

Energy Sector

- Statement of Qualifications -



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

www.tbte.ca



Company Overview

TBT Engineering Limited (TBTE) is Northwestern Ontario's largest independently owned multi-disciplinary engineering consulting firm with headquarters in Thunder Bay, ON.

Originally established in 1968, TBTE currently employs over 100 full time professional and technical staff, with as many as 50 additional seasonal staff serving public and private clients across a diverse range of industries and sectors.



We have successfully completed numerous projects all across Ontario and Western Canada, from British Columbia all the way to Nunavut in Canada's Far North.

Our Areas of Expertise Include:

- Construction Contract Administration & Total Project Management
- Drilling Services & Drill Rentals
- Surveys & Plans
- Geotechnical (Ground) Engineering
- Environmental Services
- Construction Materials Testing & Inspection Services
- Transportation Engineering (Including Highway & Pavement Design)
- Structural Engineering and Building Sciences
- Geological Services Including Aggregate Prospecting & Investigations

Primary Sectors We Serve Include:

- Mining
- Infrastructure
- First Nations
- Government
- Energy
- Transportation

TBT Engineering is licensed to practice engineering in Ontario, Manitoba, Alberta and Saskatchewan. Our materials testing laboratory located in Thunder Bay, ON is CSA, CCIL, MTO, OPSS, MIT and ASTM certified. In addition, we are members in good standing with associations including ACEC, CEO, CGWA, IHSA and APGO



Commitment to Health & Safety

TBT Engineering Limited is committed to providing a safe and healthy environment for our employees, clients, contractors, suppliers, visitors and the general public. To achieve this goal, every reasonable effort is made to utilize the principles of incident and loss prevention in the management of all activities and programs as well as through support for and participation in community safety organizations, programs and events.



Our health and safety program consists of standards, policies, safe operating procedures

and training; and is driven by a strong safety culture, willfully supported by our Senior Management team. Management review and evaluation of safety systems, combined with a strong Joint Health and Safety Committee and valuable input from employees helps ensure our safety programs are up-to-date and workable for everyone, everyday, on every job.

TBT Engineering Limited realizes that there can be NO compromise for safety. To this end, we truly believe and take pride in our safety slogan....."No Job is so Important that we Cannot Take Time to do it Safely!"

Commitment to Our Communities

TBT Engineering is proud to be an active community partner, making a positive difference in the lives of people and families in our city. A stronger, healthier and happier community is something that benefits all of us!

Every year, TBT Engineering supports a wide range of community events, campaigns and causes. From social causes and cultural



events to education-based training and youth activities, we support various initiatives through financial assistance, prize donations, or corporate support.

Moving forward, TBT Engineering will continue to take a strategic approach to philanthropy by supporting causes, events, and activities that (a) align with our corporate beliefs and values and (b) enrich the communities in which we our employees and clients live, work and play.



Senior Management Team

Ms. Liana Frenette, B.A, B.Ed. - Chief Executive Officer



Liana has amassed over 20 years of experience in business management and ownership since purchasing TBT Engineering Limited in 1995 together with husband Rob and ultimately overseeing the company's metamorphosis into Northwestern Ontario's largest independently owned multi-disciplinary civil engineering consulting firm.

As company CEO, Liana remains directly responsible for overall management of business operations. In addition to supervising the daily work of engineers, technicians, administrative and field staff, she is also responsible for coordinating and auditing work projects and ensuring that objectives and deadlines are met. Liana coordinates all community relations and business development initiatives and oversees the creation and operation

of all company policy, employee benefits, workplace rules and procedures, safe operating procedures, as well as health and safety policies.

Liana is also very passionate about a number of causes including education, the environment, and health and safety in workplaces and communities. Past and present, she has chaired, co-chaired, or stood in good standing on a number of committees and community groups including the North Superior Workforce Planning Board, Lakehead University Alumni Board, Thunder Bay Chamber of Commerce Small Business Committee, Thunder Bay Safe Communities, Canadian Society of Safety Engineers – Thunder Bay Chapter, and the Association of Ontario Health Centers Board. Liana's passion for Health & Safety also included 5 years of teaching (Occupational Health & Safety – Business Division) at Thunder Bay's Confederation College.

Mr. Robert J. Frenette, P.Eng. - President



Rob has 25+ years of experience in civil engineering from planning through to contract administration. Rob has a strong background in total project management, construction and road design, surveying, environmental and materials engineering.

As President / Owner of TBT Engineering Limited, Rob is directly responsible for all corporate management of technical and business operations. He has over 20 years experience in business ownership providing quality assurance testing, project management, site inspections and various other engineering services.

