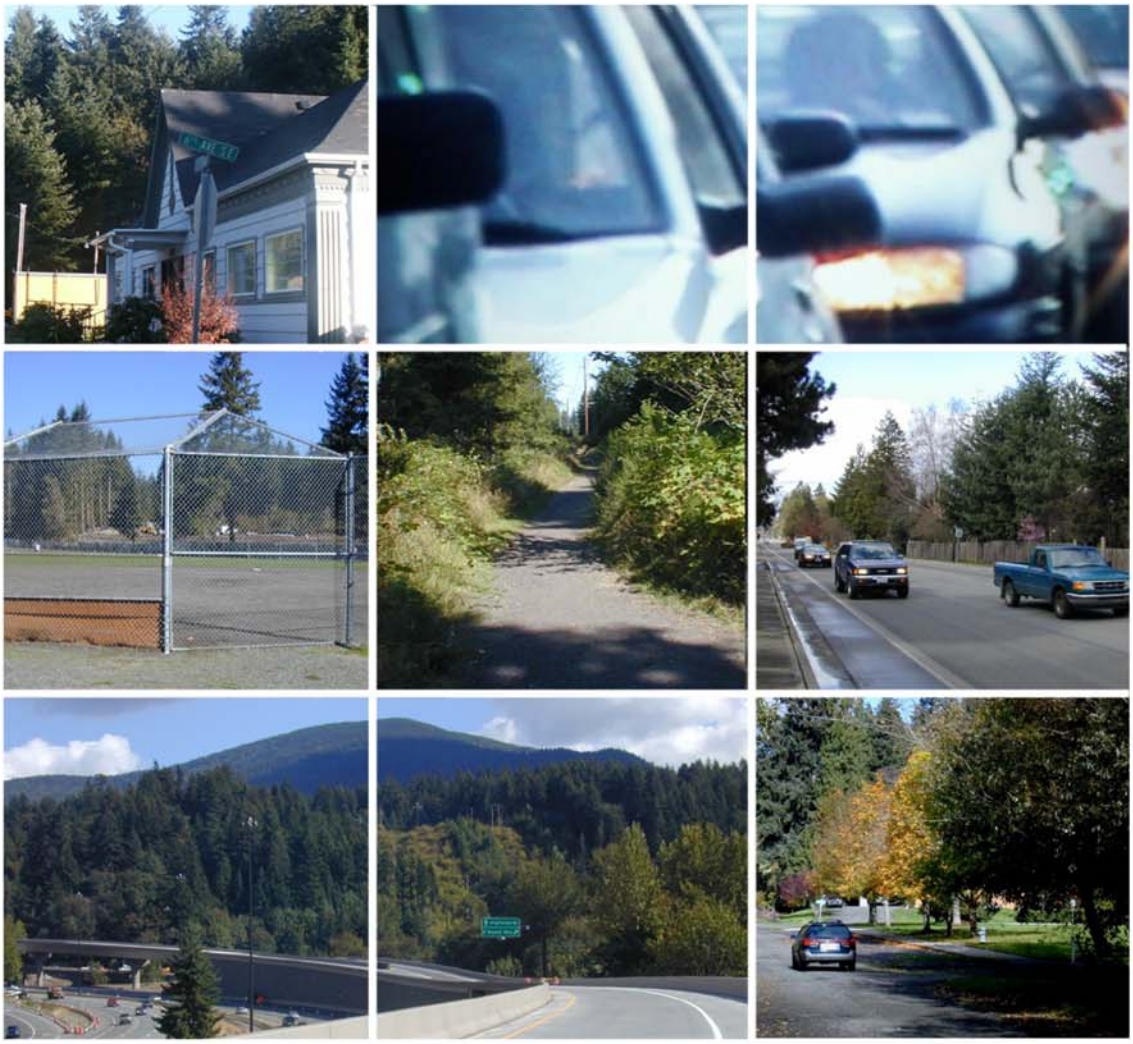
SOUTHEAST ISSAQUAH BYPASS

Draft Supplemental Environmental Impact Statement
and Section 4(f) Evaluation

June 2004

Technical Appendices



Washington State
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CITY OF ISSAQUAH

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June 2004

Volume 2: Technical Appendices

U.S. Department of Transportation
Federal Highway Administration

Washington State
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CITY OF ISSAQUAH

Appendices

Appendix D Initial Wetland Mitigation Plan

Appendix E Water Quality Supplemental Technical Analysis

Appendix F Transportation Technical Report

Appendix G Noise Technical Report

Appendix H Air Quality Technical Report

Southeast Issaquah Bypass
Draft Supplemental EIS

Appendix D

Initial Wetland Mitigation Plan

Southeast Issaquah Bypass
Draft Supplemental EIS

INITIAL WETLAND MITIGATION PLAN

Southeast Issaquah Bypass

Prepared for

Parsons Brinckerhoff Quade and Douglas, Inc.

October 2003

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INITIAL WETLAND MITIGATION PLAN

Southeast Issaquah Bypass

Prepared for

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and

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October 29, 2003

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Project Description

This initial wetland mitigation plan has been prepared for the proposed Southeast Issaquah Bypass in Issaquah, Washington. The City of Issaquah Public Works Engineering Department is the proponent of this project, which involves constructing a new roadway along the eastern edge of Issaquah from Interstate 90 (I-90) to Issaquah-Hobart Road. A total of six development alternatives and a no-action alternative were studied within the project area, which are described in the *Southeast Issaquah Bypass Draft Supplemental Environmental Impact Statement* (Parsons Brinckerhoff 2003). These alternatives were assembled from the combination of three proposed alignments in the northern half of the project area (North A, North B, and North C), and two proposed alignments in the southern half of the project area (South A and South C).

This initial wetland mitigation plan addresses the preferred alternative (North C/South C), and supports the associated permit applications that will be submitted to federal, state, and local agencies for their review of potential impacts from the proposed action. The outline and content of this mitigation plan is based on *Guidelines for Developing Freshwater Wetlands Mitigation Plans and Proposals* (Ecology 1994). Information on the project location, responsible parties, and a description of the proposed action is provided below.

Project Location

The project is located along the eastern edge of the City of Issaquah, in King County, Washington (Figure 1). The project area lies at the base of Tiger Mountain in Sections 3 and 35, Township 23 North, Range 6 East; and Section 27, Township 24 North, Range 6 East (USGS 1973). The proposed arterial roadway would extend approximately 2 kilometers (1.25 miles), from the I-90/E. Sunset Way interchange to Issaquah-Hobart Road. The project corridor extends south from I-90 along an abandoned railroad grade, passing along the eastern edge of Issaquah High School, and curving southwest to the intersection of Second Avenue NE and Front Street (Figure 2). The project area is surrounded by low- and high-density residential neighborhoods, and commercial and industrial development. Construction would occur within Issaquah, except for a small area within unincorporated King County near the Issaquah Sportsmen's Clubhouse in the north project area, and a small area south of SE 96th Street near the southern limits of the project area.

Figure 3 illustrates the topography and surface water features in the Southeast Issaquah Bypass project area, which includes Issaquah Creek, the East Fork of Issaquah Creek, and two unnamed tributaries (identified as north tributary and south tributary) to Issaquah Creek.

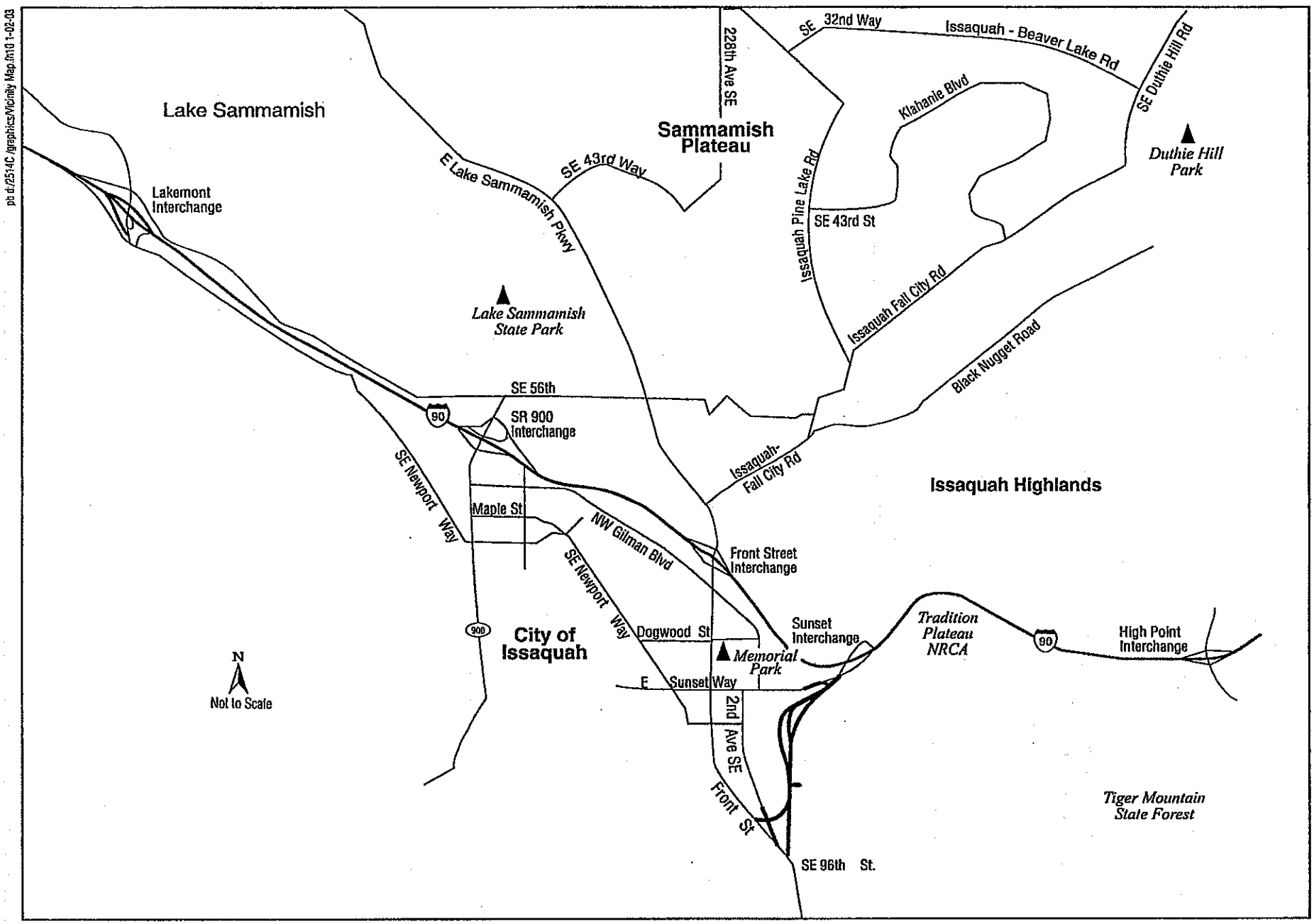

Figure 1
Vicinity Map of SE Issaquah Bypass Project Site in Issaquah, WA

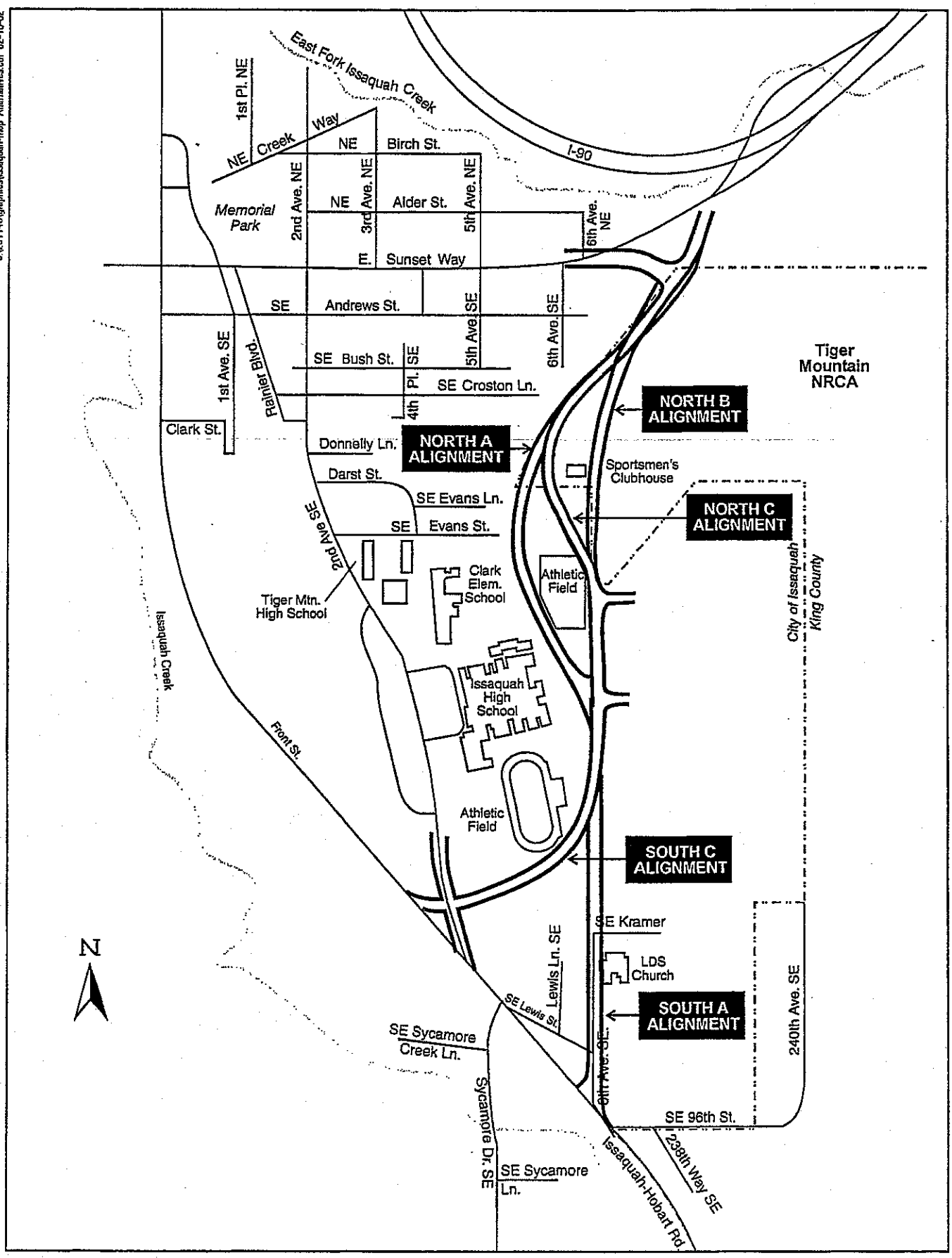

Figure 2
Location of the Southeast Issaquah Bypass Project Site in Issaquah, WA

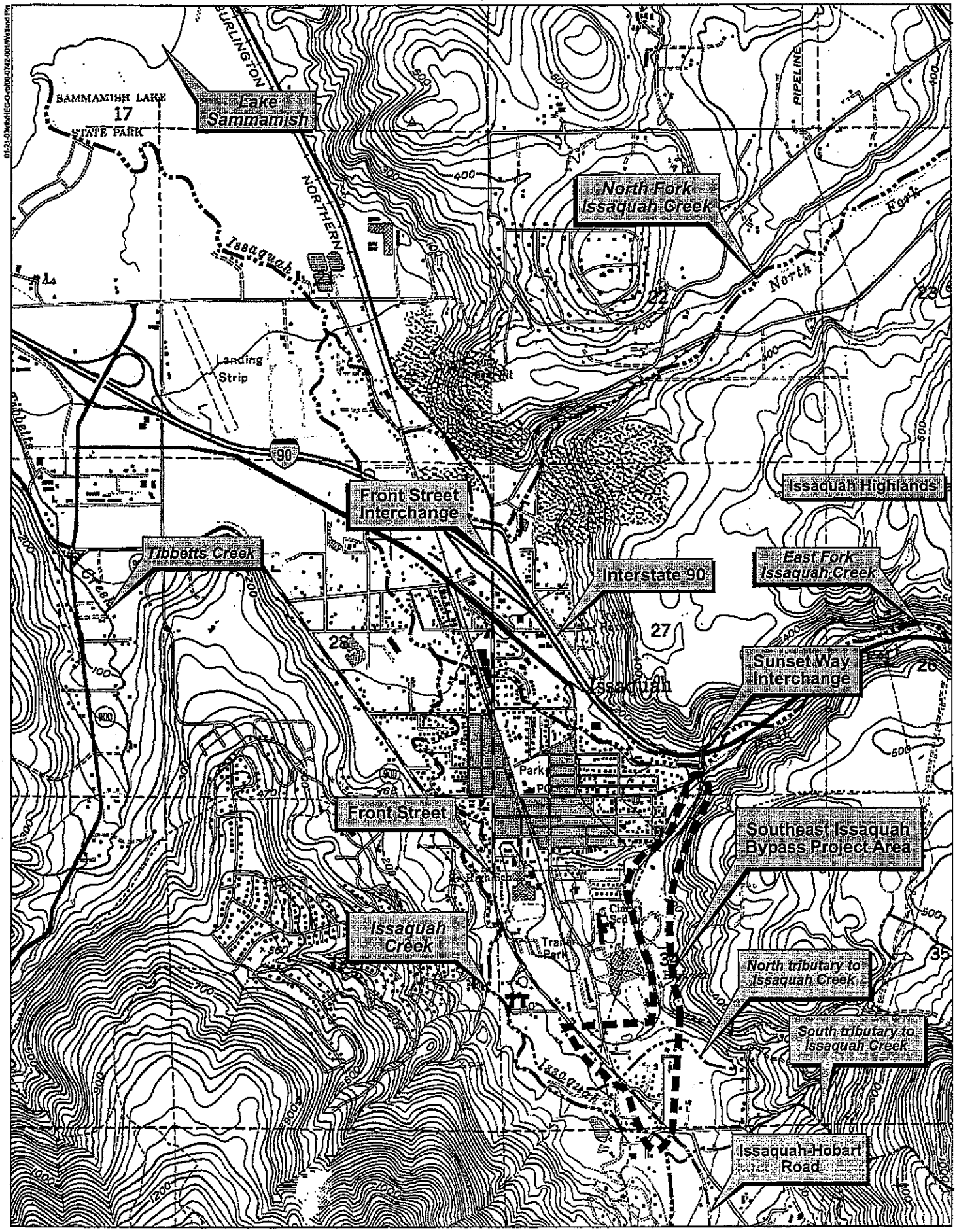

Figure 3. Surface Water Features in the Southeast Issaquah Bypass Project Area.

Responsible Parties

The City of Issaquah Public Works Engineering Department is the applicant and lead agency for this proposed project. This mitigation plan was prepared by Herrera Environmental Consultants, Inc. (Herrera) as a subconsultant to Parsons Brinckerhoff Quade and Douglas, Inc.

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Description of Proposed Action

The preferred alternative (North C/South C alignment) would provide a bypass to Front Street through downtown Issaquah to reduce congestion on local streets by providing an alternative route around the downtown business district. This alignment would generally follow an existing railroad grade along the southern portion of the route (South C) and terminate at a new four-way intersection at Front Street and Second Avenue SE. The proposed roadway includes multiple lanes for through travel, turn lane channelization, bicycle lanes, curbs, gutters, sidewalks, stormwater conveyance, stormwater detention, retaining walls, bridges, landscaping, signage, illumination, and signalization. Improvements to existing roads would also occur where the proposed arterial intersects them.

Wetland Delineation of the Impact Area

Wetland delineations were performed by Herrera biologists within the Southeast Issaquah Bypass project area. A summary of these delineation results and the wetlands affected by the project is provided below.

Wetland Delineation of the Southeast Issaquah Bypass Project Area

Based on a review of existing literature sources and investigations of the project area, a total of four wetland areas (identified as Wetlands HS, GW, VL, and RD) were delineated according to the routine method described in the *Corps of Engineers Wetlands Delineation Manual* (Environmental Laboratory 1987). These four wetlands, located in the southern portion of the project area, are described in the *Jurisdictional Wetland Delineation Technical Report* (Herrera

1998a). Figure 4 illustrates the location of these four wetlands in the Southeast Issaquah Bypass project. These four wetlands range in size from 0.2 hectares (0.6 acres) to 10.4 hectares (26 acres) and are dominated by forested vegetation, with some wetlands containing scrub/shrub and emergent components. Table 1 summarizes the characteristics of the four delineated wetlands. Table 2 provides numeric scores for each category in the wetland function assessment.

Wetland Impacts in the Southeast Issaquah Bypass Project Area

Proposed construction of the Southeast Issaquah Bypass may result in both temporary and permanent impacts on Wetlands HS and GW and their buffers. Permanent wetland impacts on Wetland HS are attributable to placement of fill, shading, and disturbance/loss of vegetation. Long-term indirect wetland impacts include changes in stormwater runoff characteristics, loss of ground water recharge areas, and colonization by invasive species. Temporary construction impacts and permanent loss of habitat will also occur in the buffers surrounding Wetlands HS and GW. A detailed description of these impacts is presented below and illustrated in Figure 5. Table 3 summarizes these impacts for Wetlands HS and GW.

Temporary Construction Impacts

Proposed construction of the Southeast Issaquah Bypass may result in temporary impacts on Wetlands HS and GW from clearing of vegetation, minor grading, the potential for accidental spills of toxic materials, and staging of equipment. However, best management practices will be implemented to avoid or minimize any construction impacts.

Direct Wetland Impacts

No wetland impacts would be associated with the North B alignment. Direct impacts on wetlands from the South C alignment would result from filling Wetland HS during construction of the roadway. The South C alignment would require filling 0.06 hectares (0.16 acres) along the south edge of Wetland HS. Retaining walls will be used to minimize the wetland filling and the culvert draining this wetland will be replaced to lessen water table fluctuations.

Indirect Wetland Impacts

Replacement of the culvert underneath the railroad grade and construction of two stormwater ponds (South Pond 2 and North Pond 2) may change the hydrology in Wetland HS. These two stormwater ponds are designed to overflow into Wetland HS during large storm events and may increase the volume of water that passes through the wetland. Currently, the water level in Wetland HS is controlled by a culvert underneath the railroad grade that is partially clogged. This culvert will be replaced, and the inlet will be reconfigured to reduce clogging. The new culvert should reduce water level fluctuation and help promote increased plant diversity in the wetland. Water level fluctuations have been shown to reduce plant diversity and favor more tolerant species, such as cattails.

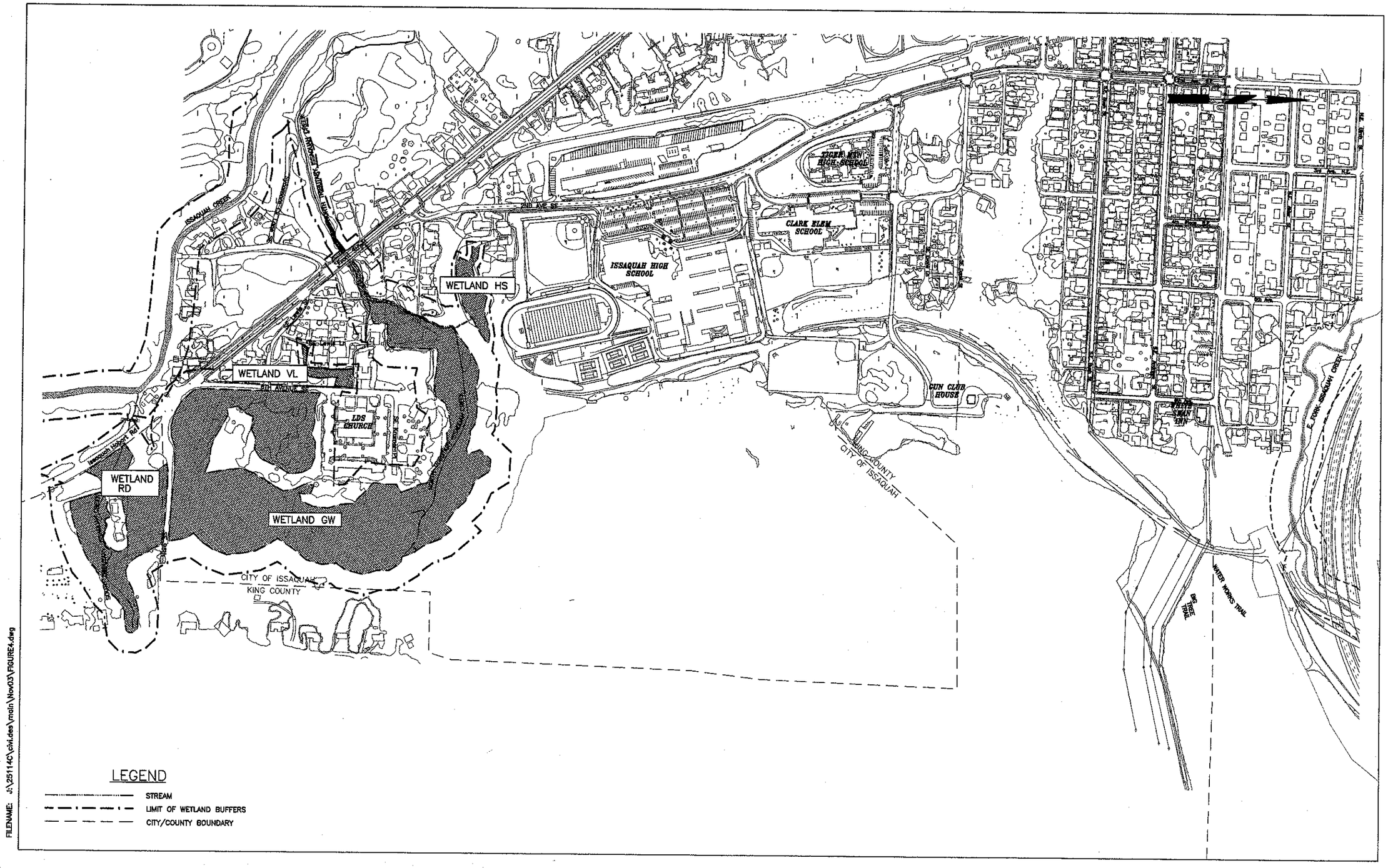

FIGURE 4. Locations of Wetlands and Streams Within the Southeast Issaquah Project Area

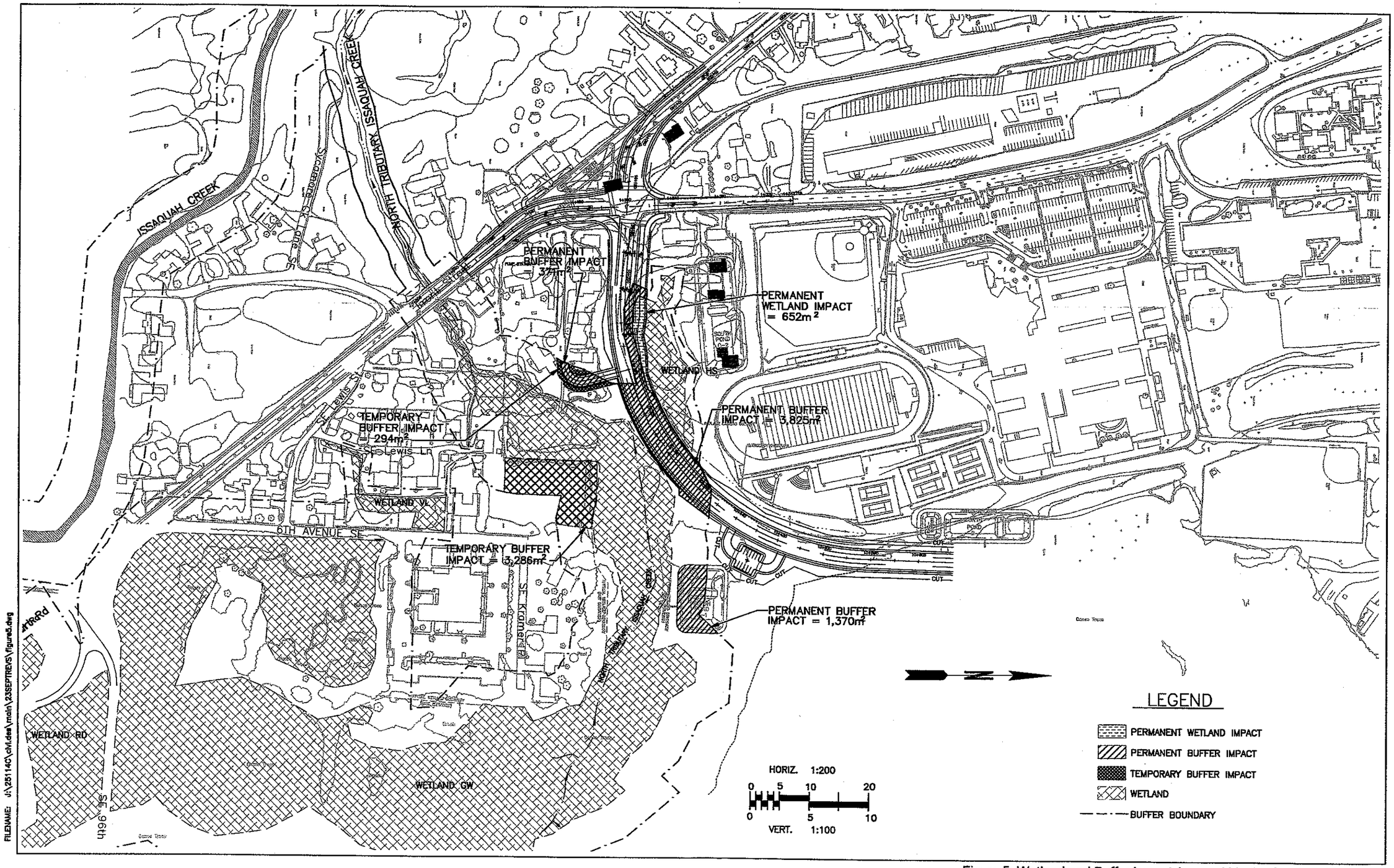

Figure 5: Wetland and Buffer Impact Areas within the South C Alignment

Table 1. Summary of wetlands observed in the Southeast Issaquah Bypass project area.

Wetland Label	Location	Approximate Size	NRCS Soil Type [a]	Wetland Function Rating [b]	USFWS Classification [c]	City of Issaquah Classification	Department of Ecology Category	Buffer Width (feet)
HS	North of abandoned railroad grade and south of Issaquah High School	0.4 hectares (1.0 acres)	Everett gravelly sandy loam	M	PFO, seasonally flooded	2	II	50
GW	East of Sixth Avenue S. and north of SE 96th Street	10.4 hectares (26 acres)	Oridia silt loam	H	PFO, permanently flooded	1	II	100
VL	West of Sixth Avenue S. and east of Lewis Lane SE	0.2 hectares (0.6 acres)	Everett gravelly sandy loam	L	PFO, seasonally flooded	2	III	50
RD	South of SE 96th Street and east of Issaquah-Hobart Road	0.3 hectares (0.8 acres)	Pilchuck loamy fine sand	M	PFO, seasonally flooded	1	II	100

[a] King County soil types are based on USDA (1973) classification.
[b] Function rating: high (H), moderate (M), and low (L).
[c] USFWS classification of wetlands in the project area includes the palustrine forested (PFO) wetland type (USFWS 1989).

Table 2. Wetland and buffer function assessment for four wetlands observed in the Southeast Issaquah Bypass project area.

	Flood and Stormwater Control (max. 15)		Baseflow and Ground Water Support (max. 15)		Erosion and Shoreline Protection (max. 9)		Water Quality Improvement (max. 12)		Natural Biological Support (max. 36)		Overall Habitat Functions (max. 9)		Specific Habitat Functions (max. 15)		Cultural and Socioeconomic Values (max. 21)	
Wetland	Points	Rating	Points	Rating	Points	Rating	Points	Rating	Points	Rating	Points	Rating	Points	Rating	Points	Rating
HS	8	M	7	L	6	M	8	M	20	M	5	M	7	L	10	L
GW	10	M	11	M	8	H	9	H	29	H	8	H	10	M	14	M
VL	6	L	8	M	4	L	8	M	15	L	4	L	7	L	8	L
RD	6	L	8	M	8	H	7	M	21	M	5	M	7	L	9	L

Rating: high (H), moderate (M), and low (L).

Buffer Impacts

Temporary buffer impacts in two locations in Wetland GW will occur during construction from clearing vegetation, and minor grading to create an access road and stormwater South Pond C-1. Approximately 0.36 hectares (0.89 acres) of the wetland buffer would be disturbed during construction. However, these areas will be restored after completion of construction by returning the ground to its original grade and replanting with native species.

The South C alignment and its associated stormwater ponds would encroach on buffers surrounding Wetlands HS and GW. A total of 0.56 hectares (1.39 acres) of permanent buffer impacts would occur in three locations where vegetated buffers would be affected to create the roadway and stormwater South Pond C-1. These permanent buffer impacts involve conversion of vegetated buffers around Wetland HS (1,247 m^2) and Wetland GW (3,525 m^2) to create paved roads, an area around Wetland GW for an access road (371 m^2), an area around Wetland GW for the stormwater South Pond C-1 (1,370 m^2), and an area around Wetland HS for the stormwater South Pond C-2 (54 m^2). Of these impacts, the most significant would be the permanent conversion of a vegetated buffer to a paved roadway.

Table 3. Summary of wetland impacts for the Southeast Issaquah Bypass project.

Wetland Name	Permanent Wetland Impacts		Temporary Buffer Impacts		Permanent Buffer Impacts	
	Hectares	Acres	Hectares	Acres	Hectares	Acres
HS	0.06	0.16	–	–	–	–
GW	–	–	0.36	0.89	0.56	1.39
Total	0.06	0.16	0.36	0.89	0.56	1.39

Ecological Assessment of the Impact Area

Descriptions of Wetlands HS and GW, which will be affected by the Southeast Issaquah Bypass project, are presented below and include information on existing vegetation, soils, hydrology, wetland functions, and wetland classification. This section also includes a description of water quality conditions, the position of the wetlands in the overall landscape, and the fish and wildlife resources present in the project vicinity. Table 4 lists the plant species identified in wetlands within the project area. This table lists the plant species within each vegetation layer according to their common and scientific names and wetland indicator status.

Wetland Descriptions

Wetland HS

This 0.4-hectare (0.9-acre) wetland is located north of the abandoned railroad grade, south of Issaquah High School, and east of Second Avenue SE. This forested wetland occurs in a depression confined by steep slopes formed by the abandoned railroad grade to the south. This wetland is hydrologically connected to the north tributary to Issaquah Creek by a culvert underneath the abandoned railroad grade.

Vegetation

This forested wetland has moderate species diversity and is intermixed with upland plants growing on hummocks within the wetland area. Scattered clumps of trees in Wetland HS include red alder (*Alnus rubra*), western red cedar (*Thuja plicata*), and black cottonwood (*Populus balsamifera*). The shrub understory is dominated by salmonberry (*Rubus spectabilis*), hardhack (*Spiraea douglasii*), and saplings of red alder and western red cedar. Dominant herbaceous species include reed canarygrass (*Phalaris arundinacea*), lady fern (*Athyrium filix-femina*), slough sedge (*Carex obnupta*), and soft rush (*Juncus effusus*). Typical upland species growing on hummocks within the wetland include Himalayan blackberry (*Rubus armeniacus*), evergreen blackberry (*Rubus laciniatus*), salal (*Gaultheria shallon*), red huckleberry (*Vaccinium parvifolium*), trailing blackberry (*Rubus ursinus*), and sword fern (*Polystichum munitum*).

Soils

One soil pit (SP-1) was examined to the 16-inch depth during the delineation of Wetland HS, and it exhibited hydric conditions (2.5Y 4/2 silt with mottles). Soil characteristics in the test pit are not consistent with the Everett gravelly sandy loam description for this area (USDA 1973).

Table 4. List of plant species observed in the Southeast Issaquah Bypass project area in Issaquah, Washington.

Stratum	Scientific Name	Common Name	WIS[a]
Tree	*Acer macrophyllum*	Big-leaf maple	FACU
	Alnus rubra	Red alder	FAC
	Populus balsamifera	Black cottonwood	FAC
	Pseudotsuga menziesii	Douglas fir	FACU
	Salix lasiandra	Pacific willow	FACW+
	Thuja plicata	Western red cedar	FAC
	Tsuga heterophylla	Western hemlock	FACU-
Shrub	*Acer circinatum*	Vine maple	FAC-
	Berberis aquifolium	Tall Oregon grape	UPL
	Clematis ligusticifolia	Western clematis	FAC-
	Cornus stolonifera	Red-osier dogwood	FACW
	Crataegus monogyna	Hawthorn	FACU+
	Cytisus scoparius	Scots broom	UPL
	Gaultheria shallon	Salal	FACU
	Ilex aquifolium	English holly	UPL
	Oplopanax horridus	Devil's club	FAC+
	Rubus discolor	Himalayan blackberry	FACU
	Rubus laciniatus	Evergreen blackberry	FACU+
	Rubus spectabilis	Salmonberry	FAC+
	Rubus ursinus	Pacific dewberry	FACU
	Salix lasiandra	Pacific willow sapling	FACW+
	Salix sitchensis	Sitka willow	FACW
	Sambucus racemosa	Red elderberry	FACU
	Spiraea douglasii	Hardhack	FACW
	Symphoricarpos albus	Snowberry	FACU
	Vaccinium parvifolium	Red huckleberry	UPL
Herb	*Agrostis* sp.	Bentgrass	FAC
	Athyrium filix-femina	Lady fern	FAC
	Blechnum spicant	Deer fern	FAC+
	Carex obnupta	Slough sedge	OBL
	Convolvulus arvensis	Morning glory	UPL
	Dicentra formosa	Bleeding heart	FACU
	Epilobium ciliatum ssp. *watsonii*	Watson's willowherb	FACW
	Equisetum arvense	Field horsetail	FAC
	Festuca arundinacea	Tall fescue	FAC-
	Geum macrophyllum	Large-leaved avens	FACW-
	Geranium robertianum	Herb Robert	UPL
	Hedera helix	English ivy	UPL
	Holcus lanatus	Common velvetgrass	FAC
	Juncus effusus	Soft rush	FACW
	Lysichiton americanum	Skunk cabbage	OBL
	Phalaris arundinacea	Reed canarygrass	FACW
	Plantago lanceolata	English plantain	FAC
	Poa sp.	Bluegrass	FAC - FACU
	Polystichum munitum	Sword fern	FACU
	Pteridium aquilinum	Bracken fern	FACU
	Ranunculus repens	Creeping buttercup	FACW
	Scirpus microcarpus	Small-fruited bulrush	OBL
	Solanum dulcamara	Bittersweet nightshade	FAC+
	Tolmiea menziesii	Piggy-back plant	FAC
	Typha latifolia	Common cattail	OBL

[a] WIS: Wetland indicator status as defined by U.S. Army Corps of Engineers (Environmental Laboratory 1987).

Hydrology

Wetland hydrology is indicated by topographic breaks, standing water, and drainage patterns. The wetland is in a depression that collects surface water runoff from the surrounding area and from several culverts draining the Issaquah High School athletic fields. This wetland has an outlet through a culvert that passes underneath the abandoned railroad grade and empties into the north tributary to Issaquah Creek.

Wetland Functions

The stormwater control function of Wetland HS is rated low to moderate based on the size of the depression, its constrained outlet, and its location in the lower portion of the drainage basin. Because this small depression is occasionally flooded, the ground water support function is rated low to moderate. The erosion protection function is rated moderate based on the width and vegetative density of the wetland that extends past the open water area. Because of the amount of vegetation cover, retention of overland runoff, and position of the wetland downstream of residential development, water quality improvement functions in Wetland HS are rated moderate. The biological support function is rated low to moderate based on moderate plant diversity, amount of primary productivity and organic accumulation, and condition of the upland buffers. Although it is located near a school and open space, this wetland lacks historic and recreational values. Therefore, cultural and socioeconomic values are rated low to moderate.

Wetland Classification

Wetland HS is classified by the Cowardin (1979) system as a palustrine, forested, broad-leaved deciduous wetland, with subclasses of scrub/shrub and emergent vegetation, that is seasonally flooded. Based on the Washington Department of Ecology (1993) classification system, this wetland is rated Category II with a recommended buffer width of 30 to 60 meters (100 to 200 feet). Using the City of Issaquah (1995) rating system, this wetland is a Class 2 and requires a 50-foot buffer.

Wetland GW

This approximately 10-hectare (26-acre) forested wetland is located south of the abandoned railroad grade, north of SE 96th Street, and between Front Street on the west and the toe of a steep slope to the east. This wetland receives most of its water from ground water seeps discharging from the toe of a steep slope along its eastern border, between an elevation of 43 to 45 meters (143 to 151 feet). Precipitation that falls within the wetland is also stored for an extended time. The water that accumulates in the various portions of the wetland system exhibits several flow patterns, as discussed below in the Hydrology section.

Vegetation

There are at least four different plant communities in this wetland, including a mature mixed forest, a scrub/shrub-dominated area, clearings dominated by emergent species, and transitional areas along the boundary of the wetland that have a mixture of hydrophytic and upland species.

The mature mixed forest is found along the east and south edges of the wetland and is dominated by red alder, western red cedar, and black cottonwood trees. This plant community is relatively undisturbed and contains an understory of salmonberry, hardhack, vine maple (*Acer circinatum*), devil's club (*Oplopanax horridus*), reed canarygrass, small-fruited bulrush (*Scirpus microcarpus*), and skunk cabbage (*Lysichiton americanum*).

The scrub/shrub plant community is located along the northern edge of the wetland and is associated with the north tributary to Issaquah Creek. The dominant vegetation in this area includes red alder, Pacific willow (*Salix lasiandra*), Sitka willow (*Salix sitchensis*), red-osier dogwood (*Cornus stolonifera*), salmonberry, hardhack, reed canarygrass, and skunk cabbage.

Emergent vegetation dominates several clearings located along the west central portion of Wetland GW. These emergent species include reed canarygrass, slough sedge, soft rush, common cattails (*Typha latifolia*), and creeping buttercup (*Ranunculus repens*). It appears that these clearings were disturbed in the past, and emergent species are recolonizing the area as the initial stage of succession.

The fourth plant community consists of a mixture of upland and hydrophytic species forming a transitional zone along the west and southwest portion of the wetland. It appears that past clearing activities have favored colonizing plants such as red alder, Himalayan blackberry, evergreen blackberry, and reed canarygrass. Within this transitional zone, there is a slight topographic gradient that changes the depth-to-soil saturation and the subsequent formation of hydric soils.

Soils

Three soil pits (SP-2, SP-3, and SP-4) were examined to the 16-inch depth during the delineation of Wetland GW. SP-2, located in the scrub/shrub plant community along the banks of the north tributary to Issaquah Creek, exhibits hydric conditions (10YR 4/1 silty sand with mottles). SP-3, located in the mature mixed forest near the ground water seeps that supply hydrology to this wetland, exhibits hydric conditions (10YR 3/1 gravelly silt). SP-4, located in a clearing dominated by emergent species, also exhibits hydric conditions (10YR 2/1 silt and peat/organic). Soil characteristics in all three test pits are consistent with the Oridia silt loam soil series mapped for this area.

Hydrology

The main source of water to this wetland is ground water seeps that discharge at the toe of a steep slope along the eastern edge. This ground water discharge, occurring at an elevation of approximately 44 meters (147 feet) along the base of this steep slope, appears to have a constant year-round flow rate. These ground water seeps form braided rivulets as they flow west from their source into Wetland GW. This water then splits into two main drainage features separated by the Church of Jesus Christ of Latter-Day Saints complex. These two drainage features (northern and southern) are described below.

The northern drainage feature originates from ground water seeps at the northeast corner of Wetland GW. This discharge sheet flows a short distance from its source, then flows in a defined channel that becomes the north tributary to Issaquah Creek. This stream channel flows west paralleling the abandoned railroad grade, then flows southwest past Nyberg Lane and into a pond adjacent to Front Street. Outflows from this pond discharge via a large culvert beneath Front Street and into Issaquah Creek. According to a homeowner (Mr. Nyberg) on Nyberg Lane, the unnamed stream flows year-round.

The southern drainage feature flows from ground water seeps at the toe of slope toward the southwest corner of Wetland GW. Standing water is present throughout the southwest portion of the wetland, where it is interrupted by higher ground of the paved roadways for SE 96th Street and Sixth Avenue SE. Occasionally during the winter season, this water sheet flows across Sixth Avenue SE and floods residential homes around SE Lewis Street. This stormwater drainage has recently been altered as part of the Front Street road improvement project. This drainage is now intercepted by a ditch paralleling the east shoulder of Sixth Avenue SE and flows south toward the intersection with SE 96th Street, where it is culverted underneath Front Street to Issaquah Creek.

Wetland Functions

The stormwater control function of Wetland GW is rated moderate based on the size of this forested wetland, its constrained outlet, and its location in the upper portion of the drainage basin. Because this large headwaters wetland is occasionally flooded, the ground water support function is rated moderate to high. Erosion and shoreline protection functions are rated high based on the width and vegetative density of the wetland above the open water area. Because this wetland has high vegetation density and it retains overland runoff from a partially developed basin, the water quality improvement function is rated moderate to high. The biological support function of Wetland GW is rated moderate to high, because this large wetland has four habitat types, moderate plant diversity, moderate organic accumulation from primary production, and is well connected to upland buffers. Cultural and socioeconomic values are rated moderate based on the potential educational, historic, and recreational value of this privately owned property.

Wetland Classification

According to the U.S. Fish and Wildlife Service system (Cowardin et al. 1979), the classification of Wetland GW is palustrine forested, broad-leaved deciduous, with components of scrub/shrub and emergent vegetation, and is permanently flooded. Based on the Ecology (1993) classification system, this wetland is rated Category II with a recommended buffer width of 30 to 60 meters (100 to 200 feet). Using the City of Issaquah (1995) rating system, this wetland is Class 1 and requires a 100-foot buffer.

Water Quality

In order to protect fish and wildlife resources, Ecology has established numerical standards for specific water quality parameters. Under the Washington Administrative Code, all of the water

bodies in the project area are designated as Class A waters (excellent water quality) based on physical and chemical characteristics (WAC 1992). This includes Issaquah Creek, the East Fork of Issaquah Creek, and the two tributaries to Issaquah Creek (north tributary and south tributary) in the project area.

Position of Wetlands in the Landscape

The two wetlands located within the project area are situated in the Issaquah Creek watershed in an urbanized area with a variety of land uses. Based on the hydrogeomorphic classification system, Wetland GW is a slope wetland that provides hydrologic support to Issaquah Creek; Wetland HS is a depressional flow-through wetland that supports the north tributary to Issaquah Creek (Brinson 1993).

Existing Fish and Wildlife

The following discussion of existing fish and wildlife resources within the project area includes information on threatened and endangered species (according to federal and state agencies) and resident and seasonal fish distribution in Issaquah Creek. Additional information on streams and fish habitat in the project area is presented in the *Streams and Fisheries Technical Report* (Herrera 1998b).

A biological assessment was conducted by Herrera (1999) to determine if the proposed Southeast Issaquah Bypass site would affect any fish species that are listed, proposed, or candidates for listing according to the Endangered Species Act of 1973. The project area lies within the evolutionarily significant unit (ESU) for chinook salmon (*Oncorhynchus tshawytscha*), a threatened species; coho salmon (*O. kisutch*), a candidate for listing as threatened; and bull trout (*Salvelinus confluentus*), a threatened species. The determination of effect for these species is that project construction and use "may affect, unlikely to adversely affect chinook salmon and bull trout" and "will not jeopardize the continued existence of coho salmon" (Herrera 1999).

Mitigation Approach

Mitigation Sequencing

Recommended mitigation measures are based on a hierarchy of avoiding impacts through careful design, minimizing impacts through best management practices (BMPs), and compensating for unavoidable adverse impacts (Ecology 1994).

Impact Avoidance

Efforts to avoid direct impacts on wetlands and buffers within the Southeast Issaquah Bypass project area have involved modifying the alignment and design features of the roadway. The proposed design of the South C alignment has been modified to avoid filling wetlands and the north tributary of Issaquah Creek. In order to avoid impacts on Wetlands HS and GW, retaining walls will be installed instead of fill slopes. Stormwater management facilities have also been designed and sited to avoid wetland areas, although they will be located in buffers. Stormwater conveyance facilities for the new roadway have been designed to improve existing wetland hydrologic characteristics. As with road construction in general, a public agency and utility exception, and/or conditional use permit and variance will be needed to allow construction in the wetland buffer area.

Impact Minimization

Efforts to minimize impacts on Wetlands HS and GW and the north tributary to Issaquah Creek involve implementing the following BMPs:

- Prior to construction, the limits of clearing and boundaries of wetlands will be clearly marked in the field.
- Prior to any excavation work, erosion control devices (silt fencing, straw bales, filter bags) will be placed to minimize transport of sediment into wetlands and streams. Temporary erosion and sedimentation control measures will be implemented to control stormwater runoff from the construction site.
- All equipment or vehicle washwater associated with construction will be contained to prevent runoff into adjacent wetlands.
- All refueling operations will be conducted off-site and away from the wetlands and Issaquah Creek. A pollution prevention plan will be prepared that addresses the prevention and cleanup of accidental spills.

- All exposed soils will be stabilized with straw mulch or hydroseeding.
- All cleared areas will be revegetated with native species that provide good wildlife habitat.
- All stockpiles of soil will be covered with impervious material when left unattended or during rain events.
- Construction access roads from the site will have a gravel pad that limits movement of sediment from vehicle tires onto paved roadways.
- Water samples from the north tributary to Issaquah Creek will be collected to monitor turbidity during construction. Any discharge or dewatering must comply with the National Pollution Discharge Elimination System (NPDES) permit and Washington Department of Ecology water quality regulations.

Compensatory Mitigation for Wetland Impacts

Some unavoidable adverse impacts would occur from construction of the South C alignment along the railroad grade. These permanent impacts would involve 0.06 hectares (0.16 acres) of filling along the southern edge of Wetland HS. The functions that this wetland area provides are rated low to moderate for flood and stormwater control, ground water recharge, biological support, and water quality improvement. Based on the replacement ratio (2:1) required by the City of Issaquah (1995) for Class 2 wetlands, this wetland filling would require compensatory mitigation for 0.13 hectares (0.33 acres) of forested and scrub/shrub wetland habitat.

The preferred approach for compensatory mitigation involves creation of a Class 2 wetland on-site and within the same drainage basin as the disturbed wetland. The mitigation site will be protected by a 50-foot buffer for the Class 2 wetland created. Criteria for selecting a mitigation site for wetland creation are discussed below.

- The mitigation site should be in the Issaquah Creek drainage basin, preferably near Issaquah Creek. This will ensure that the hydrologic regime is comparable. Sites in the immediate vicinity of the impact site are preferred over sites farther away in the drainage system. This will ensure that surface water drainage and ground water recharge functions provided by the wetlands are replaced.
- Instead of enhancing an existing wetland, an upland site with the potential to be converted into a wetland should be used. Criteria for identifying suitable site properties include whether they are underlain by hydric soil, whether there is a reliable water source, and whether the site contains structures that can be easily removed.

- The wetland plant communities that are affected in Wetland HS should be replaced in-kind. This includes palustrine emergent, scrub/shrub, and forested classes.
- The property should be available for purchase at a reasonable cost. The property should be available for permanent dedication as open space, with specific deed language stating that all future owners are encumbered with the land use.
- The property should be easily accessed from a public road in order to allow heavy equipment to be transported to the site. The access road to the site should not cross private property that is not involved in the mitigation.

A potential wetland mitigation site has been selected that involves wetland creation from an upland site adjacent to Wetland GW. Construction of this site involves excavating soil from the upland area to provide wetland hydrology and re-vegetating the area with native emergent, scrub/shrub, and forested species. These actions increase the likelihood that hydric soils are present below the surface layer of upland soil, a hydrologic source is present, and that minimal structures would have to be removed.

Compensatory Mitigation for Wetland Buffer Impacts

Compensatory mitigation will be required for impacts to wetland buffers from construction of the South C alignment that cannot be avoided or minimized. These impacts involve conversion of buffer areas surrounding Wetlands HS and GW to create the roadway and stormwater facilities. Compensatory mitigation for 0.56 hectares (1.39 acres) of impacts on wetland buffers will consist of buffer enhancement to improve the functions provided by the buffers. Criteria for selecting an area for enhancement of wetland buffers are discussed below.

- The areas where the buffers are to be enhanced should be disturbed and not functioning well in protecting the wetland.
- The property proposed for buffer replacement should be available for purchase at a reasonable cost. The property should be available for permanent dedication as open space, with specific deed language stating that all future owners are encumbered with the land use.

Buffer enhancement will be used in three locations surrounding Wetlands HS and GW where the buffer is disturbed and not functioning well in protecting the wetland. A total of 0.59 hectares (1.45 acres) of buffer will be enhanced, which includes one area around Wetland HS and two buffer areas around Wetland GW. At each of these three sites, the buffer will be enhanced by selectively clearing invasive plant species and retaining native trees greater than 6 inches diameter at breast height. Topsoil will then be spread across the site, and native trees and shrubs will be planted. Fences will be installed along the buffer boundaries with signs identifying the area as open space.

In addition, a 0.25 hectare (0.62 acre) area surrounding the wetland mitigation site will be created as buffer for Wetland GW. The combined area for the three buffer enhancement sites and the buffer around the wetland mitigation site amounts to 0.84 hectares (2.07 acres), which is greater than the impacted buffer areas.

Mitigation Goals and Objectives for Wetland Creation

The mitigation goal and objectives for creation of a wetland adjacent to Wetland GW are described below.

Mitigation Goal—Create 0.12 hectares (0.32 acres) of wetland adjacent to Wetland GW that includes emergent, scrub/shrub, and forested vegetation classes. This wetland will provide functions such as flood storage capacity for Issaquah Creek, water quality improvement from biofiltration and nutrient uptake by plants, stormwater attenuation from woody vegetation slowing floodwaters, and ground water recharge.

- **Objective 1**—Selectively clear non-native, invasive plant species (Himalayan blackberry, evergreen blackberry, and reed canarygrass) from 0.16 acres of upland and retain native trees (red alder, black cottonwood, and willows) greater than 6 inches diameter at breast height, wherever possible.
- **Objective 2**—Selectively remove approximately 3 feet of non-hydric soils from the upland buffer adjacent to Wetland GW while excavating around any native trees that are to be retained. In order to provide reliable wetland hydrology, upland soils will be removed to a point where a hydric soil layer is encountered or the ground water table of the wetland is intercepted.
- **Objective 3**—To promote plant growth, overexcavate and backfill the excavated area with a 1-foot-thick layer of soil with a high organic content. Grade the soils in the created wetland to provide habitat complexity from varying elevations and a convoluted edge.
- **Objective 4**—Plant native vegetation in the newly created wetland areas using emergent (rated as obligate to facultative wet), shrub (rated as facultative to facultative wet), and tree species (rated as facultative wetland to facultative).
- **Objective 5**—Plant native tree, shrub, and herbaceous species (rated as facultative to facultative upland) in the newly created buffer.

Performance Standards for Wetland Creation

Quantifiable criteria presented as performance standards are used as the basis for measuring the success of the project area. The following performance standards will be used to determine whether the mitigation goal and objectives are met.

- Within the 1-year guarantee period for plants, all native plant species installed by the landscape contractor that did not survive must be replaced.
- Tree and shrub plantings should cover a minimum of 20 percent of the ground 1 year after planting, 30 percent after 2 years, 40 percent after 3 years, and 60 percent after 5 years.
- At least 80 percent of plantings should be in a healthy and vigorous growing condition after 5 years.
- Invasive species such as Himalayan blackberry, evergreen blackberry, and reed canarygrass should not re-colonize more than 20 percent of the mitigation site after 5 years.
- Saturated soil should be present to the surface for a consecutive number of days during at least 12.5 percent of the growing season (March 1 to October 31).

Mitigation Goals and Objectives for Buffer Enhancement

The mitigation goal and objectives for enhancement of the buffer around Wetlands HS and GW are described below.

Mitigation Goal—Enhance 0.84 hectares (2.07 acres) of the buffer around Wetlands HS and GW in areas that are disturbed and functioning poorly.

- **Objective 1**—Purchase the property surrounding Wetlands HS and GW where the buffer can be enhanced. Dedicate this buffer area as open space, with specific deed language stating that all future owners are encumbered with the land use.
- **Objective 2**—Selectively clear non-native, invasive plant species (Himalayan blackberry, evergreen blackberry, and reed canarygrass) from 2.07 acres of upland and retain native trees (red alder, black cottonwood, and willows) greater than 6 inches diameter at breast height, wherever possible.
- **Objective 3**—Plant native trees, shrubs, and herbaceous species in the enhanced buffer.

- **Objective 4**—Install fences along the buffer boundaries and attach signs identifying the area as open space.

Performance Standards for Buffer Enhancement

The following performance standards will be used to determine whether the mitigation goal and objectives are met.

- Within the 1-year guarantee period for plants, all native plant species installed by the landscape contractor that did not survive must be replaced.
- Tree and shrub plantings should cover a minimum of 20 percent of the ground 1 year after planting, 30 percent after 2 years, 40 percent after 3 years, and 60 percent after 5 years.
- At least 80 percent of plantings should be in a healthy and vigorous growing condition after 5 years.
- Invasive species such as Himalayan blackberry, evergreen blackberry, and reed canarygrass should not re-colonize more than 20 percent of the mitigation site after 5 years.

Proposed Mitigation Sites

The wetland mitigation sites located within the Southeast Issaquah Bypass project area are described below. This includes a wetland creation site and four buffer enhancement sites. These properties are immediately adjacent to Wetlands HS and GW near the areas where wetlands and buffers will be affected, and therefore provide on-site and in-kind mitigation. Figure 6 illustrates the wetland and buffer mitigation sites proposed for the South C alignment. Appendix A contains photographs of existing conditions at these potential mitigation sites.

Wetland Creation Site

The creation of this wetland site involves removing upland fill material that encroaches on Wetland GW and widening the riparian zone associated with the north tributary to Issaquah Creek. This site is located in a farm field northwest of the intersection of SE Kramer Place and Sixth Avenue SE. This wetland creation site, covering 0.25 hectares (0.62 acres), will abut Wetland GW on its western and northern borders. The eastern and southern borders of the wetland creation site will be surrounded by an upland buffer that is 50 feet wide.

Ownership

Rolland and Ruth Rose currently own the proposed wetland creation site. The tax account number for this 76,665-square-foot (1.76-acre) property is 342406-9272. The assessed value of the land is $183,000. The zoning designation for this area is single family suburban.

Rationale for Selection

The proposed wetland creation site was selected for the following reasons.

- The property is immediately adjacent to Wetland GW. Its location provides on-site mitigation to replace lost wetland functions and values.
- The north tributary to Issaquah Creek and Wetland GW are near the mitigation site, which provides a dependable source of hydrology.
- The property is available at a reasonable cost, no structures would have to be removed, and the site is accessible for construction equipment.

Ecological Assessment of the Mitigation Site

The proposed mitigation site consists of two habitat types: an open field and a shrub thicket paralleling the north and east property lines. The open pasture is dominated by non-native upland grasses, invasive weeds, and Himalayan blackberry. There is a thicket lining a fence

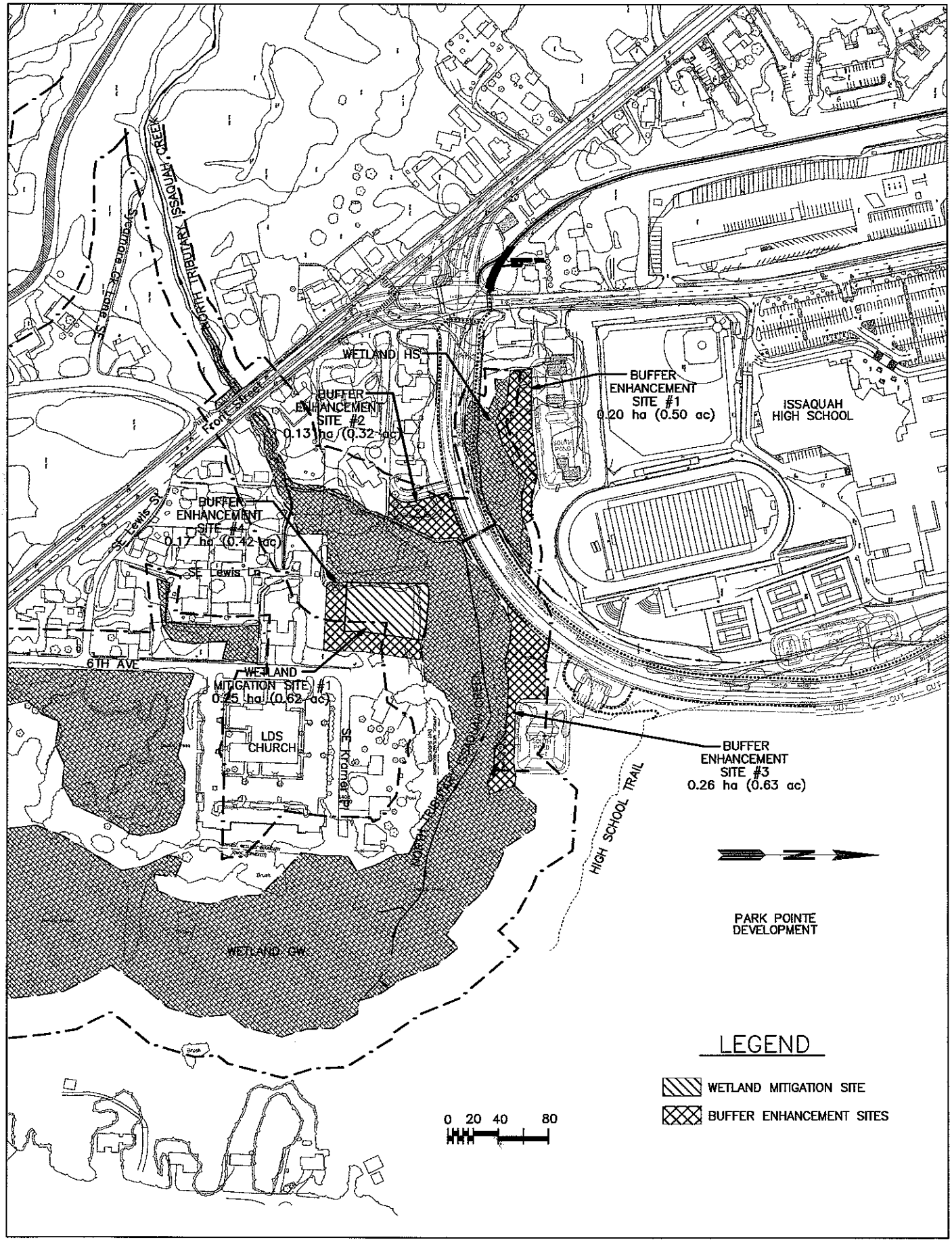

Figure 6
Proposed Wetland Mitigation for the South C Alignment of the Southeast Issaquah Bypass project

line on the north edge between Wetland GW and the open pasture and the east edge between SE Kramer Place and the open pasture that is dominated by Himalayan blackberry. The upland fill material covering the historic wetland surface appears to be 3 feet deep.

Preliminary Site Plan

This wetland creation site involves creating a wetland depression with an elevation that is similar to Wetland GW. Fill material will be excavated from this upland site, and trees greater than 6 inches in diameter at breast height will be retained. The vegetation and soil will be transported off-site for disposal. Upland soil will be removed until the grade of the mitigation site is below the existing ground elevation of the adjacent wetland. The excavated area will be backfilled with 1-foot of suitable organic soil to match the grade of the adjacent wetland. This will ensure that a high ground water table and seasonal flooding will permanently saturate the soils at the mitigation site.

The native plants that will be used for wetland creation on the mitigation site are listed in Table 5. The site will be planted with a mixture of native trees, shrubs, and emergent species that provide wetland functions and wildlife habitat. The tree species include Oregon ash (*Fraxinus latifolia*), Sitka spruce (*Picea sitchensis*), black cottonwood, Pacific willow, and western red cedar. The shrub species include red-osier dogwood, Pacific ninebark (*Physocarpus capitatus*), salmonberry, and Sitka willow. The trees will be spaced at 10 feet on center, and the shrubs will be planted as monotypic groupings between the trees. The emergent species that will be planted include slough sedge, common spike rush (*Eleocharis palustris*), daggerleaf rush (*Juncus ensifolius*), skunk cabbage, and small-fruited bulrush. The emergent species will be planted in scattered groupings underneath the shrub and tree strata to mimic a naturally occurring plant community.

Buffer Enhancement Site 1

Buffer enhancement will be used to compensate for impacts caused by constructing the roadway within the Wetland HS buffer. The buffer along the north edge of Wetland HS will be widened and enhanced to improve the functions of the buffer. This includes a 0.20 hectare (0.50 acre) buffer area between Wetland HS and stormwater South Pond C-2.

Ownership

The City of Issaquah will purchase this buffer enhancement site as right-of-way for the roadway and stormwater pond. The zoning designation for this buffer widening site currently is single family suburban.

Table 5. Plant species proposed for wetland creation for the Southeast Issaquah Bypass project.

Stratum	Scientific Name	Common Name	Wetland Indicator Status [a]	Size and Condition	Spacing (on center)
Tree	*Fraxinus latifolia*	Oregon ash	FACW	2-gal. container	10 feet
	Picea sitchensis	Sitka spruce	FAC	5-gal. container	10 feet
	Populus balsamifera	Black cottonwood	FAC	2-gal. container	10 feet
	Salix lasiandra	Pacific willow	FAC	2-gal. container	10 feet
	Thuja plicata	Western red cedar	FAC	5-gal. container	10 feet
Shrub	*Cornus stolonifera*	Red-osier dogwood	FACW	2-gal. container	5 feet
	Physocarpus capitatus	Pacific ninebark	FACW-	2-gal. container	5 feet
	Rubus spectabilis	Salmonberry	FAC+	2-gal. container	5 feet
	Salix sitchensis	Sitka willow	FACW	2-gal. container	5 feet
Emergent	*Carex obnupta*	Slough sedge	OBL	6-inch sprig	12-inch
	Eleocharis palustris	Common spike rush	OBL	6-inch sprig	12-inch
	Juncus ensifolius	Daggerleaf rush	FACW	6-inch sprig	12-inch
	Lysichiton americanum	Skunk cabbage	OBL	6-inch sprig	12-inch
	Scirpus microcarpus	Small-fruited bulrush	OBL	6-inch sprig	12-inch

[a] Wetland indicator status definitions: OBL = obligate, FACW = facultative wetland, FAC = facultative.
Note: The + suffix indicates plants with a somewhat higher probability of occurring in wetlands; the – suffix indicates plants with a somewhat lower probability of occurring in wetlands.

Rationale for Selection

The proposed buffer widening site was selected for the following reasons.

- The property is immediately adjacent to where buffer impacts in Wetland HS will occur and thus will provide on-site mitigation to replace lost buffer functions.
- The buffer has been disturbed and the plant community is dominated by non-native and invasive species. The buffer is functioning poorly as wildlife habitat and in protecting water quality in Wetland HS.
- Widening the buffer between Wetland HS and the proposed stormwater South Pond C-2 will minimize impacts from construction and operation of the stormwater facility.

Ecological Assessment of the Mitigation Site

The proposed buffer widening site is covered with mixed second-growth forest that has three canopy layers. The plant community is dominated by native upland species, although some invasive species exist. The tree layer is composed of Douglas fir, western red cedar, red alder,

and big-leaf maple (*Acer macrophyllum*). The shrub understory includes vine maple, snowberry (*Symphoricarpos albus*), holly (*Ilex aquifolium*), salmonberry, and Himalayan blackberry. Herbaceous species include sword fern, herb Robert (*Geranium robertianum*), and bentgrass (*Agrostis* sp.).

Preliminary Site Plan

Mitigation at this site involves clearing of invasive species and planting native tree, shrub, and herbaceous species to improve the functions of this buffer. The native plants that will be used for buffer enhancement are listed in Table 6. Within the upland buffer areas, the tree species that will be planted include big-leaf maple and Douglas fir. The shrub species include California hazelnut (*Corylus cornuta)*, Indian plum (*Oemleria cerasiformis)*, bald hip rose (*Rosa gymnocarpa)*, thimbleberry (*Rubus parviflorus)*, red elderberry (*Sambucus racemosa)*, and snowberry. The herbaceous species that will be planted include sword fern and Oregon grape (*Mahonia nervosa)*. A fence will be installed along the property boundaries where buffer widening will occur. Signs will be attached to this fence that identify this buffer for Wetland HS as open space.

Table 6. Plant species proposed within the buffer of the wetland creation site and the three buffer enhancement sites for the Southeast Issaquah Bypass project.

Stratum	Scientific Name	Common Name	Wetland Indicator Status [a]	Size and Condition	Spacing (on center)
Tree	*Acer macrophyllum*	Big-leaf maple	FACU	2-gal. container	10 feet
	Pseudotsuga menziesii	Douglas fir	FACU	5-gal. container	10 feet
Shrub	*Corylus cornuta*	California hazelnut	FACU	2-gal. container	5 feet
	Oemleria cerasiformis	Indian plum	FACU	2-gal. container	5 feet
	Rosa gymnocarpa	Bald hip rose	FACU	2-gal. container	5 feet
	Rubus parviflorus	Thimbleberry	FAC-	2-gal. container	5 feet
	Sambucus racemosa	Red elderberry	FACU	2-gal. container	5 feet
	Symphoricarpos albus	Snowberry	FACU	2-gal. container	5 feet
Herbaceous	*Polystichum munitum*	Sword fern	FACU	1-gal. container	2 feet
	Mahonia nervosa	Oregon grape	FACU	1-gal. container	2 feet

[a] Wetland indicator status definitions: FACU = facultative upland, FAC = facultative.

Buffer Enhancement Site 2

Wetland buffer impacts will also be mitigated by enhancing the existing buffer around Wetland GW and the north tributary to Issaquah Creek. This includes a 0.13 hectare (0.32 acre) buffer area near the Nyberg residence along the northwest corner of Wetland GW. Mitigation at this site involves clearing of invasive species and planting native tree, shrub, and herbaceous species to improve the functions of this buffer.

Ownership

The City of Issaquah will purchase this buffer enhancement site as right-of-way for the roadway and an access road onto Nyberg Lane. The zoning designation for this buffer enhancement site currently is single family suburban.

Rationale for Selection

The proposed buffer enhancement site was selected for the following reasons.

- The property is immediately adjacent to where buffer impacts on Wetland GW will occur, thus it will provide on-site mitigation to replace lost buffer functions.
- The buffer has been disturbed, and the plant community is dominated by non-native and invasive species. The buffer is functioning poorly as wildlife habitat and in protecting water quality in Wetland GW and the north tributary to Issaquah Creek.

Ecological Assessment of the Mitigation Site

The proposed buffer enhancement site consists of a disturbed area that has been colonized by both native and invasive species. The tree canopy consists of red alder trees, and the shrub layer is dominated by sparse thickets of Himalayan blackberry, salmonberry, and English holly. The dominant herbaceous plants include creeping buttercup, lawn grass, and sword fern. The existing property owner (Nyberg) has created a pond and landscaped this area.

Preliminary Site Plan

The conceptual design of this buffer enhancement site involves clearing and grubbing of invasive species, and retaining all trees greater than 6 inches in diameter at breast height. The cleared vegetation will be transported off-site for disposal. The same native plants listed in Table 6 will be used for buffer enhancement.

An opportunity exists on the Nyberg property to convert an existing pond into off-channel rearing habitat. The pond could be connected to the north tributary of Issaquah Creek to allow fish passage into and out of the pond. Riparian vegetation would be planted around the pond and large woody debris would be placed in the pond for fish habitat. This project would especially benefit juvenile coho salmon. Large woody debris would also be placed in the north tributary channel to provide structural complexity, enhance channel forming processes, and provide insect and fish habitat.

In addition, fisheries habitat in the north tributary of Issaquah Creek would be enhanced by importing clean gravel for coho and steelhead spawning and by removing a fish passage barrier.

This gravel would be added into suitable areas (pool tailouts or riffles) to increase the availability of spawning habitat in the basin. A possible fish passage barrier just upstream of Front Street South would be removed.

Buffer Enhancement Site 3

The third site for buffer enhancement consists of a grass clearing and thickets of invasive shrubs that is located north of Wetland GW and south of the abandoned railroad grade. A power line corridor passes over the western edge of this site and periodic clearing has limited tree growth. This 0.26 hectare (0.63 acre) buffer area is located between Wetland GW and stormwater South Pond C-1. Mitigation at this site involves clearing of invasive species and planting native tree, shrub, and herbaceous species to improve the functions of this buffer.

Ownership

The City of Issaquah will purchase this buffer enhancement site as right-of-way for the roadway and South Pond C-1. The zoning designation for this buffer enhancement site currently is single family suburban.

Rationale for Selection

The proposed mitigation site was selected for the following reasons.

- The property is immediately adjacent to where buffer impacts on Wetland GW will occur, thus it will provide on-site mitigation to replace lost buffer functions.
- The buffer has been disturbed and the plant community is dominated by non-native and invasive species. The buffer is functioning poorly as wildlife habitat and in protecting water quality in Wetland GW.
- Enhancing the buffer between Wetland GW and the proposed stormwater South Pond C-1 will minimize impacts from construction and operation of the stormwater facilities.

Ecological Assessment of the Mitigation Site

This proposed buffer enhancement site consists of a disturbed area that has been colonized by both native and invasive species. The tree canopy consists of red alder and ornamental trees, and the shrub layer is dominated by Himalayan blackberry, trailing blackberry, and evergreen blackberry. The dominant herbaceous plants include reed canarygrass, upland grasses, and bracken fern (*Pteridium aquilinum*). It is assumed there was an historical homestead on the site,

which had ornamental trees that have naturalized, although the buildings no longer remain. There is a power line corridor through this area that has been re-colonized by Himalayan blackberries.

Preliminary Site Plan

The conceptual design of this buffer enhancement site involves clearing and grubbing of invasive species and retaining all trees greater than 6 inches in diameter at breast height. The top layer of soil will be overexcavated by 1 foot to remove the root system and seed bank of the invasive species. The cleared vegetation and soil will be transported off-site for disposal. Suitable organic soil will be backfilled throughout the excavated area to restore the original grades. This will ensure optimum growing conditions for a mixture of native trees, shrubs, and herbaceous species. The same native plants listed in Table 6 will be used for buffer enhancement.

Buffer Enhancement Site 4

Buffer enhancement will occur during construction of the wetland creation site described previously. This involves creating a 50-foot-wide buffer surrounding the south and east edges of the wetland creation site. Buffer enhancement includes a 0.25 hectare (0.62 acre) area using similar methods as described previously.

Monitoring Plan

Monitoring the wetland and buffer mitigation sites to ensure that performance standards are met is an important element of this mitigation plan. The goal of this monitoring is to ensure the successful functioning of the created wetland and enhanced buffers over a 5-year period. Data will be collected to quantify plant survival and condition, plant coverage, and hydrologic conditions at the mitigation sites. The City of Issaquah or its representative will be responsible for monitoring the sites once a year during the peak growing season (May to August). Monitoring will commence the first season after construction work is completed (year 1) and will also be conducted during years 2, 3, and 5. Monitoring methods for vegetation and water regime are described below.

Vegetation

Monitoring of plant communities at the wetland creation site and buffer enhancement sites will evaluate vegetation survival and percent coverage, to ensure that the developing plant communities are consistent with the species listed in the planting plan. Vegetation plantings in the wetland mitigation site and upland buffer will make use of native species that provide food and cover for wildlife. These plantings will serve to improve wetland functions and values.

Plant Survival

The landscape contractor will warrant all plant materials to be in healthy and growing condition at the time of the planting. At that time, if the plants are healthy and in a flourishing condition of active growth, the City of Issaquah will issue a notice of final acceptance to the contractor releasing the contractor from the warranty period. Prior to the end of the 1-year plant guarantee period, the survival of all plants installed at the wetland creation (emergent, shrub, and tree species) and four buffer enhancement sites (tree, shrub, and herbaceous species) will be assessed. Any plants installed by the landscape contractor that are found to be dead during the summer growing season will be flagged with ribbon, identified on the as-built drawings, and enumerated to assist the landscape contractor in plant replacement. The landscape contractor and commercial nursery responsible for these plants will be required to replace them with the same species or a suitable alternative agreed upon by the project biologist.

Plant Coverage

Evaluation of the percent coverage of plants at the mitigation sites is based on the performance standards stated for specific years of monitoring. These performance standards will be applied during the designated monitoring periods for each class of vegetation. Vegetation coverage will be evaluated during the summer when foliage is in full development. Representative sampling of vegetation will be conducted along belt transects that are 10 meters (33 feet) long and 3 meters

(10 feet) wide for a total area of 30 square meters (320 square feet). Permanent sampling locations for quantitative sampling of plant coverage will be established along these transects. These transects will be located along a topographic gradient, starting in the upper zone and extending downgradient to the lower zone. Percent coverage of shrub and tree species will be sampled in 30-square-meter (320-square-foot) plots. The percent coverage of emergent species in the wetland creation sites and herbaceous species in the buffer enhancement sites will be qualitatively assessed.

