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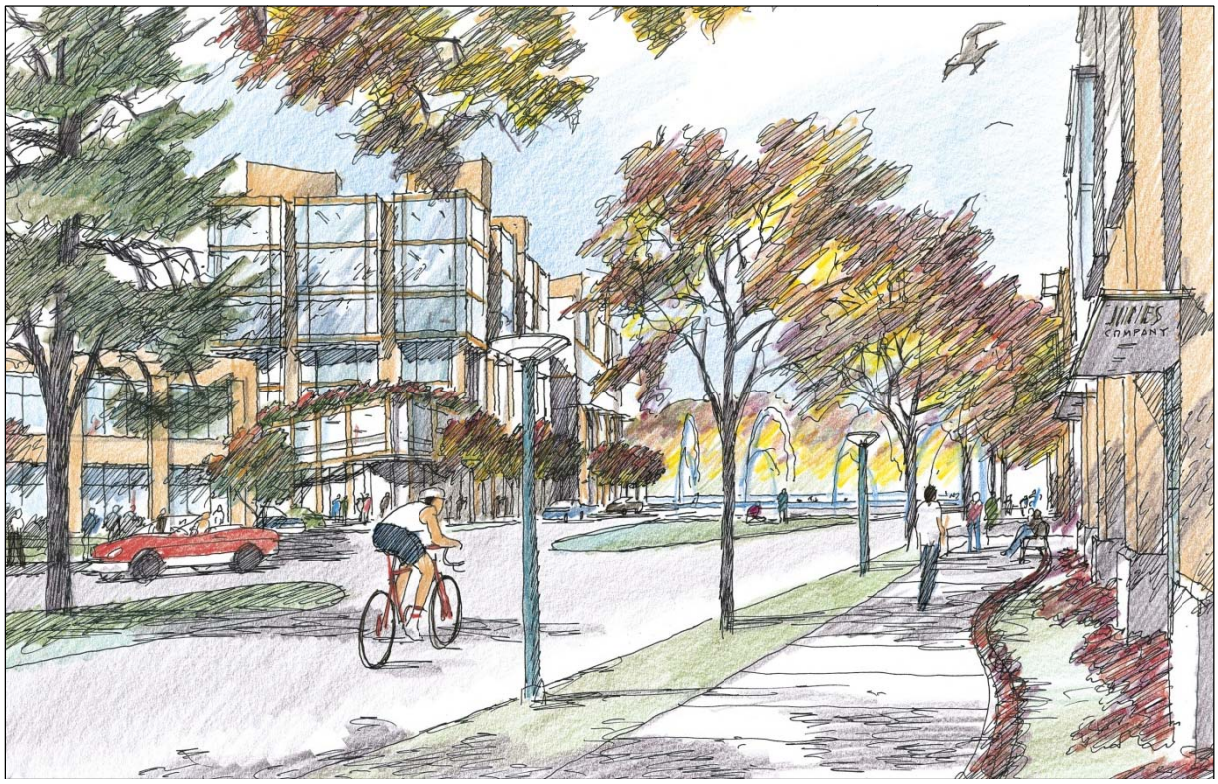
Draft Environmental Impact Statement

20th Street SE Corridor



Subarea Plan

CITY OF LAKE STEVENS

Planning and Community Development
City of Lake Stevens
P. O. Box 257
Lake Stevens, WA 98258
(425) 377-3230

January 24, 2012

Dear Affected Agencies, Tribes, Organizations and Interested Parties:

Enclosed is the Draft Environmental Impact Statement (Draft EIS) for the 20th Street SE Corridor Subarea Plan. This document has been prepared to comply with the requirements of the State Environmental Policy Act (SEPA).

The 845-acre 20th Street SE Corridor subarea covers an area of the city that is substantially undeveloped, but which includes existing residential neighborhoods, a park, schools, and a small commercial area. The City is considering the following actions:

1. Adopting a subarea plan, pursuant to the Revised Code of Washington (RCW) 36.70A.080, which will amend and become an element of the Lake Stevens Comprehensive Plan;
2. Amending the zoning map to rezone properties consistent with the subarea plan;
3. Revising the zoning code to amend or adopt new classifications, development standards and/or design guidelines;
4. Amending the Comprehensive Plan's Transportation Element and Capital Facilities Element to address infrastructure needs required to support planned growth in the subarea; and
5. Adopting an ordinance designating the subarea as a Planned Action, pursuant to the State Environmental Policy Act (SEPA, RCW 43.21C.031) and the SEPA Rules (Washington Administrative Code (WAC, 197-11-164), for purposes of future environmental review and permitting.

Subarea plan objectives encourage creation of an employment center with mixed-use and commercial nodes and higher density residential to increase economic development, balance jobs and housing, guide future growth, and improve infrastructure.

The City is using an integrated planning and environmental review process to evaluate three land use alternatives for the subarea. The alternatives presented in the Draft EIS consider varying levels of growth and place different emphases on commercial or residential land uses. There is not a preferred alternative at this time. The table below summarizes the land use assumptions for the alternatives.

Alternative	Retail (Gross Sq. Ft)	Office (Gross Sq. Ft)	Housing Units (dwelling units)
Alternative 1 – No Action	150,000-180,000 gsf	20,000-35,000 gsf	600-1,200 du
Alternative 2 – Employment/Commercial Emphasis	400,000-450,000 gsf	1-1.25 million gsf	900-1,000 du
Alternative 3 – Moderate Employment/Commercial with Residential Emphasis	300,000-350,000 gsf	600,000 - 750,000 gsf	1,200-1,400 du

The Draft EIS considers the following broad areas of environmental concern:

- Earth
- Stormwater
- Water Resources
- Plants & Animals
- Air Quality & Greenhouse Gas Emissions
- Cultural Resources
- Land Use
- Population, Housing & Employment
- Aesthetics
- Transportation
- Public Services
- Utilities

The City of Lakes Stevens has distributed the Draft EIS to agencies, tribes and organizations noted on the Distribution List. Interested parties can review the Draft EIS and background information concerning the proposal, between the hours of 8:30 AM and 4:30 PM, at the Lake Stevens Department of Planning and Community Development offices at 1812 Main Street, Lake Stevens, WA 98258. The Draft EIS is also available for review at the Lake Stevens Library located at 1804 Main Street.

Printed and CD copies of the Draft EIS may also be purchased from the Lake Stevens Planning and Community Development Department at the address listed above. The Draft EIS is also available on the internet at the City's website and can be viewed or downloaded at http://www.ci.lake-stevens.wa.us/20thStreetSECorridor.htm.

Comments Invited: The public comment period for this Draft EIS is **January 24, 2012 through March 8, 2012**. Interested parties and affected agencies should address comments to the SEPA Responsible Official at the following address:

Rebecca Ableman, SEPA Responsible Official
City of Lake Stevens
P.O. Box 257
Lake Stevens, WA 98258
Fax: 425.212.3327
Email: bableman@lakestevenswa.gov

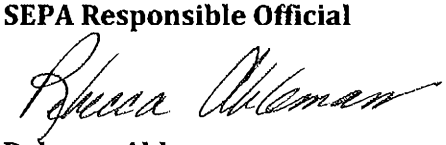
For additional information, please contact:

Karen Watkins, Principal Planner
City of Lake Stevens
P.O. Box 257
Lake Stevens, WA 98258
425.377.3221
kwatkins@lakestevenswa.gov

The City has scheduled a public meeting on the Draft EIS for Thursday, February 16, 2012, 6:00 pm at the Lake Stevens Fire Conference Center, 10518 18th Street SE, Lake Stevens. Interested parties may provide comments at the meeting.

Thank you for your interest in the 20th Street SE Subarea Plan.

SEPA Responsible Official



Rebecca Ableman

FACT SHEET

Project Title

20th Street SE Corridor Subarea Plan/Planned Action

Proponent

City of Lake Stevens

Location

The City of Lake Stevens is located in Snohomish County, approximately six miles east of downtown Everett. The 20th Street SE Corridor crosses the southern side of the City from approximately South Lake Stevens Road in the east to Cavalero Road in the west and is a major east-west route for traffic to Interstate 5 via State Route (SR) 2 on the trestle to Everett. The 20th Street SE Corridor Subarea is comprised of approximately 845 acres of land located north and south of 20th Street SE, east and west of SR-9.

Proposed Action & Alternatives

The City of Lake Stevens will consider the following actions and approvals:

1. Adopting a subarea plan, pursuant to the Revised Code of Washington (RCW) 36.70A.080, for the 20th Street SE Corridor Subarea, which will amend and become an element of the Lake Stevens Comprehensive Plan;
2. Amending the zoning map to rezone properties consistent with the subarea plan;
3. Revising the zoning code text to amend or adopt new classifications, development standards and/or design guidelines;
4. Amending the Comprehensive Plan's Transportation Element and Capital Facilities Element to address infrastructure needs required to support planned growth in the subarea; and
5. Adopting an ordinance designating the subarea as a Planned Action, pursuant to the State Environmental Policy Act (SEPA, RCW 43.21C.031), and the SEPA Rules (Washington Administrative Code (WAC) 197-11-164), for purposes of future environmental review and permitting.

These actions are legislative in nature and require a public hearing(s), a recommendation by the Planning Commission and approval by the City Council.
The EIS considers three alternatives, which involve different amounts, types and intensities of growth within the subarea:

> ***Alternative 1/No Action,*** which is required by SEPA, assumes continued growth under existing zoning and current plans without the adoption of a subarea plan;

Alternative 2, places the greatest emphasis on encouraging and accommodating significant employment and commercial growth in the subarea. It focuses growth in a number of nodes along the corridor, alongside some larger complexes, with an increase in high-density residential uses in transitional areas; and

Alternative 3, which is similar to *Alternative 2,* emphasizes moderate employment growth in identified commercial and mixed-use nodes and centers, but places a greater relative emphasis on residential growth, particularly high-density residential growth compared to *Alternative 2*.

The type and intensities of new growth being considered under the EIS alternatives is summarized below.

Summary of Growth Assumptions for Alternatives

Alternative	Retail (Gross Sq. Ft)	Office (Gross Sq. Ft.)	Housing (dwelling units)
Alternative 1 – No Action	150,000-180,000 gsf	20,000-35,000 gsf	600-1,200 du
Alternative 2 – Employment/Commercial Emphasis	400,000-450,000 gsf	1-1.25 million gsf	900-1,000 du
Alternative 3 – Moderate Employment/Commercial with Residential Emphasis	300,000-350,000 gsf	600,000 - 750,000 gsf	1,200-1,400 du

Integrated SEPA/GMA Planning Process

The City is using an integrated planning and environmental review process, as authorized by WAC 197-11-210, to identify a preferred alternative for consideration. The preferred alternative may combine elements of several EIS alternatives within the identified ranges for land uses, jobs and population estimates, beyond what the City identified in the current Comprehensive Plan.

Phased Environmental Review and Adoption of Existing Document

The City is using phased environmental review, as authorized by WAC 197-11-060(5), for its Growth Management Act planning decisions. Phased review is intended to allow agencies and the public to focus on issues that are ready for decision and to exclude issues that have already been decided or are not ready for detailed evaluation.

The City is also adopting the EIS prepared in 2006 for its Comprehensive Plan to help meet its SEPA responsibilities for the present proposal.

The City recently issued Planned Action DEIS on December 27, 2011 for the Lake Stevens Center Subarea Plan. The two subareas are independent projects, which are being planned and reviewed concurrently; future connections between the two subareas and related cumulative effects are being considered. Both subareas were included in a previous economic development strategy and fiscal analysis.

Lead Agency

City of Lake Stevens Planning and Community Development Department

Responsible Official

Rebecca Ableman, Planning and Community Development Director

Contact Person

For additional information, please contact:

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City of Lake Stevens kwatkins@lakestevenswa.gov
P.O. Box 257
Lake Stevens, WA 98258

Draft EIS Principal Authors & Contributors

The Draft EIS was prepared under the direction of the City of Lake Stevens. The following firms and entities participated in preparation of the Draft EIS.

Weinman Consulting – Document compilation and editing; Planned Action Ordinance
AHBL – Earth; Water Resources; Plants & Animals, Wetlands; Cultural Resources; Utilities; document production
Fehr & Peers – Transportation, Greenhouse Gas Emissions
Environ Corp – Air Quality
City of Lake Stevens – Land Use; Population, Housing & Employment; Public Services
LMN Architects – Subarea Plan & Alternatives

Location of Background Material

City of Lake Stevens Planning and Community Development Department
Permit Center
1812 Main Street
Lake Stevens, WA 98258

Date of Draft EIS Issuance

January 24, 2012

Comment Period/Public Meeting

Comments on the Draft EIS will be accepted until 5 PM on **March 8, 2012**. Interested parties or affected agencies may submit comments by mail, email or fax to:

Rebecca Ableman, SEPA Responsible Official
City of Lake Stevens
P.O. Box 257
Lake Stevens, WA 98258
Fax: 425.212.3327
Email: bableman@lakestevenswa.gov

The City has scheduled a public meeting for the Draft EIS on February 16th, 2012, at 6 PM, at the Lake Stevens Fire Conference Center, 10518 18th Street SE, Lake Stevens. Interested citizens will have an opportunity to obtain further information about the subarea plan and EIS, and to provide comments on the Draft EIS.

Cost and Availability of Document

Copies of the Draft EIS and/or notices of availability have been distributed to the agencies, tribes, organizations and individuals noted in the Distribution List.

The Draft EIS is available for review at the Lake Stevens Planning and Community Development Department, at the address above, and at the Lake Stevens Library, located at 1804 Main Street, in downtown Lake Stevens and on the City's website at http://www.ci.lake-stevens.wa.us/LakeStevensCenter.htm. Printed copies of the Draft EIS may be purchased from the City, at the previously noted address, for a cost of $70. Copies on CD are available for a cost of $5.

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1. SUMMARY

1.1 PROPOSED ACTION & ALTERNATIVES

Legislative Actions

The City of Lake Stevens will consider the following actions and approvals for the 20th Street SE Corridor Subarea:

1. Adopting a subarea plan, pursuant to the Revised Code of Washington (RCW) 36.70A.080, which will amend and become an element of the Lake Stevens Comprehensive Plan;
2. Amending the zoning map to rezone properties consistent with the subarea plan;
3. Revising the zoning code text to amend or adopt new classifications, development standards and/or design guidelines;
4. Amending the Comprehensive Plan's Transportation Element and Capital Facilities Element to address infrastructure needs required to support planned growth in the subarea; and
5. Adopting an ordinance designating the subarea as a Planned Action, pursuant to the State Environmental Policy Act (SEPA, RCW 43.21C.031) and the SEPA Rules (Washington Administrative Code (WAC) 197-11-164), for purposes of future environmental review and permitting.

Study Area

The City of Lake Stevens is located in Snohomish County, approximately six miles east of downtown Everett. The 20th Street SE Corridor crosses the southern portion of the City from approximately South Lake Stevens Road in the east to Cavalero Road in the west. The 20th Street SE Corridor Subarea, shown in Figure 2-1, is comprised of approximately 845 acres of land located north and south of 20th Street SE, east and west of SR-9. The subarea was annexed into the City on December 31, 2009.

Proposal Objectives

The objectives for the 20th Street SE Corridor Subarea Plan are based on policies in the Lake Stevens Comprehensive Plan and the opportunities identified in recent economic studies and an economic development strategy. The objectives provide a basis for developing and evaluating subarea plan alternatives.

1. Establish 20th Street SE as an appealing gateway into the city with attributes reflecting a distinct, unified community.
2. Promote economic development and a more positive balance of jobs and housing by providing a mixture of jobs, goods and services, housing with recreation/open space and protection of important environmental resources.

3. Attract a variety of employers of varying sizes.
4. Encourage a concentration of local and regional retailing and services around the intersection of 20th Street SE and SR 9.
5. Create pockets of parks and open space throughout the corridor.
6. Continue the widening of 20th Street SE westward towards the Hewett Avenue (US-2) trestle.
7. Provide multiple routes of travel with clear circulation and access to destinations including parallel east-west circulation routes north and south of 20th Street SE.
8. Enhance the appearance of streets, sidewalks, sites, and buildings.

EIS Subarea Alternatives

The EIS considers three alternatives, which involve different amounts, types and intensities of growth within the subarea, as summarized in Table 1-1. Assumptions about future growth are based on a review of historical land use patterns, adopted forecasts, projects currently under review, and emerging economic development strategies. Land use for the alternatives is illustrated in Figures 2-2, 2-3 and 2-4, contained in Chapter 2.

Table 1-1. Summary of Growth Assumptions for Alternatives

Alternative	Retail (Gross Sq. Ft)	Office (Gross Sq. Ft)	Housing Units (dwelling units)
Alternative 1 – No Action	150,000-180,000	20,000-35,000	600-1,200
Alternative 2 – Employment/Commercial Emphasis	400,000-450,000	1-1.25 million	900-1,000
Alternative 3 – Moderate Employment/Commercial with Residential Emphasis	300,000-350,000	600,000-750,000	1,200-1,400

Alternative 1 – No Action

The No Action Alternative, which is required by SEPA, assumes continued growth under existing zoning and current plans without the adoption of a subarea plan. Land use would be primarily single-family residential, with one or two areas of commercial development. The subarea would not be designated as a Planned Action. Overall, under *the No Action Alternative,* the 20th Street SE Corridor would retain much of its current character in terms of type and intensity of land uses. Site-by-site development would occur without the guidance of an overarching plan or vision. Commercial growth

assumed in the *No Action Alternative* primarily reflects vested or planned development projects. A wide variety of commercial uses could occur on appropriately zoned properties (Local Business and Sub-Regional Commercial zones) alongside single-family residential uses in the remainder of the area.

Alternative 2 – Employment/Commercial Emphasis

Alternative 2 places the greatest emphasis on encouraging and accommodating significant employment and commercial growth in the subarea that focuses growth in a number of nodes along the corridor, alongside some larger complexes, with an increase in high-density residential uses in transitional areas.

Alternative 3 – Moderate Retail/Commercial with Residential Emphasis

Alternative 3, which is similar to *Alternative 2,* emphasizes moderate employment growth in identified commercial and mixed-use nodes and centers, but places a greater relative emphasis on residential growth, particularly high-density residential growth.

In contrast to *No Action*, which is based on past trends and would perpetuate existing development patterns, land uses for *Alternative 2* and *Alternative 3*, would be driven by market opportunities and an economic development strategy. Rather than following past trends, *Alternative 2* and *Alternative 3* would establish a different image and land use pattern for the 20th Street SE Corridor with a strong emphasis on employment growth, economic diversification and capturing the retail spending occurring outside the City. Identified development nodes would encourage a more intensive mix of uses – in the same building, on the same site, or within the same area – through new zoning classifications. These nodes would complement concentrated commercial and employment centers in the area and provide services to local neighborhoods and beyond. Permitted uses would be more limited than at present and more focused on market opportunities. New development would be subject to design guidelines and standards to achieve the desired quality and character of the subarea. Designating the subarea as a Planned Action will provide an incentive to attract the desired type of growth.

None of the alternatives is preferred at this time. The City is using the integrated SEPA/GMA process described in Section 1.2 to help craft and select a preferred alternative which will be proposed for adoption. The selected alternative may combine elements of the various EIS alternatives, and will be identified in the Final EIS.

1.2 PLANNED ACTION & ENVIRONMENTAL REVIEW PROCESS

Planned Action

A Planned Action is a tool that cities can use to provide regulatory certainty and encourage economic development. This tool is permitted by state law (RCW 43.21C.031 and WAC 197-11-164), and operates by performing up-front SEPA review for a subarea plan and/or specific geographic area to streamline SEPA review for subsequent projects that are consistent with the plan. A Planned Action is designated by ordinance following preparation of an Environmental Impact Statement (EIS); the EIS evaluates the impacts of planned growth and identifies mitigation measures the City will require of the development.

Environmental Review Process

SEPA/GMA Integration. State Rules for implementing the State Environmental Policy Act (SEPA), authorize cities to combine the planning requirements of the Growth Management Act (GMA) with the environmental review requirements of SEPA in their planning processes (WAC 197-11-210). The goal of this "integration" is to ensure that consideration of environmental issues is an integral part of local planning, that it occurs early in the process, and that informed public involvement occurs. The integration rules provide flexibility regarding the timing of SEPA review and the format of planning and SEPA documents.

The City is developing a subarea plan for the 20th Street SE Corridor concurrently with the Planned Action EIS. This approach will generate environmental information early in the planning process, and allow decision makers to make planning decisions – including identification of a preferred alternative – using this information.

Prior Environmental Review. In 2006, the City prepared an integrated EIS for its 10-year Comprehensive Plan Update, which extended the planning horizon and population projections for the Comprehensive Plan. The EIS to the Comprehensive Plan identified the general (programmatic) impacts to the natural and built environment associated with the additional incremental growth. The EIS also identified a range of programmatic actions – including changes to policies and development regulations – that could mitigate potential impacts. The 2025 population and employment targets evaluated in the EIS are still the basis for City planning and for *Alternative 1* of this EIS.

The City recently issued a Planned Action DEIS on December 27, 2011 for the Lake Stevens Center Subarea Plan. The two subareas are independent projects, which are being planned and reviewed concurrently with consideration of future connections between the two subareas and related cumulative effects. Both subareas were included in a previous economic development strategy and fiscal analysis.

