SR 519 INTERMODAL ACCESS PROJECT PHASE 2: SOUTH ATLANTIC CORRIDOR

Noise Discipline Report

Prepared for

U.S. Department of Transportation
Federal Highway Administration

Washington State Department of Transportation

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Acronyms and Abbreviations

	C
CFR	Code of Federal Regulations
	D
dBA	a-weighted decibels
	F
FHWA	Federal Highway Administration
	K
kHz	kilohertz
	L
L_{dn}	day-night noise equivalent level
L_{eq}	equivalent average sound level
$L_{eq\ (h)}$	hourly equivalent average sound level
L_{max}	maximum sound level
	N
NAC	noise abatement criteria
NEPA	National Environmental Policy Act
	S
SEPA	State Environmental Policy Act
	T
TNM	FHWA TNM 2.5 Traffic Noise Model
	W
WSDOT	Washington State Department of Transportation

Glossary of Technical Terms

A-weighted sound level – Frequency-weighted sound pressure level approximating the frequency response of the human ear. It is defined as the sound level, in decibels, measured with a sound level meter having the metering characteristics and a frequency weighting specified in the American National Standards Institute Specification for Sound Level Meters, ANSI S 1.4 - 1983. The A-weighting de-emphasizes lower frequency sounds below 1 kilohertz (kHz) and higher frequency sounds above 4 kHz. It emphasizes sounds between 1 kHz and 4 kHz. A-weighting is the most used measure for traffic and environmental noise throughout the world.

Background noise – The total of all noise in a system or situation, independent of the presence of the noise source of interest (i.e., without the noise of interest).

Decibels – The decibel (dB) scale is a common measure of sound noise. A decibel is one-tenth of a Bel. The scale is logarithmic, so each unit increase in Bels (or 10 decibels) equates to a tenfold increase in the magnitude of sound noise (i.e., 110 dB is 10 times more powerful than 100 dB).

Existing noise levels – The noise resulting from the natural and mechanical sources and human activity considered to be usually present in a particular area.

Day-night noise equivalent level (L_{dn}) – The equivalent average sound level **(**L_{eq}) over a 24-hour period with 10 dBA added to the hours 10 PM to 7 AM to account for the sensitivity of people to noise when they are sleeping.

Equivalent average sound level (L_{eq}) – This is the continuous dBA level with the same A-weighted sound energy during the duration of a noise measurement.

Hourly equivalent average sound level ($L_{eq\ (h)}$) – The equivalent average sound level of noise over a one-hour period.

Maximum sound level (L_{max}) – The maximum sound level is the root-mean-squared level that occurred during the measurement period.

Noise Abatement Criteria (NAC) – These are objective absolute noise levels for varying land use categories where an impact is triggered. If impacts are identified, noise abatement measures must be considered and, if found to be feasible and reasonable must be implemented (23 CFR 772; WSDOT, 2006).

Noise abatement measures – These are methods to reduce noise effects, such as noise walls, relocating transportation facilities, reduction of allowable traffic speeds, or retrofitting insulation or improved windows in buildings.

Substantial increase – A quantitatively defined increase in noise over existing sound levels. The definition includes two tiers. A Tier 1 substantial increase is at least a 10-dBA increase over existing sound levels. A Tier 2 substantial increase is a 15-dBA or greater increase over existing sound levels.

Traffic Noise Model (TNM) – This is FHWA's preferred noise model, which is based upon reference energy emission levels for automobiles, medium trucks (two axles), and heavy trucks (three or more axles), with consideration given to vehicle volume, speed, roadway configuration, distance to receiver, and the acoustical characteristics of the site.

Summary

What is the proposed project and why is it needed?

The Federal Highway Administration (FHWA) and Washington State Department of Transportation (WSDOT) propose to construct improvements to State Route (SR) 519 in Seattle as Phase 2 of the SR 519 Intermodal Access Project. The project would include three components:

- A proposed new Interstate 90 (I-90) off-ramp to South Atlantic Street (I-90 off-ramp)
- A proposed new South Royal Brougham Way railroad overpass (BNSF Railway overpass)
- Roadway widening along the existing South Atlantic Street east of First Avenue South and improvements to the intersection of First Avenue South and South Atlantic Street

SR 519 is an important thoroughfare for cars, trucks, and pedestrians in Seattle's South of Downtown (SODO) district. In 2004, WSDOT opened Phase 1 of the SR 519 project, consisting of the South Atlantic Street overpass (Edgar Martinez Drive) and a new on-ramp from South Atlantic Street to I-5 and I-90. The Proposed Action (SR 519 Intermodal Access Project – Phase 2: South Atlantic Corridor) would complete the SR 519 project by providing a direct westbound connection from the I-5/I-90 freeway system to the Seattle waterfront and Port of Seattle. Currently, westbound traffic from the freeway exits at Fourth Avenue South and follows a circuitous route to South Atlantic Street to cross safely over the BNSF Railway tracks located just east of Safeco Field and Qwest Field. Vehicular and pedestrian traffic on South Royal Brougham Way must use an at-grade railroad crossing. New

roadway structures are needed to allow vehicles and pedestrians to reach their destinations safely, quickly, and directly.

The Proposed Action would connect the existing westbound off-ramp from I-5 and I-90 to the current South Atlantic Street overpass, and it would construct improvements at the intersection of First Avenue South and South Atlantic Street and widen South Atlantic Street to accommodate traffic along this new route. A grade-separated crossing over the railroad tracks at South Royal Brougham Way would also be built.

This project would increase traffic mobility and safety by improving connections between Interstates 5 and 90 and Port of Seattle terminals, the Washington State Ferries terminal at Colman Dock, waterfront commercial interests, and the stadium area. The project would also allow people to walk more safely to and from the stadium area.

What is the affected environment?

The affected environment for noise analysis consists of the area bounded by Fifth Avenue South to the east, South Dearborn Street to the north, Alaskan Way South to the west, and South Massachusetts Street to the south. Surrounding land uses are primarily heavy and light industry, freight, transportation, and manufacturing, with railroad mainline tracks and many spur lines to local businesses. These are discussed in greater detail in the Land Use Discipline Report.

The project team identified three sensitive receiver locations, one at an outdoor dining area at the Pyramid Alehouse, near the southwest corner of First Avenue South and South Royal Brougham Way, another at a seasonal outdoor dining area used by Ivar's Clambake, near the southeast corner of First Avenue South and South Atlantic Street. Ivar's Clambake is open only during 3-hour periods up to the opening pitches at home baseball games. The third sensitive receiver represents interior noise at the Salvation Army Adult Rehabilitation Center (Salvation Army residence). The Salvation Army Adult residence provides short-term housing and is located on the

east side of Fourth Avenue South opposite the existing I-90 off-ramp and adjacent to a Salvation Army Thrift Store. The Salvation Army residence is considered a nonprofit institution.

Although Seattle's stadium district is the core of the study area, the stadiums themselves were not considered sensitive receivers because they are used for sporting events that attract large crowds, which generate high noise volumes during the games. The tenth-floor outdoor swimming pool at the Silver Cloud Inn was noted, but because of its vertical distance from project roadways, it would not likely be affected by the project and was not, therefore, considered a sensitive receiver.

How were the noise effects of the project analyzed?

This noise analysis used procedures and criteria developed by FHWA and WSDOT to assess the probable noise effects from vehicular traffic associated with the Proposed Action. The project team used peak-hour traffic volumes for each alternative to calculate both existing and future noise levels using the FHWA TNM 2.5 noise model (TNM). The project team also took noise measurements to calibrate the TNM model and to evaluate background (existing) noise levels. The noise levels for both alternatives were evaluated using guidance established by WSDOT and FHWA. The modeled future noise levels are compared to the Noise Abatement Criteria (NAC). Also, the modeled increase in noise levels above existing conditions are compared to a substantial increase. WSDOT has special conditions for examining substantial increases, discussed in Appendix A.

What are Noise Abatement Criteria?

Noise Abatement Criteria, or NAC, are objective absolute noise levels that federal and state regulations apply to a variety of land use categories where an impact is triggered. If impacts are identified, noise abatement measures must be considered and, if found to be feasible and reasonable, must be implemented (23 CFR 772; WSDOT, 2006). The NAC Table is shown in Exhibit 3-1.

Noise levels were evaluated at six modeling locations in the study area, which included outdoor use areas for two restaurants, the sidewalk adjacent to Silver Cloud Inn (hotel), and the parking lot adjacent to the Salvation Army residence. The hotel and Salvation Army residence contain no designated outdoor use areas, apart from the hotel's rooftop swimming pool which, because of its vertical distance from project roadways, would not likely be affected by the Proposed Action. Interior noise levels at the Salvation Army residence were evaluated. Two additional locations were used to demonstrate

general noise levels in the study area. WSDOT approved the selection of the noise modeling and monitoring locations before field work began.

Background (existing) noise levels were field-measured at four locations. Then, using the TNM and traffic volumes measured in the field, the project team calibrated the noise model. Once the TNM was determined to be accurate, it was used to predict noise levels associated with the Proposed Action and No Build Alternative.

The noise receiver sites identified in this report are listed below and shown in Exhibit 4-4. Receiver locations starting with "M" are monitoring and modeling locations, and receiver locations starting with "R" are locations used only for modeling.

- M1 is located in the parking lot of the Salvation Army Thrift Store opposite and directly east of the intersection of Fourth Avenue South and the existing I-90 off-ramp. The Salvation Army residence is located south of the Salvation Army Thrift Store, and Qwest Field and the BNSF Railway right-of-way are situated west of the intersection. There are no designated outdoor uses for the Salvation Army residence; however, indoor noise was evaluated at this location.
- M2 is located on the sidewalk between the Silver Cloud Inn and South Royal Brougham Way. South Royal Brougham Way intersects with First Avenue South directly west of the M2 site. Across First Avenue South to the southwest is the Pyramid Alehouse restaurant and parking lot. Safeco Field is across South Royal Brougham Way to the south of the site. The hotel has an outdoor swimming pool on the 10th floor, but there are no balconies or ground-level or second-story outdoor uses associated with the building.
- M3 is located on the dining patio of Pyramid Alehouse at the southwest corner of the intersection between South Royal Brougham Way and First Avenue South. Safeco Field is opposite and to the east, across First Avenue South,

and the Silver Cloud Inn is located to the northeast diagonally across the intersection.

- M4 is located west of Fourth Avenue South and directly beneath the South Atlantic Street overpass. The I-90 and I-5 elevated on-ramps are located directly above this section of Fourth Avenue South. Directly to the west of M4 are Third Avenue South, the BNSF Railway right-of-way, and Safeco Field.
- R1 is located on the north of South Royal Brougham Way between First Avenue South and Third Avenue South along the sidewalk, adjacent to the south side of the parking lot for Qwest Field.
- R2 is located in the temporary Ivar's Clambake dining area on the east side of First Avenue South between South Atlantic Street and South Massachusetts Street. The outdoor dining area is approximately 100 feet east of First Avenue South and 100 feet south of South Atlantic Street.

What noise effects would occur during construction of the project, and what mitigation is proposed?

During the construction phase, noise levels would temporarily increase near the construction site because of heavy equipment use and the transport of construction materials. Noise levels generated during construction would vary widely, reflecting differences in site conditions and construction phases. WSDOT performance standards will require contractors to keep construction noise levels below local, state, and federal thresholds. In cases where construction noise would occur at night and exceed the City of Seattle maximum permissible sound levels (Seattle Municipal Code 25.08.410), technical noise variances for nighttime construction would be required by the City of Seattle. The Washington State Administrative Code (WAC 173, Chapters 58-62) exempts construction noise from regulation during the day (7 AM to 10 PM).

Construction noise effects could be mitigated by measures including, but not necessarily limited to, the following:

- Developing a construction management plan (CMP) that would establish specific noise levels that could not be exceeded by the contractors for various activities during specific time periods. The CMP would establish a set of noise limits that could be met by the contractors while still protecting the public from excessive noise effects.
- Crushing and recycling of concrete offsite, away from noise-sensitive locations, would decrease construction noise effects. Onsite crushing and recycling of concrete would require an operation plan defining the locations and hours of operations.
- Constructing temporary noise barriers around stationary equipment and long-term work areas.
- Limiting the noisiest construction to between 7 AM and 10 PM on weekdays and between 9 AM and 10 PM on weekends would reduce construction noise levels during sensitive nighttime hours. A noise variance would be required from the City of Seattle for construction between 10 PM and 7 AM on weekdays and between 10 PM and 9 AM on weekends.
- Sequencing construction to avoid the simultaneous use of multiple noisy machines and to avoid the loudest tasks (such as pile driving) during stadium or exhibition center events.
- Recommending contractors to use OSHA-approved backup alarms which use ambient sound level sensing; this could reduce disturbances to nearby residents from backup alarms during quieter periods.
- Requiring contractors to maintain all equipment and train their equipment operators; this could reduce noise levels and increase operational efficiency.
- Minimizing idling of power equipment.
- Where possible, locating stationary equipment away from sensitive receiving properties.

- If necessary, notifying the Silver Cloud Inn and Salvation Army residence before periods of intense nighttime construction.
- Providing a 24-hour noise complaint line.
- Using utility-supplied electric power rather than diesel-powered electric generators, whenever practicable.

What noise effects would occur during operation of the project, and what mitigation is proposed?

For 2030, the project design year, a 1 to 2 dBA noise increase over existing noise levels is predicted under either the Proposed Action or the No Build Alternative for half the receivers modeled. Under either alternative, traffic noise levels would equal the NAC of 67 dBA at the Pyramid Alehouse (M3) and approach the NAC (66 dBA) at Ivar's Clambake (R2). However, any increases in traffic noise at these locations would result from the cumulative effect of greater volumes of traffic, and not directly from the Proposed Action. The predicted changes in noise levels, 1 to 2 dBA, at the two dining locations would be too small to be perceptible to people (FHWA, 1995). For this reason, the project team concluded that the increases were not excessive.

