

Landslide Briefing to City Council

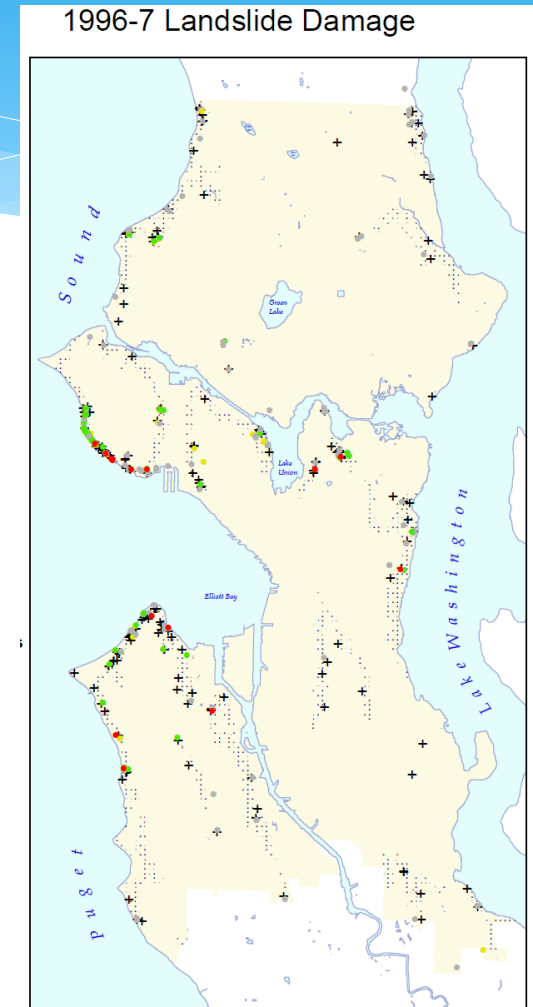
April 28, 2014

OEM: Barb Graff
DPD: Susan Chang, P.E.
SPU: Nancy Ahern
SDOT: Lawrence Eichhorn
SFD: Chief A. D. Vickery



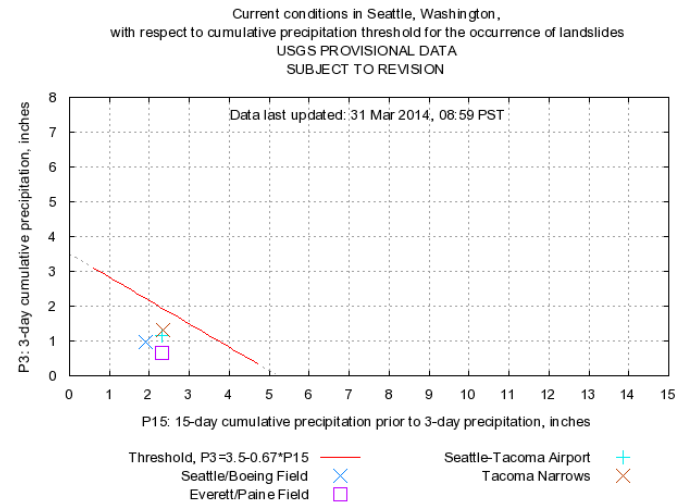
Landslide Planning and Response

- * History of landslides
- * Causes include:
 - * Topography
 - * Geology
 - * Water
 - * Human Activities
 - * Earthquake
- * Seattle Hazard Identification and Vulnerability Analysis (seattle.gov/emergency)



