The existing soil strata at this site include deep clays with various discontinuous seams and layers of silt, sand, and sand and gravel overlying till and bedrock. The bedrock exists at depths of 25.2 to 27.6 m. Rock cores and soil samples were taken and tested accordingly.

For shallow foundations, the east and west alignments (Boreholes 1 and 3) perform marginally better. The centre alignment (Borehole 2, in line with Pine River Road), has slightly weaker (firm) clays within a depth of 4 m. There is also evidence that soft clays may exist within the upper 2 m based on findings of several of the hand auger holes carried out along the centre alignment. Sub-excavation of the soft clays may be considered.

Where deep foundations are required, there is little difference in foundation performance of the three proposed alignments.

Embankment height will be a critical factor. For the approach embankments, the east and west alignments (Boreholes 1 and 3) perform marginally better in terms of settlement performance.

Detail Foundation Design

Detailed foundation investigations will be required at the approved Pinewood River crossing. A Detailed Foundations Design Report will be issued.

The following items should be considered during the future detailed foundation investigation:

- A series of piezometers should be installed with the lower clays, till and bedrock to measure the artesian pressures.
- Sampling of the bedrock should be carried out to a depth greater than 3 m to identify the depth of better quality bedrock.
- Consolidation testing should be carried out to refine settlement analyses and estimate consolidation time lines.
- Additional in-situ undrained strength testing of the upper clay soils should be considered to identify potential soft clay areas.
- Effective stress strength testing (example, drained direct shear testing) of the clay soils is required.
- Sampling and strength testing of the river bottom may be required where infilling is being considered.

5.7 Roadside Safety

5.7.1 Clear Zone

The Ministry of Transportation *Roadside Safety Manual, 1993* defines the clear zone width as “the distance from the edge of the travelled roadway to the face of an unprotected hazard.” This width, which is dependent on design speed and roadway geometrics, must be traversable and clear of any hazards such as: rigid sign supports, light standards, and non-traversable drainage structures.

The applications of clear zone width will be reviewed in accordance with the Roadside Safety Manual. Obstacles within the clear zone should be treated in the following order of preference: remove the hazard; relocate the hazard outside the clear zone; minimize the hazard by making it traversable (i.e., slope flattening) or using breakaway devices; and shield the hazard.

The minimum required clear zone distance for an 80 km/h design speed and an AADT of less than 750 is 4.0 m on tangents and 5.5 m for a minimum radius curve. The typical highway cross-section in rock cuts will provide for a clear zone of 4.3 m. A review of the clear zone will be conducted in the Detail Design.

From field observations, existing utilities, culverts or fences were not considered a roadside hazard. The majority of the obstacles within the clear zone could be cross culverts. According to the Roadside Safety Manual, culverts where the ditch slope is traversable do not require barriers. The preferred treatment is to match the inlet and outlet slopes of the pipe to the foreslope. It is recommended that any major culverts and structures be shielded with an appropriate length of guide rail.

5.7.2 Guide Rail

Where it is not practical to relocate a roadside hazard or to provide traversable embankment slopes, all hazards that are located within the clear zone will be protected with guide rail according to current Ministry design standards, practices and procedures.

The requirements for guide rail will be determined in the Detail Design stage in accordance with the Roadside Safety Manual and the length of need.

The Pinewood River crossing will require guide rail for the bridge protection end treatments.

Ideally, surplus excavation material is utilized for slope flattening to eliminate and/or minimize the need for guide rail. There are limited options for this due to the narrower right-of-way width and existing wet conditions.

5.8 Traffic Signing and Pavement Markings

Pavement markings are not required for the gravel surface.

Permanent and temporary signing will be in accordance with the *Ontario Traffic Manual*. All recommended permanent signage is to be reviewed by the Ministry. Wording on both permanent and construction identification signs must be Ministry approved.

Approved permanent signage is to be detailed in the contract packages. A Traffic Signage Plan and materials ordering table will be provided.

Signing (Temporary)

Significant, temporary signage within the construction limits is not foreseen. Local traffic use will be minimal. It is recommended that a detour will be established along Highway 617, Highway 11 and Highway 71 to route non-local traffic around the development area for the road construction stage. See Construction Traffic Mitigation Report Appendix B.

All temporary signing shall be in accordance with the Ontario Traffic Manuals, Ministry standards and regional guidelines. A Temporary Signing Plan and a Temporary Signing Table will be prepared. The Temporary Signing Table shall include, but not be limited to, information detailing sign location (chainage and which side of the road), height to bottom of sign, lateral offset to post #1, support type with dimensions, sign code with

dimensions and the message/description, etc. The Temporary Signing Plan and Temporary Signing Table shall be submitted for review and approval.

Signing (Permanent)

The Consultant is to review and recommend all signage requirements throughout the project including cautionary signing at critical locations. All recommended permanent signage is to be reviewed and approved by the Ministry. Approved permanent signage is to be detailed in the contract package. Wording on both permanent and construction identification signs must be approved.

A Permanent Signing Plan and a Permanent Signing Table will be prepared. The Permanent Signing Table shall include, but not be limited to, information detailing sign location (chainage and which side of the road), height to bottom of sign, lateral offset to post #1, support type with dimensions, sign code with dimensions and the message/description (including TODS/LOGO signs), etc. All permanent signing shall be in accordance with the Ontario Traffic Manuals, King's Highway Guide Signing Policy Manual, Ministry standards and regional guidelines. The Permanent Signing Plan and Permanent Signing Table shall be submitted for review and approval.

Eastbound stop sign control at the intersection of new Highway 600 and Barwick Road will apply with consideration for an advisory Stop Sign Ahead sign. This will be akin to the existing westbound Highway 600/Barwick Road intersection.

5.9 Pinewood River Bridge Structure

5.9.1 Crossing Description

A crossing of the Pinewood River is required. Three crossing locations West, Centre and East were identified as viable alternatives.

The exact location will be determined during Detail Design based upon vertical clearances, length of span, hydrology, soils conditions and construction footprint.

Each of the alternative crossing locations will be clear spanned to avoid environmental concerns.

5.9.2 Navigable Water Protection Act (NWPA) Approval

Pinewood River may be a navigable waterway and approval from Transport Canada may be required. An assessment will be undertaken during the preliminary structural design phase and requirements confirmed.

5.9.3 Hydrology/Hydraulics Report

Structural hydrology and hydraulic studies will be completed during Detail Structural Design.

5.9.4 Structural Design Report

The MTO advised that a two-lane modular bridge is an acceptable structure at the Pinewood River crossing.

The type of structure will need to be further reviewed and assessed as part of the Structural Design.

5.10 Utilities

5.10.1 Utility Relocation Plans

Utility companies will be contacted to determine any potential utility concerns in regards to the design. Appropriate procedures from the *"Utility Relocation Guidelines January 28, 2010"* will be adopted to facilitate utility relocations for the project.

The Bell telephone and Hydro One plant will be relocated from the Bypassed Loop of Highway 600 to the new Highway 600 right-of-way. The existing highway, although abandoned, can no longer be utilized as the utility plant conflicts with the mine development operations. In addition, existing Bell and Hydro plant along Tait Road may be impacted.

A Comprehensive Utility Plan of existing utilities will be required to prepare Utility Relocation Plans.

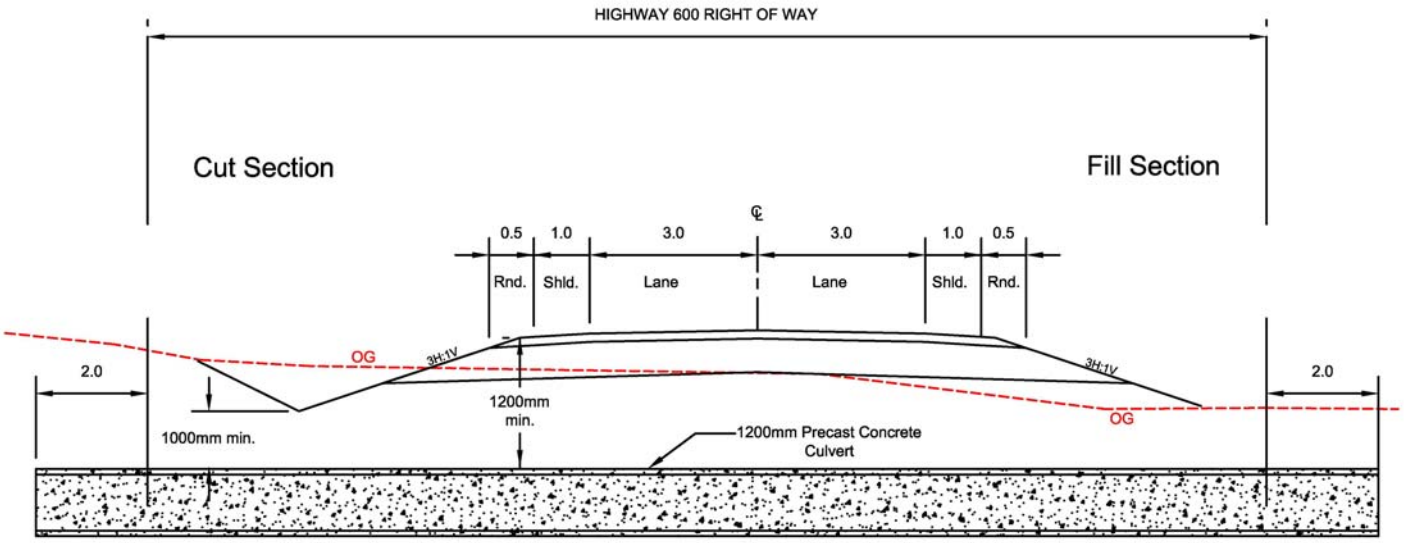
5.10.2 Freshwater Pipeline

RRR requires a freshwater pipeline. The proposed pipeline will run from a pumping station at the Pinewood River west of the new highway to the mine site.

Should the pipeline run parallel to the new highway, a setback of 3 m from the highway right-of-way to the pipeline will apply. A Building and Land Use Permit will be required from MTO for all pipeline plant within 45 m of the highway right-of-way or 1380 m of an existing or proposed intersection.

The pipeline requires a highway crossing at a location to be determined in Detail Design. A precast concrete structure to accommodate the pipeline is proposed to be constructed to 2 m beyond the right-of-way limits. The depth of cover will be determined in consultation with the MTO's Corridor Management Office. Before transfer of the constructed highway to the MTO an encroachment permit will be in effect.

Figure 6 – Freshwater Pipeline Highway Crossing Detail



Note: Appropriate frost treatment for 20 (k-d) will apply

5.11 Clearing

Essentially tree clearing will be to the limits of the right-of-way which will be in close proximity to the grading slopes.

Muskeg/organic deposits to be excavated shall be cleared, not grubbed as deemed necessary.

5.12 Snowplough Turnarounds / Road Closing Cul-de-Sacs

There are no requirements on the Bypassed Loop of Highway 600.

5.13 Materials Management/Aggregate Resources

5.13.1 Materials Management

Construction Material

Excess earth will be generated as the majority of excavated earth material is unsuitable for roadway construction purposes. The design will be considerate of the *"MTO Earth Best Practices & Recommendations for Design & Construction – June, 2010."*

The responsibility will be placed on the contractor to effectively manage earth that is excess to the contract requirements outside the right-of-way.

Surplus materials shall be managed in accordance with the RRGP On-Site Waste Management Plan. The surplus material may be utilized for various reasons including site grading, pit rehabilitation or abandonment rehabilitation. Surplus material cannot be accommodated within the narrow right-of-way.

5.13.2 Aggregate Sources

The proximity of a potential quarry and its location will have a large effect on haul rates and ultimately the cost of road construction. Using topographic and surficial soil mapping, potential quarry sources were identified.

The selected Alternate C has several potential quarry sources located centrally with the alignment.

5.14 Property

5.14.1 Right-of-Way Requirements

Private property (non-RRR owned) abuts or traverses the majority of the new highway alignment. Private property acquisitions will be required.

RRR will acquire all lands for the purposes of highway construction. Upon completion of construction and prior to opening to traffic, the new highway right-of-way shall be assumed and dedicated by the MTO.

The proposed right-of way will be typically 20 m in width, which is consistent with the right-of-way width for adjacent sections of Highway 600. MTO indicated preference for a 30 m right-of-way. If property acquisitions are a constraint and the roadway and associated utility plant can be facilitated in a 20 m right-of-way, consideration may be given to accept the 20 m width based on localised circumstances.

During Detail Design cross-sections will be developed to facilitate construction of the new Highway 600 and all associated utility plant within the right-of-way.

5.14.2 Property Requirements

Property acquisition and legal title and transfer will be handled by others.

5.14.3 Permission to Enter for Construction Purposes

Some entrances may require grading into private property to accommodate the new highway grade. For example: a 0.5 m grade raise on Tait Road may result in an entrance gradient of 10%. The type of entrance and usage will be a control for the maximum gradient.

5.14.4 Fencing/Gates

There is some fencing along Pine River Road and Tait Road. Dependent upon the grading and right-of-way requirements, this fence may be impacted. An assessment of new fencing requirements will be made during Detail Design.

5.15 Construction Staging and Traffic Management Plan

5.15.1 Construction Staging/Detours

In general, on existing highways, construction staging and/or detours are required for various purposes including safety, traffic control, grading requirements and other related highway improvements. In areas where geometric improvements are proposed, temporary delays and/or detours will be required for construction purposes. Detours may

involve temporary shoulder widening and temporary flagging during construction operations. Longer delays are anticipated due to rock excavation and paving operations.

As a majority of the new construction is on a new alignment, major traffic impacts on the existing highway are not anticipated during construction. Municipal road traffic access must be maintained during construction for Tait Road, McMillan Road and Sheppard Road**.**

Construction of the new East Access Road and the realignment of Highway 600 will be coincidental with construction activities associated with the mine development. Staging was considered as an option to mitigate potential impacts; however, current schedule constraints negate the opportunity to construct the new highway in advance of the mine development.

TBTE was commissioned by Rainy River Resources to complete a Construction Traffic Mitigation Study. On the basis of that study, a six (6) month detour of non-local users of Highway 600 was recommended via provincial Highway 617, Highway 11 and Highway 71. During this period construction traffic associated with the road construction and mine construction will access the development area via existing Highway 600, primarily from Highway 71. Within the development area local road users will still be allowed access along Highway 600 and appropriate construction signage in accordance with OTM Book 7 were identified.

See Appendix B for Construction Traffic Mitigation Study.

5.15.2 Traffic Management Plan

Refer to recommendations in the Construction Traffic Mitigation Study in Appendix B.

5.16 Detail Design Requirements

5.16.1 Anticipated Activities

Highway Engineering
1.1 Issue line and grade
1.2 Road Design (Inroads Software)
1.3 Drainage Design ditches and culverts
1.4 Erosion and Sediment Control Plan
1.5 Roadside Safety design
1.6 Utility Relocation Plans
1.7 Property Requirements Plan (legal surveys separate)
1.8 Traffic Management Plan
1.9 Traffic Signage
1.10 Construction Quantity/ Cost Estimate
1.11 Prepare Contract Documents
1.12 Technical Reviews (Peer Reviews)
1.13 Design Synopsis Report
1.14 Design/Construction Liaison

Roadway Drainage and Hydrology Design
1.1 Drainage and Hydrology Report

Structural Design for Pinewood River Bridge Crossing
1.1 Hydrology and Hydraulics Report
1.2 Structure Design Reports
1.3 General Arrangement Drawing
1.4 Navigable Waters Plan (if required)
1.5 Quantities/Cost Estimate
1.6 Contract Documents

Foundations Design for Pinewood River Bridge Crossing and Approaches
1.1 Complete subsurface foundation investigations for the proposed structure
1.2 Complete subsurface foundation investigations for areas of high fill and embankments over swamp
1.3 Foundation Design Report for Pinewood River Bridge and Approaches

Geotechnical
1.1 Geotechnical investigations to confirm subsurface conditions
1.2 Geotechnical Design Report
1.3 Review Road Design with Highway Designer

Geomatics Engineering Survey & Plan Preparation
1.1 Complete topographic field survey of the new Highway 600 alignment
1.2 Provide DTM for highway design

Geomatics Legal Surveys (Post Construction)
1.1 prepare legal plans for assumption, designations, etc.
1.2 prepare legal plans for closings of Highway 600 Bypassed Loop

Environmental Considerations
1.1. Permit To Take Water, if required
1.2 Navigable Waters Permit for the Pinewood River Crossing, if applicable
1.3. Develop environmental components of the tender documents.

6.0 CORRIDOR CONTROL

6.1 Background

The following corridor control requirements may not be all-encompassing and are provided for reference purposes.

The assumption, closing, designation, revocation, removal and transfer of highways occurs under the statutory authority of the Public Transportation and Highway Improvement Act (PT&HI Act) and may result from:

- The establishment of new or proposed provincial highway corridors;
- The construction or realignment of provincial highways;
- The reconstruction or realignment of municipal roads;
- Municipal amalgamation and restructuring;
- The deletion of existing or proposed highways from the provincial system; and/or
- The addition of existing highways or proposed highways to the provincial system.

Closing, designation, revocation, removal and transfer of a King's Highway are accomplished through the Order in Council process. MTO will have to confirm the actual process that will be required in this case.

Once construction is complete, the Ministry will need to acquire/assume and designate the new alignment. Following this, the Ministry will have to remove the designation from the by-passed alignment and dispose of it to the proponent. Documents will have to be prepared for assumption/closure/designation including an Order-in-Council.

It is unknown at this time how long the process to acquire and designate the new section of highway, and close and dispose of the bypassed section of highway, could take following completion of construction. The Ministry will undertake internal discussions to confirm the steps and the timing.

The MTO's Geomatics Section document titled *"Acquisition and Jurisdictional Processes for MTO Highways"* outlines the corridor control requirements.

Ministry Directive PLNG-B-009 will be adopted**.** Directives B-037, 086, 110, 127 are also in effect. MTO and proponent obligations will be defined in the legal agreement.

6.2 Assumptions

Assumption is the process of acquiring title to any public highway or road allowance. Upon registration of the Preliminary Assumption Plan, Assumption Plan or Notice of Assumption, the highway vests in and is under the jurisdiction and control of the Crown and the Minister shall give notice in writing of such vesting to any municipality concerned. (PT & HI Act, Sec. 8)

Assumptions are accomplished through the registration of a Preliminary Assumption Plan, Assumption Plan or a Notice of Assumption in the appropriate Land Registry Office.

6.3 Closings

Closing refers to the procedure whereby the public highway status is removed from a highway or proposed highway under the jurisdiction and control of the Ministry. (PT & HI Act, Sec.29 (2)).

Bypassed Loop Highway 600

Existing Highway 600 from Dearlock to Blackhawk will require formal closure with the physical boundaries to be determined.

6.4 Revocations

Revocation refers to the procedure that removes an existing or proposed designation. Revocation of a designation on an existing highway, however, does not absolve the Ministry of liability as a landowner, nor does it create a surplus parcel. Thereafter, the highway is not subject to the controls of the PT&HI Act. A designation can be revoked by an Order in Council or the revocation can occur automatically under the PT&HI Act. (Interpretation Act, Sec. 28 (g)).

Bypassed Loop Highway 600

Existing Highway 600 from Dearlock to Blackhawk will require revocation.

6.5 Transfers

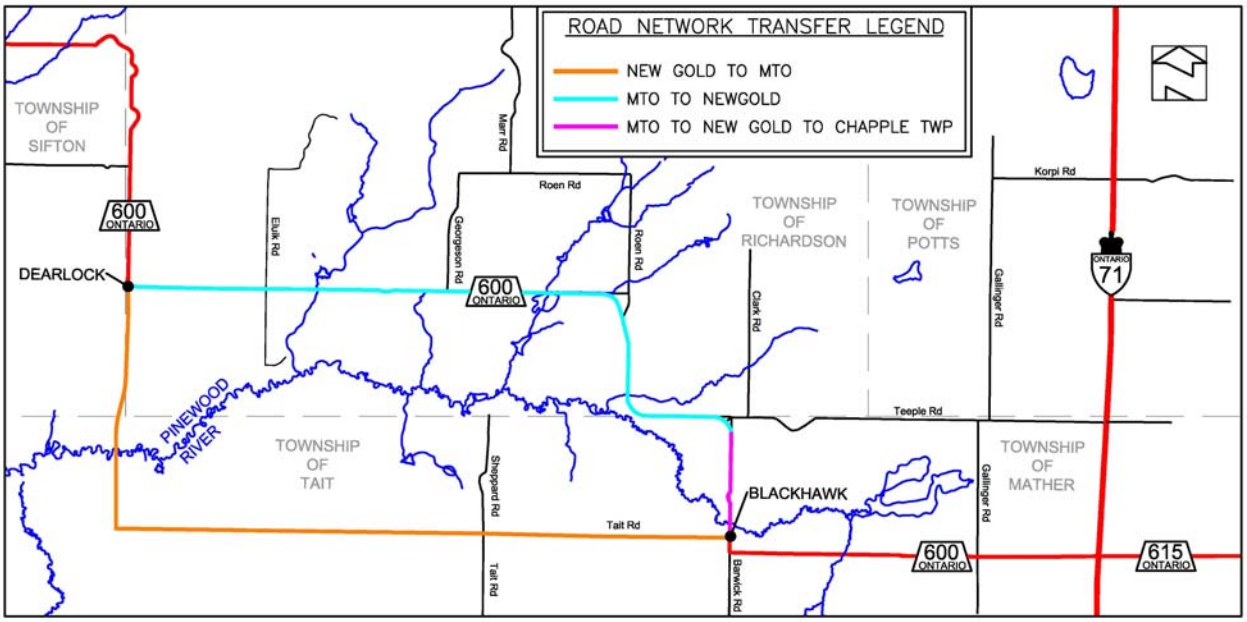
Transfer refers to the procedure by which jurisdiction and control of a highway is conveyed to a municipality or other road authority. Thereafter, the highway vests in the municipality and is deemed to be part of the road system of the municipality. (PT & HI Act, Sec.29 (4)).

MTO advised that current provincial asset management rules have not allowed the transfer of bypassed highway lands to local municipalities for some time now, so special consideration may need to be sought. MTO will determine process, timing and

anticipated costs for undertaking this transfer.

MTO can only transfer a roadway to another road jurisdiction and cannot close a public road for which land access is required. Properties along the section of the Bypassed Loop proposed for transfer to the Township of Chapple may be acquired by RRR. The actual transfer process will be determined by MTO based upon additional information from RRR on land access requirements.

Figure 7 – Highway Closings/Assumptions/Designations/Transfers



6.6 Designations

As per ministry directive, designations on new alignments shall not be processed until approval under The Environmental Assessment Act has been obtained.

The MTO Regional Director shall arrange to notify the local Member of the Legislature of all Controlled Access Highway designations, whether they are new designations or re-designations during the time that the Surveys and Plans Section is preparing the plans.

Public Notice

The following designations or revocations of existing designations shal be advertised as outlined below:

- the designation of a proposed highway as a King's Highway;
- the designation of an existing King's Highway as a Controlled Access Highway;
- the designation of a proposed highway as a Controlled Access Highway; and
- the revocation of any Controlled Access Highway designation.

Immediately following the registration of the designating Order-in-Council in the appropriate Land Registry Office, the Regional Head of Surveys and Plans shall cause to be published a public notice once a week for three consecutive weeks in a newspaper(s) having general circulation in the locality in which the highway is situated, giving the pertinent details of the location of the highway and the effective date of the designation.

6.7 Municipal Council Resolutions

A Township of Chapple Council resolution will be required for the transferring of surplus land (portion of Highway 600 Bypassed Loop) to the municipality.

7.0 LEGAL AGREEMENTS/COST SHARING/RECOVERABLES

7.1 Legal Agreements

The realigned portion of Highway 600 will have to be designed and constructed to MTO standards. A legal agreement will be required between MTO and the proponent to address responsibilities, obligations, etc.

7.2 Cost Sharing

The proponent shall be responsible for all costs of the project.

