Waterways Slope Stability

Presentation to the Wood Buffalo Recovery Committee
March 8th, 2017
Agenda

- Fort McMurray Slope Stability Program
- Waterways Slope Stability Background Information
- Waterways Slope Stability Results
- Summary of March 7th Here For You
- Next Steps
Fort McMurray Slope Stability Program

• Program is designed to perform slope stability analysis to assess the potential for failure of slopes in and around Fort McMurray

• Primary objective of analysis is to determine factor of safety of selected slopes, to predict if/when failure is imminent, and to assess remedial treatments when necessary
Fort McMurray Slope Stability Program

• Phase 1: Preliminary Assessment (to be complete March 2017)
  – Identify hills that might present potential slope stability issues, to classify hill in terms of their instability/stability and to rate the potential hazards they represent

• Phase 2: Immediate Action Plan for Remediation
  – Describe proposed immediate action plan for implementation of corrective measures as per Phase 1 findings
  – Produce technical specifications so Municipality can undertake corrective action
Fort McMurray Slope Stability Program

• Phase 3: Monitoring Program
  – Follow up on hill slopes classified as requiring close monitoring
  – Describe required activities for exploration, evaluation, instrumentation and monitoring equipment
Waterways Slope Stability Background

• Objectives
  – Determine relative stability of the slope after May 2016 wildfire
  – Assess potential of a slope failure that would impact public and private properties
  – Provide general guidelines for redevelopment of Waterways
  – Identify any constraints to redevelopment within the study area
Zone 1 – Blue Area

- Rebuilding can follow Municipality’s standard guidelines, from a geotechnical perspective
Zone 2 – Beige Area

- Suitable for redevelopment
- Site specific geotechnical investigation recommended for proposed buildings, to determine suitable development setback from crest of terrace sideslope
Zone 2A – Light Beige Area

- Not considered suitable for the construction of buildings
- No buildings in this area prior to fire
Zone 3 – Yellow Area

• Inherent risks with building in this area due to slope movements if careful planning, construction and maintenance are not followed

• Property owners planning to rebuild in this area should be aware of the risks and the special provisions required to rebuild
Zone 3 – Yellow Area

• Site specific geotechnical investigation required at time of development permit application
• Special Provisions Specific to Rebuild
  – No additional excavations into the slope (i.e. to create more space in back yard, for auxiliary building or bigger structure) other than what was previously permitted, unless approved by a geotechnical engineer
  – Finished grades should not be changed by more than 0.5 metres of the current grades
  – No swimming pools, decorative ponds and in-ground sprinklers systems
  – No stockpiling of material on the slope
Zone 3A – Red Area

- Most sensitive area
- High risk of ground movements could affect proposed development in this zone and in adjacent properties, if adequate stabilizing measures are not considered
Zone 3A – Red Area

- Municipality has three mitigation options for Zone 3A
  - Option 1: Warn and Restrict
  - Option 2: Construct community level structural mitigation
  - Option 3: Acquire, no development, mitigate
Zone 3A - Option 1: Warn & Restrict

• Site specific geotechnical investigation required at time of development permit application
• All Special Provisions for Zone 3 apply to rebuilding in Zone 3A
• Additional provisions for 3A include:
  – No uncontrolled excavations
  – Any excavated foundation must have the foundation walls designed as structural retaining walls capable of supporting the soils behind them
  – Excavation of the foundation should not be completed until the foundation walls are in place and capable of supporting the soils
Zone 3A – Option 2: Structural Mitigation

• Municipality would need to complete a comprehensive geotechnical investigation specific to this area

• Depending on findings above, Municipality could construct structural mitigation in the form of a series of retaining walls
  – Expand and improve existing retaining wall along Cliff Avenue from Tomlinson Street to Huggard Street and;
  – Construct a retaining wall along Lower Cliff Alley
Zone 3A – Option 3: Acquire, No Development, Mitigate

- Municipality could acquire, rezone to restrict development and mitigate the lots
- Some regrading and embankment construction within lots would be required to maintain the long term stability of the slope
- Not allowing development on these lots would likely decrease overall risk to Zones 1 and 3
Zone 3A – Summary of Options and Impacts
<table>
<thead>
<tr>
<th>Impact to Rebuild Timeline</th>
<th>Cost to Municipality</th>
<th>Cost to Resident (Approximate)</th>
<th>Effect on Slope Stability</th>
<th>Insurance Risk</th>
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</thead>
<tbody>
<tr>
<td><strong>Option 1: Warn and restrict</strong></td>
<td>Subject to individual lot geotechnical study, rebuild can proceed as soon as possible</td>
<td>No immediate cost</td>
<td>Lot level geotechnical + cost of piled foundation walls</td>
<td>Lot by Lot basis</td>
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<tr>
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<td>Potential future liability if any slope failure occurs</td>
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<td>Typical Foundation Cost: $40,000 - $45,000</td>
<td>Does not provide any improvement of slope stability for other zones</td>
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<td>Potential future liability if any slope failure occurs</td>
<td>Foundations of this type can range from $60,000 to in excess of $80,000</td>
<td>Residents may not be covered for additional costs as coverage is typically based on date of loss rather than date of rebuild</td>
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| **Option 2: Structural mitigation – series of retaining walls** | Comprehensive Pre-design study: $30,000 to $40,000  
Detailed Design: $40,000 to $100,000  
Construction cost: $8 to $16 million (TBC by study)  
Total: 8.07 million to 16.14 million + ongoing operating costs | Additional living expenses due to timing associated with construction of mitigation | Only protects affected lots within Zone 3A.  
Does not provide any improvement of slope stability for other zones | Formal letter to Insurance Industry requesting waiver on two year rebuild requirement |
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| **Option 3: Acquire, no development, mitigate** | Rebuild would not occur in this area, providing immediate certainty to property owners | Acquisition Cost: TBC by lot specific appraisal  
Geotechnical Cost: $10,000 to $20,000  
Regrading Cost: $1 million  
Total: TBC by lot specific appraisal | Resident may incur costs to relocation (i.e. purchase of a new property, moving etc.) | Regrading and embankment construction likely improves slope stability for Zones 1 and 3 | Formal letter to Insurance Industry requesting waiver on build in place requirement |
Zone 4 – No colour

• No Development allowed
• Slope areas appear to be more active than areas previously developed
• Promote re-vegetation to improve floor cover, reduce surface infiltration and erosion
Summary of March 7th Here for You
Next Steps

• Draft report will be finalized and made available for the public
• Property owners rebuilding in Zone 1 can proceed with permitting process and their rebuild
• Property owners within Zone 2 and 3 can proceed with lot level geotechnical investigation, permitting process and rebuild
• Council decision will be required on the mitigation option for Zone 3A