



Transportation Engineering

- Capabilities & Expertise -



*From Testing Through to Consultation,
We Are Your "Down to Earth" Consultants*

www.tbte.ca

Transportation Engineering – Roadways

At TBT Engineering, we provide complete engineering services for road improvements, new road construction and highway maintenance systems. We manage all aspects of highway engineering projects, including consulting, researching and planning, designing, and building.



TBT Engineering can provide clients with feasibility studies that outline the scope of the project, summarizing preferred routes, possible alternatives, assumptions, any environmental and social considerations, economic justification, as well as interim and final reports.

With every project, extensive research and planning are key. TBT Engineering has the expertise to manage and coordinate large teams of industry professionals, incorporating multiple disciplines. Noise and air quality, landscaping, structural design, drainage, and geotechnical appraisals are all aspects we take into consideration.

Select List of Services Offered

Road Study (Preliminary Design) Phase I

- Assembly of all pertinent data
- Meet with residents (if applicable) and Project Team representatives
- Perform a detailed field review and assessment of the roadway
- Perform a detailed assessment of existing culverts and drainage facilities
- Complete engineering field surveys and plans preparation
- Complete preliminary geotechnical investigations
- Preparation of applicable design criteria
- Develop alternatives/recommendations for roadway improvements
- Perform Class C estimates for improvements
- Provide recommended staging plans
- Prepare Road Study Report detailing findings and recommendations
- Present recommendations to residents (if applicable) and Project Team
- Update Road Study Report based on comments

Detail Design Phase II

- Undertake additional surveys/geotechnical/environmental investigations
- Identify all applicable stakeholders and agencies
- Complete required environmental documentation
- Assess existing and new aggregate sources for suitability
- Develop detailed drainage improvements such as ditching and culvert replacements
- Complete detailed plans and drawings for 66% and 99% review
- Provide detailed Class B Cost Estimates for 66% and 99% review
- Prepare an Interim and Draft Final Report for 66% and 99% review
- Prepare Final Tender Package(s) and Final Report with Class A cost estimate

HIGHLIGHTED EXPERIENCE – GPAR Road, Nunavut

Between 2005 and 2009 TBTE provided route planning, preliminary design, surveying, and preliminary aggregate source plan preparation for the GPAR road extending from Gray's Bay on Coronation Gulf southerly through High Lake and Ulu to Lupin, then westerly in direction generally along the BIPAR route to IZOK.



Route planning was completed using available base plan mapping and LIDAR surveys where available. Preliminary design was completed using topographic base mapping developed from LIDAR and photogrammetric mapping and supplemented by ground based surveys where necessary. Staking of the alignment from High Lake to Gray's Bay was completed for the entire alignment using alignment markers visible from air for helicopter reconnaissance.

Preliminary aggregate sources identified from base maps were subjected to a visual assessment and preliminary test pits conducted by hand shovel to verify aggregate characteristics. Preliminary quarry sources identified from base maps were subjected to a visual assessment for quality purposes.

HIGHLIGHTED EXPERIENCE – Wabaseemoong First Nation Access Road

TBT Engineering was retained by Wabaseemoong Independent Nations to provide professional engineering services for the investigation and design portions of proposed road work to upgrade the existing White Dog Community roadway system and the Hwy access road. A total of 15.8 km of the existing unsurfaced, granular/dirt roadway was improved by providing grading enhancement and surfacing of the roadway.



Design Consulting Services included investigative geotechnical and environmental drilling,, laboratory testing of all construction materials, Aggregate Source Investigations, geotechnical investigations and associated engineering, environmental assessment and biological review, engineering surveys, pavement engineering including bedrock quarry source assessments and soil reports, road design including scope creation, drainage and culvert assessments, and item quantity determine, design option analysis report and recommendations.

A three contract approach was recommended and implemented for that project including an Aggregate Preparation Contract, Grading Contract and Surfacing Contract. TBT Engineering completed all project management and administration of the roadway improvements.