Rob is an ACI Certified Examiner, a certified RMCAO Concrete Plant Inspector, an experienced QA/QC Administrator, an experienced highway and construction engineer, a past

experienced highway and construction engineer, a past sessional lecturer at Lakehead University, and a member of ASQ and CSCE. Prior to purchasing TBT in 1995, Rob worked 10 years at MTO NWR Planning and Design Section (Senior Project Engineer) and MTO NWR Construction Section (Project Supervisor) in the Northwestern Region.



Dr. Jag Mohan, PhD, PEng – Senior Vice President & Divisional Manager



As Senior Vice President of Engineering at TBTE, Jag is responsible for providing technical and project management services for many of TBT Engineering's divisions. Jag is also Manager of Structural Engineering as well as Research & Development at TBTE.

Jag is a Designated Consulting Engineer in Ontario and has over 30 years of professional engineering experience in building sector with expertise in multi-disciplinary design coordination, project management and contract administration of construction projects for public and private clients in the building industry. He has blended experience in both the engineering profession and leadership in engineering education (23 years) embedded with

research, thus enabling him to lead a large diverse team of professionals with a capacity to access, analyze and apply efficient cost effective solutions in projects.

Jag has been honored as a Fellow of Engineers Canada (FEC) in recognition for his contributions to the engineering profession and also received a "Distinguished Service Award" from Ontario Association of Certified Engineering Technicians and Technologists (OACETT).

Mr. Scott Peterson, P.Geo. - Company Vice President & Divisional Manager



As Vice President of Engineering at TBTE, Scott is responsible for providing technical and project management services for many of TBT Engineering's divisions. Scott is also Manager of Geological and Pavement Engineering at TBTE and has more than 13 years experience in various aspects of geotechnical, geological, and environmental engineering.

He specializes in geotechnical & geological investigations and design studies, environmental & hydrogeological investigations and assessments, pavement structure evaluation and rehabilitation investigations and design reports, aggregate and quarry source studies, and waste water management solutions.

Mr. Doug Otto, C.E.T. – Company Vice President & Divisional Manager



As Vice President of Engineering at TBTE, Doug is responsible for providing technical and project management services for many of TBT Engineering's divisions.

Doug is also Manager of Drilling Services at TBT Engineering and has 16 years experience providing field-testing and inspection services including concrete, granular, pipe installation, rebar and grout ensuring completeness and accuracy, compliance to industry and government standards and corporate administration procedures.

He has extensive experience as a road supervisor responsible for construction and maintenance of winter-road projects.



Drilling Services & Rentals

TBT Engineering's Drilling Services Department offers comprehensive drilling services and rentals for both environmental and geotechnical projects. From split spoon sampling to hollow or solid stem auguring, we use cutting edge technology and equipment to ensure you get results of the highest quality, completed on time and on budget. TBTE's in-house drilling rigs and equipment ensure optimal project scheduling, and our knowledgeable staff will get the job done right the first time, saving you both time and money.

Largest Drill Inventory in the Region!

- Truck Mounted Sterling Solid Stem Kelly Bar Power Auger
- Track Mounted Acker Bushmaster Heli-portable Rig
- Truck Mounted Pioneer Drill Rig
- Trailer Mounted CME 45 Drill Rig
- Track Mounted CME 55 All Terrain Rig
- Truck Mounted CME 55 Drill Rig
- Skidder Mounted CME 750 All Terrain Rig
- Tri-pod supported Cathead equipment
- PEDO Hand Auger equipment
- Drill Barge and Pontoon Platform
- Support vehicles including trucks, floats, snow machines and 4 wheelers

Services Offered

- Solid stem auguring
- O. Reg 903 Certified Groundwater Monitoring Well Installations
- O. Reg 903 Certified Groundwater Monitoring Well Decommissioning
- Geotechnical Subsurface Condition Investigations
- Roadway / Highway / Pavement Investigations
- Environment Soil Sampling & Investigations
- Aggregate Source Investigations (ASIs)
- Rock Quarry Investigations
- Environmental & Geotechnical Marine Investigations
- Construction Site Assessments
- Hazard Assessments

Project Experience

We have completed hundreds of projects for energy clients ranging from Refergy Canada and Goldcorp to Ontario Power Generation and Renewable Energy Systems.

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Engineering Surveys

Need a topographic or construction survey completed? Consider letting TBT Surveyors Inc. (a TBT Engineering Consulting Group company) be your full service engineering survey providers! Our technical professionals have satisfied hundreds of clients over the years across a broad range of industries. Using a combination of cutting edge equipment and the latest in engineering survey techniques, we combine solutions of the highest quality with first class customer service.