Multi-Department Effort

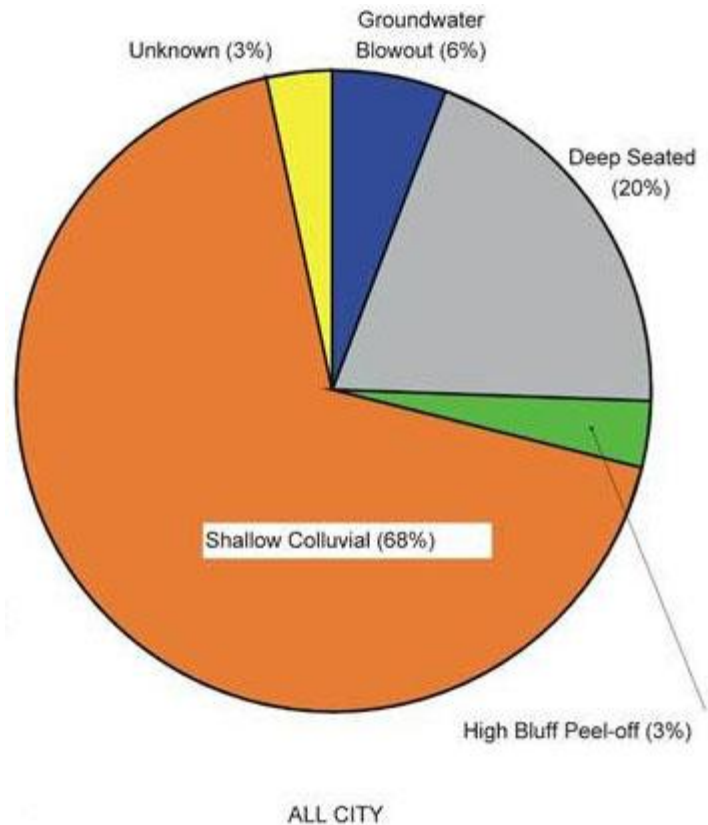
- * Landslide awareness workshops: DPD, OEM, SPU, SDOT, Parks, civil engineers, engineering geologists
- * Multi-department response coordination group
- * Mitigation programs:
 - * SPU, Parks, SDOT
- * Public education campaigns
- * USGS Threshold Indicator



- * landslides.usgs.gov/monitoring/seattle/rtd/plot.php



What Do We Know About Landslides?