Water Regime

Monitoring of water levels in the wetland creation site will provide information on whether the hydrologic regime in the wetland can support hydrophytic vegetation. This monitoring will be accomplished by installing shallow ground water monitoring wells along the vegetation transects to record water table elevations. These wells will consist of a perforated pipe surrounded by sand that extends at least 41 centimeters (16 inches) below the ground surface. These wells will be used to monitor soil saturation within 41 centimeters (16 inches) of the ground surface during the growing season to determine whether the performance standard is met. A surveyed benchmark will be used to determine the elevations of each well. The elevation at the top of each monitoring well will be recorded on the as-built drawing and the depth to ground water will be subtracted from this elevation to determine if saturated soil is present within 41 centimeters (16 inches) of the surface.

Photographic Viewpoints

At the same time plant coverage is recorded, dated photographs will be taken of the vegetation along each of the monitoring transects. This photographic record of plant conditions will provide a visual supplement to the plant coverage data. Permanent photograph stations will be established and photographs will be taken in the same direction at each monitoring event. Color photographs will be taken at the time of sampling to supplement quantitative vegetation characterization and provide visual documentation of vegetation changes over time.

Reporting

Post-construction monitoring reports will be submitted at the end of each monitoring period. These reports will describe and, as much as possible, quantify the level of success of the mitigation plan. Data collected on percent coverage of vegetation and water level elevations will be compared to the performance standards to determine if contingency actions are warranted. These monitoring reports will include vegetation coverage data from the transects, invasive species coverage, data obtained from the monitoring wells, and photographs from fixed photographic viewpoints. These annual reports will be forwarded to the U.S. Army Corps of Engineers and the Washington Department of Ecology.

Maintenance and Contingency Plans

Maintenance

The landscape contractor is responsible for maintaining the wetland creation and three buffer enhancement sites throughout the plant survival guarantee period. After the warranty period expires, the sites will be inspected and maintained annually by City of Issaquah or its representative. The mitigation sites will be kept free of invasive plants species, such as Himalayan blackberry, evergreen blackberry, and reed canarygrass. This will ensure the performance standards for percent coverage of invasive species is met.

Contingency

Wetland mitigation plantings will be in healthy, vigorous growing condition during the 5 years of the monitoring program. If after the 5-year monitoring period, more than 80 percent of the planted stock survives and the vegetation cover goals are met, no contingency action will be taken. If only 70 percent to 80 percent of the planted stock survives or if vegetation cover goals are not met, reasons for mortality or poor growth will be evaluated and stock will be replanted or fertilized to achieve the performance standard. If less than 70 percent of the planted stock survives or vegetation coverage goals are not met, reasons for mortality and poor growth will be evaluated, species suitability for site conditions will be considered, and stock will be replanted with the same or alternate species. If invasive species (Himalayan blackberry, evergreen blackberry, and reed canarygrass) exceed the 20 percent coverage criteria, corrective actions will be taken. This may require selective pruning or herbicide spraying using Rodeo®.

Performance Bond

Because this mitigation project is being undertaken by the City of Issaquah, no performance bonds are required.

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APPENDIX A

Photographic Documentation

Southeast Issaquah Bypass
Photographic Documentation

Photo Number	Mitigation Site	Photo Description
1	Wetland creation site	Upland pasture in foreground where wetland would be created, with Wetland GW in background.
2	Buffer enhancement site 1	Buffer in foreground that would be enhanced, with Wetland HS in background.
3	Buffer enhancement site 2	Lawn grass on banks of north tributary to Issaquah Creek that would be enhanced.
4	Buffer enhancement site 3	Upland pasture in foreground where buffer would be enhanced, with Wetland GW in background.

1

2

3

4

Appendix E

Water Quality Supplemental Technical Analysis

Southeast Issaquah Bypass

Draft Supplemental EIS

Technical Report
Southeast Issaquah Bypass

Supplementary Technical Analysis of Long-Term Stormwater Pollutant Impacts and Accidental Spill Probability

December 2003

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Introduction

This appendix provides details on analyses of potential long-term pollutant loadings under the build alternatives and the No-Action Alternative for the Southeast Issaquah Bypass project, and the potential for accidental spills of hazardous materials on the new bypass roadway. The methods and results of these analyses are discussed, including details on supporting information used in the analyses.

Pollutant Loading Analysis Approach

To assess the long-term operational impacts of the proposed Southeast Issaquah Bypass development on receiving water quality, average annual pollutant loadings in site stormwater discharges were estimated for all development alternatives and for the No-Action Alternative. These loading estimates incorporate the approximate pollutant removal effectiveness of required stormwater treatment systems under the development alternatives. The analysis includes pollutant loadings from existing roadways in the site vicinity that would experience significant traffic flow differences between any of the development alternatives and the No-Action Alternative. The affected roadways include Front Street from Issaquah-Hobart Road to I-90 and East Sunset Way from Front Street to the proposed connection of the Southeast Issaquah Bypass with the new I-90 Sunset interchange, in addition to the new Southeast Issaquah Bypass roadway.

This area of analysis was divided into six general components based on the fate of discharged stormwater pollutants:

1) Runoff from roadways in the northern portion of the Southeast Issaquah Bypass project area would be directed to infiltration ponds preceded by wet ponds for treatment, with treated flows discharging to the underlying ground water.
2) Some of the precipitation on the ground surface in off-road areas in the northern and southern portions of the Southeast Issaquah Bypass right-of-way corridor would discharge to underlying ground water, with pollutant removal occurring naturally in the native soils.
3) Minor surface runoff from off-road areas in the northern portion of the Southeast Issaquah Bypass right-of-way corridor would reach the East of Fork Issaquah Creek without being purposefully treated beforehand. This runoff does not require treatment per existing regulations, and it would generally be of good quality.
4) Runoff from roadways in the southern portion of the Southeast Issaquah Bypass project area would be directed to wet/detention ponds, with treated flows discharging to the main stem of Issaquah Creek via the North Tributary (Sycamore Creek).
5) Runoff from off-road areas in the southern portion of the Southeast Issaquah Bypass right-of-way corridor would reach the main stem of Issaquah Creek (via the North Tributary to Issaquah Creek) without being purposefully treated beforehand. This runoff does not require treatment per existing regulations, and it would generally be of good quality.

6) Runoff from Front Street and East Sunset Way would flow directly to the main stem and East Fork of Issaquah Creek without treatment.

The pollutant loadings that would reach ground and surface water respectively, would differ because the source areas differ in size and traffic flow (i.e., pollutant deposition characteristics), and the extent of pollutant removal in the native soils versus the removal in wet ponds would differ.

Several pollutants were included in this analysis, including total suspended solids (TSS), total phosphorus (TP), nitrate and nitrite forms of nitrogen (nitrate+nitrite), total copper, and total zinc. In addition, chemical oxygen demand (COD) levels in stormwater runoff from the project site were estimated. These pollutants are representative of the types of stormwater contaminants that are commonly present in urban roadway runoff and the types of contaminants that are currently contributing to water quality degradation in the project area.

Pollutant loading estimates provide an approximate measure of the effect of a particular land use, or combination of land uses, on receiving water quality. Over time, the mass loading of a particular pollutant can be a cumulative burden on water quality, sediment quality, and biological resources within a receiving water. In the context of this EIS analysis, these mass loading estimates enable a simple means of comparing stormwater quality before and after development, and provide an assessment of the potential cumulative effects of project site runoff on receiving waters of interest.

Pollutant concentrations in site runoff were also estimated to enable comparisons to Washington state water quality standards for the Issaquah Creek system and for ground water. As discussed later in this appendix, pollutant concentrations were derived based on the mass loading estimates and calculations of average annual stormwater runoff and infiltration volumes under the various project alternatives.

Pollutant Loadings from Roadways

Average annual pollutant loadings from road surfaces within the project limits were estimated for the design year of 2030 using a calculation procedure developed by Driscoll et al. (1990) for the Federal Highway Administration (FHWA), as documented in *Evaluation and Management of Highway Runoff Water Quality* (FHWA, 1996). This procedure uses information on drainage area and percent impervious surface cover, precipitation characteristics, and typical pollutant concentrations in highway runoff to derive annual loadings of various pollutants in roadway runoff. Although the roadways included in the pollutant loading calculations are not highways, there is no comparable simplified methodology available that has been tailored to arterial roadways.

The FHWA pollutant loading analysis method involves calculation of the runoff flow volume for the mean storm event, calculation of average storm event mean pollutant concentrations, calculation of the mean storm event pollutant loading from both of the previous calculations, and calculation of average annual pollutant loadings based on the mean event loadings and the average number of storms per year. These equations and the corresponding input parameters are listed below.

$$V_{ms} = Rv \times H_{ms} \times A \times 10$$

where V_{ms} = Volume of runoff for mean storm event (m^3)

Rv = runoff coefficient, which is equal to 0.007 x I +0.10 where I is the percentage of imperviousness in the drainage area (100% for all road segments analyzed)

H_{ms} = Rainfall depth for the mean storm event = 11.7 mm for the Seattle area

A = drainage area of the highway segment (hectares)

The rainfall depth for the mean storm event is given for the Seattle area in FHWA (1996).

$$C_m = C_{med} \times (1 + CV^2)^{0.5}$$

where C_m = Average event mean pollutant concentration (mg/L)
C_{med} = Site median pollutant concentration (mg/L)
CV = Coefficient of variation of event mean concentration = 0.71 for urban highways

Median pollutant concentrations are provided in FHWA (1996) for two types of highways: urban (with greater than 30,000 vehicles per day) and rural (less than 30,000 vehicles per day). All of the roadways in the Southeast Issaquah Bypass vicinity included in this analysis are projected to have traffic volumes of less than 30,000 vehicles per day in the year 2030, and therefore the median pollutant concentration data for rural highways (from FHWA, 1996) were applied for those pollutants where local data are not available (e.g., copper and chemical oxygen demand). For three of the six pollutants incorporated in this analysis, total suspended solids (TSS), total zinc, total phosphorus, and local event mean concentration data were obtained from the City of Issaquah Resource Monitoring Program (Issaquah, 2003). Specifically, the City's stormwater and base flow water quality monitoring data for the period of 1998-2002 from a ditch system adjacent to Gilman Boulevard (Issaquah sampling station T-0170) northwest of the project site were reviewed to determine appropriate concentrations to use for these three pollutants. This ditch system drains a busy arterial roadway and surrounding land uses that comprise extensive impervious surfaces. The runoff in this ditch system is reasonably representative of what could be expected from the Issaquah Southeast Bypass roadway. Compared to the FHWA (1996) pollutant concentration data, the concentrations of TSS, total zinc, and total phosphorus at this sampling station are lower. To be conservative, the concentration values for TSS, total zinc, and total phosphorus used in the pollutant loading calculations were well above the observed mean concentrations in the City's data. Event mean concentrations for one of the pollutants incorporated in this analysis, nitrate + nitrite nitrogen, are not provided in FHWA pollutant concentration data (1996) and applicable local data are not available. The mean concentration value for this pollutant was obtained from Horner et al. (1994).

The average annual mass loading of the pollutants analyzed was estimated using the following equation (FHWA 1996):

$$L_m = C_m \times V_{ms}/1000$$

where L_m = Mean pollutant mass loading (kg per event)

Finally, the annual mass loading of a particular pollutant was then calculated as follows:

$$L_a = L_m \times N_s$$

where L_a = Annual mass loading of pollutant (kg per year)
N_s = Average number of storms per year (almost 87), based on the average interval of storms for the Seattle area (101 hours)

Traffic volumes on the Southeast Bypass would be essentially the same for each of the six development alternatives, and the lengths of roadway under each alternative are similar. Thus, this analysis does not distinguish minor differences in pollutant loadings between the development alternatives.

Tables F-1 and F-2 show the various road segments, lengths of those segments, the mean pollutant concentrations applied to those road segments, and the resultant average annual pollutant loadings in runoff from each road segment based on the equations listed above. The pollutant loadings shown for the development alternatives in Table E-2 do not account for the pollutant removal (i.e., deposition) that would occur in the proposed onsite stormwater treatment systems. The estimated net pollutant loadings to local ground water or nearby surface waters are discussed later in this appendix.

Table E-1
Estimated Pollutant Concentrations from Road Surfaces in the Southeast Issaquah Bypass Project Area in the Year 2030

Road Segment	Length (meters)	Approx Road Width (meters)	Impervious Surface Area [1] (m^2)	Impervious Surface Area (hectares)	V_{ms} (volume of runoff for mean storm event) (m^3)	Average event mean pollutant concentrations (mg/L) [2] C_m TSS	C_m COD	C_m Nitrate + Nitrite	C_m TP	C_m Copper	Annual TKN Load (lbs)	C_m Zinc
Development Alternatives												
Southeast Bypass - North	1000		31188	3.12	292	20	60	0.85	0.25	0.03	50	0.05
Southeast Bypass - South	750		21573	2.16	202	20	60	0.85	0.25	0.03	50	0.05
Front St. - I-90 to Gilman	200	21	4200	0.42	39	20	60	0.85	0.25	0.03	50	0.05
Front St. - Gilman to Dogwood	450	21	9450	0.95	88	20	60	0.85	0.25	0.03	50	0.05
Front St. - Dogwood to Sunset	425	18	7650	0.77	72	20	60	0.85	0.25	0.03	50	0.05
Front St. - Sunset to Clark	280	15	4200	0.42	39	20	60	0.85	0.25	0.03	50	0.05
Front St. - Clark to 2nd	1150	15	17250	1.73	161	20	60	0.85	0.25	0.03	50	0.05
E. Sunset Way (west to Front St.)	1000	16	16000	1.60	150	20	60	0.85	0.25	0.03	50	0.05
TOTALS												
No Action Alternative												
Front St. - I-90 to Gilman	200	21	4200	0.42	39	20	60	0.85	0.25	0.03	50	0.05
Front St. - Gilman to Dogwood	450	21	9450	0.95	88	20	60	0.85	0.25	0.03	50	0.05
Front St. - Dogwood to Sunset	425	18	7650	0.77	72	20	60	0.85	0.25	0.03	50	0.05
Front St. - Sunset to Clark	280	15	4200	0.42	39	20	60	0.85	0.25	0.03	50	0.05
Front St. - Clark to 2nd	1150	15	17250	1.73	161	20	60	0.85	0.25	0.03	50	0.05
E. Sunset Way - Front St. to I90	1200	16	19200	1.92	180	20	60	0.85	0.25	0.03	50	0.05
TOTALS												

Notes:

[1] Impervious surface areas for the southeast bypass roadway were measured from project plans. Impervious surface areas for existing roadways in the project area were estimated based on roadway length and an approximate width of pavement from anecdotal observation.

[2] Event mean concentrations for COD and copper from FHWA (1996); for NO_3+NO_2 from Horner et al. (1994), for TSS, zinc, and TP from Issaquah (2003)

TSS = total suspended solids.

COD = chemical oxygen demand.

TP = total phosphorus.

Table E-3 shows the estimated wet pond and infiltration soil treatment performance for the pollutants analyzed in this study. Table E-4 shows the estimated "large" wet pond treatment performance for the pollutants analyzed in this study. The treatment performance for various pollutants is based on available research conducted nationwide, with emphasis on research from the Puget Sound area where possible (Horner et al., 1994; Winer, 2000; U.S. EPA, 2002). For runoff from Front Street and East Sunset Way, the calculations in Table E-4 assume no pollutant removal (direct discharge).

Table E-2
Estimated Pollutant Loadings from Road Surfaces
in the Southeast Issaquah Bypass Project Area in the Year 2030

	Event mean mass pollutant loadings (kg)						Annual mass pollutant loadings (kg)					
Road Segment	L_m TSS	L_m COD	L_m Nitrate + Nitrite	L_m TP	L_m Copper	L_m Zinc	L_a TSS	L_a COD	L_a Nitrate + Nitrite	L_a TP	L_a Copper	L_a Zinc
Development Alternatives												
Southeast Bypass - North	5.84	17.52	0.25	0.07	0.01	0.01	506.4	1519.1	21.5	6.3	0.7	1.3
Southeast Bypass - South	4.04	12.12	0.17	0.05	0.01	0.01	350.3	1050.8	14.9	4.4	0.5	0.9
Front St. - I-90 to Gilman	0.79	2.36	0.03	0.01	0.00	0.00	68.2	204.6	2.9	0.9	0.1	0.2
Front St. - Gilman to Dogwood	1.77	5.31	0.08	0.02	0.00	0.00	153.4	460.3	6.5	1.9	0.2	0.4
Front St. - Dogwood to Sunset	1.43	4.30	0.06	0.02	0.00	0.00	124.2	372.6	5.3	1.6	0.2	0.3
Front St. - Sunset to Clark	0.79	2.36	0.03	0.01	0.00	0.00	68.2	204.6	2.9	0.9	0.1	0.2
Front St. - Clark to 2nd	3.23	9.69	0.14	0.04	0.00	0.01	280.1	840.2	11.9	3.5	0.4	0.7
E. Sunset Way (west to Front St.)	3.00	8.99	0.13	0.04	0.00	0.01	259.8	779.3	11.0	3.2	0.4	0.6
TOTALS							1891	5528	78.3	23.4	2.5	4.7
No Action Alternative												
Front St. - I-90 to Gilman	0.79	2.36	0.03	0.01	0.00	0.00	68.2	204.6	2.9	0.9	0.1	0.2
Front St. - Gilman to Dogwood	1.77	5.31	0.08	0.02	0.00	0.00	153.4	460.3	6.5	1.9	0.2	0.4
Front St. - Dogwood to Sunset	1.43	4.30	0.06	0.02	0.00	0.00	124.2	372.6	5.3	1.6	0.2	0.3
Front St. - Sunset to Clark	0.79	2.36	0.03	0.01	0.00	0.00	68.2	204.6	2.9	0.9	0.1	0.2
Front St. - Clark to 2nd	3.23	9.69	0.14	0.04	0.00	0.01	280.1	840.2	11.9	3.5	0.4	0.7
E. Sunset Way - Front St. to I90	3.59	10.78	0.15	0.04	0.00	0.01	311.7	935.2	13.2	3.9	0.4	0.8
TOTALS							1006	3018	42.7	12.6	1.4	2.5

Notes:
TSS = total suspended solids.
COD = chemical oxygen demand.
TP = total phosphorus.

Pollutant Loadings from Other Areas Within the Project Site

Pollutant loadings from land areas within the proposed Southeast Issaquah Bypass right-of-way but outside of the new roadway footprint were also estimated in order to provide a characterization of the total site pollutant loading to surface and ground waters after development. These areas include existing open space, new landscaping that would be installed for the project, and excavation and fill slopes adjacent to roadways. Similarly, pollutant loadings were estimated for the same site areas under existing conditions. Those pollutant loadings from areas not subject to vehicular use were developed using loading factors obtained from literature sources (Horner et al., 1994; Horner and Mar, 1982; Metro, 1995; U.S. EPA, 1983).

Tables F-3 and F-4 show the areas of various land uses (aside from roadways) for the development alternatives and the No-Action Alternative, and the corresponding pollutant loading factors that were applied to them. The off-road pollutant loadings shown in Table E-3 (for runoff that is not infiltrated) would not be reduced by onsite wet ponds for any of these alternatives. In the case of the development alternatives, only drainage from roadways would be routed to stormwater treatment facilities.

Much of the off-road drainage would infiltrate the ground in the northern and southern portions of the project area under all development alternatives and therefore would not reach the East Fork or main stem of Issaquah Creek. The pollutant removal effectiveness of native soils on the site is assumed to be the same as would occur in constructed infiltration basins.

Total Pollutant Loadings

Table E-3 shows the total pollutant loadings estimated to enter shallow ground water in the site area in the year 2030 under the No-Action Alternative and the development alternatives, if site runoff in the northern portion of the project area infiltrates into the ground and most of the off-road precipitation and runoff throughout the project site infiltrates the ground. Under the No-Action Alternative it is assumed that this runoff is treated naturally in the native soils. Under the development alternatives, roadway runoff that infiltrates the ground in the northern portion of the project site would also be treated by wet ponds, and thus would be treated to a greater degree than off-road runoff.

Similarly, Table E-4 shows the total pollutant loadings estimated to enter Issaquah Creek and tributary streams in the year 2030 under any of the development alternatives and under the No-Action Alternative. The net pollutant loading to the main stem of Issaquah Creek includes untreated discharges from Front Street (south of East Sunset Way), treated discharges from "large" wet ponds proposed in the southern portion of the Southeast Issaquah Bypass roadway corridor, and untreated overland runoff from off-road areas within the southern portion of the proposed bypass right-of-way.

Table E-3
Estimated Net Pollutant Loading to Local Ground Water from the Southeast Issaquah Bypass Project Area in the Year 2030

Pollutant	Loading from Roadways to Infilt. Basin[a] (kg/yr)	Basic Wetpond + Infiltration Removal[b] (%)	Net Loading to Ground Water from Roadways (kg/yr)	Off-road Open Space Area (hectares)	Open Space Load Factor[c] (kg/ha/yr)	Forest Area (hectares)	Forest Load Factor[c] (kg/ha/yr)	Gross Infiltrated Loading from Off-road Areas (kg/yr)	Natural Pollutant Removal in Soils (%)	Net Infiltrated Loading From Off-road Areas (kg/yr)	Total Loading to Local Ground Water (kg/yr)
Development Alternatives											
TSS	506	100%	0	3.2	346	0	87	1,096	100%	0	0
COD	1,519	75%	380	3.2	2.0	0	2.0	6.4	60%	2.6	382
Zinc	1.3	80%	0.3	3.2	0.10	0	0.02	0.3	65%	0.1	0.4
Copper	0.7	65%	0.2	3.2	0.03	0	0.03	0.1	55%	0.0	0.3
NO_3+NO_2	21.5	90%	2.2	3.2	2.7	0	0.67	8.5	80%	1.7	3.9
TP	6.3	75%	1.6	3.2	0.20	0	0.14	0.6	45%	0.3	1.9
No Action Alternative[d]											
TSS	0	N/A	0	2.3	346	4.0	87	1,137	100%	0	0
COD	0	N/A	0	2.3	2.0	4.0	2.0	12.7	60%	5.1	5.1
Zinc	0	N/A	0	2.3	0.10	4.0	0.02	0.3	65%	0.1	0.1
Copper	0	N/A	0	2.3	0.03	4.0	0.03	0.2	55%	0.1	0.1
NO_3+NO_2	0	N/A	0	2.3	2.7	4.0	0.67	8.9	80%	1.8	1.8
TP	0	N/A	0	2.3	0.20	4.0	0.14	1.0	45%	0.6	0.6

[a] Loadings from the SE Bypass North Segment are routed to infiltration ponds. Under the No Action alternative, it is assumed that no roadway drainage would infiltrate to ground water.

[b] Removal efficiencies from Schueler (1987), Winer (2000), and U.S. EPA (2002).

[c] Loading factors for zinc, copper, TSS, and COD taken from Horner et al. (1994) and Horner and Mar (1982).
TP / forest loading factor taken from Metro (1995) study of Lake Sammamish watershed TP inputs, using the value for "East-West" basins.
TP / open space factor proportioned from TP / forest factor based on ratios evident in other research.
Nitrate+nitrate loading factors proportioned relative to TSS loading factors based on results of data for "open space" from the Nationwide Urban Runoff Program (U.S. EPA 1983).

[d] The no action alternative assumes runoff and pollutant loadings from the equivalent area of new roadways plus off-road open space from the development alternative

TSS = total suspended solids.
COD = chemical oxygen demand.
NO_3+NO_2 = nitrate and nitrite forms of nitrogen.
TP = total phosphorus.

Table E-4
Estimated Net Pollutant Loading to Surface Waters from the Southeast Issaquah Bypass Project Site, East Sunset Way, and Front Street in the Year 2030

Pollutant	Gross Loading to Wet Ponds from Roadways (kg/yr)	Wet Pond Removal[c] (%)	Treated Wet Pond Outflows to Issaquah Creek (kg/yr)	Untreated Loading to East Fork from Roadways (kg/yr)	Untreated Loading to Main Stem from Roadways (kg/yr)	Off-road Open Space Area (hectares)	Open Space Load Factor[d] (kg/ha/yr)	Forest Area (hectares)	Forest Load Factor[d] (kg/ha/yr)	Untreated Loading to all Streams from Off-road Areas[e] (kg/yr)	Total Loading to East Fork (kg/yr)	Total Loading to Main Stem Iss. Creek (kg/yr)	Total Loading to Issaquah Creek (kg/yr)
Development Alternatives													
TSS	350	90%	35	606	348	3.2	346	0	87	1,120	1,558	551	2,109
COD	1,051	30%	736	1,817	1,045	3.2	2.0	0	2.0	6.5	1,822	1,781	3,604
Zinc	0.9	65%	0.3	1.5	0.9	3.2	0.10	0	0.02	0.3	1.8	1.2	3.0
Copper	0.5	55%	0.2	0.8	0.5	3.2	0.03	0	0.03	0.1	0.9	0.7	1.6
NO_3+NO_2	14.9	35%	9.7	25.7	14.8	3.2	2.7	0	0.67	8.7	33	25.8	59
TP	4.4	50%	2.2	7.6	4.4	3.2	0.20	0	0.14	0.6	8.1	6.6	15
No Action Alternative[f]													
TSS	0	N/A	0	658	348	2.0	346	3.5	87	1,000	1,508	498	2,006
COD	0	N/A	0	1,973	1,045	2.0	2.0	3.5	2.0	11.2	1,982	1,046	3,029
Zinc	0	N/A	0.0	1.6	0.9	2.0	0.10	3.5	0.02	0.3	1.9	0.9	2.8
Copper	0	N/A	0.0	0.9	0.5	2.0	0.03	3.5	0.03	0.2	1.0	0.5	1.5
NO_3+NO_2	0	N/A	0.0	28	14.8	2.0	2.7	3.5	0.67	7.8	35	16.0	51
TP	0	N/A	0.0	8.2	4.4	2.0	0.20	3.5	0.14	0.9	9	4.5	13

[c] Removal efficiency for TSS and TP from King County (1996). Removal efficiency for COD from Horner et al. (1994)
Removal efficiencies for other pollutants from Winer (2000) and U.S. EPA (2002)

[d] Loading factors for zinc, copper, TSS, and COD taken from Horner et al. (1994) and Horner and Mar (1982).
TP / forest loading factor taken from Metro (1995) study of Lake Sammamish watershed TP inputs, using the lower value for "East-West" basins.
TP / open space factor proportioned from TP / forest factor based on ratios evident in other research.
Nitrate+nitrite loading factors proportioned relative to TSS loading factors based on results of data for "open space" from the Nationwide Urban Runoff Program (U.S. EPA 1983).

[e] Roughly 15% of the open space and forest area is in southern end of bypass corridor, draining to main stem.
All other open space and forest runoff would flow to East Fork.

[f] The no action alternative assumes runoff and pollutant loadings from the same source areas as under the development alternatives, with land uses corresponding to existing conditions

TSS = total suspended solids.
COD = chemical oxygen demand.
NO_3+NO_2 = nitrate and nitrite forms of nitrogen.
TP = total phosphorus.

The estimated loadings to East Fork Issaquah Creek include untreated drainage from Front Street between East Sunset Way and I-90, untreated drainage from East Sunset Way between Front Street and the I-90 Sunset interchange to the east, and untreated overland runoff from off-road areas within the northern portion of the proposed bypass right-of-way.

The net loading estimates must be considered approximate because of a variety of uncertainties and approximations in the traffic modeling, the loading calculation method, and actual runoff treatment performance that would be realized under the development alternatives. However, these estimates provide a reasonable indication of the trends that are expected in pollutant loadings and thus are useful for evaluating the receiving water impacts that could be expected. As shown in Tables F-3 and F-4, it is estimated that pollutant loadings to ground water would increase under any of the development alternatives for all parameters analyzed, and pollutant loadings to surface waters may increase slightly under the development alternatives.

Pollutant Concentrations

To enable comparison of project site runoff quality to the current state water quality standards, total runoff concentrations for the estimated surface and ground water discharges were calculated. The estimated average annual pollutant loadings (in the year 2030) from the project site were converted into concentrations using the estimated average annual stormwater runoff volume from the corresponding drainage areas under existing (i.e., no-action) and developed conditions.

For paved areas it was assumed that 90 percent of the average annual precipitation would produce runoff. For the open space and forested areas, it was assumed that 10 percent of the annual precipitation produces runoff in the developed condition, and 5 percent of the annual precipitation produces runoff in the undeveloped condition. For the open space and forested areas, it was also assumed that 55 percent of the average annual precipitation would infiltrate the ground (see the *Waterways and Hydrologic Systems Technical Report* [Herrera, 1998a] for more on these assumptions). In those open space and forested areas, the remainder of the average annual precipitation would be intercepted by or be taken up by vegetation and then evaporate or transpire back to the air.

Tables F-5 and F-6 show the estimated annual runoff volumes from the project site and nearby roads that would flow to ground water and surface waters, respectively, under each alternative for a typical precipitation year (average annual rainfall in the project vicinity is approximately 146 centimeters [57.5 inches]). The estimated average pollutant concentrations in runoff from the site and nearby roads are also shown in Tables F-5 and F-6. The estimated concentrations of pollutants discharged from the site should be considered approximate, but they do provide a basis for comparing pre- and post-development water quality characteristics.

The state ground water quality standards are shown in Table E-5 for reference. As indicated in Table E-5, the state ground water quality standards would not be violated under any of the project alternatives.

Table E-5
Estimates of Average Stormwater Pollutant Concentrations Discharged to Shallow Ground Water from the Southeast Issaquah Bypass Project Site in the Year 2030

Pollutant	Average Annual Loading to Ground Water (kg)	Area of Pavement Draining to Ground Water[a] (hectares)	Annual Volume of Pavement Runoff Draining to Ground Water[b] (m^3)	Area of Open Space and Forest (hectares)	Annual Volume of Infiltrated Precip in Open Space and Forest Areas[c] (m^3)	Total Infiltration Volume from Site (m^3)	Pollutant Conc. in Infiltrated Runoff[d] (mg/L)	State Ground Water Quality Standard[e] (mg/L)
Development Alternatives								
TSS	0	3.1	41,011	3.2	25,453	66,464	0.000	N/A
COD	382	3.1	41,011	3.2	25,453	66,464	5.75	N/A
Zinc	0.4	3.1	41,011	3.2	25,453	66,464	0.005	5.0
Copper	0.3	3.1	41,011	3.2	25,453	66,464	0.004	1.0
NO_3+NO_2	3.9	3.1	41,011	3.2	25,453	66,464	0.058	10
TP	1.9	3.1	41,011	3.2	25,453	66,464	0.029	N/A
No Action Alternative								
TSS	0	0	0.0	6.3	50,710	50,710	0.000	N/A
COD	5.1	0	0.0	6.3	50,710	50,710	0.10	N/A
Zinc	0.1	0	0.0	6.3	50,710	50,710	0.002	5.0
Copper	0.1	0	0.0	6.3	50,710	50,710	0.002	1.0
NO_3+NO_2	1.8	0	0.0	6.3	50,710	50,710	0.035	10
TP	0.6	0	0.0	6.3	50,710	50,710	0.011	N/A

[a] Includes impervious surface in excess of new construction due to existing road segment runoff contributions.
[b] The annual volume of pavement runoff is calculated as pavement area multiplied by 57.5 inches of rain (1.46 meters) and multiplied by 0.9 to account for some storms that do not produce runo
[c] The annual volume of infiltrated precipitation in open space and forest areas is estimated as 55% of annual precipitation for developed alternatives and for no action.
[d] Loading in kilograms per year is divided by runoff volume in cubic meters and converted to units of milligrams per liter using 1,000,000 mg/kg and 1000 liters per m^3
[e] From WAC 173-200.
Area of open space and forest for no-action = sum of open space and forest from Table F-3
TSS = total suspended solids.
COD = chemical oxygen demand.
NO_3+NO_2 = nitrate and nitrite forms of nitrogen.
TP = total phosphorus.

Table E-6

Estimates of Average Stormwater Runoff Pollutant Concentrations Entering Surface Waters from the Southeast Issaquah Bypass Project Site and Nearby Roads in the Year 2030

Pollutant	Average Annual Loading to Issaquah Creek (kg)	Area of Pavement (hectares)	Annual Volume of Pavement Runoff [b] (m^3)	Area of Open Space and Forest (hectares)	Annual Volume of Open Space and Forest Runoff [c] (m^3)	Total Runoff Volume from Site (m^3)	Pollutant Conc. in Runoff [d] (mg/L)	State Surface Water Quality Standard [e] (mg/L)
Development Alternatives								
TSS	2,109	6.1	79,789	3.2	11,821	91,609	23.0	N/A
COD	3,604	6.1	79,789	3.2	11,821	91,609	39.3	N/A
Zinc	3.0	6.1	79,789	3.2	11,821	91,609	0.033	0.042 [f]
Copper	1.6	6.1	79,789	3.2	11,821	91,609	0.017	0.005 [f]
NO_3+NO_2	59	6.1	79,789	3.2	11,821	91,609	0.64	N/A
TP	15	6.1	79,789	3.2	11,821	91,609	0.16	N/A
No Action Alternative								
TSS	2,006	3.8	50,054	6.3	23,050	73,104	27.4	N/A
COD	3,029	3.8	50,054	6.3	23,050	73,104	41.4	N/A
Zinc	2.8	3.8	50,054	6.3	23,050	73,104	0.038	0.042 [f]
Copper	1.5	3.8	50,054	6.3	23,050	73,104	0.021	0.005 [f]
NO_3+NO_2	51	3.8	50,054	6.3	23,050	73,104	0.69	N/A
TP	13	3.8	50,054	6.3	23,050	73,104	0.18	N/A

[a] Includes impervious surface in excess of new construction due to existing road segment runoff contributions.

[b] The annual volume of pavement runoff is calculated as pavement area multiplied by 57.5 inches of rain (1.46 meters) and multiplied by 0.9 to account for some storms that do not produce runoff.

[c] Estimated as 10% of annual precipitation for developed alternative (5 percent for no action), multiplied by area.

[d] Loading in kilograms per year is divided by runoff volume in cubic meters and converted to units of milligrams per liter using 1,000,000 mg/kg and 1000 liters per m^3

[e] Freshwater (WAC 173-201A).

[f] Chronic effects threshold based on an assumed hardness of 35 mg/L as $CaCO_3$.

TSS = total suspended solids.
COD = chemical oxygen demand.
NO_3+NO_2 = nitrate and nitrite forms of nitrogen.
TP = total phosphorus.

The runoff concentrations shown in Table E-6 represent site averages and do not distinguish between discharges to the East Fork and main stem of Issaquah Creek. (Most of the surface runoff from the Bypass and on Front Street would enter the main stem, whereas most of the runoff from East Sunset Way and from Front Street north of East Sunset Way would enter the East Fork). The current state water quality standards for freshwaters are shown in Table E-6 for reference. Of the pollutants analyzed in this study, the only ones that the state has established surface water quality standards for are zinc and copper. However, the state standards are established for dissolved metals, as opposed to total metals as estimated here. The dissolved fraction of copper and zinc in project area runoff would be at much lower concentrations than total copper and total zinc. Dissolved zinc concentrations would likely be lower than the state standard for surface water quality under any of the project alternatives. It is possible that the state standards for copper would not be met under any of the project alternatives. The comparatively high zinc concentration predicted for the No-Action Alternative is due to projected high traffic volumes in the year 2030 on existing roads (Front Street and East Sunset Way) that do not currently have runoff treatment facilities.

While the state does not have a specified standard for total phosphorus concentrations in freshwaters, the recommended limit set forth by the U.S. Environmental Protection Agency for streams in the Puget Sound lowlands is 19.5 μg/L (0.0195 mg/L) or less (U.S. EPA, 2000). Even with effective treatment of site runoff, discharges to surface waters would probably exceed this concentration under any of the alternatives evaluated in this study. The development alternatives would result in slightly lower average pollutant concentrations in runoff than the No-Action Alternative.

Existing water quality data for Issaquah Creek indicates that the recommended phosphorus concentration limit is not being met most of the time, and occasionally the phosphorus concentrations are much higher than the U.S. EPA recommended limit.

Potential for Accidental Spills of Hazardous Materials

The risk of hazardous material spills contaminating surface or ground waters was evaluated using traffic volume data developed for this project for the design year of 2030, traffic accident data compiled by the State of Washington (WSDOT, undated), and information on nationwide highway truck cargoes prepared by the U.S. Department of Transportation. It is assumed that accidental spills could occur in the Southeast Issaquah Bypass area resulting from accidents involving medium and heavy vehicles (typically trucks) carrying hazardous materials. Table E-7 shows the estimated risk of hazardous material spills on the north and south segments of the Southeast Issaquah Bypass roadway as well as adjacent sections of Front Street South and East Sunset Way. The estimated risk of hazardous material spills has been calculated for the development alternatives and for the No-Action Alternative. The estimated spill occurrence rates shown in Table E-7 are based on projected average daily traffic (ADT) volumes, which were derived from peak p.m. hour traffic volumes for the year 2030 (*Transportation Technical Report*, Parsons Brinckerhoff–see **Appendix G** of this document).

For this evaluation it was assumed that, in addition to trucks carrying hazardous material cargo, all trucks carry hazardous materials in the form of fuel in their fuel tanks. Available spill data for Washington and Oregon indicate that many truck accident-related spills are caused by the rupture of fuel tanks (Adolfson, 1994). The truck accident rate shown in Table E-7 for the proposed bypass roadway assumes that the roadway would be considered a "principal arterial" in terms of functional classification. Additionally, it was assumed that 5 percent of accidents involving trucks result in hazardous material spills (U.S. DOT, 1992). A sample calculation of spill risk is shown at the bottom of Table E-7. The accidental spill calculations were performed for the Alternative 1 configuration of the Southeast Issaquah Bypass because it represents the worst-case potential for spills (the longest combination of road segments amongst the development alternatives). The probability of accidental spills would theoretically be slightly lower (less frequent) under the other development alternatives because they would have reduced roadway lengths in comparison to Alternative 1 for the same traffic volumes.

As Table E-7 shows, the calculated hazardous material spill risk for the Southeast Issaquah Bypass and adjacent arterial roadways indicates that spills would rarely occur. Although the calculated risk must be considered approximate, the trend evident in the table is reasonable. While it is possible that one or more accidental spills could occur in the project area each year, the probability is very low and this would be highly unlikely.

If a spill occurred on a roadway area that drains to an infiltration facility, local ground water quality could be adversely affected under any development alternative if adequate containment measures are not incorporated into the project drainage system design. Although some of the spilled material would be trapped in the soils underlying the infiltration surface, some of it (depending on the magnitude of the spill) would likely escape collection and pass through soil layers, reaching the ground water table. If a spill occurred on a roadway draining to a wet/detention pond, there would be more opportunity to isolate and clean up toxic spill materials to minimize water quality degradation in Issaquah Creek and downstream. If a toxic material spill occurred and the material escaped collection, there could be severe, short-term water quality impacts in downstream surface waters.

Although the estimated rate of occurrence of accidental spills within the project limits indicates that this type of water quality problem would be very rare, the consequences could be major for local well users. Two of the water supply wells operated by the City of Issaquah are located on the south side of I-90 approximately 800 meters (2,600 feet) northwest, and downgradient, of the location proposed for an infiltration pond near the north end of the bypass corridor. A toxic material spill that drains to this infiltration pond could affect water supplies at the nearby wells within a few years if cleanup actions are not taken or if other spill containment measures are not incorporated in the stormwater management facility design. Toxic material spills that would drain to infiltration facilities further south near Issaquah High School could cause similar impacts, but the travel time to the municipal production wells would be longer. Private wells would not likely be impacted by a spill, because no private wells were identified for this study down-gradient of the bypass corridor (see the Waterways and Hydrologic Systems Technical Report [Herrera 1998a] for a map of well locations in the area).

Table E-7

Southeast Issaquah Bypass Hazardous Material Spill Risk in the Year 2030

Road Segment	Assumed Functional Roadway Class[a]	Length (miles)[b]	Peak p.m. Hour Traffic[b]	Average Daily Traffic[b]	Truck Accident Rate[c]	Hazardous Materials Spill Risk (probability in any given year)[d]	Hazardous Materials Spill Risk (1/# years)[d]
Development Alternatives							
Southeast Issaquah Bypass - North	Principal Arterial	0.62	2,960	26,936	0.148	0.045	22.2
Southeast Issaquah Bypass - South	Principal Arterial	0.47	2,435	22,159	0.148	0.028	35.5
Front St. - I-90 to Gilman	Principal Arterial	0.12	3,150	28,665	0.148	0.010	104.0
Front St. - Gilman to Dogwood	Principal Arterial	0.28	1,145	10,420	0.148	0.008	127.1
Front St. - Dogwood to Sunset	Principal Arterial	0.26	1,075	9,783	0.148	0.007	143.3
Front St. - Sunset to Clark	Principal Arterial	0.17	675	6,143	0.148	0.003	346.5
Front St. - Clark to 2nd	Principal Arterial	0.71	900	8,190	0.148	0.016	63.3
E. Sunset Way (west to Front St.)	Principal Arterial	0.62	620	5,642	0.148	0.009	105.6
No Action Alternative							
Front St. - I-90 to Gilman	Principal Arterial	0.12	2,656	24,170	0.148	0.008	123.3
Front St. - Gilman to Dogwood	Principal Arterial	0.28	1,705	15,516	0.148	0.012	85.4
Front St. - Dogwood to Sunset	Principal Arterial	0.26	1,685	15,334	0.148	0.011	91.5
Front St. - Sunset to Clark	Principal Arterial	0.17	1,295	11,785	0.148	0.006	180.6
Front St. - Clark to 2nd	Principal Arterial	0.71	2,000	18,200	0.148	0.035	28.5
E. Sunset Way (west to Front St.)	Principal Arterial	0.75	1,900	17,290	0.148	0.035	28.7

[a] Functional class based on WSDOT Design Manual under RCW 47.05.021.

[b] Length, Peak p.m. Hour Traffic and Average DailyTraffic form Appendix G

[c] Truck accident rate, which is the number of accidents per 1,000,000 vehicle miles, is the product of 1995 WSDOT functional class accident rates (urban areas) and percentage of truck accidents.

[d] Example calculation for principal arterial:

Spill risk = (29,936 veh/d) * (0.62 mi) * (365 d/yr) * (0.148 truck accidents/1,000,000 veh miles) * (0.05 spills/truck accident) = 0.045.

Frequency of spills = 1/0.045 = 1 per 22.2 years on average.

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Appendix F

Transportation Technical Report

Southeast Issaquah Bypass

Draft Supplemental EIS

Draft Technical Report
Southeast Issaquah Bypass

Transportation

December 2003

Prepared for:
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Introduction

This Draft Transportation Technical report examines the feasibility and potential traffic operations within the City of Issaquah with and without the implementation of the proposed roadway, the Southeast Bypass roadway.

The proposed roadway, known as the SE Issaquah Bypass Road, is a north-south corridor connecting at the I-90/Sunset interchange to the north and with Issaquah-Hobart Road to the south.

Six Build Scenario alignment alternatives were evaluated for the Southeast Bypass Road as well as an additional No Action Scenario for Opening Year 2005 and Design Year 2030. Each of the Build alignment alternatives assumed a four-lane footprint (two lanes per direction). This report describes the different alignment alternatives and presents the traffic analysis results from the evaluation.

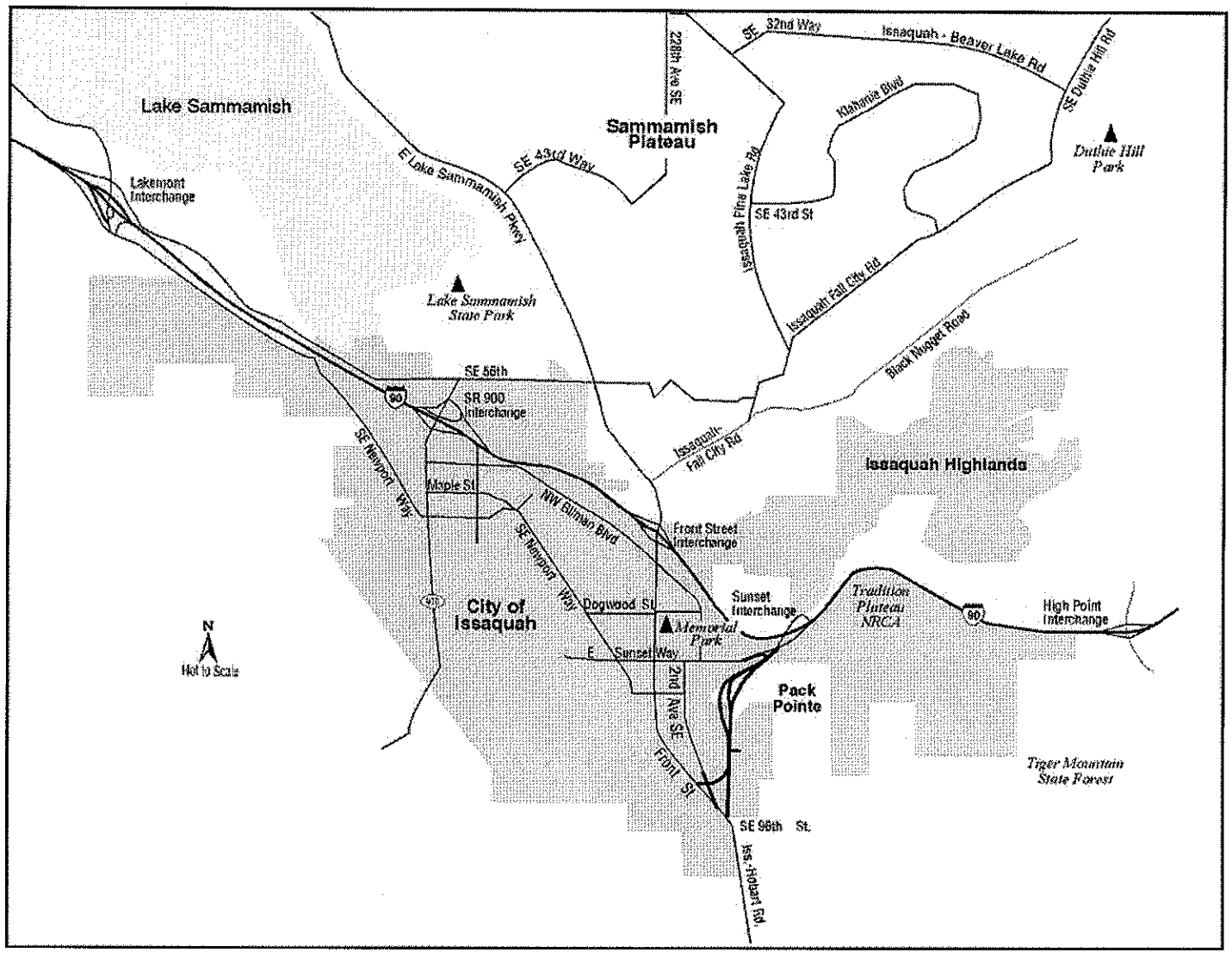
Purpose

The purpose of the Transportation Technical Report is to present the traffic analysis results for two transportation infrastructure scenarios within the City of Issaquah. The first scenario, the No Action, analyzes the major City corridors without the Southeast Bypass roadway. The second scenario, the Build, analyzes the traffic operations for the major City corridors with the inclusion of a variety of alignment alternatives for the Southeast Bypass Road. For both scenarios, future Opening Year 2005 and Design Year 2030 condition were analyzed. The Build Scenario includes several various north and south alignments making a total of six Build alignment alternatives.

Both scenarios evaluated peak hour traffic operations for the main intersections within the City limits for the Front Street corridor, East Lake Sammamish Parkway, Issaquah Fall City Road, North and South Sammamish Plateau Access Road (SPAR), and East Sunset Way. **Figure 1** illustrates the major corridors examined in this study. Though the Issaquah-Hobart Road and May Valley Road intersection is outside the city limits, this intersection was included in the traffic analysis due to its proximity to Front Street and the proposed Southeast Bypass, and the intersection's potential influence on both arterials.

The city is currently experiencing a large volume of pass-through traffic in the AM and PM peak hours, pass through traffic in Issaquah is essentially defined as those trips originating and ending outside the City. Most of the pass-through traffic occurs in the north-south direction, as vehicles try to access Interstate 90 in the peak hours. Travel forecast models show that the proposed SE Issaquah Bypass Road will act as a bypass to the Front Street corridor, which currently serves most of the pass-through traffic and is heavily congested. The Southeast Bypass roadway will also reduce neighborhood cut-through traffic along Second Avenue SE, which is forecasted to occur without the Southeast Bypass Road. Second Avenue SE is primarily a residential arterial with Issaquah High School located nearby. The purpose of this report will be to compare traffic results for different alignment alternatives and provide a full picture of existing and future projected traffic operational conditions.

Figure 1: Vicinity Map and Roadway Network



Project Description

The proposed project would involve construction of a new north-south arterial in the City of Issaquah in order to reduce congestion on local streets by providing an alternate connection to I-90 (the Sunset interchange) at the north end of the arterial as well as a connection to Issaquah-Hobart Road at the south end. Construction would occur entirely within the Issaquah city limits, except for two small portions of unincorporated King County land near the Issaquah Sportsmen's Clubhouse in the north and an area south of SE 96th Street near the southern limits of the project area. The new roadway would be approximately 1.25 miles (mi) (2 kilometers [km]) long.

Background

In June of 2000, the Southeast Issaquah Bypass Draft Environmental Impact Statement (DEIS) was completed and submitted for review and comment. In that report, six alignment alternatives were considered, each combining one of three north alignments[1] (North A, B, and C) with one of two south alignments (South A and B). As a result of that review, the three alignment alternatives that would include the South B alignments were rejected due to potential wetland impacts. As the City began to explore other approaches for the southern alignments at the end of 2000, the project was placed on hold while additional funding sources were pursued. When funding was restored in the fall of 2001, a new south alignment following the abandoned railroad right-of-way south of Issaquah High School and west to the intersection of Second Avenue and Front Street was developed. This new alignment, identified as South C, is being considered in combination with the northern alignments identified in the DEIS, for additional environmental evaluation.

Another modification that occurred once funding was restored was the decision to update the traffic model for the proposed project. The need for a new traffic model resulted from consultation with state and federal transportation agencies involved in reviewing the DEIS. The traffic model used in the DEIS was largely the same as that utilized in the South SPAR EIS in 1999, when it was thought that the Southeast Bypass project would follow closely behind other Issaquah-area transportation proposals. Because of project delays, the Southeast Bypass schedule has changed. In order to evaluate a long-term horizon year more appropriate to state and federal regulations, the City agreed to change the design year analysis from Year 2015, as evaluated in the DEIS, to Year 2030. As the new traffic model was developed, the baseline existing conditions year was also modified from Year 1995/96 to Year 2000. Opening Year 2005 will remain the same; however, updated traffic modeling and traffic analysis was also performed for Year 2005.

The revised traffic modeling will be used to refine the South A and South C alignment designs for review in a Supplementary Environmental Impact (SEIS) where potential environmental impacts of the South C alignment will be presented.

[1] The alignments identified in the DEIS are described for completeness in this technical report in the paragraph 'Alternatives Analyzed'

Alignment Alternatives Analyzed

In this report six Build alignment alternatives are evaluated. These alignment alternatives are a combination of three possible alignments in the north ((North A, B, and C) and two in the south (South A and C). The posted speed limit would be 35 miles per hour for each of the Build alternative alignments. These alignment alternatives are evaluated for both the Opening Year 2005 and the Design Year 2030. Please refer to **Figure 2** for an illustration of the various proposed alignments of the Southeast Bypass Road.

The three north alignments were presented in the DEIS (June 2000). These three north alignments stretch from just south of East Sunset Way to approximately SE Evans Street. The North A alignment is routed between the Issaquah High School building and its adjacent athletic field along an old railroad grade. The North B alignment is routed between the school athletic field and the Issaquah Sportsman's Club. The North C alignment is routed between North A and North B, east of the school athletic field, and west of the Issaquah Sportsman's Club.

Two south alignments were carried forward, the South A and the South C alignments, and span from approximately SE Evans Street to Issaquah-Hobart Road. The South A Alignment was also presented in the DEIS (June 2000) and is routed adjacent to the existing Sixth Avenue SE. The South C alignment was developed after the DEIS was published. This alignment follows the abandoned railroad right-of-way south of Issaquah High School, then west to the intersection of Second Avenue SE and Front Street, creating a modification to the existing intersection.

The alignment alternatives can be categorized as follows:

Alternative 1: North A alignment and South A alignment

Alternative 2: North A alignment and South C alignment

Alternative 3: North B alignment and South A alignment

Alternative 4: North B alignment and South C alignment

Alternative 5: North C alignment and South A alignment

Alternative 6: North C alignment and South C alignment

Alternative 7: No Action

Although the three north alignments (North A, B, and C) result in different impacts for some environmental elements, traffic operations for the three north alignments are projected to be similar. The channelization and traffic capacity characteristics are similar for all north alignments. Therefore, for the purpose of this discipline report, the alignment alternatives analyzed combine a representative "generic" north alignment with the South A and South C alignments. In essence then, two Build alignment alternatives are studied for this report, the "generic" north alignment combined with the South A alignment, and the "generic" north alignment combined with the South C alignment. **Figure 3** and **Figure 4** depict the preliminary South A and South C alignments and proposed channelization along the SE Issaquah Bypass Road, respectively.

In addition to the Build Scenario alignment alternatives, a No Action Scenario (Alternative 7) is evaluated in this document for Years 2005 and 2030. The No Action Scenario is included to provide a baseline against which to compare the future impacts of the Build Scenario alignment alternatives. In the No Action Scenario, the Southeast Issaquah Bypass project would not be constructed and vehicles would continue to use the existing travel routes in the area. Other improvements, such as the North and South SPAR and Sunset Interchange would be implemented and are included in the No Action Scenario for Years 2005 and 2030.

Summary of Results

The following summarizes the traffic analysis results for the various scenarios analyzed for Opening Year 2005 and Design Year 2030:

- The SE Issaquah Bypass Road will effectively operate as a bypass to Front Street, reducing Front Street congestion and detract cut-through neighborhood traffic along Second Avenue (volume reductions were observed on both Front St. & and Second Avenue when the SE Issaquah Bypass Road was modeled) as compared to the future No-Action results.
- Traffic demand forecasts indicate that the SE Issaquah Bypass Road should be a four-lane arterial (two lanes per direction) approximately five years after opening year.
- All three North Alignments (North A, B, & C) along with the South A and C alignments are acceptable in terms of traffic operations.
- Issaquah-Hobart Road is expected to become capacity constrained by the Year 2030.
- Greater reductions in volumes along Front Street are observed with implementing the SE Issaquah Bypass Road in comparison to widening SR 18 to four lanes.

East Lake Sammamish Parkway, Issaquah-Fall City Road, and SR 900 are anticipated to operate poorly by the Year 2030 with or without the SE Issaquah Bypass Road.

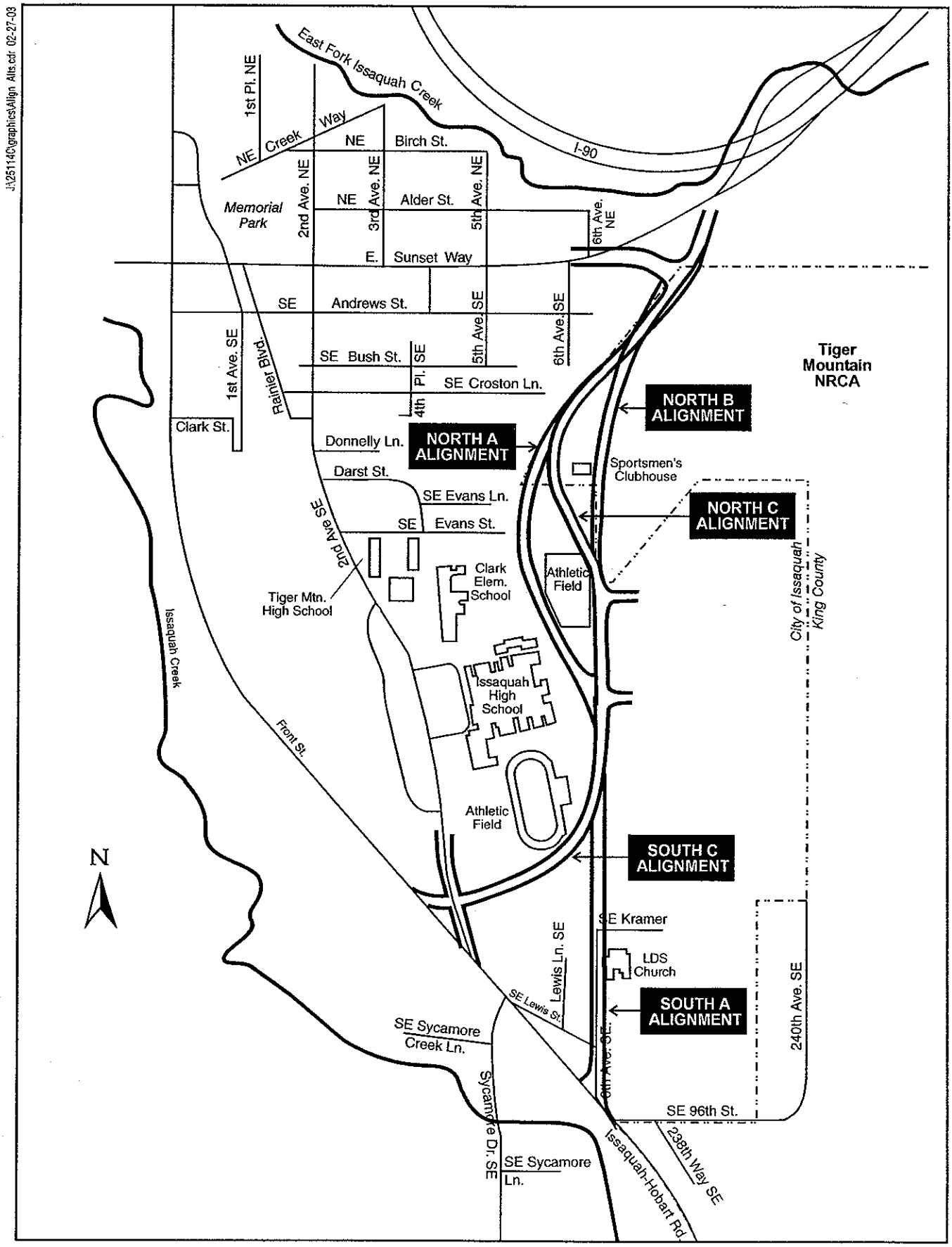


Figure 2
Southeast Issaquah Bypass
SDEIS Alignment Alternatives

Figure 3: Proposed Channelization for South A

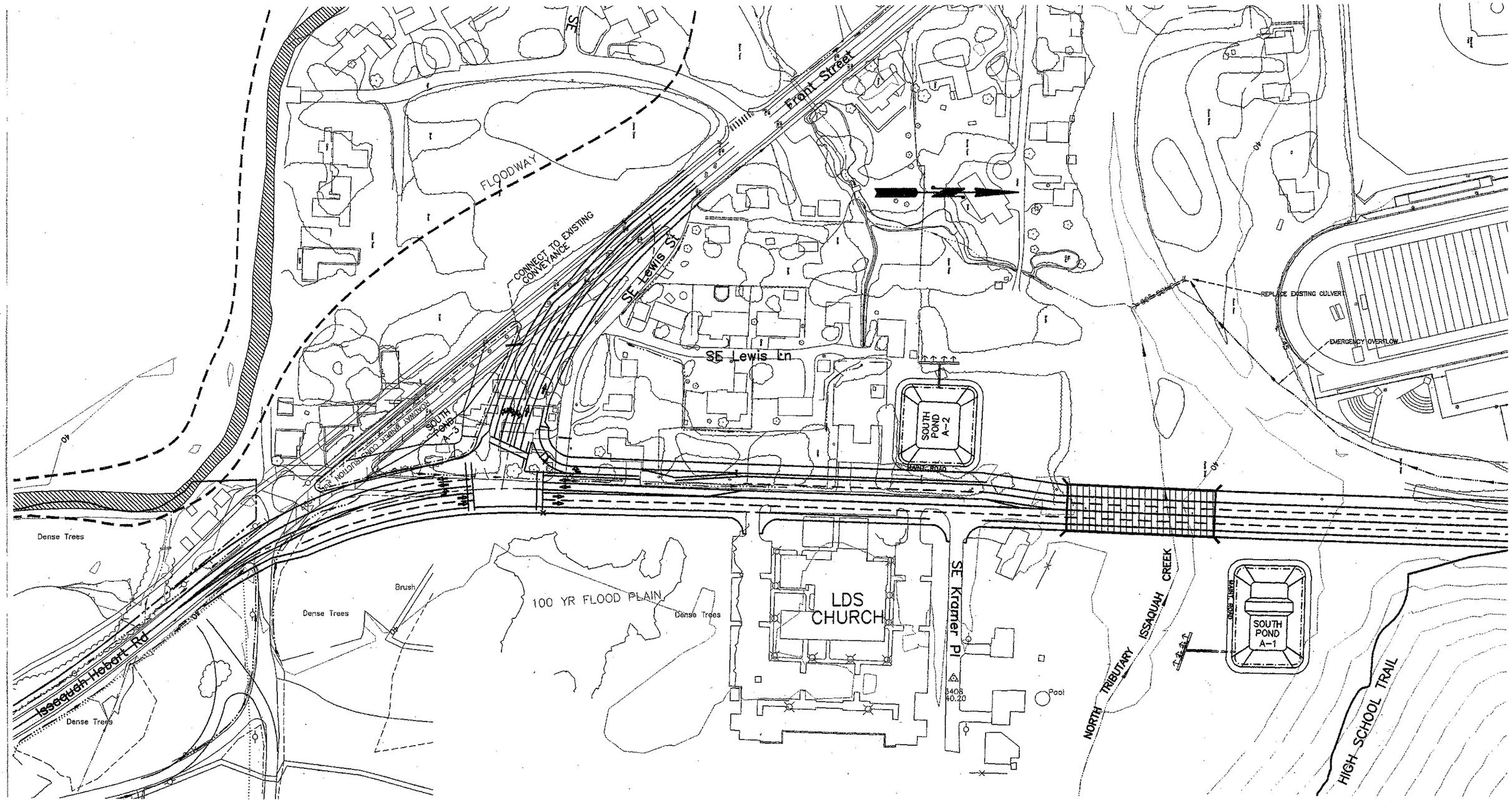
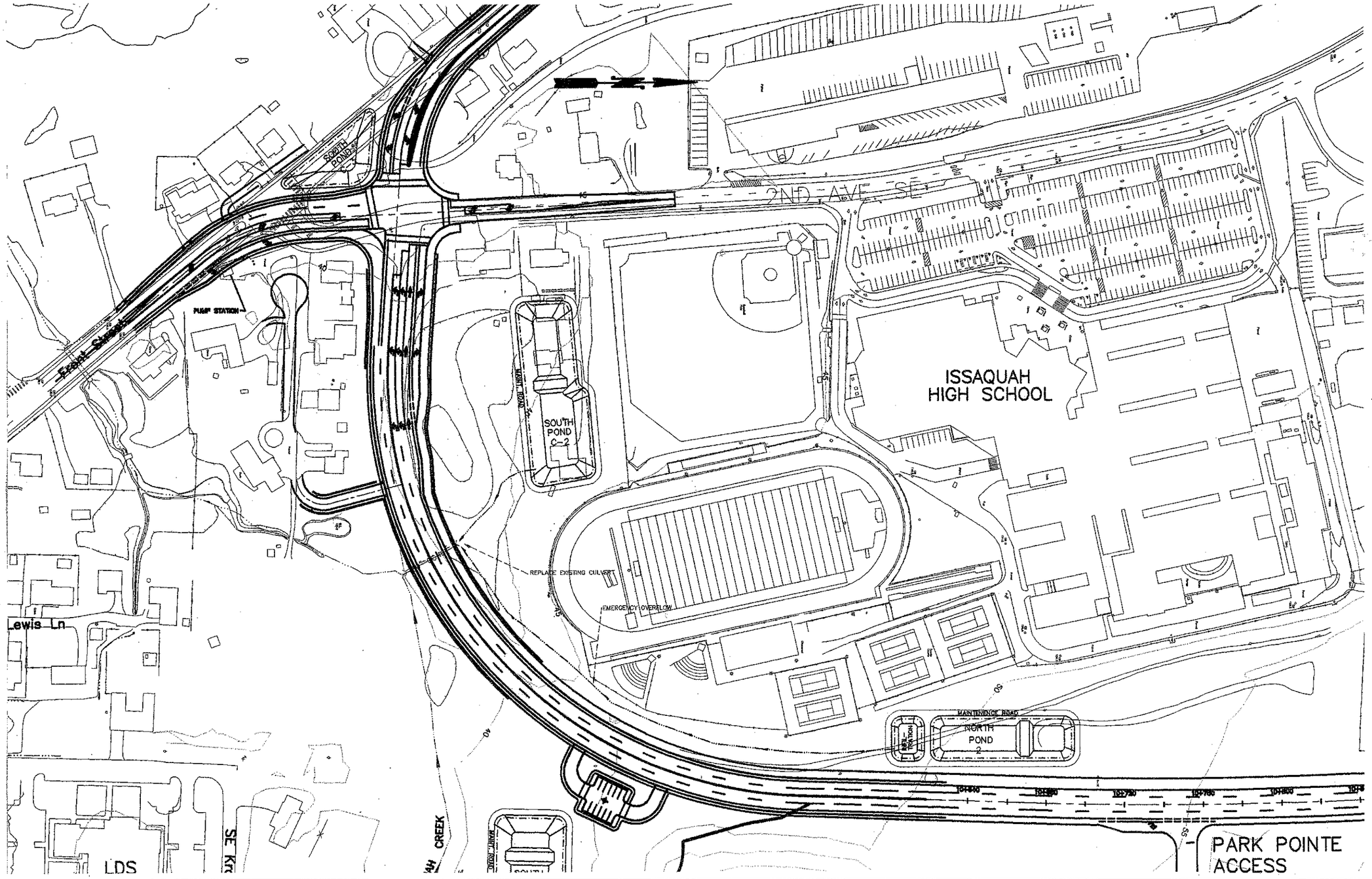


Figure 4: Proposed Channelization for South C



Traffic Forecast Modeling Methodology

This chapter summarizes the methodology used for developing the Years 2005 and 2030 traffic forecast models. One of the outcomes from the review process of the DEIS (June 2000) was to update the travel demand forecast estimates and modify the design horizon year from 2015 to 2030. The updated travel forecasting process also changed the existing base year model from 1995/6 to Year 2000. The opening year stayed the same, at Year 2005; however the traffic forecasts were updated based on the updated Issaquah travel model. The Issaquah travel model estimated future travel demand on the arterials within the project study area. The following is a summary of the development of the Issaquah travel demand forecasting model. Please refer to Appendices C and D for the methodology reports in their entirety.

Issaquah Travel Model for Year 2005 and Year 2030

The Issaquah travel model estimates the travel demand for each corridor within the City of Issaquah for the AM and PM peak hours for future years. The travel model uses both employment and population forecasts as a basis for developing the traffic forecasts. The Issaquah travel model has not changed in its basic concept since it was delivered to the City in its original 1997 version, as developed by the TModel[2] Corporation. The model represents a "windowed" approach as opposed to a regional approach. Estimates of traffic at external stations (points where major roads enter and exit the study area) must be obtained from a regional model such as King County's. The model has been refined through various traffic studies. The current version of the model was calibrated with updated land uses as of the end of 1999 and traffic counts taken in early 2000.

The original 1997 version of the model is documented in a technical report entitled "Issaquah Transportation Planning Model Report," TModel Corporation, April 1998. The most recent update is described in "Update of the Issaquah Travel Model to 1999 Conditions," May 22, 2001.

Land Use

Land use forecasts identify the amount and rate of residential and employment growth anticipated. This information is used to estimate trip productions (residential development) and trip attractions (employment development) that can be expected for each zone within the model. These data are inputs for the traffic model to produce and assign vehicle trips.

Household and employment estimates for Year 2005 were available from the *SR900 Definition Study*, completed by Parsons Brinckerhoff in 2000. However, subsequent to that study, the Issaquah Travel Model had been updated with new estimates of existing land use. The 2005 estimates from the SR 900 Definition Study were therefore compared with the new existing land use estimates, in each location and for each category of activity, to be certain that 2005 values were at least as high as existing values. The final 2005 estimates are shown below in **Table 1** along with the most recent estimates of 1999 land use

[2] See Appendix A for a description of the software used in this study.

Table 1: Comparison of Land Use Scenarios for the Issaquah Model

Floor area in thousands of sq ft:

Land Use Scenario	Total HH	Retail	Office	WTCUM
Existing Conditions (as of 1999)	16,793	1,826	1,857	1,806
2005 for Southeast Bypass	23,641	2,692	4,527	2,051

Note: WTCUM = wholesale, transportation, communication, utilities, and manufacturing.

The 2005 land use estimates shown in Table 1 included the proposed Park Pointe development, consisting of 594 SFDUs (single-family dwelling units) and 163,000 square feet of office space; this assumes the SE Issaquah Bypass is constructed. In the No-Action scenario, where it is assumed that the SE Bypass would not be built; it was assumed that no office space would be developed and 431 SFDUs would be constructed. Also under 2005 land use assumptions, Issaquah Highlands was assumed to be partially built out with 713 SFDUs, 960 MFDUs (multi-family dwelling units), 112,000 square feet of retail, 913,000 square feet of office, and 500 Park and Ride lot spaces.

The travel demand for Year 2030 was estimated by using the Issaquah travel model together with the best current estimates of land uses for the Year 2030. The most recent update of the Issaquah travel model had resulted in two land use scenarios being prepared: one for 1999, and one to illustrate "concurrency." In the Issaquah model the concurrency scenario consists of existing land use, plus any development proposals that are either considered to be vested or have been certified as concurrent by one of the three jurisdictions in the Issaquah model window (Issaquah, King County, and Sammamish).

By definition, the concurrency scenario is not associated with any specific future year, because specific years of completion are not defined for the various proposed developments considered vested or concurrent. However, the concurrency scenario is similar to the idea of "pipeline" growth—growth that is foreseeable because it has actually been proposed by landowners or developers. It was assumed that the development proposals contained in the concurrency scenario would be completed before the Year 2030.

With this in mind, it was initially assumed that 2030 land uses could be estimated for the Issaquah model by first creating a pipeline scenario and then adding sufficient growth to reach the 2030 land use projections of the Puget Sound Regional Council (PSRC). These projections are provided at the level of the PSRC's own traffic analysis zones (TAZs), which are considerably larger than the sub area analysis zones (SAZs) of the Issaquah model.

The pipeline scenario was created by taking concurrent development as a starting point, and adding the proposed Park Pointe development, which is expected to consist of 594 single-family households and 163,000 square feet (ksf) of office; assuming that the SE Bypass is constructed. Park Pointe is of particular significance because, as proposed, it would have direct access to the SE Bypass arterial. In the No-Action scenario, where it

is assumed that the SE Bypass would not be built, the Park Pointe Development consisted of no office space and 431 SFDUs.

Because the PSRC model uses employees and the Issaquah model uses floor area as variables, a conversion factor was developed for a common year (1999). The PSRC land use forecasts were then translated into floor areas as used in the Issaquah model.

Once the conversion was completed, it was noted that the PSRC's forecast 2030 land use appeared to be generally lower than that of the pipeline scenario. After discussions with PSRC and Issaquah staff, it appeared that the problem was most evident in the Issaquah Highlands area, where vested development is much higher than the PSRC forecasts.

A first solution to this problem was to compare the PSRC and pipeline forecasts for each land use category and TAZ, and in each case simply accept the higher of the two values. Since the PSRC forecasts were in some instances higher than pipeline, this necessarily produced a "hybrid" scenario higher than either PSRC or pipeline. But once this had been accomplished, the results showed residential growth at locations in the City of Issaquah where traffic would almost certainly generate level of service failures under the City's concurrency policies. Such growth could not, in fact, be approved under the City's concurrency standards without street system improvements that are not now considered to be committed projects as defined in the state Growth Management Act (GMA). Within the City, therefore, residential growth under the hybrid scenario was slightly reduced to a level just above pipeline estimates. The final 2030 land use estimates for the study area contained by the Issaquah models are shown below in Table 2 along with 1999, concurrency, and PSRC-based estimates.

Table 2. Comparison of Land Use Scenarios for the Issaquah Model

Floor area in thousands of sq ft

LAND USE SCENARIO	Total HH	Retail	Office	WTCUM
Existing conditions (as of 1999)	16,793	1,826	1,857	1,806
Concurrency (as of 1999)	25,823	3,070	8,485	1,464
2030 PSRC	23,392	2,072	2,591	2,264
2030 Hybrid	30,593	3,196	8,973	2,299
2030 Hybrid with HH reduction	29,690	3,196	9,129	2,299

Note: WTCUM = wholesale, transportation, communication, utilities, and manufacturing.

In the 2030 scenario, Issaquah Highlands was included as a vested project consisting of 1,468 single-family units, 2,397 multi-family units, 477-ksf retail, 3,386-ksf office, and 1,000 park-and-ride spaces.

King County has produced 2020 traffic forecasts using a new travel model, but has not produced any forecasts for 2030. It was therefore necessary to estimate 2030 external station traffic for the Issaquah model using a different method. To do this, the assumption was made that traffic at the model's external stations would increase at the same rate of growth as internal trip generation between the concurrency and 2030 land use scenarios.

Trip Generation

The PM peak hour origin-destination vehicle trip generation rates developed for the existing condition model's calibration were also used for the Years 2005 and 2030. Because the model uses vehicle trip generation rates directly, carpools and non-carpools are merged in the final trip table. Also, there is no explicit estimate of the share of person trips using transit; the transit mode share is implicit in the model's vehicle trip generation rates. The assumption of constant rates, however, is equivalent to assuming that both 2005 and 2030 vehicle occupancies and transit shares will be equivalent to current levels.

For this report, the PM peak hour trip tables normally generated by the Issaquah model were transposed and loaded on the network in order to obtain approximations of system traffic demand in the AM peak hour. In the calibration year, comparisons of the resulting AM traffic flows to a limited number of AM counts on I-90 indicated a good match, so no further changes were made in this procedure.

Project Scenarios for Year 2005 and Year 2030

Two scenarios – No Action and Build – were analyzed for both 2005 and 2030. The definition of the SE Issaquah Bypass Road (as a four-lane footprint) is assumed for both evaluation years. As mentioned previously, the similarity in traffic operations between the three North alignments, allowed just one North alignment to be modeled. However, the South alignments warranted separate analysis and a brief descriptions of the two alignments are described below:

- **Build with South A Alignment.** The proposed south alignment would continue south from the high school and run immediately west of Sixth Avenue SE. The South A alignment was presented previously in the DEIS (please refer to **Figure 3**).
- **Build with South C Alignment.** The proposed south alignment would curve westward to follow the railroad tracks and form a new four-way signalized intersection with Second Avenue SE, just north of where Second Avenue SE currently intersects Front Street. The South C alignment is a new alignment proposal that was not described in the DEIS (please refer to **Figure 4**).

Under the Build Scenario, it is also assumed that there would be two access points from the Southeast Bypass Road to the proposed Park Pointe development. The first would be at a location roughly in line with Evans Street and the second would be an unsignalized access south of the main entrance operating as a right in, right out.

For the No Action Scenario, the Southeast Bypass Road is eliminated between East Sunset Way and Front Street, and the intersection of Front Street and Second Avenue SE remains in its existing configuration. The Park Pointe development as currently proposed would not occur without the Southeast Bypass Road, but would be replaced with a less-intensive residential development under current zoning if the Southeast Bypass Road was not built. It was further assumed that this smaller development would have an access road connecting to Front Street roughly where Sixth Avenue currently intersects Front. No other changes were made between the Action and No Action networks.

Roadway Network Assumptions for the Intersection Analyses

The future build networks in both the Issaquah Travel Model and the traffic operations analysis simulation models consisted of the existing street system plus any network improvements planned. The City of Issaquah has identified certain projects in its Transportation Improvement Program (TIP 2002 - 2007) that will be completed in the next few years. The TIP includes other jurisdictions in the model window, including King County, City of Sammamish, and WSDOT (please refer to Appendix C for the Year 2005 network assumptions and for the Year 2030 assumptions, please refer to Appendix D). **Table 3** depicts the proposed facilities and assumptions made for the Build and No Action Scenarios. The difference between the two scenarios is the inclusion of the SE Issaquah Bypass Road; where the roadway is included in the Build Scenario and not in the No Action Scenario.

