AECOM

Geotechnical Services

Delivering a better world

At AECOM, our geoscience experts solve complex problems related to natural resources, environmental management, and infrastructure development. From geotechnical engineering on large design-build transportation projects to the design of major structures over soft ground conditions, we critically analyze the characteristics of a site and perform in-house testing to assess risks, and identify and evaluate solutions to enable construction.

We offer integrated civil, geotechnical and environmental strategies which are tailored to meet the unique needs of each project, working closely with our clients to ensure that their objectives are met within their budget and timeframes.

Why Choose AECOM?

Safety: Our teams play a critical role in ensuring the safety of structures and people. By evaluating the physical properties of soil and rock formations, we can design safe and efficient foundation systems, assess slope stability, and identify potential hazards, such as landslides and sinkholes – reducing the need for future costly repairs or replacements and contributing to sustainable development.

Risk Mitigation: We can help mitigate risks associated with site development, such as environmental and geologic hazards, and soil instability by conducting risk assessments and recommending appropriate remedial measures to avoid costly delays and minimize potential liability.

Cost-Effective Design: AECOM's geotechnical engineers can help save money by optimizing the design of structures and foundations. By conducting detailed site investigations, we can provide accurate data on soil and rock properties to design cost-effective foundation systems.

Environmental Compliance: We can manage compliance with municipal, provincial and federal environmental regulations by assessing potential impacts on soil and water quality, evaluating remediation options, and providing solutions that minimize the negative impact on the environment and promote sustainable development. This includes optimizing the use of materials, such as designing foundations that require less concrete or reducing the amount of excavation required, leading to significant reductions in the use of natural resources and associated environmental impacts.

Quality Assurance: We are driven by local knowledge and world class expertise to deliver quality, reliable and accurate data on soil and rock properties, conducting quality control testing, and effectively monitoring construction activities.

Geotechnical Engineering

Taking on challenges at any scale, our team is regularly innovating in the investigation and analysis of subsurface conditions, and also understands the challenges of delivering projects within increasing regulatory and budgetary pressures.

AECOM's geotechnical engineers have extensive expertise in road and rail, bridge and building foundations, tunnelling, rock mechanics, soft soil mechanics, slope stability design and analysis, liquefaction analysis, ground improvement, and 2D/3D numerical modelling. Our services include:

- Desktop site background review and analysis
- Proposal support including risk management / mitigation, compliance with AECOM SOP 405 – drilling, boring and direct-push probing, and variance approval as appropriate prior to submission
- Site supervision of field investigations, soil classification, sampling and testing, including the procurement and management of subcontractors
- Analysis and review of geotechnical properties, design parameters and chemical properties of soil and rock
- Preparation of borehole logs and site documentation
- Preparation of technical memoranda / reports and development of recommendations for preliminary design, detailed design and construction
- Preparation of geotechnical engineering investigation and design reports
- Consulting on a wide range of geotechnical problems
- Creating / providing clarification on technical specifications / tender documents
- Extensive experience working / being in compliance with MOL, MTO, MECP, CSA, ASTM, and OPS standards and regulations.

Field Inspection and Material Testing Services

AECOM's field inspection and material testing services offer innovative thinking and sound engineering solutions including:

Construction Inspection

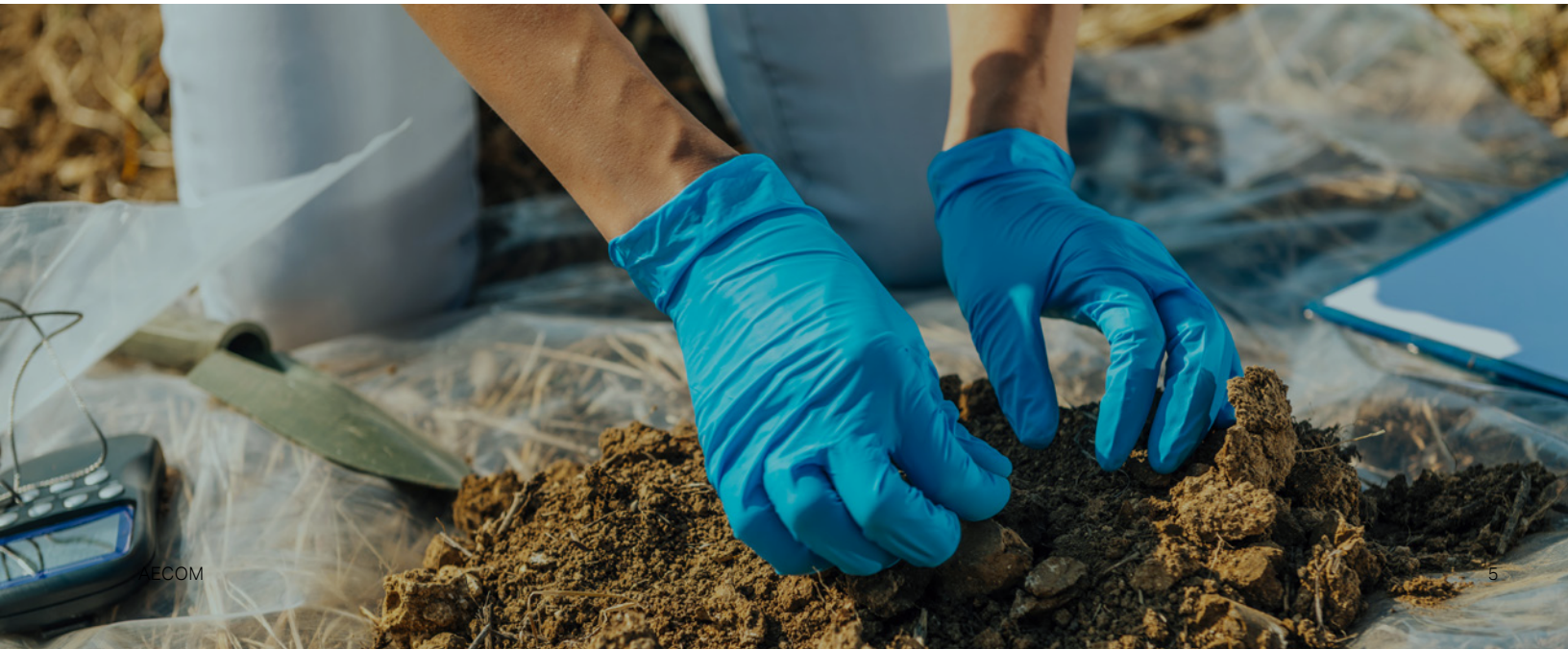
- Subgrade Inspection
- Inspection for Pipe Bedding and Embedment Placement
- Inspection for Backfill Placement
- Excavation Slope Inspection
- Temporary Shoring Inspection
- Engineered Fill Placement
- Footing Inspection
- Reinforcing Steel Inspection
- Retaining Structure Inspection and Certification
- Material Selection and Approval
- Ground Reinforcement
- Pavement Construction

Field Testing

- Field Density Test for Earth
- Materials: Granular Base, Granular Sub-base and Other Earth Fill Materials
- Asphaltic Concrete Density Test
- Ground Anchor Load Test (performance, proof and lift off)
- Drilling Supervision - logging soils and bedrock
- Slope Inclinometer installation and monitoring
- VWP installation and monitoring
- Dynamic Cone Penetrometer Testing
- Hand Augering

Concrete Sampling and Testing

- Slump Test
- Entrained Air Content Test
- Maturity Temperatures Test
- Electrical Conductivity Test
- Concrete/Asphalt Coring
- Density testing of Roller Compacted Concrete



Laboratory Testing Services

Our Calgary, Toronto and Winnipeg laboratories are Canadian Council of Independent Laboratories (CCIL) certified operations and are outfitted with state-of-the-art equipment and tools to provide accurate and reliable results for material testing. Our team of experienced technicians and engineers perform testing of fill and backfill materials; granular base and subbase; cement treated base; hot mix asphalt; Portland cement concrete pavement; and cast-in-place concrete. Each laboratory has a defined set of procedures to ensure that all operations are carried out in a manner consistent with AECOM's critical requirements and recognized industry standards. We have formal documentation procedures to record the history of any given sample. Specific forms are used during testing to supplement automatic data acquisition. Regular checks are taken during data entry along with the use of in-house computer programs to calculate and plot final test results according to acceptable formats. The results are thoroughly checked by the laboratory manager and the completed results submitted for final review and approval by the project engineer.