Scope of Environmental Review

The City initiated the SEPA process for the 20th Street SE Corridor in June 2011, by issuing a determination of significance (DS), indicating that an environmental impact statement would be prepared, and requesting comments on the scope of the EIS. A public scoping meeting was held on July 14, 2011. The scoping comment period was open from June 28 to July 22, 2011. Based on its review of comments received and other available information, the City identified the following topics for discussion in the EIS:

- **Natural Environment**
  Earth – soils, geologically hazardous areas
  Water – wetlands, streams and groundwater
  Plants & Animals – wildlife, habitat and fisheries
- **Air Quality** – greenhouse gas emissions
- **Land & Shoreline Use** – land use patterns, consistency with adopted plans & polices, population, housing and employment
- **Aesthetics/Light & Glare** – changes to visual character and impacts to views
- **Historic & Cultural Resources** – impacts to documented and potential cultural resources within the study area
- **Transportation** – vehicular and pedestrian movement, traffic congestion, parking, and public transit
- **Public Services** – police, fire, schools, parks and recreation
- **Utilities** – sewer, water, drainage and stormwater

1.3 SUMMARY OF IMPACTS

Table 1-2 summarizes the impacts of the EIS alternatives and is based on the analysis in Chapter 3 of the Draft EIS. It is intended to be brief and selective; the reader is directed to the complete analysis for more information.

Table 1-2 Summary of Impacts

Alternative 1 – No Action	Alternative 2	Alternative 3
Natural Environment		
Earth • Clearing and grading could cause some erosion.	*Earth* • Clearing and grading could cause some erosion. Greater clearing and grading than No Action.	*Earth* • Clearing and grading could cause some erosion. Clearing and grading similar to Alternative 2.
Geologically Hazardous Areas • Erosion hazards affect 6.6 acres; 6 acres characterized as steep slopes.	*Geologically Hazardous Areas* • Erosion hazards affect 6.6 acres; 6 acres characterized as steep slopes.	*Geologically Hazardous Areas* • Erosion hazards affect 6.6 acres; 6 acres characterized as steep slopes.
Water Resources • Aquifer sensitivity of subarea is "low" and no designated recharge areas or wellhead protection areas are present. No significant impacts are anticipated. • The increase in impervious surface from development would reduce infiltration and increase runoff to surface water bodies.	*Water Resources* • Aquifer sensitivity of subarea is "low" and no designated recharge areas or wellhead protection areas are present. No significant impacts are anticipated. • The increase in impervious surface from development would be greater than No Action and would reduce infiltration and increase runoff to surface water bodies.	*Water Resources* • Aquifer sensitivity of subarea is "low" and no designated recharge areas or wellhead protection areas are present. No significant impacts are anticipated. • The increase in impervious surface from development would be similar to Alternative 2 and would reduce infiltration and increase runoff to surface water bodies.
Streams • Clearing of vegetation and increasing impervious surfaces would increase stormwater flows and carry pollutants and sediments to streams.	*Streams* • Clearing of vegetation and increasing impervious surfaces would increase stormwater flows and carry pollutants and sediments to streams. Potential impacts greater than *No Action*.	*Streams* • Clearing of vegetation and increasing impervious surfaces would increase stormwater flows and carry pollutants and sediments to streams. Potential impacts similar to *Alternative 2*.
Wetlands • Development could affect wetlands and buffers, but impacts would be limited by adopted regulations.	*Wetlands* • Development could affect wetlands and buffers, but impacts would be limited by adopted regulations.	*Wetlands* • Development could affect wetlands and buffers, but impacts would be limited by adopted regulations.
Flooding • No flooding impacts would occur.	*Flooding* • No flooding impacts would occur.	*Flooding* • No flooding impacts would occur.
Wildlife/ Habitat • Reduction in vegetation and further fragmentation	*Wildlife/Habitat* • Reduction in vegetation and further fragmentation	*Wildlife/Habitat* • Reduction in vegetation and further fragmentation

Alternative 1 – No Action	Alternative 2	Alternative 3
of remaining habitat. • No significant impacts to threatened, endangered or candidate species would occur. • No significant impacts to fish would occur.	of remaining habitat. Impacts greater than *No Action*, but limited by existing regulations. • No significant impacts to threatened, endangered or candidate species would occur. • Potentially greater impacts to fish compared to *No Action*, but impacts would be limited by existing regulations.	of remaining habitat. Impacts and mitigation similar to *Alternative 2*. • No significant impacts to threatened, endangered or candidate species would occur. • Potentially greater impacts to fish compared to *No Action*, but impacts would be limited by existing regulations.
Air		
Air Quality <u>Construction Impacts</u> • Dust from construction activities would contribute to ambient concentrations of suspended particulate matter. • Construction would require the use of heavy trucks and smaller equipment such as generators and compressors. These engines would emit air pollutants that would slightly degrade local air quality. • Some phases of construction would cause odors detectable to some people in the area, particularly during paving operations using asphalt. Impact would be short term. <u>Operational Impacts</u> • Based on projected traffic with *any alternative*, under existing (2011) or future conditions (2025), CO concentrations would be less than the ambient air quality standards for CO. No significant impacts to ambient air quality are likely.	*Air Quality* <u>Construction Impacts</u> • Dust from construction activities would contribute to ambient concentrations of suspended particulate matter. • Construction would require the use of heavy trucks and smaller equipment such as generators and compressors. These engines would emit air pollutants that would slightly degrade local air quality. Impacts greater than *No Action*. • Some phases of construction would cause odors detectable to some people in the area, particularly during paving operations using asphalt. Impact would be short term. <u>Operational Impacts</u> • Based on projected traffic with *any alternative*, under existing (2011) or future conditions (2025), CO concentrations would be less than the ambient air quality standards for CO. No significant impacts to ambient air quality are likely.	*Air Quality* <u>Construction Impacts</u> • Dust from construction activities would contribute to ambient concentrations of suspended particulate matter. • Construction would require the use of heavy trucks and smaller equipment such as generators and compressors. These engines would emit air pollutants that would slightly degrade local air quality. Impacts similar to *Alternative 2.* • Some phases of construction would cause odors detectable to some people in the area. This would be particularly true during paving operations using asphalt. Impact would be short term. <u>Operational Impacts</u> • Based on projected traffic with *any alternative*, under existing (2011) or future conditions (2025), CO concentrations would be less than the ambient air quality standards for CO. No significant impacts to ambient air quality are likely.

Alternative 1 – No Action	Alternative 2	Alternative 3
Greenhouse Gas Emissions • The No Action Alternative would result in lower total GHG emissions than *Alternative 2* or *Alternative 3*, but would have higher GHG emissions per service area population. • The overall significance of GHG impacts at the subarea level is uncertain.	*Greenhouse Gas Emissions* • *Alternative 2* would result in the highest total GHG emissions, but would have lower emissions per service area population compared to existing conditions and *No Action*. • The overall significance of GHG impacts at the subarea level is uncertain.	*Greenhouse Gas Emissions* • *Alternative 3* would result in the highest total GHG emissions, but would have the lowest GHG emissions per service area population. • The overall significance of GHG impacts at the subarea level is uncertain.
Land Use		
• Vacant land would be developed for urban uses, primarily single-family residential. • Minor changes to the type, form and intensity of land use would occur. The subarea would remain primarily residential in character, but could include large format retail. • Development would occur lot-by-lot, controlled by existing zoning and without the guidance of a subarea plan. Design standards would not be adopted and existing character would continue. • Gross residential density would increase from less than 1 dwelling unit (du) per acre to a high of approximately 2.4 du per acre. • Some potential for land use conflicts exists due to broad range of permitted uses in existing commercial zones. • Without adoption of subarea plans for 20th Street SE and Lake Stevens Center and, growth would be less focused in designated centers.	• Vacant land would be developed for a mix of urban uses. Land would be used more intensively than with *No Action*. • The types, form and intensity of land use would change significantly. The land use pattern would include more mixed-use and mid-rise buildings, and large format retail. • Development would be guided to various nodes through a plan; new zoning regulations, design guidelines and standards would positively influence development character. • Gross residential density would increase from 1 du per acre currently to approximately 2.2 du per acre, primarily in multifamily buildings. • Land uses would be guided to identified activity nodes; uses within the activity nodes would generally be complimentary in character and no significant land use conflicts are anticipated. • Adoption of subarea plans for 20th Street SE and Lake Stevens Center and together would help focus growth in designated centers, consistent with the	• Vacant land would be developed for a mix of urban uses. Land would be used more intensively than with *No Action*. • The types, form and intensity of land use would change significantly. The land use pattern would include more mixed-use and mid-rise buildings, and large format retail. • Development would be guided to various nodes of activity through a plan; new zoning regulations, design guidelines and standards would positively influence development character. • Gross residential density would increase from 1 du per acre currently to approximately2.7 du per acre, primarily in multifamily buildings. • Land uses would be guided to identified activity nodes would generally be complimentary in character and no significant land use conflicts are anticipated. • Adoption of subarea plans for 20th Street SE and Lake Stevens Center and together would help focus growth in designated centers, consistent with the

Alternative 1 – No Action	Alternative 2	Alternative 3
• Construction would cause short-term impacts such as dust, noise, and temporary interruptions in access.	Comprehensive Plan and regional growth policies. • Construction would cause short-term impacts, including dust, noise, and temporary interruptions in access. Impacts more extensive than *No Action*.	Comprehensive Plan and regional growth policies. • Construction would cause short-term impacts, including dust, noise, and temporary interruptions in access. Impacts similar to *Alternative 2*.
Population, Housing & Employment		
Population • Population increase of 1,722-3,444 from existing over 20 years; within City's 2025 population target. *Housing* • Housing increase of 600-1,200 units. *Employment* • Increase of 360-465 jobs over 20 years.	*Population* • Population increase of 2,600-2,900 from existing; within City's 2025 population target. *Housing* • Housing increase of 900-1,000 units from existing. *Employment* • Greatest focus on employment uses, and increase of 3,800-4,500 jobs.	*Population* • Population increase of 3,500-4,000 from existing; within City's 2025 population target. *Housing* • Greater emphasis on housing, with increase of 1,200-1,400 units from existing. *Employment* • More balance between housing and employment uses, with Increase of 3,500-4,000 jobs.
Aesthetics		
Visual Character • Existing character would change incrementally over time as development occurs. Some larger multifamily and commercial buildings would develop but most development would be single-family. • No new regulations or design guidelines/standards would be adopted to influence design. • Landscaping per existing regulations. *Views* • No significant impacts to views from public parks or spaces, which are limited.	*Visual Character* • Visual character would change significantly over time as subarea develops with a mix of more intensive urban uses. • Design guidelines and standards would be adopted and would help establish consistent approach to design of sites, streetscape, landscaping and lighting. • More substantial landscaping than *No Action*. *Views* • Potential for greater view blockage from larger buildings. Subarea plan	*Visual Character* • Visual character would change significantly over time as subarea develops with a mix of more intensive urban uses. Impacts would be similar to *Alternative 2*. • Impacts would be similar to *Alternative 2*. Design guidelines and standards would be adopted and would help establish consistent approach to design of sites, streetscape, landscaping and lighting. • More substantial landscaping, similar to *Alternative 2*. *Views* • Impacts would be similar to *Alternative 2*. Potential to locate parks and open

Alternative 1 – No Action	Alternative 2	Alternative 3
	includes potential to locate parks and open space to capture views, and to protect view corridors through design review.	space to capture views, and to protect view corridors through design review.
Light & Glare • Increase in lighting, but no significant impacts are anticipated. • Some potential for shadowing from larger buildings.	*Light & Glare* • Increase in lighting, but no significant impacts are anticipated. Lighting design would be addressed in design guidelines and standards. • Greater potential for shadowing from larger buildings. Shadow impacts would be addressed in design guidelines and standards.	*Light & Glare* • Increase in lighting, but no significant impacts are anticipated. Lighting design would be addressed in design guidelines and standards. • Impacts similar to *Alternative 2.* Greater potential for shadowing from larger buildings. Shadow impacts would be addressed in design guidelines and standards.
Cultural Resources		
• Potential for impacts to identified and unidentified resources.	• Potential for impacts to identified and unidentified resources.	• Potential for impacts to identified and unidentified resources.
Transportation		
Roadway Operations PM peak hour Level of Service (LOS) would be degraded at the following intersections: • 20th St SE/Cavalero Rd (F) • 20th St SE/SR-9 (E) AM peak hour Level of Service would be degraded at the following intersections: • SR-9/20th Street SE (D), • 20th St SE/83rd Ave SE (E)	*Roadway Operations* PM peak hour Level of Service (LOS) would be degraded at the following intersections: • 20th St SE/Cavalero Rd (F) • 20th St SE/91st Ave SE (E) • 20th St SE/SR-9 (F) AM peak hour Level of Service would be degraded at the following intersections: • 20th Street SE/79th Ave SE (D) • 20th St SE/83rd Ave SE (F) • 20th St SE/SR-9 (F) • 20th St SE/S Lake Stevens Rd (D)	*Roadway Operations* PM peak hour Level of Service (LOS) would be degraded at the following intersections: • 20th St SE/Cavalero Rd (F) • 20th St SE/91st Ave SE (D) AM peak hour Level of Service would be degraded at the following intersections: • 20th Street SE/79th Ave SE (D) • 20th St SE/83rd Ave SE (F) • 20th St SE/SR-9 (E) • 20th St SE/SR-9 (F) • 20th St SE/S Lake Stevens Rd (D)
Pedestrian and Bicycle System • The *No Action Alternative* is not anticipated to interfere with any existing or planned pedestrian or bicycle facilities. Overall traffic growth would result in more pedestrian and bicycle interactions.	*Pedestrian and Bicycle System* • *Alternative 2* is not anticipated to interfere with any existing or planned pedestrian or bicycle facilities. Proposed improvements (new bicycle lanes, sidewalks, landscaping, and off-street trails) would substantially	*Pedestrian and Bicycle System* • *Alternative 3* is not anticipated to interfere with any existing or planned pedestrian or bicycle facilities. Proposed improvements (new bicycle lanes, sidewalks, landscaping, and off-street trails) would substantially

Alternative 1 – No Action	Alternative 2	Alternative 3
	improve the quality of the pedestrian and bicycle system when compared to the *No Action Alternative*.	improve the quality of the pedestrian and bicycle system when compared to the *No Action Alternative*.
Transit • No transit routes are expected to be adversely affected. Vehicle operations may be slower due to increased traffic congestion.	*Transit* • No transit routes are expected to be adversely affected. Vehicle operations may be slower due to increased traffic congestion.	*Transit* • No transit routes are expected to be adversely affected. Vehicle operations may be slower due to increased traffic congestion.
Public Services		
• Public service impacts would generally be proportional to population increase. *Police Service* • Calls for service would increase. • Need for 40-42 additional officers per adopted level of service, and additional equipment and facility space. Needs are addressed in the adopted CIP. *Fire & EMS* • Calls for service would increase, generating need for additional firefighters and equipment. • A ladder truck would be required for any development above 2 stories. *Schools* • Housing growth could generate between 86 and 171 additional students, depending on the type, number and size of housing units. Growth is addressed in school district's CFP. • Construction could have	• Public service impacts would generally be proportional to population increase. *Police Service* • Calls for service would increase. • Need for 41-42 additional officers per adopted level of service, and additional equipment and facility space. Needs are addressed in the adopted CIP. *Fire & EMS* • Calls for service would increase, generating need for additional firefighters and equipment. • A ladder truck would be required for any development above 2 stories. • Response times could be reduced for a more concentrated, higher density development pattern. *Schools* • Housing growth could generate between 75 and 83 additional students, depending on the type, number and size of housing units. Growth is addressed in school district's CFP. • Construction could have	• Public service impacts would generally be proportional to population increase. *Police Service* • Calls for service would increase. • Need for 44-45 additional officers per adopted level of service, and additional equipment and facility space. Needs are addressed in the adopted CIP. *Fire & EMS* • Calls for service would increase, generating need for additional firefighters and equipment. • A ladder truck would be required for any development above 2 stories. • Response times could be reduced for a more concentrated, higher density development pattern. *Schools* • Housing growth could generate between 100 and 116 additional students, depending on the type, number and size of housing units. Growth is addressed in school district's CFP. • Construction could have

Alternative 1 – No Action	Alternative 2	Alternative 3
temporary impacts for school bus routes. *Parks & Recreation* • Subarea growth would require between 13 and 26 acres of park land, based on the City's adopted LOS. • Existing park facilities would be used more intensively.	temporary impacts for school bus routes. *Parks & Recreation* • Subarea growth would require between 20 and 22 acres of park land based on the City's adopted LOS. • Existing park facilities would be used more intensively. • The utility corridor could provide locations for 8-10 acres of public parks and trails. New residential and commercial areas could provide additional parks and open spaces.	temporary impacts for school bus routes. *Parks & Recreation* • Subarea growth would require between 26 and 30 acres of park land based on the City's adopted LOS. • Existing park facilities would be used more intensively. • The utility corridor could provide locations for 8-10 acres of public parks and trails. New residential and commercial areas could provide additional parks and open spaces.
Utilities		
Stormwater & Drainage • Development would result in increases in impervious surface and clearing which would increase stormwater runoff and could degrade water quality. The City would review development proposals and apply its adopted stormwater regulations to ensure that no significant impacts occur. *Water* • Projected increase in water demand from development (713-1,346 equivalent residential units/134,040-253,035 gallons per day) represents 18% of available water supply. No significant impact would occur. • Planned improvements in 2012 and 2018 would provide sufficient water storage; increase in required storage would not result in significant impacts	*Stormwater & Drainage* • Development would increase impervious surface and clearing which would increase stormwater runoff and could degrade water quality. The City would review development proposals and apply its adopted stormwater regulations to ensure that no significant impacts occur. *Water* • Projected increase in water demand from development (2,093-2,412 equivalent residential units/393,400-453,500 gallons per day) represents 32.5% of available water supply. No significant impact would occur. Additional water supply may be necessary to serve long-term growth. • Planned improvements in 2012 and 2018 would provide sufficient water storage; increase in required storage would not result in significant impacts	*Stormwater & Drainage* • Development would increase impervious surface and clearing which would increase stormwater runoff and could degrade water quality. The City would review development proposals and apply its adopted stormwater regulations to ensure that no significant impacts occur. *Water* • Projected increase in water demand from development (1,953-2,341 equivalent residential units/367,200-440,200 gallons per day) represents 31.5% of available water supply. No significant impact would occur. Additional water supply may be necessary to serve long-term growth. • Planned improvements in 2012 and 2018 would provide sufficient water storage; increase in required storage would not result in significant impacts

Alternative 1 – No Action	Alternative 2	Alternative 3
to the system. • Additional distribution facilities would be required to serve new development. • Some upgrading of fire flow conveyance systems (pipes) could be required in specific areas, depending on the type and intensity of development. Project-specific needs would be determined by the City, PUD and Fire Marshall in conjunction with development review. *Sewer* • Growth would increase the demand for sewerage collection and treatment, but are within the capacity of the existing and planned system; no significant impacts would occur. • A planned upgrade of Lift Station 11 would address an existing deficiency. • Portions of the subarea are not currently sewered, and additional collection lines will be required to provide service.	to the system. Planned development could consume approximately 1/3 of available surplus. • Additional distribution facilities would be required to serve new development • Some upgrading of fire flow conveyance systems (pipes) could be required in specific areas, depending on the type and intensity of development. Project-specific needs would be determined by the City, PUD and Fire Marshall in conjunction with development review. *Sewer* • Growth would increase sewerage flows and loadings (up to 104%) but are within the capacity of the existing and planned treatment system; no significant impacts would occur. • A planned upgrade of Lift Station 11 would address an existing deficiency. • Portions of the subarea are not currently sewered, and additional collection lines will be required to provide service.	to the system. Planned development could consume approximately 1/3 of available surplus. • Additional distribution facilities would be required to serve new development. • Some upgrading of fire flow conveyance systems (pipes) could be required in specific areas, depending on the type and intensity of development. Project-specific needs would be determined by the City, PUD and Fire Marshall in conjunction with development review. *Sewer* • Growth would increase sewerage flows and loadings (353%-361%) but are within the capacity of the existing and planned system; no significant impacts would occur. • A planned upgrade of Lift Station 11 would address an existing deficiency. • Portions of the subarea are not currently sewered, and additional collection lines will be required to provide service.

1.4 MITIGATION MEASURES

1.4.1 Natural Environment

Earth

Applicable Regulations and Commitments

- **Geological Assessments Required:** The Lake Stevens Municipal Code requires the preparation of a geological assessment for any development proposal within 200 feet of an area designated as geologically hazardous. Must analyze potential impacts to geologically hazardous areas resulting from the proposed development and identify appropriate mitigation measures necessary to protect development and the geologically hazardous area (LSMC 14.88.630).
- **Native Growth Protection Area:** LSMC 14.88.670 requires developers to place geologically hazardous areas not approved for alteration and their buffers in a native growth protection area; lawfully altered geologically hazardous areas are subject to a covenant of notification and indemnification/hold harmless agreement.
- **Erosion Control Measures Required:** LSMC 14.64.130 requires the implementation of sedimentation and erosion control measures for any development that would entail land disturbance. The Public Works Director must review and approve erosion control plans.

Additional Mitigation Measures

- No additional measures are required.

Water Resources

Applicable Regulations and Commitments

- **Stormwater Management:** The City's municipal code requires the use of natural drainage systems to the extent feasible in order to preserve natural topography (LSMC 14.64.100). The Code also requires all new stormwater drainage systems to be constructed in accordance with the requirements of the Department of Ecology's 2005 Stormwater Management Manual for Western Washington (LSMC 11.06.020 and LSMC 14.64.140). Continued implementation of the City's stormwater management codes will ensure a rigorous permit review process that promotes sound development and redevelopment policies; continued protection of water quality in the City's lakes, streams and wetlands habitats and groundwater recharge; property protection from increased runoff; and the promotion of low impact development strategies that reduce impervious surface and stormwater runoff.
- **NPDES Phase II Municipal Stormwater Permit:** The Western Washington Phase II Municipal Stormwater Permit was issued in 2007 to implement the

requirements of the Clean Water Act and the National Pollutant Discharge Elimination System as codified in Sections 11.06.020 and 14.64.140 of the City's municipal code. In accordance with the requirements of the permit, the City of Lake Stevens has adopted a stormwater management plan focused on public education and outreach, detection and elimination of illicit stormwater discharge, controlling runoff generated by new development activities, and prevention of pollution resulting from municipal activities. Continued implementation of the measures contained in the stormwater management program would reduce pollutant loading and improve water quality in the City's lakes, streams and wetlands.

