SWANA Northern Lights Chapter

EXTINGUISHING THE IQALUIT LANDFILL FIRE

Winnipeg
May 20, 2015

Prepared by:
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Landfill Fire Control Inc.
Extinguishing the Iqaluit Landfill Fire

AGENDA

• Site History
• Fire History
• Field Investigation
• Extinguishment Options
• Extinguishment Plan
• Implementation
• Risk Reduction
June 19 – Fire Spread across entire Old Phase, Day 31
On most days smoke blowing north or south - June 28
Smoke Impacts at Airport
Smoke from dump fire Drifting Into Town – Day 31 June 19
Noticeable impacts in town (23 ug/m3 PM2.5)
Site History

- Landfill established in 1995
- Currently receives approx. 9,000 tonnes of MSW
- Operated by City of Iqaluit
- Little to no soil cover
- Footprint is limited, garbage is being placed with very steep side slopes
- Extreme risk of spontaneous combustion
2010 Fire took 5 weeks to extinguish, overhaul used. Rough estimate that pile contained 10,000 m³.
Fire 6 Reported – May 20, 2014 Day 1
Same Problem Corner as Fire 3, pile now contains 50,000 m³
Fireguard completed – Day 2
Iqaluit FD Resources: 20 full time, 15 volunteers, pumper, ladder, 3 EMS
Residents wanted the fire extinguished
Air Photo for Hercules
June 29th, 2014

- Old Phase
- Phase on Fire
- Fuel Tank
- Quanset Hut
- Active Face
- Fire Break
Fire Time Line

- **Six fires since 2010**
- **Most Fires in same area “problem corner”**
  1. September, 2010 (5 weeks)
  3. December, 2013
  5. March, 2014
  6. May 20, 2014

- **LFCI Mobilized June 28th, 2014**
- **LFCI Suppression Plan Completed July 1, 2014**
- **Hellfire Mobilized to Site August 31st, 2014**
- **Fire Extinguished Sept. 16, 2014**
The problem

• LFCI suspected that deep seated landfill fire has been burning since December, 2013.
• Extinguishment of deep seated landfill fires is very difficult.
• Fire Dept. resources are not set up and do not have the equipment or training to fight landfill fires.
• Multiple attacks are often required to fully extinguish a deep seated landfill fire.
• June 11, 2014 Council resolved that fire be extinguished as soon as possible with assistance of experts and help from Government of Nunavut.
Particulate levels very high at landfill (downwind)
PM 10 in smoke 7500 ug/m³ (42,000 ug/m³ highest)
<table>
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<tr>
<th>Color</th>
<th>Air Quality Rating</th>
<th>1-Hour Average (μg/m³)</th>
<th>24-Hour Average (μg/m³)</th>
<th>Actions to take</th>
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<td>Green</td>
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<td>0 - 19.9</td>
<td>0 - 15.4</td>
<td>• No health impacts are expected when levels are within this range.</td>
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<td>Yellow</td>
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<td>• Unusually sensitive people, such as those with asthma, should consider limiting prolonged outdoor activity.</td>
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<td>Orange</td>
<td>Unhealthy for sensitive groups</td>
<td>60 - 99.9</td>
<td>40.5 - 65.4</td>
<td>• Active children and adults as well as people with respiratory disease, such as asthma, should limit prolonged outdoor exertion.</td>
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| Red     | Unhealthy          | 100 - 249.9            | 65.5 - 150.4            | • Everyone, especially children, should limit prolonged outdoor exertion.  
|         |                    |                        |                         | • People with respiratory disease, such as asthma, should avoid prolonged outdoor exertion. |
| Purple  | Very Unhealthy     | 250 - 499.9            | 150.5 - 250.4           | • Everyone, especially children, should limit outdoor exertion.  
|         |                    |                        |                         | • People with respiratory disease, such as asthma, should avoid all outdoor exertion and limit exposure by staying inside (air conditioned spaces are best). |
| Maroon  | Hazardous          | 500+                   | 250.5+                  | • Everyone should avoid any outdoor exertion. |
Bi-Law Station

- VOCs
- PAHs
- PM 2.5 (nephelometer)
- NO2
- O3
- CO
- SO2
HC’s Preliminary Report

- Airpointer data June 14th-18th
- All 24hr [X]averages below health standards
  - Had a 2hr spike of 35 μg/m³
Assessment of Smoke Impacts

- **Prevailing wind directions usually keep smoke out of town.**
- **Strong winds usually provide a lot of dispersion, reducing concentrations.**
- **Available Environment Canada monitoring shows mostly no impact with few events of moderate impact.**
- **Airport site is downwind more often, requires additional monitoring.**
- **Air quality at landfill site is problematic. All staff at site to wear appropriate respiratory protection.**
LFCI Analysis of Fire History

