Hope Lake Nunavut - Site Assessment, Development of Site Specific Criteria, Remediation Design & Tendering

Presented By: Abbas Syed, M.Eng., P.Eng.

RemTech - October 19, 2012

creating & delivering | BETTER SOLUTIONS

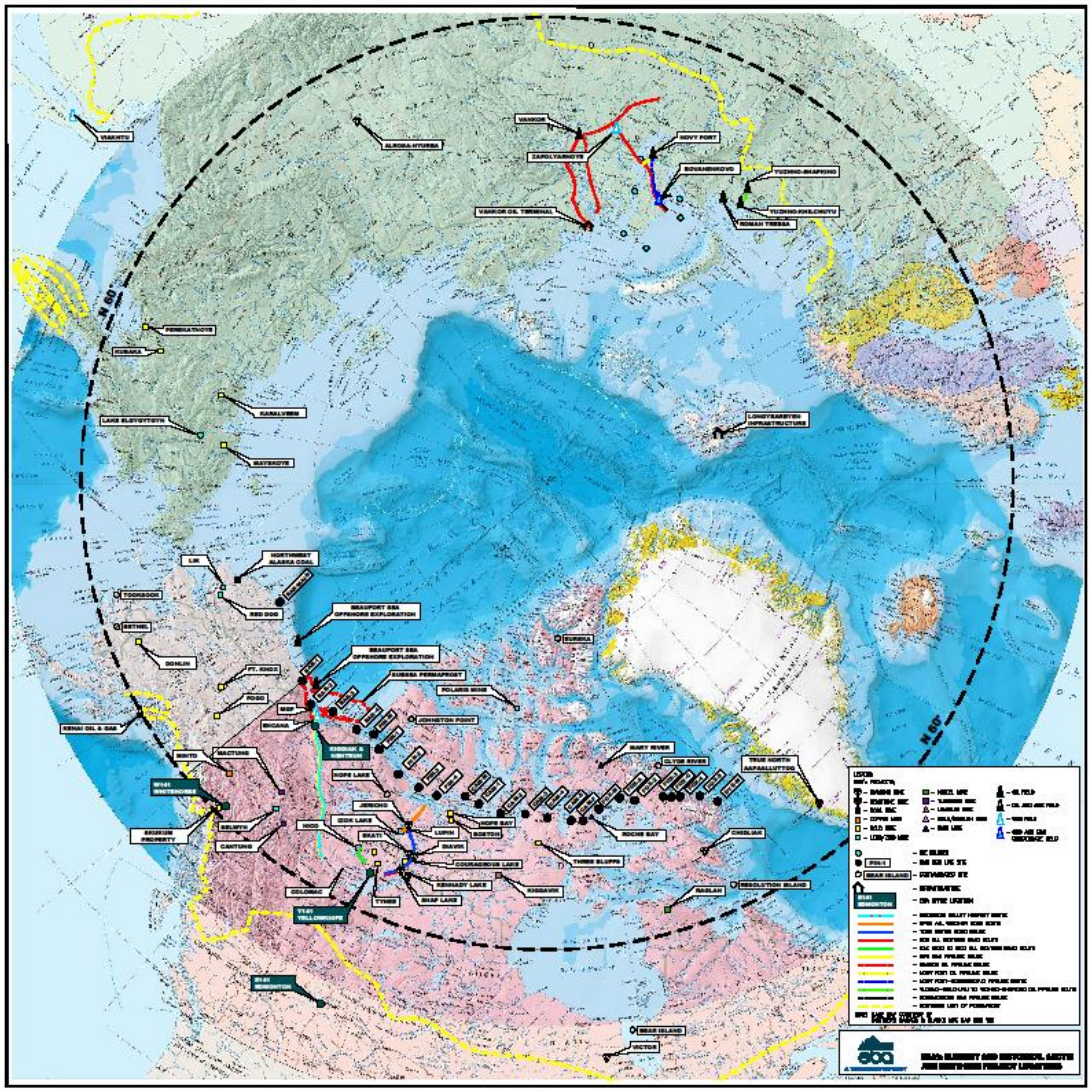
Overview of Presentation

- EBA Engineering Consultants Ltd., A Tetra Tech Company
- Hope Lake Project Site Location and History
- 2008 Environmental Site Assessment
- 2010 Environmental Site Assessment
- Quantification of on-site environmental impacts
- Major challenges
- Remediation option analysis
- Project added value
- Future Work
- Questions