Engineering Survey Services

- Topographic Surveys
- Digital Terrain Modeling
- Site Plans / Building Layout
- Municipal Design & Drainage Services
- Construction Layout
- Land Development Services
- Bathymetric Surveys
- Remote Surveys

Engineering Client Services

- Preparation of Reference & Crown Land Plans
- Preparation of draft plans and final plans for subdivision and condominiums
- Preparation of plans for building permits and site plan agreements
- Committee of Adjustment/Land
- Division & Zoning applications

Equipment:

- Trimble Series 3 R8 RTK Survey Grade GPS Systems (12 heads)
 - These systems allow us to survey large areas without needing line of site. Eliminates line cutting, significantly reduces vegetation damage, and results in cost savings. We are capable of fielding 4 independent teams.
- Sokkia Set 3110 Total Stations (5 heads)

Two and Three second total stations

Reflectorless Technology

 We can survey a point without placing a prism target on that location. We are capable of conducting these surveys in difficult to traverse terrain such as rock faces, bridge abutments, buildings, etc.

• Software Capabilities

- We use AutoCAD, Land Desktop, Civil 3d and Bentley InRoads for plans processing of survey data
- GIS Capabilities
 - We have full GIS capabilities for road and infrastructure planning. We can provide resource inventory mapping and analysis, integration of field survey data to GIS mapping, layout planning and general mapping services for all levels of presentation. TBT Surveyors Inc. uses ArcGIS software.









Project Experience

Renewable Energy Systems Canada – Greenwich Wind Farm

Dorion, Ontario

TBT Surveyors Inc. completed Intervisable Control Establishment Surveys for approximately 22.5 kilometres of road situated north of Dorion, Ontario. Trimble Series 3 R8 RTK Survey Grade GPS Systems were used, control points were established and related information, along with detailed site plans were provided to the client.

• Skypower / Siemens Canada – TBay Airport Solar Farm Thunder Bay, Ontario

TBT Surveyors Inc. successfully conducted a legal survey to determine boundary limits of the solar array. A staking survey of the fence layout as per plan provided by Siemens Canada Ltd of the east and north boundary of the proposed Solar Site including the laydown area was then completed. TBT Surveyors then conducted a foundation point layout survey of 8,500 foundation points located at the Thunder Bay International Airport.

• Ontario Power Generation – High Hill Harbor and Forestry Gauge Sites Macdarmid, Ontario

TBT successfully completed vertical elevation surveys of benchmarks at both High Hill Harbour and Forestry Gauge. Survey equipment included a Trimble R8 Series 3 RTK GPS system and engineer levels. Vertical control was flyleveled from first order Geodetic Benchmarks along Highway 11 to the OPG Benchmarks. A level loop was completed to ensure that no errors were recorded during the level survey. Data processing was conducted using Trimble Business Centre.

HIGHLIGHTED EXPERIENCE

Fort William First Nations Solar Park – Engineering Surveys

Location: Thunder Bay, ON

TBT Engineering was initially contracted by the client(s) to conduct a Limited Phase I/II Environmental Site Assessment. Upon completion of environmental consulting, TBT Engineering was then tasked with a topographic survey of the Fort William First Nation Industrial Park. The purpose of the survey was to develop a site plan that detailed topography, shoreline, drainage, terrain elevations, and natural and manmade features within the site. A legal survey was then completed to establish property boundary with corners identified. Associated drawings, documents and maps where also created. Additional surveys where then completed including clearing layout, conduit layout, road layout, fence section and post layout, as well as topographic survey of the lay-down area. A topographic survey of fill brought into lay-down area was also completed to calculate volumes. Additionally, TBT Engineering conducted construction inspections and was responsible for construction materials testing including compaction and concrete testing.





Materials Testing and Inspection

TBT Engineering provides a wide range of material testing and laboratory services to the construction industry. Our laboratory and technologists are fully certified to meet the needs of our clients.

Laboratory Services

- Grain Size Analyses
- Atterberg Limits
- Unconfined Compression Strength Testing of Soil
- Unconfined Compressive Strength of Testing Rock
- Concrete Compressive Strength Testing
- Consolidation Testing
- Direct Shear Testing
- Hydraulic Conductivity of Soil
- Soil and Aggregate Permeability
- Water Soluble Chloride for Concrete (3rd Party)
- Rapid Chloride of Concrete (3rd Party)
- Air voids Analysis of Hardened Concrete (3rd Party)
- Triaxial Testing of Soil
- Asphalt Testing Marshall Method & Super Pave
- Asphalt and Concrete Mix Designs
- Mortar & Grout Compressive Strength Testing
- Concrete Admixture Testing
- Aggregate Physical Property Testing (such as LA abrasion, Soundness, Low Density Materials Content)
- Point Load Testing Rock
- Bond Tests of Overlays
- Petrographic Analysis
- Rock Core Logging

Certifications

- Canadian Standards Association
- Canadian Council of Independent Laboratories
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Project Experience

TBT Engineering has provided material testing services to a broad range of clients and industries. Some of these segments and clients are listed on the next page:





Many of our clients have come from the energy sector including:

