



GOLDER

# Waste Management in the Northwest Territories

2018 SWANA NORTHERN LIGHTS  
CONFERENCE, EDMONTON, ALBERTA

May 10, 2018

# Overview of Study

## STUDY OF WASTE MANAGEMENT SYSTEMS IN THE NORTHWEST TERRITORIES

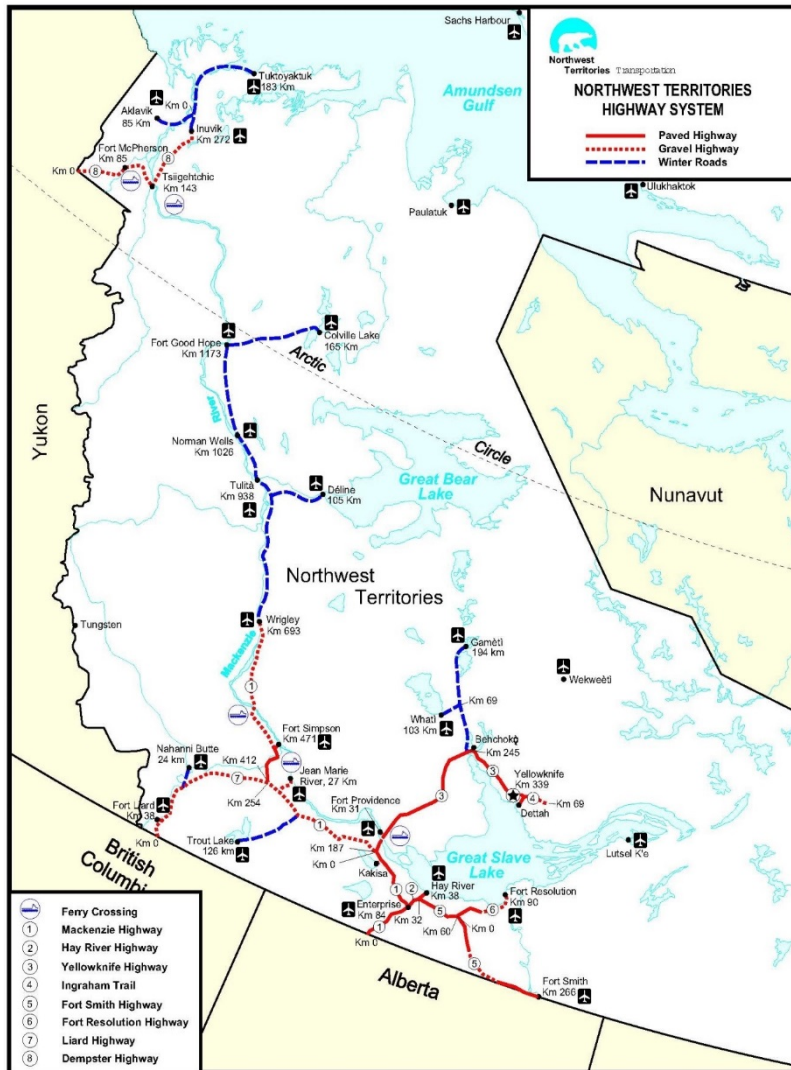
- Site visits completed to 31 waste management sites across the NWT in 2014 and 2015 to provide consistent assessment of conditions and gather data for evaluation
- Identified site conditions, compared design and operational approaches, waste collection and diversion
- Assessed waste management costs 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)