Laboratory Testing

- Aggregate Test (Sieve & Hydrometer Analysis)
- Standard & Modified Proctor Test
- Unit Weight Of Soil
- Specific Gravity
- Atterberg Limits (Liquid & Plastic) Test
- Standard One-Dimensional Consolidation Test
- Unconfined Compression Test (soil)
- CBR Test
- Concrete And Mortar Strength Test (Cube Or Cylinder)
- Marshall Stability & Flow Test
- Aggregate Extraction & Gradation Test
- Triaxial Tests On Soil (UU, CU, CD)
- Direct Shear Test
- Flexible Wall Hydraulic Conductivity Test
- Fixed Wall Hydraulic Conductivity Test (Constant Head & Falling Head)
- Uniaxial Compressive Test On Rock Core
- Brazilian Test
- Point Load Test
- Rock Joint Shear Test (Upcoming 2023 Fall)

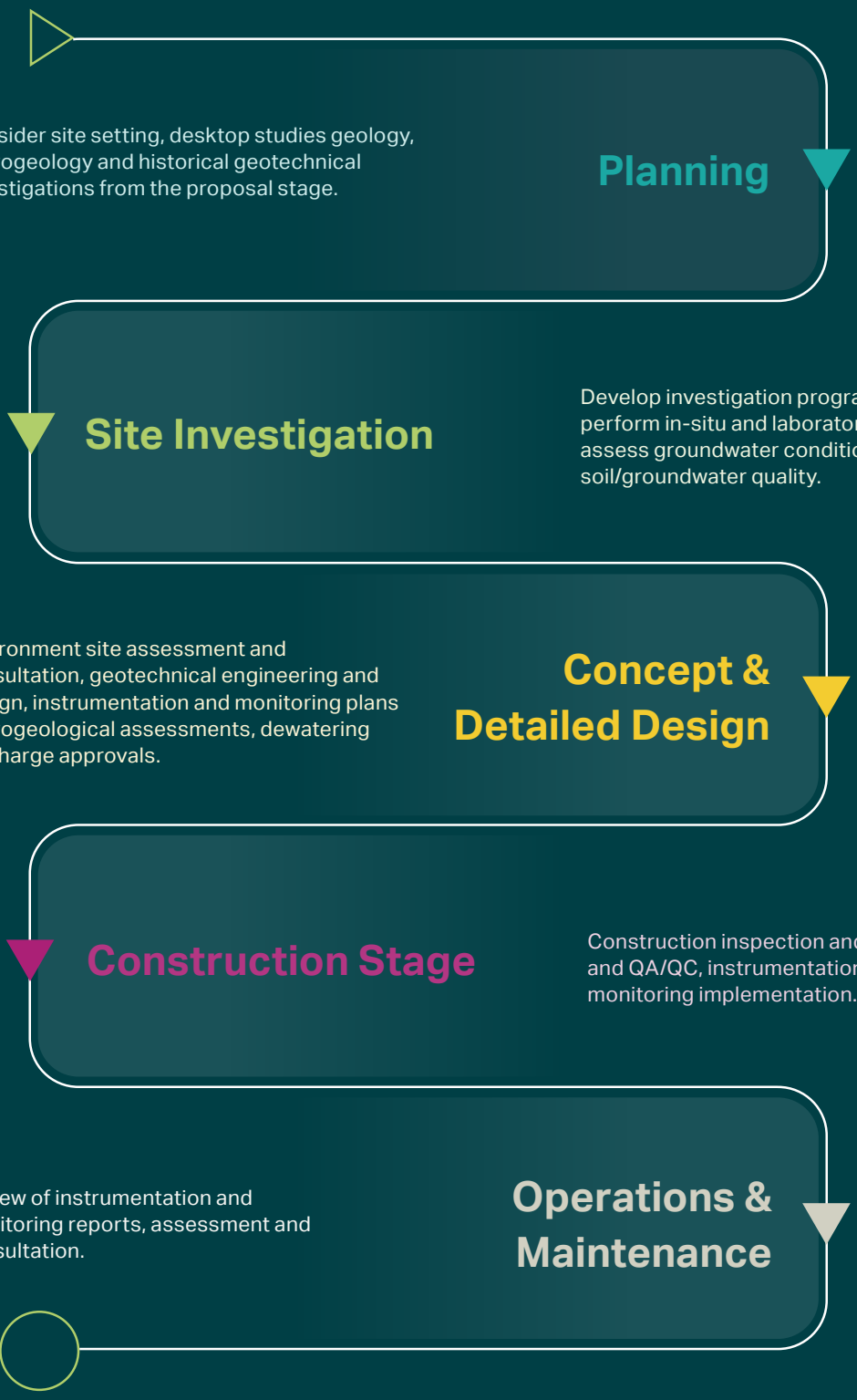
AECOM labs located in Calgary, Toronto, and Winnipeg offer a comprehensive range of testing methods for soil and aggregate, rock, concrete, and asphalt materials, as outlined in the table below.