HIGHLIGHTED EXPERIENCE – Pikangikum All Weather Access Road

The proposed Pikangikum Road was a new all weather access road from the Pikangikum First Nation southerly to Nungesser Road (at approximately the 90 km mark), a distance of about 20.8 km. The road link was to provide year round access to Pakangikum First Nation.



Aggregate Resource Investigations

TBT Engineering was retained by Timberline Forest Inventory Consultants to undertake the aggregate resource investigations necessary to locate, qualify and secure aggregate permits for sufficient resources to complete the project. This included a preliminary airborne survey to identify potential sources, as well as detailed field investigations to assess the quality and quantity of potential granular deposits.

At feasible sites, test holes were dug and samples obtained which were then tested at TBT Engineering's construction materials testing lab in Thunder Bay. Aggregate resources (evaluation of material quality and quantity) were outlined on base plans prepared by TBT Engineering from Total Station surveys completed over the entire proposed aggregate permit area.

Category 9 Aggregate Resource Permit Application

As the proposed aggregate sources were located on Crown Land, TBT Engineering prepared the necessary Category 9 Aggregate Resource Permit application. The permit included a surveyed Site Plan, Level 1 Natural Sciences Environmental Assessment and a Stage 1 Cultural-Heritage Assessment.

Geotechnical Investigation

TBT Engineering then completed a geotechnical investigation for the proposed all season road. The purpose of the investigation was to investigate the sub-surface conditions at a limited number of locations along the route and to provide geotechnical design data based on the conditions encountered.

Alignment Survey

TBTE undertook a total station survey of the entire Right Of Way (ROW). Control monumentation was placed along the ROW limits for reference during construction. From the total station field information TBT Engineering developed a Digital Terrain Model and prepared a plan and profile for the entire alignment illustrating existing ground details as well as proposed roadway location and elevation following construction.

Design Services

TBT Engineering provided detailed roadway design services for the project utilizing Softdesk design parameters over the original ground DTM developed from field surveys. Construction plans, profiles, drawings, typical sections, tender quantities and contract specifications were developed in accordance with OPSS requirements for an acceptable all weather access road. Preliminary cost estimates were also determined. As well, TBT Engineering tendered and administered an aggregate production contract providing for sufficient granular material for project purposes.

HIGHLIGHTED EXPERIENCE – Mitaanjigamiing First Nation Access Road

TBT Engineering Consulting Group was commissioned by Mitaanjigamiing First Nation to complete a preliminary study of the Mitaanjigamiing First Nation Access Road. The Mitaanjigamiing community is located approximately 12 km north of Fort Frances on Mitaanjigamiing Bay.



Approximately 100 people residing in the Mitaanjigamiing community relied on the road for daily commuting. The purpose of the study was to address substandard alignment, grade, base and drainage elements and improve traffic safety. The study needed to evaluate the condition of the existing roadway and drainage facilities, develop alternative improvement strategies and associated costs, and recommend improvements.

As the consultant of record, TBT Engineering Limited was tasked with assessing the existing access road and propose improvements based on an approximate construction budget of \$ 4,000,000.00.

TBTE completed a field review in the fall of 2011 along with preliminary geotechnical investigations, a preliminary natural science study and an engineering survey of the existing roadway to assist with the analysis of existing conditions and development of proposed roadway improvement strategies.

Review of the existing roadway conditions revealed the existing granular base, drainage elements and roadway geometrics require significant improvements to safely accommodate road users. Based on the existing roadway geometrics and the anticipated construction budget, it was determined that a 40km/hr design speed will be the desirable standard for roadway improvements.

A geometric rating system was developed using the RLU 40 Design Standards and applied to the existing roadway to aid in determining the sections of road that were most substandard. Three categories of revisions were developed based on the availability of information and the revision strategy. Revision areas were then identified, prioritized and incorporated into two alternate roadway improvement strategies.

The final report provided recommendations for the rehabilitation of the existing access road including horizontal and vertical alignment revisions to address substandard geometrics, widening, drainage improvements, granular base, and the application of a low class bituminous surface treatment to increase surface friction and reduce future maintenance costs.