- Hatch Energy
- Ontario Power Generation
- Skypower Solar Inc.
- Hydro One
- Sun Edison
- Renewable Energy Systems Canada
- Siemens Canada
- Great Lakes Power
- Trans Canada Pipelines
- Thunder Bay Hydro
- CG Power Solutions USA

We have also worked extensively in other sectors including:

- Federal and Provincial Government
 - Ontario Ministry of Transportation
- First Nations
 - o Worked with various communities all over Northwestern Ontario
- Education
 - Lakehead University, Confederation College, and others
- Forestry
 - o Resolute Forest Products, Domtar, and Weyerhaeuser
- Commercial Clients
 - Real Estate Developers, General Contractors, and many more!
- Airports
 - Thunder Bay, Red Lake, Nakina, Geraldton, Sioux Lookout, and more.
- Municipalities
 - o Thunder Bay, Dryden, Fort Frances, Atikokan, and Greenstone
- Mining
 - o INCO Shebandowan Mine, Lac des Iles Mine, and more

INNOVATIVE PRODUCT PROFILE – "WipFrag" Fragmentation Analysis Software



When it comes to predicting blast results, it's no secret that accurate fragmentation analysis is vital. TBT Engineering utilizes cutting-edge "WipFrag" fragmentation analysis software to help ensure accurate grain size photoanalysis. This helps ensure clients have the proper information needed to properly determine blast models, formulas and expected results. Fragmentation analysis has been proven useful in the

mining, forestry and aggregate industries by helping cut energy costs, improving efficiency and minimizing equipment maintenance costs.

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Geotechnical Engineering

Our Geotechnical Engineering Division provides a wide range of services. We have fully equipped drill rigs and specialized field and laboratory testing equipment to handle almost any ground condition and/or project requirement. These are discussed further in subsequent sections of this document. Our staff has extensive technical capabilities and experience in modeling and analyzing routine to complex geotechnical problems.



Modeling Capabilities:

- Foundation Analyses
 - Piles & Footings
 - Compensated
 - Mat Foundations
- Bearing Capacity
- Settlement Performance Analyses
 - **Ground Improvement**
 - Site Preloads
 - Dynamic Compaction
- Pile Analysis
 - o All Pile
 - o Driven
 - o GRL Weap
- Slope / Embankment Stability
 - Slope/W by Geoslope International Inc.
- Seepage Analyses
 - Finite Element Seep/W by Geoslope International Inc.
- Stress and Deformation Analyses Finite Element
 - Sigma/W by Geoslope International Inc.
- Liquefaction Assessment (Liquefy Pro)
- Geothermal Modeling

Instrumentation:

- Slope Inclinometers
- Piezometers
- Thermocouples
- Settlement Gauges
- Vibration Measurements and Monitoring

Project Experience:

TBT Engineering has extensive experience in a wide range of geotechnical projects including foundation investigations for commercial and industrial projects, bridges, culverts, embankments, marine structures, and earth dams. Project examples summarizing our work in the energy sector begin on the next page.



• Fuel Tank Farm, Thunder Bay, ON: Canadian Operators Petroleum

Detailed geotechnical investigation for a fuel tank farm. For the weak and highly compressible foundation soils, the tank sizing was modified to allow construction to be carried out using a mat foundation without piles and/or a long term site preload. Detailed settlement



analysis was carried out to optimize the design of the mat foundation.

• Greenwich Lake Wind Farm, Dorion, ON: RES America Development Inc.

Geotechnical investigation and foundation recommendations for 6 wind turbine sites and various other structures. The geotechnical field and laboratory testing programs involved extensive bedrock coring, strength testing and interpretation of design parameters. Foundation recommendations were provided for both gravity based foundations and/or rock anchor foundations.

• Kam Kotia Phase E Project:

Wardrop Engineering Inc.

TBT Engineering provided geotechnical stability analysis for the East-West dam as a part of the Kam Kotia Phase E project. The geotechnical assessment of the East-West Dam analysed the theoretical stability of various dam sections based on available geotechnical data. These analyses provided assessments of the calculated safety factors for various embankment (dam) sections subsequent to

• Annual Dam Safety Inspection, Tailings Containment Perimeter Dams, Lupin Mine, Nunavut:

MMG Resources Inc.

Annual inspection of eight earth dam structures for tailings containment was carried out. The project involved historical data review, field inspections, collection and interpretation of thermal couple data and reporting which included inspection records, photographic records, and recommendations for upgrading and further investigation where appropriate.

• Diesel Generating Station Addition, Kasabonika, ON:

Keewatin-Aski Ltd., Hydro One Remote Communities TBT Engineering conducted a geotechnical investigation for a proposed diesel generation station addition and a transformer pad for Keewatin-Aski Ltd. The proposed addition consisted of a single storey pre- engineered steel structure on a concrete foundation. A sub-surface investigation for the proposed addition and pad was completed and findings of the investigation along with geotechnical recommendations for the proposed addition and pads where provided to client.