Noise walls and other noise abatement measures are neither feasible nor reasonable at either of the outdoor dining locations. Each location is adjacent to a parking lot with driveways which would create gaps in the walls and reduce the noise-reduction effect. In addition, a noise wall at either location would block public access to the facility. Noise walls would create a safety issue by reducing drivers' views from the driveways, making it difficult to merge into traffic. Walls would also block the visibility of the businesses to potential customers on roadways and sidewalks, and interfere with police traffic control during stadium events.

Because of the density of commercial and industrial developments throughout the study area, realigning the roadways would not be feasible without extensive property acquisitions. Acquisition of property rights is costly and timely.

For the same reason, creation of buffer zones would not be a viable option for noise abatement. Traffic management measures, such as lowering the speed limit or limiting truck traffic, would not be consistent with the project's purpose or need and given the already low speed limits and high density of industrial and commercial use in the area. Creation of buffer zones would not be feasible without extensive property acquisition. Consequently, noise mitigation is not required once construction has been completed and the project enters its long-term operational phase.

What cumulative effects would involve noise?

Historically, many sources of noise have been introduced during the urban development of the study area since the mid-nineteenth century, including industrial activities associated with the Greater Duwamish Manufacturing and Industrial Center, the Port of Seattle terminals, the Washington State Ferries terminal at Colman Dock, commercial waterfront developments, the I-5 and I-90 freeways, truck and rail freight traffic, the Ryerson bus base, and, most recently, stadium district events. By 2030, the Proposed Action, in combination with reasonably foreseeable future actions (RFFAs), would contribute to a barely perceivable increase in the cumulative noise level of the study area. A similar increase would occur under the No Build Alternative. In other words, the general noise level within the study area will increase slightly between now and 2030, with or without the project, because of population growth and continuing development.

Are any of the identified effects considered excessive?

The Proposed Action would not produce excessive noise effects. The increases in noise level predicted as a result of modeling the project are 2 dBA or less, changes that would be too small to be perceptible to people (FHWA, 1995).

What noise effects would occur if the Proposed Action were not built?

Noise levels in 2030 under the No Build Alternative are predicted to be similar to those with the Proposed Action. Because future traffic volumes would increase in comparison with existing levels, with or without the project, noise in the study area would increase by 2 dBA or less over existing levels by 2030, the project design year.

Chapter 1 Introduction

1 Why is noise considered in this report?

FHWA requires that the effects of noise be considered in environmental impact assessments prepared under provisions of the National Environmental Policy Act (NEPA). The Washington State Environmental Policy Act (SEPA) similarly requires that noise be considered in environmental documents to assist in the comparison of alternatives. This discipline report supports the NEPA/SEPA Environmental Assessment for the SR 519 Intermodal Access Project – Phase 2: South Atlantic Corridor.

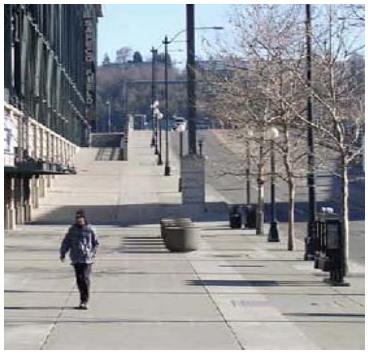
2 What are the key points of this report?

This discipline report analyzes the expected long-term noise effects of the Proposed Action and No Build Alternative with respect to a *substantial increase* and the Noise Abatement Criteria (NAC), WSDOT, and FHWA criteria. The expected short-term effects of the Proposed Action and No Build Alternative are discussed with respect to effects of construction noise. There would be no substantial increase in noise levels under either alternative. Also, the forecasted noise levels would approach (at 66 dBA) or equal the NAC of 67 dBA at two outdoor dining areas, R2 and M3, resulting in a noise effect for which mitigation must be considered. Noise mitigation would not be feasible and is not required at these locations because of existing developments, the high density of commercial use, the number of driveways, the proximity of dining areas to the driveways, and safety issues associated with noise walls adjacent to driveways. Although the NAC would be approached or equaled, the predicted increase in noise levels by

1-2 dBA would be too small to be perceptible to people (FHWA, 1995).

Chapter 2 Description of Alternatives

SR 519 is an important thoroughfare for cars, trucks, and pedestrians in Seattle's South Downtown (SODO) district (Exhibit 2-1). In 2004, WSDOT opened Phase 1 of the SR 519 project, consisting of the South Atlantic Street railroad overpass (Edgar Martinez Drive South) and a new eastbound on-ramp from South Atlantic Street to I-5 and I-90. The overpass separates road and railway traffic at Third and Fourth Avenues South and improves access to the freeway system from important waterfront facilities such as the Port of Seattle terminals, railroad freight yards, and the Washington State Ferries terminal at Colman Dock.

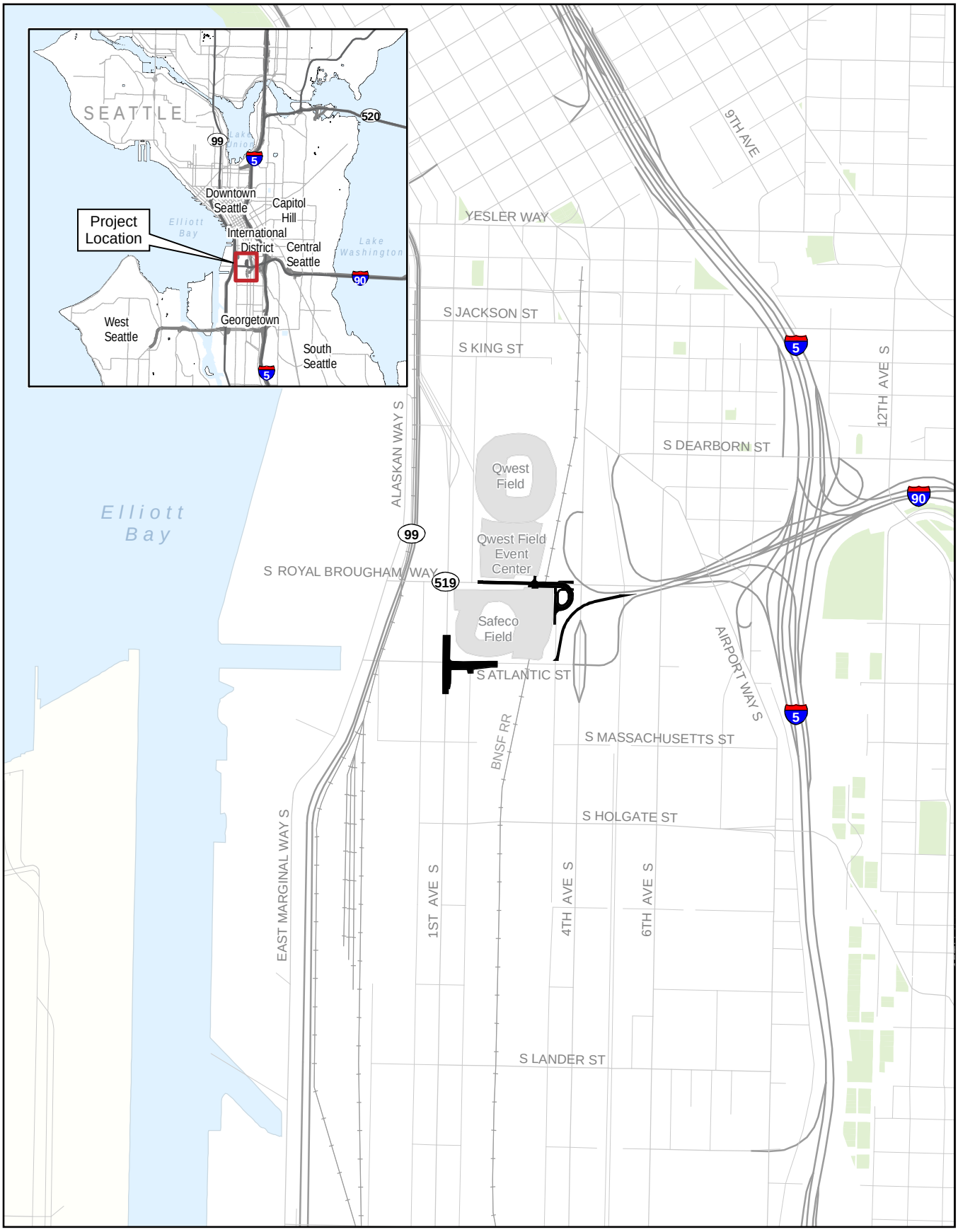


New South Atlantic Street overpass built in SR 519 Phase 1

The Phase 1 project had four main components which:

- Provided the eastbound connection from the waterfront to I-5 and I-90 via South Atlantic Street
- Removed the old eastbound I-90 ramp on Fourth Avenue South
- Made improvements to South Atlantic Street between First Avenue South and the Alaskan Way South/East Marginal Way intersection
- Constructed the South Weller Street Pedestrian Bridge

When Phase 1 opened, eastbound freight, ferry, and event traffic immediately moved more freely, because connections from the Port of Seattle, waterfront, and stadium area to the freeway system were improved.



Source: City of Seattle (2007) and King County (2006)

Stadiums
Project

N
0 1,000 Feet

Exhibit 2-1
Vicinity Map

1 Why is the Phase 2 project needed?

SR 519 provides a vital roadway system for east-west traffic through Seattle, but it currently does not assist in the efficient westbound movement of cars, trucks, trains, and pedestrians through Seattle's SODO district. The route passes through an area that has changed so much in recent years that the roadway arrangement is not well suited to present conditions. A new design and new roadway structures are needed to allow vehicles and pedestrians to reach their destinations safely, quickly, and more directly.

This project would help to resolve several issues:

- Safety concerns from traffic and people crossing surface-level railroad tracks in the stadium area
- The expected increase in rail traffic and pedestrian crossings at South Royal Brougham Way when Sound Transit Central Link light rail service begins in 2009, resulting in safety concerns and travel delays
- Poor westbound access between I-5/I-90 and the Seattle waterfront, especially the Port of Seattle terminals and the Washington State Ferries terminal at Colman Dock
- Delays in moving products between Port of Seattle terminals and local, regional, and national markets

2 What is the purpose of the project?

This project would improve traffic mobility and safety by improving westbound connections between I-5/I-90 and the Port of Seattle terminals, the Washington State Ferries terminal at Colman Dock, waterfront commercial interests, and the stadium area. The project would allow people to walk more safely to and from the stadium area.

The purpose of the project is to:

- Provide a more direct route between I-5/I-90 and the Seattle waterfront, so that westbound freight, commuters, and local traffic can move more safely and efficiently through the stadium area

- Improve safety and reduce railroad and vehicle delays at the surface-level rail crossing on South Royal Brougham Way west of Fourth Avenue South
- Improve safety for people walking to events, work, and neighborhood destinations
- Reduce truck and rail traffic conflicts so that freight operators can move products more efficiently between Port of Seattle terminals and markets

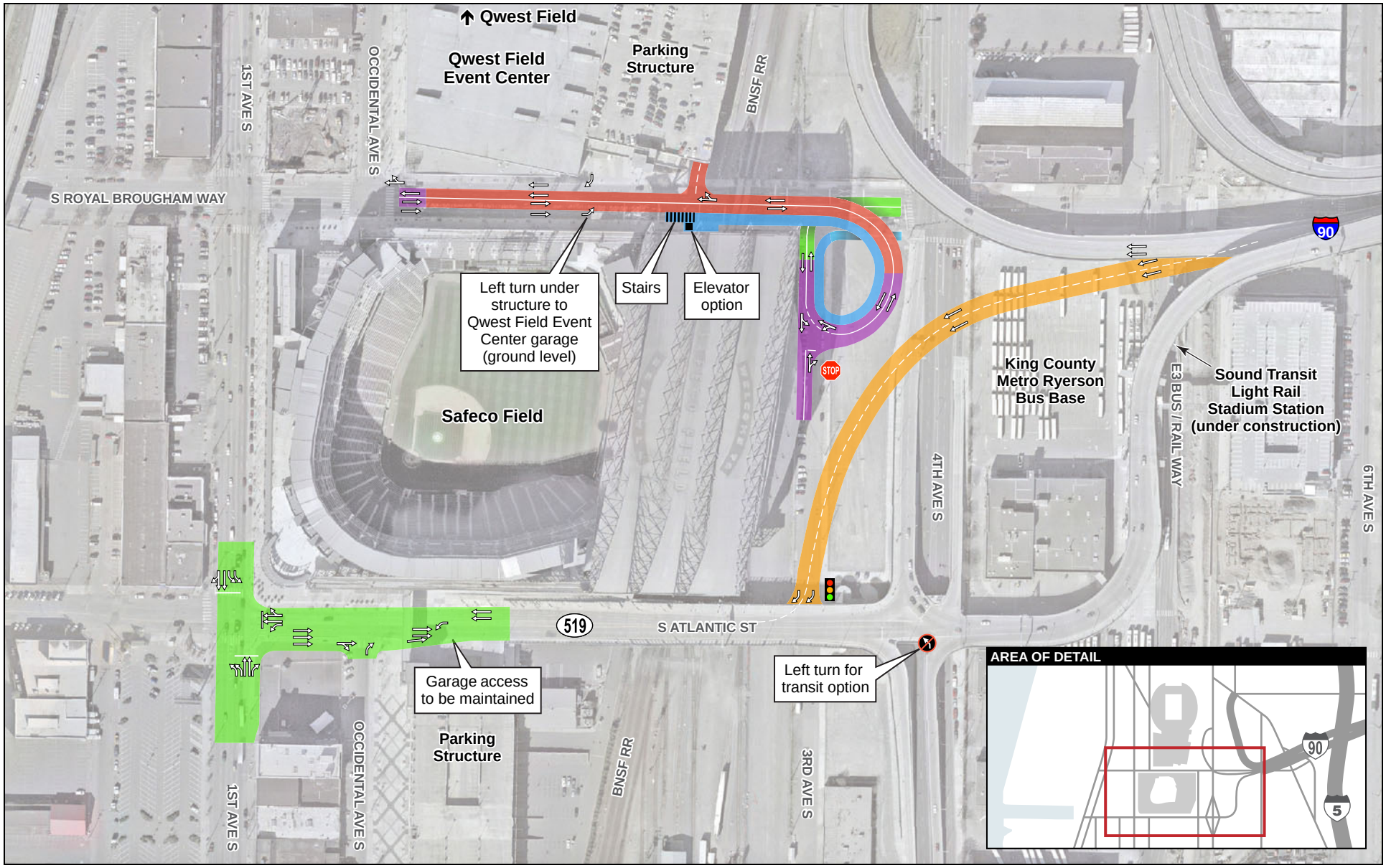
3 What are the project alternatives?