Table 3. Proposed Facilities for Scenarios

	Proposed Facilities				
FORECAST YEAR AND SCENARIO	Funded and Planned Transportation Improvements	Modified Sunset Interchange	South SPAR	North SPAR	Southeast Issaquah Bypass
Existing					
2005 No Action	✔	✔	✔	✔	
2005 Build	✔	✔	✔	✔	✔
2030 No Action	✔	✔	✔	✔	
2030 Build	✔	✔	✔	✔	✔

Various corridors throughout the City of Issaquah were evaluated for Existing Year 2000, year 2005, and Year 2030 traffic conditions. The evaluation included the main intersections along that corridor (primarily signalized intersections). These corridors included:

- Front Street – from the I-90 Ramps to Second Avenue SE
- Issaquah Fall City Road – from Issaquah-Pine Lake Road to East Lake Sammamish Parkway
- East Lake Sammamish Parkway – from SE 43rd Way to I-90 Ramps
- SR 900 – from NW Sammamish Road to Newport Way NW
- Second Avenue SE – from Front Street to East Sunset Way
- East Sunset Way – from the Sunset Interchange to Front Street
- Issaquah-Hobart Road – from Second Avenue SE to SE May Valley Road

Additionally, for Years 2005 and 2030, two additional corridors were considered:

- North and South Sammamish Plateau Access Road (SPAR) – from SE Issaquah-Fall City Road to Sunset Interchange.

- SE Issaquah Bypass Road – from East Sunset Way to Front Street

The lane configuration assumptions, traffic volumes, and signal timings for Existing conditions 2000 were based on field observations. An existing conditions traffic operations simulation model using the Synchro/Simtraffic[4] software was developed previously for the City and used for the Southeast Bypass project. The lane configuration assumptions for Year 2005 and Year 2030 (Build and No Action Scenarios) for the corridors were based on a review of the City of Issaquah's 2000 Comprehensive Plan, the Transportation Improvement Program (TIP) 2002 – 2007, and the Capital Improvement Plan (CIP) 2002 – 2007. Additionally, some of the planned and programmed improvements have not been studied completely to date; therefore after discussions with the City, reasonable assumptions were made as to what the design would look like, and these assumptions are presented below in **Table 4**. The assumptions made for this traffic analysis are considered reasonable and meet the purpose of the Southeast Issaquah Bypass transportation technical analysis for Years 2005 and 2030.

Table 4. Planned Improvements Assumed for the Traffic Operation Analysis

Intersection	Planned and Programmed Improvement	Synchro Model Year Incorporation
Front St N & I-90 WB Ramps	Construct an additional NB Lane (3 total)	2030
Front St N & I-90 EB Ramps	Interchange Reconstruction Construct an additional lane for left turning movements at the off-ramp – continue 3 lanes north to Issaquah-Fall City Rd	2030
Front St N & Gilman	Increase length of EB left-turn pockets, modify SB right turn lane & island for free right, re-stripe WB Gilman to convert TH/RT to RT only lane	2030
Front St N & Dogwood	Intersection improvement study Realign intersection for improved operations & safety NW Dogwood Street Improvements – restore road base for 2 travel lanes Roadway Reconstruction & Paving on Dogwood from Newport Way to Front St N	2030[3]
E Lk Samm & 56th St SE	Committed 4/5 lane project SE 56th St from I-90 to E Lk Sammamish Pkwy Dual NB & EB LT lanes	2005 & 2030

[4] See Appendix A for a description of the software used in this study.

[3] It was assumed that by the year 2030, the Front Street & Dogwood intersection would be realigned and would operate as a four-way signalized intersection.

Issaquah-Fall City & E Lk Samm	Recommended 6/7 lane project on E Lk Sammamish from I-90 to Issaquah-Fall City Rd Construct an additional NB lane (3 total)	2005 & 2030
SR 900	Widening of the arterial including an HOV Bypass Lane	2005 & 2030
Sunset Way Interchange	Modification of the Interchange in order to provide full access	2005 & 2030
SPAR	North and South SPAR arterial developed and tied into Issaquah-Fall City Rd/Issaquah Pine Lake Rd to the north and the Sunset Interchange to the south	2005 & 2030

Travel Patterns

North / South Corridors

In the AM peak hour, the peak direction of traffic in the North/South corridor south of I-90 was northbound. SR 900, Front Street, South SPAR, Second Avenue SE, and the SE Bypass Road (Build Scenario) all show higher volumes in the northbound direction. This peak directional movement is due to vehicles from the south destined to I-90 combined with those heading into the Issaquah downtown area. In the PM peak hour, the heavy directional movement changes where vehicles traversing the corridors south of I-90 are primarily heading southbound from the freeway, or destined out of the business district to the residential areas to the south. North of I-90, the North SPAR arterial is also a North/South corridor, serving many residential areas. In the PM peak hour, the peak direction of travel for North SPAR is northbound (again, away from the freeway).

East / West Corridors

A clear travel pattern for the east/west corridors was more difficult to determine since many east/west arterials serve residential areas as well as commercial areas. When east/west arterials lead to I-90 access points, the peak direction was toward I-90 in the AM peak hour and away from the freeway in the PM peak hour.

Intersection Traffic Analysis

Once the travel demand for future years are developed for the peak hours using the Issaquah Travel model, the peak hour volumes are incorporated into the Synchro/SimTraffic software in order to obtain several measures of effectiveness (MOEs) such as level of-service, intersection delay and potential queuing at each intersection. The various MOEs were collected in the simulation portion of the software package (SimTraffic) in order to account for potential impacts due to queuing.

The Synchro and SimTraffic simulation model software was used to analyze traffic operations for various networks. Five networks were developed to analyze various arterial corridors. Corridors analyzed as networks included SR 900, Fall-Fall City Road, and East Lake Sammamish Parkway. Front Street, Second Avenue SE, East Sunset

Way, SPAR, Issaquah-Hobart Road, and SE Issaquah Bypass Road corridors were analyzed together in one network. Aerial images were used to determine general intersection spacing and several field visits were conducted to confirm channelization for existing intersections and the estimated storage lengths for right- and left-turn pockets. Volumes from the Issaquah Travel Model were used as input for the Synchro models.

As described previously, three North alignments (North A, North B, and North C) are being considered for the SE Issaquah Bypass Road. The differences in impacts between the three north alignments relate more to the environmental and right-of-way impacts than to traffic operations. The traffic operations for all of the north alignments are very similar, and therefore have been modeled as just one North alignment (the North A alignment was assumed to be representative of all three alignments). Please refer to **Figure 3** and **Figure 4** for illustrations of the lane configurations assumed for the SE Issaquah Bypass Road (South A and C alignments) for Design Year 2030.

Two South alignments were considered for the SE Bypass Road, which included South A and South C. The differences between the two south alignments were significant enough to warrant two separate Synchro/SimTraffic models. **Figure 2** illustrates the North and South Alignments considered.

The traffic analysis results are recorded as a level of service (LOS) designation primarily determined through the anticipated intersection delay. The results recorded are based on SimTraffic software results. SimTraffic simulates the network corridor, and the simulation is recorded for the entire peak hour. The AM peak hour was designated as 7:00 to 8:00 AM and the PM peak hour was considered as 5:00 to 6:00 PM. SimTraffic creates a simulation for the peak hour and assumes random arrival for vehicles at the intersections. Due the random arrival assumptions, results may differ slightly per file run; therefore three simulations were run for each alignment alternative and peak hour. The results presented in this report are an average of the three simulations.

The SimTraffic software program defines a queued vehicle as one that is stopped for at least five seconds. However, queued vehicles that are moving at 5 to 10 mph, known as rolling queues, also impact intersection operations. These rolling queues would not be accounted for because of the five-second-queue definition. Therefore, areas where rolling queues were observed throughout the analyses will be noted as appropriate.

Existing Conditions

This section describes the existing characteristics of the transportation system within the study area. The study area is defined in the DEIS as bounded by SE 43rd Way on the North, SR 900 on the west, Issaquah-Hobart Road at Issaquah's southern city limits on the south, and the edge of the west-facing slope of the Lake Tradition plateau on the east. Existing conditions refers to roadway infrastructure conditions for the Year 2000.

The existing transportation network consists of the street system as existing in Year 2000. Any transportation improvement implemented after Year 2000 is not taken into account in this description.

As discussed previously, the Synchro/SimTraffic software was used to analyze the operations of the study intersection during the peak hours. The level of service (LOS) analysis was based on the methodology outlined in the 2000 Highway Capacity Manual (HCM) as calculated by the SimTraffic software program.

Intersection/Corridor Analyses

The corridors analyzed for the existing conditions include Front Street, Second Avenue SE, East Lake Sammamish Parkway, Issaquah-Fall City Road, and SR 900. The existing conditions traffic operations simulation model had been developed earlier by the City and was subsequently used for this project. The following describes peak hour traffic operations currently experienced for the study corridors. Please refer to **Table 5** and **Table 6** for a summary listing of all the intersections in the study area and the estimated AM and PM peak hour delay and level-of-service (LOS) for each.

Front Street

Front Street is a north-south arterial that provides a connection between I-90, the South Sammamish Plateau area, downtown Issaquah, and areas to the south and southeast of Issaquah. Through the downtown area the posted speed limit is 25 mph and has one lane in each direction. Front Street becomes East Lake Sammamish Parkway north of I-90 and Issaquah Hobart Road south of the Issaquah City limits. Signalized intersections on Front Street include those with the eastbound and westbound I-90 ramps, NW Gilman Boulevard, East Sunset Way, SE Newport Way/Clark Street, and Second Ave SE.

Table 7 presents existing peak hour traffic operations analysis results for Front Street. See **Figure 5** for a graphical display of volumes as well as calculated LOS results along Front Street.

Table 5
Years 2000, 2005 and 2030 AM Peak Hour Intersection Level of Service

EIS Alternatives and Forecast Years			Intersection Name																											
Forecast Year	SPAR	Bypass	SR9 00/NW Sammamish	SR 900/WB Ramps	SR 900/EB Ramps	SR 900/Gilman	SR 900/Maple	SR 900/Newport Way	Front/WB Ramps	Front/EB Ramps	Front/Gilman	Front/Dogwood	Front/Sunset	Front/Clark	Sunset/WB Ramps	Sunset/EB Ramps	SE Bypass/Sunset	SE Bypass/Park Pointe Access	SE Bypass/Front (South C)	SE Bypass/Front (South A)	Iss-Hobart/May Valley Rd	Sunset/2nd[1]	Bush/2nd[1]	Front/2nd[2]	E Lk Sammamish/Iss Fall City Rd	E Lk Sammamish/43rd	E Lk Sammamish/56th	E Lk Sammamish/62nd	E Lk Sammamish/Black Nugget	Iss-Fall/Iss-Pine/SPAR	Issaquah-Fall/Black Nugget	SPAR/Black Nugget
Year 2000: Existing	No Build	No Build	E 69	B 17	D 40	C 31	C 26	F >80	F >80>	F 80	C 26	B 16	C 31	C 20	NA not coded	NA not coded	NA	NA	NA	NA	NA not coded	A 7	A 7	F >80	F >80	NA not coded	E 64	C 29	B 17	F >80	F >80	NA
Year 2005: No Action	Build	No Build	C 31	B 10	F >80	E 61	D 43	F >80	C 29	B 15	E 72	A 10	C 22	F >80	A 8	B 17	NA	NA	NA	NA	F >80	B 11	B 11	F >80	F >80	E 64	F >80	D 46	A 8	E 66	C 23	A 8
Year 2005: Build	Build	Build	C 33	A 10	F >80	E 66	D 47	F >80	C 29	B 20	D 48	B 13	C 25	D 41	B 15	B 16	A 8	B 16	C 32	B 12	F >80	A 5	A 4	A 4	F >80	C 21	F >80	F >8	B 16	F >80	C 33	A 9
Year 2030: No Action	Build	No Build	F >80	F >8	F 0>8	F 0>8	F 0>8	F 0	C 22	C 22	F >80	E 71	F >80	F >8 0	B 12	A 6	NA	NA	NA	NA	F >80	C 29	B 14	F >80	F >80	E 75	F >80	F >8	D 36	F >80	E 58	C 26
Year 2030: Build	Build	Build	F >80	F >8	F 0>8	F 0>8	F 0>8	F 0	D 46	C 27	E 69	D 49	E 60	E 73	B 14	B 12	B 12	C 22	D 38	B 19	F >80	A 6	A 4	C 25	F >80	F >8	F 0>8	F 0	C 24	F >80>	F 80	C 28

Notes: For signal controlled intersections, level of service is provided with letter grade (A through F) and corresponding average seconds of delay per vehicle during the peak hour.

Synchro and SimTraffic software packages were used to analyzed the traffic operations for the intersections (signalized and unsignalzied) presented above. The results presented are output results from SimTraffic.

[1] - Unsignalized intersection

[2] - Applicable to South A Alignment only

Table 6
Years 2000, 2005 and 2030 PM Peak Hour Intersection Level of Service

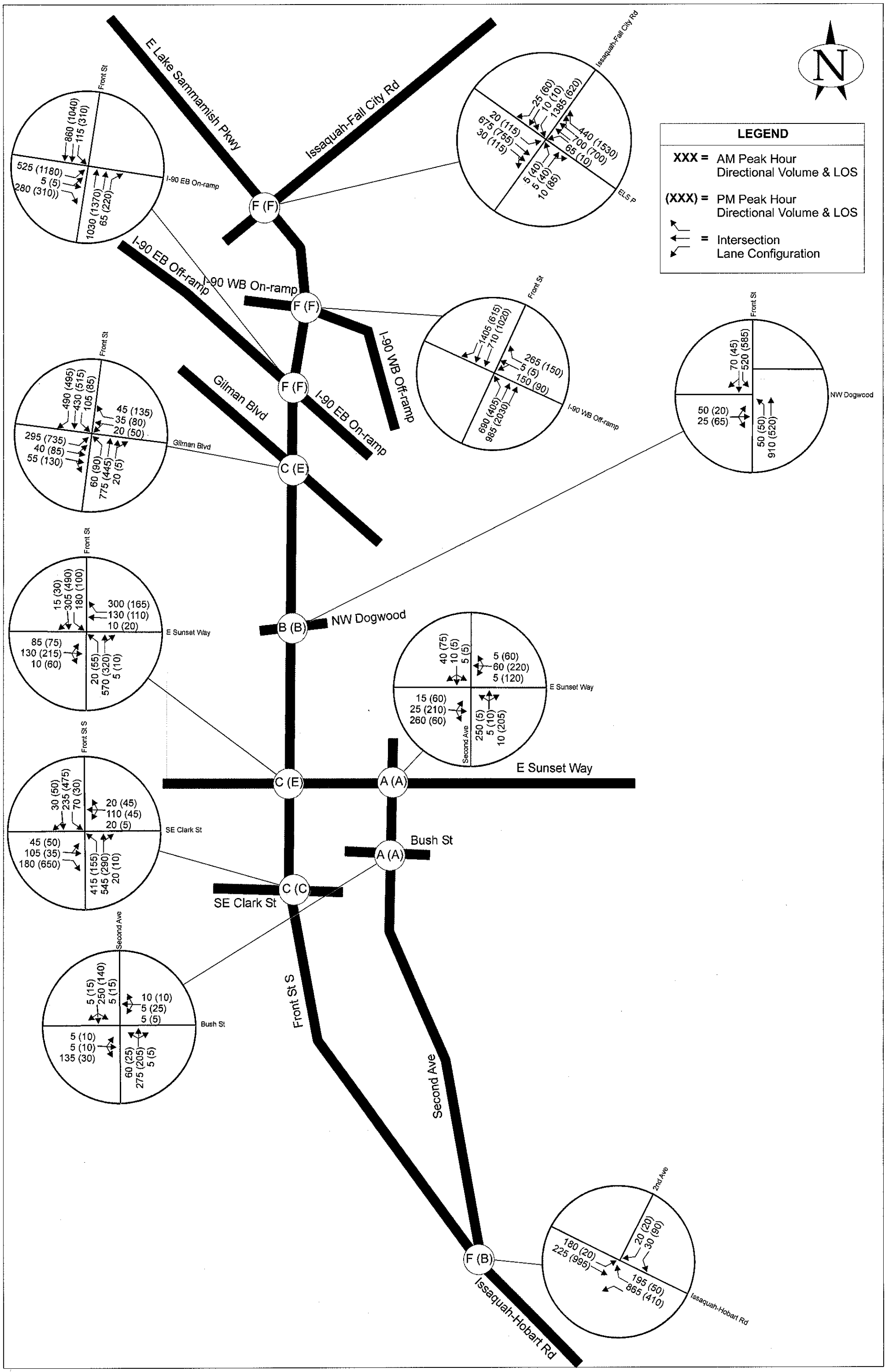
EIS Alternatives and Forecast Years			Intersection Name																													
Forecast Year	SPAR	Bypass	SR9 00/NW Sammamish	SR 900/WB Ramps	SR 900/EB Ramps	SR 900/Gilman	SR 900/Maple	SR 900/Newport Way	Front/WB Ramps	Front/EB Ramps	Front/Gilman	Front/Dogwood	Front/Sunset	Front/Clark	Sunset/WB Ramps	Sunset/EB Ramps	SE Bypass/Sunset	SE Bypass/Park Pointe Access	SE Bypass/Front (South C)	SE Bypass/Front (South A)	Iss-Hobart/May Valley Rd	Sunset/2nd[1]	Bush/2nd[1]	Front/2nd[2]	E Lk Sammamish/Iss Fall City Rd	E Lk Sammamish/43rd	E Lk Sammamish/56th	E Lk Sammamish/62nd	E Lk Sammamish/Black Nugget	Iss-Fall/Iss-Pine/SPAR	Issaquah-Fall/Black Nugget	SPAR/Black Nugget
Year 2000: Existing	No Build	No Build	E	C	E	F	D	E	F	F	E	B	E	C	NA	NA	NA	NA	NA	NA	NA	A	A	B	F	NA	D	C	B	C	C	NA
			60	32	66	>80	52	80	>80	>80	72	13	76	30	not coded	not coded					not coded	9	6	18	>80	not coded	47	25	18	29	28	
Year 2005: No Action	Build	No Build	D	B	C	D	B	F	E	E	F	D	C	C	A	B					F	C	F	C	F	C	F	F	F	C	C	A
			43	11	27	38	19	>80	57	57	>80	43	27	33	6	15	NA	NA	NA	NA	>80	29	>80	30	>80	35	>80	>80	>80	27	28	6
Year 2005: Build	Build	Build	D	B	C	C	B	F	D	E	F	B	B	B	B	B	A	B	B	C	F	A	A	B	D	C	F	F	F	C	C	A
			49	10	28	34	17	>80	53	75	>80	12	19	17	12	18	8	12	17	24	>80	5	4	16	43	34	>80	>80	>80	25	25	6
Year 2030: No Action	Build	No Build	F	B	F	F	E	F	D	F	F	D	C	F	D	F	NA	NA	NA	NA	F	F	E	F	F	E	F	F	D	D	C	B
			>80	17	>80	>80	65	>80	47	>80	>80	41	31	>80	53	>80					>80	>80	78	>80	>80	77	>80	>80	46	36	25	11
Year 2030: Build	Build	Build	F	B	D	F	E	F	D	F	F	A	B	B	F	F	C	D	F	F	F	A	A	C	F	F	F	F	D	C	C	B
			>80	19	49	>80	58	>80	52	>80	>80	9	12	12	>80	>80	26	48	>80	>80	>80	5	3	29	>80	>80	>80	>80	48	33	35	18

Notes: For signal controlled intersections, level of service is provided with letter grade (A through F) and corresponding average seconds of delay per vehicle during the peak hour.

Synchro and SimTraffic software packages were used to analyzed the traffic operations for the intersections (signalized and unsignalzied) presented above. The results presented are output results from SimTraffic.

[1] - Unsignalized intersection

[2] - Applicable to South A Alignment only



Front St/Second Ave/Sunset Way Corridors
2000 Peak Hour Volumes and LOS
Existing Scenario
Figure 5

Table 7. Year 2000 Intersection Operations along Front Street

Front Street Intersections: Year 2000 LOS & Delay		
	Existing Conditions	
	AM Peak Hour	PM Peak Hour
Front/WB I-90 Ramps	LOS F >80 sec/veh	LOS F >80 sec/veh
Front/EB I-90 Ramps	LOS F >80 sec/veh	LOS F >80 sec/veh
Front/Gilman	LOS C 26 sec/veh	LOS E 72 sec/veh
Front/Dogwood	LOS B 16 sec/veh	LOS B 13 sec/veh
Front/Sunset	LOS C 31 sec/veh	LOS E 76 sec/veh
Front/Clark	LOS C 20 sec/veh	LOS C 30 sec/veh
Front/Second	LOS F >80 sec/veh	LOS B 18 sec/veh

During both the AM and PM Peak hours, the intersections of Front St and the I-90 ramps experience failing traffic conditions. The delays at the intersections with the I-90 ramps are greater than 80 seconds per vehicle, which translates into a level-of-service (LOS) F. Generally, failing conditions occur when flow rates exceed the capacity of these intersections. In the AM peak hour, the other intersection that experience failing conditions is Front Street and Second Avenue SE. Significant queuing is observed in both AM and PM peak hours, especially in proximity of the I-90 ramps.

Second Avenue SE

Second Avenue SE is a two-lane local neighborhood collector connecting at East Sunset Way in the north and Issaquah Hobart Road to the south. The posted speed limit is 25 mph. Second Avenue SE intersections modeled in the Synchro/SimTraffic model include those with East Sunset Way, SE Bush Street, and Front Street. During the AM peak hour, the intersection at Front Street experienced failing conditions. The SimTraffic simulation shows significant queuing in proximity of this intersection, especially for the AM peak hour. Please refer to **Figure 5** for volumes and LOS for each intersection along Second Avenue SE, a summary is shown below in **Table 8**. Please note that the intersection of Second Avenue SE and Bush Street is analyzed as an unsignalized two-way stop-controlled intersection.

Table 8. Year 2000 Intersection Operations along Front Street

Second Avenue SE Intersections: Year 2000 LOS & Delay Existing Conditions		
	AM Peak Hour	PM Peak Hour
Second Ave SE/E Sunset Way	LOS A 7 sec/veh	LOS B 11 sec/veh
Second Ave SE/Bush Street	LOS A 7 sec/veh	LOS B 11 sec/veh
Second Ave SE/Front Street	LOS F >80 sec/veh	LOS F >80 sec/veh

East Lake Sammamish Parkway

East Lake Sammamish Parkway SE (ELSP) is an arterial located along the east side of Lake Sammamish and west of the Sammamish Plateau. The posted speed limit is 40 mph. East Lake Sammamish Parkway intersects with several signalized intersections including: SE 43rd Way, SE 56th Street, SE Black Nugget Road, and Issaquah-Fall City Road. The only one with a delay exceeding 80 seconds per vehicle and, consequently, with a LOS F is the intersection with Issaquah Fall City Road for both AM and PM peak hours. Please refer to **Figure 6** for the volumes and LOS information. **Table 9** summarizes the LOS and intersection delay for the corridor.

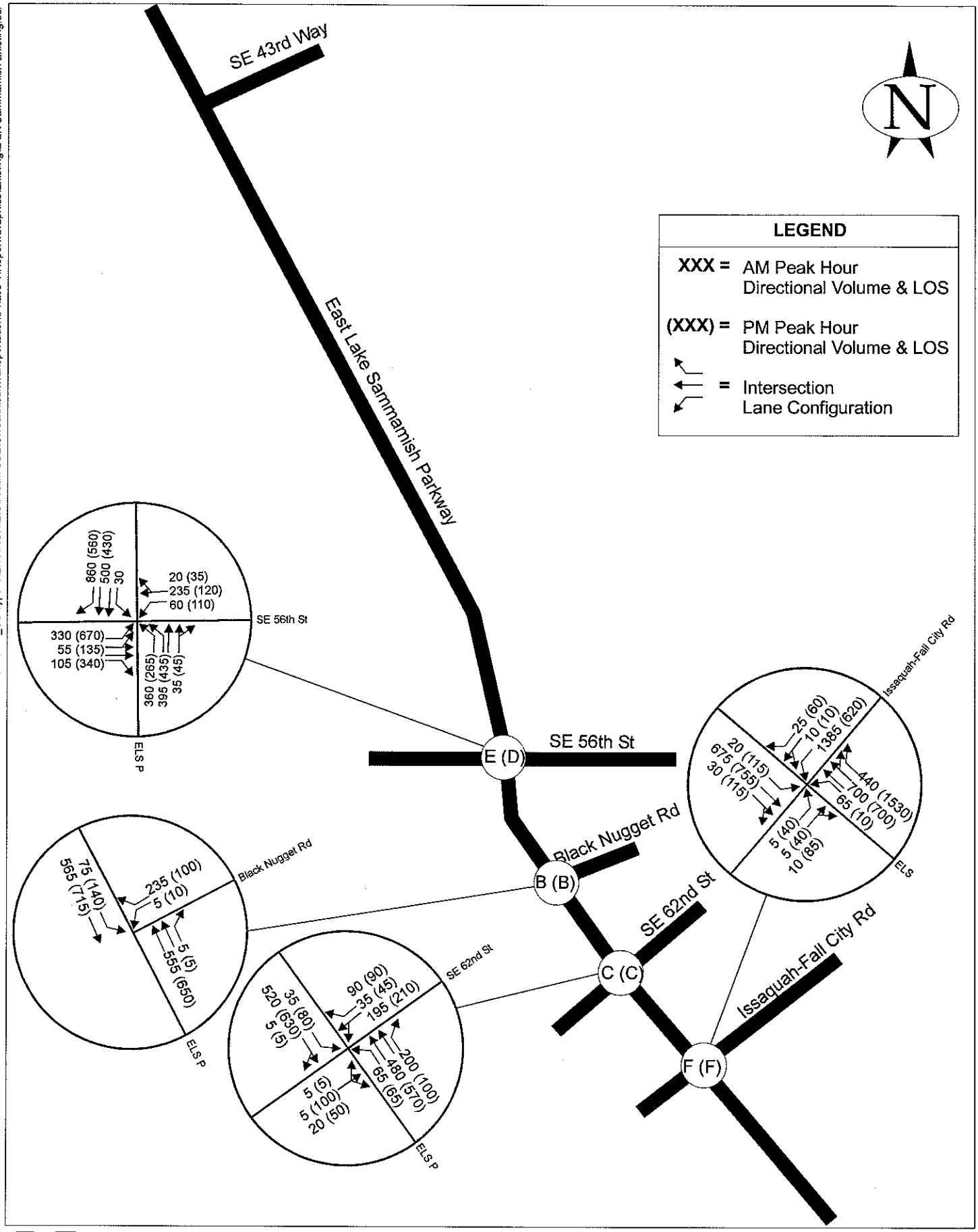
Table 9. Year 2000 Intersection Operations along East Lake Sammamish Parkway

East Lake Sammamish Parkway Intersections: Year 2000 LOS & Delay Existing Conditions		
	AM Peak Hour	PM Peak Hour
ELSP/ 43rd Street	N/A[4]	N/A[4]
ELSP/ SE 56th Street	LOS E 64 sec/veh	LOS D 47 sec/veh
ELSP/ SE Black Nugget Road	LOS B 17 sec/veh	LOS B 18 sec/veh
ELSP/ Issaquah-Fall City Road	LOS F >80 sec/veh	LOS F >80 sec/veh

Issaquah-Fall City Road

Issaquah-Fall City Road (IFC) is the primary access to the top of the Sammamish Plateau. It is a four-lane road with a posted speed of 35 mph. The intersections along Issaquah-Fall City Road that were analyzed in this study include East Lake Sammamish Parkway, SE Black Nugget Road, and Issaquah-Pine Lake Road. These are signalized intersections and they are all failing in the AM peak hour. In the PM peak hour, the intersection with Issaquah-Fall City Road is also failing. In both peak hours, the SimTraffic simulations show extensive queuing along the entire corridor especially in the westbound direction. **Table 10** summarizes the LOS and delay per intersection. **Figure 7** depicts volumes and LOS for the intersections within the corridor.

[4] The ELSP & SE 43rd Street intersection was not included in the existing conditions model developed previously for the City of Issaquah. However, this intersection was analyzed for future year 2005 and 2030.



East Lake Sammamish Pkwy Corridor
Existing Peak Hour Volumes and LOS
Figure 6

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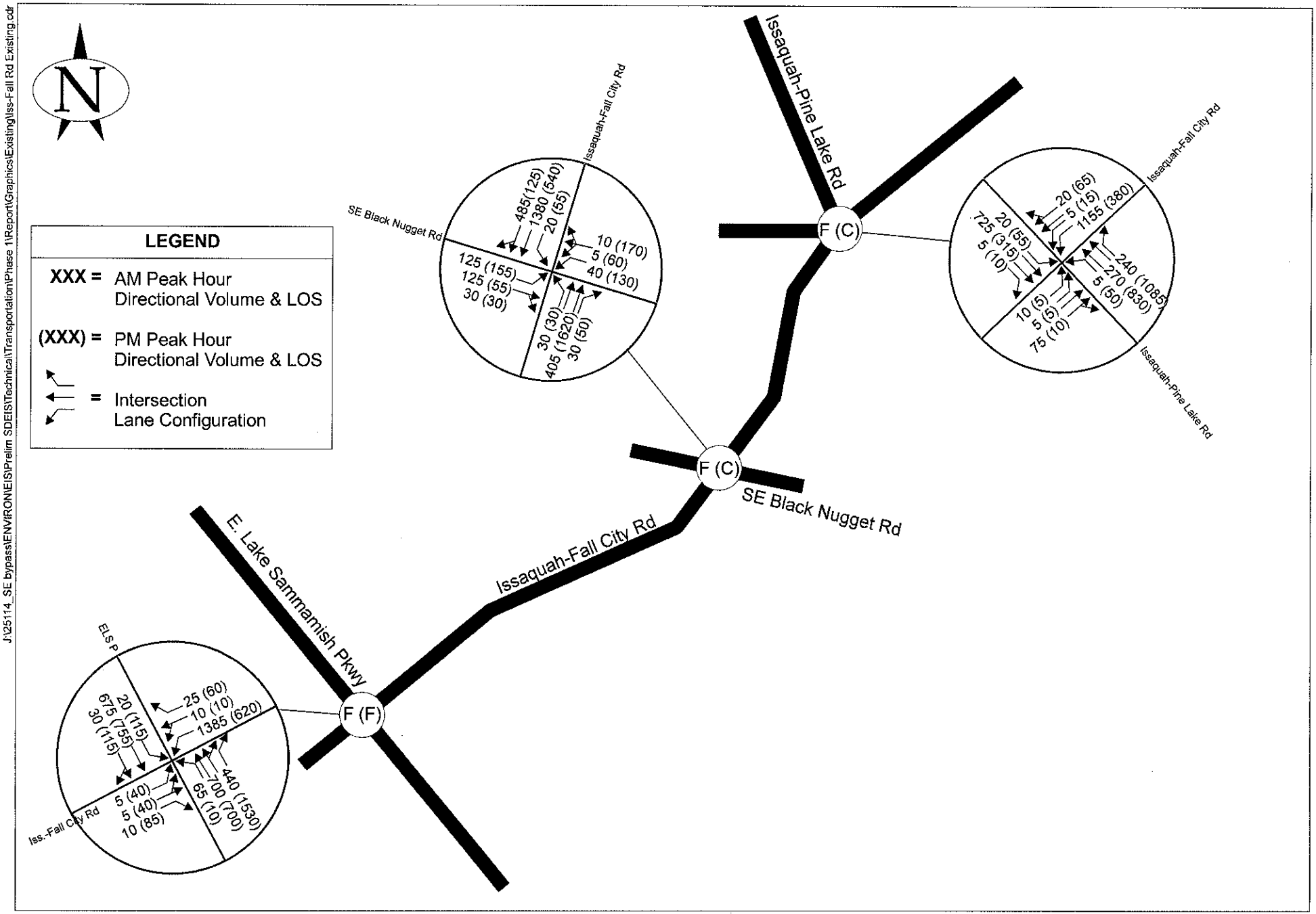

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Issaquah-Fall City Road Corridor
Existing Peak Hour Volumes and LOS
Figure 7

Table 10. Year 2000 Intersection Operations along Issaquah-Fall City Road

Issaquah-Fall City Road Intersections: Year 2000 LOS & Delay		
	Existing Conditions	
	AM Peak Hour	PM Peak Hour
IFC/ELSP	LOS F >80 sec/veh	LOS F >80 sec/veh
IFC/SE Black Nugget Road	LOS F >80 sec/veh	LOS C 29 sec/veh
IFC/Iss-Pine Lake Road	LOS F >80 sec/veh	LOS C 28 sec/veh

Issaquah-Hobart Road

Issaquah-Hobart Road is the continuation of Front Street south of the Issaquah City limits. The Issaquah-Hobart Road continues southeast between Tiger Mountain and Squak Mountain. It is a two-lane facility with a posted speed limit of 35 mph. The signalized intersection at Second Avenue SE and Front Street was modeled in the Synchro model used for existing conditions. This was discussed previously in the *Front Street Corridor* section. The existing conditions model that was developed previously for the City did not include the intersection of May Valley Road and Issaquah-Hobart Road. However, this intersection was modeled in future Years 2005 and 2030.

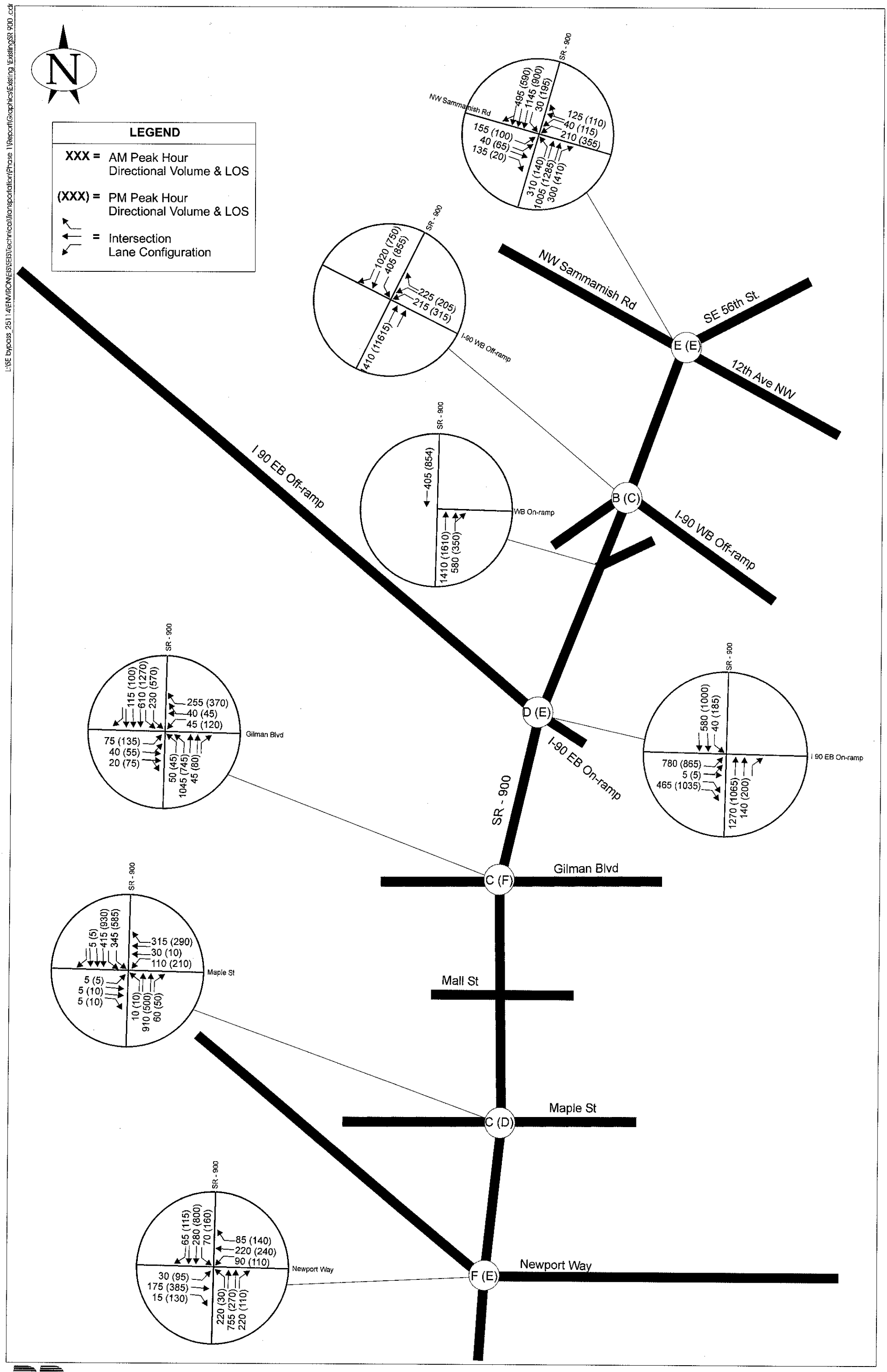
SR 900

SR 900 (Renton-Issaquah Road) is a north-south arterial connecting the urban areas of Issaquah and Renton. It is a five lane arterial with a posted speed limit of 45 mph. Within the study area, SR 900 has signalized intersections at NW Sammamish Road, the I-90 eastbound and westbound ramps, Gilman Boulevard, Maple Street, and SE Newport Way.

Table 11. Year 2000 Intersection Operations along SR 900

SR 900 Intersections: Year 2000 LOS & Delay		
	Existing Conditions	
	AM Peak Hour	PM Peak Hour
SR 900/NW Sammamish	LOS E 69 sec/veh	LOS E>60 sec/veh
SR 900/WB Ramps	LOS B 17 sec/veh	LOS C32 sec/veh
SR 900/EB Ramps	LOS D 40 sec/veh	LOS E>66 sec/veh
SR 900/Gilman	LOS C 31 sec/veh	LOS F>80 sec/veh
SR 900/Maple	LOS C >26 sec/veh	LOS D52 sec/veh
SR 900/Newport Way	LOS F >80 sec/veh	LOS E80 sec/veh

As illustrated in **Table 11**, most of the intersections along this corridor have delays greater than 35 second per vehicle. This translates into LOS D, E, or F. As a consequence, the level of congestion is generally noticeable during the peak hours. In the AM peak hour, the SR 900 and Newport Way intersection is failing operationally and in the PM peak hour, the SR 900 and Gilman Boulevard intersection is also operating at LOS F. Please refer to **Figure 8** for an illustration of both intersection volumes and projected LOS.



SR 900 Corridor
Existing Peak Hour Volumes and LOS
Figure 8

Accident Data

Accidents are unexpected and undesirable events that can generally be attributed to a complex interaction between characteristics of the driver, vehicle, roadway design and maintenance, and traffic congestion. Knowing the general principles contributing to the cause of accidents as well as the potential operational safety measures can assist in qualitatively determining the effect of a proposed facility on the existing accident rate.

Some factors that may decrease vehicular accident rates along a corridor are:

- Decrease of access frequency (intersections, driveways, ramps);
- Decrease of number of traffic lanes;
- Reduction in the slope or depth of ditch;
- Decrease in the number of roadway and traffic changes requiring driver decision;
- Increase in lane, roadway, bridge, or median widths;
- Provision of escape lanes or ramps;
- Increase of maintenance and enforcement;
- Decrease of speed;
- Decrease in traffic congestion

Five year historical accident data (from 1998 to 2002) were used to assess existing safety problems. This historical data was provided by the City of Issaquah and is located in Appendix B. Accidents were categorized by accident types in the following categories[5]:

- Rear End refers to a collision where the front end of one vehicle collides with the front end of another vehicle while the two vehicles are traveling in opposite directions.
- Angled Collision refers to collisions which are not head-on, rear-end, rear-to-rear, or sideswipe (can be right angle, left turn, and right turn).
- Head on refers to a collision where the front end of one vehicle collides with the front end of another vehicle while the two vehicles are traveling in opposite directions.
- Sideswipe refers to a collision in which the sides of both vehicles sustain minimal engagements.
- Fixed object refers to a collision with stationary structures or substantial vegetation attached to the terrain.

[5] Source: National Center for Statistics & Analysis http://www-fars.nhtsa.dot.gov/main.cfm

Table 12 lists the intersection accidents by accident type at the major intersections in the study area. The prevailing accident type was rear-end accidents with 48.4% of total intersection accidents. This is not a surprise in an area where queues are an issue. Rear end are followed by left turn (20.0%) and right angle (14.0%). Pedestrian and bike accidents accounted for 1.6%. The intersection with the worst accident history was the intersection of Front Street with the I-90 EB ramp. Most accidents occurring at this intersection were rear end type of accident. The second intersection with the worst accident history was the one of Front Street with Gilman Boulevard and again rear-end accident was the most common type of accident.

Table 13 lists accidents by accident type along arterials in the study area. The prevailing accident type was rear-end accident with 62.2% of total accidents along arterials. The second leading accident type was right angle (18.9%) followed by sideswipe (10.8%). Pedestrian and bike accidents accounted for 1.2% of the total number of accident. The arterial segment with the worst accident history was Front Street that reported the highest number of accidents in the segment from 229th Ave SE to Gilman Boulevard. This is the most congested part of Front Street and includes the interchange ramps with I-90.

Table 12: Intersection Accidents by Accident Type

Intersection Accidents	Rear End	Right Angle	Left Turn	Right Turn	Head On	Side Swipe	Ped/Bike	Drive way	Fixed Object	Other	Total
SR 900 & NW Sammamish Road/12th Ave NW	28	6	2	1		3			1		41
SR 900 & I-90 WB Ramps	9	4	1			1					15
SR 900 & EB Ramps	11	4	2			4	1				22
SR 900 & NW Gilman Blvd	17	5	10			4	1			1	38
SR 900 & Maple Street	3	4	16			1					24
SR 900 & Mall Street	12	4	4			2					22
SR 900 & SE Newport Way	5		16		1	1			1		24
E Lake Sammamish Pk & SE 43rd Way											0
E Lake Sammamish Pk & SE 56th Street	7	1	2			4	1			1	16
E Lake Sammamish Rd & SE Black Nugget Rd	2		3								5
E Lake Sammamish Pk & SE 62th Street	6	2									8
E. Lk Sammamish Pk & Issaquah Fall City Rd	9	4	8			27			1		49
Front Street & I-90 WB Ramps	9	3	5								17
Front Street & I-90 EB Ramps	33	8	16			3					60
Front Street & Gilman Blvd	31	9	3			6	1				50
Front Street & Dogwood Street NW	8	1							1		10
Front Street & Sunset Way	2			1		1	2		1		7
Front Street & SE Clark Street	15	1	2	1					1	1	21
Front Street & 2nd Ave SE	3										3
2nd Ave NE & Sunset Way	2	4				1	1				8
Issaquah Fall City Rd & Issaquah Pine Lake Rd	6	3				1					10
Total	218	63	90	3	1	59	7	0	6	3	450
Percent	48.4%	14.0%	20.0%	0.7%	0.2%	13.1%	1.6%	0.0%	1.3%	0.7%	100.0%

Table 13: Intersection Accidents by Accident Type

Intersection Accidents	Rear End	Right Angle	Left Turn	Right Turn	Head On	Side Swipe	Ped /Bike	Drive way	Fixed Object	Other	Total
SR 900											
from NW Sammamish Road to NW Gilman Blvd	15	1				2			1		19
from NW Gilman Road to Newport WY NW	14					2			2		18
East Lake Sammamish Parkway SE											
from SE 56th Street to 62nd Street	3	1	1						1		6
from 62nd Street to 229th Ave SE	13	14	1			2					30
Front Street											
from 229th Ave SE to Gilman Blvd	35	14	15			7					71
from Gilman Blvd to NW Dogwood Street	14	2	7			4			2		29
from NW Dogwood Street to Sunset Way	17	3				1			1		
from Sunset Way to Newport Way NW	6	2				1					9
from Newport Way NW to 2nd Ave SE	16					2			3		21
Sunset											
from Newport Way to 6th Ave NE	5	1				1			2		9
2nd Avenue											
from E Sunset Way to SE Clark Street	2	7							1		10
from SE Clark Street to Front Street	18					6	3		1	1	29
Issaquah-Fall City Road											
from East Lake Sammamish Parkway SE to Issaquah Pine Lake Road SE	18	5			1	2			1		27
Total	161	49	24	0	1	28	3	0	14	1	259
Percent	62.2%	18.9%	9.3%	0.0%	0.4%	10.8%	1.2%	0.0%	5.4%	0.4%	100.0%

Opening Year 2005: Traffic Forecast Modeling

Year 2005 is the expected opening year for the Southeast Issaquah Bypass. This section describes and compares the traffic volumes, travel patterns and operations at the study area intersections for the following scenarios:

- **No Action,** including the I-90 Sunset Interchange modifications, the SR 900 modifications, and the North and South SPAR.
- **Full Build,** including the I-90 Interchange, the SR 900 modifications, the North and the South SPAR, and the Southeast Issaquah Bypass.

Intersection/Corridor Analysis

The following provides a description of the anticipated peak hour intersection operations for Year 2005 for the Build and No Action Scenarios. Please refer to **Table 5** and **Table 6** (which serve as a reference table) for a summary of the estimated level of service and delay per vehicle for the intersections analyzed in both scenarios. The following section discusses the forecasted traffic operations on the various corridors within Issaquah.

Southeast Issaquah Bypass Road

Roadway Volumes

By the Year 2005, most of the major corridors within Issaquah will be experiencing heavy congestion and poor levels of service during the peak hours. The SE Issaquah Bypass Road provides an alternative north/south corridor. In the No Action Scenario, Front Street will experience poor traffic operations where high levels of congestion and delay may be observed. The level of congestion would suggest that the peak hour would likely spread for a longer period of time. Given the level of congestion projected for Front Street without the Southeast Bypass, other corridors such as Second Ave, which primarily serves residential communities and Issaquah High School, will be utilized. It is estimated that the proposed Southeast Bypass would need two lanes in each direction approximately five years after the year of opening. In the Year 2005 AM peak hour, over 1,300 vph are estimated between Park Pointe and East Sunset Way. As **Table 14** illustrates, In the PM peak hour the volume heading southbound south of I-90 is over 1,700 vph and north of Issaquah Hobart Road is approximately 1,200 vph. These volumes justify a four-lane footprint of the Southeast Bypass that would experience acceptable levels of service along the corridor.

Table 14. PM Peak Hour Volumes for 2005 Build and No Action Scenarios

	No Action Scenario		Build Scenario*	
LOCATION:	**Southbound**	**Northbound**	**Southbound**	**Northbound**
Bypass s/o I-90	-	-	1,795	860
Bypass n/o Iss-Hobart Road	-	-	1,200	440
Front Street s/o Newport	1,185	445	530	250
Front Street n/o Sunset	825	505	470	425
Front Street n/o Gilman	1,305	1710	955	1710
Second Avenue s/o Evans	665	225	25	15

** Volumes are the same for both South A and South C alignment alternatives unless otherwise noted.*

Table 14 also illustrates that in implementing the SE Issaquah Bypass Road, significant reduction in traffic can be observed along both Front Street and Second Avenue SE between No Action and Build Scenarios. This result indicates that the Southeast Issaquah Bypass would operate as a bypass facility to Front Street. The Front Street corridor will continue to be utilized in the future.

Traffic Operations

Figure 9, **Figure 10**, and **Figure 11** depict the forecasted volumes and LOS along the SE Issaquah Bypass Road for Year 2005 No Action Scenario, South A Build Alignment and South C Build Alignment, respectively. Additionally, **Table 15** summarizes the LOS and associated average delay anticipated in Year 2005 for both Build Scenario intersections.

Table 15. Year 2005 LOS and Delay for SE Issaquah Bypass Road

	South A Alignment		South C Alignment	
	AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour
Southeast Bypass E Sunset Way	LOS A 8 sec/veh	LOS A 8 sec/veh	LOS A 8 SEC/VEH	LOS A 8 sec/veh
Southeast Bypass and Park Pointe Access	LOS B 16 veh/sec	LOS B 12 veh/sec	LOS B 16 veh/sec	LOS B 12 veh/sec
Southeast Bypass and Front Street	LOS B 12 veh/sec	LOS B 16 veh/sec	LOS C 24 veh/sec	LOS B 17 veh/sec

The LOS presented in **Table 15** represent the traffic operations anticipated by the end of the AM and PM peak hours. Most of the intersections operate similarly between the two south alignments, and both alignments operate at an acceptable level of service. The only difference in level of service is at the intersection of Southeast Bypass and Front Street in the AM peak hour. The South A alignment is estimated to operate at LOS B whereas the South C alignment is estimated to operate at LOS C.

Future traffic cycle lengths were estimated for the year 2005 as follows:

<u>Downtown Area (Front Street, Southeast Bypass, 2nd Avenue, Sunset Way)</u>
No Action:
AM Peak Hour = 45-110; PM Peak Hour = 45-100

Build Scenario:
AM Peak Hour = 55-120; PM Peak Hour = 60-120

<u>East Lake Sammamish</u>
No Action:
AM Peak Hour = 70-110; PM Peak Hour = 100-120

Build Scenario:
AM Peak Hour = 70-120; PM Peak Hour = 100

SR 900
No Action:
AM Peak Hour = 120; PM Peak Hour = 120

Build Scenario:
AM Peak Hour = 55-120; PM Peak Hour = 60-120

Issaquah-Fall City Road
No Action:
AM Peak Hour = 90-110; PM Peak Hour = 100-110

Build Scenario:
AM Peak Hour = 100-120; PM Peak Hour = 120

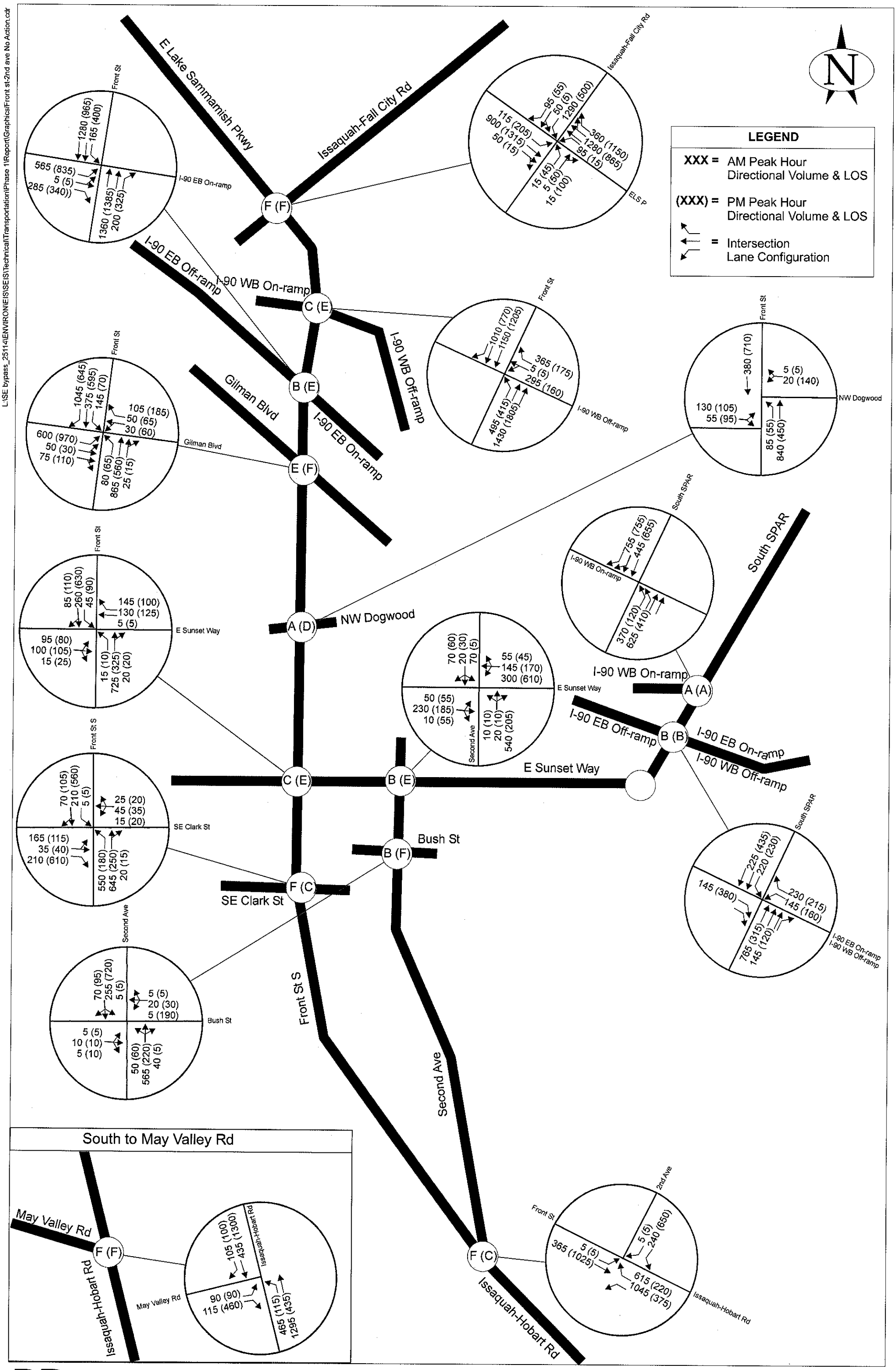
Front Street Corridor

Table 16 presents the traffic operations anticipated for Year 2005 along Front Street. **Figure 9, Figure 10**, and **Figure 11** illustrate both intersection volumes and LOS anticipated along Front Street for the No Action Scenario, South A Build Alignment and South C Build Alignment respectively.

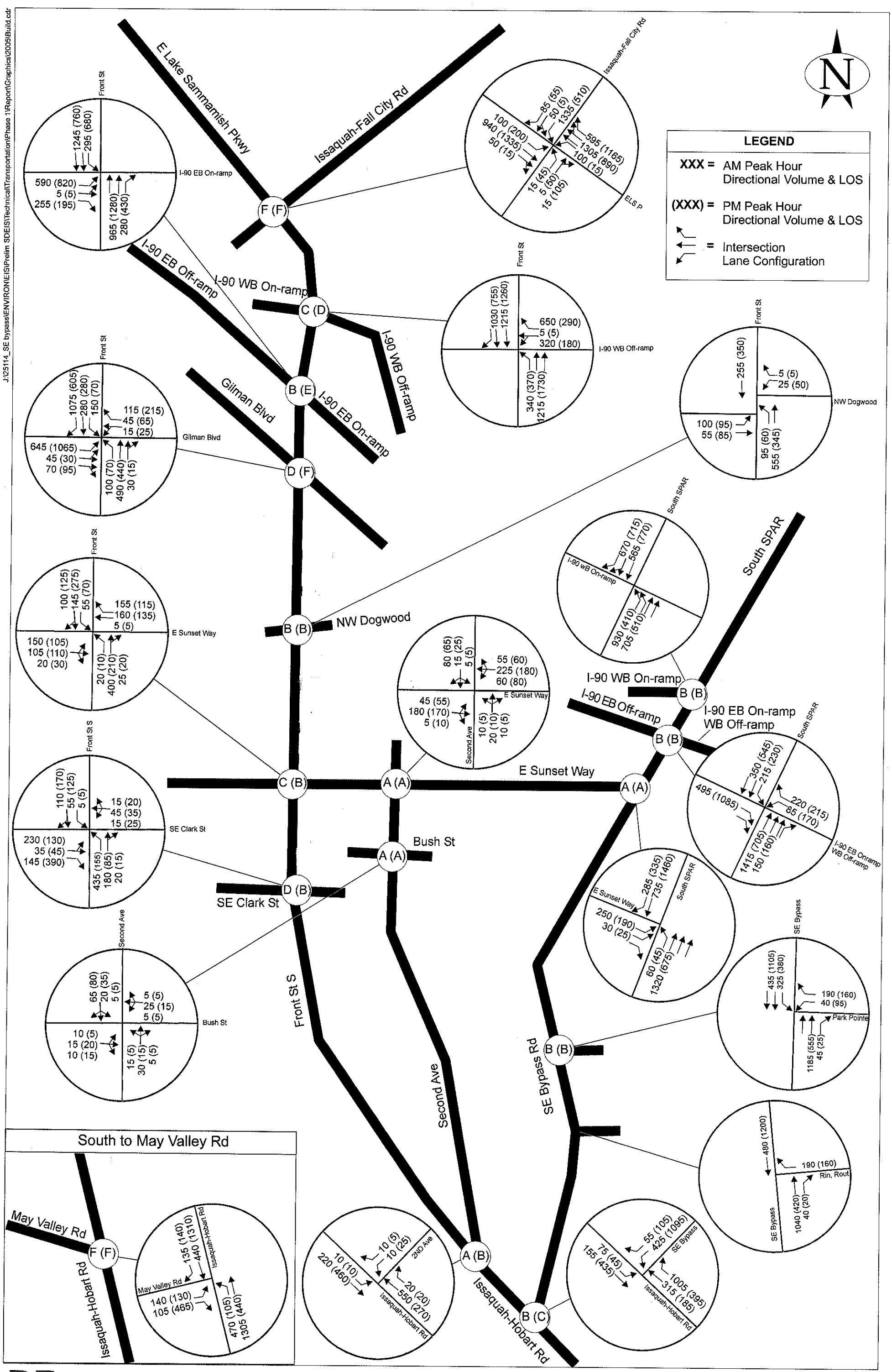
Peak hour pedestrian crossing volumes were assumed in the traffic analysis models as unsignalized crosswalks along Front Street. These crosswalk locations are north of Clark Street, three crosswalks between East Sunset Way and Dogwood, and two crosswalks between NW Dogwood & Gilman Blvd.

For most of the intersections along the Front Street corridor, the Build Scenario shows a traffic operational improvement over the No Action Scenario. This suggests that with the implementation of the SE Issaquah Bypass Road, vehicles will use it in order to bypass Front Street. The volumes suggest a similar conclusion. Please refer to **Table 14** for a comparison of projected volumes on Front Street with and without the SE Bypass Road. Significant reduction in volumes along Front Street is anticipated with the inclusion of the SE Bypass Road as compared to without the SE Bypass Road. However, the average vehicle delay for the EB I-90 intersection with Front Street increases over the No Action for both the AM and PM peak hours. Although overall volumes on Front Street are reduced with the inclusion of the SE Bypass Road, there is an increase in volumes at the intersection of WB 90 I-90 ramps and Front Street. For those vehicles destined north on East Lake Sammamish Parkway from points south of Issaquah, the travel would suggest that a portion may use the Southeast Bypass to bypass congestion on Front Street and then exit at the Front Street interchange to access East Lake Sammamish Parkway. This diversion pattern results in an increase in volumes at the Front Street intersection and in a slightly higher delay at this location for the Build Scenario as compared to than the No Action Scenario. However, its impact on mainline operation is projected to be negligible.

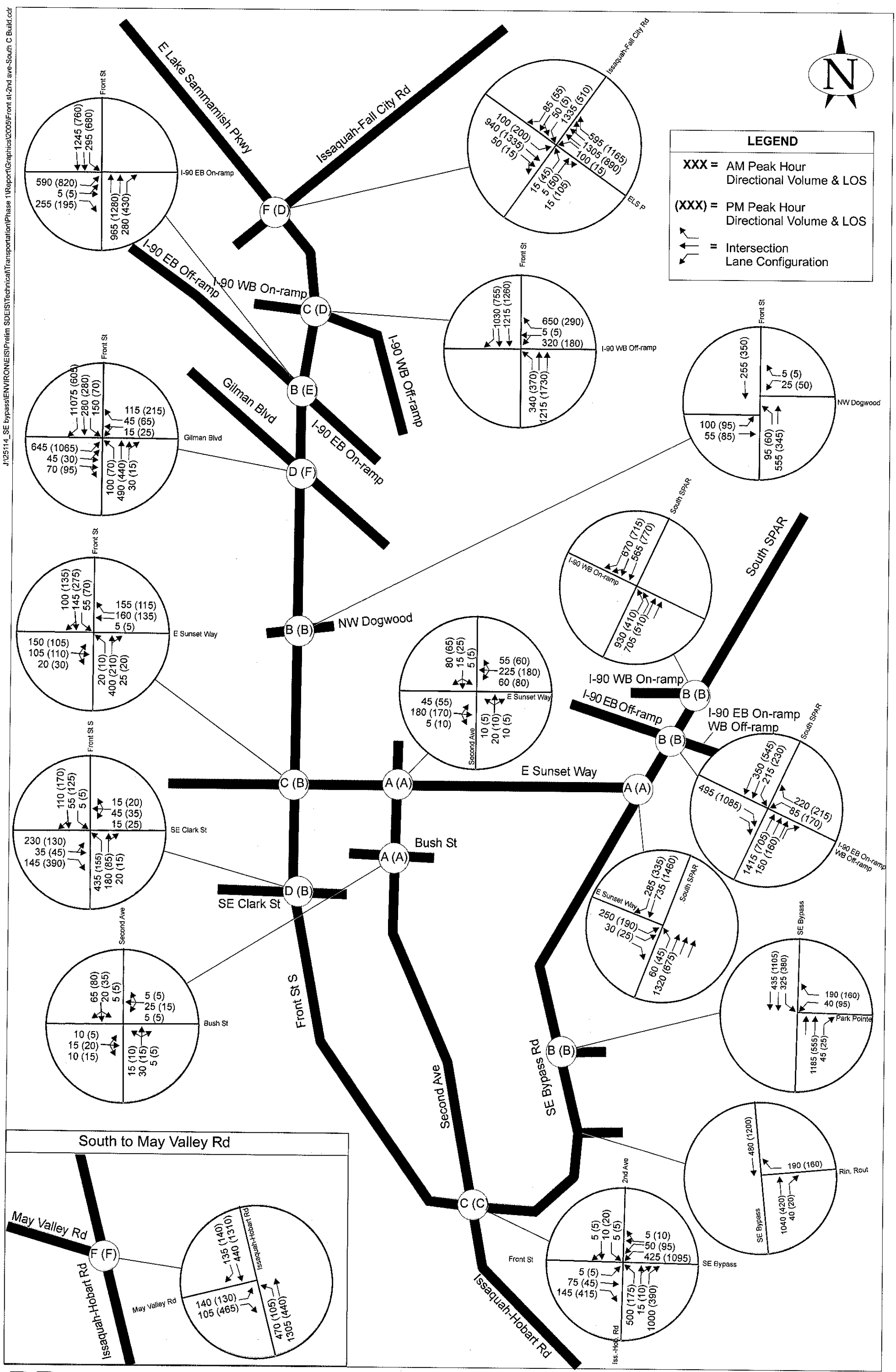
In the No Action Scenario, the intersection between Front Street and SE Clark Street has a delay greater than 80 sec/veh corresponding to a LOS F. The SimTraffic simulation also shows that there are some rolling queues on northbound Front Street in the proximity of this intersection. In the Build Scenario, these rolling queues disappear.



Front St/Second Ave/Sunset Way Corridors
2005 Peak Hour Volumes and LOS
No Action Scenario
Figure 9



Front St/Second Ave/SE Issaquah Bypass Corridors
2005 Peak Hour Volumes and LOS
South A Build Scenario
Figure 10



Front St/Second Ave/SE Issaquah Bypass Corridors
2005 Peak Hour Volumes and LOS
South C Build Scenario
Figure 11

Table 16. Year 2005 Intersection Operations along Front Street

Front Street Intersections: Year 2005 LOS & Delay				
	No Action Scenario		Build Scenario*	
	AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour
Front/WB I-90 Ramps	LOS C 29 sec/veh	LOS E 57 sec/veh	LOS C 29 sec/veh	LOS D 53 sec/veh
Front/EB I-90 Ramps	LOS B 15 sec/veh	LOS E 57 sec/veh	LOS B 20 sec/veh	LOS E 75 sec/veh
Front/Gilman	LOS E 72 sec/veh	LOS F >80 sec/veh	LOS D 48 sec/veh	LOS F >80 sec/veh
Front/Dogwood	LOS A 10 sec/veh	LOS D 43 sec/veh	LOS B 13 sec/veh	LOS B 12 sec/veh
Front/Sunset	LOS C 22 sec/veh	LOS C 27 sec/veh	LOS C 25 sec/veh	LOS B 19 sec/veh
Front/Clark	LOS F >80 sec/veh	LOS C 33 sec/veh	LOS D 41 sec/veh	LOS B 17 sec/veh

** Results are the same for both South A and South C Build Scenario Alignment Alternatives*

The intersection between Gilman Boulevard and Front Street is failing in the PM peak period for both No Action and Build Scenarios. Heavy delays are primarily experienced along northbound Front Street and eastbound Gilman Boulevard.

In summary, with the SE Issaquah Bypass Road in place, a reduction in volume is estimated along Front Street when compared to the No Action Scenario. As **Table 14** illustrates, during the PM peak hour the estimated volumes along Front Street without the Southeast Bypass approach the capacity of the facility; however, with the inclusion of the Southeast Bypass, the intersection delay and rolling queues are reduced significantly.

Second Avenue SE

Table 17 presents the anticipated intersection traffic operations along Second Avenue SE. Please refer to **Figure 9, Figure 10**, and **Figure 11** for volumes and Year 2005 intersection LOS for the No Action, South A Build and South C Build respectively. Both the intersections of Bush Street and East Sunset Way were analyzed as unsignalized intersections.

Table 17. Year 2005 Intersection Operations along Second Avenue SE

Second Avenue SE Intersections: Year 2005 LOS & Delay				
	No Action Scenario		Build Scenario*	
	AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour
Second/Sunset	LOS B 11 sec/veh	LOS C 29 sec/veh	LOS A 5 sec/veh	LOS A 5 sec/veh
Second/Bush	LOS B 11 sec/veh	LOS F >80 sec/veh	LOS A 4 sec/veh	LOS A 4 sec/veh
Second/Front	LOS F >80 sec/veh	LOS C 30 sec/veh	LOS A (South A) 4 sec/veh LOS C (South C) 24 sec/veh	LOS B (South A) 16 sec/veh LOS B (South C) 17 sec/veh

** Results are the same for both South A and South C Build Scenario Alignment Alternatives*

From **Table 6**, it is evident that the Build Scenario significantly improves traffic operations along Second Avenue SE. In the No Action Scenario, drivers look for other arterials that may be less congested than Front Street. As a consequence, neighborhood cut-through traffic increases and traffic volumes build along Second Avenue SE. This explains why the intersection between Second Ave and Bush Street is failing in the PM peak period for the No Action Scenario. With the implementation of the SE Issaquah Bypass Road, drivers use the Southeast Bypass rather than Second Avenue SE, and a significant drop in vehicles may be observed. According to the Year 2005 traffic forecast model, over 600 vehicles (south of Evans Street) in the southbound direction in the PM Peak hour will shift their trip to utilize the Southeast Bypass rather than using Second Avenue SE. These results are similar to the ones presented in *the SE Issaquah Bypass Neighborhood Traffic Mitigation Study* (2002), which examined potential neighborhood impacts of opening the Sunset Interchange without the SE Issaquah Bypass Road in place (forecasted analysis year was 2005).

The intersection at Second Ave and Front Street is failing in the AM peak hour for the No Action Scenario. In the South A Build Scenario Alignment Alternative, this same intersection is projected to have a very low delay. In the South C Build Scenario Alignment Alternative, the intersection becomes a four-leg intersection with SE Bypass Road, Second Ave, and Front Street and operates at an LOS C, which is an acceptable level of service.

East Lake Sammamish Parkway

The East Lake Sammamish Parkway corridor is expected to experience poor levels of service and significant queuing in both the No Action and Build Scenarios. The incorporation of the SE Bypass Road has minimal impact on this corridor. Anticipated poor levels of operation in both scenarios may be attributed to the high number of vehicles destined to the Plateau area and having very limited options to access that area. **Figure 12** and **Figure 13** present peak hour intersection volumes and LOS anticipated for the No Action and 2005 Build Scenarios respectively.

Table 18 presents the anticipated intersection peak hour LOS and delay per vehicle for both scenarios along East Lake Sammamish Parkway. The intersection with Issaquah-Fall City Road is failing in both peak hours for both scenarios with the exception of the PM Build Scenario, where an improvement to LOS D is observed. The intersection with SE 56th Street is failing in both AM and PM peak hours for both scenarios. The intersection with SE 62nd Street is also generally failing with the exception of the AM peak for the No Action Scenario, which is anticipated to operate at LOS D. The intersection with Black Nugget Road is failing in the PM peak hour for both No Action and Build Scenarios. In summary, the inclusion of the SE Issaquah Bypass Road does not alter traffic operations along East Lake Sammamish Parkway due to the limited options available to access the plateau areas.

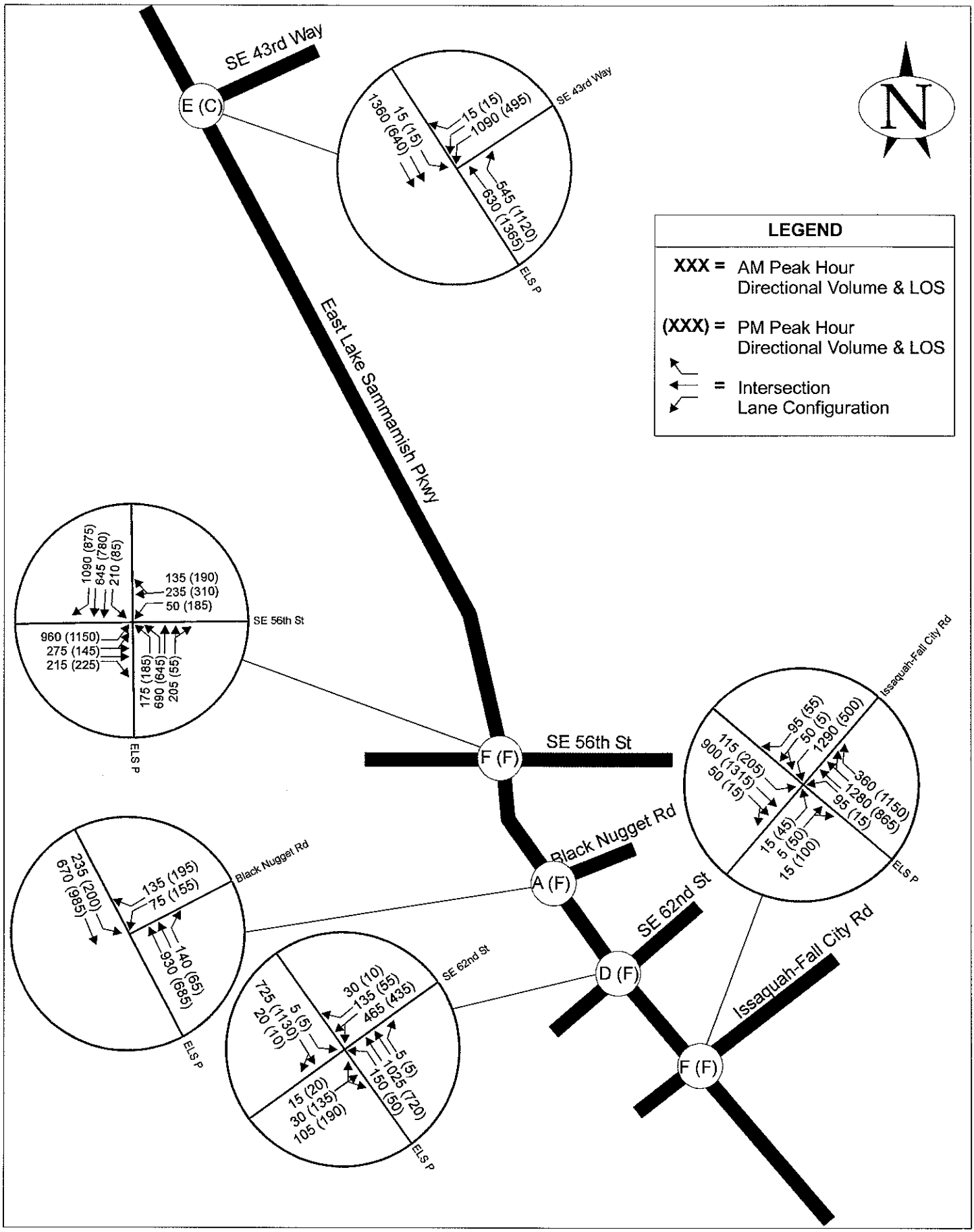
Table 18. Year 2005 Intersection Operations Along East Lake Sammamish Parkway

East Lake Sammamish Parkway (ELSP) Intersections: Year 2005 LOS & Delay				
	No Action Scenario		Build Scenario*	
	AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour
ELSP/Issaquah-Fall City Road	LOS F >80 sec/veh	LOS F >80 sec/veh	LOS F >80 sec/veh	LOS D 43 sec/veh
ELSP/43rd	LOS E 64 sec/veh	LOS C 35 sec/veh	LOS C 21 sec/veh	LOS C 34 sec/veh
ELSP/56th	LOS F >80 sec/veh	LOS F >80 sec/veh	LOS F >80 sec/veh	LOS F >80 sec/veh
ELSP/62nd	LOS D 46 sec/veh	LOS F >80 sec/veh	LOS F >80 sec/veh	LOS F >80 sec/veh
ELSP/Black Nugget Rd	LOS A 8 sec/veh	LOS F >80 sec/veh	LOS B 16 sec/veh	LOS F >80 sec/veh

** Results are the same for both South A and South C Build Scenario Alignment Alternatives*

Issaquah Fall City Road

Significant queuing is projected for southbound Issaquah-Fall City Road in the AM peak hour in both the No Action and Build Scenarios. The Issaquah-Fall City Road serves many new residential areas, and therefore, in the AM peak hour, many drivers are accessing the I-90 interchange and to a lesser extent, the downtown Issaquah area. The queuing is more evident in the 2005 Build Scenario between SE Black Nugget Road and East Lake Sammamish Parkway and in proximity of the intersection with Issaquah-Pine Lake Road & SPAR. This last intersection is projected to failing the AM peak hour for the Build Scenario. **Table 19** presents projected Year 2005 peak hour intersection operations along the corridor. Please refer to **Figure 14** and **Figure 15** for anticipated Year 2005 peak hour intersection volumes and LOS designations for the No Action and Build Scenarios respectively, along Issaquah-Fall City Road.