• Greenwich Lake Wind Farm, Dorion, ON:

MSE Power Systems Inc.

Services rendered included sub-grade inspections for sub-station foundations (including test pit logging and final report), as well as assistance with sub-station permitting (Building, Fire, Electrical, MOE COA, etc).



HIGHLIGHTED EXPERIENCE

Project: Geotechnical Investigation for Proposed Biomass Conversation Project Location: Atikokan, ON

Client: Ausenco Sandwell on behalf of Ontario Power Generation.

TBT Engineering Limited was retained by the client to carry out a geotechnical investigation for the proposed bio mass conversion project at the Ontario Power Generation (OPG) Station. A subsurface investigation for the proposed project was completed and a report documenting the findings of the field investigation for the proposed facility was submitted.



Field Work

Fieldwork was carried out utilizing a geotechnical drill rig and excavator. In consultation with the client, the majority of the borehole and test pit locations were altered in the field to accommodate required service setbacks. Test pits were located outside of the proposed structure footprint to avoid excessive disturbance of the existing subgrade.

Boreholes were advanced using hollow stem augers to auger refusal. Certain Boreholes were advanced past auger refusal using diamond drilling techniques. Twelve test pits were excavated - termination occurred either due to excavation caving, refusal or due to the limitation of the excavator.

During the drilling operations, soil samples were obtained from the auger flights and using the techniques of the standard penetration test (SPT). This involved driving a 51 mm diameter thick-walled sampler into the soil under the energy of a 63.5 kg weight falling through 760 mm. The number of blows required to drive the sampler 0.3 m is known as the standard penetration blow count (N) which provides an indication of the condition or consistency of the soil. Following completion of the test, a representative soil sample was obtained from within the sampler. Soil samples were also collected from excavated material within the test pits. In addition, hand operated cone penetration testing (CPT) was carried out at selected locations.

Design Recommendations & Discussions

In addition to investigation procedures and a description of sub-surface conditions, the final report centered on recommendations and discussions for the following topics

- Suitability of existing fill materials for foundation support
- Raft foundation discussion on raft foundation on existing fills
- Shallow footings on soil discussion on shallow footings over existing fills
- Bearing capacity of bedrock
- Rock socketed piles lateral capacity of rock socketed piles
- Compacted engineering fill
- Rock anchors
- Lateral earth pressure coefficients
- Slabs on grade
- Frost Protection penetration, heave, jacking adfreeze
- Subgrade preparation
- Seismic site classification
- Excavations



Aggregate Applications

TBT Engineering Limited has been helping aggregate operators navigate this process for more than 13 years. We are proud to have assisted in or managed the permitting and application process for over 500 pits and quarries!

Services Offered:

Preparation of Applications

- Aggregate Resource Act approvals
 - License applications (private land)
 - Permit applications (crown land)
 - Wayside permits (public authority highway construction projects)
- Preparation and processing of Planning Act applications
- Permits to Take Water
- Certificates of Approval for MOE (Air and Noise)

Planning & Consultation

- Total Project Management
- Expert Testimony at the Ontario Municipal Board
- Public, Government, and First Nations Consultation
- Third party mitigation and mediation

Surveying

- Aggregate quantity calculations and estimates (Volumetric Surveying)
- Topographic Surveying and Mapping
- Survey-Grade (RTK) GPS Site Mapping, Pit Plans, & Summary Reports
- Digital Terrain Modeling
- Land Development Services

Environmental Services

- Environmental Site Assessments and reporting Phase I & II
- Well and Piezometer Installations and Monitoring
- Biology
- Compliance monitoring and reporting
- Planning and design for final site rehabilitation

Geological Services

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- Hydrogeological investigations and reporting
- Watershed studies and modeling
 - Aggregate Prospecting & Identification o Core Drilling
- Feasibility Studies
- Complete petrographic services

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HIGHLIGHTED EXPERIENCE

Project Description: Aggregate Source Investigations Location: Northwestern Ontario Client: Ministry of Transportation – North West Region

