

4.11 Geology and Soils

4.11.1 Summary

New slopes and new earth fills would be required for all build alternatives, which would travel through areas where geologic hazards exist, such as erosion, steep slopes, landslides, and seismic hazards. These hazard areas are not extensive for any alternative. Sound Transit anticipates that the effects of the FWLE on local geology and effects of geology on the FWLE would be minor for all the build alternatives and manageable through typical design efforts.

Appendix D4.11 presents additional information on the geology of the FLWE corridor, including maps.

4.11.2 Introduction to Resources and Regulatory Requirements

Geology and soil considerations that could affect or be affected by the build alternatives include topography, geology, soil characteristics, groundwater location, and geologic hazards. This assessment of geology and soils considered both regional and project-specific conditions. The regional considerations include geology and seismicity of the Puget Sound area; project-specific considerations include topography, soil conditions, groundwater location, and geologic hazards along the build alternatives alignments. While geology and soil conditions are described for the project vicinity, the potential for impacts was determined by looking within a study area of 100 feet from either side of each alternative, station, or ancillary facility.

The regulatory requirements applicable to the FWLE corridor include the Washington State Growth Management Act (GMA) (Revised Code of Washington Chapter 36.70A). Under the GMA, all cities and counties are required to identify critical areas within their jurisdictions and to formulate development regulations for their protection. The GMA defines geologically hazardous areas or critical areas as areas that are susceptible to erosion, sliding, earthquake, or other geological events. The hazards could affect the design, construction, and operation of the FWLE and, if not considered appropriately, could pose a risk to public health and safety.

Geology and soils considerations are closely related to groundwater conditions. This section includes general information on groundwater in the project vicinity, as related to the assessment of geologic

hazards. More detailed information on groundwater locations and uses along each alternative is discussed in Section 4.8, Water Resources. Locations of possible contaminated soils and contaminated groundwater are identified and discussed in Section 4.12, Hazardous Materials.

4.11.3 Affected Environment

Sound Transit assessed the regional geology, topography, seismicity, site geology, and geologic hazards using available printed and online maps published by government agencies, including the U.S. Department of Agriculture (USDA) and the U.S. Geological Survey (USGS). Sound Transit also collected available geotechnical reports for previous projects conducted in and near the FWLE corridor. A total of 53 historical geotechnical or hydrogeologic reports or partial reports were identified (from 1954 through 2007; listed in Appendix D4.11, Table D4.11-1). Locations of soil borings advanced in those investigations are shown on Exhibit D4.11-1 in Appendix D4.11. Appendix D4.11 also includes a summary of the geologic units and engineering properties within the study area and maps of regional geology, topography, erosion hazard areas, steep slopes, and seismic hazard areas.

4.11.3.1 Regional Geology

The FWLE is located within the central Puget Lowland, a north-south trending trough bordered by the Cascade Mountains to the east and the Olympic Mountains to the west. The existing topography and regional geology have been largely shaped by past glacial activity. The regional geology includes a thick sequence of glacially consolidated soils overlying bedrock, which is typically 600 to 1,200 feet below the ground surface in the project vicinity (Jones, 1996). The surface geology along both the SR 99 and I-5 corridors was heavily modified during construction of I-5 and SR 99, and therefore the discussion of the study area geology is primarily focused on the underlying native geology.

4.11.3.2 Topography

The study area is located in an upland area bounded by the Green River Valley to the east and Puget Sound to the west. Ground surface elevations typically range from approximately 250 to over 400 feet above sea level (USGS, 2004a; USGS, 2004b). The study area has local depressions, stream channels, lakes, and wetlands that are underlain

by more recent soils, including recessional outwash and wetland deposits.

4.11.3.3 Seismicity

The Puget Sound Region is located at the convergent continental boundary known as the Cascadia Subduction Zone (CSZ). Relative movement between the North American Plate and subducting Juan de Fuca Plate at this boundary has resulted in a long history of seismic events in the Puget Sound Region. These events are associated with three primary sources: shallow earthquakes in the crust of the North American Plate, deep subcrustal zone (intraslab) earthquakes in the subducted Juan de Fuca Plate in the CSZ, and very large earthquakes at the interface between the Juan de Fuca Plate and North American Plate.

One of the consequences of plate movement is the potential for ground displacement from fault rupture. These ruptures occur within the North American Plate. The closest active faults in the area include the Seattle and Tacoma faults. In addition to being the source of strong ground shaking, the faults can result in ground displacement. The FWLE corridor is located outside of known fault zones, so the risk of fault displacement is low.

4.11.3.4 Site Geology and Groundwater Conditions

Based on the geologic mapping and existing geotechnical reports, the study area is typically underlain by glacially consolidated soils and more recent soils, including unconsolidated recessional outwash and wetland deposits. Groundwater is typically located within 20 feet to 155 feet of the ground surface; however, in some locations, shallow or perched groundwater occurs (WDNR, 2014). In areas mapped as wetlands, groundwater can be from a few feet below the ground surface to at the ground surface. Section 4.8, Water Resources, describes groundwater in the study area.

Similar geologic and groundwater conditions exist for all build alternatives, with the exception of the I-5 Alternative at the Midway Landfill. The landfill is a Superfund site, as discussed in Section 4.12, Hazardous Materials. The demolition debris and municipal waste that make up the landfill create a zone of poor bearing material that would be susceptible to large and erratic settlement under new earth or structural loading. A potential for gas and contaminated groundwater also exists in the landfill, as discussed in Section 4.8,

Water Resources; Section 4.12, Hazardous Materials; and Chapter 5, Construction.

4.11.3.5 Geologic Hazards

The cities of SeaTac, Des Moines, Kent, and Federal Way and unincorporated King County all have defined geologically hazardous areas in their respective land use codes. Geologic hazards in the study area include the following:

- Soils that are potentially susceptible to erosion. In general the erosion hazard is low within the study area, although surficial soils are prone to erosion if left exposed (e.g., during land clearing activities for installation of alignment infrastructure). Certain types of soil, such as silt, are more prone to erosion hazards. The potential for erosion also increases as the slope steepness increases.
- Steep slope hazard areas, with slopes having slope angles between 15 and 40 percent. These slopes may move during wet weather or seismic events.
- Landslide hazard areas where past slides have occurred, where the soil types under steep slopes make them unstable, or any areas where the slope is steeper than 40 percent.
- Seismic hazard areas subject to fault displacement or earthquake-induced ground shaking. Liquefaction is the key seismic hazard in the region because some areas have saturated loose granular soils that can become unstable in a seismic event. Areas with wetland deposits are interpreted as seismic hazard areas.
- Settlement hazard areas where the soft soils are subject to settlement under increased loads from embankments or structures. Areas mapped with wetland deposits are interpreted as settlement hazard areas. Other localized deposits of soft soils could also exist.

Geologic hazards can also include tsunamis, seiches, and volcanic hazards. The FWLE is located at an elevation that precludes tsunami hazards, and bodies of water near the corridor are too small to result in a hazardous seiche. The alignments are also outside areas that would be affected by lahars (volcanic mudflow) associated with a volcanic eruption in the Cascade Mountain range.

4.11.4 Environmental Impacts

This section summarizes the impacts that could result from the No Build Alternative and the build alternatives. The impacts include changes to geology and soils caused by the FWLE, as well as how geologic hazards could affect the FWLE. The impacts of geologic hazards on the project are identified where these hazards could present a future risk to the safe operation of the FWLE.

4.11.4.1 No Build Alternative

Under the No Build Alternative, the FWLE would not be constructed. The existing geology and soils environment would essentially remain unchanged.

4.11.4.2 Build Alternatives

For the FWLE, the discussion of impacts covers the general impacts that are common to all alternatives, and then the key differences in impacts for the alternatives. Chapter 5, Construction, provides an overview of the potential construction activities, their impacts, and timing of those activities.

Direct Impacts

Slope Stability, Retaining Structures, and Landslides

Earth slopes and retaining wall structures could be a hazard if not permanently stabilized. Earth slopes include existing slopes, slopes that could be steepened as part of the FWLE, and slopes for embankment fills needed to support the alignment. The risk of insufficient slope stability would be greater if a large seismic event were to occur.

All build alternatives have steep slope and landslide hazard areas along the alignments (see Exhibit D4.11-5). Most of the landslide hazard areas are located over 500 feet from the alternatives. Where land clearing would be conducted for installation of the alignment infrastructure in steep slope areas, soil erosion hazards could increase. However, erosion control management practices would be implemented to mitigate hazards, keeping the overall risk low.

Although all alternatives would pass through or would be located near steep slopes, the overall risk of impacts from instability of steep slopes would be low for these locations. This is because the occurrence of steep slopes along the alternatives alignments is limited and, in general, competent ground conditions exist in most areas along the corridor.

The one exception to these conditions is along the S 272nd Redondo Trench Station Option for the SR 99 Alternative, where approximately 3 miles of this alignment option would travel through areas with steep slopes, as shown on Exhibit D4.11-5 and on the topographic map, Exhibit D4.11-3. Although the geologic units underlying this area are mapped dense to very dense and could provide excellent foundation support and stable cuts (Table D4.11-2), the 3-mile stretch of steep slopes are located close to the alignment and in combination with shallow groundwater, if encountered, could be susceptible to slope instabilities. Groundwater depths throughout the FWLE corridor range from 20 to 155 feet below ground surface and are suspected to be at the higher end of the range along this alignment option (WDNR, 2014). Preventative measures such as slope stabilization or retaining walls would be implemented to stabilize the areas of potential risk.

Seismic Hazards

Seismic ground shaking during light rail operation would be transmitted into the light rail vehicles operating on the tracks, causing increased inertial loading and movement within structures supporting the light rail system.

If the FWLE is located on sloping ground, the ground shaking could also result in permanent movement of the ground and the supported facilities. Seismic ground shaking could also lead to liquefaction of loose, saturated, cohesionless soils; settlement from densification of loose soils; increased risk of unstable earth slopes and retaining walls; and increased earth pressures on retaining walls. The areas underlain by soft or loose soils along the alternatives are identified as seismic hazard areas because these areas are more likely to experience intense ground shaking from seismic events.

Although these impacts could present a risk to light rail facilities and users, the elevated, at-grade, and below-grade light rail support systems and retaining structures, including retained fills or cuts, would be designed to withstand the effects of seismic ground shaking, thus minimizing the risks to rail facilities and users. The Sound Transit light rail design standards are based on the occurrence of a rare, very large seismic event with a probability of occurrence of 2 percent in 50 years, which equates to an approximate return period of once every 2,475 years. Based on these design standards, the risk of damage from seismic ground shaking would be low.

Settlement of New Earth Fills

Retained fills would be used in some areas where the FWLE facilities would be above the existing grade. Walls would typically be used to retain the fill, thereby minimizing the area covered by fill. The fill would cause increased loads on the existing soil, which could result in settlement of soft soil. If not mitigated, this settlement could damage light rail structures, as well as nearby structures, roadways, and utilities.

The overall risk of settlement for all alternatives is low. Project design would incorporate measures to improve the soils in locations where the potential for settlement is identified, or would allow tolerances for anticipated settlement. Most of the new earth fills would be located in areas underlain by glacially consolidated soils, which are not expected to experience settlement, as these soils have already been loaded with much higher pressures from glaciers. In areas where settlement-prone soils exist, such as at the Midway Landfill along the I-5 Alternative and in areas near wetlands north of S 272nd Street where the potential additional station at S 260th Street (East option) and the S 272nd Redondo Trench station options would be built, mitigation measures would be used to avoid the detrimental effects of settlement. The I-5 Landfill Median Alignment Option would avoid this issue on the Midway Landfill.

Light Rail Facilities

Elevated guideway structures and light rail stations could have shallow or deep foundations; below-grade stations or track would most likely be located on either shallow foundations or existing soil.

Retaining structures would be required in areas along the alternatives alignments where the track or stations would either be below-grade in a trench or above-grade on retained fills. Some retaining structures could require permanent soil anchors or tiebacks that extend beyond the limits of the project footprint onto adjacent properties, which would require permanent easements and could affect the future use of neighboring properties. Retaining structures can affect or be affected by local groundwater movement and seepage. The retaining structures' design would consider groundwater conditions and provide appropriate means of drainage or waterproofing for control of groundwater.

Parking structures could be supported on shallow or deep foundations, depending on ground conditions at the parking structure

location. Ground improvement may also be used in combination with shallow foundations if soft or loose soils are encountered at the ground surface and structure loads are not too high. Surface parking lots would be supported at grade.

Stormwater facilities would be required along the FWLE to treat and discharge increased runoff from the project impervious areas, such as guideways, parking lots, or structures. Where possible, low-impact design principles would be used, focusing on infiltration where possible. Geologic units within the study area that are often feasible for infiltration include pre-Olympia gravel deposits, pre-Fraser coarse-grained deposits, advance outwash, and recessional outwash. Additional information about the permeability characteristics of the geologic units is included in Table D4.11-2. See Section 4.8, Water Resources, for additional information on stormwater facilities.