- **Critical Areas Regulations:** Under all alternatives, future development will be subject to the adopted critical areas regulations found in Chapter 14.88 LSMC, including all applicable mitigation requirements and mitigation sequencing procedures.

Additional Mitigation Measures

- **Stormwater Detention:** For properties adjacent to identified wetlands and their buffers, new development and redevelopment cannot result in an increased rate of runoff from the site to the wetland. Where onsite stormwater management is not feasible, the City may, consistent with federal and state regulations, encourage design and construction of regional stormwater detention and infiltration infrastructure.
- **Low Impact Development (LID):** The City should also consider providing incentives for the use of LID techniques to reduce stormwater impacts in the subarea plan and new zoning regulations.
- **Critical Areas:** More detailed analysis – including full delineation, classification and function assessment – will be required in conjunction with development permitting for future projects that occur on sites containing critical areas.

Plants & Animals

Applicable Regulations and Commitments

- **Tree Retention:** The City's land use code (LSMC 14.76.120) requires development projects to retain existing significant trees and stands of trees that occur on the development site. The code also requires that removed significant trees be replaced and that retained and replanted trees be protected during construction. Similarly, the code requires retention or planting of trees along dedicated streets (LSMC 14.76.110).
- **Critical Areas Regulations:** Future development in the study area has the potential to adversely affect wildlife and habitat through clearing of vegetated areas. However, the City's critical areas regulations protect wetlands, riparian

areas, and other critical areas that provide habitat for plants and animals by limiting the activities allowed within the critical area and establishing appropriate protective buffers and mitigation strategies for unavoidable impacts.

1.4.2 Air Quality

Air Quality

Mitigation During Construction

Although significant air quality impacts from construction are not anticipated with any of the alternatives, construction contractors would be required to comply with all relevant federal, state, and local air quality rules. In addition, implementation of best management practices would also reduce emissions related to the construction phase of the project. The Washington Associated General Contractors brochure *Guide to Handling Fugitive Dust from Construction Projects* and the PSCAA suggest a number of methods for controlling dust and reducing the potential exposure of people to emissions from diesel equipment during construction. A list of possible control measures is included in the Air Quality section (3.2) of the Draft EIS.

Mitigation During Operation

The air quality analysis indicates that the alternatives would not result in any significant adverse air quality impacts in the study area. Consequently, no operational impact mitigation measures are warranted or proposed.

Greenhouse Gas Emissions

Some or all of the following strategies for reducing GHG could be implemented:

- Adopt green building standards for new development (e.g., LEED silver or better);
- Adopt a mandatory commute trip reduction program for all applicable employers in the 20th Street SE Corridor subarea. This commute trip reduction program could include the establishment of the following:
    - Mode split goals
    - Mode split monitoring program
    - Mode split goal implementation program
    - Transportation management agency which provides resources for employers such as carpool matching, vanpool/transit information, and a guaranteed ride home program;
- In conjunction with a commute trip reduction program, expand transit options such as the Community Transit vanpool program or new fixed route bus service; and
- Implement efficient transportation design standards including the use of roundabouts and LED street lighting and area lighting where appropriate.

1.4.3 Land Use

Many of the land use changes identified in the Land Use section (3.3) of the Draft EIS – including increased density/intensity and a greater diversification and mix of land uses – are not considered adverse impacts. The change in the subarea's land use pattern would be significant, but does not require mitigation. However, to implement the subarea plan the City will develop refined development regulations and design guidelines and standards.

Potential land use conflicts, between proximate land uses of different intensity, can be avoided or otherwise mitigated through the application of new development regulations and design guidelines and standards that ensure appropriate land uses along with adequate buffering and transitions between different abutting land uses. For example, height and bulk limits and setback requirements in zoning regulations could be tailored to address these potential conflicts. Landscaping requirements can also help to buffer and screen land uses of dissimilar intensity or scale. Design guidelines and standards would also require approaches to site planning and building design, which reduce a range of potential impacts, such as shadows, noise and visual incongruities. These techniques are an integral aspect of implementing the subarea plan.

1.4.4 Population, Housing & Employment

Population

No significant adverse impacts have been identified and no mitigation is necessary.

Housing

No significant adverse impacts have been identified and no mitigation is necessary.

Employment

No significant adverse impacts have been identified and no mitigation is necessary.

1.4.5 Aesthetics, Light & Glare

Visual Character

- **Development Regulations**: New zoning regulations in combination with specific design guidelines and standards would be adopted to implement the subarea plan. Regulations would address appropriate uses, height, setbacks, and similar development parameters. The code could also include incentives, such as bonuses in height or intensity, in exchange for incorporating a menu of public amenities in new development. Existing landscaping standards would be modified to create the desired character for development sites, roads, and sidewalks and trails. Existing tree protection/replacement requirements could be modified to ensure the subarea maintains a desirable amount of vegetative cover.

- **Design Guidelines and Standards**: Design guidelines and standards would ensure that future development achieves a cohesive visual character and high-quality site planning, building design, lighting and signage.

Views

- **Park & Open Space Planning**: The City will update its *Parks & Open Space Plan* to address needs created by planned growth in the 20th Street SE Corridor. In conjunction with this planning, the City may identify new parks or open space areas that provide views of landscape features and consider ways to preserve specified viewpoints. New development in some portions of the subarea may also create public spaces that provide open views of the landscape.
- **Design Guidelines and Standards**: In addition, the City could consider adopting guidelines and standards that identify when and how site plans or building design could be modified to protect views from parks and other public spaces.

Light & Glare

- **Development Regulations**: The City should consider adopting "dark sky" regulations to minimize lighting increases and night glow in the subarea.
- **Design Guidelines and Standards**: Design guidelines and standards should provide guidance on avoiding light spillage, glare and shadow impacts through site planning, building design and landscaping. The guidelines and standards would specifically address lighting and signage.

1.4.6 Historic & Cultural Resources

Applicable Regulations and Commitments

- **Chapter 27.53 RCW:** Washington State Law prohibits the disturbance, destruction, or removal of historic or prehistoric archaeological deposits without approval from Department of Archaeology and Historic Preservation (DAHP). Persons who violate the terms of this statue are subject to both criminal and civil liability.

Additional Mitigation Measures

- **New Cultural Resources Policies:** Although the *Lake Stevens Comprehensive Plan* currently contains policies designed to protect archaeological resource and promote preservation of historic structures, this commitment could be emphasized by also including such policies in the subarea plan.
- **Archaeological Survey**: As part of the development review process, the City could require an archaeological survey for properties in the same general vicinity as the known archaeological site, and for properties, which display a similar history of logging activity, to determine the presence of archaeological or historic resources.

- **Development Agreements:** The City may consider the use of development agreements, per LSMC 14.16C.055, for any properties with known archaeological or historic resources. Such a development agreement could include mitigation measures to protect archaeological resources, such as a memorandum of agreement with DAHP regarding research and curation of artifacts, as well as construction monitoring by a qualified archaeologist.
- **Inadvertent Discovery Plan:** For development proposals on properties that are extensively forested, previously undeveloped, or known to be associated with the historic railroad or historic logging operations, the City should require the preparation of an inadvertent discovery plan to establish protocols for handling archaeological deposits uncovered during construction.

1.4.7 Transportation

Concurrency

Concurrency is intended to ensure that improvements are planned and constructed in phase with projected growth(i.e., within six years). It requires adoption of level of service standards to gauge performance of the transportation system, identification of improvements necessary to maintain the adopted level of service, and a system to ensure that concurrency is maintained. If the trips generated by a development will cause a facility to fall below the adopted LOS standard, the local government may deny permits for the project, change the LOS standard, or modify land use. Changes may be made to a development proposal to meet the concurrency requirements, such as reducing project size or employing travel demand management to reduce the number of trips generated.

Per the Growth Management Act, concurrency does not apply to highways of statewide significance, such as SR-9. Lake Stevens' adopted concurrency management system, set forth in LSMC 14.110, identifies three options an applicant may select to maintain concurrency when mitigation is required: (1) reducing the size of the development; (2) delaying the development until needed improvements are provided by the City or others; or (3) constructing the needed facilities.

Level of Service Threshold

The City has adopted LOS C as its PM peak hour standard for all areas except the downtown. In view of the level of growth encouraged by the subarea plan, and the extent of improvements that would be required to achieve this LOS, it may not be feasible financially to maintain the current level of service threshold (LOS C) at all intersections within the study area (Fehr & Peers, 2011). In addition, poor traffic conditions on state highways (notably US-2 and SR-9) constrain the ability of Lake Stevens to manage traffic congestion in the 20th Street Corridor since there are no plans to address some of the regional traffic congestion issues. Therefore, it is recommended that the City amend its threshold for signalized intersections in designated centers and mixed-use areas to strive for a goal of LOS E.

In addition, it should be acknowledged that some intersections will operate at LOS F during peak travel periods and these intersections should be exempted from the LOS E goal. For unsignalized intersections, it is recommended that an intersection be considered deficient if it falls below LOS E operations *and* meets a signal warrant. This level of service will be more affordable and practical and will support Comprehensive Plan policies related to centers. It is also in line with the typical traffic activity seen in economically vibrant areas.

If the recommended LOS thresholds are adopted, then only the following intersections would be considered deficient or impacted:

- 20th Street SE and Cavalero Road under *all alternatives* during the PM peak hour;
- 20th Street and 83rd Avenue SE under *Alternatives 2* and *3* during the AM peak hour; and
- 20th Street SE and SR-9 under *Alternative 2* during the AM and PM peak hours, and under *Alternative 3* during the PM peak hour.

Intersection-Specific Mitigation Measures

20th Street SE and Cavalero Road

A signal or roundabout should be added to the intersection of 20th Street SE and Cavalero Road. Future traffic volumes would fulfill the requirements for a peak hour signal warrant under all three land use alternatives. Under *Alternative 2* during the PM peak hour, signalizing the intersection would improve operations to LOS C.

20th Street and 83rd Avenue SE

This intersection would operate at LOS F under *Alternative 2* and *Alternative 3* during the AM peak hour. Adding a southbound right turn pocket would improve the intersection's overall LOS to D with 52 seconds of delay. If a left turn pocket could be added to the northbound approach, delay would decrease by an additional 12 seconds,

although overall LOS would still remain at D. A dual-lane roundabout would also work at this intersection if the metered traffic volumes are assumed.

20th Street SE and SR-9

This intersection is under the jurisdiction of WSDOT and mitigation measures would likely be identified as part of the *SR-9 Corridor Planning Study*. Adding dual left turn lanes to all approaches would result in LOS E (80 seconds of delay) at this intersection. To achieve additional improvements in LOS would require either additional lanes on SR-9, grade separation, or an unconventional intersection, such as a "continuous flow intersection" (CFI).

Design Alternatives

The Draft EIS Transportation section (3.8) discusses a number of design options (e.g., roundabouts) for improvements to the intersections along the 20th Street SE corridor. Please refer to the Draft EIS for more information.

Additional Mitigation Measures

In addition to the capacity enhancing projects described above, it is recommended that the City of Lake Stevens explore the potential for other programmatic mitigation measures identified below.

Impact Fees

The improvements described above will require a substantial capital investment to implement (Fehr & Peers, 2011). To generate the funds necessary to implement the mitigation measures described above, it is recommended that a traffic impact fee program be established by ordinance. This fee could be exclusive to the 20th Street SE Corridor or could be part of a citywide impact fee program.

Given that the majority of the traffic impacts would occur on the state highway system, it is recommended that if an impact fee program is established, the City of Lake Stevens enter an interlocal agreement with WSDOT that would allow the City and WSDOT to share fee revenues and help construct the required improvements.

Transportation Benefit District

Formation of a Transportation Benefit District (TBD), as authorized by RCW 36.73.120, is another approach the City could use to help finance transportation improvements. While more complex to establish and administer, compared to traffic impact fees, the formation of a TBD would enable the City to assess additional fees and charges within the district, including a supplemental sales tax. A TBD could apply citywide or specific to 20th Street SE Corridor, and could be used in conjunction with a traffic impact fee.

Transportation Demand Management
Transportation demand management (TDM) strategies include mandatory commute trip reduction programs and enhanced transit service. These measures have proven to be effective at reducing trip generation even in low-density areas such as Lake Stevens (California Air Pollution Control Officers Association. August 2010). While these measures will help reduce overall trip generation and vehicle congestion impacts, their effectiveness relative to the magnitude of the congestion levels in the study area would be small.

1.4.8 Public Services

Under all alternatives, development would be subject to adopted development regulations, which require emergency access, fire suppression systems, and school and park impact mitigation fees to offset impacts to these services.

Alternative 2 and A*lternative 3* could incorporate the following additional measures:

- During construction, implement security measures such as onsite lighting, fencing, onsite surveillance, etc. to reduce potential criminal activity.
- Construct a well-designed internal street system that provides fast and efficient police, fire and emergency vehicle access to all areas of the subarea.
- Develop streets, sidewalks, walkways, bicycle and pedestrian paths and public spaces designed to promote public safety and visibility for residents, employees, site visitors and police.
- Design all parking areas and public spaces with specially designed no-glare security lighting to provide for security.
- Include incentives in development regulations for providing public spaces in new development.
- Begin a planning process to identify additional park space within the subarea. Identify land that is suitable for acquisition, and investigate the potential for acquiring easements within the utility corridor.

1.4.9 Utilities

Drainage

Applicable Regulations and Commitments

- **City of Lake Stevens Stormwater Ordinance:** Chapter 11.06 and Chapter 14.64 (Part II) of the Lake Stevens Municipal Code adopt the *Department of Ecology's 2005 Stormwater Management Manual for Western Washington*. Any project that meets or exceeds the thresholds defined in the manual for new impervious area, drainage system modifications, or redevelopment is subject to City review and permit approval.

- **Ecology Stormwater Manual Adopted:** The City has adopted the *Department of Ecology's 2005 Stormwater Management Manual for Western Washington* as its minimum design standard for stormwater infrastructure. All development meeting the minimum thresholds is required to design associated stormwater infrastructure to be consistent with these standards.
- **Low Impact Development Encouraged:** The City's stormwater ordinance states that Low Impact Development solutions, as defined and listed in the LID Technical Guidance Manual for Puget Sound, are acceptable and encouraged alternative standards for management of stormwater.

Additional Mitigation Measures

- **Permitting Incentives for Low Impact Development:** To reduce the need for new stormwater conveyance infrastructure and protect water quality, the City should incentivize the use of LID techniques for onsite stormwater treatment and detention for appropriate projects.

Water

Applicable Regulations and Commitments

- **Supply Upgrades:** Snohomish County PUD's *2011 Water System Plan* identifies necessary capital improvements to provide adequate water supply for the next 20 years. Planned and budgeted supply improvements include conversion of the system's two emergency groundwater wells to a full-time source, increasing system supply by approximately 1.2 MG per day.
- **Storage Upgrades:** The PUD's *2011 Water System Plan* identifies the following planned and budgeted capital improvements to storage capacity:
    - Walker Hill Booster Zone Intertie: Eliminates dead storage in the Walker Hill tanks, making this water available to the Lake Stevens 500 zone for emergency use (2012).
    - Getchell Reservoir: New 9.2 MG reservoir serving the Lake Stevens 500 pressure zone.
- **Distribution Upgrades:** The PUD's ongoing water main replacement program annually evaluates aging pipes for replacement with a focus on the replacement of galvanized iron/steel and asbestos cement pipes.

Additional Mitigation Measures

- **Joint Planning with Snohomish County PUD:** Upon adoption of a preferred alternative, the City should consult with Snohomish County PUD to establish a joint planning process for capital improvements necessary to serve anticipated development in the subarea. This process should also address any cumulative

needs for water storage generated by the 20th Street SE Corridor Subarea Plan in combination with the Lake Stevens Center Subarea Plan.

- **Design Review for Fire Flow:** The City and developers should coordinate development permit application with Snohomish County PUD and the Lake Stevens Fire Marshal to determine fire flow requirements based on project design. Upgrades to existing lines should be coordinated with Snohomish County PUD. Installation of new water lines adequate to provide required fire flows should be the responsibility of the developer and/or the City.
    - 12-inch pipes and 3000 gpm for commercial areas, possibly multifamily,
    - 8-inch pipes and 1500 gpm for existing residential areas,
    - intermediate value for other areas, for example 10-inch pipe with 2000 gpm.

Sewer

Applicable Regulations and Commitments

- **Planned Capital Improvements:** As described in the impact analysis, the Lake Stevens Sewer District updated its Comprehensive Plan in 2007 and 2010, describing the capital improvements planned for the near future, including several pipeline expansions, decommissioning of several lift stations, pump upgrades, and construction of a new wastewater treatment plant. These improvements are designed to relieve existing system deficiencies and create the capacity necessary to serve future development.

Additional Mitigation Measures

- **Joint Planning with Lake Stevens Sewer District:** Upon adoption of a preferred alternative, the City should consult with the Lake Stevens Sewer District to establish a joint planning process for capital improvements necessary to serve anticipated development in the subarea, including new wastewater collection infrastructure and future expansions to the new treatment plant that may be necessary to accept projected flows from development under the subarea plan.
- **Development Review for Wastewater Flows and Loads:** Because planned improvements to the wastewater system will be implemented in phases over several years, the Planned Action should establish size thresholds for new development that, when met or exceeded, would require developers to initiate consultation with Lake Stevens Sewer District. Consultation would confirm that projected wastewater flows and loads from any proposed project would not exceed the treatment or conveyance capacity of the wastewater system existing at that time.

1.5 SIGNIFICANT UNAVOIDABLE ADVERSE IMPACTS

1.5.1 Natural Environment

All alternatives could result in additional development within the subarea, thereby increasing the level of impervious surface and reducing vegetated areas. Additional development within the study area is also anticipated to generate increased stormwater runoff that must by detained or treated before discharge to surface water. With application of the City's adopted regulations regarding critical areas, stormwater, and tree retention, as well as proposed mitigation measures, no significant unavoidable adverse impacts to the natural environment are anticipated.

1.5.2 Air Quality

No significant unavoidable adverse impacts have been identified for air quality or greenhouse gas emissions and none are anticipated.

1.5.3 Land Use

The land use pattern of the subarea would change significantly to accomplish the objectives of *Alternative 2* or *Alternative 3.* This would result in the subarea becoming more urbanized and intensively developed, with a greater mix of uses. The area would experience a significant increase in employment uses and population relative to the *No Action Alternative*. This change, while significant, is not considered adverse.

1.5.4 Population, Housing & Employment

While population growth is unavoidable, it is not necessarily an adverse impact. No significant unavoidable adverse impacts would occur.

1.5.5 Aesthetics, Light & Glare

Visual Character

The visual character of the subarea would change significantly over time as a result of growth and development. The direction of change would be from a primarily single-family residential area with large lots to an area that includes a mixed-use employment district alongside residential neighborhoods. It would become more densely developed and urban in character with taller, larger scale buildings. This change could be considered adverse by some viewers and positive by others, but this change is an unavoidable consequence of implementing the subarea plan.

Views

Some existing views to the west from locations in the western portion of the subarea could be partially or completely obstructed by future development. View blockage could be mitigated through use of new development regulations, however, this impact is not considered unavoidable. The subarea plan, and future planning for parks and open

spaces, could focus on identifying future public spaces from which views could be protected through design guidelines and standards.

Light & Glare

Lighting will increase, but will be controlled through development regulations and design guidelines and standards. No significant unavoidable adverse impacts are anticipated.

1.5.6 Historic & Cultural Resources

Although the subarea is believed to have a low probability for discovery of archaeological resources, there is some potential for undiscovered archaeological resources to be inadvertently destroyed during construction. This is neither certain to occur nor unavoidable, however. With implementation of appropriate implementation measures, no significant unavoidable adverse impacts are anticipated.

1.5.7 Transportation

As described above, the increased traffic volumes caused by the action alternatives (*Alternative 2* and *Alternative 3*), lead to increased delay at the 20th Street SE/SR-9 intersection. Since WSDOT has not yet defined its plan to improve traffic conditions along SR-9, specific mitigation measures cannot be identified. Given that WSDOT is actively planning to improve the SR-9 corridor and some level of mitigation is possible (although full improvement to provide LOS D conditions is unlikely because of the high costs), impacts are not necessarily inevitable or entirely unavoidable.

Similarly, Lake Stevens does not own or control the intersection of South Lake Stevens Road/24th Street SE/SR-9. While the analysis in this document showed that a traffic signal would operate acceptably at this location, this improvement has not been approved by WSDOT and there is no certainty that it will be implemented. If a full access intersection is not provided at this location, turning movements will be added to the 20th Street SE/SR-9 intersection, further exacerbating poor operations at that location.

1.5.8 Public Services

Demand for public services would increase incrementally in conjunction with the additional population and commercial growth expected to locate in the subarea. Any additional needs would be addressed in the City's Capital Facilities Plan and are not unavoidable.

1.5.9 Utilities

All alternatives are anticipated to result in additional development within the subarea, thereby increasing demand for water, sewer, and stormwater services. An increase in population and employment in the study area could exacerbate existing water and wastewater system deficiencies and increase demand for services beyond the capacity

of existing infrastructure in some limited areas. However, with application of mitigation measures, which include both regulatory measures and planned capital improvements, no significant unavoidable adverse impacts are anticipated.