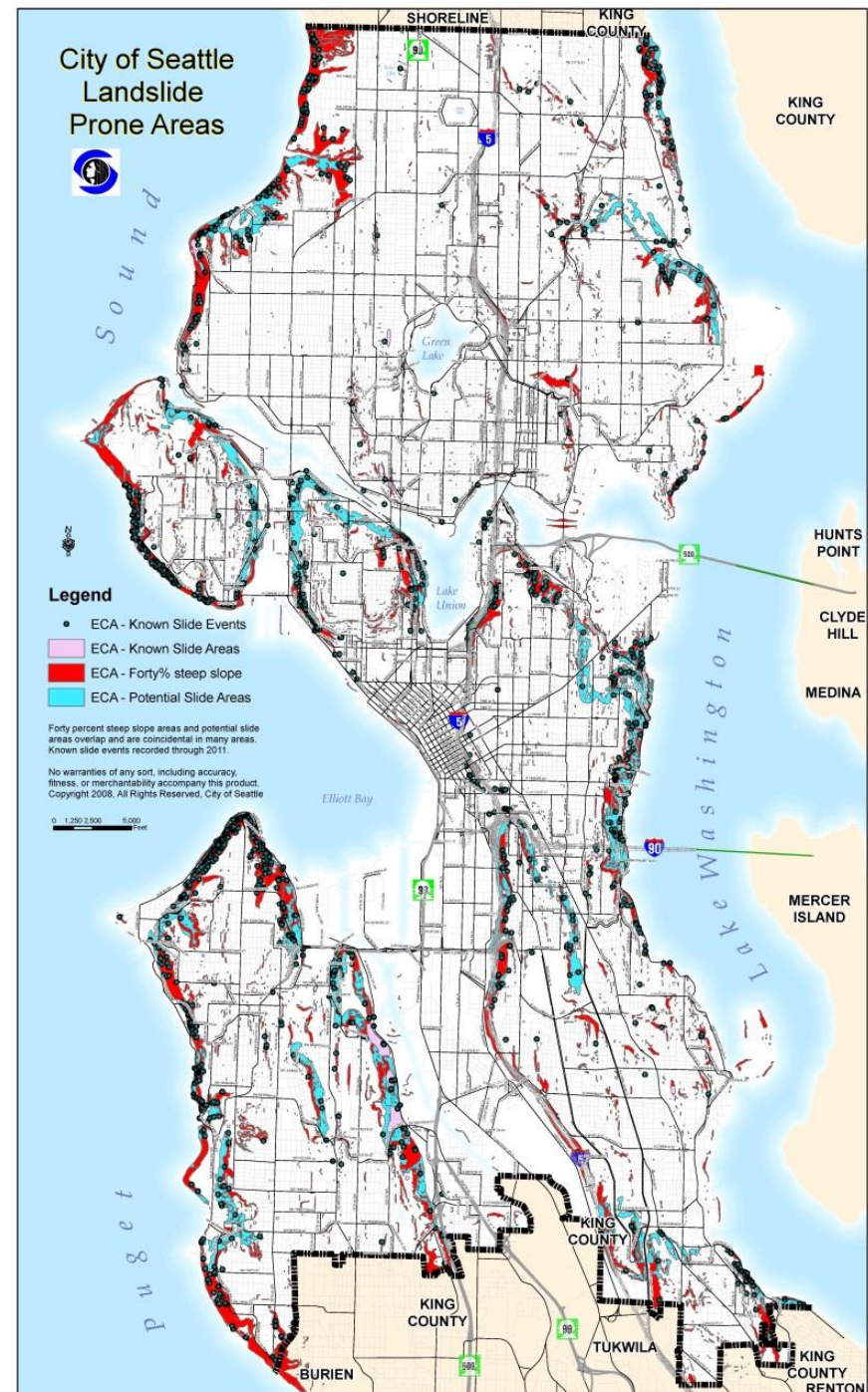


- Seattle Landslide Study (2000, 2003)
 - Led by SPU, with substantial contributions from DPD and SDOT
 - Compiled detailed database of historic landslides in Seattle (from 1890's)
 - Refined definition of landslide hazard zones within the City
- Most landslides in Seattle are shallow slides and caused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



Regulations for Landslide-Prone Property

- 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



Responding to Landslides



- 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



Landslides Awareness and Public Information

- 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**](#)