Two alternatives were analyzed for this report: the Proposed Action and the No Build Alternative. The Proposed Action, which has been designed to meet current and projected future traffic conditions, was developed following the completion of an earlier NEPA Environmental Assessment and associated Finding of No Significant Impact (FONSI) (USDOT et al., 1997) and builds on the more recent screening and evaluation of 21 preliminary Phase 2 options by WSDOT in a feasibility study (KPFF et al., 2006).

Proposed Action

The Proposed Action (SR 519 Intermodal Access Project Phase 2: Atlantic Corridor) would connect the existing westbound off-ramp from I-5 and I-90 to the existing South Atlantic Street overpass. It would also provide improvements at the intersection of First Avenue South and South Atlantic Street to accommodate traffic more efficiently along the route. In addition, it would build a grade-separated crossing over the railroad tracks at South Royal Brougham Way. These proposed improvements are described in more detail below and are illustrated on Exhibit 2-2. Traffic flow with the proposed improvements in place is shown in Exhibit 2-3. All proposed improvements would comply with the Americans with Disabilities Act of 1990 (ADA).

I-90 Off-Ramp to South Atlantic Street. A new two-lane elevated ramp connection would be built from westbound I-90 to terminate at a signalized T-intersection on the South Atlantic Street railroad overpass.

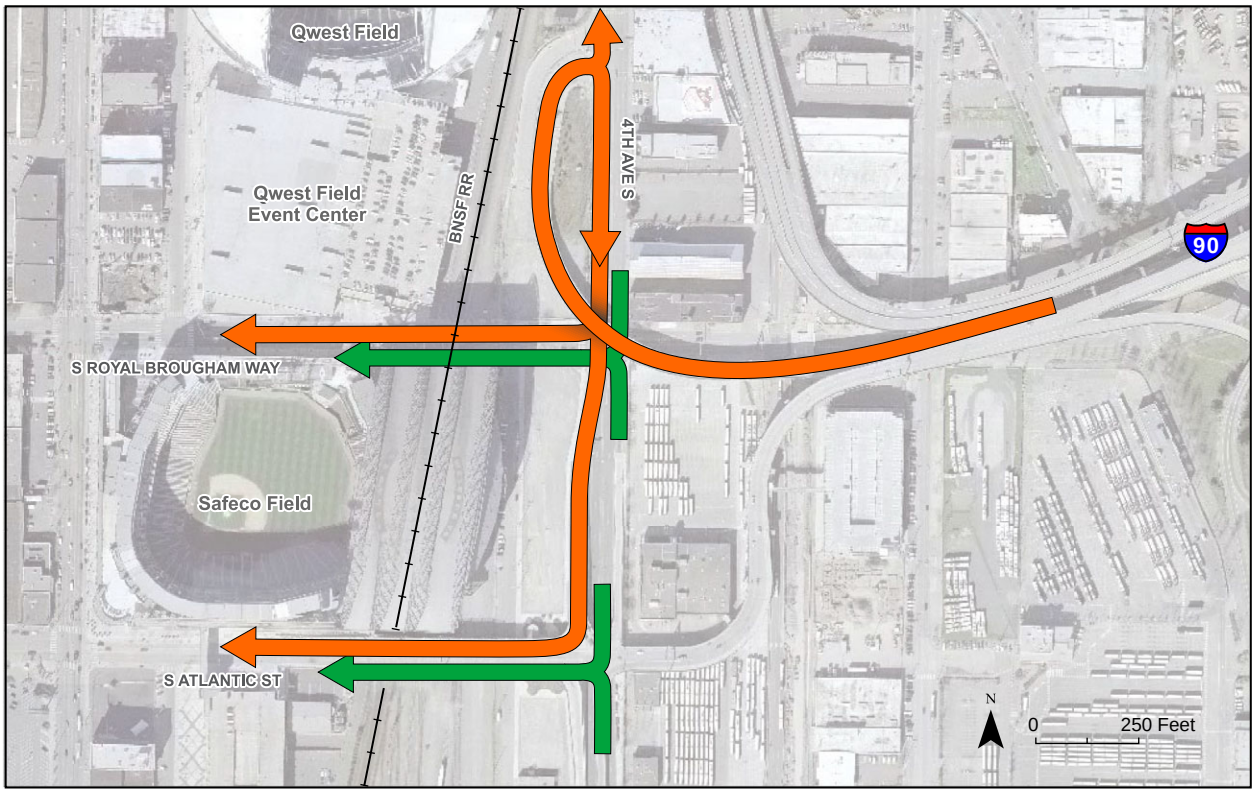


Arterial Bridge
Elevated Ramp
Pedestrian Bridge
Surface Improvements
Fill Embankment

N
0
250 Feet

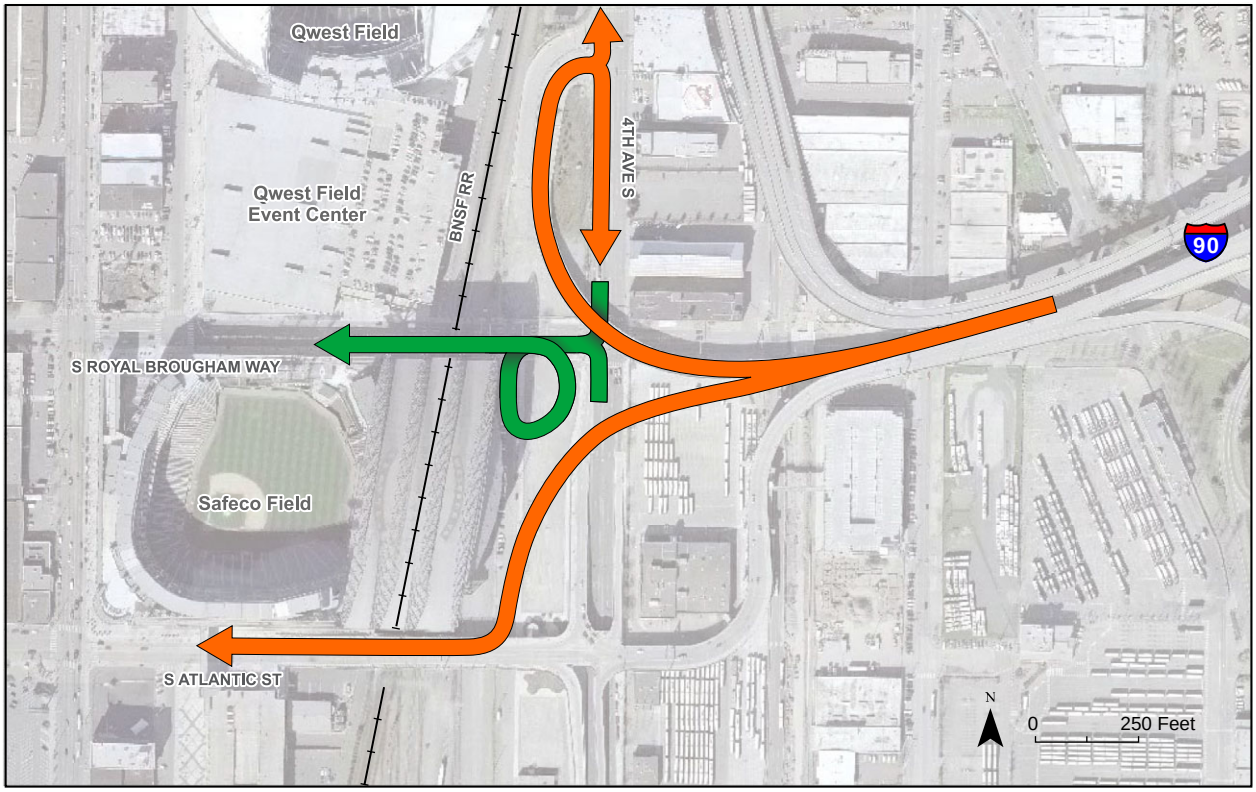
Exhibit 2-2
Project Elements

SR 519 Intermodal Access Project - Phase 2
February 2008



Existing Westbound Regional Routes
Existing Westbound Local Routes

Existing Westbound Travel Routes



Proposed Westbound Regional Routes
Proposed Westbound Local Routes

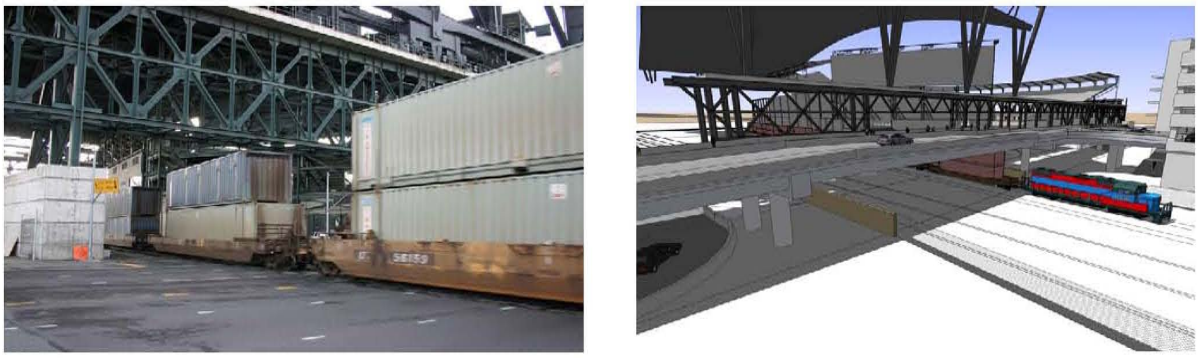
Proposed Westbound Travel Routes

Exhibit 2-3
Existing and Proposed Westbound Travel Routes

The new South Atlantic Street connection would serve westbound freeway traffic exiting I-90 and I-5. The new ramp would be entirely elevated, passing over Fourth Avenue South and Third Avenue South and connecting to the South Atlantic Street overpass southeast of Safeco Field. Exiting northbound I-5 traffic would be routed to South Atlantic Street, while exiting southbound I-5 traffic would have the option of using either the new off-ramp to South Atlantic Street or the existing I-90 off-ramp to Fourth Avenue South.

South Royal Brougham Way Railroad Overpass. The South Royal Brougham Way at-grade railroad crossing would be closed, but it could possibly be opened to public services in the event of a major emergency in the vicinity. A new two-lane elevated structure would be built, connecting Occidental Avenue South to Third Avenue South. The new overpass would transport vehicular, pedestrian, and bicycle traffic over the railroad tracks and provide a new connection and entrance from South Royal Brougham Way to the second level of the Qwest Field Event Center parking garage. The new ramp would accommodate local two-way traffic and provide ADA-compliant access.

Proposed ramp at east end of South Royal Brougham Way railroad overpass



South Royal Brougham Way existing at-grade railroad crossing (left) and proposed overpass (right)

Improvements to the Intersection of First Avenue South and South Atlantic Street. The project would widen the intersection by adding additional turn lanes to each approach. Existing parking lanes along First Avenue South would be converted into travel lanes, with a new eastbound lane added to South Atlantic Street. Sidewalks along the southern edge of

South Atlantic Street east of First Avenue South would be relocated to the south to accommodate the added eastbound lane.

Construction Components

Construction of the SR 519 Phase 2 project could take about 3 years, and WSDOT is exploring ways to accelerate this schedule. Construction would involve three project components:

- Improvements to the intersection of First Avenue South and South Atlantic Street could begin first, with construction starting in 2009 and lasting 6 to 9 months.
- Construction of the new I-90 ramp connection to the South Atlantic Street overpass could last 15 to 18 months and could begin as improvements to the intersection of First Avenue South and South Atlantic Street are underway.
- Construction of the new South Royal Brougham Way railroad overpass, most likely beginning in 2010, could overlap with construction of the new I-90 off-ramp and last 18 to 21 months.

Proposed Construction Schedule

Access for emergency service vehicles would be maintained at all times. A construction management plan (CMP) would be developed to optimize the sequencing of the SR 519 Phase 2 project elements. The CMP would identify approaches that best

coordinate with and minimize unwanted effects on the following:

- Stadiums and Event Center activities
- Port of Seattle container operations
- Washington State Ferries
- BNSF Railway mainline and yard operations, AMTRAK mainline operations, and Sound Transit commuter rail operations
- Sound Transit Link light rail operations, Sounder commuter rail service, and Regional Express bus operations
- King County Metro Ryerson Bus Base operations and Metro bus service throughout the affected area, including through-routes operating within the area, and access to the bases and downtown Seattle transit tunnel
- Greater Duwamish Manufacturing and Industrial Center freight operations

Temporary construction staging areas would be required to store equipment and materials during construction. A gravel lot owned by WSDOT, bounded by South Atlantic Street and South Royal Brougham Way, and Third Avenue South and Fourth Avenue South, would serve as the primary construction staging area for the SR 519 Phase 2 project. This lot is vacant, and no adverse environmental effects are expected from staging at this location. Other temporary staging areas would be determined through consultation with King County and the City of Seattle during project design.

