2014 Mine Design, Operations & Closure Conference

Lessons from Kennecott Utah Copper’s Manefay Slide
Cody Sutherlin, Manager Cornerstone Operations

April 2014
Rio Tinto Kennecott Overview

Asset details:
- Location: Salt Lake City, Utah, USA
- Ownership: Rio Tinto 100%
- History: RTZ acquired from BP in 1989
- Products:
  - Cu cathode (200kt per annum)
  - Molybdenum (10-30mlbs)
  - Gold (200k oz)
  - Silver (3moz)
  - Sulphuric Acid (900mt)

Operations:
- Open pit
- Mill & tailings
- Smelter
- Refinery & PM plant
- Acid plant
- Power plant
Rio Tinto Kennecott – Bingham Pit Mine
Before the Manefay Slide - April 9th 2013
After the Manefay Slide
East Wall Geology

Manefay

Congor

Winebago

Parnell

Fortuna Sill

September 2012
Incident Area

Expected Impact Area
10% of pit floor covered

Actual Impact Area
95% of pit floor covered
Pre-Incident Photo of West Pit Floor
Post-Incident Photo of West Pit Floor
P&H 4100 C Shovel
Komatsu 930 SE Haul trucks
Bingham Truck Shop
April 10, 2013

Employees were safely evacuated and accounted for with no injuries.

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Nine layers of protection

The Geotechnical monitoring system at the Bingham Canyon Mine provides nine layers of safety, mitigating a potentially catastrophic event during Manefay slide.

1) 800+ trained eyes everywhere
2) Routine documented inspections
3) IBIS slope stability radars
4) GroundProbe slope stability radars
5) 300+ Prism network and five RTS skyboxes
6) Time Domain Reflectometry
7) GPS Monitoring
8) Extensometers
9) Micro seismic array
IBIS radar Manefay data

IBIS Radar Manefay Movement

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Pre-incident movement zone

Consolidated movement estimated to exceed 100 million tons
**Daily Manefay Status Update**

**Thursday, April 4, 2013**

**Current Manefay Response Level is GREEN**

- Current ‘Upper Manefay’ overall movement rates are 0.50”/day
- Current ‘Lower Manefay’ overall movement rates are 0.55”/day
- Current Movement Trend: Steady
- Actions Required:
  - Reduce operational activity
  - Continue monitoring

**Friday, April 5, 2013**

**Current Manefay Response Level is YELLOW**

- Current ‘Upper Manefay’ overall movement rates are 0.60”/day
- Current ‘Lower Manefay’ overall movement rates are 0.60”/day
- Current Movement Trend: Gradual acceleration with localized increased
- Action Required:
  - Implement additional safety measures
  - Continue monitoring

**Wednesday, April 10, 2013**

**Current Manefay Response Level is ORANGE**

- Current ‘Upper Manefay’ overall movement rates are 2.6”/day
- Current ‘Lower Manefay’ overall movement rates are 2.6”/day
- Current Movement Trend: Increasing acceleration with localized rockfall

- Actions Required:
  - Close the upper 10% to all traffic
  - Evacuate the lower pit and suspend mining until further notice
  - Close the mine access road from the notch to 6190
    - Route essential traffic through the 4H road
  - Maintain spotters and sentries at key locations
  - Prioritize activities in alignment with Orange response
Infrastructure Relocation

44kv Electrical Line Relocation

Communication Tower Relocation
Building Relocation
Available Assets
Keystone Access
Daily Average Exceeded

68 Shovel
Producing Beyond Historical Rates

- 50ktpd
- 70ktpd
- 100ktpd
- 120ktpd
## Equipment Delivery

Support from our partners was critical to our success

<table>
<thead>
<tr>
<th>Total Equipment</th>
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<tbody>
<tr>
<td>Haul Trucks</td>
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<tr>
<td>Dozers</td>
<td>38</td>
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<tr>
<td>Drills</td>
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<td>Shovels</td>
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<td>Remote Systems</td>
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<tr>
<th>Manufactures and Suppliers</th>
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<tr>
<td>• Caterpillar</td>
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<tr>
<td>• Komatsu</td>
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<tr>
<td>• Joy Global (P&amp;H)</td>
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<td>• Hitachi</td>
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<td>• Arnold Equipment</td>
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<td>• TORC Robotics</td>
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<td>• ASI</td>
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<td>• Remote Control Technologies</td>
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Hitachi EX5600 Hydraulic Shovel Build
Hitachi Shovel Build Completed
Komatsu 930 SE Trucks in Pit Bottom
Komatsu 930 SE Truck Milestones

- First truck commissioned – June 30th
- First truck in pit bottom - July 26th
- Fourth truck in pit bottom - August 15th
- 20th truck commissioned - October 31st
Remediation Work

- +400ft Vertical Scarps
- Remaining Rock mass on slide plane – Poss. Of 20Mt failure
- Truck Shop Destroyed
- Pit Access Road Destroyed +1500ft
- More than 2000 vertical feet of covered benches
- Bottom of pit covered +300ft deep
# Remediation Timeline

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Plan: Yellow; Actual: Red
Head Scarp Mining – May 2013
Autonomous Drilling
Remote and Manned Equipment Working Together
Head Scarp Completion – November 2013
Remote Dozer Recovery

601 Remote Dozer
Remote Dozer Recovery
Bingham Shop Removal
Bingham Shop Removal With Remote Excavator
6690 Knob Remediation
6690 Knob Remediation
6690 Knob Remediation
6690 Knob Completion
E5 Bench Cleaning
E5 Bench Cleaning Completion
New Pit Access Road Design

Slot Ramp Cut: 818 ktons
Bench Clean/Modification
Dozer Pushover Fill: 470 ktons

Dozer Ramp Location

10% Haul Road Fill (Phase 2): 1,838 ktons
New Pit Access Road Construction
New Pit Access Road Mining
Uncovering E4 North
Fill Bridge Road and E4 North
Delivered Ahead of Schedule and Without Injury!
Kennecott Utah Copper Rising To The Occasion!