East Lake Sammamish Pkwy Corridor
Year 2005 Peak Hour Volumes and LOS
No Action Scenario
Figure 12

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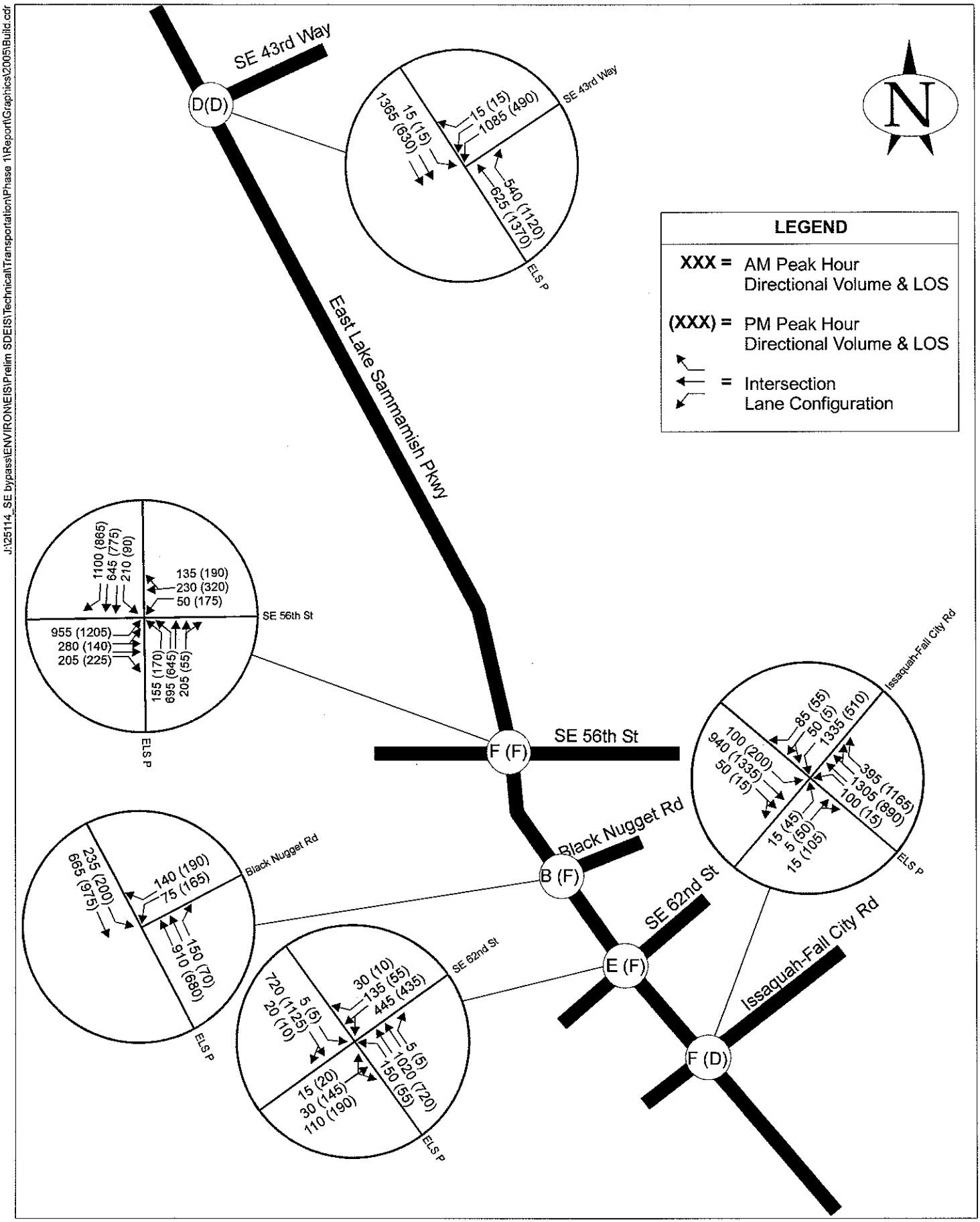
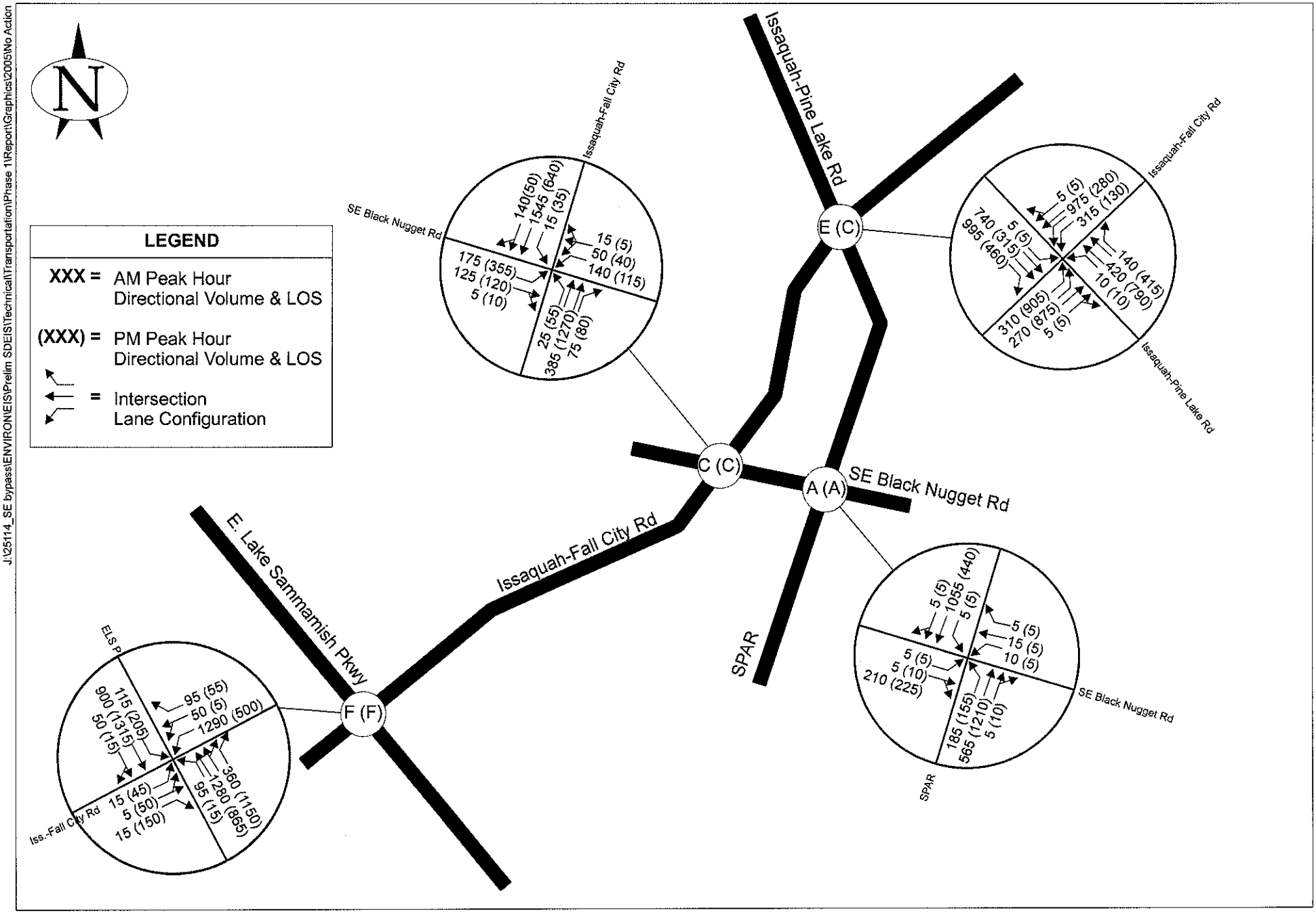
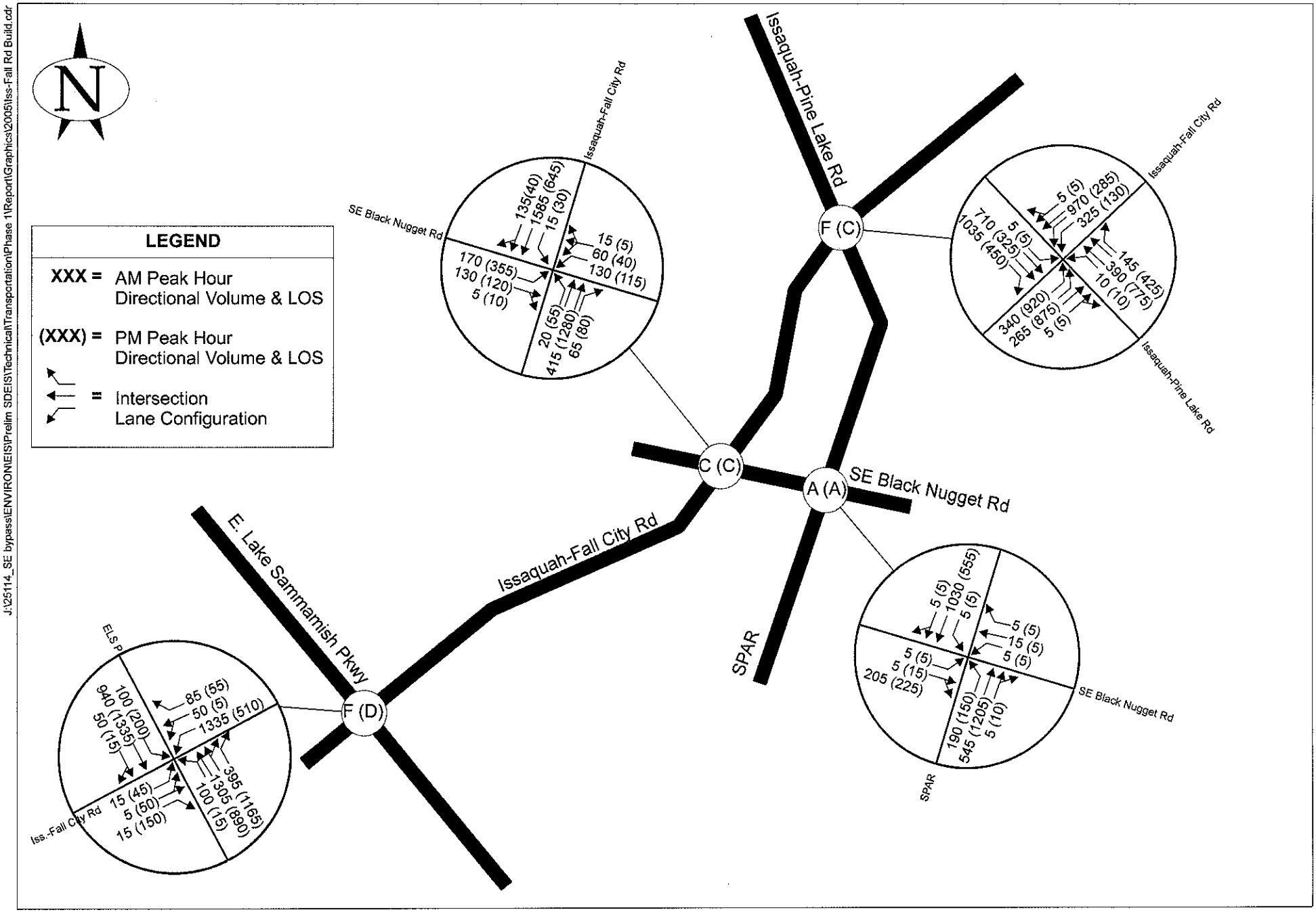


East Lake Sammamish Pkwy Corridor
Year 2005 Peak Hour Volumes and LOS
Build Scenario
Figure 13



Issaquah-Fall City Road Corridor
Year 2005 Peak Hour Volumes and LOS
No Action Scenario
Figure 14



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Issaquah-Fall City Road Corridor
Year 2005 Peak Hour Volumes and LOS
Build Scenario
Figure 15

Table 19. Year 2005 Intersection Operations Along Issaquah-Fall City Road

Issaquah Fall City Road (IFC) Intersections: Year 2005 LOS & Delay				
	No Action Scenario		Build Scenario*	
	AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour
IFC/Issaquah-Pine Lk/SPAR	LOS E 66 sec/veh	LOS C 27 sec/veh	LOS F >80 sec/veh	LOS C 25 sec/veh
IFC/Black Nugget Road	LOS C 23 sec/veh	LOS C 28 sec/veh	LOS C 33 sec/veh	LOS C 25 sec/veh
SPAR/Black Nugget Road	LOS A 8 sec/veh	LOS A 6 sec/veh	LOS A 9 sec/veh	LOS A 6 sec/veh

* *Results are the same for both South A and South C Build Scenario Alignment Alternatives unless otherwise noted*

Please note that though the forecasted peak hour volumes between the No Action and Build scenarios are fairly similar; in the AM Peak hour there is slight increase in the intersection delay in the Build scenario. This increase in delay can be attributed to the way congestion is modeled in the simulation software (SimTraffic). SimTraffic has the capability to account for congestion and queuing; which is observed in the No-Action scenario to a greater degree than in the Build scenario. Queued traffic essentially operates as metered traffic for intersection upstream and downstream from the bottleneck. Therefore the actual volumes that reach the intersections are even higher in the build scenario given the improved overall capacity of the system and this may attribute to the higher delay illustrated in **Table 19**.

Issaquah-Hobart Road

From the traffic analysis, it seems that extensive queues occur along Issaquah-Hobart Road primarily due to the limited capacity and options available to access the area served by this facility. The Issaquah-Hobart Road, from Second Avenue SE to May Valley Road is a two-lane facility (one lane per direction). Most of the Issaquah-Hobart Road section described falls within King County's jurisdiction, and currently there are no plans for expanding this roadway facility.

According to the traffic forecast model, by the Year 2005 Issaquah-Hobart Road is anticipated to have volumes that approach the capacity of a one-lane facility, with or without the Southeast Issaquah Bypass Road. Please refer to **Table 20** for anticipated volumes along Issaquah Hobart Road in the PM peak hour. Intersection LOS and volumes for this facility are included in **Figure 9, Figure 10**, and **Figure 11**. Extensive rolling queues may be observed throughout this corridor and the peak congestion period is anticipated to spread for a longer period of time. The intersection of May Valley Road and Issaquah-Hobart Road is failing in both peak hours for both scenarios as shown in **Table 5** and **Table 6**.

Table 20. Year 2005 Southbound Volumes for Issaquah-Hobart Road

	No Action Scenario	Build Scenario*
South of Second Avenue SE	1,670 vph	1,525 vph
North of SE 96th Street	1,415 vph	1,475 vph
North of May-Valley Road	1,405 vph	1,465 vph

** Volumes are the same for both South A and South C Build Scenario Alignment Alternatives*

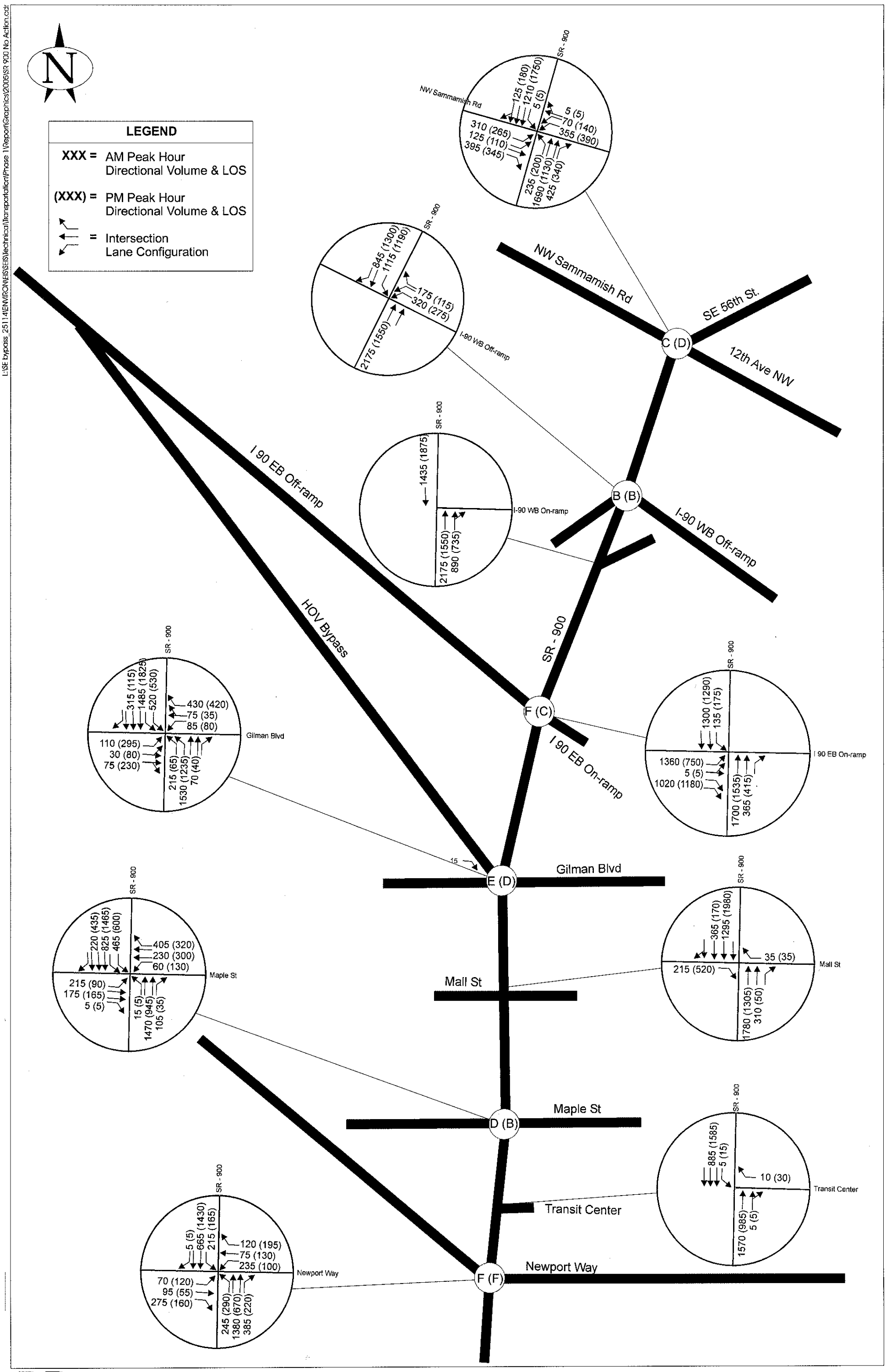
SR 900 Corridor

The SR 900 corridor is projected to experience similar levels of service for the Build and No Action Scenarios in the Year 2005. Please refer to **Table 21** for peak hour intersection LOS and average delay per vehicle along SR 900. **Figure 16** and **Figure 17** present peak hour intersection volumes and LOS for the No Action and Build Scenarios, respectively. Note that all the levels of service are the same in the No Action Scenario and Build Scenario with the exception of the intersection at NW Gilman Boulevard for the PM peak hour. This intersection slightly improves in the Build Scenario. The intersection with the I-90 EB ramp is failing in the AM peak hour for both scenarios. The SimTraffic simulation shows queues at this intersection especially for those vehicles exiting from EB I-90 and heading north. The intersection with Newport Way is failing in both peak hours and in both No Action and Build Scenarios. The simulation shows extensive queues northbound along SR 900 in the AM peak hour. These Year 2005 results are somewhat similar to those presented in the *SR 900: SE 78th to Interstate 90 Transportation Technical Report (2001)*. However, the 2005 Travel Model was updated for the SE Bypass project, in addition, different simulation software was utilized when conducting the traffic analysis; therefore the results may slightly differ.

Table 21. Year 2005 Intersection Operations along SR 900

SR 900 Intersections: Year 2005 LOS & Delay				
	No Action Scenario		Build Scenario*	
	AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour
SR 900/NW Sammamish	LOS C 31 sec/veh	LOS D 43 sec/veh	LOS C 33 sec/veh	LOS D 49 sec/veh
SR 900/WB Ramps	LOS A 10 sec/veh	LOS B 11 sec/veh	LOS A 10 sec/veh	LOS B 10 sec/veh
SR 900/EB Ramps	LOS F >80 sec/veh	LOS C 27 sec/veh	LOS F >80 sec/veh	LOS C 28 sec/veh
SR 900/Gilman	LOS E 61 sec/veh	LOS D 38 sec/veh	LOS E 66 sec/veh	LOS C 34 sec/veh
SR 900/Maple	LOS D 43 sec/veh	LOS B 19 sec/veh	LOS D 47 sec/veh	LOS B 17 sec/veh
SR 900/Newport Way	LOS F >80 sec/veh	LOS F >80 sec/veh	LOS F >80 sec/veh	LOS F >80 sec/veh

** Results are the same for both South A and South C Build Scenario Alignment Alternatives*



SR 900 Corridor
2005 Peak Hour Volumes and LOS
No Action Scenario
Figure 16

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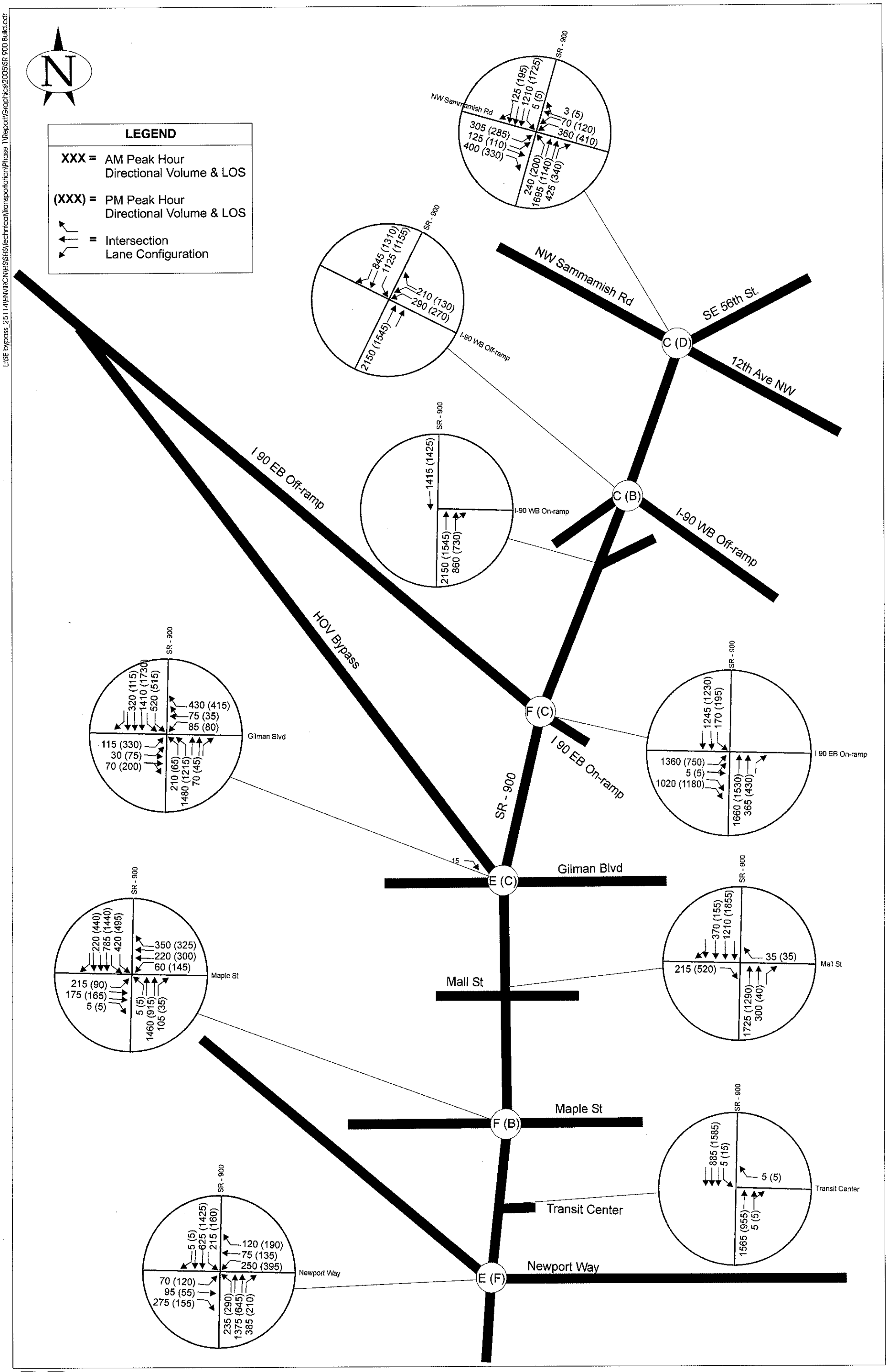

SR 900 Corridor
2005 Peak Hour Volumes and LOS
Build Scenario
Figure 17

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Design Year 2030: Traffic Forecast Modeling

Year 2030 is the design year for the SE Issaquah Bypass Road. Similarly to the section for the Opening Year 2005, this section describes and compares the traffic volumes, travel patterns and operations for the intersections with the study area for the following Year 2030 scenarios:

- **No Action,** including the I-90 Sunset Interchange modifications, the SR 900 modifications, and the North and South SPAR.
- **Full Build,** including the I-90 Interchange, the SR 900 modifications, the North and the South SPAR, and the Southeast Issaquah Bypass.

The organization of the Year 2030 Traffic Analysis section is similar in its presentation as Year 2005 (year of opening).

Intersection/Corridor Analysis

The remaining part of this section discusses the forecasted traffic operation on the various corridors analyzed for Year 2030 for the Build and No Action Scenarios. **Table 5** and **Table 6** summarizes the estimated level of service and delay per vehicle for the intersections analyzed in both scenarios and serves as a reference table for all the scenarios and years analyzed.

Please, note that although the network assumptions are the same made for the opening year, the operational performance of most intersections greatly degrades from Year 2005 to Year 2030 due to a significant increase of traffic volumes. **Table 13** shows how traffic volumes increase from 2005 to 2030 in some sections for the No Action Scenarios. These sections were chosen along Front Street and Second Avenue SE in an area that would be significantly impacted by the construction of the Southeast Bypass. The volumes are the sum of northbound and southbound intersection volumes. As shown in **Table 22**, the volumes can increase in some cases over 30% and approach the necessity of considering further improvements.

Table 22. 2005 and 2030 PM Peak Hour No Action Volume Increase

	2005	2030	% Change
Location			
Front Street s/o Newport	1,630	2,230	36.8%
Front Street n/o Sunset	1,330	1,495	12.4%
Front Street n/o Gilman	3,015	3,680	22.1%
Second Avenue s/o Evans	890	1,165	30.9%

Southeast Issaquah Bypass Road

Roadway Volumes

As expected for the Design Year 2030, traffic volumes for all scenarios would increase substantially over current and opening year traffic volumes. In the Year 2030 AM peak hour, over 1,700 vph are projected to head northbound (just north of Front Street/Issaquah-Hobart Road) on the Southeast Bypass in the Build Scenario. Additionally, it is estimated that between Park Pointe and East Sunset Way, over 2000 vph will be traversing the SE Bypass Road corridor. Similar volumes are projected for the PM peak hour in the southbound direction. These volumes exceed the capacity of a one-lane per direction facility, and therefore two lanes per direction are recommended for the SE Issaquah Bypass Road by the Year 2030.

By the Year 2030, most major corridors within Issaquah will be experiencing congestion and poor level of service during the peak hours. The inclusion of the SE Issaquah Bypass Road eases the forecasted congestion by providing an alternative North/south corridor; however, congestion is still anticipated along Front Street with the Southeast Bypass Road. The primary difference is the level of congestion and spillover impacts (such as neighborhood cut-through traffic) without the Southeast Issaquah Bypass. Without the Southeast Bypass, the duration of peak hour congestion will spread and remain for a longer period of time. Additionally, if Front Street operates at congestion levels that are considered intolerable by drivers, other arterials will be utilized, such as Second Avenue SE, which primarily serves residential communities and Issaquah High School; i.e., essentially an increase in neighborhood cut-through traffic would be observed. **Table 23** shows a comparison of PM peak hour volumes for Build and No Action Scenarios.

Table 23. 2030 PM Peak Hour Volumes for Build and No Action Scenarios

	No Action Scenario		Build Scenario	
LOCATION:	**Southbound**	**Northbound**	**Southbound**	**Northbound**
Bypass s/o I-90	-	-	2,520	1,000
Bypass n/o Iss-Hobart Road	-	-	1,830	595
Front Street s/o Newport	1,695	535	680	325
Front Street n/o Sunset	925	570	515	530
Front Street n/o Gilman	1,510	2,170	1,060	2,085
Second Avenue s/o Evans	895	270	25	15

Table 23 presents PM peak hour volumes for the 2030 No Action and Build Scenarios. It illustrates that implementation of the SE Issaquah Bypass Road would determine a significant reduction in traffic along Front Street and Second Avenue SE. This is again a confirmation that the Southeast Issaquah Bypass would operate as a bypass facility to Front Street.

Traffic Operations

Figure 18, Figure 19, and **Figure 20** depict the forecasted volumes and LOS along SE Bypass Road in Year 2030 for the No Action Scenario and South A Build and South C Build Scenario alignment alternatives. **Table 24** provides a summary and comparison of the LOS anticipated in Year 2030 for both Build Scenario alignment alternatives.

Table 24. Year 2030 LOS and Delay for Southeast Issaquah Bypass Road

	South A Alignment		South C Alignment	
	AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour
Southeast Bypass and East Sunset Way	LOS B 12 sec/veh	LOS C 26 sec/veh	LOS B 12 sec/veh	LOS C 26 sec/veh
Southeast Bypass and Park Pointe Access	LOS C 22 veh/sec	LOS D 48 veh/sec	LOS C 22 veh/sec	LOS D 48 veh/sec
Southeast Bypass and Front Street	LOS B 19 veh/sec	LOS F >80 veh/sec	LOS D 38 veh/sec	LOS F > 80 veh/sec

For the most part, both South alignments operate very similarly in the AM and PM peak hours. However, in the AM peak hour, the Southeast Bypass and Front Street intersection is anticipated to operate at LOS B for the South A and operate LOS D for the South C alignment. Please note that the flow rate in the PM Peak Hour exceeds the capacity of the intersection and the level of service will be failing. The failing level of service is primarily due to the high demand of vehicles utilizing the Front Street/Issaquah-Hobart Road which is limited to a two-lane facility.

As mentioned previously, the level of service and intersection delay does not account for rolling queues that may be occurring on the corridor, which is the case for the SE Issaquah Bypass Road. Primarily in the PM peak hour, the model simulation in all the alignment alternatives indicated that by the end of the hour, a rolling queue could be anticipated throughout the southbound direction of the SE Issaquah Bypass Road, and continuing on along southbound Issaquah-Hobart Road to May Valley Road. Additionally, a rolling queue can be anticipated for much of Front Street, heading southbound in the PM peak hour towards Issaquah-Hobart Road. The rolling queue is due primarily to the limited capacity on the Issaquah-Hobart Road. Please note that with or without the SE Bypass Road, a rolling queue would be observed. Because of the limited capacity available on Issaquah-Hobart Road heading northbound in the AM peak hour, the traffic is somewhat metered by the capacity constraints and therefore the queuing is less extensive in the northbound direction.

Future traffic cycle lengths were estimated for the year 2030 as follows:

<u>Downtown Area (Front Street, Southeast Bypass, 2nd Avenue, Sunset Way)</u>
No Action:
AM Peak Hour = 55-100; PM Peak Hour = 60-150

Build Scenario:
AM Peak Hour = 60-160; PM Peak Hour = 100-140

<u>East Lake Sammamish</u>
No Action:
AM Peak Hour = 65-100; PM Peak Hour = 90-130

Build Scenario:
AM Peak Hour = 90-100; PM Peak Hour = 90-130

SR 900
No Action:
AM Peak Hour = 130; PM Peak Hour = 130

Build Scenario:
AM Peak Hour = 130; PM Peak Hour = 130

Issaquah-Fall City Road
No Action:
AM Peak Hour = 100-150; PM Peak Hour = 90-120

Build Scenario:
AM Peak Hour = 90-150; PM Peak Hour = 90-120

Front Street Corridor

Table 25 presents the traffic operations anticipated for Year 2030 along Front Street. Please, refer to **Figure 18, Figure 19**, and **Figure 20** for volumes and LOS anticipated along Front Street for the No Action Scenario and the South A Build and South C Build Scenario alignment alternatives, respectively.

Table 25. Year 2030 Intersection Operations along Front Street

Front Street Intersections: Year 2030 LOS & Delay				
	No Action Scenario		Build Scenario*	
	AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour
Front/WB I-90 Ramps	LOS C 22 sec/veh	LOS D 47 sec/veh	LOS D 46 sec/veh	LOS D 52 sec/veh
Front/EB I-90 Ramps	LOS C 22 sec/veh	LOS F >80 sec/veh	LOS C 27 sec/veh	LOS F >80 sec/veh
Front/Gilman	LOS F >80 sec/veh	LOS F >80 sec/veh	LOS E 69 sec/veh	LOS F >80 sec/veh
Front/Dogwood	LOS E 71 sec/veh	LOS D 41 sec/veh	LOS E 49 sec/veh	LOS A 9 sec/veh
Front/Sunset	LOS F >80 sec/veh	LOS C 31 sec/veh	LOS E 60 sec/veh	LOS B 12 sec/veh
Front/Clark	LOS F >80 sec/veh	LOS F >80 sec/veh	LOS E 73 sec/veh	LOS B 12 sec/veh

** Results are the same for both South A and South C Build Scenario alignment alternatives*

The Build Scenario shows a general traffic operational improvement over the No Action Scenario due to the implementation of the SE Issaquah Bypass Road. When the Southeast Bypass is operational, vehicles will use it to bypass the congestion on Front Street. The delays with the I-90 ramps are increasing in the Build Scenario for both AM and PM peak hours. The SimTraffic simulation shows that vehicles behave similarly to what was already seen in the Opening Year 2005. In summary, in the AM peak hour vehicles head northbound on the SE Bypass Road (instead of Front Street), head westbound on I-90 and then exit at the Front Street interchange in order to access East Lake Sammamish Parkway; therefore a slightly higher volume can be observed at the Front Street and WB I-90 intersection than the No Action. This determines one LOS degradation at the intersection with the westbound I-90 ramps with Front Street in the PM peak hour. However, the impact to the I-90 mainline due to this potential diversion pattern is expected to be minimal. The intersection at Gilman Boulevard is failing

operationally with the exception of the AM peak hour for the Build Scenario. The Dogwood, Sunset, and Clark Street intersections show improvements in the Build Scenario for both the AM and PM peak hours.

In summary, the implementation of the SE Issaquah Bypass Road results in a reduction in volume along Front Street. During the PM peak hour in the southbound direction, the volume reduction varies from approximately 500 vehicles around the Front Street/East Sunset Way intersection to nearly 1,000 vehicles north of Second Avenue SE. The estimated volumes along Front Street in the No Action Scenario approach or exceed the capacity of the facility. This suggests that in the No Action Scenario, the peak congestion time period would likely spread for a longer period of time and vehicles will utilize other corridors such as Second Avenue SE in order to bypass the Front Street congestion.

Second Avenue SE

Table 26 presents the anticipated intersection traffic operations along Second Avenue SE. Please see **Figure 18, Figure 19**, and **Figure 20** for volumes in Year 2030 for the No Action Scenario and the South A Build and South C Build Scenario alignment alternatives, respectively. The network assumptions along Second Avenue SE are similar to those in Year 2005, where the intersections of Bush Street and East Sunset Way were analyzed as unsignalized intersections.

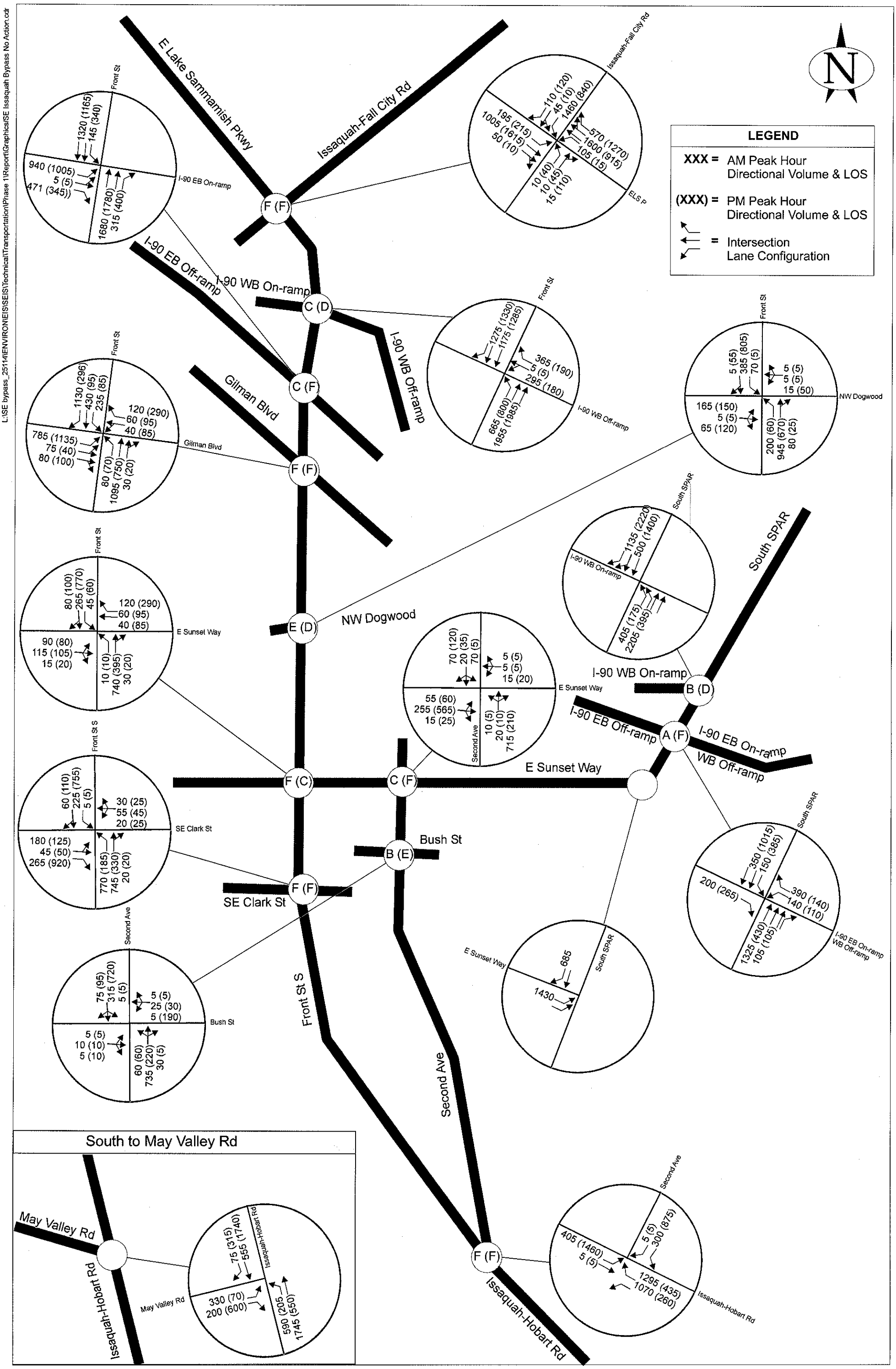
Table 26. Year 2030 Intersection Operations along Second Avenue SE

Second Avenue SE Intersections: Year 2030 LOS & Delay				
	No Action Scenario		Build Scenario*	
	AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour
Second/Sunset	LOS C 29 sec/veh	LOS F >80 sec/veh	LOS A 3 sec/veh	LOS A 5 sec/veh
Second/Bush	LOS B 14 sec/veh	LOS E 78 sec/veh	LOS A 4 sec/veh	LOS A 6 sec/veh
Second/Front	LOS F >80 sec/veh	LOS F >80 sec/veh	LOS B (South A) 19 sec/veh LOS D (South C) 38 sec/veh	LOS F (South A) >80 sec/veh LOS F (South C) >80 sec/veh

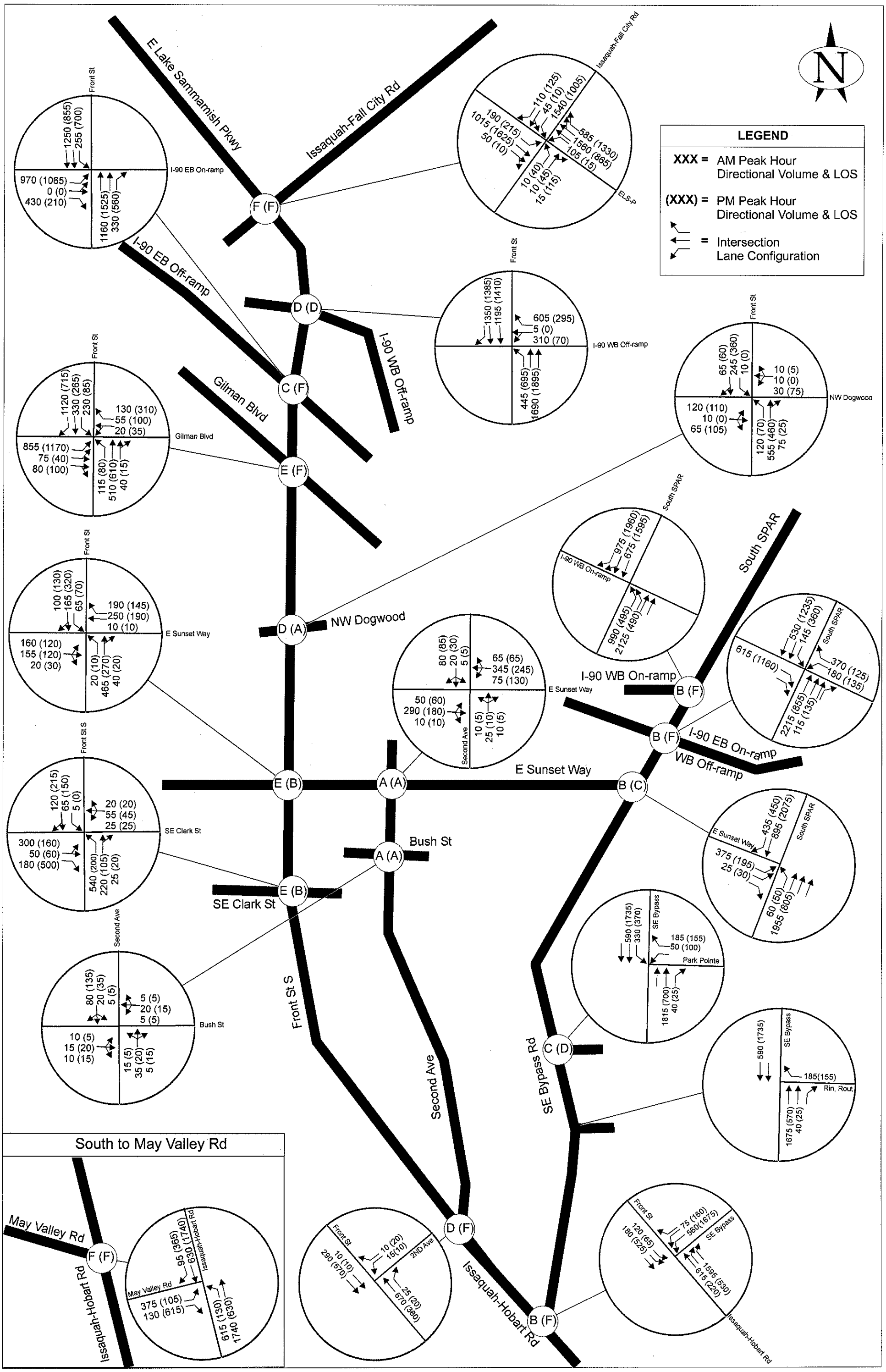
** Results are the same for both South A and South C Build Scenario alignment alternatives*

From **Table 26** it is evident that traffic operations improve significantly along Second Avenue SE in the Build Scenario. In the No Action Scenario, the Front Street corridor is congested for a long period of time; therefore drivers look for other arterials that may have less congestion. Vehicles move onto Second Avenue SE and neighborhood cut-through traffic increases. The implementation of the SE Issaquah Bypass Road provides a significant drop in vehicle volumes along Second Avenue SE because drivers use the Southeast Bypass Road instead. In the Year 2030, traffic forecast show a decrease of over 800 vehicles (south of Evans Street) in the southbound direction on Second Avenue SE in the Build Scenario.

The intersection between Second Avenue SE and Front Street is failing in the No Action Scenario for both peak hours and is failing in the PM peak hour for the Build Scenario alignment alternatives. This failing condition in the Build alignments is primarily due to the significant delay and queuing experienced on Issaquah-Hobart Road, given the limited capacity available.



Front St/Second Ave/Sunset Way Corridors
2030 Peak Hour Volumes and LOS
No Action Scenario
Figure 18



Front St/2nd Ave/SE Issaquah Bypass Corridors
2030 Peak Hour Volumes and LOS
South A Build Scenario
Figure 19

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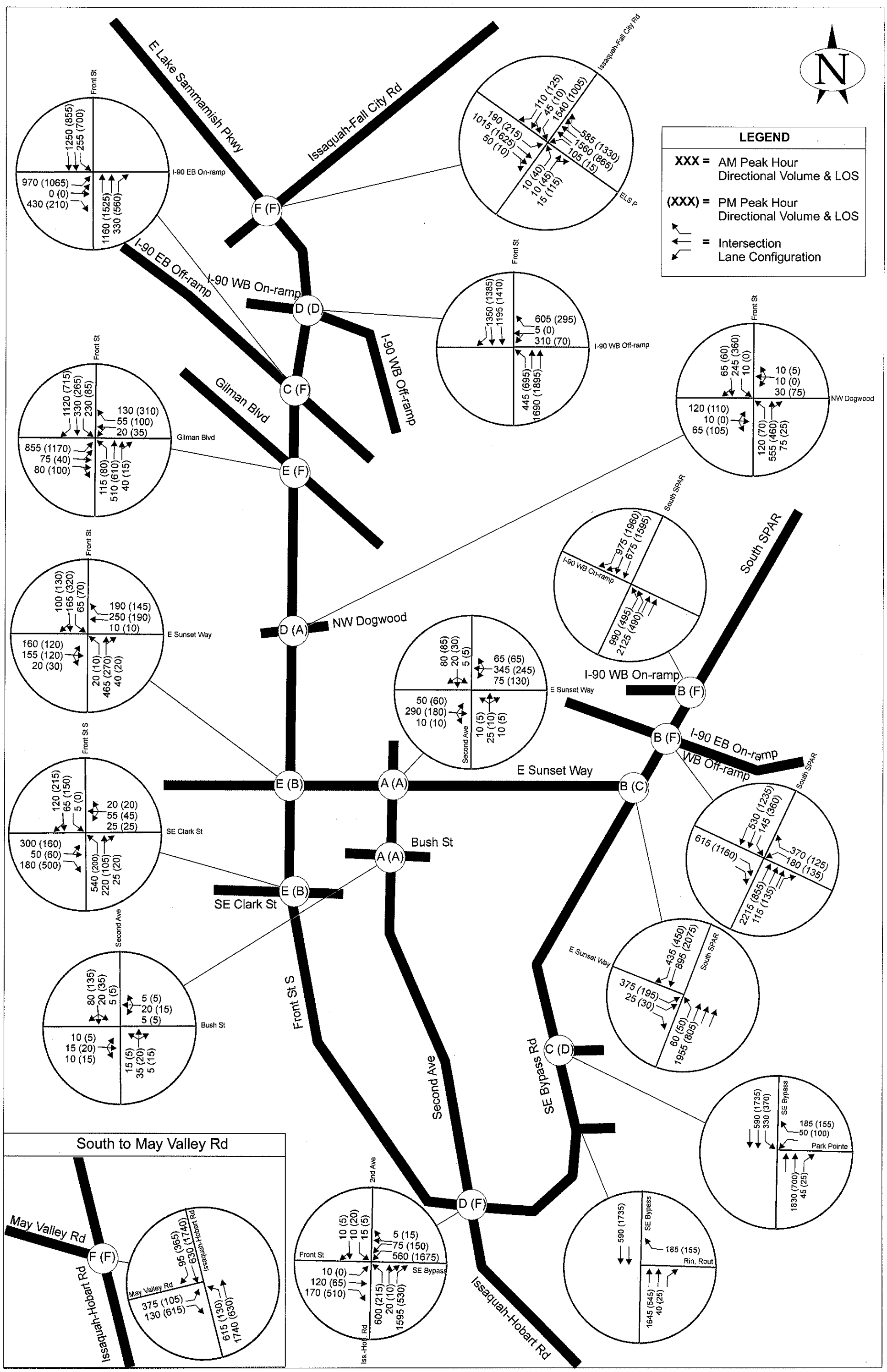


Front St/2nd Ave/SE Issaquah Bypass Corridors
2030 Peak Hour Volumes and LOS
South C Build Scenario
Figure 20

East Lake Sammamish Parkway

For the design year, similarly to the opening year, the East Lake Sammamish Parkway corridor is expected to experience poor levels of service and significant queuing in both the No Action and Build Scenarios. Please refer to **Figure 21** and **Figure 22** for the peak hour intersection volumes and LOS anticipated for the No Action and Build Scenarios respectively. As **Table 27** illustrates, most of the intersections along East Lake Sammamish Parkway are failing. The only exceptions are the intersection with Black Nugget Road in both the No Action and Build Scenarios and the intersection with SE 43rd Way for the No Action Scenario. The SimTraffic simulations show significant queuing in all the 2030 alignment alternatives. Because there are limited access options for the Plateau area, delay and queuing are expected with or without the Southeast Bypass being incorporated.

Table 27. Year 2030 Intersection Operations along East Lake Sammamish Parkway

East Lake Sammamish Parkway (ELSP) Intersections: Year 2030 LOS & Delay				
	No Action Scenario		Build Scenario*	
	AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour
ELSP/Issaquah-Fall City Road	LOS F >80 sec/veh	LOS F >80 sec/veh	LOS F >80 sec/veh	LOS F >80 sec/veh
ELSP/43rd	LOS E 75 sec/veh	LOS E 77 sec/veh	LOS F >80 sec/veh	LOS F >80 sec/veh
ELSP/56th	LOS F >80 sec/veh	LOS F >80 sec/veh	LOS F >80 sec/veh	LOS F >80 sec/veh
ELSP/62nd	LOS F >80 sec/veh	LOS F >80 sec/veh	LOS F >80 sec/veh	LOS F >80 sec/veh
ELSP/Black Nugget Rd	LOS D 36 sec/veh	LOS D 46 sec/veh	LOS C 24 sec/veh	LOS D 48 sec/veh

** Results are the same for both South A and South C Build Scenario alignment alternatives*

Issaquah-Fall City Road

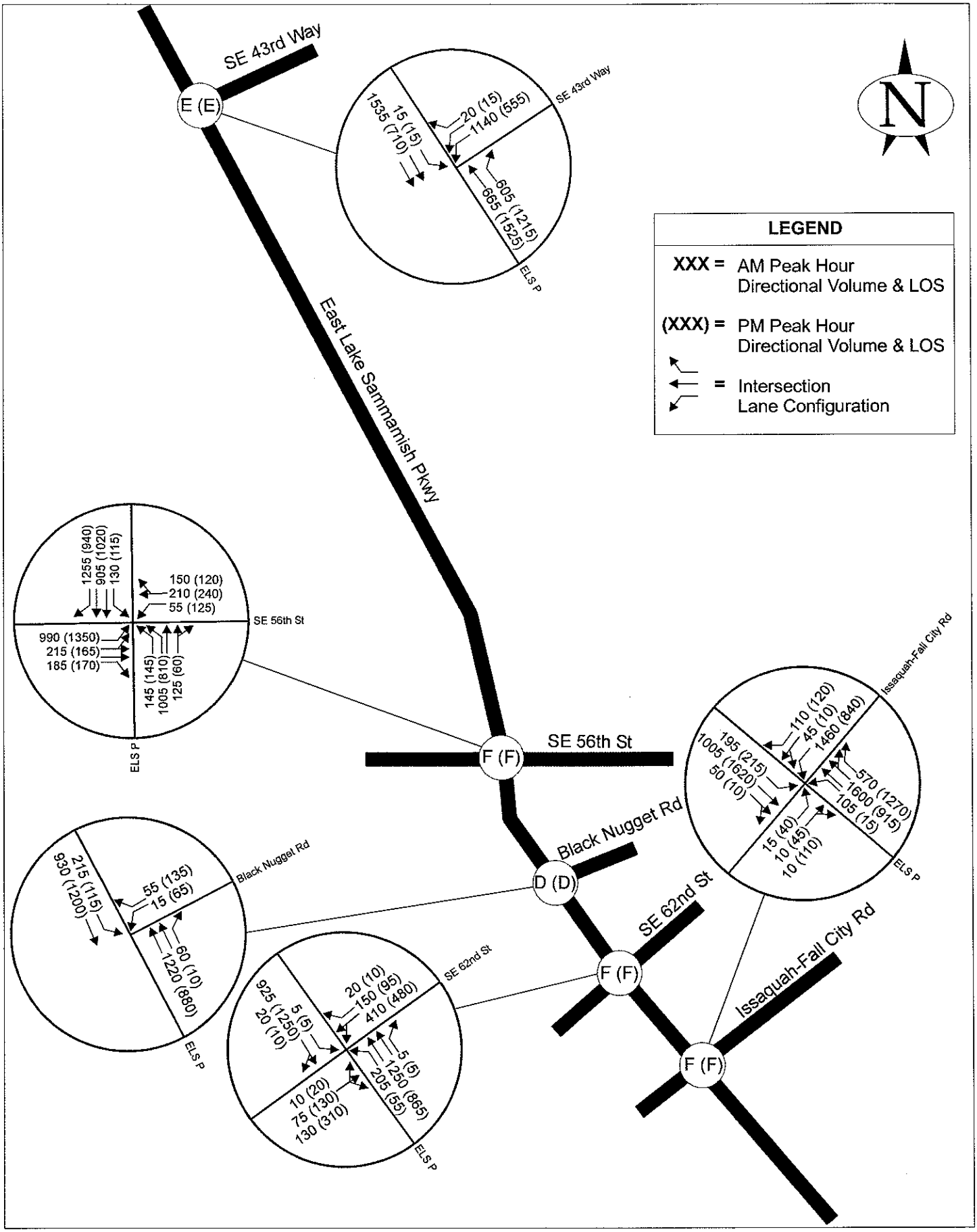
The Issaquah Fall City Road is also expected to experience poor levels of service by the Year 2030. The SimTraffic simulations show significant queues southbound along Issaquah Fall-City Road in the AM peak hour. This corridor serves many new residential areas, and therefore, in the AM peak hour, many drivers are accessing the I-90 interchange and the downtown area. **Table 28** presents projected Year 2030 peak hour intersection operations along the corridor. See **Figure 23** and **Figure 24** for anticipated Year 2030 peak hour intersection volumes and LOS designations for the No Action and Build Scenarios respectively, along Issaquah-Fall City Road.

Table 28. Year 2030 Intersection Operations along Issaquah-Fall City Road

Issaquah Fall City Road (IFC) Intersections: Year 2030 LOS & Delay				
	No Action Scenario		Build Scenario*	
	AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour
IFC/Issaquah-Pine Lk/SPAR	LOS F >80 sec/veh	LOS D 36 sec/veh	LOS F >80 sec/veh	LOS C 33 sec/veh
IFC/Black Nugget Road	LOS E 58 sec/veh	LOS C 25 sec/veh	LOS F >80 sec/veh	LOS C 35 sec/veh
SPAR/Black Nugget Road	LOS C 26 sec/veh	LOS B 11 sec/veh	LOS C 28 sec/veh	LOS B 18 sec/veh

Results are the same for both South A and South C Build Scenario alignment alternatives

As noted in the 2005 analysis, the forecasted peak hour volumes between the No Action and Build scenarios are fairly similar; however, at some intersections (both in the AM and PM peak hour) there is slight increase in the intersection delay in the Build scenario. This increase in delay can be attributed to the way congestion is modeled in the simulation software (SimTraffic). SimTraffic has the capability to account for congestion and queuing; which is observed in the No-Action scenario to a greater degree than in the Build scenario. Queued traffic essentially operates as metered traffic for intersection upstream and downstream from the bottleneck. Therefore the actual volumes that reach the intersections are even higher in the build scenario given the improved overall capacity of the system and this may attribute to the higher delay illustrated in **Table 28**.



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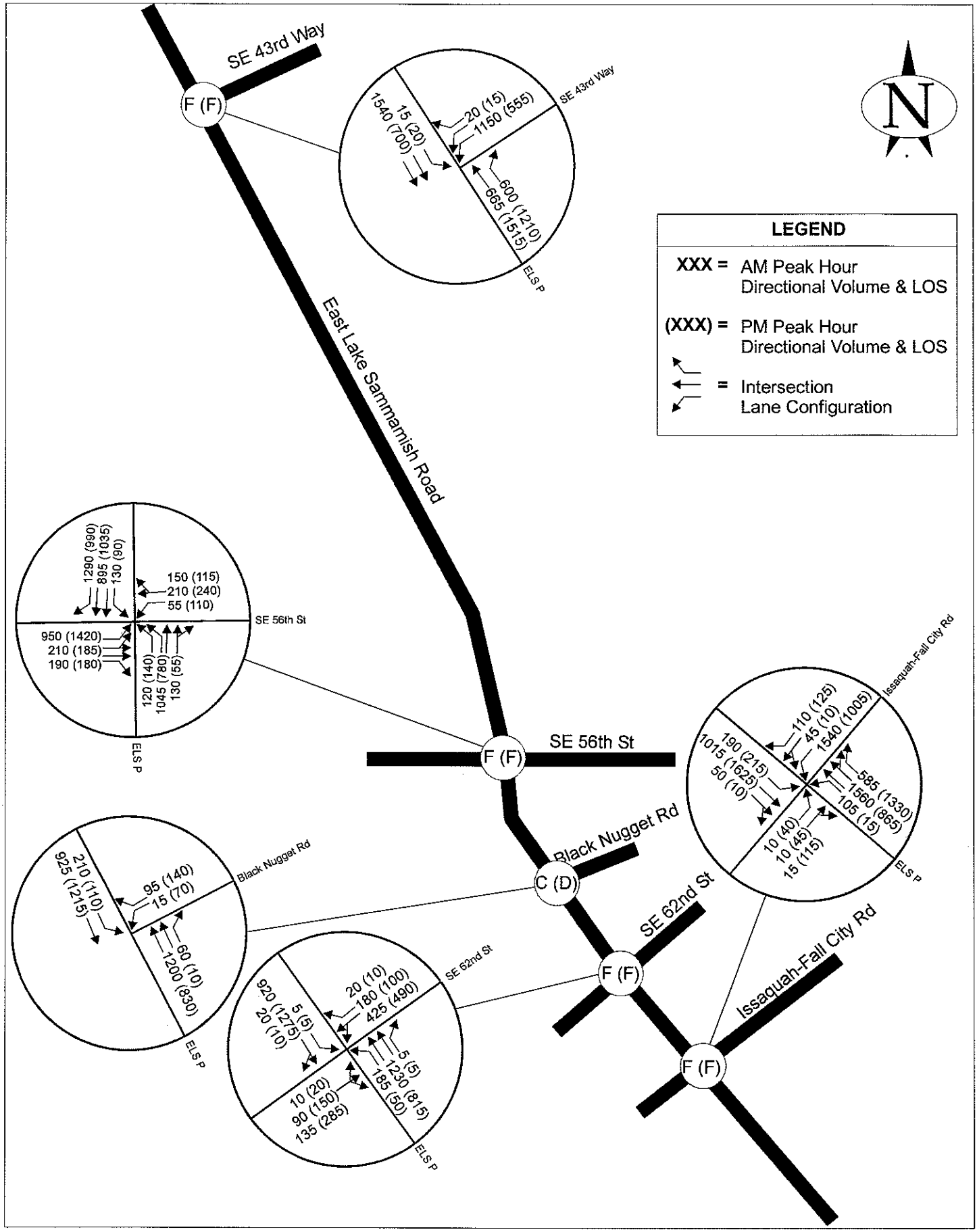
East Lake Sammamish Pkwy Corridor
Year 2030 Peak Hour Volumes and LOS
No Action Scenario
Figure 21



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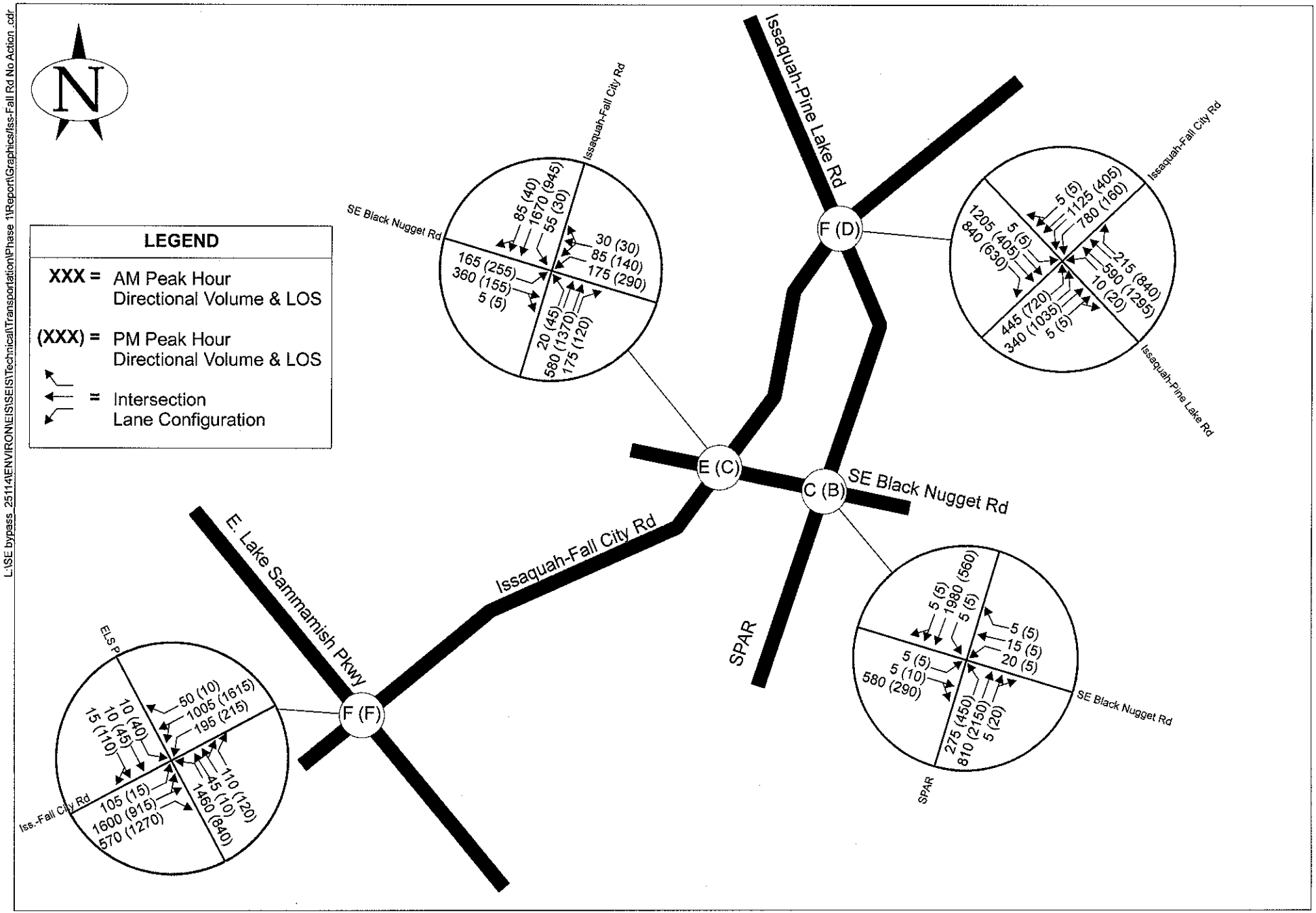
East Lake Sammamish Pkwy Corridor
Year 2030 Peak Hour Volumes and LOS
Build Scenario
Figure 22



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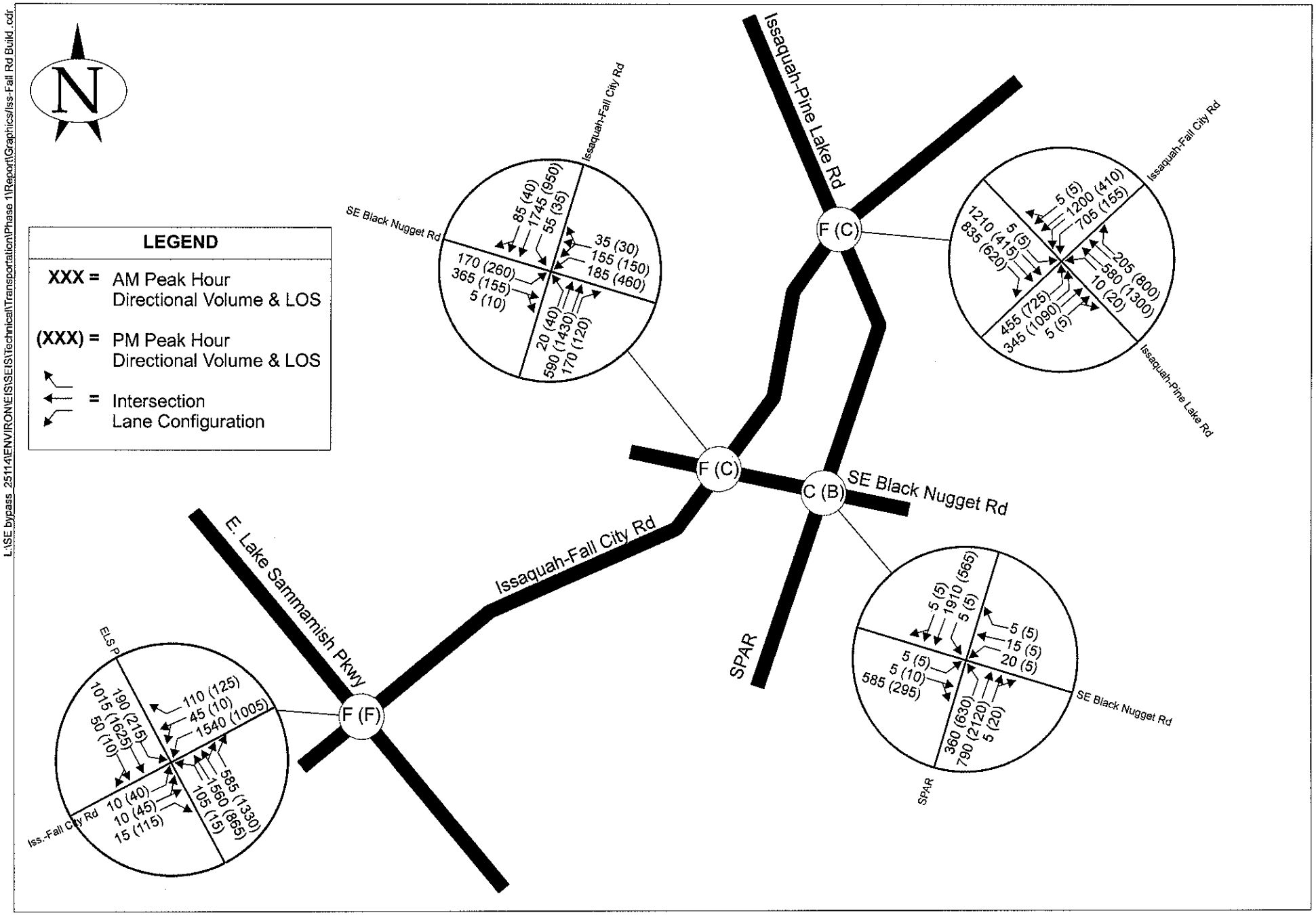
PB 100 YEARS

Issaquah-Fall City Road Corridor
Year 2030 Peak Hour Volumes and LOS
No Action Scenario
Figure 23



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Issaquah-Fall City Road Corridor
Year 2030 Peak Hour Volumes and LOS
Build Scenario
Figure 24

Issaquah-Hobart Road

The Issaquah-Hobart Road, from Second Avenue SE to May Valley Road is a two-lane facility (one lane per direction). **Table 29** presents traffic forecast volumes for the Issaquah-Hobart Road for the Design Year 2030. For this year, Issaquah-Hobart Road is anticipated to have volumes that exceed the capacity of one lane, with or without the SE Issaquah Bypass Road. The limited capacity of this corridor explains the extensive queue as well as the failure of the intersection of Issaquah-Hobart Road with SE May Valley Road in all the alignments analyzed.

Table 29. Year 2030 Volumes for Issaquah-Hobart Road

Issaquah-Hobart Road		
Year 2030 Southbound PM Peak hour Volumes		
	No Action Scenario	Build Scenario
South of Second Avenue SE	2335 vph	2200 vph
North of SE 96th Street	2070 vph	2135 vph
North of May-Valley Road	2060 vph	2125 vph

** Volumes are the same for both South A and South C Build Scenario alignment alternatives*

Based on the traffic analysis results of a two-lane facility at Issaquah-Hobart Road, a four-lane facility was also modeled. The intent was to determine the difference in traffic operations with additional capacity, not to provide recommendations on improvements to the Issaquah-Hobart Road facility. Analysis of Issaquah-Hobart Road is somewhat limited. First, this stretch of roadway is designated as rural, and many residential homes reside in this area with access directly to Issaquah-Hobart Road. The impact of turning movements into the access points was not considered. Additionally, various roadway modification alternatives were not tested. Given these parameters of the analysis for Issaquah-Hobart Road, it was noted that additional capacity along Issaquah-Hobart Road, from Second Avenue SE to May Valley Road, would significantly reduce queuing during the PM peak hour. Queuing along Southeast Bypass and Front Street were also significantly reduced. A thorough analysis of the Issaquah-Hobart Road corridor is recommended.

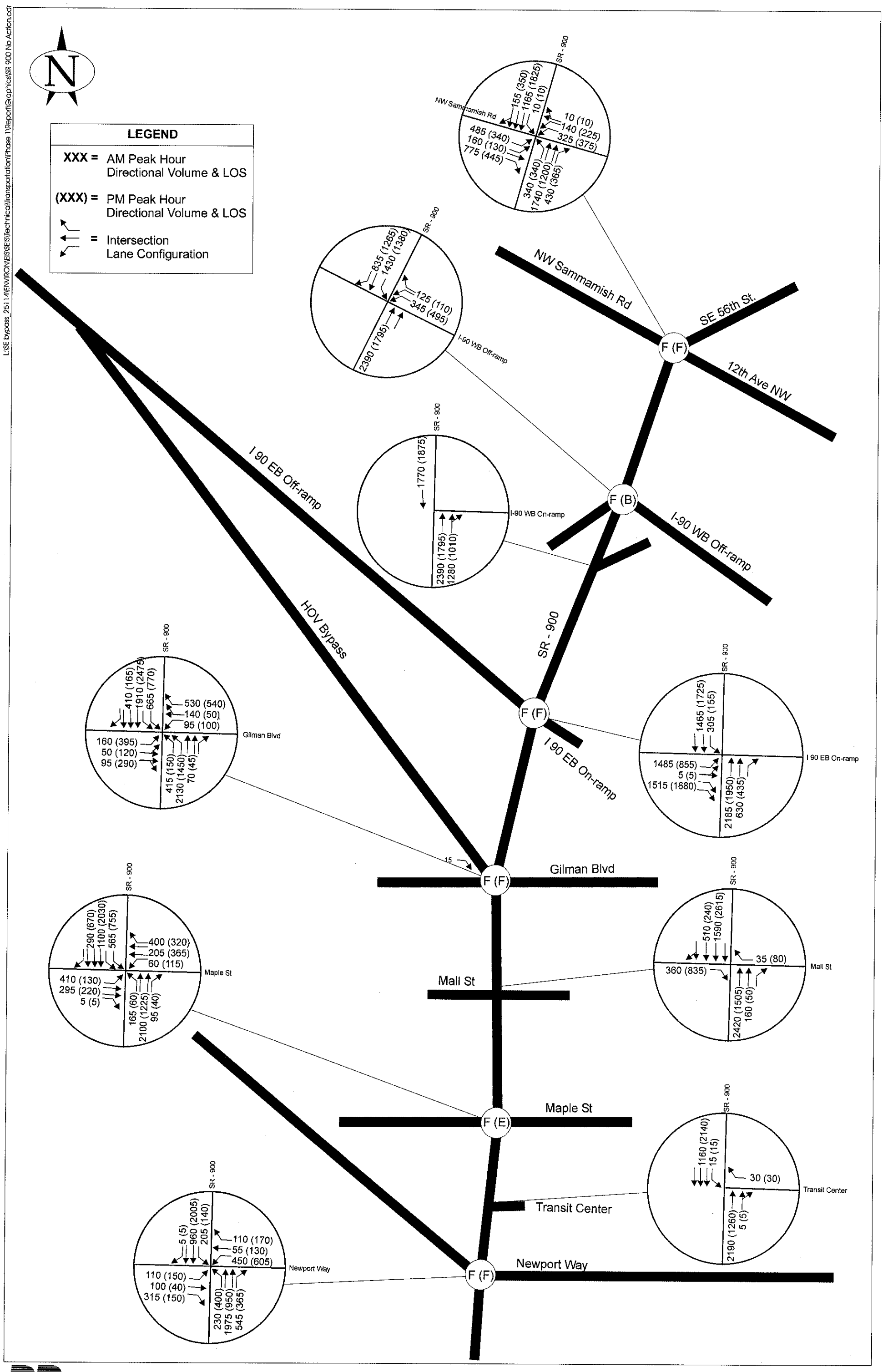
SR 900 Corridor

The SR 900 corridor is projected to experience poor levels of service by the Year 2030 in both the No Action and Build Scenarios. Refer to **Table 30** for peak hour intersection LOS and average delay per vehicle along SR 900. **Figure 25** and **Figure 26** present peak hour intersection volumes and LOS for the No Action and Build Scenarios, respectively. Note that while the Build Scenario does not appear to significantly affect most intersections in this corridor, it does result in an improved LOS (from LOS F to LOS D) at the intersection of SR 900 and EB I-90 ramps in the PM peak hour. This is likely due to diversion of traffic to the SE Issaquah Bypass Road via the Sunset Interchange.

Table 30. Year 2030 Intersection Operations along SR 900

SR 900 Intersections: Year 2030 LOS & Delay				
	No Action Scenario		Build Scenario*	
	AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour
SR 900/NW Sammamish	LOS F >80 sec/veh	LOS F >80 sec/veh	LOS F >80 sec/veh	LOS F >80 sec/veh
SR 900/WB Ramps	LOS F >80 sec/veh	LOS B 17 sec/veh	LOS F >80 sec/veh	LOS B 19 sec/veh
SR 900/EB Ramps	LOS F >80 sec/veh	LOS F >80 sec/veh	LOS F >80 sec/veh	LOS D 49 sec/veh
SR 900/Gilman	LOS F >80 sec/veh	LOS F >80 sec/veh	LOS F >80 sec/veh	LOS F >80 sec/veh
SR 900/Maple	LOS F >80 sec/veh	LOS E 65 sec/veh	LOS F >80 sec/veh	LOS E 58 sec/veh
SR 900/Newport Way	LOS F >80 sec/veh	LOS F >80 sec/veh	LOS F >80 sec/veh	LOS F >80 sec/veh

** Results are the same for both South A and South C Build Scenario Alignment Alternatives*



SR 900 Corridor
2030 Peak Hour Volumes and LOS
No Action Scenario
Figure 25

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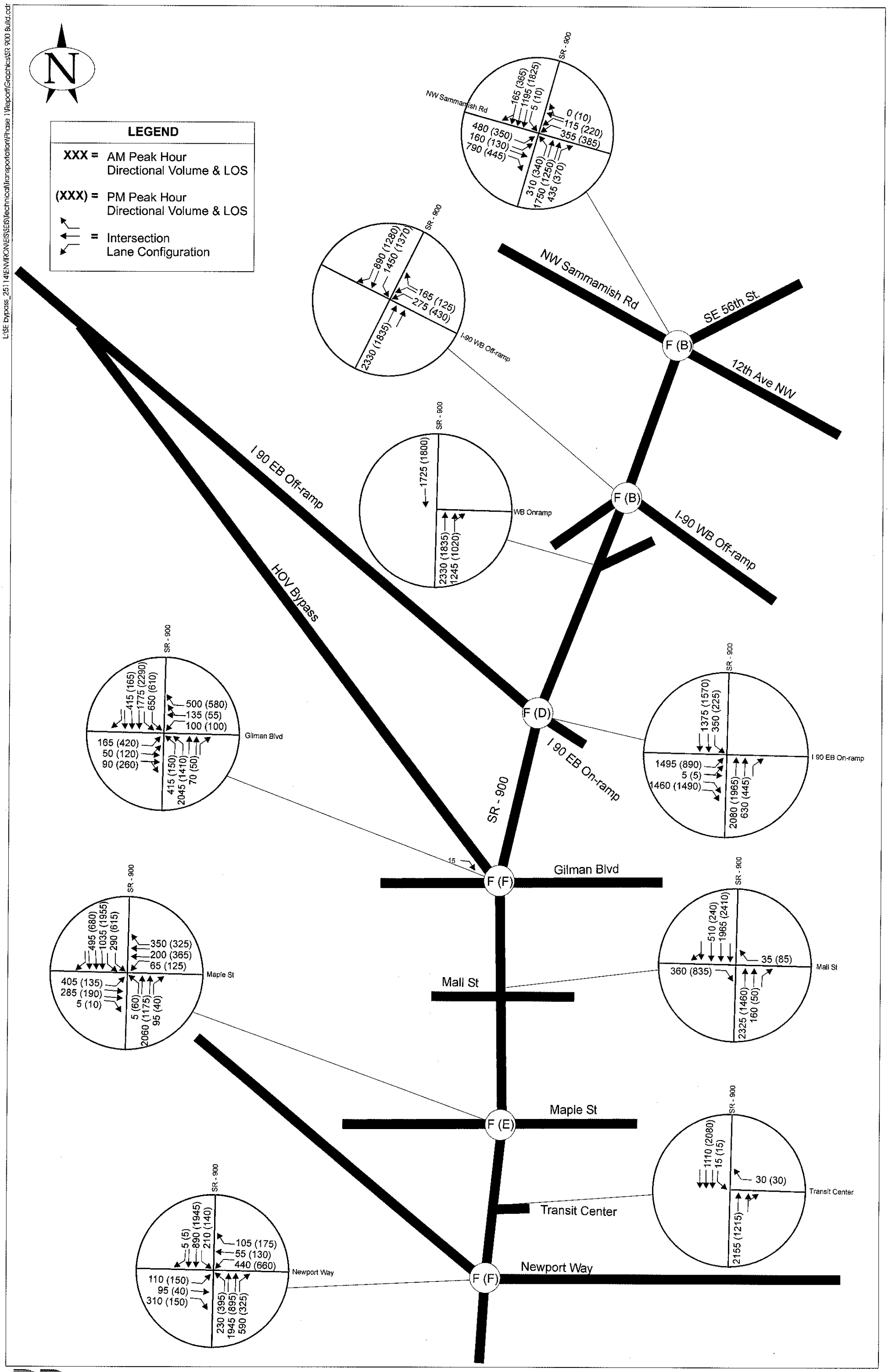

SR 900 Corridor
2030 Peak Hour Volumes and LOS
Build Scenario
Figure 26

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SR 18 Widening: Modeling Results

Another objective of this report is to analyze the potential widening of SR 18 between Issaquah-Hobart Road and I-90, to determine whether this widening could serve essentially the same function as the proposed Bypass. Since SR 18 lies outside the study area contained in the Issaquah travel model, this question was analyzed using King County's current long-range travel model.

Effects of Widening SR 18

This study considers the potential widening of SR 18 from a two-lane section to a four-lane section between Issaquah-Hobart Road and I-90. This question was addressed using King County's current 2020 travel model for the PM peak period. Because the demand year of this model is 2020 rather than 2030, and because of other methodological differences between the King County and Issaquah models, this analysis was limited to an assessment of the percentage impact to Front Street traffic of either building the Southeast Bypass or widening SR-18. The results are summarized below in **Table 31**.