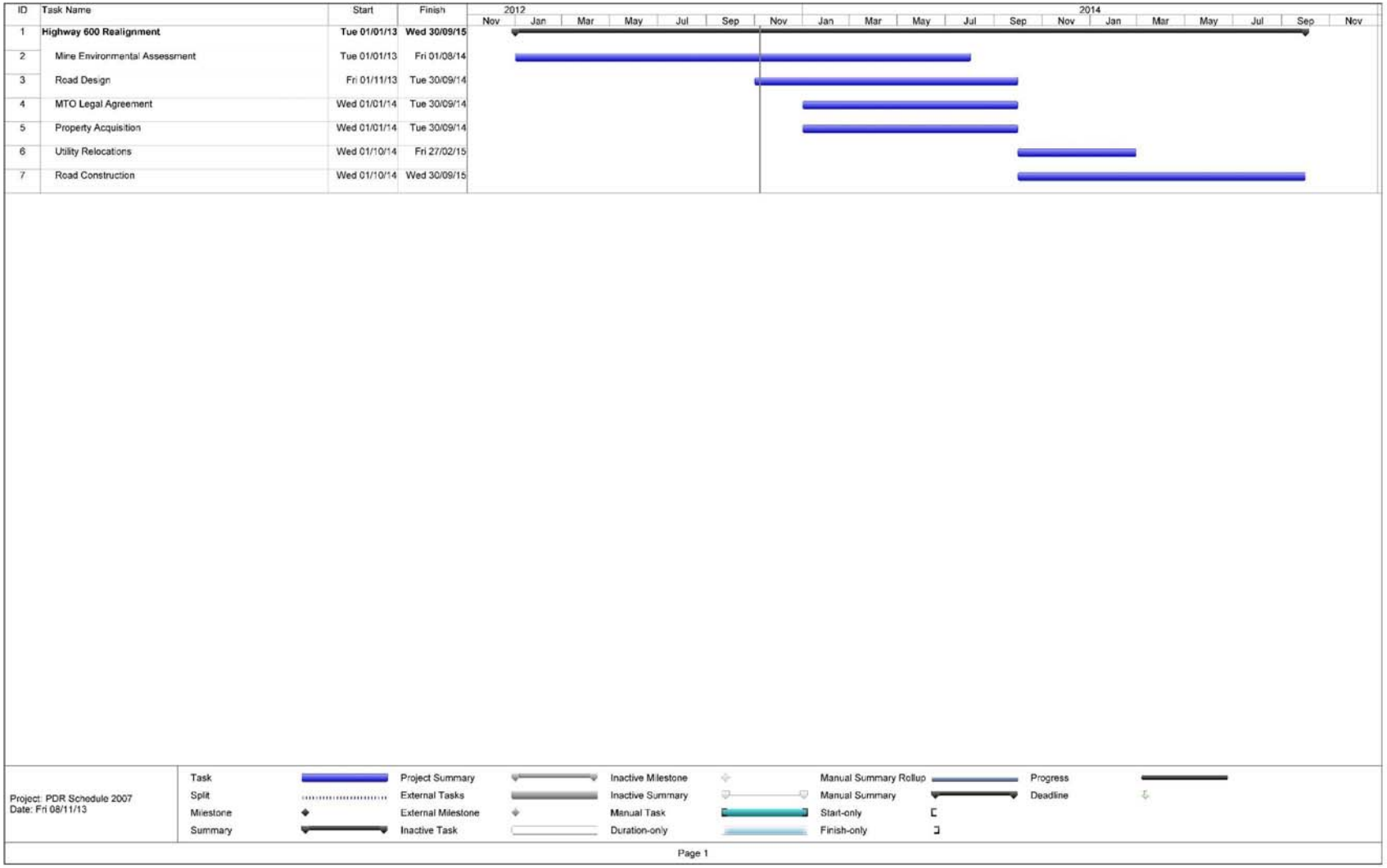
7.3 Recoverables

The proponent shall be responsible for all costs of the project.

8.0 PROJECT SCHEDULE

The Project Schedule for the Highway 600 construction is governed by the RRGP Mine Class EA. Property acquisition, highway design, utility relocations, highway construction and highway transfers and designations will be in alignment with the RRGP Class EA.

See next page for Figure 8 – Project Schedule.


ID
Task Name
Start
Finish
2012
2014
Nov
Jan
Mar
May
Jul
Sep
1 Highway 600 Realignment Tue 01/01/13 Wed 30/09/15
2 Mine Environmental Assessment Tue 01/01/13 Fri 01/08/14
3 Road Design Fri 01/11/13 Tue 30/09/14
4 MTO Legal Agreement Wed 01/01/14 Tue 30/09/14
5 Property Acquisition Wed 01/01/14 Tue 30/09/14
6 Utility Relocations Wed 01/10/14 Fri 27/02/15
7 Road Construction Wed 01/10/14 Wed 30/09/15
Project: PDR Schedule 2007
Date: Fri 08/11/13
Task
Split
Milestone
Summary
Project Summary
External Tasks
External Milestone
Inactive Task
Inactive Milestone
Inactive Summary
Manual Task
Duration-only
Manual Summary Rollup
Manual Summary
Start-only
Finish-only
Progress
Deadline
Page 1

9.0 CONSTRUCTION COST ESTIMATES

The estimated construction cost for Highway 600 is $14,400,000 inclusive of engineering and contract administration.

10.0 DRAFT DESIGN CRITERIA

A Draft Design Criteria has been prepared in accordance with the MTO guidelines for content and format as per the Ministry policy for Design Criteria contained in Ministry Directive PHM-B-021.

This Draft Design Criteria describes the scope of work and the geometric elements and standards that will form the basis for the design of the new Highway 600 facility.

See Appendix A for Draft Design Criteria.

11.0 CLOSURE

APPENDIX A

Draft Design Criteria

DRAFT DESIGN CRITERIA

Date: November 8, 2013

PROJECT: RAINY RIVER GOLD **HWY NO.** 600 RE-ALIGNMENT **TYPE OF PROJECT**:G,D,GB & STRUCTURE

LOCATION: From Highway 600/Pine River Road intersection at Dearlock to Highway 600/Tait Road intersection at Blackhawk

LENGTH 11.4 km

LIMITS **FROM STA** 10+000 Twp. Richardson **TO STA** 21+400 Twp. Tait

MUNICIPAL JURISDICTIONS: Township Municipality of Chapple
Geographic Township(s): Sifton, Richardson, Tait

		PRESENT CONDITIONS	DESIGN STANDARDS	PROPOSED STANDARDS
FUNCTIONAL HIGHWAY CLASSIFICATION		RLU80	RLU80	RLU80
MINIMUM STOPPING SIGHT DISTANCE		unknown	135	135
EQUIVALENT MINIMUM "K" FACTOR	**CREST**	unknown	35	35
	SAG	unknown	30	30
GRADES MAXIMUM (%)		unknown	8.0	3.0
RADIUS MINIMUM (m)		unknown	250	250
PAVEMENT WIDTH (m)		3.0	3.25	3.0 (a)
SHOULDER WIDTH (m)		1.0	1.0	1.0
SHOULDER ROUNDING (m)		0.5	0.5	0.50 (b)
MEDIAN WIDTH (m)		N/A	N/A	N/A
R.O.W. WIDTH (m)		20 - 30	30	20 (c)
POSTED SPEED (km/h)		80	80	80
MISCELLANEOUS				

NOTES:

a) Lanes will be gravel. Width is consistent with existing highway and Table D2-2 lane widths for lower volume highways
b) 1.0 m rounding at steel beam guide rail locations
c) Existing Highway 600 right-way is primarily 20 metres

TRAFFIC:

Annual Average Daily Traffic (AADT) is 110. Highway 600 is low volume with little truck traffic.

REMARKS:

1. **Project Purpose and Scope**

The purpose of this project is the construction of a new section of Highway 600 around the Rainy River Gold Project (RRGP). The proponent, Rainy River Resources (RRR) will be responsible for all aspects of the project. Existing Highway 600 from Dearlock to Blackhawk will be bypassed in it entirety.

Work will consist of:
Clearing and grubbing the limits of the new right-of-way
Earth/muskeg and rock excavation/embankment grading
Placement of Granular 'A' and Granular 'B' Type II
Two lane modular structure crossing of the Pinewood River
Drainage features such as culverts and ditching
Placement of guide rail and roadside safety items
Temporary/Permanent erosion control features
Temporary/Permanent highway traffic signing

2. **Construction Year**

Construction is anticipated for 2014.

3. **Related Studies and Adjacent Projects**

There are no adjacent projects on the Ministry's two year program.

4. **Environmental Assessment**

The draft Environmental Assessment (EA) Report for the Rainy River Gold Project (RRGP) was developed and structured in a manner that follows the Approved Provincial Terms of Reference and the Federal Environmental Impact Statement (EIS) guidelines, as directed by the Ministry of the Environment (MOE) and the Canadian Environmental Assessment Agency (CEAA), who are respectively, the Provincial and Federal EA leads for the coordinated RRGP EA. The Federal and Provincial government authorities agreed that a single body of knowledge, including the EA Report, would be used for the coordinated EA process. The Ministry of Transportation (MTO) indicated that this process will satisfy MTO Class EA requirements for the relocation of the Highway 600 alignment outside of the footprint of the mine development.

5. **Pavement Design**

The roadway does not warrant a hard asphaltic surface. Based on the traffic volumes and design subgrade and MTO's Northwest Region Pavement Design Thickness Chart, the design Granular Base Equivalency (GBE) is 653.

Appropriate subgrade depths will apply based on soil/embankment type. The recommended base course is 150mm of Granular "A" and Granular subbase material is Granular "B" Type II.

6. **Cross-Fall**

Cross-fall will meet Design Standards.

7. **Superelevation**

Superelevation will meet the 80 km/h Design Speed.

8. Drainage

The MTO Gravity Pipe Design Guidelines will assist in designing the gravity pipe systems. A 25 year storm return period will be used for the hydrological design of centreline culverts.The minimum highway crossing culvert size will be 800 mm diameter.

9. Roadside Safety

Clear zone of 4.0 m on tangent will apply per Table 2.2.1 of the Roadside Safety Manual. Guide rail protection is required at the Pinewood River crossing. Highway Design Bulletin 2011-003 will be followed for guide rail improvement. Slope flattening will be assessed. There are limited options due to environmental constraints and/or right-of-way width.

10. Signing

Signing will be installed in accordance with current Ministry standards.

11. Illumination

Not applicable to this project**.**

12. Traffic Signals

Not applicable to this project.

13. Commercial Entrances

Not applicable to this project.

14. Intersections

Tait Road, Sheppard Road and McMillan Road, low volume stop control municipal sideroads intersect the highway. The new intersection width will match municipal standards. Turning lanes do not apply.

A future municipal road intersection will be created for access to a freshwater pipeline pumping station. A 'T' intersection will be permitted at that time. Highway 600 will make a 90 degree bend, similar to the existing intersection at Dearlock. A horizontal curve on Highway 600 is not required.

Stop control will apply for eastbound traffic at the east limit at the existing Tait Road/Highway 600 intersection.

15. Structures

A two lane modular structure is acceptable at the Pinewood River. Approvals under the Navigable Waters Protection Act will be determined in Detail Design.

16. Curve Widening

Widening is unwarranted due to low truck traffic volumes.

17. Passing Lanes / Truck Climbing Lanes

Not applicable to this project.

18. Fencing

Fencing requirements to be determined during Detail Design based upon property purchase agreements.

19. Active Transportation Infrastructure

Not applicable to this project.

20. Property Requirements

Private property (non RRR owned) abuts or traverses the majority of the new highway alignment. RRR will acquire all lands for the purposes of highway construction.

The proposed right-of way will be typically 20 metres unless additional is required for grading purposes. The Ministry preference is for a 30m right-of-way. If property acquisitions are a constraint and the roadway and associated utility plant can be facilitated in a 20m right-of-way, then consideration will be given to accept the 20m width based on localised circumstances.

21. Railway Crossings

Not applicable to this project.

22. Utilities

Buried Bell telephone and Hydro One aerial plant is located within the project limits along existing Tait Road and at the Pine River Road/Highway 600 intersection. Existing Highway (Bypassed Loop) has Bell telephone and Hydro One plant which will be permitted to relocate to the new right-of-way. Utility relocations will be determined during Detail Design. All costs for relocation will be borne by the proponent.

A concrete box structure to accommodate RRR's freshwater pipeline will cross Highway 600 at a location to be determined during Detail Design. All work will be in compliance with Corridor Control Permit and frost treatment requirements.

23. Construction Staging/Detours/Traffic Management

As a majority of the new highway construction is on a new alignment, major traffic impacts on the existing highway are not anticipated. For safety reasons, as mine construction activities will be coincidental with the highway works, a six-month detour of non-local users via Highway 600 Highway 617, Highway 11 and Highway 71 will be in effect. Appropriate construction signage for local users will in accordance with OTM Book 7.

24. Legal Agreements and Approvals

A legal agreement will be required between MTO and the proponent to address responsibilities, obligations, etc.

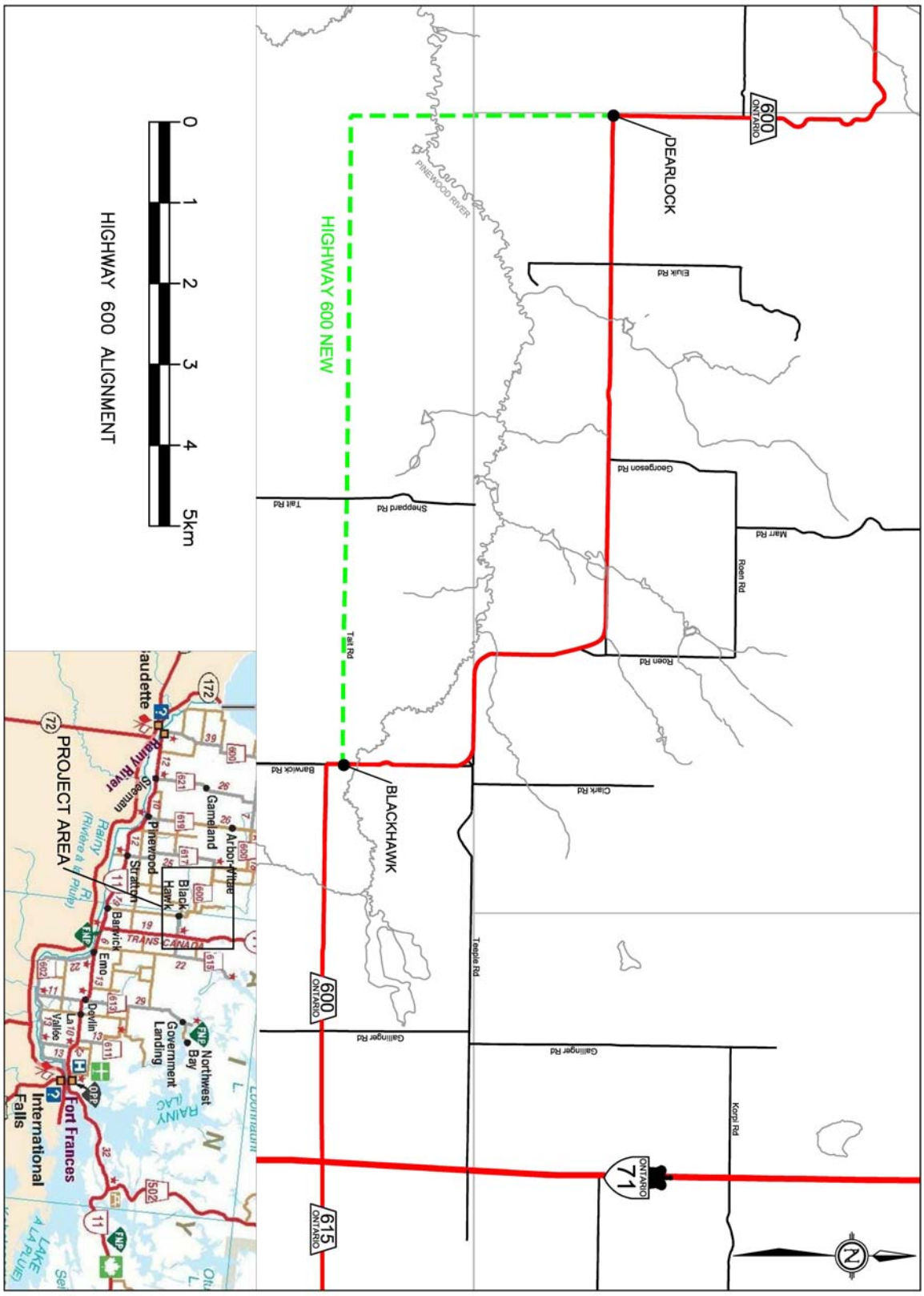
25. Highway Closings, Assumptions, Transfers

Once construction is complete, the Ministry will need to acquire/assume and dedicate the new alignment. Following this, the Ministry will have to remove the designation from the Bypassed Loop and dispose of it to the proponent. Documents will have to be prepared for assumption, closure and designation including an Order-in-Council. The Ministry will confirm the actual process that will be required.

26. Municipal Council Resolution

A Township of Chapple Council resolution will be required for the transferring of a 1.6 km portion of the Highway 600 Bypassed Loop between Tait Road and Teeple Road to their jurisdiction and control.

LOCATION MAP



APPENDIX B

Construction Traffic Mitigation Study

Highway 600
Construction Traffic Mitigation Study

Prepared for
Rainy River Resources Limited

By TBT Engineering

May 1, 2013

1.0 Introduction

TBT Engineering Consulting Group (TBTE) was commissioned by Rainy River Resources Limited (RRR) to provide a Construction Traffic Mitigation Study for accommodating local and provincial highway traffic during the construction of a proposed realignment of Highway 600 in the District of Rainy River, Ontario.

The existing Highway 600 alignment traverses through a proposed mine development area near the community of Blackhawk. Following completion of a separate Feasibility Study in February 2012 and consultation with the Township of Chapple it was recommended to permanently relocate Highway 600 south of the proposed mine development area.

During the period when the new Highway 600 alignment is being constructed anticipated mine development is expected to result in a significant increase in local traffic volumes.

This current study will identify anticipated impacts associated with proposed construction activities, evaluate proposed alternatives for mitigating construction traffic impacts on local motorists, and provide recommendations for implementation of measures designed to safely accommodate local and provincial road users as well as construction personnel and equipment involved with development of the mine and the new highway alignment.

2.0 Study Area

Highway 600 is a minor secondary provincial highway running northerly from Rainy River for 27 km then generally easterly 62 km to Kings Highway 71.

The study area for this report includes Highway 600 from Highway 617 to Highway 71. Enclosure 1 identifies the section of Highway 600 included under this study.

This study area is larger than the proposed mine development and proposed realignment of Highway 600 to allow for evaluation of construction staging and detour options during construction.

3.0 Existing Conditions

Land uses along Highway 600 include agricultural, residential, recreational/hunting properties and timber extraction.

Highway 600 is classified as a rural local undivided (RLU) facility and within the study area has a granular surface with a posted speed limit of 80 km/hr.

TBT Engineering Limited 1918 Yonge Street, Thunder Bay, ON P7E 6T9 807-624-5160

Existing annual average daily traffic volumes (AADT) within the study area are 110 vehicles/day.

4.0 Proposed Development

Rainy River Resources is proposing to construct a new mine development along Highway 600 in the vicinity of Blackhawk.

To accommodate the proposed mine development a section of Highway 600 extending from Dearlock to Blackhawk is recommended for relocation. A feasibility study was completed that considered eight options for the Highway 600 relocation. The options were presented to the Township of Chapple and subsequently the Township of Chapple provided a correspondence letter indicating Alternate C was the preferred option.

Enclosure 2 identifies the proposed new (Alternate C) alignment for Highway 600 south of the proposed mine development area.

Ultimately a new access road will be constructed to the mine development from Highway 71. Enclosure 2 identifies the proposed location of the East Access Road.

5.0 Development Stages

Road Construction

This stage is anticipated to take approximately 6 months and is currently scheduled for the period from Aug 1, 2014 to Jan 31, 2015.

Construction of the East Access Road and the realignment of Highway 600 south of the proposed mine development will be coincidental with construction activities associated with the mine development.

Accordingly it is anticipated that significant increases over the existing traffic volume (AADT 110) will be experienced during this stage, and the increased number and nature of the construction vehicles working in vicinity of existing Highway 600 will result in a change in the character of the current traffic flow.

During this period construction traffic associated with the road construction and mine construction will access the development area via existing Highway 600, primarily from Highway 71.

Mine Construction

This stage is anticipated to take approximately 23 months and is currently scheduled for the period from Aug 15, 2014 to July 15, 2016.

After the new Highway 600 bypass is opened in February 2015 impacts to the local and provincial highway users on Highway 600 will be negligible.

Mine construction traffic will be primarily facilitated by the East Access Road from Highway 71 once that link is completed.

Mine Operation

During this stage mine traffic will primarily be facilitated via the East Access Road.

Mine Closure

This stage will extend from the mine closure date and extend until decommissioning is completed however ongoing monitoring requirements may result in periodic access to the development after completion of closure activities.

During this stage mine traffic will primarily be facilitated via the East Access Road.

6.0 Anticipated Traffic Generation

Anticipated traffic volumes associated with the development are estimated to result in a cumulative count of 4,272 personnel vehicles over a 23 month period resulting in an additional AADT of approximately 200 additional vehicles per day.

Anticipate construction traffic volumes associated with the development are estimated to result in a cumulative count of 1918 trucks/loads/deliveries over a 23 month period resulting in an additional AADT of approximately 90 vehicles per day.

Taken cumulatively it is estimated that the proposed development will result in an increase in the current AADT of 110 vehicles per day to an estimated 400 vehicles per day with 25% trucks.

It is noted that once the East Access Road is completed mine traffic will be limited to Highway 71 then access to the site along existing and new municipal roadways. At that time traffic volumes on Highway 600 are expected to return to current level.

7.0 Construction Traffic Mitigation Study

The purpose of this study is to identify methods of mitigating impacts of anticipated construction traffic associated with the development, with primary focus on the stage when road construction is occurring coincidentally with mine construction.

During this period of time accommodating existing road users along Highway 600 while safely conducting construction activities will require comprehensive construction traffic safety measures as Highway 600 through the proposed development area will remain open until the new Highway 600 alignment is completed and transferred to the Province.

Staging was considered as an option to mitigate potential impacts however current schedule constraints negate the opportunity to construct the bypass in advance of the mine development.

Construction of the new Highway 600 alignment has been included with the overall Mine EA process, and as such pre-construction of this new roadway cannot proceed until EA clearance and associated permitting for the mine development is achieved.

Delay of initiating mine construction to allow for construction of the new Highway 600 alignment is not feasible as mine development plans are contingent on construction of water retention facilities in 2014 to ensure sufficient process water is available for mine start-up in 2016.

Closing existing Highway 600 during the period is not feasible as there are local land owners who access their property and residences via this route. School buses, utility companies with existing plant along Highway 600 and emergency response vehicles may also continue to require access along this route.

Accordingly, although the road will remain open, the recommended means of mitigating potential traffic impacts during this initial stage will include a proposed detour of non-local road users along Highway 600.

It is recommended that a detour will be established along Highway 617, Highway 11 and Highway 71 to route non-local traffic around the development area for the road construction stage (Aug 15, 2014 – Feb 1, 2015).

Enclosures 3 and 4 provide details regarding the proposed detour route and signage.

Within the development area local road users will still be allowed access along Highway 600 and appropriate construction signage in accordance with OTM Book 7 are recommended as identified in Enclosures 3 and 4.

Once construction of the East Access Road is complete local road users within the development area will access Highway 71 via the newly constructed East Access Road. This will allow local traffic to bypass mine construction and eliminate the need for existing Highway 600 to provide local traffic access to Highway 71.

8.0 Recommendations and Conclusions

TBTE was commissioned by Rainy River Resources to complete a Construction Traffic Mitigation Study for the initial stage when construction of the new Highway 600 alignment and East Access Road are scheduled to occur coincidently with mine construction activities.

On the basis of this study a 6 month detour of non-local users of Highway 600 is recommended via provincial Highway 617, Highway 11 and Highway 71.

Consultation with Ministry of Transportation of Ontario, Township of Chapple, Municipality of Stratton, school bus operators, utility companies and emergency response groups will be completed upon approval of the recommendations of this study.