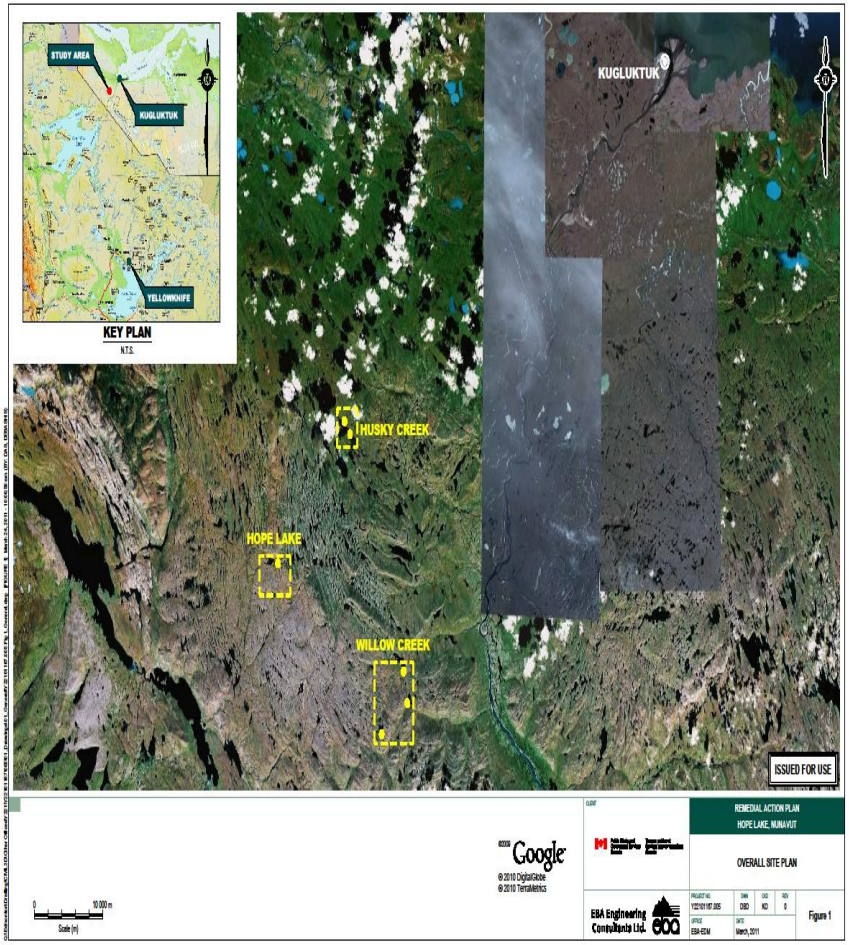
EBA Engineering Consultants Ltd., – A Tetra Tech Company - Introduction

- Established in 1966
- Based in Edmonton, Alberta
- Worked in the Canadian Arctic for more than 45 years
- 11 offices in AB, NWT, Yukon, BC and satellite offices in Regina and Ottawa
- A partner with Kiggiak, Nehtruh, Norman Wells Claimant Corporation, 5658 NWT Ltd., Ne'Rahten Development
- EBA acquired by Tetra Tech in August 2010
- Over 13,000 personnel

Selected EBA Northern Projects Conducted by EBA



Hope Lake Site History and Location



History

- **Three sites involved**: Hope Lake, Willow Creek, and Husky Creek
- **Hope Lake Nunavut area**: Copper mining exploration site since 1929
- **Hope Lake includes**: Coppermine River Ltd. (CRL) Camp, Hearne Camp and New Camp
- **Features**: Fishing, hunting, recreation, flora, fauna and tundra

Location

- **Hope Lake** - 75 km SW of Kugluktuk, Nunavut
- **Willow Creek** – 65 km SW of Kugluktuk, Nunavut
- **Husky Creek** – 55 km SW of Kugluktuk, Nunavut

