Overview of Study

STUDY OF WASTE MANAGEMENT SYSTEMS IN THE NORTHWEST TERRITORIES

• Site visits completed to 31 waste management sites across the NWT in 2014 and 2015 to provide consistent assessment of conditions and gather data for evaluation
• Identified site conditions, compared design and operational approaches, waste collection and diversion
• Assessed waste management costs including staff and equipment
• Developed recommendations to provide a framework for NWT-wide management of waste
• Highlight and evaluate priority issues for consideration by Territory, communities, Land and Water Boards and public
Communities and Physiography

- 33 communities
- Total population ~43,600 (2014)
- Majority (78%) in south, notably Yellowknife (~19,200)
- Community populations range from medium sized “hubs” (1,000 to 4,000) to smaller, often remote communities (~50 to 1,000)
Transportation Network - Northwest Territories

- Paved roads limited to major communities in south
- Seasonally limited gravel highways in some areas
- Seasonal ice roads and river crossings
- Seasonal barge access only for remote communities
Temperature and Precipitation

- Climate in the populated part of NWT ranges from cool to arctic (Average Annual Temperatures -20 to -5 °C) and from dry to arid (Precipitation 140 to 400 mm annually).

- Overall, from a leachate impact perspective, generation potential is low compared to a “typical” southern landfill.

- Climate is changing rapidly, warming over 2°C since 1970s; increased frequency and larger precipitation events.
Permafrost Distribution

- Permafrost defined as rock or soil that remains below 0°C for at least two consecutive years.
- Broad regions represent variations in permafrost; are rapidly changing due to warming.
- Limited in the southern part of the NWT.
Waste Generation

- Waste generation in NWT poorly understood other than in Yellowknife, due to minimal auditing and weigh scale data:
  - Yellowknife (including CRD) 1495 kg/p/y
  - Yellowknife (excluding CRD) 831 kg/p/y
  - Medium sized communities 633 to 1028 kg/p/y
  - Small communities 550 to 649 kg/p/y

- Generation formula based for other communities; some based partly on collection volumes
- Are somewhat higher than comparative communities in south
- Waste systems are closed (no other disposal options)
Waste Segregation and Reduction Programs

GNWT regulates:

- Single-use retail bags
- Beverage containers
- Waste electronics
- Guidelines for Management of Hazardous Waste

Support for:

- Household Hazardous Waste collection in communities
- Community compost initiatives
Licencing, Operations, Staffing

- Landfill sites approved under Water Licence process managed by Land and Water Boards; 24 communities do not have a licence
- Operations and Maintenance Plan provides guidance to site operation; often out of date or not completed
- Size of community dictates resources, equipment and staff availability
- Funding of landfill site operation from general revenues
- Many staff are trained through GNWT and SWANA programs
Landfill Siting and Design

• Typically located within 500 m to a few kilometres from community
• Most are near to a water body, although not commonly within water source catchment
• With a few exceptions, the landfills are all natural attenuation design
• Lined (geosynthetic) landfills in Yellowknife, Tuktoyaktuk
• Typically designed for a site life of 20 years or more
• Final soil cover to shed precipitation; in areas of continuous permafrost may act as transition layer
should this slide be moved after the typical slides (e.g. current slide 14)?
Hoffarth, Laurel, 2018-05-09
Typical Landfill Site Layout

Typically combine landfills with:

- CRD Waste
- Wastewater
- Land-farming
- Sludge
- Bulky material segregation
Waste Segregation

Materials at the waste sites are usually segregated into following categories:

- Municipal Solid Waste (MSW)
- Construction, Renovation and Demolition Waste (CRD)
- Clean wood and brush
- Bulky metals
- White goods
- End-of-life vehicles
- Hazardous and Special Waste (Used Oil, Antifreeze)
- Batteries
- Empty drums, gas cylinders
Storage of Bulky Metal, Vehicles and Drums

LARGE AREAS OF SITE TAKEN UP BY “STORAGE”
Typical “Area Fill” Landfilling Operation