Changes in Groundwater Flow

Retaining walls used to support retained fills or cuts can affect or be affected by local groundwater movement and seepage. In areas where groundwater depths are 20 feet or less below the ground surface, the retaining structures could change shallow groundwater flow directions. Additionally, increased infiltration from stormwater runoff over impervious areas, such as parking lots, could temporarily increase groundwater levels and flow following storm events. This impact would be more likely to occur in areas where depth to groundwater is 20 feet or less.

Indirect Impacts

Indirect impacts could result from permanent soil anchors or tiebacks that would be used in retaining wall structures. These wall support systems could restrict the type of excavations feasible for future developments within the anchor zones.

4.11.5 Potential Mitigation Measures

During final design, Sound Transit would conduct additional geotechnical studies involving borings and other exploration methods, laboratory testing of soil, and detailed foundation design evaluations to inform and refine development of design and construction techniques and potential mitigation measures. At sites where geologic conditions are not suitable, appropriate design and construction measures as described in Section 4.11.4, Section 5.2.12, and Section 5.3.12 would be refined and implemented to avoid potential adverse effects and geologic risks during operations.

4.12 Hazardous Materials

4.12.1 Summary

The SR 99 Alternative has a higher number of high-risk hazardous materials sites within or adjacent to its footprint than the other alternatives (Table 4.12-1). While the I-5 Alternative has the lowest number of high-risk sites within or adjacent to its footprint, it would cross the Midway Landfill, a Superfund site. The landfill is covered with a thick, sealed cap. The risk associated with crossing the landfill may be substantial because of the regulatory requirements associated with altering the cap and installing light rail columns in or through the landfill. The I-5 Landfill Median Alignment Option, however, would avoid the landfill and the potential impacts associated with this crossing. Appendix D4.12 includes a table of all hazardous material sites in the study area, along with a map of soil arsenic concentrations in the study area associated with the ASARCO smelter plume.

TABLE 4.12-1

Number of Contaminated Sites within the Project's Long-Term Footprint

Alternative	Number of High-Risk Sites within Project's Long-Term Footprint (Range with Options)
SR 99 Alternative	6 (5-7)
I-5 Alternative	1 (0-2)
SR 99 to I-5 Alternative	3 (2-4)
I-5 to SR 99 Alternative	3 (3-3)

4.12.2 Introduction to Resources and Regulatory Requirements

Hazardous materials can be classified in a number of different ways based on laws and regulations that define their characteristics and use. The categories generally include hazardous waste, dangerous waste, hazardous substances, and toxic substances.

Applicable laws and regulations include the following:

- Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (42 United States Code [U.S.C.] 9601, et seq.)
- Superfund Amendments and Reauthorization Act (Public Law No. 99-499)
- Resource Conservation and Recovery Act of 1976, as amended (42 U.S.C. 6901, et seq.)
- Clean Water Act (33 U.S.C. Section 1251, et seq.)
- Toxic Substances Control Act (15 U.S.C. 2601-2629)
- Dangerous Waste Regulations (Washington Administrative Code [WAC] 173-303)
- Model Toxics Control Act (MTCA) (WAC 173-340)
- Underground Storage Tanks (WAC 163-360)
- Sediment Management Standards (WAC 173-204)

Section 4.2, Land Use, describes existing land uses in the study area and Sections 4.8, Water Resources, and 4.11, Geology and Soils discuss related resources and regulatory requirements that pertain to contaminated sites.

4.12.3 Affected Environment

The hazardous materials analysis study area is the area within an approximately 1/8-mile radius from each alternative. Within this study area, contaminated sites could affect the project or the project could affect the site.

Sound Transit acquired information from multiple sources about sites with known contamination or potential contamination within the study area, as well as relevant historical conditions within the study area. Sources included the following:

- Environmental agency database records (Environmental Data Resources, Inc. [EDR], 2013a, 2013b)
- Historical aerial photographs (Washington State Department of Transportation [WSDOT], 2013)
- Online King County Assessor data (King County GIS Center, 2013)
- Current and historical topographic maps (EDR, 2013b)

- Historical city directories for south King County and Kent, Washington
- Windshield survey of the FWLE corridor on March 15, 2013

Agency records reviewed include those maintained by the U.S. Environmental Protection Agency (EPA) and the Washington State Department of Ecology (Ecology). These databases track properties with potential or confirmed hazardous material releases to the environment and facilities that manage hazardous materials as part of their operations.

A search of the EPA and Ecology databases was conducted in January 2013 (EDR, 2013a) to identify sites in the study area that have a record of hazardous material, substance, or waste handling, or that could be contaminated or have been contaminated in the past. The approximate locations of the sites identified are shown on the maps in Appendix D4.12. Appendix D4.12 also presents tables with detailed information about these sites.

Based on the information collected, sites were categorized into three risk categories: high, medium, and low. The purpose of this risk analysis was to prioritize sites based on the need for avoidance, remediation, or mitigation while considering associated costs and liability. The risk levels are defined as follows:

- **High-risk** sites are properties that might be substantially contaminated and might create liability for Sound Transit either due to construction activities or by virtue of acquiring all or a portion of the site. High-risk sites typically have contaminants that are difficult to treat (for example, tetrachloroethene [PCE]), have large volumes of contaminated materials, or have long histories of industrial or commercial use.
- **Medium-risk** sites are properties where the nature of potential contamination is known based on existing investigation data, the potential contaminants are not extremely toxic or difficult to treat, and probable remediation approaches are straightforward. These sites are typically located within or adjacent to project construction limits and have soil contaminated with petroleum products, or are nonadjacent sites that have groundwater contaminated with petroleum products.
- **Low-risk** sites are properties where the nature of potential contamination is known based on existing investigation data, and

the sites are not expected to have noticeable impacts on the project alternatives due to their location. These sites are typically not directly adjacent to the FWLE right-of-way and do not have groundwater contamination.

Table 4.12-2 lists the number of sites within the project's long-term footprint for each alternative by risk category and provides a range of these sites for the options associated with each alternative. Appendix D4.12 provides more detail on the number of properties within the study area of each option.

For the high-risk sites, files were reviewed at Ecology in January and February 2014 to further understand the potential risks of the sites. Files were also obtained from Seattle Public Utilities in October 2013 and January 2014 regarding the Midway Landfill. These sites are shown on Exhibits 4.12-1 and 4.12-2.

The study area for all alternatives is also within a plume of arsenic- and lead-impacted soils originating from aerial deposition of metals emitted from the former ASARCO smelter in Tacoma, which operated from 1890 until 1985. Ecology has published a map of arsenic concentrations in the top 6 inches of soil in the Puget Sound Region (Ecology, 2009, 2012). Appendix D4.12 provides a copy of the map. Elevated levels of lead are also associated with the ASARCO smelter plume, but were not mapped by Ecology.

4.12.4 Environmental Impacts

4.12.4.1 No Build Alternative

With the No Build Alternative, there would be no project-related removal or cleanup of potentially hazardous materials in the study area, including contaminated soil or groundwater, and the potential uncontrolled migration of existing contaminants would likely continue.

4.12.4.2 Build Alternatives

This section discusses the potential long-term, operational impacts that the build alternatives could have on known contaminated sites, and the potential impacts that the contaminated sites could have on project development and Sound Transit's liability. Impacts during construction activities, including excavation and soil disturbance, are discussed in Chapter 5, Construction.

TABLE 4.12-2
Number of Sites within Study Area (1/8 mile of Each Alternative)

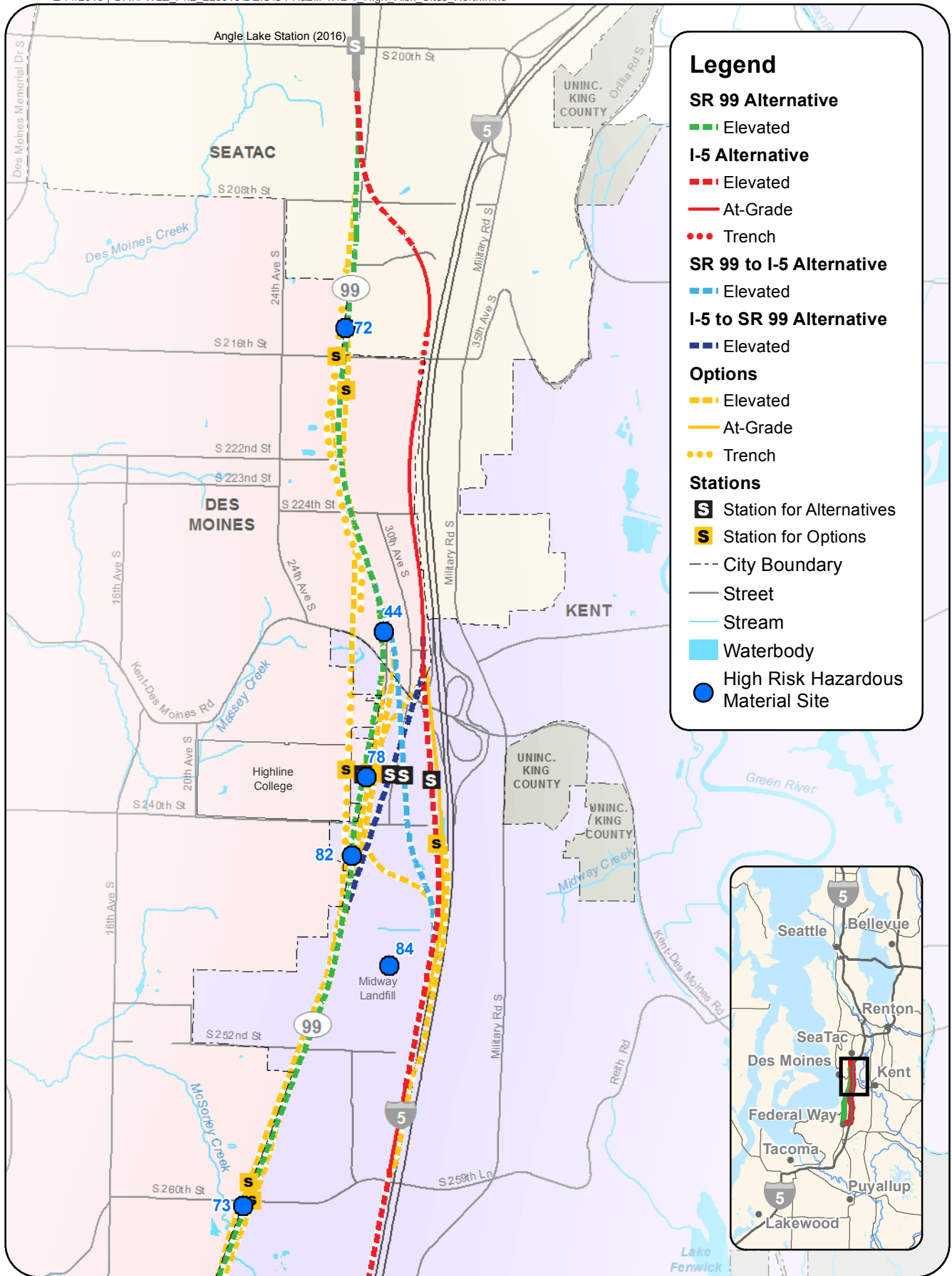
Alternatives	Number of Sites within Study Area (Range with Options)		
	High Risk Level	Medium Risk Level	Low Risk Level
SR 99 Alternative	11 (11-12)	72 (64-72)	86 (86-86)
I-5 Alternative	2 (1-3)	6 (4-10)	59 (59-60)
SR 99 to I-5 Alternative	5 (4-6)	38 (35-38)	48 (48-49)
I-5 to SR 99 Alternative	7 (7-7)	39 (38-39)	68 (68-68)

Note: The number of hazardous material sites for all risk levels should be considered as a snapshot in time. Actual facility environmental conditions vary over time and environmental databases are constantly being updated. Sites are added or deleted regularly. The number of medium- and low-risk sites should be approximate because the site locations have been identified as a single point and portions of a property can fall inside or outside of the 1/8-mile (660-foot) buffer.

Direct Impacts

Long-term impacts could occur when Sound Transit acquires properties that are the source of contamination and, therefore, could require ongoing cleanup responsibility. Such sites are typically associated with groundwater contamination or are large and complex. The actual long-term impacts at such hazardous materials sites cannot be identified or assessed without evaluating in detail site-specific conditions, which would be performed before, during, or after construction. The high-risk sites that could be directly affected by build alternatives are shown in Exhibits 4.12-1 and 4.12-2, and described below by alternative. Additional high-risk sites, not described below or included in Exhibits 4.12-1 and 4.12-2, are present within the FWLE corridor and are listed in Appendix D4.12. These sites have been ranked as “High” based on the potential for significant contamination; however, based on the alignment of alternatives and station options, these additional high-risk sites are not expected to be affected by the FWLE.