Table 31: 2020 Impacts of the SR 18 Widening and Bypass on No Action PM Peak Traffic at Selected Locations

	Effect of:	Effect of:
	widening	Bypass
Location:	SR18 only	only
Issaquah-Hobart s/o May Valley	-19%	8%
Issaquah-Hobart s/o 6th	-13%	17%
Front s/o Newport	-8%	-47%
Front n/o Sunset	-10%	-51%
Front n/o Gilman	-7%	-18%
S. SPAR n/o I-90	0%	2%
I-90 e/o Sunset interchange	14%	-2%

Source: King County 2020 Travel Model

A number of conclusions may be drawn from this table. First, widening SR 18 would produce a reduction in demand at Issaquah-Hobart Road south of the City, whereas the proposed Southeast Bypass, by relieving congestion on Front Street and providing new capacity, would slightly increase the usage of Issaquah-Hobart at the same point. The same effects are seen on Issaquah-Hobart south of Sixth Avenue. On Front Street from just south of Newport to I-90, however, the greater benefit seems to be produced by the Southeast Bypass. Along this segment, the SR 18 widening would produce traffic reductions between 7% and 10%, whereas the Southeast Bypass would reduce traffic from approximately 18% to as much as 51%. The impacts of both proposals on the

south SPAR are essentially equivalent, but the SR 18 widening actually increases use of I-90 east of the Sunset interchange.

These conclusions are reasonably consistent with the 2030 analysis based on the Issaquah travel model, while incorporating shifts in use of the regional network that lies outside the Issaquah model study area.

Transit And HOV Provisions

Existing Service

King County Metro and Sound Transit provide transit service to and from the City of Issaquah. A total of eleven routes currently service the area; where King County Metro operates nine out of the eleven routes; which are route numbers 200, 209, 210, 214, 216, 217, 269, 271, and 927; while Sound Transit operates the remaining two routes, route number 554 and 555. The primary Park-and-Ride lot in the City, known as the Issaquah Park-and-Ride is located at the intersection of SE Newport Way and SR 900. This 397-vehicle lot currently operates at or over capacity. Another Park-and-Ride facility, the Tibbitt's Valley Park-and-Ride was recently added and contains 94 more parking stalls and serves as an extension of the Issaquah Park-and-Ride lot. This park-and-ride is located at the southeast corner of the SR900/Newport Way intersection.

These transit routes provide a variety of options including service within the City, service to other eastside cities such as Redmond and Bellevue, and the predominately used route – service to the downtown Seattle. Route service varies between AM and PM peak period only, as well as service throughout the day.

Inner-City Route Service

- Route 200 provides neighborhood service within the City of Issaquah. It provides services primarily between downtown Issaquah and north Issaquah via Front Street, NW Gilman Boulevard, SR 900, and SE 56th Street. This route also serves Second Ave between Front Street and E Sunset Way.
- Route 927 is a Dial-a-Ride Transit (DART) route serving the Sammamish Plateau area. DART is a demand responsive shuttle service that picks up people at their doorstep and takes them to their destination, rather than following fixed routes. DART is used in developing areas where transit service is not well established.

Route Service to Other Eastside Cities

Service from the City of Issaquah to other neighboring eastside communities include:

- Route 209 provides services between North Bend and Issaquah. This route uses the I-90/Sunset Way Interchange.

- Route 269 operates between the Redmond Park-and-Ride and downtown Issaquah via the Sammamish Plateau. It also provides service to downtown Issaquah via Front Street.

Route Service to the City of Seattle

- Route 210, 214, and 217 serve the Issaquah Park-and-Ride lot and provide service to Seattle. Route 210 provides peak-time service to downtown Seattle. It runs in the morning from the Issaquah Park-and-Ride to Seattle and, in the afternoon, from Seattle to the Issaquah Park-and-Ride. Route 214 provides peak-time service between downtown Seattle, the park-and-ride, Preston, Fall City, and Snoqualmie. Route 214 also operates in downtown Issaquah along E Sunset way, Front Street N, and NW Gilman Boulevard. Route 217 provides peak time service between downtown Seattle and downtown Issaquah, running in the morning from downtown Seattle to the Issaquah Park-and-Ride and, in the afternoon, from the Issaquah Park-and-Ride and downtown Seattle.
- Route 271 operates all day between the Issaquah Park-and-Ride and the University of Washington, and also provides late evening service to downtown Issaquah via NW Gilman Boulevard, Front Street, and W Sunset Way.
- Route 216 operates as a peak-period, fixed-route service between downtown Seattle and the City of Sammamish. This route serves north Issaquah via SE 56th Street.

Sound Transit Routes 554 and 555 are two regional express routes from the Issaquah Park-and-Ride that operate frequently throughout the day with headways of approximately 30 minutes. Route 554 provides limited-stop service between the Issaquah Park-and-Ride and downtown Seattle and Route 555 provides limited-stop service between the Issaquah Park-and-Ride, downtown Bellevue Transit Center, and Northgate Transit Center.

According to King County's *Six Year Transit Development Plan for 2002 to 2007* and Sound Transit's *Sound Move: the Ten-Year Regional Transit System Plan,* the City of Issaquah is designated as an employment target area. Regional transit plans identify new transit routes and some additional service for the Issaquah area. New regional routes planned include Routes 218 and 554. Both routes will serve the Issaquah Highlands and the Seattle CBD. Existing transit routes anticipated to have improved service frequency include Routes 269 and 271.

Planned Improvements

A new park-and-ride facility is scheduled for construction in the Issaquah Highlands in 2004. This Park-and-Ride will be located within the Issaquah Highlands development adjacent to SPAR. This facility will serve the residents of the Sammamish Plateau and Issaquah Highlands and will include approximately 500 stalls at the year of opening and expanding to 1000 spaces by Year 2015. In order to decrease bus travel times, high occupancy vehicle (HOV) lanes have been constructed for the I-90 Sunset interchange on-ramps. King County Metro, Sound Transit and the City of Issaquah are negotiating to

consider transit area expansion and to have transit serving Issaquah Highlands via South SPAR and the flyover ramp

The City of Issaquah recently completed studying the feasibility and potential location of a new transit center in Issaquah. The study recommended that a new transit center be located near the existing Issaquah Park-and-Ride location, at the intersection of SR 900 and Newport Way Northwest. Environmental documentation is anticipated to be completed in the Year 2003 and construction completed in the Year 2005.

Viability of Maintaining a Two-lane Footprint with Additional Transit Service

Given the forecasted demand in future Year 2005 and Year 2030, historic transit use for a suburban community, lack of additional planned transit service within the study corridor, and the historic political climate; it seems that it would be difficult to serve enough north/south trips to reduce the four-lane footprint of the SE Issaquah Bypass Road to a two-lane general-purpose and HOV lanes. The issues identified in this paper are intended to guide consideration of whether a transit-based approach can limit the proposed roadway to two lanes, and thereby serve as a reasonable alternative to the proposed construction of a four-lane roadway.

- By Year 2005 and Year 2030, it is unlikely that transit use would alleviate enough traffic volume that would allow the SE Bypass Road to be a two-lane facility versus a four-lane facility, which is currently recommended. According to current traffic analysis, a four-lane facility would be needed shortly after opening year, with or without, aggressive transit assumptions.
- According to the Year 2030 Issaquah Traffic Model, an approximate 25% to 30% reduction in the number of projected trips along the proposed SE Bypass Road would be needed in order for the SE Bypass to operate as a two-lane facility. It would be quite optimistic to assume that this level of trip reduction could be achieved in a very densely populated urban setting, and even more so within a suburban community, as the following points suggest

The Puget Sound Regional Council (PSRC) EMME/2 Travel Demand Model trends indicate that transit generally captures an estimated amount of 3% or less of work-trips leaving suburban locations and that the transit mode share, as projected by the 2030 PSRC Model, was estimated at 3% or less for the Issaquah area.

Additionally, in the SE Issaquah Bypass Draft EIS (June, 2000) it was noted that, the Metropolitan Transportation Plan for Year 2020 estimates that the present trend for transit mode-split for work-trips within the *region* is about 8%. With HOV & transit-oriented development (as well as roadway improvements) the mode-split increases for transit are projected to be approximately 12% for the *region*. However, the *regional average* includes the mode-split percentages for larger downtown locations, including Seattle, Tacoma, Everett, and Bellevue. Smaller cities and rural locations will experience a lower transit mode-split than the projected regional mode-split. Given the PSRC's estimated transit service and ridership projections, for both 2020 and 2030, accomplishing a 25% to 30% trip reduction in the SE Bypass corridor would not be likely.

Most transit planner would agree that transit can be somewhat difficult to serve for a suburban / rural community; this basic idea was concluded in the High Capacity Transit (HCT) workshops sponsored by the City of Issaquah (in late 1997 and early 1998) which included staff members from King County Metro and Sound Transit, as well as representatives from Port Blakely Communities, the primary proponent of the Issaquah Highlands development. Based on workshop results, one conclusion reached at this meeting was that Metro and Sound Transit would not provide service to a potential park-and-ride lot at the south end of the proposed SE Bypass project, due to the following reasons:

- A Park-and-Ride at the south city limits would incur high support facility costs (e.g. potential need for transit-only lanes, bus pull-outs, etc.)
- Limited travel-time advantages, or none at all, would be expected to result from a park-and-ride facility at this location.

Additionally, the Issaquah-Hobart Road Survey (conducted by the Gilmore Research Group in 1999, at the City of Issaquah's request) found that most vehicles using Issaquah-Hobart Road were heading for east King County and the Sammamish Plateau, not to large traffic-generating destinations in Seattle. None of the top 10 destinations indicated in the survey were going to a single-point destination such as Seattle, which would be more transit-friendly in terms of the ability to attract riders. Ninety-two percent of the surveyed drivers said they do not currently use park-and-ride facilities. Moreover, 66% of the same drivers indicated they had no interest in a new park-and ride-facility in the south portion of the city.

King County Metro transportation officials have indicated that these results suggest that Issaquah-Hobart Road would be a poor candidate for increased transit service, especially in comparison to other potential locations. Given the limited amount of funds available for new transit, the survey results also suggest that Issaquah-Hobart Road would rank low against other competing corridors where potential transit projects would better serve potential transit riders. Therefore, at that time it was recommended that the City may wish to pursue a location for a park-and-pool lot near the southern city limits, potentially in conjunction with a local church.

Much of Issaquah's draw-area can be considered rural. These areas include North Bend, Maple Valley, Covington, Black Diamond and Enumclaw. Low densities characterize rural areas, so the origin of potential transit riders is dispersed. This pattern makes achieving cost-effective transit service difficult to implement and limits its effectiveness. This pattern can be seen on the 1997 Metro License Place Survey of Issaquah Park-and-Ride users: clustering can be seen within Issaquah and to the north on the Plateau, but there are no obvious clusters to the east, south or southeast of Issaquah.

A 25% to 30% travel demand reduction through the use of transit service alone, could not be reasonably expected, given current and future trends which indicate that the most optimistic transit mode-split achievable would be considerably lower than that needed to validate a two-lane footprint by Year 2030. Additionally, the viability of maintaining a two-lane SE Issaquah Bypass facility with improved transit service in Year 2030 will not meet the project's purpose and need of:

- Reducing traffic congestion that causes existing interchanges and the Front Street corridor to be overburdened

- Provide improved access to Interstate 90

In addition, during the development of the DEIS (June 2000) two non-construction options: congestion pricing (charging tolls) and expanded transit service were studied. These alternatives were evaluated considering the following factors: relationship to the Purpose and Need, ability to reduce congestion, impacts to the natural and social environment, and operational and technical issues. The investigation which is documented in detail in the DEIS (June 2000), concluded that congestion management alone, expanded transit service alone, or the two in combination, would not substantially reduce the pass-through trips on Front Street that cause much of Issaquah's traffic congestion.

Although the Southeast Issaquah Bypass project would not include HOV lanes under the present design, buses may still take advantage of the proposed roadway to improve travel times. As the eastern portion of the city develops, it is possible that the Southeast Issaquah Bypass, along with the proposed Park Pointe project, may provide an opportunity for Issaquah and King County to revisit the issue of improving transit service in this area.

Non-motorized Transportation

Recreation

Affected Environment

The primary recreational facilities in the project area include Tiger Mountain and Squak Mountain State Parks, and Community Center Park and Memorial Park in Issaquah. Issaquah also provides recreational trails that serve the project area. Parks and recreational areas are described below. Recreational trails are identified in Chapter 4 of the document. The main recreational trail in the project area follows the former Burlington Northern Railroad right-of-way. The right-of-way is part of the old rail network that once served the Issaquah area. Beginning in 1888, the Seattle, Lake Shore & Eastern Railroad operated in the area. It was later sold to the Northern Pacific Railroad Company, which merged with Burlington Northern in 1970. The railway was abandoned about that time, when I-90 was built and the lower cost of truck transportation combined with the interstate highway system caused the popularity of rail use to decline. The railroad route was previously connected to routes on both sides of Lake Sammamish, Tiger Mountain, and Grand Ridge. Most of these lines have since been abandoned as new development has come to the area. Presently, the former railroad right-of-way is connected to the City's Rainier Trail on the west and crosses I-90 to the east, following the Railroad Grade Trail to High Point.

The Tiger Mountain Natural Resources Conservation Area (NRCA) is adjacent to the east of the proposed Southeast Bypass route. This is a 1,780-ha (4,400-ac) recreational area managed by the State Department of Natural Resources and the City of Issaquah. It was set aside for protection of its natural resources, to provide low-impact recreation, and for environmental education. Two trails near the proposed project route provide access to the NRCA. The Tradition Lake trail is near the northeast portion of the proposed Southeast Bypass, and the Issaquah High School trail is located near the southeast portion of the project route.

Squak Mountain State Park is located approximately 0.8 km (0.5 mi) southwest from where the southern end of the proposed project route would connect with Front Street South. Squak Mountain is a 670.5-ha (1,657-ac) wilderness park in the center of a public recreation area owned by the state, King County, and Issaquah. The park provides hiking trails only and in keeping with the wilderness designation, vehicular use, roads, and horses are prohibited.

Memorial Park is located in downtown Issaquah, approximately 0.8 km (0.5 mi) west of the Sunset Way/I-90 Interchange at the northern end of the proposed project route. The four-acre park includes softball/baseball fields, a football field, a play lot with equipment, horseshoe pits, restrooms, picnic tables, a basketball court, a multipurpose room, a bicycle trail, and parking.

Community Center Park is located approximately 0.8 km (0.5 mi) west of the center of the proposed project route. The five-acre site includes the city's 2,972.8 sq. m. (32,000 sq. ft.) community center that includes a youth center, three sports courts (basketball, volleyball, aerobics) that can be used as one large room for other uses, a walking/running track, fitness room, two meeting rooms, and an office/staff area. Expansion of the Community Center has been proposed, however, plans for Phase II have not been finalized.

Uses and facilities in the planned expansion would be determined through a future public outreach forum. Issaquah also has a ten-acre site located along the Issaquah-Hobart Road, approximately 275 meters (900 feet) south of the southern end of the proposed project route. This site consists of undeveloped open fields along Issaquah Creek, and may be the location of a future Corps of Engineers enhancement project adjacent to the creek.

Pedestrian and Bicycle Facilities

City trails, with connections to the Tiger Mountain trails, provide the main pedestrian and bicycle facilities in the project area. The city trail system includes access to the High School Trail in the Tiger Mountain NRCA. City trails provide access for walking and bicycle use and Tiger Mountain includes hiking, bicycle, and horse trails. The Rainier Boulevard corridor walkway, which provides hiking and bicycling opportunities, ends on East Sunset Way near the northern end of the proposed project route. Please refer to Chapter 4 for detailed description of potential impacts and mitigation measures proposed for each alternative.

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Appendix A: Software Used in Transportation Analysis

Forecast Modeling – TModel[6]

TModel was used to prepare travel demand forecasts. TModel is a transportation analysis software produced by TModel Corporation on Vashon Island, Washington. TModel is an interactive graphic multi-modal urban transportation planning software.

TModel provides a set of tools used to construct and analyze multi-modal transportation planning models, allowing the implementation of a four-step model. After a modeler enters land use or socioeconomic data (population and employment) and network (street and intersection) data, the model determines the trip destinations, predicts how the trips will be divided among the available modes of travels, and assigns those trips to the streets of the network based on the least cost (time and/or distance) paths.

TModel is a mathematical model. It allows the user to select operating formulas and coefficients, to insert land use and street network data, and then to calibrate until the model produces traffic volumes that closely approximate known counts for the network. TModel offers reporting capabilities through tables, graphs, and mapping capabilities.

Intersection Analysis – Synchro and SimTraffic[7]

Synchro and SimTraffic (Version 5, Build 3.12) were used to model and simulate traffic operations on the arterial network. Synchro is a traffic modeling and signal timing optimization software produced by Trafficware Corporation in Albany, CA. It is a macroscopic traffic program that can replicate the signalized intersection capacity analysis as specified in the Year 2000 Highway Capacity Manual (HCM). Synchro outputs include seconds of delay per vehicle, level of services (LOS), and volume to capacity ratios (v/c), for both individual turning movements and the intersection as a whole.

Synchro also integrates with SimTraffic, a microscopic simulation model. SimTraffic can simulate a variety of traffic controls, including networks with signals operating on different cycle lengths or fully actuated conditions. It builds a simulation based upon the Synchro file, but changes the rate at which traffic arrives at each intersection due to signal-to-signal interaction and overall network functioning. The simulation feature offered with SimTraffic allows vehicle queuing impacts to be considered when determining intersection delay. Additionally, queuing impacts and capacity constraints from the upstream and downstream intersections are considered and therefore the reported delay output considers the entire corridor as a system rather than isolated intersections. Delay and LOS output will therefore differ slightly between Synchro and SimTraffic for some cases.

For this project, input information was first included in the Synchro software, and then transposed into the SimTraffic program. The intersection delay, LOS, and output presented in this discipline report were obtained from the SimTraffic program.

[6] Source: TModel Corporation Web Page at http://www.tmodel.com/tmodel2.html
[7] Source: Synchro and SimTraffic User Guides

Appendix B: Accident Data

The City of Issaquah provided the historical accident data for years 1998 through 2002 (for both intersection and mid-block) and is contained in this Appendix.

SR 900 FROM 12TH AVE NW TO SE 95TH											
DATE	TIME	DIST	DIR.	LOCATION	ACCIDENT TYPE	DIR FROM (UNIT 1)	ACTION (UNIT 1)	DIR FROM (UNIT 2)	ACTION (UNIT 2)	#INJURED	#KILLED
1/7/98	13:38	0'	In Int.	12TH AVENUE NW	Approach Turn	West	Going Straight Ahead	East	Making Left Turn	0	0
12/26/98	13:50	0'	In Int.	12TH AVENUE NW	Approach Turn	West	Making Left Turn	East	Going Straight Ahead	0	0
12/4/00	7:12	0'	In Int.	12TH AVENUE NW	Approach Turn	West	Making Right Turn	East	Making Left Turn	0	0
3/1/00	21:21	0'	In Int.	12TH AVENUE NW	Parked Vehicle / Fixed Object	West	Going Straight Ahead			0	0
3/19/98	11:52	0'	In Int.	12TH AVENUE NW	Rear-End	South	Making Right Turn	South	Going Straight Ahead	1	0
4/10/98	13:23	0'	In Int.	12TH AVENUE NW	Rear-End	South	Going Straight Ahead	South	Slowing	0	0
10/1/98	16:00	0'	In Int.	12TH AVENUE NW	Rear-End	SW	Going Straight Ahead	SW	Stopped at Signal or Stop Sign	0	0
1/22/99	9:21	0'	In Int.	12TH AVENUE NW	Rear-End	West	Making Right Turn	West	Making Right Turn	0	0
4/3/99	17:30	0'	In Int.	12TH AVENUE NW	Rear-End	East	Going Straight Ahead	East	Making Left Turn	1	0
6/14/99	15:09	0'	In Int.	12TH AVENUE NW	Rear-End	South	Going Straight Ahead	South	Slowing	1	0
9/17/99	16:47	0'	In Int.	12TH AVENUE NW	Rear-End	West	Going Straight Ahead	West	Going Straight Ahead	0	0
10/20/99	16:39	0'	In Int.	12TH AVENUE NW	Rear-End	North	Slowing	North	Going Straight Ahead	0	0
10/22/99	14:55	0'	In Int.	12TH AVENUE NW	Rear-End	East	Slowing	East	Stopped at Signal or Stop Sign	0	0
11/30/99	13:08	0'	In Int.	12TH AVENUE NW	Rear-End	South	Backing	South	Going Straight Ahead	0	0
1/31/00	18:22	0'	In Int.	12TH AVENUE NW	Rear-End	South	Going Straight Ahead	South	Going Straight Ahead	0	0
3/14/00	18:36	0'	In Int.	12TH AVENUE NW	Rear-End	SE	Making Left Turn	NW	Going Straight Ahead	0	0
4/25/00	11:06	0'	In Int.	12TH AVENUE NW	Rear-End	North	Going Straight Ahead	North	Changing Lanes	0	0

SR 900 FROM 12TH AVE NW TO SE 95TH											
DATE	TIME	DIST	DIR.	LOCATION	ACCIDENT TYPE	DIR FROM (UNIT 1)	ACTION (UNIT 1)	DIR FROM (UNIT 2)	ACTION (UNIT 2)	#INJURED	#KILLED
8/23/00	7:42	0'	In Int.	12TH AVENUE NW	Rear-End	South	Going Straight Ahead	South	Stopped at Signal or Stop Sign	0	0
9/13/00	15:40	0'	In Int.	12TH AVENUE NW	Rear-End	North	Going Straight Ahead	North	Stopped at Signal or Stop Sign	0	0
10/3/00	10:17	0'	In Int.	12TH AVENUE NW	Rear-End	East	Making Left Turn	East	Making Left Turn	0	0
10/27/00	19:15	0'	In Int.	12TH AVENUE NW	Rear-End	South	Going Straight Ahead	South	Stopped For Traffic	0	0
11/21/00	6:53	0'	In Int.	12TH AVENUE NW	Rear-End	South	Going Straight Ahead	South	Stopped at Signal or Stop Sign	0	0
4/10/01	8:03	0'	In Int.	12TH AVENUE NW	Rear-End	South	Merging; entering traffic	South	Stopped at Signal or Stop Sign	0	0
4/12/01	14:40	50'	South of	12TH AVENUE NW	Rear-End	East	Going Straight Ahead	Vehicle Stopped	Stopped For Traffic	0	0
4/16/01	22:10	0'	In Int.	12TH AVENUE NW	Rear-End	South	Going Straight Ahead	Vehicle Stopped	Stopped at Signal or Stop Sign	1	0
6/29/01	15:54	100'	South of	12TH AVENUE NW	Rear-End	South	Going Straight Ahead	South	Stopped at Signal or Stop Sign	0	0
6/30/01	13:25	0'	In Int.	12TH AVENUE NW	Rear-End	East	Stopped in Roadway	East	Going Straight Ahead	0	0
8/22/01	15:41	0'	In Int.	12TH AVENUE NW	Rear-End	South	Going Straight Ahead	South	Stopped at Signal or Stop Sign	0	0
10/21/01	11:27	0'	In Int.	12TH AVENUE NW	Rear-End	NE	Going Straight Ahead	Vehicle Stopped	Stopped For Traffic	1	0
2/14/02	17:08	0'	In Int.	12TH AVENUE NW	Rear-End	North	Going Straight Ahead	North	Going Straight Ahead	0	0
4/13/02	16:12	0'	In Int.	12TH AVENUE NW	Rear-End	South	Going Straight Ahead	South	Stopped at Signal or Stop Sign	1	0

SR 900 FROM 12TH AVE NW TO SE 95TH											
DATE	TIME	DIST	DIR.	LOCATION	ACCIDENT TYPE	DIR FROM (UNIT 1)	ACTION (UNIT 1)	DIR FROM (UNIT 2)	ACTION (UNIT 2)	#INJURED	#KILLED
4/23/02	16:11	25'	South of	12TH AVENUE NW	Rear-End	South	Going Straight Ahead	South	Stopped For Traffic	0	0
6/21/02	18:03	0'	In Int.	12TH AVENUE NW	Rear-End	South	Going Straight Ahead	South	Stopped at Signal or Stop Sign	0	0
12/28/98	20:15	0'	In Int.	12TH AVENUE NW	Right Angle / Broadside	North	Going Straight Ahead	West	Going Straight Ahead	0	0
2/22/99	9:30	0'	In Int.	12TH AVENUE NW	Right Angle / Broadside	South	Going Straight Ahead	East	Making Left Turn	0	0
4/2/99	22:11	0'	In Int.	12TH AVENUE NW	Right Angle / Broadside	North	Going Straight Ahead	East	Making Left Turn	0	0
10/7/01	19:45	0'	In Int.	12TH AVENUE NW	Right Angle / Broadside	North	Going Straight Ahead	West	Making Left Turn	3	0
11/2/01	6:54	0'	In Int.	12TH AVENUE NW	Right Angle / Broadside	East	Making Left Turn	South	Going Straight Ahead	0	0
5/15/02	21:52	0'	In Int.	12TH AVENUE NW	Right Angle / Broadside	East	Going Straight Ahead	North	Going Straight Ahead	0	0
5/31/00	15:39	75'	South of	12TH AVENUE NW	Sideswipe / Lane Change	North	Changing Lanes	North	Going Straight Ahead	0	0
7/3/02	14:54	0'	In Int.	12TH AVENUE NW	Sideswipe / Lane Change	North	Changing Lanes	North	Going Straight Ahead	0	0
7/16/02	7:53	0'	In Int.	12TH AVENUE NW	Sideswipe / Lane Change	North	Overtaking and Passing	North	Going Straight Ahead	0	0
5/28/98	8:10	0'	In Int.	NEWPORT WAY NW	Approach Turn	West	Making Left Turn	East	Going Straight Ahead	0	0
7/14/98	12:09	0'	In Int.	NEWPORT WAY NW	Approach Turn	North	Going Straight Ahead	South	Making Left Turn	0	0
9/22/98	19:22	0'	In Int.	NEWPORT WAY NW	Approach Turn	West	Making Left Turn	East	Going Straight Ahead	2	
9/25/98	16:35	0'	In Int.	NEWPORT WAY NW	Approach Turn	East	Making Left Turn	West	Going Straight Ahead	0	0
11/10/98	20:49	0'	In Int.	NEWPORT WAY NW	Approach Turn	West	Making Left Turn	East	Going Straight Ahead	0	0
1/13/99	21:38	0'	In Int.	NEWPORT WAY NW	Approach Turn	North	Making Left Turn	South	Going Straight Ahead	0	0

SR 900 FROM 12TH AVE NW TO SE 95TH											
DATE	TIME	DIST	DIR.	LOCATION	ACCIDENT TYPE	DIR FROM (UNIT 1)	ACTION (UNIT 1)	DIR FROM (UNIT 2)	ACTION (UNIT 2)	#INJURED	#KILLED
10/28/99	13:38	0'	In Int.	NEWPORT WAY NW	Approach Turn	West	Making Left Turn	East	Going Straight Ahead	0	0
11/7/99	21:29	0'	In Int.	NEWPORT WAY NW	Approach Turn	East	Making Left Turn	West	Going Straight Ahead	0	0
5/2/00	11:55	0'	In Int.	NEWPORT WAY NW	Approach Turn	West	Making Left Turn	East	Going Straight Ahead	0	0
10/17/00	8:05	0'	In Int.	NEWPORT WAY NW	Approach Turn	South	Making Left Turn	North	Going Straight Ahead	2	0
12/16/00	15:59	0'	In Int.	NEWPORT WAY NW	Approach Turn	West	Making Left Turn	East	Going Straight Ahead	0	0
2/17/01	21:01	0'	In Int.	NEWPORT WAY NW	Approach Turn	West	Making Left Turn	East	Going Straight Ahead	0	0
6/12/01	5:34	0'	In Int.	NEWPORT WAY NW	Approach Turn	South	Making Left Turn	North	Going Straight Ahead	0	0
11/9/01	19:35	0'	In Int.	NEWPORT WAY NW	Approach Turn	East	Making Left Turn	West	Going Straight Ahead	0	0
2/20/02	6:52	0'	In Int.	NEWPORT WAY NW	Approach Turn	South	Making Left Turn	North	Going Straight Ahead	0	0
3/12/02	18:51	0'	In Int.	NEWPORT WAY NW	Approach Turn	North	Making Left Turn	South	Going Straight Ahead	0	0
10/20/01	23:18	25'	South of	NEWPORT WAY NW	Head-On	North	Going Straight Ahead	South	Going Straight Ahead	2	1
11/27/99	23:09	100'	South of	NEWPORT WAY NW	Parked Vehicle / Fixed Object	South	Going Straight Ahead			1	0
12/11/00	12:43	1300'	South of	NEWPORT WAY NW	Parked Vehicle / Fixed Object	North	Going Straight Ahead			1	0
10/21/01	4:40	0'	In Int.	NEWPORT WAY NW	Parked Vehicle / Fixed Object	East	Making Left Turn			0	0
1/14/98	17:15	100'	North of	NEWPORT WAY NW	Rear-End	North	Going Straight Ahead	North	Going Straight Ahead	1	0
11/13/98	7:16	600'	South of	NEWPORT WAY NW	Rear-End	South	Going Straight Ahead	South	Stopped For Traffic	1	0
8/26/99	13:29	0'	In Int.	NEWPORT WAY NW	Rear-End	East	Making Left Turn	West	Going Straight Ahead	2	0
9/18/99	19:08	1000'	North of	NEWPORT WAY NW	Rear-End	North	Going Straight Ahead	North	Stopped For Traffic	0	0

SR 900 FROM 12TH AVE NW TO SE 95TH											
DATE	TIME	DIST	DIR.	LOCATION	ACCIDENT TYPE	DIR FROM (UNIT 1)	ACTION (UNIT 1)	DIR FROM (UNIT 2)	ACTION (UNIT 2)	#INJURED	#KILLED
10/13/99	7:13	600'	South of	NEWPORT WAY NW	Rear-End	South	Going Straight Ahead	South	Going Straight Ahead	2	0
12/14/99	16:44	0'	In Int.	NEWPORT WAY NW	Rear-End	North	Going Straight Ahead	North	Going Straight Ahead	0	0
2/8/00	7:44	300'	South of	NEWPORT WAY NW	Rear-End	South	Going Straight Ahead	South	Stopped For Traffic	0	0
3/1/00	16:37	120'	North of	NEWPORT WAY NW	Rear-End	North	Going Straight Ahead	North	Stopped For Traffic	0	0
11/4/00	10:06	0'	In Int.	NEWPORT WAY NW	Rear-End	West	Stopped For Traffic	West	Stopped For Traffic	0	0
4/3/01	18:18	0'	In Int.	NEWPORT WAY NW	Rear-End	North	Going Straight Ahead	North	Stopped at Signal or Stop Sign	0	0
4/10/02	12:12	0'	In Int.	NEWPORT WAY NW	Rear-End	North	Making Right Turn	North	Making Right Turn	0	0
7/13/98	8:35	0'	In Int.	NEWPORT WAY NW	Sideswipe / Lane Change	West	Making Right Turn	West	Making Right Turn	0	0
1/2/99	16:47	700'	South of	NEWPORT WAY NW	Sideswipe / Lane Change	North	Overtaking and Passing	North	Slowing	1	0
8/23/98	22:20	0'	In Int.	NW GILMAN BOULEVARD	Approach Turn	East	Making Left Turn	West	Going Straight Ahead	0	0
10/22/98	18:41	0'	In Int.	NW GILMAN BOULEVARD	Approach Turn	East	Making Left Turn	West	Going Straight Ahead	0	0
5/28/99	21:44	0'	In Int.	NW GILMAN BOULEVARD	Approach Turn	East	Making Left Turn	West	Going Straight Ahead	1	0
12/30/99	22:30	0'	In Int.	NW GILMAN BOULEVARD	Approach Turn	East	Making Left Turn	West	Going Straight Ahead	1	0
1/14/00	17:40	0'	In Int.	NW GILMAN BOULEVARD	Approach Turn	West	Going Straight Ahead	East	Going Straight Ahead	3	0
4/11/00	13:02	0'	In Int.	NW GILMAN BOULEVARD	Approach Turn	East	Making Left Turn	West	Going Straight Ahead	0	0
8/3/00	11:29	0'	In Int.	NW GILMAN BOULEVARD	Approach Turn	West	Making Left Turn	East	Going Straight Ahead	0	0
1/16/01	19:11	0'	In Int.	NW GILMAN BOULEVARD	Approach Turn	East	Making Left Turn	West	Going Straight Ahead	1	0

SR 900 FROM 12TH AVE NW TO SE 95TH											
DATE	TIME	DIST	DIR.	LOCATION	ACCIDENT TYPE	DIR FROM (UNIT 1)	ACTION (UNIT 1)	DIR FROM (UNIT 2)	ACTION (UNIT 2)	#INJURED	#KILLED
6/27/01	13:35	0'	In Int.	NW GILMAN BOULEVARD	Approach Turn	West	Going Straight Ahead	East	Making Left Turn	1	0
3/13/02	14:21	0'	In Int.	NW GILMAN BOULEVARD	Approach Turn	East	Making Left Turn	West	Going Straight Ahead	0	0
3/29/02	20:06	0'	In Int.	NW GILMAN BOULEVARD	Approach Turn	East	Making Left Turn	West	Going Straight Ahead	1	0
12/13/99	17:37	0'	In Int.	NW GILMAN BOULEVARD	Pedestrian / Bicycle Involved	West	Making Left Turn	West	Going Straight Ahead	1	0
1/9/98	14:44	0'	In Int.	NW GILMAN BOULEVARD	Rear-End	North	Going Straight Ahead	North	Stopped at Signal or Stop Sign	0	0
4/14/98	12:01	0'	In Int.	NW GILMAN BOULEVARD	Rear-End	South	Going Straight Ahead	South	Stopped For Traffic	1	0
5/29/98	15:37	50'	North of	NW GILMAN BOULEVARD	Rear-End	South	Going Straight Ahead	South	Going Straight Ahead	0	0
7/11/98	9:47	0'	In Int.	NW GILMAN BOULEVARD	Rear-End	North	Going Straight Ahead	North	Stopped at Signal or Stop Sign	1	0
7/11/98	15:23	0'	In Int.	NW GILMAN BOULEVARD	Rear-End	South	Going Straight Ahead	South	Stopped at Signal or Stop Sign	0	0
8/10/98	15:18	200'	North of	NW GILMAN BOULEVARD	Rear-End	South	Going Straight Ahead	South	Stopped For Traffic	0	0
11/12/98	18:21	100'	North of	NW GILMAN BOULEVARD	Rear-End	South	Going Straight Ahead	South	Stopped For Traffic	1	0
1/11/99	7:23	20'	North of	NW GILMAN BOULEVARD	Rear-End	North	Going Straight Ahead	North	Slowing	0	0
5/30/99	13:00	0'	In Int.	NW GILMAN BOULEVARD	Rear-End	South	Going Straight Ahead	South	Going Straight Ahead	0	0
6/24/99	15:50	0'	In Int.	NW GILMAN BOULEVARD	Rear-End	South	Going Straight Ahead	South	Stopped For Traffic	0	0
12/15/99	8:28	0'	In Int.	NW GILMAN BOULEVARD	Rear-End	North	Going Straight Ahead	North	Stopped For Traffic	1	0
3/14/00	21:39	0'	In Int.	NW GILMAN BOULEVARD	Rear-End	South	Going Straight Ahead	South	Stopped For Traffic	0	0

SR 900 FROM 12TH AVE NW TO SE 95TH											
DATE	TIME	DIST	DIR.	LOCATION	ACCIDENT TYPE	DIR FROM (UNIT 1)	ACTION (UNIT 1)	DIR FROM (UNIT 2)	ACTION (UNIT 2)	#INJURED	#KILLED
4/3/00	13:57	0'	In Int.	NW GILMAN BOULEVARD	Rear-End	East	Making Left Turn	East	Making Left Turn	0	0
7/21/00	12:26	0'	In Int.	NW GILMAN BOULEVARD	Rear-End	East	Slowing	East	Stopped For Traffic	0	0
8/18/00	10:43	0'	In Int.	NW GILMAN BOULEVARD	Rear-End	North	Going Straight Ahead	North	Stopped at Signal or Stop Sign	0	0
8/20/00	10:40	0'	In Int.	NW GILMAN BOULEVARD	Rear-End	North	Going Straight Ahead	North	Stopped For Traffic	0	0
9/4/00	14:39	50'	North of	NW GILMAN BOULEVARD	Rear-End	South	Going Straight Ahead	South	Stopped For Traffic	0	0
10/17/00	7:27	300'	North of	NW GILMAN BOULEVARD	Rear-End	South	Going Straight Ahead	South	Stopped For Traffic	1	0
10/17/00	9:51	300'	North of	NW GILMAN BOULEVARD	Rear-End	North	Going Straight Ahead	North	Stopped For Traffic	0	0
10/27/00	21:27	300'	North of	NW GILMAN BOULEVARD	Rear-End	South	Going Straight Ahead	South	Stopped For Traffic	0	0
1/16/01	17:34	300'	South of	NW GILMAN BOULEVARD	Rear-End	North	Going Straight Ahead	North	Stopped For Traffic	0	0
2/22/01	6:17	100'	South of	NW GILMAN BOULEVARD	Rear-End	South	Going Straight Ahead	South	Stopped For Traffic	1	0
7/5/01	17:06	100'	North of	NW GILMAN BOULEVARD	Rear-End	South	Stopped For Traffic	Vehicle Stopped	Stopped For Traffic	1	0
7/11/01	10:49	0'	In Int.	NW GILMAN BOULEVARD	Rear-End	South	Going Straight Ahead	South	Stopped For Traffic	1	0
9/21/01	12:37	100'	North of	NW GILMAN BOULEVARD	Rear-End	South	Going Straight Ahead	South	Going Straight Ahead	2	0
4/5/02	10:28	100'	North of	NW GILMAN BOULEVARD	Rear-End	South	Going Straight Ahead	South	Slowing	0	0
5/4/02	11:32	0'	In Int.	NW GILMAN BOULEVARD	Rear-End	North	Going Straight Ahead	North	Stopped For Traffic	1	0
5/27/98	15:56	0'	In Int.	NW GILMAN BOULEVARD	Right Angle / Broadside	South	Making Left Turn	East	Going Straight Ahead	0	0
12/6/98	19:13	0'	In Int.	NW GILMAN BOULEVARD	Right Angle / Broadside	North	Going Straight Ahead	West	Going Straight Ahead	2	0

SR 900 FROM 12TH AVE NW TO SE 95TH											
DATE	TIME	DIST	DIR.	LOCATION	ACCIDENT TYPE	DIR FROM (UNIT 1)	ACTION (UNIT 1)	DIR FROM (UNIT 2)	ACTION (UNIT 2)	#INJURED	#KILLED
5/22/99	15:30	0'	In Int.	NW GILMAN BOULEVARD	Right Angle / Broadside	North	Going Straight Ahead	West	Going Straight Ahead	0	0
5/8/00	9:38	0'	In Int.	NW GILMAN BOULEVARD	Right Angle / Broadside	West	Making Left Turn	East	Going Straight Ahead	0	0
5/22/01	18:39	0'	In Int.	NW GILMAN BOULEVARD	Right Angle / Broadside	East	Making Right Turn	South	Going Straight Ahead	0	0
12/18/98	9:17	0'	In Int.	NW GILMAN BOULEVARD	Sideswipe / Lane Change	North	Going Straight Ahead	North	Stopped For Traffic	0	0
1/31/99	20:19	50'	North of	NW GILMAN BOULEVARD	Sideswipe / Lane Change	North	Going Straight Ahead	North	Changing Lanes	0	0
2/9/01	16:49	300'	South of	NW GILMAN BOULEVARD	Sideswipe / Lane Change	South	Changing Lanes	South	Going Straight Ahead	0	0
5/31/01	10:20	200'	North of	NW GILMAN BOULEVARD	Sideswipe / Lane Change	South	Changing Lanes	South	Going Straight Ahead	0	0
8/2/01	14:45	0'	In Int.	NW GILMAN BOULEVARD	Sideswipe / Lane Change	North	Going Straight Ahead	North	Going Straight Ahead	0	0
6/27/02	10:36	0'	In Int.	NW GILMAN BOULEVARD	Sideswipe / Lane Change	East	Making Right Turn	West	Making Left Turn	0	0
6/7/00	7:14	0'	In Int.	NW GOODE PLACE	Rear-End	North	Going Straight Ahead	North	Stopped For Traffic	1	0
5/14/02	8:14	500'	South of	NW GOODE PLACE	Rear-End	South	Going Straight Ahead	South	Stopped For Traffic	1	0
6/14/02	14:28	100'	South of	NW GOODE PLACE	Rear-End	South	Going Straight Ahead	South	Stopped For Traffic	0	0
1/23/02	14:47	0'	In Int.	NW GOODE PLACE	Right Angle / Broadside	West	Making Left Turn	South	Going Straight Ahead	1	0
7/20/02	18:40	300'	South of	NW GOODE PLACE	Sideswipe / Lane Change	North	Overtaking and Passing	North	Making Left Turn	1	0
6/25/01	7:33	0'	In Int.	NW JAMES BUSH ROAD	Rear-End	South	Going Straight Ahead	South	Slowing	0	0
3/10/98	12:19	0'	In Int.	NW MALL STREET	Approach Turn	North	Making Left Turn	South	Going Straight Ahead	0	0
7/17/00	5:54	0'	In Int.	NW MALL STREET	Approach Turn	South	Making Left Turn	North	Going Straight Ahead	1	0
8/7/00	12:38	0'	In Int.	NW MALL STREET	Approach Turn	North	Making Left Turn	South	Going Straight Ahead	0	0

SR 900 FROM 12TH AVE NW TO SE 95TH											
DATE	TIME	DIST	DIR.	LOCATION	ACCIDENT TYPE	DIR FROM (UNIT 1)	ACTION (UNIT 1)	DIR FROM (UNIT 2)	ACTION (UNIT 2)	#INJURED	#KILLED
9/17/01	7:26	0'	In Int.	NW MALL STREET	Approach Turn	North	Making Left Turn	South	Going Straight Ahead	1	0
1/7/98	12:51	0'	In Int.	NW MALL STREET	Rear-End	North	Going Straight Ahead	North	Making Left Turn	0	0
3/13/98	18:26	20'	South of	NW MALL STREET	Rear-End	South	Going Straight Ahead	South	Stopped For Traffic		0
5/17/98	13:48	0'	In Int.	NW MALL STREET	Rear-End	North	Going Straight Ahead	North	Making Left Turn	1	0
12/13/99	20:01	0'	In Int.	NW MALL STREET	Rear-End	North	Stopped For Traffic	North	Going Straight Ahead	1	0
6/7/00	15:14	0'	In Int.	NW MALL STREET	Rear-End	North	Going Straight Ahead	North	Stopped For Traffic	0	0
8/19/00	13:50	0'	In Int.	NW MALL STREET	Rear-End	North	Backing	South	Stopped For Traffic	0	0
9/2/00	13:38	50'	South of	NW MALL STREET	Rear-End	South	Going Straight Ahead	South	Stopped For Traffic	0	0
9/23/00	13:36	0'	In Int.	NW MALL STREET	Rear-End	South	Going Straight Ahead	South	Stopped For Traffic	0	0
12/1/00	15:43	50'	North of	NW MALL STREET	Rear-End	South	Changing Lanes	South	Stopped For Traffic	1	0
3/15/01	6:45	150'	South of	NW MALL STREET	Rear-End	South	Changing Lanes	South	Stopped For Traffic	0	0
8/23/01	6:43	0'	In Int.	NW MALL STREET	Rear-End	South	Going Straight Ahead	South	Making Left Turn	1	0
12/2/01	12:30	0'	In Int.	NW MALL STREET	Rear-End	East	Backing	East	Going Straight Ahead	0	0
5/10/02	15:50	100'	South of	NW MALL STREET	Rear-End	North	Going Straight Ahead	North	Going Straight Ahead	1	0
5/21/02	18:13	40'	South of	NW MALL STREET	Rear-End	South	Going Straight Ahead	South	Stopped For Traffic	0	0
5/4/00	8:30	0'	In Int.	NW MALL STREET	Right Angle / Broadside	North	Making Left Turn	South	Going Straight Ahead	0	0
9/27/00	14:20	0'	In Int.	NW MALL STREET	Right Angle / Broadside	West	Making Right Turn	South	Going Straight Ahead	0	0
8/2/01	9:51	0'	In Int.	NW MALL STREET	Right Angle / Broadside	West	Going Straight Ahead	North	Going Straight Ahead	0	0

SR 900 FROM 12TH AVE NW TO SE 95TH											
DATE	TIME	DIST	DIR.	LOCATION	ACCIDENT TYPE	DIR FROM (UNIT 1)	ACTION (UNIT 1)	DIR FROM (UNIT 2)	ACTION (UNIT 2)	#INJURED	#KILLED
7/31/02	9:42	0'	In Int.	NW MALL STREET	Right Angle / Broadside	West	Making Left Turn	South	Going Straight Ahead	0	0
1/30/98	14:46	0'	In Int.	NW MALL STREET	Sideswipe / Lane Change	South	Going Straight Ahead	South	Going Straight Ahead	0	0
5/14/98	17:21	0'	In Int.	NW MALL STREET	Sideswipe / Lane Change	North	Changing Lanes	North	Going Straight Ahead	0	0
1/8/98	18:00	0'	In Int.	NW MAPLE STREET	Approach Turn	North	Making Left Turn	South	Going Straight Ahead	0	0
2/21/98	21:57	0'	In Int.	NW MAPLE STREET	Approach Turn	South	Going Straight Ahead	North	Making Left Turn	0	0
4/4/98	21:31	0'	In Int.	NW MAPLE STREET	Approach Turn	North	Making Left Turn	South	Going Straight Ahead	0	0
12/4/98	6:15	0'	In Int.	NW MAPLE STREET	Approach Turn	North	Making Left Turn	South	Going Straight Ahead	0	0
4/16/99	8:35	0'	In Int.	NW MAPLE STREET	Approach Turn	North	Making Left Turn	South	Going Straight Ahead	1	0
12/1/99	19:31	0'	In Int.	NW MAPLE STREET	Approach Turn	North	Making Left Turn	South	Going Straight Ahead	1	0
12/26/99	10:50	0'	In Int.	NW MAPLE STREET	Approach Turn	North	Making Left Turn	South	Going Straight Ahead	1	0
5/17/00	18:18	0'	In Int.	NW MAPLE STREET	Approach Turn	North	Making Left Turn	South	Going Straight Ahead	0	0
7/12/00	15:27	0'	In Int.	NW MAPLE STREET	Approach Turn	North	Making Left Turn	South	Going Straight Ahead	2	0
8/5/00	14:25	0'	In Int.	NW MAPLE STREET	Approach Turn	North	Making Left Turn	South	Going Straight Ahead	3	0
9/22/00	10:19	0'	In Int.	NW MAPLE STREET	Approach Turn	North	Going Straight Ahead	South	Making Left Turn	2	0
2/18/01	10:00	0'	In Int.	NW MAPLE STREET	Approach Turn	North	Making Left Turn	South	Going Straight Ahead	1	0
9/6/01	15:00	0'	In Int.	NW MAPLE STREET	Approach Turn	North	Making Left Turn	South	Going Straight Ahead	0	0
10/10/01	12:02	0'	In Int.	NW MAPLE STREET	Approach Turn	North	Making Left Turn	South	Going Straight Ahead	0	0
11/28/01	17:06	0'	In Int.	NW MAPLE STREET	Approach Turn	North	Making Left Turn	South	Going Straight Ahead	0	0

SR 900 FROM 12TH AVE NW TO SE 95TH											
DATE	TIME	DIST	DIR.	LOCATION	ACCIDENT TYPE	DIR FROM (UNIT 1)	ACTION (UNIT 1)	DIR FROM (UNIT 2)	ACTION (UNIT 2)	#INJURED	#KILLED
7/23/02	22:00	0'	In Int.	NW MAPLE STREET	Approach Turn	South	Going Straight Ahead	North	Making Left Turn	0	0
10/30/98	13:32	0'	In Int.	NW MAPLE STREET	Rear-End	East	Making Right Turn	East	Making Right Turn	1	0
11/4/98	17:25	300'	North of	NW MAPLE STREET	Rear-End	North	Going Straight Ahead	North	Stopped For Traffic	1	0
12/10/00	19:02	0'	In Int.	NW MAPLE STREET	Rear-End	North	Making Left Turn	North	Making Left Turn	0	0
2/26/01	16:43	300'	South of	NW MAPLE STREET	Rear-End	South	Going Straight Ahead	South	Stopped For Traffic	0	0
5/2/02	13:58	0'	In Int.	NW MAPLE STREET	Rear-End	North	Going Straight Ahead	North	Stopped at Signal or Stop Sign	6	0
6/17/02	15:46	300'	North of	NW MAPLE STREET	Rear-End	North	Going Straight Ahead	North	Stopped For Traffic	0	0
7/6/99	7:49	0'	In Int.	NW MAPLE STREET	Right Angle / Broadside	South	Going Straight Ahead	East	Making Left Turn	1	0
2/21/00	12:30	0'	In Int.	NW MAPLE STREET	Right Angle / Broadside	South	Going Straight Ahead	East	Making Left Turn	1	0
1/9/01	17:48	0'	In Int.	NW MAPLE STREET	Right Angle / Broadside	North	Making Left Turn	South	Going Straight Ahead	0	0
1/17/01	9:02	0'	In Int.	NW MAPLE STREET	Right Angle / Broadside	South	Making Right Turn	South	Going Straight Ahead	0	0
4/2/01	13:47	50'	North of	NW MAPLE STREET	Sideswipe / Lane Change	South	Changing Lanes	South	Going Straight Ahead	0	0
8/20/01	17:38	100'	North of	NW MAPLE STREET		South	Going Straight Ahead	South	Stopped For Traffic	1	0
9/22/01	9:33	250'	North of	ROUTE 90	Parked Vehicle / Fixed Object	South	Going Straight Ahead			1	0
7/24/98	15:04	200'	North of	ROUTE 90	Right Angle / Broadside	North	Making Left Turn	North	Going Straight Ahead	0	0
10/20/99	10:55	0'	In Int.	ROUTE 90 E/B OFFRAMP	Pedestrian / Bicycle Involved	West	Making Right Turn	South	Going Straight Ahead	1	0
6/7/98	11:49	0'	In Int.	ROUTE 90 E/B OFFRAMP	Rear-End	North	Going Straight Ahead	North	Stopped at Signal or Stop Sign	0	0

SR 900 FROM 12TH AVE NW TO SE 95TH											
DATE	TIME	DIST	DIR.	LOCATION	ACCIDENT TYPE	DIR FROM (UNIT 1)	ACTION (UNIT 1)	DIR FROM (UNIT 2)	ACTION (UNIT 2)	#INJURED	#KILLED
10/7/00	19:16	100'	South of	ROUTE 90 E/B OFFRAMP	Rear-End	South	Changing Lanes	South	Changing Lanes	0	0
5/7/01	12:52	0'	In Int.	ROUTE 90 E/B OFFRAMP	Rear-End	West	Making Left Turn	West	Making Left Turn	0	0
5/12/02	21:35	10'	North of	ROUTE 90 E/B OFFRAMP	Rear-End	North	Going Straight Ahead	North	Stopped at Signal or Stop Sign	1	0
3/12/00	12:26	0'	In Int.	ROUTE 90 E/B OFFRAMP	Right Angle / Broadside	North	Going Straight Ahead	West	Making Right Turn	0	0
6/1/01	11:05	0'	In Int.	ROUTE 90 E/B OFFRAMP	Right Angle / Broadside	North	Going Straight Ahead	West	Making Left Turn	0	0
8/20/01	16:19	0'	In Int.	ROUTE 90 E/B OFFRAMP	Right Angle / Broadside	North	Going Straight Ahead	West	Making Left Turn	0	0
11/19/98	17:43	0'	In Int.	ROUTE 90 E/B OFFRAMP	Sideswipe / Lane Change	West	Making Right Turn	West	Making Right Turn	0	0
12/12/01	12:36	0'	In Int.	ROUTE 90 E/B OFFRAMP	Sideswipe / Lane Change	West	Making Right Turn	West	Making Right Turn	0	0
12/26/01	13:25	0'	In Int.	ROUTE 90 E/B OFFRAMP	Sideswipe / Lane Change	West	Making Right Turn	West	Making Right Turn	0	0
3/6/02	12:09	100'	South of	ROUTE 90 E/B OFFRAMP	Sideswipe / Lane Change	North	Making Right Turn	North	Making Right Turn	0	0
3/9/01	20:04	0'	In Int.	ROUTE 90 E/B ONRAMP	Approach Turn	North	Making Left Turn	South	Going Straight Ahead	2	0
9/20/01	19:59	0'	In Int.	ROUTE 90 E/B ONRAMP	Approach Turn	North	Making Left Turn	South	Going Straight Ahead	1	0
7/11/98	23:20	0'	In Int.	ROUTE 90 E/B ONRAMP	Rear-End	North	Going Straight Ahead	North	Stopped at Signal or Stop Sign	2	0
10/16/00	10:15	1000'	South of	ROUTE 90 E/B ONRAMP	Rear-End	South	Going Straight Ahead	South	Stopped For Traffic	0	0
2/22/01	20:00	50'	South of	ROUTE 90 E/B ONRAMP	Rear-End	South	Going Straight Ahead	South	Stopped at Signal or Stop Sign	1	0
3/1/01	14:09	0'	In Int.	ROUTE 90 E/B ONRAMP	Rear-End	South	Going Straight Ahead	South	Going Straight Ahead	0	0

SR 900 FROM 12TH AVE NW TO SE 95TH											
DATE	TIME	DIST	DIR.	LOCATION	ACCIDENT TYPE	DIR FROM (UNIT 1)	ACTION (UNIT 1)	DIR FROM (UNIT 2)	ACTION (UNIT 2)	#INJURED	#KILLED
3/5/01	13:35	50'	South of	ROUTE 90 E/B ONRAMP	Rear-End	South	Going Straight Ahead	South	Stopped For Traffic	0	0
9/19/01	14:50	0'	In Int.	ROUTE 90 E/B ONRAMP	Rear-End	South	Stopped For Traffic	Vehicle Stopped	Stopped at Signal or Stop Sign	0	0
11/3/01	17:14	200'	South of	ROUTE 90 E/B ONRAMP	Rear-End	South	Going Straight Ahead	South	Stopped For Traffic	2	0
3/10/02	8:06	10'	South of	ROUTE 90 E/B ONRAMP	Rear-End	South	Going Straight Ahead	South	Stopped at Signal or Stop Sign	0	0
6/7/02	12:44	0'	In Int.	ROUTE 90 E/B ONRAMP	Rear-End	South	Stopped For Traffic	South	Going Straight Ahead	0	0
11/7/00	18:18	0'	In Int.	ROUTE 90 E/B ONRAMP	Right Angle / Broadside	West	Making Right Turn	North	Going Straight Ahead	0	0
8/25/98	10:01	0'	In Int.	ROUTE 90 E/B ONRAMP	Sideswipe / Lane Change	North	Changing Lanes	North	Going Straight Ahead	0	0
9/1/99	18:59	0'	In Int.	ROUTE 90 W/B OFFRAMP/ONRAMP	Approach Turn	South	Making Left Turn	North	Going Straight Ahead	0	0
3/9/98	9:26	0'	In Int.	ROUTE 90 W/B OFFRAMP/ONRAMP	Rear-End	South	Stopped at Signal or Stop Sign	South	Going Straight Ahead	1	0
10/2/98	7:54	300'	South of	ROUTE 90 W/B OFFRAMP/ONRAMP	Rear-End	South	Going Straight Ahead	South	Stopped For Traffic	0	0
5/12/99	8:54	0'	In Int.	ROUTE 90 W/B OFFRAMP/ONRAMP	Rear-End	South	Going Straight Ahead	South	Slowing	0	0
7/13/99	8:24	50'	South of	ROUTE 90 W/B OFFRAMP/ONRAMP	Rear-End	South	Going Straight Ahead	South	Going Straight Ahead	0	0
12/19/99	15:48	0'	In Int.	ROUTE 90 W/B OFFRAMP/ONRAMP	Rear-End	North	Going Straight Ahead	North	Stopped For Traffic	0	0
3/3/00	15:45	0'	In Int.	ROUTE 90 W/B OFFRAMP/ONRAMP	Rear-End	South	Going Straight Ahead	South	Going Straight Ahead	1	0
10/31/00	8:45	0'	In Int.	ROUTE 90 W/B OFFRAMP/ONRAMP	Rear-End	North	Stopped at Signal or Stop Sign	North	Going Straight Ahead	0	0
5/12/01	12:19	10'	South of	ROUTE 90 W/B OFFRAMP/ONRAMP	Rear-End	South	Going Straight Ahead	South	Going Straight Ahead	0	0

SR 900 FROM 12TH AVE NW TO SE 95TH											
DATE	TIME	DIST	DIR.	LOCATION	ACCIDENT TYPE	DIR FROM (UNIT 1)	ACTION (UNIT 1)	DIR FROM (UNIT 2)	ACTION (UNIT 2)	#INJURED	#KILLED
7/30/01	14:29	20'	South of	ROUTE 90 W/B OFFRAMP/ONRAMP	Rear-End	South	Going Straight Ahead	South	Stopped For Traffic	0	0
8/10/01	19:24	0'	In Int.	ROUTE 90 W/B OFFRAMP/ONRAMP	Rear-End	North	Going Straight Ahead	North	Going Straight Ahead	0	0
11/2/01	6:55	150'	North of	ROUTE 90 W/B OFFRAMP/ONRAMP	Rear-End	South	Going Straight Ahead	South	Stopped For Traffic	0	0
6/13/98	16:38	0'	In Int.	ROUTE 90 W/B OFFRAMP/ONRAMP	Right Angle / Broadside	East	Making Left Turn	South	Going Straight Ahead	0	0
9/9/98	10:49	0'	In Int.	ROUTE 90 W/B OFFRAMP/ONRAMP	Right Angle / Broadside	South	Going Straight Ahead	East	Making Left Turn	0	0
4/12/00	5:35	0'	In Int.	ROUTE 90 W/B OFFRAMP/ONRAMP	Right Angle / Broadside	South	Going Straight Ahead	East	Making Left Turn	1	0
8/21/01	21:23	0'	In Int.	ROUTE 90 W/B OFFRAMP/ONRAMP	Right Angle / Broadside	East	Going Straight Ahead	North	Making Right Turn	1	0
9/18/99	16:23	0'	In Int.	ROUTE 90 W/B OFFRAMP/ONRAMP	Sideswipe / Lane Change	West	Making Right Turn	West	Making Right Turn	0	0
10/8/01	7:32	50'	South of	SE 75TH STREET	Backing	South	Backing	South	Going Straight Ahead	0	0
2/15/01	7:17	50'	South of	SE 75TH STREET	Rear-End	South	Going Straight Ahead	South	Slowing	0	0
7/25/00	11:24	500'	South of	SE 75TH STREET	Right Angle / Broadside	East	Going Straight Ahead	East	Making Left Turn	0	0
5/28/02	1:41	0'	In Int.	SE 75TH STREET	Right Angle / Broadside	East	Going Straight Ahead	North	Going Straight Ahead	0	0
7/25/98	14:43	500'	South of	SE 78TH STREET	Parked Vehicle / Fixed Object	North	Going Straight Ahead			1	0
1/10/01	4:16	900'	South of	SE 78TH STREET	Parked Vehicle / Fixed Object	SW	Going Straight Ahead			1	0
4/11/98	10:09	200'	South of	SE 78TH STREET	Rear-End	North	Stopped For Traffic	North	Going Straight Ahead	0	0
11/12/01	7:39	500'	South of	SE 78TH STREET	Rear-End	South	Going Straight Ahead	South	Making Left Turn	0	0
6/10/02	11:17	100'	North of	SE 78TH STREET	Rear-End	North	Going Straight Ahead	North	Stopped For Traffic	0	0
12/9/00	16:21	100'	North of	SE 78TH STREET	Sideswipe / Lane Change	North	Overtaking and Passing	North	Making Left Turn	1	0

SR 900 FROM 12TH AVE NW TO SE 95TH											
DATE	TIME	DIST	DIR.	LOCATION	ACCIDENT TYPE	DIR FROM (UNIT 1)	ACTION (UNIT 1)	DIR FROM (UNIT 2)	ACTION (UNIT 2)	#INJURED	#KILLED
12/30/01	1:24	700'	North of	SE 82ND PLACE	Parked Vehicle / Fixed Object	South	Going Straight Ahead			0	0
12/8/98	15:53	0'	In Int.	SE 82ND PLACE	Rear-End	South	Going Straight Ahead	South	Making Left Turn	0	0
9/21/99	9:15	20'	North of	SE 82ND PLACE	Rear-End	South	Going Straight Ahead	South	Stopped For Traffic	0	0
6/12/00	9:39	150'	South of	SE 83RD PLACE	Head-On	East	Other	West	Going Straight Ahead	2	0
9/21/01	8:56	1320'	South of	SE 83RD PLACE	Parked Vehicle / Fixed Object	North	Going Straight Ahead			0	0
7/6/00	14:12	1000'	North of	SE 95TH STREET	Rear-End	South	Going Straight Ahead	South	Stopped For Traffic	0	0

ISSAQUAH FALL CITY ROAD FROM ISSAQUAH PINE LAKE TO EAST LAKE SAMMAMISH PKWY											
DATE	TIME	DIST	DIR.	LOCATION	ACCIDENT TYPE	DIR FROM (UNIT 1)	ACTION (UNIT 1)	DIR FROM (UNIT 2)	ACTION (UNIT 2)	#INJURED	#KILLED
4/6/00	15:28	0'	In Int.	EAST LAKE SAMMAMISH PARKWAY SE	Approach Turn	North	Making Left Turn	South	Going Straight Ahead	0	0
5/18/00	21:37	0'	In Int.	EAST LAKE SAMMAMISH PARKWAY SE	Approach Turn	North	Making Left Turn	South	Going Straight Ahead	0	0
5/23/00	21:03	0'	In Int.	EAST LAKE SAMMAMISH PARKWAY SE	Approach Turn	North	Making Left Turn	South	Going Straight Ahead	3	0
6/2/00	23:26	0'	In Int.	EAST LAKE SAMMAMISH PARKWAY SE	Approach Turn	North	Making Left Turn	South	Going Straight Ahead	2	0
8/4/00	16:52	0'	In Int.	EAST LAKE SAMMAMISH PARKWAY SE	Approach Turn	South	Going Straight Ahead	North	Making Left Turn	0	0
10/28/00	7:28	0'	In Int.	EAST LAKE SAMMAMISH PARKWAY SE	Approach Turn	North	Making Left Turn	South	Going Straight Ahead	1	0
1/13/01	16:42	0'	In Int.	EAST LAKE SAMMAMISH PARKWAY SE	Approach Turn	North	Making Left Turn	South	Going Straight Ahead	0	0
1/22/01	19:11	0'	In Int.	EAST LAKE SAMMAMISH PARKWAY SE	Approach Turn	South	Going Straight Ahead	North	Making Left Turn	0	0
2/20/02	23:40	0'	In Int.	EAST LAKE SAMMAMISH PARKWAY SE	Parked Vehicle / Fixed Object	South	Going Straight Ahead				
6/25/00	18:23	300'	East of	EAST LAKE SAMMAMISH PARKWAY SE	Rear-End	West	Going Straight Ahead	West	Stopped For Traffic	0	0
7/12/00	7:34	200'	East of	EAST LAKE SAMMAMISH PARKWAY SE	Rear-End	East	Going Straight Ahead	East	Stopped For Traffic	0	0
11/15/00	8:46	600'	East of	EAST LAKE SAMMAMISH PARKWAY SE	Rear-End	East	Going Straight Ahead	East	Stopped For Traffic	1	0
1/15/01	15:47	100'	East of	EAST LAKE SAMMAMISH PARKWAY SE	Rear-End	East	Going Straight Ahead	East	Slowing	1	0
1/17/01	18:08	100'	East of	EAST LAKE SAMMAMISH PARKWAY SE	Rear-End	East	Stopped For Traffic	East	Going Straight Ahead	0	0
1/21/01	13:45	200'	East of	EAST LAKE SAMMAMISH PARKWAY SE	Rear-End	East	Going Straight Ahead	East	Stopped For Traffic	0	0
2/7/01	9:30	100'	East of	EAST LAKE SAMMAMISH PARKWAY SE	Rear-End	East	Going Straight Ahead	East	Stopped For Traffic	0	0

ISSAQUAH FALL CITY ROAD FROM ISSAQUAH PINE LAKE TO EAST LAKE SAMMAMISH PKWY											
DATE	TIME	DIST	DIR.	LOCATION	ACCIDENT TYPE	DIR FROM (UNIT 1)	ACTION (UNIT 1)	DIR FROM (UNIT 2)	ACTION (UNIT 2)	#INJURED	#KILLED
2/21/01	7:42	250'	East of	EAST LAKE SAMMAMISH PARKWAY SE	Rear-End	East	Going Straight Ahead	East	Stopped For Traffic	0	0
5/1/01	12:25	0'	In Int.	EAST LAKE SAMMAMISH PARKWAY SE	Rear-End	South	Going Straight Ahead	South	Going Straight Ahead	0	0
5/1/01	17:25	0'	In Int.	EAST LAKE SAMMAMISH PARKWAY SE	Rear-End	South	Going Straight Ahead	South	Making Right Turn	0	0
6/1/01	14:29	600'	East of	EAST LAKE SAMMAMISH PARKWAY SE	Rear-End	West	Going Straight Ahead	West	Going Straight Ahead	0	0
6/2/01	13:51	200'	East of	EAST LAKE SAMMAMISH PARKWAY SE	Rear-End	South	Making Left Turn	East	Going Straight Ahead	0	0
7/11/01	10:16	200'	East of	EAST LAKE SAMMAMISH PARKWAY SE	Rear-End	East	Going Straight Ahead	East	Slowing	0	0
7/12/01	9:05	100'	East of	EAST LAKE SAMMAMISH PARKWAY SE	Rear-End	East	Going Straight Ahead	East	Stopped For Traffic	0	0
11/4/01	14:28	100'	East of	EAST LAKE SAMMAMISH PARKWAY SE	Rear-End	East	Making Left Turn	East	Going Straight Ahead	2	0
11/19/01	9:24	800'	East of	EAST LAKE SAMMAMISH PARKWAY SE	Rear-End	East	Going Straight Ahead	East	Stopped For Traffic	0	0
1/3/02	19:40	500'	East of	EAST LAKE SAMMAMISH PARKWAY SE	Rear-End	West	Overtaking and Passing	West	Stopped For Traffic	0	0
1/19/02	12:09	5'	East of	EAST LAKE SAMMAMISH PARKWAY SE	Rear-End	East	Going Straight Ahead	East	Signal or Stop Sign	0	0
2/6/02	11:32	50'	East of	EAST LAKE SAMMAMISH PARKWAY SE	Rear-End	East	Going Straight Ahead	East	Signal or Stop Sign	0	0
3/13/02	17:28	200'	East of	EAST LAKE SAMMAMISH PARKWAY SE	Rear-End	West	Going Straight Ahead	West	Stopped in Roadway	0	0
3/20/02	9:04	100'	East of	EAST LAKE SAMMAMISH PARKWAY SE	Rear-End	East	Going Straight Ahead	East	Going Straight Ahead	1	0
5/13/02	17:16	0'	In Int.	EAST LAKE SAMMAMISH PARKWAY SE	Rear-End	East	Going Straight Ahead	East	Signal or Stop Sign	1	0
6/27/02	21:03	0'	In Int.	EAST LAKE SAMMAMISH PARKWAY SE	Rear-End	North	Going Straight Ahead	North	Going Straight Ahead	0	0

ISSAQUAH FALL CITY ROAD FROM ISSAQUAH PINE LAKE TO EAST LAKE SAMMAMISH PKWY											
DATE	TIME	DIST	DIR.	LOCATION	ACCIDENT TYPE	DIR FROM (UNIT 1)	ACTION (UNIT 1)	DIR FROM (UNIT 2)	ACTION (UNIT 2)	#INJURED	#KILLED
5/30/00	20:28	0'	In Int.	EAST LAKE SAMMAMISH PARKWAY SE	Right Angle / Broadside	South	Making Right Turn	East	Stopped For Traffic	0	0
6/27/00	9:45	200'	East of	EAST LAKE SAMMAMISH PARKWAY SE	Right Angle / Broadside	South	Making Left Turn	West	Going Straight Ahead	0	0
7/10/00	11:17	200'	East of	EAST LAKE SAMMAMISH PARKWAY SE	Right Angle / Broadside	East	Going Straight Ahead	South	Making Left Turn	1	0
1/3/01	11:21	200'	East of	EAST LAKE SAMMAMISH PARKWAY SE	Right Angle / Broadside	South	Making Left Turn	West	Going Straight Ahead	0	0
1/10/01	5:50	0'	In Int.	EAST LAKE SAMMAMISH PARKWAY SE	Right Angle / Broadside	South	Going Straight Ahead	East	Making Left Turn	0	0
8/30/01	21:02	0'	In Int.	EAST LAKE SAMMAMISH PARKWAY SE	Right Angle / Broadside	North	Making Left Turn	East	Signal or Stop Sign	0	0
11/1/01	13:32	200'	East of	EAST LAKE SAMMAMISH PARKWAY SE	Right Angle / Broadside	South	Making Left Turn	East	Going Straight Ahead	0	0
7/23/02	20:14	0'	In Int.	EAST LAKE SAMMAMISH PARKWAY SE	Right Angle / Broadside	East	Going Straight Ahead	North	Making Left Turn	0	0
3/7/00	19:12	0'	In Int.	EAST LAKE SAMMAMISH PARKWAY SE	Sideswipe / Lane Change	South	Making Right Turn	South	Making Right Turn	0	0
5/3/00	21:23	0'	In Int.	EAST LAKE SAMMAMISH PARKWAY SE	Sideswipe / Lane Change	South	Going Straight Ahead	South	Making Right Turn	0	0
6/7/00	20:57	0'	In Int.	EAST LAKE SAMMAMISH PARKWAY SE	Sideswipe / Lane Change	South	Making Right Turn	South	Making Right Turn	0	0
6/28/00	12:44	0'	In Int.	EAST LAKE SAMMAMISH PARKWAY SE	Sideswipe / Lane Change	South	Making Right Turn	South	Making Right Turn	0	0
7/7/00	9:36	0'	In Int.	EAST LAKE SAMMAMISH PARKWAY SE	Sideswipe / Lane Change	South	Making Right Turn	South	Making Right Turn	0	0
8/16/00	18:45	0'	In Int.	EAST LAKE SAMMAMISH PARKWAY SE	Sideswipe / Lane Change	South	Going Straight Ahead	South	Making Right Turn	0	0
10/11/00	17:05	0'	In Int.	EAST LAKE SAMMAMISH PARKWAY SE	Sideswipe / Lane Change	South	Making Right Turn	South	Making Right Turn	0	0
11/28/00	16:47	0'	In Int.	EAST LAKE SAMMAMISH PARKWAY SE	Sideswipe / Lane Change	South	Making Right Turn	South	Making Right Turn	0	0

ISSAQUAH FALL CITY ROAD FROM ISSAQUAH PINE LAKE TO EAST LAKE SAMMAMISH PKWY											
DATE	TIME	DIST	DIR.	LOCATION	ACCIDENT TYPE	DIR FROM (UNIT 1)	ACTION (UNIT 1)	DIR FROM (UNIT 2)	ACTION (UNIT 2)	#INJURED	#KILLED
12/1/00	11:21	1000'	East of	EAST LAKE SAMMAMISH PARKWAY SE	Sideswipe / Lane Change	West	Changing Lanes	West	Going Straight Ahead	0	0
1/25/01	23:29	0'	In Int.	EAST LAKE SAMMAMISH PARKWAY SE	Sideswipe / Lane Change	South	Going Straight Ahead	South	Making Right Turn	0	0
2/13/01	17:20	0'	In Int.	EAST LAKE SAMMAMISH PARKWAY SE	Sideswipe / Lane Change	South	Going Straight Ahead	South	Making Right Turn	1	0
3/22/01	17:32	0'	In Int.	EAST LAKE SAMMAMISH PARKWAY SE	Sideswipe / Lane Change	South	Going Straight Ahead	South	Making Right Turn	0	0
4/10/01	12:54	0'	In Int.	EAST LAKE SAMMAMISH PARKWAY SE	Sideswipe / Lane Change	South	Making Right Turn	South	Making Right Turn	1	0
4/25/01	19:16	0'	In Int.	EAST LAKE SAMMAMISH PARKWAY SE	Sideswipe / Lane Change	South	Making Right Turn	South	Making Right Turn	0	0
4/30/01	11:22	0'	In Int.	EAST LAKE SAMMAMISH PARKWAY SE	Sideswipe / Lane Change	South	Going Straight Ahead	South	Making Right Turn	0	0
5/1/01	12:53	0'	In Int.	EAST LAKE SAMMAMISH PARKWAY SE	Sideswipe / Lane Change	South	Going Straight Ahead	South	Making Right Turn	0	0
7/13/01	14:56	0'	In Int.	EAST LAKE SAMMAMISH PARKWAY SE	Sideswipe / Lane Change	East	Going Straight Ahead	East	Making Right Turn	0	0
7/14/01	9:34	0'	In Int.	EAST LAKE SAMMAMISH PARKWAY SE	Sideswipe / Lane Change	South	Making Right Turn	South	Making Right Turn	0	0
7/16/01	22:03	0'	In Int.	EAST LAKE SAMMAMISH PARKWAY SE	Sideswipe / Lane Change	SE	Making Right Turn	SE	Making Right Turn	0	0
11/24/01	17:09	0'	In Int.	EAST LAKE SAMMAMISH PARKWAY SE	Sideswipe /.Lane Change	South	Going Straight Ahead	South	Making Right Turn	0	0
12/2/01	0:31	1000'	East of	EAST LAKE SAMMAMISH PARKWAY SE	Sideswipe / Lane Change	South	Making Right Turn	West	Going Straight Ahead	0	0
12/24/01	19:41	0'	In Int.	EAST LAKE SAMMAMISH PARKWAY SE	Sideswipe / Lane Change	South	Making Right Turn	South	Making Right Turn	0	0
2/11/02	15:54	0'	In Int.	EAST LAKE SAMMAMISH PARKWAY SE	Sideswipe / Lane Change	South	Going Straight Ahead	South	Going Straight Ahead	0	0
2/18/02	13:53	0'	In Int.	EAST LAKE SAMMAMISH PARKWAY SE	Sideswipe / Lane Change	South	Going Straight Ahead	South	Making Right Turn	0	0

ISSAQUAH FALL CITY ROAD FROM ISSAQUAH PINE LAKE TO EAST LAKE SAMMAMISH PKWY											
DATE	TIME	DIST	DIR.	LOCATION	ACCIDENT TYPE	DIR FROM (UNIT 1)	ACTION (UNIT 1)	DIR FROM (UNIT 2)	ACTION (UNIT 2)	#INJURED	#KILLED
3/15/02	16:41	0'	In Int.	EAST LAKE SAMMAMISH PARKWAY SE	Sideswipe / Lane Change	East	Making Left Turn	East	Making Left Turn	0	0
7/1/02	12:20	0'	In Int.	EAST LAKE SAMMAMISH PARKWAY SE	Sideswipe / Lane Change	South	Making Right Turn	South	Making Right Turn	0	0
7/15/02	13:13	50'	East of	EAST LAKE SAMMAMISH PARKWAY SE	Sideswipe / Lane Change	West	Changing Lanes	West	Going Straight Ahead	0	0
7/24/02	17:23	0'	In Int.	EAST LAKE SAMMAMISH PARKWAY SE	Sideswipe / Lane Change	South	Going Straight Ahead	South	Making Right Turn	1	0
4/10/00	12:53	0'	In Int.	ISSAQUAH PINE LAKE ROAD SE	Rear-End	South	Going Straight Ahead	South	Stopped For Traffic	0	0
6/12/00	7:35	0'	In Int.	ISSAQUAH PINE LAKE ROAD SE	Rear-End	South	Going Straight Ahead	South	Signal or Stop Sign	0	0
1/14/01	11:45	0'	In Int.	ISSAQUAH PINE LAKE ROAD SE	Rear-End	South	Making Right Turn	South	Making Right Turn	0	0
5/15/01	9:56	0'	In Int.	ISSAQUAH PINE LAKE ROAD SE	Rear-End	South	Going Straight Ahead	South	Signal or Stop Sign	1	0
9/13/01	16:42	0'	In Int.	ISSAQUAH PINE LAKE ROAD SE	Rear-End	North	Going Straight Ahead	North	Stopped For Traffic	0	0
12/16/01	14:16	0'	In Int.	ISSAQUAH PINE LAKE ROAD SE	Rear-End	South	Going Straight Ahead	South	Signal or Stop Sign	0	0
5/10/00	6:50	0'	In Int.	ISSAQUAH PINE LAKE ROAD SE	Right Angle / Broadside	East	Making Left Turn	South	Making Left Turn	0	0
7/31/00	14:14	0'	In Int.	ISSAQUAH PINE LAKE ROAD SE	Right Angle / Broadside	North	Going Straight Ahead	East	Making Left Turn	0	0
12/14/01	13:39	1000'	East of	ISSAQUAH PINE LAKE ROAD SE	Right Angle / Broadside	West	Making U Turn	West	Going Straight Ahead	0	0
3/6/02	18:35	0'	In Int.	ISSAQUAH PINE LAKE ROAD SE	Right Angle / Broadside	East	Signal or Stop Sign	North	Signal or Stop Sign	0	0
7/12/01	19:20	0'	In Int.	ISSAQUAH PINE LAKE ROAD SE	Sideswipe / Lane Change	South	Going Straight Ahead	South	Changing Lanes	0	0
4/25/01	15:47	100'	North of	SE 58TH STREET	Head-On	South	Going Straight Ahead	North	Going Straight Ahead	4	0