Contract Administration Services - Highways

TBT Engineering has unparalleled industry experience in the field of highway construction contract administration. Most recently, this has been reflected via our ongoing involvement in the 4 Laning of Hwy 11/17 between Thunder Bay, Ontario and Nipigon, Ontario.



Our firm recently completed oversight of construction for six kilometres of four-lane divided highway between Hodder Avenue and Highway 527. This project also included a full interchange at Hodder Avenue and realignment of the access to the Terry Fox rest area.

We are currently overseeing construction of a new 14-kilometre section of four-lane divided highway between Mackenzie Station Road and Birch Beach Road on a new alignment. This includes installing new bridges over the Mackenzie River. As well, TBT Engineering will also be overseeing the four-laning for 12 km of four-lane divided highway between Red Rock and Stillwater Creek starting in 2014.

As Northwestern Ontario's most diversified firm, TBTE is unparalleled in terms of providing supplementary knowledge and experience in the many associated fields of legal and engineering surveying, environmental, highway engineering, pavement engineering, foundation engineering, traffic engineering, drainage engineering, hydrology, aggregate resources, drilling, materials testing and inspection (both in laboratory and field environments) as well as technical training and development (ACI Concrete Field Technician Training and Certification, RMCAO Plant Audits and Certifications, CCIL aggregate and pavement training, CSA staff certification, and MTO QA/QC Nuclear Gauge Training and Certification).

Our comprehensive expertise in all relevant areas of project management including planning, investigating, designing, administrating, inspecting, testing and providing technical training for roadway and bridge construction projects provides for a unique ability to recognize those elements of each structural project that will be challenging during construction.

TBTE's engineering services are among the highest rated of all Northwestern Ontario engineering firms providing services on MTO projects. As many of our staff work both in design and in construction, there is a strong understanding of the basic requirements for successfully completing construction contract administration. It is undeniable that the best designer's have construction experience, and the best CA staff have design experience.

Much of our success in both fields has been based on our ability to have many of the same staff do both design AND construction.

HIGHLIGHTED EXPERIENCE – Trans Canada Highway Four-Laning Phase I

The Ontario Ministry of Transportation retained TBT Engineering Limited to provide Total Project Management (TPM) and Construction Contract Administration (CCA) for grading, granular base, drainage, hot mix paving, electrical and structural works on Highway 11/17, from 1.0 km west of the Hodder Avenue/Copenhagen Road intersection easterly for 6.0 km. This work was needed to provide a four-lane divided highway between Hodder Avenue and 0.8 km east of Highway 527.



The project also involved a unique feature known as a partial cloverleaf (parclo) – an interchange that included looped deceleration and acceleration ramps. This unique structure – the first of its kind in Northwestern Ontario – included ramps on two of its four quadrants and allowed for drivers to safely merge onto the highway from Hodder Avenue and Copenhagen Road. That part of the highway currently sees more than 7,000 vehicles per day and could no longer operate safely as an at-grade intersection due to the rugged topography of the area, the proximity to the Current River, as well as the horizontal and vertical curvature of the highway.



This project, valued at \$42 million, also included a new entrance at the Terry Fox Scenic Lookout as well as widening of the eastbound bridge over the Current River. Over the course of this 3 year project, TBT Engineering supervised and inspected all construction and related progress associated with the following activities:

- 692,000 m³ of Earth Excavation
- 378,000 m³ of Rock Excavation
- 296,000 m³ of Rock Embankment
- 289,000 tonnes of Granular B processing and placement
- 95,000 tonnes of Granular A processing and placement
- 23,200 tonnes of SuperPave (12.5)
- 30,700 tonnes of SuperPave (19.0)
- Relocation of City Watermain & Sanitary Sewer
- 1000 metres of Pipe Culvert
- 100 metres of Concrete Box Culvert
- 2,456 metres of Flex Electrical Duct with associated cable for lighting
- 1,492 metres of Rigid Electrical Duct with associated cable for lighting
- All structural work at Current River Bridge and Hodder Avenue/Copenhagen Road intersection

The 6 km highway twinning, together with the parclo superstructure, constitutes the first phase of the four-laning of the Trans Canada Highway (11/17) between Thunder Bay and Nipigon – a 100-kilometre-long twinning of the vital North Shore highway.