Contamination at any site affected by the FWLE would be addressed before and during project construction (see Chapter 5). Long-term monitoring or other protective measures or restrictions could be required. Long-term monitoring is currently occurring at the Midway Texaco (Map ID site 44), Midway Cleaners (Map ID Site 78), Arco 5363 (Map ID Site 85), 7-Eleven 18758 (Map ID Site 73), and the Midway



Legend

SR 99 Alternative
 ■ Elevated
 ■ At-Grade
 ● Trench

I-5 Alternative
 ■ Elevated
 ■ At-Grade
 ● Trench

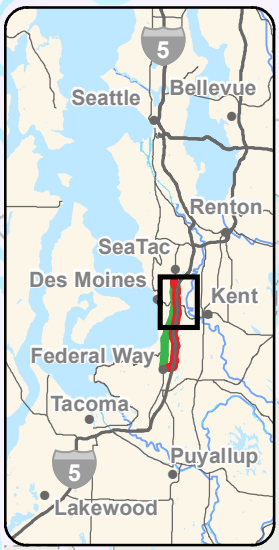
SR 99 to I-5 Alternative
 ■ Elevated

I-5 to SR 99 Alternative
 ■ Elevated

Options
 ■ Elevated
 ■ At-Grade
 ● Trench

Stations
 ■ Station for Alternatives
 ■ Station for Options

--- City Boundary
 — Street
 — Stream
 ■ Waterbody
 ● High Risk Hazardous Material Site



Data Sources: King County, Cities of Des Moines, Federal Way, Kent, SeaTac, EDR (2013).

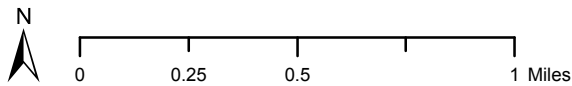
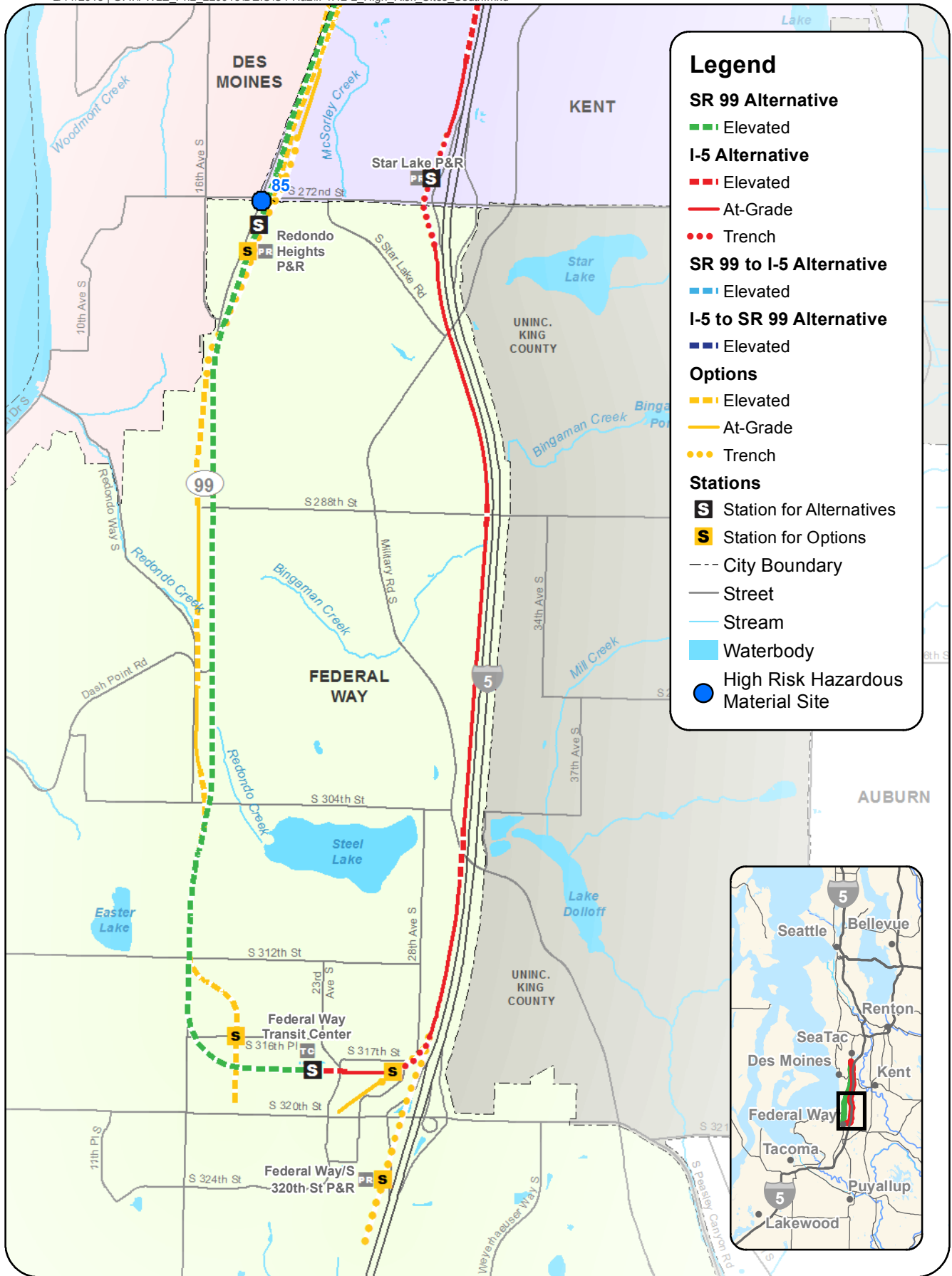


EXHIBIT 4.12-1
 High Risk Hazardous Material Sites (North)



Data Sources: King County, Cities of Des Moines, Federal Way, Kent, SeaTac, EDR (2013).

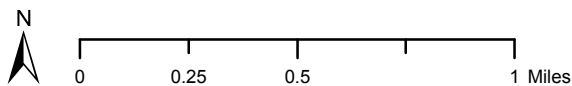


EXHIBIT 4.12-2
High Risk Hazardous Material Sites (South)

Federal Way Link Extension

Landfill (Map ID Site 84). Each of these is within the footprint of one or more alternatives.

Each site would be handled in accordance with the requirements of applicable regulations and approvals and the specific site needs. The likelihood of impacts (i.e., releases) from FWLE operations and maintenance activities would be low. Because the trains operate using electricity, fuel spills would not occur and impacts during normal operation are unlikely. However, minor impacts during operations could result from use of hazardous materials during maintenance activities on the tracks. There would be a low chance that a small amount of diesel fuel or hydraulic fluid could spill from maintenance vehicles during track maintenance. There would be no impacts during operation related to the ASARCO smelter plume. Construction impacts related to the smelter plume are discussed in Chapter 5, Construction.

SR 99 Alternative

With the SR 99 Alternative, long-term impacts could occur at the following high-risk sites if Sound Transit acquires all or part of these properties:

- Sunmart 1 (Map ID Site 72) is a former service station with known groundwater contamination for petroleum. This property would be partially acquired for the SR 99 alternative and most station options. It would be fully acquired for the potential additional station at S 216th Street (West option).
- Midway Texaco (Map ID Site 44) is an active service station with known groundwater contamination for petroleum. This property would be fully acquired for the SR 99 Alternative as well as for the Kent/Des Moines SR 99 Median Station Option. The Kent/Des Moines HC Campus Station Option and the SR 99 East Station Option would avoid this property.
- Midway Cleaners (Map ID Site 78) is a dry cleaning business with known contamination of PCE in soil and groundwater. The property would be fully acquired for the SR 99 Alternative and station options except the Kent/Des Moines SR 99 East Station Option, which would avoid this property.
- Japanese Auto Sales & Service (Map ID Site 82) is a former auto sales and service property that was investigated by regulatory agencies for failing to store and handle dangerous waste properly.

This property would be partially acquired for the SR 99 Alternative. The Kent/Des Moines HC Campus Station Option and the potential additional station at S 260th Street (West option) would fully acquire this property, and the Kent/Des Moines SR 99 East Station Option would avoid this property.

- 7-11 Eleven No. 18758 (Map ID Site 73) is an active service station with known groundwater contamination for petroleum. This property would be partially acquired for the potential additional station at S 260th Street (West option).
- Arco 5363 (Map ID Site 85) is an active service station with known groundwater contamination for petroleum. This property would be fully acquired for the SR 99 Alternative.

I-5 Alternative

With the I-5 Alternative, long-term impacts would only occur with crossing the Midway Landfill (Site 84). This site is a 60-acre former gravel quarry that was used as an unlined landfill from 1966 to 1983. The Midway Landfill is active on the National Priorities List (NPL) and has confirmed groundwater contamination. Sites on the NPL, also known as Superfund, have been identified for priority cleanup by EPA. Deed restrictions are in place for the site.

The Midway Landfill is closed and capped. The current landfill cap consists of 1 foot of cover soil over a 1-foot drainage layer, which is over filter fabric, a drainage net, and a 50-mil high-density polyethylene membrane, all of which are over a 1-foot compacted soil/clay layer. There are numerous wells in place to capture gases from below the cap. The type and magnitude of impacts at the landfill would be dependent on the crossing option.

Two crossing options are being considered. One option is to cross the landfill using an elevated guideway supported by drilled shafts. The construction of the drilled shafts would require removal of a portion of the landfill cover, removal of waste material, drilling shafts up to 10 feet in diameter, and replacement of the landfill cover around the shafts. The other option to cross the landfill would require removal of a portion of the cover, compaction of waste material in place, replacement of the cover over the compacted waste, and placement of ballast material for the tracks at ground level. The overhead catenary system poles would be supported by small drilled shafts.

Both options would require regulatory approval from EPA and Ecology.

Penetrations of the landfill, such as drilled shafts, would be constructed so that the landfill liner is replaced around the shafts to prevent surface water infiltration and leachate migration in the long term. The compaction of waste and replacement of the liner would prevent any surface water infiltration post-construction because the existing liner and replacement liner would be reconnected and sealed. Based on the current conceptual design, drilled shafts would be approximately 50 to 75 feet deep. The best available information related to groundwater monitoring at the landfill indicates the shaft depths would be approximately 35 feet or more above groundwater. Compaction of the waste would minimize the creation of new leachate pathways to groundwater in the long term.

Long-term commitments associated with crossing the Midway Landfill would likely include monitoring the cover to ensure its integrity, preventing surface water infiltration into the landfill, and preventing gas migration from the landfill. The Landfill Median Alignment Option would avoid impacts on the landfill. No other contaminated sites within the study area would be affected by this alternative.

SR 99 to I-5 Alternative

Long-term operational impacts could occur at the following high-risk sites with the SR 99 to I-5 Alternative: Sunmart 1 (Site 72), Midway Texaco (Site 44), and the Midway Landfill (Site 84). Potential impacts associated with Sunmart 1 (Site 72) and Midway Texaco (Site 44) would be the same as discussed for the SR 99 Alternative. Potential impacts associated with Site 84 would be the same as discussed for the I-5 Alternative.

I-5 to SR 99 Alternative

Long-term operational impacts could occur at the Arco 5363 (Site 85) with the I-5 to SR 99 Alternative, and the potential impacts would be the same as discussed for the SR 99 Alternative.

Indirect Impacts

The FWLE would support redevelopment of properties around station areas where local zoning allows. Properties where contamination is present could be cleaned up for redevelopment earlier than might otherwise occur, which would be an indirect benefit of the project.

4.12.5 Potential Mitigation Measures

In order to mitigate potential impacts from all potential hazardous materials sites, Sound Transit would perform a level of environmental due diligence appropriate to the size and presumed past use of the property at all properties along the corridor before they are acquired. Phase 2 environmental site assessments would be conducted where appropriate. Where known hazardous materials are present, Sound Transit would be responsible for the remediation of any contaminated soil and groundwater, including any that is previously unknown and found during construction. To the extent practical, Sound Transit would limit construction activities that might encounter contaminated groundwater or contaminated soil.

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4.13 Electromagnetic Fields

4.13.1 Summary

In the FWLE study area, there are no sensitive facilities containing equipment susceptible to electromagnetic interference. While utilities can be affected by stray electric currents, avoidance measures are part of the project design. Therefore, there is no potential for electromagnetic field impacts in the study area.

4.13.2 Introduction to Resources and Regulatory Requirements

Electric and magnetic fields, known as electromagnetic fields (EMFs), are produced wherever electricity is used. Electric fields are produced by charges. Magnetic fields are created by the flow of electric current. The greater the electric charge, the greater the electric field. Similarly, the greater the electric current, the greater the magnetic field. EMFs are produced by electrical equipment and facilities, including electrical conveyance lines and electrical devices, and they can also be emitted with the movement of transportation vehicles, such as truck traffic.

Where there are electric currents, stray currents can occur when a portion of the electric current finds an alternative conducting path, such as metal, water, or a buried pipe or cable. Over time, a stray current can cause corrosion, which in turn can cause pipes to leak or wires to break. EMFs can also interfere with the functioning of sensitive equipment. These effects are known to the design and construction community. Utility lines are normally insulated and cathodic protection systems can be used to prevent corrosion damage.