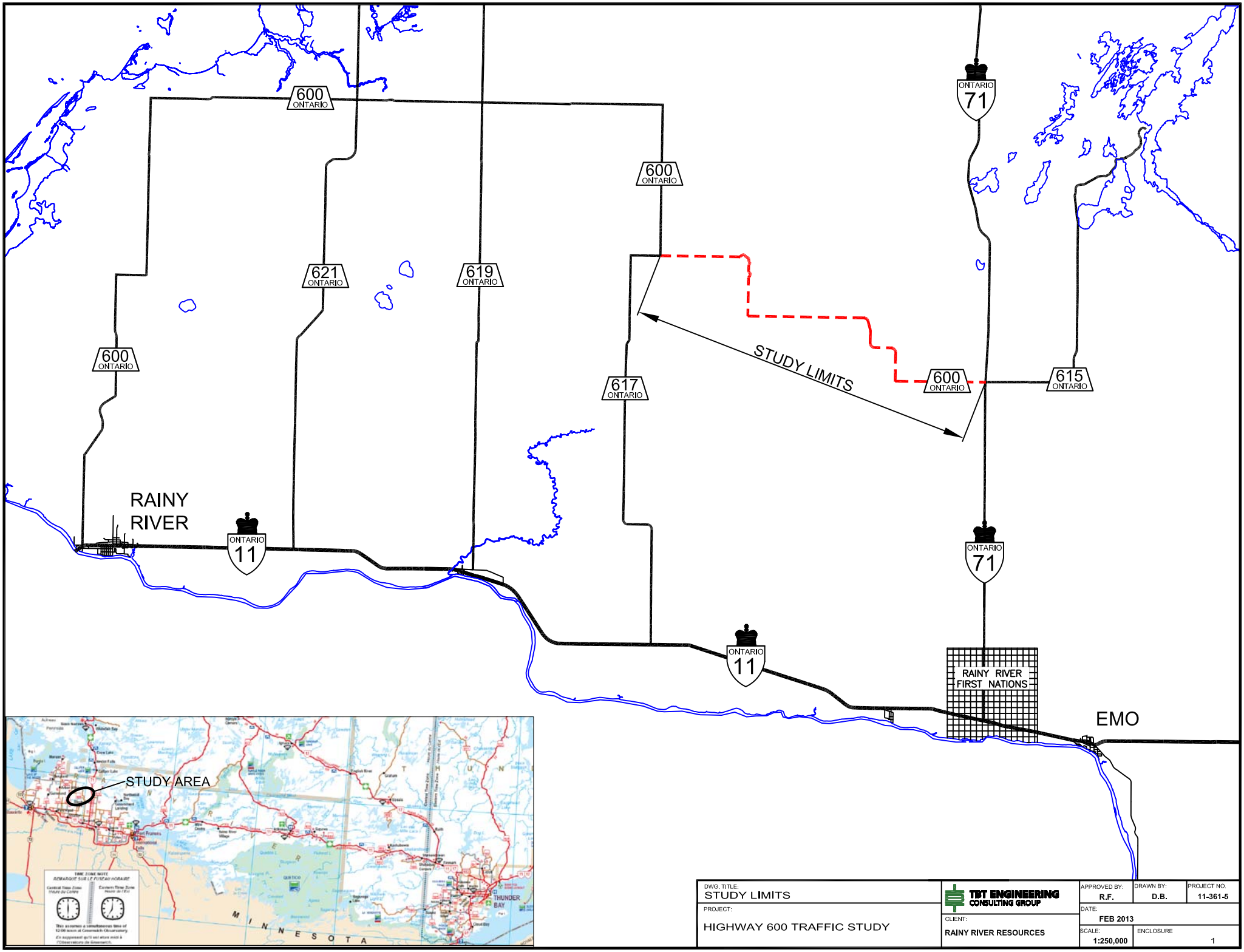
Prepared By:

Rob Frenette, P. Eng. President
TBT Engineering Consulting Group

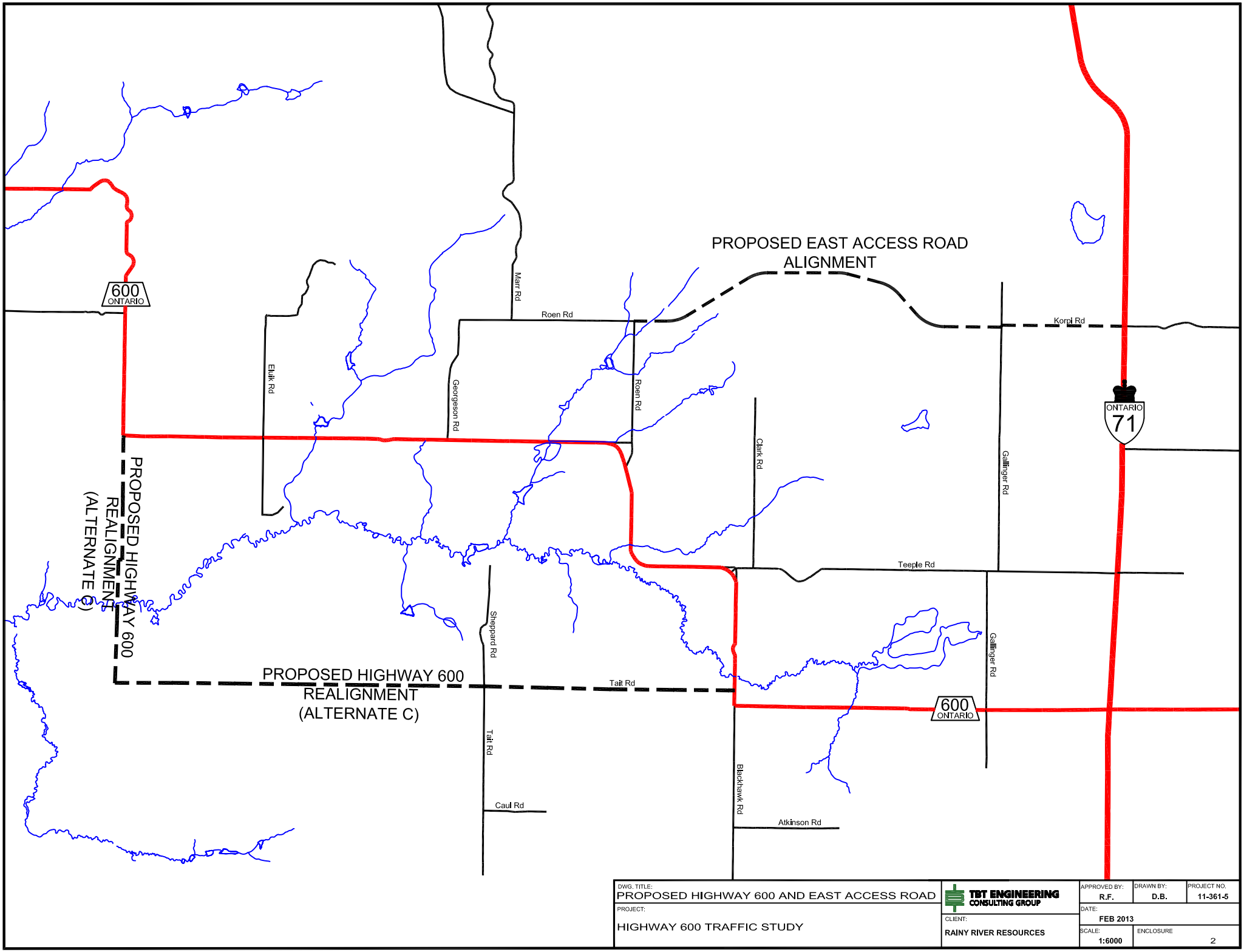
APPENDIX

Enclosures 1 – 4

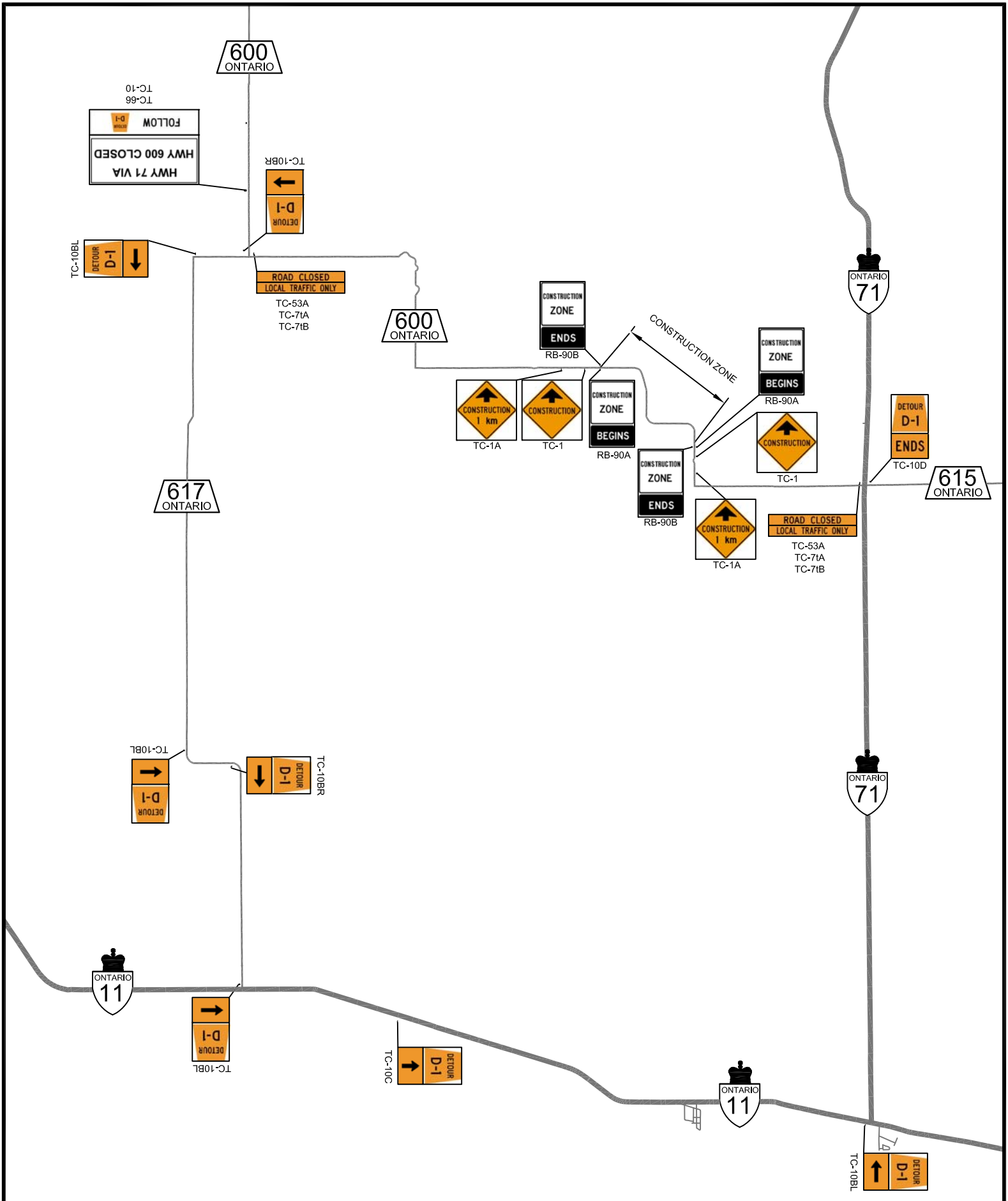
Estimated Traffic Volumes
Township of Chapple Correspondence Letter



DWG. TITLE: STUDY LIMITS	TBT ENGINEERING CONSULTING GROUP	APPROVED BY: R.F.	DRAWN BY: D.B.	PROJECT NO. 11-361-5
PROJECT: HIGHWAY 600 TRAFFIC STUDY	CLIENT: RAINY RIVER RESOURCES	DATE: FEB 2013		
		SCALE: 1:250,000	ENCLOSURE 1	



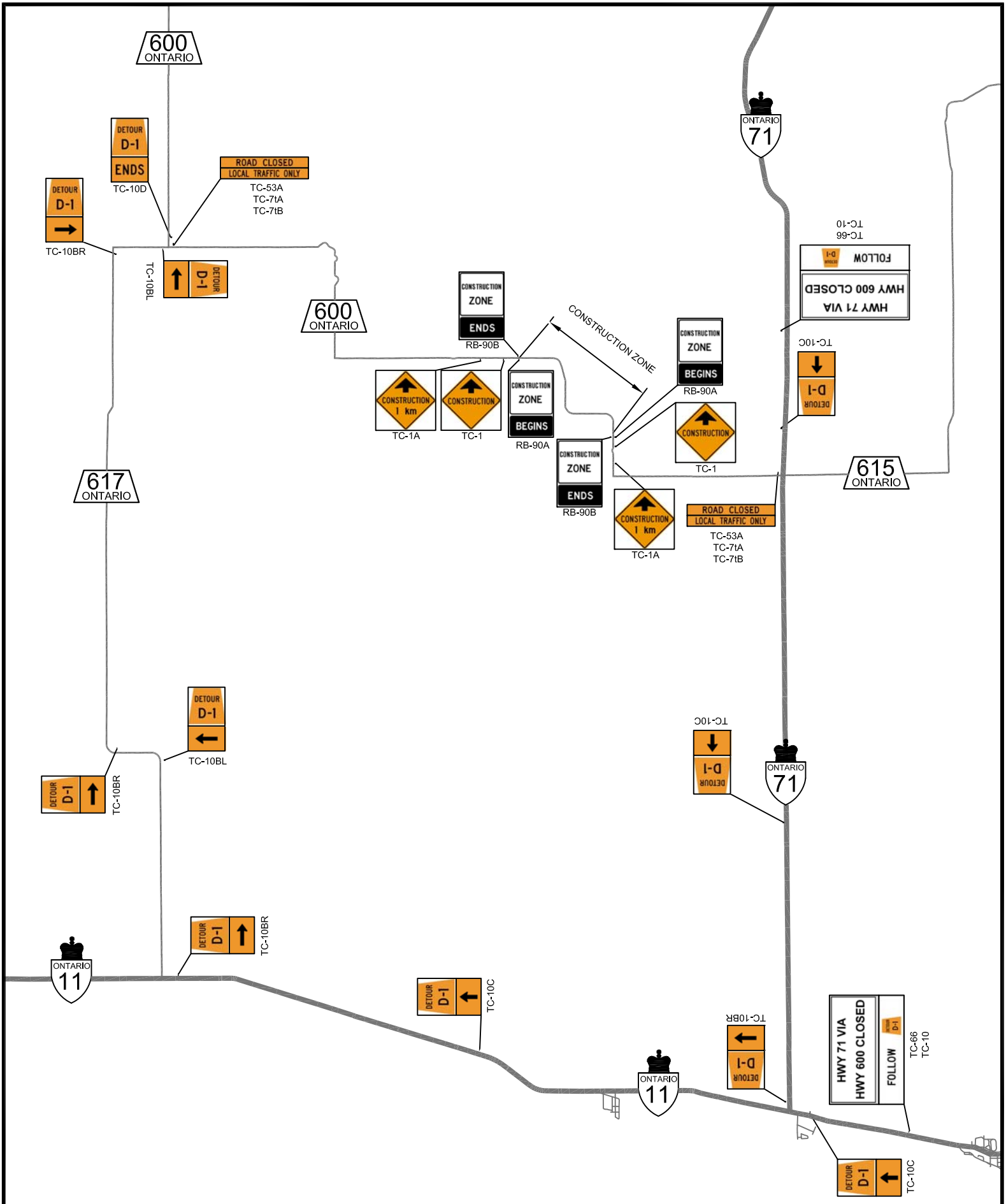
DWG. TITLE: PROPOSED HIGHWAY 600 AND EAST ACCESS ROAD	TBT ENGINEERING CONSULTING GROUP	APPROVED BY: R.F.	DRAWN BY: D.B.	PROJECT NO. 11-361-5
PROJECT: HIGHWAY 600 TRAFFIC STUDY	CLIENT: RAINY RIVER RESOURCES	DATE: FEB 2013		
		SCALE: 1:6000	ENCLOSURE 2	



NOTES:

1. DRAWING TO BE READ IN CONJUNCTION WITH OTM BOOK 7

DWG. TITLE: HIGHWAY 600 EAST DETOUR	TBT ENGINEERING CONSULTING GROUP	APPROVED BY: R.F.	DRAWN BY: D.B.	PROJECT NO. 11-361-5
PROJECT: HIGHWAY 600 TRAFFIC STUDY	CLIENT: RAINY RIVER RESOURCES	DATE: FEB 2013		
		SCALE: NTS	ENCLOSURE 3	



NOTES:

1. DRAWING TO BE READ IN CONJUNCTION WITH OTM BOOK 7

DWG. TITLE: HIGHWAY 600 WEST DETOUR

PROJECT: HIGHWAY 600 TRAFFIC STUDY

TBT ENGINEERING CONSULTING GROUP

CLIENT: RAINY RIVER RESOURCES

APPROVED BY:	DRAWN BY:	PROJECT NO.
R.F.	D.B.	11-361-5

DATE: FEB 2013

SCALE: NTS

ENCLOSURE: 4

1 **Construction Manpower Light Vehicles - Including CM Team (Assuming No Busing to Site)**

Duration Aug 2014 - April 2016

100% Construction Manpower

DATE	MANPOWER MONTHLY FORECAST	CUMULATIVE
Aug/14	145	145
Sep/14	248	393
Oct/14	309	702
Nov/14	172	874
Dec/14	131	1,005
Jan/15	90	1,095
Feb/15	35	1,130
Mar/15	38	1,168
Apr/15	117	1,285
May/15	247	1,532
Jun/15	298	1,830
Jul/15	368	2,198
Aug/15	356	2,554
Sep/15	383	2,937
Oct/15	400	3,337
Nov/15	326	3,663
Dec/15	228	3,891
Jan/16	171	4,062
Feb/16	147	4,209
Mar/16	63	4,272
Apr/16	1	4,273
TOTAL	4,272	

Assuming Construction Manpower use 25% Ride Share

DATE	MANPOWER MONTHLY FORECAST	CUMULATIVE	CM Vehicles	Total Personnel Vehicles
Aug/14	109	109	9	118
Sep/14	186	295	14	200
Oct/14	232	527	18	250
Nov/14	129	656	18	147
Dec/14	98	754	21	119
Jan/15	68	821	23	91
Feb/15	26	848	26	52
Mar/15	29	876	26	55
Apr/15	88	964	26	114
May/15	185	1,149	26	211
Jun/15	224	1,373	26	250
Jul/15	276	1,649	26	302
Aug/15	267	1,916	26	293
Sep/15	287	2,203	26	313
Oct/15	300	2,503	26	326
Nov/15	245	2,747	26	271
Dec/15	171	2,918	26	197
Jan/16	128	3,047	26	154
Feb/16	110	3,157	17	127
Mar/16	47	3,204	12	59
Apr/16	1	3,205	11	12
TOTAL	3,204			3,660

Construction Equipment, Trailers & Bulk Material Deliveries

2 Civil Bulk Earthworks (Excluding Pre Stripping)

Duration August 2014 - October 2015

Construction Equipment

Description	Quantity
Volvo EC460B Excavator c/w Hydraulic Thumb 1	1
John Deere 450 DLC c/w Coupler and Bucket 1	1
John Deere 350DLC c/w Hydraulic Thumb 1	1
Komatsu PC300LC-8 c/w Hydraulic Thumb 1	1
Komatsu PC300LC-8 c/w Hydraulic Thumb 1	1
Komatsu PC200LC-8 c/w Hydraulic Thumb 1	1
Komatsu WA470-6 Wheel Loader 2	2
John Deere 724J Wheel Loader 1	1
Komatsu WA250 PZ-6 Wheel Loader 1	1
Komatsu WA470-6 Wheel Loader 1	1
Caterpillar D8 2	2
Caterpillar D6 3	3
Komatsu HM350-2 Articulating Rock Truck 2	2
Komatsu HM300-1 Articulating Rock Truck 1	1
Terex TA30 Articulating Rock Truck 1	1
Volvo A25C 6X6 Articulating Rock Truck 2	2
Terex TA30 Articulating Rock Truck 4	4
Komatsu HM400 Articulating Rock Truck 5	5
John Deere 853G Feller/Buncher 1	1
John Deere 748GII Grapple Skidder 1	1
Bandit 2590 Chipper 1	1
Volvo G780 Grader 1	1
Superpac Ride-On Compactor 1	1
Ingersol Rand SD100D Smooth Drum 1	1

	Bomag Smooth Drum 1	1
	Total	38
	Site Facilities - Trailers	5
	Fuel Delivery (8 Tankers / month X 15 mo)	120
	Misc Service Trucks	30
	Total Heavy / Legal Loads for Civil Bulk Earthworkks	**193**
3	**Concrete Supply (On Site Batch Plant - Local Aggregates)**	
	Duration August 2014 - April 2016	
	Set Up Site Batch Plant	6
	Ancillary Equipment - Loaders / Cement Trucks	8
	Cement Powder Deliveries (Avg 275kg / m3 x 38,000 m3)	500
	Additives / Fly Ash Deliveries (Avg 100kg/m3)	190
	Site Facilities - Trailers	2
	Fuel Delivery (1 Tankers / month X 21 mo)	21
	Misc Service Trucks	30
	Total Concrete Supply	**757**
4	**Concrete Placement Contractor**	
	Duration August 2014 - April 2016	
	Concrete Pumpers	2
	Mobile Cranes (100T Hyd)	1
	Formwork Deliveries	30

	Scaffolding / Falseworks	10
	Construction Equipment - General	8
	C Cans - Storage / Warehousing	4
	Misc Metals, Embeds, Anchor Bolts etc	12
	Site Facilities - Trailers	6
	Fuel Delivery (2 Tankers / month X 21 mo)	42
	Misc Service Trucks	20
	Total Concrete Placement	**135**
5	**Structural Steel**	
	Duration October 2014 - March 2016	
	Mobile Cranes (100T Hyd)	2
	Fork Lift (20,000 lb)	2
	Compressors	3
	Diesel Welding Machines	6
	Construction Equipment - General	6
	C Cans - Storage / Warehousing	4
	Structural Steel Deliveries (Avg 20T / Load)	270
	Structural Bolt Deliveries (Est 400 Kegs)	16
	Siding & Roofing Deliveries	12
	Site Facilities - Trailers	6
	Fuel Delivery (2 Tankers / month X 20 mo)	40
	Misc Service Trucks	20
	Total Structural Steel	**387**
6	**Architectural**	
	Duration October 2014 - December 2015	
	Delivery of Purchased Packages by BBA	-

	Mobile Cranes (100T Hyd)	1
	Fork Lift (20,000 lb)	1
	Compressors	2
	Diesel Welding Machines	3
	Construction Equipment - General	3
	C Cans - Storage / Warehousing	2
	Truck Shop Steel Delivery (Assume 600 T)	30
	Structural Bolt Deliveries (Est 400 Kegs)	2
	Siding & Roofing Deliveries	6
	Site Facilities - Trailers	2
	Fuel Delivery (1 Tankers / month X 10 mo)	10
	Misc Service Trucks	14
	Total Architectural	**76**

7 Mechanical Installations

Duration August 2014 - April 2016

	Delivery of Purchased Packages by BBA	-
	Mobile Cranes (60T Hyd)	2
	Fork Lift (20,000 lb)	2
	Compressors	4
	Diesel Welding Machines	6
	Construction Equipment - General	8
	C Cans - Storage / Warehousing	5
	Site Facilities - Trailers	5
	Fuel Delivery (1 Tankers / month X 20 mo)	20
	Misc Service Trucks	30
	Total Mechanical	**82**

8 Piping Installations

Duration September 2014 - April 2016

Pipe Material Deliveries (Assume 50 lengths avg / load)	95
Valves, Fitting & Supports	12
Mobile Cranes (60T Hyd)	2
Fork Lift (20,000 lb)	2
Compressors	4
Diesel Welding Machines	6
Construction Equipment - General	10
C Cans - Storage / Warehousing	5
Site Facilities - Trailers	8
Fuel Delivery (1 Tankers / month X 20 mo)	20
Misc Service Trucks	30
Total Piping	**194**

9 Electrical & Instrumentation - Incl 230kV Powerline

Duration August 2014 - April 2016

Delivery of Purchased Packages by BBA	-
Cable & Tray Deliveries - Process Plant	10
Cable & Post Deliveries - 230kV Powerline	24
Mobile Cranes (75T Hyd)	1
Fork Lift (20,000 lb)	1
Compressors	2
Diesel Welding Machines	2
Construction Equipment - General	6
C Cans - Storage / Warehousing	4
Site Facilities - Trailers	4
Fuel Delivery (1 Tankers / month X 10 mo)	10
Misc Service Trucks	30
Total Electrical & Instrumentation	**94**

Summary For Construction Equipment, Trailers & Bulk Material Deliveries

2	Total Heavy / Legal Loads for Civil Bulk Earthworkks				193
3	Total Concrete Supply				757
4	Total Concrete Placement				135
5	Total Structural Steel				387
6	Total Architectural				76
7	Total Mechanical				82
8	Total Piping				194
9	Total Electrical & Instrunentation				94
	Total Hwy Loads				1918

CORPORATION OF THE TOWNSHIP OF CHAPPLE

P.O. Box 4
BARWICK, ONTARIO P0W 1A0
Phone 807-487-2354 Fax 807-487-2406

OFFICE OF THE CLERK-TREASURER
e-mail: chapple@tbaytel.net

January 16, 2012

Rainy River Resources Ltd.
1111 Victoria Avenue East
Thunder Bay, Ontario
P7C 1B7

Attention: Kyle Stanfield, P.Eng.
Director, Environment & Sustainability

Dear Kyle Stanfield:

Re: Highway 600 – Realignment Options

Please be advised after consideration of Council and Public Works Superintendent, Randy Both, the following ranking of options was agreed upon:

1) Alternative C

2) Alternative D, B or A

3) Alternative E

4) Alternative F

The Township of Chapple was in agreement that they prefer one of the southerly options to better accommodate local traffic. It was felt with Alternative C, there would be less impact to local landowners when obtaining land for the construction – that with this option the majority of highway would follow municipal road allowances. It was noted that there is the need to consider school bus routes and access to the Richardson landfill and gravel pit. As mentioned in your presentation, a portion of Alternative E would also be necessary to provide access to the Marr Road.

Thank you for your consideration in this matter.

Sincerely,

Peggy Johnson

Peggy Johnson, CMO
CAO/Clerk Treasurer

APPENDIX C

Final Draft Traffic Impact Study

Rainy River Resources Mine
Traffic Impact Study (Draft Final)

Prepared For
Rainy River Resources

Submitted By
MMM Group Limited

September 2013

5513099.161

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

STANDARD LIMITATIONS

This report was prepared by MMM Group Limited (MMM) for the account of **Rainy River Resources** (the Client). The disclosure of any information contained in this report is the sole responsibility of the client. The material in this report reflects MMM's best judgment in light of the information available to it at the time of preparation. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. MMM accepts no responsibility for damages, if any, suffered by a third party as a result of decisions made or actions based on this report.

