

Livingston Engineering Associates LTD. (LEA)

59 Horton Crescent, Yellowknife, NT. X1A 3B8

Livingston Engineering
Associates LTD

LEA Registered Business:

Nova Scotia: 2000

Nunavut: 2008

Northwest Territories: 2014

LEA Federally-Incorporated

Established in 2013

LEA NAPEG Registration

Permit to Practice No. P-900

Thomas G. Livingston, P.Eng. Principal

Mr. Livingston has more than 40 years experience in the Built Environment, eleven of which have been in the Northwest Territories and Nunavut. Starting off with many years as a highly skilled tradesman, he is a Civil Engineer with 25+ years prior design and construction experience. His knowledge is in a variety of engineering fields, among which are structural engineering, cold regions engineering, building design, project/construction management, solar engineering, building science, and solid waste and wastewater treatment. He has just completed *Annex F* in CSA's S502, *Managing Changing Snow Load Risks for Buildings in Canada's North*, and sits on the National Research Council's *Standing Committee on Environmental Separation*.

Mr. Livingston has designed many reinforced concrete foundations, as well as complete buildings in structural steel, timber, reinforced concrete, and masonry – in addition to designing civil engineering works such as northern roads, cross-sections, drainage plans, solid waste sites and wastewater treatment stabilization ponds that include innovative decant structures.

In an interesting sense, Mr. Livingston's career is just beginning, for through LEA and his growing number of highly respected colleagues, he can draw from his years in a great many fields: as a woodworking tradesman, as a contractor, as a solar architecture lecturer, as a climate change and energy visionary, as a television series writer and host, as a senior structural engineer, civil engineer, and building scientist, and as a technical and software writer.

FORMAL EDUCATION

- Bachelor of Engineering (Civil/Structural), Dalhousie U. (DalTech), 2000, Halifax, Nova Scotia
- Bachelor of Applied Science (Environmental Impact & Solar Theory), Acadia U. 2001, Wolfville, Nova Scotia
- Certificate in Applied Science, Acadia U. 1998, Wolfville, Nova Scotia
- Pre-Calculus Maths, Chemistry, Physics, Drafting, Dawson College, 1979, Montreal, Quebec
- Trades Diploma in Cabinet-making (1308 hrs), Polyvalente Massey-Vanier, 1974, Cowansville, Quebec
- Bachelor of Arts, McGill University, (Major: Sociology; Minor: English Literature), 1971, Montreal, Quebec
- A-Level Exams (English Literature & European History), Oxford & Cambridge Schools Examination Board, UK

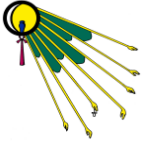
PROFESSIONAL AFFILIATIONS

- Association of Professional Engineers and Geoscientists of the Northwest Territories (NAPEG), 2004-
 - NAPEG Governing Council, First Vice President, current
 - NAPEG Governing Council, 2008 to present (currently serving a second term)
 - NAPEG Ad Hoc Committee on Continuing Competence, Chair, 2014-present
 - NAPEG Environment Committee, 2004-present
- Association of Professional Engineers of Nova Scotia (APENS, Engineers Nova Scotia), 2000-2013
 - APENS Environment Committee, 2001-2004
 - APENS Engineering Act Enforcement Committee, 2001-2004

Awards

Nova Scotia Home Award. 1997

CMHC's Canadian National Healthy Housing Design Competition, *Suburban Detached* category. 1992.



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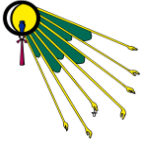
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Work History

