Final Technical Report
USGS Award G11AC20312
Portland Urban Geologic Database

Award #:	G11AC20312
Title:	Portland Urban Geologic Database
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Abstract

This project is the culmination of a multi year cooperative program between the USGS and Oregon Department of Geology and Mineral Industries (DOGAMI) to develop new geologic maps and models for the Portland, Oregon urban area. Portland faces significant geologic hazards, from locally abundant landslides (Burns and others 2013) to earthquake hazards posed both by local faults and the Cascadia Subduction Zone. DOGAMI has been collaborating with the USGS Pacific Northwest Urban Corridor Project to develop new detailed geologic data to assess these hazards with. The USGS team has focused on developing a new 1:24,000 scale geologic map of the greater Portland Region, while DOGAMI has focused on the Portland urban area, with geologic mapping of select quadrangles, comprehensive landslide inventory, a detailed lidar-based surficial geologic map, a database of located and interpreted geotechnical borehole logs and a 3D stratigraphic model that was used to build a new Vs30 map for the region. The geologic quadrangle maps, surficial geology map, landslide inventory maps, borehole database, 3d model and Vs30 map have all been published by DOGAMI as Open-File reports.

Introduction

The tasks carried out under this cooperative agreement are the culmination of nearly a decade of cooperative work between DOGAMI and USGS to develop improved geologic data for the Portland urban area to support earthquake and landslide hazard studies. Starting in FY 2003 DOGAMI completed the following tasks under awards 03HQAG0013 and 08HQAG0140:

- The best available digital geologic mapping for the Portland area was assembled into a single database, and packaged with collected borehole data and gridded 3D data from past studies. Those data were published as DOGAMI Open-File Report, O-04-02.
- DOGAMI prepared a new digital geologic map of the Oregon City Quadrangle, including lidar-based surficial and landslide mapping, and that map was published as DOGAMI GMS-119.
- DOGAMI completed a new digital geologic map of the Dixie Mtn. quadrangle, and obtained high resolution lidar of part of the Tualatin Mountains. The Dixie Mtn. map was published as DOGAMI Open-File Report, O-08-07 and the lidar data are available from the Puget Sound Lidar Consortium or from the Oregon Lidar Consortium,
- DOGAMI completed a new digital geologic map of the Linnton Quadrangle, which was published as DOGAMI Open-File Report, O-08-06.
- DOGAMI completed digital geologic maps of the Gladstone, Redlands and Estacada quadrangles, and those maps were incorporated into the subsequent regional surficial geologic map
- DOGAMI completed lidar-based landslide inventory mapping for the entire Portland urban area at a scale of 1:8,000, and those 27 maps were published as DOGAMI IMS 26-53

Under award # G11AC20312 the primary tasks were to complete a new lidar based digital surficial geology map, and a borehole database, 3D geologic model, and a regional Vs30 map.

Surficial Geology Map

Building on the existing digital geologic data for the Portland urban area, we used high resolution lidar data (1m pixel DEMs generated from 8 pulse/m^2 point clouds collected by the Portland Lidar Consortium) to remap the surficial geology of the region. We reviewed the lidar DEMs in hillshade and slopeshade visualizations with and without elevation color gradient overlays, and with half meter contours locally as needed to identify surficial geologic units and contacts, and digitized a seamless map across the entire Portland region. The resulting detailed geodatabase was published as DOGAMI Open-File Report O-12-02, which included a thematic map of the regional geology that was aimed at a more general audience.

Borehole database, 3D model and Vs30 map.

The final task was to build a 3D geologic model of the Portland urban area to be used to provide geologic and geotechnical data for hazard studies. We started with the surficial geologic map, and added geotechnical and subsurface geologic data from thousands of geotechnical borehole logs acquired from local agencies. We interpreted the geology of each borehole in terms of the units of the surficial geologic map, and then built a series of TIN surfaces defining the top and bottom of each unit. The model is designed to make it easy to add data, and update interpretations, and then recalculate the TIN surfaces. Differencing successive TIN surfaces provides thickness data for each unit. We collected all available shear wave velocity measurements for the region, and combined them with the 3D model to produce a regional map of Vs30. The database, geologic models, and Vs30 map were published as DOGAMI Open-File Report O-13-12.

Bibliography

Roe, W. P., and Madin, I.P., 2013, 3D geology and shear-wave velocity models of the Portland, Oregon, metropolitan area: 48 p., geodatabase, DOGAMI O-13-12.