LARGE AREA, SEASONAL COVER
Typical “Trench Fill” Landfilling Operation

CONTROLLED AND SMALL FILL AREA
MSW Landfill Site Observations

- Divertible or burnable material, Hazardous Waste and HHW often mixed in with MSW
- CRD waste accounts for a large proportion of the area of the site, occasionally used as cover, not considered in site lifespan
- Bulky metals, vehicles are “stored” in some cases for a decade or more
- Hazardous liquid waste “stored”, significant expense to remove, notably from remote communities
- Bulky materials end up being buried at closure of the landfill site
- Waste often placed over entire area of cell, rather than in smaller working face
- Compaction and cover limited in some cases, windblown litter common
- Gates usually present, partial fencing, inoperative electrified fencing
Waste Site Operational Issues at Some Sites

**MIXED WASTE, NO DEFINED WORKING FACE**
Hazardous Waste Containment Varies

BARREL CONDITION, CONTAINMENT DESIGN CHALLENGES
Hazardous Waste Storage
Wildlife Controls

OPERATING FENCING TO LIMIT WASTE AS A FOOD SOURCE

Unauthorized Resident
Key Operational Issues

The following represent items which are site specific or can be managed through operational changes:

• Hazardous waste storage, notably legacy waste, is one of the largest environmental risks

• Mixing of hazardous materials within the MSW cell

• Active areas often too large

• Limited covering and compaction in some cases, limited by staff, equipment or quarry limitations

• CRD and bulky waste disposal not accounted for in site life
I feel like you could split this up into issues identified in the desiging, siting and operations... although some fall into all three categories.
Key Management / Planning Issues

The following represent items outside of local operational control:

- **Scale** – Costs to manage MSE are much higher per capita ($50 to $350)
- **Transportation** – Many communities are remote, seasonally inaccessible; limits options for shared services and alternative disposal
- **Funding** – Typically largely funded by GNWT
- **Unfunded Cost** - Legacy waste management is largely unfunded
- **Diversion** - Remote communities limited in options to participate fully in waste diversion
Opportunities
Opportunities – Site Management and Design

- **Water Licence** - Consistent use and compliance relative to design, Operations and Maintenance Plan and annual reporting
- **Limit Active Area** – Cell design to consider seasonal covering with interim or final cover
- **Operator Training and Community Education** – Focus on compaction/cover operation and diversion at source (CRD?)
- **Centralized Waste Management** - Consider regional waste management where practical, including transfer stations for smaller communities and centralized waste disposal
- **Site Security** - Improve fencing and access control at sites to limit wildlife and unauthorized/unsupervised disposal
- **Update Landfill Design** – Recent Guidelines developed for consistency
Opportunities – Hazardous Waste

- **Storage** - Improve hazardous waste storage and containment; store in area with frequent supervision
- **HHW** - Encourage segregation of HHW through community collection, organized depot
- **Manifesting** – Develop and enforce consistent manifesting of all hazardous waste
- **Legacy Hazardous Waste** – Develop funding and prioritization to stabilize and ship out legacy waste materials
- **Drums** – Develop empty drum drainage, crushing and management program to reduce environmental risk and space; potentially ship with legacy waste or ELV
- **ELV, White Goods** – Develop updated market analysis or partnership to remove from communities
Opportunities – Waste System Planning

• **Waste Management Strategy** - Development of a long-term strategy including community input (currently in process); additional diversion and reduction approaches under consideration

• **Waste Generation Data** - Implement landfill volume survey and weighing at selected communities to generate realistic inputs for future site design and management

• **Waste auditing** – Develop understanding of non-MSW materials within waste stream

• **Funding** - Separate waste management from general community funding based on funding model developed by GNWT

• **Construction Contract Conditions** – Reduce volume of material from construction and demolition projects through contract conditions

• **Bulky Waste** – Develop programs to manage bulky materials including ELV, White Goods, etc. and consider funding model from new purchases / EPR
Thank You