3.14 NOISE

This section characterizes existing and future baseline noise conditions in the site area, analyzes noise conditions under the three development alternatives, and identifies measures to mitigate potential noise impacts. Background information for this section is contained in Appendix K, Noise Technical Report (Parsons Brinckerhoff, 2004).

3.14.1 Affected Environment

Noise Characteristics

Sound is created when objects vibrate, resulting in a minute variation in surrounding atmospheric pressure called *sound pressure*. The human response to sound depends on the magnitude of a sound as a function of its frequency and time pattern (EPA, 1974). Magnitude measures the physical sound energy in the air. The range of magnitude, from the faintest to the loudest sound the ear can hear, is so large that sound pressure is expressed on a logarithmic scale in units called decibels (dB).

Humans respond to a sound's frequency or pitch. Environmental noise is composed of many frequencies, each occurring simultaneously at its own sound-pressure level. Frequency weighting combines the overall sound frequency into one sound level that simulates how an average person hears sounds. The commonly used frequency weighting for environmental noise is A-weighting (dBA), which is most similar to how humans perceive sounds of low to moderate magnitude.

Using a logarithmic decibel scale (dBA), a doubling of the number of noise sources (e.g., the number of cars operating on a roadway) increases noise levels by 3 dBA. The human ear can barely perceive a 3 dBA increase; a 5 dBA increase, however, is readily noticeable. A ten-fold increase in the number of noise sources will add 10 dBA. A 10-dBA increase appears to be a doubling in noise level to most listeners.

Traffic Noise

Noise levels from traffic sources depend on the volume, speed, and type of vehicle. Generally, an increase in volume, speed, or vehicle size increases traffic noise levels. Vehicular noise is a combination of noises from engines, exhaust, and tires. Other conditions affecting traffic noise include defective mufflers, steep grades, terrain, vegetation, distance from the roadway, and shielding by barriers and buildings.

Noise levels decrease with distance from the noise source. For a line source such as a roadway, noise levels decrease 3 dBA over hard ground (concrete, pavement) or 4.5 dBA over soft ground (grass) for every doubling of distance between the source and the receptor. For a point source such as construction sources, noise levels will decrease between 6 and 7.5 dBA for every doubling of distance from the source.

Table 3.14-1 shows typical sound levels associated with transportation noise sources and other common activities.

Table 3.14-1
TYPICAL NOISE LEVELS

Transportation Sources	Noise Level (dBA)	Other Sources	Description
	130		Painfully loud
Jet takeoff (200 feet)	120		
Car horn (3 feet)			Maximum vocal
	110		Effort
	100	Shout (.5 feet)	
			Very annoying
Heavy truck (50 feet)	90	Jack hammer (50 feet)	Loss of hearing with
		Home shop tools (3 feet)	prolonged exposure
Train on a structure (50 feet)	85	Backhoe (50 feet)	
City bus (50 feet)	80	Bulldozer (50 feet)	Annoying
		Vacuum cleaner (3 feet)	
Train (50 feet)	75	Blender (3 feet)	
City bus at stop (50 feet)			
Freeway traffic (50 feet)	70	Lawn mower (50 feet)	
		Large office	
Train in station (50 feet)	65	Washing machine (3 feet)	Intrusive
	60	TV (10 feet)	
Light traffic (50 feet)		Talking (10 feet)	
Light traffic (100 feet)	50		Quiet
		Refrigerator (3 feet)	
	40	Library	
	30	Soft whisper (15 feet)	Very quiet

Sources: FTA, 1995; EPA, 1971; EPA, 1974

Noise Descriptors

A widely used descriptor for environmental noise is the equivalent sound level (L_{eq}). The L_{eq} can be considered a measure of the average noise energy during a specified period of time. It emphasizes the occasional high noise levels that accompany general background noise levels. L_{eq} is defined as the constant level that, over a given period of time, transmits to the receiver the same amount of acoustical energy as the actual time-varying sound. For example, two sounds, one of which contains twice as much energy, but lasts only half as long, have the same L_{eq} noise levels. L_{eq} measured over a one-hour period is the hourly L_{eq} [L_{eq}(h)], which is used for highway noise impact and abatement analyses.