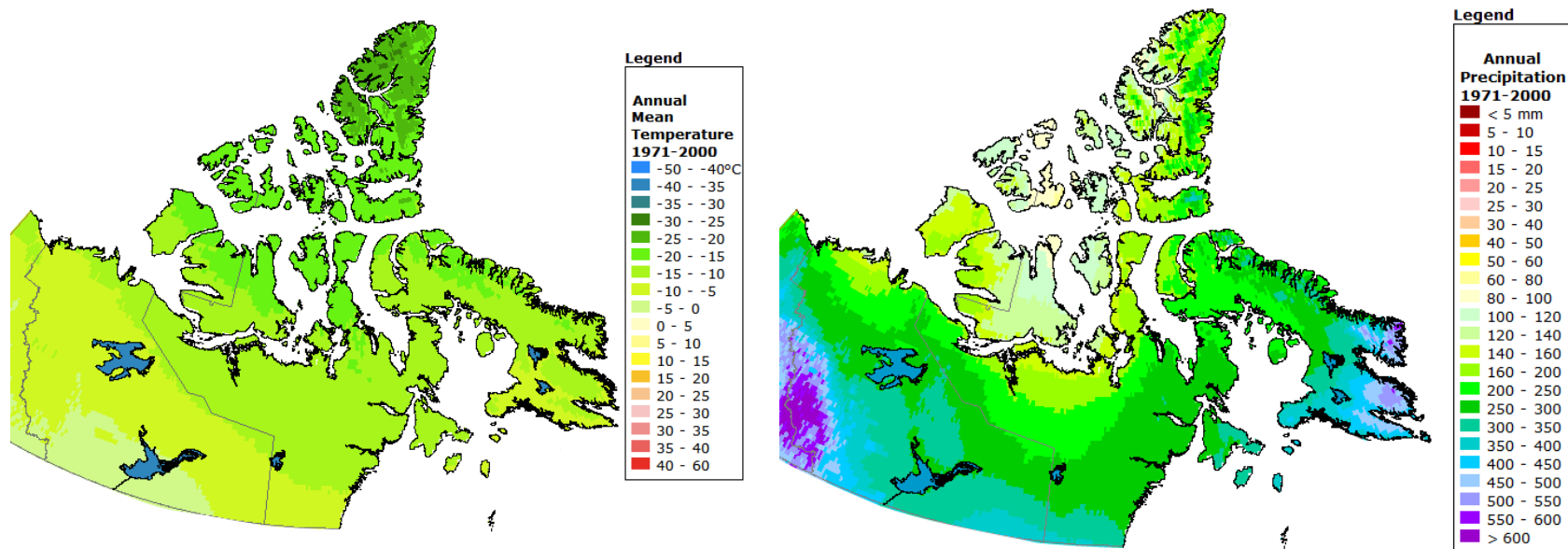
# Transportation Network - Northwest Territories