1.6 BENEFITS & DISADVANTAGES OF DELAYING THE PROPOSED ACTION

The City is taking advantage of the current economic downturn to prepare for the next wave of growth; subarea planning is an element of a conscious strategy to grow and diversify the local economy. Benefits of the proposed action, and the objectives of the subarea plan, include additional retail and services, expanded housing, increased employment opportunities, and concentrated growth in a mixed-use center. From an economic development perspective, the proposal seeks to attract a greater amount of regional employment to the City, and to use the subarea plan and planned action to create an attractive environment and incentives for development.

Delaying the proposed subarea plan would be equivalent to implementing the *No Action* alternative, and would result in these possible benefits being postponed or potentially lost. Growth in the City would also be relatively more dispersed and less concentrated in centers. At the same time, lower levels of growth would create lower demand for public services and capital facilities.

1.7 ISSUES TO BE RESOLVED

Issues to be resolved by the City in selecting a preferred alternative include determining the appropriate types, intensity and overall magnitude of development for the subarea and how this could change the existing character of the area.

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2. DESCRIPTION OF PROPOSAL AND ALTERNATIVES

2.1 OVERVIEW OF THE PROPOSED ACTION

The City of Lake Stevens will consider the following actions and approvals:

1. Adopting a subarea plan, pursuant to the Revised Code of Washington (RCW) 36.70A.080, for the 20th Street SE Corridor Subarea, which will amend and become an element of the Lake Stevens Comprehensive Plan;
2. Amending the zoning map to rezone properties consistent with the subarea plan;
3. Revising the zoning code text to amend or adopt new classifications, development standards and/or design guidelines;
4. Amending the Comprehensive Plan's Transportation Element and Capital Facilities Element to address infrastructure needs required to support planned growth in the subarea; and
5. Adopting an ordinance designating the subarea as a Planned Action, pursuant to the State Environmental Policy Act (SEPA) specifically RCW 43.21C.031, and the SEPA Rules, specifically Washington Administrative Code (WAC) 197-11-164, for purposes of future environmental review and permitting.

Study Area

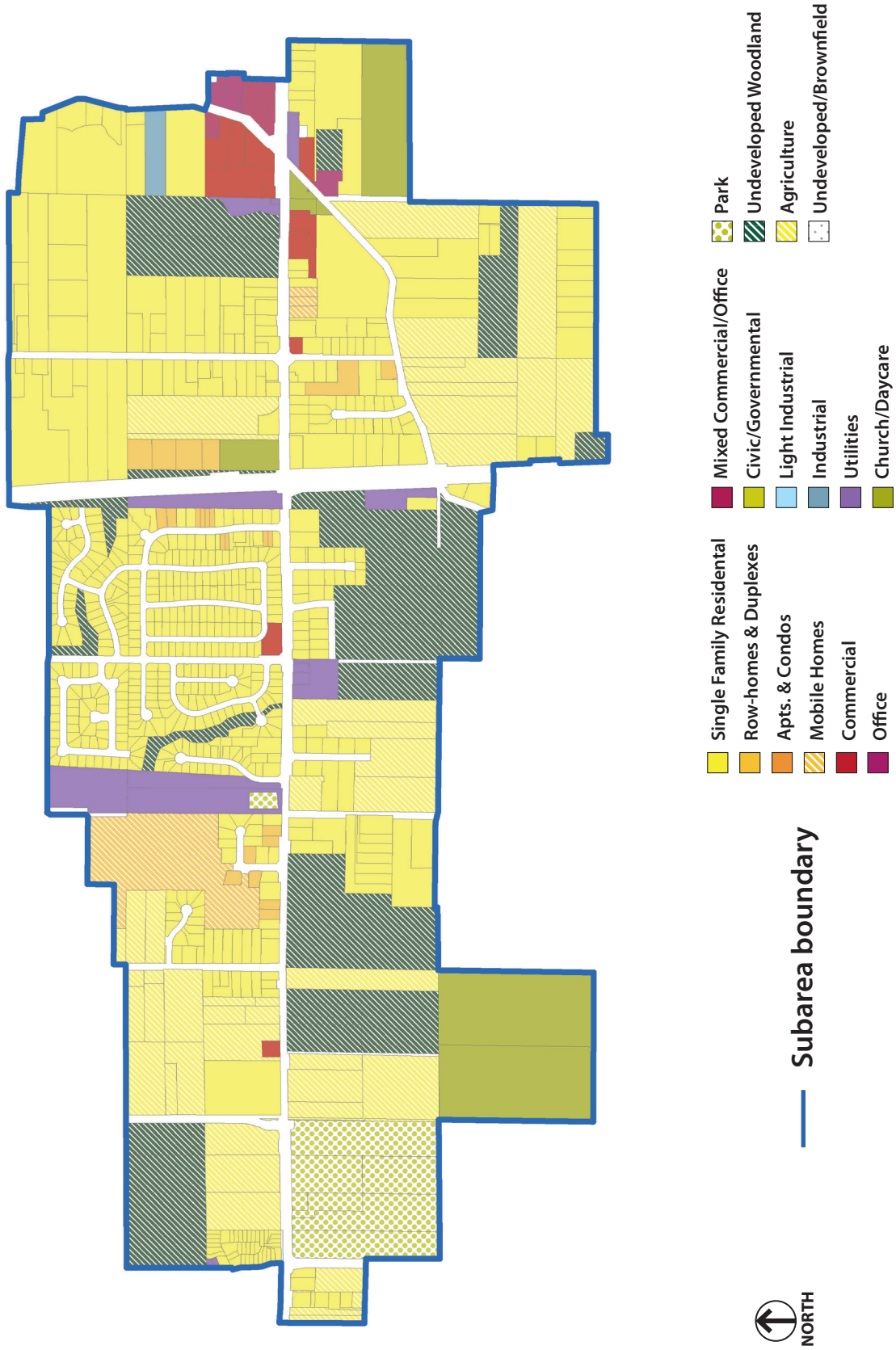
The City of Lake Stevens is located in Snohomish County, approximately six miles east of downtown Everett. The 20th Street SE Corridor crosses the southern portion of the City from approximately South Lake Stevens Road in the east to Cavalero Road in the west. The 20th Street SE Corridor Subarea, shown in Figure 2-1, is comprised of approximately 845 acres of land located north and south of 20th Street SE, and east and west of SR-9. The subarea was annexed into the City on December 31, 2009.

2.2 BACKGROUND & PLANNING CONTEXT

Growth Management Act

The Growth Management Act (GMA, Chapter 36.70A RCW) establishes a framework that the state's largest cities and counties must use to plan for growth in a manner that is coordinated with infrastructure needs and protects environmental resources. Each city subject to the GMA must plan to accommodate the population and employment projected to occur over a 20-year period. Local Comprehensive Plans must contain specific "elements" that, among other things, designate land uses, guide where and how growth will occur, identify necessary facilities and services, and plan for efficient multimodal transportation systems. In general, development projects must provide facilities and services "concurrent" with development (defined as within 6 years). The GMA authorizes cities to prepare plans for smaller subareas (RCW 36.70A.080).

Figure 2-1. 20th Street SE Corridor Study Area



Lake Stevens Growth Strategy

The City's strategy for accommodating growth, as expressed in the Lake Stevens Comprehensive Plan (adopted 1994 and amended annually), is to direct the majority of residential and employment growth into highly concentrated "growth centers," where infrastructure and services are available. Centers were designated in 2006 and updated in 2010, and include the Central Business District, Frontier Village (currently called Lake Stevens Center), Hartford Industrial Center, and South Lake (currently called 20th Street SE Corridor). Objectives of the growth strategy include increasing employment and improving the City's jobs/housing balance, conserving environmental resources, and providing services and facilities efficiently. The Comprehensive Plan expresses the City's intent to prepare a subarea plan for each growth center.

Economic Assessment Report

In 2010, the City had an *Economic Assessment* (Leland Consulting Group & LMN Architects, 2011a) prepared to evaluate the opportunities and constraints associated with each growth center. For the 20th Street SE Corridor, the assessment report identified the potential to add significant retail and office space over the next 20 years, and for the corridor to contain the City's highest concentration of jobs, which would help support its tax base.

Economic Development Strategy

Alongside the economic assessment, the City also had the Leland Consulting Group & LMN Architects prepare an economic development strategy (*Retail Forecast and Leakage Analysis* 2011b). The economic development strategy identified that significant retail "leakage" was occurring (i.e., consumers were travelling outside the City to spend retail dollars), and that the City has an opportunity to attract new retail development based on its demographics, location, and quality of life. The vision for the 20th Street SE Corridor is to provide high quality office/employment uses, with multiple nodes of modern retail/mixed-use development and additional high-density and multifamily residential units on the periphery or in mixed-use nodes. Potential target employment sectors include aerospace, clean technology, health sciences and outdoor sports/recreation gear.

2.3 PROPOSAL OBJECTIVES

The objectives for the 20th Street SE Corridor Subarea Plan are based on policies in the Lake Stevens Comprehensive Plan and the opportunities identified in the *Economic Assessment* and economic development strategy, discussed above. The objectives provide a basis for developing and evaluating subarea plan alternatives.

1. Establish 20th Street SE as an appealing gateway into the city with attributes reflecting a distinct, unified community.

2. Promote economic development and a more positive balance of jobs and housing by providing a mixture of jobs, goods and services, housing with recreation/open space and protection of important environmental resources.
3. Attract a variety of employers of varying sizes.
4. Encourage a concentration of local and regional retailing and services around the intersection of 20th Street SE and SR 9.
5. Create pockets of parks and open space throughout the corridor.
6. Continue the widening of 20th Street SE westward towards the Hewett Avenue (US-2) trestle.
7. Provide multiple routes of travel with clear circulation and access to destinations including parallel east-west circulation routes north and south of 20th Street SE.
8. Enhance the appearance of streets, sidewalks, sites, and buildings.

Draft subarea plan goals are summarized in Section 2.8.

2.4 PLANNED ACTION DESIGNATION

A Planned Action is a tool that cities can use to provide regulatory certainty and encourage economic development. This tool is permitted by state law (RCW 43.21C.031 and WAC 197-11-164), and operates by performing up-front SEPA review for a subarea plan and/or specific geographic area to streamline SEPA review for subsequent projects that are consistent with the plan. A Planned Action is designated by ordinance following preparation of an Environmental Impact Statement (EIS); the EIS evaluates the impacts of planned growth and identifies mitigation measures the City will require of the development. The Planned Action ordinance includes the following information:

- Designates the Planned Action area;
- Identifies the types of projects and amount of development that will be considered Planned Actions for purposes of SEPA compliance (certain types of development are not eligible, e.g., essential public facilities);
- Contains a finding that environmental impacts have been adequately addressed in the EIS;
- Identifies conditions or mitigation measures that will apply to projects; and
- Shows how the designated project meets the statutory definitions and criteria of a Planned Action.

When development is proposed in the planned action area, the City will evaluate the application to determine if it meets the criteria in the Planned Action Ordinance and "qualifies" as an implementing project. The criteria to determine consistency are:

- Is it the type of project anticipated in the subarea plan?
- Does it meet the conditions and mitigation requirements of the planned action?
- Have the significant environmental impacts been addressed in the EIS?

If a development proposal meets these criteria, then it qualifies as a planned action implementing project and no SEPA threshold determination is required; therefore, the project cannot be challenged on SEPA grounds. Developers may still propose projects that do not qualify as planned actions; however, they would perform their own SEPA analysis.

2.5 ENVIRONMENTAL REVIEW PROCESS

SEPA/GMA Integration

State Rules for implementing the State Environmental Policy Act (SEPA), authorize cities to combine the requirements of the GMA and SEPA in their planning processes (WAC 197-11-210). The goal of this "integration" is to ensure that consideration of environmental issues is an integral part of local planning, that it occurs early in the process, and that informed public involvement occurs. The integration rules provide flexibility regarding the timing of SEPA review and the format of planning and SEPA documents.

The City is developing a subarea plan for the 20th Street SE Corridor concurrently with the Planned Action EIS. This approach will generate environmental information early in the planning process, and allow decision makers to make planning decisions – including identification of a preferred alternative – using this information.

Prior Environmental Review

In 2006, the City prepared an integrated EIS for its 10-year Comprehensive Plan Update, which extended the planning horizon and population projections for the Comprehensive Plan. The EIS to the Comprehensive Plan identified the general (programmatic) impacts to the natural and built environment associated with the additional incremental growth. The EIS also identified a range of programmatic actions – including changes to policies and development regulations – that could mitigate potential impacts. The 2025 population and employment targets evaluated in the EIS are still the basis for City planning and for *Alternative 1* of this EIS.

Scope of Review for Subarea Plan

The City initiated the SEPA process for the 20th Street SE Corridor in June 2011, by issuing a determination of significance (DS), indicating that an environmental impact statement would be prepared, and requesting comments on the scope of the EIS. A public scoping meeting was held on July 14, 2011. The scoping comment period was open from June 28 to July 22, 2011. Based on its review of comments received and other

available information, the City identified the following topics for discussion in the EIS as part of a combined scoping notice:

- **Natural Environment**

  Earth – soils, geologically hazardous areas;

  Water – wetlands, streams and groundwater;

  Plants & Animals – wildlife, habitat and fisheries;

- **Air** – air quality and greenhouse gas emissions;
- **Land Use** – land use patterns, consistency with adopted plans & polices, population, housing and employment;
- **Aesthetics/Light & Glare** – changes to visual character and impacts to views;
- **Historic & Cultural Resources** – impacts to documented and potential cultural resources within the study area;
- **Transportation** – vehicular and pedestrian movement, traffic congestion, parking, and public transit;
- **Public Services** – police, fire, schools, parks and recreation; and
- **Utilities** – sewer, water, drainage and stormwater.

Other potential issues, such as noise and soil contamination, did not receive detailed study in the EIS based on review of existing environmental information and/or conclusions that the subarea plan was not likely to have a significant impact on those elements of the environment.

2.6 PROPOSAL & ALTERNATIVES

Overview

The EIS considers three alternatives, which involve different amounts, types and intensities of growth within the subarea:

> ***Alternative 1,*** *the No Action Alternative,* is required by SEPA and assumes continued growth under existing zoning and current plans without the adoption of a subarea plan;
>
> ***Alternative 2,*** places the greatest emphasis on encouraging and accommodating significant employment and commercial growth in the subarea that focuses growth in a number of nodes along the corridor, alongside some larger complexes, with an increase in high-density residential uses in transitional areas; and
>
> ***Alternative 3,*** which is similar to *Alternative 2,* emphasizes moderate employment and commercial growth in identified commercial and mixed-use

nodes and centers, but places a greater relative emphasis on residential growth, particularly high-density residential growth compared to *Alternative 2*.

The City is using the integrated planning and environmental review process, described previously, to help identify a preferred alternative for consideration. The preferred alternative may combine elements of several EIS alternatives within the identified ranges for land uses, jobs and population estimates, beyond what the City identified in the current Comprehensive Plan. Table 2-1 provides an overview of the type and intensities of new growth for consideration under the EIS alternatives.

Table 2-1. Summary of Growth Assumptions for Alternatives

Alternative	Retail (Gross Sq. Ft)	Office (Gross Sq. Ft)	Housing Units (dwelling units)
Alternative 1 – No Action	150,000-180,000 gsf	20,000-35,000 gsf	600-1,200 du
Alternative 2 – Employment/Commercial Emphasis	400,000-450,000 gsf	1-1.25 million gsf	900-1,000 du
Alternative 3 – Moderate Employment/ Commercial with Residential Emphasis	300,000-350,000 gsf	600,000-750,000 gsf	1,200-1,400 du

Assumptions about future growth are based on a review of historical land use patterns, adopted forecasts, projects currently under review, and emerging economic development strategies. The *No Action Alternative* reflects a continuation of recent growth patterns. The low end of the range of dwelling units for the *No Action Alternative* (600) approximates a continuation of the subarea's current proportion of housing and population to citywide housing and population (9.2 percent), projected to 2025. The high end of the range (1,200) is an increase above the projection provided in the economic study, prepared for the City (Leland Consulting Group, 2011). A related study assumes a 1.63 percent increase in the subarea's population to 2025 (Leland Consulting Group & LMN Architects 2011a). Either population projection reflects a scenario in which the City would not adopt a subarea plan, would not modify zoning, and would not otherwise take action to change existing development trends. The *No Action Alternative* does not reflect the ultimate capacity of the subarea provided by all vacant and redevelopable land in the area and does not represent buildout. In 2025, the subarea would still contain substantial vacant and redevelopable land at the end of the planning horizon.

Overall, under the *No Action Alternative,* the 20th Street SE Corridor would retain much of its current character in terms of type and intensity of land uses. Site-by-site development would occur without the guidance of an overarching plan or vision.

Commercial growth assumed in *the No Action Alternative* primarily reflects vested or planned development projects. Existing zoning, which segregates categories of uses (e.g., residential, commercial) would continue. A wide variety of commercial uses could occur on appropriately zoned properties (Local Business and Sub-Regional Commercial zones) alongside single-family residential uses in the remainder of the area.

In contrast, land uses for *Alternative 2* and *Alternative 3*, would be driven by market opportunities and an economic development strategy. Rather than following past trends, the action alternatives would establish a different image and land use pattern for the 20th Street SE Corridor with a strong emphasis on employment growth, economic diversification and capturing the retail spending occurring outside the City. The types and amount of land uses embodied in the action alternatives are based on market opportunities identified in an economic assessment and economic development strategy prepared for the City (Leland Consulting Group, 2011 and L Leland Consulting Group & LMN Architects 2011a). Identified development nodes would encourage a more intensive mix of uses – in the same building, on the same site, or within the same area – through new zoning classifications. These nodes would complement concentrated commercial and employment centers in the area and provide services to local neighborhoods and beyond. To ensure compatibility, permitted uses would be more limited than at present and more focused on market opportunities. To achieve the desired quality and character of the subarea, new development would be subject to design guidelines and standards. Designating the subarea as a Planned Action will provide an incentive to attract the desired type of growth.

The amount of growth occurring in the subarea under *Alternative 2* and *Alternative 3* primarily reflects an acceleration of historical growth trends; it is not based on a discrete forecast. It assumes that the subarea will attract a greater amount of citywide growth because of the previously mentioned factors.

The following sections describe the major elements of each alternative in detail below. The graphics illustrating *Alternative 2* and *Alternative 3* are generalized representations of the locations of various land uses. The alternative diagrams are not zoning maps and are not regulatory in nature. Boundaries shown on the graphics do not necessarily follow property boundaries. Zoning maps will be developed later, following public discussions of subarea issues and clear legislative direction establishing a preferred alternative for the plan.

Alternative 1 - No Action

The *No Action Alternative*, a mandatory element in every EIS, is based on the current zoning designations in the subarea and assumes that the City will not adopt a subarea plan for the 20th Street SE Corridor. It does not mean that growth will not occur in the subarea. Existing zoning and land use designations, shown in Figure 2-2, will continue to apply; any changes would result from project-specific amendments. Under this

alternative, the City would not target economic growth proactively in the subarea. Levels of growth, shown in Table 2-2, could range from a modest increase consistent with recent trends and forecasts (low end of range), to realizing a slightly greater proportion of citywide housing and population growth (high end of range). Land use would be predominantly single use in nature (i.e., no mixed-use development or employment/retail nodes). Housing would be predominantly single-family with some high-density and multifamily components. Commercial and retail development would occur in locations zoned for such uses (Local Business and Sub-Regional Commercial zones). Existing regulations allow a broad range of commercial uses with different bulk standards. For example, building heights currently range from 60- 85 feet in commercial zones.

Table 2-2. No Action Alternative: 2025 Growth Assumptions

Land Use	Net Housing Increase	Net Population Increase	Net Commercial Increase (Gross Sq.Ft.)	Net Jobs Increase
Focus on Residential, limited Commercial	600-1,200	1,722-3,444	Retail: 150,000-180,000 Office: 20,000-30,000	360-465

No significant infrastructure improvements would occur in the subarea, beyond those identified in the existing Capital Facilities Plan. The *No Action Alternative* would not designate the subarea as a Planned Action; therefore, individual development projects would prepare their own SEPA documentation and would address development impacts and mitigation on a project-by-project basis. The *No Action Alternative* would not accomplish the City's stated objectives for the subarea.

Alternative 2 – Intensive Employment/Commercial Emphasis with some Residential Growth

Alternative 2 is the most concentrated action alternative presented for the 20th Street SE Corridor. This alternative emphasizes significant retail/service and employment growth along with a moderate increase in high-density residential development. *Alternative 2* promotes proactive employment and commercial growth that provides a balance of jobs and housing, directing significant growth to the 20th Street SE Corridor. The projected growth would occur through development of vacant, underdeveloped, or underused parcels throughout the corridor and with concentrations at major intersections.

Figure 2-3 shows the subarea's proposed land use pattern. Table 2-3 shows the growth assumptions for *Alternative 2*. This alternative would locate a major portion of the City's 2025 employment growth target in the subarea, which could potentially exceed the current 2025 job projection. In addition, a significant proportion (up to 14 percent) of citywide 2025 housing and population growth could occur in the subarea. (Forecasts

are discussed in greater detail in Section 3.5 of the Draft EIS). *Alternative 2* assumes housing growth will be 75 percent multifamily and 25 percent small lot single-family.