1.0 INTRODUCTION

Rainy River Resources retained MMM Group Limited (MMM) to conduct a transportation impact study (TIS) as supporting material for an Environmental Assessment west of Fort Frances, Ontario. The proposed development will consist of an open pit and underground gold mining and processing complex, to be located between the intersections of Highway 71 at Korpi Road, and Highway 600 at Tait Road, as indicated in **Figure 1.1**. The TIS is focused on the intersection of Highway 71 at Korpi Road, as this intersection is proposed to be the only access point to the mine site once the mine is in operation. Construction mitigation on Highway 600 at Tait Road is also discussed due to the realignment of Highway 600 and additional construction traffic that will need to be accommodated. The Ministry of Transportation for Ontario (MTO) have indicated that a hybrid of a traffic impact study and a traffic impact statement is appropriate for the proposed development.

This study investigates the potential traffic impacts related to the proposed mine on the adjacent highway network and recommends any necessary upgrades to the proposed intersection and roadway. This study includes weekday a.m. and p.m. peak hour analysis for the peak year in 2022, as the mine workforce decreases in the following years due to decommissioning of the open pit mine and underground mine. The Highway 71 analysis also addresses summer traffic given the difference between summer and winter traffic volumes along Highway 71. The study follows the Ministry of Transportation for Ontario (MTO) *General Guidelines for the Preparation of Traffic Impact Studies*.

This draft document will be submitted to MTO as part of the PDR process associated with the proposed mine development.

Figure 1.1 illustrates the approximate location of the proposed Rainy River mine.

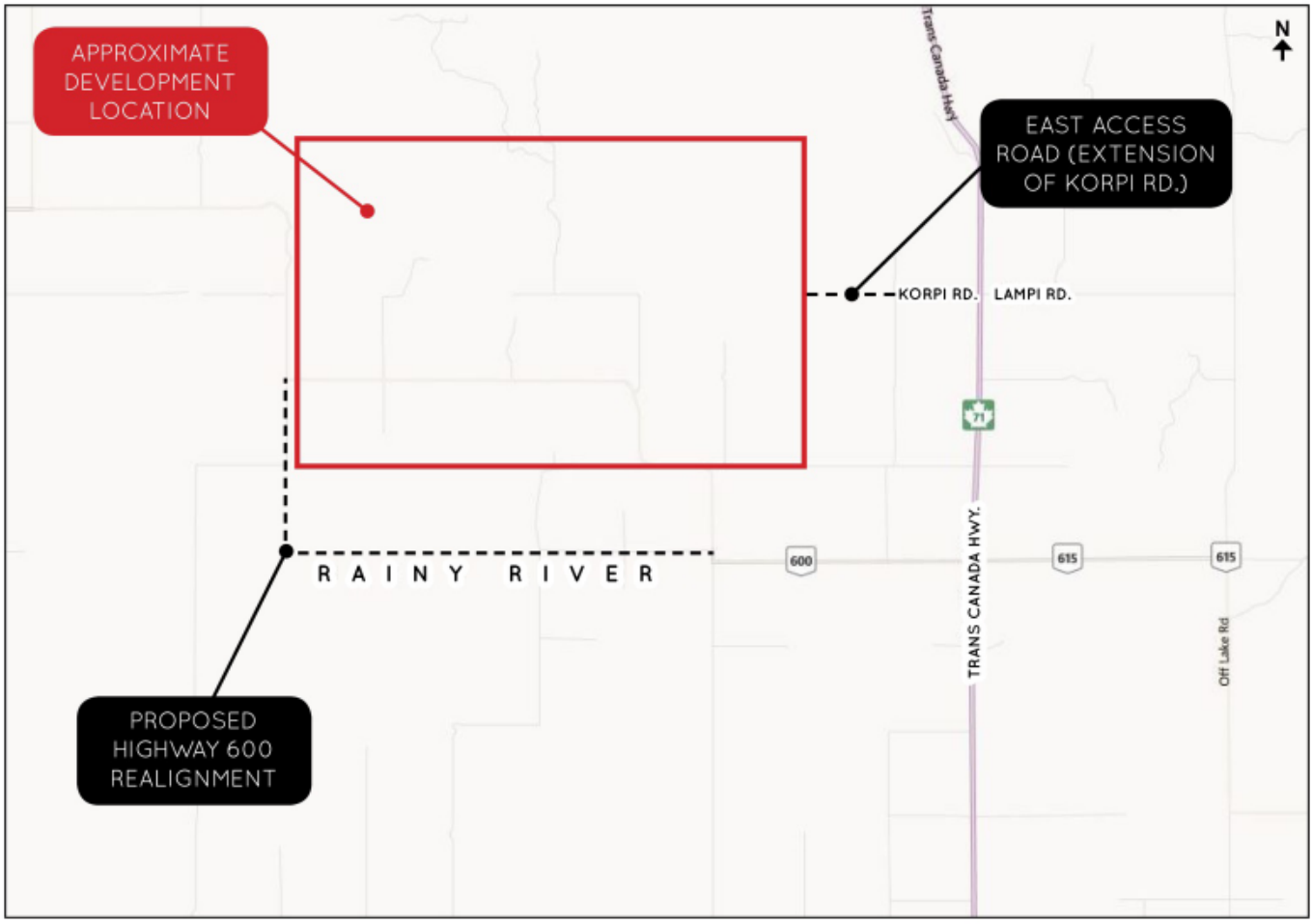


Figure 1.1: Development Location

2.0 HIGHWAY 71 AT KORPI ROAD TIS

2.1 Study Area

The proposed mine site is located west of Fort Frances. Land use in the vicinity of the development includes farmland and forested areas. A convenience store/restaurant is located on the north-east corner of the Highway 71 at Korpi Road intersection. The development area is illustrated in **Figure 1.1**.

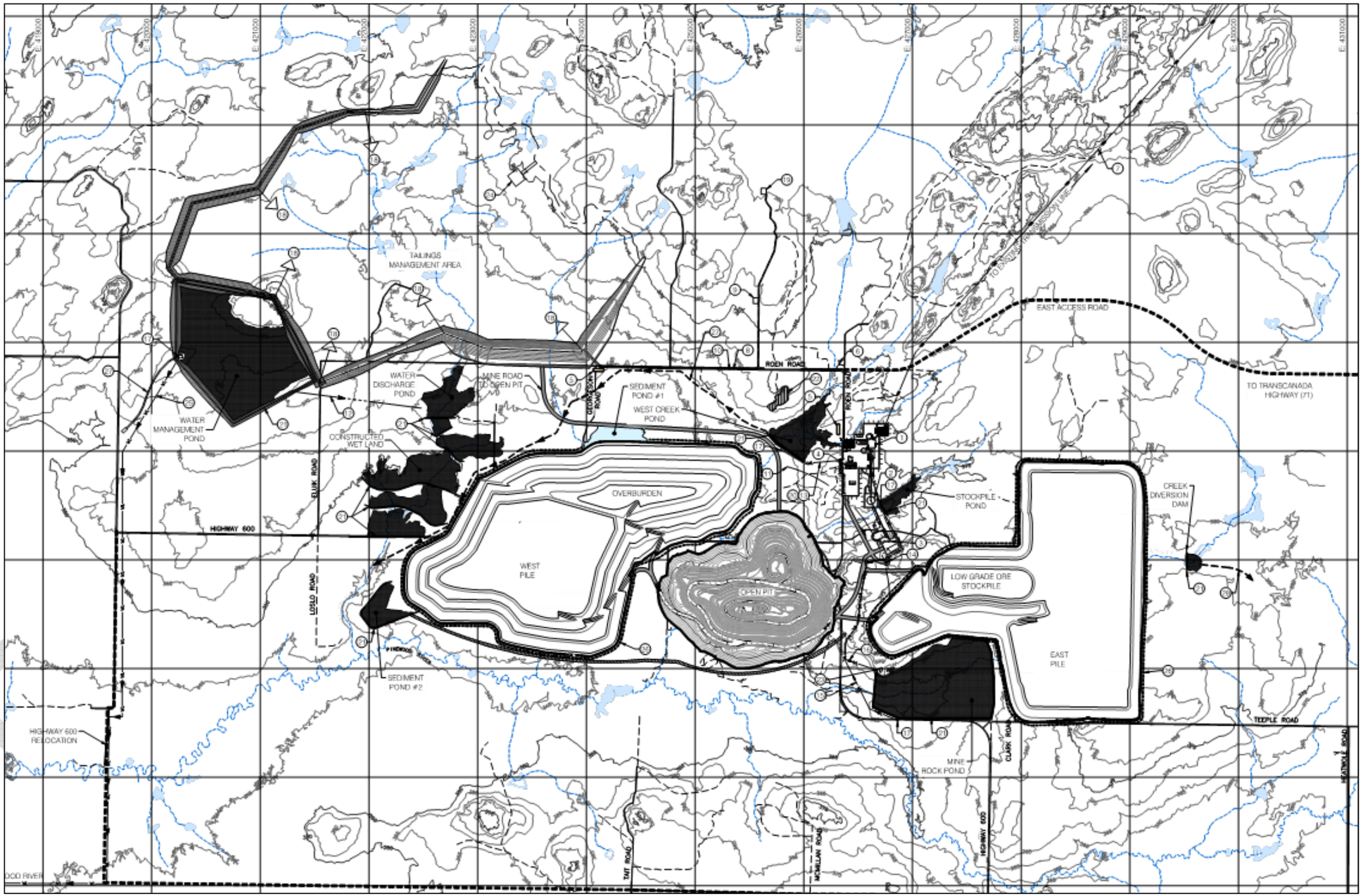
Highway 71 is a two-lane undivided paved roadway with gravel shoulders and a speed limit of 90 kilometres per hour adjacent to the proposed development. Highway 71 is classified as a Rural Collector road.

Korpi Road is a narrow two-lane undivided gravel roadway with no posted speed limit. It serves as an access road to the farms in the area. Korpi Road is classified as a Rural Local road.

The intersection of Highway 71 at Korpi Road is a two-way stop intersection, with Korpi Road and Lampi Road (the road adjacent to Highway 71 on the east side) being the roads with stop control. The shoulders on Highway 71 are paved at the intersection, and the condition of the roadway is good. There is currently no illumination at the intersection and there are no major intersections in the vicinity.

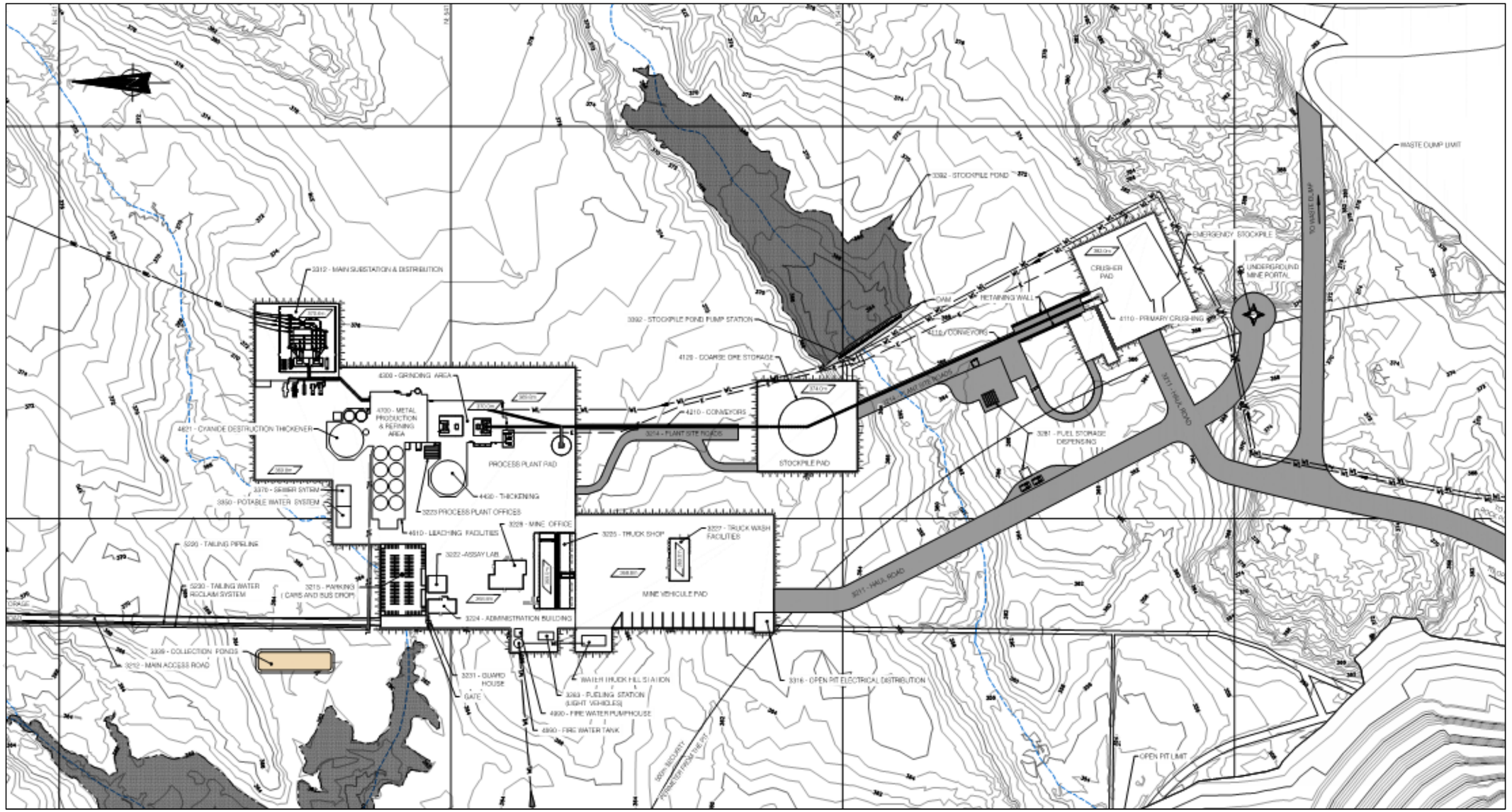
2.2 Proposed Development

The proposed development site plan is illustrated in **Figures 2.1** and **2.2**. The development is anticipated to include an open pit mine and an underground mine, together with an associated processing area when it opens in 2016. The mine is expected to reach an employee peak in year 2022, and then to decrease in stages thereafter until mine decommissioning, expected to commence in 2032.



Source: BBA

Figure 2.1: Mine Site Plan



Source: BBA

Figure 2.2: Process Plant Site Plan

2.4 Traffic Volumes

2.4.1 Existing Traffic

The weekday a.m. and p.m. peak hours were selected for analysis in this study as they are busy time periods for through traffic, construction and mine related traffic on Highway 71.

Traffic information for Highway 71 near the proposed development was obtained from the MTO website (traffic data is included in **Appendix A**). MTO road segment traffic data is provided in the form of Annual Average Daily Traffic (AADT) and Summer Average Daily Traffic (SADT). A turning movement count was provided by MTO at a nearby intersection (Highway 71 at Highway 600), and a count was performed by MMM staff at the intersection of Highway 71 at Korpi Road on August 8th and 9th, 2013 for both the weekday a.m. and p.m. peak times.

The Highway 71 at Highway 600 turning movement count was primarily used to determine background volumes at Highway 71 at Korpi Road. The count was started at 8:00 a.m., and completed at 5:00 p.m. The rate of change from the a.m. peak hour to the start time was calculated, with the hourly start times beginning in 15 minute intervals (for example; 9:00 to 10:00, then 8:45 to 9:45). The rates were averaged, and the average rate was used to extrapolate the hourly volumes to the hour being analysed. The same was done for the afternoon; the rate of change was calculated for each hour from the p.m. peak hour to the end of the count, the rates were averaged, and the average was applied to determine hourly volumes for the later times under consideration. These volumes are only slightly higher than the volumes observed at the intersection of Highway 71 at Korpi Road, so they provide a conservative estimate. To provide a more accurate estimate of the activity at the intersection being analysed, the ratio of each turning movement peak hour volume observed to the overall intersection peak hour volume was determined, and the ratios were applied to the extrapolated volumes from the MTO turning movement count.

The percent of heavy vehicles was provided in the Highway 71 at Highway 600 count. The percent trucks in the northbound and southbound directions on Highway 71 were averaged for both the a.m. and p.m. peak hours. The a.m. peak hour had 13.5 percent trucks, and the p.m. peak hour had 16 percent trucks. It was assumed that the same would apply to Highway 71 at Korpi Road.

2.4.2 Future Traffic

Historical AADT and SADT counts were used to determine the historical growth rate on Highway 71. This data is illustrated in **Figure 2.3**. **Table 2.1** summarizes the growth rates for the last five and 10 years of data.

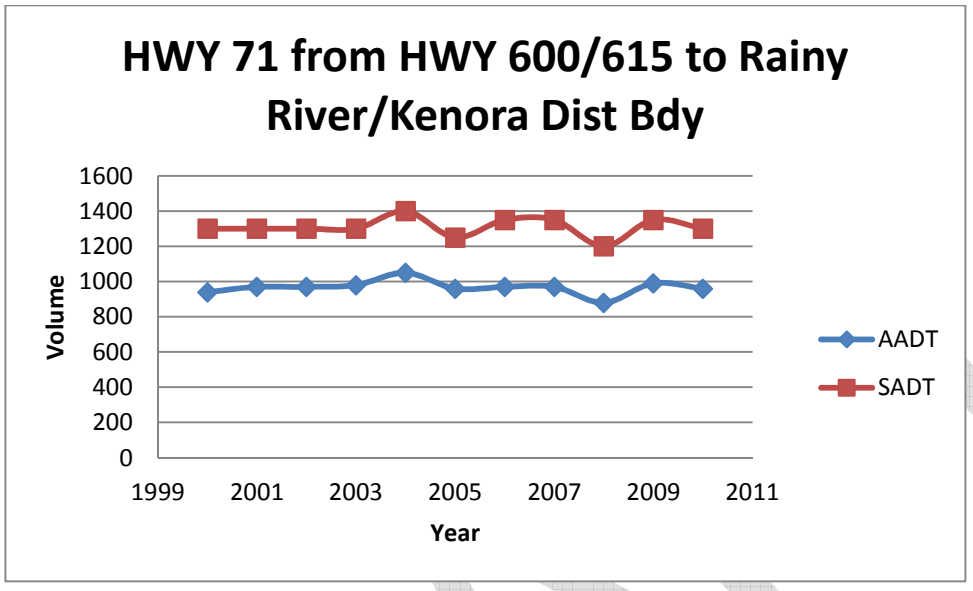


Figure 2.3: Historical Daily Traffic Information – Hwy 71

Table 2.1: Hwy 71 Growth Rates

	Five Year Growth Rate	Ten Year Growth Rate
AADT	0.0%	0.2%
SADT	0.8%	0.0%

Historical data indicates that traffic volumes have fluctuated over the past 10 years on Highway 71, with an overall increase in volumes. A conservative growth rate of one percent per year was selected for Highway 71 based on the historical data and because there has been minimal development near the proposed mine site in recent years.

Background traffic volumes for the weekday a.m. and p.m. peak hours and average daily traffic are illustrated in **Figures 2.4** to **2.7**.

Figure 2.4: 2013 Peak Hour Background Traffic Volumes (6-7 a.m. & 7-8 p.m.)

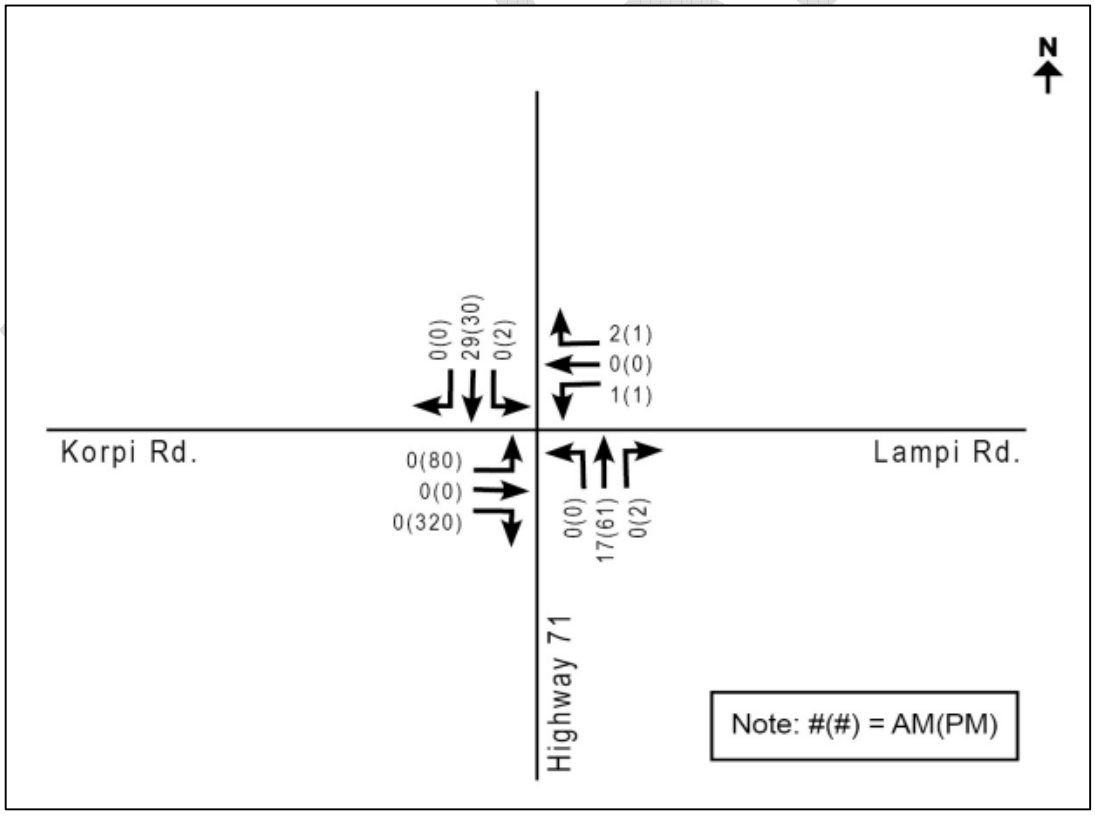


Figure 2.5: 2022 Peak Hour Background Traffic Volumes (6-7 a.m. & 7-8 p.m.)