Noise Regulations and Guidelines

City of Tukwila

General Noise Limits and Construction Noise Hours

Applicable noise regulations and guidelines provide a basis for evaluating potential noise impacts. The City of Tukwila (Tukwila Municipal Code (TMC), Chapter 8.22) has adopted the Washington State Department of Ecology standards (WAC Chapter 173-60). Sound level limits at residential, commercial, and industrial property lines are presented in Table 3.14-2. The standard does not include noise from traffic, aircraft, and railway operations in public right of way.

Table 3.14-2
CITY OF TUKWILA MAXIMUM PERMISSIBLE SOUND LEVELS (dBA)

	Receiving Property			
Noise Source	**Residential**		**Commercial**	**Industrial**
	Day	**Night[1]**		
Residential	55	45	57	60
Commercial	57	47	60	65
Industrial	60	50	65	70

Source: TMC, Chapter 8.22.040.
[1] The maximum permissible noise levels are reduced by 10 dBA for residential receiving properties between 10 PM and 7 AM.

Noise levels in Table 3.14-2 apply to activities on individual parcels. The maximum permissible sound levels (as reduced per Note 1 of Table 3.14-2) also apply to construction activities occurring between 10:00 PM and 7:00 AM on weekdays and 10:00 PM and 8:00 AM on weekends and State-recognized holidays. Performance of construction activities exceeding these levels during nighttime hours would require a noise variance from the City of Tukwila. Construction activities carried out between 7:00 AM and 10:00 PM on weekdays and between 8:00 AM and 10:00 PM on weekends and State-recognized holidays are allowed to exceed the property line standards per the following:

- Equipment with electrical or internal combustion engines emanating from temporary construction sites (Tukwila Municipal Code 8.22.140).

- Motor vehicles over 10,000 pounds gross vehicle weight cannot exceed noise levels of 86 dBA at 45 mph or less (90 dBA over 45 mph) as measured at a distance of 50 feet from the center of the lane of travel pursuant to Washington State Department of Ecology standards (WAC 173-62-030). (Tukwila Municipal Code 8.22.140)

- Impact equipment such as jackhammers may not exceed the following (King County Code 12.88.040):
    a. L_{eq} of 90 dBA continuously;
    b. L_{eq} of 93 dBA for thirty minutes;

c. L_{eq} of 96 dBA for fifteen minutes; or
d. L_{eq} of 99 for seven and one-half minutes.

The City of Kent (City of Kent Code, Chapter 8.05), King County (King County Code 12.88) and the City of Tukwila (8.22) have noise standards that are similar to the Washington State Department of Ecology standards (WAC 173-62).

Traffic Noise Criteria

Because traffic is exempt from the City of Tukwila standards, the Federal Highway Administration (FHWA) noise abatement criteria were used to determine impacts from traffic noise. Under the FHWA guidelines, impacts occur when predicted L_{eq}(h) noise levels approach or exceed the FHWA's established noise abatement criteria or "substantially exceed" existing noise levels (U.S. Department of Transportation, 1982, Noise Abatement Council). "Substantially exceed" is defined as an increase of 10 dBA or more in the State of Washington.

The FHWA noise abatement criteria specify exterior L_{eq}(h) noise levels for various land activity categories (Table 3.14-3). For receptors where serenity and quiet are of extraordinary significance, the noise criterion is 57 dBA. For residences, parks, schools, churches, and similar areas, the noise criterion is 67 dBA. For other developed lands, the noise criterion is 72 dBA. A traffic noise impact is defined to occur if the predicted L_{eq}(h) traffic noise level approaches within 1 dBA of the noise abatement criteria. Thus, if a noise level were 66 dBA or higher, it would approach or exceed the FHWA noise abatement criterion of 67 dBA for residences.

Table 3.14-3
FHWA NOISE ABATEMENT CRITERIA

Activity Category	L_{eq} (h) (dBA)	Description of Activity Category
A	57 (exterior)	Lands on which serenity and quiet are of extraordinary significance and serve an important public need, and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.
B	67 (exterior)	Picnic areas, recreation areas, playgrounds, active sports areas, parks, residences, motels, hotels, schools, churches, libraries, and hospitals.
C	72 (exterior)	Developed lands, properties, or activities not included in Categories A or B above.
D	-	Undeveloped lands.
E	52 (interior)	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, and auditoriums.

