TETRA TECH

Bill T. Horne, M.Sc., P.Eng.

Director Arctic Engineering

EXPERIENCE SUMMARY

Mr. Horne is a Senior Engineer/Principal Consultant in the Edmonton office. He has over 30 years of experience in civil engineering and permafrost engineering for mining, oil and gas facilities, and municipal projects in Northwest Territories, Yukon, Alaska, Alberta, Russia, Norway, and the Beaufort Sea. Areas of expertise water and tailings dam designs, tailings deposition management, geothermal and deformation modelling, include industrial plant site development, heavy equipment foundations, and project management.

RELEVANT EXPERIENCE

Gahcho Kue Diamond Mine, NWT. De Beers Canada Inc.

- Project Manager for geotechnical components of the mine including a feasibility study, permitting, detailed design and construction. Responsible for waste and water management plan, tailings management, waste rock dumps, permafrost issues, geotechnical investigations. The project included a total of 15 dykes for water management.

Kubaka Water Dam and Tailings Dam, Magadan Russia, Kinross

- Project Engineer for the design and construction of a tailings facility for the Kubaka Gold Mine, Magadan, Russia. A thickened tailings deposition scheme was developed. A water retention dam was constructed downstream of the tailings area.

Meliadine Gold Mine, Nunavut, Agnico Eagle

- Senior Engineer for the geotechnical aspects of the Meliadine Gold Mine, Nunavut. Responsible for the detailed design of the dry stack Tailings Storage Facility, and water collection ponds. Review engineer for the two water retention dams on permafrost.

Mayskoye Gold Mine, Russia

- Mayskoye Gold Mine, Russia. Principal Consultant for foundation components of a new gold mine in northern Russia. Facilities were placed on bedrock and ice rich permafrost. A large ventilated pad was designed for the plant site and power house to maintain the permafrost condition. Involved in the project through feasibility design, detailed design and construction.

EDUCATION

B.Sc., Civil Engineering,
University of Calgary,
Calgary, AB, 1983

M.Sc., Geotechnical Engineering,
University of Alberta,
Edmonton, AB, 1987

AREA OF EXPERTISE

Civil and Permafrost Engineering, foundation analysis and design, earth dam designs, numerical modelling, and construction drawings and specifications for variety of mining and hydrocarbon projects

Site investigation, foundation and earth embankment designs

REGISTRATIONS/ AFFILIATIONS

Member, Association of Professional Engineers and Geoscientists of Alberta (APEGA)

Licensee, Northwest Territories and Nunavut Association of Professional Engineers and Geoscientists (NAPEG)

Member, Canadian Geotechnical Society (CGS)

Member, Geotechnical Society of Edmonton (GSE)

OFFICE

Edmonton, AB

YEARS OF EXPERIENCE

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CONTACT

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Diavik Diamond Mine – Tailings Facility Review.

- Diavik Diamond Mine, NWT. Principal Consultant for an independent review of the processed kimberlite containment facility, management, emergency preparedness, dyke design and construction, and performance. The dykes are constructed on a permafrost foundation. Carried out a options analysis for the tailings storage facility.
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Lik Lead Zinc Deposit, Alaska, Zazu Metals Corp.

- Project Manager for a pre-feasibility study for the Lik Lead Zinc Project. Tetra Tech provided the plant site foundation design, tailings dam design, water diversion structures design, open stability assessment, permafrost mapping, and permafrost/geotechnical investigation.

Yamal LNG Facility. Yamal LNG.

- Yamal LNG Facility, Russia. Yamal LNG, Technip, Chicago Bridge and Iron Works. Senior Project Engineer and Manager for foundation design for the Yamal LNG Terminal in Sabetta, Russia. Large diameter pipe piles were used to support LNG Tanks and plant facilities in warm permafrost. Nineteen full size pile load tests were carried out and interpreted to support the foundation design. The pile load tests measured the pile creep and capacity. Estimates of long term deformation were calculated based on laboratory creep tests and the pile load tests. Over 5000 piles will be used to support the plant site.

Ruth – Bullmoose Mines Closure

- Project Manager for the closure and reclamation planning for seven abandoned mines east of Yellowknife, NWT. Geo-environmental sampling was carried out to determine the level of contamination in tailings, soils and lakebed sediments. Portal and mine shaft closure designs were provided. The underground mines were in permafrost conditions. A remedial action plan and Class I costs estimates were prepared to define the clean-up.

Jericho Diamond Mine – Development and Operation, Care and Maintenance Reopening. Closure.

- Jericho Mine, Nunavut, Tahera Diamond Corporation – Principal Engineer for the design and construction of the tailings facility. Dams and dykes were designed to retain fine processed kimberlite tailings. Both frozen core and geomembrane dams were constructed on a permafrost foundation. A tailings management operation guideline document was prepared. A water balance for the tailings facility was developed, along with guidelines for process water discharge.