TBT Engineering Consultant Assignments as Prime (Value Over \$ 100,000)		
Project	Year	Description
NWR ASI West	2000	Pit Investigations – Testing, Surveying & Environmental
NWR ASI East	2000	Pit Investigations – Testing, Surveying & Environmental
NWR ASI	2001	Pit & Quarry Investigations – Testing, Surveying & Environmental
NWR ASI	2002	Pit & Quarry Investigations – Testing, Surveying & Environmental
NWR ASI East	2003	Pit & Quarry Investigations – Testing, Surveying & Environmental
NWR ASI West	2003	Pit & Quarry Investigations – Testing, Surveying & Environmental
NWR ASI Pits	2004	Pit Investigations – Testing, Surveying & Environmental
NWR ASI Quarries	2004	Quarry Investigations – Testing, Surveying & Environmental
NWR ASI	2005	Pit & Quarry Investigations – Testing, Surveying & Environmental
NWR ASI	2006	Pit & Quarry Investigations – Testing, Surveying & Environmental
NWR ASI	2007	Pit & Quarry Investigations – Testing, Surveying & Environmental
NWR ASI	2008	Pit & Quarry Investigations – Testing, Surveying & Environmental
NWR ASI	2009	Pit & Quarry Investigations – Testing, Surveying & Environmental
NWR ASI	2010	Pit & Quarry Investigations – Testing, Surveying & Environmental
NWR ASI	2011	Pit & Quarry Investigations – Testing, Surveying & Environmental

HIGHLIGHTED EXPERIENCE

Project Description: Geological Assessment – Proposed Rock Quarry Site Location: Thunder Bay, ON

Client: Ontario Power Generation.

TBT Engineering Ltd. was originally retained to perform a field review and borehole investigation for the geological assessment of the proposed rock quarry site located north of Armstrong, Ontario. TBTE Professional Geoscientists began by visiting the proposed quarry site and observing the type and nature of any bedrock outcroppings or rock cuts. In addition, any standing surface waters were investigated and located on a sketch map, and several GPS waypoints were collected. Two possible quarry sites were investigated thoroughly for access, volume estimation, rock conditions, and quarrying logistics.

TBT Engineering advanced a 10.36 m deep vertical borehole (BQ size) and recovered cores which where labeled, boxed, and returned to TBTE's lab in Thunder Bay for logging and sampling. Each 1.5 m drill run was treated separately, and all pertinent geological and geotechnical detail was collected. After completion of the drilling, one drawdown-recovery test was performed at the borehole to investigate groundwater levels in the borehole. Groundwater conditions were observed to help determine water table elevation and any potential underground discharge areas.

TBT Engineering presented all pertinent data to the client in the form of a final report. The report included recommendations for where the quarry should be located based on topography, ease of access road lay-out, as well as results determined from the field review and borehole investigations.



Transportation Engineering

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 including 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



We are fully qualified to perform all aspects of road design projects and have over 15 years experience undertaking such services for First Nations, Municipalities, MTO, Mining and Industrial clients within Ontario, Manitoba, British Columbia and Nunavut.

We recently completed a transportation assignment for Wabaseemong (White Dog) First Nation near Kenora for upgrading and surfacing of 15.5 km of access and community roads. A three contract approach was recommended for that project including an Aggregate Preparation Contract, Grading Contract and Surfacing Contract.

We have previously provided roadway engineering services for various clients such as Lac Seul FN (Kajic Bay Road), Pikangikum FN (Pikangikum Road), Shebandowan Mine, and Ontario Power Generation.

We have undertaken municipal road design projects for the City of Thunder Bay, Town of Fort Frances, Town of Atikokan, Municipality of Oliver Paipoonge and Municipality of Shuniah.

HIGHLIGHTED ROAD DESIGN PROJECT – 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 FEASIBILITY STUDY EXPERIANCE – Rainy River Resources

TBT Engineering has recently completed a feasibility study for Rainy River Resources which includes route study and preliminary design. TBT Engineering conducted environmental, geotechnical and geomatics studies as well as quantitiave and qualitivite analysis of transporation alternatives.



Environmental Studies

Our Environmental Services Division offer the services of specialists in water sampling and environmental site assessment, monitoring and remediation, environmental assessments, permitting and biological sampling. To support our Division's talents, we have a variety of water testing equipment as well as a wide variety of equipment for aquatic sampling.



Project Experience

Our Environmental Services Division has completed a wide variety of projects for government, the energy sector, private enterprise and private property owners. These include Phase 1 and 2 environmental assessments, permitting of highway and industrial projects, environmental assessments and biological sampling.

We have completed various environmental assignments for energy organizations such as Ontario Power Generation. Below are some examples of our recent work:

Groundwater / Hydrogeological Study Ontario Power Generation

Armstrong, ON

TBT Engineering Limited was retained by Ontario Power Generation to provide a Groundwater Summary Statement to identify the elevation and gradient of the groundwater table and specify an appropriate extraction elevation limit that would maintain a 2.0 m buffer between extraction operations and the groundwater table for a proposed Category 11 aggregate extraction site. The Summary Statement specifically addressed the extraction limitations for Category 11 operations at the proposed Site. TBT Engineering engaged in site reconnaissance and field investigations, then analyzed and described surface water conditions. Hydrogeological settings where also determined and described including surficial geology, bedrock geology, and groundwater tables.