Source: U.S. Department of Transportation, 1982.

Existing Noise Levels

Noise Receptor Locations

Six receptors were modeled as representative of similar noise sensitive receptors in the area. The receptors include worst-case (closest to the subject area) and other local noise-sensitive receptors that could be affected by either increases or decreases in traffic noise as a result of the Tukwila South Project. The six modeled receptors are described below and depicted in Figure 3.14-1.

Receptor 1

Receptor 1 is located at 17815 54th Place South adjacent to S 178th Street. This receptor is representative of exterior noise levels experienced at approximately five nearby residences. It is assumed that all five residences would be removed as part of development under Alternatives 1 and 2 in the future. Therefore, no residences would remain and no impacts would occur under Alternatives 1 and 2. Under the No Action Alternative, it is assumed that all five residences would remain. These receptors are located approximately 100 feet south of the existing S 178th Street.

Receptor 2

Receptor 2 is representative of Briscoe Park in the City of Kent. This park is located east of the site across the Green River. This receptor is representative of the exterior noise levels experienced at the park. This receptor is located approximately 500 feet east of the existing Southcenter Parkway.

Receptor 3

Receptor 3 is located at 19212 Southcenter Road, approximately 50 feet east of the existing Southcenter Parkway. This receptor is representative of exterior noise levels at an existing single family residence. This property would be removed as part of development under Alternatives 1 and 2 and would not experience any impacts. Under the No Action alternative, it is assumed that this residence would also be removed and, therefore, would not be impacted.

Receptor 4

Receptor 4 is located at 4420 S 200th Street at Orillia Road. This receptor is representative of the exterior noise levels experienced at four off-site single-family residences. These residences are located approximately 100 to 200 feet west of Orillia Road and 500 feet southeast of I-5.

Receptor 5

Receptor 5 is located at 4655 S 200th Street. This receptor is representative of the exterior noise levels at three single-family residences. It is assumed that these three residences would be removed as part of development under Alternatives 1 and 2 in the future. Therefore, there would be no impacts under Alternatives 1 and 2. These residences would remain under the No Action Alternative. These residences are located approximately 100 feet south of S 200th Street.