2008 Environmental Site Assessment (ESA)

Client	Public Works and Government Services Canada (PWGSC) on behalf of Aboriginal Affairs and Northern Development Canada (AANDC)
Project Name	Integrated Phase I and II ESAs
Samples Collected	Soil, sediment, surface water, paint and building materials
Findings	Hydrocarbon impacted soil, anthropogenic metals contamination, hazardous and non-hazardous waste identified
Recommendations	Further delineation of identified impacts

2010 Environmental Site Assessment (ESA)

- Data Gap Analysis
- Phase III ESA, hazardous and non-hazardous materials audit, geotechnical evaluation, and archaeological investigation
- Characterize and quantify all hazardous and non-hazardous wastes
- Soil, sediment and water assessment
- Sampling at previously identified impacted areas in 2008 and background sampling for metals
- Bioinventory of Flora and Fauna
- Identification of borrow sources, potential landfill and landfarm locations

Current Site Conditions – Husky Creek

Areas of Potential Concerns (APECs)

- Can cache
- Propane cylinders
- Barrels
- Scattered debris
- Solid material
- Metal debris
- Surficial stains
- Leachable lead paint
- Compressed air cylinders

Major Findings

Soil

- Petroleum hydrocarbon fractions F1-F3

Other Issues

- Solid material, liquid material, and empty drums (non-hazardous)
- Leachable lead paint on drums (hazardous)

Site view (Husky Creek)

Pump parts, pulley system, heater

Can cache

View of shoreline with debris area

Bombardier snow machine

Current Site Conditions – Willow Creek

Areas of Potential Concerns (APECs)

- Drum cache
- Scattered debris
- Surficial stains
- Collapsed building
- Can cache
- Burn pits
- Fiberboard
- Insulating material
- Batteries

Major Findings

Soil

- Petroleum hydrocarbon fractions F2
- Burn pits - metals mainly Zinc

Other Issues

- Solid material, liquid material, drums (non-hazardous)
- Asbestos containing insulating material, batteries, leachable lead paint on drums

Site view (Willow Creek)

Aerial view looking south

Aerial view float plane dock

Drill core boxes with drill core

Drums with leachable paint

Current Site Conditions – Hope Lake

Areas of Potential Concerns (APECs)

- Drum caches
- Petroleum, oil, lubricant tanks
- Collapsed building
- Light ballasts
- Waste
- Wood debris
- Calcium chloride bags
- Fluorescent lights
- Caterpillar

Major Findings

Soil

- Petroleum hydrocarbon fractions F1-F4
- Metals mainly arsenic, copper, chromium, nickel, lead, vanadium, zinc and barium

Other Issues

- Non-hazardous solid material, liquid material, tanks, drums
- Hazardous light ballast, fire extinguisher, fluorescent lights, electrical insulators, leachable lead paint, asbestos containing mastic, drilling fluid containers

Site view 1 (Hope Lake)

Aerial view

Test pit

Fuel tanks (3,700 L)

Bulk fuel ASTs (75,000 L)

Site view 2 (Hope Lake)

Scattered debris

Drum cache and caterpillar

Drum culvert

Test pit for borrow area

Quantification of On-Site Impacts

- **101 m^3 of metal contaminated soil**
- **1,762 m^3 of petroleum hydrocarbon contaminated soil**
- **5.7 m^3 of asbestos**
- **9,500 L of liquid non-hazardous waste**
- **16,800 L of liquid hazardous waste**

Criteria Used to Narrow Remedial Options

- Determination of hazardous (asbestos, organic liquid, pressurized cylinders, fire extinguishers, leachable paint and other solid) waste
- Determination of non-hazardous (wood, aqueous liquids and other solid) waste
- Determination of metals impacted soil
- Determination of hydrocarbon impacted soil
- Identification and evaluation of preferred disposal options

Remedial Options Analysis

- **Kepner Tregoe evaluation process**
  - Situation appraisal
  - Problem analysis
  - Decision analysis
  - Potential problem analysis
  - Weighted attributes includes cost, effectiveness in meeting goals, ease of implementation, regulatory acceptance, community acceptance, loss of natural capital, and timeframe for remediation