4.13.3 Affected Environment

Although there are no regulatory requirements for EMFs, EMFs create electromagnetic interference (EMI), which can cause disruptions and possibly malfunction of some types of equipment. In certain situations with sufficiently high exposure, EMFs can also affect human health. The FWLE would not produce EMF levels that could affect nearby people, and therefore the EMF study area for FWLE depends on the location of sensitive equipment in relation to the light rail line and the amount of electrical power required to accelerate or decelerate light rail vehicles near sensitive facilities. However, the

potential for a light rail vehicle to adversely affect sensitive equipment from a distance greater than 100 feet is very low.

An exploration of land uses in the FWLE corridor included a search for existing and planned land uses where potential EMFs from light rail vehicles might interfere with normal operation and function of sensitive equipment. The survey of land uses noted whether there are research or medical facilities present that may use sensitive medical or laboratory equipment. The most noteworthy uses in the corridor include dental and medical facilities such as clinics and individual practice offices. None of these uses in the FWLE corridor are large enough to have equipment with high potential to be sensitive near a light rail facility, such as MRI, CAT scan, or laser equipment.

Therefore, none of the clinics or medical/dental offices are expected to contain equipment with enough sensitivity to be affected by heightened EMFs. There are four medical facilities under construction or in operation where an interview with the owners was conducted to determine whether the facilities use or will use sensitive equipment. They are:

- **HealthPoint Midway Medical:** An existing community health clinic is at 26401 Pacific Highway South, Des Moines, WA 98198, which is located directly adjacent to SR 99.
- **Sea Mar Community Health Center:** A new community medical clinic is proposed at 24215 Pacific Highway South, Des Moines, WA 98918, on the property of the previous Des Moines Sea Mar facility and will be directly adjacent to SR 99. This project is under construction.
- **UW Medicine Neighborhood Clinic Federal Way:** An existing community medical clinic at 32018 23rd Avenue S, Federal Way, WA 98003, which is located between SR 99 and I-5.
- **UW Medicine Neighborhood Clinic Kent/Des Moines:** An existing community medical clinic at 23213 Pacific Highway South, Kent, WA 98032, which is located directly adjacent to SR 99.

Based on communications with each clinic, none of these clinics contain medical equipment sensitive to EMFs.

4.13.4 Environmental Impacts

4.13.4.1 No Build Alternative

If the FWLE is not built, then the existing EMF environment would not change.

4.13.4.2 Build Alternatives

The following subsections describe the direct and indirect impacts of the build alternatives. Construction impacts related to EMFs are discussed in Chapter 5, Construction Impacts.

Direct Impacts

Electromagnetic Fields

Since the clinics described in Section 4.13.3 do not contain sensitive medical equipment and no industrial or scientific facilities that contain sensitive equipment have been identified along the various alignments, the FWLE alternatives would have no interference with sensitive medical or electronic equipment. The electric current from the traction power substations carried by the catenary wires is a pulsating form of direct current, which can interfere with radio waves such as those used to transmit AM radio broadcasts. Many forms of electric charges can interfere with low-frequency radio waves, such as high-voltage power lines, trolley wires for electric buses, and hybrid cars. This interference can result in annoyance to the listener, but does not result in any damage to the radio equipment.

Stray Currents

Without control measures, a portion of the electrical current flowing through the light rail trains could stray to underground metallic objects, such as buried pipes, cables, or rebar. The current could then flow along conducting metallic lines in the ground back to the traction power substation or to nearby utilities. To avoid this issue, Sound Transit would coordinate control measures with the owners and operators of the utility lines that could be affected.

Sound Transit would minimize or avoid the potential for stray current impacts by selecting best management practices (BMPs) appropriate for the circumstances. The BMPs may include one or a combination of the following:

- Installing cathodic protection systems in nearby utility lines to protect them from corrosion
- Installing insulating unions to break the electrical conductivity of the pipe and thus force the stray current to take another path
- Isolating the electrical rails from the ground
- Installing stray-current-control track-fastening systems where appropriate, such as:

- Tie-and-ballasted track using high-resistance track-fastening systems on concrete ties
- Direct-fixation track using high-resistance, rubberized track-fastening systems
- Embedded track using various methods of rail encapsulation such as rail coatings, polyurethane encasement, and rail boots

Cathodic protection system components include the following:

- Galvanic anodes
- Electrical isolation with insulating unions at connections to existing piping
- Pipe coatings
- Bonded mechanical pipe joints
- Permanent test facilities to monitor stray currents and rates of corrosion

Where tracks are elevated on overhead guideway structures, the return current cannot get to ground as easily as on structures that are not elevated; therefore, EMFs from overhead structures are less likely to affect underground utility lines.

Potential Health Effects from Light Rail Alternatives

EMFs can cause a variety of effects on humans. Certain EMF combinations can cause shock and burn injuries through direct contact with energized components; others can interfere with the operation of electrical and magnetic devices, including heart pacemakers. Based on data available from similar rail systems, operation of the light rail is unlikely to generate health impacts for riders or people along the tracks. Anticipated EMF intensities at locations of human exposure within and adjacent to the light rail line are considerably below exposure guidelines established by the American Conference of Governmental Industrial Hygienists and the more recent guidelines established by the International Commission on Non-Ionizing Radiation Protection. These guidelines address known biological effects and do not address speculative concerns about cancer and other possible health effects. Given uncertainties in potential biological effects, these guidelines do incorporate safety factors. Among the various alternatives, no notable differences exist in potential health impacts related to EMFs.

Indirect Impacts

There is no potential for indirect impacts because there are no sensitive equipment or facilities in the project study area.

4.13.5 Potential Mitigation Measures

No impacts were identified, and therefore no mitigation will be necessary.

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4.14 Public Services, Safety, and Security

4.14.1 Summary

The FWLE would not result in adverse impacts on public services because all alternatives are grade-separated from traffic and would not affect travel or response times for public service vehicles, including fire, emergency medical, and police. Access to the exclusive right-of-way, whether elevated, at-grade, or in a trench, would require additional coordination with fire and emergency medical services and police. A U.S. Post Office in Kent would need to be relocated for the Kent/Des Moines SR 99 East Station Option associated with both the SR 99 Alternative and the I-5 Alternative, as well as for the SR 99 to I-5 Alternative. Minor property acquisition or easements would be required from Mark Twain Elementary School and Federal Way High School properties, but would not affect operation of these schools. Property from a Highline College campus parking lot would be acquired for the Kent/Des Moines HC Campus Station Option for the SR 99 Alternative, and the Highline College Outreach Center on SR 99 would be displaced by the Kent/Des Moines SR 99 West Station and Kent/Des Moines HC Campus Station options. The Outreach Center would be relocated near or on the campus.

4.14.2 Introduction to Resources and Regulatory Requirements

This section discusses potential impacts from the FWLE on public services located within the study area or with service boundaries within the study area. These services include fire and emergency medical services (including hospitals), police, schools (public and private), solid waste and recycling collection, and mail delivery. This section also discusses project-related operations that could lead to increases or changes in emergency response services related to crime or other emergency response incidents. There are no regulatory requirements related to public services.

4.14.3 Affected Environment

The study area for public services is defined as a 0.5-mile boundary around the FWLE alternatives and includes the cities of SeaTac, Des Moines, Kent, and Federal Way. This section describes the locations and public service providers within the study area. Table 4.14-1 summarizes information on the public service providers within the

study area. Locations of facilities in the study area are shown on Exhibits 4.4-1 and 4.4-2 in Section 4.4, Social Impacts, Community Facilities, and Neighborhoods.

TABLE 4.14-1

Summary of Public Service Providers within Study Area

	Location			
	SeaTac	Des Moines	Kent	Federal Way
Police				
Local	SeaTac Police Department	Des Moines Police Department	Kent Police Department	Federal Way Police Department
County	King County Metro Transit Police King County Sheriff			
State	Washington State Patrol			
Fire/Emergency Medical				
Local	Kent Fire Department Regional Fire Authority	South King Fire & Rescue	Kent Fire Department Regional Fire Authority	South King Fire & Rescue
County	King County Medic One			
Solid Waste				
	Allied Waste Services	Recology Cleanscapes	Allied Waste Services	Waste Management
Schools				
Local School District	Highline School District	Highline School District	Kent School District	Federal Way School District
Private	Private schools are located throughout the study area.			
Post-Secondary	Highline College			
Other Government Facilities				
Federal Government Facilities	Federal Detention Center	U.S. Post Office	U.S. Post Office	None

Sources: City of SeaTac, 2013; City of Des Moines, 2013; City of Kent, 2013; City of Federal Way, 2013.

4.14.3.1 Fire and Emergency Medical Services

Fire and emergency medical services are provided by the Kent Fire Department Regional Fire Authority and South King Fire & Rescue. There are four stations located in the study area:

- SeaTac Fire Station 45, 2929 S 200th Street, SeaTac
- South King Fire & Rescue Station 26, 2238 S 223rd Street, Des Moines

- South King Fire & Rescue Station 66, 27010 15th Avenue S, Des Moines
- Kent Fire Station 73, 26512 Military Road S, Kent

There are no hospitals or emergency medical facilities located within the study area.

4.14.3.2 Police Services

There is a police substation located within the study area at 31620 23rd Avenue S in Federal Way, across from the Federal Way Transit Center (*Federal Way Mirror*, 2014). Sound Transit compared crime data for the cities in the study area with King County and Washington State to show the relative crime rates at the local, regional, and statewide levels. The crime reporting program provides statistics for violent crimes (i.e., murder, forcible rape, robbery, and aggravated assaults) and property crimes (i.e., burglary, larceny-theft, motor vehicle theft, and arson). Table 4.14-2 lists the numbers of offenses and crime rates by jurisdiction for 2011 and 2012, based on available data (Washington Association of Sheriffs and Police Chiefs, 2013, 2014).

TABLE 4.14-2
2011 and 2012 Violent and Property Crime Rates by Jurisdiction

Jurisdiction (Year)	Part 1 Offenses (Violent and Property Crimes)	Violent Crime Rate (per 1,000 Population)	Property Crime Rate (per 1,000 Population)
City of SeaTac (2012)	2,107	12.9	64.5
City of Des Moines (2011)	1,146	3.0	35.6
City of Kent (2012)	7,067	13.3	46.0
City of Federal Way (2011)	4,509	2.7	47.7
King County (2012)	6,721	4.0	21.9
Washington State (2012)	313,500	14.1	52.9

Source: Washington Association of Sheriffs and Police Chiefs, 2013, 2014.

Information was collected on criminal activity reported near Sound Transit's and King County's existing transit facilities located within the study area. Table 4.14-3 shows the number of violent and property crimes reported within 0.5-mile of these facilities between September 2011 and March 2013 (Crimereports.com, 2014).

TABLE 4.14-3
Violent and Property Crimes near Transit Centers and Park-and-Ride Lots within Study Area between September 2013 and March 2014

Owner	Location	Violent Crimes	Property Crimes
Sound Transit	Federal Way Transit Center	4	46
King County	Star Lake Park-and-Ride	14	15
King County	Redondo Heights Park-and-Ride	14	23
King County	S 320th Park-and-Ride	4	51

Source: CrimeReports.com, 2014.

4.14.3.3 Solid Waste Services

All nonhazardous solid waste collected in the study area is taken to transfer stations and then to the King County Cedar Hills Landfill in Maple Valley. The closest facility that accepts household hazardous waste is the South Transfer Station, managed by Seattle Public Utilities and located in Seattle.

4.14.3.4 Schools

There are 19 public and private primary and secondary schools located within the study area (Exhibits 4.4-1 and 4.4-2). These schools served approximately 9,900 students in the 2012-2013 school year. In addition, approximately 17,000 students attend Highline College (Highline College, 2014).

4.14.3.5 Other Government Facilities

Within the study area, other government facilities include a Federal Detention Center at 2425 S 200th Street in SeaTac and U.S. post offices at 23418 Pacific Highway S in Kent and 2003 S 216th Street in Des Moines.

4.14.4 Environmental Impacts

Sound Transit determined potential operational impacts on public services by reviewing design drawings to identify possible changes in the travel and response times for public service vehicles, including project elements that could alter access to public service facilities. Sound Transit qualitatively compared the crime rates of the cities within the study area with the overall crime rate of King County and performed a literature review associated with crime and light rail systems.

4.14.4.1 No Build Alternative

As a result of continued growth in population and employment in the study area, there would be increases in public services demands. In

addition, increases in traffic congestion could affect emergency services response times.

4.14.4.2 Build Alternatives

The following subsections describe the direct and indirect impacts of the build alternatives. Construction impacts related to public services are discussed in Chapter 5, Construction.

Direct Impacts

Impacts Common to All Alternatives

All of the build alternatives would have similar types of impacts on public services and safety and security.

Fire and Emergency Medical Services

Safety is one of the Sound Transit design criteria used to avoid conflicts with vehicular, bicycle, and pedestrian traffic. A safety and security management plan (SSMP) will be prepared for the FWLE. The SSMP establishes the safety and security organization required for the FWLE to integrate safety and security throughout the project life cycle (design, construction, and operation).