No Build Alternative

Under the No Build Alternative, the three proposed Phase 2 components discussed above would not be built. Westbound traffic exiting from I-5 and I-90 would continue to flow as shown in Exhibit 2-3.

4 What permits would be required to build the project?

The SR 519 Phase 2 project would be built under close regulatory scrutiny. WSDOT would apply to the State of Washington, King County, and the City of Seattle for a number of permits and approvals. They would most likely include, but not necessarily be limited to:

- National Pollutant Discharge Elimination System (NPDES) Construction Stormwater General Permit (Washington State Department of Ecology)
- Wastewater Discharge Approval (King County)
- Street Use Permit (City of Seattle)
- Side Sewer Permit (City of Seattle)
- Noise Variance (City of Seattle)

WSDOT will confirm the requirement for these and other permits as engineering design and construction planning proceed in coordination with the permitting authorities.

Chapter 3 Methodology

1 What is the study area for noise and how was it selected?

The study area for noise consists of properties within and adjacent to the project footprint that may be affected by construction and/or operation of the Proposed Action. The affected environment for noise analysis consists of the area bounded by Fifth Avenue South to the east, South Dearborn Street to the north, Alaskan Way South to the west, and South Massachusetts Avenue to the south. The study area was selected on the basis of land use and the extent of sensitive receiver locations within 500 feet of the Proposed Action alignments. The extent and boundaries of the study area for noise were reviewed by WSDOT before the noise analysis began.

2 How was the information collected?

This noise analysis presented in this discipline report followed FHWA guidelines established by Title 23 of the Code of Federal Regulations, Chapter 1, Part 772 (23 CFR 772) for the analysis of traffic noise effects of Type 1 projects (new transportation facilities). It determined whether noise abatement measures would be required to mitigate the effects of the Proposed Action, giving weight to the benefits and costs of abatement and to expected social, economic, and environmental effects. Appendix A presents more information on regulatory requirements and criteria relating to noise and measures to mitigate its effects.

The noise analysis of the existing, or baseline, environment included the following components:

- Inspection of the study area and categorization of existing land uses

- Measurement of the existing study area sound levels and characterization of the noise sources
- Modeling existing noise levels using peak hour traffic volumes

The project team identified existing activities on developed properties so that their sensitivity to noise effects could be evaluated. The team also took field measurements at four locations to calibrate FHWA TNM 2.5 Noise Model (TNM) and determine background noise levels, following the procedures in *Measurement of Highway-Related Noise* (FHWA, 1996). Calibration is accomplished by comparing measured noise levels to predicted noise levels based on observed traffic volumes and speeds. All measurements and references to noise levels are in A-weighted decibels of equivalent average sound level (dBA L_{eq}). Four short-term measurements of 20-minute duration were taken with concurrent traffic counts and vehicle classifications on July 24, 2007. While making the noise measurements, the project team noted that noise in the study area was loud and possibly attributable to various non-roadway sources such as dock activities, freight and commuter trains, overhead aircraft, and various industrial activities, as well as to traffic. To calibrate the model more precisely, the project team made additional traffic counts for ramps adjacent to the project alignment on September 12, 2007.

3 What methods were used to evaluate potential effects of the Proposed Action and the No Build Alternative?

The project team used noise analysis procedures, TNM, and noise abatement criteria (NAC) and substantial increases developed by the FHWA and WSDOT (23 CFR 772; WSDOT, 2006) to assess probable noise effects from vehicular traffic that would be generated by the Proposed Action. The team compared the modeled Proposed Action noise levels with the NAC. The analysis included the following components:

- Calibrating the existing noise model with monitoring data (Chapter 3)
- Assessing potential construction noise effects (Chapter 5)
- Modeling noise levels associated with existing conditions, the Proposed Action, and the No Build Alternative (Chapter 5)
- Determining traffic noise effects (Chapter 5)
- Evaluating noise mitigation measures, if needed (Chapter 5)

TNM uses data on roadway and receiver geometry, traffic volume and speed, vehicle types, and topographic features as inputs to its noise prediction algorithms.

The project team calibrated the TNM by modeling the existing roadway configuration with the traffic volumes and vehicle types counted during the existing noise measurements. Since the measured and modeled noise levels were within 2 dBA, they are considered accurate, and no adjustments were made to the modeling results for existing, No Build, and Proposed Action noise levels. Exhibit 3-1 shows the results of the calibration process.

EXHIBIT 3-1. CALIBRATION RESULTS FOR NOISE LEVELS COLLECTED JULY 2007

Measurement Site	Measured Noise Level in dBA (20-minute L_{eq})	Modeled Noise Level in dBA (20-minute L_{eq})	Difference (Model - Measured) (dBA)
M1	71	69	2
M2	73	71	2
M3	69	67	2
M4	69	67	2

Note: Noise measurements taken July 24, 2007

After the model was calibrated, it was used as a template for calculating the existing year and 2030 Proposed Action and No Build Alternative noise levels using traffic forecast data (The Transpo Group, 2007). Any changes in roadway configuration

or traffic flow patterns due to the project were incorporated into the model for the Proposed Action in design year 2030.

The project team used the TNM to quantify predicted noise levels for the Proposed Action and No Build Alternative at all noise modeling locations that would be affected by project-generated traffic.

The traffic engineering data provided by The Transpo Group on vehicle volumes, the proportion of passenger cars and trucks, and typical vehicle speeds used in the modeling of future conditions are shown in Exhibit 3-2. Additional background traffic data for vehicle type percentages for peak hour traffic volumes are included in Appendix C.

The modeled noise levels for each receiver were evaluated using WSDOT and FHWA procedures, the NAC level for each land use category, and substantial increase Tier 1 and Tier 2 noise levels. Noise abatement measures were considered if the modeled noise levels approached or exceeded these criteria or exceeded the substantial increase.

For the NAC, WSDOT guidance defines "approach" when project noise levels reach within 1 dBA of the FHWA NAC.

Two tiers of substantial exceedances are defined by WSDOT. Tier 1 is defined as an increase of 10 to 14 dBA over existing levels or as a design year noise level of 71 to 75 dBA. Tier 2 is defined as an increase of 15 dBA or more over existing levels or as a design year noise level of 76 dBA or greater. See Appendix A for a tabular presentation of Tier 1 and Tier 2 Substantial Exceedances.

WSDOT's policies are set forth in *Traffic Noise Analysis and Abatement Policy and Procedures* (WSDOT, 2006a). Federal and state regulations associated with noise are discussed in more detail in Chapter 4 and in Appendix A.

4 What would be considered an excessive noise effect?

As defined by the project team for this analysis, an excessive noise effect is one that would be perceptible to people and

disturb or disrupt activities that people normally engage in, such as conversation, dining, outdoor recreation, or sleeping.

EXHIBIT 3-2. MODELED TRAFFIC VOLUMES

Roadway Segment	Speed (mph)	Existing (2007)			2030 No Build			2030 Proposed Action		
		Cars	Med. Trucks	Heavy Trucks	Cars	Med. Trucks	Heavy Trucks	Cars	Med. Trucks	Heavy Trucks
First Avenue NB: Holgate to Atlantic	35	1,323	25	12	1,517	36	17	1,722	32	16
First NB: Atlantic to Royal Brougham	35	1,345	30	14	1,248	18	9	1,340	30	15
First NB: Royal Brougham to RR	35	1,689	38	18	1,018	15	7	1,103	25	12
First SB: Royal Brougham to RR	35	1,530	30	10	1,159	16	5	1,092	21	7
First SB: Atlantic to Royal Brougham	35	1,464	105	41	1,164	112	44	1,205	87	33
First SB: after Atlantic	35	886	64	25	1,111	107	42	1,164	84	32
Fourth NB: before Atlantic	30	1,284	29	17	1,679	45	26	1,496	34	20
Fourth NB: Atlantic to Royal Brougham	30	547	18	29	634	30	46	828	28	44
Fourth NB: before Off-Ramp	30	506	17	27	661	31	48	681	23	36
Fourth NB: after Off-Ramp	30	1,256	42	67	1,527	72	111	1,574	53	83
Fourth SB: North of Off-Ramp	30	1,028	11	6	1,239	14	7	1,239	13	8
Fourth SB: South of Off-Ramp	30	2,016	22	12	2,459	27	14	1,957	21	12
Fourth Avenue SB: Atlantic to Royal Brougham	30	2,063	23	12	2,734	30	16	2,429	26	15
Fourth SB: after Atlantic	30	1,009	8	3	1,370	14	6	1,375	10	5
Atlantic WB: First to Fourth	30	342	24	14	833	52	30	751	73	41
Atlantic EB: First to Fourth	30	1,110	33	17	1,671	51	28	1,726	64	35
Royal Brougham EB: First to Fourth	30	384	11	5	452	17	6	466	3	1
Royal Brougham WB: First to Fourth	30	643	25	11	566	30	14	631	6	3
Existing off-ramp to Fourth Avenue	40	949	34	22	1,235	45	30	707	14	9
Ext Off-ramp to Fourth Avenue-2	30	949	34	22	1,235	45	30	707	14	9
EB on-ramp	30	2,519	107	54	3,196	136	68	3,196	136	68
Proposed Fourth SB: after Atlantic	30	-	-	-	-	-	-	528	31	21
Proposed Ext Off-ramp to Atlantic	40	-	-	-	-	-	-	1,090	22	14
Proposed Royal Brougham WB and EB: First to Fourth	30	-	-	--		-	-	1097	9	4

NB = northbound, SB = southbound, WB = westbound, EB = eastbound, Ext = extension
Source: SR 519 Transportation Discipline Report (The Transpo Group, 2007)

Chapter 4 Affected Environment

1 How is noise regulated?

Traffic noise from highway and transit projects is regulated by federal and state agencies. The FHWA has established noise abatement criteria, or NAC (23 CFR 772), that apply to federally funded highway projects. The criteria are summarized in Exhibit 4-1. The noise levels are expressed in A-weighted decibels hourly equivalent sound levels ($L_{eq\ (h)}$). Additional acoustical fundamentals and regulatory information are presented in Appendix A.

Land use determines noise compatibility. Land use categories adjacent to the Proposed Action are classified under Activity Categories "B" for outdoor dining areas (M3 and R2), "C" for commercial and industrial properties, and "E" for the interior noise levels at Salvation Army residence (M1), a nonprofit institution.

EXHIBIT 4-1. FHWA NOISE ABATEMENT CRITERIA

Activity Category	$L_{eq\ (h)}$	Description of Activity Category
A	57 dBA (exterior)	Lands on which serenity and quiet are of extraordinary significance.
B	67 dBA (exterior)	Residences, motels, schools, churches, parks, play fields, hospitals
C	72 dBA (exterior)	Developed lands not included in A or B.
E	52dBA (interior)	Residences, motels, schools, libraries, hospitals, auditoriums

Source: FHWA Traffic Noise Abatement Criteria (23 CFR 772, 1997)

WSDOT is responsible for applying FHWA regulations to state highway projects and has developed the definitions essential to performing highway noise studies.

WSDOT considers noise effects from vehicle traffic to occur if existing or predicted levels exceed or approach (within 1 dBA) the NAC. WSDOT also considers a substantial increase in noise levels a noise effect. Two tiers of substantial exceedances are defined by WSDOT. Tier 1 is defined as an increase of 10 to 14 dBA over existing levels or as a design year noise level of 71 to 75 dBA. Tier 2 is defined as an increase of 15 dBA or more over existing levels or as a design year noise level of 76 dBA or greater. See Appendix A for a tabular presentation of Tier 1 and Tier 2 substantial increases.

The City of Seattle limits noise levels at property lines of neighboring properties (Seattle Municipal Code 25.08.410). The maximum permissible sound level depends on the land uses of both the source noise and the receiving property (Exhibit 4-2). The maximum permissible sound levels apply to construction activities only if they occur between 10 PM and 7 AM on weekdays and 10 PM and 9 AM on weekends. During project construction, the source of noise is in a commercial district, and the sensitive receiving properties would include Salvation Army residence (M1) and the Silver Cloud Inn (M2). For these properties, the maximum permissible noise limit is 47 dBA. Exhibit4-2 summarizes the City of Seattle maximum permissible sound levels.

EXHIBIT 4-2. CITY OF SEATTLE MAXIMUM PERMISSIBLE SOUND LEVELS (DBA)

District of Noise Source			Commercial	Industrial
	Day	Night		
Residential	55	45	57	60
Commercial	57	47	60	65
Industrial	60	50	65	70

Source: Seattle Municipal Code 25.08.410

2 What noise-sensitive properties are in the study area?

The land uses within the study area are industrial/terminal/ warehouse, recreational/entertainment (Qwest Field, Qwest Field Event Center, Safeco Field), and commercial. In addition, there are retail/service businesses, offices, the Silver Cloud Inn, and the Salvation Army residence. The Salvation Army residence, adjacent to the end of the existing I-90 off-ramp on Fourth Avenue South, has no designated outdoor use areas. However, since the Salvation Army residence is a non-profit institution, interior noise levels will be included in this analysis as Category E. Another noise-sensitive land use category for this analysis is Category B for picnic and recreational land; the outdoor dining areas at Ivar's Clambake (R2); and the Pyramid Alehouse (M3). All other model locations are classified as category C for developed properties. Exhibit 4-3 shows existing zoning in the study area. The stadiums are not included in the analysis because their use is intermittent for sporting events which themselves generate noise. The tenth floor outdoor swimming pool at the Silver Cloud Inn was not considered a sensitive location as the pool is far enough away from the roadways in a vertical direction not to be affected.

What is a noise sensitive property?

