

Appendix F

Rail and Vessel Corridor Information

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This appendix summarizes information from the Tesoro Savage Vancouver Energy Distribution Terminal Facility Draft Environmental Impact Statement (Washington State Energy Facility Site Evaluation Council 2015). The Washington State Department of Ecology (Ecology), as the co-lead agency with statewide interest, is including this information to describe existing conditions for rail and vessel corridors in Washington State for some resource areas. These corridors are generally the same that would be used by trains and ships for the Proposed Action.

Land and Shoreline Use

Existing Conditions

Rail Corridor

Most of the land crossed by the rail corridor is agricultural land, forested timber land, or open space. The next largest category is open water, which reflects the fact that the rail corridor runs parallel to the Columbia River at varying distances (from immediately adjacent to over a mile from). Major population centers located along the rail corridor in Washington include Spokane, Cheney, Tri-Cities (Pasco, Richland, and Kennewick), and Vancouver/Camas/Washougal. Notable land uses crossed by the rail corridor along the Columbia River include Umatilla, Pierce, Franz Lake, and Steigerwald national wildlife refuges (NWRs) and Columbia River Gorge National Scenic Area, which includes large portions of Gifford Pinchot National Forest.

Vessel Corridor

Land uses along the Columbia River are primarily rural with agriculture, forestry, and open space making up the largest area. The majority of the vessel route passes through nonurbanized areas of shrub- and grasslands, forest, and agriculture. Incorporated cities and towns along the Washington side of the Columbia River include Vancouver, Kalama, Longview, Cathlamet, and Ilwaco. Cities and towns on the Oregon side of the Columbia River include Portland, St. Helens, Rainier, Astoria, and Warrenton. Notable land uses along the vessel corridor include the Ridgefield, Julia Butler Hansen, and Lewis and Clark NWRs and Fort Columbia and Cape Disappointment State Parks.

Impacts

Rail Corridor

Because the unit trains will operate along the existing BNSF rail lines along the Columbia River, no direct impact would occur to existing or proposed land uses within the rail corridor. No additional land would be acquired along the rail corridor for new or expanded rail facilities directly related to the Proposed Action, therefore land use impacts would be negligible.

Land use plans in urban areas typically take into account the presence of existing rail infrastructure and encourage the development of compatible land uses in areas near major rail lines. For example, the comprehensive plans for the cities of Pasco and Kennewick, Washington, designate most areas along the proposed rail route within their jurisdictions as Industrial (City of Kennewick 2013, City of Pasco 2007). In some communities along the rail route existing land use within the rail corridor is not as compatible with rail operations as is industrial land use. In these areas, due to historical development patterns or restrictive topography, residential and commercial land uses are often located immediately adjacent to the railroad right-of-way. This pattern can be seen along the rail corridor in many of the small towns along the Columbia River. The trains for the Proposed Action would not change existing land uses along the rail corridor.

Vessel Corridor

Normal vessel operations would require no improvements to the marine navigation channel or adjacent upland areas along the vessel route. The navigation channel and adjacent land uses are not expected to change as a result of the shipping traffic associated with the Proposed Action. The vessels for the Proposed Action would not change existing land uses along the rail corridor.

Geology and Soils

Existing Conditions

Rail Corridor

The rail corridor within Washington would traverse the Columbia Plateau and the Cascade Mountain Range geologic provinces to reach the Portland Basin. These geologic provinces consist of volcanic and sedimentary rocks of varying composition and texture. Numerous soil types are found along the rail corridor within Washington. Soils vary with parent rock, with the diverse elevation along the route, as well as the varied climates along the proposed rail route.

Earthquake Hazards

Seismic hazards along the rail corridor generally diminish from west to east from the Vancouver area toward the Washington-Idaho border. Seismic activity is well documented across all of Washington, with many historic earthquakes. Seismic hazards along the rail corridor in Washington include fault rupture, ground motion, and soil liquefaction. Large-scale earthquake induced tsunamis occur in marine environments and would, therefore, not be encountered along the rail corridor.

