EXHIBIT 25

MEMORANDUM
Community Development Department | Long Range Planning

To:	**Brian Martin**
From:	**Sarale Hickson**
Date:	**June 20, 2024**
Subject:	**Landslide map methodology**

Susceptibility, Risk, and Regulation

Natural hazards like landslides are inevitable. Human behavior can impact their frequency and intensity, but they cannot prevent all landslides. The Department of Geology and Mineral Industries (DOGAMI) has models and inventories that can identifying landslide susceptibility.

Risk is a measure of what impact the hazard will have on people and property. Regulating what happens in areas with landslide susceptibility can reduce the risk. Oregon Statewide Planning Goal 7 is to protect people and property from natural hazards and states "Local governments shall adopt comprehensive plans (inventories, policies and implementing measures) to reduce risk to people and property from natural hazards."
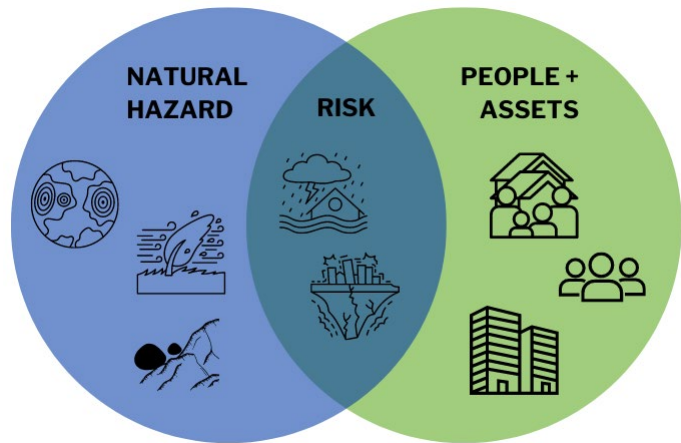
The Department of Land Conservation and Development (DLCD) and DOGAMI produced a guide for communities in dealing with landslide hazards. The intersection of science and policy will be navigated differently by different Cities based on the community risk tolerance and development context.

The worked described herein reflects the best available science regarding the landscape's susceptibility to landslides and staff's understanding of the

community's preference regarding landscape risk and need for development
(particularly residential development).

Landslide Risk Map

Map Purpose:

Identify areas that need regulations to minimize the potential for hazards to life and
property resulting from landslide.

Regulation:

Require geotechnical review for land divisions in mapped area.

Objective:

Produce a map that can be easily applied and understood by planners, the public,
and other city staff.

Data Inputs:

Most of the data can be visualized on the DOGAMI SLIDO (Statewide Landslide
Information Layer for Oregon) map.

Name	Date	Description	Rationale	Use of Data
O-2016-02 Landslide susceptibility overview map of Oregon Open-File Report O-16-02	2016	1:500,000 (1inch = 41,667 ft) scale Uses • geologic map • landslide inventory • LiDAR slope maps	Best available susceptibility data that covers the entire city/USB	Use areas coded moderate, high, and very high, in areas 25% slope.
IMS-47 Landslide inventory maps of the Hillsboro quadrangle, Washington and Multnomah Counties, Oregon	2012	1:8,000 (1 inch = 667 ft) scale Uses • LiDAR imagery	Landslide deposits have the potential to reactivate	Include all areas of existing landslide deposit
IMS-22 GIS overview map of potential rapidly moving landslide hazards in western Oregon IMS-22 report	2002	1:24,000 (1 inch = 2,000 ft) scale .	This map includes potential debris flow runout zones which are not included in other maps	Include all areas of potential rapidly moving landslide hazards

Landslide Inventory

An area that is part of an historic or prehistoric landslide is much more susceptible to sliding again. Deposits are essentially a naturally occurring form of unconsolidated fill. Scarps are the extremely steep slopes left behind when land moved. Landslides can reactivate in part or entirety so Sometimes a portion of a landslide will reactivate; other times the entire landslide will reactivate. Some landslides, such as channelized debris flows, will reoccur in the same channel over and over because the conditions in the channel are suitable for this type of landslide. Therefore, existing landslides are part of the overall landslide hazard puzzle.

Lidar, a form of laser technology, has significantly increased the ability to locate and map existing landslides. The best data available is a 2012 lidar derived study.