The FWLE would operate in its own (exclusive) right-of-way and would not conflict with vehicular traffic, bicycles, and pedestrians. Because light rail trains would not cross surface streets at grade, light rail operations would not directly affect emergency and incident response routes or times. Increased congestion at station areas and park-and-ride lots could affect response times, but traffic impacts would be mitigated. Chapter 3, Transportation Environment and Consequences, identified locations where traffic congestion and delays could occur with the FWLE alternatives.

All of the jurisdictions along the project corridor currently operate emergency vehicle preemption (EVP) programs that give emergency vehicles priority. Sound Transit would work with the jurisdictions to anticipate the EVP programming needs around stations and to ensure that emergency response times would not be affected.

Access to fire hydrants, fire lanes, and fire response access points within or adjacent to the FWLE boundaries would be maintained where possible; where it is not possible, access would be redesigned working with the appropriate agencies and jurisdictions. Fire department regulations and procedures prohibit placing fire hoses over active railroad tracks, so light rail operations could be temporarily shut down during fire emergencies.

Emergency incidents associated with the FWLE are expected to be minimal because the facilities would be made of noncombustible materials. The vehicles are electrically powered and do not use combustible fuels. Fire and emergency service vehicles would have to use different methods and, in some cases, different equipment, when responding to incidents associated with the different alternative profiles. Emergency service providers and Sound Transit personnel would be trained to respond to emergencies on elevated guideways or in trenches and restricted areas within Washington State Department of Transportation (WSDOT) right-of-way. Elevated and trench sections would be designed to provide emergency access and evacuation in conformance with state and local codes and with National Fire Protection Association (NFPA) 130: Standard for Fixed Guideway Transit Systems. Emergency vehicle access would be provided at approximately 2,500-foot intervals, consistent with NFPA 130. At these locations, emergency vehicles would be able to access the elevated, at-grade, and trenched light rail tracks. Where necessary to ensure that access is provided, new access points, such as bulb-outs and new access roads, would be created. Access to trains on elevated and trenched guideways could be provided via trains on the adjacent track. When a second train is not practical, Sound Transit would follow state and local fire codes and NFPA 130. Local fire departments in the study area have ladder trucks to properly respond to incidents on elevated structures.

A required component of the SSMP is the formation of the Fire/Life Safety Committee, which would review safety requirements and obtain concurrence from local authorities that have jurisdiction. The Fire/Life Safety Committee would develop solutions regarding access to the light rail system, emergency routes, water and fire hydrant needs, training, costs, and other design features. Sound Transit would continue to consult with local jurisdictions throughout FWLE design to minimize impacts on emergency response times. Implementing the required SSMP would minimize impacts on fire and emergency medical services during FWLE operation.

Police

Police vehicles traveling in the FWLE study area should not experience increased response times. Similar to fire and emergency medical responders, police vehicles could have difficulty in responding to calls at elevated sections of track or stations and to stations not easily

accessible from the existing roadway network, which would require additional planning between Sound Transit and local emergency providers.

All alternatives would create facilities where additional police and security staff would be needed to monitor stations, parking facilities, and other areas to protect people and property. Sound Transit operates its own security force at its facilities. Although an increase in crime at transit facilities is not anticipated, research from other transit systems shows that some petty crimes could occur at transit stations or park-and-ride lots. Studies have consistently found that crime at transit facilities, such as stations, generally reflects the conditions in the surrounding neighborhoods (Billings et al., 2011; City of Seattle, 1999; Loukaitou-Sideris et al., 2002). Quality of life crimes (for example, vandalism, drunkenness, and panhandling) and property crimes account for more than 90 percent of crimes at transit facilities. Violent crimes account for most remaining crimes. Crimes are more likely to occur at a station than on a light rail vehicle. In addition, stations with park-and-ride lots can have more potential for crime than stations without parking. Different types of station access (stairs, escalators, or elevators) do not appear to influence criminal activity, but their design and location can be a factor if they provide places where criminals can act without being observed by others.

Sound Transit would work with local authorities during final design to incorporate crime prevention through environmental design (CPTED) principles. The design of stations would be spacious, well-lit, uncluttered, and would provide open access. Attention would be given to lines of sight and visibility, with corners, dark or hidden areas, and opaque shelter screens eliminated or minimized. Public waiting areas, including station platforms, would be easily visible to other patrons and to police and Sound Transit security personnel. These methods, in association with other security features such as closed-circuit television cameras connected to the Link Control Center, passenger emergency telephones, sealed fare boxes, controlled exits, and security personnel would help to deter criminal activity and generally make light rail stations and parking facilities more secure. To address issues related to potential terrorist threats, Sound Transit will work with the Federal Transit Administration and local law enforcement agencies, the U.S. Department of Homeland

Security, and emergency service providers to develop strategies to prevent and respond to these potential threats.

Solid Waste

No adverse impacts on solid waste collection and disposal would occur during operation. The FWLE would not acquire any property currently occupied by recycling, composting, and solid waste facilities or operating bases. Collection routes would not be affected and would not experience delays resulting from minor changes in the existing roadways. Operation of the FWLE is not anticipated to result in a noticeable increase in the demand for solid waste services.

Schools

No FWLE alternatives would travel through neighborhoods with grade school-crossing zones. All of the alternatives include a station in the Kent/Des Moines area, which would improve access to Highline College. No adverse impacts related to school transportation are anticipated. Chapter 3, Transportation Environment and Consequences, explains that overall transit travel times would improve, which would improve the commute times for students and school staff commuting by transit.

Government Facilities

No adverse impacts are anticipated to postal collection or delivery and postal vehicles would not experience any delays resulting from changes to the existing roadways. The beginning of the FWLE is south of the Federal Detention Center in SeaTac and would have no impact on this facility.

Impacts by Alternative

SR 99 Alternative

The elevated guideway for the SR 99 Alternative would require placement of columns in the median of SR 99, which would not conflict with existing left-turn and u-turn movements.

The Kent/Des Moines SR 99 East Station Option would acquire the property where a U.S. Post Office is located at 23418 Pacific Highway S in Kent. The U.S. Postal Service has identified this post office for potential closure in the future (Puget Sound Business Journal, 2011). Sound Transit would work with the U.S. Postal Service to determine if this post office should be relocated and, if so, identify an appropriate location to serve this community.

The Kent/Des Moines HC Campus Station Option would locate the station on the Highline College campus, but it would be located in the current East Parking Lot and would not directly affect any college buildings. The parking displaced with this option would be replaced within a similar distance to the campus, potentially between the East Parking Lot and SR 99. In addition, parking for this station, along with the Kent/Des Moines SR 99 West Station, would displace the current Highline College Outreach Center at 23835 Pacific Highway S, which is a leased facility.

The SR 99 Alternative would acquire a portion of property from the Federal Way Public Schools associated with the east side of the Federal Way High School property for minor roadway improvements. No buildings or school uses would be affected because the alignment would be elevated in this area.

I-5 Alternative

The Kent/Des Moines SR 99 East Station Option would acquire the property where a U.S. Post Office is located at 23418 Pacific Highway S in Kent.

The I-5 Alternative alignment would travel under the playfields and driveway/bus loop at Mark Twain Elementary School at 2450 S Star Lake Road in Federal Way, south of the S 272nd Star Lake Station. The alignment would require an underground easement from this property, but no surface property is expected to be required. Although these playfields and the driveway loop would be closed temporarily during construction, they would be restored to existing conditions and no permanent impacts on the school facilities would occur. For further discussion, see Chapter 5, Construction.

SR 99 to I-5 Alternative

Potential impacts from the SR 99 to I-5 Alternative would be the same as for the SR 99 and I-5 alternatives where it follows those alignments. This alternative would acquire the property where a U.S. Post Office is located at 23418 Pacific Highway S in Kent.

I-5 to SR 99 Alternative

Potential impacts from the I-5 to SR 99 Alternative would include minor property acquisition from Federal Way High School for roadway improvements. No additional impacts would be associated with this alternative.

Indirect Impacts

The FWLE would not lead to an unplanned or induced increase in population, so it would not require additional public services beyond those already planned. The FWLE could result in focused population and employment redistribution within the station areas.

4.14.5 Potential Mitigation Measures

The Fire/Life Safety Committee and other Sound Transit safety and security specialists would continue to address public service issues throughout design, construction, and operation. Displaced public services would be relocated in accordance with the Uniform Relocation Assistance and Real Property Acquisitions Policies Act of 1970 and the Sound Transit Real Estate Property Acquisition and Relocation Policy, Procedures and Guidelines, as described in Sections 4.1.6 and 4.1.7. No additional mitigation would be needed.

4.15 Utilities

4.15.1 Summary

The Federal Way Link Extension (FWLE) alternatives would all have similar electrical requirements, and it is not anticipated that new electrical system capacity would be needed to accommodate the project. Alternatives or options with trenched areas would have more potential for long-term corrosion to underground utilities. This would be caused by underground stray electrical currents from electricity being transmitted from traction power substations (TPSSs) to the light rail system. This impact would be avoided through appropriate controls. No long-term adverse effects on existing utilities in the FWLE corridor would occur during operation of the FWLE. Most of the utility impacts would be due to construction activities (see Chapter 5, Construction Impacts).

4.15.2 Introduction to Resources and Regulatory Requirements

The relationship between transportation projects and utilities within the project corridor is regulated by state and local regulations and permitting processes. Local policies and procedures for the FWLE are administered by the cities of SeaTac, Des Moines, Kent, and Federal Way, as well as the Washington Administrative Code (WAC) 468-34, and by Washington State Department of Transportation (WSDOT) policies within WSDOT's right-of-way.

4.15.3 Affected Environment

The study area for utilities is defined as the area within 1/2 mile of the alternative alignments and stations. Sound Transit identified existing and planned utilities in the study area, including electrical power, natural gas, water, sanitary sewer, communications, and stormwater drainage systems. Information on existing utilities was obtained through database research and by contacting local municipalities and utility companies.

Although the FWLE would cross through the cities of SeaTac, Des Moines, Kent, and Federal Way, many of the utilities within the study area provide services in multiple jurisdictions. Table 4.15-1 summarizes the utility providers in each jurisdiction.

TABLE 4.15-1
Summary of Existing Utility Providers

Utility	SeaTac	Des Moines	Kent	Federal Way
Natural Gas	Puget Sound Energy			
Electricity	Puget Sound Energy			
Water	Highline Water District			Highline Water District Lakehaven Utility District
Sanitary Sewer	Midway Sewer District			Midway Sewer District Lakehaven Utility District
Stormwater	WSDOT, City of SeaTac	WSDOT, City of Des Moines	WSDOT, City of Kent	WSDOT, City of Federal Way
Communications	Century Link, Comcast, Level 3			

Sound Transit contacted utility providers to identify planned upgrades or new projects planned in the study area. The only planned utility improvement identified was a minor expansion of the Puget Sound Energy substation at S 221st Street.

4.15.4 Environmental Impacts

4.15.4.1 No Build Alternative

Under the No Build Alternative, the FWLE would not be constructed and no impacts on utilities within the study area would occur.

4.15.4.2 Build Alternatives

The discussion below addresses general impacts that would be common to all alternatives during operation of the FWLE. Impacts during operation include the utility demands of the operating light rail system. Most of the project impacts on utilities would be temporary and would be from construction activities rather than from operation. Temporary construction impacts on utilities, including relocations, are described in Chapter 5, Construction Impacts.

Direct Impacts

Long-term, direct impacts are common to all alternatives; there would be no operational impacts unique to any of the alternatives.

The FWLE light rail line would increase electricity usage in the study area because trains with up to four cars would operate on direct-current power taken from 26-kilovolt (kV) electric distribution facilities. Lighting installed at stations and safety lighting along the alignments, parking areas, and other light rail facilities would also increase electricity demand slightly. However, the FWLE would result in a slight regional reduction of passenger and transit vehicle miles traveled as people shift to the light rail system; therefore, overall

energy consumption would be less when compared to the No Build Alternative.

Electricity for operation of the FWLE light rail vehicles, stations, and facilities would be provided by Puget Sound Energy (PSE). The energy needed to power the FWLE light rail vehicles is less than 0.1 percent of the PSE 2011 power generation and is not expected to adversely affect the electric system or require that PSE develop additional energy resources. Sound Transit would coordinate with PSE to determine if improvements to any local substations would be necessary. Energy consumption rates are described in Section 4.10, Energy Impacts.

TPSSs would be located approximately every 2 miles to distribute power to the overhead catenary system (OCS). These stations would be powered by 26-kV electric lines connecting to the nearest power pole. Availability of power to each TPSS might, in some cases, require that additional distribution lines be constructed to the substation.