Table 2-3. Alternative 2: 2025 Growth Assumptions

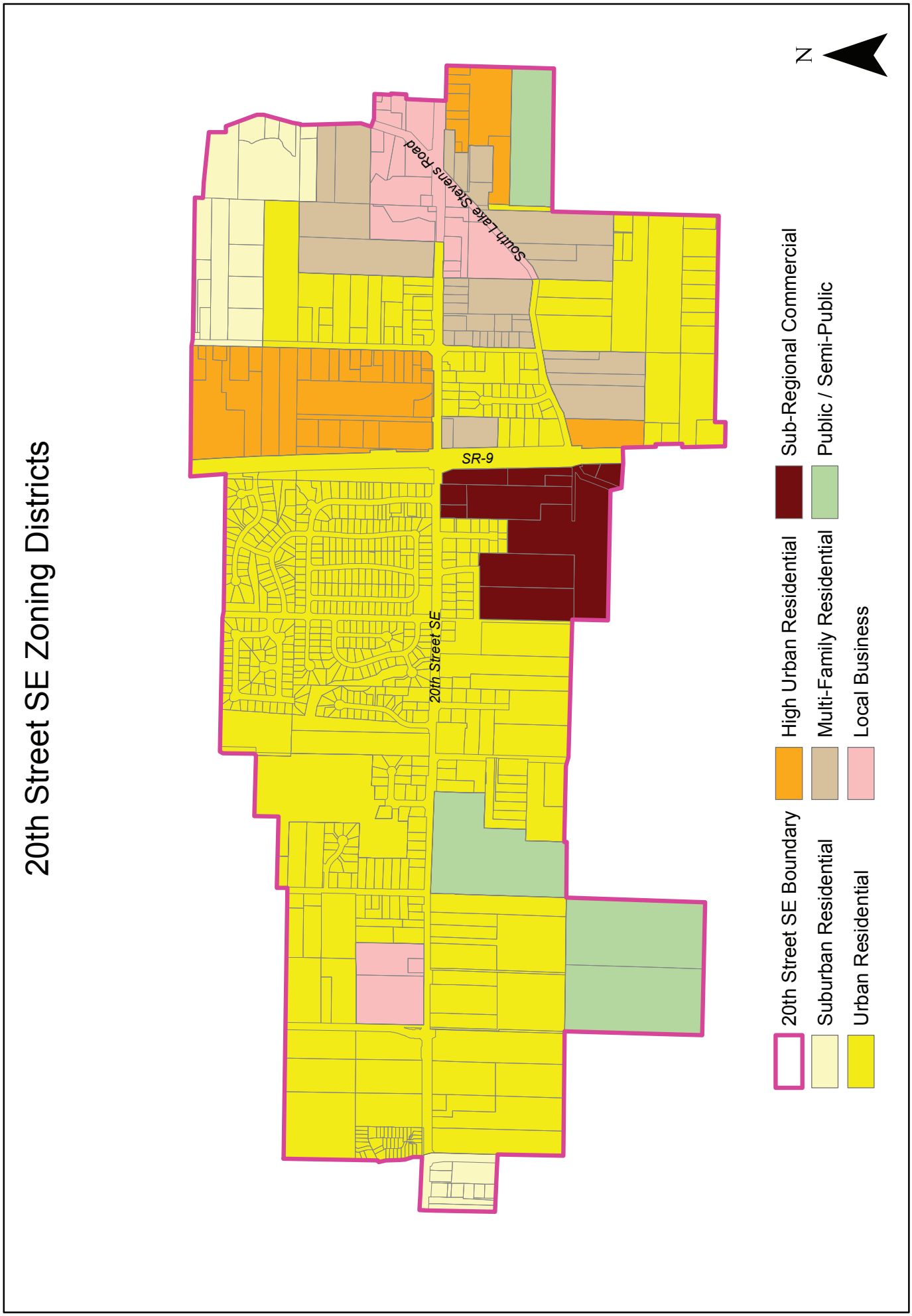
Land Use	Net Housing Increase	Net Population Increase	Net Commercial Increase (Gross Sq. Ft)	Net Jobs Increase
Mix of Retail, Office, and Residential	900-1,000	2,600-2,900	Retail: 400,000-450,000 Office: 1-1.25 million	3,800-4,500

The subarea would create a mixed-use district with several use-specific nodes of varying intensities. Retail development would occur in a number of nodes, shown on Figure 2-3, with a major commercial area concentrated at the southwest corner of 20th Street SE and SR-9. Office development would occur in the identified office nodes as well as in two larger office parks. High-density and small-lot single-family residential uses would be located in transitional areas throughout the subarea. It is likely that mixed-use areas will contain an option for multifamily units.

The City, special purpose districts, and developers would provide new and upgraded utility infrastructure (sewer, water, and drainage/stormwater) to support planned growth. Road, circulation and transit improvements could include the following:

- Completing the expansion of 20th Street SE toward the Hewett Avenue trestle;
- Constructing a new two-lane east-west road extending 24th Street SE between SR-9, to the east, and Cavalero Road, to the west;
- Including roundabouts at major intersections for traffic control while maintaining the traffic signal at the SR-9 intersection;
- Extending 91st Ave SE south to 24th Ave SE;
- Conversion of some private roads to public roads;
- Constructing multi-use trails on the northern side of the extended 24th Ave SE and under the powerlines;
- Widening and improving road shoulders to accommodate bicycles, where identified;
- Constructing a new transit center in the area to support employment and retail centers and nodes; and
- Establishing a finer-grained street grid as properties develop in the western portion of the study area, north and south of 20th Street SE.

Figure 2-2. No Action Alternative (Existing Zoning)



This alternative would identify parks and recreation opportunities to support the goal of integrating the natural environment with the built environment. For example, the City would coordinate with Snohomish County to develop the existing County park site. In response to residential development, the City would plan and construct new parks and open spaces to meet adopted level of service standards with updates to the Parks and Recreation Plan. Revised development regulations may encourage new office, commercial and mixed-use development projects to provide public or semi-public open spaces.

New and amended zoning regulations and design guidelines and standards would address the mix, scale, and form of development. A transportation impact fee program will be considered to address subarea transportation needs, along with other techniques to help finance improvements.

The 20th Street SE Corridor subarea would be designated as a Planned Action, which would encourage economic development and facilitate SEPA review for projects that are consistent with the subarea plan and the EIS.

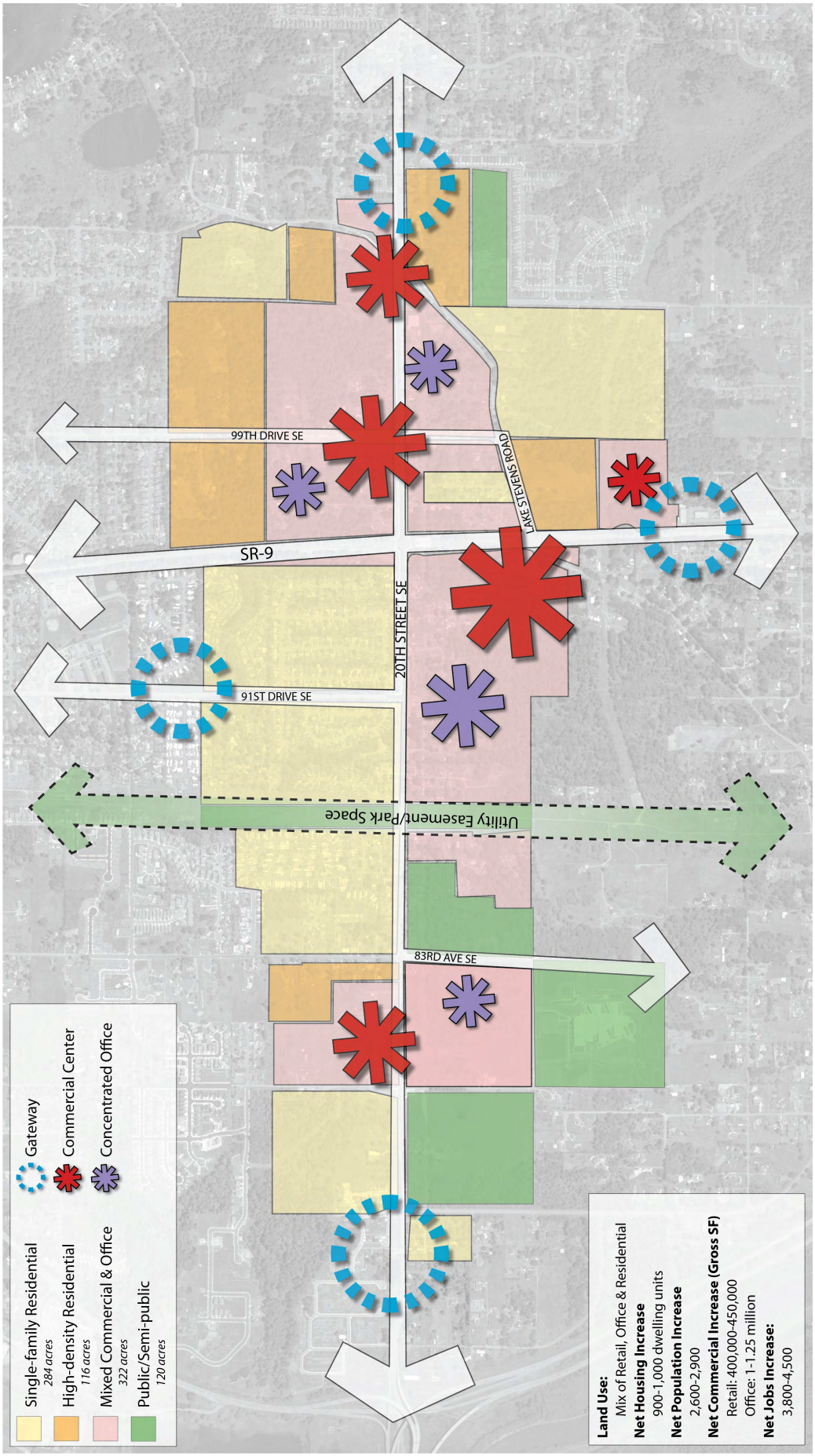
Alternative 2 would accomplish the City's stated objectives for the subarea.

Alternative 3 – Moderate Employment/Commercial with Emphasis on Residential Growth

Alternative 3 includes a mix of retail, office, and residential growth in the amounts shown in Table 2-4. Proposed land uses are shown in Figure 2-4. While *Alternative 3* is similar to, *Alternative 2*, this alternative reduces the intensity of commercial and employment uses while proposing a greater amount of residential development throughout the area. In fact, this alternative envisions the greatest increase in residential development among all the alternatives. Like *Alternative 2*, the subarea would include a mixed-use district with individual commercial, office, and retail uses focused in nodes as identified in Figure 2-4.

Under this scenario, the subarea could accommodate between 20 percent and 30 percent of the City's targeted population increase by 2025. New jobs in the subarea would represent between 71 percent and 89 percent of citywide jobs by 2025 (Growth assumptions and forecasts are discussed in greater detail in Section 3.5 of the Draft EIS).

Figure 2-3. Alternative 2 Land Use



20th Street Corridor Alternative 2: Intensive Employment with Residential

September 22, 2011

Table 2-4. Alternative 3: 2025 Growth Assumptions

Land Use	Net Housing Increase	New Population Increase	Net Commercial Increase (Gross Sq.Ft.)	Net Jobs Increase
Mix of Retail, Office and Residential	1,200-1,400	3,500-4,000	Retail: 300,000-350,000 Office: 600,000-750,000	2,400-3,000

Similar to *Alternative 2*, new and upgraded utility infrastructure (sewer, water, and drainage/stormwater) would be provided to support planned growth. Also similar to *Alternative 2*, a program of road, circulation and transit improvements could be constructed as described for *Alternative 2* above.

Under *Alternative 3*, parks and recreation planning would be as discussed for *Alternative 2*. The City would coordinate with Snohomish County regarding development of the existing County park site. In response to residential development, the City would plan and construct new parks and open spaces to meet adopted level of service standards with updates to the Parks and Recreation Plan.. Zoning regulations would also require or encourage provision of public or semi-public spaces in new office, commercial and mixed-use development projects.

Alternative 3 would include new and amended zoning regulations and design guidelines and standards to address the mix, scale and form of development. This would include new zoning classifications. A transportation impact fee program would be established to address subarea transportation needs, along with other techniques to help finance improvements.

The subarea would be designated as a Planned Action, which would encourage economic development and facilitate SEPA review for projects that are consistent with the subarea plan and the EIS.

Alternative 3 would accomplish the City's stated objectives for the subarea.

2.7 BUILDING TYPOLOGIES

For purposes of illustration, and to assist in the EIS analysis, several typical building types that could occur in the subarea have been developed and are shown in Figures 2-5, 2-6 and 2-7. Illustrative building types include office (office park, low-rise office and mixed-use), commercial/retail (neighborhood and regional scale centers), and higher density residential (multifamily and small lot residential). The illustrations are intended to represent the potential types and scale of development that could occur under *Alternative 2* and *Alternative 3*, consistent with draft subarea plan policies,

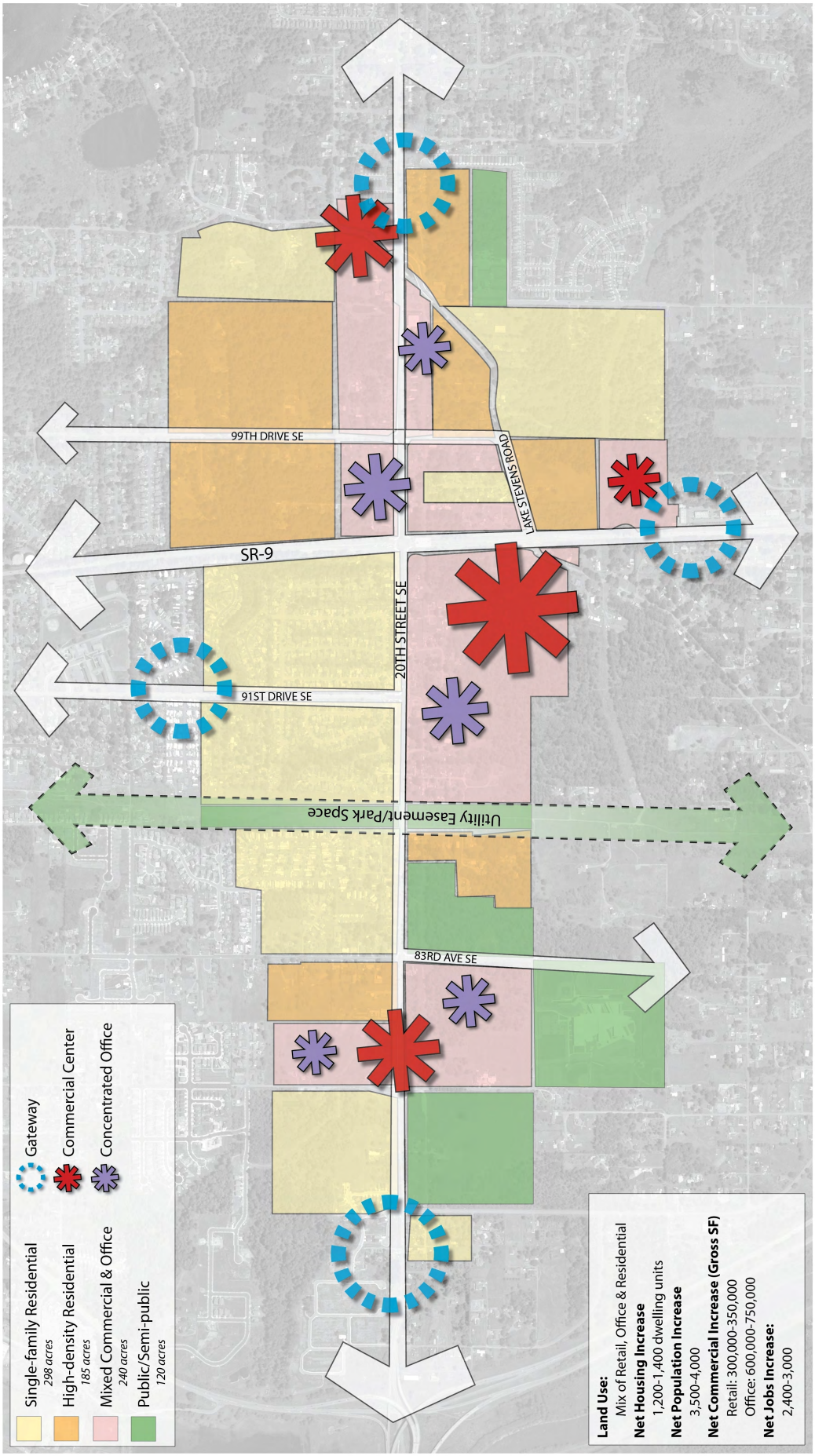
revised/new zoning regulations and new design guidelines and standards, and the development assumptions in the Draft EIS. The illustrations do not represent specific development proposals by property owners or the City.

2.8 SUBAREA PLAN GOALS

Under *Alternative 2* and *Alternative 3*, a Subarea Plan would be adopted to guide the type, amount, location and character of future growth. Draft preliminary subarea plan goals are summarized briefly below. The subarea plan is being developed in coordination with the EIS and will change in response to environmental information, public comment and legislative direction established by the City Council with the assistance of the Planning Commission. As noted previously, the *No Action Alternative* does not include adoption of a subarea plan.

The subarea plan establishes a framework for implementing a vision for the 20th Street SE Corridor. It relies on and supplements general policies and regulations found in the Lake Stevens Comprehensive Plan, municipal code, and *Engineering Design and Development Standards* with clear policy statements and guidance regarding the type, amount, location, and character of future growth in the 20th Street SE Corridor. The subarea plan will guide the development of new or amended development regulations.

Figure 2-4. Alternative 3 Land Use



20th Street Corridor Alternative 3: Enhanced Employment/Increased Residential

September 22, 2011

Figure 2-5 Prototype Illustrations – Office

Office

Employment opportunities within the City of Lake Stevens are supported by a combination low and medium intensity office uses. The majority of these uses are planned for the 20th Street SE Corridor Subarea. These uses are expected to serve both local and regional employers. The proposed office related zones, in both subareas, are intended to prevent the appearance of strip commercial development by allowing office uses but limiting the amount of commercial uses. However, the 20th Street SE Office Typology Development is expected to be somewhat auto-accommodating.

a. Office Park

The location of an Office Park is the product of lot size and access. Typically a collection of 2-4 story buildings, Office Parks are often times sited in a natural, "campus-like" environment where landscaping serves to soften the scale of the buildings and adjacent parking areas. A number of smaller parking lots with greenbelts, landscaping or open areas is preferable to one large parking area.

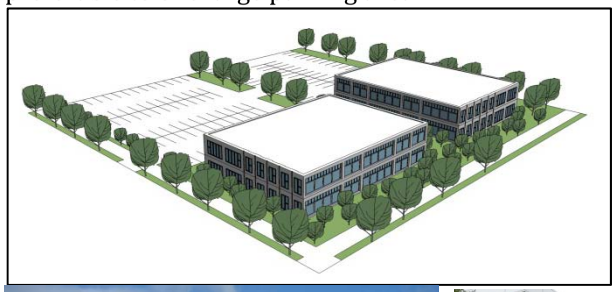


Illustration of office park development

Examples of office park development

b. Low-Rise Office

Low-rise development is intended to be of a scale and character similar to nearby residential developments as a means of promoting compatibility with the surrounding area. The allowed uses are intended to primarily serve nearby neighborhoods and have few detrimental impacts on the neighborhood. Where feasible, development should be oriented to local pedestrians and bicyclists.

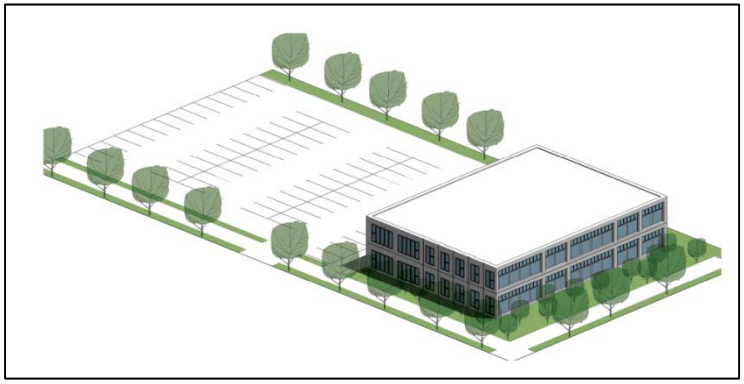


Illustration of low-rise office development

Examples of low-rise office development

Figure 2-5 Prototype Illustrations – Office

c. Mid-Rise Office

The location of Mid-rise Office is the product of lot size and access. Typically 2-4 stories, Mid-rise Office is often times sited in a "park-like" environment where landscaping serves to soften the scale of the building and adjacent parking areas.

Illustration of mid-rise office development
Example of mid-rise office development

d. Mixed-Use Office

Unlike the low office which is designated to be compatible with surrounding residential neighborhoods and solely consist of surface parking, mixed-use examples of office include shared parking with the other commercial and/or residential use and some tuck-under structured parking, which can be accommodated onsite or integrated vertically into the office building.

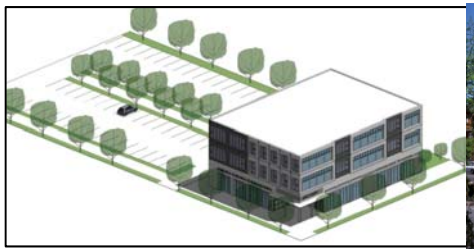


Illustration of mixed use office development
Example of mixed use office development

Figure 2-6 Prototype Illustrations – Commercial/Retail

Commercial

Commercial uses in the 20th Street SE Subarea are envisioned to include both neighborhood-oriented retail uses that serve the surrounding residential neighborhoods and larger format retail chains serving a region. The 20th Street SE Subarea will be developed with recognition and respect for natural areas, where feasible, including views of designated woodlands and habitat corridors. Development is also intended to be pedestrian-oriented with limited parking allowed between the building and the street, lush landscaping that helps screen the building and clearly defines the pedestrian realm. Landscaping associated with stormwater management practices shall be incorporated into all parking areas.