- Principal, Livingston Engineering Associates LTD, Yellowknife, NT, June '13-present
- Program Coordinator: capital project work relating to diamond recovery, sorting, valuation, & control, for Dominion Diamond Ekati Corporation, Yellowknife, NT, June to December, '14 (seconded)
- Sr. Structural Engineer & Building Science Lead, Williams Engineering, Yellowknife, NT, July, '11-June, '14
- Municipal Planning Engineer, Kitikmeot Region, Community & Government Services, NU, 2005-June, '11
- Assistant Director, Baffin Region (Acting), Community & Government Services, NU, July, '10 to May, '11
- Director, Community Infrastructure Division (Acting), Community & Government Services, NU, various times
- Director, Community & Government Services (Acting), Kitikmeot Region, December, 2006
- Director, Technical Services Division (Acting), Community & Government Services, NU, Jan.-May, '06
- Manager, Projects Division (Acting), Community & Government Services: various times
- Project Officer, Community & Government Services, Government of Nunavut, 2004-2005
- Principal, Livingston Engineering Associates, Canning, Nova Scotia, 2001-2004
- Co-host and writer for *The Resourceful Renovator* television series, 1994-1997
- Teacher, Acadia University Continuing Education Green Architecture Courses, Wolfville, NS, 1992-'97
- Principal, Ariel Design, Fine Furniture & House Construction, Nova Scotia, 1986-1997
- Foreman/Lead Carpenter (rough and finish), Lynes Construction, Hendersonville, North Carolina, 1981
- Principal, Livingston Woodworks & Period Renovations, Montreal, Quebec, 1975-1986
- Coordinator/co-founder: *Yellow Door Elderly Project* (inner-city out-reach program) Montreal, Que, '72-'74
- Carpenter/Labourer: Heney House, Drerup, Kantor, White construction, Waterloo, Que, 1971-'72
- Manager, geological exploration bases, Brinex Corp & Hollinger: Labrador & Ungava Bay, summers '69-'71

Professional Courses, Continuing Education

- ACSA, OSSA Competency Certificate: Industrial/Commercial Fall Protection, 2013
- Can/CSA-Z317.13-07: *Fundamentals of Infection Control during Construction, Renovation, or Maintenance of Health Care Facilities*, Yellowknife, 2011
- Can/CSA-Z317.13-07: *Practical Applications in Infection Control during Construction, Renovation, or Maintenance of Health Care Facilities*, Yellowknife, 2011
- *Cold Regions Engineering* given through the University of Washington State, 2011
- *First Circular International Short Course on Permafrost Engineering: Effective Design and Construction in Permafrost Regions*, Department of Civil and Environmental Engineering, University of Alberta, Edmonton, and Cold Regions Geotechnology Division, Canadian Geotechnical Society. May 7-12, 2009
- *Sustainable Infrastructure: Techniques, Tools, & Guidelines*, National Research Council of Canada, Yellowknife, NWT, November, 2006
- *Managing Human Performance* (Canadian School of Public Service), September, 2006
- *Contract Administration/Project Management Training*, September, 2004
- *QP1 On-Site Sewage Disposal System Engineering Course and Certification* (Dalhousie U. Centre for Water Resources) 2002
- *Photovoltaic Design: Advanced Level*, October, 2001
- *Photovoltaic Design Installation (grid-connect)*, July, 2001
- NSHDA NBCC Part 9 Course, 1997
- Hot-2000 Design Evaluator's Course, May, 1996
- NSHBA National Building Code, Certificate March, 1996
- NSHBA: Certified Residential Builder (CRB), 1996
- NSHBA: Certified Housing Professional (CHP), 1996



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- NSHBA "The Better-Built Home", Certificate January, 1996
- HRAI Residential Mechanical Ventilation & Design Qualification; CSA F-326, March, 1990
- R-2000 Builder's Workshop and Certification, January, 1990

Associations, Committees, and Professional Organizations – Currently or Recently Serving On

- Association of Consulting Engineers of the Northwest Territories (CENT), 2011-present
- National Research Council (NRC) Standing Committee on Environmental Separation (SCES), current
- Northwest Territories and Nunavut Construction Association Board of Directors, 2011-2014
- CSA Working Group: S502, *Managing Changing Snow Load Risks for Buildings in Canada's North*, '13-'14
- GNWT Committee to update the NT *Fire Protection Act* (representing NAPEG), 2013-14
- Canadian Council of Ministers of the Environment (CCME) Municipal Wastewater Effluent Coordinating Committee (NU Representative). Served on three Working Groups.¹ 2007-2011
- Joint Task Group on Energy Efficiency in Housing and Small Buildings, Institute for Research in Construction – Canadian Codes Centre, 2010
- Provincial-Territorial Advisory Committee, PTAC (Nunavut Rep.) – Standards Council of Canada, '09-'11
- Provincial/Territorial Policy Advisory Committee on Codes, PTPACC (Nunavut Representative), 2009-2011
- Nunavut Building Code and Fire Safety Committee (Chair), 2009-2010
- Northern Sustainable Housing Forum Steering Committee & Co-Chair of Climate Change Panel, 2009-2010
- Northern Research Working Group (Northern wastewater treatment best practices), 2007-2011
- Northern Territories Water and Waste Association (NTWWA), Board of Directors, 2005-2006 & 2009-2011

Languages: Fluent in English. Basic writing/speaking French.