Underground utilities within or adjacent to the project footprint, including communications, gas, sewer, water, and electric lines, could be susceptible to corrosion from stray electrical currents traveling from the TPSS to OCS poles. The greatest potential for stray current impacts would occur in trenched areas of FWLE alternatives or options. Sound Transit would coordinate with utility providers to identify appropriate control measures, which could include:

- Installing cathodic protection systems
- Installing insulating unions to break the electrical conductivity of the utility
- Isolating electrical rails from the ground
- Installing stray-current-control track fastening systems where appropriate

Section 4.13, Electromagnetic Fields, provides additional discussion of the effects on utilities of stray currents from light rail vehicles. No substantial differences among build alternatives are expected in long-term utility service. Major service disruptions to utility customers during light rail repair and maintenance operations are unlikely. The light rail alignment would be designed so that access to utilities for maintenance and repair could be maintained. In some cases, sewer manholes, pipes, vaults, and other access points might have to be

relocated. Sound Transit would work closely with utility providers to maintain required access to these utilities and any relocated sewer holes and vaults, utility mains, fire hydrants, and other features.

Sound Transit would integrate efficient operating practices at existing and new facilities and use equipment to reduce energy and water demand and to recycle water. Implementing these and other sustainable practices would reduce consumption and demand on utilities.

Indirect Impacts

The improved transit access from the availability of light rail service would support planned development or redevelopment in the vicinity of the FWLE stations, which in turn could increase the demand for utility services in this area. Local governments have already planned for increased development in their adopted local land use plans and policies, consistent with regional plans. Furthermore, the project corridor is located entirely within the urban growth boundaries of the cities of SeaTac, Des Moines, Kent, and Federal Way, and any development near the FWLE would not be denser than what is allowed in the adopted land use plans of these cities. The indirect impacts on utilities should not be greater with or without the FWLE. See Section 4.4, Land Use, for more details on the indirect impacts related to land use development.

4.15.5 Potential Mitigation Measures

No long-term adverse impacts on utilities are anticipated, such as the need to develop additional capacity or transmission facilities to serve light rail operations; therefore, no mitigation is proposed.

4.16 Historic and Archaeological Resources

4.16.1 Summary

Within the FWLE area of potential effects (APE) for historic and archaeological resources, this analysis identified no archaeological resources. It identified eleven historic buildings that have been determined eligible for the National Register of Historic Places (NRHP).

The Kent/Des Moines Highline College (HC) Campus Station Option for the SR 99 Alternative would occupy the eastern edge of the Highline College parking lot, which would change a component of the setting of nine individually NRHP-eligible Highline College buildings. However, since the parking lot is not a contributing element to these historic buildings, this change would not constitute an adverse effect.

As a result of roadway widening, the SR 99 Alternative and the Federal Way SR 99 Station Option for the SR 99 Alternative would acquire part of the parcel occupied by the NRHP-eligible US Bank building. The area acquired is immediately adjacent to SR 99. The US Bank building is set back on the parcel and would not be physically impacted by the acquisition. Impacts to the building's setting would be minor and would not constitute an adverse effect. The Federal Transit Administration (FTA) has made a preliminary finding of "No Adverse Effects to Historic Properties" for the SR 99 Alternative.

Elements of the Federal Way I-5 Station Option for the I-5 Alternative and the SR 99 to I-5 Alternative would be located approximately 152 feet from the NRHP-eligible Calvary Lutheran Church, but would not affect the church or its setting. FTA has made a preliminary finding of "No Historic Properties Affected" for the I-5 Alternative, the SR 99 to I-5 Alternative, and the I-5 to SR 99 Alternative.

Alternatives that would acquire parts of parcels with NRHP-eligible buildings may result in "*de minimis*" use of historic properties under Section 4(f) of the Department of Transportation Act. Appendix E includes a Section 4(f) analysis and preliminary determination.

De Minimis Impacts

De minimis impacts cannot "adversely affect the activities, features, and attributes" of a Section 4(f) resource. For historic and archaeological sites, a *de minimis* impact is allowed if FTA has determined "no adverse effect" in compliance with Section 106 of the National Historic Preservation Act of 1966 (NHPA). When FTA has made a *de minimis* determination, the project is not required to analyze avoidance alternatives for that Section 4(f) property.

4.16.2 Introduction to Resources and Regulatory Requirements

The two main federal laws protecting historic and archaeological resources are the National Historic Preservation Act (NHPA) and the National Environmental Policy Act (NEPA). “Historic properties” are defined in NHPA’s regulations as any prehistoric or historic district, site, building, structure, or object included in or eligible for the NRHP. Cultural resources must also be given consideration under NEPA. In addition, for U.S. Department of Transportation projects, Section 4(f) of the U.S. Department of Transportation Act protects NRHP-eligible properties.

Applicable state laws and authorities include the Washington State Environmental Policy Act (SEPA) and laws and regulations relating to cultural and archaeological resources. These include the Washington Heritage Register (WHR) program (administered by the Department of Archaeology and Historic Preservation [DAHP]). Under Washington state law, any alteration to an archaeological site requires a permit from DAHP. State law also protects Native American burial sites.

Properties within unincorporated areas of King County may be designated and protected as King County landmarks under the King County Historic Preservation Program by the King County Landmarks Commission. This Commission also acts as a municipal landmarks board for cities (including Des Moines and Kent) that have entered into interlocal agreements with the County for historic preservation services. A historic resource may be designated as a King County Landmark if it is more than 40 years old or, in the case of a landmark district, contains resources that are more than 40 years old. This differs from NRHP criteria, which require that a property be 50 years old unless it is exceptionally important. The King County Landmarks Commission determines if a property is eligible as a King County Landmark. Discussions of potential King County Landmark eligibility in this Draft EIS are recommendations only, based on a review of the King County Landmarks Commission ordinance. There are no designated King County Landmarks in the APE.

Laws and Authorities that Protect Historic and Archaeological Resources

National Historic Preservation Act of 1966, as amended (54 U.S. Code [U.S.C.] 300101)

Protection of Historic Properties (36 CFR 800)

National Environmental Policy Act of 1969 (42 U.S.C. § 4321)

Section 4(f) of the U.S. Department of Transportation Act (23 CFR 774)

Washington State Environmental Policy Act (Chapter 43.21C Revised Code of Washington [RCW])

Washington Heritage Register (27.34.200 RCW)

Indian Graves and Records (RCW 27.44)

Archaeological Sites and Resources (RCW 27.53)

King County Landmarks Commission ordinance (King County Code 20.62)

Eligibility Criteria for the National Register of Historic Places

- Criterion A: Associated with events that have made a significant contribution to the broad patterns of our history; or
- Criterion B: Associated with the lives of persons significant in our past; or
- Criterion C: Embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
- Criterion D: Yielded, or may be likely to yield, information important in prehistory or history.

4.16.3 Affected Environment

The Historic and Archaeological Technical Report (Appendix G4) includes a history of the FWLE study area, additional information about federal, state, and local regulations affecting cultural resources, and further detail regarding the NRHP-eligible resources described in the following sections. It also includes information on each of the parcels inventoried as part of the built environment survey.

4.16.3.1 Archaeology

The FWLE APE for archaeology includes areas that would experience ground disturbance within 200 feet of the guideway centerline, and within 200 feet of the edge of ground disturbance for stations and other ancillary facilities. On December 30, 2013, DAHP concurred with FTA on this APE. The study area used for the archaeology literature review is a 0.5-mile radius of the project alternative centerlines. This is larger than the APE to provide greater context for the type of historic properties that may be encountered within the APE. A file search using DAHP's Washington Information System for Architectural and Archaeological Records Data (WISAARD) database on June 10, 2014, showed that there were 10 previous cultural resource studies in the 0.5-mile study area, but no recorded archaeological resources within the APE. A limited reconnaissance-level survey was conducted for publicly owned parcels that were accessed for the wetland survey. No archaeological sites were recorded or encountered during the survey.

The DAHP archaeological predictive model identifies some areas within the APE as high probability areas. These areas are primarily along the SR 99 corridor or concentrated near stream drainages, and are shown in Appendix G4. This information will be used to target areas for archaeological investigation after the Preferred Alternative is identified. More information is provided in Appendix G4.

4.16.3.2 Traditional Cultural Properties

With support from Sound Transit, FTA is conducting government-to-government consultation with the Yakama Nation, Muckleshoot Indian Tribe, Puyallup Tribe of Indians, Snoqualmie Indian Tribe, Stillaguamish Tribe of Indians, and Suquamish Tribe about the project and its potential effects on archaeological sites and traditional cultural properties (TCPs). Sound Transit and FTA also initiated consultation under Section 106 with the non-federally-recognized

Duwamish and Snohomish tribes. Consultation with the tribes, which began in June 2013, has revealed no TCPs in the project vicinity.

4.16.3.3 Built Environment

The FWLE APE for the built environment generally extends 200 feet from the edge of each alternative's long-term footprint, including guideways, stations, parking, ancillary facilities, and road improvements. The standard NRHP age threshold for significance is 50 years. Sound Transit used 1970 as the threshold year to capture all properties that will be 50 years old at the time the project is likely to be acquiring and demolishing structures in the project right-of-way. On December 30, 2013, DAHP concurred with FTA on the APE.

Literature Review

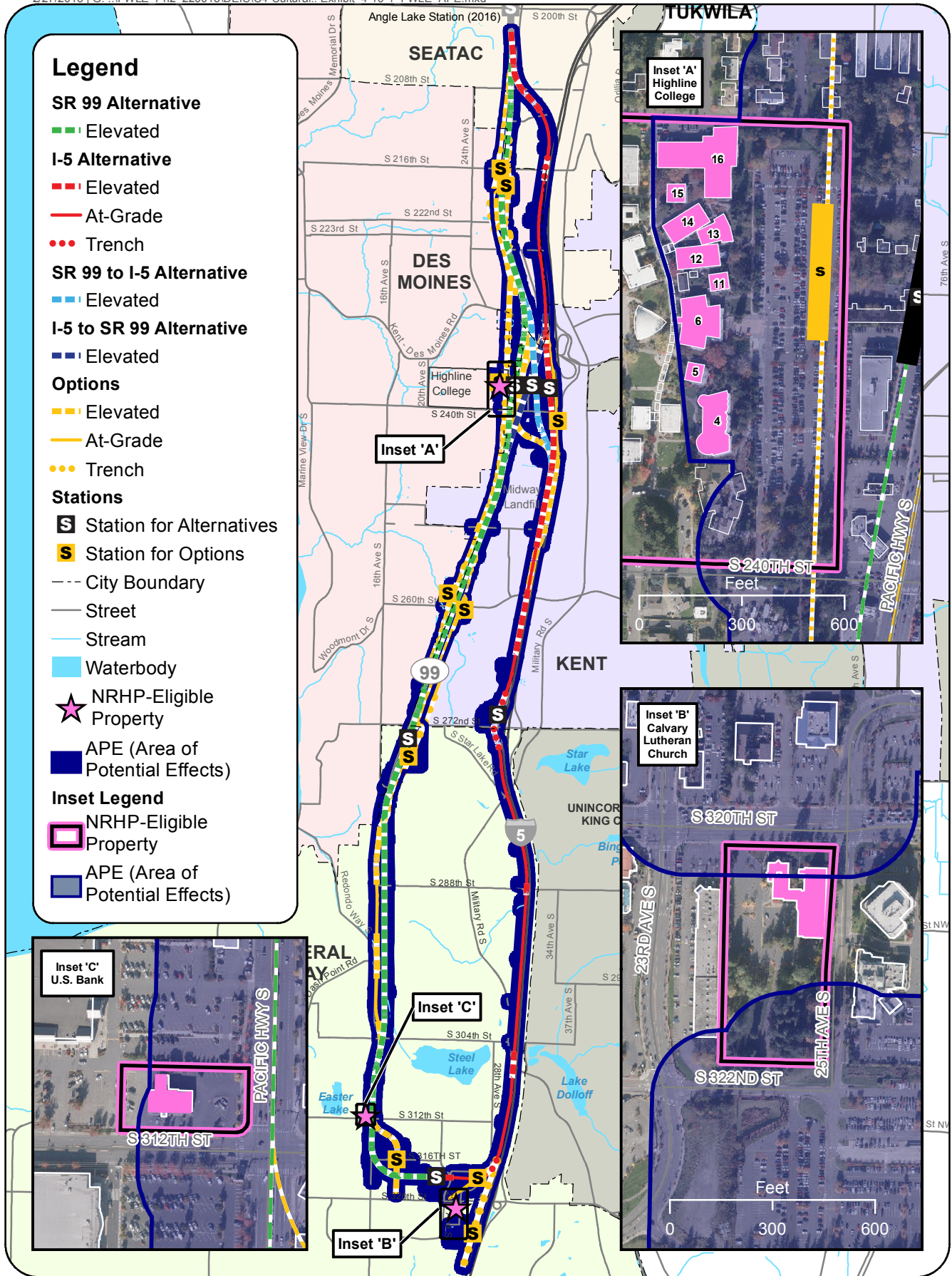
A literature search indicated that there are no NRHP- or WHR-listed built-environment resources and no designated King County Landmarks in the APE. Nine buildings along the eastern edge of the Highline College campus are located more than 200 feet from any project component; however, Sound Transit expanded the APE to encompass them to ensure potential effects were evaluated. Four of the buildings (Buildings 4, 5, 6, and 11; see Inset A of Exhibit 4.16-1) were previously determined eligible for the NRHP under Criterion C in 2013 and therefore are also eligible for the WHR.