Certification	Calgary	Toronto	Winnipeg
CCIL Aggregate Certified	Type C C702, C117, C136, D5821	Type C LS-600, LS-601/C117, LS-602, LS-607, LS-608, LS-621 Type D LS-706/D698, LS-705, LS-703/704/D4318, LS-702	Type C C702, C117, C136, D5821, D4791 Type D C131, C535, D6928
CCIL Asphalt Certified	Asphalt Full Mix Compliance - Marshall Method (Type B) AC Determination - D6307 Gradation of Extracted Aggregate - D5444		
Granular and Soil Physical Property Tests		D698, D4318, T88	D698, D4318, T88
CCIL Concrete Certified	Type Q CSA A283 Basic Concrete Certification – CSA A23.2 – 1C, 3C, 4C, 5C, 9C, 17C & 19C	Type Q CSA A283 Basic Concrete Certification – CSA A23.2 – 1C, 3C, 4C, 5C, 9C, 17C	

Services Across the Full Project Life Cycle

At AECOM, we understand that geotechnical engineering is a crucial aspect of any infrastructure project and that every project has unique challenges. That is why we offer a wide range of geotechnical services, from site investigations and geotechnical assessments to design recommendations and operations and maintenance.

Our experienced team of geotechnical engineers and technicians are committed to providing cost-effective and innovative solutions throughout the project lifecycle. We pride ourselves on our technical expertise, attention to detail, and customer-focused approach, which has earned us a reputation for excellence in the industry.