ISSAQUAH FALL CITY ROAD FROM ISSAQUAH PINE LAKE TO EAST LAKE SAMMAMISH PKWY											
DATE	TIME	DIST	DIR.	LOCATION	ACCIDENT TYPE	DIR FROM (UNIT 1)	ACTION (UNIT 1)	DIR FROM (UNIT 2)	ACTION (UNIT 2)	#INJURED	#KILLED
5/8/01	17:57	0'	In Int.	SE 58TH STREET	Right Angle / Broadside	East	Making Left Turn	North	Going Straight Ahead	1	0
5/2/02	18:20	0'	In Int.	SE 58TH STREET	Right Angle / Broadside	West	Signal or Stop Sign	North	Going Straight Ahead	0	0
2/19/01	14:25	200'	North of	SE BLACK NUGGET ROAD	Rear-End	South	Going Straight Ahead	South	Going Straight Ahead	0	0
4/10/01	8:19	0'	In Int.	SE BLACK NUGGET ROAD	Approach Turn	East	Making U Turn	West	Going Straight Ahead	2	0
10/16/01	18:24	0'	In Int.	SE BLACK NUGGET ROAD	Approach Turn	South	Making Left Turn	North	Going Straight Ahead	0	0
6/21/02	7:38	0'	In Int.	SE BLACK NUGGET ROAD	Approach Turn	South	Making Left Turn	North	Going Straight Ahead	0	0
11/3/00	5:56	1000'	West of	SE BLACK NUGGET ROAD	Parked Vehicle / Fixed Object	West	Going Straight Ahead			1	0
5/12/00	8:33	0'	In Int.	SE BLACK NUGGET ROAD	Rear-End	North	Going Straight Ahead	North	Going Straight Ahead	1	0
7/19/00	16:21	20'	North of	SE BLACK NUGGET ROAD	Rear-End	SW	Overtaking and Passing	SW	Going Straight Ahead	0	0
6/15/02	16:03	0'	In Int.	SE BLACK NUGGET ROAD	Rear-End	SW	Going Straight Ahead	SW	Going Straight Ahead	0	0
2/11/01	22:37	0'	In Int.	SE BLACK NUGGET ROAD	Right Angle / Broadside	North	Making Left Turn	South	Going Straight Ahead	1	0
5/14/02	15:09	0'	In Int.	SE BLACK NUGGET ROAD	Right Angle / Broadside	South	Going Straight Ahead	East	Making Left Turn	1	0

SUNSET WAY FROM NEWPORT TO I-90											
DATE	TIME	DIST	DIR.	LOCATION	ACCIDENT TYPE	DIR FROM (UNIT 1)	ACTION (UNIT 1)	DIR FROM (UNIT 2)	ACTION (UNIT 2)	#INJURED	#KILLED
7/19/00	17:50	100'	West of	1ST AVENUE NW	Parked Vehicle	West	Going Straight Ahead			0	0
4/17/00	17:39	600'	East of	6TH AVENUE NE	Rear-End	West	Going Straight Ahead	West	Stopped in Roadway	1	0
2/3/00	16:08	0'	In Int.	6TH AVENUE SE	Right Angle / Broadside	South	Making Left Turn	West	Going Straight Ahead	0	0
12/17/98	23:01	100'	East of	FRONT STREET	Parked Vehicle	South	Making Left Turn			0	0
12/17/98	16:45	100'	East of	FRONT STREET	Rear-End	East	Going Straight Ahead	East	Stopped For Traffic	0	0
9/7/99	7:28	150'	East of	FRONT STREET	Rear-End	West	Stopped For Traffic	West	Going Straight Ahead	0	0
12/8/99	14:59	100'	East of	FRONT STREET	Sideswipe / Lane Change	East	Overtaking and Passing	East	Going Straight Ahead	0	0
10/6/00	17:57	150'	East of	FRONT STREET	Rear-End	West	Stopped For Traffic	West	Going Straight Ahead	0	0
7/24/00	12:34	60'	East of	NEWPORT WAY	Rear-End	East	Overtaking and Passing	East	Signal or Stop Sign	0	0

FRONT ST FROM 229TH TO 2ND AVE SE											
DATE	TIME	DIST	DIR.	LOCATION	ACCIDENT TYPE	DIR FROM (UNIT 1)	ACTION (UNIT 1)	DIR FROM (UNIT 2)	ACTION (UNIT 2)	#INJURED	#KILLED
6/9/00	15:14	100'	South of	229TH AVENUE SE	Rear-End	South	Going Straight Ahead	South	Slowing	1	0
7/9/02	18:04	100'	South of	229TH AVENUE SE	Sideswipe / Lane Change	North	Changing Lanes	North	Going Straight Ahead	0	0
1/9/98	17:57	1000'	North of	2ND AVENUE SE	Pedestrian / Bicycle Involved	East	Merging; entering traffic	North	Going Straight Ahead	1	0
9/13/99	15:25	500'	North of	2ND AVENUE SE	Pedestrian / Bicycle Involved	North	Going Straight Ahead	West	Going Straight Ahead	0	0
5/11/98	9:01	250'	North of	2ND AVENUE SE	Rear-End	South	Going Straight Ahead	South	Going Straight Ahead	0	0
5/19/98	15:55	200'	North of	2ND AVENUE SE	Rear-End	North	Going Straight Ahead	North	Going Straight Ahead	0	0
10/27/98	16:55	150'	North of	2ND AVENUE SE	Rear-End	North	Going Straight Ahead	North	Stopped For Traffic	0	0
3/19/99	17:54	200'	North of	2ND AVENUE SE	Rear-End	North	Going Straight Ahead	North	Stopped For Traffic	1	0
5/4/99	11:41	1000'	North of	2ND AVENUE SE	Rear-End	North	Making Right Turn	North	Going Straight Ahead	0	0
6/11/99	7:44	300'	North of	2ND AVENUE SE	Rear-End	North	Changing Lanes	North	Making Left Turn	0	0
6/11/99	8:15	200'	North of	2ND AVENUE SE	Rear-End	South	Going Straight Ahead	South	Going Straight Ahead	0	0
4/28/00	6:41	1000'	North of	2ND AVENUE SE	Rear-End	South	Going Straight Ahead	South	Going Straight Ahead	3	0
5/11/00	18:41	300'	North of	2ND AVENUE SE	Rear-End	North	Going Straight Ahead	North	Stopped For Traffic	0	0
1/16/02	17:26	600'	North of	2ND AVENUE SE	Rear-End	North	Going Straight Ahead	North	Stopped For Traffic	0	0
1/16/02	17:32	1320'	North of	2ND AVENUE SE	Rear-End	North	Going Straight Ahead	Vehicle Stopped	Stopped For Traffic	1	0
4/10/02	13:31	1200'	North of	2ND AVENUE SE	Rear-End	South	Going Straight Ahead	South	Stopped For Traffic	0	0
2/14/98	22:24	50'	North of	2ND AVENUE SE	Sideswipe / Lane Change	North	Overtaking and Passing	North	Going Straight Ahead	0	0

FRONT ST FROM 229TH TO 2ND AVE SE											
DATE	TIME	DIST	DIR.	LOCATION	ACCIDENT TYPE	DIR FROM (UNIT 1)	ACTION (UNIT 1)	DIR FROM (UNIT 2)	ACTION (UNIT 2)	#INJURED	#KILLED
4/28/98	15:45	100'	North of	NE CRESCENT DRIVE	Rear-End	North	Going Straight Ahead	North	Stopped For Traffic	0	0
8/14/01	10:56	250'	North of	NE CRESCENT DRIVE	Rear-End	North	Going Straight Ahead	North	Stopped For Traffic	0	0
11/9/00	14:57	200'	North of	NE DOGWOOD STREET	Rear-End	South	Going Straight Ahead	South	Stopped For Traffic	0	0
11/18/00	13:51	200'	South of	NE DOGWOOD STREET	Rear-End	South	Going Straight Ahead	South	Stopped For Traffic	0	0
8/27/01	17:48	300'	North of	NE DOGWOOD STREET	Rear-End	South	Going Straight Ahead	South	Stopped For Traffic	2	0
3/19/02	15:54	200'	North of	NE DOGWOOD STREET	Right Angle / Broadside	West	Making Left Turn	North	Going Straight Ahead	0	0
1/24/01	8:42	500'	South of	NEWPORT WAY SW	Pedestrian / Bicycle Involved	East	Making Right Turn	North	Going Straight Ahead	1	0
3/2/99	8:45	1000'	South of	NEWPORT WAY SW	Rear-End	South	Going Straight Ahead	South	Going Straight Ahead	1	0
2/29/00	15:51	80'	South of	NEWPORT WAY SW	Rear-End	South	Going Straight Ahead	South	Stopped For Traffic	0	0
6/18/02	13:38	1000'	South of	NEWPORT WAY SW	Rear-End	North	Going Straight Ahead	North	Slowing	0	0
7/8/02	15:21	2500'	South of	NEWPORT WAY SW	Rear-End	South	Going Straight Ahead	South	Making Right Turn	0	0
6/2/01	12:00	200'	South of	NEWPORT WAY SW	Sideswipe / Lane Change	South	Making Left Turn	South	Going Straight Ahead	0	0
2/15/98	12:56	120'	North of	NW ALDER PLACE	Rear-End	North	Stopped For Traffic	North	Stopped For Traffic	0	0
2/15/98	13:09	75'	North of	NW ALDER PLACE	Rear-End	North	Going Straight Ahead	North	Stopped in Roadway	1	0
8/21/98	17:57	150'	North of	NW ALDER PLACE	Rear-End	North	Going Straight Ahead	North	Stopped For Traffic	0	0
10/6/98	12:35	100'	North of	NW ALDER PLACE	Rear-End	North	Going Straight Ahead	North	Slowing	2	0
3/1/99	14:47	100'	South of	NW ALDER PLACE	Rear-End	South	Going Straight Ahead	South	Stopped For Traffic	0	0

FRONT ST FROM 229TH TO 2ND AVE SE											
DATE	TIME	DIST	DIR.	LOCATION	ACCIDENT TYPE	DIR FROM (UNIT 1)	ACTION (UNIT 1)	DIR FROM (UNIT 2)	ACTION (UNIT 2)	#INJURED	#KILLED
10/28/99	10:21	300'	North of	NW ALDER PLACE	Rear-End	South	Going Straight Ahead	South	Stopped For Traffic	0	0
5/1/02	11:50	50'	North of	NW ALDER PLACE	Right Angle / Broadside	East	Making Right Turn	South	Going Straight Ahead	0	0
4/13/02	17:11	50'	North of	NW ALDER PLACE	Sideswipe / Lane Change	Vehicle Stopped	Starting From Parked	South	Going Straight Ahead	0	0
7/12/02	1:57	543'	South of	NW DOGWOOD STREET	Parked Vehicle / Fixed Object	North	Going Straight Ahead	Vehicle Stopped	Legally Parked,	2	0
3/6/98	18:04	200'	South of	NW DOGWOOD STREET	Rear-End	North	Going Straight Ahead	North	Stopped For Traffic	0	0
2/27/99	11:05	250'	South of	NW DOGWOOD STREET	Rear-End	North	Going Straight Ahead	North	Going Straight Ahead	0	0
5/6/99	16:37	500'	North of	NW DOGWOOD STREET	Rear-End	North	Going Straight Ahead	North	Stopped For Traffic	1	0
7/14/00	15:55	200'	North of	NW DOGWOOD STREET	Rear-End	North	Going Straight Ahead	North	Stopped For Traffic	3	0
1/28/01	21:12	200'	South of	NW DOGWOOD STREET	Rear-End	South	Going Straight Ahead	Vehicle Stopped	Stopped in Roadway	1	0
1/29/01	15:48	250'	South of	NW DOGWOOD STREET	Rear-End	South	Going Straight Ahead	Vehicle Stopped	Stopped For Traffic	3	0
1/15/02	14:29	300'	South of	NW DOGWOOD STREET	Rear-End	South	Going Straight Ahead	South	Going Straight Ahead	3	0
5/11/02	17:22	500'	South of	NW DOGWOOD STREET	Rear-End	North	Going Straight Ahead	North	Stopped For Traffic	2	0
5/21/02	21:45	500'	South of	NW DOGWOOD STREET	Rear-End	North	Going Straight Ahead	North	Stopped in Roadway	0	0
6/7/02	14:26	300'	North of	NW DOGWOOD STREET	Rear-End	North	Going Straight Ahead	North	Stopped For Traffic	1	0
11/19/98	19:00	200'	South of	NW DOGWOOD STREET	Right Angle / Broadside	West	Making Left Turn	North	Going Straight Ahead	0	0
3/26/98	7:45	100'	North of	NW GILMAN BOULEVARD	Approach Turn	South	Making Left Turn	South	Going Straight Ahead	0	0
4/15/98	19:05	100'	North of	NW GILMAN BOULEVARD	Approach Turn	North	Making Left Turn	South	Going Straight Ahead	0	0

FRONT ST FROM 229TH TO 2ND AVE SE											
DATE	TIME	DIST	DIR.	LOCATION	ACCIDENT TYPE	DIR FROM (UNIT 1)	ACTION (UNIT 1)	DIR FROM (UNIT 2)	ACTION (UNIT 2)	#INJURED	#KILLED
6/18/98	11:35	100'	North of	NW GILMAN BOULEVARD	Approach Turn	South	Making Left Turn	North	Going Straight Ahead	1	0
8/4/98	17:10	100'	North of	NW GILMAN BOULEVARD	Approach Turn	South	Making Left Turn	North	Going Straight Ahead	2	0
8/22/98	13:04	50'	South of	NW GILMAN BOULEVARD	Approach Turn	South	Making Left Turn	North	Going Straight Ahead	0	0
9/9/98	19:08	150'	North of	NW GILMAN BOULEVARD	Approach Turn	South	Making Left Turn	North	Going Straight Ahead	0	0
3/5/99	18:55	200'	North of	NW GILMAN BOULEVARD	Approach Turn	North	Making Left Turn	South	Going Straight Ahead	0	0
8/23/99	17:39	100'	South of	NW GILMAN BOULEVARD	Approach Turn	North	Making Left Turn	South	Going Straight Ahead	1	0
9/2/99	13:30	100'	South of	NW GILMAN BOULEVARD	Approach Turn	North	Making Left Turn	South	Going Straight Ahead	0	0
10/26/99	16:47	50'	North of	NW GILMAN BOULEVARD	Approach Turn	North	Making Left Turn	South	Going Straight Ahead	0	0
10/21/00	18:12	300'	South of	NW GILMAN BOULEVARD	Approach Turn	North	Making Left Turn	South	Going Straight Ahead	2	0
11/14/00	6:22	100'	North of	NW GILMAN BOULEVARD	Approach Turn	South	Going Straight Ahead	North	Making Left Turn	0	0
5/30/01	14:06	200'	North of	NW GILMAN BOULEVARD	Approach Turn	South	Making Left Turn	North	Going Straight Ahead	0	0
7/1/01	16:24	100'	South of	NW GILMAN BOULEVARD	Approach Turn	South	Going Straight Ahead	North	Making Left Turn	0	0
7/30/01	13:37	80'	North of	NW GILMAN BOULEVARD	Approach Turn	North	Going Straight Ahead	South	Making Left Turn	0	0
10/10/01	14:51	200'	North of	NW GILMAN BOULEVARD	Approach Turn	North	Making Left Turn	South	Going Straight Ahead	0	0
1/7/02	11:22	50'	North of	NW GILMAN BOULEVARD	Approach Turn	North	Making Left Turn	South	Going Straight Ahead	2	0
5/11/02	12:28	200'	North of	NW GILMAN BOULEVARD	Approach Turn	East	Making Left Turn	North	Going Straight Ahead	3	0
6/6/02	11:53	200'	North of	NW GILMAN BOULEVARD	Approach Turn	South	Making Left Turn	North	Going Straight Ahead	1	0

FRONT ST FROM 229TH TO 2ND AVE SE											
DATE	TIME	DIST	DIR.	LOCATION	ACCIDENT TYPE	DIR FROM (UNIT 1)	ACTION (UNIT 1)	DIR FROM (UNIT 2)	ACTION (UNIT 2)	#INJURED	#KILLED
1/26/02	2:05	150'	South of	NW GILMAN BOULEVARD	Parked Vehicle/Fixed	North	Going Straight Ahead			0	0
3/31/98	19:34	150'	South of	NW GILMAN BOULEVARD	Rear-End	North	Going Straight Ahead	North	Stopped For Traffic	0	0
6/5/98	10:51	150'	North of	NW GILMAN BOULEVARD	Rear-End	North	Going Straight Ahead	North	Going Straight Ahead	0	0
8/5/98	16:17	200'	North of	NW GILMAN BOULEVARD	Rear-End	South	Going Straight Ahead	South	Stopped For Traffic	0	0
9/14/98	16:35	75'	North of	NW GILMAN BOULEVARD	Rear-End	North	Stopped For Traffic	North	Going Straight Ahead	0	0
9/18/98	17:06	50'	South of	NW GILMAN BOULEVARD	Rear-End	South	Going Straight Ahead	South	Stopped For Traffic	1	0
2/16/99	13:13	75'	North of	NW GILMAN BOULEVARD	Rear-End	North	Going Straight Ahead	North	Going Straight Ahead	0	0
2/23/99	15:38	200'	North of	NW GILMAN BOULEVARD	Rear-End	South	Going Straight Ahead	NW	Going Straight Ahead	0	0
9/22/99	14:40	150'	North of	NW GILMAN BOULEVARD	Rear-End	South	Going Straight Ahead	South	Going Straight Ahead	0	0
11/2/99	12:13	150'	North of	NW GILMAN BOULEVARD	Rear-End	South	Going Straight Ahead	South	Stopped For Traffic	1	0
2/2/00	14:00	150'	North of	NW GILMAN BOULEVARD	Rear-End	South	Going Straight Ahead	South	Stopped For Traffic	0	0
12/26/00	17:24	200'	North of	NW GILMAN BOULEVARD	Rear-End	East	Merging; entering traffic	South	Stopped For Traffic	1	0
1/6/01	11:49	150'	North of	NW GILMAN BOULEVARD	Rear-End	West	Going Straight Ahead	West	Going Straight Ahead	0	0
8/20/01	11:43	75'	North of	NW GILMAN BOULEVARD	Rear-End	North	Going Straight Ahead	North	Slowing	1	0
10/15/01	10:02	150'	North of	NW GILMAN BOULEVARD	Rear-End	South	Going Straight Ahead	South	Slowing	0	0
11/27/01	14:25	100'	South of	NW GILMAN BOULEVARD	Rear-End	South	Going Straight Ahead	South	Going Straight Ahead	1	0
1/29/02	15:35	200'	North of	NW GILMAN BOULEVARD	Rear-End	South	Going Straight Ahead	South	Making Right Turn	0	0

FRONT ST FROM 229TH TO 2ND AVE SE											
DATE	TIME	DIST	DIR.	LOCATION	ACCIDENT TYPE	DIR FROM (UNIT 1)	ACTION (UNIT 1)	DIR FROM (UNIT 2)	ACTION (UNIT 2)	#INJURED	#KILLED
4/20/02	16:09	200'	North of	NW GILMAN BOULEVARD	Rear-End	South	Stopped For Traffic	South	Going Straight Ahead	1	0
4/22/02	9:58	200'	South of	NW GILMAN BOULEVARD	Rear-End	South	Going Straight Ahead	South	Stopped For Traffic	0	0
4/21/98	5:56	100'	North of	NW GILMAN BOULEVARD	Right Angle / Broadside	East	Making Left Turn	North	Going Straight Ahead	0	0
8/11/98	17:30	300'	North of	NW GILMAN BOULEVARD	Right Angle / Broadside	East	Other	North	Going Straight Ahead	0	0
9/16/99	5:50	100'	North of	NW GILMAN BOULEVARD	Right Angle / Broadside	East	Making Right Turn	South	Going Straight Ahead	0	0
11/8/99	19:30	50'	North of	NW GILMAN BOULEVARD	Right Angle / Broadside	East	Merging; entering traffic	South	Going Straight Ahead	0	0
12/28/99	13:39	100'	North of	NW GILMAN BOULEVARD	Right Angle / Broadside	West	Making Left Turn	North	Going Straight Ahead	0	0
1/11/00	7:40	100'	North of	NW GILMAN BOULEVARD	Right Angle / Broadside	West	Making Right Turn	North	Going Straight Ahead	0	0
1/25/00	20:27	200'	South of	NW GILMAN BOULEVARD	Right Angle / Broadside	East	Stopped in Roadway	South	Going Straight Ahead	0	0
4/25/00	16:02	80'	North of	NW GILMAN BOULEVARD	Right Angle / Broadside	West	Making Left Turn	North	Going Straight Ahead	2	0
5/12/00	19:50	150'	North of	NW GILMAN BOULEVARD	Right Angle / Broadside	West	Making Left Turn	North	Going Straight Ahead	0	0
6/13/00	7:48	150'	North of	NW GILMAN BOULEVARD	Right Angle / Broadside	East	Making Right Turn	South	Stopped For Traffic	0	0
11/16/00	9:40	200'	North of	NW GILMAN BOULEVARD	Right Angle / Broadside	North	Making Left Turn	East	Going Straight Ahead	0	0
11/20/00	9:31	500'	North of	NW GILMAN BOULEVARD	Right Angle / Broadside	East	Going Straight Ahead	North	Going Straight Ahead	0	0
5/4/01	14:57	200'	North of	NW GILMAN BOULEVARD	Right Angle / Broadside	North	Going Straight Ahead	West	Going Straight Ahead	1	0
6/4/01	21:32	200'	North of	NW GILMAN BOULEVARD	Right Angle / Broadside	South	Going Straight Ahead	East	Making Left Turn	0	0
10/3/01	15:47	200'	North of	NW GILMAN BOULEVARD	Right Angle / Broadside	South	Making Left Turn	North	Going Straight Ahead	2	0

FRONT ST FROM 229TH TO 2ND AVE SE											
DATE	TIME	DIST	DIR.	LOCATION	ACCIDENT TYPE	DIR FROM (UNIT 1)	ACTION (UNIT 1)	DIR FROM (UNIT 2)	ACTION (UNIT 2)	#INJURED	#KILLED
4/17/98	2:12	250'	North of	NW GILMAN BOULEVARD	Sideswipe / Lane Change	North	Changing Lanes	North	Going Straight Ahead	0	0
5/19/99	14:12	200'	North of	NW GILMAN BOULEVARD	Sideswipe / Lane Change	North	Making Left Turn	North	Going Straight Ahead	0	0
10/12/99	17:00	100'	North of	NW GILMAN BOULEVARD	Sideswipe / Lane Change	North	Changing Lanes	North	Going Straight Ahead	0	0
12/19/00	17:47	100'	North of	NW GILMAN BOULEVARD	Sideswipe / Lane Change	East	Making Right Turn	East	Making Right Turn	0	0
4/6/01	13:30	100'	South of	NW GILMAN BOULEVARD	Sideswipe / Lane Change	South	Changing Lanes	Vehicle Stopped	Stopped at Signal or Stop	0	0
11/21/98	13:48	200'	South of	NW HOLLY STREET	Approach Turn	North	Making Left Turn	South	Going Straight Ahead	0	0
7/30/00	17:36	150'	South of	NW HOLLY STREET	Approach Turn	North	Making Left Turn	South	Going Straight Ahead	0	0
10/4/01	8:08	200'	South of	NW HOLLY STREET	Parked Vehicle /Fixed Object	South	Going Straight Ahead			0	0
8/28/00	15:54	100'	South of	NW HOLLY STREET	Rear-End	South	Going Straight Ahead	South	Going Straight Ahead	0	0
12/3/01	12:44	200'	South of	NW HOLLY STREET	Rear-End	South	Going Straight Ahead	South	Going Straight Ahead	0	0
1/5/01	14:52	200'	South of	NW HOLLY STREET	Sideswipe / Lane Change	South	Changing Lanes	South	Going Straight Ahead	0	0
6/14/01	13:20	250'	North of	NW HOLLY STREET	Sideswipe / Lane Change	South	Merging; entering traffic	South	Going Straight Ahead	0	0
6/21/99	17:34	50'	South of	ROUTE 90	Rear-End	South	Going Straight Ahead	South	Going Straight Ahead	0	0
7/27/01	12:07	500'	North of	ROUTE 90	Rear-End	South	Going Straight Ahead	South	Going Straight Ahead	0	0
10/10/01	18:04	100'	South of	ROUTE 90	Rear-End	South	Going Straight Ahead	South	Going Straight Ahead	0	0
5/22/02	17:40	100'	South of	ROUTE 90	Rear-End	South	Going Straight Ahead	South	Going Straight Ahead	0	0
1/2/01	16:03	100'	South of	ROUTE 90 E/B OFFRAMP/ONRAMP	Approach Turn	South	Making Left Turn	North	Going Straight Ahead	0	0

FRONT ST FROM 229TH TO 2ND AVE SE											
DATE	TIME	DIST	DIR.	LOCATION	ACCIDENT TYPE	DIR FROM (UNIT 1)	ACTION (UNIT 1)	DIR FROM (UNIT 2)	ACTION (UNIT 2)	#INJURED	#KILLED
11/19/98	18:28	200'	North of	ROUTE 90 E/B OFFRAMP/ONRAMP	Rear-End	South	Changing Lanes	South	Stopped For Traffic	1	0
9/2/99	7:45	75'	South of	ROUTE 90 E/B OFFRAMP/ONRAMP	Rear-End	South	Going Straight Ahead	South	Stopped at Signal or Stop	1	0
11/1/00	11:44	50'	South of	ROUTE 90 E/B OFFRAMP/ONRAMP	Rear-End	South	Going Straight Ahead	South	Going Straight Ahead	0	0
6/12/02	17:46	50'	North of	ROUTE 90 E/B OFFRAMP/ONRAMP	Rear-End	South	Going Straight Ahead	South	Going Straight Ahead	0	0
8/28/01	9:49	100'	South of	ROUTE 90 E/B OFFRAMP/ONRAMP	Sideswipe / Lane Change	North	Changing Lanes	North	Going Straight Ahead	0	0
3/24/98	9:47	150'	South of	ROUTE 90 W/B OFFRAMP/ONRAMP	Rear-End	North	Going Straight Ahead	North	Stopped For Traffic	2	0
1/21/99	13:24	250'	South of	ROUTE 90 W/B OFFRAMP/ONRAMP	Rear-End	South	Going Straight Ahead	South	Stopped For Traffic	1	0
11/22/99	16:07	100'	South of	ROUTE 90 W/B OFFRAMP/ONRAMP	Rear-End	South	Going Straight Ahead	South	Stopped For Traffic	2	0
9/18/00	18:02	100'	South of	ROUTE 90 W/B OFFRAMP/ONRAMP	Rear-End	South	Going Straight Ahead	South	Going Straight Ahead	0	0
11/10/00	16:31	50'	South of	ROUTE 90 W/B OFFRAMP/ONRAMP	Rear-End	South	Going Straight Ahead	South	Stopped For Traffic	0	0
11/27/00	13:42	100'	South of	ROUTE 90 W/B OFFRAMP/ONRAMP	Rear-End	South	Going Straight Ahead	South	Stopped For Traffic	1	0
11/29/00	13:04	300'	South of	ROUTE 90 W/B OFFRAMP/ONRAMP	Rear-End	South	Going Straight Ahead	South	Stopped For Traffic	1	0
7/27/01	13:00	200'	South of	ROUTE 90 W/B OFFRAMP/ONRAMP	Rear-End	South	Going Straight Ahead	South	Changing Lanes	2	0
10/27/01	21:57	200'	North of	ROUTE 90 W/B OFFRAMP/ONRAMP	Rear-End	South	Going Straight Ahead	South	Stopped For Traffic	0	0
12/8/01	18:22	100'	South of	ROUTE 90 W/B OFFRAMP/ONRAMP	Rear-End	South	Going Straight Ahead	South	Stopped For Traffic	0	0
12/11/01	9:41	100'	South of	ROUTE 90 W/B OFFRAMP/ONRAMP	Rear-End	South	Going Straight Ahead	South	Stopped For Traffic	0	0
3/3/02	14:32	100'	South of	ROUTE 90 W/B OFFRAMP/ONRAMP	Rear-End	South	Going Straight Ahead	South	Stopped For Traffic	0	0

FRONT ST FROM 229TH TO 2ND AVE SE											
DATE	TIME	DIST	DIR.	LOCATION	ACCIDENT TYPE	DIR FROM (UNIT 1)	ACTION (UNIT 1)	DIR FROM (UNIT 2)	ACTION (UNIT 2)	#INJURED	#KILLED
11/2/00	12:32	100'	North of	ROUTE 90 W/B OFFRAMP/ONRAMP	Sideswipe / Lane Change	North	Changing Lanes	North	Going Straight Ahead	0	0
5/16/99	18:02	100'	North of	SE ANDREWS STREET	Right Angle / Broadside	East	Merging; entering traffic	South	Going Straight Ahead	0	0
4/4/02	17:04	100'	North of	SE ANDREWS STREET	Sideswipe / Lane Change	North	Changing Lanes	North	Going Straight Ahead	0	0
6/3/98	7:23	100'	South of	SE BUSH STREET	Rear-End	South	Going Straight Ahead	South	Stopped For Traffic	0	0
6/1/01	9:05	100'	South of	SE BUSH STREET	Rear-End	South	Going Straight Ahead	South	Stopped For Traffic	0	0
6/20/02	17:43	200'	North of	SE BUSH STREET	Rear-End	North	Going Straight Ahead	North	Going Straight Ahead	0	0
12/6/99	7:55	500'	South of	SUNSET WAY	Rear-End	South	Going Straight Ahead	South	Going Straight Ahead	0	0
9/20/00	21:34	300'	North of	SUNSET WAY	Rear-End	South	Going Straight Ahead	South	Stopped For Traffic	0	0
3/7/01	10:17	50'	South of	SUNSET WAY	Rear-End	South	Going Straight Ahead	South	Going Straight Ahead	0	0
8/14/01	12:30	300'	North of	SUNSET WAY	Rear-End	South	Going Straight Ahead	South	Stopped For Traffic	1	0
9/14/01	16:32	100'	North of	SUNSET WAY	Rear-End	North	Going Straight Ahead	North	Stopped For Traffic	0	0
5/17/02	17:33	500'	South of	SUNSET WAY	Rear-End	South	Going Straight Ahead	South	Stopped For Traffic	0	0
7/10/02	9:41	200'	North of	SUNSET WAY	Rear-End	North	Going Straight Ahead	Vehicle Stopped	Stopped For Traffic	0	0
3/22/98	11:00	150'	North of	SUNSET WAY	Right Angle / Broadside	East	Making U Turn	South	Going Straight Ahead	0	0
3/14/00	14:36	100'	South of	SUNSET WAY	Right Angle / Broadside	South	Going Straight Ahead	East	Making Left Turn	0	0

E. LAKE SAMMAMISH FROM SE 56TH TO 229TH											
DATE	TIME	DIST	DIR.	LOCATION	ACCIDENT TYPE	DIR FROM (UNIT 1)	ACTION (UNIT 1)	DIR FROM (UNIT 2)	ACTION (UNIT 2)	#INJURED	#KILLED
2/26/01	9:30	200'	South of	SE 56TH STREET	Approach Turn	North	Making Left Turn	South	Going Straight Ahead	0	0
5/23/01	17:15	150'	South of	SE 56TH STREET	Right Angle / Broadside	South	Going Straight Ahead	East	Making Left Turn	1	0
11/25/00	17:52	75'	North of	SE 62ND STREET	Parked /Fixed Object	South	Going Straight			1	0
3/23/00	14:29	200'	South of	SE 62ND STREET	Rear-End	South	Going Straight	South	Stopped For Traffic	0	0
9/23/00	11:10	200'	South of	SE 62ND STREET	Rear-End	South	Going Straight	South	Stopped For Traffic	1	0
5/29/01	7:51	1500'	North of	SE 62ND STREET	Rear-End	North	Going Straight	North	Going Straight Ahead	0	0
10/30/01	14:17	200'	South of	SE 62ND STREET	Rear-End	North	Going Straight	North	Stopped For Traffic	0	0
5/12/02	14:19	100'	North of	SE BLACK NUGGET ROAD	Rear-End	North	Going Straight	North	Going Straight Ahead	0	0
7/22/02	10:19	150'	North of	SE BLACK NUGGET ROAD	Rear-End	South	Going Straight	South	Making Right Turn	0	0
5/21/01	7:41	500'	South of	SE ISSAQUAH FALL CITY RD	Approach Turn	North	Making Left Turn	South	Going Straight Ahead	0	0
3/8/00	17:08	1320'	South of	SE ISSAQUAH FALL CITY RD	Rear-End	South	Going Straight	South	Stopped For Traffic	1	0
4/20/00	20:53	100'	South of	SE ISSAQUAH FALL CITY RD	Rear-End	South	Going Straight	South	Going Straight Ahead	0	0
7/5/00	17:38	400'	North of	SE ISSAQUAH FALL CITY RD	Rear-End	South	Going Straight	South	Going Straight Ahead	0	0
9/8/00	9:37	300'	South of	SE ISSAQUAH FALL CITY RD	Rear-End	North	Going Straight	North	Going Straight Ahead	0	0
10/4/00	21:08	500'	North of	SE ISSAQUAH FALL CITY RD	Rear-End	West	Going Straight	West	Stopped For Traffic	1	0
3/3/01	11:44	200'	South of	SE ISSAQUAH FALL CITY RD	Rear-End	South	Going Straight	South	Going Straight Ahead	0	0
7/7/01	12:01	1000'	South of	SE ISSAQUAH FALL CITY RD	Rear-End	South	Going Straight	South	Going Straight Ahead	0	0

E. LAKE SAMMAMISH FROM SE 56TH TO 229TH											
DATE	TIME	DIST	DIR.	LOCATION	ACCIDENT TYPE	DIR FROM (UNIT 1)	ACTION (UNIT 1)	DIR FROM (UNIT 2)	ACTION (UNIT 2)	#INJURED	#KILLED
5/24/02	13:29	100'	North of	SE ISSAQUAH FALL CITY RD	Rear-End	North	Going Straight	North	Going Straight Ahead	0	0
6/18/02	12:55	300'	North of	SE ISSAQUAH FALL CITY RD	Rear-End	West	Going Straight	West	Stopped For Traffic	0	0
6/27/02	16:31	200'	South of	SE ISSAQUAH FALL CITY RD	Rear-End	South	Going Straight	South	Going Straight Ahead	0	0
4/4/00	13:13	100'	South of	SE ISSAQUAH FALL CITY RD	Right Angle / Broadside	East	Making Left Turn	South	Going Straight Ahead	1	0
8/9/00	16:27	100'	South of	SE ISSAQUAH FALL CITY RD	Right Angle / Broadside	South	Making Left Turn	East	Making Left Turn	0	0
10/5/00	15:21	200'	South of	SE ISSAQUAH FALL CITY RD	Right Angle / Broadside	East	Merging; entering traffic	South	Overtaking and Passing	0	0
11/27/00	6:44	60'	South of	SE ISSAQUAH FALL CITY RD	Right Angle / Broadside	SW	Making Left Turn	South	Going Straight Ahead	0	0
12/5/00	6:40	200'	South of	SE ISSAQUAH FALL CITY RD	Right Angle / Broadside	East	Making Left Turn	South	Going Straight Ahead	0	0
1/12/01	7:46	200'	South of	SE ISSAQUAH FALL CITY RD	Right Angle / Broadside	East	Going Straight Ahead	South	Going Straight Ahead	0	0
1/18/01	12:13	200'	South of	SE ISSAQUAH FALL CITY RD	Right Angle / Broadside	East	Making Left Turn	South	Going Straight Ahead	0	0
1/30/01	11:35	200'	South of	SE ISSAQUAH FALL CITY RD	Right Angle / Broadside	East	Making Left Turn	South	Going Straight Ahead	0	0
8/23/01	17:38	200'	South of	SE ISSAQUAH FALL CITY RD	Right Angle / Broadside	East	Making Left Turn	North	Going Straight Ahead	0	0
10/23/01	15:10	200'	South of	SE ISSAQUAH FALL CITY RD	Right Angle / Broadside	East	Making Left Turn	South	Going Straight Ahead	1	0
11/15/01	15:12	200'	South of	SE ISSAQUAH FALL CITY RD	Right Angle / Broadside	East	Making Left Turn	South	Going Straight Ahead	0	0
1/14/02	9:02	150'	South of	SE ISSAQUAH FALL CITY RD	Right Angle / Broadside	East	Making Left Turn	South	Going Straight Ahead	0	0
2/24/02	16:10	100'	South of	SE ISSAQUAH FALL CITY RD	Right Angle / Broadside	East	Making Left Turn	South	Going Straight Ahead	0	0
5/22/02	21:22	200'	South of	SE ISSAQUAH FALL CITY RD	Right Angle / Broadside	South	Going Straight	East	Making Left Turn	0	0

E. LAKE SAMMAMISH FROM SE 56TH TO 229TH											
DATE	TIME	DIST	DIR.	LOCATION	ACCIDENT TYPE	DIR FROM (UNIT 1)	ACTION (UNIT 1)	DIR FROM (UNIT 2)	ACTION (UNIT 2)	#INJURED	#KILLED
11/29/00	10:57	100'	South of	SE ISSAQUAH FALL CITY RD	Sideswipe / Lane Change	South	Changing Lanes	South	Going Straight Ahead	0	0
5/4/01	12:26	100'	North of	SE ISSAQUAH FALL CITY RD	Sideswipe / Lane Change	South	Making U Turn	South	Going Straight Ahead	0	0

2ND AVENUE FROM SUNSET WAY TO FRONT STREET S											
DATE	TIME	DIST	DIR.	LOCATION	ACCIDENT TYPE	DIR FROM (UNIT 1)	ACTION (UNIT 1)	DIR FROM (UNIT 2)	ACTION (UNIT 2)	#INJURED	#KILLED
1/9/98	17:57	1000'	North of	FRONT STREET S	Pedestrian / Bicycle Involved	East	Merging; entering traffic	North	Going Straight Ahead	1	0
9/13/99	15:25	500'	North of	FRONT STREET S	Pedestrian / Bicycle Involved	North	Going Straight Ahead	West	Going Straight Ahead	0	0
5/11/98	9:01	250'	North of	FRONT STREET S	Rear-End	South	Going Straight Ahead	South	Going Straight Ahead	0	0
5/19/98	15:55	200'	North of	FRONT STREET S	Rear-End	North	Going Straight Ahead	North	Going Straight Ahead	0	0
10/27/98	16:55	150'	North of	FRONT STREET S	Rear-End	North	Going Straight Ahead	North	Stopped For Traffic	0	0
3/19/99	17:54	200'	North of	FRONT STREET S	Rear-End	North	Going Straight Ahead	North	Stopped For Traffic	1	0
5/4/99	11:41	1000'	North of	FRONT STREET S	Rear-End	North	Making Right Turn	North	Going Straight Ahead	0	0
6/11/99	7:44	300'	North of	FRONT STREET S	Rear-End	North	Changing Lanes	North	Making Left Turn	0	0
6/11/99	8:15	200'	North of	FRONT STREET S	Rear-End	South	Going Straight Ahead	South	Going Straight Ahead	0	0
4/28/00	6:41	1000'	North of	FRONT STREET S	Rear-End	South	Going Straight Ahead	South	Going Straight Ahead	3	0
5/11/00	18:41	300'	North of	FRONT STREET S	Rear-End	North	Going Straight Ahead	North	Stopped For Traffic	0	0
1/16/02	17:26	600'	North of	FRONT STREET S	Rear-End	North	Going Straight Ahead	North	Stopped For Traffic	0	0
1/16/02	17:32	1320'	North of	FRONT STREET S	Rear-End	North	Going Straight Ahead	Vehicle Stopped	Stopped For Traffic	1	0
4/10/02	13:31	1200'	North of	FRONT STREET S	Rear-End	South	Going Straight Ahead	South	Stopped For Traffic	0	0
7/1/02	11:16	0'	In Int.	FRONT STREET S	Rear-End	South	Signal or Stop Sign	South	Going Straight Ahead	1	0
2/14/98	22:24	50'	North of	FRONT STREET S	Sideswipe / Lane Change	North	Overtaking and Passing	North	Going Straight Ahead	0	0
1/12/01	9:44	100'	South of	SE ANDREWS STREET	Rear-End	South	Going Straight Ahead	Vehicle Stopped	Legally Parked, Occupied	1	0

2ND AVENUE FROM SUNSET WAY TO FRONT STREET S											
DATE	TIME	DIST	DIR.	LOCATION	ACCIDENT TYPE	DIR FROM (UNIT 1)	ACTION (UNIT 1)	DIR FROM (UNIT 2)	ACTION (UNIT 2)	#INJURED	#KILLED
7/22/00	17:36	0'	In Int.	SE ANDREWS STREET	Right Angle / Broadside	West	Going Straight Ahead	South	Going Straight Ahead	0	0
12/10/01	15:45	0'	In Int.	SE ANDREWS STREET	Right Angle / Broadside	East	Going Straight Ahead	North	Going Straight Ahead	1	0
5/6/98	14:35	0'	In Int.	SE BUSH STREET	Right Angle / Broadside	East	Going Straight Ahead	North	Going Straight Ahead	0	0
9/21/99	15:38	0'	In Int.	SE BUSH STREET	Right Angle / Broadside	West	Going Straight Ahead	North	Going Straight Ahead	2	0
8/23/01	10:13	0'	In Int.	SE BUSH STREET	Right Angle / Broadside	West	Going Straight Ahead	South	Going Straight Ahead	0	0
7/22/02	10:06	0'	In Int.	SE BUSH STREET	Right Angle / Broadside	East	Making Right Turn	South	Going Straight Ahead	0	0
5/23/00	14:31	50'	North of	SE CLARK STREET	Rear-End	South	Going Straight Ahead	South	Stopped For Traffic	0	0
10/25/01	7:32	0'	In Int.	SE DARST STREET	Pedestrian / Bicycle Involved	North	Going Straight Ahead	West	Going Straight Ahead	1	0
6/6/99	18:53	200'	South of	SE DONNELLY LANE	Parked Vehicle / Fixed Object	East	Signal or Stop Sign			2	0
3/19/98	14:27	75'	North of	SE EVANS STREET	Rear-End	South	Going Straight Ahead	South	Stopped For Traffic	0	0
5/20/98	9:24	0'	In Int.	SE EVANS STREET	Rear-End	East	Stopped For Traffic	East	Going Straight Ahead	1	0
4/21/99	14:31	100'	South of	SE EVANS STREET	Rear-End	South	Going Straight Ahead	South	Stopped For Traffic	0	0
1/8/01	14:36	25'	South of	SE EVANS STREET	Rear-End	South	Going Straight Ahead	South	Stopped For Traffic	0	0
9/12/01	14:32	100'	South of	SE EVANS STREET	Rear-End	South	Going Straight Ahead	Vehicle Stopped	Stopped For Traffic	1	0
1/21/00	11:43	500'	South of	SE EVANS STREET	Sideswipe / Lane Change	North	Making Right Turn	Vehicle Stopped	Legally Parked, Unoccupied	0	0
2/9/00	14:31	400'	South of	SE EVANS STREET	Sideswipe / Lane Change	South	Starting From Parked Position	South	Going Straight Ahead	0	0
3/7/00	14:32	200'	South of	SE EVANS STREET	Sideswipe / Lane Change	South	Merging; entering traffic	South	Going Straight Ahead	0	0

2ND AVENUE FROM SUNSET WAY TO FRONT STREET S											
DATE	TIME	DIST	DIR.	LOCATION	ACCIDENT TYPE	DIR FROM (UNIT 1)	ACTION (UNIT 1)	DIR FROM (UNIT 2)	ACTION (UNIT 2)	#INJURED	#KILLED
9/22/00	12:06	0'	In Int.	SE EVANS STREET	Sideswipe / Lane Change	East	Backing	East	Stopped For Traffic	0	0
10/30/01	11:17	400'	South of	SE EVANS STREET	Sideswipe / Lane Change	North	Starting From Parked Position	North	Going Straight Ahead	0	0
10/24/01	7:15	1000'	North of	SE JONES LANE	Backing	SE	Backing	Vehicle Stopped	Stopped For Traffic	0	0
1/27/02	10:15	50'	South of	SUNSET WAY	Parked Vehicle / Fixed Object	West	Making Left Turn	Vehicle Stopped	Legally Parked, Unoccupied	0	0
5/28/99	20:27	50'	South of	SUNSET WAY	Right Angle / Broadside	North	Going Straight Ahead	West	Making Left Turn	1	0

Appendix C

Year 2005
Traffic Forecast Modeling Methodology

2005 IMPACTS OF THE PROPOSED SE BYPASS
HT Associates

January 7, 2003

-DRAFT-

This appendix describes the application of the Issaquah travel model to estimate 2005 travel impacts of the proposed SE Bypass in Issaquah, as part of the City of Issaquah's supplemental environmental impact statement (SEIS) on the project. Much of the material in this appendix relies on and refers to information contained in Appendix D, which describes the impacts of the SE Bypass for the Year 2030. The reader is referred to Appendix D for a more general background on the Issaquah travel model and the SE Bypass SEIS.

2005 Travel Demand

2005 Land Use

2005 household and employment estimates for the Issaquah travel model were available from the *SR900 Definition Study*, completed by Parsons Brinckerhoff in 2000. However, subsequent to that study, the Issaquah model had been updated with new estimates of existing land use. The 2005 estimates from the SR900 Definition Study were therefore compared with the new existing land use estimates, in each location and for each category of activity, to be certain that 2005 values were at least as high as existing values. Also, in subarea analysis zone (SAZ) 116, the estimate of one particular category of commercial activity (wholesale, transportation, communication, utilities, and manufacturing floor area) was reduced to be more consistent with existing and pipeline estimates. The final 2005 estimates are shown below in Table 1 along with the most recent estimates of 1999 land use and the 2030 projections used in Phase I of the SE Bypass SEIS.

Table 1: Comparison of Land Use Scenarios for the Issaquah Model

Land Use Scenario	Total HH	Retail	Office	WTCUM
Existing conditions (as of 1999)	16,793	1,826	1,857	1,806
2005 for SE Bypass	23,641	2,692	4,527	2,051
2030 for SE Bypass	29,690	3,196	9,129	2,299

Note: WTCUM = wholesale, transportation, communication, utilities, and manufacturing.

The 2005 land use estimates shown in Table 1 included the proposed Park Pointe development, consisting of 594 SFDUs (single-family dwelling units) and 163,000 square feet of office space. For 2005, Issaquah Highlands was assumed to be partially built out with 713 SFDUs, 960 MFDUs (multi-family dwelling units), 112,000 square feet of retail, 913,000 square feet of office, and 500 Park and Ride lot spaces.

2005 External Stations

The earlier *SR900 Definition Study* included estimates of 2005 traffic volumes at external stations, which are those points where streets enter and exit the travel model study area. However, once again, a subsequent update of the travel model made it possible to use more recent traffic counts at the external stations as the basis of a new set of 2005 external station estimates. The basic method was to compare 1995 and 2020 model volumes from King County's travel model, and add 80% of the difference to observed 2000 external station counts as an estimate of 2020 external station volumes. 2005 external station volumes were then estimated from 2000 counts and 2020 projections by interpolation. The results differed from the *SR900 Definition Study* at specific locations, but the total volumes into and out of the study area were almost unchanged.

2005 NETWORK ASSUMPTIONS

The committed transportation improvement program (TIP) improvements assumed for 2005 were identical to those assumed for 2030. The street system improvements assumed to be present in the 2005 network are shown in Table 2.

2005 TRIP GENERATION

The PM peak hour origin-destination vehicle trip generation rates developed for the model's calibration, and used for the Year 2030 analysis of the SE Bypass, were also used for the Year 2005. Because the model uses vehicle trip generation rates directly, carpools and non-carpools are merged in the final trip table. Also, there was no explicit estimate of the share of person trips using transit; the transit mode share is implicit in the model's vehicle trip generation rates. The assumption of constant rates, however, is equivalent to assuming that 2005 vehicle occupancies and transit shares will be equal to current levels.

For the SEIS, the 2005 PM peak hour trip tables normally generated by the Issaquah model were transposed and loaded on the network in order to obtain approximations of system traffic demand in the 2005 AM peak hour.

2005 PROJECT SCENARIOS

Build and No Action Scenarios

The scenarios consisted of a Build and No Action, the former being defined as the TIP network plus the SE Bypass; the latter defined as the TIP network without the SE Bypass. As for 2030, the Build scenario included the proposed Park Pointe development with direct access to the Bypass; the No Action scenario included a less-intensive residential development at the Park Pointe site, consistent with existing zoning, and having access to Front via the present Sixth Avenue.

Findings

For the 2005 Build and No Action scenarios, the findings (for the PM peak hour) are summarized below in **Table 3**.

Table 3: Summary of 2005 Action and No Action PM Peak Hour Volumes

	P.M. Peak Hour Vehicle Trips----------			
	No Action Alternative		Action Alternative	
Location:	*southbound*	*northbound*	*southbound*	*northbound*
Bypass s/o I-90	-	-	1,792	861
Bypass n/o Issaquah-Hobart Road	-	-	1,198	438
Front Street s/o Newport	1,183	441	532	250
Front Street n/o Sunset	822	505	468	421
Front Street n/o Gilman	1,303	1,707	954	1,707
2nd Avenue s/o Evans	662	225	23	12

By this comparison, it can be seen that the Bypass would absorb much of the 2005 PM peak traffic forecast to use Front Street, and almost all of the traffic forecast to use Second Avenue. Two-way PM peak volumes on the Bypass itself would range from 2,693 just south of the Sunset interchange to 1,636 just north of Issaquah-Hobart Road. The findings in the morning peak are similar, but reversed in the direction of major flow.

Appendix D

Year 2030
Traffic Forecast Modeling Methodology

2030 ANALYSIS OF THE PROPOSED SE BYPASS USING THE ISSAQUAH TRAVEL MODEL
HT Associates

January 28, 2002

-DRAFT-

This report describes the application of the Issaquah and King County travel models to estimate travel impacts of the proposed SE Bypass in Issaquah, as part of the City of Issaquah's supplemental environmental impact statement (SEIS) on the project.

BACKGROUND

The proposed SE Bypass would extend from Issaquah-Hobart road at approximately __ and run northward to join the proposed south Sammamish Plateau Access Road (south SPAR) at I-90. Traffic on the Bypass would be able to access I-90 westbound and eastbound at the Sunset interchange.

One of the objectives of the SEIS was to update the travel demand estimates of the original EIS by using the most recent Issaquah travel model available, together with the best current estimates of study area land use for the Year 2030. The Issaquah model was to be used to estimate detailed impacts on streets in the project vicinity.

Another objective was to respond to comments on the original EIS about a proposal to widen SR 18 between Issaquah-Hobart Road and I-90, specifically, whether this widening could serve essentially the same function as the proposed Bypass. Since SR 18 lies outside the study area contained in the Issaquah travel model, this question was analyzed using King County's current long-range travel model.

ISSAQUAH TRAVEL MODEL

The Issaquah travel model has not changed in its basic concept since it was delivered to the City in its original 1997 version, as developed by the Tmodel Corporation. The model represents a "windowed" approach as opposed to a regional approach. Estimates of traffic at external stations (points where major roads enter and exit the study area) must be obtained from a regional model such as King County's. The model has been refined through various traffic studies such as the East Village EIS, the SR900 Definition Study, the Freegard Transportation Study, and the Park Pointe. Through annexation and incorporation, much of the model's land area that in 1997 lay within King County is now in either Sammamish or Issaquah. The current version of the model was calibrated with land use as of the end of 1999 and traffic counts taken in early 2000.

The original 1997 version of the model is documented in a technical report entitled "Issaquah Transportation Planning Model Report," Tmodel Corporation, April 1998. The

most recent update is described in "Update of the Issaquah Travel Model to 1999 Conditions," May 22, 2001.

2030 DEMAND

2030 Land Use

The most recent update of the Issaquah travel model had resulted in two land use scenarios being prepared: 1999 and "concurrency." In the Issaquah model, the concurrency scenario consists of existing land use, plus any development proposals that are either considered to be vested, or have been certified as concurrent, by one of the three jurisdictions in the Issaquah model window (Issaquah, King County, and Sammamish).

By definition, the concurrency scenario is not associated with any specific future year, because specific years of completion are not defined for the various proposed developments considered vested or concurrent. However, the concurrency scenario is similar to the idea of "pipeline" growth—growth that is foreseeable because it has actually been proposed by landowners or developers. It was assumed that the development proposals contained in the concurrency scenario would be completed before the Year 2030.

With this in mind, it was initially assumed that 2030 land use could be estimated for the Issaquah model by first creating a pipeline scenario and then adding sufficient growth to reach the 2030 land use projections of the Puget Sound Regional Council (PSRC). These projections are provided at the level of the PSRC's own traffic analysis zones (TAZs), which are considerably larger than the subarea analysis zones (SAZs) of the Issaquah model.

The pipeline scenario was created by taking concurrent development as a starting point, and adding the proposed Park Pointe development, consisting of 594 single-family households and 163 thousand square feet (ksf) of office. Park Pointe is of particular significance to the SEIS, because as proposed, it would have direct access to the Bypass.

The first problem in adjusting the pipeline scenario to match the PSRC's 2030 projections was that the commercial land use variables of the PSRC forecasts are quite different from those used in the Issaquah model. Basically, the PSRC uses employees, and the Issaquah model uses floor area. This problem was resolved by developing conversion factors between the two sets of variables for a common year, 1999, for which both were available. By using these conversion factors, the PSRC land use forecasts were translated into floor areas as used in the Issaquah model.

Once this had been done, however, the second problem emerged, which was that the PSRC's forecast 2030 land use appeared to be generally lower than that of the pipeline scenario. After discussions with PSRC and Issaquah staff, it appeared that the problem was most evident in the Issaquah Highlands area, where vested development is much higher than the PSRC forecasts. The disparity was not uniform for all types of land use and all TAZs in the PSRC forecast; in some locations, and particularly for residential development, the PSRC's 2030 values were higher than pipeline. But accepting the PSRC's total 2030 forecasts for the model window would have implied a level of growth

below pipeline levels, that is, below the level of proposals already deemed vested, concurrent, or likely.

A first solution to this problem was to compare the PSRC and pipeline forecasts for each land use category and TAZ, and in each case simply accept the higher of the two values. Since the PSRC forecasts were in some instances higher than pipeline, this necessarily produced a "hybrid" scenario higher than either PSRC or pipeline. But once this had been accomplished, the results showed residential growth at locations in the City of Issaquah where traffic would almost certainly generate level of service failures under the City's concurrency policies. Such growth could not, in fact, be approved under the City's concurrency standards without street system improvements that are not now considered to be committed as defined in the state GMA (Growth Management Act). Within the City, therefore, residential growth under the hybrid scenario was slightly reduced to a level just above pipeline estimates. The final 2030 land use estimates for the study area contained by the Issaquah model are shown below along with 1999, concurrency, and PSRC-based estimates.

Table 1: Comparison of Land Use Scenarios for the Issaquah Model

		Floor area in thousands of sq ft:		
Land Use Scenario	Total HH	Retail	Office	WTCUM
Existing conditions (as of 1999)	16,793	1,826	1,857	1,806
Concurrency (as of 1999)	25,823	3,070	8,485	1,464
2030 PSRC	23,392	2,072	2,591	2,264
2030 Hybrid	30,593	3,196	8,973	2,299
2030 Hybrid with HH reduction	29,690	3,196	9,129	2,299

Note: WTCUM = wholesale, transportation, communication, utilities, and manufacturing.

In the 2030 scenario, Issaquah Highlands was included as a vested project consisting of 1,468 single-family units, 2,397 multi-family units, 477 ksf retail, 3,386 ksf office, and 1000 park and ride spaces.

2030 External Stations

Because the Issaquah model uses a windowed structure, it is dependent on other sources, such as regional models, to supply estimates of traffic entering and exiting the study area on those streets that cross the window's edges. In previous forecasts, King County's concurrency model was used for this purpose. Generally speaking, this regional model was similar to Issaquah's in that it represented the County's own concurrency scenario and six-year TIP network. The concurrency scenario of the Issaquah model employs external station forecasts from a King County concurrency model run that included the SE Bypass, north and south SPAR, and no widening of SR 18 between I-90 and Issaquah-Hobart Road.

King County has produced 2020 traffic forecasts using a new travel model, but has not produced any forecasts for 2030. It was therefore necessary to estimate 2030 external station traffic for the Issaquah model using a different method. The assumption was made that traffic at the model's external stations would increase at the same rate of growth as internal trip generation between the concurrency and 2030 land use scenarios.

2030 NETWORK ASSUMPTIONS

For the SE Bypass SEIS, as for other forecasts prepared using the Issaquah model, the future network consisted of the existing street system plus any network improvements considered to be committed. The City of Issaquah has identified certain projects in its six-year Transportation Improvement Program (TIP) to be considered committed for planning purposes. The six-year TIPs of other jurisdictions in the model window, including King County, Sammamish, and the WSDOT, were consulted to complete the list of improvements assumed to be committed, shown below in Table 2.

Table 2: Assumed 2001-2006 Street Improvements

Improvement	Location	Type	Comment
Issaquah:			
B1: SE Bypass Project	Front St to I-90 Sunset I/C	New	4-lane section
B2: Newport Way Project	*10 Ave NW to W Sunset*	*Widen*	*Center turn lane*
B3: NW Juniper St	Newport Way to Rainier Blvd	Widen	Center turn lane
B4: I-90 Sunset I/C Revision	I-90 Sunset Interchange	New	See KC 201496
B4A: S. SPAR	Iss. Highlands to I-90	New	6-lane section
B5: NW Dogwood	*NW Newport to Rainier*	Rehab	*Not a major capacity. improve.*
B-6: I-90 Front St I/C Improve.	*I-90 Front St Interchange*	*Widen*	*Ramp EB and Front St NB*
B-7: SR900 Corridor	I-90 WB ramp to E. Village	Widen	Auto/bus improve. (w/WSDOT)
B8: Maple St Extension	SR 900 to Newport Way	New	5-lane bridge
Elk Road (by developer)	Black Nugget Rd to SE 62	New	3-lane section
King County:			
N. SPAR (101289)	Iss. Highlands - Iss. Fall City Rd	New	4 lane section
Bl. Nugget intersection (101289)	N. SPAR @ Black Nugget Rd	New	New signalized intersection
Sunset I/C Revision (201496)	I-90 Sunset Interchange	New	Revise to full I/C
Iss.-Fall City II (200195)	Iss.-Fall City / Iss.-Pine Lk	Spot	Channelization
Iss. Fall City III (201597)	*SE 48 St to Klahanie*	*Widen*	*5-lane section after 2004*
Iss.-Pine Lk I (200291)	Iss.-Fall City Rd to 238 Way SE	Widen	Center turn lane
Iss.-Pine Lk II (200494)	Iss.-Pine Lk / SE 32 Way	*Spot*	*Safety improvement*
E Lk Samm Pkwy (201197)	Iss.-Fall City to I-90	Widen	HOV SB, RT-turn lane NB
228th SE I (200295)	Iss.-Pine Lk to Inglewood Hill	Widen	New limits; 4-lane section

SE 8 St (201397)	*228 Ave SE to 244 Ave SE*	*Widen*	*Center turn lane (Samm. City)*
City of Sammamish:			
228th Ave SE Ph IB	SE 24th – SE 8th	Widen	Four-lane section
244th Ave SE Ph II	SE 24th – SE 8th	New	Two-lane section
Issaquah-Pine Lake Rd Ext	228th Ave – 212th Ave	New	Two-lane section

Note: italicized projects excluded from model network.

Sources: Issaquah, Six-Year Transportation Improvement Program, *2001-2006, and City staff; King County, online* Capital Improvement Program; *and City of Sammamish.*

2030 TRIP GENERATION

The PM peak hour origin-destination vehicle trip generation rates developed for the model's calibration were also used for the Year 2030. Because the model uses vehicle trip generation rates directly, carpools and non-carpools are merged in the final trip table. Also, there is no explicit estimate of the share of person trips using transit; the transit mode share is implicit in the model's vehicle trip generation rates. The assumption of constant rates, however, is equivalent to assuming that 2030 vehicle occupancies and transit shares will be equivalent to current levels.

For the SEIS, the PM peak hour trip tables normally generated by the Issaquah model were transposed and loaded on the network to obtain approximations of system traffic demand in the AM peak hour. In the calibration year, comparisons of the resulting AM traffic flows to a limited number of AM counts on I-90 indicated a good match, so no further changes were made in this procedure.

2030 PROJECT ALTERNATIVES

Action and No Action Alternatives

Once the travel model's 2030 land use and network had been determined, testing the project alternatives was straightforward. The alternatives consisted of Action and No Action. For the Action alternative, the SE Bypass was assumed to be present as a six-lane cross-section between I-90 and Sunset, and as a four-lane facility between Sunset and Front Street. The Bypass would curve westward to form a new four-way signalized intersection with Second Avenue, just north of where Second currently intersects Front. The segment between the old Front/Second and new Front/Bypass intersections would be vacated. As previously mentioned, under the Action alternative it was also assumed that there would be access from the Bypass to the proposed Park Pointe development at a location roughly in line with Evans Street.

For No Action, the Bypass was deleted between Sunset Way and Front Street, with the intersection of Front and Second Avenue left in its current configuration. It was assumed that Park Pointe as currently proposed would not occur without the Bypass, but would be replaced with a less-intensive residential development under current zoning, consisting of 431 single-family households. It was further assumed that this smaller development would have an access road connecting to Front Street roughly where Sixth Avenue currently intersects Front. No other changes were made between the Action and No Action networks.

Findings

For the 2030 Action and No Action alternatives, the findings (for the PM peak hour) are summarized below in Table 3.

Table 3: Summary of Action and No Action PM Peak Hour Volumes

	P.M. Peak Hour Vehicle Trips----------			
	No Action Alternative		Action Alternative	
Location:	*southbound*	*northbound*	*southbound*	*northbound*
Bypass s/o I-90	-	-	2,520	996
Bypass n/o Issaquah-Hobart Road	-	-	1,830	592
Front Street s/o Newport	1,695	531	679	323
Front Street n/o Sunset	924	570	512	528
Front Street n/o Gilman	1,509	2,168	1,060	2,081
2nd Avenue s/o Evans	893	266	25	13

By this comparison, it can be seen that the Bypass would absorb much of the 2030 PM peak traffic forecast to use Front Street, and almost all of the traffic forecast to use Second Avenue. Two-way PM peak volumes on the Bypass itself would range from 3,516 just south of the Sunset interchange to 2,422 just north of Issaquah-Hobart Road. The findings in the morning peak are similar, but reversed in the direction of major flow.

Effects of Widening SR 18

As previously stated, one of the questions to be addressed in the SEIS was the impact of a proposed widening of SR 18 from a two-lane section to a four-lane section between Issaquah-Hobart Road and I-90. This question was addressed using King County's current 2020 travel model for the PM peak period. Because the demand year of this model is 2020 rather than 2030, and because of other methodological differences between the King County and Issaquah models, this analysis was limited to an assessment of the percentage impact to Front Street traffic of either building the Bypass or widening SR 18. The results are summarized below in Table 4.

Table 4: 2020 Impacts of the SR 18 Widening and Bypass on No Action PM Peak Traffic at Selected Locations

Location:	**Effect of: widening SR18 only**	**Effect of: Bypass only**
Issaquah-Hobart s/o May Valley	-19%	8%
Issaquah-Hobart s/o 6th	-13%	17%
Front s/o Newport	-8%	-47%
Front n/o Sunset	-10%	-51%
Front n/o Gilman	-7%	-18%
S. SPAR n/o I-90	0%	2%
I-90 e/o Sunset interchange	14%	-2%

Source: King County 2020 Travel Model

A number of conclusions may be drawn from this table. First, widening SR 18 would produce a reduction in demand at Issaquah-Hobart Road south of the City, whereas the Bypass, by relieving congestion on Front and providing new capacity, would slightly increase the popularity of Issaquah-Hobart at the same point. The same effects are seen on Issaquah-Hobart south of Sixth Avenue. On Front Street from just south of Newport to I-90, however, the greater benefit seems to be produced by the Bypass. Along this segment, the SR 18 widening would produce traffic reductions between 7% and 10%, whereas the Bypass would reduce traffic by between 18 and 51 %. The impacts of both proposals on the south SPAR are essentially equivalent, but the SR 18 widening actually increases use of I-90 east of the Sunset interchange.

These conclusions are reasonably consistent with the 2030 analysis based on the Issaquah travel model, while incorporating shifts in use of the regional network that lies outside the Issaquah model study area.

Appendix G

Noise Technical Report

Southeast Issaquah Bypass

Draft Supplemental EIS

Technical Report
Southeast Issaquah Bypass

Noise

DECEMBER 2003

ORIGINAL PUBLICATION: SHAPIRO AND ASSOCIATES, 1998
UPDATED: PARSONS BRINCKERHOFF, 2000

PREPARED FOR:
CITY OF ISSAQUAH

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Executive Summary

The analysis of noise impacts in the Southeast Issaquah Bypass project area is based on a comparison of predicted build alternative noise levels to existing and predicted future No Action Alternative noise levels and appropriate regulatory requirements, primarily the U.S. Federal Highway Administration (FHWA) Noise Prediction Model and Noise Abatement Council (NAC) noise ordinance. Construction noise impacts are described based on maximum noise levels of construction equipment published by the U.S. Environmental Protection Agency (EPA). Traffic noise levels are predicted at sensitive receptors based on worst-case traffic conditions using the in the form of the TNM 2.0 computer model. Mitigation measures are discussed, where appropriate, to avoid or reduce potential noise impacts.

Environmental noise is composed of many frequencies, each occurring simultaneously at its own sound pressure level. 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). The commonly used frequency weighting for environmental noise is A-weighting (dBA), which simulates how an average person hears sound.

A noise descriptor for environmental noise is the equivalent A-weighted sound level (L_{eq}). L_{eq} is defined as the steady sound pressure level that, over a given period of time, has the same total energy as the actual fluctuating noise. 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 analysis.

The project area is located within both the City of Issaquah and King County. Traffic noise is exempted from King County and City of Issaquah noise limits. For this study, noise impacts are evaluated by comparing the build alternatives to the existing audible environment. FHWA noise abatement criteria, which apply to federally funded projects, have been used to evaluate noise impacts associated with the Southeast Issaquah Bypass project. Under these criteria, traffic noise impacts occur when predicted $L_{eq}(h)$ noise levels approach or exceed noise abatement criteria, as established by the FHWA, or substantially exceed existing noise levels. The Washington State Department of Transportation (WSDOT) defines a substantial increase for state and federal projects to occur when future traffic noise levels are predicted to increase by 10 dBA or more. Washington State Department of Ecology (Ecology) regulations limit noise levels at property lines of neighboring properties (WAC Chapter 173-60). Although sounds from motor vehicles on public roads are exempt, construction noise from the project must meet Ecology property line regulations at certain times. King County (King County Code, Chapters 12.86 - 12.99) noise standards are similar to the Ecology regulation.

Ambient noise levels were measured to describe the existing noise environment and to identify major noise sources in the project area. Seventeen receptors were modeled as representative of similar receptors in the area. The receptors include both worst-case (closest to the Southeast Issaquah Bypass and new construction) and other local noise-sensitive receptors that could be affected by project noise. The accuracy of the model was confirmed by predicting existing noise levels and comparing them to actual noise measurements at seven measured receptors.

The Existing Conditions and No Action models included Front Street S., Second Avenue

S.E., East Sunset Way, and I-90. Models for the build alternatives added the Southeast Issaquah Bypass with Sunset Interchange modifications, and, for Cumulative Impact, the South SPAR and North SPAR.

Table 1 summarizes environmental impacts and mitigation measures for each build alternative. For design year 2030, with or without the proposed project, noise levels in the Southeast Issaquah Bypass project area were predicted to generally increase. Predicted noise levels could become an estimated 5 dBA lower (because of the projected lower traffic volumes on residential streets) to 6 dBA higher than existing conditions. Under the build alternatives, 2030 operational noise levels were predicted to range between 50 dBA and 68 dBA, ranging from 5 dBA lower to 17 dBA higher than existing conditions.

Noise impacts from long-term operation of the project could be reduced by implementing traffic-control measures, acquiring land as buffer zones, realigning the roadway, and constructing noise barriers. A variety of mitigation measures can be effective at reducing traffic noise impacts. For example, barriers and other roadway mitigation were evaluated for their potential to reduce noise impacts from the project. Under all build alternatives, mitigation by installing noise barriers along the North B, North C, South A, and South C alignments was found not to be feasible and because of the uneven terrain and the need to accommodate access to residences and local streets.

For Alternatives 1 and 2, a noise wall 200 meters (656 feet) long, 2 meters (6 feet) high, and 15 meters (50 feet) west of the North A option was found to be feasible and reasonable, in accordance with WSDOT cost-benefit criteria, in reducing noise from the proposed roadway. This barrier would extend from 147 meters (482 feet) north to 53 meters (174 feet) south of S.E. Evans Street, and would cross S.E. Evans Street on the bypass structure. Design year 2030 noise levels at the east end of S.E. Evans Lane, with the barrier in place, were predicted to be 57 dBA, an increase of 8 dBA above existing conditions. This would be a reduction of 8 dBA compared to Alternatives 1 and 2 without the barrier.

For Alternatives 1 and 2, a noise wall 387 meters (1,270 feet) long, 3 meters (10 feet) high, and 15 meters (50 feet) west of the North A option centerline was found to be feasible and reasonable, in accordance with WSDOT cost-benefit criteria, in reducing noise from the proposed roadway. Design year 2030 noise levels on the west side of Issaquah High School, with the barrier in place, were predicted to be 56 dBA, an increase of 6 dBA above existing conditions. This would be a reduction of 8 dBA compared to Alternatives 1 and 2 without the barrier.

Final determination of the placement of noise barriers will take place following a comprehensive engineering evaluation and the public comment phase of the project.

Under all build alternatives, construction noise would be generated. Maximum noise levels from construction equipment would range from 69 dBA to 106 dBA at 15 meters (50 feet). The size of the construction areas and duration of construction would be similar for all build alternatives. Construction noise would be short-term. Construction noise could be reduced by using enclosures or walls to surround noisy equipment, installing mufflers on engines, substituting quieter equipment or construction methods, minimizing time of operation, and locating equipment farther from sensitive receptors.

Table 1. Summary of Noise Impacts and Mitigation

Alternative	Construction Impacts	Operation Impacts	Mitigation Measures
Existing Conditions	None	None	None
Alternative 1: North A and South A	Nearby receptors would experience temporary noise impacts during project construction.	SE Evans Lane area would experience up to a 16-dBA increase, Issaquah High school a 15-dBA increase, SE Kramer area a 14-dBA increase and Lewis Lane SE area a 17-dBA increase.	SE Evans Lane area: 200-meter long, 2-meter tall noise wall is feasible and reasonable. Issaquah High School: 387-meter long, 3-meter tall noise wall is feasible and reasonable. Other areas: Noise walls are not feasible or reasonable.
Alternative 2: North A and South C	Nearby receptors would experience temporary noise impacts during project construction.	SE Evans Lane area would experience up to a 16-dBA increase, Issaquah High school a 15-dBA increase, and South of South C alignment a 13-dBA increase.	SE Evans Lane area: 200-meter long, 2-meter tall noise wall is feasible and reasonable. Issaquah High School: 387-meter long, 3-meter tall noise wall is feasible and reasonable. Other areas: Noise walls are not feasible and/or reasonable.
Alternative 3: North B and South A	Nearby receptors would experience temporary noise impacts during project construction.	SE Kramer area would experience up to a 14-dBA increase and Lewis Lane SE area a 17-dBA increase.	Noise walls are not feasible and/or reasonable.
Alternative 4: North B and South C	Nearby receptors would experience temporary noise impacts during project construction.	South of South C alignment would experience up to a 13-dBA increase.	Noise walls are not feasible and/or reasonable.
Alternative 5: North C and South A	Nearby receptors would experience temporary noise impacts during project construction.	The athletic field would experience up to a 15-dBA increase, the SE Kramer area up to a 14-dBA increase, and the Lewis Lane SE area up to a 17-dBA increase.	Noise walls are not feasible and/or reasonable.
Alternative 6: North C and South C	Nearby receptors would experience temporary noise impacts during project construction.	South of South C alignment would experience up to a 13-dBA increase.	Noise walls are not feasible and/or reasonable.
Alternative 7: No Action	No project-related construction would occur.	Up to a 5-dBA increase in project area traffic noise levels.	None

Introduction

This technical report analyzes existing noise conditions and potential impacts associated with implementation of proposed alternatives for the Southeast Issaquah Bypass project. Results of the analysis in this technical report will be incorporated into a project-specific Environmental Impact Statement (EIS) that meets the requirements of the National Environmental Policy Act (NEPA) (U.S.C. 4332(2)(c)) and the Washington State Environmental Policy Act (SEPA) (RCW 43.21C).

Background

The City of Issaquah is preparing an EIS for a new bypass arterial connecting the I-90 Sunset Interchange to the Issaquah-Hobart Road in southeastern Issaquah, Washington (Figure 1). The northern portion of the project is located in the City of Issaquah, and the southern portion of the project is located in unincorporated King County. The proposed bypass would be an approximately 2 kilometers (1.25 miles) long four-lane road (two-lanes in each direction) with through-lanes and turn-lane channelization. The new arterial would be located along one of four alternative alignments defined in the *Southeast Issaquah Bypass Road Alternatives Alignment Study* (PBQD, 1997)

The EIS will also take into consideration two separate but related projects which are in the preliminary design and environmental planning stage: (1) the proposed South Sammamish Plateau Access Road (South SPAR)/ I-90 Sunset Interchange Modification project and (2) the proposed North Sammamish Plateau Access Road (North SPAR).

The South SPAR/ I-90 Sunset Interchange project would involve construction of a new north-south arterial that would connect the I-90 East Sunset Way interchange with a new east-west arterial within the Issaquah Highlands development. The project would also modify the existing interchange to provide both west bound and eastbound on-ramps and off-ramps. The project is currently being addressed in a separate NEPA EIS.

The North SPAR project would provide access from the proposed South SPAR to the existing intersection of Issaquah-Pine Lake Road Southeast and Issaquah-Fall City Road SE.

Description of Alternatives

This report evaluates six build alternatives and a no action alternative. As shown in Figure 2, the proposed Southeast Issaquah Bypass alignment alternatives include three alignment options in the northern part of the project area (labeled North A, North B and North C), and two alignment options in the southern part of the project area (labeled South A and South C). The posted speed limit would be 35 miles per hour for each of the alternative alignments.

Each of the northern and southern segments meet at a common point in the middle of the project area. The three north alignments extend southward from the I-90 Sunset Way interchange to Issaquah High School. The North A alignment is routed between the

Issaquah High School building and its adjacent athletic field along the old railroad grade. The North B alignment is routed east of the North A alignment between the school athletic field and the Issaquah Sportsman's Club. The North C alignment is routed east of both the school athletic field and the Issaquah Sportsmen's Club. The South A alignment extends southward from Issaquah High School to Issaquah-Hobart Road and is routed adjacent to the existing 6th Avenue SE west of the LDS church. The South C alignment extends south and bends west to Front Street and is routed south of Issaquah High School.