• Environmental Data Interpretation & Reporting Ontario Power Generation – Northwest Plant Thunder Bay, ON

TBT Engineering was retained by the client to provide a report to interpret the test results for various samples to show if each was suitable for use for Lake filling in Ontario as per the MOE Fill Quality Guidelines for Lake Filling in Ontario. TBTE was asked to confirm and elaborate on whether all mandatory parameter concentrations where acceptable in comparison to the Provincial Water Quality Objectives (PWQO) or PWQO x 10 values as required by the Fill Quality Guidelines.



HIGHLIGHTED EXPERIENCE

Project Description: Various Environmental Services – Solar Electricity Generation Project Location: Thunder Bay, ON Client: Fort William First Nations

Limited Phase I / II Environmental Site Assessment

TBT Engineering was retained by SkyPower Limited to conduct a Limited Phase I/II Environmental Site Assessment (Phase I/II ESA). The purpose of the limited Phase I ESA portion of the project was to review historical information for the site and surrounding properties for evidence of potential contamination while the purpose of the Phase II ESA portion was to assess subsurface conditions (i.e., soil and groundwater) for the



presence/absence of suspect contaminants at discrete locations across the site. Target parameters were selected to investigate potential contamination from historical use at the subject property and current and historical uses of the surrounding properties.

Preliminary Environmental Screening

TBT Engineering was retained by SkyPower Limited to conduct a preliminary environmental screening for a proposed solar electrical generation site on Fort William First Nation. The objective or plan was to screen the site against criteria found in the Ontario Ministry of Environment (MOE) publication (2001) entitled 'Guide to Environmental Assessment Requirements for Electricity Projects'. Potential impacts on natural values that might occur as a result of development were reviewed.

Screening criteria that TBTE used included surface and ground, air and noise, heritage and culture, water, land, natural environment, resources, socio-economic, and Aboriginal concerns.

Erosion & Sediment Control Plan

TBT Engineering was retained by SkyPower Limited to identify Erosion and Sediment Control (ESC) measures recommended to ensure the immediate protection of fish and fish habitat associated with the development of a Solar Park on Fort William First Nation's land adjacent to the Kamanistiquia River.

The goal of the ESC Plan was to minimize erosion potential in the construction zone, apply erosion control measures to minimize mobilization of sediment, and apply sediment control measures to minimize off-site sediment release in the event of sediment mobilization.

Proposed erosion and sediment control measures straw bale flow checks sediment fencing along the base of exposed slopes rock flow checks within the two creeks/manmade drainage ditches a rock-lined pool a splash pad of large rubble-sized rocks at the outlet of the creek to prevent on-going suspension of fines in the Kaministiquia River, as well as hydroseeding of exposed creek banks to quickly re-establish vegetation in areas vulnerable to erosion.



Field Services

Our Field Services Division provides a wide range of services. We have a fully trained staff in the use of our field testing equipment. These are discussed further in subsequent sections of this document. Our staff has extensive technical capabilities and experience in routine to complex Field Services and Inspection Projects.



Instrumentation:

- Tensile Bond Machine
- Dowel Testing Machine
- Thermocouples
- Nuclear Densometers
- Concrete Testing Equipment
- Concrete Coring Equipment
- Half Cell Survey Equipment
- Chain dragging Equipment
- Moisture Testing Equipment
- Torque Wrench
- High speed Inertial Profilograph

Types of Testing:

- Concrete Testing (CSA Standards)
- Compaction Testing (ASTM, CSA, MTO)
- Tensile Bond Testing (CSA, MTO, ASTM)
- Dowel Testing (MTO)
- Concrete Investigations(Concrete Coring, Half Cell Survey and Delaminating)
- Roof Inspections
- Structural and Reinforcing Steel Inspections
- Bolt Torque Testing
- Fire Proof Inspection
- Sub grade Inspection
- Inertial Profilograph Analysis
- Material Sampling
- Pile Inspection

Project Experience:

TBT Engineering has extensive experience in a wide range of field services and inspection projects from material testing and inspections for commercial and industrial projects, bridges, culverts, roadways, and earth dams.

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Field Services & Materials Testing – Greenwich Lake Wind Farm



Wind Energy Project

Tower Foundations Inc, Renewable Energy Systems Canada, Swan & Associates Inc., EPTCON Ltd., Nelson Engineering, CG Power Solutions, Rigarus Construction

- Performed compaction testing for various structures (sub-stations & switchyards), turbine bases and foundations. Also completed all concrete QA / QC testing. Subgrade inspections were conducted to verify the suitability of materials for foundation bearing. Other inspection services where performed for various aspects of concrete, rebar, and general construction
- Completed all grout testing and also performed sub-grade inspections on turbine bases.
- An extensive laboratory testing program was also undertaken and successfully • implemented to support field services & inspections.