Statewide Landslide Susceptibility Overview

The statewide susceptibility data is based on best available landslide inventory data, Statewide is coarse grained but covers the entire city. There are some smaller more rich studies/datasets that cover portions of Beaverton. While generally best available data should be used, in this case (after talking to the data owner - Bill Burns (bill.burns@dogami.oregon.gov) the citywide data should be used.

These data use landslide inventory, slope, and generalized geology and categorizes risks as:

- Low (meaning land sliding is unlikely).
- Moderate (meaning land sliding is possible).
- High (meaning land sliding is likely).
- Very High (meaning there are existing landslides).

Potential Rapidly Moving Landslide

IMS-22 is the best available data for potential rapidly moving landslides also known as channelized debris flow. It is an older dataset originally designed to identify areas that required further review to ascertain landslide risk.

Processing
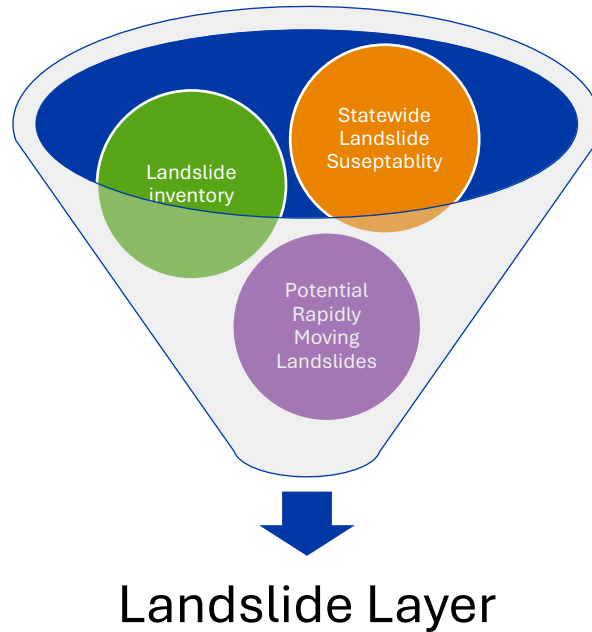
Landslide Layer

These data can best be used in conjunction with each other and community risk tolerance. This process is derived from Portland's proposed methodology but is modified due to the comparative coarseness of the data.

Statewide Landslide Susceptibility Overview

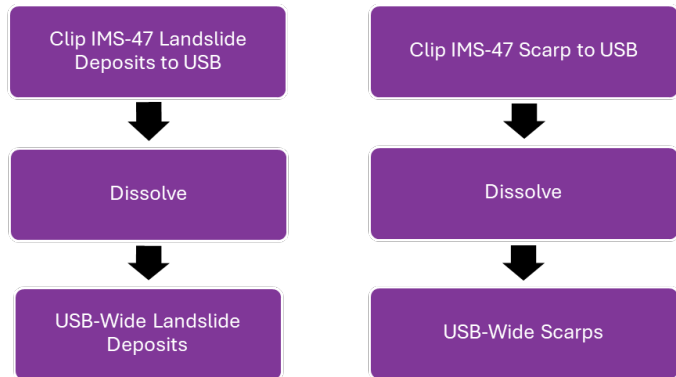Only areas designated as Moderate, High, and Very High were used.

To reduce the number of properties which would be unnecessarily included in the regulatory map, the landslide susceptibility areas were reduced to include only areas where the overall neighborhood slope averaged 25 percent or greater. Areas of 25 percent or greater slope were derived by smoothing the LiDAR digital elevation model. Smoothing was accomplished by applying bilinear resampling to a 12-foot cell and then calculating the percent slope using the surface parameters tool by ESRI and a neighbor distance of 84 feet.

To account for the coarseness of the data, disconnected patches of 5,000 square feet or less were removed.
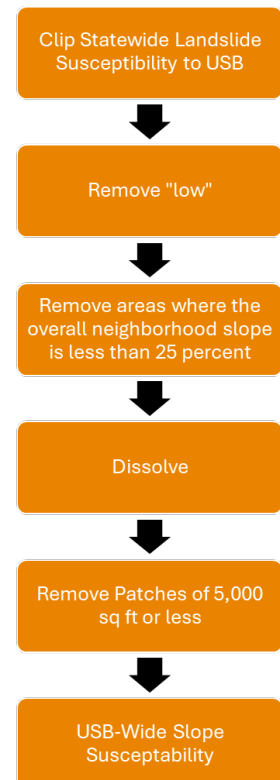
IMS-47 Landslide Inventory

Landslide deposit and scarp face layers were both used.