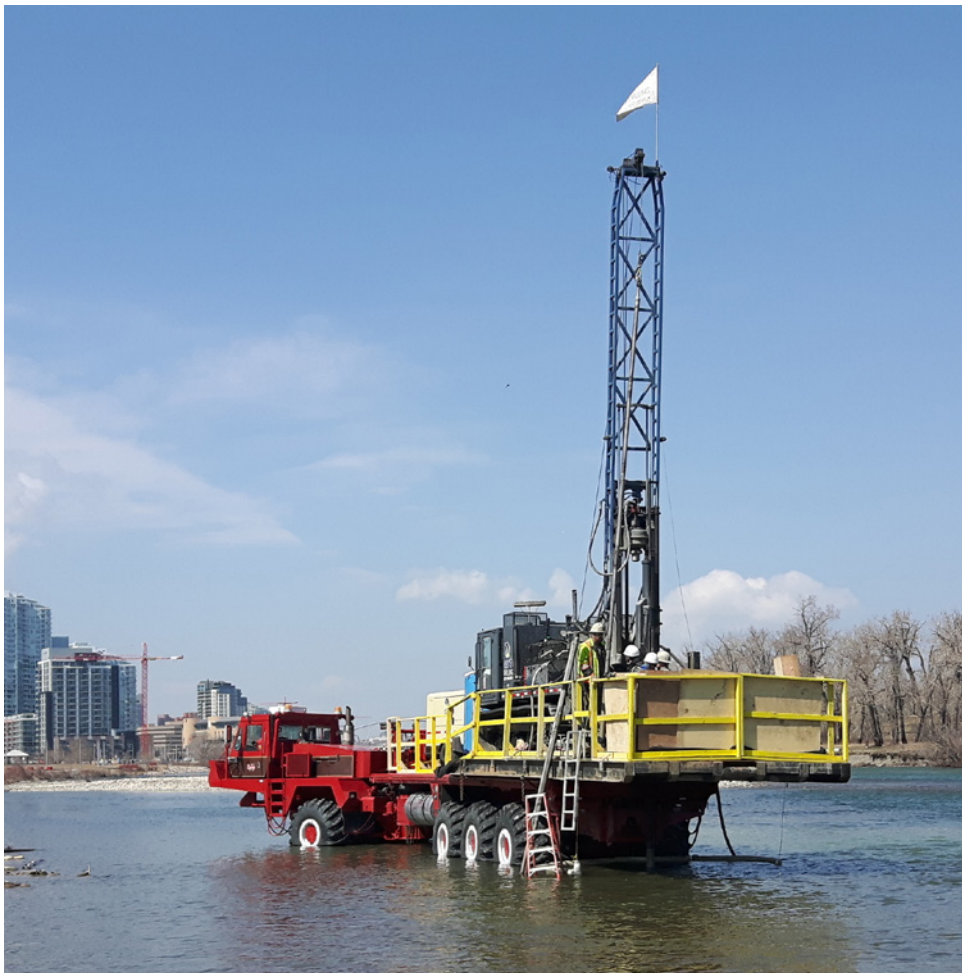
Featured Projects

Gordie Howe International Bridge

Windsor, ON and Detroit, MI

The Gordie Howe International Bridge project is set to build an impressive 853m clear-span cable-stayed bridge between Windsor, Ontario and Detroit Michigan. This massive undertaking includes the design and construction of bridge approaches, interchanges, and ports of entry for both the United States and Canada. It is a truly dynamic project that will transform the way people and goods travel between these two countries.

Geoscience services provided: AECOM is responsible for the management, technical oversight and implementation of geotechnical and hydrogeological investigations and recommendations for both the main bridge span and Point of Entry both on the US and Canadian sides. This includes ground improvement (wick drain with surcharge); geotechnical instrumentation and monitoring; and foundation design (based on settlement criteria).



Inglewood Sanitary Trunk

Calgary, AB

AECOM provided preliminary and detailed design, as well as contract administration services for the Inglewood Sanitary Trunk project in Calgary. The project is part of the larger Nose Creek Sanitary District study and involves upgrading conveyance capacity from the Bow River to the Bonnybrook Wastewater Treatment Plant. The project is divided into two phases: Phase 1 includes 3470 m of microtunneling and 265 m of open cut from the Inner City Trunk to the BBWTP, and Phase 2 is a 510 m Bow River Crossing that will use microtunneling methods. The project traverses through a mature neighborhood and interfaces with several railways.

AECOM's geotechnical group performed all geotechnical investigations for the project and prepared a geotechnical data report (GDR) and a geotechnical baseline report (GBR) in accordance with ASECE guidelines. The team also provided QA/QC inspection and monitoring services during construction. The project faced several geotechnical challenges, including congested residential/industrial areas, challenging ground conditions, and high groundwater inflow rates in shafts. To address these issues, AECOM recommended using Pressurized Close Face MTBMs, sealed methods of shaft construction, and advanced lab testing to determine accurate baseline ground conditions. Diligent QA/QC inspection and testing during construction helped document encountered conditions and supported the city against claims of changing ground conditions.