Landslide Hazards

Potential exists for landslides along steep slopes within the rail corridor. According to WDNR mapping, the areas that are most prone to landslides are in the Columbia River Gorge in Skamania County and near Bingen in Klickitat County. Landslides are present along other areas of the rail corridor but mapped deposits occur less frequently. Zones of “High Landslide Incidence” and “Moderate Landslide Incidence” occur along the central to western portion of the rail corridor paralleling the Columbia River in Washington. A 4-mile stretch, mostly on the northern side of the

rail corridor, is classified as having a “Certain” landslide probability according to the WDNR. This location is where the very large ancient Bonneville Landslide occurred near the town of Cascade Locks, Oregon. The landslide originated from the Washington side and temporarily blocked the Columbia River (O’Connor and Burns 2009). WDNR also reported additional movement of landslide material in that vicinity in 2007 (Washington Division of Geology and Earth Resources 2007). The USGS has recently remapped landslides in the western portion of the Columbia River Gorge in Washington using Light Detection and Ranging ([LiDAR]) (Pierson et al. 2014). This mapping indicates that within the USGS study area, landslides are more numerous and complex than previously mapped and cover approximately 65 percent of the study area. Six currently active landslides were identified.

Volcanic Hazards

In the event of a massive eruption from Mt. Hood, Mt. Adams, and Mt. St. Helens, ashfall from any nearby volcanoes could reach portions of the rail corridor. Lahars and/or debris flows from an eruption of either Mt. Hood or Mt. Adams could extend down to the rail corridor in the Hood River valley (Mt. Hood) or White Salmon River and Klickitat River valleys (Mt. Adams) (Scott et al. 1995, Burns et al. 2012).

Vessel Corridor

Bedrock outcrops are varied along the lower reaches of the Columbia River. Most bedrock is buried beneath river sediments. Sediments along the Columbia River bottom include a diverse array of sands, silts, and clays. Shoreline soils are varied and generally support significant vegetation. Shoreline soils vary from sandy beaches to deep soils supporting mature forests.

Tsunamis generated by earthquakes from the CSZ are a potential hazard near the Lower Columbia River mouth and in nearshore environments along marine routes in the Pacific Ocean. Landslides could occur along the shorelines of the Lower Columbia River.

Impacts

Rail Corridor

Earthquake Hazards

There is potential for seismic activity to impact rail transportation, including potential derailments. BNSF policy requires that rail operations halt all traffic following a seismic event of magnitude 5.5 or higher in those areas where impacts could occur. For UP, all rail traffic within a 50-mile radius of the epicenter is directed to stop in the event of an earthquake of 5 to 7 on the Richter scale (Sirotek 2002). Operations would not commence until inspections of the impacted areas were completed. Ground motion/shaking associated with earthquake activity in the region could cause some minor damage to rail facilities. Soil liquefaction along the rail corridor could be associated with some minor landslides.

Landslide Hazards

There is potential for impacts from landslides to rail transportation. The rail corridor would pass through various regions with steep slopes where potential exists for landslides to occur. The USGS

and WDNR have identified areas of elevated landslide susceptibility and incidence along the rail corridor. A landslide could result in a train car derailment if the active slide were to strike the train, or if slide debris covered or damaged the tracks and a train was unable to stop prior to impacting the debris. BNSF identified locations where landslide susceptibility is high, and these sites are monitored by rail operators to reduce the potential for injuries and damage to rail equipment. BNSF has installed slide fences, catchment walls, and widened ditches to contain landslide debris and stabilize slopes. BNSF routinely inspects and maintains the slopes, ditches, retaining structures, and tracks to minimize impacts to railroad operations when landslides occur. Inspection and monitoring of the rail corridor in known slide locations is heightened during the rainy season. When a landslide occurs that blocks one or more tracks, BNSF imposes automatic moratoria on rail service through the impacted segment of the corridor until cleanup/repairs can be completed. In areas where landslides have resulted in service disruptions and other impacts, BNSF would initiate a program to mitigate issues.

