PARSONS BRINCKERHOFF

Memorandum

Date: December 9, 2013
To: Kristi Krueger, Principal Civil Engineer, Community Development Division, Development and Public Works Department, City of Springfield
From: Evan Garich, Parsons Brinckerhoff
Subject: Seismic Conditions, Franklin Boulevard Design Refinement and Environmental Classification Project

SITE CONDITIONS AND GEOLOGY

The Franklin Boulevard Project Corridor (Figure 1) is located near the southern terminus of the Willamette Valley physiographic province. The Willamette Valley is bordered by the Cascade Mountains to the east and the Coast Range to the west. The Project Corridor is generally flat. The Willamette River is located at the eastern terminus of the Project Corridor; the river then bends westerly and is located approximately 200 feet to 1,000 feet north of the Project Corridor. The geology of the Project Corridor is sand, silt, and gravel of the meander belt of the Willamette River. Bedrock consisting of sandstone and siltstone of the Eugene Formation is estimated to be at a depth of approximately 25 feet within the Project Corridor.[1] Based on a review of well logs, groundwater has been encountered within 8 feet of the surface in the vicinity.[2]

SEISMIC CONDITIONS

The Project Corridor is located in a seismically active area. The Willamette Valley is vulnerable to earthquakes from the Cascadia Subduction Zone (CSZ) and shallow crustal faults. The CSZ is capable of producing megathrust and intraplate earthquakes. Megathrust earthquakes occur at the subduction plate interface and may be up to a moment magnitude of 9.0+. Intraplate earthquakes occur within the subducting tectonic plate. The Nisqually 2001, magnitude 6.8, earthquake is an example of an intraplate earthquake. CSZ megathrust events are likely to initiate approximately 60 kilometers west of the Project Corridor. There are no historic instances of CSZ intraplate events beneath the Willamette Valley; however, the possibility exists given the seismotectonic framework of the region. CSZ intraplate events generally occur as shallow as 40 kilometers below the ground surface.[3] CSZ megathrust events dominate (compose more than 50 percent of the seismic risk) and CSZ intraplate events are a significant contributor (approximately 15 to 20 percent of the seismic risk) to the seismic hazard in the southern Willamette Valley.[4]

---

[1] Madin, Ian P. and Murray, Robert B. 2006. Preliminary Geologic Map of the Eugene East and West 7.5' Quadrangles, Lane County, Oregon. Open-File Report O-06-17. Oregon Department of Geology and Mineral Industries.

[2] Oregon Water Resources Department (WRD). 2013. Well Log Query. http://apps.wrd.state.or.us/apps/gw/well_log/Default.aspx.

[3] Barnet, EA, Weaver, CS, Meagher, KL, Haugerud, RA, Wang, Z, Madin, IP, Wang, Y, Well, RE, Blakely, RJ, Ballantyne, DB, and Dareinzo, M. 2009. Earthquake Hazards and Lifelines in the Interstate 5 Urban Corridor: Cottage Grove to Woodburn, Oregon. U.S. Geological Survey.

[4] U.S. Geological Survey. 2008. National Seismic Hazards Mapping Project. 2008 Interactive Deaggregation. https://geohazards.usgs.gov/deaggint/2008/.

There are no known active faults within the Project Corridor. Four potentially active faults have been mapped within 25 to 50 miles of the Project Corridor. These include the Upper Willamette River Fault Zone, the Owl Creek Fault, the Drain Sutherlin Faults, and the Corvallis Fault Zone:[5, 6]

- Upper Willamette River Fault Zone. Consists of several northwest trending faults mapped along the upper reach of the Willamette River, approximately 25 miles southeast of the Project Corridor. The total length of the faults is estimated to be approximately 30 miles. Long-term activity of the fault zone is uncertain and the fault zone may be inactive.
- Owl Creek Fault. A north-south trending fault located approximately 30 miles north of the Project Corridor. The total length of the fault is estimated to be approximately 9 miles. The fault may have displaced in the last 130,000 years and is considered to have a low probability of future activity.
- Drain-Sutherlin Area Faults. Consists of two inferred northeast trending faults located approximately 30 miles southwest of Eugene. The faults are estimated to be 9 and 12 miles in length. These faults are considered to have a low probability of future activity.
- Corvallis Fault Zone. A northeast trending fault zone located approximately 40 miles northwest of the Project Corridor that forms the western margin of the Willamette Valley in the vicinity of Corvallis. The fault zone is estimated to be approximately 35 miles in length. The fault is considered to have a low probability of future activity.

Earthquakes from the CSZ and the above faults could result in ground shaking. Ground shaking is responsible for generating high inertial forces and excessive dynamic movements that can impart unacceptable damage to structures. Ground shaking should be mitigated by using the design ground motions and site classification in accordance with the applicable design standards.

The Oregon Department of Geology and Mineral Industries (DOGAMI) developed a Statewide Geohazards Viewer which displays several geologic hazards throughout the state. The DOGAMI study relied most heavily on remote mapping techniques and geographic information systems (GIS) analysis as opposed to on-site investigation. The Project Corridor is mapped as having a moderate earthquake soft soil hazard.[7] Soft soil hazard areas are at risk of liquefying during strong ground motion. Liquefaction occurs when soil becomes soft and liquid-like during very strong ground shaking (e.g., associated with an earthquake). Wet or low-lying areas with unconsolidated sediment may be susceptible to liquefaction. Bedrock areas are not susceptible to liquefaction. Earthquake soft soil hazard mapping prepared by DOGAMI indicates that liquefaction susceptibility in the Project Corridor is generally moderate to low. Based on the flat topography of the Project Corridor the risk of lateral spreading is considered low.

---

[5] U.S. Geological Survey. 2002. Quaternary Fault and Fold Database of the United States. http://earthquake.usgs.gov/hazards/qfaults/.

[6] GeoMatrix Consultants. 1995. Seismic Design Mapping. State of Oregon. January 1995.

[7] Oregon Department of Geology and Mineral Industries (DOGAMI). 2013. Oregon HazVu: Statewide Geohazards Viewer. http://www.oregongeology.org/hazvu/.

Figure 1 Franklin Corridor Project Area

Western Half of Project Corridor

Eastern Half of Project Corridor