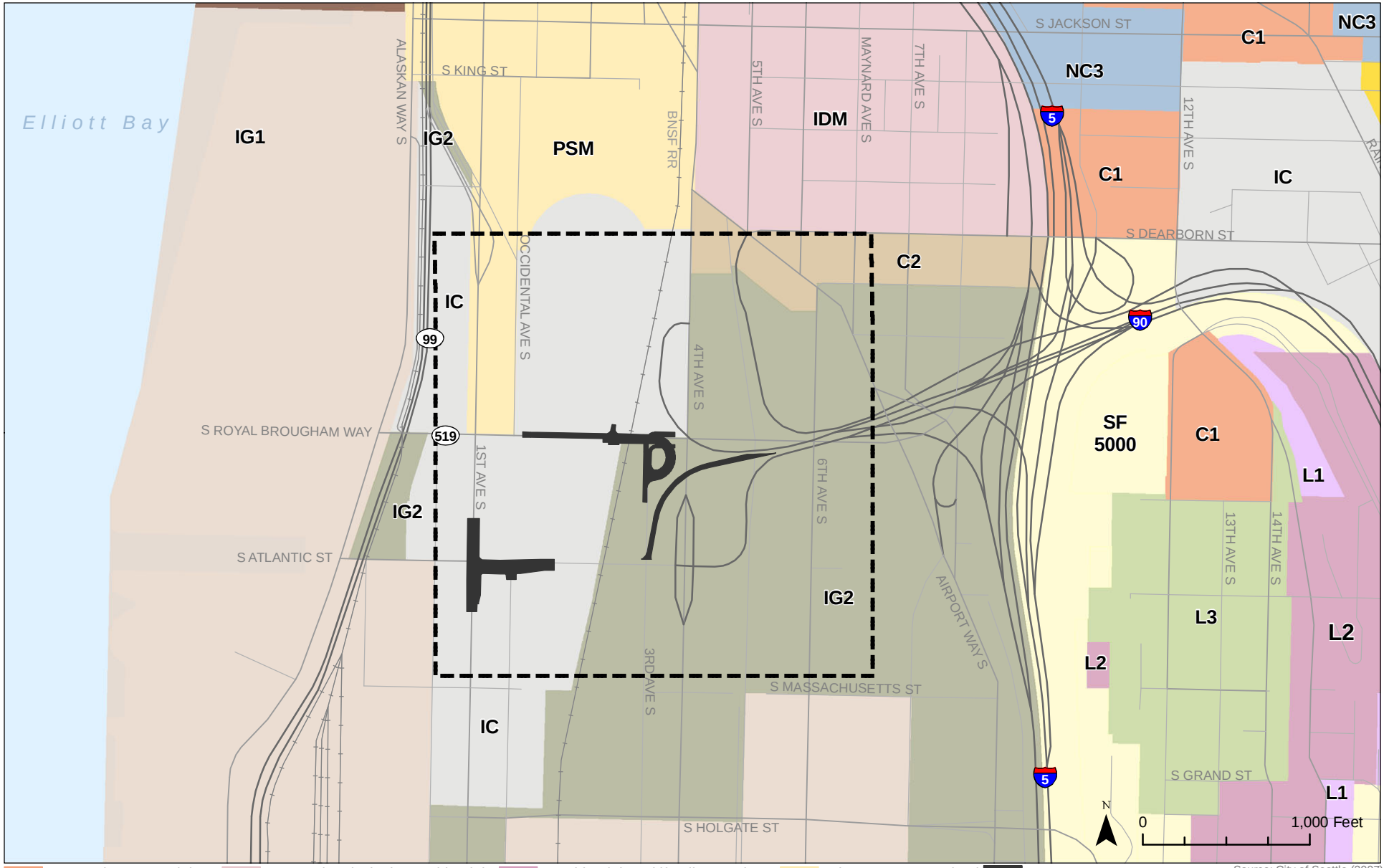
A noise sensitive property is an outdoor area of frequent human use. Where no outdoor use areas are available, indoor locations may be used. Some examples of sensitive properties are residences, motels, hotels, schools, churches, and libraries.

3 What are the existing noise levels?

Existing noise levels were measured and calculated using peak-hour traffic data. Short-term (20-minute) noise measurements were made at locations M1 through M4; the noise levels are shown on Exhibit 4-4. A description of each existing noise level measurement is provided in Exhibit 4-5. The measured noise levels and concurrent traffic counts that were collected during the noise measurements are summarized in Exhibit 4-6. For locations M1 and M4, the project team made additional traffic counts on September 12, 2007, for adjacent roadways for which traffic counts were not made during the previous noise monitoring. These additional traffic counts are shown in Appendix B and summarized in Exhibit 4-6. Appendix B contains the field measurement and traffic count

documentation. The traffic monitoring data were used to calibrate TNM accurately, as discussed in Chapter 3.

The calculated existing noise levels, which used existing traffic data prepared by The Transpo Group for the Transportation Discipline Report, are also shown in Exhibit 4-4. For the Salvation Army residence (M1), interior noise levels were calculated by applying the FHWA building noise reduction factor of 25 to exterior calculated noise levels at M1 (FHWA, 1995). These calculated existing noise levels are compared with the NAC in Exhibit 4-7 Under existing conditions, at the outdoor dining area (M3) noise levels equal the NAC (67 dBA), and at the sidewalk adjacent to the Silver Cloud Inn (M2) noise levels approach the NAC (71 dBA).



Source: City of Seattle (2007)

Exhibit 4-3
Zoning

Modeled Location

Modeling and Monitoring Locations

Project

Noise Level in dBA:

A) Measured
B) Modeled
NM= Not Measured

N

0 200 Feet

Source:The Noise Measurement and model calculations were conducted by CH2M HILL (2007) and Port of Seattle (2006)

Exhibit 4-4
Existing Modeled Noise Levels and 2007 Measured Noise Levels

EXHIBIT 4-5. DESCRIPTION OF MONITORING LOCATIONS AND 2007 MEASURED NOISE LEVELS

Receiver	Address	Description	Noise Level (dBA)
M1	Corner of Fourth Avenue South and I-90 off ramp	20-minute measurement located adjacent to the Salvation Army Thrift Store and a residence building. There are no outdoor use areas at this location. The dominant noise is from traffic traveling on Fourth Avenue South.	71
M2	Corner of South Royal Brougham Way and First Avenue South	20-minute measurement located adjacent to the Silver Cloud Inn. There are no outdoor use areas at this location. The dominant noise is from traffic traveling on South Royal Brougham Way and First Avenue South.	73
M3	Corner of South Royal Brougham Way and First Avenue South	20-minute measurement located on the dining patio of Pyramid Alehouse. The patio area is 2 feet above ground level. The dominant noise is from traffic traveling on South Royal Brougham Way and First Avenue South.	69
M4	Corner of Fourth Avenue South and South Atlantic Street overpass	20-minute measurement located west of Fourth Avenue South and directly beneath the South Atlantic Street overpass. There are no outdoor use areas at this location. The dominant noise is from traffic traveling on Fourth Avenue South.	69

Note: Exhibit 4-7 shows the calculated existing noise levels which use The Transpo Group peak hour volumes.

EXHIBIT 4-6 SUMMARY OF NOISE LEVEL MEASUREMENTS AND TRAFFIC COUNTS

		Leq			Northbound/Eastbound Traffic					Southbound/Westbound Traffic				
Receiver	Date	(dBA)	Street Name	Speed (mph)	Autos	Medium Trucks	Heavy Trucks	Buses	Motor-cycles	Autos	Medium Trucks	Heavy Trucks	Buses	Motor-cycles
M1	24-Jul-07 10:53-11:13am	71	Fourth Avenue. South	35[a]	726	39	0	39	6	1,194	72	33	24	0
			Exit Ramp to Fourth Avenue.	30	1,416	24	32	0	0	0	0	0	0	0
M2	24-Jul-07 09:38-9:58 am	73	First Avenue South	40	648	42	9	15	0	807	54	3	15	12
			Royal Brougham	35	123	33	3	3	3	411	21	12	0	12
M3	24-Jul-07 10:11-10:31 am	69	First Avenue. South	40	723	57	3	6	9	831	33	18	6	18
			Royal Brougham	35	225	15	6	0	3	342	27	15	0	6
M4	24-Jul-07 11:42-12:02am	69	Fourth Avenue. South	35	483	30	6	9	3	735	72	36	6	6
			Fourth Avenue. Eastbound Atlantic to Fourth Avenue. Southbound	35	60	0	8	0	0	0	0	0	0	0
			Fourth Avenue. Northbound Ramp to East I-90	35	596	48	68	0	0	0	0	0	0	0
			Atlantic Ramp to Fourth Avenue. Northbound	35	8	0	0	0	0	0	0	0	0	0
			Eastbound On-Ramp	40	1,432	104	184							
			Fourth Avenue. Southbound Ramp to Atlantic	30	464	40	24	0	0	0	0	0	0	0

[a] More elevated part of ramp was modeled with speed of 45 mph.

EXHIBIT 4-7. MODELED EXISTING NOISE LEVELS

Receiver	Land Use Category	Traffic Noise (dBA L_{eq})		Existing Approaches or Exceeds NAC?
		NAC	Existing Conditions	
M1	Category C	72	67	No
M1	Category E	52	42	No
M2	Category C	72	**71**	Yes
M3	Category B	67	**67**	Yes
M4	Category C	72	64	No
R1	Category C	72	63	No
R2	Category B	67	65	No

Notes:

Existing noise levels were modeled using existing traffic data prepared by The Transpo Group, 2007. Modeling files are provided in Appendix D.

Bold type indicates noise level approaches or exceeds NAC.

Chapter 5 Environmental Consequences and Mitigation Measures

1 How would project construction temporarily affect noise in the study area?

During the construction phase of the Proposed Action, noise levels would temporarily increase near the construction site due to use of heavy equipment and transport of construction materials. Noise levels generated during construction would vary widely, reflecting the differences in site conditions and construction phases.

Construction Noise Effects of Proposed Action

Direct Effects

Construction of the Proposed Action would require the use of a variety of noisy machinery extending over a 30-month period. Construction would proceed in three parts, as follows:

- Improvements to the intersection of First Avenue South and South Atlantic Street could be completed first, with construction starting in 2009 and lasting 6 to 9 months.
- Construction of the new I-90 ramp connection to the South Atlantic Street overpass could last 15 to 18 months and could begin as improvements to the intersection of First Avenue South and South Atlantic Street are underway.
- Construction of the new South Royal Brougham Way railroad overpass would last 18 to 21 months, and would begin in 2010.

Drilled shaft noise levels will be one of the loudest construction operations. This work is not anticipated to occur in front of the Ale House Restaurant or Silver Cloud Inn. Machinery typically used during construction and typical noise levels of that equipment are shown in Exhibit 5-1.

EXHIBIT 5-1. TYPICAL CONSTRUCTION MACHINERY NOISE LEVELS	
Type of Machinery	**L_{max} Noise Level at 50 feet (dBA)**
Flat Bed Truck	74
Welder	74
Dump Truck	77
Paving Machine	77
Backhoe	78
Concrete Mixer Truck	79
Front End Loader	79
Chain Saw	81
Crane	81
Excavator	81
Pumps	81
Dozer	82
Compactor	83
Warning Horn/ Backup Alarm	85
Dredge	87
Jackhammer	89
Pile Driver (vibratory)	101
Source: Roadway Construction Noise Model (RCNM), Version 1.0.	

Indirect Effects

No indirect effects from construction noise are expected under the Proposed Action.

Construction Noise Effects of No Build Alternative

Under the No Build Alternative, the existing SR 519 transportation facilities would undergo periodic maintenance as needed. Some of the equipment listed in Exhibit 5-1 would be used. The work would be limited in scope and noise effects would be of short duration.

2 How would the Proposed Action permanently affect noise in the study area?

Traffic noise modeling for the Proposed Action indicates that noise levels would be equal to or slightly less than those under the No Build Alternative throughout the study area except at R1, where the noise level would be 4 dBA less. This modeled reduction is a result of the new elevated South Royal Brougham Way railroad overpass, which would raise the roadway approximately 30 feet above the current grade at the

receiver location. The new elevated roadway would shield R1 from the traffic noise.

Noise Effects of Traffic

TNM noise levels and comparisons are summarized in Exhibit 5-2 and discussed below. The noise levels by location for the Proposed Action and No Build Alternative are shown by location on Exhibit 5-3.

