Landslide Briefing to City Council
April 28, 2014

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SFD: Chief A. D. Vickery
Landslide Planning and Response

- History of landslides
- Causes include:
  - Topography
  - Geology
  - Water
  - Human Activities
  - Earthquake
- Seattle Hazard Identification and Vulnerability Analysis (seattle.gov/emergency)
* Landslide awareness workshops: DPD, OEM, SPU, SDOT, Parks, civil engineers, engineering geologists
* Multi-department response coordination group
* Mitigation programs: SPU, Parks, SDOT
* Public education campaigns
* USGS Threshold Indicator

* landslides.usgs.gov/monitoring/seattle/rtd/plot.php
What Do We Know About Landslides?

- Seattle Landslide Study (2000, 2003)
  - Led by SPU, with substantial contributions from DPD and SDOT
  - Compiled detailed database of historic landslides in Seattle (from 1890’s)
  - Refined definition of landslide hazard zones within the City

- Most landslides in Seattle are shallow slides and caused by human activity
Regulations for Landslide-Prone Property

- Environmental Critical Areas Ordinance
  - Known landslide areas
  - Potential landslide areas
  - Steep slopes (40% slope at least 10-feet high)

- Regulations and maps updated every 8 years to incorporate best available science
- DPD currently working on a regular update to the City’s ECA regulations

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Development in landslide-prone areas subject to higher level of review and regulation

- Pre-application site visit
- Stay out of the landslide-prone area if possible
- Complete stabilization required
- Geotechnical report typically required
- Special inspections typically required
- Grading (excavation/fill) season restriction
- Permit application reviews by DPD geotechnical engineers
- Potential Landslide Area Covenant

Permit is required for grading over 25 cubic yards and retaining walls of any height. Some tree and vegetation removal plans subject to review.
How Does Seattle Measure Up?

- We have geologic and historic slide information dating back to the 1890’s
- Extensive geotechnical exploration data (borings, water table info, etc.)
- Access to comprehensive mapping information about landslide-prone areas
- City has several geotechnical engineers on staff across different departments, which isn’t common in other jurisdictions

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If a landslide has occurred:
- Call 9-1-1 for emergency situations
- If uncertain, call DPD for a visual assessment of the structure at 615-0808
- Contact private engineer for professional evaluation of the hillside and/or structure
- SDOT, Parks and SPU also respond depending on how City assets may be impacted
- WebEOC
Annual landslide awareness meetings held twice a year for the public since 1997

Geotechnical coaching for public (15 minutes free)

Annual media outreach in preparation for landslide season, including press releases, blog posts and social media references to our webpage and helpful hints

Comprehensive DPD Emergency Management webpage includes hints for hillside maintenance, maps, recent studies and City contact information

DPD Interactive GIS
SPU’s Roles in Landslide Mitigation

- Provide updates for GIS map layer
- Partner on public outreach
- Monitor and communicate Landslide Threshold
- Participate in unified response to events
- Evaluate infrastructure and operations risks, take appropriate action
USGS Landslide Threshold

P₃, 3-DAY CUMULATIVE PRECIPITATION, INCHES

P₁₅, 15-DAY CUMULATIVE PRECIPITATION BEFORE P₃, INCHES

Landslides likely

Cumulative Precipitation Threshold

P₃ = 3.5 - 0.67P₁₅

Landslides unlikely

15 days 3 days

Time

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Landslide Threshold

Rain Gauge 5 – Fauntleroy, March 3, 2014
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Seattle Landslide Prone Area Map

City of Seattle Landslide Prone Areas

West Seattle

SITE
Landslide Potential in Cedar & Tolt Watersheds, Transmission System

- 100,000 acres of watershed land
- 192 miles of transmission pipeline
- Landslide risk areas mapped
- Past watershed landslides small to modest size with manageable impacts
- Monitoring higher risk landslide area along Tolt pipeline
Response focus: Public safety, mobility and access
* Maintain key arterial operations
* Mitigate hazards in right of way
* Disseminate critical transportation information

Response activation: Incident Command System scalable according to volume, impact and infrastructure damage
* On scene: Assisting agency or incident/unified command
* City wide: Incident Management Team and Department Operations Center

Recovery/mitigation: Roadway structures - retaining walls
Seattle Fire Department Incident Priorities

* Life Safety
* Incident Stabilization
* Property Conservation
* Environment
ESF#4 – Firefighting/EMS

Mass Casualty Incident Priorities

* Triage
* Treatment
* Hospital assignment
* Transportation
ESF#9 – Search and Rescue

SFD Operations & Tactics at a Significant Search and Rescue Incident

* Assessment of Damage
  * Area scanned for surface victims, scene stability and visible hazards

* Removal of Surface Victims
  * Performed by specially trained members only (USAR)

* Search of Voids and Accessible Spaces
  * Use of special tools and techniques to remove entrapped victims and attempt to locate other victims

* Selected/Targeted Debris Removal
  * Conducted after all known victims are removed

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Emergency Operations Center

Coordination

* Information
* Resources
* Plans of Action
* Policies
* Integrating assistance from external agencies