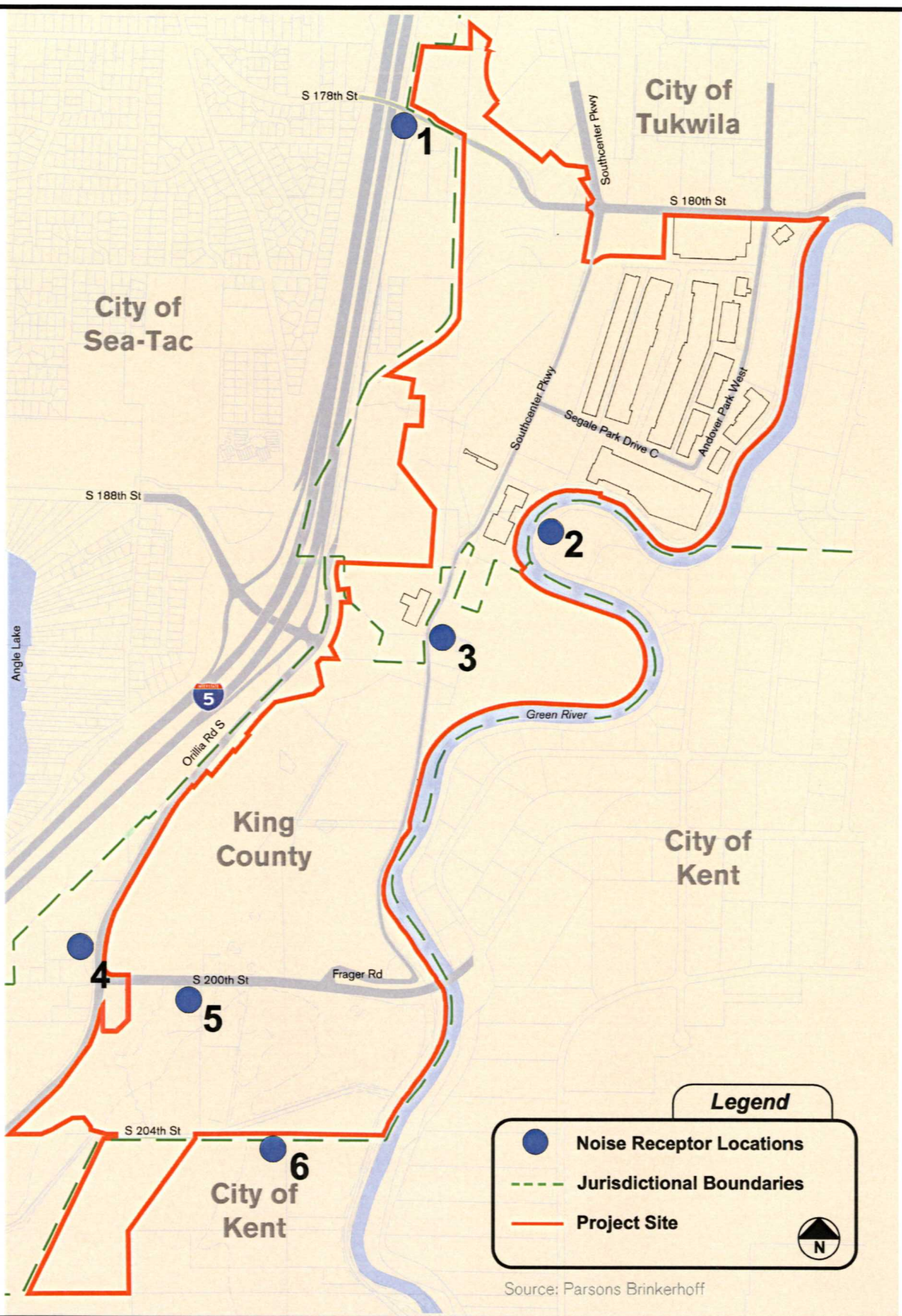

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Figure 3.14-1
Noise Receptor Locations

Tukwila South Project EIS

Receptor 6

Receptor 6 is located at the intersection of S 204th Street and Frager Road. This receptor is representative of the exterior noise levels at three off-site single family residences. These residences are approximately 1000 feet south of S 200th Street.

Southcenter Parkway

Noise levels were also analyzed along the new Southcenter Parkway extension, at 50 foot intervals and up to 500 feet from the center of the road, to identify potential noise sensitive locations. These predicted noise levels are representative of most locations along Southcenter Parkway between Segale Park Drive C and S 200th Street.

Existing Noise Levels

Ambient noise levels were measured to describe the existing noise environment and to identify major noise sources in the site area. Noise measurements were taken at five of the six receptor locations (Receptors 2 through 6) for the primary purpose of calibrating the noise model to predict existing and future noise levels (see discussion below under Traffic Noise Modeling). Table 3.14-4 identifies the location of the receptors, the primary noise source at the location, and their measured noise levels. Measured noise levels currently exceed the FHWA noise abatement criteria at Receptors 4 and 5, on S 200th Street (refer to Figure 3.14-1).

Table 3.14-4
EXISTING NOISE MEASUREMENT RESULTS

Receptor	Measurement Site	Primary Noise Source	Measured Leq (dBA)
1[1]	17815 54TH PL S	I-5	----------
2	Briscoe Park	Southcenter Parkway	51
3	19212 Southcenter Road	Southcenter Parkway	62
4	4420 S 200th Street	Orillia Road	67
5	4655 S 200th Street	S 200th Street	68
6	S 204th Street and Frager Road	I-5	57

Source: Parsons Brinckerhoff, 2004.
[1] Receptor 1 is a modeled receptor only.

3.14.2 Impacts

This section discusses potential noise impacts from infrastructure development and from assumed traffic increases associated with development assumed under Alternatives 1, 2, and 3 (No Action) at full buildout. Future development of the site would occur gradually over the 22-year buildout period.