EXAMPLES OF RELEVANT EXPERIENCE²

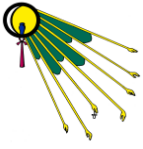
NORTHERN DESIGN WORK

STRUCTURAL ENGINEERING and/or FORENSIC INVESTIGATIONS

- ◆ **BHP Diamond Sorting Facility Additions**, Yellowknife, NT
Structural design: reinforced concrete T-beam floor, steel frame and roof structures, raised deck interior floor. Structural design and review
- ◆ **Water Treatment Plant**, Kugluktuk, NU
Complete Building design, structural, and building science engineering: steel sway-frame structure, composite deck, reinforced concrete T-beam insulated slab floor pinned to bedrock. Original design of roughing filters for turbidity issue, and auxiliary intake for saline invasion.
- ◆ **Warehouse concrete foundation**, Cambridge Bay, NU
Structural Design: foundation pad, reinforced concrete grade beams, concrete slab floor.
- ◆ **Building materials storage warehouse**, Lutsel K'e, NT
Structural Design: innovative gabion foundation for fabric structure.
- ◆ **Con Mine Stope Caps**, Yellowknife, NT

¹ Northern Working Group, Science Research Coordination Working Group, Administration Agreement Working Group

² These are projects with which Tom Livingston was involved while working with Livingston Engineering Associates, or while with other engineering design firms, or within the Government of Nunavut.

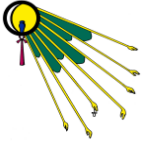


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Structural design: mass reinforced concrete slabs closing old mine stopes. Included design of specified concrete mix using high-volume fly ash concrete to reduce heat of hydration. Structural design and review.

- ◆ **Senior's Nine-plex**, Fort Good Hope, Fort Liard, Fort Providence, Whati, NT
Structural engineering and contract documents
- ◆ **New Health Centre**, Fort Providence, NT
Structural design: for design/build project. Structural design and review
- ◆ **Long-Term Care Facility**, Behchoko, NT
Structural Design: Steel and timber facility on rock-socketed piles. Structural design and review.
- ◆ **Arena/Community Centre, Behchoko**, NT
Project Management of engineering team
- ◆ **ECO Housing Complex**, Yellowknife, NT
Structural design: green apartment building design in city centre. Structural design and review
- ◆ **Prince of Wales Northern Heritage Centre**, Yellowknife, NT
Structural assessment: Fire damaged elements, subsequent restoration designs
- ◆ **Foundation and Structural Concrete Slab Designs**, Yellowknife, NT.
Structural design: numerous foundations, from Insulated Concrete Forms on stepped footings anchored to bedrock, insulated slabs on grade, high reinforced concrete foundations, elevated Garage slabs (T-Beam and composite steel decking), reinforced concrete slabs on steel rock-socketed piles.
- ◆ **Solarium**, Yellowknife, NT
Building design, structural, and building science design: elevated addition pinned to bedrock, including innovative fenestration.
- ◆ **Kitikmeot Foods Processing Plant**, Cambridge Bay, NU.
Structural assessment, remediation and repair of key elements: project oversight
- ◆ **Intake Pumphouse/Truck-fill Station**, Kugaaruk, NU
Building Science: new container structure, insulation, filter racks, skid frame
- ◆ **Warehouse Stability**, Kugluktuk, NU
Engineering analysis: foundation pad, Insulated Concrete Form walls, open web steel joist roof. Advice to hamlet as to whether it is worth purchasing and how to repair existing structure.
- ◆ **Various Commercial Building upgrades**, Gjoa Haven, NU
Structural engineering: for third bay interior mezzanine of Mechanics Garage, and organized team of engineers (electrical and mechanical) to perform all upgrades.
- ◆ **Investigation of flood damage to General Store with a PT Wood foundation**, Nihanni Butte, NT
Assessment and Building Code analysis report on building damagee from catastrophic flooding along the river. Store had been built with a Pressure-Treated Wood foundation
- ◆ **RCMP foundation assessments**, Tuktoyaktuk and Inuvik, NT
Engineering oversight
- ◆ **NT Visitors Centre**, Yellowknife, NT
Stability assessment
- ◆ **Old Stone Church Stabilization design** Cambridge Bay, NU
Performed structural designs for stabilizing this historic landmark after a fire destroyed all flammable components.
- ◆ **Airport Terminal Building Envelope Investigation**, Norman Wells, NT
Structural engineering analysis: siding failure, envelope tightness. Thermography, structural analysis, design of metal cladding panel support system
- ◆ **Arena/Community Hall Inspection/Code Review**, Kugluktuk, NU
Architectural, Structural, Building Envelope Investigation and Contract Documentation