Major Challenges

- Logistical issues
- Limited site access
- Limited heavy equipment available in community
- Permafrost
- Achievement of delineation
- Short summer season
- Extreme weather

INAC Abandoned Military Site Remediation Protocol (2008)

- Chapter 4 – *Protocol for Evaluation of Hydrocarbon Impacted Areas in the Abandoned Military Site Remediation Protocol (AMSRP), Volume II – Technical Supporting Documentation (INAC, 2008)* was prepared by EBA
- Intended to provide modified hydrocarbon remediation criteria for the DEW Lines Sites in the Arctic Region

Human Health and Ecological Risk Assessment

Objective

- Determination of on-site contaminant Risks to Human and Ecological Receptors
- Development of site specific guidelines
- Risk Assessment used the data collected during 2008, 2010 for:
  a) Soil
  b) Sediments
  c) Soil invertebrates
  d) Vegetation
  e) Small mammals and wildlife

Potential Receptors

- Human Receptors
  i. On-site workers for site remediation
  ii. Inuit hunters
- Ecological Receptors
  i. Shrews
  ii. Lemming
  iii. Snowshoe Hare, Weasels, Wolves, Arctic Fox
  iv. Grizzly Bears
- Exposure pathways assessed were ingestion and dermal and vapour inhalation and potable groundwater pathways were excluded

Development of Site Specific Criteria

Contaminants of Concern	CCME Criteria (mg/kg) in Soil	Site Specific Target Level (mg/kg) in Soil	Exposure Pathway (Protective of)
Copper	63	580	Ecological Health
F1	210	2,500	Terrestrial Wildlife
F2	150		Terrestrial Wildlife
F3	300		Terrestrial Wildlife
Vanadium	130	310	Ecological Health

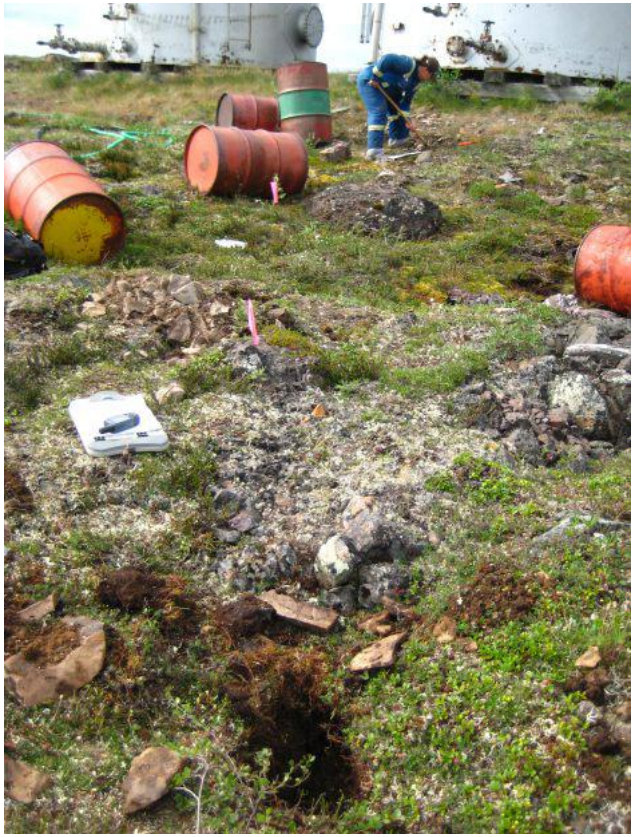
Type B Soil: Sum of PHC F1 to F3

Project Added Value

- Site Assessment was completed with remedial action plan
- Reduce the environmental liability and maximize the benefits to the local community
- Site specific criteria was used in conjunction with the remedial action plan to avoid major disturbance
- The usage of site specific criteria reduced the contaminated soil volume by 94%

Future Work

- **Remediation of the site starting this winter (2012 – 2013)**
- **Mobilization to the site December 2012**
- **Remediation in Summer 2013**
- **Demobilization in Winter 2013**



Thanks for your attention

- Questions???