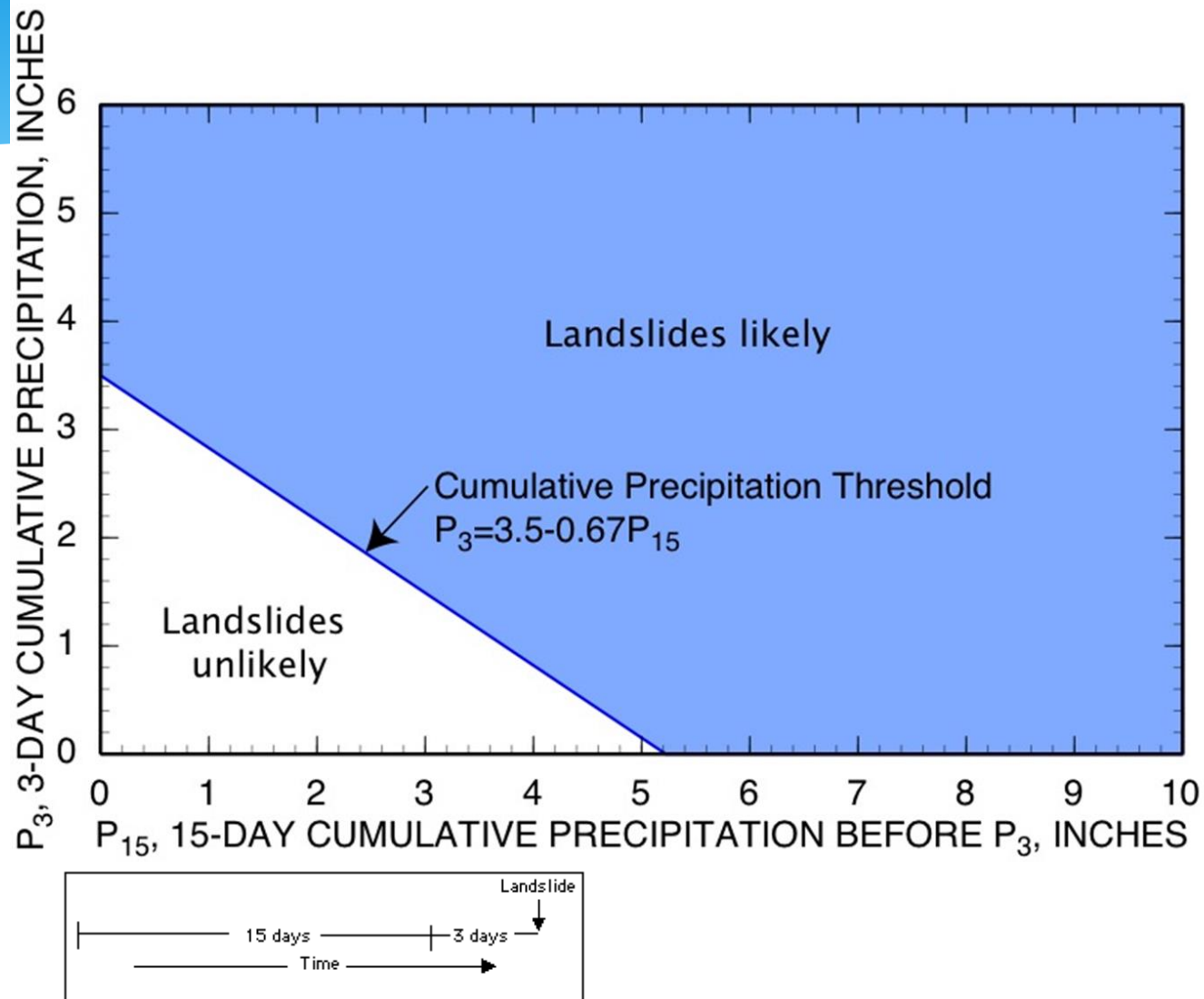


SPU's Roles in Landslide Mitigation

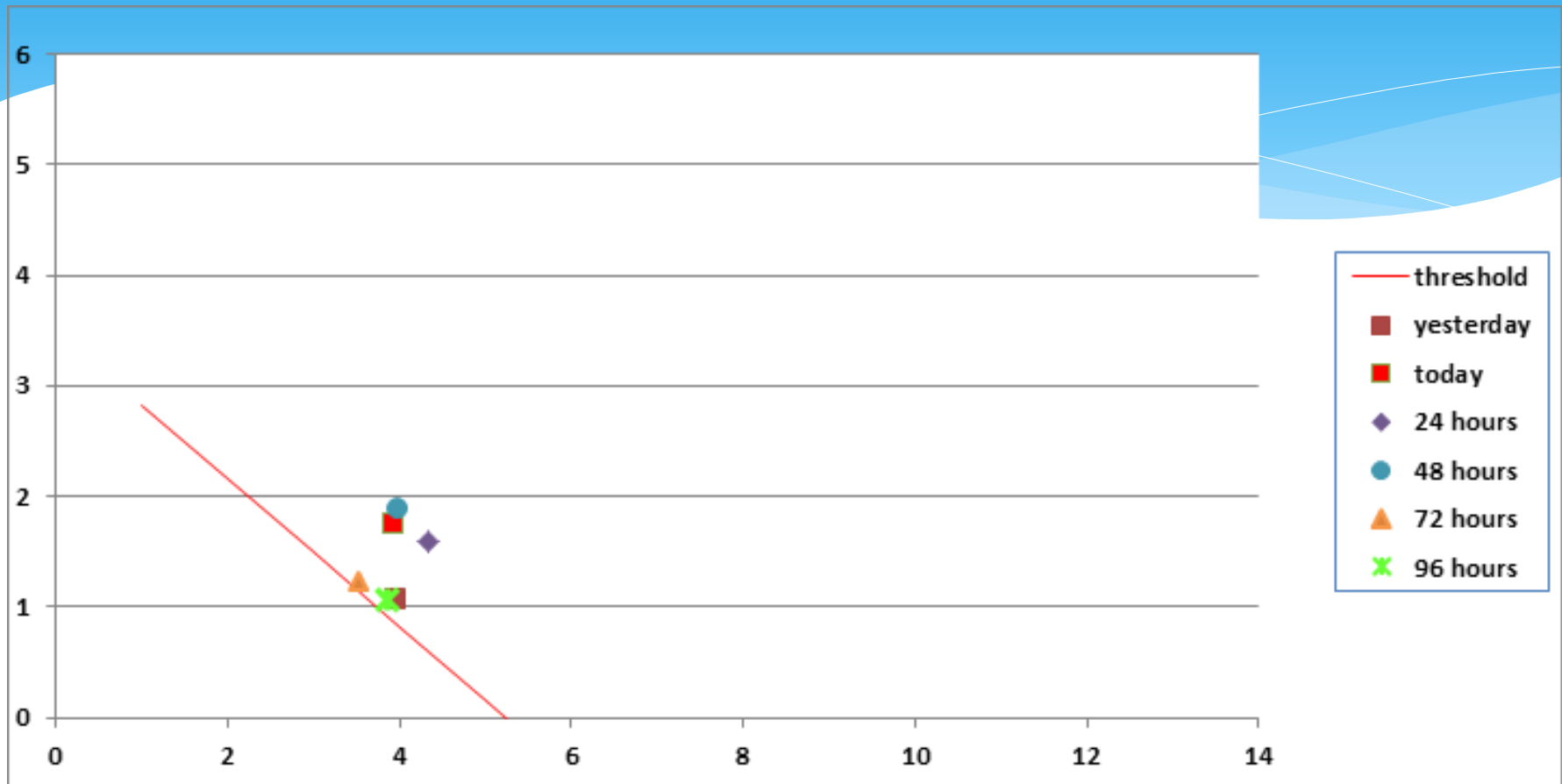
- Provide updates for GIS map layer
- Partner on public outreach
- Monitor and communicate Landslide Threshold
- Participate in unified response to events
- Evaluate infrastructure and operations risks, take appropriate action