Volcanic Hazards

Depending on the size of an eruption, quantity of ash released, and the prevailing wind direction at the time of eruption, ashfall from these or other volcanoes could impact the rail corridor. Lahars and/or debris flows could travel down river valleys that extend to the railroad corridor along the Columbia River. The Cascades Volcano Observatory/USGS maintains an extensive seismic network on regional volcanoes. In the event of an impending eruption, widespread warning would be given throughout the region, initiating measures to protect personnel and equipment along the rail corridor.

Vessel Corridor

Increased deep-draft vessel traffic has the potential to increase soil erosion caused by vessel wakes. The banks of the Columbia River generally consist of loose, unconsolidated soils and sedimentary deposits, and soil erosion would be limited to the lower approximately 33 miles of the river where shorelines with beaches close to the channel are not shielded from wave action and have beach slopes less than 10 percent. Wake effects would be the greatest as vessels pass through the Columbia River estuary and its associated habitats including tidal wetlands, shallow water, and tidal flats. The increase in deepdraft vessel traffic and associated increase in vessel wakes could have an impact to erosion, primarily in the Columbia River estuary.

Earthquake Hazards

There is potential for impacts from seismic hazards along the vessel corridor. These hazards are associated with potential tsunamis generated from either the CSZ or other Pacific Ocean subduction zones. Earthquake-generated submarine landslides could also create tsunami waves that could impact vessels in nearshore environments. National Oceanic and Atmospheric Administration (NOAA) operates the Pacific Tsunami Warning System, which provides warnings for the United States. The warning system uses seismic data, tide gauges, and buoys to predict, detect, and issue warnings for seismic events. In the event of an earthquake capable of generating tsunamis, NOAA issues warnings to all potentially impacted vessels.

Volcanic Hazards

There is potential for impacts from an eruption to vessels. Along the Columbia River, distances between the Mt. Rainier, Mt. Adams, Mt. St. Helens, and Mt. Hood and the vessel corridor are great, and any ashfall would likely disperse before depositing in high quantities on vessels. Additionally, the dominant wind direction in the area is to the east, so most volcanic ash would likely blow away from the vessel corridor, not toward it. If evidence monitored at the Cascades Volcano Observatory suggests an impending eruption could produce significant ashfall or lahars, widespread warning would be given throughout the region, allowing for implementation of measures to protect personnel and equipment along the vessel corridor.

Surface Water and Floodplains

Existing Conditions

Rail Corridor

Key surface water resources along the rail corridor in Washington include numerous freshwater rivers and small tributaries to the Columbia River, as well as the Columbia River mainstem. The rail corridor parallels and crosses segments of the Spokane River (NWAC 2011). Four major dams and locks on the Columbia River are within the rail corridor: Bonneville, McNary, The Dalles, and John Day. These dams, as well as other upstream dams on tributaries and the main channel, flood control levees, and other water conveyance systems and watershed uses, have altered the river's hydrology and flow regime. The river between the dams is essentially made up of reservoir pools with deeply submerged riverbed features and shorelines ranging from bedrock headlands and wave-cut platforms to sand, gravel, and cobble beaches and marshes (NWAC 2015). There are known exceedances of permit limits on dam operations for temperature and total dissolved gases have occurred in the reservoirs created by the dams (Ecology 2015). Surface water features include intermittent and perennial streams, canals and ditches, artificial paths (reservoir impoundment of the Columbia River), and water connector/pipelines.

The vast majority of floodplains in the rail corridor occur along the Columbia River. Since the railroad bed is generally elevated above floodplains, the risk of flood hazard to the rail line is typically low, aside from crossing points where rail bridge abutments could be vulnerable to flooding, scour, or bank erosion.