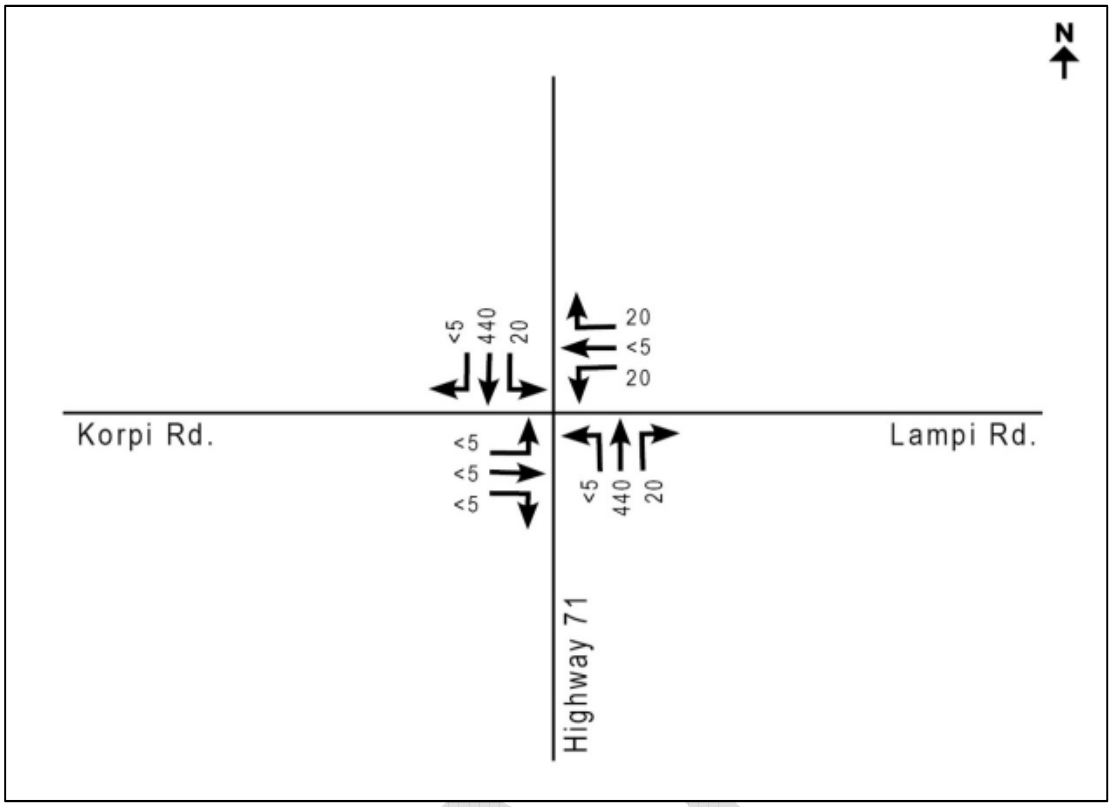


Figure 2.6: 2022 Average Daily Background Traffic Volumes (AADT)

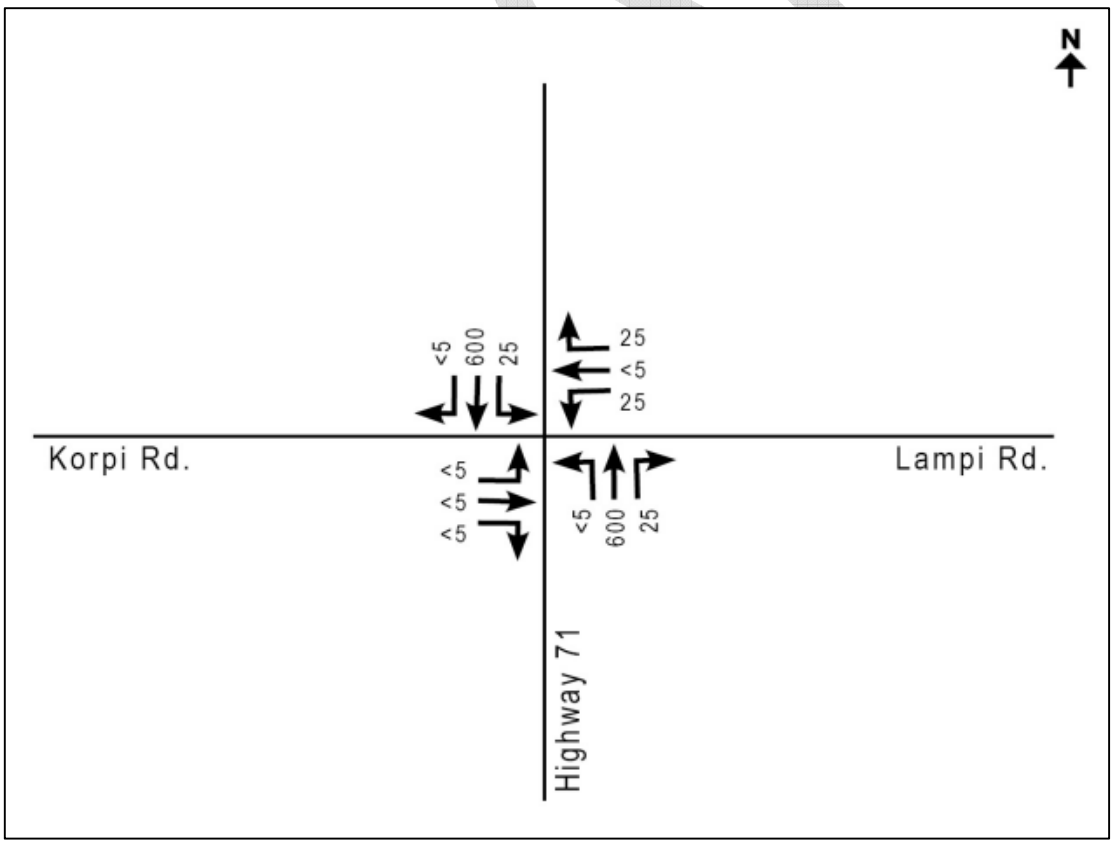


Figure 2.7: 2022 Average Daily Background Traffic Volumes (SADT)

2.4.3 Site Generated Traffic

Trip generation for the mine was provided by the mining engineering firm involved in the project (BBA). Approximately 360 trips per weekday are forecast to visit the mine at its peak in 2022.

The following assumptions used in this study were provided by BBA and Rainy River Resources:

- Salaried employees work Monday to Friday shifts, 9:00 a.m. to 5:00 p.m.;
- Hourly employees work 12 hour shifts from 7:00 a.m. to 7:00 p.m. and 7:00 p.m. to 7:00 a.m.;
- There are a total of 601 project personnel in the peak year of 2022, with 111 being salaried employees and 490 being hourly employees. All salaried employees work Monday to Friday, and approximately one quarter of all hourly employees (125 hourly personnel) work per shift;
- It was assumed that employees drive to work in a typical car, with no car-pooling; and
- All deliveries are made on weekdays, with an average of 5 trucks per weekday.

Higher volumes are generated by the hourly employees in the a.m. and p.m. peak hours than by the salaried employees. When one hourly shift is leaving another is arriving. Therefore, the hour before and after the daytime hourly shift was analysed. To be conservative, it was assumed that hourly employees leaving their nighttime shift would leave within the same hour as the hourly employees arriving to start their daytime shift, and vice versa.

MMM also analysed Highway 71 at Korpi Road based on the addition of construction traffic. As described in The Highway 600 Construction Traffic Mitigation Study in **Appendix E** prepared by TBT Engineering, construction of the East Access Road and the realignment of Highway 600 will coincide with the proposed mine development and is anticipated to continue over a period of six months. After this period, the additional traffic on Highway 600 will be removed, and all of the construction traffic will use the East Access Road (Korpi Road). It was determined that the period of concurrent highway and mine construction is not the critical period with respect to traffic. Greater monthly workforce forecasts occur in the fall of 2015, with 400 workers required daily in October of 2015. The following assumptions were made by TBT Engineering and MMM Group:

- The construction traffic will access the sites via Highway 71. For the purpose of this analysis, it was assumed that all the construction related traffic would travel via Highway 71;
- Construction worker shifts are from 7:00 a.m. to 7:00 p.m.;
- All construction workers arrive to site within one hour (6:00 to 7:00 a.m.), and leave within one hour (7:00 to 8:00 p.m.);
- No carpooling was assumed; and
- Although more trucks will be required during construction, their use will be dispersed throughout the day rather than being in use during shift change time. For this reason, truck traffic during the peak hours of construction traffic is assumed to be minimal.

It should be noted that the average number of construction workers required on site per day is approximately 215. Therefore, the peak month of 400 workers over-represents the average daily trips.

Trip generation for the proposed Rainy River Resources mine and the construction period are outlined in **Table 2.2**. The a.m. and p.m. peak periods for the hourly workers had higher trip generation than a.m. and p.m. peak periods for the salaried workers, and were therefore chosen to be analysed. In 2022 the mine is forecast to generate a total of 720 vehicles per day (360 inbound and 360 outbound), and 250 vehicles per hour (125 inbound and 125 outbound) during both the weekday peak hours. The peak construction month is forecast to generate a total of 890 vehicles per day (445 inbound and 445 outbound), 400 vehicles per hour in the a.m. peak hour (400 inbound and 0 outbound) and 400 vehicles per hour in the p.m. peak hour (0 inbound and 400 outbound).

Table 2.2: Construction and Mine Trip Generation

Trip Generation		Peak Construction Month			Peak Year (2022)		
		Weekday AM Peak Hour (6-7)	Weekday PM Peak Hour (7-8)	Weekday	Weekday AM Peak Hour (6-7)	Weekday PM Peak Hour (7-8)	Weekday
Trip Direction	Inbound	100 %	0 %	50 %	50 %	50 %	50 %
	Outbound	0 %	100 %	50 %	50 %	50 %	50 %
Employee Trips	Inbound	400	0	400	125	125	360
	Outbound	0	400	400	125	125	360
	Total	400	400	800	250	250	720
Heavy Vehicle Trips	Inbound	0	0	~ 45	0	0	5
	Outbound	0	0	~ 45	0	0	5
	Total	0	0	~ 90	0	0	10
Total Trips	**Inbound**	**400**	**0**	**445**	**125**	**125**	**360**
	Outbound	**0**	**400**	**445**	**125**	**125**	**360**
	Total	**400**	**400**	**890**	**250**	**250**	**720**

2.4.4 Trip Distribution and Assignment

Trip distribution refers to the directional split of traffic entering and exiting the study area, and trip assignment refers to the assignment of distributed trips to the adjacent road network. Trip distribution for the construction and mine traffic is based on the surrounding communities that employees would likely live in, and was provided by the client. The following trip distribution was used:

- 20 percent to/from the north on Highway 71; and
- 80 percent to/from the south on Highway 71.

New trips generated by construction and the proposed mine were distributed and assigned to the road network based on the split noted above. Background traffic was combined with the additional traffic generated, distributed and assigned to the road network to determine traffic projections for the peak construction and post development scenarios. Peak construction and Post development traffic volumes for the weekday a.m. and p.m. peak hours and average daily traffic are illustrated in **Figures 2.8 to 2.11**.

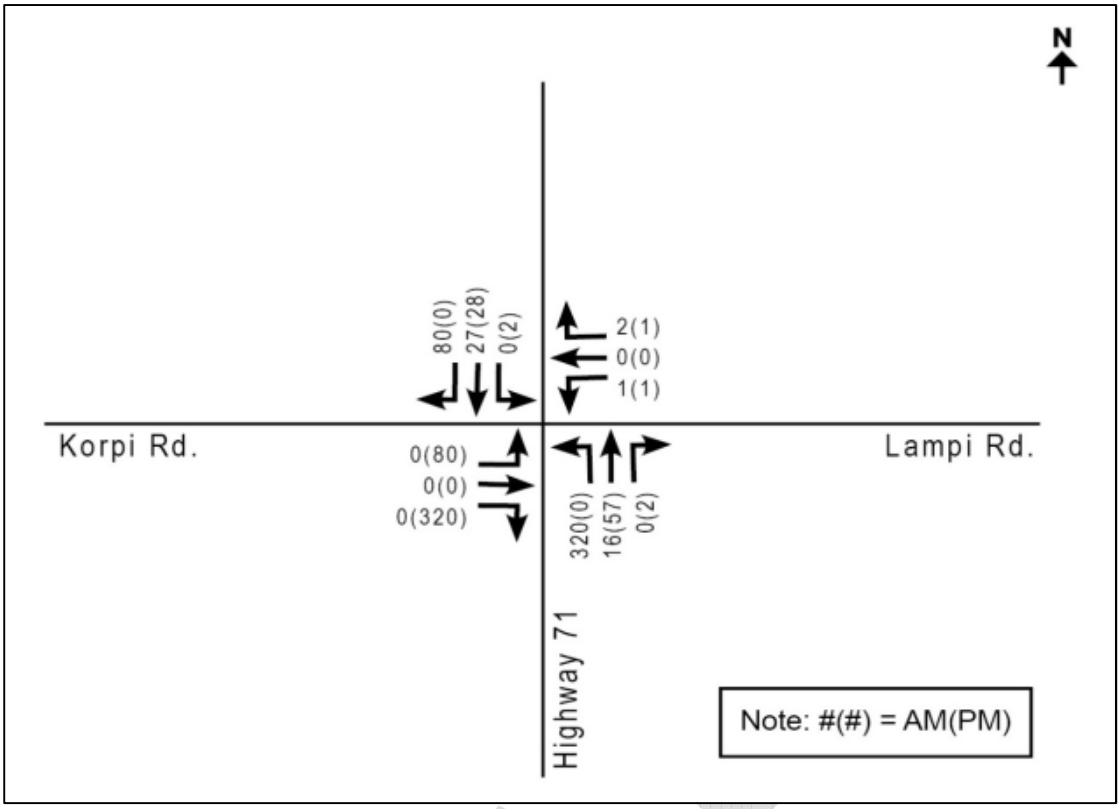


Figure 2.8: Peak Construction Period- Peak Hour Traffic Volumes

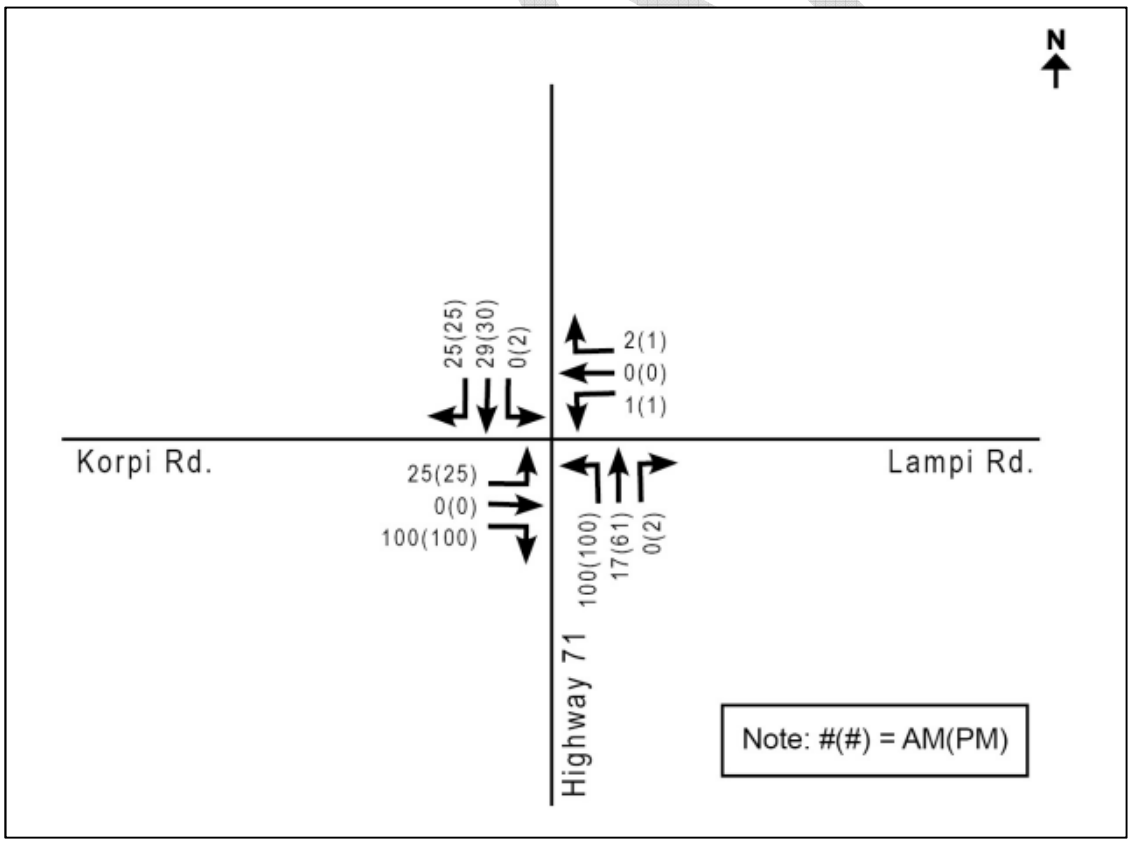


Figure 2.9: 2022 Peak Hour Post Development Traffic Volumes

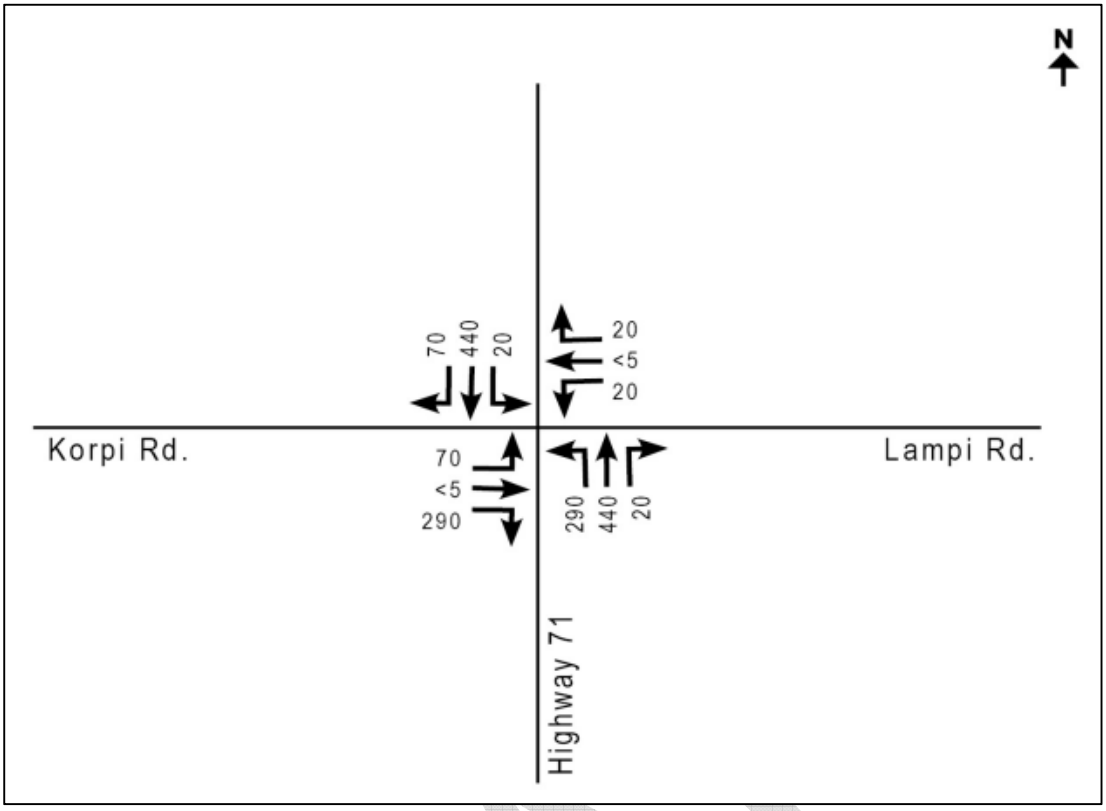


Figure 2.10: 2022 Average Daily Post Development Traffic Volumes (AADT)

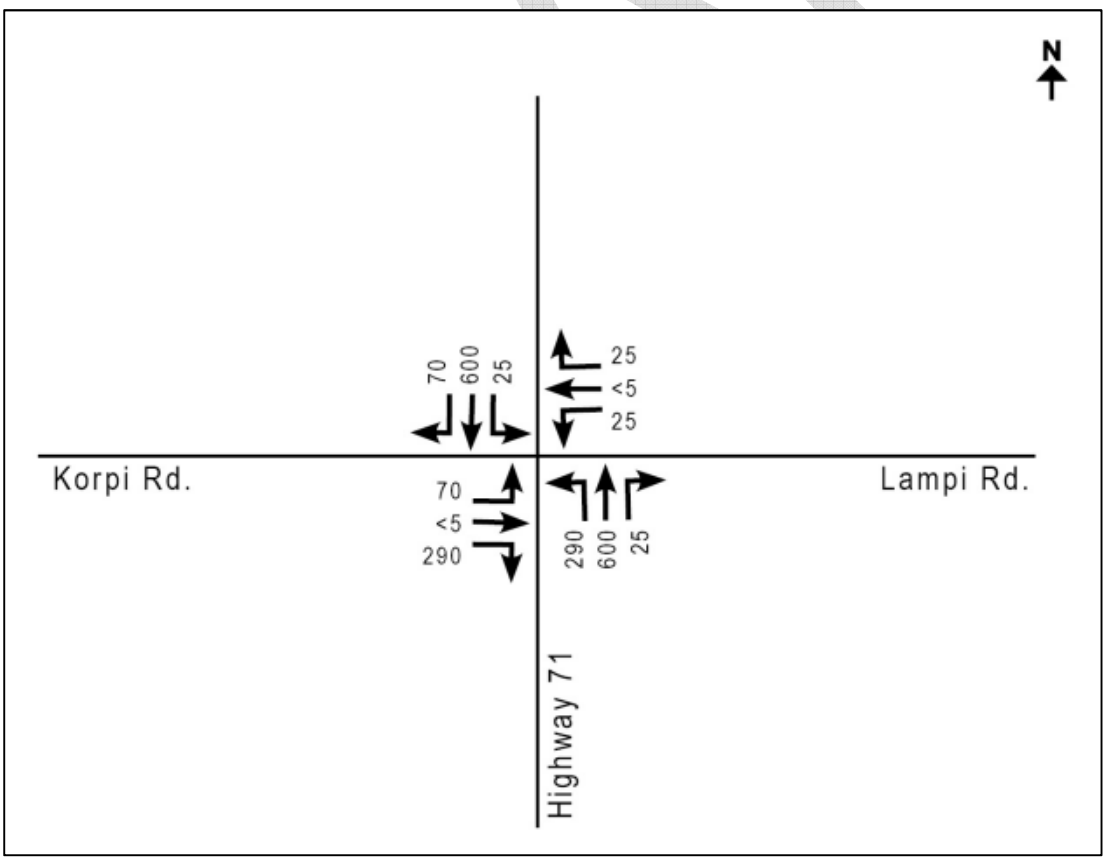


Figure 2.11: 2022 Average Daily Post Development Traffic Volumes (SADT)

2.5 Traffic Analysis

2.5.1 Intersection Analysis

The traffic analysis for the proposed development was undertaken using Synchro 8.0 traffic analysis software. The relative performance of an intersection is measured in terms of level of service (LOS). LOS ranges from A (excellent) to F (beyond capacity). In general, LOS E is considered to be at capacity. LOS for un-signalized intersections is defined in terms of delay. Delay is the total elapsed time from when a vehicle stops at the end of the queue until the vehicle departs from the stop line. This includes the time required for the vehicle to travel from the last-in-queue position to the first.

LOS B or better for the overall intersection is widely considered desirable in a rural area during peak traffic periods. At un-signalized intersections, LOS C or better is generally considered acceptable for minor roads accessing major provincial roads and highways, with LOS B or better acceptable for through movements on the highway.

Intersection capacity utilization level of service (ICU LOS) provides additional insight into how an intersection is functioning and how much extra capacity is available to handle traffic fluctuations and incidents. ICU LOS ranges from A (excellent) to H (beyond capacity), with ICU LOS E generally considered to be at practical capacity.

For this analysis, it is assumed that the northbound and southbound approaches on Highway 71 will remain free-flowing while eastbound and westbound vehicles on Korpi Road and Lampi Road will remain under stop control at the intersection with Highway 71. All four approaches at the intersection were assumed to consist of a single approach lane.

Table 2.3 summarizes the results of the background, peak construction period, and post development intersection analyses for Highway 71 and Korpi Road. The detailed Synchro results are included in **Appendix B**.

Table 2.3: Hwy 71 and Korpi Road Intersection Analysis

Scenario	Overall Intersection			Critical Movement	
	Average Delay	ICU LOS	Intersection Utilization	Movement	LOS (Delay)
Weekday PM Peak Hour					
2022 AM Background	0 sec	A	13%	WB	A (9 sec)
2022 PM Background	0 sec	A	13%	WB	A (9 sec)
Peak Construction Period AM Peak (6-7)	6 sec	A	35%	WB	B (12 sec)
Peak Construction Period PM Peak (7-8)	9 sec	A	35%	WB	B (12 sec)
2022 AM Peak (6-7)	7 sec	A	28%	WB	A (10 sec)
2022 PM Peak (7-8)	6 sec	A	30%	WB	B (11 sec)

The data provided in **Table 2.3** indicates the following:

- All scenarios feature less than 10 seconds of average delay per vehicle for the overall intersection.
- All post development scenarios feature ICU LOS A for the overall intersection.
- The Peak Construction Period scenarios feature LOS B and 12 seconds of delay for the westbound movements.

2.5.2 Traffic Signal Warrant Analysis

Based on the low background and post development traffic volumes, it was concluded that traffic signals would not be warranted and a traffic signal warrant analysis was therefore not performed.

2.6 Improvement Analysis

2.6.1 Intersection Treatment Warrant

The intersection treatment warrant analysis was completed following the MTO *Geometric Design Standards for Ontario Highways, Chapter E- At-Grade Intersections*. Warrants were completed for the peak construction period, the average construction period, and 2022 post development traffic volumes. The detailed warrant analysis is included in **Appendix C**. The results of the warrant analysis are summarized in **Table 2.4.**

Table 2.4: Hwy 71 at Korpi Rd Intersection Treatment Warrant Analysis

Scenario	Highway 71		Korpi Road
	Left-turn Lane	Right-turn Channelization	Right-turn Channelization
Peak Construction Period	Warranted	Warranted	Warranted
Average Construction	Not Warranted	Not Warranted	Warranted
2022 Post Development	Not Warranted	Not Warranted	Warranted

The left-turn lane warrant analysis was performed based on 40 percent of the advancing traffic being left-turns, which is the maximum left-turn percentage available in the *Geometric Design Standards for Ontario Highways*. In reality, the percent of left-turns varied from 60 to 95 percent in the scenarios analysed. With the majority of traffic travelling northbound on Highway 71 making a left-turn it is unlikely that a vehicle travelling straight through the Highway 71 and Korpi Road intersection will encounter a vehicle waiting to turn left.

A northbound left-turn lane is warranted for the month with 400 construction workers working on site. However, at approximately 350 workers the left-turn lane is no longer warranted, and there are only 4 months out of the 20 months of construction that have more than 350 workers. As mentioned in Section 2.4.3, the average number of construction workers employed over the construction period is 215, which is much lower than the peak period. The addition of a left turn lane is therefore not recommended.

The same methodology applies to the right-turn channelization warrant. MTO warrants right-turn channelization when 60 vehicles per hour make a right turn. This is warranted in the peak construction period, and every month with 300 or more workers driving to site every day, which is a total of six months out of the entire construction period. It is not recommended that right-turn channelization be implemented based on the short time that it is warranted.

Right-turn channelization is warranted for the eastbound right-turn movement from Korpi Road onto Highway 71 in all scenarios. It is recommended that a right-turn cut-off lane be constructed at Korpi Road and Highway 71.