The six proposed build alternatives are based on various combinations of the north and south optional alignments, as follows:

Alternative 1: North A and South A alignments

Alternative 2: North A and South C alignments

Alternative 3: North B and South A alignments

Alternative 4: North B and South C alignments

Alternative 5: North C and South A alignments

Alternative 6: North C and South C alignments

Figure 1. Vicinity Map

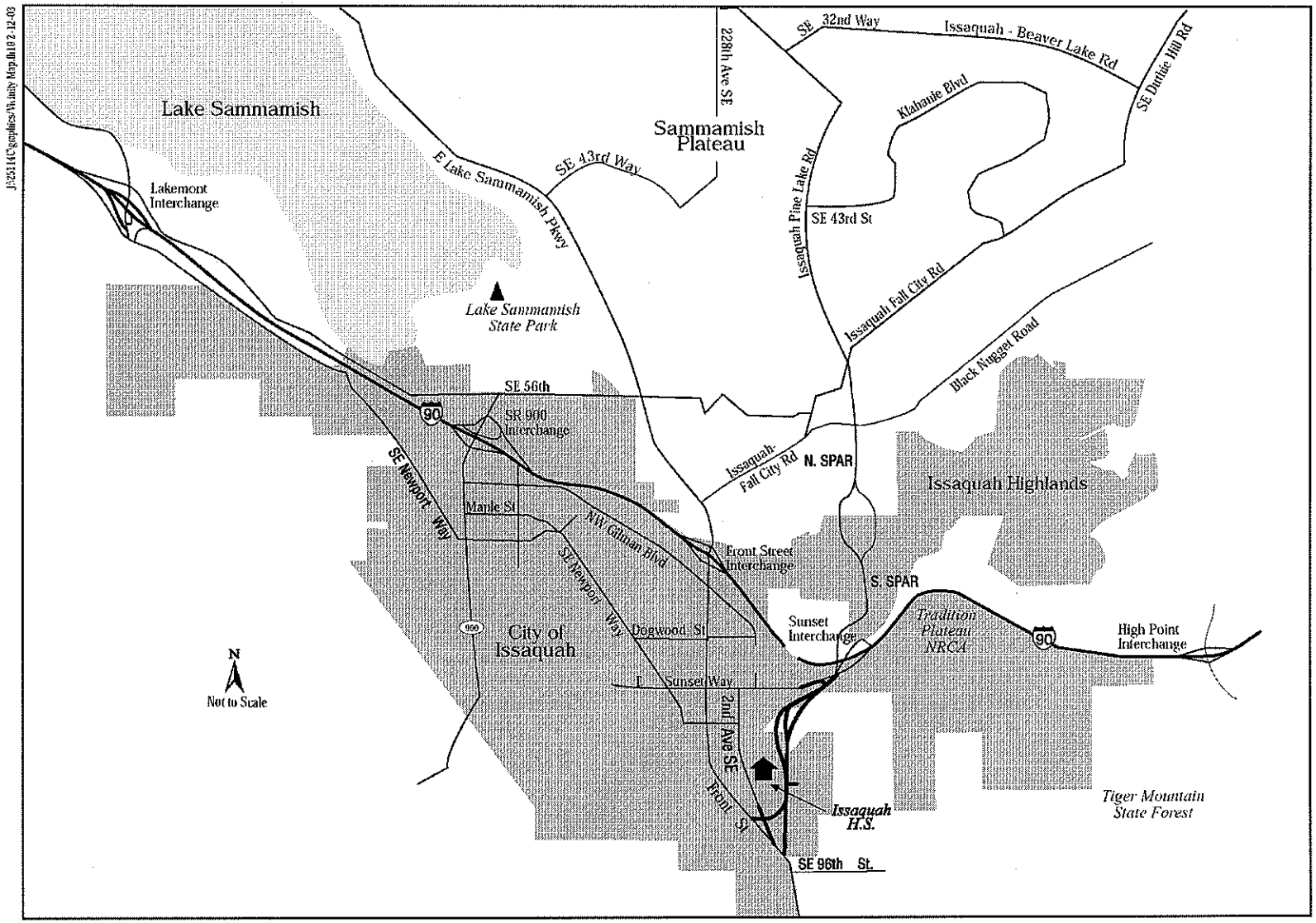
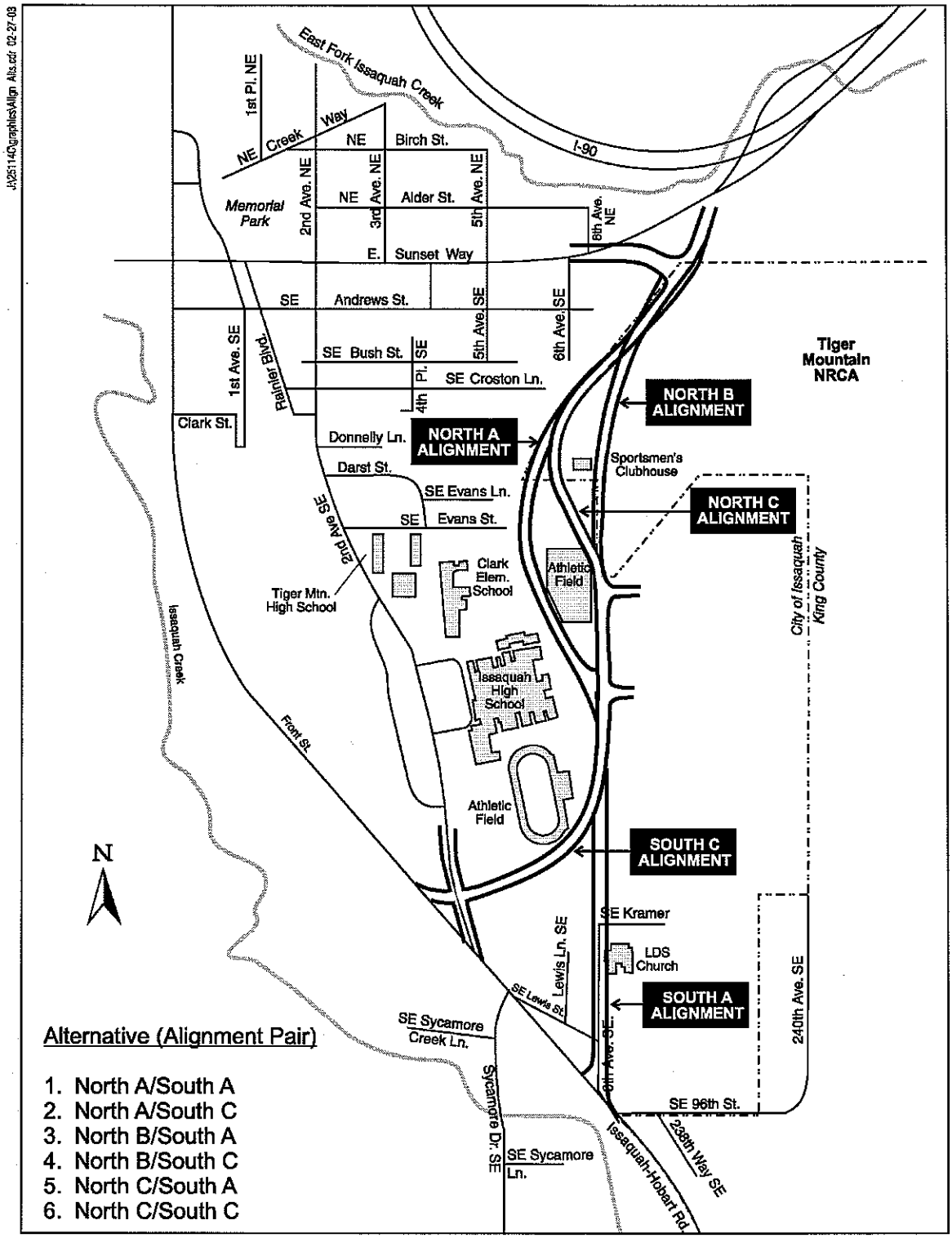


Figure 3. Alignment Alternatives



Studies and Coordination

This chapter describes the characteristics of noise, noise level descriptors, effects of noise, noise regulations, and noise impact criteria.

Characteristics of Noise

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). Loudness, compared to physical sound measurement, refers to how people subjectively judge a sound, and this varies from person to person. Magnitudes of typical noise levels are presented in Table 2.

Humans respond to a sound's frequency or pitch. The human ear is very effective at perceiving sounds with a frequency between approximately 1,000 and 5,000 Hz, and the efficiency decreases outside this range. Environmental noise is composed of many frequencies, each occurring simultaneously at its own sound-pressure level. Frequency weighting, which is applied electronically by a sound-level meter, 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.

Because of the logarithmic decibel scale, a doubling of the number of noise sources (e.g., the number of cars operating on a roadway) increases noise levels by 3 dBA. A ten-fold increase in the number of noise sources will add 10 dBA. As a result, a noise source emitting a noise level of 60 dBA combined with another noise source of 60 dBA yields a combined noise level of 63 dBA (not 120 dBA). The human ear can barely perceive a 3 dBA increase, but a 5 or 6 dBA increase is readily noticeable and sounds as if the noise is about one and one-half times as loud. A 10-dBA increase appears to be a doubling in noise level to most listeners.

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.

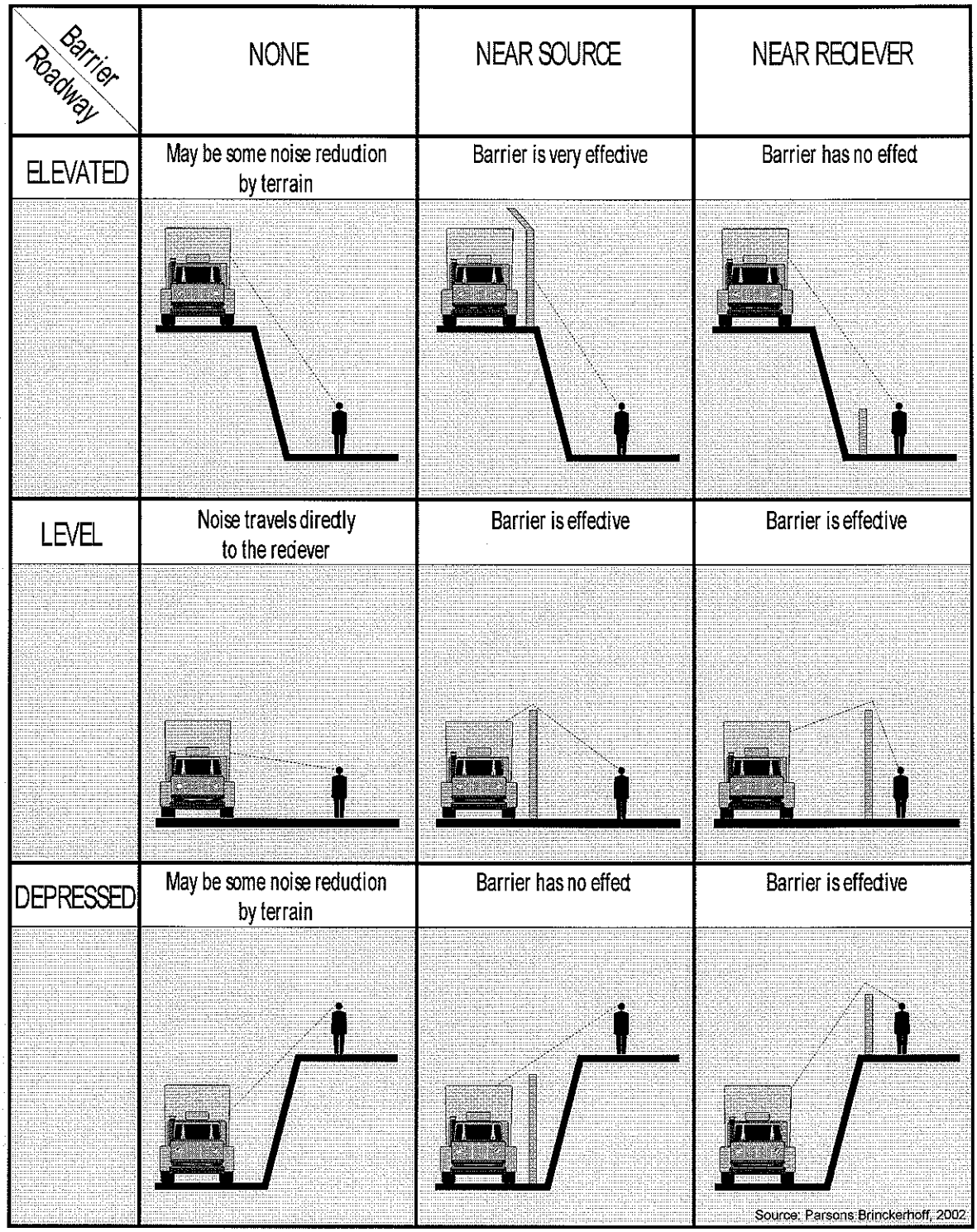
The propagation of noise can be greatly affected by terrain and the elevation of the receiver relative to the noise source (Figure 3). Level ground is the simplest scenario, where noise travels in a straight line-of-sight path between the source and receiver. If the noise source is depressed or the receiver is elevated, noise generally travels directly to the receiver. Noise levels may be reduced when the terrain crests between the source and receiver and results in a partial noise barrier near the receiver. If the noise source is elevated or the receiver is depressed, noise is often reduced at the receiver. The edge of a roadway can also act as a partial noise barrier, blocking some sound transmission between the source and receiver. Even a short barrier (e.g., a solid concrete jersey-type safety barrier) can be effective at reducing noise levels. Breaking the line of sight between the receiver and the highest noise source results in a noise reduction of approximately 5 dBA.

Table 2. 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

Figure 5. Noise Barrier Effectiveness



Noise Level 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 level during a specified period of time. It is a measure of total noise, or a summation of all sounds during a time period. 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.

Short-term noise levels (e.g., from a single truck passing) can be described by either the total noise energy or the highest instantaneous noise level that occurs during the event. The sound exposure level (SEL) is a measure of total sound energy from an event, and is useful in determining what the L_{eq} would be over a period in time when several noise events occur. The maximum sound level (L_{max}) is the greatest short-duration sound level that occurs during a single event. L_{max} is related to impacts on speech interference and sleep disruption. In comparison, L_{min} is the minimum sound level during a period of time.

People will generally find a moderately high, constant sound level more tolerable than a quiet background level interrupted by frequent high-level noise intrusions. An individual's response to sound depends greatly on the range that the sound varies in a given environment. For example, steady traffic noise from a highway is normally less bothersome than occasional aircraft flyovers in a relatively quiet area. In light of this subjective response, it is often useful to look at a statistical distribution of sound levels over a given time period in addition to the average sound level. Such distributions identify the sound level exceeded and the percentage of time exceeded. Therefore, it allows for a more thorough description of the range of sound levels during the given measurement period. These distributions are identified with an L_n where n is the percentage of time that the levels are exceeded. For example, the L_{10} level is the noise level that is exceeded 10 percent of the time.

Effects of Noise

Prolonged exposure to very high levels of environmental noise directly affects human health by causing the disease of hearing loss. The EPA has established a protective level of 70 dBA (24), below which hearing is conserved for exposure over a 40-year period (U.S. EPA, 1974). Although current scientific evidence is not conclusive, noise is suspected of causing or aggravating other diseases. Elevated background noise levels can interfere with speech recognition. Environmental noise indirectly affects human welfare by interfering with sleep, thought, and conversation. The FHWA noise abatement criteria are based on speech interference, which is a well-documented impact that is relatively reproducible in human response studies. Noise can also affect wildlife.

Noise Regulations and Impact Criteria

Applicable noise regulations and guidelines provide a basis for evaluating potential noise impacts. For federally funded highway projects, traffic noise impacts occur when predicted L_{eq}(h) noise levels approach or exceed the FHWA's established noise abatement criteria (NAC) by or substantially exceed existing noise levels (U.S.

Department of Transportation, 1982, Noise Abatement Council). WSDOT has defined an increase of 10 dBA or more to be a substantial increase.

Because traffic is exempt from the King County Standards, the Federal Highway Department (FHWA) noise abatement criteria (NAC) are used to determine impacts from traffic noise. Under the FHWA guidelines, impacts occur when predicted $L_{eq}(h)$ noise levels approach or exceed the NAC or substantially exceed existing noise levels (U.S. Department of Transportation, 1982, Noise Abatement Council). Substantially exceed is defined 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) 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 Table 3. 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. 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.

King County, however, does limit noise levels at property lines of neighboring properties (King County Code 12.88.020). Property line noise regulations are presented in Table 4. The King County noise code is an adoption of the Washington State Department of Ecology standards (WAC Chapter 173-60). The maximum permissible sound levels depend on the land use district of both the source noise and receiving property. The standard does not include noise from traffic, aircraft, and railway operations in public right of way.

Noise levels in Table 4 apply to activities on individual parcels. The maximum permissible sound levels also apply to construction activities occurring between 10 p.m. and 7 a.m. on weekdays and 10 p.m. and 9 a.m. on weekends (King County Code 12.88.020).Performance of construction activities during nighttime hours would require a noise variance from King County. Construction activities carried out between 7 a.m. and 10 p.m. on weekdays and between 9 a.m. and 10 p.m. on weekends are allowed to

exceed the property line standards per the following limits (King County Code 12.88.040). The city of Issaquah limits construction noise to between 7 a.m. and 6 p.m. on weekdays (Issaquah Municipal Code, Chap.16.35). To meet the city requirements, a permit would be required from the city to carry out construction at other times.

Table 4. King County Maximum Permissible Sound Levels (dBA)

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

Notes: [1]The maximum permissible noise levels are reduced by 10 dBA for residential receiving properties between 10 p.m. and 7 a.m.

Source: King County Code 12.88.020.

- Earthmoving or other large construction equipment may exceed the applicable property line limit by 25 dBA,
- Portable powered equipment may exceed the limit by 20 dBA, and
- Impact equipment, such as jackhammers, may not exceed an L_{eq}(h) of 90 dBA.

Short-term exceedances above the permissible sound level are allowed for any noise source. The maximum level may be exceeded by 5 dBA for a total of 15 minutes, by 10 dBA for a total of 5 minutes, or by 15 dBA for a total of 1.5 minutes during any one-hour period. These allowed exceptions are referred to in terms of the percentage of time a certain level is exceeded; an L_{25} is the noise level that is exceeded 15 minutes during an hour. Therefore, the permissible L_{25} would be 5 dBA greater than the values in Table 3 provided that the noise level is below the permissible level in Table 3 for the rest of the hour and never exceeds the permissible level by more than 5 dBA. An hourly L_{eq} of approximately 2 dBA higher than the values in Table 3 is an equivalent sound level to the permissible levels, including the allowed short-term excursions. Using this rule, an L_{eq} (h) of 59 dBA corresponds approximately to a noise level of 57 dBA for 45 minutes and 62 dBA for 15 minutes, which is the maximum permissible noise level created by a source in a commercial zone and received by a property in a residential zone.

Sound levels in school are regulated in the Washington Administrative Code (WAC Chapter 246-366-110). The WAC specifies that background noise at student locations within classrooms shall not exceed 45 dBA L_{eq}. This level is being considered the impact criteria for project noise that would be experienced by students inside of a classroom.

Methodology

Ambient sound levels were measured at several locations near the project area to characterize the weekday noise levels and calibrate the traffic noise model (Figure 4). Measured noise locations were representative of all sensitive use in the study area and consistent with the FHWA "*Manual for Highway Noise and Land Use*". Additional sound level measurements were taken at Issaquah High School to evaluate building acoustics and better describe the daily sound environment at the school.

Existing and future noise levels for each of the alternatives were modeled at each of the monitoring locations to describe the alternative's effects on the audible environment. Typical Receptor distances range between 25 and 200 feet from modeled roadways.

FHWA's Traffic Noise Model (TNM) Version 2.0 computer model (FHWA, 2002) was used to predict $L_{eq}(h)$ traffic noise levels. TNM is the state-of-the-art industry standard model to estimate traffic noise levels at discrete points by considering interactions between different noise sources and the effects of topographical features on the noise level. Noise emissions from free-flowing traffic depend on the number of automobiles, medium trucks, and heavy trucks per hour; vehicular speed; and reference noise emission levels of an individual vehicle. Noise from sources other than traffic are not included in the model; therefore, when non-traffic noise, such as aircraft or school activities, is considerable in an area, TNM will underpredict the actual noise level. Noise monitoring results were used to calibrate the existing conditions noise model.

For noise model calibration, the existing noise model was run with traffic volumes counted during noise measurements. The TNM model was able to model peak-hour noise levels at each of the eight measured sites within 2 dBA of the measured level. Aviation noise makes up a substantial portion of the area's overall noise environment. Firearms noise is also present in the vicinity of the Sportsman's Club. The modeled existing traffic noise levels at the Issaquah High School and the Athletic Field do not include noise created by the daily activities. Therefore measured noise levels were used to describe the existing audible environment in these locations..

Predicted noise levels were based on PM peak-hour traffic conditions to estimate worst-case noise levels. Existing traffic volumes for 2000 and expected future traffic volumes for 2030 were taken from the SE Bypass Project Draft Transportation Discipline Report (March, 2002) (Table 5). For noise modeling purposes the PM Peak hours of the 24-hour reading were used to model that location. Truck percentages of one percent medium trucks, four percent heavy trucks, with the remaining 95% percent automobiles were estimated for I-90. For arterial roads, including the proposed bypass, truck percentages of three percent medium trucks, one percent heavy trucks, with the remaining 96% percent automobiles. For local access streets truck percentages of one percent medium trucks, one percent heavy trucks, with the remaining 98% percent automobiles.

Table 5. Modeled Traffic Volumes

		2000 Existing Conditions			2030 Build Alternatives			2030 No Action Alternative		
Location	Speed (km/h)	Cars	Med. Trucks	Heavy Trucks	Cars	Med. Trucks	Heavy Trucks	Cars	Med. Trucks	Heavy Trucks
I-90 WB	96	983	10	41	1556	16	66	1568	17	66
I-90 EB	96	2864	30	121	3809	40	160	3816	40	161
I-90 WB Off-Ramp	72	168	5	2	248	8	3	235	7	2
I-90 EB On-Ramp	72	144	5	2	483	15	5	466	15	5
I-90 EB Off-Ramp to Sunset Way	72	0	0	0	1110	35	12	252	8	3
I-90 EB Off-Ramp to Sammamish Plateau Access Road	72	0	0	0	1245	39	13	1267	40	13
Bypass SB	72	0	0	0	2015	63	21	0	0	0
Bypass NB	72	0	0	0	818	26	9	0	0	0
Issaquah-Hobart Road NB	56	441	14	5	715	22	7	641	20	7
Issaquah-Hobart Road SB	56	1041	33	11	2108	66	22	2187	68	23
East Sunset Way WB	48	216	2	2	488	5	5	1356	14	14
East Sunset Way EB	48	147	2	2	217	2	2	522	5	5
2nd Avenue NB	56	67	1	1	20	0	0	252	3	3
2nd Avenue SB	56	108	1	1	21	0	0	857	9	9
Front Street NB	56	426	4	4	352	4	4	425	4	4
Front Street SB	56	1063	11	11	559	6	6	1431	15	15
6th Avenue NB	48	13	0	0	13	0	0	13	0	0
6th Avenue SB	48	7	0	0	7	0	0	7	0	0

Traffic volumes taken from SE Bypass Project Draft Transportation Discipline Report (March, 2002)

Affected Environment

Description of Study Area

Noise-sensitive receptors in the project area include residential, recreational, and commercial usage. Schools, churches, and parks are in close proximity to the project.

The area south of I-90 and west of the Sunset Interchange is entirely residential. Most of the structures are one-story single-family dwellings. The terrain is level; streets are paved; and local traffic is light and non-commercial with the exception of Sunset Way, which provides primary access to Downtown Issaquah from the east. The area south of Sunset Way and east of the Front Street Interchange is primarily residential, with some commercial uses. The area south of I-90 and east of the Sunset Interchange, extending the full north-south length of the project area, is the Tradition Plateau Natural Resources Conservation Area (NRCA) of Tiger Mountain State Forest. It is undeveloped, hilly and set aside for resource conservation and low-impact recreational activity, primarily hiking. Camping is also allowed. Primary uses elsewhere in the project area are residential and school property, and the Issaquah Sportsmen's Club, Inc., east of Clark Elementary School.

Existing Noise Levels

Existing noise levels were field measured at eight locations (see Figure 4). Ten and fifteen-minute noise measurements were taken at seven locations. At Issaquah High School a 24-hour noise measurement was recorded (Figure 5) in addition to a fifteen-minute reading. The measured noise levels were used to validate the Existing conditions traffic noise model, as described in the methodology section of this report (Chapter 4). 10 locations in addition to the seven measured sites (for a total of 17 locations) were modeled using TNM (Table 6).

Receptor A is located at the north side of the apartment complex at the corner of Sunset Way and Sixth Avenue (582 East Sunset Way). This location is representative of 12 residential receptors adjacent to the proposed realignment of East Sunset Way and the Southeast Issaquah Bypass.

Receptor B is located in the side yard of the residence at the intersection of Bush Street and 6th Avenue. This location is representative of 12 residential receptors adjacent to the proposed Southeast Issaquah Bypass, immediately south of the Sunset Interchange.

Receptor C is located in the parking lot of the Saint Michael and All Angels Episcopal Church at 325 Darst Street, on the south side of the street. This location overlooks Front Street S. and Second Avenue S.E from the east, and is representative of 13 residential receptors and the church between Second Avenue S.E. and the proposed Southeast Issaquah Bypass.

Receptor D is located at 550 S.E. Evans Lane, a residence at the end of the cul-de-sac. This location is representative of seven residential receptors closest to the proposed

north segments of the Southeast Issaquah Bypass.

Receptor E is located at Tiger Mountain High School east of Second Avenue S.E. Tiger Mountain High School is the only receptor represented at this location.

Receptor F is located at the Clark Elementary School east of Second Avenue S.E. Clark Elementary School is the only receptor represented at this location.

Receptor G is located in the athletic field east of Clark Elementary School. This location is representative of the athletic field only.

Receptor H is located at the east side of Issaquah High School. This location was chosen because of its suitability as an outdoor classroom activity and study area. This location is representative of the student population only.

Receptor I is located on the west side of Front Street S. north of the Front Street S./Second Avenue S.E. intersection. The major source of noise is traffic along Front Street S. This location is representative of 5 residential receptors.

Receptor J is located on the east side of Front Street S. north of the Front Street S./Second Avenue S.E. intersection. The major source of noise is traffic along Front Street S. This location is representative of 3 residential receptors.

Receptor K is located on the east side of Second Avenue S.E. north of the Front Street S./Second Avenue S.E. intersection. The major source of noise is traffic along Second Avenue S.E. This location is representative of 5 residential receptors and the Issaquah High School baseball field.

Receptor L is located in the front yard of a residence on S.E. Kramer Place. This location is representative of three residences and the LDS Church. This receptor represents those closest to the proposed South A segment of the Southeast Issaquah Bypass. This area is currently quiet because there is no through traffic in the immediate vicinity.

Receptor M is directly south of the proposed South C alignment, east of the Front Street S./Second Avenue S.E. intersection. Major sources of noise at this location include traffic along Second Avenue S.E. and Front S. This receptor is representative of four nearby residential receptors.

Receptor N is located in the back yard of 1104 Lewis Lane S.E. This location is representative of seven residential receptors between Front Street S. and the proposed South A option of Southeast Issaquah Bypass.

Receptor O is west of the current Front Street S./Second Avenue S.E. intersection. This location is representative of three residential receptors.

Receptor P is located east of the current Front Street S./Second Avenue S.E. intersection. This location is representative of five residential receptors.

Receptor Q is located southwest of the existing 6th Avenue S.E./Issaquah-Hobart Road. This location is representative of three residential receptors.

Noise levels at the proposed Park Pointe development are not analyzed in this study because the specific location and type of noise sensitive uses has not been defined for the development. The Park Pointe development is currently in the planning stage and undergoing environmental review that assumes completion of the Southeast Issaquah Bypass project prior to completion of the development.

Predicted noise levels (Table 6) were compared to the FHWA noise abatement criteria, and the number of receptors affected by each alternative were evaluated. .

Table 6. Existing Conditions Measured and Modeled Noise Levels

	Location	Measured Leq (dBA)	Date	Time	Modeled Peak-Hour Leq (dBA)
A	East Sunset Way	This location was modeled, but not measured			**63**
B	6th Ave and Bush St SE	50	October 8th, 2002	11:00 AM	**53**
C	Darst St.	49	April 22nd, 1998	5:00 PM	**50**
D	550 Evans Lane	47	October 8th, 2002	10:30 AM	**49**
E	Tiger Mountain High School	This location was modeled, but not measured			**52**
F	Clark School	This location was modeled, but not measured			**47**
G	Athletic Field	**49**	October 8th, 2002	10:00 AM	46
H	Issaquah High School	**50**	October 8th, 2002	9:30 AM	47
I	Front St (NW of 2nd)	This location was modeled, but not measured			**60**
J	Front St (NE of 2nd)	This location was modeled, but not measured			**62**
K	2nd Avenue (N of Front St)	This location was modeled, but not measured			**58**
L	SE Kramer	**50**	October 8th, 2002	1:45 PM	46
M	South of South C Alignment	This location was modeled, but not measured			**55**
N	Lewis Lane SE	50	October 8th, 2002	1:15 PM	**49**
O	Front St (SW of 2nd)	This location was modeled, but not measured			**63**
P	Front St. S & 2nd Ave*	68	October 8th, 2002	12:45 PM	**62**
Q	Issaquah-Hobart Rd	This location was modeled, but not measured			**59**

In areas dominated by traffic noise, the modeled peak-hour traffic noise Leq (in Bold) were used for Existing Sound Levels. In areas dominated by other noise sources, the measured Leq (in Bold) were used.

**Measurement site was at edge of roadway and used for calibration only. Modeled result is at nearest residence.*

Figure 7. Noise Measurement and Modeling Locations

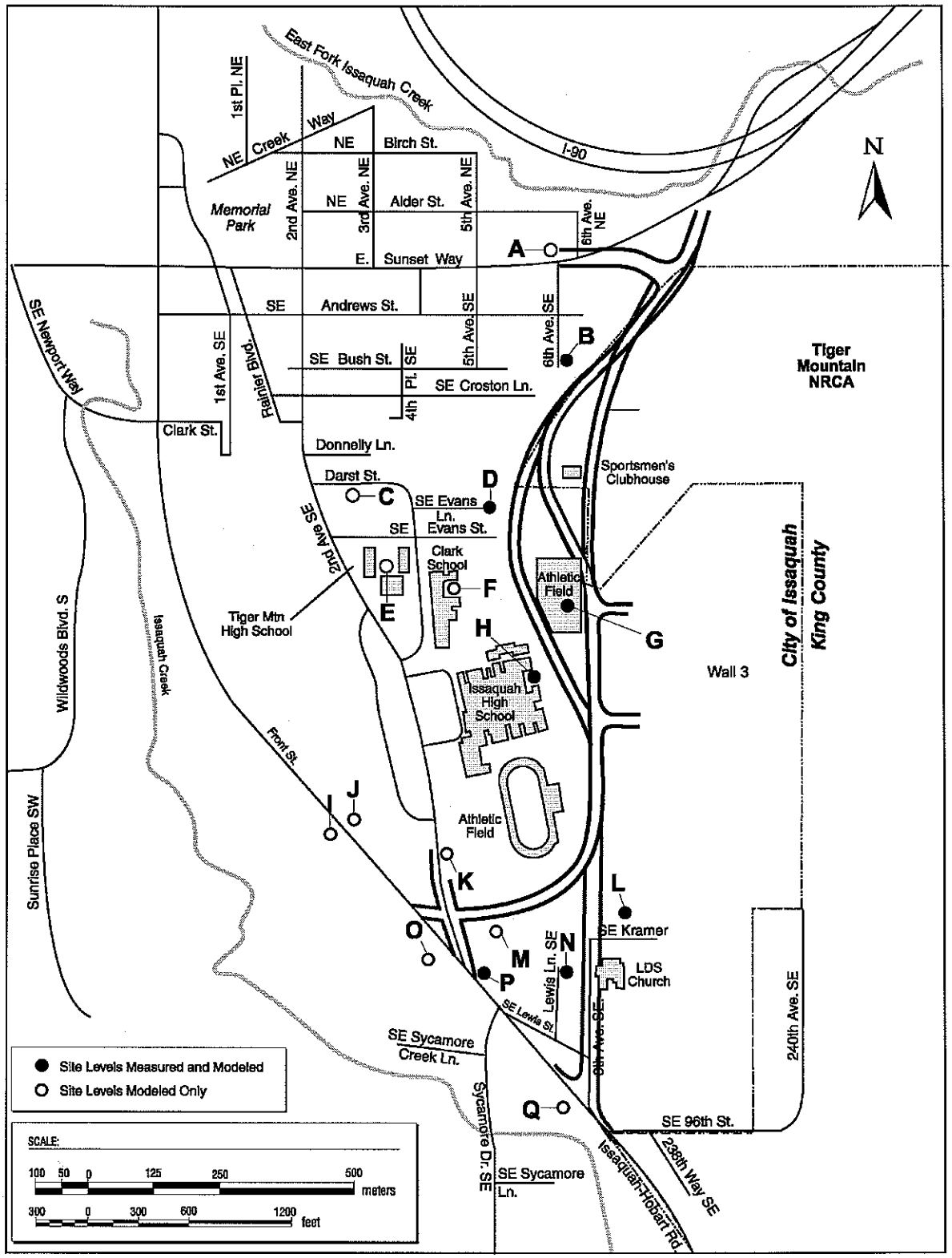
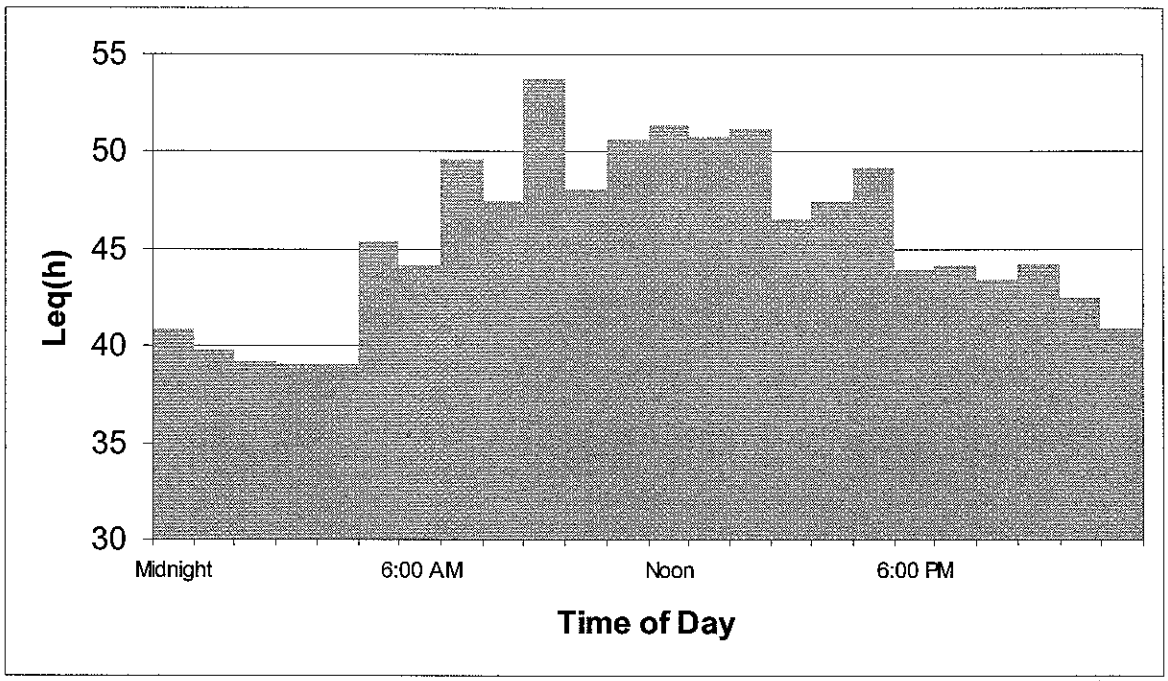


Figure 9. Daily Noise Pattern at Issaquah High School



Issaquah High School Acoustical Environment

Exterior to interior sound reduction (Table 7) and hallway sound propagation (Table 8) measurements were taken at Issaquah High School using a noise generator. A noise meter was also placed overnight inside classroom F5. Leq noise levels inside the school when the classroom was empty were between 43 and 46 dBA when the ventilation system was running and 34 dBA in the middle of the night.

The building measurements were used to calculate transmission loss through the building walls. Through the east wall of the building, the transmission loss was approximately 50 dBA. Through the hallway walls transmission loss was approximately 36 dBA to room N2 and 30 dBA to room F5. Based on observations of classroom designs, Room F5 is a worst-case classroom with a large window area and a through-wall ventilator. With the classroom doors open, there was an approximately 16-dBA sound reduction in each of the classrooms at each location measured. The distance from the noise source appears to have little effect in this configuration, as first row and center of room measurements were consistent.

The hallway propagation measurement shows between a 4 and 6 dBA reduction per doubling of distance from a sound point source. In an idealized location (reflective floor, no walls), there would be a 6-dBA reduction per doubling of distance for a point source noise source, such as the noise generator used in this study. The measured results suggest that there is some reflection of sound along the hallway; therefore, sound does not decrease as quickly with distance as in an idealized location, but neither is the sound re-enforced resulting in a sound level increase.

Table 7. Issaquah High School Exterior and Interior Noise Measurements

Description	Interior Leq	Exterior Leq
East wall of classroom N2, inside is nearest workstation	52	105*
East wall of N2, inside is center of classroom	51	105*
Hallway to N2, door closed, inside center of classroom	58	97*
Hallway to N2, door open, inside center of classroom	78	94
Hallway to F5, door open, inside desk nearest doorway	80	96
Hallway to F5, door closed, inside desk nearest doorway	66	99*
Hallway to F5, door open, inside desk center of classroom	80	96
Hallway to F5, door closed, inside desk center of classroom	61	99*

Notes: Room N2 has a small window and no through-wall ventilation. Room F5 has large windows and a through-wall ventilator.

** These measurements include 3 dBA of reflected noise, they are reduced by 3 dBA when computing transmission loss.*

Table 8. Issaquah High School Hallway Propagation Noise Measurements

Location Description	Distance from Sound Source	Leq
East end of hallway between F and N wings	25 feet	112
Mid-length along hallway	208 feet	93
Near school office	353 feet	90

Impacts

This chapter describes direct and secondary and cumulative impacts of each alternative resulting from the Southeast Issaquah Bypass.

Direct Operational Impacts

Several receptors would experience noise levels that approach or exceed the FHWA NAC and/or would experience noise increase impacts (Table 9). Total numbers of noise-impacted receptors for each alternative are shown in Table 10. Traffic noise from the Southeast Issaquah Bypass would also affect future residences within the proposed Park Pointe development. Completion of the Southeast Issaquah Bypass prior to construction of the Park Pointe development has been assumed in the separate environmental documentation for that development. Therefore, the development needs to consider its noise compatibility with the Southeast Issaquah Bypass.

Table 9. Predicted Modeled Noise Levels

Receptor	2000 Existing Conditions	2030 Alt. 1	2030 Alt. 2	2030 Alt. 3	2030 Alt. 4	2030 Alt. 5	2030 Alt. 6	2030 Alt. 7 (No Action)
A	63	65	65	65	65	65	65	**68**
B	53	54	54	57	57	54	54	53
C	50	54	53	52	51	53	53	55
D	49	65	65	53	53	58	58	51
E	52	54	53	52	51	53	52	57
F	47	56	56	50	50	53	54	51
G	49*	65	65	56	56	64	64	49
H	50	64	64	55	53	57	57	51
I	60	57	60	58	60	58	60	61
J	62	61	62	61	62	61	62	63
K	58	55	59	55	59	55	59	61
L	50*	64	55	64	55	64	55	49
M	55	56	**68**	56	**68**	56	**68**	59
N	49	**66**	55	**66**	55	**66**	55	51
O	63	61	65	62	65	62	65	**66**
P	62	60	**66**	61	**66**	61	**66**	65
Q	59	60	63	60	63	60	63	62

Underline = Noise increase impact

Bold = Approaches or exceeds FHWA NAC

*In areas dominated by traffic noise, the modeled peak-hour L_{eq} were used for Existing Sound Levels. In areas dominated by other noise sources, the measured L_{eq} were used.

Table 10. Summary of Noise Impacts

	Impacts (without Mitigation)		Impacts (with Mitigation)	
Alternative	**Residences**	**Other**	**Residences**	**Other**
Alternative 1	11	3	4	2
Alternative 2	14	2	7	1
Alternative 3	4	1	4	1
Alternative 4	7	0	7	0
Alternative 5	4	2	4	2
Alternative 6	7	1	7	1
Alt. 7 No Action	15	0	15	0
Other includes: outdoor recreation areas, motels, hotels, schools, churches, libraries, and hospitals.				

Alternative 1: North A and South A

Impacts

Under Alternative 1, noise level changes in the project area would range from a 3-dBA decrease to an increase of 17 dBA above existing conditions.

In the north, at Receptor D, noise levels were predicted to increase from the existing 49 dBA to 65 dBA, a change of 16 dBA. At Receptor G, noise levels could increase by 16 dBA. At Receptor H, noise levels could increase by 15 dBA. These would be severe increase noise impacts under WSDOT noise criteria, and would be the result of traffic noise from the North A option of the Southeast Issaquah Bypass.

In the south, Receptor L could incur increases in noise levels of 14 dBA. At receptor N, noise levels could increase by 17 dBA. These increases would be caused primarily by traffic noise from the Southeast Issaquah Bypass South A option. These increases are more than 10 dBA above existing conditions and would be noise impacts under WSDOT criteria. Noise levels at Receptors I, J, K, O, and P were predicted to decrease between 1 and 3 dBA due to the projected diversion of traffic volumes from Front Street S. and Second Avenue S.E. to the Southeast Issaquah Bypass.

Traffic noise levels within Issaquah High School, assuming open classroom doors, would be approximately 48 dBA inside the first row of classrooms and would decrease at classrooms further from the bypass. This level is greater than the allowed classroom noise level for new construction and could affect student speech intelligibility if the classroom door is open.

Alternative 2: North A and South C

Impacts

Under Alternative 2, noise level changes in the project area would range from no change to an increase of 16 dBA above existing conditions.

In the north, at Receptor D, noise levels were predicted to increase from the existing 49 dBA to 65 dBA, a change of 16 dBA. At Receptor G, noise levels could increase by 16 dBA. At Receptor H, noise levels could increase by 15 dBA. These would be severe increase noise impacts under WSDOT noise criteria, and would be the result of traffic noise from the North A option of the Southeast Issaquah Bypass. Because an impact was found near the Issaquah High School classrooms, noise levels at the football stadium were modeled for this alternative. Traffic noise levels in 2030 were modeled to be 56 dBA at the Bleachers and 57 on the field. This would not meet WSDOT noise impact criteria. Traffic noise levels in the vicinity of the football stadium would be lower for all other alternatives because traffic noise sources would be farther away.

In the south, at Receptor M, noise levels were predicted to increase from the existing 55 dBA to 68 dBA, a change of 13 dBA. Receiver P would reach 66 dBA and would approach the maximum permissible noise levels. These increases would be caused primarily by traffic noise from the Southeast Issaquah Bypass South C option.

Traffic noise levels within Issaquah High School, assuming open classroom doors, would be approximately 48 dBA inside the first row of classrooms and would decrease at classrooms further from the bypass. This level is greater than the allowed classroom noise level for new construction and could affect student speech intelligibility if the classroom door is open.

Alternative 3: North B and South C

Impacts

Under Alternative 3, noise level changes in the project area would range from 2-dBA decrease to an increase of 17 dBA above existing conditions.

In the north, no substantial increases in noise levels would occur as a result of the Southeast Issaquah Bypass North B Option. Traffic noise levels in the portion of the project area between approximately Croston Lane and Issaquah High School (Receptors C through H) would be lower by between 1 and 5 dBA under Alternative 3 compared to Alternatives 1,2,5, and 6. The lower noise levels would be a result of the greater distance to and the lowered profile of the roadway compared to the other alternatives. A 1-dBA reduction is not perceptible, while a 5-dBA reduction is readily noticeable.

In the south, Receptor L could incur increases in noise levels of 14 dBA. At receptor N, noise levels could increase by 17 dBA. These increases would be caused primarily by traffic noise from the Southeast Issaquah Bypass South A option. These increases are more than 10 dBA above existing conditions and would be noise impacts under WSDOT criteria. Noise levels at Receptors I, J, K, O, and P were predicted to decrease between 1 and 3 dBA due to the projected diversion of traffic volumes from Front Street S. and Second Avenue S.E. to the Southeast Issaquah Bypass.

Traffic noise levels within Issaquah High School, assuming open classroom doors, would be approximately 39 dBA inside the first row of classrooms and would decrease at classrooms further from the bypass. This level is less than the allowed classroom

noise level for new construction and would not result in a noise impact inside the classrooms.

Alternative 4: North B and South C

Impacts

Under Alternative 4, noise level changes in the project area would range from 1 dBA decrease to an increase of 17 dBA above existing conditions.

In the north, no substantial increases in noise levels would occur as a result of the Southeast Issaquah Bypass North B Option. Traffic noise levels in the portion of the project area between approximately Croston Lane and Issaquah High School (Receptors C through H) would be lower by between 2 and 5 dBA under Alternative 4 compared to Alternatives 1,2,5, and 6. The lower noise levels would be a result of the greater distance to and the lowered profile of the roadway compared to the other alternatives. A 2-dBA reduction is generally not perceptible, while a 5-dBA reduction is readily noticeable.

In the south, at Receptor M, noise levels were predicted to increase from the existing 55 dBA to 68 dBA, a change of 13 dBA. Receiver P would reach 66 dBA and would approach the maximum permissible noise levels. These increases would be caused primarily by traffic noise from the Southeast Issaquah Bypass South C option.

Traffic noise levels within Issaquah High School, assuming open classroom doors, would be approximately 37 dBA inside the first row of classrooms and would decrease at classrooms further from the bypass. This level is less than the allowed classroom noise level for new construction and would not result in a noise impact inside the classrooms.

Alternative 5: North C and South A

Impacts

Under Alternative 5, noise level changes in the project area would range from 3-dBA decrease to an increase of 15 dBA above existing conditions.

In the north, at Receptor G, noise levels could increase by 15 dBA. This would be a severe increase noise impact under WSDOT noise criteria, and would be the result of traffic noise from the North C option of the Southeast Issaquah Bypass.

In the south, Receptor L could incur increases in noise levels of 14 dBA. At receptor N, noise levels could increase by 17 dBA. These increases would be caused primarily by traffic noise from the Southeast Issaquah Bypass South A option. These increases are more than 10 dBA above existing conditions and would be noise impacts under WSDOT criteria. Noise levels at Receptors I, J, K, O, and P were predicted to decrease between 1 and 3 dBA due to the projected diversion of traffic volumes from Front Street S. and Second Avenue S.E. to the Southeast Issaquah Bypass.

Traffic noise levels within Issaquah High School, assuming open classroom doors, would be approximately 41 dBA inside the first row of classrooms and would decrease at classrooms further from the bypass. This level is less than the allowed classroom noise level for new construction and would not result in a noise impact inside the classrooms.

Alternative 6: North C and South C

Impacts

Under Alternative 6, noise level changes in the project area would range from no change to an increase of 15 dBA above existing conditions.

In the north, at Receptor G, noise levels could increase by 15 dBA. This would be a severe increase noise impact under WSDOT noise criteria, and would be the result of traffic noise from the North C option of the Southeast Issaquah Bypass.

In the south, at Receptor M, noise levels were predicted to increase from the existing 55 dBA to 68 dBA, a change of 13 dBA. Receiver P would reach 66 dBA and would approach the maximum permissible noise levels. These increases would be caused primarily by traffic noise from the Southeast Issaquah Bypass South C option.

Traffic noise levels within Issaquah High School, assuming open classroom doors, would be approximately 41 dBA inside the first row of classrooms and would decrease at classrooms further from the bypass. This level is less than the allowed classroom noise level for new construction and would not result in a noise impact inside the classrooms

Alternative 7: No Action

Impacts

Under Alternative 7, noise level changes in the project area would range from no change to an increase of 5 dBA above existing conditions. This increase is caused by traffic volume increases

Construction

Noise during the construction period for all build alternatives could be bothersome to nearby residences. Construction workers also would be subject to construction noise while working on the site. Construction usually would be carried out in several reasonably discrete steps that each having its own mix of equipment and, consequently, its own noise characteristics. Construction noise is temporary and would vary widely both spatially and time-wise over the course of the project.

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. Mobile equipment operates in a cyclic fashion, but stationary equipment (e.g., generators and compressors) operates at sound levels that

are fairly constant over time. Because trucks would be present during most phases and would not be confined to the project site, noise from trucks could affect more receptors. Other noise sources would include impact equipment and tools such as pile drivers. Impact tools could be pneumatically powered, hydraulic, or electric.

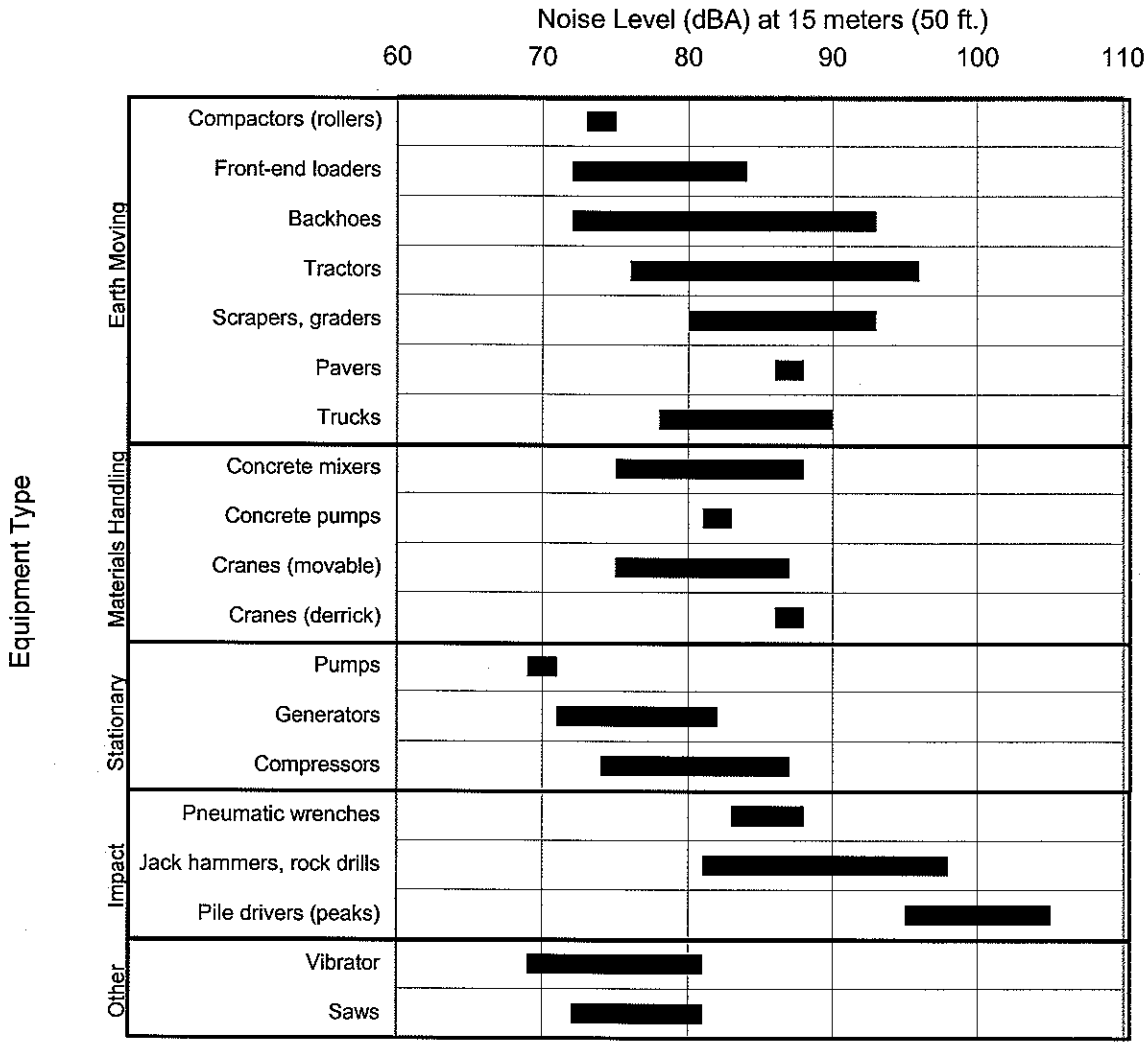
Construction noise would be intermittent, occurring during the construction period at various locations in the project area. Construction noise levels would depend on the type, amount, and location of construction activities. The type of construction methods would establish the maximum noise levels of construction equipment used. The amount of construction activity would quantify how often construction noise would occur throughout the day. The location of construction equipment relative to adjacent properties would determine any effects of distance in reducing construction noise levels. The maximum noise levels of construction equipment under all build alternatives would be similar to the typical maximum construction equipment noise levels presented in Figure 6.

As shown in Figure 6, maximum noise levels from construction equipment would range from 69 to 106 dBA at 50 feet (15 meters). Construction noise at residences farther away would decrease at a rate of 6 dBA per doubling of distance from the source. The number of occurrences of the L_{max} noise peaks would increase during construction, particularly during pile-driving activities. 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, average L_{eq} daytime noise levels would be less than the maximum noise levels presented in Figure 6.

Construction noise is exempt from local property-line regulations during daytime hours. Construction noise levels could be reduced by the construction practices identified in the mitigation section (Chapter 7).

Construction noise levels could be reduced by the construction practices identified in the Mitigation section of this report. Construction activities carried out between 7 a.m. and 10 p.m. are exempt from King County property line standards, but must comply with the construction and equipment operation requirements (King County Code 12.88.040). Any activities completed between 10 p.m. and 7 a.m. would require a nighttime construction variance from the City of Issaquah.

Figure 11. Construction Noise Levels



Source: EPA, 1971 and WSDOT, 1991.

Secondary and Cumulative Impacts

The noise analysis for this project is based on the transportation demand forecasting model, including the effects of unmet demand on the transportation system. By including unmet demand, the secondary effects of increased transportation capacity are included in the analysis. Because ambient noise levels in the affected area are not assumed to increase substantially in the future, the noise analysis captures the cumulative effects of noise within the affected area.

Mitigation

Noise can be controlled/mitigated at three locations relative to the source of the noise: (1) at the source (e.g., with mufflers and quieter engines), (2) along the noise path, with barriers, and (3) at the receptor, with insulation. Noise abatement is necessary only where frequent human use occurs and where a lower noise level would have benefits (U.S. DOT, 1982).

Construction

Construction noise could be reduced by using enclosures or walls to surround noisy equipment, installing mufflers on engines, substituting quieter equipment or construction methods, minimizing operation time, and locating equipment farther from sensitive receptors. To reduce construction noise at nearby receptors, the following mitigation measures could be incorporated into construction plans and contractor specifications:

- Limiting construction activities to between 7 a.m. and 10 p.m. would reduce construction noise levels during sensitive nighttime hours.
- Equipping construction equipment engines with adequate mufflers, intake silencers, and engine enclosures would reduce their noise by 5 to 10 dBA (U.S. EPA, 1971).
- Specifying the quietest equipment available would reduce noise by 5 to 10 dBA.
- Requiring contractors to use Occupational Safety and Health Administration (OSHA) -approved ambient sound-level sensing backup alarms would reduce disturbances to nearby residents from backup alarms during quieter periods.
- 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 operational efficiency.
- 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 residences would decrease noise levels at nearby sensitive receptors.

Operation

A variety of mitigation measures can be effective at reducing traffic noise impacts. For example, noise impacts from the long-term operation of the project could be reduced by implementing traffic management measures, acquiring land as buffer zones; or, for construction of noise barriers or berms, realigning the roadway, and noise insulating public use or nonprofit institutional structures. These mitigation measures were

evaluated for their potential to reduce noise impacts from the proposed action, and the results of the evaluation are summarized below. A final determination of the size and placement of noise barriers or berms and the implementation of other mitigation methods will take place during detailed project design, after an opportunity for public involvement, and after approval at the local, state, and federal levels.

Many factors are evaluated to determine whether or not mitigation would be feasible and/or reasonable. Determination of feasibility includes whether the mitigation could achieve a noise reduction of at least 7 dBA at the closest receptors. Determination of reasonability includes the number of sensitive receptors benefited by at least 3 dBA, the cost-effectiveness of the mitigation, and concerns such as aesthetics, safety, and the desires of nearby residents. The reasonableness criteria for the mitigation costs allowed per benefited receptor is summarized in Table 11.

Table 11. State of Washington Mitigation Allowance for Impacts Caused by Traffic Noise Level

Design Year Traffic Noise Decibel Level	Allowed Mitigation Cost Per Household	Allowed Equivalent Barrier Area Per Household
66 dBA	$15,500	65.0 Sq. Meters (700 Sq. Ft)
67 dBA	$17,000	71.5 Sq. Meters (770 Sq. Ft.)
68 dBA	$18,500	77.7 Sq. Meters (837 Sq. Ft.)
69 dBA	$20,000	84.0 Sq. Meters (905 Sq. Ft.)
70 dBA	$21,500	90.5 Sq. Meters (973 Sq. Ft)
71 dBA	$23,000	96.7 Sq. Meters (1041 Sq. Ft.)
72 dBA	$24,500	103.0 Sq. Meters (1109 Sq. Ft.)
73 dBA	$26,000	109.2 Sq. Meters (1176 Sq. Ft.)
74 dBA	$27,500	115.5 Sq. Meters (1244 Sq. Ft)

Traffic Management Measures

These include time restrictions or traffic control devices and signing for prohibition of certain vehicle types (such as motorcycles and heavy trucks), modified speed limits, and exclusive land designations. Restriction of vehicle types and lower speed limits on the Issaquah Bypass could worsen congestion on other routes to and from the city, rendering these measures infeasible. Noise impacts could be reduced by land use controls throughout the study area. The City of Issaquah could implement land use plans and zoning that would restrict future land uses in the project area to those compatible with roadway noise. A transportation system management plan to encourage the use of car pools, public transit, and shuttle buses would reduce vehicle trips and, subsequently, traffic noise.

Land Acquisition for Noise Buffers or Barriers

The Issaquah Bypass corridor is bordered by state, municipal, and residential properties, which could be unreasonably expensive to acquire for the purpose of noise mitigation.

Realigning the Roadway

The six build alternatives presented in this study represent all feasible potential horizontal alignments. Vertical realignment (bridges or overpasses, or sub-grade roadways) could be effective, but additional design and construction could be unreasonably expensive.

Noise Insulation of Buildings

Insulation of buildings could be feasible, but this remedy does not apply to commercial and residential structures that constitute most of the project area. This could be an effective way to mitigate interior noise levels for Issaquah High School, but assuming a 20-dBA reduction factor for the school's walls (with windows closed, which is typical for climate-controlled buildings), no interior noise above the FHWA NAC of 52 dBA would be expected; therefore, there would be no interior noise impacts to mitigate.

Noise Barriers

Noise barriers include noise walls, berms, and buildings that are not noise-sensitive. The effectiveness of a noise barrier is determined by its height and length and the project site's topography. To be effective, the barrier must block the "line of sight" between the highest point of a noise source (e.g., a truck's exhaust stack) and the highest part of a receiver. It must be long enough to prevent sounds from passing around the ends, have no openings such as driveway connections, and be dense enough so that noise would not be transmitted through it. Intervening rows of buildings that are not noise-sensitive could also be used as barriers (U.S. DOT, 1973).

Determination of engineering feasibility includes whether barriers could be built in a location to achieve a noise reduction of at least 7 dBA at the closest receptors. Determination of reasonability includes the number of sensitive receptors benefited by at least 3 dBA, the cost-effectiveness of the barriers, and concerns such as aesthetics, safety, and the desires of nearby residents. The reasonableness criteria for the barrier areas provided per benefited receptor are summarized in Table 11.

Future noise levels for each alternative were modeled to approach or exceed the noise abatement criteria at several locations along the project corridor. In areas where the criteria were exceeded, noise walls were evaluated. The results of the evaluation are summarized in Table 12. The approximate location of the noise walls evaluated is shown in Figure 7. Noise barriers were not evaluated for the No Action Alternative. The exact locations and sizes of the walls evaluated are provided wall-by-wall below.

Figure 13. Noise Wall Locations Evaluated

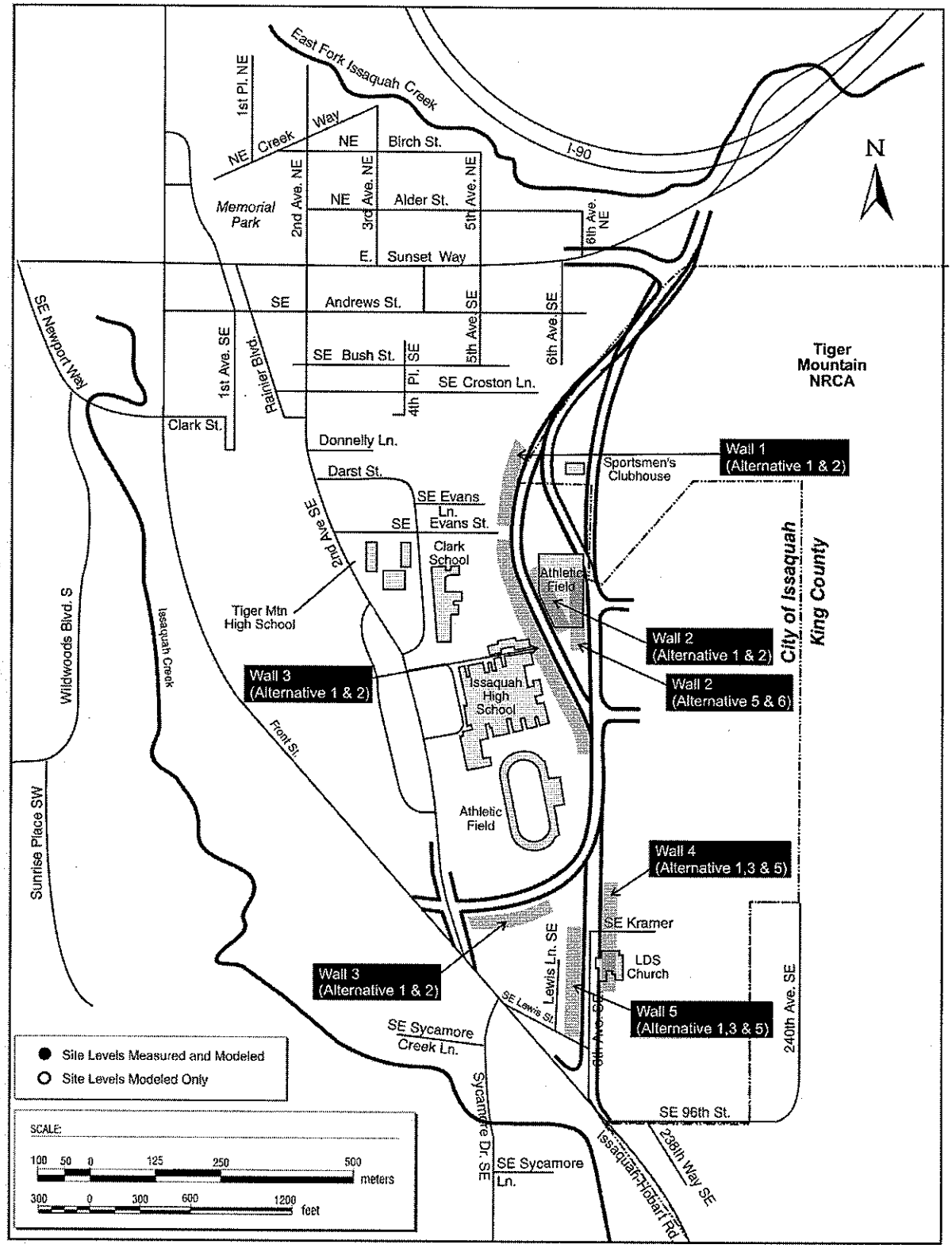


Table 12. Summary of Walls Evaluated

Wall Evaluated – Benefited Receptors; Alternatives	Result
Wall 1 – Receptor D; Alternatives 1 and 2	Feasible, Reasonable
Wall 2 – Receptor G; Alternatives 1, and 2	Not Feasible
Wall 2 – Receptor G; Alternatives 5 and 6	Feasible, Not Reasonable
Wall 3 – Receptor H; Alternatives 1 and 2	Feasible, Reasonable
Wall 4 – Receptor L; Alternatives 1, 3 and 5	Not Feasible
Wall 5 – Receptor N; Alternatives 1, 3 and 5	Feasible, Not Reasonable
Wall 6 – Receptors M & P; Alternatives 2, 4 and 6	Feasible, Not Reasonable

Wall 1: Alternatives 1 and 2 (Feasible, Reasonable)

Wall 1 was examined for seven receptors in the S. E. Evans Lane neighborhood represented by Receptor D. A wall 200 meters (656 feet) long, 2 meters (6.6 feet) high, and 15 meters (50 feet) west of the North A centerline was found to be feasible and reasonable, in accordance with WSDOT cost-benefit criteria, in reducing noise from the roadway proposed for Alternatives 1 and 2. This barrier would extend from 147 meters (482 feet) north, Station 8+600, to 53 meters (174 feet) south, Station 8+400, of S.E. Evans Street, and would cross S.E. Evans Street on the bypass structure. Design year 2030 noise levels at the east end of S.E. Evans Lane (Receptor D), with the barrier in place, were predicted to be 57 dBA, an increase of 8 dBA above existing conditions. This would be a reduction of 8 dBA compared to Alternative 1 without the barrier. The Equivalent Barrier Area per household would be 57.0 square meters. The effectiveness of this modestly sized barrier is enhanced by the difference in elevation of the terrain at the barrier compared to the elevation at the homes at the east end of S.E. Evans Lane, which are approximately six meters lower. At $22.10 per square foot, Wall 1 would cost approximately $95,000.

Wall 2: Alternatives 1 and 2 (Not Feasible)

Wall 2 was examined to provide a reduction in noise at the athletic field represented by Receptor G for Alternatives 1 and 2 with a North A or North C alignment. A wall 210 meters (690 feet) long, 6 meters (20 feet) high, and 10 meters (33 feet) east of the North A centerline was found to be not feasible in accordance with WSDOT because a noise reduction of only 5 dBA was achieved. WSDOT Determination of Feasibility includes that the mitigation could achieve a noise reduction of at least 7 dBA.

Wall 2: Alternatives 5 and 6 (Feasible, Not Reasonable)

Wall 2 was examined to provide a reduction in noise at the athletic field represented by Receptor G for Alternatives 5 and 6 with a North C alignment. A wall 180 meters (590 feet) long, 4.5 meters (15 feet) high, and 10 meters (33 feet) west of the North A

centerline was found to be feasible in accordance with WSDOT cost-benefit criteria, in reducing noise from the roadway proposed for Alternatives 5 and 6. Design year 2030 noise levels at the athletic field (Receptor G), with the barrier in place, were predicted to be 56 dBA, an increase of 7 dBA above existing conditions. This would be a reduction of 8 dBA compared to Alternatives 5 and 6 without the barrier.

This barrier was found to be not reasonable in accordance with WSDOT cost-benefit criteria. The upper Issaquah High School fields are used by the high school for softball and practice for other sports. Community groups also use them. The fields are used during spring and fall for sports practice and softball. Information provided by the Issaquah School District suggests that the fields are used by the high school in the afternoons five days per week for approximately eighteen weeks per year. Assuming an average of 30 users at one time, this is equivalent to eight residences. The fields were reserved for 910 hours of community activities last year. Assuming an average of 30 users at one time, the community use has a noise-sensitive residential equivalence of one. In total, the upper Issaquah High School has equivalent noise-sensitive use as nine residences (see Appendix for calculation of equivalent noise-sensitive use). The barrier area per household equivalent would be 95.8 square meters. The allowed barrier area for this receptor is 65 square meters per household equivalent. The planning-level cost estimate for the wall is $206,000, compared to an allowed reasonable cost of $140,000.

Wall 3: Alternatives 1 and 2 (Feasible, Reasonable)

For Issaquah High School, represented by Receptor H, a noise wall 387 meters (1,270 feet) long, 3 meters (10 feet) high, and 15 meters (50 feet) west of the North A option centerline was found to be feasible in accordance with WSDOT criteria, in reducing noise from the proposed Alternatives 1 and 2 roadway. This barrier would extend north of Issaquah High School (Station 8+280) to south of the tennis courts (Station 0+880 for South A or 10+520 for South C options). Design year 2030 noise levels on the west side of Issaquah High School, the barrier would reduce the noise level under Alternatives 1 and 2 by 8 dBA to 56 dBA, an increase of 6 dBA above existing conditions. Issaquah High School serves 1,370 students. This has a residential equivalency of 100 households (WSDOT, 1987). At $22.10 per square foot, Wall 3 would cost approximately $280,000.

Wall 4: Alternatives 1, 3, and 5 (Not Feasible)

Noise walls for the east side of the proposed South A option (Alternatives 1,3 and 5) of Southeast Bypass are not feasible because of the requirement for access to SE Kramer Place and the LDS church.

Wall 5: Alternatives 1, 3, and 5 (Feasible, Not Reasonable)

Wall 5 was examined for two receptors south of the South A alignment represented by Receptor N. In existing conditions Receptor N represents seven receptors, but with the construction of alignment South A only two receptors would remain. A wall 170 meters (509 feet) long, 2.5 meters (13.1 feet) high, and 15 meters (50 feet) south of the South A centerline was found to be feasible in accordance with WSDOT criteria, in reducing noise levels for the residences represented by Receptor N from the proposed South A alignments for Alternatives 1, 3 and 5. Design year 2030 noise levels for residences represented by Receptor N, with the barrier in place, were predicted to be 58 dBA, an

increase of 9 dBA above existing conditions. This would be a reduction of 8 dBA compared to Alternatives 1, 3 and 5 without the barrier.

This barrier was found to be not reasonable in accordance with WSDOT cost-benefit criteria. The equivalent barrier area per household would be 213 square meters. The allowed equivalent barrier area for these receptors is 65 square meters per household. This corresponds to a cost per benefited household of $50,000, compared to an allowed cost of $15,500 per household.

Wall 6: Alternatives 2, 4, and 6 (Feasible, Not Reasonable)

Wall 6 was examined for four receptors south of the South C alignment represented by Receptor M and for two receptors represented by Receptor P. A wall 155 meters (509 feet) long, 4 meters (13.1 feet) high, and 10 meters (33 feet) south of the South C centerline was found to be feasible in accordance with WSDOT criteria, in reducing noise levels for the residences represented by Receptor M from the proposed South C alignments for Alternatives 2,4 and 6. Receptor P receives the majority of its noise from Front Street and would only experience a 1 dBA from Wall 5 and therefore it would not be feasible in accordance with WSDOT criteria. Design year 2030 noise levels for residences represented by Receptor M, with the barrier in place, were predicted to be 60 dBA, an increase of 4 dBA above existing conditions. This would be a reduction of 8 dBA compared to Alternatives 2, 4 and 6 without the barrier.

This barrier was found to be not reasonable in accordance with WSDOT cost-benefit criteria. The equivalent barrier area per household would be 155 square meters. The allowed equivalent barrier area for these receptors ranges between 65 and 78 square meters per household depending on the predicted traffic noise level. This corresponds to a cost per benefited household of $36,900 compared to an allowed cost of between $15,500 and $18,500 per household.

Summary of Noise Barriers

Two noise barriers were found to be feasible and reasonable for the North A alignments Alternatives 1 and 2 (Walls 1 and 3). Noise barriers were not found to be feasible or reasonable for any of the other alternatives or alignments (North B, North C, South A and South C). Appendix A of this report contains traffic noise model results for each noise barrier analyzed.

References

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Appendix

Calculation of Equivalent Noise-Sensitive Users for the Athletic Field (Receptor G)and Traffic Noise Model Output

Athletic Field (Wall 2, Alternative 5 &6 - Receptor G) Use Per D22-22

Use by Non-School Activities

910 hours per year
30 assumed average number of people at one time
365 days in a year
24 hours in a day
People per residential
3 equiv.

1.038813 Residential Equivalent

School Activities

3 Hours Per day
5 Days Per Week
18 Weeks Per Year
30 assumed average number of people at one time
52 Weeks in a year
7 days in a week
3 People per residential equiv.