Neighborhood Retail Centers

The neighborhood centers could occur at intersections throughout the Subarea and could be zoned for mixed-use development. The existing center in the northeast corner of 20th Street SE and South Lake Stevens Road is an example of a smaller retail center serving a neighborhood as well as including the administrative offices for Lake Stevens Fire.

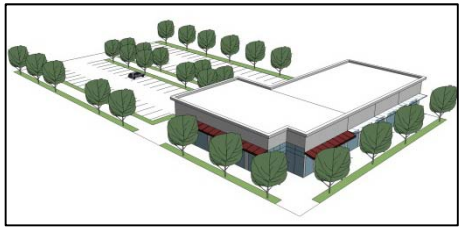


Illustration of neighborhood retail center
Example of neighborhood retail center

Regional Retail Centers

The larger retail centers correspond to the availability of larger sites within the 20th Street SE Subarea. One location is the area in the southwest corner of SR9 and 20th Street SE. These centers could include big box retail with smaller retail, restaurants, and entertainment.

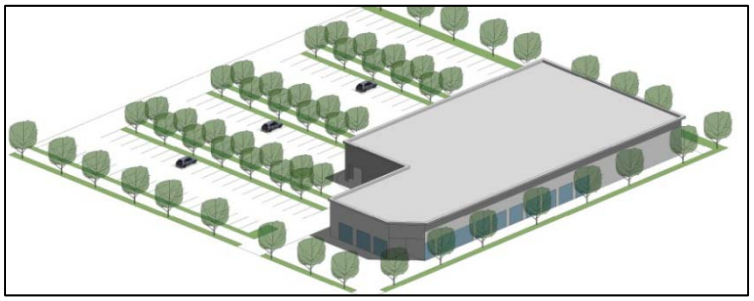


Illustration of regional retail center

Illustration of regional retail center

Figure 2-7 Building Prototypes – Higher Density Residential

Higher Density Residential

Higher density residential development in the subarea would support the new jobs and commercial centers. The use can also serve as a transition zone between higher intensity uses such as office parks and regional commercial centers and existing single-family housing developments. There are two types of higher density residential: multi-family residential and small lot single-family residential.

a. Multi-Family Residential

Multi-family residential development includes condominiums, apartments, townhouses, and row houses. Complexes proposed in the 20th Street SE Subarea are expected to be 2-4 stories with a common street frontage and parking behind or to the side of the buildings. Based upon the size of the development, buildings are to include a common or shared open space that encourages neighbors to gather and children play.

Besides creating a consistent and unified edge condition, the street facing façade should consist of a range of plantings, including grass that softens the appearance of the building. Where feasible, the primary street facing façade is oriented to a public amenity such as a park, retail or a community service use or a civic use such as a local library or a post office. Safety, in the shared open space and along the street, is promoted by a site and building layout that encourages "eyes on the street."

Illustration of a multi-family housing

Examples of multi-family housing

b. Small Lot Single-Family Residential

Small lot single-family residential includes single-family homes on small or shared lots, duplexes, cottage housing, etc. These serve to increase housing density near employment and retail locations, while serving as a transition between the higher density use and existing single-family developments. Due to the closeness of the houses, shared open areas such as community gardens, lawn areas or seating areas are important amenities. Non-motorized connections to nearby parks or trails, retail centers or other facilities are important.

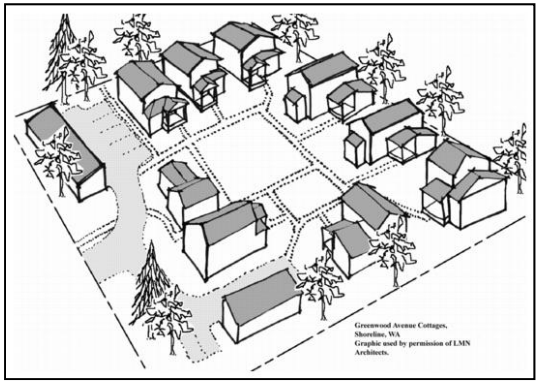


Illustration of a cottage housing development

Illustration of a cottage housing development

The major objectives of the subarea plan are to promote the addition of significant retail and office space in the subarea over the planning horizon in multiple retail/mixed-use nodes, to create a concentrated job center, and to provide opportunities for quality high-density residential neighborhoods in transitional areas. Secondary objectives include attracting a variety of different sized employers; establishing a program of road, circulation and transit improvements; and emphasizing high quality design standards. Major plan elements and goals include the following:

1. **Community Character**
   Goal 1.1: The corridor should evolve into a more cohesive district with a particular identity high quality development, attractive streets, and public spaces, but one with various neighborhoods containing different mixtures and concentrations of use.
2. **Livable Places & Housing**
   Goal 1.2: The subarea should evolve into a collection of neighborhoods that offer a range of choices in housing type and size, as well as tenure retail goods and services, and employment in development that affects high standards of design.
3. **Land Use & Intensity**
   Goal 1.3: The subarea holds great potential for accommodating employers, a land use that is deficient in the City as a whole. It also would be the location of at least one retail/mixed-use center with a regional draw.
4. **Circulation & Mobility**
   Goal 1.4: The subarea should have a complete transportation system that supports all modes of travel, including motorized vehicles, transit, bicycles, and walking.
5. **Sustainability & Natural Resources**
   Goal 1.5: New development for this area should integrate into the natural systems of wetlands, creeks, and greenbelts.
6. **Public Places & Community Facilities**
   Goal 1.6: Investment in public spaces is critical to attract high-quality residential and employment development.

In addition, the subarea plan identifies development typologies, which portray the main development types anticipated, both visually and descriptively, as they relate to various locations envisioned in the plan. The main typologies include High Density Residential (multifamily and small lot single-family), Retail, Office, and Mixed-Use.

2.9 BENEFITS & DISADVANTAGES OF DELAYING THE PROPOSED ACTION

The City is preparing for the next wave of growth, and subarea planning is an element of a conscious strategy to grow and diversify the local economy. Benefits of the proposed action, and the objectives of the subarea plan, include attracting additional retail and services, expanding housing, increasing employment opportunities, and concentrating growth in a mixed-use center. From an economic development perspective, the proposal seeks to attract a greater amount of regional employment and commercial opportunities to the City, and it will use the subarea plan and planned action to create an attractive environment and incentives for development.

Delaying the proposed subarea plan would be equivalent to implementing the *No Action* alternative, and would result in these benefits being postponed or potentially lost. Growth in the City would also be relatively more dispersed and less concentrated in centers. At the same time, lower levels of growth would create lower demand for public services and capital facilities.

2.10 ISSUES TO BE RESOLVED

In selecting a preferred alternative, the City must determine the appropriate types, intensity and overall magnitude of development for the subarea. Furthermore, the City will need to examine how these elements could change the existing character of the area. For example, the change in zoning could lead to changes in property values indirectly, which could affect individual assets, and property taxes. In addition, increased growth will affect the cost, timing and ability to fund necessary public services and capital improvements.

3. ENVIRONMENTAL ANALYSIS

3.1 NATURAL ENVIRONMENT

3.1.1 Affected Environment

This section includes a discussion of existing conditions within the City of Lake Stevens in general, and within the study area in particular, as they relate to the natural environment. Natural resources discussed here include the following: Earth Resources including geological features such as topography, soils and geological hazards; Water Resources including groundwater, surface water, and wetlands; and Plants and Animals, including wildlife and fish. This section provides a general overview of these topics, but focuses specifically on those resources protected by local, state, and federal regulations, particularly those identified in the City of Lake Stevens Municipal Code as critical areas (Chapter 14.88 LSMC).

Earth

Topography and Soils

While the central portion of the City of Lake Stevens is characterized by a ring of hills surrounding the lake basin, the study area, which lies in the southwestern corner of the city, is located on a relatively level Pleistocene glacial terrace. Terrain in the study area is relatively level at approximately 300 feet above sea level, though the topography slopes down toward Ebey Slough at the western end of the study area and slopes up toward a small plateau in the northeastern portion of the study area (City of Lake Stevens, 2010).

Soils in the study area consist primarily of a variety of gravelly, sandy, and silty loams. Tokul gravelly loam is the dominant soil type in the area, accounting for 70.7 percent of the study area at 0-8 percent slopes and 20.1percent of the study area at 8-15percent slopes. A summary of soil units in the study area is presented in Table 3.1-1 below.

As described in the Lake Stevens Comprehensive Plan, Tokul gravelly loams have moderate depth and drainage. Areas underlain by these soils often experience slow water infiltration, which can lead to septic system failures.

Geologically Hazardous Areas

Geologically hazardous areas, as defined by the Lake Stevens Municipal Code (LSMC), include areas susceptible to erosion, sliding, earthquakes, liquefaction, or other geological events (LSMC 14.88.600(a)). The LSMC classifies geologically hazardous areas based on their characteristics. The LSMC requires that development proposals within 200 feet of any mapped geologically hazardous area must submit a geological assessment that analyzes the potential impacts associated with development in

proximity to the hazard area and identifies mitigation measures to protect development onsite and on adjacent properties.

Table 3.1-1. Subarea Soil Units

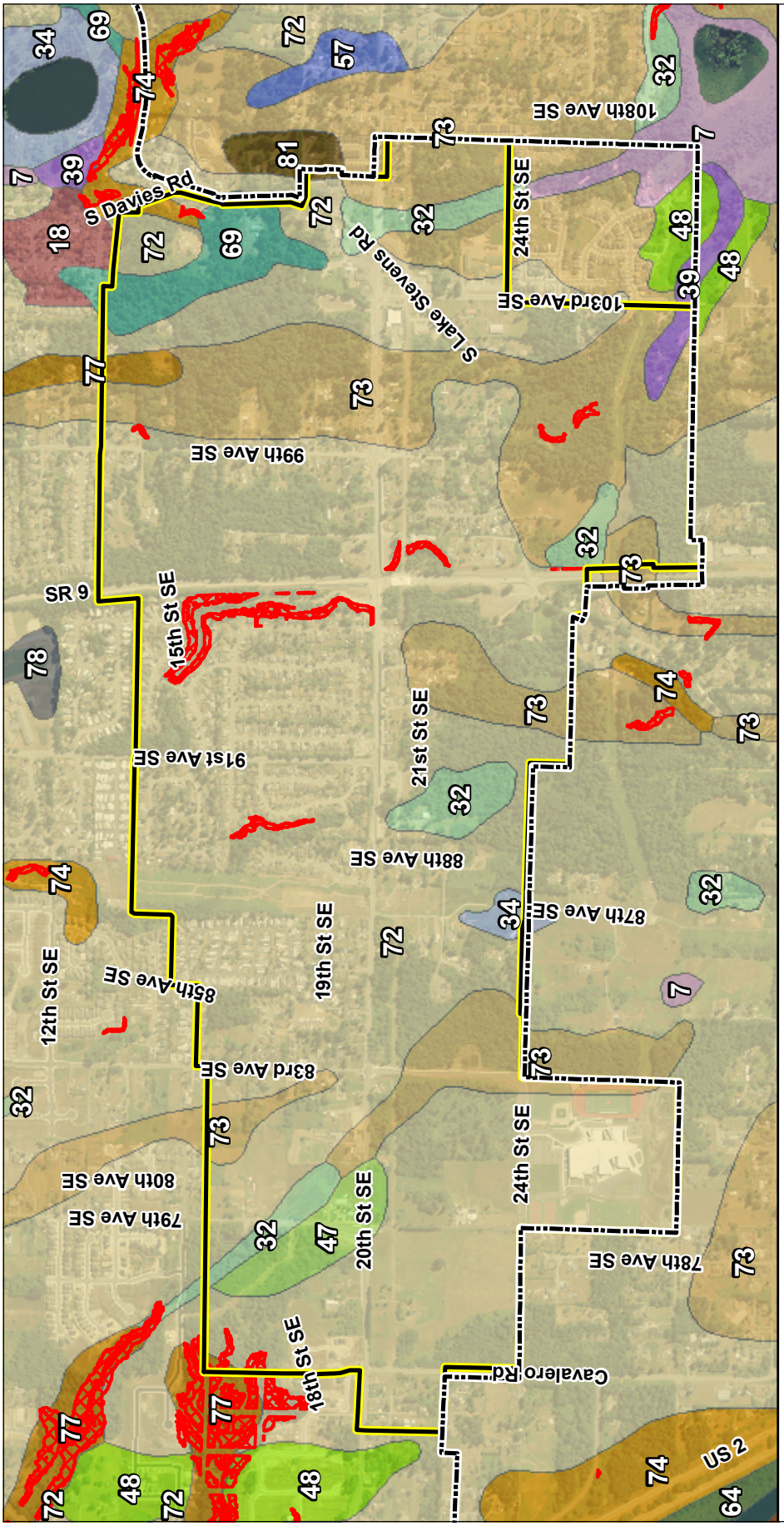
Soil unit	Acres	Percent of Study Area
Everett gravelly sandy loam, 8 to 15 percent slopes	0.09	0.01
McKenna gravelly silt loam, 0 to 8 percent slopes	29.37	3.47
Mukilteo muck	3.29	0.39
Norma loam	3.75	0.44
Pastik silt loam, 0 to 8 percent slopes	15.27	1.81
Pastik silt loam, 8 to 25 percent slopes	0.17	0.02
Terric Medisaprists, nearly level	19.25	2.28
Tokul gravelly loam, 0 to 8 percent slopes	597.64	70.72
Tokul gravelly loam, 15 to 25 percent slopes	1.59	0.19
Tokul gravelly loam, 8 to 15 percent slopes	169.63	20.07
Tokul-Winston gravelly loams, 25 to 65 percent slopes	4.41	0.52
Winston gravelly loam, 3 to 30 percent slopes	0.61	0.07
Total:	**845.07**	**100%**

Source: USDA, 2010

According to the City's GIS database, the study area contains approximately 6 acres of geologically hazardous areas in the form of steep slopes. The largest concentration of steep slopes is located near the intersection of 20th Street SE and SR-9, along both sides of a forested stream bank. Steep slope hazard areas are also located approximately 0.25-mile west of this intersection, also along a stream bank, and in the far northwestern corner of the study area (City of Lake Stevens, 2007a). The distribution of geologically hazardous areas in this study area is shown in Figure 3.1-1.

The LSMC also regulates areas that are geologically hazardous due to risk of soil erosion. Erosion hazard areas are defined as areas designated by the USDA Soil Conservation Service, the US Geological Survey, or the Department of Ecology Coastal Zone Atlas as being erosion hazards. The US Department of Agriculture (USDA) considers Tokul gravelly loams at 15-25 percent slopes moderate erosion hazards, as well as Winston gravelly loams. Some erosion is likely in these areas, and erosion control measures may be necessary. Tokul-Winston gravelly loams with slopes greater than 25 percent are considered severe erosion hazard areas. As illustrated in Figure 3.1-1, these soil types, indicated by soil map units 74, 81, and 77, respectively, cover approximately 6.6 acres, which is a relatively small proportion of the study area.

Figure 3.1-1. Soil Units & Geologic Hazards



Soil Unit	Description
7	Bellingham silty clay loam
18	Everett gravelly sandy loam, 8 to 15 percent slopes
30	Lynnwood loamy sand, 0 to 3 percent slopes
32	McKenna gravelly silt loam, 0 to 8 percent slopes
34	Mukilteo muck
39	Norma loam
47	Pastik silt loam, 0 to 8 percent slopes
48	Pastik silt loam, 8 to 25 percent slopes
55	Puget silty clay loam
57	Ragnar fine sandy loam, 0 to 8 percent slopes
64	Snohomish silt loam
69	Terric Medisaprists, nearly level
72	Tokul gravelly loam, 0 to 8 percent slopes
73	Tokul gravelly loam, 8 to 15 percent slopes
74	Tokul gravelly loam, 15 to 25 percent slopes
77	Tokul-Winston gravelly loams, 25 to 65 percent slopes
78	Urban land
81	Winston gravelly loam, 3 to 30 percent slopes

City Boundary

Steep Slopes

Study Area

0 500 1,000 Feet

Water Resources

Groundwater

Snohomish County Public Utility District (PUD) #1 maintains two emergency groundwater wells over the aquifer; no public water system currently uses the aquifer as its primary water source. According to the Lake Stevens Comprehensive Plan, the aquifer is located in the northeastern portion of the city, outside the study area (City of Lake Stevens, 2010). However, the PUD plans to convert these wells to full-time use within the next few years to supplement the primary water supply. Snohomish County records also indicate that, because depth to groundwater in most of the study area is over 100 feet and because local soils have limited permeability, the sensitivity of the aquifer to pollution from surface activities is low to moderate (Snohomish County, 2007).

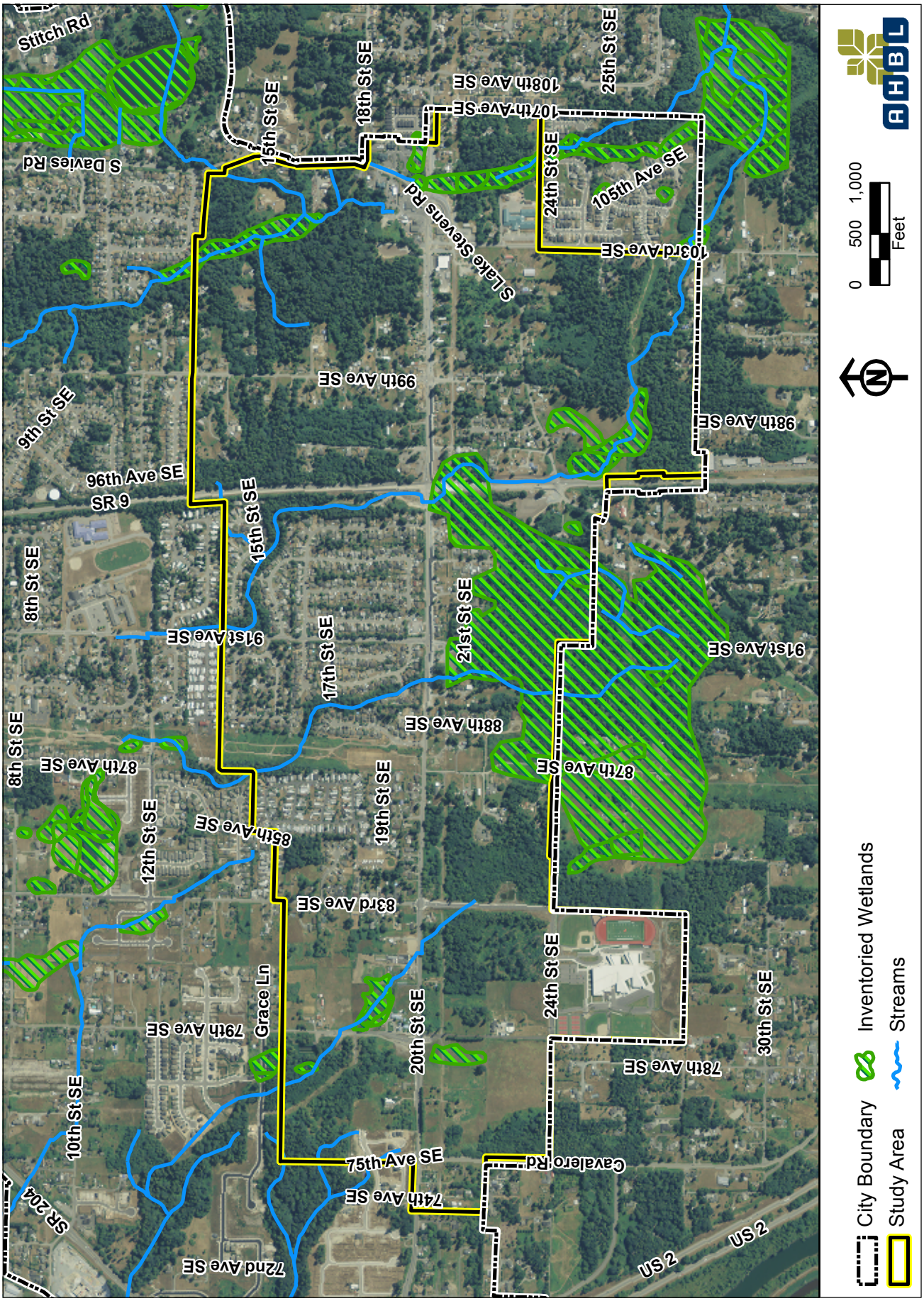
While no public water systems near Lake Stevens use groundwater as a primary water source, the study area contains seven private water sources that serve development not connected to a public water supply. While the City does not maintain records of the exact locations of private wells, the Washington State Department of Ecology maintains well log records for legally established resource protection and water supply wells, including approximate locations. According to Ecology records, private wells within the study area are concentrated west of 87th Avenue SE; five are located south of 20th Street SE, and one is located north of 20th Street SE. One additional well is located at the far eastern edge of the study area, north of the intersection of 20th Street SE and South Lake Stevens Road. In addition to the legal wells documented by Ecology, the City is aware of an additional five or six unpermitted wells in the southeastern corner of the study area, serving residential properties on the west side of 103rd Avenue SE.

The City's Critical Area regulations (Chapter 14.88 LSMC) do not define aquifer recharge areas and do not categorize them as geologic hazard areas. Such areas are not mapped.