Vessel Corridor

The Columbia River Estuary generally includes the area from the river mouth upstream to approximately RM 34, near the upstream extent of saltwater influence, as well as nearshore marine waters and the Columbia River plume (Lower Columbia Fish Recovery Board 2004). Key tributaries entering the Columbia River along the vessel corridor (in downstream order) include the Lake, Lewis, Kalama, Cowlitz, Clatskanie, Elochoman, Grays, Deep, Youngs, Lewis & Clark, Chinook, and Wollacut rivers, along with other smaller creeks and streams.

As is common for the lower reaches of large rivers, the 100-year flood elevation decreases along the Lower Columbia River. The vessel corridor in the navigation channel, is by definition, within the

primary flood conveyance area of the main channel (i.e., the floodway) and surrounded by additional floodway and floodplain as controlled by natural topography and levees.

Impacts

Impacts of rail transportation to water resources in the rail corridor study area could result from brakepad consumption, locomotive lubrication, and fuel drips due to increased rail operations in general (Puget Sound Regional Council 2010). Drips and leaks of very small quantities of crude oil and diesel would create a sheen on surface water immediately adjacent to the rail line, including potentially surface waters immediately adjacent to the rail line. There is potential for impacts to surface water from the increased rail transportation. Rail operations associated would not add any new flood hazard risks to rail bridges, and rail operations would not require construction within floodplains or the placement of permanent fill that could modify floodwater elevations or routing.

Wakes and wave action generated by deep-draft vessels could impact water quality of the Lower Columbia River by direct turbulence, erosion, sedimentation, and sediment resuspension. Such temporary increases in turbidity and local redistribution of sediment on the channel bed and/or to active channel bars and floodplain surfaces from vessel transits within the Lower Columbia River would not be considerably different from natural geomorphic processes, nor would it be expected to alter the river channel, its hydrology, or water quality relative of baseline conditions.

Groundwater

Existing Conditions

While outside the stated study area, for the rail corridor along the Columbia River to the Idaho border, two types of aquifers are common. The most prolific and widespread aquifers in the area are those in unconsolidated deposits that consist primarily of alluvial sand and gravel that fill basins. These aquifers are important sources of water for public supply and domestic, commercial, agricultural, and industrial needs because of their location in generally flat lowlands where human activities are concentrated. Permeability of the unconsolidated deposits is variable. The other important aquifers are within underlying volcanic rocks, usually Miocene basaltic rocks of the Columbia Plateau in northeastern Oregon and southeastern Washington. Water from these aquifers is used primarily for irrigation. Permeability of the Miocene basaltic-rock aquifers is extremely variable. The following EPA-designated sole source aquifers are crossed by the rail corridor: the Spokane Valley-Rathdrum Prairie Aquifer and the Troutdale Aquifer System.

Impacts

Impacts of rail transportation to water resources in the rail corridor study area could result from brakepad consumption, locomotive lubrication, and fuel drips due to increased rail operations in general (Puget Sound Regional Council 2010). These would not be expected to affect groundwater.

Water Quality

Impacts

Impacts of rail transportation to water resources in the rail corridor along the Columbia River could result from brakepad consumption, locomotive lubrication, and fuel drips due to increased rail operations in general (Puget Sound Regional Council 2010). Drips and leaks of very small quantities could create a sheen on surface water immediately adjacent to the rail line, including potentially surface waters immediately adjacent to the rail line. There is potential for water quality impairment from increased rail transportation.

Vegetation

Existing Conditions

While outside of the stated study area, this section summarizes information on vegetation along railroad and vessel transportation corridors in Washington along the Columbia River associated with the Proposed Action.

Rail Corridor

The rail corridor within Washington crosses or parallels freshwater rivers and streams and long stretches of the Columbia River and the predominant land cover along the rail corridor is open water as well as areas developed for human use and areas with agricultural vegetation. Native vegetation crossed by the rail corridor includes more than 60 different vegetation communities primarily within the semidesert, forests and woodlands, and shrubland and grassland vegetation types.