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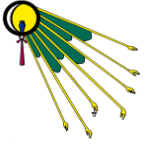
- ◆ **Air Crew Shelters**, Various Communities, NT
Overturning assessment: porch re-design, foundation pad, screw anchors, inspection

CIVIL ENGINEERING

- ◆ **New Subdivision**, Cambridge Bay, NU
Designed road layout, road sections, driveway approaches, culverts and culvert placement for drainage plan, and full specifications and contract documents for the Hamlet
- ◆ **Fuel Facilities Pipeline Upgrades, Kugluktuk, NU**
Structural design: over 100 adjustable pipeline stands on unstable permafrost, performed structural analysis, wrote specifications and scope of work
- ◆ **Building Stability Investigation**, Lutsel K'e, NT
Engineering analysis: foundation pad erosion issues causing buildings to wrack for GNWT Housing Corp
- ◆ **ATV and Snow Machine Bridges**, Kugluktuk, NU
Performed structural engineering design and specifications for steel bridges (24 ft and 30 ft spans) for ATV and snow machines to cross small streams on the way to Bloody Falls Park utilizing Schedule 40 steel pipe that was available in the community.
- ◆ **New Utilidor Loop**, Resolute Bay, NU
Laid out new Loop and Access Vaults for housing units. A.D. Williams project
- ◆ **Fuel Facilities Upgrade/Expansion**, Baker Lake, NU
Project Management of engineering team
- ◆ **New Sewage Lagoon Decant Structure**, Kugaaruk, NU
Design: secondary lagoon cell with level rock-studded rim spreads gravity-fed effluent over a wide swath of tundra, increasing aeration, UV treatment, and phyto-remediation. Dillon Consulting project
- ◆ **New Sewage Lagoon Decant Structure**, Cambridge Bay, NU
Design: series of bermed terraces spread pumped effluent over a wide swath of tundra, increasing aeration, UV treatment, and phyto-remediation. AECOM project
- ◆ **New Sewage Lagoon Decant Structure**, Kugluktuk, NU
Design: perforated pipe that spreads pumped effluent over a wide swath of tundra, increasing aeration, UV treatment, and phyto-remediation. Nuna Burnside project

BUILDING DESIGN and/or BUILDING SCIENCE

- ◆ **Ciara Manor Balconies**, Yellowknife, NT
New balconies designed to be double width as original ones: Pre-design.
- ◆ **Design of interior layout, Men's Healing Facility**, Kugluktuk, NU
Did CAD drawings of new interior layout, crawlspace passive ventilation
- ◆ **Auxiliary Pumphouse (for Salt Water Intrusion)**, Kugluktuk, NU
Designed temporary pumphouse. pump sizing, and appurtenances. Structural engineering, Building design drawings, specifications.
- ◆ **Combined Services Pellet Boiler Building, Yellowknife, NT**
Building science detailing: insulated building envelope design
- ◆ **General Store Foundation Flood Damage Assessment**, Nahanni Butte, NT
Structural and Code analysis: Preserved Wood Foundation damage
- ◆ **Community Centre Condition Assessment**, Tuktoyaktuk, NT
General structural and building envelope investigation and report: including condition of 30-yr old wooden piles. Thermographic scans and report on building envelope energy leakage.
- ◆ **Housing Corp Building 1553 Roof water intrusion/condensation investigation**, Iqaulit, NU



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- Building Science Analysis: thermographic scan of roof insulation, air/vapour barrier integrity
- ◆ **Housing Corp Building 1553 Roof water intrusion/condensation investigation**, Iqaulit, NU
Building Science Analysis: thermographic scan of roof insulation, air/vapour barrier integrity
- ◆ **Elementary School Water Damage Investigation**, Gjoa Haven, NU
Building Science Analysis: Assessment of potential for mould growth and water damage from sprinklers

PROJECT MANAGEMENT

◆ **BUILDINGS**

New Health Centre, Taloyoak, NU
New Hamlet Office, Kugluktuk, NU
New Hamlet Office, Taloyoak, NU
New Hamlet Office, Cambridge Bay, NU
Men's Healing Facility, Kugluktuk, NU
Community Hall, Gjoa Haven, NU
Community Hall Expansion, Cambridge Bay, NU
Hamlet Office Renovation, Gjoa Haven, NU
Hamlet Office Renovation, Kugaaruk, NU