Surface Water

As described in the City of Lake Stevens Comprehensive Plan, portions of the city lie within three major drainage basins: the Lake Stevens drainage basin, the Sunnyside Creek drainage basin, and the Pilchuck River drainage basin. Ultimately, all surface waters in the city drain to Puget Sound, either directly via Ebey Slough or via the Pilchuck and Snohomish Rivers (City of Lake Stevens, 2010). Based on sub-basin mapping performed by the Snohomish County Department of Public Works, the majority of the study area lies within the Sunnyside drainage basin, though the eastern edge of the study area lies within the Lake Stevens drainage basin (Snohomish County, n.d.).

Figure 3.1-2. Streams & Wetlands



The study area does not contain any major streams, but it does contain approximately 4.3 miles of unnamed streams, shown in Figure 3.1-2. The eastern end of the study area contains two perennial streams with a combined length of 2,676.24 feet, one of which has been documented as hosting Coho salmon (Oncorhyncus kisutch). The study area also contains several seasonal streams with a combined length of 2,896.76 feet. DNR has not assigned a stream type code for the remaining streams, nor has DNR identified the presence of fish in these systems. (DNR, 2006).

Wetlands

Wetlands are widespread throughout the City of Lake Stevens, with several large complexes located along major streams, including Catherine Creek, Lundeen Creek and Stevens Creek, as well as a number of unnamed streams that drain into or provide drainage from Lake Stevens. Wetland areas within the 20th Street SE Corridor consist of palustrine systems, primarily emergent, forested, and scrub-shrub communities. According to the Snohomish County Stream and Wetland Inventory, combined with high-level inventory data from the City of Lake Stevens, the 20th Street SE Corridor subarea contains approximately 105 acres of wetlands. These wetlands are concentrated in the eastern and southern portions of the study area; the largest is an approximate 55-acre wetland-upland complex in a forested area south of 20th Street SE between 87th Avenue SE and SR-9. The locations of wetlands in the study area are illustrated in Figure 3-2 (City of Lake Stevens, 2007a).

Frequently Flooded Areas

Floodplain areas in the city are generally confined to the areas around Lake Stevens and along Catherine Creek. The study area does not contain any lands that lie within the FEMA 100-year floodplain (City of Lake Stevens, 2007a).

Plants & Animals

Vegetation

The Lake Stevens area supports a variety of deciduous and coniferous trees, such as Douglas fir, spruce, hemlock, cedar, alder, cottonwood, and maple. Native shrubs, grasses, herbs, and wetland plants occur in the greater city and study area, even though much of the remaining habitat is disjointed and fractured because of urbanization (City of Lake Stevens, 2010).

The Washington Natural Heritage Program (NHP), administered by the Washington State Department of Natural Resources (DNR), maintains an inventory of species and ecosystems that are rare or are not widely distributed outside a specific area and that are targeted for conservation efforts. Review of the latest dataset indicates that no NHP plant species or ecosystems occur within the City of Lake Stevens or within the bounds of the subarea (DNR, 2010).

Wildlife
The Lake Stevens area supports a variety of wildlife species. While urbanization in the area has removed much native habitat, common urban birds, such as sparrows, robins, crows, and starlings are likely to occur, as well as small mammals, such as raccoons, opossum, skunks, mice, rats, moles, voles, and shrews. Deer may also be present in less intensely developed portions of the City (Snohomish County Public Works, 2005).

Washington Department of Fish and Wildlife (WDFW) data identify several monitored species within the City of Lake Stevens, including bald eagles and great blue heron. Two bald eagle nests have been identified northwest of the lake, and a great blue heron colony is located near the southwestern Lake Stevens shoreline of the lake. However, no threatened or endangered species habitat has been documented within either the City or the 20th Street SE Corridor (WDFW, 2011).

Fish
The Lake Stevens area supports a variety of fish species, including trout (*Oncorhynchus sp*, Kokanee salmon (*Oncorhynchus nerka)*, bass, catfish, and perch (City of Lake Stevens, 2010). WDFW has documented the presence of Coho salmon, a species of concern, in Lake Stevens and Stevens Creek, as well as in an unnamed stream in the southeastern corner of the study area (WDFW, 2011). No other fish species of concern have been documented with the study area by WDFW.

Applicable Regulations
A variety of adopted federal, state and local regulations apply to development activities associated with natural environment features. Relevant existing regulations for protection of vegetation, wildlife and habitat include the following:

- **Endangered Species Act (16 U.S.C. 1531-1544):** The ESA provides for the conservation of threatened or endangered plant and animal species and their habitat. Any action taken, authorized, or funded by a federal agency is subject to review by the U.S. Fish and Wildlife Service (USFWS) or the U.S. National Oceanic and Atmospheric Administration (NOAA). The ESA also prohibits "taking" of any listed species.
- **Clean Water Act (33 U.S.C. 1251):** Section 404 of the Clean Water Act prohibits the discharge of dredged or fill material to waters of the United States, which often include wetlands. Any development activity that proposes to fill a wetland that has been determined to be a water of the United States must obtain a permit from the U.S. Army Corps of Engineers.
- **Washington State Water Pollution Control Act (90.48 RCW):** Chapter 90.48 of the Revised Code of Washington (RCW) prohibits discharge of any material that causes pollution into a water of the state. The Act applies the Washington Department of Ecology standards for Clean Water Act Section 404 permits to projects without a federal nexus.

- **City of Lake Stevens Critical Areas Ordinance:** Chapter 14.88 of the Lake Stevens Municipal Code regulates development activities that occur in environmentally critical areas, including valuable vegetation, fish, and wildlife habitat; geologically hazardous areas; wetlands; streams; frequently flooded areas; and fish and wildlife conservation areas. Development within a designated critical area is subject to additional development standards designed to preserve and protect sensitive natural resources from human influence.

3.1.2 Impacts of the Alternatives

Overview

Similar impacts to natural resources could occur in connection with development under any of the alternatives. Relative differences in impacts would be the result of differing types and intensities of development in relation to the location of environmental resources, particularly wetlands. Because the level of available information about wetland resources in the subarea is somewhat general at this time, additional review will need to occur at the project level to determine site-specific impacts, consistent with the City's critical area regulations (Chapter 14.88 LSMC). The analysis in this section is focused on potential impacts that are common to all the alternatives, but identifies situations or locations in which one or another alternative could result in a greater level of impacts.

In general, the larger footprint buildings anticipated under *Alternative 2* and *Alternative 3* could be more difficult to site and design on affected properties without impacting wetlands or buffers. Depending on the characteristics of the resources, this could result in greater mitigation requirements or reduced development potential on particular sites. At the same time, the potential for more dispersed lot-by-lot development under the *No Action Alternative*, without the benefit of a subarea plan, would provide reduced opportunities to address and mitigate wetland impacts on an areawide basis.

Earth

Impacts to earth resources have the potential to result from development of currently vacant land, increases in impervious surface coverage, and soil erosion from excavation and clearing of vegetation. Construction on steep slopes or in geologically hazardous areas can also lead to adverse impacts.

Topography and Soils

As described in Section 3.1.1, the topography of the study area is relatively flat, with limited steep slopes. Though the study area terrain is not steeply sloped, clearing and grading of development sites has the potential to cause soil erosion; the limited permeability of Tokul gravelly loam may also increase surface runoff from cleared land, leading to increased soil erosion if best management practices and mitigation measures are not implemented. While these soils are more susceptible to erosion, they do not

meet the criteria for an erosion hazard area under the Lake Stevens Municipal Code, which defines an erosion hazard as an area designated by the USDA Soil Conservation Service, the US Geological Survey, or the Department of Ecology Coastal Zone Atlas as being an erosion hazard. The USDA classifies Tokul gravelly loams at slopes less than 15 percent as having only a slight risk of erosion. As described in Section 3.1.1, moderate and severe erosion hazard areas are confined to a very small area in the eastern end of the study area.

Geologically Hazardous Areas

The study area contains approximately 6 acres of land classified as steep slopes and approximately 6.6 acres of soils classified as erosion hazards; see Figure 3.1-1. All subarea alternatives would primarily designate the areas containing these steep slopes and erosion hazards for single-family residential development. In general, it may be easier to design single-family residential projects to avoid or otherwise mitigate impacts to these limited geologically hazardous areas. *Alternative 2* and *Alternative 3* emphasize higher density housing; areas designated for this type of development do not contain identified steep slopes or erosion hazards. Compared to *Alternative 1*, there is a reduced potential for residential development to occur in steep slope areas.

The City's critical area regulations require that a geologic assessment be performed for any development that is proposed within 200 feet of a geologically hazardous area to identify mitigation measures necessary to protect the proposed development and neighboring properties. Given this regulatory requirement and the limited amount of geologically hazardous area present along the 20th Street SE Corridor, no significant adverse impacts are anticipated.

Water Resources

Groundwater

Section 3.1.1 characterizes the area as "low" sensitivity, and the depth to groundwater in the study area varies from approximately 40 feet to over 100 feet. This means there is low potential for contaminants on the surface to infiltrate to groundwater. No designated aquifer recharge zones or wellhead protection areas are located in the vicinity. However, development within the study area under all alternatives is likely to increase impervious surface coverage, which could result in reduced groundwater recharge from infiltration of stormwater runoff without implementation of LID techniques such as pervious pavement or infiltration systems. Reduced groundwater recharge could result in a net increase in groundwater draw-down as the existing residential wells described in Section 3.1.1 continue to tap the aquifer. However, there are only seven legally recorded wells in the study area and future development will likely transition to public water service. No significant impacts to groundwater are anticipated to result under any of the alternatives.

Surface Water

Impacts on surface water resources (streams) would primarily result from increased stormwater runoff caused by increased impervious surfaces throughout the 20th Street SE Corridor. The study area contains several small, non-fish bearing streams, as well as a single fish-bearing stream. All stormwater runoff from the study area that is not infiltrated onsite is eventually discharged to a surface water body. The study area contains large areas of undeveloped land. Under all alternatives, future growth would entail clearing vegetation and increasing impervious surface cover, resulting in additional stormwater flows, which may carry pollutants and sediment to receiving surface water bodies, if not treated. These development impacts would be greater under *Alternative 2* and *Alternative 3* than under the *No Action Alternative* due to higher anticipated levels of growth and the location of higher intensity mixed-use, commercial, and employment nodes and centers in some areas containing streams (see Figure 3.1-2).

Under all alternatives, stormwater discharges to surface waters would be subject to the City's adopted stormwater regulations, which require implementation of mitigation measures and best management practices, including water storage and water quality measures, to minimize effects on surface water resources.

Wetlands

The study area contains approximately 105 acres of wetlands, concentrated mostly in the southern and eastern portions of the study area. As described in Section 3.1.1, field reconnaissance in August 2011 indicated the study area contains Category I, Category II, and Category III wetland complexes, which would be subject to protection under Section 404 of the Clean Water Act and Chapter 14.88 LSMC. Filling of any such wetlands would require an individual permit from the Army Corps of Engineers and mitigation pursuant to the City's critical area regulations.

Alternative 2 and *Alternative 3* propose to locate commercial/employment node and centers in the general areas near identified wetlands and streams, which has the potential to impact these wetlands or streams directly or indirectly. In particular, the properties in the southwest quadrant of 20th Street SE/SR-9 appear to be heavily impacted by wetlands and streams. Existing zoning for *Alternative 1* would also permit intensive commercial development of this area. Since site-specific development plans do not exist at this time, it is not possible to identify building footprints or wetland/buffer intrusions, if any, with specificity. Future site development plans would need to delineate wetland and buffer locations and any impacts from development. It may not be possible to avoid impacts completely following future development; thus some projects would likely require mitigation.

The City's adopted critical areas regulations (Chapter 14.88 LSMC) regulate development in and near wetlands. The critical area regulations identify allowed

activities, restrict wetland disturbance, and establish wetland buffers that vary in size based on the quality of ecological function provided by the wetland and the intensity of the land use proposed.

Increased development in the study area would increase the level of impervious surfaces, thereby generating more stormwater runoff, which could increase the amount of water and pollutant loads draining to wetlands within the study area. While wetlands provide pollution filtration and groundwater infiltration functions, large alterations to existing hydrology can adversely affect wetland plant and animal species.

This effect would be greater under *Alternative 2* and *Alternative 3* than under the *No Action Alternative* due to higher anticipated levels and intensity of development. In particular, the retail and office development proposed for the area south of 20th Street between SR-9 and 83rd Avenue SE could entail clearing of vegetation, increasing impervious coverage, and/or filling or altering the site, which could adversely affect nearby wetlands. However, existing zoning for *Alternative 1* would also permit development of a commercial development of comparable scale and intensity in this same location

Under all alternatives, the implementation of best management practices and mitigation measures including water storage and water quality treatment would be required to minimize hydrologic effects on wetlands. City regulations also require mitigation for any permitted fill.

Frequently Flooded Areas

The study area does not contain any lands within the FEMA 100-year floodplain. No adverse impacts to frequently flooded areas would occur under any of the alternatives.

Plants & Animals

Vegetation

Development of the study area under all alternatives could result in clearing of vegetation from development sites and fragmentation of vegetated areas, particularly in the southern and eastern portions of the study area where large, contiguous areas of vegetation remain. As described in Section 3.1.1 and shown on Figure 3.1-2, these vegetated areas loosely correspond to the locations of wetland complexes subject to protection under the City's critical areas regulations (Chapter 14.88 LSMC).

Alternative 2 and *Alternative 3* would result in mixed commercial/office and high-density residential development in several portions of the study area that are extensively vegetated. Development in these locations would likely entail extensive clearing, which has the potential to further reduce the area's habitat function for native wildlife. However, all development in the city, including future development in the study area, is subject to the provision of the City's tree retention and protection code

(LSMC 14.76.120). The tree code requires that all development retain existing significant trees to the greatest extent possible and replace any significant trees removed at a 3:1 ratio.

The Washington Forest Practices Act (RCW 76.09) governs forest practices occurring on non-federal land. A forest practice permit is required when more than 5,000 board-feet of merchantable timber is harvested from a property within any 12-month period (WAC 122-16-050(3)). This includes the removal of salable timber as part of pre-construction site clearing. Some of the larger, heavily vegetated properties within the study area may meet the requirements for a forest practices permit if they are cleared for development under any of the alternatives. Permit applications are reviewed by Washington State Department of Natural Resources to ensure adequate protection of forest soils, fisheries, wildlife, and water quality.

Future capital improvement projects, including development of new roads and trails, regional stormwater facilities and installation of new utility infrastructure, could also potentially disturb or remove vegetation. However, some public and/or utility activities may be permitted within critical areas (LSMC 14.88.220), but would still require the implementation of best management practices and appropriate mitigation measures to avoid or minimize impacts to vegetated areas.

Wildlife

As described in Section 3.1.1, much of the wildlife habitat in Lake Stevens has been lost or fragmented due to ongoing urbanization and is concentrated in wetlands, along streams, and in other vegetated areas. Priority Habitat and Species (PHS) data from the Washington Department of Fish and Wildlife confirms that no threatened, endangered, or candidate terrestrial species occur within the study area.

Clearing of vegetation in connection with future development under any subarea alternative would further reduce habitat function and could potentially disrupt wildlife corridors. Clearing would be more dispersed under *Alternative 1*, but concentrated in several intensively developed commercial and mixed-use nodes and centers under *Alternative 2* and *Alternative 3;* please refer to Figures 2-2, 2-3 and 2-4**.** A number of the proposed commercial and employment areas correspond to existing heavily vegetated areas. *Alternative 1* and existing zoning would permit intensive development of the undeveloped properties in the southwest quadrant of 20th Street SE and SR-9.

The City's critical area regulations (LSMC 14.88.400) designate streams as fish and wildlife habitat conservation areas and require mitigation, which may be in the form of dedication of an open space easement onsite or off-site (LSMC 14.88.440). The City's code also requires permanent protection for wetlands, streams, and buffers in the form of Native Growth Protection Areas (NGPAs) dedicated to the City (LSMC 14.88.295). Within NGPAs, clearing, grading, filling, and building or road construction is prohibited,

with the exceptions of hazard tree removal and utility installation supported by a critical areas assessment. The City's critical areas regulations do allow limited construction within fish and wildlife habitat conservation areas for educational, scientific, and research uses, as well as nature trails, provided that such construction occurs within the outer 25 percent of the critical area buffer and that critical area functions will not be reduced by such activities, as demonstrated by a site-specific study.

Given the small amount and fragmented nature of wildlife habitat within the study area, impacts to wildlife are anticipated to be minimal. With the application of mitigation measures for the preservation of wetlands and streams, no significant adverse impacts to wildlife are anticipated to occur.

Fish

As described in Section 3.1.1, the study area contains a single fish-bearing stream where the Washington Department of Fish and Wildlife has documented the presence of Coho salmon (*Oncorhynchus kisutch*). This stream is located in the southeastern corner of the study area, between SR-9 and 103rd Avenue NE (see Figure 3.1-2). This portion of the study area is currently sparsely developed and extensively forested. The City of the Lake Stevens critical areas inventory also documented several wetlands in this area.

Under all alternatives, future development within the study area would result in reduced vegetative cover and increased impervious surfaces. Without mitigation, such development would increase the level of stormwater runoff and pollutant loading in nearby streams, which could degrade aquatic habitat and harm salmonids. Potential impacts would be relatively greater under *Alternative 2* and *Alternative 3*, due to their more intensive levels of development. Both alternatives also propose high density residential development and a commercial center adjacent to the stream documented to contain salmonids.

Such high-intensity development would be likely to entail widespread clearing of upland vegetation, which would increase stormwater runoff and could increase sediment movement to the streams. *Alternative 1* would also permit high-density residential development in this general area, though at a less intense level than *Alternative 2* or *Alternative 3*. However, the Lake Stevens critical areas regulations require the preservation of undisturbed vegetated buffers adjacent to streams to protect habitat function. Also, as described in the discussion of potential impacts to surface water, all future development would be subject to the City's adopted stormwater regulations, which require adequate detention, infiltration, or treatment systems to mitigate impacts from increased runoff. In addition, the City's tree retention and protection code requires the preservation of significant trees on development sites and limits disturbance within the critical root zone of such trees, which results in a greater amount of natural ground surface being preserved onsite.

3.1.3 Mitigation Measures

Earth

Applicable Regulations and Commitments

1. ***Geological Assessments Required:*** The Lake Stevens Municipal Code requires the preparation of a geological assessment for any development proposal within 200 feet of an area designated as geologically hazardous. Geological assessments must contain an analysis of the potential impacts to geologically hazardous areas resulting from the proposed development and identify appropriate mitigation measures necessary to protect development and the geologically hazardous area (LSMC 14.88.630).
2. ***Native Growth Protection Area:*** LSMC 14.88.670 requires developers to place geologically hazardous areas not approved for alteration and their buffers in a native growth protection area; lawfully altered geologically hazardous areas are subject to a covenant of notification and indemnification/hold harmless agreement.
3. ***Erosion Control Measures Required:*** LSMC 14.64.130 requires the implementation of sedimentation and erosion control measures for any development that would entail land disturbance. The Public Works Director must review and approve erosion control plans.

Additional Mitigation Measures

- No additional measures are required.

Water Resources

Applicable Regulations and Commitments

- ***Stormwater Management:*** The City's municipal code requires the use of natural drainage systems to the extent feasible in order to preserve natural topography (LSMC 14.64.100). The Code also requires all new stormwater drainage systems to be constructed in accordance with the requirements of the Department of Ecology's 2005 Stormwater Management Manual for Western Washington (LSMC 11.06.020 and LSMC 14.64.140). Continued implementation of the City's stormwater management codes will ensure a rigorous permit review process that promotes sound development and redevelopment policies; continued protection of water quality in the City's lakes, streams and wetlands habitats and groundwater recharge; property protection from increased runoff; and the promotion of low impact development strategies that reduce impervious surface and stormwater runoff. Regional stormwater facilities are allowed under the code.
- ***NPDES Phase II Municipal Stormwater Permit:*** The Western Washington Phase II Municipal Stormwater Permit was issued in 2007 to implement the

requirements of the Clean Water Act and the National Pollutant Discharge Elimination System as codified in Sections 11.06.020 and 14.64.140 of the City's municipal code. Local jurisdictions covered under the permit, including the City of Lake Stevens, are required to develop a stormwater management program designed to reduce the discharge of pollutants and protect water quality. In accordance with the requirements of the permit, the City of Lake Stevens has adopted a stormwater management plan focused on public education and outreach, detection and elimination of illicit stormwater discharge, controlling runoff generated by new development activities, and prevention of pollution resulting from municipal activities. Continued implementation of the measures contained in the stormwater management program would reduce pollutant loading and improve water quality in the City's lakes, streams and wetlands.

- **Critical Areas Regulations:** The City's critical areas regulations protect wetlands by limiting the activities allowed and establishing buffers of varying size based on wetland classification.

Additional Mitigation Measures

- **Stormwater Detention:** For properties adjacent to identified wetlands and their buffers, new development and redevelopment should not result in an increased rate of runoff from the site to the wetland. Where onsite stormwater management is not feasible, the City could possibly, consistent with applicable state and federal regulations, encourage design and construction of regional stormwater detention and infiltration infrastructure that serves multiple developments within the study area, as well as consolidation of existing detention facilities.
- **Low Impact Development (LID):** The City should consider providing incentives for the use of LID techniques to reduce stormwater impacts in the subarea plan and new zoning regulations.
- **Critical Areas:** More detailed study is necessary, in conjunction with development review, for properties with a known or suspected presence of wetlands and streams. The City should also investigate the potential for mitigation banking or other areawide approaches to wetland mitigation for wetland impacts that occur within the study area.