The shoulders on Highway 71 at Korpi Road are currently paved, and it is recommended that they continue to be maintained as paved shoulders as vehicles making a right-turn from southbound Highway 71 onto Korpi Road will likely use the shoulder.

2.6.2 Illumination Warrant

An MTO illumination warrant was conducted for the intersection of Highway 71 at Korpi Road as per MTO Directives PLNG-B-05 and 06. The illumination warrant is included in **Appendix D**. MTO typically requires partial illumination at non-freeway intersections with 62 or more warrant points. Where information was not known (such as the percent of night-to-total accidents and the grades on approach streets), conservative estimates were made. The intersection generates 50 warrant points, and illumination is therefore not warranted.

3.0 HIGHWAY 600 CONSTRUCTION MITIGATION

The Highway 600 Construction Traffic Mitigation Study done by TBT Engineering for Rainy River Resources was reviewed and is attached in **Appendix E**. MMM concurs with the assumptions and conclusions made by TBT, and the Township of Chapple is in agreement with the chosen detour alternative.

4.0 CONCLUSIONS AND RECOMMENDATIONS

The following conclusions and recommendations are made for the proposed Rainy River Resources mine based on the results of the analysis:

- During the peak construction period, construction activities are forecast to generate 400 new trips (400 entering and 0 exiting) during the a.m. peak hour, 400 new trips (0 entering and 400 exiting) during the p.m. peak hour, and 890 new daily trips (445 entering and 445 exiting).
- The proposed mine is forecast to generate 250 new trips (125 entering and 125 exiting) during both the weekday a.m. and weekday p.m. peak hours and 720 new daily trips (360 entering and 360 exiting).
- 80 percent of the construction and mine traffic is expected to access the site to/from the south on Highway 71 and 20 percent of the construction and mine traffic is expected to access the site to/from the north on Highway 71.
- The intersection of Highway 71 at Korpi Road is forecast to operate at an acceptable level of service with both the construction traffic and the proposed mine traffic. Northbound and southbound vehicles on Highway 71 will be free-flowing while westbound and eastbound traffic will approach a stop sign at the intersection.
- Traffic signals are not warranted at the Highway 71 and Korpi Road intersection based on the low forecast 2022 post development traffic volumes. However, it is recommended that “Trucks Turning Ahead” signs be installed on Highway 71 north and south of the intersection as an added safety measure.
- Highway 71 at Korpi Road was analyzed and although it does meet the MTO warrants for intersection upgrades in the peak construction period scenarios, no upgrades are recommended. However, a right-turn cut-off from Korpi Road onto Highway 71 is warranted and recommended.
- Illumination is not warranted at the intersection of Highway 71 at Korpi Road.

Ministry of Transportation
Engineering Office

Traffic Section
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615 South James Street
Thunder Bay, Ontario
P7E 6P6
PH: 807-473-2138
FAX: 807-473-2168

Ministère des Transports

Bureau de genie

Section de la circulation routière
615 rue James
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Tél: (807) 473-2061
Télé: (807) 473-2168

August 7, 2013

Ms. Vanessa Nickel, EIT
Designer
Transportation Planning
MMM Group Limited
111-93 Lombard Avenue
Winnipeg, Manitoba
Canada R3B 3B1

Re: Traffic Information Request
Turning Movement at Highways 11, 71 & 600

This is further to your request of August 2, 2013, attached are 2012 8-hr total, AM, PM peak hour, and 15 minute counts for the above location.

If you require clarification, please contact me at your convenience.

Yours truly,

Nancy Chu-McKercher
Traffic Supervisor

Attach

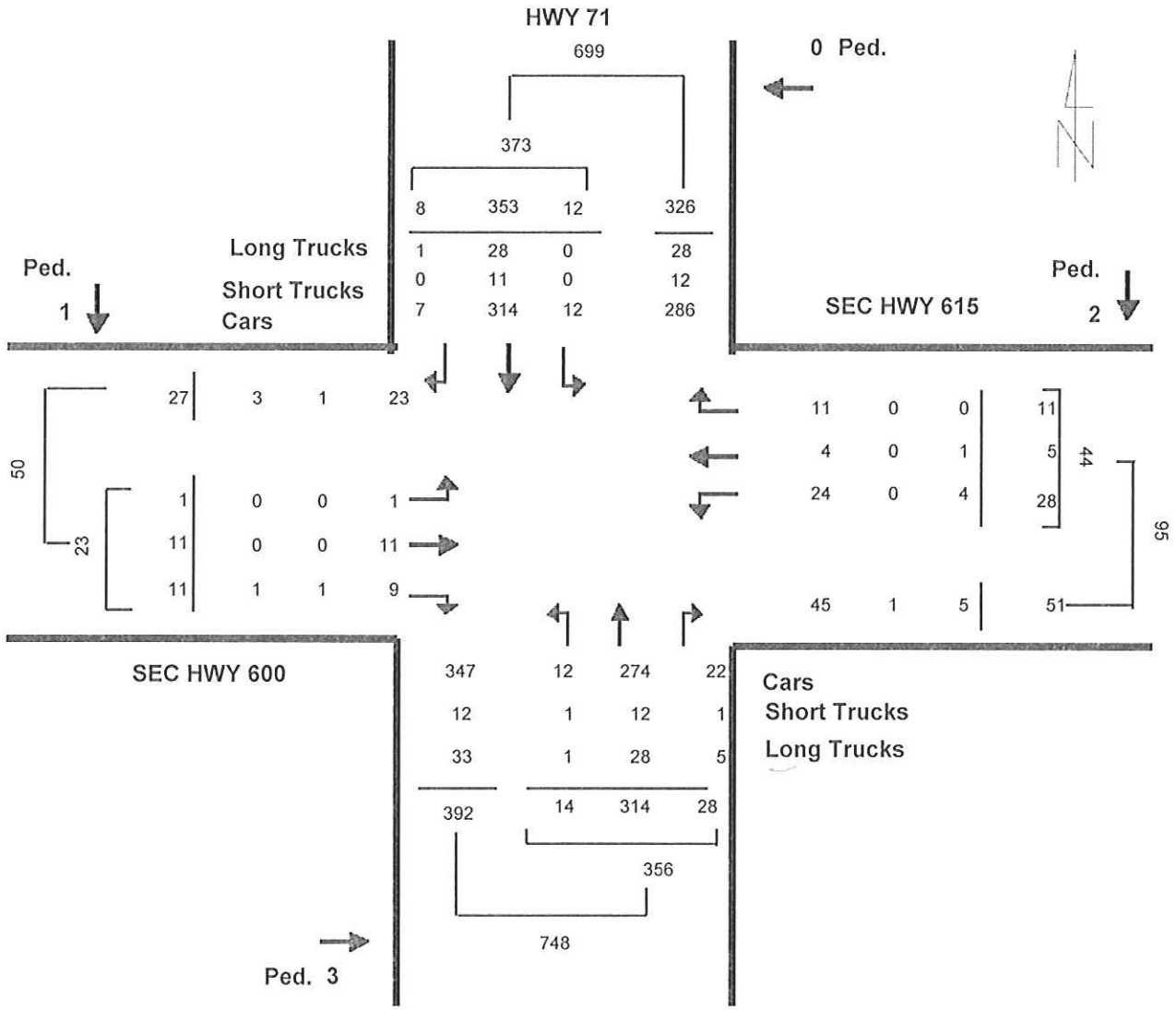
Traffic
Engineering
Software

8 HOUR COUNT TOTAL

HWY 71, HWY 600 (W) & HWY 615 (E)

Northwest

Intersection ID:36080 0.0 Date: Aug 16, 2012



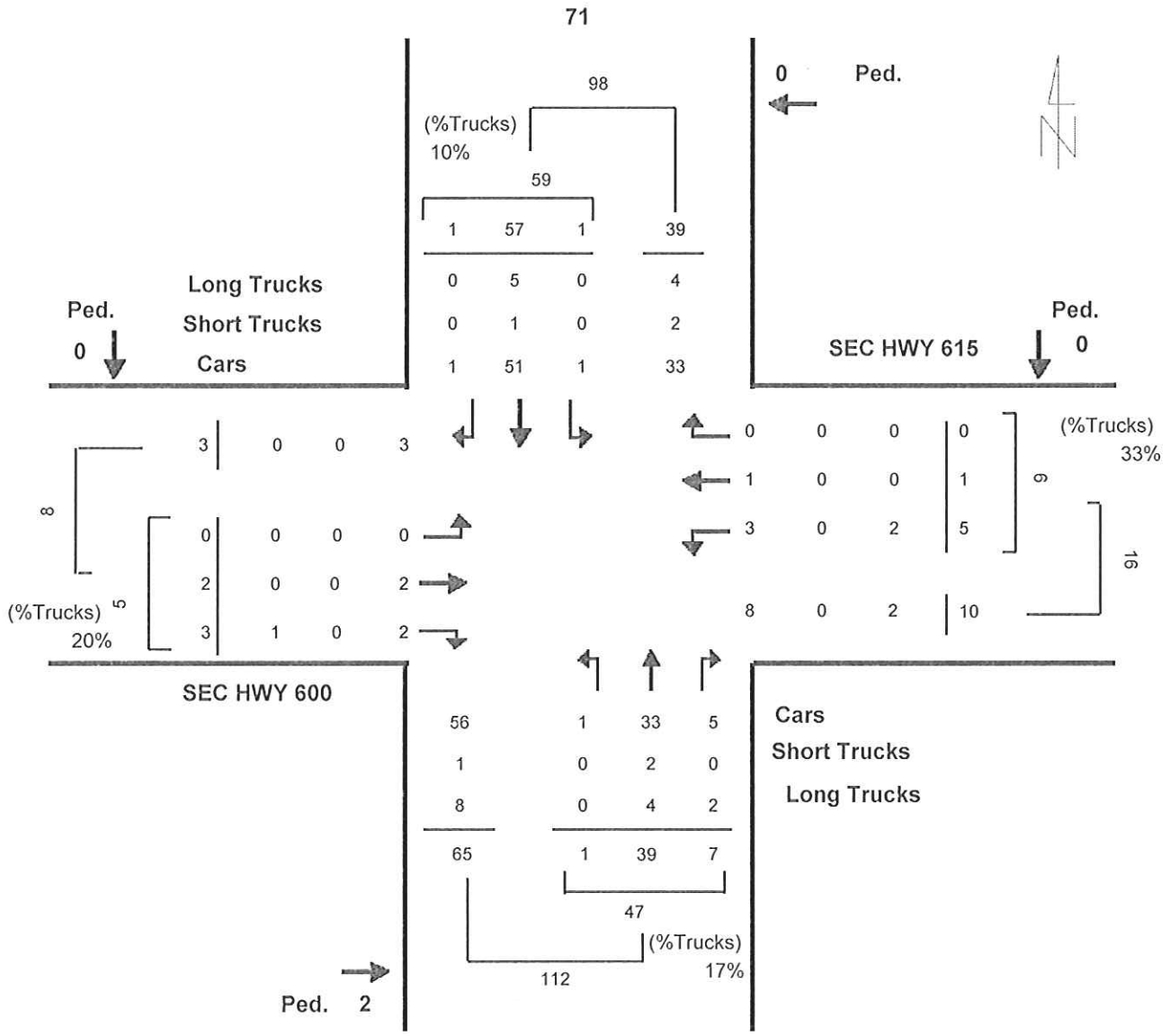
Traffic
Engineering
Software

AM Peak Hour Diagram

HWY 71, SEC HWY 600 (W) & HWY 615 (E)

Northwest

Intersection ID:36080 0.0 | PK HR End: 10:45 | Day: Thursday | Date:Aug 16, 2012



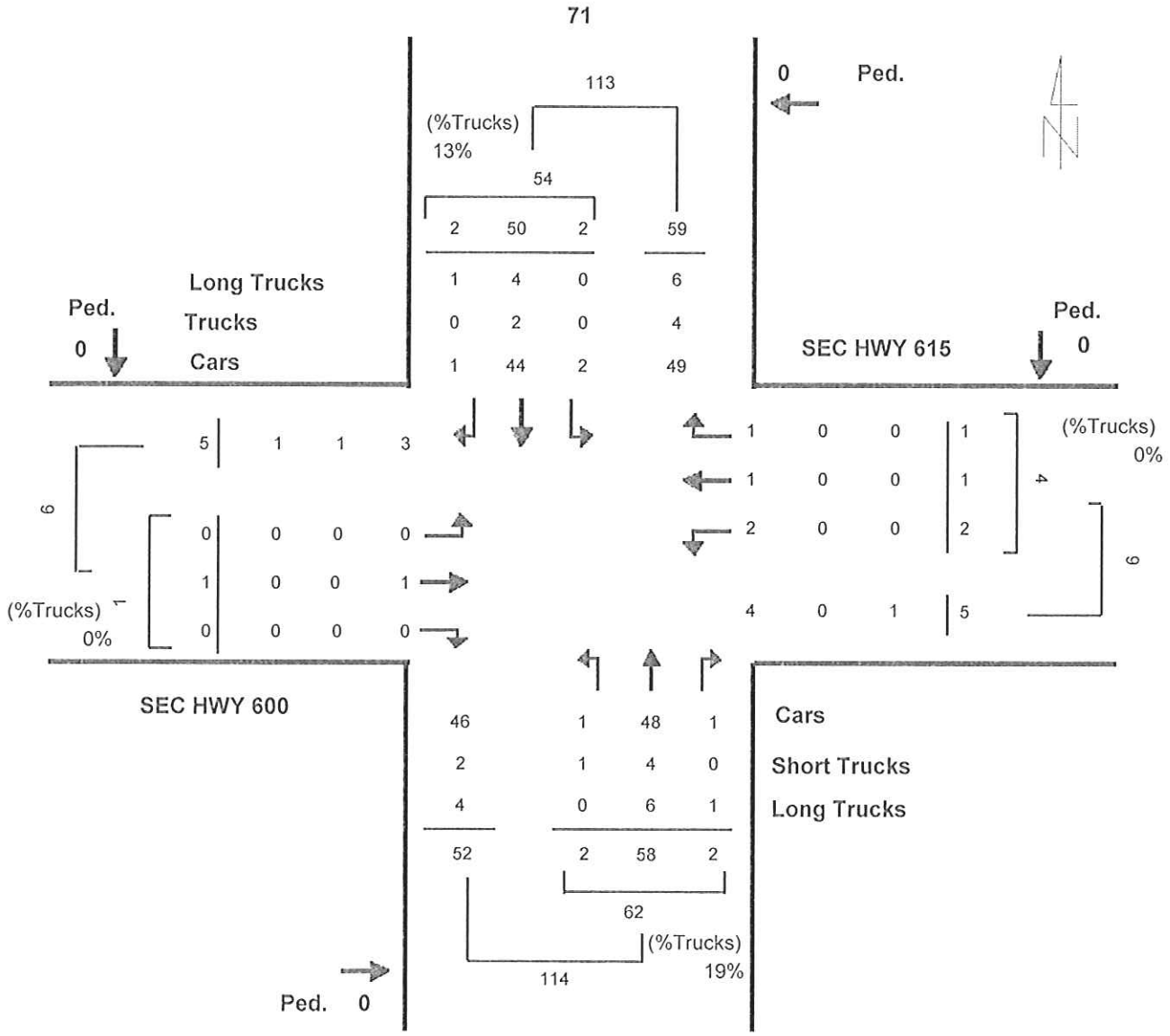
PM Peak Hour Diagram

Traffic Engineering Software

HWY 71, SEC HWY 600 (W) & HWY 615 (E)

Northwest

Intersection ID:36080 0.0 | PK HR End: 14:45 | Day: Thursday | Date:Aug 16, 2012



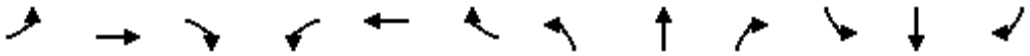
15 MIN REPORT

Intersection ID:36080 0.0 HWY 71, SEC HWY 600 (W) & HWY 615 (E) Municipality: Northwest Date: Aug 16, 2012

	NORTH APPROACH										EAST APPROACH										SOUTH APPROACH										WEST APPROACH										
Time	Cars			Trucks			Heavies			Ped	Cars			Trucks			Heavies			Ped	Cars			Trucks			Heavies			Ped	Cars			Trucks			Heavies			Ped	Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right		Left	Thru	Right	Left	Thru	Right	Left	Thru	Right		Left	Thru	Right	Left	Thru	Right	Left	Thru	Right		Left	Thru	Right	Left	Thru	Right	Left	Thru	Right		
Period1																																								
8:15	0	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	12
8:30	0	13	0	0	0	0	0	0	0	0	2	0	1	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	19
8:45	0	4	1	0	1	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	7	1	0	0	0	0	1	1	0	0	1	0	0	0	0	0	0	0	0	19
9:00	0	11	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	6	1	0	1	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	24
9:15	0	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	9	3	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	24
9:30	1	10	0	0	0	0	0	0	0	0	3	0	1	0	0	0	0	0	0	0	0	7	1	0	0	0	0	2	0	0	0	0	2	0	0	0	0	0	0	0	27
9:45	2	5	0	0	1	0	0	0	0	0	2	0	2	0	0	0	0	0	0	2	1	5	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	22
10:00	1	14	1	0	1	0	0	0	0	0	2	0	0	0	0	0	1	0	0	0	1	12	0	0	1	0	0	1	0	2	0	1	1	0	0	0	0	0	1	0	40
10:15	0	13	0	0	0	0	0	2	0	0	0	0	0	0	0	0	1	0	0	0	0	7	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	26
10:30	0	13	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	7	1	0	0	0	0	0	1	0	0	1	1	0	0	0	0	0	0	0	26
10:45	0	11	0	0	0	0	0	1	0	0	1	1	0	0	0	0	0	0	0	0	0	7	3	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	27
11:00	1	8	0	0	0	0	0	3	0	0	2	0	1	0	0	0	0	0	0	0	2	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	22
11:15	0	15	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	0	0	2	0	0	1	0	0	0	2	0	0	0	0	0	0	0	0	30
11:30	0	8	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	1	8	1	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	23
11:45	0	12	2	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	5	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	22
12:00	0	7	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	7	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	16
Period2																																									
13:15	0	7	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	9	1	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	20
13:30	0	7	0	0	0	0	0	4	0	0	2	0	1	0	0	0	0	0	0	0	0	8	2	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	26
13:45	2	9	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	8	0	0	1	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	23
14:00	0	12	1	0	0	0	0	2	1	0	0	0	1	0	0	0	0	0	0	0	1	11	0	0	1	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	32
14:15	0	9	0	0	0	0	0	2	0	0	2	0	0	0	0	0	0	0	0	0	0	14	0	1	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	31
14:30	1	14	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11	1	0	3	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	33
14:45	1	9	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	12	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	25
15:00	0	6	0	0	0	0	0	2	0	0	0	0	0	0	0	0	1	0	0	0	0	10	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	22
15:15	1	12	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	2	12	0	0	0	0	0	2	0	1	0	0	2	0	0	0	0	0	0	0	33
15:30	0	12	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	22
15:45	0	6	0	0	1	0	0	3	0	0	0	0	0	0	0	0	1	0	0	0	0	10	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	22
16:00	0	12	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	13	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	30
16:15	0	6	0	0	2	0	0	0	0	0	1	0	2	0	0	0	0	0	0	0	1	9	1	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	24
16:30	2	13	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	2	12	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	33
16:45	0	8	0	0	0	0	0	1	0	0	2	0	0	0	0	0	0	0	0	0	0	12	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	25
17:00	0	10	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	10	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	22

	START TIME	NBL	NBT	NBR	SBL	SBT	SBR	WBL	WBT	WBR	EBL	EBT	EBR
HWY 600 @ TAIT RD	8:00												
	8:15		2										
	8:30					1							
	8:45												
	PK HR VOLS	0	2	0	0	1	0	0	0	0	0	0	0
	9:00												
HWY 71 @ KORPI RD	9:15		10			13							
	9:30		10			12							
	9:45		6			16			1				
	10:00		9			18		1					
	10:15		5			11		1		2			
	10:30		12			22		1					
	10:45		11			12				2			
	PK HR VOLS	0	37	0	0	63	0	3	0	4	0	0	0
HWY 71 @ KORPI RD	2:30		8	1		7							
	2:45		7			11							
	3:00		10	1		10							
	3:15		13			6							
	3:30		14		1	4							
	3:45		14			4		1		1			
	4:00		12			10							
	4:15		11	2	1	7							
	PK HR VOLS	0	51	2	2	25	0	1	0	1	0	0	0
	4:30												
HWY 600 @ TAIT RD	4:45		1								1		
	5:00					1							
	5:15		1			1							
	5:30												
	PK HR VOLS	0	2	0	0	2	0	0	0	0	1	0	0

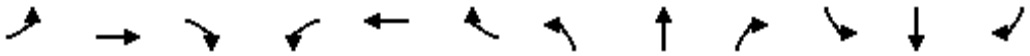
	TURNING MOVEMENT RATIOS TO TOTAL PEAK HOUR VOLUME											
	NBL	NBT	NBR	SBL	SBT	SBR	WBL	WBT	WBR	EBL	EBT	EBR
AM PEAK	0%	35%	0%	0%	59%	0%	3%	0%	4%	0%	0%	0%
PM PEAK	0%	62%	2%	2%	30%	0%	1%	0%	1%	0%	0%	0%
AM PEAK	0%	67%	0%	0%	33%	0%	0%	0%	0%	0%	0%	0%
PM PEAK	0%	40%	0%	0%	40%	0%	0%	0%	0%	20%	0%	0%



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	0	1	0	2	0	17	0	0	29	25
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	1	0	2	0	18	0	0	32	27
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	66	64	45	64	77	18	59			18		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	66	64	45	64	77	18	59			18		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.2			4.2		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.3			2.3		
p0 queue free %	100	100	100	100	100	100	100			100		
cM capacity (veh/h)	926	827	1025	931	813	1060	1472			1523		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	0	3	18	59
Volume Left	0	1	0	0
Volume Right	0	2	0	27
cSH	1700	1013	1472	1523
Volume to Capacity	0.00	0.00	0.00	0.00
Queue Length 95th (m)	0.0	0.1	0.0	0.0
Control Delay (s)	0.0	8.6	0.0	0.0
Lane LOS	A	A		
Approach Delay (s)	0.0	8.6	0.0	0.0
Approach LOS	A	A		

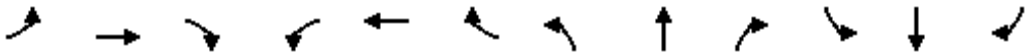
Intersection Summary				
Average Delay	0.3			
Intersection Capacity Utilization	13.3%	ICU Level of Service	A	
Analysis Period (min)	15			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	25	0	100	1	0	2	100	17	0	0	29	25
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	27	0	109	1	0	2	109	18	0	0	32	27
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	283	281	45	390	295	18	59			18		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	283	281	45	390	295	18	59			18		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	96	100	89	100	100	100	93			100		
cM capacity (veh/h)	632	583	1025	482	573	1060	1545			1598		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	136	3	127	59
Volume Left	27	1	109	0
Volume Right	109	2	0	27
cSH	911	757	1545	1598
Volume to Capacity	0.15	0.00	0.07	0.00
Queue Length 95th (m)	4.2	0.1	1.8	0.0
Control Delay (s)	9.6	9.8	6.5	0.0
Lane LOS	A	A	A	
Approach Delay (s)	9.6	9.8	6.5	0.0
Approach LOS	A	A		

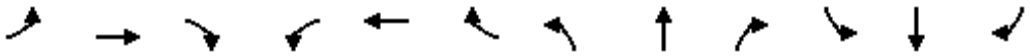
Intersection Summary				
Average Delay	6.7			
Intersection Capacity Utilization	28.4%	ICU Level of Service	A	
Analysis Period (min)	15			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	0	1	0	2	320	17	0	0	29	80
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	1	0	2	348	18	0	0	32	87
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	791	789	75	789	833	18	118			18		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	791	789	75	789	833	18	118			18		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	100	100	100	100	76			100		
cM capacity (veh/h)	251	246	986	252	232	1060	1470			1598		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	0	3	366	118
Volume Left	0	1	348	0
Volume Right	0	2	0	87
cSH	1700	512	1470	1598
Volume to Capacity	0.00	0.01	0.24	0.00
Queue Length 95th (m)	0.0	0.2	7.4	0.0
Control Delay (s)	0.0	12.1	7.9	0.0
Lane LOS	A	B	A	
Approach Delay (s)	0.0	12.1	7.9	0.0
Approach LOS	A	B		

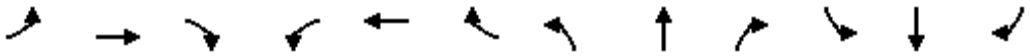
Intersection Summary				
Average Delay	6.0			
Intersection Capacity Utilization	35.3%	ICU Level of Service	A	
Analysis Period (min)	15			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	0	1	0	1	0	61	2	2	30	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	1	0	1	0	66	2	2	33	0
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	105	105	33	104	104	67	33			68		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	105	105	33	104	104	67	33			68		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.3			4.3		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.3			2.3		
p0 queue free %	100	100	100	100	100	100	100			100		
cM capacity (veh/h)	872	783	1041	875	785	996	1493			1448		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	0	2	68	35
Volume Left	0	1	0	2
Volume Right	0	1	2	0
cSH	1700	931	1493	1448
Volume to Capacity	0.00	0.00	0.00	0.00
Queue Length 95th (m)	0.0	0.1	0.0	0.0
Control Delay (s)	0.0	8.9	0.0	0.5
Lane LOS	A	A		A
Approach Delay (s)	0.0	8.9	0.0	0.5
Approach LOS	A	A		