EXHIBIT 5-2. MODELED NOISE LEVELS FOR EXISTING CONDITIONS, NO BUILD ALTERNATIVE, AND PROPOSED ACTION

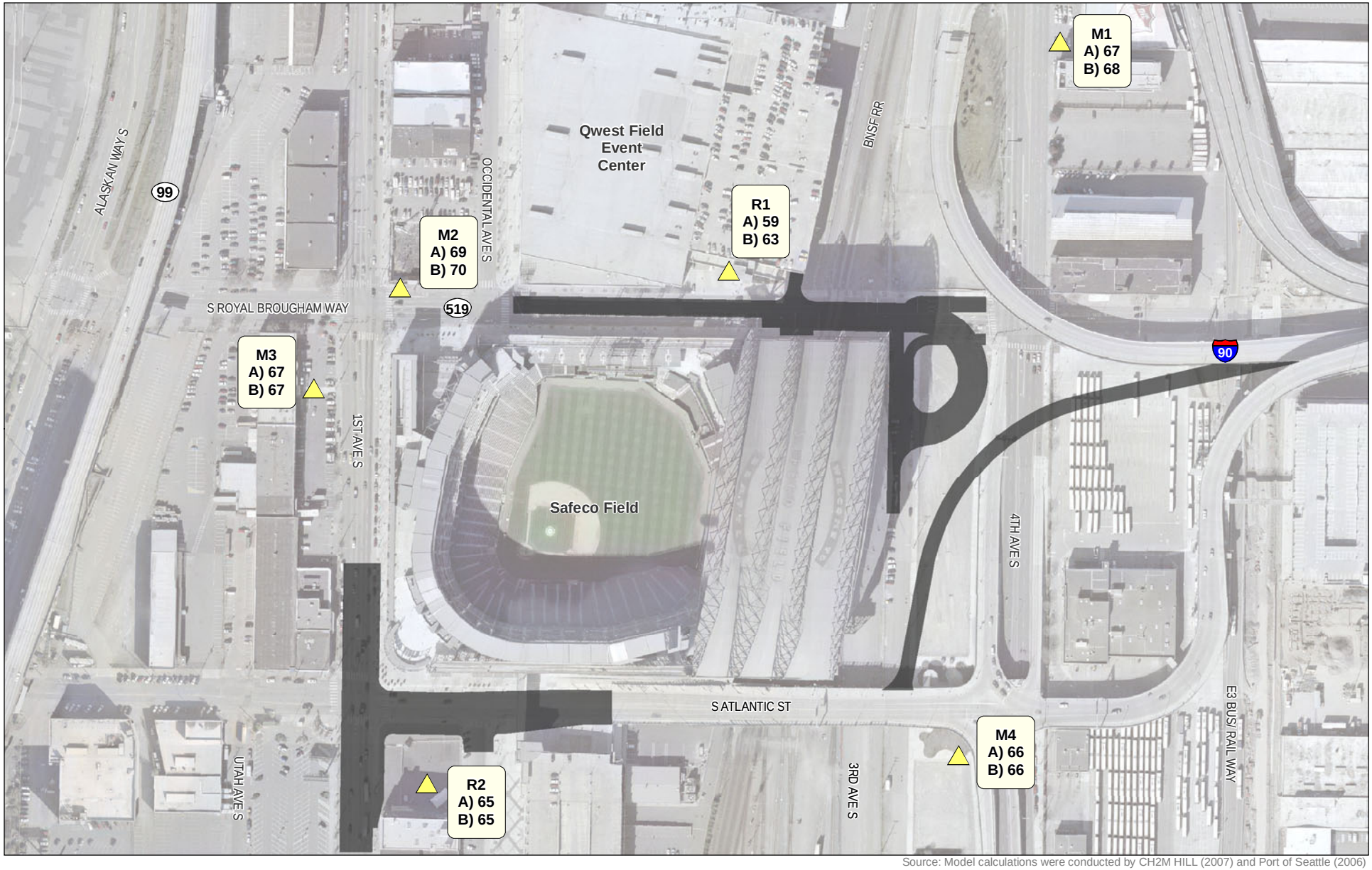
Receiver	Traffic Noise (dBA L_{eq})						2030 with Proposed Action Approaches or Exceeds NAC?
	NAC	Existing Conditions	2030 No Build	2030 with Proposed Action	No Build Change vs. Existing	Proposed Action Change vs. Existing	
M1	72	67	68	67	1	0	No
M1	52	42	43	42	1	0	No
M2	72	**71**	70	69	-1	-2	No
M3	67	**67**	**67**	**67**	0	0	Yes
M4	72	64	66	66	2	2	No
R1	72	63	63	59	0	-4	No
R2	67	65	**66**	**66**	1	1	Yes

Source: CH2M HILL 2007.
Note: **Bold** type indicates noise level approaches or exceeds NAC. Approach values are NAC-1.

Operational Effects of Proposed Action

Direct Effects

The Proposed Action would connect the existing westbound off-ramp from I-5 and I-90 to the existing South Atlantic Street overpass. Currently, all westbound traffic exits I-5 and I-90 onto Fourth Avenue South. The new two-lane elevated ramp to South Atlantic Street would split the total volume of traffic exiting I-5 and I-90 to the north and south. This would redistribute the traffic noise over a larger area.



Source: Model calculations were conducted by CH2M HILL (2007) and Port of Seattle (2006)

△ Modeled Location

Project

Noise Levels in dBA:

A) Proposed Action
B) No Build

N

0 200 Feet

Exhibit 5-3
Noise Levels for 2030 Project and No Build

With the Proposed Action in operation, traffic volumes along First Avenue South between South Royal Brougham Way and South Atlantic Street would decrease from existing conditions. In addition, the elevated South Royal Brougham Way structure would decrease the level of traffic noise exposure for at-grade pedestrians (R1) (see Exhibit 3-2).

Exhibit 5-3 summarizes traffic noise levels predicted for the Proposed Action. Noise levels would increase 1 to 2 dBA over existing levels at locations M4 (66 dBA) and R2 (66 dBA), which are the closest modeling locations to the proposed site of the new I-90 off-ramp. At all other modeled locations, the noise level would decrease or equal the existing noise level and remain below the NAC except at M3 and R2. The modeled noise level at M3 (67 dBA), an outdoor dining area, equals the NAC level, and the modeled level at R2 (66 dBA), also an outdoor dining area, approaches the NAC. Both results are considered to be noise effects.

The interior noise levels resulting from operation of the Proposed Action at the Salvation Army residence would not approach or exceed the Category E NAC of 52 dBA once a FHWA building noise reduction factor of 25 dBA (FHWA, 1995) has been applied to the outdoor noise levels. The interior noise level at Salvation Army residence (M1) is 42 dBA which is below the NAC.

In conclusion, the changes in modeled noise levels for the Proposed Action are 2 dBA or less over existing levels and would not be perceptible (FHWA, 1995).

Indirect Effects

No long-term indirect effects are expected from traffic noise under the Proposed Action.

Operational Effects of No Build Alternative

Future noise levels under the No Build Alternative would be equal to or within 1dBA of those predicted for the Proposed Action. Traffic volumes associated with the No Build Alternative would increase beyond existing levels along all roadways except First Avenue South between South Royal

Brougham Way and South Atlantic Street. Exhibit 5-3 summarizes traffic noise levels predicted for the No Build Alternative. Under this alternative, noise levels would increase 1 to 2 dBA over existing levels at locations M1 (68 dBA), M4 (66 dBA), and R2 (66 dBA). Interior noise levels for M1 (43 dBA) is also an increase of 1dBA over existing. For all other modeling locations, noise levels remain the same as existing levels and below the NAC, except for location M3. The modeled noise level for M3 (67 dBA), an outdoor dining area, equals the NAC and is considered to be a noise effect, despite the fact that the modeled future noise level equals existing conditions. The noise level at R2 approaches the NAC at 66 dBA and is also considered a noise effect. Although two noise effects would occur under the Proposed Action, the expected increases would be 2 dBA or less and would not be perceptible.

3 What measures are proposed to mitigate identified adverse effects of the project?

Construction Mitigation

Because construction of the Proposed Action would include nighttime construction activities, a nighttime noise variance would be required from the City of Seattle. At night, construction noise from the project which is in a commercial district would be subject to a maximum permissible noise limit of 47 dBA at a residential property, which would include the Salvation Army residence (M1) and the Silver Cloud Inn (M2). Construction noise mitigation requirements would be developed in coordination with the City and specified in the noise variance. The noise variance would comply with all requirements of the Seattle Municipal Code in Appendix E. WSDOT performance standards would require contractors to keep construction noise levels below local, state, and federal thresholds.

Construction noise effects could be mitigated by measures including, but not necessarily limited to, the following:

- Developing a construction management plan (CMP) establishing specific noise levels that could not be exceeded by the contractors for various activities during specific time

periods. This would establish a set of noise limits that could be met by the contractors while still protecting the public from excessive noise effects.

- Crushing and recycling of concrete offsite, away from noise sensitive locations, to decrease construction noise effects. If concrete were crushed and recycled onsite, an operation plan would be required to define the locations and hours of operations.
- Installing temporary noise walls around stationary equipment and long-term work areas.
- Limiting the noisiest construction to between 7 AM and 10 PM on weekdays and between 9 AM and 10 PM on weekends to reduce construction noise levels during sensitive nighttime hours. A noise variance would be required from the City of Seattle for construction between 10 PM and 7 AM on weekdays and between 10 PM and 9 AM on weekends.
- Sequencing construction to avoid the simultaneous use of multiple noisy machines and to avoid the loudest tasks (such as pile driving) during stadium or exhibition center events.
- Recommending contractors to use OSHA-approved backup alarms which use ambient sound level sensing; this could reduce disturbances to nearby residents from backup alarms during quieter periods.
- Requiring contractors to maintain all equipment and train their equipment operators; this could reduce noise levels and increase operational efficiency.
- Minimizing idling of power equipment.
- Where possible, locating stationary equipment away from sensitive receiving properties.
- If necessary, notifying the Silver Cloud Inn and Salvation Army residence prior to periods of intense nighttime construction.

- Providing a 24-hour noise complaint line.
- Using utility-supplied electric power rather than diesel-powered electric generators, whenever practicable.

Operational Mitigation

Based on WSDOT's NAC, noise abatement measures must be considered when the predicted noise levels approach or exceed the values shown in Exhibit 5-2. This means noise abatement measures must be considered for any outdoor dining location where peak-hour noise levels equal or exceed 66 dBA.

Potential traffic noise abatement measures that may be considered for outdoor use areas include the following:

- Acquisition of property rights for construction of noise walls
- Construction of noise walls between the roadway(s) and residential locations where future peak-hour noise levels approach or exceed the NAC
- Realignment of the roadway(s)
- Implementation of traffic management measures (reduced speed limits, limitations, or restrictions on truck traffic)
- Acquisition of "buffer zones" between the highway and affected properties
- Noise insulation of public use or nonprofit institutional structures

Of the above mitigation measures, the noise wall option is usually the most practical and effective choice. Acquisition of property rights is costly and timely. Because of the current density of commercial and industrial developments throughout the study area, realigning the roadways would not be feasible without extensive property acquisitions. Additionally, traffic management measures, such as lowering the speed limit or limiting truck traffic, would not be feasible given the already low speed limits and high density of industrial and commercial use in the area. Creation of buffer zones would not be feasible

without extensive property acquisition. Noise insulation of public use building is also costly.

Noise abatement in the form of noise walls is typically not recommended for commercial or industrial areas. Commercial establishments rely on visual exposure to the roadway to attract customers and to provide convenient access. In addition, noise abatement is usually provided for areas where a lowered noise level would be of benefit, such as parks, schools, and churches. Customers using the outdoor dining facilities in the study area would expect to hear traffic and industrial noise consistent with the surrounding land uses. In general, noise walls are not considered to be compatible with commercial or industrial zoning.

A noise wall at either of the outdoor dining facilities in the study area is not feasible, because the number of driveways associated with each facility would create gaps in any noise wall and reduce its effectiveness. Installing noise walls at either outdoor dining location would not achieve a 5 dBA reduction. In addition, noise walls would create safety issues by restricting drivers' views.

Because a noise wall would not be feasible at either of the outdoor dining locations in the study area, a reasonableness analysis, based on WSDOT guidance, was not conducted. Exhibit 5-4 summarizes the feasibility and reasonableness discussion for each outdoor dining facility. Based on the lack of feasibility and reasonableness for a noise wall, noise walls will not be required for this project. Additional information regarding a WSDOT feasibility and reasonableness analysis for noise wall mitigation is given in Appendix A.

4 Are any of the identified effects considered excessive?

The project team does not consider the modeled noise effects associated with the Proposed Action, increases of 1 to 2 dBA, to be excessive. This is because they would be too small to be perceptible to people (FHWA, 1995), would not be likely to disturb ongoing activities, and would occur with or without the

Proposed Action. Nevertheless, FHWA and WSDOT require that if the NAC is approached or equaled, noise abatement measures must be considered and implemented if they are reasonable and feasible. Under the Proposed Action, traffic noise levels would equal the NAC of 67 dBA at the Pyramid Alehouse (M3) and approach the NAC at Ivar's Clambake (66 dBA). However, mitigation at these locations was determined not to be feasible, and is not required, because of existing developments, high density of commercial use, the number of driveways, the proximity of dining areas to the driveways, and safety issues associated with noise walls adjacent to driveways.

EXHIBIT 5-4. SUMMARY OF FEASIBLE/REASONABLE NOISE WALL DETERMINATION

ID	Location Notes	Feasible	Reasonable	Comments
M3	Pyramid Alehouse	No	No	This property has three wide driveways that would create gaps in a noise wall and reduce the noise reduction effect. One driveway is adjacent to the outdoor dining area and therefore no wall could be placed at this location. A noise wall at this location would not be feasible. Since no feasible noise wall could be constructed at this location, no reasonable analysis can be conducted for this location. A noise wall at this location would not meet the reasonable and feasible criteria.
R2	Ivar's Clambake	No	No	This property has multiple driveways that would create gaps in a noise wall and reduce the noise reduction effect. A noise wall at this location would not be feasible. Since no feasible noise wall could be constructed at this location, no reasonable analysis can be conducted for this location. A noise wall at this location would not meet the reasonable and feasible criteria.

Chapter 6 Cumulative Effects

1 What are cumulative effects, and why are they important?

Cumulative effects are important because they help us to understand the project in terms of a "bigger picture." They can reveal possible unintended consequences of the Proposed Action or No Build Alternative that might not be apparent when we look at the project by itself. Because of this, cumulative effects help us to evaluate how sustainable the project is likely to be in future years, and how it might interact with other projects that are planned but have not been built yet.

What are cumulative effects?

Cumulative effects are impacts on the environment that result "from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. Defined by FHWA and Council on Environmental Quality (CEQ) regulations (40 CFR 1508.7)." (WSDOT, 2007)

2 How did the project team identify expected cumulative effects related to noise?

The project team identified expected cumulative effects of the Proposed Action and No Build Alternative by following a process recommended by the President's Council on Environmental Quality (CEQ, 1997) and as identified in Chapter 412 of the WSDOT *Environmental Procedures Manual* (WSDOT, 2007). First, the team considered how past and present actions have already affected the study area. Those past and present developments have changed noise from the original condition and continue to influence current trends. Next, the expected direct and indirect effects of the Proposed Action or No Build Alternative on noise, discussed in Chapter 5, were added. Finally, the probable effects of other reasonably foreseeable future actions (RFFAs) that are planned but not yet built were considered. The project team used year 2030, the project design year, as the future boundary for the cumulative effects assessment.