- Operations and Fire history reviewed.
- Fire burning over previously combusted material
- Fire is deep seated
- Landfill operations do not use best practices
  - Excessively steep slopes
  - Inadequate cover to no cover
  - No clean up and recompaction after fire extinguished
  - Re-ignition of fire through spontaneous combustion very likely
Composition – lots of ash and inerts
Strategies for extinguishing “DUMPCANO”
Extinguishment Strategies – Used in past and suggested

• Do nothing (not an option, too long)
• Bury with Dirt (possible collapse risk, steep slopes)
• Water Saturation (geometrically not possible)
• Inject Water (horizontal rig??)
• Overhaul
• Overhaul with Dirt Cover
• Carbon Dioxide/Nitrogen (not practical, logistics)
• Surface Foam Blanket (loss of blanket over time, costs)
• Inject Foam (Canadrill technology)
More unconventional extinguishment strategies suggested by public

- Geomembrane Cover (melts, wont work)
- Geomembrane Welders Tarp (fire resistant tarp, placement impossible, seams not possible)
- Water Bombers (will not work fire deep, will run-off)
- Sea Ice / Ice Burial (environmental damage, slow)
- Accelerated Burn
- Accelerated Burn with Diesel (not acceptable)
- Blow up with Explosives (can’t be controlled)
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Site Investigation – June 29th

- Excavated 3 test pits to assess:
  - Nature of waste
  - Amount of Inert
  - Temperature at depth
  - Potential for accelerated burn
  - Particulate release during work
Excavated 3 test pits 3 – 4 m deep
Cost of Overhaul and Quench

- **Equipment (7 pieces)** $24,500 / day
- **Manpower (13 workers)** $14,550 / day
- **Supplies** $17,733 / day

**Daily Cost:** $56,783 / day

**Daily Production** 1,000 m³

**Number of Days** 60

**Total Cost** $3,407,000
Extinguishment Action Plan

- Secure funding for $2 to $3 million in fire suppression effort.
- Commence drafting health and safety plan for protecting fire fighters and contractors.
- Mobilize Hellfire Suppression and Tower Arctic
- Establish Water Supply and Quenching Pond
- Commence Overhaul
- Compact extinguished material and cover
- Demobilize
- Treat leachate
Fire Fighting Resources

• **Heavy Equipment**
  - 2 medium excavators
  - 1 large excavator
  - 1 Dozer (D7 or larger)
  - 1 Loader
  - ($24,500 @ $400/unit on 10-12 hr days)

• **Fire Suppression**
  - 3 monitors (500 to 1,000 GPM)
  - 2 low head, high volume diesel pumps
  - 2 high head pumps capable of 1,000 GPM
  - 4” manifold system and hose
  - 10 day supply of Class A foam at 1%
Tower Arctic Contracting at work
Required Resources

- **Manpower**
  - Incident Command Team (3 people)
  - 6 fire fighters from Hellfire
  - 2 fire fighters from Iqaluit FD
  - 4 Equipment operators (plus 2 spares)
  - 2 Security
  - Total 17 to 20 people

- **Logistics**
  - Command Post
  - radios – common frequency
  - Equipment storage
  - Food supply
Hellfire Quad Pod Monitor – 1200 GPM
Start-Up

- Health and Safety Orientation
- Establish Command Post
- Clear staging areas
- Establish water supply
- Construct Quenching Pond
- Prepare Extinguishment Laydown Area
- Prepare fire water system
- Prepare 4,500 m³ lined drafting pond (1,500 GPM 2 days supply)
- Commence overhaul
Nearest Creek 2 km away
Lined Water Supply Pond
Daily Operations

- Safety Briefing
- Overhaul Operations
- 15 minute break every two hours
- 30 minute lunch break
- 10 to 12 hours of productivity
- Target productivity 1,000 m³/day, but may be much slower if lots of heat and dry ash
- Volume roughly estimated at 50,000 m³
Fire Fighter and Excavator working fire
Saturation in Quenching Trench
Actual Cost of Overhaul

- Hellfire Fire Fighters $1.0 million
- Arctic Tower Contracting $800K
- Project Managers $200K
- Public Works $300K
- Iqaluit Fire $115K
- Retention Ponds $750K
- Flights $600K
- Logistics $200K

Total Cost $3.965 million

LFCI Estimate $3.407 million
Avoiding Future Problems

• Landfill not operated following best practice.
• Operations virtually guaranteed this problem would happen.
• In future you MUST reduce slopes to 3H:1V.
• In future you MUST build landfill in cells.
• In future you MUST cover cells with 300 mm of DIRT.
• In future you should divert cardboard and clean wood and periodically burn it or compost.
• In future you should recycle and ship plastics back.
Lessons Learned

• Avoiding compaction and good soil cover is penny wise but pound foolish.

• Landfill fires overwhelm small town fire dept. resources, mutual aid critical.

• Landfill fires do not burn out on their own, they smoulder and smoulder.

• Air quality impacts near landfill will be severe, respiratory protection for all is critical.

• Extinguishment could cost millions, having a plan to secure funding is very important.

• Provincial and Federal Govt. provided only limited support.
Decisions you make today will affect your kids tomorrow.