Alternatives 1 and 2

Infrastructure Development Phase

A substantial portion of construction noise from the Tukwila South site would occur during the Infrastructure Development Phase, which is assumed to occur between 2006 and 2008, and would include, in part, construction of the Southcenter Parkway extension, realignment of S 178th Street, and mass grading over a large portion of the site (refer to Chapter 2, Description of the Proposed Actions and Alternatives for additional information). As discussed above under Noise Regulations and Guidelines, construction noise impacts would be controlled by limits placed on the allowable hours of construction activities in the Tukwila Municipal Code (refer to Table 3.14-2, above). In general, construction activities are allowed between 7 AM and 10 PM on weekdays and between 8 AM and 10 PM on weekends. In the event construction activities exceeding the applicable noise standards were scheduled during nighttime hours, a noise variance would be required from the City of Tukwila.

In general, construction noise is temporary and varies widely both spatially and time-wise over the course of a project. Under Alternatives 1 and 2, construction noise would be intermittent, occurring during the infrastructure development phase at various locations within the site. Construction noise levels would depend on the specific type, amount, and location of construction activities. The most prevalent noise source at construction sites would be internal combustion engines. Earth-moving equipment, material-handling equipment, and stationary equipment are all engine-powered. Because trucks would be present during most activities and would not be confined to the site, noise from trucks could also affect receptors along area roadways as they passed by. Other noise sources would include impact equipment and tools such as pile drivers.

Maximum noise levels from construction equipment would range from 69 to 106 dBA at a distance of 50 feet (15 meters). Construction noise would decrease at a rate of 6 dBA per doubling of distance from the source. Because various pieces of equipment would be turned off, idling, or operating at less than full power at any given time and because construction machinery is typically used to complete short-term tasks at any given location, the range of average L_{eq} daytime noise levels would be less than the identified range of the maximum noise levels.

The most sensitive noise receptors in the site area are adjacent residences, many of which would be removed as part of the infrastructure development phase (refer to Table 3.14-5, below). Other noise receptors include users of Briscoe Park and the Green River Trail, east of the river and the site. Construction activities closest to the east and south perimeters of the site, could affect these off-site receptors on a temporary basis. The majority of these construction activities would be associated with excavation for the stormwater ponds and elements of the Sensitive Area Master Plan, including the Green River Off-Channel Habitat Restoration Area, the new Johnson Creek channel, and activities associated with the wetland rehabilitation effort in the southeast portion of the site. Areas north and west of the site would be affected by construction of the north stormwater detention pond and the realigned S 178th Street; however, as stated previously, residences in the vicinity of these features would be removed during infrastructure development.

Beyond the infrastructure development phase, building and road development that occur onsite during the 22-year buildout period could also affect off-site receptors. Given the temporary nature of construction, significant impacts would not be expected. Construction noise levels could be reduced by the construction practices identified in the Section 3.14.3, Mitigation, below.

Full Buildout

Traffic Noise Modeling

Existing and future noise levels under Alternatives 1, 2, and 3 were modeled at each of the monitoring locations using Federal Highway Administration's (FHWA) Traffic Noise Model and input data from the Transportation Technical Report prepared as part of this Draft EIS (Appendix I). As described above, ambient noise levels were measured to describe the existing noise environment, to identify major noise sources in the site area, and to calibrate the model. Six receptors were modeled as representative of similar receptors in the area. Accuracy of the model was confirmed by predicting noise levels and comparing them to actual noise measurements at the five measured receptors. FHWA's Traffic Noise Model was used to predict L_{eq}(h) traffic noise levels, based on PM peak-hour traffic conditions, in order to estimate worst-case noise levels. Traffic noise levels were predicted at year 2030 for Alternative 1, the higher-density alternative and Alternative 3 (No Action), which includes a different alignment for Southcenter Parkway and no realignment of S 178th Street. Alternative 2, the moderate-density alternative, would feature the same primary roadway network as Alternative 1 and is assessed qualitatively. Refer to Appendix K, Noise Technical Report, for a full description of the modeling methodology.

Modeled Receptors

The six receptor locations identified above in Table 3.14-4 were modeled to evaluate traffic noise under existing conditions (2004) and at full buildout (2030). As described above, under the FHWA guidelines impacts occur when predicted L_{eq}(h) noise levels approach or exceed the FHWA's established noise abatement criteria (refer to Table 3.14-3). Under existing conditions (as modeled), Receptors 1, 4, and 5 reflect noise levels that currently exceed the noise abatement criteria. Motor vehicle traffic would be the single greatest noise source under Alternatives 1 and 2. Table 3.14-5 shows the results of the modeled existing and future noise levels under Alternative 1.