- 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

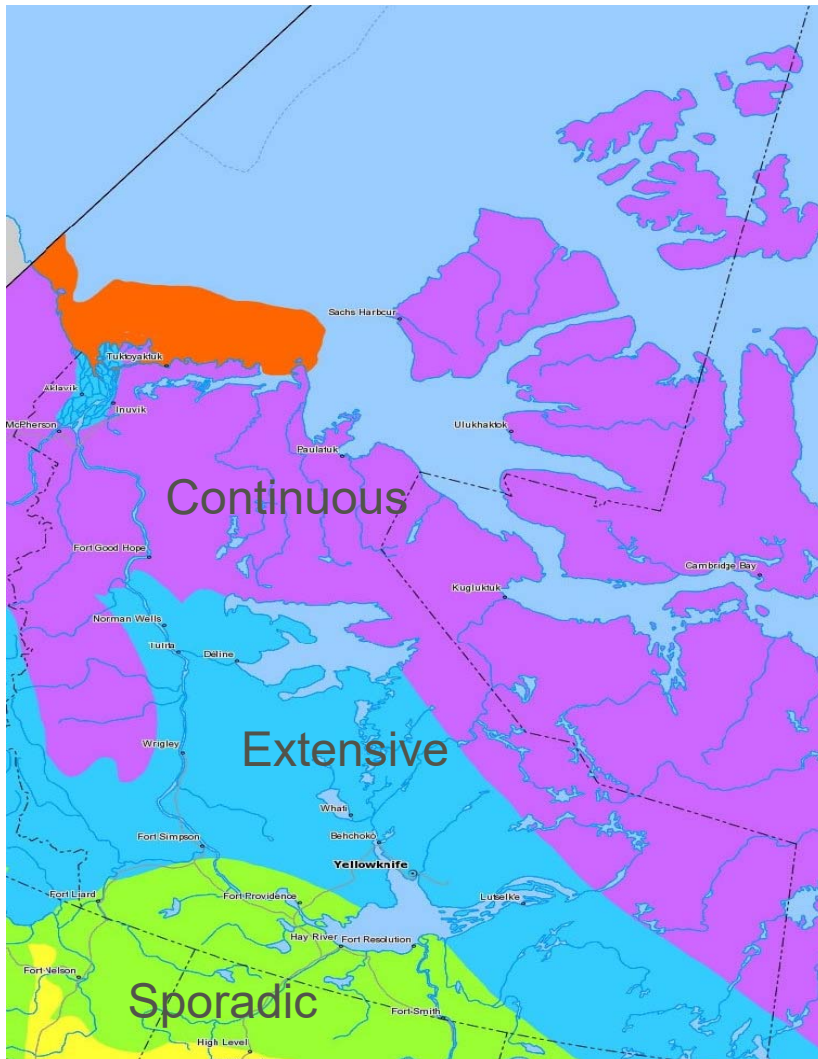


# Temperature and Precipitation



- 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

## Slide 10

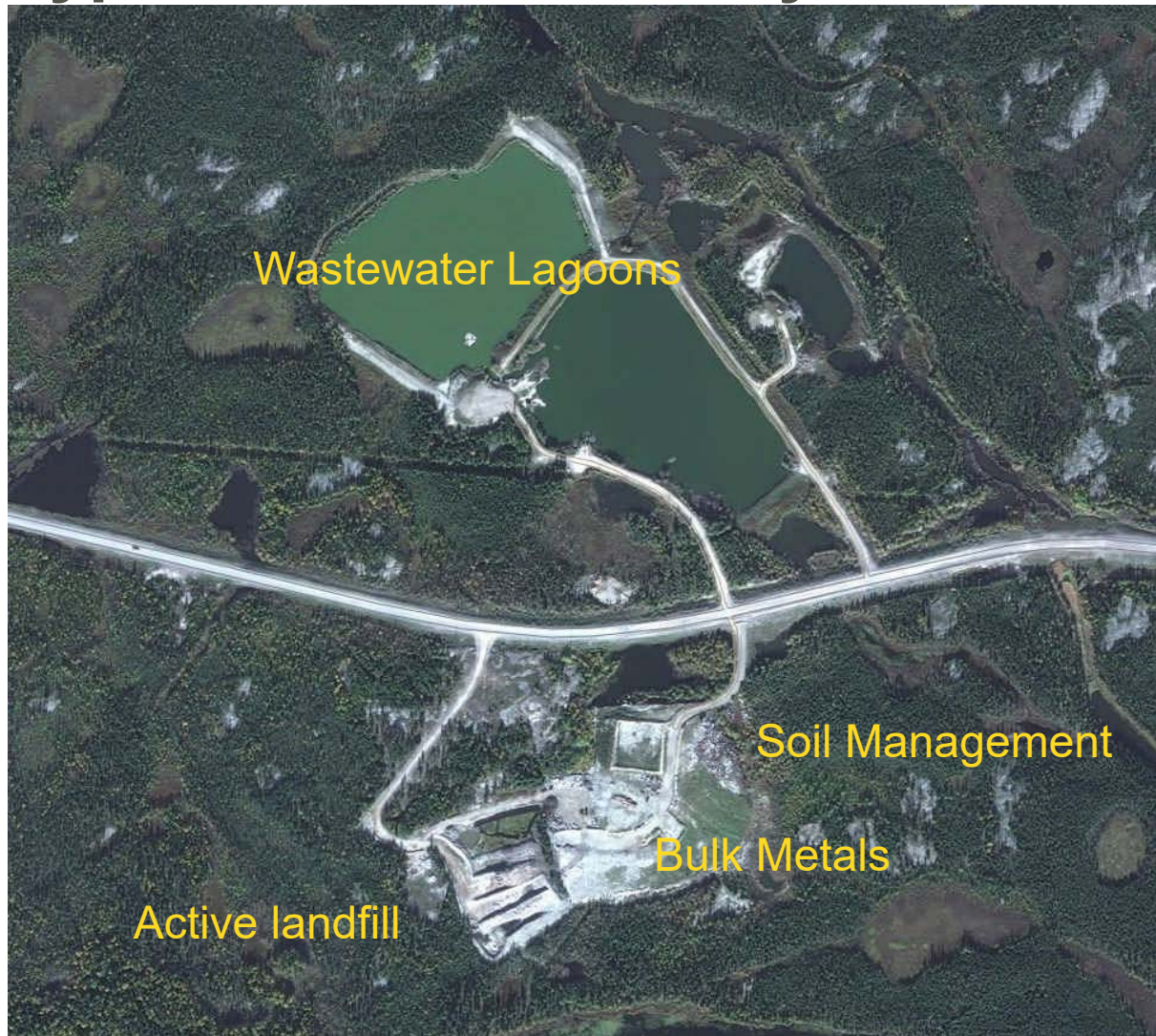
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**HL7**