Clip IMS-47 Landslide Deposits to USB
↓
Dissolve
↓
USB-Wide Landslide Deposits

Clip IMS-47 Scarp to USB
↓
Dissolve
↓
USB-Wide Scarps

IMS-22 Potential Rapidly Moving Landslides

The "Washington E" data was used.

Clip IMS-22 Potential Rapidly Moving Landslides (Washington E) to USB
↓
Dissolve
↓
USB-Wide Potential Rapidly Moving Landslides
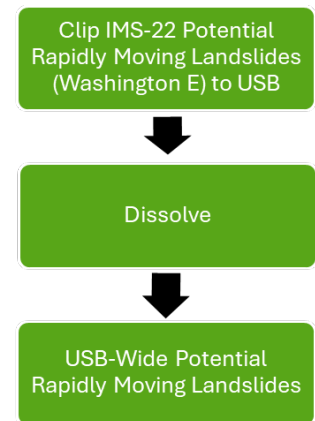
Landslide layer

The clipped and dissolved layers were merged into a single layer. The layer at this point can be used to identify which of the inputs is the reason for the area's inclusion in the layer. The layer was then dissolved to create a simple landslide risk layer.

Merge: Slope, Deposits, Scarp Flank → Dissolve → USB-Wide Landslide Risk Layer
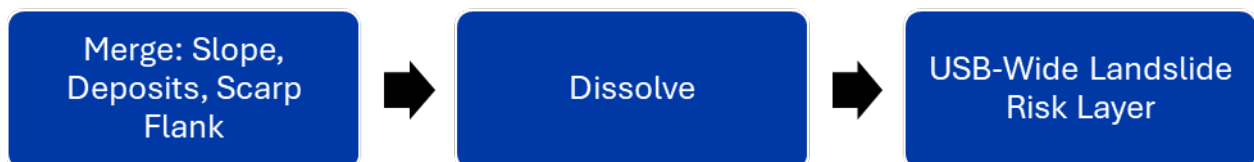
Glossary

This section is taken from *"[Landslide Hazards Land Use Guide for Oregon Communities](#)"* by Tricia R. Sears and Marian Lahav from DLCD and William J. Burns and Justin McCarley from DOGAMI (2019)

Hazard is something that has the potential to cause harm; it is a possible source of danger. Hazard is defined in this Guide as the frequency and magnitude at which landslides will happen.

The term **susceptibility** is defined here as capable of being affected by a specified action or process, and in this Guide the process is mass wasting by means of slope failure or landsliding.

The term **risk** is defined here as the probability of loss or injury. In this Guide risk is the intersection of the hazard with assets (such as buildings) and their vulnerability to the hazard (Burns, Hughes, Olsen, McClaughry & others, 20166). Risk is an expression of the potential magnitude of a disaster's impact. Figure 2-8 shows risk
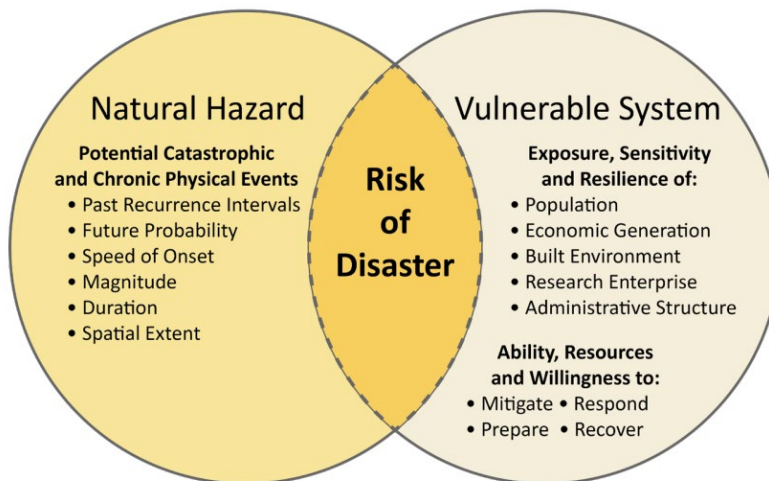
Understanding Risk Source: USGS Fact Sheet, Understanding Risk and Resilience to Natural Hazards (Wood, 201144) as the intersection of natural hazards and vulnerable systems.