AECOM's laboratories in Calgary, Toronto, and Winnipeg provide a complete suite of testing methodologies for soil and aggregate, rock, concrete, and asphalt materials, detailed in the table below.

Laboratory Testing	Test Met zhod	Calgary	Toronto	Winnipeg
Soil and Aggregate Tests				
Moisture Content	ASTM D2216	★	★	★
Organic Content	ASTM D2974	★	★	
Atterberg Limits Test	ASTM D4318	★	★	★
Grain Size Analysis – Hydrometer, fine grained soils	ASTM D7928 or D422	★	★	★
Grain Size Analysis – Sieve, fine grained soils	ASTM D6913 or D422	★	★	★
Grain Size Analysis – Sieve, coarse aggregate	ASTM C136 or D422	★	★	★
Moisture Density Relationship (Proctor) – Standard Effort	ASTM D698	★	★	★
Moisture Density Relationship (Proctor) – Modified Effort	ASTM D1557	★	★	★
Specific Gravity of Soils	ASTM D854	★	★	★
Unit Weight of Soils or Rock	ASTM D7263	★	★	
California Bearing Ratio (CBR)	ASTM D1883	★	★	★
Hydraulic Conductivity – Flexible Wall Permeameter	ASTM D5084	★	★	★
Hydraulic Conductivity – Coarse-Grained Soils	ASTM D2434	★	★	
Hydraulic Conductivity Test – Fixed Wall (constant head and falling head)	ASTM D5856		★	
Unconfined Compressive Strength of Cohesive Soil	ASTM D2166		★	★
One-Dimensional Consolidation Test	ASTM D2435		★	
Triaxial Compression Test (UU, CU, CD)	ASTM D2850 / D4767 / D7181		★	
Direct Shear Test	ASTM D3038		★	
Rock, Concrete and Asphalt Tests				
Unconfined Compressive Strength – Rock Core	ASTM D7012		★	
Splitting (Brazilian) Tensile Strength – Rock Core	ASTM D3967		★	
Point Load Index – Rock Core	ASTM D5731		★	
Rock Joint Shear Test (upcoming 2023 fall)	ASTM D-732		★	
Compressive Strength of Concrete Cylinders	CSA A23.2-3C&9C	★		
Compressive Strength of Grout	CSA A23.2-9C	★		
Compressive Strength of Concrete Beams	CSA A23.2-3C&8C, ATCM C39)	★		
Unit Weight of Hardened Concrete	ASTM C138	★		
Density of Plastic Concrete	CSA A23.2-6C	★		
Compressive Strength of Concrete Cores	CSA A23.2-14C	★		
Marshall Stability and Flow Test	ASTM D6927 / D1559 / D1188 / D2726 / D5581 / ATT*	★		
Full Asphalt EPS Testing Lot	as per ATT*	★		
Full Asphalt MQA Testing Lot	as per ATT*	★		
Asphalt Extraction and Gradation Test	ASTM D5444 / ATT*	★		
Coring and Sampling Asphaltic Concrete	ASTM D5361 / ATT*	★		

***ATT - Alberta Transportation Test Procedures**

AECOM's geotechnical engineers execute activities in compliance with federal, provincial and municipal regulatory requirements. Working together with hydrogeology and tunneling groups, projects are focused on delivering the most cost efficient and timely strategies by scoping only necessary field and laboratory testing, analyses, design and reporting requirements.

About AECOM

AECOM is the world's trusted infrastructure consulting firm, delivering professional services throughout the project lifecycle – from advisory, planning, design and engineering to program and construction management. On projects spanning transportation, buildings, water, new energy, and the environment, our public- and private-sector clients trust us to solve their most complex challenges. Our teams are driven by a common purpose to deliver a better world through our unrivaled technical and digital expertise, a culture of equity, diversity and inclusion, and a commitment to environmental, social and governance priorities. AECOM is a *Fortune 500* firm and its Professional Services business had revenue of $14.4 billion in fiscal year 2023. See how we are delivering sustainable legacies for generations to come at aecom.com and @AECOM.

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