Liquefaction Potential

INTRO

The liquefaction potential map consists of a qualitative assessment of the potential of geologic materials to liquefy during loading such as from earthquake shaking. Refer to the Seismic Hazards Map for information about the tectonic setting and potential for earthquakes to impact the City of Kirkland. The map includes polygons showing three categories of liquefaction potential based on a weighted matrix of geologic parameters including, grain size, age of deposit, density from standard penetration tests, and depth to groundwater. Areas of modified land (either filled and/or graded), provided as a separate layer, should always be included on the map because they significantly impact the liquefaction potential. The geologic units were determined using: geomorphic analyses of LiDAR data; field observations in excavations, gullies, and roadcuts; subsurface data from exploration logs in geotechnical documents; and geologic principles. These data are stored in a searchable Microsoft SQL database accessed via ArcGIS.

DATES

Data were compiled by GeoMapNW, in the Department of Earth and Space Sciences at the University of Washington, in two phases: 1) prior to 2010 for the City of Kirkland, 2) in 2016-2017 to include the recently annexed areas and updating the 2010 coverage area.

TOTALS

<table>
<thead>
<tr>
<th>Exploration Points: 5544</th>
<th>Exposures (excavations and outcrops): 651</th>
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<tbody>
<tr>
<td>High liquefaction potential: 1.68 sq mi</td>
<td>Medium: 5.49 sq mi</td>
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LIQUEFACTION POTENTIAL CATEGORIES

The three qualitative liquefaction potential categories consist of: high, medium, and low. Most of the land surface area of Kirkland falls into the low category. The high liquefaction potential category includes loose sandy deposits with shallow groundwater like: alluvium, alluvial fan deposits, young lake deposits, glacial recessional outwash. The medium liquefaction potential category includes unconsolidated silty/sandy deposits like glacial recessional lake deposits, ice-contact deposits, and peat and wetland deposits. The low liquefaction potential category includes glacially overridden silty and clayey deposits like till, and glacial and nonglacial lake deposits.

DEPTH OF INFLUENCE

The liquefaction potential map reflects an assessment of surficial geologic units and so does not reflect potential for deep liquefaction. The thickness of liquefiable deposits varies by location and underlying geology. In general, the assessment reflects the upper 30 feet, except where fill and colluvium are present. Colluvium is present and thickest across most slopes steeper than 15 degrees. The map does
not reflect the influence of the topsoil layer since it is assumed to have essentially the same influence everywhere.

CONFIDENCE AND SCALE

Although this map is provided in digital form, the map scale should be considered 1:12,000. The highest confidence within the map and contacts is at data points (explorations and exposures). However not all data points are of high quality or provided definitive information. All geologic information is inferred between data points using standard geologic mapping principles and most contacts are concealed beneath vegetation, fill, colluvium, or structures.

LONG-TERM ACCESS

The City of Kirkland and GeoMapNW will have a complete copy of the database. Additional information can be obtained from Kathy Troost at ktroost@uw.edu.

LIMITATIONS

The liquefaction potential map is based on over 6000 data points as well as standard geologic interpretation. The exploration data contained in the database were obtained from outside sources and no guarantee of the validity/quality of the original data is implied. Data were entered into the database using trained students and data entry forms to reduce errors, then data entry was underwent QA. Data gaps are present and reflect the lack of subsurface explorations in older residential neighborhoods with few critical areas. Additional data gaps exist where vegetation is heavy and/or where the land has been modified by the addition of fill, coverage by colluvium on slopes, and obscured by development. This qualitative liquefaction potential map should be used to evaluate and understand the character of the City as a whole and should not be used for site-specific evaluations. The map does not show where ground improvements decrease the potential for liquefaction. Furthermore the map does not reflect the level of impact possible as a result of liquefaction.

REVIEW

This document and the map were reviewed by the City of Kirkland on and peer reviewed by AESI.