USGS Landslide Threshold



Landslide Threshold



Rain Gauge 5 – Fauntleroy, March 3, 2014



Seattle Landslide Prone Area Map



City of Seattle Landslide
Prone Areas



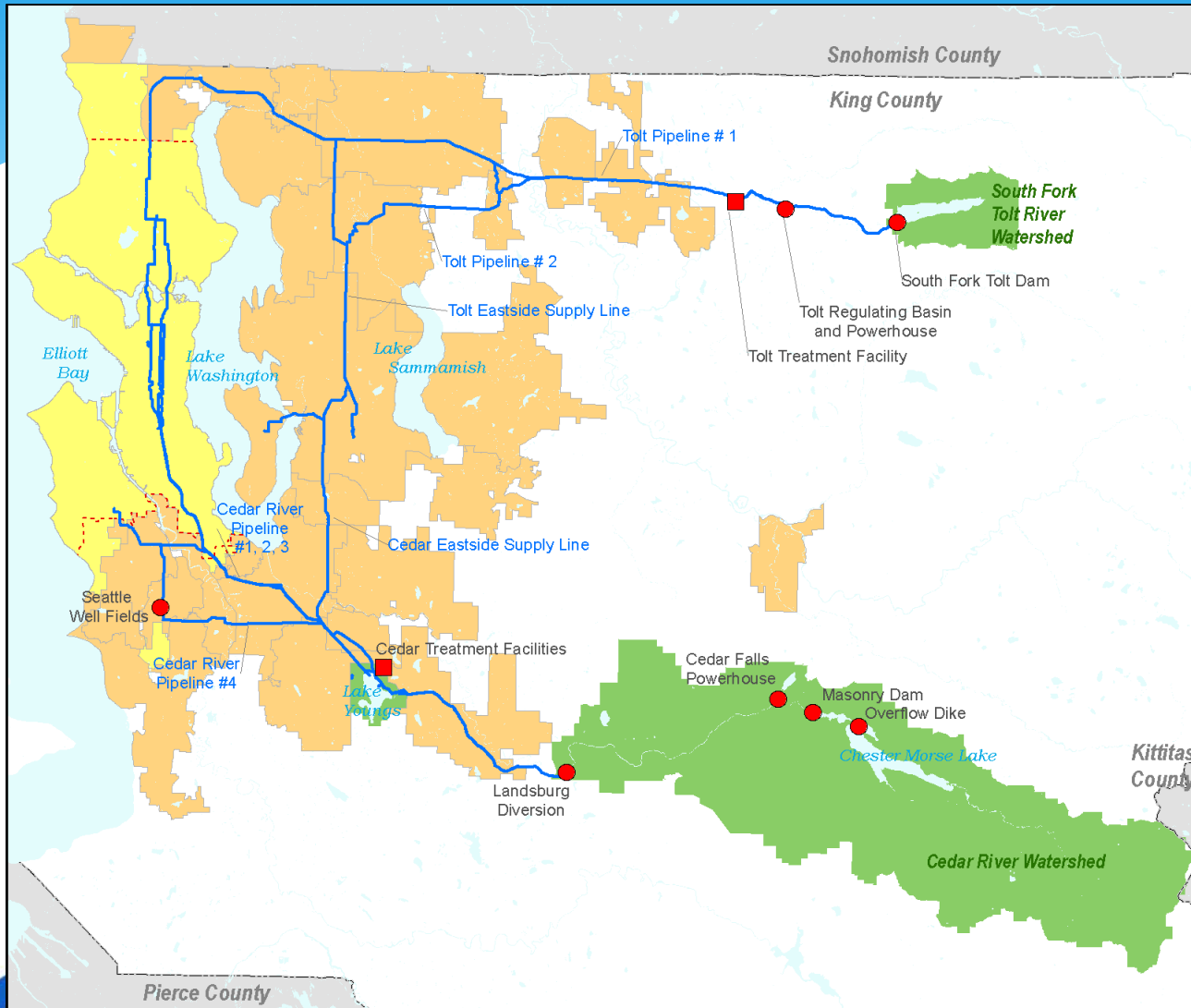
West Seattle



SW Jacobsen Rd



Seattle's Regional Water System



**Seattle Retail
Service Area**

**Wholesale
Customers**

Watersheds

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



Seattle Department of Transportation

- * 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



ESF#4 – Firefighting/EMS

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
- * Search of Voids and Accessible Spaces
 - * Performed by specially trained members only (USAR)
- * Selected/Targeted Debris Removal
 - * Use of special tools and techniques to remove entrapped victims and attempt to locate other victims
- * General Debris Removal & Victim Remains Recovery
 - * Conducted after all known victims are removed



Emergency Operations Center

Coordination

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