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





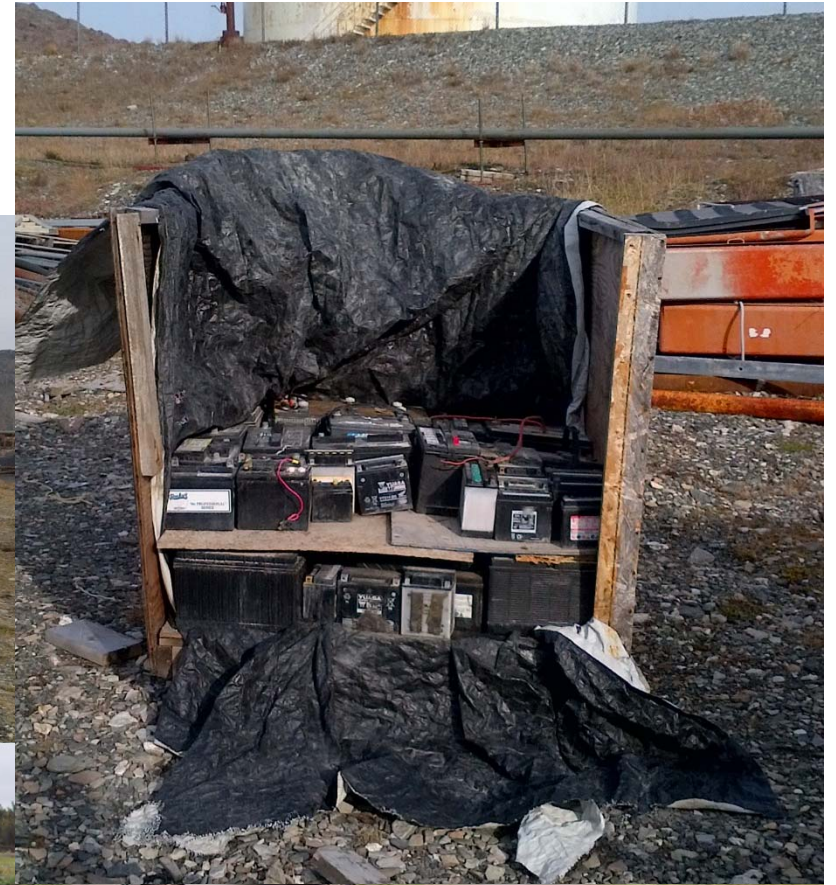
# Hazardous Waste Containment Varies

BARREL CONDITION, CONTAINMENT DESIGN CHALLENGES





# Hazardous Waste Storage





# Wildlife Controls

## OPERATING FENCING TO LIMIT WASTE AS A FOOD SOURCE



## 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

## Slide 21

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### HL22

I feel like you could split this up into issues identified in the desing, siting and operations... although some fall into all three categories

Hoffarth, Laurel, 2018-05-09

# 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





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# 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**