Under Alternative 1, worst-case modeled noise levels at the six receptor locations represented increases of between 2 and 7 dBA above the modeled existing conditions. These increases would be caused primarily by traffic volume increases and the realignment of S 178th Street.

Noise levels would further exceed the noise abatement criteria at Receptor 4, which represents approximately four existing residences that would still be present under Alternative 1 at buildout. The major source of noise for this receptor is Orillia Road. I-5 also contributes noise to Receptor 4. Alternative 1 would increase the noise level by 3 dBA, which would be barely perceptible by most individuals.

Table 3.14-5
TRAFFIC NOISE MODELING RESULTS, ALTERNATIVE 1, 2030

Modeled Receptor	2004 Existing (L_{eq})[1]	2030 Alternative 1 (L_{eq})
1	**70**	*NA*[2]
2	52	59
3	65	*NA*[2]
4	**69**	**72**
5	**70**	*NA*[2]
6	56	58

Source: Parsons Brinckerhoff, 2004.
[1] **Bold** numbers exceed the FHWA traffic noise impact criteria.
[2] *NA* indicates that all noise receptors would be displaced by future development.

Alternative 2 would have the same roadway reconfigurations and approximately 10 percent to 25 percent less traffic volume than Alternative 1, but would still experience increases in traffic volumes, as compared to existing conditions. In general, worst-case noise levels would be between 1 and 2 dBA lower for Alternative 2 than Alternative 1 in 2030. Under Alternative 2, noise levels would also further exceed the noise abatement criteria at Receptor 4 by 2 to 3 dBA. A noise level of 2 to 3 dBA is barely perceptible by most individuals.

Southcenter Parkway

As described above, traffic noise levels along the new Southcenter Parkway were also modeled at 50 foot intervals, up to 500 feet from the center of the road. Under Alternative 1, results of the modeling showed that the noise abatement criteria for residences (67 dBA) could be exceeded at distances up to 250 feet from Southcenter Parkway (refer to Figure 4, Appendix F). Under Alternative 2, noise levels along the new Southcenter Parkway extension would be similar to Alternative 1. If sensitive receptors, such as residences, were proposed to be built within 250 feet of Southcenter Parkway, noise compatibility or reduction measures could be considered (see Section 3.14.3, Mitigation, below).

Indirect/Cumulative

The noise analysis for Alternatives 1 and 2 is based on the transportation impact analysis prepared for this Draft EIS, which includes the effects of baseline growth in the site area on the transportation network to 2030 (refer to Appendix I, Transportation Impact Study). By considering baseline growth, the secondary effects of increased transportation capacity are also included in the analysis. Because ambient noise levels in the site area are not assumed to increase substantially in the future (without traffic growth), the noise analysis conducted for this Draft EIS captures the cumulative effects of noise within the site area. No significant indirect or cumulative noise impacts would occur.

No Action Alternative

Construction

Under the No Action Alternative, the extension of Southcenter Parkway to S 200th Street (along a different alignment) is proposed (refer to Chapter 2.7 in this Draft EIS, Description of Alternatives). However, the realignment of S 178th Street and the mass grading program assumed under Alternatives 1 and 2 would not occur. Construction activities onsite would correlate more directly with specific development projects. The potential for existing land uses onsite to be demolished would depend on the specific location of these future development projects.

Individual construction activities would result in similar types of impacts and range of noise levels as described under Alternatives 1 and 2, above. However, the overall magnitude of construction-related noise would likely be lower, based on the comparatively lower amount of construction activity that would occur onsite. As described under Alternatives 1 and 2, construction noise levels could be reduced by the construction practices identified in Section 3.14.3, Mitigation.

Full Buildout

Under the No Action Alternative, worst-case noise levels in the site area would experience an increase between 1 and 3 dBA above existing conditions. This increase would be caused by increases in traffic volumes. Table 3.14-6 shows the results of the modeled existing and future noise levels under Alternative 3.