Semi-desert communities are predominately big sagebrush (*Artemisia tridentata*) steppe and shrubland communities. Forest and woodland vegetation communities are predominately ponderosa pine (*Pinus ponderosa* var. *ponderosa*) woodland and savanna, and maritime dry-mesic-wet Douglas fir (*Pseudotsuga menziesii*)-western hemlock (*Tsuga heterophylla*) forests. Shrublands and grasslands are predominately Columbia Basin dry grasslands with deeprooted bunchgrass such as bluebunch wheatgrass (*Pseudoroegneria spicata*) or Fendler threeawn (*Aristida purpurea* var. *longiseta*) (WDNR 2011a) and Northern Rocky Mountain grasslands with cool season bunchgrasses such as bluebunch wheatgrass, rough fescue (*Festuca campestris*), Idaho fescue (*Festuca idahoensis*), or prairie Junegrass (*Koeleria macrantha*) (WDNR 2011b).

Vessel Corridor

Aquatic vegetation communities are distributed throughout the vessel corridor and range from freshwater riverine wetland communities to submerged aquatic marine vegetation. Shrublands and grasslands are the most abundant land cover followed by forests and woodlands, and then agricultural and developed. Within the shrublands and grasslands, the most common vegetation communities are intertidal freshwater wetlands, coastal sand dune and strand, and freshwater mudflats. Vegetation structure varies in the intertidal freshwater wetlands depending on substrate characteristics, elevation, and tidal flooding and includes tree, shrub, and herbaceous patches

(WDNR 2011e). Herbaceous plants are commonly sedges (Lyngbye's sedge [*Carex lyngbyei*], slough sedge [*Carex obnupta*]), western watermilfoil (*Myriophyllum hippuroides*), narrowleaf cattail (*Typha angustifolia*), and common ladyfern (*Athyrium filix-femina*)(WDNR 2011e).

Impacts

Rail Corridor

Vegetation communities within the rail corridor could be affected by leaks of small quantities of grease, oil, and fuel along the railways. Small spills and leaks would be expected to remain on the gravel railbed. Rail lines act as a corridor for migration of plants as seeds or vegetative propagules that are carried and deposited along the tracks (Wiłkomirski et al. 2012). Noxious weeds and invasive plants may displace special-status plants from the rail corridor and degrade vegetation communities where they become established. Increased rail traffic may facilitate the rate at which noxious weeds are dispersed along the rail line.

Vessel Corridor

Vessels transiting the Columbia River would create vessel wakes, which have the potential to impact riparian vegetation directly through breakage, swamping, and erosion and indirectly through altered patterns of erosion and deposition and spread of noxious weeds. Vessel wakes are most likely to affect shoreline vegetation communities at or near water level. Wakes can redistribute fine sediment that can smother aquatic vegetation, but can also provide substrate for colonization of emergent wetland plants. Vessels traveling up and down the Columbia River could assist with dislodging (with wakes) and facilitating waterborne transport of wetland and riparian zone invasive exotic plants.

Fish

Impacts

The rail corridor within Washington crosses over and is adjacent to more than 500 streams and waterbodies between the Washington-Idaho border and Vancouver, WA. The rail route crosses many freshwater rivers and smaller tributaries to the Columbia River and Pacific Ocean, including approximately 75 fish-bearing streams and 44 shoreline streams. East of the Cascades, freshwater lakes and tributaries within the rail corridor could provide potentially suitable habitat for inland special-status fish species, amphibians, reptiles, and invertebrates. Impacts on aquatic habitats and species in Washington could occur in the event that waterbodies are impacted by hazardous materials that enter waterways. Increased rail operations could contribute to the accumulation and transportation of caked-on grease on tracks and creosote discharge from old railroad ties. However, it is unlikely that the volumes of these materials would disperse outside of the immediate rail tracks and unlikely that they would enter waterways in sufficient quantities to cause adverse impacts on surface water and associated impacts on fish, amphibians, reptiles, and invertebrates.