The project team combined past and present actions and RFFAs with the expected direct and indirect effects of each of the two alternatives to produce a cumulative picture of how noise might be affected, with and without the Proposed Action, in the future.

Past and Present Actions

The presence of freeway traffic on I-5 and I-90, aircraft overhead, freight and commuter trains, transit facilities, waterfront operations, stadium events, and general industrial activities have produced lasting effects that shape the present, or baseline, ambient noise condition within the study area. These existing noise sources will continue to affect the study area in the reasonably foreseeable future.

Direct and Indirect Effects of the Proposed Action

As discussed in Chapter 5, for 2030, a 1- to 2-dBA noise increase over existing noise levels is predicted under both the Proposed Action and the No Build Alternative for M1, M4, and R2. All other receivers would equal the existing noise levels or decrease. Under either alternative, traffic noise levels would approach or equal NAC of 67 dBA at two outdoor dining areas: the Pyramid Alehouse (M3), and Ivar's Clambake (R2). The noise effect at M3 is equal to existing noise levels for No Build and the Proposed Action and therefore not a result of the project. The noise effect at R2 is an increase of 1 dBA above existing conditions. No mitigation is required at these locations.

During the construction phase, noise levels would temporarily increase near the construction site due to use of heavy equipment and transport of construction materials. Various construction mitigation methods could be followed as discussed in Chapter 5.

Direct and Indirect Effects of the No Build Alternative

Under the No Build Alternative, some or all of the existing noise in addition to new transportation projects could increase or decrease their contribution to noise in the study area. Noise would increase up to 2 dBA in the study area by 2030. An

increase this small over existing noise levels is considered imperceptible to people (FHWA, 1995).

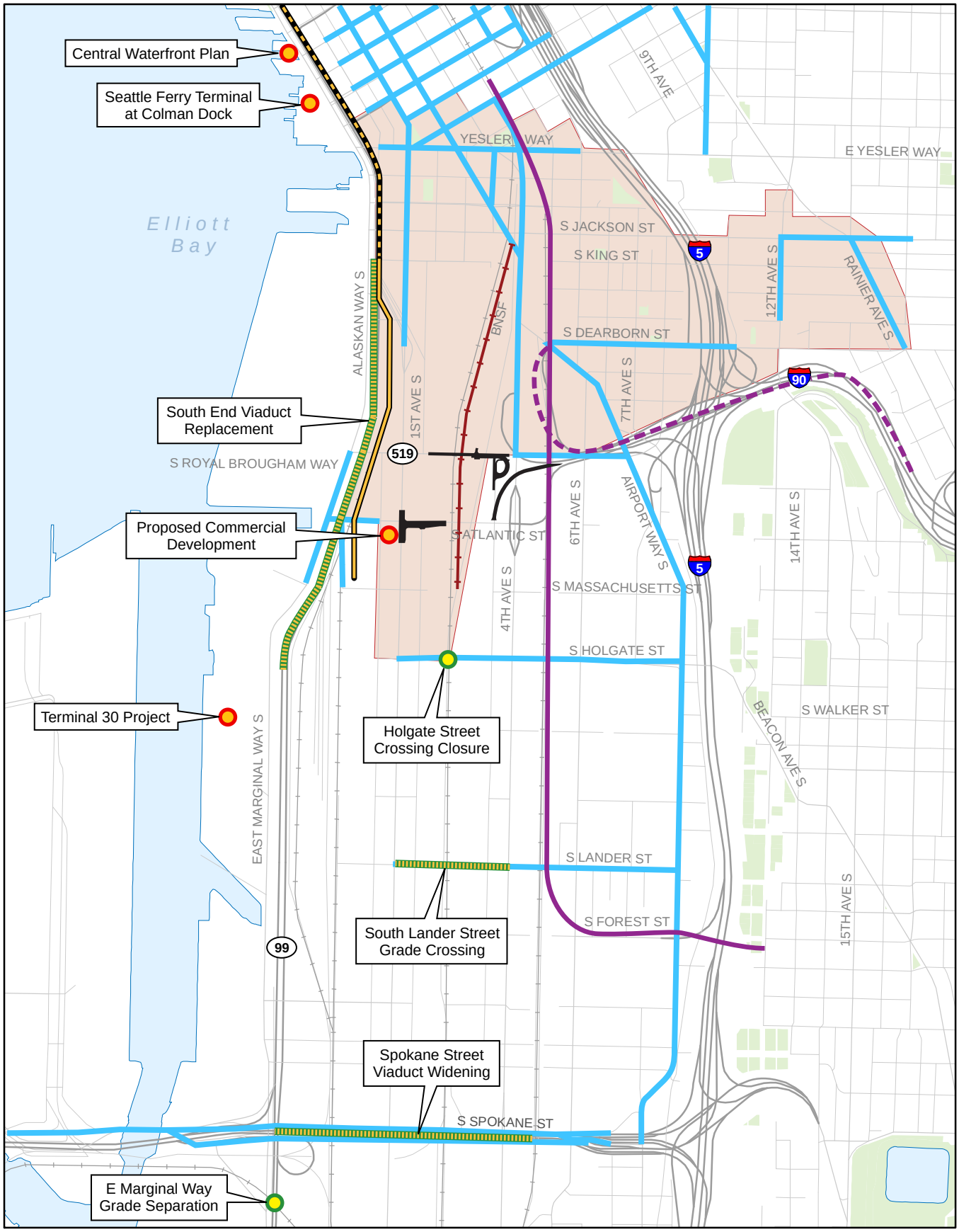
Cumulative Effects of the No Build Alternative

The cumulative effects on noise to which the No Build Alternative would contribute are minimal. The cumulative noise effect of the No Build Alternative would not cause an adverse effect because traffic noise levels are a small contributor to overall noise in the area.

Reasonably Foreseeable Future Actions

Exhibit 6-1 shows approximate locations of some of the larger reasonably foreseeable future actions (RFFAs) that could add to or interact with the Proposed Action to contribute to cumulative effects on air quality. Exhibit 6-2 briefly summarizes information about these projects. They include, but are not limited to:

- The South Holgate Street to South King Street Viaduct Replacement Project, and the two-phase Electrical Line Relocation Project, which are Moving Forward projects within the Alaskan Way Viaduct and Seawall Replacement Program
- The South Spokane Street Viaduct project
- Completion of BNSF Railway track improvements
- Sound Transit light rail projects
- Closure of the South Holgate Street rail crossing
- Conversion of the Port of Seattle's Terminal 30 to a container terminal
- The East Marginal Way Grade Separation Project
- The City of Seattle's Central Waterfront Plan
- The City of Seattle's Bridging the Gap paving projects
- Washington State Ferries Terminal Improvements at Colman Dock



Source: City of Seattle (2007) and King County (2006)

- Project
- Livable South Downtown Study Area (Approx.)
- BNSF Railway Completion
- Electrical Line Relocation Phase 1 and Phase 2
- Sound Transit Central Link
- Proposed Sound Transit East Link
- Bridging the Gap Paving Project
- Road Project
- Development Project

N

0 1,000 Feet

Exhibit 6-1
Reasonably Foreseeable Future Actions

SR 519 Intermodal Access Project - Phase 2
February 2008

EXHIBIT 6-2. REASONABLY FORESEEABLE FUTURE ACTIONS IN OR NEAR THE STUDY AREA

Project[a]	Location	Purpose	Proponent	Expected Construction Time Frame[b]
South Holgate Street to South King Street Viaduct Replacement Project	SR 99 from South Holgate Street to South King Street	Build new SR 99 between South Holgate Street and South King Street. Includes South Atlantic Street and South Royal Brougham Way grade separation, detour routes, and temporary connections	Washington State Department of Transportation	2009-2012
Electrical Line Relocation	Phase 1: South Massachusetts Street to South King Street Phase 2: South King Street to Union Street	Remove network distribution lines and transmission lines that are located under the existing Viaduct before it is demolished	Washington State Department of Transportation	Phase 1: Construction scheduled for 2008-2009. Phase 2: To be determined.
Completion of BNSF Railway Improvements	King Street Station to South Royal Brougham Way	Reduce rail transportation conflicts along the BNSF right-of-way; increase safety at the BNSF crossing of South Royal Brougham Way	BNSF Railway	Improvements at South Royal Brougham Way have been completed; with additional improvements along the BNSF right-of-way currently in progress.
Central Link Light Rail	Downtown Seattle to Sea-Tac Airport	Provide light rail service between downtown Seattle and Sea-Tac Airport	Sound Transit	2008-2009
East Link Light Rail	Downtown Seattle to Redmond	Provide light rail service between downtown Seattle, Mercer Island, Bellevue, and Redmond	Sound Transit	Construction not scheduled. Environmental impact statement scheduled for release in fall 2009.
Proposed Commercial Development	South side of South Atlantic Street between First Avenue South and Utah Avenue South	Provide office and retail uses	Gull Industries	2010-2012
Livable South Downtown Planning Study	The study examines growth and planning issues specific to Pioneer Square, the Chinatown/ International District (including the Little Saigon area east of I-5), and the northernmost edges of the Greater Duwamish Manufacturing and Industrial Center.	Stimulate housing and related development consistent with the Mayor's Center City Seattle strategy	City of Seattle, Department of Planning and Development	Environmental impact statement and legislative proposals in 2008

EXHIBIT 6-2. REASONABLY FORESEEABLE FUTURE ACTIONS IN OR NEAR THE STUDY AREA

Project[a]	Location	Purpose	Proponent	Expected Construction Time Frame[b]
Closure of South Holgate Street at BNSF Railway Crossing	South Holgate Street at the BNSF Railway crossing	Eliminate conflicts between rail and vehicle traffic.	City of Seattle, Department of Transportation	Construction not scheduled
South Lander Street Grade Separation	South Lander Street between First Avenue South and Fourth Avenue South	Improve safety and traffic flow by constructing a roadway bridge for vehicles, bicycles, and pedestrians over the BNSF Railway tracks.	City of Seattle, Department of Transportation	2009-2011
South Spokane Street Viaduct Widening	South Spokane Street from Sixth Avenue South to West Seattle Bridge	Improve traffic safety and upgrade the structural and seismic performance of the viaduct that connects I-5 to the West Seattle High Level Bridge. Construct a new eastbound loop ramp to Fourth Avenue South, to the south of South Spokane Street.	City of Seattle, Department of Transportation	Seismic retrofit, median barrier installation, and street-level utility relocations have been completed. Viaduct widening and ramp construction is scheduled to start in 2008 and would be constructed in phases as funds become available, so exact construction range not known.
Bridging the Gap Paving Projects	Seattle arterial streets	As part of a larger program, the paving projects will resurface, restore, or replace approximately 300 lane-miles of arterial streets; rehabilitate or replace 3-5 bridges and seismically retrofit 5 additional bridges; repair or restore approximately 144 blocks of existing sidewalks; build approximately 117 blocks of new sidewalks; rehabilitate approximately 50 stairways; and restripe about 5,000 crosswalks.	City of Seattle, Department of Transportation	2006-2013

EXHIBIT 6-2. REASONABLY FORESEEABLE FUTURE ACTIONS IN OR NEAR THE STUDY AREA

Project[a]	Location	Purpose	Proponent	Expected Construction Time Frame[b]
Central Waterfront Plan	South Atlantic Street to West Thomas Street along the shoreline edge of the Center City	Following replacement of the existing Alaskan Way Viaduct, construct new parks and open spaces, shoreline and habitat improvements, improved linkages to the downtown core, *and* transit connections, *and implement* land use and regulatory changes.	City of Seattle	Presently in planning process. Construction will begin with the removal of the viaduct and will be ongoing for several years.
Terminal 30 Conversion	East Marginal Way South between approximately South Holgate Street and South Lander Street	Terminal 30 had been used for cruise operations but will be converted back to its original use as a container terminal. This and the adjacent Terminal 25 will provide 70 acres for container use.	Port of Seattle	2007-2009
East Marginal Way Grade Separation Project	East Marginal Way South just south of South Spokane Street	Provide a north- and southbound grade separation on Duwamish Avenue South, relocating East Marginal Way through this corridor to improve access among Port of Seattle terminals, rail yards, and industrial warehouses.	Port of Seattle	2006-2008
Washington State Ferries Terminal Improvements at Colman Dock	Pier 54 at Seattle Waterfront on Alaskan Way South	Upgrade structures and facilities and increase capacity.	Washington State Department of Transportation	Construction not scheduled. For 2008-2009, focus will be on system-wide planning and coordination with nearby projects, including the proposed SR 519 Phase 2.

[a]Only major planned projects are listed. Many other projects that could be implemented in the reasonably foreseeable future are not shown.
[b]Dates are approximate.
Sources: General information from the WSDOT, City of Seattle, Port of Seattle, and Sound Transit websites**.**

Urban development is increasing in portions of the South Downtown area immediately north of the study area. This area, which includes Seattle's International District/Chinatown/Little Saigon neighborhood, is currently the subject of Livable South Downtown, a major planning effort by the City of Seattle's Department of Planning and Development. In November 2007, the City of Seattle released the *Draft EIS for Livable South Downtown Planning* (City of Seattle, 2007), a SEPA programmatic EIS which evaluates options for a comprehensive neighborhood plan for the South Downtown area.

The study examines growth and planning issues specific to Pioneer Square, the Chinatown/International District (including the Little Saigon area east of I-5), and the northernmost edges of the Greater Duwamish Manufacturing and Industrial Center. Preliminary recommendations were released by the City's Department of Planning and Development in March 2006. Land use and zoning changes considered as part of this process will require conducting an environmental review prior to legislative decision-making.