7.417582 Residential Equivalent

8.4564	**Total Users**	**Equivalent**

Wall Area	**Equivalent Users**	**Equivalent Barrier Per Household**
810	8.4564	**95.78549**

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RESULTS: SOUND LEVELS
PROJECT/CONTRACT: SE Issaquah Bypass / 25114C
RUN: Existing Conditions
BARRIER DESIGN: INPUT HEIGHTS
ATMOSPHERICS: 20 deg C, 50% RH

Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h Calculated	Crit'n	Increase over existing Calculated	Crit'n Sub'l Inc	Type Impact	With Barrier Calculated LAeq1h	Noise Reduction Calculated	Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
A - Sunset	1	12	0.0	63.1	66	63.1	10	----	63.1	0.0	8	-8.0
B - Bush St	3	12	0.0	53.0	66	53.0	10	----	53.0	0.0	8	-8.0
C - Darst St	5	13	0.0	50.4	66	50.4	10	----	50.4	0.0	8	-8.0
D - SE Evans Lane	7	7	0.0	49.2	66	49.2	10	----	49.2	0.0	8	-8.0
E - Tiger Mnt High School	9	0	0.0	52.4	66	52.4	10	----	52.4	0.0	8	-8.0
F - Clark School	11	0	0.0	47.2	66	47.2	10	----	47.2	0.0	8	-8.0
G - Athletic Field	13	0	0.0	46.2	66	46.2	10	----	46.2	0.0	8	-8.0
H - Issaquah High School	15	0	0.0	47.1	66	47.1	10	----	47.1	0.0	8	-8.0
I - Front St (NW of 2nd)	17	5	0.0	59.7	66	59.7	10	----	59.7	0.0	8	-8.0
J - Front St (NE of 2nd)	19	3	0.0	61.8	66	61.8	10	----	61.8	0.0	8	-8.0
K - 2nd Ave	23	5	0.0	58.0	66	58.0	10	----	58.0	0.0	8	-8.0
L - SE Kramer	25	1	0.0	45.6	66	45.6	10	----	45.6	0.0	8	-8.0
M - South of South C	30	7	0.0	55.2	66	55.2	10	----	55.2	0.0	8	-8.0
N - Lewis Lane SE	32	7	0.0	48.6	66	48.6	10	----	48.6	0.0	8	-8.0
O - Front St (SW of 2nd)	34	3	0.0	63.4	66	63.4	10	----	63.4	0.0	8	-8.0
P - Front St (SE of 2nd)	36	5	0.0	62.0	66	62.0	10	----	62.0	0.0	8	-8.0
Q - Issaquah -Hobart Rd.	38	3	0.0	59.1	66	59.1	10	----	59.1	0.0	8	-8.0

Dwelling Units	# DUs	Noise Reduction Min	Avg	Max
		dB	dB	dB
All Selected	83	0.0	0.0	0.0
All Impacted	0	0.0	0.0	0.0
All that meet NR Goal	0	0.0	0.0	0.0

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RESULTS: SOUND LEVELS
PROJECT/CONTRACT: SE Issaquah Bypass / 25114C
RUN: 2030 Alt3: North B and South A
BARRIER DESIGN: INPUT HEIGHTS
ATMOSPHERICS: 20 deg C, 50% RH

Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h Calculated	Crit'n	Increase over existing Calculated	Crit'n Sub'l Inc	Type Impact	With Barrier Calculated LAeq1h	Noise Reduction Calculated	Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
A - Sunset	4	12	63.1	64.5	66	1.4	10	----	64.5	0.0	8	-8.0
B - Bush St	5	12	53.0	57.4	66	4.4	10	----	57.4	0.0	8	-8.0
C - Darst St	6	13	50.4	51.7	66	1.3	10	----	51.7	0.0	8	-8.0
D - SE Evans Lane	7	7	49.2	52.6	66	3.4	10	----	52.6	0.0	8	-8.0
E - Tiger Mnt High School	8	0	52.4	51.9	66	-0.5	10	----	51.9	0.0	8	-8.0
F - Clark School	9	0	47.2	50.3	66	3.1	10	----	50.3	0.0	8	-8.0
G - Athletic Field	10	0	46.2	56.2	66	10.0	10	Sub'l Inc	56.2	0.0	8	-8.0
H - Issaquah High School	11	0	47.1	54.7	66	7.6	10	----	54.7	0.0	8	-8.0
I - Front St (NW of 2nd)	12	2	59.7	57.7	66	-2.0	10	----	57.7	0.0	8	-8.0
J - Front St (NE of 2nd)	13	3	61.8	60.7	66	-1.1	10	----	60.7	0.0	8	-8.0
K - 2nd Ave	14	5	58.0	54.5	66	-3.5	10	----	54.5	0.0	8	-8.0
L - SE Kramer	15	2	45.6	63.6	66	18.0	10	Sub'l Inc	63.6	0.0	8	-8.0
M - South of South C	16	7	55.2	55.9	66	0.7	10	----	55.9	0.0	8	-8.0
N - Lewis Lane SE	17	2	48.6	65.7	66	17.1	10	Sub'l Inc	65.7	0.0	8	-8.0
O - Front St (SW of 2nd)	18	3	63.4	61.5	66	-1.9	10	----	61.5	0.0	8	-8.0
P - Front St (SE of 2nd)	19	5	62.0	60.5	66	-1.5	10	----	60.5	0.0	8	-8.0
Q - Issaquah -Hobart Rd.	20	3	59.1	59.8	66	0.7	10	----	59.8	0.0	8	-8.0

Dwelling Units	# DUs	Noise Reduction Min	Avg	Max
		dB	dB	dB
All Selected	76	0.0	0.0	0.0
All Impacted	4	0.0	0.0	0.0
All that meet NR Goal	0	0.0	0.0	0.0

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RESULTS: SOUND LEVELS
PROJECT/CONTRACT: SE Issaquah Bypass / 25114C
RUN: 2030 Alt 1: North A - South A
BARRIER DESIGN: INPUT HEIGHTS
ATMOSPHERICS: 20 deg C, 50% RH

Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h Calculated	Crit'n	Increase over existing Calculated	Crit'n Sub'l Inc	Type Impact	With Barrier Calculated LAeq1h	Noise Reduction Calculated	Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
A - Sunset	4	12	63.1	64.5	66	1.4	10	----	64.5	0.0	8	-8.0
B - Bush St	5	12	53.0	54.0	66	1.0	10	----	54.0	0.0	8	-8.0
C - Darst St	6	13	50.4	53.6	66	3.2	10	----	53.6	0.0	8	-8.0
D - SE Evans Lane	7	7	49.2	64.6	66	15.4	10	Sub'l Inc	64.6	0.0	8	-8.0
E - Tiger Mnt High School	8	0	52.4	53.5	66	1.1	10	----	53.5	0.0	8	-8.0
F - Clark School	9	0	47.2	56.2	66	9.0	10	----	56.2	0.0	8	-8.0
G - Athletic Field	10	0	46.2	65.4	66	19.2	10	Sub'l Inc	65.4	0.0	8	-8.0
H - Issaquah High School	11	0	47.1	63.9	66	16.8	10	Sub'l Inc	63.9	0.0	8	-8.0
I - Front St (NW of 2nd)	12	2	59.7	57.4	66	-2.3	10	----	57.4	0.0	8	-8.0
J - Front St (NE of 2nd)	13	3	61.8	60.6	66	-1.2	10	----	60.6	0.0	8	-8.0
K - 2nd Ave	14	5	58.0	54.9	66	-3.1	10	----	54.9	0.0	8	-8.0
L - SE Kramer	15	2	45.6	63.7	66	18.1	10	Sub'l Inc	63.7	0.0	8	-8.0
M - South of South C	16	7	55.2	55.9	66	0.7	10	----	55.9	0.0	8	-8.0
N - Lewis Lane SE	17	2	48.6	65.7	66	17.1	10	Sub'l Inc	65.7	0.0	8	-8.0
O - Front St (SW of 2nd)	18	3	63.4	61.3	66	-2.1	10	----	61.3	0.0	8	-8.0
P - Front St (SE of 2nd)	19	5	62.0	60.3	66	-1.7	10	----	60.3	0.0	8	-8.0
Q - Issaquah -Hobart Rd.	20	3	59.1	59.8	66	0.7	10	----	59.8	0.0	8	-8.0

Dwelling Units	# DUs	Noise Reduction Min	Avg	Max
		dB	dB	dB
All Selected	76	0.0	0.0	0.0
All Impacted	11	0.0	0.0	0.0
All that meet NR Goal	0	0.0	0.0	0.0

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RESULTS: SOUND LEVELS
PROJECT/CONTRACT: SE Issaquah Bypass / 25114C
RUN: 2030 Alt 2: North A - South C
BARRIER DESIGN: INPUT HEIGHTS
ATMOSPHERICS: 20 deg C, 50% RH

Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h Calculated	No Barrier LAeq1h Crit'n	Increase over existing Calculated	Increase over existing Crit'n Sub'l Inc	Type Impact	With Barrier Calculated LAeq1h	Noise Reduction Calculated	Noise Reduction Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
A - Sunset	4	12	63.1	64.5	66	1.4	10	----	64.5	0.0	8	-8.0
B - Bush St	6	12	53.0	54.0	66	1.0	10	----	54.0	0.0	8	-8.0
C - Darst St	7	13	50.4	53.4	66	3.0	10	----	53.4	0.0	8	-8.0
D - SE Evans Lane	8	7	49.2	64.6	66	15.4	10	Sub'l Inc	64.6	0.0	8	-8.0
E - Tiger Mnt High School	9	0	52.4	53.1	66	0.7	10	----	53.1	0.0	8	-8.0
F - Clark School	10	0	47.2	56.3	66	9.1	10	----	56.3	0.0	8	-8.0
G - Athletic Field	11	0	46.2	65.4	66	19.2	10	Sub'l Inc	65.4	0.0	8	-8.0
H - Issaquah High School	12	0	47.1	63.9	66	16.8	10	Sub'l Inc	63.9	0.0	8	-8.0
I - Front St (NW of 2nd)	13	5	59.7	60.0	66	0.3	10	----	60.0	0.0	8	-8.0
J - Front St (NE of 2nd)	14	1	61.8	62.2	66	0.4	10	----	62.2	0.0	8	-8.0
K - 2nd Ave	15	2	58.0	59.3	66	1.3	10	----	59.3	0.0	8	-8.0
L - SE Kramer	16	3	45.6	55.4	66	9.8	10	----	55.4	0.0	8	-8.0
M - South of South C	17	7	55.2	68.1	66	12.9	10	Both	68.1	0.0	8	-8.0
N - Lewis Lane SE	18	7	48.6	54.9	66	6.3	10	----	54.9	0.0	8	-8.0
O - Front St (SW of 2nd)	19	3	63.4	64.8	66	1.4	10	----	64.8	0.0	8	-8.0
P - Front St (SE of 2nd)	20	5	62.0	65.9	66	3.9	10	----	65.9	0.0	8	-8.0
Q - Issaquah -Hobart Rd.	21	3	59.1	62.8	66	3.7	10	----	62.8	0.0	8	-8.0

Dwelling Units	# DUs	Noise Reduction Min	Noise Reduction Avg	Noise Reduction Max
		dB	dB	dB
All Selected	80	0.0	0.0	0.0
All Impacted	14	0.0	0.0	0.0
All that meet NR Goal	0	0.0	0.0	0.0

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RESULTS: SOUND LEVELS
PROJECT/CONTRACT: SE Issaquah Bypass / 25114C
RUN: 2030 Alt4: North B and South C
BARRIER DESIGN: INPUT HEIGHTS
ATMOSPHERICS: 20 deg C, 50% RH

Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h Calculated	Crit'n	Increase over existing Calculated	Crit'n Sub'l Inc	Type Impact	With Barrier Calculated LAeq1h	Noise Reduction Calculated	Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
A - Sunset	6	12	63.1	64.5	66	1.4	10	----	64.5	0.0	8	-8.0
B - Bush St	7	12	53.0	57.4	66	4.4	10	----	57.4	0.0	8	-8.0
C - Darst St	8	13	50.4	51.2	66	0.8	10	----	51.2	0.0	8	-8.0
D - SE Evans Lane	9	7	49.2	52.5	66	3.3	10	----	52.5	0.0	8	-8.0
E - Tiger Mnt High School	10	0	52.4	51.2	66	-1.2	10	----	51.2	0.0	8	-8.0
F - Clark School	11	0	47.2	50.4	66	3.2	10	----	50.4	0.0	8	-8.0
G - Athletic Field	12	0	46.2	56.1	66	9.9	10	----	56.1	0.0	8	-8.0
H - Issaquah High School	13	0	47.1	53.3	66	6.2	10	----	53.3	0.0	8	-8.0
I - Front St (NW of 2nd)	14	5	59.7	59.9	66	0.2	10	----	59.9	0.0	8	-8.0
J - Front St (NE of 2nd)	15	1	61.8	62.1	66	0.3	10	----	62.1	0.0	8	-8.0
K - 2nd Ave	16	2	58.0	59.1	66	1.1	10	----	59.1	0.0	8	-8.0
L - SE Kramer	17	3	45.6	55.4	66	9.8	10	----	55.4	0.0	8	-8.0
M - South of South C	18	7	55.2	68.0	66	12.8	10	Both	68.0	0.0	8	-8.0
N - Lewis Lane SE	19	7	48.6	54.9	66	6.3	10	----	54.9	0.0	8	-8.0
O - Front St (SW of 2nd)	20	3	63.4	64.7	66	1.3	10	----	64.7	0.0	8	-8.0
P - Front St (SE of 2nd)	21	5	62.0	65.8	66	3.8	10	----	65.8	0.0	8	-8.0
Q - Issaquah -Hobart Rd.	22	3	59.1	62.7	66	3.6	10	----	62.7	0.0	8	-8.0

Dwelling Units	# DUs	Noise Reduction Min	Avg	Max
		dB	dB	dB
All Selected	80	0.0	0.0	0.0
All Impacted	7	0.0	0.0	0.0
All that meet NR Goal	0	0.0	0.0	0.0

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Ginette Lalonde

24 January 2003
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RESULTS: SOUND LEVELS
PROJECT/CONTRACT: SE Issaquah Bypass / 25114C
RUN: 2030 Alt 5: North C and South A
BARRIER DESIGN: INPUT HEIGHTS
ATMOSPHERICS: 20 deg C, 50% RH

Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h Calculated	Crit'n	Increase over existing Calculated	Crit'n Sub'l Inc	Type Impact	With Barrier Calculated LAeq1h	Noise Reduction Calculated	Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
A - Sunset	4	12	63.1	64.5	66	1.4	10	----	64.5	0.0	8	-8.0
B - Bush St	5	12	53.0	54.0	66	1.0	10	----	54.0	0.0	8	-8.0
C - Darst St	6	13	50.4	52.7	66	2.3	10	----	52.7	0.0	8	-8.0
D - SE Evans Lane	7	7	49.2	58.2	66	9.0	10	----	58.2	0.0	8	-8.0
E - Tiger Mnt High School	8	0	52.4	52.6	66	0.2	10	----	52.6	0.0	8	-8.0
F - Clark School	9	0	47.2	53.3	66	6.1	10	----	53.3	0.0	8	-8.0
G - Athletic Field	10	0	46.2	64.2	66	18.0	10	Sub'l Inc	64.2	0.0	8	-8.0
H - Issaquah High School	11	0	47.1	57.4	66	10.3	10	Sub'l Inc	57.4	0.0	8	-8.0
I - Front St (NW of 2nd)	12	2	59.7	57.7	66	-2.0	10	----	57.7	0.0	8	-8.0
J - Front St (NE of 2nd)	13	3	61.8	60.8	66	-1.0	10	----	60.8	0.0	8	-8.0
K - 2nd Ave	14	5	58.0	54.7	66	-3.3	10	----	54.7	0.0	8	-8.0
L - SE Kramer	15	2	45.6	63.6	66	18.0	10	Sub'l Inc	63.6	0.0	8	-8.0
M - South of South C	16	7	55.2	56.0	66	0.8	10	----	56.0	0.0	8	-8.0
N - Lewis Lane SE	17	2	48.6	65.7	66	17.1	10	Sub'l Inc	65.7	0.0	8	-8.0
O - Front St (SW of 2nd)	18	3	63.4	61.5	66	-1.9	10	----	61.5	0.0	8	-8.0
P - Front St (SE of 2nd)	19	5	62.0	60.5	66	-1.5	10	----	60.5	0.0	8	-8.0
Q - Issaquah -Hobart Rd.	20	3	59.1	59.8	66	0.7	10	----	59.8	0.0	8	-8.0

Dwelling Units	# DUs	Noise Reduction Min	Avg	Max
		dB	dB	dB
All Selected	76	0.0	0.0	0.0
All Impacted	4	0.0	0.0	0.0
All that meet NR Goal	0	0.0	0.0	0.0

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Ginette Lalonde

24 January 2003
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RESULTS: SOUND LEVELS
PROJECT/CONTRACT: SE Issaquah Bypass / 25114C
RUN: 2030 Alt 6: North C - South C
BARRIER DESIGN: INPUT HEIGHTS
ATMOSPHERICS: 20 deg C, 50% RH

Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h Calculated	Crit'n	Increase over existing Calculated	Crit'n Sub'l Inc	Type Impact	With Barrier Calculated LAeq1h	Noise Reduction Calculated	Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
A - Sunset	6	12	63.1	64.5	66	1.4	10	----	64.5	0.0	8	-8.0
B - Bush St	7	12	53.0	53.7	66	0.7	10	----	53.7	0.0	8	-8.0
C - Darst St	8	13	50.4	52.5	66	2.1	10	----	52.5	0.0	8	-8.0
D - SE Evans Lane	9	7	49.2	58.2	66	9.0	10	----	58.2	0.0	8	-8.0
E - Tiger Mnt High School	10	0	52.4	52.2	66	-0.2	10	----	52.2	0.0	8	-8.0
F - Clark School	11	0	47.2	53.5	66	6.3	10	----	53.5	0.0	8	-8.0
G - Athletic Field	12	0	46.2	64.2	66	18.0	10	Sub'l Inc	64.2	0.0	8	-8.0
H - Issaquah High School	13	0	47.1	57.4	66	10.3	10	Sub'l Inc	57.4	0.0	8	-8.0
I - Front St (NW of 2nd)	14	5	59.7	59.9	66	0.2	10	----	59.9	0.0	8	-8.0
J - Front St (NE of 2nd)	15	1	61.8	62.1	66	0.3	10	----	62.1	0.0	8	-8.0
K - 2nd Ave	16	2	58.0	59.3	66	1.3	10	----	59.3	0.0	8	-8.0
L - SE Kramer	17	3	45.6	55.3	66	9.7	10	----	55.3	0.0	8	-8.0
M - South of South C	18	7	55.2	68.1	66	12.9	10	Both	68.1	0.0	8	-8.0
N - Lewis Lane SE	19	7	48.6	54.9	66	6.3	10	----	54.9	0.0	8	-8.0
O - Front St (SW of 2nd)	20	3	63.4	64.8	66	1.4	10	----	64.8	0.0	8	-8.0
P - Front St (SE of 2nd)	21	5	62.0	65.9	66	3.9	10	----	65.9	0.0	8	-8.0
Q - Issaquah -Hobart Rd.	22	3	59.1	62.8	66	3.7	10	----	62.8	0.0	8	-8.0

Dwelling Units	# DUs	Noise Reduction Min	Avg	Max
		dB	dB	dB
All Selected	80	0.0	0.0	0.0
All Impacted	7	0.0	0.0	0.0
All that meet NR Goal	0	0.0	0.0	0.0

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RESULTS: SOUND LEVELS
PROJECT/CONTRACT: SE Issaquah Bypass / 25114C
RUN: 2030 Alt7: No Action
BARRIER DESIGN: INPUT HEIGHTS
ATMOSPHERICS: 20 deg C, 50% RH

Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h Calculated	No Barrier LAeq1h Crit'n	Increase over existing Calculated	Increase over existing Crit'n Sub'l Inc	Type Impact	With Barrier Calculated LAeq1h	Noise Reduction Calculated	Noise Reduction Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
A - Sunset	4	12	63.1	67.9	66	4.8	10	Snd Lvl	67.9	0.0	8	-8.0
B - Bush St	5	12	53.0	52.5	66	-0.5	10	----	52.5	0.0	8	-8.0
C - Darst St	6	13	50.4	54.5	66	4.1	10	----	54.5	0.0	8	-8.0
D - SE Evans Lane	7	7	49.2	51.3	66	2.1	10	----	51.3	0.0	8	-8.0
E - Tiger Mnt High School	8	0	52.4	56.7	66	4.3	10	----	56.7	0.0	8	-8.0
F - Clark School	9	0	47.2	50.7	66	3.5	10	----	50.7	0.0	8	-8.0
G - Athletic Field	10	0	46.2	49.1	66	2.9	10	----	49.1	0.0	8	-8.0
H - Issaquah High School	11	0	47.1	50.5	66	3.4	10	----	50.5	0.0	8	-8.0
I - Front St (NW of 2nd)	12	5	59.7	60.9	66	1.2	10	----	60.9	0.0	8	-8.0
J - Front St (NE of 2nd)	13	3	61.8	63.0	66	1.2	10	----	63.0	0.0	8	-8.0
K - 2nd Ave	14	5	58.0	61.4	66	3.4	10	----	61.4	0.0	8	-8.0
L - SE Kramer	15	3	45.6	48.5	66	2.9	10	----	48.5	0.0	8	-8.0
M - South of South C	16	7	55.2	58.7	66	3.5	10	----	58.7	0.0	8	-8.0
N - Lewis Lane SE	17	7	48.6	51.1	66	2.5	10	----	51.1	0.0	8	-8.0
O - Front St (SW of 2nd)	18	3	63.4	65.9	66	2.5	10	----	65.9	0.0	8	-8.0
P - Front St (SE of 2nd)	19	5	62.0	65.0	66	3.0	10	----	65.0	0.0	8	-8.0
Q - Issaquah -Hobart Rd.	20	3	59.1	62.4	66	3.3	10	----	62.4	0.0	8	-8.0

Dwelling Units	# DUs	Noise Reduction Min	Noise Reduction Avg	Noise Reduction Max
		dB	dB	dB
All Selected	85	0.0	0.0	0.0
All Impacted	12	0.0	0.0	0.0
All that meet NR Goal	0	0.0	0.0	0.0

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24 January 2003
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RESULTS: SOUND LEVELS
PROJECT/CONTRACT: SE Issaquah Bypass / 25114C
RUN: North A
BARRIER DESIGN: Wall 1 - Receptor D
ATMOSPHERICS: 20 deg C, 50% RH

Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.

Receiver												
Name	No.	#DUs	Existing LAeq1h	No Barrier					With Barrier			
				LAeq1h		Increase over existing		Type Impact	Calculated LAeq1h	Noise Reduction		
				Calculated	Crit'n	Calculated	Crit'n Sub'l Inc			Calculated	Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
D - SE Evans Lane	7	7	49.2	63.6	66	14.4	10	Sub'l Inc	57.1	6.5	8	-1.5

Dwelling Units	# DUs	Noise Reduction		
		Min	Avg	Max
		dB	dB	dB
All Selected	7	6.5	6.5	6.5
All Impacted	7	6.5	6.5	6.5
All that meet NR Goal	0	0.0	0.0	0.0

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24 January 2003
TNM 2.0

RESULTS: SOUND LEVELS
PROJECT/CONTRACT: SE Issaquah Bypass / 25114C
RUN: North A
BARRIER DESIGN: Wall 3
ATMOSPHERICS: 20 deg C, 50% RH

Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h Calculated	Crit'n	Increase over existing Calculated	Crit'n Sub'l Inc	Type Impact	With Barrier Calculated LAeq1h	Noise Reduction Calculated	Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
H - Issaquah High School	11	0	47.1	63.9	66	16.8	10	Sub'l Inc	56.3	7.6	8	-0.4

Dwelling Units	# DUs	Noise Reduction Min	Avg	Max
		dB	dB	dB
All Selected	0	7.6	7.6	7.6
All Impacted	0	7.6	7.6	7.6
All that meet NR Goal	0	0.0	0.0	0.0

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24 January 2003
TNM 2.0

RESULTS: SOUND LEVELS
PROJECT/CONTRACT: SE Issaquah Bypass / 25114C
RUN: South A
BARRIER DESIGN: Wall 5 - Receptor N
ATMOSPHERICS: 20 deg C, 50% RH

Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.

Receiver												
Name	No.	#DUs	Existing LAeq1h	No Barrier					With Barrier			
				LAeq1h		Increase over existing		Type Impact	Calculated LAeq1h	Noise Reduction		
				Calculated	Crit'n	Calculated	Crit'n Sub'l Inc			Calculated	Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
N - Lewis Lane SE	17	2	48.6	65.7	66	17.1	10	Sub'l Inc	58.2	7.5	8	-0.5

Dwelling Units	# DUs	Noise Reduction		
		Min	Avg	Max
		dB	dB	dB
All Selected	2	7.5	7.5	7.5
All Impacted	2	7.5	7.5	7.5
All that meet NR Goal	0	0.0	0.0	0.0

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24 January 2003
TNM 2.0

RESULTS: SOUND LEVELS
PROJECT/CONTRACT: SE Issaquah Bypass / 25114C
RUN: South C
BARRIER DESIGN: Wall 6 - Receptors M and P
ATMOSPHERICS: 20 deg C, 50% RH

Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.

Receiver												
Name	No.	#DUs	Existing LAeq1h	No Barrier					With Barrier			
				LAeq1h		Increase over existing		Type Impact	Calculated LAeq1h	Noise Reduction		
				Calculated	Crit'n	Calculated	Crit'n Sub'l Inc			Calculated	Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
P - Front St (SE of 2nd)	21	5	62.0	65.8	66	3.8	10	----	65.0	0.8	8	-7.2
M - South of South C	18	7	55.2	68.1	66	12.9	10	Both	60.0	8.1	8	0.1

Dwelling Units	# DUs	Noise Reduction		
		Min	Avg	Max
		dB	dB	dB
All Selected	12	0.8	4.5	8.1
All Impacted	7	8.1	8.1	8.1
All that meet NR Goal	7	8.1	8.1	8.1

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20 October 2003
TNM 2.1
Calculated with TNM 2.1

RESULTS: SOUND LEVELS

PROJECT/CONTRACT: SE Issaquah Bypass / 25114C
RUN: 2030 South C - Football Stadium
BARRIER DESIGN: INPUT HEIGHTS
ATMOSPHERICS: 20 deg C, 50% RH

Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.

Receiver												
Name	No.	#DUs	Existing	No Barrier					With Barrier			
			LAeq1h	LAeq1h		Increase over existing		Type	Calculated	Noise Reduction		
				Calculated	Crit'n	Calculated	Crit'n	Impact	LAeq1h	Calculated	Goal	Calculated
							Sub'l Inc					minus
												Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
H - Issaquah High School	12	0	47.1	63.9	66	16.8	10	Sub'l Inc	63.9	0.0	8	-8.0
K - 2nd Ave	15	2	58.0	58.8	66	0.8	10	----	58.8	0.0	8	-8.0
Middle Football Field	24	1	0.0	57.1	66	57.1	10	----	57.1	0.0	8	-8.0
Bleachers - Track Field	25	1	0.0	55.9	66	55.9	10	----	55.9	0.0	8	-8.0
Middle Baseball field	27	1	0.0	55.9	66	55.9	10	----	55.9	0.0	8	-8.0

Dwelling Units	# DUs	Noise Reduction		
		Min	Avg	Max
		dB	dB	dB
All Selected	5	0.0	0.0	0.0
All Impacted	0	0.0	0.0	0.0
All that meet NR Goal	0	0.0	0.0	0.0

Appendix H

Air Quality Technical Report

Southeast Issaquah Bypass

Draft Supplemental EIS

Technical Report
Southeast Issaquah Bypass

Air Quality

December 2003

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Executive Summary

The proposed Southeast Issaquah Bypass would provide a new arterial connecting the I-90 Sunset Interchange to the Issaquah-Hobart Road. The project was developed in coordination with federal and state permitting agencies, and includes three alignment options in the northern part of the project area and two alignment options in the southern part of the project area. All of the northern and southern segments meet at a common point in the middle of the project area.

The three north alignments extend southward from the I-90 Sunset Way interchange to Issaquah High School. The North A alignment is routed between the Issaquah High School building and its adjacent athletic field along the old railroad grade. The North B alignment is routed east of the North A alignment between the high school athletic field and the Issaquah Sportsman's Club. The North C alignment is routed east of both the school athletic field and the Issaquah Sportsmen's Club. The South A alignment extends southward from Issaquah High School to Issaquah-Hobart Road and is routed adjacent to the existing 6th Avenue SE west of the LDS church. The South C alignment extends south, bends west to Front Street South, and is routed south of Issaquah High School.

Seven alternatives are evaluated in this study. The alternatives are based on various combinations of the north and south optional alignments and a No Action Alternative, as follows:

Alternative 1: North A and South A alignments

Alternative 2: North A and South C alignments

Alternative 3: North B and South A alignments

Alternative 4: North B and South C alignments

Alternative 5: North C and South A alignments

Alternative 6: North C and South C alignments

Alternative 7: No Action

The Southeast Issaquah Bypass project area lies within ozone and CO maintenance areas. Potential air quality impacts for this project are evaluated for CO, ozone, and particulate matter.

Concentrations of CO were predicted for existing conditions (2000), the year of opening (2005), and the project design year (2030) using the Mobile and CAL3QHC models. Ozone concentrations that would result from this project were not modeled, because ozone is a secondary pollutant generated through a series of complex reactions between pollutants emitted from motor vehicles and other sources. Particulate emissions are construction-related and best controlled by mitigation measures during construction.

No exceedances of the national ambient air quality standards for CO were predicted to result from any of the build alternatives for the years 2005 and 2030. Therefore, no new significant adverse impacts would be created or worsened by the project under any of

the build alternatives, and mitigation would not be required for any of the alternatives. Impacts from the alternatives are summarized in Table 1.

The Southeast Issaquah Bypass project is included in the current conforming Metropolitan Transportation Plan and Transportation Improvement Plan. Because the project would not cause or contribute to any exceedances of the NAAQS and is included in a conforming plan, it meets the requirements of the EPA conformity rule and WAC 173-420.

Construction activities typical to roadway projects temporarily generate particulate matter and small amounts of other pollutants if not properly mitigated. Mitigation measures for minimizing construction impacts are presented in this report.

Table 1:
Summary of Air Quality Impacts and Mitigation

Alternative	Construction Impacts	Operation Impacts	Mitigation Measures
Alternatives 1, 3 and 5	Construction activities would temporarily generate particulate matter and small amounts of CO and NO_x.	Predicted maximum eight-hour CO concentrations would range from 3.7 to 6.0 ppm for the year 2005 and from 2.7 to 5.0 ppm for the year 2030.	None required
Alternatives 2, 4, 6	Identical to Alternative 1	Predicted maximum eight-hour CO concentrations hour range from 5.3 to 6.0 ppm for the year 2005 and from to 3.6 to 4.5 ppm for the year 2030.	None required
No Action	None	Predicted maximum eight-hour CO concentrations hour range from 4.8 to 5.0 ppm for the year 2005 and from 3.8 to 3.9 ppm for the year 2030.	None required

Introduction

This technical report analyzes the existing air quality and potential impacts associated with implementation of the proposed alternatives for the Southeast Issaquah Bypass project. The results of the analysis in this report will be incorporated into a project-specific Environmental Impact Statement (EIS) that meets the requirements of the National Environmental Policy Act (NEPA) (U.S.C. 4332(2)(c)) and the Washington State Environmental Policy Act (SEPA) (RCW 43.21C).

Background

The City of Issaquah is preparing an EIS for a new bypass arterial connecting the I-90 Sunset Interchange to the Issaquah-Hobart Road in southeastern Issaquah, Washington (Figure 1). The northern portion of the project is located in the City of Issaquah, and the southern portion is located in unincorporated King County. The proposed Southeast Bypass would be an approximately 2-kilometer (km) (1.25-mile [mi]) long multi-lane road with through-lanes and turn-lane channelization. The new arterial would be located along one of four alternative alignments defined in the *Southeast Issaquah Bypass Road Alternatives Alignment Study* (PBQD, 1997)

The EIS will also take into consideration the following two separate but related projects, which are in the preliminary design and environmental planning stage: (1) the proposed South Sammamish Plateau Access Road (South SPAR)/I-90 Sunset Interchange Modification project, and (2) the proposed North Sammamish Plateau Access Road (North SPAR).

The South SPAR/ I-90 Sunset Interchange project would involve construction of a new north-south arterial that would connect the I-90 East Sunset Way interchange with a new east-west arterial within the Issaquah Highlands development. The project would also modify the existing interchange to provide westbound and eastbound on-ramps and off-ramps. The project is currently being addressed in a separate NEPA EIS.

The North SPAR project would provide access from the proposed South SPAR to the existing intersection of Issaquah-Pine Lake Road Southeast and Issaquah-Fall City Road SE.

Description of Alternatives

This report evaluates six build alternatives and a No Action Alternative. As shown in Figure 2, the proposed Southeast Issaquah Bypass alignment alternatives include three alignment options in the northern part of the project area (North A, North B and North C), and two alignment options in the southern part of the project area (South A and South C). Each of the northern and southern segments meet at a common point in the middle of the project area. The three north alignments extend southward from the I-90 Sunset Way interchange to Issaquah High School. The North A alignment is routed between the Issaquah High School building and its adjacent athletic field along the old railroad grade. The North B alignment is routed east of the North A alignment between the high school athletic field and the Issaquah Sportsman's Club. The North C alignment

is routed east of both the school athletic field and the Issaquah Sportsmen's Club. The South A alignment extends southward from Issaquah High School to Issaquah-Hobart Road and is routed adjacent to the existing 6th Avenue SE west of the LDS church. The South C alignment extends south, bends west to Front Street South, and is routed south of Issaquah High School.

The following seven alternatives are evaluated in this study. The alternatives are based on various combinations of the north and south optional alignments and a No Action Alternative, as follows:

Alternative 1: North A and South A alignments

Alternative 2: North A and South C alignments

Alternative 3: North B and South A alignments

Alternative 4: North B and South C alignments

Alternative 5: North C and South A alignments

Alternative 6: North C and South C alignments

Alternative 7: No Action

Figure 1
Vicinity Map

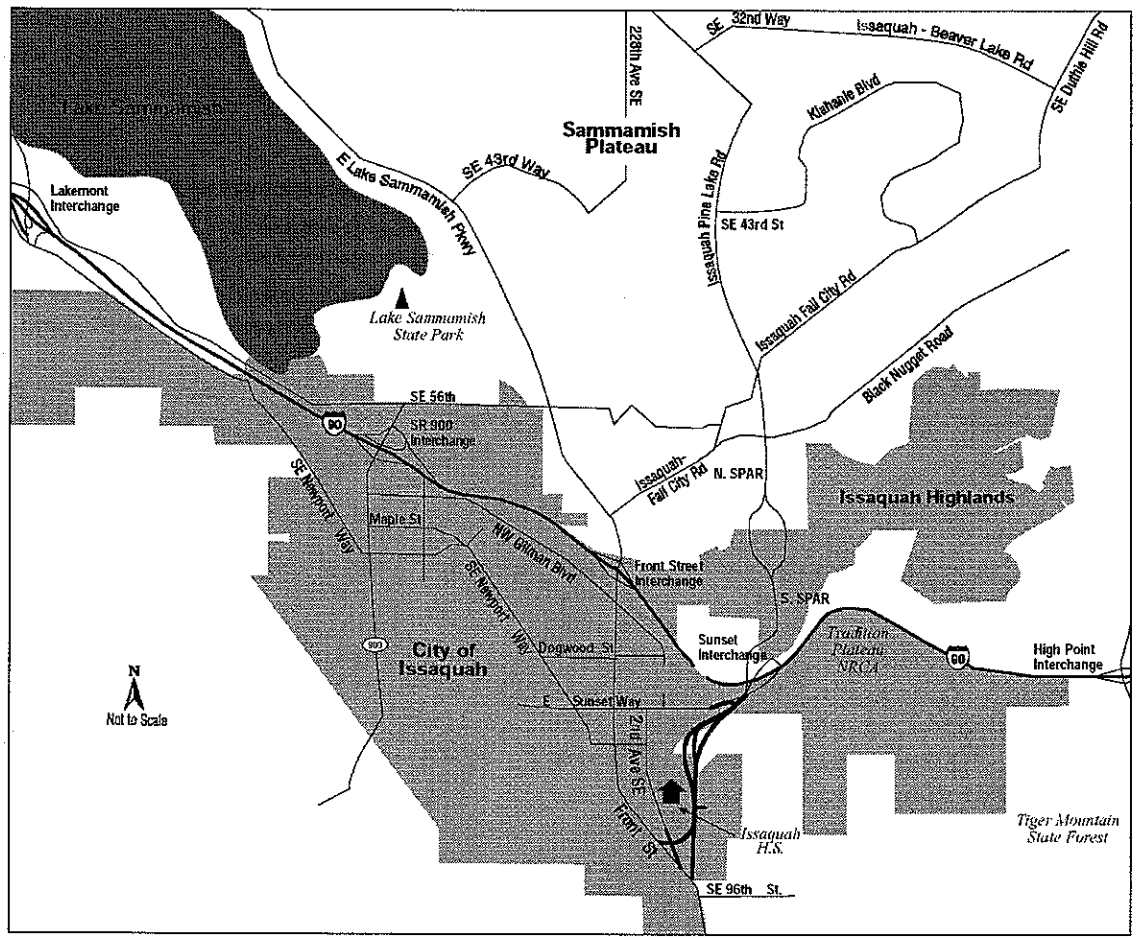
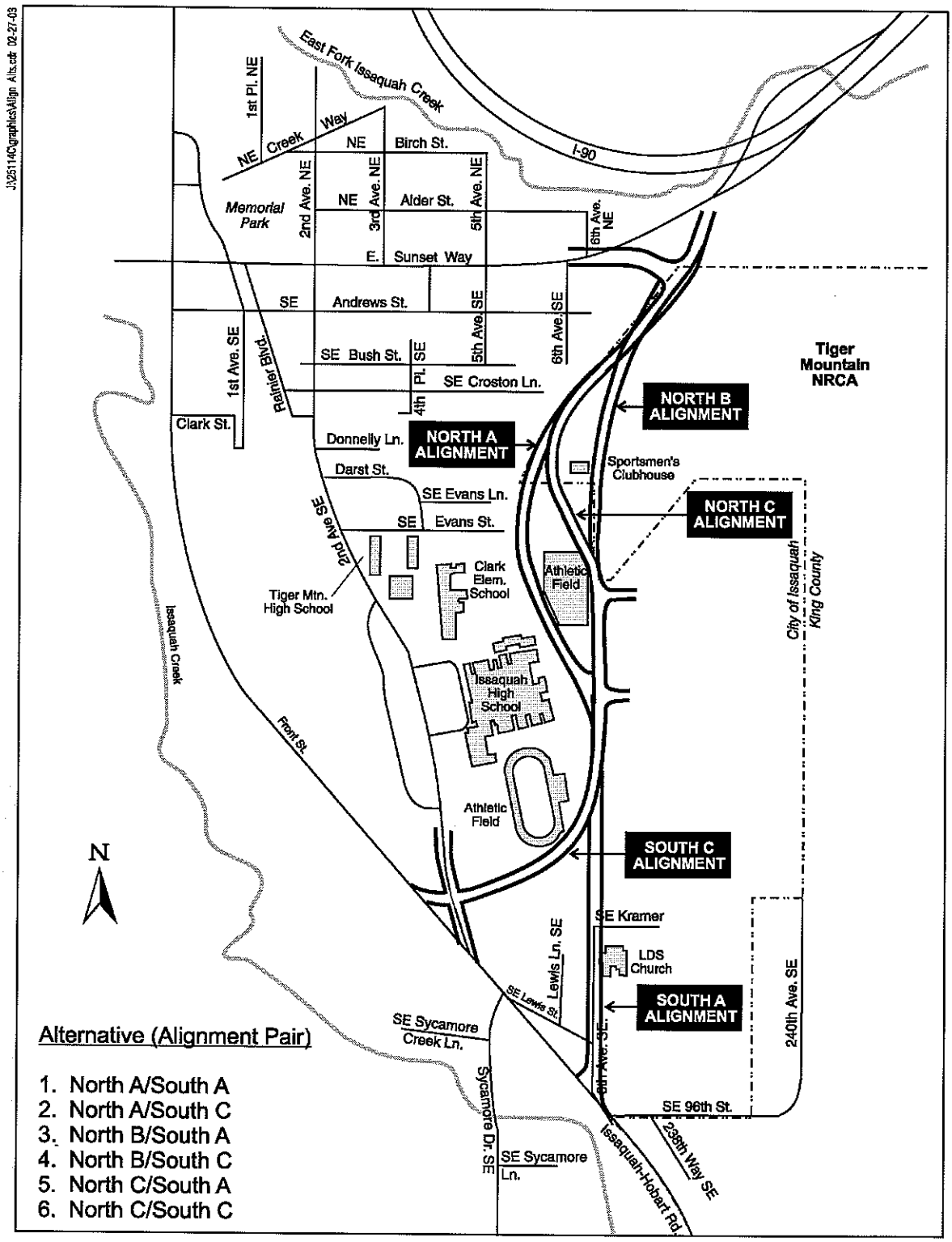


Figure 2
Alignment Alternatives



Studies and Coordination

The U.S. Environmental Protection Agency (EPA), Washington State Department of Ecology (WADOE), and Puget Sound Clean Air Agency (PSCAA) regulate air quality in the project area. Under the Clean Air Act, the EPA has established National Ambient Air Quality Standards (NAAQS), which specify maximum concentrations for carbon monoxide (CO), particulate matter less than 10 micrometers in size (PM_{10}), particulate matter less than 2.5 micrometers in size ($PM_{2.5}$), ozone, sulfur dioxide, lead, and nitrogen dioxide. These regulated pollutants are referred to as criteria pollutants. The standards applicable to transportation projects are summarized in Table 2.

A federal appeals court upheld the eight-hour ozone and $PM_{2.5}$ standards on March 26, 2002. This followed a Feb. 27, 2001 U.S. Supreme Court ruling that the Clean Air Act's requirement for EPA to establish national ambient air quality standards (NAAQS) at a level "requisite" to protect public health is within the constitutional scope of discretion that Congress can delegate to a federal agency (*Whitman v. American Trucking Associations*, U.S., No. 99-1257, 2/27/00). Because there is not yet sufficient background monitoring data, the EPA hasn't yet implemented the new standards. The one-hour ozone standard will be phased out and replaced by the new eight-hour standard.

The eight-hour CO standard of 9 parts per million (ppm) is the standard most likely to be exceeded as the result of transportation projects. Nonconformance with NAAQS may threaten federal funding of transportation projects in the state.

Nonattainment areas are geographical regions where air pollutant concentrations exceed the NAAQS. Air quality maintenance areas are regions that have recently attained compliance with the NAAQS. The Southeast Bypass study area lies within the Puget Sound ozone and CO air quality maintenance areas. Air quality emissions in the Puget Sound Region are currently being managed under the provisions of Air Quality Maintenance Plans (AQMP) for ozone and CO. PSCAA and WADOE developed the current plans and the EPA approved the plans in 1996. Any regionally significant transportation project in the Puget Sound Air Quality Maintenance areas must conform to the AQMPs. Conformity is demonstrated by showing that the project would not cause or contribute to any new violation of any NAAQS, increase the frequency or severity of any existing NAAQS violations, or delay timely attainment of the NAAQS.

Table 2
Summary of Ambient Air Quality Standards

Pollutant	National Primary Standard	Washington State Standard	PSCAA Regional Standard
CARBON MONOXIDE (CO)			
One-Hour Average (not to be exceeded more than once per year)	35 ppm	35 ppm	35 ppm
Eight-Hour Average (not to be exceeded more than once per year)	9 ppm	9 ppm	9 ppm
PM_{10}			
Annual Arithmetic Mean	50 $\mu g/m^3$	50 $\mu g/m^3$	50 $\mu g/m^3$
24-Hour Average Concentration (not to be exceeded more than once per year)	150 $\mu g/m^3$	150 $\mu g/m^3$	150 $\mu g/m^3$
$PM_{2.5}$			
Annual Arithmetic Mean	15 $\mu g/m^3$	NS	NS
24-Hour Average Concentration (not to be exceeded more than once per year)	65 $\mu g/m^3$	NS	NS
TOTAL SUSPENDED PARTICULATES (TSP)			
Annual Arithmetic Mean	NS	60 $\mu g/m^3$	60 $\mu g/m^3$
24-Hour Average Concentration (not to be exceeded more than once per year)	NS	150 $\mu g/m^3$	150 $\mu g/m^3$
OZONE			
One-Hour Average (not to be exceeded more than once per year)	0.12 ppm	0.12 ppm	0.12 ppm
Eight-Hour Average (not to be exceeded more than once per year)	0.08 ppm	NS	NS

Notes: ppm = parts per million
$\mu g/m^3$ = micrograms per cubic meter
NS = No Standard
Sources: PSCAA Regulation 1 (1994)
40 CFR Part 50 (1997)
WAC chapters. 173-470, 173-474, 173-175 (1987)

Climate

Weather directly influences air quality. Important meteorological factors include wind speed and direction, atmospheric stability, temperature, sunlight intensity, and mixing depth. Temperature inversions, which are associated with higher air pollution concentrations, occur when warmer air overlies cooler air. During temperature inversions in late fall and winter, particulates and CO from wood stoves and vehicle sources can be trapped close to the ground, which can lead to violations of the NAAQS. In the Puget Sound area, the highest ozone concentrations occur from mid-May until mid-September, when urban emissions are trapped by temperature inversions and followed by intense sunlight and high temperatures.

In 1999, the Department of Ecology replaced their Pollutant Standards Index (a scale of daily concentrations of individual air pollutants) with the Air Quality Index (AQI) that has been standardized by EPA. Using forecast meteorology and real-time pollutant monitoring WADOE and PSCAA forecast the AQI to be one of six levels: good, moderate, unhealthy to sensitive populations, unhealthy, very unhealthy, and hazardous. Since adoption of the AQI in the Puget Sound Region, there have been several instances of air quality in the moderate category. Between June1999 and December 2001, air quality was declared "unhealthy for sensitive groups" in western Washington eleven times, most often in Tacoma. It was declared unhealthy in Tacoma once during that period.

Carbon Monoxide

Carbon monoxide (CO) is a colorless, odorless, poisonous gas that reduces the blood's oxygen-carrying capability by bonding with hemoglobin and forming carboxyhemoglobin, which prevents oxygenation of the blood. Exposure to CO concentrations of 80 ppm over eight hours results in a carboxyhemoglobin level of approximately 15 percent (Erlich, 1977). Acute health effects such as headaches, slowed reflexes, weakened judgment, and impaired perception begins at about 3 percent carboxyhemoglobin (carbon monoxide bonding with 3 percent of the hemoglobin). Chronic effects include aggravation of pre-existing cardiovascular disease and increased heart disease risk in healthy individuals. At carboxyhemoglobin levels of approximately 30 percent, individuals become nauseous and collapse, and at very high levels (above 50 percent carboxyhemoglobin) individuals die.

The major source of CO is vehicular traffic, industry, wood stoves, and slash burns. In urban areas, motor vehicles are often the source of over 90 percent of the CO emissions that cause ambient levels to exceed the NAAQS (EPA, 1992).

Areas of high CO concentrations are usually localized. They occur near congested roadways and intersections in fall and winter and are associated with light winds, cool temperatures, and stable atmospheric conditions. These localized areas of elevated CO levels are referred to as "hot spots". CO concentration decreases in most areas have resulted from stringent federal emission standards for new vehicles and the gradual replacement of older, more polluting vehicles. CO levels have declined in urban areas, but are leveling off or increasing in areas experiencing rapid growth in traffic volumes, including remote suburbs in the Puget Sound region.

Particulate Matter

Particulate matter includes small particles of dust, soot, and organic matter suspended in the atmosphere. Particulates less than 100 micrometers in diameter are measured as Total Suspended Particulates (TSP). Particles less than 10 micrometers in size are measured as PM_{10}, a component of TSP. Particles less than 2.5 micrometers in size are measured as $PM_{2.5}$, a component of PM_{10} and TSP. The smaller $PM_{2.5}$ and PM_{10} particles can be inhaled deeply into the lungs, potentially leading to respiratory diseases and cancer because particulate matter may carry absorbed toxic substances, and the particle itself may be inherently toxic.

Particulate matter can affect visibility, plant growth, and building materials. Sources of particulates include motor vehicles, industrial boilers, wood stoves, open burning, and dust from roads, quarries, and construction activities. Most vehicular emissions are in the $PM_{2.5}$ size range, and road and construction dust is often in the larger PM_{10} size range. Most vehicle fine-particulate emissions result from diesel vehicles, which release fine particulates both directly (mostly as carbon compounds) and indirectly in the form of sulfur dioxide (SO_2), a gas that reacts in the atmosphere to form sulfate particulates. High $PM_{2.5}$ and PM_{10} concentrations occur in fall and winter during periods of air stagnation and high use of wood for heat. In the Puget Sound Region, fireplaces and woodstoves account for almost two-thirds of winter $PM_{2.5}$ emissions (PSCAA, 1999). On-road vehicle emissions contribute approximately 12 percent of the region's $PM_{2.5}$ emissions, and construction and other dust sources contribute approximately 6 percent.

Particulates emitted from diesel vehicles pose specific health risks compared to other types of particulate matter. The EPA's Clean Air Scientific Advisory Committee is currently reviewing recent health assessment data on diesel emissions, however the data is not yet available for citation. Previous EPA research (EPA, 1993) found that components of diesel particulates (primarily high-molecular-weight organic compounds) have several negative health effects, including carcinogenisis, accumulation of particles in the lungs, tissue inflammation, respiratory irritation, and other related effects. Health effects associated with diesel particulates were one of the major contributing factors to establishing the new $PM_{2.5}$ standard.

Ozone

Ozone is a highly toxic form of oxygen and a major component of the complex chemical mixture that forms photochemical smog. Ozone is not produced directly, but formed by a reaction between sunlight, nitrogen oxides (NO_x), and hydrocarbons (HC). Ozone is primarily a product of regional vehicular traffic, point-source, and fugitive emissions of the ozone precursors. Tropospheric (ground-level) ozone, which results from ground-level precursor emissions, is a health-risk. Stratospheric (upper-atmosphere) ozone, which is produced through a different set of chemical reactions that only require oxygen and intense sunlight, protects people from harmful solar radiation. In the remainder of this report, the term ozone refers to tropospheric ozone.

Ozone irritates the eyes and respiratory tract and increases the risk of respiratory and heart diseases. Ozone reduces the lung function of healthy people during exercise, can cause breathing difficulty in susceptible populations (such as asthmatics and the elderly), and damages crops, trees, paint, fabric, and synthetic rubber products. The

severity of the health effects are both dose and exposure-duration related (National Research Council, 1992). As with $PM_{2.5}$, the EPA has adopted a new eight-hour ozone standard (Table 2). However, the old one-hour standard is still applicable for current nonconformity and maintenance areas. Regional ozone planning efforts by PSCAA consider both standards.

In the Puget Sound area, the highest ozone concentrations occur from mid-May until mid-September, when urban emissions are trapped by temperature inversions and followed by intense sunlight and high temperatures. Maximum ozone levels generally occur between noon and early evening at locations several miles downwind from the sources, after NO_x and HC have had time to mix and react under sunlight. Light, northeasterly winds arising during these conditions result in high ozone concentrations near the Cascade foothills, to the south and southeast of major cities.

Hazardous Air Pollutants

Other chemicals or classes of chemicals in motor vehicle emissions that are considered hazardous by EPA include benzene, formaldehyde, 1,3-butadiene, acetaldehyde, and gasoline vapors (EPA, 1993). Benzene emissions in the Puget Sound region are substantially higher than the national average. The emissions of all of the transportation-related hazardous air pollutants are much lower than the emissions of the criteria pollutants evaluated in this study, and would vary in a similar fashion to the pollutants presented here.

Greenhouse Gases

Automobiles also emit greenhouse gases, primarily carbon dioxide (CO_2). CO_2 emissions are proportional to fuel consumption. Passenger cars emit on average 225 grams CO_2 per kilometer traveled (0.8 pounds per mile) and sport-utility vehicles and light trucks emit about 50 percent more CO_2 per mile because they are less efficient. These are an order of magnitude greater than CO emissions, and would vary between the alternatives in a similar fashion to CO emissions.

Methodology

Predictions of existing and future localized air pollution concentrations in the project vicinity for this and most other roadway air quality studies are made for CO only. Most other pollutants must be monitored and dealt with regionally. This is done for four reasons:

1. Total CO emissions in the atmosphere from automobiles are greater than the emissions of all other pollutants combined. For example, in 2015 an average automobile traveling at 35 mph is expected to emit approximately 13.6 grams of CO per mile of travel, but only 1.5 and 2.2 grams of HC and NO_x, respectively (Mobile 5b results).
2. Motor vehicles are the greatest source of CO emissions, accounting for more than 90% of total CO emissions in urban areas; therefore, it is generally not necessary to account for other, often unquantified, sources of CO near the project area (U.S. EPA, 1993).
3. The complex reactive natures of some of the other pollutants are such that accurate predictions of local ambient concentrations cannot be made using current modeling procedures (Wayne, 1991).
4. CO emissions from motor vehicles may be high enough to affect individuals in the immediate area, while most other pollutants are not (Erlich, 1977).

Average carbon monoxide (CO) peak-hour concentrations (in parts per million: ppm) were calculated for existing conditions (2000), for year of opening (2005), and the project design year (2030) using the p.m. peak hour traffic volumes presented in the Draft Southeast Bypass Transportation Technical Report using Mobile 5b emission factors and CAL3QHC software. Four scenarios were evaluated to determine the cumulative impacts of the Southeast Issaquah Bypass project with the proposed North SPAR and South SPAR / I-90 Sunset interchange projects. The intersections modeled were selected based on traffic volume, level of service, and the impact of the proposed project on traffic flow at their location.

The first model included Sunset interchange intersections. The second model covered the Front Street and 2nd Avenue intersection. The third model was created for a proposed Southeast Bypass and Part Pointe Access Road intersection. A fourth model was created for a proposed Southeast Bypass and Issaquah Hobart Road intersection for alternatives that include South C. The traffic data used for each model considered the effects of the upstream and/or downstream intersections that may have not been included in the model.

MOBILE5b Model

MOBILE5b is an updated version of the Mobile Source Emission Factor Model computer program developed by the EPA to calculate emission factors from highway motor vehicles in the units of grams of pollutant per mile traveled. Because MOBILE5b accounts for gradual replacement of older vehicles with newer, less-polluting vehicles, the predicted emission rates for future years are lower than current emission rates.

MOBILE5b emission factors for analysis of the 2000 existing conditions, 2005 and 2030 alternatives were provided by PSRC (Tier II Adjusted CO Mobile5b Output Files, February 2001).

CAL3QHC Model

CAL3QHC Version 2 is a line-source dispersion model that predicts pollutant concentrations near roadways. CAL3QHC input variables include MOBILE5b free flow and calculated idle emission factors, roadway geometries, traffic volumes, site characteristics, background pollutant concentrations, signal timing, and meteorological conditions. CAL3QHC predicts inert pollutant concentrations in ppm averaged over a one-hour period near roadways. CAL3QHC was used to predict CO concentrations at affected study-area intersections.

Carbon monoxide levels were modeled at four intersections including: Sunset Interchange, Front Street and 2nd Avenue, Southeast Bypass and the Park Pointe Access Road, and Southeast Bypass and Issaquah Hobart Road. Sunset Interchange, and Front Street and 2nd Avenue intersection were modeled for existing conditions (2000). All four intersections were modeled for 2005, and 2030 for each alternative.

CAL3QHC predicts peak one-hour pollutant concentrations based on stable meteorology and peak-hour traffic flow. This study assumed a wind speed of 1 meter (3 feet) per second and evaluated wind directions in 10-degree increments to select the worst-case wind angle. Background CO concentrations were assumed to be 3 ppm averaged over one-hour to represent Puget Sound conditions (Ecology, 1995). An atmospheric stability class of E (non-urban land use) was modeled per EPA Guidance (EPA, 1992). These conditions usually do not persist for an eight-hour period; therefore, the worst-case eight-hour CO concentrations are lower than the maximum one-hour concentrations. The eight-hour average CO concentration is calculated by multiplying the maximum one-hour concentration by a persistence factor, which accounts for the time variance in traffic and meteorological conditions. EPA recommends a persistence factor of 0.7 (EPA, 1992).

Free-flow traffic was modeled at the posted speed limit. Traffic volumes were obtained from the Southeast Bypass Project Draft Transportation Discipline Report (March, 2002). Traffic operations data, including turn movements, signal times, and saturation flow rates were taken from the Synchro and Sim Traffic runs that were completed as part of the transportation study.

Specific locations where CO concentrations are predicted are known as *receptors.* Receptors are modeled in locations where maximum concentrations likely would occur because of traffic congestion and where the general public would have access (EPA, 1992). For this analysis, receptors were located in areas accessible to the general public at mid-sidewalk distance from the edge of the travel lane and 6 feet off the ground. At each intersection, individual receptors were modeled at the corners and at 75-foot intervals to a distance of 10 feet from the intersection. Only the highest concentration of CO at each intersection was reported for each modeled scenario.

Typical link and receptor geometry is illustrated in Figure 5. Unsignalized operations were approximated by modeling stopped traffic using a short-duration signal cycle. Unstopped traffic was modeled as free-flowing.

Figure 3
Intersections Modeled for CO Concentrations

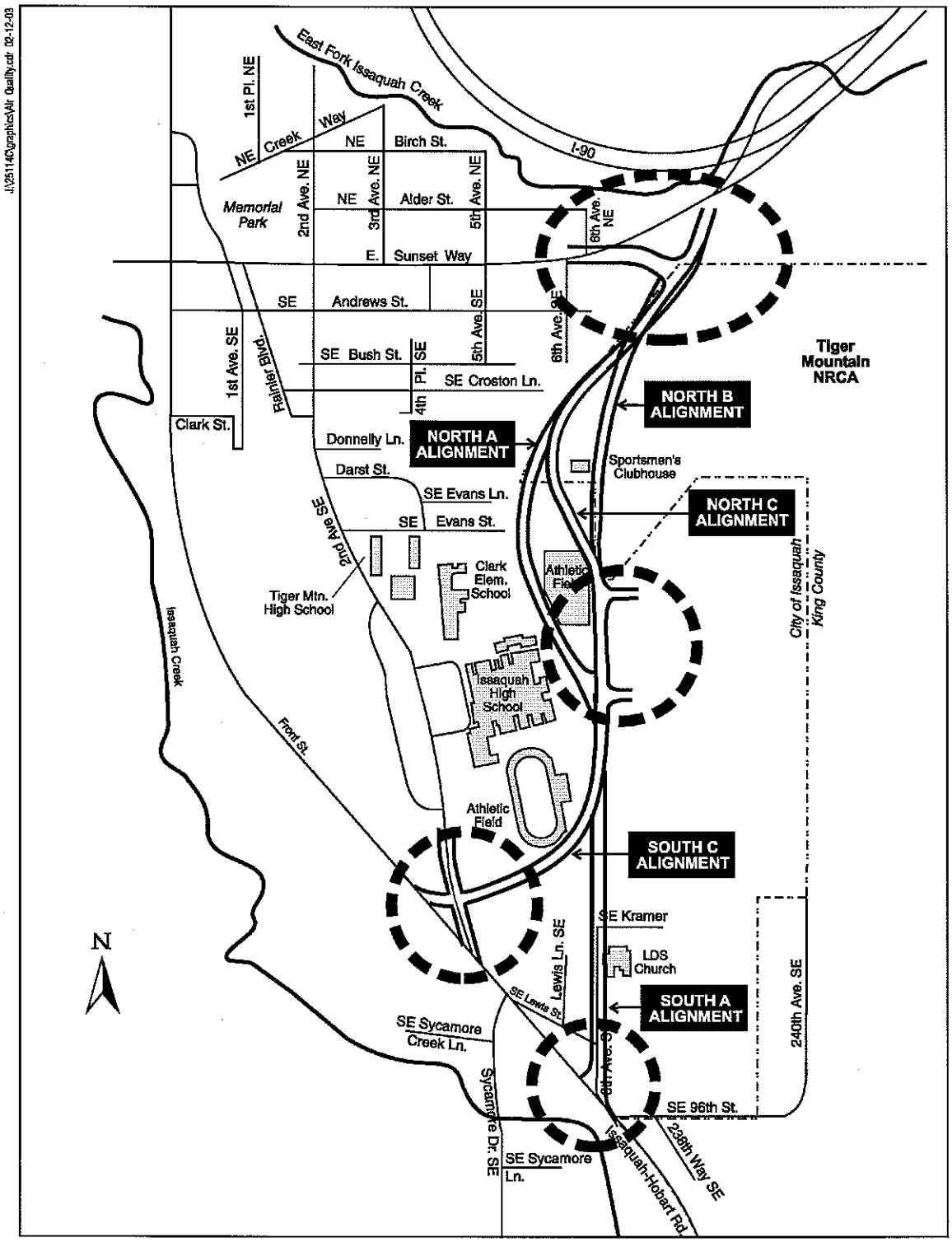
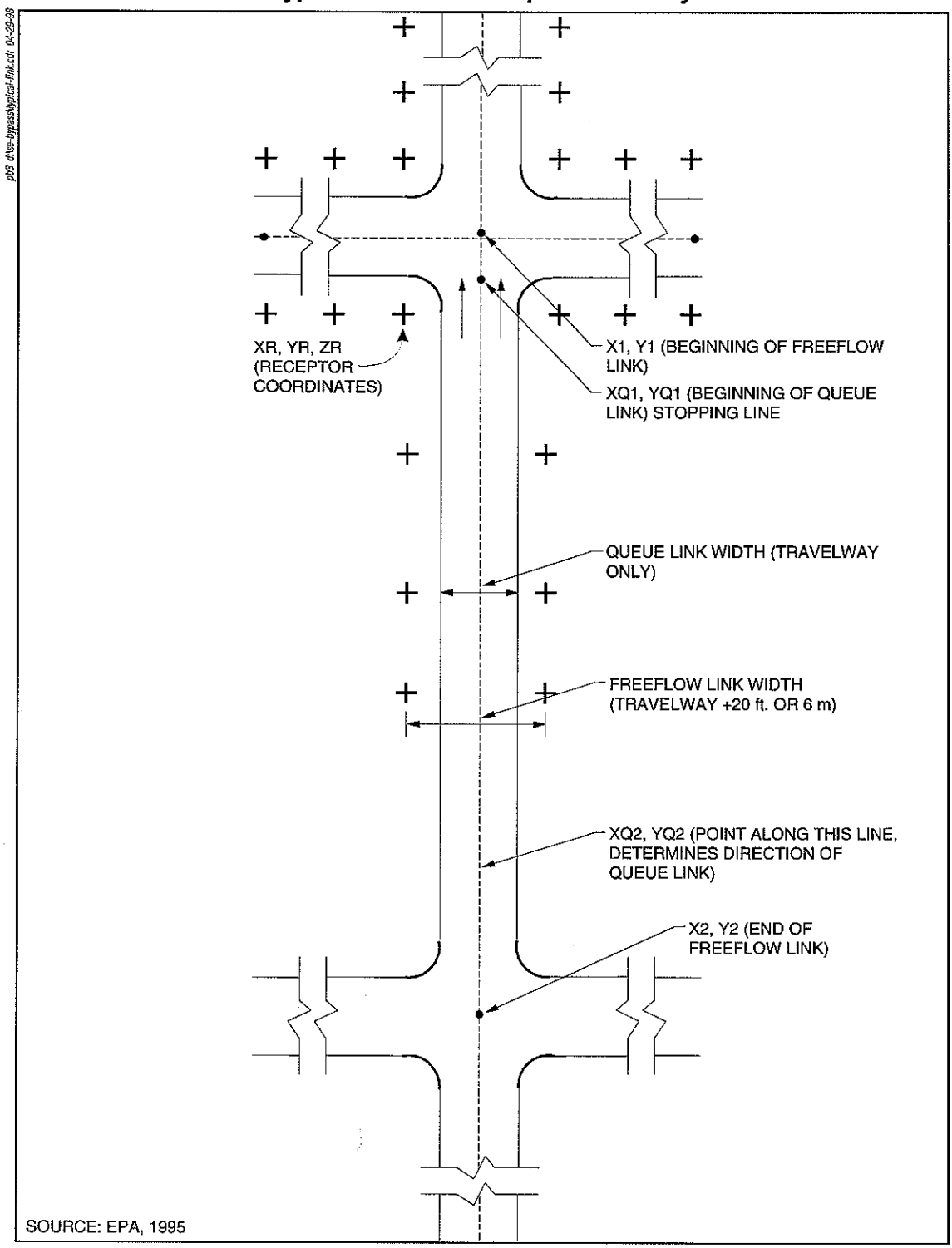


Figure 4
Typical Link and Receptor Geometry



SOURCE: EPA, 1995

Affected Environment

This chapter of the report describes the study area, emission trends, air quality monitoring, and localized carbon monoxide concentrations.

Emission Trends

Fuel combustion by motor vehicles and other sources releases carbon dioxide (CO_2), which is a "greenhouse gas" that traps heat within the earth's atmosphere. CO_2 is not directly harmful to human health and is not a criteria pollutant. Considerable progress has been made in the U.S. and in the Puget Sound Region to reduce criteria air pollutant emissions from motor vehicles and improve air quality since the 1970s, even as vehicle travel has increased rapidly.

Nationally, emissions of criteria pollutants decreased 25% between 1970 and 2001. In general, the air is noticeably cleaner than in 1970, and all criteria pollutant emissions from motor vehicles are less than they were in 1970, despite the fact that vehicle miles of travel have more than doubled. Still, challenges remain. Based on monitored data, approximately 46 million people in the U.S. reside in counties that did not meet the air quality standard for at least one NAAQS pollutant in 1996 (EPA 1996 and EPA 2002).

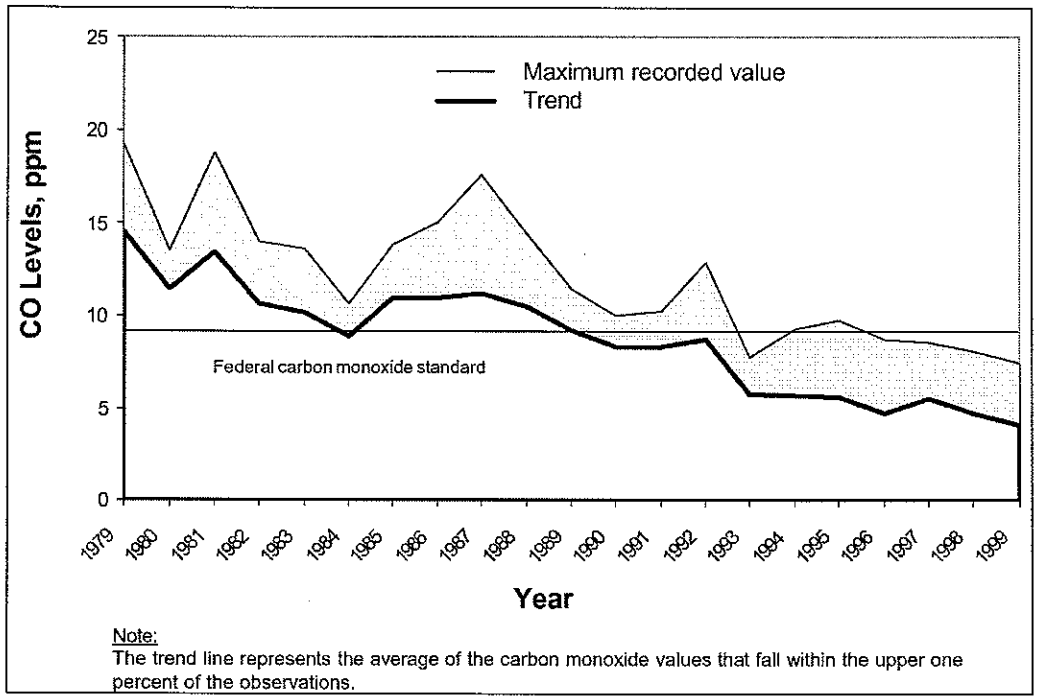
National Air Pollution Trends

Nationwide, air pollutant emissions from motor vehicles have dropped considerably since 1970. Volatile Organic Compound emissions (also referred to as hydrocarbon (HC) emissions) are down 38 percent, oxides of nitrogen (NO_x) emissions have increased 15 percent, emissions from particulate matter less than 10 micrometers in size (PM_{10}) are down 76 percent, and carbon monoxide (CO) emissions are down 19 percent. These reductions have occurred along with increasing population, economic growth, and vehicle travel (EPA, 2002).

Regional Air Pollution Trends

Regional air pollutant trends have generally followed national patterns over the last 20 years. Although the average weekday vehicle miles traveled in the central Puget Sound region has increased from 30 million miles in 1981 to 65 million in 1999 (PSRC, 2000), pollutant emissions associated with transportation sources have decreased. Carbon monoxide (CO) is the criteria pollutant most closely tied to transportation, with over 90 percent of the CO emissions in the Puget Sound urban areas coming from transportation sources. Regionally, the maximum measured CO concentrations have decreased over the past 20 years (see Figure 6). Other transportation pollutants have followed similar, but less pronounced trends.

Figure 5:
Central Puget Sound Region Carbon Monoxide Trends



Source: Department of Ecology, 1999

The Puget Sound Regional Council (PSRC) completed the regional emission analysis, to evaluate the air quality effects of *Destination 2030*, the new Metropolitan Transportation Plan (MTP) for the central Puget Sound region through 2030. The emission analysis includes updates to reflect new EPA emission requirements, including the Tier II Gasoline/Sulfur Rule. The revised emission budget from the latest Air Quality Maintenance Plan (AQMP) and the most recent emission trend modeling are shown in Table 3.

Table 3:
Destination 2030 Regional Air Pollutant Emission Projections
(metric tons per day)

Pollutant	AQMP Budget	2010 PSRC MTP Forecast	2020 PSRC MTP Forecast	2030 PSRC MTP Forecast
Carbon Monoxide	1,497	860	718	735
Hydrocarbons	248	164	171	202
Nitrogen Oxides	263	206	199	217

Source: PSRC, 2001

Based on the *Destination 2030* analysis, none of the future transportation emissions scenarios is expected to exceed the regional AQMP transportation emission budgets. The downward trend in CO is expected to continue for the Puget Sound region through 2020, but is expected to begin increasing again by 2030 because of increases in vehicle miles traveled. For ozone, the future trend is not as positive. Hydrocarbon emissions, which largely drive ozone formation in the central Puget Sound region, are projected to increase between 2010 and 2020 and continue to increase to 2030. However, hydrocarbon emissions are expected to be below the emissions budget through 2030.

Air Quality Monitoring

Monitoring Results for Criteria Pollutants

The evaluation of existing air quality is based on ambient air quality data collected and published by the Department of Ecology and the Puget Sound Clean Air Agency (PSCAA). WADOE and PSCAA have established air pollution monitoring stations throughout Washington State. In general, these stations are located where air quality problems have been identified. The closest air quality monitoring station for CO is approximately 20 kilometers (15 miles) west of the project area. No exceedance of NAAQS for CO were observed at this location from 1997 through 2002. The Department of Ecology also monitors ozone, and the nearest monitoring station is at Lake Sammamish State Park, approximately 10 kilometers (5miles) west of the project area. No exceedances of NAAQS for ozone were observed at this location from 1997 through 2002. The closest PM_{10} monitoring station to the study area is located approximately 20 kilometers (15 miles) west of the project area in downtown Bellevue. Both 24-maximum and annual levels at this monitoring station were well below the primary standards from 1997 to 1999; this monitor was not operating in 2000, 2001 or 2002.

Localized Carbon Monoxide Concentrations

One-hour and eight-hour average CO concentrations for the 2000 existing conditions scenario were modeled using the same methodology as 2005 and 2030 predictions (refer to Tables 4 and Table 5, respectively). Because consistent methodology and assumptions were utilized, modeled CO concentration for 2000 can be compared with those predicted for future alternatives, to show the trend in air quality expected in the project area.

Table 4.
Maximum One-Hour Average CO Concentrations

Scenario	Intersection			
	Sunset Interchange	**Front Street and 2nd Avenue**	**Southeast Issaquah Bypass and Park Pointe Access Road**	**Southeast Issaquah Bypass and Issaquah-Hobart Road**
2000 Existing Conditions	NA	6.4	NA	NA
2005 Alternatives 1, 3 & 5 (North A, B, C and South A)	7.1	5.3	8.6	7.1
2005 Alternatives 2, 4 & 6 (North A, B, C and South C)	7.1	7.6	8.6	NA
2005 Alternative 7 (No Action)	7.1	6.8	NA	NA
2030 Alternatives 1, 3 & 5 (North A, B, C and South A)	6.4	3.9	5.1	7.1
2030 Alternatives 2, 4 & 6 (North A, B, C and South C)	6.4	5.9	5.1	NA
2030 Alternative 7 (No Action)	5.4	5.6	NA	NA

Notes:

NA = Not Applicable (the intersection would not exist under this alternative)

Concentration values are in parts per million (ppm).

The one-hour average NAAQS for CO is 35 ppm.

Table 5
Maximum Eight-Hour Average CO Concentrations

	Intersection			
Scenario	**Sunset Interchange**	**Front Street and 2nd Avenue**	**Southeast Issaquah Bypass and Park Pointe Access Road**	**Southeast Issaquah Bypass and Issaquah-Hobart Road**
2000 Existing Conditions	NA	4.5	NA	NA
2005 Alternatives 1, 3 & 5 (North A, B, C and South A)	5.0	3.7	6.0	5.0
2005 Alternatives 2, 4 & 6 (North A, B, C and South C)	5.0	5.3	6.0	NA
2005 Alternative 7 (No Action)	5.0	4.8	NA	NA
2030 Alternatives 1, 3 & 5 (North A, B, C and South A)	4.5	2.7	3.6	5.0
2030 Alternatives 2, 4 & 6 (North A, B, C and South C)	4.5	4.1	3.6	NA
2030 Alternative 7 (No Action)	3.8	3.9	NA	NA

Notes:

NA = Not Applicable (the intersection would not exist under this alternative)

Concentration values are in parts per million (ppm).

The eight-hour average NAAQS for CO is 9 ppm.

Impacts

This chapter discussed the construction, operation, secondary and cumulative impacts that would result from the Southeast Bypass Project.

Long-term effects on air quality in the project area would result primarily from vehicle emissions. At some locations air quality would improve compared to existing conditions because of decreases in vehicular emissions through baseline transportation improvements independent of this project, emission reductions as a result of the Puget Sound area inspection and maintenance (I&M) program, stricter vehicle emission standards for new cars, and gradual replacement of older, more polluting vehicles with newer, cleaner cars. Future decreases in emissions per vehicle will partially offset increases in emissions from growth in background traffic, slower vehicular speeds, and the elimination of oxygenated fuels in the Puget Sound area after 1996. Intersection impacts from the six build alternatives would be identical except at the intersection of the bypass and Front Street for the South A and South C alternatives.

Alternatives 1 to 6: Build Alternatives

Construction

Fugitive emissions from particulate matter less than 10 micrometers in size (PM_{10}) would be associated with land clearing, ground excavation, cut-and-fill operations, and construction of alternatives. Construction emissions would be greatest during the earthwork phase, because most emissions would be associated with moving dirt on the site.

PM_{10} emissions would vary from day to day, depending on the level of activity, specific operations, and weather conditions. PM_{10} emissions would depend on soil moisture, silt content of soil, wind speed, and amount and type of operating equipment. Larger dust particles would settle near the source, and fine particles would be dispersed over greater distances from the construction site.

The quantity of particulate emissions would be proportional to the area of the construction operations and the level of activity. Based on field measurements of suspended dust emissions from construction projects, an approximate emission factor for construction operations would be 1.2 tons per acre of construction per month of activity (U.S. EPA, 1985). Emissions would be reduced if less of the site was disturbed or mitigation was performed.

Several residences are within 100 meters (300 feet) of the proposed Southeast Issaquah bypass alignments; more residences would be within that distance under Alternative 2 than under any other alternative. At that distance, fugitive PM_{10} emissions from construction activities would be noticeable, if uncontrolled. Mud and particulates from trucks would also be noticeable if construction trucks would be routed through residential neighborhoods. Construction would require mitigation measures to comply with Puget Sound Clean Air Agency (PSCAA) regulations that require dust control during construction and prevent the deposition of mud on paved streets (PSCAA Regulation 1,

Article 9). Measures to reduce the deposition of mud and emissions of particulates are identified in the Mitigation section.

In addition to particulate emissions, heavy trucks and construction equipment powered by gasoline and diesel engines would generate small particulates, CO, and NO_x in exhaust emissions. If construction traffic were to reduce the speed of other vehicles in the area, emissions from traffic would increase slightly while those vehicles are delayed. These emissions would be temporary and limited to the immediate area surrounding the construction site. It would contribute a small amount compared with automobile traffic in the project area, because construction traffic would be a very small fraction of the total traffic in the area.

Some construction phases (particularly during paving operations using asphalt) would result in short-term odors. These odors might be detectable to some people near the project site, and would be diluted as distance from the site increases.

There will be no on-site burning of slash or other debris allowed during construction. Also, no asphalt batching or gravel crushing would occur on site, and therefore no stationary source permits will be required.

Operation

The predicted worst-case CO concentrations under all build alternatives for years 2005 and 2030 would not exceed the one-hour average or the eight-hour average NAAQS for CO at any location (see Table 4 and 5). Predicted maximum one-hour CO concentrations from vehicle emissions under the Build Alternatives ranged from 5.3 to 8.6 ppm for the year 2005 and from 3.9 to 7.1 ppm for the year 2030 (Table 4). These values are all below the one-hour average NAAQS of 35 ppm for CO. Predicted maximum eight-hour CO concentrations from vehicle emissions under the Build Alternatives ranged from 3.7 to 6.0 ppm for the year 2005 and from 2.7 to 5.0 ppm for the year 2030 (Table 5). These values are all below the eight-hour average NAAQS of 9 ppm for CO.

Alternative 7: No Action

Construction

No construction activities would take place under this alternative. Therefore, there would be no construction air quality impacts.

Operation

The predicted worst-case CO concentrations under all No Action Alternatives for years 2005 and 2030 would not exceed the one-hour average or the eight-hour average NAAQS for CO at any location (see Table 4 and 5). Predicted maximum one-hour CO concentrations from vehicle emissions under the Build Alternatives ranged from 6.8 to 7.1 ppm for the year 2005 and from 5.4 to 5.6 ppm for the year 2030 (Table 4). Predicted maximum eight-hour CO concentrations from vehicle

emissions under the Build Alternatives ranged from 4.8 to 5.0 ppm for the year 2005 and from 3.8 to 3.9 ppm for the year 2030 (Table 5).

Secondary and Cumulative Impacts

The air quality analysis described in this report was performed using projected traffic volumes for the future years. These projected traffic volumes incorporate anticipated traffic generation from planned development in the project area. Therefore, the air quality analysis includes the secondary and cumulative affects of the project and other traffic growth that would be associated with the project.

Mitigation

This chapter discusses mitigation measures that would be involved in the construction and operation of the Southeast Issaquah Bypass.

Construction

Particulate emissions (in the form of fugitive dust during construction activities) are regulated by PSCAA. Operators of fugitive dust sources shall take reasonable precautions to prevent this dust from becoming airborne, and shall maintain and operate the source to minimize emissions. Construction impacts could be reduced by incorporating the mitigation measures outlined in the Associated General Contractor of Washington Guidelines into the project's construction specifications. Possible mitigation measures to control PM_{10}, deposition of particulate matter, and emissions of CO and NOx during construction are listed below:

- Spray exposed soil with water or other dust palliatives to reduce emissions of PM_{10} and deposition of particulate matter.
- To reduce PM_{10} and deposition of particulates during transportation, cover all trucks transporting materials, wet materials in trucks, or provide adequate freeboard (space from the top of the material to the top of the truck).
- To decrease deposition of particulate matter on area roadways, provide wheel washers to remove particulate matter that would otherwise be carried off-site.
- Remove particulate matter deposited on paved, public roads to reduce mud on area roadways.
- Route and schedule construction trucks so as to reduce delays to traffic during peak travel times. This would reduce secondary air quality impacts caused by a reduction in traffic speeds while waiting for construction trucks.
- Place quarry spall aprons where trucks enter public roads, to reduce mud track-out.
- Gravel or pave haul roads to reduce particulate emissions.
- Require appropriate emission-control devices on all construction equipment powered by gasoline or diesel fuel, to reduce CO and NO_x emissions in vehicular exhaust. Use relatively new, well-maintained equipment to reduce CO and NO_x emissions.
- Plant vegetative cover as soon as possible after grading, to reduce windblown particulates in the area.
- Route construction trucks away from residential areas to minimize annoyance from dust.

Operation

Because no exceedance of NAAQS are predicted, no design or operational changes would be required.

Conformity Determination

FHWA and WSDOT projects must comply with the project-level conformity criteria of the EPA Conformity Rule, and with WAC Chapter 173-420. Regionally significant projects must be included in a conforming Metropolitan Transportation Plan (MTP) and Transportation Improvement Plan (TIP) by the regional metropolitan planning organization (MPO). The Southeast Issaquah Bypass project is included in the latest version of the PSRC's MTP and TIP as project ISS-9. As stated in 40 Code of Federal Regulation (CFR) Part 93, the following criteria must be met when determining project conformity. A brief summary of the project's conformity to the State Implementation Plan (SIP) is discussed with each criterion (criteria are indicated by italics).

- *The conformity determination must be based on the latest planning assumptions.* The Southeast Issaquah Bypass project is included in the latest version of the PSRC's MTP and TIP as project ISS-9. The plans rely on the most current planning assumptions approved by the PSRC.
- *The conformity determination must be based on the latest emission estimation model available.* Emissions to determine conformity to the MTP and TIP were calculated using MOBILE5b, the emission model used to model conformity of the current Puget Sound Air Quality Maintenance Plans.
- *The project must come from a conforming transportation plan and program.* The Southeast Issaquah Bypass project is included in the latest version of the PSRC's MTP and TIP as project ISS-9.
- *There must be a current conforming plan and a current conforming TIP at the time of project approval.* There is a current conforming MTP and TIP.
- *The project must come from a conforming transportation plan and program.* The Southeast Issaquah Bypass project is included in the latest version of the PSRC's MTP and TIP as project ISS-9.
- *The FHWA project must not cause or contribute to any new localized CO or violation in CO and PM_{10} nonattainment or maintenance areas.* The project is located in a CO maintenance area. As shown in Tables 4 and 5, under the project, no CO violations in the project area would occur in 2005 or 2030. The project area is in conformity for PM_{10}.
- *The FHWA project must comply with PM_{10} control measures in the applicable implementation plan.* The area is in conformity for PM_{10}, so no implementation plan is required.

Conformity Finding: The project meets the criteria of 40 CFR Part 93 and WAC 173-420 for projects from a conforming plan and TIP. The project meets all of the hot-spot criteria of 40 CFR Part 93 and WAC 173-420-065. The project meets the conformity criteria of 40 CFR Part 93 and WAC 173-420 and conforms to the SIP.

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Appendix A: Air Quality Data Files

For full Cal3QHC air quality input and output data files, please contact the City of Issaquah.