Field Survey

There are 388 parcels in the APE with buildings built before 1971. They include a mix of commercial and residential properties that were constructed between 1910 and 1970. Three parcels contain historic buildings that are eligible for listing in the NRHP/WHR. One contains the majority of the Highline College campus in Des Moines, including the nine historic buildings on the eastern side of the campus that are within the APE. The other two parcels are the sites of Calvary Lutheran Church and the US Bank building, both in Federal Way.

Findings of Eligibility

In consultation with DAHP, FTA determined that the following buildings are eligible for listing in the NRHP: the five Highline College buildings that had not previously been found eligible; Calvary Lutheran Church; and the US Bank building (Table 4.16-1). Buildings 4, 5, 6, and 11 were determined eligible for the NRHP in 2013. All other surveyed properties were determined not eligible. DAHP concurred with these determinations on March 14 and December 24, 2014. Additional information on these buildings is provided below. Exhibit 4.16-1 shows their locations.



Data Sources: King County, Cities of Des Moines, Federal Way, Kent, SeaTac (2013).



EXHIBIT 4.16-1
Location of Historic Properties in the APE

TABLE 4.16-1
NRHP-Eligible Properties within the APE

Building Name	Date of Construction
Highline College Building 4	1964
Highline College Building 5 (Faculty Building)	1964
Highline College Building 6 (Student Union)	1964
Highline College Building 11 (Faculty Building)	1964
Highline College Building 12	1964
Highline College Building 13	1964
Highline College Building 14	1964
Highline College Building 15	1967
Highline College Building 16	1967
Calvary Lutheran Church	1956, 1968
US Bank	1960

Notes:

All Highline College buildings are located at 2400 S 320th Street, Des Moines. Calvary Lutheran Church is located at 2415 S 320th Street, Federal Way. US Bank is located at 1436 S 312th Street, Federal Way.

All Highline College buildings appear to meet King County Landmark Status designation criteria.

All nine buildings on the Highline College campus are recommended as meeting the King County landmark designation criteria.

Highline College

Highline Community College was founded in 1961 and established at its current Des Moines location in 1963. The college's name was changed to Highline College in 2014. Ralph H. Burkhard (1908-1993) was the architect for the original college buildings. Burkhard received numerous awards and was known for his educational buildings and unusual techniques, and he continued his innovative designs at Highline College. In 1966, the American Association of School Administrators gave the campus an award for exceptional design. As noted above, the campus contains six buildings that were previously determined eligible for the NRHP under Criterion C for their architectural significance (Buildings 4, 5, 6, 11, 19, and 28; Buildings 19 and 28 are well outside the project's APE), and FTA determined that five more buildings are eligible (Buildings 12, 13, 14, 15, and 16). Buildings 4, 5, 6, 11, 12, 13, 14, 15, and 16 are located in a row along the eastern side of the Highline College campus. All are individually eligible under Criterion C for their architectural significance as examples of 1960s-era tilt-up construction.

The NRHP/WHR eligibility determinations are limited to the individual buildings and do not include the surrounding campus, which is quite large and contains numerous non-historic buildings and structures.



Highline College Building 4, West Elevation



Highline College Building 5, Northwest Corner



Highline College Building 6, West Elevation



Highline College Building 11, Southwest Corner



Highline College Building 12, Northeast Elevation



Highline College Building 13, West Elevation



Highline College Building 14, North Elevation



Highline College Building 15, West Elevation



Highline College Building 16, Northeast Elevation

Calvary Lutheran Church

First established in 1954, the Calvary Lutheran Church is composed of the original church, which is now a classroom building, and a larger sanctuary constructed in 1968. The 1968 sanctuary, designed by the Seattle firm of Steinhart, Theriault & Anderson, is a good example of the Neo-Expressionist architectural style with its exaggerated, tall, hipped roof and flared eaves. The property has undergone several additions and renovations that have diminished the integrity of the 1954 building. However, the 1968 sanctuary retains much of its integrity and is eligible for listing in the NRHP/WHR under Criterion C for its architectural significance.

US Bank Building

The US Bank building, constructed in 1960, employs certain materials and design elements that were commonly used in the 1950s and 1960s, making it a good example of mid-century architectural design.



Calvary Lutheran Church, North Elevation

Seven Aspects of Integrity

Setting, feeling, association, location, materials, design, and workmanship

The defining characteristics of the building include the glass curtain wall on the building's front (south) elevation, the flat roof, and the brick veneer walls with decorative honeycomb brickwork on the west elevation. Other features of the building, such as the drive-through banking overhang, are utilitarian features common to bank buildings of the era. The original brick veneer has been painted and a small glass enclosure for the ATM machine was added on the front elevation. However, the building retains integrity overall. The building is eligible for listing in the NRHP/WHR under Criterion C for embodying distinctive characteristics of mid-century modern commercial architecture.



US Bank, Southwest Corner

4.16.4 Environmental Impacts

This section discusses long-term impacts of the FWLE on historic resources. Section 5.2.17 of Chapter 5 addresses potential impacts to and treatment of archaeological sites encountered before or during construction.

Section 106 regulations allow three findings for effects on historic properties:

- No Historic Properties Affected
- No Adverse Effect
- Adverse Effect

FTA makes a determination of effect for each property potentially affected. Once a Preferred Alternative is identified, FTA makes an overall finding of effect for the undertaking (i.e., the project as a whole) and requests the DAHP's concurrence.

4.16.4.1 No Build Alternative

The No Build Alternative would not affect any historic properties.

4.16.4.2 Build Alternatives

Direct Impacts

Research and initial surveys have not identified any NRHP-eligible archaeological sites within the APE. After the Sound Transit Board identifies a Preferred Alternative, more detailed field survey work will likely be performed.

Table 4.16-2 summarizes each alternative's potential effects on NRHP/WHR-eligible buildings. Following the table are discussions of the impacts of each alternative. There is no discussion of the I-5 to

SR 99 Alternative because that alternative has no historic properties within its APE.

TABLE 4.16-2

Historic Properties and Findings of Effect

Property Name	Alternative	Proximity to the Alternative	Potential Impact	Section 106 Finding ^a
Highline College Building 4	Kent/Des Moines HC Campus Station Option to the SR 99 Alternative	206 feet	Minor alteration to Setting	No Adverse Effect
Highline College Building 5 (Faculty Building)	Kent/Des Moines HC Campus Station Option to the SR 99 Alternative	277 feet	Minor alteration to Setting	No Adverse Effect
Highline College Building 6 (Student Union)	Kent/Des Moines HC Campus Station Option to the SR 99 Alternative	249 feet	Minor alteration to Setting	No Adverse Effect
Highline College Building 11 (Faculty Building)	Kent/Des Moines HC Campus Station Option to the SR 99 Alternative	233 feet	Minor alteration to Setting	No Adverse Effect
Highline College Building 12	Kent/Des Moines HC Campus Station Option to the SR 99 Alternative	249 feet	Minor alteration to Setting	No Adverse Effect
Highline College Building 13	Kent/Des Moines HC Campus Station Option to the SR 99 Alternative	215 feet	Minor alteration to Setting	No Adverse Effect
Highline College Building 14	Kent/Des Moines HC Campus Station Option to the SR 99 Alternative	289 feet	Minor alteration to Setting	No Adverse Effect
Highline College Building 15	Kent/Des Moines HC Campus Station Option to the SR 99 Alternative	362 feet	Minor alteration to Setting	No Adverse Effect
Highline College Building 16	Kent/Des Moines HC Campus Station Option to the SR 99 Alternative	210 feet	Minor alteration to Setting	No Adverse Effect
Calvary Lutheran Church	Federal Way I-5 Station Option to the I-5 Alternative and to the SR 99 to I-5 Alternative	152 feet	None	No Historic Properties Affected
US Bank	SR 99 Alternative and Federal Way SR 99 Station Option to the SR 99 Alternative	172 feet	Minor alteration to setting	No Adverse Effect

^a FTA's preliminary determination.

SR 99 Alternative

The Kent/Des Moines HC Campus Station Option for the SR 99 Alternative includes a light rail station plaza located within the Highline College campus parking lot. The plaza's edge would be approximately 206 feet from the nearest eligible building. The station

would be in an open trench on the eastern edge of Highline College's east parking lot. The addition of the station would be noticeable, but the changes to the setting of the nine eligible buildings (Buildings 4, 5, 6, 11, 12, 13, 14, 15, and 16) would be minimal. While the parking lot is part of the visual area of the adjacent historic buildings, it is not historic and is not a contributing component of the historic buildings. The eligible buildings face west, oriented away from the parking lot and towards the interior of the campus. In addition, because the buildings are located on a lower grade than the existing parking lot, at the bottom of a small slope, they are visually separated from the parking lot and potential station location. The above-grade improvements required to construct the station would not physically alter the buildings. Thus, the minor impacts to their setting would not affect the aspects of integrity that qualify the nine Highline College buildings for listing in the NRHP/WHR and the option would result in no adverse effect to historic properties.

For the SR 99 Alternative and the Federal Way SR 99 Station Option for the SR 99 Alternative, Sound Transit would acquire part of the parcel on which the US Bank building is located. However, no physical changes would affect the NRHP-eligible building. The US Bank building is set back on the parcel lot, approximately 172 feet west of the project alternative. The east elevation of the building, which faces Pacific Highway S, is a side elevation clad in brick veneer with a service entrance but no other fenestration. Notable character-defining features of the building include the decorative honeycomb brickwork on the west elevation and the glass curtain wall on the building's front (south) elevation. These features do not face Pacific Highway S and would not be materially affected by the project. Currently, a large paved parking lot creates a barrier between Pacific Highway S and the historic building. Removing a narrow sliver of this parking lot would be a minor impact to the setting of the building, and it would not compromise any aspects of the building that qualify it as eligible for the NRHP/WHR. Therefore, the SR 99 Alternative and Federal Way SR 99 Station Option would result in no adverse effect to the property.

I-5 Alternative and SR 99 to I-5 Alternative

The Federal Way I-5 Station Option for the I-5 Alternative and for the SR 99 to I-5 Alternative would have no impact on the Calvary Lutheran Church. The station plaza would be partially in a trench and partially at-grade approximately 518 feet away from the historic

property. The parking lot and a tail track would be across S 320th Street and approximately 152 feet from the church. The location already experiences the visual and noise effects of heavy street traffic, and FWLE operations would cause no additional impacts. Therefore, no changes to the church's setting would occur and the station option would result in no historic properties affected.

Indirect Impacts

The project alternatives would have no indirect impacts on the eligible Highline College buildings, Calvary Lutheran Church, or US Bank building.

Section 4(f) Applicability

Section 4(f) addresses three types of use: (1) the permanent incorporation of land into a transportation facility, (2) a temporary occupancy of land that is adverse in terms of the statute's purposes, and (3) proximity impacts such that they impair important features or characteristics of the property (a "constructive use"). Section 4(f) also recognizes a *de minimis* impact, which is when there is only a minor impact to the resource. FTA has made a preliminary finding that only the SR 99 Alternative and the Federal Way SR 99 Station Option for the SR 99 Alternative would use a historic property under Section 4(f).

The project's potential Section 4(f) use of historic properties is limited to partial acquisitions of parcels where eligible buildings are located. Under the SR 99 Alternative Kent/Des Moines HC Campus Station Option, the FWLE would occupy part of a campus parking lot. The large parcel holds most of the Highline College campus, including the east parking lot and the historic buildings in the APE. The east parking lot does not contribute to the historic buildings in the APE.

The SR 99 Alternative, I-5 to SR 99 Alternative, and Federal Way SR 99 Station Option would acquire a narrow strip of the US Bank property for road widening adjacent to SR 99. The acquisition of this land would not affect the physical integrity of NRHP-eligible buildings and would have at most a minor effect on the buildings' setting. FTA's preliminary determination is that these potential effects would be *de minimis* use of historic properties.

There is no constructive use under Section 4(f) because the project's proximity impacts do not substantially impair any historic properties. See Appendix E for more information about Section 4(f).

4.16.5 Potential Mitigation Measures

No known archaeological sites are located in the APE. The project's operations would not have adverse effects to historic properties. Therefore, no long-term mitigation measures are required. Because construction could encounter unknown archaeological resources, Sound Transit will implement construction mitigation measures as described in Section 5.2.17.2.

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4.17 Parkland and Open Space

4.17.1 Summary

Seven existing parks or recreation facilities are located within the FWLE study area for parkland and open space. The Federal Way SR 99 Station Option, associated with the SR 99 Alternative and the I-5 to SR 99 Alternative, would acquire 0.7 acre of Federal Way Town Square Park for a transit connection between the station and the Federal Way Transit Center. The affected area consists of parking and landscaping, and no recreational uses at the park would be impacted. The project would not affect any other parks. Playfields at Mark Twain Elementary School would be temporarily affected during construction by the I-5 Alternative and SR 99 to I-5 Alternative, but no long-term impacts would occur (see Chapter 5). Appendix E includes a Section 4(f) analysis and preliminary determination.