◆ **POTABLE WATER SYSTEMS**

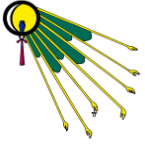
Water Line Replacement, Cambridge Bay, NU
Water System Improvements, Cambridge Bay, NU
Water System Thawing and Repairs, Cambridge Bay, NU
Water Tank Repairs, Cambridge Bay, NU
Water System Improvements, Kugluktuk, NU
Pump House Stabilization, Kugluktuk, NU
Water System Thawing and Repairs, Taloyoak, NU
Water System Upgrades, Taloyoak, NU
New Water System, Taloyoak, NU
Generator Replacement - Water System, Kugaaruk, NU
New Water System, Kugaaruk, NU
New Water Line, Gjoa Haven, NU
Water System Thawing and Repairs, Gjoa Haven, NU
Water System Thawing and Repairs (second time), Gjoa Haven, NU
Water System Reservoir Emergency, Gjoa Haven, NU
Water System Thawing and Repairs, Cape Dorset, NU

◆ **SEWAGE TREATMENT SYSTEMS AND SOLID WASTE SITES**

Sewage Lagoons and Solid Waste Sites, Cambridge Bay, NU
Sewage Lagoons and Solid Waste Sites, Kugaaruk, NU
Sewage Lagoons and Solid Waste Sites, Kugluktuk, NU
Sewage Lagoons and Solid Waste Sites, Gjoa Haven, NU
- Designed segregated areas for Hazmats (lined and bermed), re-usable wood, machine parts, etc, sequestration of bulk metals in permafrost ditches, and land farm; safe removal of batteries and drums of hazmats, CFCs for the communities of Kugaaruk, Kugluktuk, and Cambridge Bay

◆ **FUEL FACILITIES, PIPELINES**

Fuel Facilities Upgrade, Resolute Bay, NU
Fuel Facilities Land Farm, Kugaaruk, NU



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Fuel Facilities Resupply Breakwater and Staging Area, Kugluktuk, NU
Old Fuel Line Decommissioning and Soil Remediation, Kugluktuk, NU

♦ **ENVIRONMENTAL ENGINEERING**

Fuel Line Rupture, Resolute Bay, NU
Fuel Tank Leak, Sanikiluaq, NU
Fuel Tank Leak, Qikiqtarjuaq, NU
Fuel Tank Leak, Kimmirut, NU
Hazardous Material Removal, Kugaaruk, NU
Land Farm, Kugaaruk, NU

SIGNIFICANT BUILDINGS DESIGNED in Southern Canada

- ♦ **North Mountain House**, Annapolis Valley, NS
Design/Build: super-insulated, passive solar house. Featured in Canadian Mortgage and Housing Corporation's FlexHousing Professional Guide, 2000
- ♦ **Krolman House**, White Point, NS
Design/Build: Unique custom home by the sea. Designed and milled interior trim, mantle piece, eyebrow dormer window, red cedar deck.
- ♦ **Krause passive solar flex house**, Wolfville, NS
Design and structural engineering: Passive solar house designed to grow and adapt with different occupants. Heats with approximately ½ cord of wood each year.
- ♦ **Donovan Swimming Pool Enclosure**, Wolfville, NS
Design and structural engineering: Pre-cast reinforced concrete and steel Greek Revival structure
- ♦ **La Pirogue Fisheries Museum**, Cheticamp, NS: Structural Engineering (steel, reinforced concrete, heavy timber)
- ♦ **Acadia Cinema**, Wolfville, NS:
Design and structural engineering for second floor renovations in reinforced concrete T-beam floor.
- ♦ **King-Edwards Renovation**, Montreal, PQ:
Complete redesign/construction of three-storey stone house in centre-ville Montreal in the tradition of Victorian architecture
- ♦ **Hopgood House**, Port Williams, NS:
Design of Gothic revival period piece with gingerbread bargeboard gable trim, copper galvalume roof.
- ♦ **St. Stevens Church**, Lachine, PQ
Design/build: Two new massive front doors in white oak for historic Anglican Church.
- ♦ **Norman House Renovation and Patients' Entrance**, Canning, NS
Design/build: Restoration in Brazilian Mahogany and red elm. Patients' Entrance an eyebrow dormer.

MISCELLANEOUS DESIGN

- ♦ **Zimmerman off-grid home**, Digby, NS
Design/erection: 10 kW 48V wind turbine, battery storage with PV array connect capabilities. Pre-heating of hot water with excess energy.
- ♦ **Various On-Site Sewage Disposal Systems**, throughout NS
Designs and Quality Assurance of contour bed fields, slow sand filtration, etc.