Table 3.14-6
TRAFFIC NOISE MODELING RESULTS, ALTERNATIVE 3, 2030

Modeled Receptor	2004 Existing (L_{eq})[1]	2030 Alternative 3 (L_{eq})
1	**70**	***72***
2	52	55
3	65	*NA*[2]
4	**69**	**70**
5	**70**	***71***
6	56	57

Source: Parsons Brinckerhoff, 2004.
[1] **Bold** numbers exceed the FHWA traffic noise impact criteria.
[2] *NA* indicates that all noise receptors would be displaced by future development.

Noise levels at Receptors 1, 4, and 5 (representing approximately 12 residences total) currently exceed the noise abatement criteria. Under Alternative 3, worst-case noise levels would continue to exceed the noise abatement criteria at these locations. An increase of 1 to 3 dBA is barely perceptible to most individuals. Refer to Section 3.14.3, Mitigation, below, for a discussion of potential types of mitigation.

Indirect/Cumulative

As described for Alternatives 1 and 2, the noise analysis for the No Action Alternative is based on the transportation impact analysis prepared for this Draft EIS, which considers the effects of baseline growth in the site area on the transportation network to 2030. By considering baseline growth, the secondary effects of increased transportation capacity are also included in the analysis. No significant indirect or cumulative noise impacts would occur.

3.14.3 Mitigation Measures

Construction Noise

Construction noise would be mitigated in terms of duration by the limits on construction noise during certain hours imposed by the Tukwila Municipal Code (Chapter 8.22). The need for such additional measures would be dependent upon the specific location, design and degree of required construction activities in proximity to off-site sensitive noise receptors. Evaluation of the need for and the selection of any measures would occur as part of the construction permit approval process.

When construction activities would occur in close proximity to noise sensitive receptors, the following mitigation measures could be incorporated into construction plans and contractor specifications in order to reduce construction noise at these specific locations:

- Equipping construction equipment engines with adequate mufflers, intake silencers, noise blankets, rubber truck bed liners, and engine enclosures would reduce their noise by 5 to 10 dBA (EPA, 1971).
- Turning off construction equipment during prolonged periods of non-use would eliminate noise from construction equipment during those periods.
- Requiring contractors to maintain all equipment and train their equipment operators would reduce noise levels and increase efficiency of operation.
- Locating stationary equipment away from receiving properties would decrease noise from that equipment in relation to the increased distance.
- Constructing temporary noise barriers or curtains around stationary equipment that must be located close to any off-site residences would decrease noise levels at such sensitive receptors.

Operational Noise

The results of the noise modeling indicated that year 2030 worst-case noise levels would exceed the Federal Highway Administration (FHWA) noise abatement criteria at one receptor, Receptor 4, located near the intersection of S 200th Street at Orillia Road. It should be noted that noise levels at this receptor (as both measured and modeled) are currently exceeding noise abatement criteria under existing conditions.

Results of the noise modeling also showed that the noise abatement criteria related to future potential residences within the site could be exceeded at distances up to 250 feet from the center of Southcenter Parkway. A determination of the specific need for implementation of any

mitigation methods would be evaluated at the time of any future building permit applications to the City of Tukwila for residential development projects within 250 feet of Southcenter Parkway. Types of mitigation could include:

- Noise insulation and thermal pane windows for future residential uses that may be proposed in the future at a distance up to 250 feet from the new Southcenter Parkway. Such measures could result in avoidance of noise impacts from traffic.
- Office/commercial buildings could act as effective noise barriers between Southcenter Parkway and any proposed residences in the future. Development of non-residential buildings between the roadway and any future residences would reduce noise levels, allowing residential construction to be located behind the buildings and within 250 feet of the road.
- Noise insulation could be applicable to the remaining residences that experience noise levels that exceed the FHWA noise abatement criteria at Receptor 4. If noise insulation is deemed reasonable and viable at these residences, an evaluation of the buildings would be needed to determine if they can be retrofitted with thermal pane windows and other measures. However, as noted above, under SEPA, mitigation for noise level exceedances under existing conditions cannot be required of the applicant.

3.14.4 Significant Unavoidable Adverse Impacts

The predicted noise levels from the alternatives, as analyzed, would not result in significant unavoidable adverse impacts.