Ekati Diamond Mine, BHP Diamonds Inc.

- Geotechnical Engineer, Foundations design for the plant site, constructed on permafrost conditions. Tailings (Processed Kimberlite) Management and Dam and Dyke and Design for Canada's first diamond mine. The tailings management scheme and details were developed for the 25 year mine life. A combination of filter dykes and frozen core dams were developed to retain the tailings and maintain annual discharges from the tailings storage facility.

Vankor Central Processing Facility

- Senior Project Engineer for the foundation design of the Vankor Central Oil Processing Facility, Russia. Foundations were designed for processing modules and pipe racks founded warm permafrost. A combination of steel pipe piles and thermosyphons were used.

Landfill Design Guidelines

- Developed Landfill Design Guidelines for the INAC Northern Contaminated Sites program. The guideline included siting criteria, fill material specifications, geomembrane selection, permafrost and thermal considerations and the effects of climate change on landfill designs and risk analysis.

DEW Line Clean Up – Closure

- Project Manager for providing the geotechnical design for the clean-up of 21 DEW Line sites in Yukon, NWT and Nunavut. The designs include remediation of existing landfills, and construction of new landfills. Thermal analyses are used to design frozen containment structures to contain landfill leachate. Geophysics is used to delineate the extent of existing landfills. The majority of construction was carried out from 2004 to 2012. Currently responsible for review monitoring data

Diavik Diamond Mine – Tailings Facility Review.

- Diavik Diamond Mine, NWT. Principal Consultant for an independent review of the processed kimberlite containment facility, management, emergency preparedness, dyke design and construction, and performance. The dykes are constructed on a permafrost foundation.

Polaris Mine, NT, Cominco

- Project Engineer for the design of the first frozen core dam in Canada. The dam was for the tailings facility. The thermal behaviour was modelled to evaluate the thermal regime during construction and over the long term. Recommendations for the shore protection and construction materials were provided. A reclamation and abandonment plan was developed. Construction monitoring, and annual inspections were provided.

Red Dog Mine, Alaska, Teck - Cominco

- Project Engineer for providing geotechnical input to foundation designs for mill site and port site facilities. Rock socketed piles, spread footings, thrust blocks, and retaining walls were designed. Finite element thermal analyses were carried out to evaluate the performance of a ventilated pad foundation.
- Project Engineer for design components of the water diversion dam and tailings dam. Review the seepage and thermal performance post construction.

Numerical Modelling

- Conducted numerous finite-element thermal analyses to model ground temperatures and ground temperature changes. Analyses supported designs to prevent thaw or frost penetration, as well as evaluations of thermal aspects of subgrade ventilation systems and heat pipes.
- Incorporated frost heave mechanics into a finite-difference thermal program to enable prediction of frost heave magnitudes for various climatic conditions, soil properties and groundwater positions.
- Converted Tetra Tech's proprietary finite-element thermal program "GEOTHERM" from a main-frame program to a Macintosh program. Developed a graphical user interface for the program.

Permafrost, Thaw Subsidence, and Ground Cooling

- Senior reviewer for thermal analyses conducted a thermosyphon layout, and evaluation of foundation performance and requirements for Inuvik Regional Health and Social Services Centre, Inuvik, NT.
- Senior Reviewer for geotechnical assessment to convert arena to heated multi-bay garage, Sachs Harbour, NT. Included considerations and recommendations for thermosyphon-stabilized foundations to maintain foundation integrity.
- Project Engineer for artificial ground-freezing project to stabilize the Alyeska Pipeline, Alaska. A heated pipeline and pump stations were constructed on ice-rich permafrost in the early 1970s, causing permafrost degradation and large settlements over time. The ground below the pipelines and structures was refrozen using chilled brine pipes.
- Senior Project Engineer for the foundation design of the Vankor Central Processing Facility. Foundations combined steel pipe piles and thermosyphons to support for processing modules and pipe racks on warm permafrost.

Publications

- Kubaka Mine Tailings Design, Construction and Operation of Frozen Core Dam: A Case Study, ASDSO West Regional Conference 2001.
- DEW Line Landfills, IWCSE 2002 Conference, Edmonton, AB
- Permafrost Containment Landfills at Arctic DEW Line Sites, 56th Canadian Geotechnical Conference, 2003.
- DEW Line Landfill Design and Construction, ASCE Conference, Edmonton, Alberta, 2004.
- Performance Measures of Arctic Landfills, Assessment and Remediation of Contaminated Sites in Arctic and Cold Climates, (ARCSACC), 2005.
- Rationalizing Climate Change for Design of Structures on Permafrost: A Canadian Perspective, Ninth International Conference on Permafrost, Fairbanks, 2008.