Transportation Engineering - Highways

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Highway Engineering and Contract Preparation Services

- Total Project Management
- Engineering Surveys and Plan Preparation
- Roadway Investigations
- Traffic Investigations
- Traffic Impact Assessments
- Guiderail Evaluation and Design
- Eccentric Loader Quality Certification
- Intersection Design
- Auxiliary Lane Design
- Roadway Cross-section Design
- Roadway Drainage Design
- Automated Quantity Calculations
- Specification Development
- Contract Preparation and Tendering
- Land development desktop – plan design
- Autocad Drafting – Plans and Typical Drawings
- Bentley InRoads



HIGHLIGHTED EXPERIENCE – Highway Re-alignment (11.4 kms)

TBT Engineering was commissioned the client to provide a Feasibility Study, Preliminary Design, and Detail Design for the construction of a proposed realignment to an existing Provincial highway (Hwy 600). The current Hwy 600 traverses through the area being developed by the company.



The first phase of the final project deliverables to the client included an overview of the study area, design criteria in draft stage, outline of the anticipated environmental assessment process and associated timelines, information regarding Provincial and Federal permitting and approvals, explanation of natural science / existing environmental conditions, and outline of steps to be completed for a cultural heritage (archaeological) assessment.



TBT Engineering then provided a study plan showing the nature of assumed geotechnical conditions and presented plan drawings of the alignment options with terrain features and contours and claims map information. A defined quantitative and qualitative method of comparative evaluation was developed, presented and explained. A brief summary for each realignment alternative was presented along with associated construction cost estimates. In addition to quantitative analysis factors, alternative evaluations were extended to include factors such as property acquisitions, aggregate sources, permitting, travel distances for motorists, and anticipated road maintenance costs. All analysis was summarized for each alternative route in terms of costs, constructability and timelines. The optimal route realignment alternative was recommended based on completed analysis.



HIGHLIGHTED EXPERIENCE – Highway 17 Hawk Lake Re-alignment

Project objectives included replacing a deteriorating restrictive underpass (CPR Subway) with a new structure highway and grade-separated crossing bridge over the rail-road. The new highway and bridge structure would allow for the travel of oversized loads (bulk cargo) on this portion of the Trans Canada Highway, where previously there was a height restriction of less than 5 metres. Advanced engineering design and building materials to account for heavy traffic flow were project requirements, as was quick and efficient construction of the new infrastructure (and demolition of the existing infrastructure) to minimize interruption to land and rail traffic. The solution involved re-alignment of 2 km of highway and a 26m prestressed concrete box girder bridge. The re-aligned highway included 3.75 metre main lanes, 2.5 metre shoulders (fully paved), 1 metre rounding, and rumble strips. As well, a 3.5 metre truck climbing lane and existing snow plow turnaround where reconstructed. Bridge components included piles set on rock points, RSS walls, prestressed concrete box girders, prestressed/precast concrete cubs, precast concrete approach slabs, metal railing system and GFRP Reinforcing and UHPC with steel fibers for pre-cast connection.

TBT Engineering provided Total Project Management for the highway realignment and new grade separated crossing including all engineering and construction administration for the project. Vertical and horizontal alignment of Highway 17 was improved to provide geometrics consistent with a design speed of 110 km/h. All project objectives were achieved on time and within budget. As a separate TPM project, TBTE provided similar services for an innovative rapid demolition of the deteriorating CPR underpass, plus embankment construction so that CPR could rebuild track.

Unlimited clearance to highway traffic now allows for over-height loads and bulk cargo, and has resulted in more efficient and cost effective flow of goods between Eastern and Western Canada. Currently, the highway is allowing for over-sized loads that are being shipped for continued Oil Sands development, as well as renewable energy projects and mining developments in Ontario.