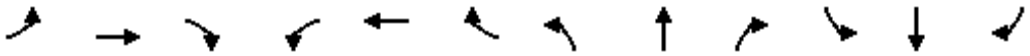
Intersection Summary				
Average Delay	0.3			
Intersection Capacity Utilization	13.3%	ICU Level of Service	A	
Analysis Period (min)	15			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	25	0	100	1	0	1	100	61	2	2	30	25
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	27	0	109	1	0	1	109	66	2	2	33	27
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	336	336	46	444	349	67	60			68		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	336	336	46	444	349	67	60			68		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	95	100	89	100	100	100	93			100		
cM capacity (veh/h)	583	542	1023	443	534	996	1544			1533		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	136	2	177	62
Volume Left	27	1	109	2
Volume Right	109	1	2	27
cSH	889	613	1544	1533
Volume to Capacity	0.15	0.00	0.07	0.00
Queue Length 95th (m)	4.3	0.1	1.8	0.0
Control Delay (s)	9.8	10.9	4.8	0.3
Lane LOS	A	B	A	A
Approach Delay (s)	9.8	10.9	4.8	0.3
Approach LOS	A	B		

Intersection Summary				
Average Delay	5.9			
Intersection Capacity Utilization	30.1%	ICU Level of Service	A	
Analysis Period (min)	15			

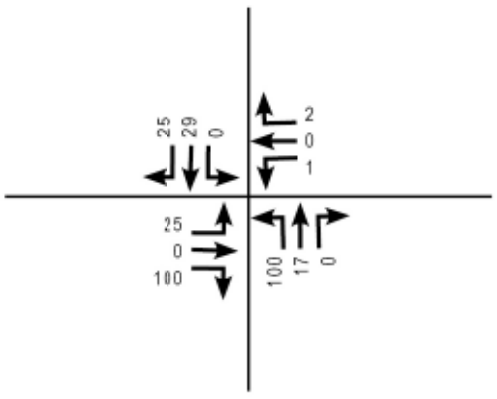


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	80	0	320	1	0	1	0	61	2	2	30	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	87	0	348	1	0	1	0	66	2	2	33	0
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	105	105	33	452	104	67	33			68		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	105	105	33	452	104	67	33			68		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	90	100	67	100	100	100	100			100		
cM capacity (veh/h)	872	784	1041	344	785	996	1579			1533		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	435	2	68	35
Volume Left	87	1	0	2
Volume Right	348	1	2	0
cSH	1002	512	1579	1533
Volume to Capacity	0.43	0.00	0.00	0.00
Queue Length 95th (m)	17.8	0.1	0.0	0.0
Control Delay (s)	11.3	12.1	0.0	0.5
Lane LOS	B	B		A
Approach Delay (s)	11.3	12.1	0.0	0.5
Approach LOS	B	B		

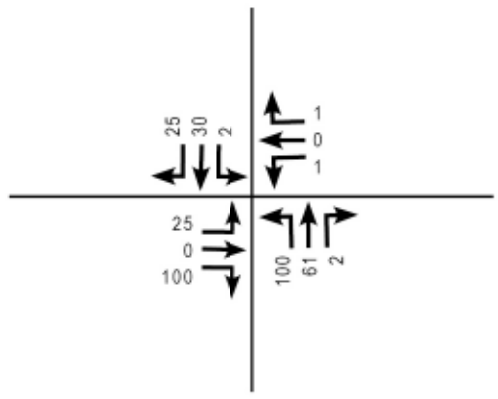
Intersection Summary				
Average Delay	9.2			
Intersection Capacity Utilization	35.1%	ICU Level of Service	A	
Analysis Period (min)	15			

2022 AM Peak PD



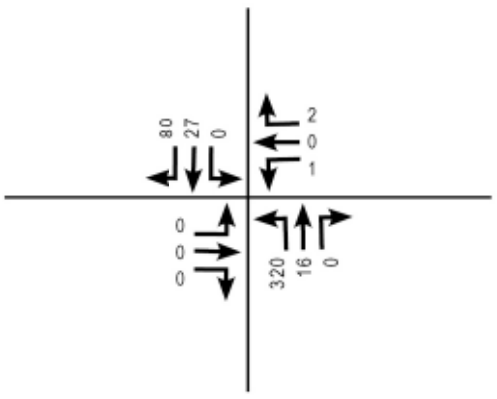
Northbound Left Turn:
Va = 117
Vo = 54
Vl = 100; % Vl = 86%
Southbound Right Turn: <60, Not Warranted
Eastbound Right Turn: >60, Warranted

2022 PM Peak PD



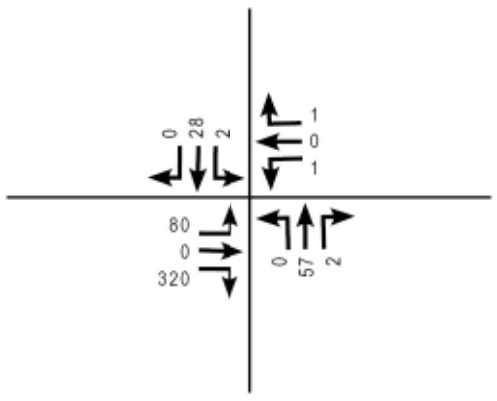
Northbound Left Turn:
Va = 163
Vc = 57
Vl = 100; % Vl = 61%
Southbound Right Turn: <60, Not Warranted
Eastbound Right Turn: >60, Warranted

2015 Peak Construction Period - AM Peak



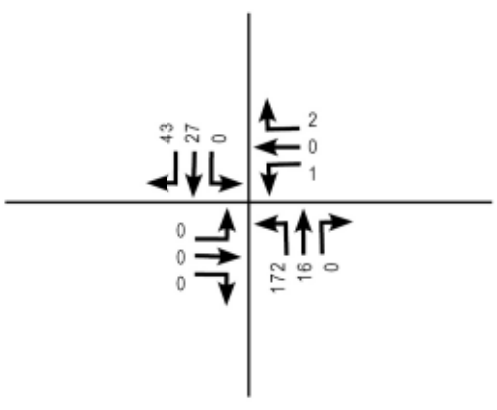
Northbound Left Turn:
Va = 336
Vo = 107
Vl = 320; % Vl = 95%
Southbound Right Turn: <60, Not Warranted
Eastbound Right Turn: None

2015 Peak Construction Period - PM Peak



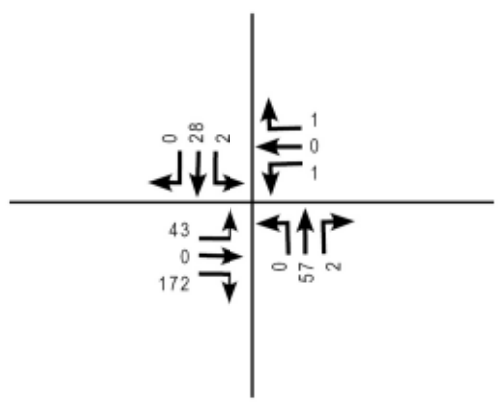
Northbound Left Turn:None
Southbound Right Turn: >60, Warranted
Eastbound Right Turn: >60, Warranted

Average Construction Period - AM Peak



Northbound Left Turn:
Va = 188
Vo = 70
Vl = 172; % Vl = 91%
Southbound Right Turn: <60, Not Warranted
Eastbound Right Turn: None

Average Construction Period - PM Peak



Northbound Left Turn: None
Southbound Right Turn: None
Eastbound Right Turn: >60, Warranted

FORM 3
NON-FREEWAY - INTERSECTION ILLUMINATION

Highway: 71 ***WP No.:***
Location: HWY 71 at KORPI RD ***Name:*** VN ***Date:*** AUG 19/13
2 pages

CLASSIFICATION FACTOR	RATING (i) 1	2	3	4	5	UNLIT WEIGHT (A)	LIGHTED WEIGHT (B)	DIFF. (A - B)	SCORE [RATING X (A - B)]
Geometric Factors Number of Legs		3	4	5	6 or more (including traffic circles)	3.0	2.5	0.5	1.5
Approach Lane Width (m)	3.75	3.50	3.25	3.00	< 3.00	3.0	2.5	0.5	0.5
Turn Lanes	no turn lanes	left turn lanes on major legs	left turn lanes on all legs, right turn lanes on major legs	left and right turn lanes on major legs	left and right turn lanes on all legs	2.0	1.0	1.0	1.0
Approach Sight Distance (m)	> 210	151 - 210	91 - 150	60 - 90	< 60	2.0	1.8	0.2	0.2
Grades on Approach Streets	< 3%	3.0 - 3.9%	4.0 - 4.9%	5.0 - 6.9%	7%	3.2	2.8	0.4	1.2
Curvature on Approach Legs m (deg.)	>600 (< 3.0°)	600-290 (3.0 - 6.0°)	289-220 (6.1 - 8.0°)	219-170 (8.1 - 10.0 °)	<170 (> 10°)	13.0	5.0	8.0	8.0
Parking in Vicinity of Intersection	prohibited both sides	loading zones only	off-peak only	permitted one side only	permitted both sides	0.2	0.1	0.1	0.1
							Geometric Total		12.5
Operational Factors Operating Speed on Approach Legs (km/hr)	40 or less	50	55	65	70 or greater	1.0	0.2	0.8	4.0
Type of Control	traffic signal control (always partial illumination)			4-way stop control	stop control to minor legs or no control	3.0	2.0	1.0	5.0
Level of Service (ii) (any dark hour)	A	B	C	D	E, F	1.2	0.2	1.0	1.0
Total Pedestrian Volume (peds/night crossing)	0 - 10	11 - 50	51 - 100	101 - 200	> 200	1.5	0.5	1.0	1.0
							Operational Total		11.0
Environmental Factors Adjacent Development	none	1 quad	2 quad	3 quad	4 quad	0.5	0.3	0.2	0.4

FORM 3
NON-FREEWAY - INTERSECTION ILLUMINATION

Highway: 71 ***WP No.:***
Location: HWY 71 *at* KORPI RD ***Name:*** VN ***Date:***
2 pages

CLASSIFICATION FACTOR	RATING (i) 1	2	3	4	5	UNLIT WEIGHT (A)	LIGHTED WEIGHT (B)	DIFF. (A - B)	SCORE [RATING X (A - B)]
Type of Development near Intersection	undeveloped	residential	50% residential 50% industrial or commercial	industrial or commercial	strip industrial or commercial	0.5	0.3	0.2	0.4
Illumination adjacent to intersection	none	1 quad	2 quad	3 quad	4 quad	3.0	1.0	2.0	2.0
							Environmental Total		2.8
Accidents % of Night-to-Total Accidents (3 yr. avg.) (iii)	< 20%	20 - 30%	31 - 40%	41 - 50%	> 50%	10.0	2.0	8.0	24.0
							Accidents Total		50.0

Benefit Cost Ratio (B/C)

GEOMETRIC TOTAL	= 12.5
OPERATIONAL TOTAL	= 11.0
ENVIRONMENTAL TOTAL	= 2.8
ACCIDENT TOTAL	= 24.0
SUM	= 50 **POINTS**
PARTIAL ILLUMINATION WARRANTING CONDITION	= **62 points** NONE

i. A rating of between 1 and 5 shall be assigned for each factor in the FORM depending on the conditions that are encountered by motorists on the roadway. The higher the rating, the more critical the need for illumination with regard to that particular factor.
ii. Use LOS methodology approved by the MTO. If not available for unsignalized intersection, use Level of Service C.
iii. For night-to-total accident ratio, accidents during darkness are used (including dusk/dawn).
Iv. The number of points for the warranting condition is based on 50% of the total points attainable, if all factors were rated 5.
Note: Worst case scenarios should be considered when assigning the ratings. For example, a section of roadway could have rush hour volumes during the hours of darkness in wintertime.
Partial illumination is always installed at signalized intersections.
Full illumination of intersection is installed when mainline has continuous illumination.

Highway 600
Construction Traffic Mitigation Study

Prepared for
Rainy River Resources Limited

By TBT Engineering

May 1, 2013

1.0 Introduction

TBT Engineering Consulting Group (TBTE) was commissioned by Rainy River Resources Limited (RRR) to provide a Construction Traffic Mitigation Study for accommodating local and provincial highway traffic during the construction of a proposed realignment of Highway 600 in the District of Rainy River, Ontario.

The existing Highway 600 alignment traverses through a proposed mine development area near the community of Blackhawk. Following completion of a separate Feasibility Study in February 2012 and consultation with the Township of Chapple it was recommended to permanently relocate Highway 600 south of the proposed mine development area.

During the period when the new Highway 600 alignment is being constructed anticipated mine development is expected to result in a significant increase in local traffic volumes.

This current study will identify anticipated impacts associated with proposed construction activities, evaluate proposed alternatives for mitigating construction traffic impacts on local motorists, and provide recommendations for implementation of measures designed to safely accommodate local and provincial road users as well as construction personnel and equipment involved with development of the mine and the new highway alignment.

2.0 Study Area

Highway 600 is a minor secondary provincial highway running northerly from Rainy River for 27 km then generally easterly 62 km to Kings Highway 71.

The study area for this report includes Highway 600 from Highway 617 to Highway 71. Enclosure 1 identifies the section of Highway 600 included under this study.

This study area is larger than the proposed mine development and proposed realignment of Highway 600 to allow for evaluation of construction staging and detour options during construction.

3.0 Existing Conditions

Land uses along Highway 600 include agricultural, residential, recreational/hunting properties and timber extraction.

Highway 600 is classified as a rural local undivided (RLU) facility and within the study area has a granular surface with a posted speed limit of 80 km/hr.

TBT Engineering Limited 1918 Yonge Street, Thunder Bay, ON P7E 6T9 807-624-5160

Existing annual average daily traffic volumes (AADT) within the study area are 110 vehicles/day.

4.0 Proposed Development

Rainy River Resources is proposing to construct a new mine development along Highway 600 in the vicinity of Blackhawk.

To accommodate the proposed mine development a section of Highway 600 extending from Dearlock to Blackhawk is recommended for relocation. A feasibility study was completed that considered eight options for the Highway 600 relocation. The options were presented to the Township of Chapple and subsequently the Township of Chapple provided a correspondence letter indicating Alternate C was the preferred option.

Enclosure 2 identifies the proposed new (Alternate C) alignment for Highway 600 south of the proposed mine development area.

Ultimately a new access road will be constructed to the mine development from Highway 71. Enclosure 2 identifies the proposed location of the East Access Road.

5.0 Development Stages

Road Construction

This stage is anticipated to take approximately 6 months and is currently scheduled for the period from Aug 1, 2014 to Jan 31, 2015.

Construction of the East Access Road and the realignment of Highway 600 south of the proposed mine development will be coincidental with construction activities associated with the mine development.

Accordingly it is anticipated that significant increases over the existing traffic volume (AADT 110) will be experienced during this stage, and the increased number and nature of the construction vehicles working in vicinity of existing Highway 600 will result in a change in the character of the current traffic flow.

During this period construction traffic associated with the road construction and mine construction will access the development area via existing Highway 600, primarily from Highway 71.

Mine Construction

This stage is anticipated to take approximately 23 months and is currently scheduled for the period from Aug 15, 2014 to July 15, 2016.

After the new Highway 600 bypass is opened in February 2015 impacts to the local and provincial highway users on Highway 600 will be negligible.

Mine construction traffic will be primarily facilitated by the East Access Road from Highway 71 once that link is completed.

Mine Operation

During this stage mine traffic will primarily be facilitated via the East Access Road.

Mine Closure

This stage will extend from the mine closure date and extend until decommissioning is completed however ongoing monitoring requirements may result in periodic access to the development after completion of closure activities.

During this stage mine traffic will primarily be facilitated via the East Access Road.

6.0 Anticipated Traffic Generation

Anticipated traffic volumes associated with the development are estimated to result in a cumulative count of 4,272 personnel vehicles over a 23 month period resulting in an additional AADT of approximately 200 additional vehicles per day.

Anticipate construction traffic volumes associated with the development are estimated to result in a cumulative count of 1918 trucks/loads/deliveries over a 23 month period resulting in an additional AADT of approximately 90 vehicles per day.

Taken cumulatively it is estimated that the proposed development will result in an increase in the current AADT of 110 vehicles per day to an estimated 400 vehicles per day with 25% trucks.

It is noted that once the East Access Road is completed mine traffic will be limited to Highway 71 then access to the site along existing and new municipal roadways. At that time traffic volumes on Highway 600 are expected to return to current level.

7.0 Construction Traffic Mitigation Study

The purpose of this study is to identify methods of mitigating impacts of anticipated construction traffic associated with the development, with primary focus on the stage when road construction is occurring coincidentally with mine construction.

During this period of time accommodating existing road users along Highway 600 while safely conducting construction activities will require comprehensive construction traffic safety measures as Highway 600 through the proposed development area will remain open until the new Highway 600 alignment is completed and transferred to the Province.

Staging was considered as an option to mitigate potential impacts however current schedule constraints negate the opportunity to construct the bypass in advance of the mine development.

Construction of the new Highway 600 alignment has been included with the overall Mine EA process, and as such pre-construction of this new roadway cannot proceed until EA clearance and associated permitting for the mine development is achieved.

Delay of initiating mine construction to allow for construction of the new Highway 600 alignment is not feasible as mine development plans are contingent on construction of water retention facilities in 2014 to ensure sufficient process water is available for mine start-up in 2016.

Closing existing Highway 600 during the period is not feasible as there are local land owners who access their property and residences via this route. School buses, utility companies with existing plant along Highway 600 and emergency response vehicles may also continue to require access along this route.

Accordingly, although the road will remain open, the recommended means of mitigating potential traffic impacts during this initial stage will include a proposed detour of non-local road users along Highway 600.

It is recommended that a detour will be established along Highway 617, Highway 11 and Highway 71 to route non-local traffic around the development area for the road construction stage (Aug 15, 2014 – Feb 1, 2015).

Enclosures 3 and 4 provide details regarding the proposed detour route and signage.

Within the development area local road users will still be allowed access along Highway 600 and appropriate construction signage in accordance with OTM Book 7 are recommended as identified in Enclosures 3 and 4.

Once construction of the East Access Road is complete local road users within the development area will access Highway 71 via the newly constructed East Access Road. This will allow local traffic to bypass mine construction and eliminate the need for existing Highway 600 to provide local traffic access to Highway 71.

8.0 Recommendations and Conclusions

TBTE was commissioned by Rainy River Resources to complete a Construction Traffic Mitigation Study for the initial stage when construction of the new Highway 600 alignment and East Access Road are scheduled to occur coincidently with mine construction activities.

On the basis of this study a 6 month detour of non-local users of Highway 600 is recommended via provincial Highway 617, Highway 11 and Highway 71.

Consultation with Ministry of Transportation of Ontario, Township of Chapple, Municipality of Stratton, school bus operators, utility companies and emergency response groups will be completed upon approval of the recommendations of this study.

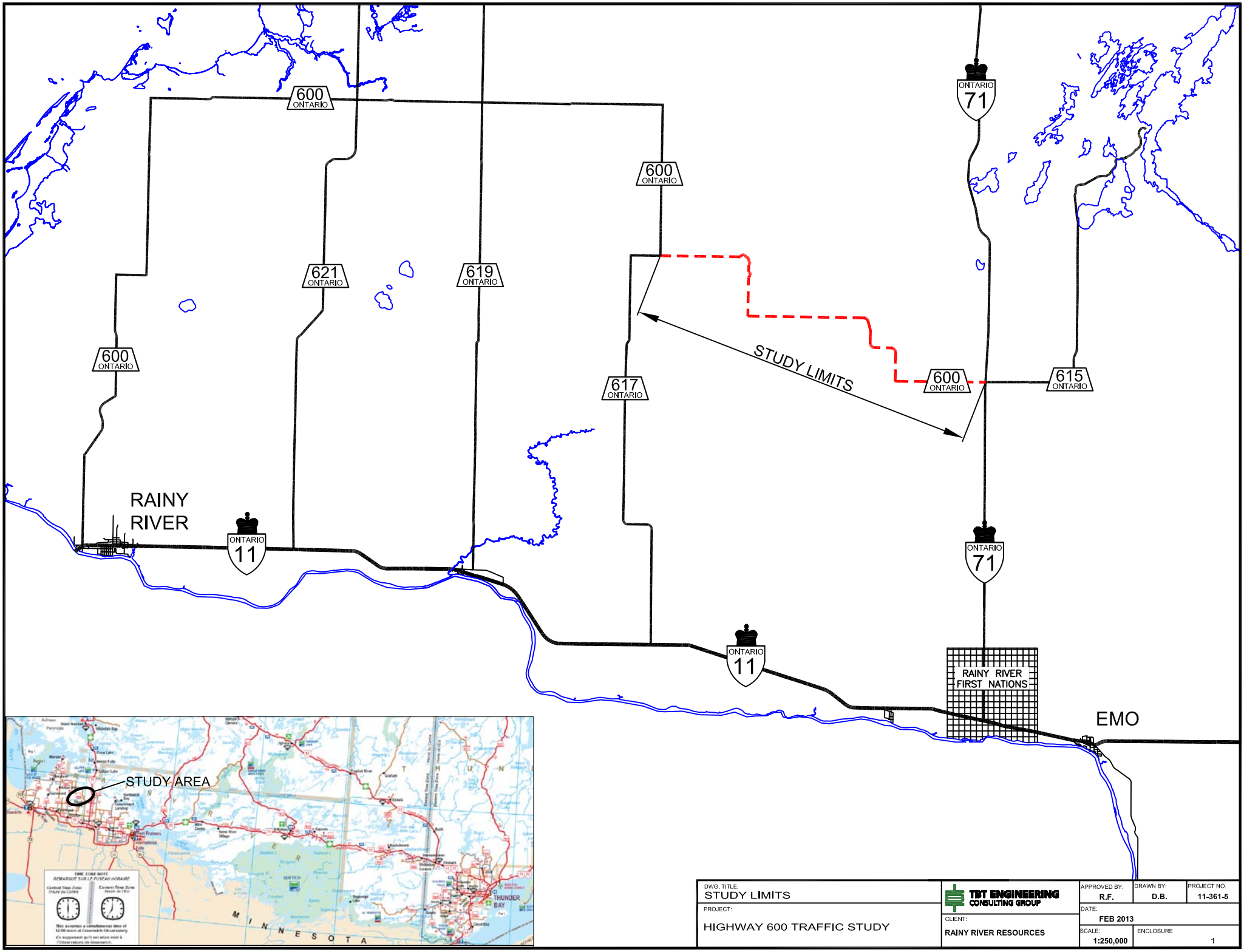
Prepared By:

Rob Frenette, P. Eng. President
TBT Engineering Consulting Group

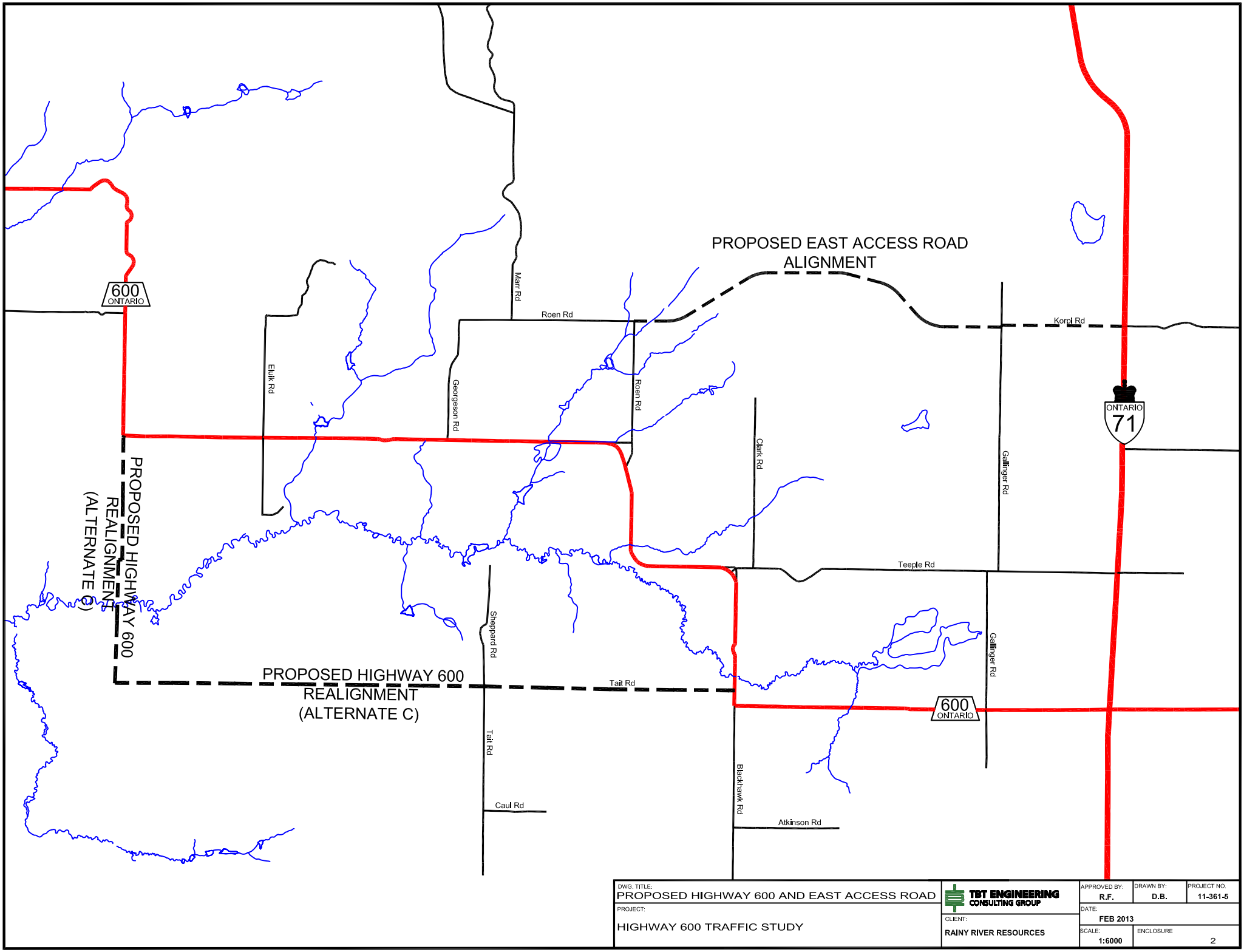
APPENDIX

Enclosures 1 – 4

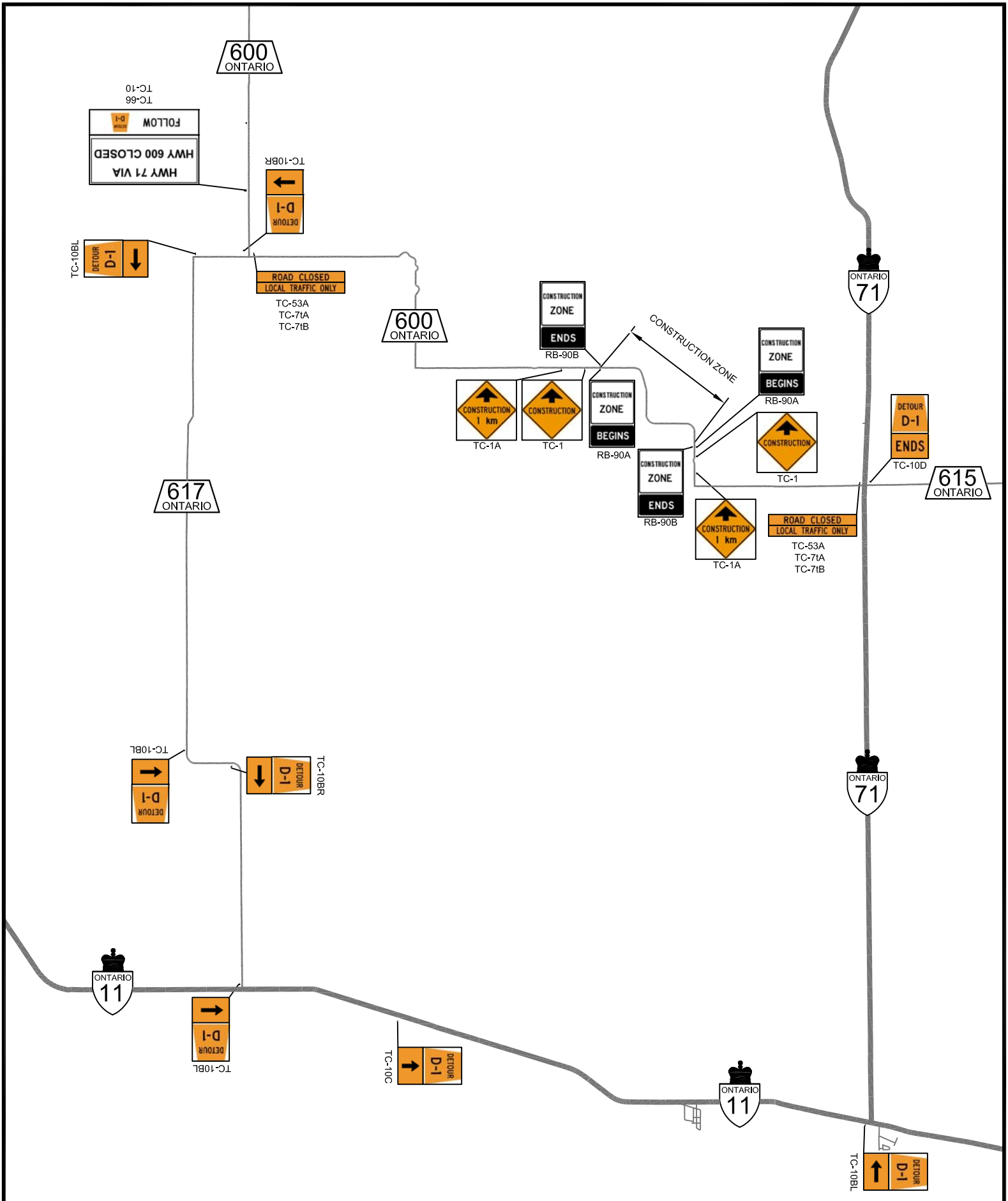
Estimated Traffic Volumes
Township of Chapple Correspondence Letter



DWG. TITLE: STUDY LIMITS	TBT ENGINEERING CONSULTING GROUP	APPROVED BY: R.F.	DRAWN BY: D.B.	PROJECT NO. 11-361-5
PROJECT: HIGHWAY 600 TRAFFIC STUDY	CLIENT: RAINY RIVER RESOURCES	DATE: FEB 2013		
		SCALE: 1:250,000	ENCLOSURE 1	



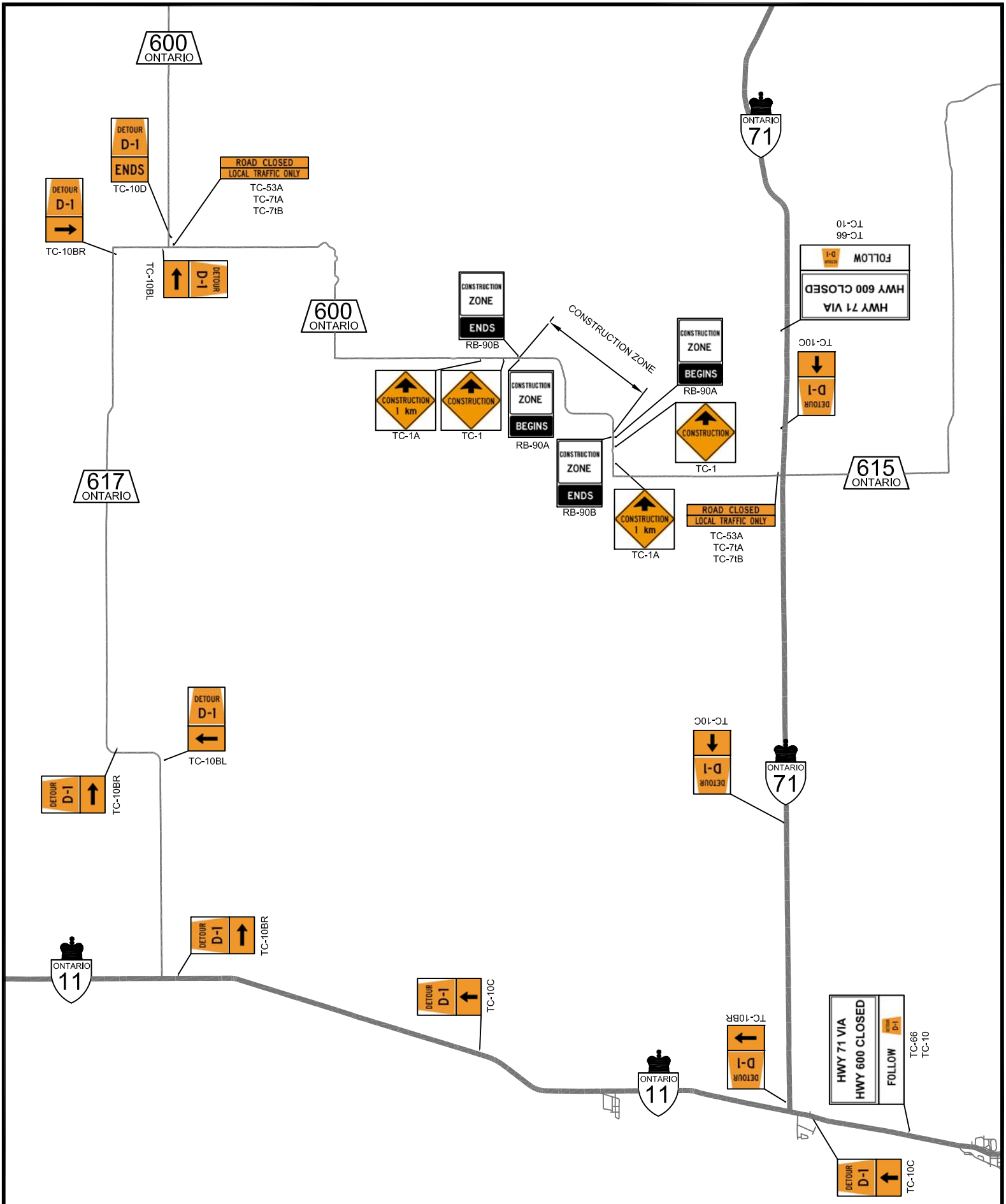
DWG. TITLE: PROPOSED HIGHWAY 600 AND EAST ACCESS ROAD	TBT ENGINEERING CONSULTING GROUP	APPROVED BY: R.F.	DRAWN BY: D.B.	PROJECT NO. 11-361-5
PROJECT: HIGHWAY 600 TRAFFIC STUDY	CLIENT: RAINY RIVER RESOURCES	DATE: FEB 2013		
		SCALE: 1:6000	ENCLOSURE 2	



NOTES:

1. DRAWING TO BE READ IN CONJUNCTION WITH OTM BOOK 7

DWG. TITLE: HIGHWAY 600 EAST DETOUR	TBT ENGINEERING CONSULTING GROUP	APPROVED BY: R.F.	DRAWN BY: D.B.	PROJECT NO. 11-361-5
PROJECT: HIGHWAY 600 TRAFFIC STUDY	CLIENT: RAINY RIVER RESOURCES	DATE: FEB 2013		
		SCALE: NTS	ENCLOSURE 3	



NOTES:

1. DRAWING TO BE READ IN CONJUNCTION WITH OTM BOOK 7

DWG. TITLE: HIGHWAY 600 WEST DETOUR

PROJECT: HIGHWAY 600 TRAFFIC STUDY

TBT ENGINEERING CONSULTING GROUP

CLIENT: RAINY RIVER RESOURCES

APPROVED BY:	DRAWN BY:	PROJECT NO.
R.F.	D.B.	11-361-5

DATE: FEB 2013

SCALE: NTS

ENCLOSURE: 4

1 **Construction Manpower Light Vehicles - Including CM Team (Assuming No Busing to Site)**

Duration Aug 2014 - April 2016

100% Construction Manpower

DATE	MANPOWER MONTHLY FORECAST	CUMULATIVE
Aug/14	145	145
Sep/14	248	393
Oct/14	309	702
Nov/14	172	874
Dec/14	131	1,005
Jan/15	90	1,095
Feb/15	35	1,130
Mar/15	38	1,168
Apr/15	117	1,285
May/15	247	1,532
Jun/15	298	1,830
Jul/15	368	2,198
Aug/15	356	2,554
Sep/15	383	2,937
Oct/15	400	3,337
Nov/15	326	3,663
Dec/15	228	3,891
Jan/16	171	4,062
Feb/16	147	4,209
Mar/16	63	4,272
Apr/16	1	4,273
TOTAL	4,272	

Assuming Construction Manpower use 25% Ride Share

DATE	MANPOWER MONTHLY FORECAST	CUMULATIVE	CM Vehicles	Total Personnel Vehicles
Aug/14	109	109	9	118
Sep/14	186	295	14	200
Oct/14	232	527	18	250
Nov/14	129	656	18	147
Dec/14	98	754	21	119
Jan/15	68	821	23	91
Feb/15	26	848	26	52
Mar/15	29	876	26	55
Apr/15	88	964	26	114
May/15	185	1,149	26	211
Jun/15	224	1,373	26	250
Jul/15	276	1,649	26	302
Aug/15	267	1,916	26	293
Sep/15	287	2,203	26	313
Oct/15	300	2,503	26	326
Nov/15	245	2,747	26	271
Dec/15	171	2,918	26	197
Jan/16	128	3,047	26	154
Feb/16	110	3,157	17	127
Mar/16	47	3,204	12	59
Apr/16	1	3,205	11	12
TOTAL	3,204			3,660

Construction Equipment, Trailers & Bulk Material Deliveries

2 Civil Bulk Earthworks (Excluding Pre Stripping)

Duration August 2014 - October 2015

Construction Equipment

Description	Quantity
Volvo EC460B Excavator c/w Hydraulic Thumb 1	1
John Deere 450 DLC c/w Coupler and Bucket 1	1
John Deere 350DLC c/w Hydraulic Thumb 1	1
Komatsu PC300LC-8 c/w Hydraulic Thumb 1	1
Komatsu PC300LC-8 c/w Hydraulic Thumb 1	1
Komatsu PC200LC-8 c/w Hydraulic Thumb 1	1
Komatsu WA470-6 Wheel Loader 2	2
John Deere 724J Wheel Loader 1	1
Komatsu WA250 PZ-6 Wheel Loader 1	1
Komatsu WA470-6 Wheel Loader 1	1
Caterpillar D8 2	2
Caterpillar D6 3	3
Komatsu HM350-2 Articulating Rock Truck 2	2
Komatsu HM300-1 Articulating Rock Truck 1	1
Terex TA30 Articulating Rock Truck 1	1
Volvo A25C 6X6 Articulating Rock Truck 2	2
Terex TA30 Articulating Rock Truck 4	4
Komatsu HM400 Articulating Rock Truck 5	5
John Deere 853G Feller/Buncher 1	1
John Deere 748GII Grapple Skidder 1	1
Bandit 2590 Chipper 1	1
Volvo G780 Grader 1	1
Superpac Ride-On Compactor 1	1
Ingersol Rand SD100D Smooth Drum 1	1

	Bomag Smooth Drum 1	1
	Total	38
	Site Facilities - Trailers	5
	Fuel Delivery (8 Tankers / month X 15 mo)	120
	Misc Service Trucks	30
	Total Heavy / Legal Loads for Civil Bulk Earthworkks	**193**
3	**Concrete Supply (On Site Batch Plant - Local Aggregates)**	
	Duration August 2014 - April 2016	
	Set Up Site Batch Plant	6
	Ancillary Equipment - Loaders / Cement Trucks	8
	Cement Powder Deliveries (Avg 275kg / m3 x 38,000 m3)	500
	Additives / Fly Ash Deliveries (Avg 100kg/m3)	190
	Site Facilities - Trailers	2
	Fuel Delivery (1 Tankers / month X 21 mo)	21
	Misc Service Trucks	30
	Total Concrete Supply	**757**
4	**Concrete Placement Contractor**	
	Duration August 2014 - April 2016	
	Concrete Pumpers	2
	Mobile Cranes (100T Hyd)	1
	Formwork Deliveries	30

	Scaffolding / Falseworks	10
	Construction Equipment - General	8
	C Cans - Storage / Warehousing	4
	Misc Metals, Embeds, Anchor Bolts etc	12
	Site Facilities - Trailers	6
	Fuel Delivery (2 Tankers / month X 21 mo)	42
	Misc Service Trucks	20
	Total Concrete Placement	**135**
5	**Structural Steel**	
	Duration October 2014 - March 2016	
	Mobile Cranes (100T Hyd)	2
	Fork Lift (20,000 lb)	2
	Compressors	3
	Diesel Welding Machines	6
	Construction Equipment - General	6
	C Cans - Storage / Warehousing	4
	Structural Steel Deliveries (Avg 20T / Load)	270
	Structural Bolt Deliveries (Est 400 Kegs)	16
	Siding & Roofing Deliveries	12
	Site Facilities - Trailers	6
	Fuel Delivery (2 Tankers / month X 20 mo)	40
	Misc Service Trucks	20
	Total Structural Steel	**387**
6	**Architectural**	
	Duration October 2014 - December 2015	
	Delivery of Purchased Packages by BBA	-

	Mobile Cranes (100T Hyd)	1
	Fork Lift (20,000 lb)	1
	Compressors	2
	Diesel Welding Machines	3
	Construction Equipment - General	3
	C Cans - Storage / Warehousing	2
	Truck Shop Steel Delivery (Assume 600 T)	30
	Structural Bolt Deliveries (Est 400 Kegs)	2
	Siding & Roofing Deliveries	6
	Site Facilities - Trailers	2
	Fuel Delivery (1 Tankers / month X 10 mo)	10
	Misc Service Trucks	14
	Total Architectural	**76**

7 Mechanical Installations

Duration August 2014 - April 2016

	Delivery of Purchased Packages by BBA	-
	Mobile Cranes (60T Hyd)	2
	Fork Lift (20,000 lb)	2
	Compressors	4
	Diesel Welding Machines	6
	Construction Equipment - General	8
	C Cans - Storage / Warehousing	5
	Site Facilities - Trailers	5
	Fuel Delivery (1 Tankers / month X 20 mo)	20
	Misc Service Trucks	30
	Total Mechanical	**82**

8 Piping Installations

Duration September 2014 - April 2016

Pipe Material Deliveries (Assume 50 lengths avg / load)	95
Valves, Fitting & Supports	12
Mobile Cranes (60T Hyd)	2
Fork Lift (20,000 lb)	2
Compressors	4
Diesel Welding Machines	6
Construction Equipment - General	10
C Cans - Storage / Warehousing	5
Site Facilities - Trailers	8
Fuel Delivery (1 Tankers / month X 20 mo)	20
Misc Service Trucks	30
Total Piping	**194**

9 Electrical & Instrumentation - Incl 230kV Powerline

Duration August 2014 - April 2016

Delivery of Purchased Packages by BBA	-
Cable & Tray Deliveries - Process Plant	10
Cable & Post Deliveries - 230kV Powerline	24
Mobile Cranes (75T Hyd)	1
Fork Lift (20,000 lb)	1
Compressors	2
Diesel Welding Machines	2
Construction Equipment - General	6
C Cans - Storage / Warehousing	4
Site Facilities - Trailers	4
Fuel Delivery (1 Tankers / month X 10 mo)	10
Misc Service Trucks	30
Total Electrical & Instrumentation	**94**

Summary For Construction Equipment, Trailers & Bulk Material Deliveries

2	Total Heavy / Legal Loads for Civil Bulk Earthworkks				193
3	Total Concrete Supply				757
4	Total Concrete Placement				135
5	Total Structural Steel				387
6	Total Architectural				76
7	Total Mechanical				82
8	Total Piping				194
9	Total Electrical & Instrunentation				94
	Total Hwy Loads				1918

CORPORATION OF THE TOWNSHIP OF CHAPPLE

P.O. Box 4
BARWICK, ONTARIO P0W 1A0
Phone 807-487-2354 Fax 807-487-2406

OFFICE OF THE CLERK-TREASURER
e-mail: chapple@tbaytel.net

January 16, 2012

Rainy River Resources Ltd.
1111 Victoria Avenue East
Thunder Bay, Ontario
P7C 1B7

Attention: Kyle Stanfield, P.Eng.
Director, Environment & Sustainability

Dear Kyle Stanfield:

Re: Highway 600 – Realignment Options

Please be advised after consideration of Council and Public Works Superintendent, Randy Both, the following ranking of options was agreed upon:

1) Alternative C

2) Alternative D, B or A

3) Alternative E

4) Alternative F

The Township of Chapple was in agreement that they prefer one of the southerly options to better accommodate local traffic. It was felt with Alternative C, there would be less impact to local landowners when obtaining land for the construction – that with this option the majority of highway would follow municipal road allowances. It was noted that there is the need to consider school bus routes and access to the Richardson landfill and gravel pit. As mentioned in your presentation, a portion of Alternative E would also be necessary to provide access to the Marr Road.

Thank you for your consideration in this matter.

Sincerely,

Peggy Johnson

Peggy Johnson, CMO
CAO/Clerk Treasurer

APPENDIX D

MTO Correspondence

Ministry of Transportation
Northwestern Region
Planning and Design
615 South James Street
Thunder Bay, Ontario P7E 6P6

Phone: (807) 473-2117
Fax: (807) 473-2168

April 4, 2012

kstanfield@rainyriverresources.com
(3 Pages)

Rainy River Resources Ltd.,
1111 Victoria Avenue East,
Thunder Bay, ON
P7C 1B7

Attention: Kyle L. Stanfield, P.Eng.
Vice President, Environment & Sustainability

Re: Highway 600 Realignment Proposal
TBT Engineering Feasibility Study

Dear Sir:

Rainy River Resources (RRR) has been exploring the potential for realigning a portion of Highway 600 that presently traverses through a mineral exploration area being developed by RRR near the community of Blackhawk in Chapple Township. Due to potential safety concerns, a new alignment is being proposed to redirect Highway 600 around the mineral exploration area. To this end, Rainy River Resources contracted TBT Engineering Consulting Group to undertake a desk-top engineering feasibility study to begin exploring various realignment alternatives. This feasibility study was submitted to this Ministry for review and comment.

Eight realignment alternatives were identified and briefly investigated. Of these, Alternative C was Rainy River Resources' preferred option, as well as that of the Township of Chapple.

The proposed realignment is a major undertaking, and involves a substantial process involving environmental assessment, public consultation, design, approvals from both federal and provincial agencies, property acquisition, and construction, to name just a few parts in this process. A 2012 construction start does not appear to be feasible or realistic.

The feasibility study did provide a broad perspective of the issue, and shed light on the many steps and details that will need to be addressed before this moves from a concept to reality. As such, this report is an excellent starting point.

The study report suggests that the required environmental assessment for the proposed highway alignment be undertaken under the Ministry's Class EA for Provincial Transportation Facilities. However, since this highway realignment is a result of a mining project, it will need

to be incorporated into the mine environmental assessment process and not under the Ministry's Class EA. In order for it to not be a part of the mine project and its environmental assessment, this proposed highway realignment would need to have a significant benefit to the Province on its own.

Based on this feasibility study as a starting point, this Ministry is receptive to the concept of realigning a portion of Highway 600 to allow for the development of the mine. However, should this proceed, this relocation will need to adhere to Ministry design standards and processes, and be fully funded by Rainy River Resources.

To this end, you will need to discuss with the Ministry of Northern Development Mines, as the Province's One Window lead, and the Ministry of the Environment, the inclusion of the Highway 600 relocation in the environmental assessment for the mine project.

The following are additional review comments:

- A 2-lane modular bridge would be an acceptable and cost effective structure for the proposed crossing of the Pinewood River.

- More detailed investigation into the bridge site on the Pinewood River is required. The river crossing may be the controlling factor in the realignment of the highway.

- At this point, and without further detailed design information, it appears that the alignment options chosen and the preliminary cost estimates for construction are reasonable. The design typicals appear suitable and would meet geotechnical standards for granular depths, width of muskeg excavations and ditching. Option "C" matches the general alignment of other roads and highways in the area and should improve the overall highway alignment. Approximately 3300 m traverses low wet potentially deep muskeg deposits which may result in potential future foundation settlement issues if not completely excavated.

- The public, through the EA process, should provide input into possible realignment routes.

- That portion of Highway 600 that is proposed to be removed from the provincial highway system, is referred to as a by-passed loop. That portion of this by-passed loop that is not part of the mining project would become municipal road.

- Two almost back-to-back 90 degree corners are proposed at the east end of the highway relocation. Curves should be introduced at these locations.

- A considerable amount of time will be required for property acquisition and associated costs. Current provincial asset management rules have not allowed the transfer of by-passed highway lands to local municipalities for quite some time now, so special consideration may need to be sought.

This Ministry looks forward to continuing to provide assistance to Rainy River Resources in its pursuit of the development of this project. Should you have any questions, please do not hesitate to contact me at your convenience.

Yours truly,

Original Signed & Filed

Jim McKever
Corridor Management Planner

cc. Rob Frenette, President, TBT Engineering Consulting Group (rfrenette@tbte.ca)
James Bonang, Corridor Management Officer, MTO, Kenora
Bryce Barker, Mineral Exploration & Development Consultant, MNDM, Thunder Bay

APPENDIX E

Township of Chapple Correspondence

CORPORATION OF THE TOWNSHIP OF CHAPPLE

P.O. Box 4
BARWICK, ONTARIO P0W 1A0
Phone 807-487-2354 Fax 807-487-2406

OFFICE OF THE CLERK-TREASURER
e-mail: chapple@tbaytel.net

January 16, 2012

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1111 Victoria Avenue East
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