Material Testing & Inspection – Webequie First Nation

New Diesel Generating Station Facility

Profor Engineering

- Provided inspection services during construction of five (5) 50,000 litre above ground tanks, a new structure to house 3 electric generators with storage rooms, and two access roads.
- Also provided compaction, concrete, and rebar testing and related construction inspection services.

Material Testing & Inspection – Kakabeka Falls Generating Station

Hydroelectric facility operated by Ontario Power Generation Comstock Canada Limited

Provided concrete testing & inspection services

Lab / Mobile Testing & Concrete Mix Design – Musselwhite Mine

2012 Construction Projects

Gold Corp Canada

Provided concrete mix designs for 2012 construction projects as requested by • the client. Aggregate(s), grading(s) and characteristics where tested on site and in the Thunder Bay laboratory.

Mobile Quality Control Testing – Detour Lake Mine

Tailings Management Area Expansion Detour Lake Gold Corporation / Chartrand Equipment

• TBT Engineering provided on-site QC testing of construction soils and aggregates in accordance with relevant project specifications and ASTM procedures at required frequencies for determining product quality and acceptance during production and placement operations.



Quality Assurance

Review procedures

TBTE has a wealth of experience conducting review procedures including Core Plans, Generic Category Plans, and Supplementary Specialty Plans (project specific) for the Ministry of Transportation. These plans are submitted through the Registry, Appraisal & Qualification System (RAQS). The plans constitute quality control procedures for the quality assurance tasks that we perform during contract administration projects. Staff members who perform quality control are independent of the quality assurance activities to help ensure neutrality.



Minimum certifications/training/education

Staff certification and licenses are continually updated and renewed to ensure regulatory compliance. This practice also ensures that TBTE can meet and exceed staff standards and expectations as set out in client contracts. When working on MTO contracts, for example, all staff from - junior inspectors up to contract administrators – are OACETT approved and certified.

In addition to proper certification and licensing, our key QA staff, including project managers and contract administrators, have a wealth of demonstrated Construction Contract Administration experience.

Minimum standards and regulatory requirements

Regulatory requirements are always satisfied prior to beginning any project. As an example, the Occupational Health and Safety Act requires that traffic control plans be put in place for the safety of both construction workers and the general public. WHIMIS training for all employees is another example of how TBTE meets the requirements of this piece of provincial legislation. Our dedication to providing a culture of Health and Safety at TBTE has resulted in the creation of a corporate H&S policy. As well as well as a plethora of related initiatives that have made us an industry leader in working safe. Environmental legislation also plays a major role in many projects that we are associated with. TBTE's Environmental Division plays a key role in ensuring that our staff are aware of the latest regulatory requirements and that compliance is assured.

Reporting periodically to customer

An example of our periodic reporting procedures includes the monthly meetings that we schedule which we invite our client(s) to attend. At these meetings, we give progress reports on the project. Project status reports are also prepared monthly by the Project Manager and submitted with billing / invoice statements.



Aside from monthly reports, shorter accountability intervals exist as well, such as the weekly status reports that take place to summarize staff hours, as well as tasks completed by both the contractor and contract administrator.

A plethora of reporting takes place at the end of a project. We engage in contractor performance rating activities which gives the client a professional record of how the contractor performed duties for a specified project. We review these ratings with the client. We also create construction reports, which summarize the work of a completed project. These reports include recommendations for improving and/or maintaining future construction effectiveness and efficiency on similar projects. Design package evaluations are completed summarize any design issues that were identified during the course of the project. Environmental reporting also takes place.

Reporting on a weekly, monthly, and contractual basis ensures the client is continually aware of what work is taking (took) place, how it is taking (took) place, and what the final result will be (was). This reporting structure also ensures that any contractor deviations from the project specifications are identified and dealt with quickly thereby helping keep the project is on time, on specification, and on budget.

Schedule control

Physical (field) audits for large jobs and document audits for small jobs take place. These auditing processes help ensure that tasks are being completed in the time frames stipulated in project documents such as an RFP or RFQ.

Use of staff alternates

While we utilize extensive crews of well-trained professionals, in the event that they are all assigned to other tasks, TBT Engineering is in the unique position to be able to utilize office staff as well. We are very fortunate to have a plethora of office staff, civil technicians, and seasonal staff that have vast amounts of field experience. They can be used as situations warrant.

Insurance Policies

TBT Engineering Limited carries a Professional Liability Policy (Errors and Omission) with liability coverage of \$5,000,000 per any one occurrence and in the aggregate.

TBTE also has a Commercial General Liability Policy with \$1,000,000 if liability coverage backed up by a \$4,000,000 umbrella policy for a total of \$5,000,000 commercial general liability coverage.

With regards to Employer Liability insurance, we are in good standing and are fully covered under the Workplace Safety and Insurance Board (WSIB).