4.17.2 Introduction to Resources and Regulatory Requirements

The FWLE parkland and open space study area includes several recreational facilities in Des Moines, Kent, and Federal Way that vary in size, type, and function. There are no parks or recreational resources in the portion of the study area located inside the city of SeaTac.

Section 4(f) of the U.S. Department of Transportation Act applies to U.S. DOT projects, including the FWLE. It protects “publicly owned land of a public park, recreation area, or wildlife and waterfowl refuge of national, State, or local significance.”

4.17.3 Affected Environment

Parkland and open space resources include public parks, greenbelts, and other undeveloped open spaces, recreational pedestrian and bicycle trails, playfields, and school district play areas that are available for public use during non-school hours. The study area for parks and other recreational resources for FWLE consists of resources located within approximately one block (250 feet) of the alternatives, staging areas, and ancillary facilities, as well as resources located within 0.25 mile (approximately 1,320 feet) of stations. Typically, impacts on recreational resources occur within these distances. An exception to the study area boundary is the area on the east side of I-5. The project would not affect any parks east of the freeway.

Most of the resources in the study area are owned or maintained by the parks and recreation departments of the cities of Des Moines, Kent, and Federal Way. Table 4.17-1 summarizes information about the seven existing local park and recreational resources in the study area.

The cities of Kent and Federal Way have generally identified possible future parks in their local planning documents that could be within the study area, but they have not defined specific locations. In addition, city zoning requirements in the corridor may result in additional parks or public open space as part of private residential and mixed-use developments in the future.

Exhibit 4.17-1 shows the study area and existing parks/recreation areas.

4.17.4 Environmental Impacts

Direct long-term impacts typically include permanent changes to a resource, such as when a project converts land from a park or recreational resource to another use. Indirect long-term impacts could include changes to the area surrounding the park or recreational resource that would affect recreational opportunities or the recreational experience. Indirect long-term impacts could also include improved access to park and recreational facilities. While long-term impacts generally refer to permanent changes, some construction impacts can be considered long-term if they would have a major effect on the resource and extend for years.

Potential impacts were identified based on the definitions above and the current use of the park and/or open space resource in the study area. Planned parks were not evaluated for long-term impacts because specific locations and designs have not been developed.

4.17.4.1 No Build Alternative

The No Build Alternative would not directly or indirectly affect any park or open space resource in the study area.

TABLE 4.17-1

Park and Recreation Resources in the FWLE Study Area

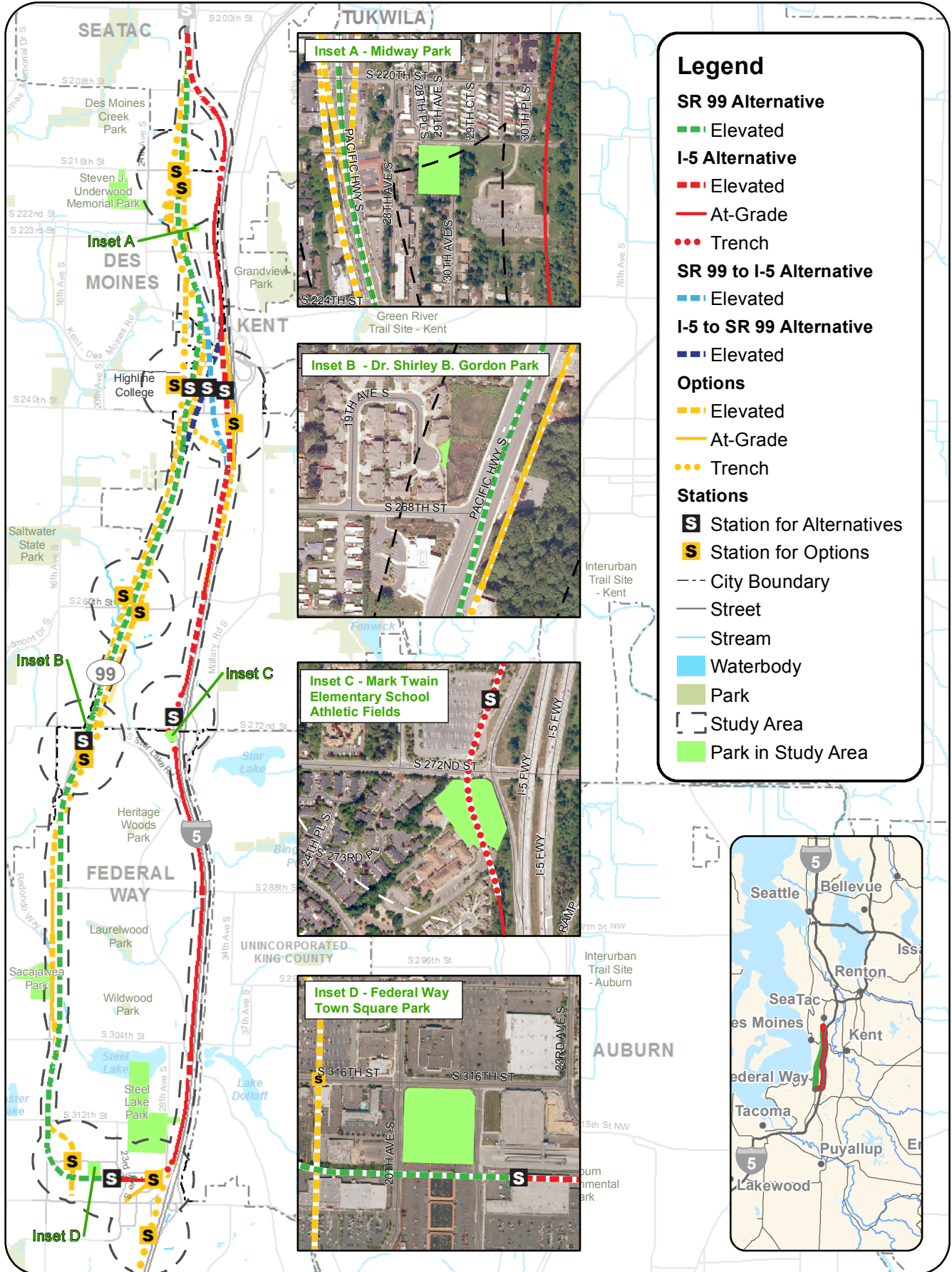
Resource Name	Size (acres)	Type and/or Function	Facilities	Ownership	Corridor
Steven J. Underwood Memorial Park	20.5	Community park	Three lighted softball fields	City of Des Moines	SR 99
Midway Park	1.6	Community park	Play area, picnicking areas, basketball hoops, and a walking path	City of Des Moines	SR 99
Dr. Shirley B. Gordon Park	0.9	Community park	Playground and open space	City of Des Moines	SR 99
Sacajawea Park	18.0	Community park	Two lighted baseball fields, a tennis court, a soccer field, a football field, a 440-yard track, walking pathways, a playground, and restrooms	City of Federal Way	SR 99
Mark Twain Elementary School Playfields	1.7	School athletic field	Playfield for softball and soccer	Federal Way Public Schools	I-5
Steel Lake Park	52.0	Community park	Beach, swimming area, boat launch, a sand volleyball pit, horseshoe pits, a concession building, restrooms, playgrounds, five picnic areas, open lawn areas, a trail, parking	City of Federal Way	SR 99 and I-5
Federal Way Town Square Park	4.1	Community park	Park with labyrinth, basketball courts, open lawn area, p-patch, chess boards, picnic area; future plans for seating area and stage	City of Federal Way	SR 99 and I-5

4.17.4.2 Build Alternatives

This section describes the direct and indirect impacts of the build alternatives. Construction impacts related to parkland and open space are discussed in Chapter 5. Table 4.17-2 summarizes each alternative's potential for direct and indirect impacts on parklands.

Direct Impacts

Long-term adverse effects on parks would occur only with the Federal Way SR 99 Station Option, which would affect Federal Way Town Square Park. This station option would convert 0.7 acre of the park's parking lot and landscaping to a new transit-only roadway. The park's parking lot would remain operational, but the roadway would remove approximately 30 of 140 parking spaces. Recreational resources such as the park's labyrinth, basketball courts, open lawn area, p-patch, chess boards, and picnic area would not be affected.



Data Sources: King County, Cities of Des Moines, Federal Way, Kent, SeaTac (2013).

EXHIBIT 4.17-1
Parks

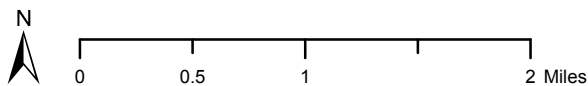


TABLE 4.17-2

Summary of Potential Park Impacts

Alternative	Parks in Study Area	Direct Impacts	Indirect Impacts
SR 99	Steven J. Underwood Memorial Park, Midway Park, Dr. Shirley B. Gordon Park, Sacajawea Park (only in the study area for the S 272nd Redondo Trench Station Option), Steel Lake Park, Federal Way Town Square Park	The Federal Way SR 99 Station Option would convert 0.7 acre of the Federal Way Town Square Park for a transit connection between the new station and the Federal Way Transit Center. Affected areas include parking and landscaping, but would not include any areas used for recreation. No adverse effects on recreational resources would occur.	No adverse impacts. Accessibility would increase at the following parks within 0.25 mile of a station or potential additional station: Steven J. Underwood Memorial Park, Midway Park, Steel Lake Park, and Town Square Park, where access would be improved with the SR 99 Alternative Federal Way Transit Center Station and the Federal Way SR 99 Station Option.
I-5	Steel Lake Park, Mark Twain Elementary School playfield, Federal Way Town Square Park	No adverse effects on recreational resources would occur. Temporary impacts at Mark Twain Elementary School are described in Chapter 5, Construction.	No adverse impacts. Accessibility would increase at Steel Lake Park and Town Square Park with the I-5 Alternative Federal Way Transit Center Station because they would be within 0.25 mile of a station. Other station options would not increase accessibility to these parks.
SR 99 to I-5	Steel Lake Park, Mark Twain Elementary School playfields, Federal Way Town Square Park	Same as I-5.	Same as I-5.
I-5 to SR 99	Dr. Shirley B. Gordon Park, Sacajawea Park, Steel Lake Park, Federal Way Town Square Park	Same as SR 99.	No adverse impacts. Accessibility would increase at Steel Lake Park and Town Square Park with the I-5 Alternative Federal Way Transit Center Station because these parks would be within 0.25 mile of a station. Other station options would not increase accessibility to these or other parks in the study area.

Indirect Impacts

Indirect long-term impacts to parkland and open space generally include changes to the area surrounding a park that would affect the recreational experience, such as increased noise levels near parks that are noise-sensitive. The parks in the FWLE study area were evaluated for sensitivity to noise, based on the types of park uses. As discussed in Section 4.7, Noise and Vibration, none of the parks in the study area are considered noise-sensitive, and no adverse noise or vibration impacts would occur. As discussed in Section 4.5, Aesthetic Resources, no visual impacts on parks would occur.

Parks that are within 0.25 mile of a station would benefit from enhanced access because people could walk from the light rail station to parks within this distance. The The SR 99 Alternative would have the most benefits because it has the most parks near station areas.

Section 4(f) Applicability

The only park directly affected by the project would be Town Square Park; this park's parking lot and landscaping would be impacted by the Federal Way SR 99 Station Option. Consultation with the City of Federal Way, which owns and maintains the property, is ongoing. This park is considered a Section 4(f) property. FTA anticipates that if that station option were part of the preferred alternative, the nature of the impacts would warrant a "*de minimis* impact" finding under Section 4(f) regulations. This is a determination that the project would not adversely affect the activities, features or attributes qualifying the park for protection under Section 4(f). The City of Federal Way must agree with this conclusion for FTA to make such a finding.

As discussed in Chapter 5, Construction, the Mark Twain Elementary School playfield would be temporarily affected by construction of the I-5 Alternative and SR 99 to I-5 Alternative. The playfield is used outside of school hours by community youth softball, baseball, and soccer leagues, primarily as a practice field. Consultation with Federal Way Public Schools, which owns and maintains the property, is ongoing. Given the nature of non-school uses at the playfield, and the school district's ability to provide for these recreational functions at other facilities, FTA's preliminary determination is that the playfield is not a "recreation area of national, State, or local significance" and therefore is not a Section 4(f) property. Federal Way Public Schools concurred with this finding on December 30, 2014. See Appendix E, Draft Section 4(f) Evaluation, for more information on Section 4(f) impacts.

De Minimis Impacts

De minimis impacts cannot "adversely affect the activities, features, and attributes" of a Section 4(f) resource. For public parks or recreation properties, a de minimis impact finding requires written concurrence from the agency with jurisdiction over the property. When FTA has made a de minimis determination, the project is not required to analyze avoidance alternatives for that Section 4(f) property.

4.17.5 Potential Mitigation Measures

To mitigate long-term impacts on parks and open space, Sound Transit would provide replacement lands, park enhancement, and/or financial compensation, where appropriate. Lost parking at Town Square Park would be mitigated with replacement parking at or near the park, or by monetary compensation.