The project most likely to interact with the Proposed Action in the near future is the South Holgate Street to South King Street Viaduct Replacement Project, which will replace the south end of the Viaduct (Exhibit 6-1). That project, a Moving Forward project within the Alaskan Way Viaduct and Seawall Replacement Program, is scheduled for construction from 2009 to 2012, the same time frame as the Proposed Action, and it will be located immediately west of the proposed SR 519 improvements.

3 What cumulative noise effects did the project team identify?

From 2009 to 2012, construction-related noise from the South End Alaskan Way Viaduct Replacement Project would add to construction-related noise effects of the Proposed Action, because both projects would be under construction at the same time. A short-term cumulative effect of increased noise would result within the study area.

The long-term cumulative effects of noise to which the Proposed Action would contribute are minimal. The past, present, and reasonably foreseeable future actions previously discussed would contribute to a cumulative noise effect whether or not the Proposed Action were implemented, and by design year 2030, that noise would increase by up to 2 dBA in the study area. This expected change, however, would be too small to be perceptible to people (FHWA, 1995).

4 How would cumulative effects on noise be monitored, mitigated, and managed?

Cumulative effects are produced by the direct and indirect contributions of many different projects and activities managed by governmental agencies, businesses, and private citizens. For that reason, the Proposed Action would contribute only a small addition to the short-term and long-term cumulative effects described above. As explained in Chapter 5, construction-related noise would be mitigated over the short term, from 2009 through 2012, but long-term measures to mitigate operational noise would not be feasible. Results of the noise modeling conducted for this analysis suggest that the cumulative noise level by design year 2030 under the Proposed Action would be comparable to conditions under the No Build Alternative.

Chapter 7 References

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Appendix A
EDR Aerial Photo Decade Package

The EDR Aerial Photo Decade Package

SR-519
1250 1st Ave South
Seattle, WA 98134

Inquiry Number: 1874982.5

March 12, 2007

EDR® Environmental Data Resources Inc

The Standard in Environmental Risk Management Information

440 Wheelers Farms Road
Milford, Connecticut 06461

Nationwide Customer Service

Telephone: 1-800-352-0050
Fax: 1-800-231-6802
Internet: www.edrnet.com

EDR Aerial Photo Decade Package

Environmental Data Resources, Inc. (EDR) Aerial Photo Decade Package is a screening tool designed to assist environmental professionals in evaluating potential liability on a target property resulting from past activities. EDRs professional researchers provide digitally reproduced historical aerial photographs, and when available, provide one photo per decade.

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Please contact EDR at 1-800-352-0050
with any questions or comments.

Date EDR Searched Historical Sources:

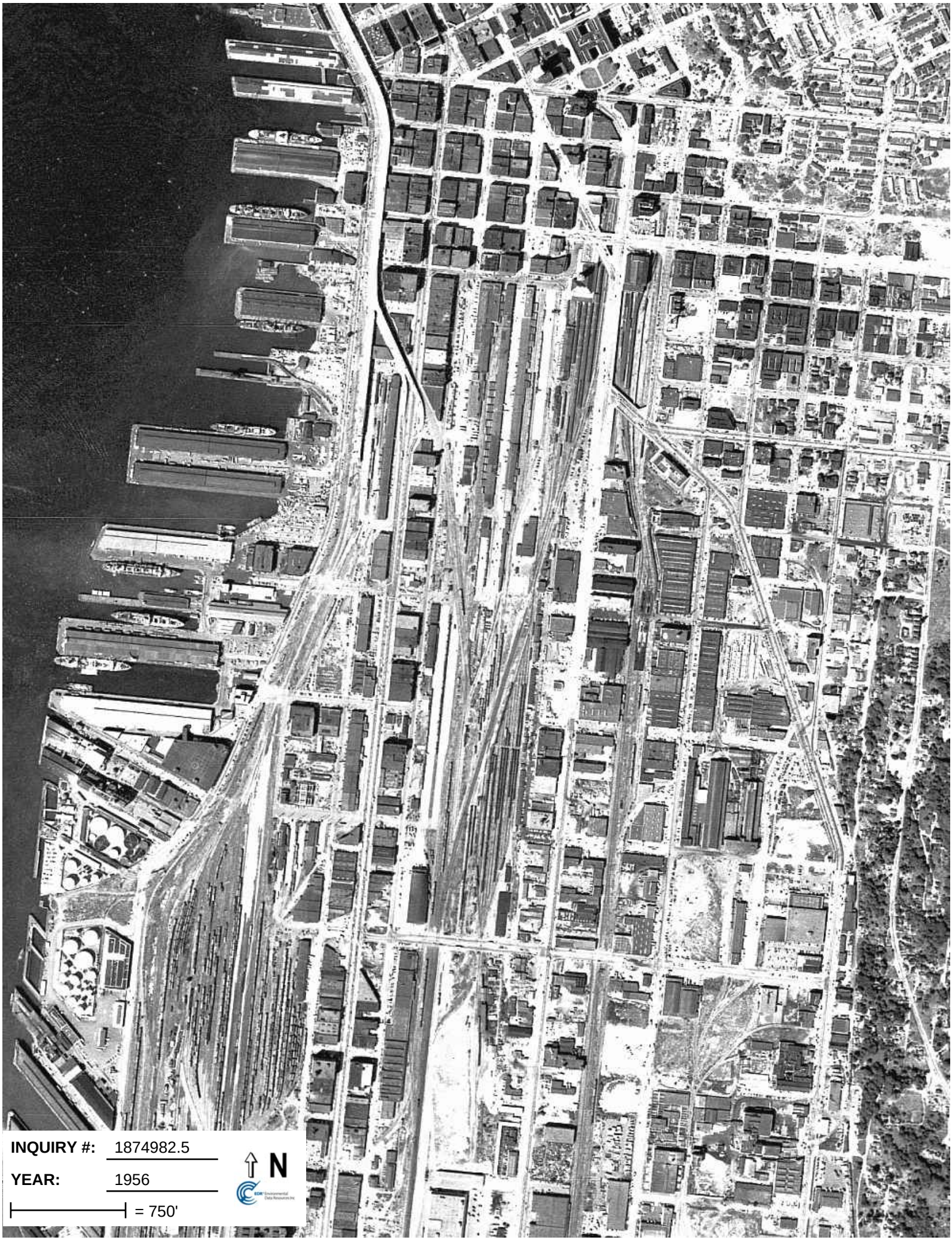
Aerial Photography March 12, 2007

Target Property:

1250 1st Ave South

Seattle, WA 98134

Year	***Scale***	***Details***	***Source***
1956	Aerial Photograph. Scale: 1"=750'	Panel #: 2447122-E3/Flight Date: August 07, 1956	EDR
1965	Aerial Photograph. Scale: 1"=750'	Panel #: 2447122-E3/Flight Date: June 30, 1965	EDR
1977	Aerial Photograph. Scale: 1"=750'	Panel #: 2447122-E3/Flight Date: September 05, 1977	EDR
1985	Aerial Photograph. Scale: 1"=750'	Panel #: 2447122-E3/Flight Date: June 19, 1985	EDR
1990	Aerial Photograph. Scale: 1"=833'	Panel #: 2447122-E3/Flight Date: July 10, 1990	EDR



INQUIRY #: 1874982.5

YEAR: 1956

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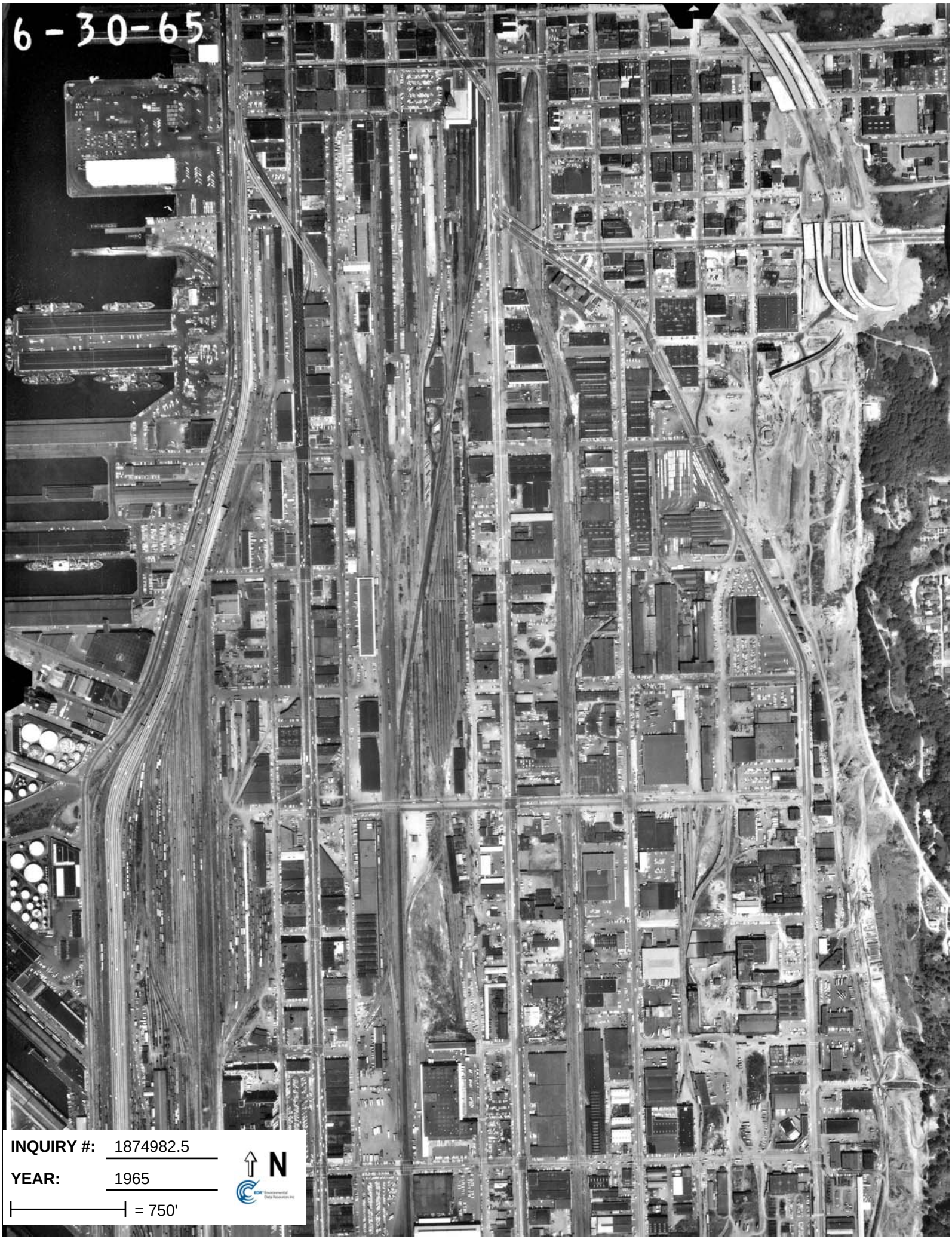
N



INQUIRY #: 1874982.5

YEAR: 1965

= 750'

N

INQUIRY #: 1874982.5

YEAR: 1977

= 750'

N


INQUIRY #: 1874982.5
YEAR: 1985
= 750'
N

INQUIRY #: 1874982.5

YEAR: 1990

= 833'

N

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1100 112 Ave NE
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Order Date: 3/9/2007 **Completion Date:** 3/12/2007
Inquiry #: 1874982.3S
P.O. #: 348513.AG.18.10
Site Name: SR-519
Address: 1250 1st Ave South
City/State: Seattle, WA 98134
Cross Streets:

Customer Project: SR-519
1122163BRU 425-453-5000

Based on client-supplied information, fire insurance maps for the following years were identified

1904 - 1 Map
1916 - 1 Map
1950 - 1 Map
1969 - 1 Map

Limited Permission to Photocopy Total Maps: 4

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- Sanborn Maps document historical property use by displaying property information through words, abbreviations, and map symbols. The Sanborn Map Key provides information to help interpret the symbols and abbreviations used on Sanborn Maps. The Key is available from EDR's Web Site at: http://www.edrnet.com/reports/samples/key.pdf

Organization of Electronic Sanborn Image File

- Sanborn Map Report, listing years of coverage
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- Oldest Sanborn Map Image
- Most recent Sanborn Map Image

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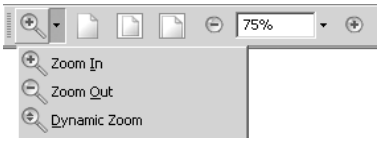

1. Open file on screen.
2. Identify TP (Target Property) on the most recent map.
3. Find TP on older printed images.
4. Using Acrobat® Reader®, zoom to 250% in order to view more clearly. (200-250% is the approximate equivalent scale of hardcopy Sanborn Maps.)
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   B. Or, use the magnifying tool and drag a box around the TP

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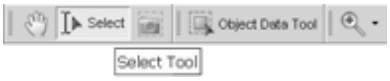
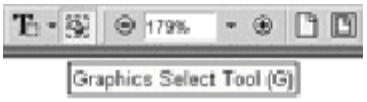
- To print only the TP area, cut and paste from Acrobat to your word processor application.

Acrobat Versions 6 and 7



1. Go to the menu bar
2. Click the "Select Tool"
3. Draw a box around the area selected
4. "Right click" on your mouse
5. Select "Copy Image to Clipboard"
6. Go to Word Processor such as Microsoft Word, paste and print.

Acrobat Version 5



1. Go to the menu bar
2. Click the "Graphics Select Tool"
3. Draw a box around the area selected
4. Go to "Menu"
5. Highlight "Edit"
6. Highlight "Copy"
7. Go to Word Processor such as Microsoft Word, paste and print.

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