



## Introduction

Earth resources include bedrock and surface geology, topography, and soils. This fact sheet summarizes how the proposed project would affect earth resources and how the proposed project may be at risk from geologic hazards.

## What was studied?

This study examined the impacts of the construction and operation of the proposed project on geology, topography, and soils. It also considered how earth movement, volcanic activity, and landslides could impact the proposed facilities and operations.

## What was the study area?

- Proposed project site
- Proposed wetland mitigation site
- Rail corridor (Anacortes Subdivision)
- BNSF Railway main line south of the proposed project site

See the Proposed Project Fact Sheet for a map of the site.

## How were impacts analyzed?

Potential impacts were assessed by reviewing published reports on geology and soils in and around the study area and considering how construction and operation of the proposed project could change those resources.

## What are the potential impacts?

### Construction Impacts

Construction activities would alter topography, soils and, in some locations, the underlying sedimentary materials at the proposed project and wetland mitigation sites. Substantial amounts of soil would be moved to and from the proposed project and wetland mitigation sites (see Chapter 2 – Proposed Project and Alternatives of the draft EIS for additional detail). Potential construction-related impacts include erosion, loss of topsoil, soil compaction, soil mixing, revegetation, and changes to groundwater hydrology. Removal of large soil volumes would indirectly affect the soil's capacity to support native vegetation or future agricultural uses.



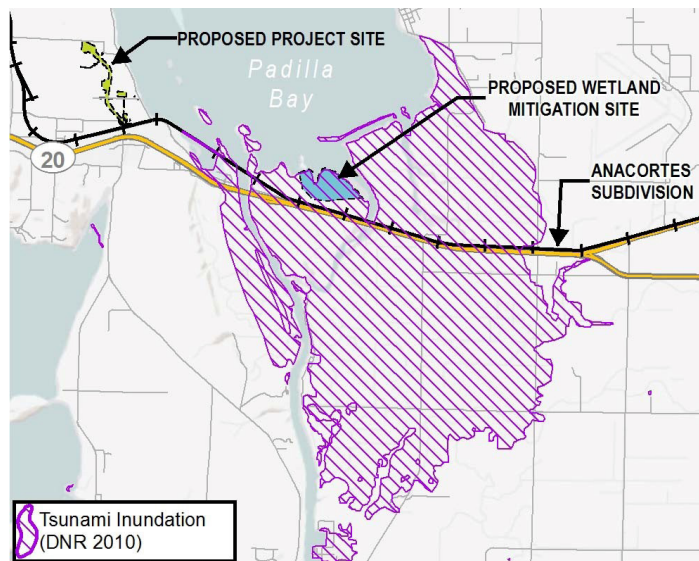
Soil excavator



Landslide susceptibility on the BNSF Railway main line south of the Anacortes Subdivision between Everett and Seattle (see Figure 3.1-4 of the draft EIS)

## Operation Impacts

Operation and maintenance of the proposed project would not require additional excavation or disturbance of ground surfaces and no direct or indirect impacts are anticipated. Geologic hazards would be present during construction and operation activities. These hazards include seismic hazards, ground motion/shaking, soils becoming liquid-like from ground shaking (known as liquefaction), tsunamis and seiches (waves that may surge onto low-lying areas), volcanic activity, and landslides.



Tsunami inundation zone

## Cumulative Impacts

Within the study area, there has been significant agricultural, industrial, commercial, and residential development. It is assumed that with this growth and new construction, earth resources have been affected. In addition, construction and operation of the proposed Tesoro Clean Products Upgrade Project has the potential to impact earth resources. The Tesoro project and the proposed project could have cumulative impacts on earth resources. These impacts would be localized to the Tesoro Anacortes Refinery site and the proposed project and wetland mitigation sites.

## What mitigation measures are proposed?

### Avoidance and Minimization

Impacts to earth resources would be minimized by implementation of the best management practices required as part of various permitting processes.

## PERMITS REQUIRED

- Clean Water Act Section 404 Individual Permit
- National Pollutant Discharge Elimination System Construction Stormwater Permit
- Shoreline Substantial Development Permit
- Skagit County Grading Permit

For example, soils would be tested for contamination and disposed of properly per Skagit County's grading permit. In addition, to minimize disturbance during construction, Shell would mark the boundaries of the project ahead of time and maintain those boundaries throughout construction. These "no work" areas would be off limits to construction personnel during non-work activities (e.g., breaks and walks). Construction workers would receive "Environmental Awareness Training," emphasizing the avoidance of adjacent natural areas (i.e., no-work areas).

## Mitigation

No additional mitigation measures are proposed beyond the avoidance and minimization measures that would be developed and enforced as part of the permitting processes.

## Are there unavoidable significant adverse impacts?

No unavoidable significant adverse impacts were identified.

## WHERE CAN I FIND MORE INFORMATION ABOUT THIS TOPIC?

Chapter 3.1 – Earth Resources of the draft EIS

The information in this fact sheet summarizes content from the draft Environmental Impact Statement; please review the full document for more detailed and complete information.

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