Plants & Animals

Applicable Regulations and Commitments

- **Tree Retention:** The City's land use code (LSMC 14.76.120) requires development projects to retain existing significant trees and stands of trees that occur on the development site unless such retention would create an unreasonable burden on the developer or create a safety hazard. The code also requires that removed significant trees be replaced and that retained and

replanted trees be protected during construction. Similarly, the code requires retention or planting of trees along dedicated streets (LSMC 14.76.110).

- **Critical Areas Regulations:** As described in the impact analysis, future development in the study area has the potential to adversely affect wildlife and habitat through clearing of vegetated areas. However, the City's critical areas regulations protect wetlands, riparian areas and other critical areas, and protect habitat for plants and animals by limiting the activities allowed within the critical area and establishing appropriate protective buffers and mitigation strategies for unavoidable impacts.

3.1.4 Significant Unavoidable Adverse Impacts

All alternatives could result in additional development within the subarea, thereby increasing the level of impervious surface and reducing vegetated areas. Additional development within the study area is also anticipated to generate increased stormwater runoff that must by detained or treated before discharge to surface water. With application of the City's adopted regulations regarding critical areas, stormwater, and tree retention, as well as proposed mitigation measures, no significant unavoidable adverse impacts to the natural environment are anticipated.

3.2 AIR

3.2.1 Air Quality

Affected Environment

Three agencies have jurisdiction over the ambient air quality in Lake Stevens: the U.S. Environmental Protection Agency (EPA), the Washington State Department of Ecology (Ecology), and the Puget Sound Clean Air Agency (PSCAA). These agencies establish regulations that govern concentrations of pollutants in the outdoor air and rates of contaminant emissions from some air pollution sources. The air quality analysis focuses on the implications of project-related traffic based on estimated concentrations of carbon monoxide, and was conducted in accord with EPA guidelines and in a manner consistent with state and federal air quality rules.

Typical air pollution sources in the project area include vehicular traffic, existing retail and commercial uses, and residential wood-burning devices. While many types of air pollutant sources are present, the overall largest pollutant emission sources are vehicles and residential wood burning. For analyses that consider proposed transportation source, the air pollutant used as the primary indicator of potential impacts is carbon monoxide (CO) because this is the vehicular pollutant emitted in the largest quantities for which there are health-based ambient air quality standards. Vehicle exhaust and tire action on paved and unpaved surfaces also generate fine particles (also called PM10 and PM2.5 based on their size), but emission rates are small compared with fine particle emitting combustion sources like wood-burning stoves. Motor vehicles also emit sulfur oxides and nitrogen dioxide, but ambient concentrations of these pollutants are not usually high except near large industrial facilities.

Existing Air Quality

To measure air pollutant concentrations and classify air quality conditions, Ecology and PSCAA maintain a network of monitoring stations throughout the Puget Sound region. Based on monitoring information collected over a period of years, the state (Ecology) and federal (EPA) agencies classify regions as "attainment" (i.e., complying with) or "nonattainment" areas for specific air pollutants. Attainment status is therefore a measure of whether air quality in an area complies with the National Ambient Air Quality Standards (NAAQS) which are intended to protect human health and welfare. Applicable air quality standards for selected air pollutants are shown in Table 3.2-1. Regions that were once designated nonattainment but that have since attained compliance with a standard are considered "maintenance" areas. The project area is within CO and ozone maintenance areas.

Another area of concern related to air pollution is the potential for such emissions to affect climate. Global climate change and greenhouse gas emissions (including carbon dioxide, CO_2) from transportation are currently unregulated federally, but some state

and local jurisdictions have developed recommended approaches for project-level disclosure of greenhouse gas emissions discussed further in this section.

Ozone

Ozone is a highly reactive form of oxygen not emitted directly by emission sources but created by sunlight-activated chemical transformations of nitrogen oxides and volatile organic compounds (hydrocarbons) in the atmosphere. Ozone problems tend to be regional in nature because the atmospheric chemical reactions that produce ozone occur over a period of time, and because during the delay between emission and ozone formation, ozone precursors can be transported far from their sources. Transportation is a major source of ozone precursors.

Table 3.2-1. Applicable Ambient Air Quality Standards for Criteria Pollutant

Pollutant	Terms of Compliance [(a)]	Concentration
Total Suspended Particulate (TSP) Annual Average (μg/m^3) 24-Hour Average (μg/m^3) WA State only; no federal standard	Geometric mean not to exceed Not to be exceeded more than once per year	60 μg/m^3 150 μg/m^3
Inhalable Particulate Matter (PM10) 24-Hour Average (μg/m^3)	The 3 year average of the 99th percentile of the daily concentrations must not exceed	150 μg/m^3
Fine Particulate Matter (PM2.5) Annual Average (μg/m^3) 24-Hour Average (μg/m^3)	The 3-year annual average of daily concentrations must not exceed The 3-year average of the 98th percentile of daily concentrations must not exceed	15 μg/m^3 35 μg/m^3
Carbon Monoxide (CO) 8-Hour Average (ppm) 1-Hour Average (ppm)	The 8-hour average must not exceed more than once per year The 1-hour average must not exceed more than once per year	9 ppm 35 ppm
Ozone (O_3) 8-Hour Average (ppm)	The 3-year average of the 4th highest daily maximum 8-hour average must not exceed	0.075 ppm

Source: ENVIRON International Corporation

Notes: μg/m^3 = micrograms per cubic meter; ppm = parts per million

[(a)] All limits are federal *and* state air quality standards except as noted. All indicated limits represent "primary" air quality standards intended to protect human health.

In the past, due to violations of the federal ozone standard the Puget Sound region was designated Nonattainment for Ozone based on the 1-hour standard in effect at that time. In 1997, the EPA determined that the Puget Sound region had attained the public

health-based NAAQS for ozone and redesignated the region as attainment for ozone. In 2005 EPA revoked the 1-hour ozone standard in most areas of the US including the Puget Sound region. This action ended the maintenance status of this region including the project study area. EPA has since adopted a more stringent 8-hour ozone standard, and although currently considered attainment, the Puget Sound region may once again be designated as Nonattainment for Ozone. Note that because ozone is not emitted directly, only very sophisticated air quality models are capable of considering ozone formation in the atmosphere, and such models are typically used for regional assessments of air quality plans instead of for project-specific reviews. So under current air quality plans and policies, the potential future nonattainment status for ozone probably has no direct implications for the proposed project.

Inhalable Particulate Matter – PM10 and PM2.5

Particulate matter air pollution is generated by many sources, including fuel combustion sources like residential wood burning, motor vehicle engines and tires, and other sources. Federal, state, and local regulations set limits for particles concentrations in the air based on the size of the particles and the related potential threat to health. When first regulated, particle pollution rules were based on concentrations of "total suspended particulate," which included all size fractions. As air sampling technology has improved and the importance of particle size and chemical composition have become more clear, ambient standards have been revised to focus on the size fractions thought to be most dangerous to people. Based on the most recent studies, EPA has redefined the size fractions and set new, more stringent standards for particulate matter based on "coarse" and "fine" inhalable particulate matter to focus control efforts on the smaller size fractions.

There are currently health-based ambient air quality standards for PM10, or particles less than or equal to about 10 micrometers (microns) in diameter, as well as for PM2.5, or particulate matter less than or equal to 2.5 microns in diameter. The latter size fraction and even smaller (ultra-fine) particles are now considered the most dangerous size fractions of airborne particulate matter because such small particles (i.e., a typical human hair is about 100 microns in diameter) can be breathed most deeply into lungs. In addition, such particles are often associated with toxic substances that are deleterious in their own right that can adsorb to the particles and be carried into the respiratory system.

With the revocation of the federal annual standard for PM10 in October 2006, the focus of ambient air monitoring and control efforts related to particle air pollution in the Puget Sound region has been almost entirely on fine particulate matter (PM2.5). There are several PM2.5 monitoring stations in the Puget Sound area, located at known or suspected PM "hot-spots." The closest PM monitors to the project area are located in Marysville (PM2.5). Based on reported data from that location, measured PM2.5 values are about two-thirds of the current 24-hour and about one-half of the annual NAAQS.

Based on particulate matter measurements over the last few years EPA in 2009 established a PM2.5 nonattainment area in Tacoma. There are no other PM nonattainment areas in Washington.

Carbon Monoxide

Carbon monoxide, also called **carbonous oxide** (CO), is the product of incomplete combustion. It is generated by transportation sources and other fuel-burning activities like residential space heating, especially heating with solid fuels like coal or wood. CO is usually the pollutant of greatest concern related to roadway transportation sources because it is the pollutant emitted in the greatest quantity for which there are short-term health standards. CO is a pollutant whose impact is usually localized, and CO concentrations typically diminish within a short distance of roads. The highest ambient concentrations of CO usually occur near congested roadways and intersections during wintertime periods of air stagnation.

The project area is located within the former Puget Sound region CO nonattainment area (established in 1991) that encompassed a large portion of the Everett-Seattle-Tacoma urban area. Because no monitoring stations had recorded violations of the CO standards in many years, in 1997 EPA redesignated the Central Puget Sound region as attainment for CO. The former nonattainment area remains an air quality maintenance area for CO, but there have been no measured violations of the standards in many years, and the former CO problem is thought to have been resolved.

In the case of projects and plans affecting the transportation system and/or traffic sources, CO is used as an indicator of potential air quality problems because of the various vehicular emissions, CO is the pollutant emitted in the largest quantity for which there are ambient air standards. Therefore, CO was the primary focus of the air quality analysis for this project. The analysis considered future roadway conditions and screening modeling to assess the potential for air quality impacts related to the proposed project.

Impacts of the Alternatives

Methodology

In accord with EPA guidance, the air quality analysis considered the potential for traffic-related impacts based on conditions at signalized intersections most likely to be adversely affected by the project alternatives. EPA guidance focuses on air quality modeling for the most congested signalized intersections based on the overall intersection delay or "level of service" (LOS) during peak-hour conditions. Intersection LOS ranges from "A" (good operation with little or no delay) to "F" (poor operation due to extensive delay). The criteria for selecting intersections for potential inclusion in air quality "hot-spot" modeling are based on considering intersections operating at LOS "D," "E," or "F," or any expected to change to LOS "D," "E," or "F" as a result of a

proposed project. Intersections operating at LOS "C" or better are therefore unlikely to cause a potential violation of the CO standard, and generally do not require further analysis (EPA 1992).

Typically, projects and plans that affect either the physical structure or the operation of the regional transportation system in an air quality nonattainment or maintenance area are subject to an air quality transportation conformity review. Air quality conformity rules are intended to prevent regionally significant transportation projects from either causing or contributing to localized air quality problems.

Transportation improvements discussed in the Draft 20th Street SE Corridor Subarea Plan and Draft EIS include the potential construction of a new road (24th Street SE) that would provide alternative access to 20th Street, and intersection configuration changes at SR-9 and South Lake Stevens Road. This road and intersection will be subject to an air quality transportation conformity review. However, an air quality conformity review requires detailed information regarding both structural configuration and intersection operational parameters, and this design information is not currently available.

Information regarding intersection configurations and operations affecting SR-9 will not be available until after the City identifies a preferred alternative for the subarea plan, and after consultation with the Washington State Department of Transportation (WSDOT). The information in the Draft EIS is also being used to identify the need and options for transportation improvements. Consequently, the air quality conformity determination will be completed during preparation of the Final EIS for the subarea plan and will be included in that document. The air quality analysis reported in the Draft EIS includes a "hot-spot" analysis that assesses potential impacts from transportation sources at project-affected intersections based on available data.

Consistent with EPA guidance, project-affected signalized intersections were screened for possible "hot-spot" modeling based on available traffic study data. The traffic study includes LOS and assumed traffic volumes at intersections along SR-9, SR-204, and 20th Street SE in future years, including the Lake Stevens Center Subarea Plan (most intensive alternative) and the 20th Street SE Corridor Subarea Plan alternatives. The three worst-performing intersections during the pm-peak period were selected for review using air quality modeling. The three selected intersections, none of which are located within the 20th Street SE Corridor Subarea, include SR-9 intersections with Lundeen Parkway, SR-204, and Market Place. Each of these signalized intersections is projected to perform at LOS F in the plan's full build out year 2025. Note that these are the same intersections and the same underlying traffic conditions considered in the previously published Lake Stevens Center Subarea Plan Draft EIS; the traffic analyses for both projects included the same elements and future year land use assumptions.

To assess the potential for traffic-related air quality impacts, ENVIRON evaluated the worst-case operating scenario at the most project-affected intersections using the Washington State Department of Transportation screening tool, WASIST. This tool applies worst-case operations and dispersion assumptions to estimate CO concentrations at nearby locations. If under these conditions no problematic concentrations are predicted, no CO impacts are likely (WSDOT 2009).

Impacts During Construction – All Alternatives

Construction in future years resulting from development along the 20th Street SE Corridor could occur with or without the proposed plan and could temporarily change localized air quality. Construction activities would be similar under all subarea plan alternatives so similar short-term changes could occur regardless of the alternative. For example, dust from construction activities would contribute to ambient concentrations of suspended particulate matter. Construction contractor(s) would have to comply with the PSCAA regulations requiring all reasonable precautions be taken to minimize fugitive dust emissions.

Construction would require the use of heavy trucks and smaller equipment such as generators and compressors. These engines would emit air pollutants that would slightly degrade local air quality. Nonetheless, emissions from construction equipment, and especially from diesel-fueled engines, are coming under increasing scrutiny because of their suspected risk to human health. Although there is little or no danger of these emissions resulting in pollutant concentrations that would exceed a health-based ambient air quality standard, pollution control agencies are now urging that emissions from diesel-powered equipment be minimized to the extent practicable in order to reduce potential health risks.

Some phases of construction would cause odors detectable to some people in the area. This would be particularly true during paving operations using asphalt. The construction contractor(s) would have to comply with the PSCAA regulations during activities that emit odor bearing air contaminants. Such odors from paving operations would be short term.

Construction equipment and material hauling can affect traffic flow in a project area. Given that there is heavy traffic during some periods of the day, scheduling haul traffic during off peak times (e.g., between 9 a.m. and 4 p.m.) would have the least effect on other traffic and would minimize indirect increases in traffic related emissions.

With implementation of required measures to provide reasonable controls of dust and odors, construction activities related to development either with or without the proposed plan would not be expected to result in significant air quality impacts.

Impacts During Operation – All Alternatives

Based on projected traffic with or without the proposed subarea plan, either under existing (2011) or future conditions (2025), and assuming a background CO concentration of 3 ppm, WASIST model-calculated CO concentrations are less than the ambient air quality standards for CO. Compared to existing conditions, model-calculated CO concentrations increase by about 2 ppm with continued growth and development under the *No Action Alternative*. Concentrations are the same under *Alternative 2* and *Alternative 3* and are similar or increase slightly compared to the No Action Alternative in 2025. This suggests that plan-related changes would not adversely affect air quality near the most congested intersections or within the vicinity of the 20th Street SE Corridor Subarea. Table 3.2-2 summarizes the WASIST modeling results.

In addition, recent studies for the 20th Street SE Corridor Improvements Project, Phase I and Phase II, considered potential traffic-related air quality impacts, and both concluded that no air quality impacts would be likely due to changes in the transportation system in the project vicinity. (ENVIRON, 2011) Based on the present review of subarea plan alternatives, additional studies, and the requirement that the subarea plan alternative selected by the City be evaluated in relation to air quality transportation conformity during the Final EIS, no significant impacts to ambient air quality are likely due to the proposed plan alternatives being considered.

Table 3.2-2. Estimated CO Concentrations at the Most Project-Affected Intersections

Intersection with SR-9	Period	Existing 2011	2025 Alternatives		
			1 No Action	2 Commercial Emphasis	3 Residential Emphasis
Lundeen Parkway	1-Hr	5.9	8.7	8.7	8.7
	8-Hr	5.0	7.0	7.0	7.0
SR-204	1-Hr	5.5	7.8	8.0	8.0
	8-Hr	4.8	6.4	6.5	6.5
Market Place	1-Hr	4.8	6.8	7.0	7.0
	8-Hr	4.3	5.7	5.8	5.8

Source: ENVIRON International Corporation

Note: The 1-hour and 8-hour ambient air quality standards are 35 ppm and 9 ppm respectively. Model-calculated 1-hour concentrations were converted to represent 8-hour average concentrations using a 0.7 persistence factor that reflects likely changes in emission and atmospheric conditions over an 8-hour period.

Mitigation Measures

Mitigation During Construction

Although significant air quality impacts are not anticipated with any of the subarea plan alternatives, construction contractors will be required to comply with all relevant federal, state, and local air quality rules. In addition, implementation of best

management practices would also reduce emissions related to the construction phase of future projects. Possible management practices for reducing the potential for air quality impacts during construction include measures for reducing both exhaust emissions and fugitive dust. The Washington Associated General Contractors brochure *Guide to Handling Fugitive Dust from Construction Projects* and the PSCAA suggest a number of methods for controlling dust and reducing the potential exposure of people to emissions from diesel equipment. Some possible control measures that could be implemented to reduce potential air quality impacts from construction activities include the following:

- Use only equipment and trucks that are maintained in optimal operational condition
- Require all off-road equipment to have emission reduction equipment (e.g., require participation in Puget Sound Region Diesel Solutions, a program designed to reduce air pollution from diesel, by project sponsors and contractors)
- Use bio diesel or other lower-emission fuels for vehicles and equipment
- Use car-pooling or other trip-reduction strategies for construction workers
- Implement restrictions on construction truck and other vehicle idling (e.g., limit idling to a maximum of 5 minutes)
- Spray exposed soil with water or other suppressant to reduce emissions of PM and deposition of particulate matter
- Pave or use gravel on staging areas and roads that would be exposed for long periods
- Cover all trucks transporting materials, wetting materials in trucks, or providing adequate freeboard (space from the top of the material to the top of the truck bed), to reduce PM emissions and deposition during transport
- Provide wheel washers to remove particulate matter that would otherwise be carried off site by vehicles to decrease deposition of particulate matter on area roadways
- Remove particulate matter deposited on paved, public roads, sidewalks, and bicycle and pedestrian paths to reduce mud and dust; sweep and wash streets continuously to reduce emissions
- Cover dirt, gravel, and debris piles as needed to reduce dust and wind-blown debris
- Stage construction to minimize overall transportation system congestion and delays to reduce regional emissions of pollutants during construction

Mitigation During Operation
The air quality analysis indicates that the proposed subarea plan alternatives would not result in any significant adverse air quality impacts in the study area. Consequently, no operational impact mitigation measures are warranted or proposed.

Significant Unavoidable Adverse Impacts
No significant unavoidable adverse impacts have been identified and none are anticipated.

3.2.2 Climate Change and Greenhouse Gas (GHG) Emissions

Affected Environment
Climate Change and GHG Emissions
The phenomenon of natural and human-caused effects on the atmosphere due to global warming and other changes is generally referred to as "climate change." Due to the importance of the "greenhouse effect" and related atmospheric warming to climate change, the gases that affect such warming are called greenhouse gases or GHGs. The GHGs of primary importance are carbon dioxide (CO_2), methane, ozone, and nitrous oxide. Because CO_2 is the most abundant of these gases (but not necessarily the most damaging to the atmosphere on a volume basis because of varying residence time after emission), GHGs are now often quantified in terms of CO_2 equivalents, or CO_2e.

Vehicles are a significant source of GHG emissions primarily through the burning of gasoline and diesel fuels. National estimates indicate the transportation sector (including on-road and construction vehicles, airplanes and boats) accounts for 30 percent or more of total domestic CO_2 emissions. Estimates for Washington State suggest that transportation accounts for nearly half of GHG emissions because our State relies heavily on hydropower for electricity, unlike other states that rely more heavily on fossil fuels (coal, petroleum, and natural gas) to generate electricity. The next largest contributors to total gross GHG emissions in Washington are about 20 percent each in fossil fuel combustion in the residential, commercial, and industrial sectors; and in electricity consumption. Solid waste contributes about two percent (WSDOT 2010).

Compared to the "criteria" air pollutants like carbon monoxide and fine particulate matter, GHGs have only recently been recognized as an issue for consideration during the environmental review of proposed projects. CO_2 is not considered an air "pollutant" based on direct health-related impacts, so it is not subject to ambient standards used to gauge pollutant concentrations in the air. Instead, approaches to managing CO_2e emissions are based on controls aimed at first slowing down and then reducing overall atmospheric concentrations over time. On the local level, GHG management is typically aimed at transportation and land use planning and/or energy conservation associated with proposed new development or redevelopment.

In response to the issue of climate change on a global or regional scale, several states and many local jurisdictions are now taking steps to begin reducing GHG emissions. For example, the states of California, Massachusetts, and Washington have adopted GHG emission reduction goals similar to those included in the Kyoto Protocol, the widely-adopted international guideline intended to address this issue. Numerous cities have adopted similar goals and have begun implementing programs to quantify GHG emissions in order to begin reducing them eventually. The U.S. Environmental Protection Agency (EPA) has recently joined the effort to quantify and reduce CO_2 emissions, but this effort has only just begun. Although recent legislation in Washington State established GHG emission reduction targets in future years and set specific emission targets for some sources, there are as yet no generally accepted emission level "impact" thresholds that provide effective means to assess potential localized impacts of GHG emissions.

In 2008, the Washington legislature passed and the Governor signed HB 2815. This bill includes, among other elements, statewide per capita vehicle miles traveled (VMT) reduction goals as part of the state's GHG emission reduction strategy.

This bill also established the Climate Action Team, a group similar to 2007's Climate Advisory Team. This group refined the Climate Advisory Team's 2007 broad recommendations into specific actions the state can take to reduce emissions. WSDOT worked as a member of this group on strategies to reduce VMT and on how to include climate change in SEPA evaluations (WSDOT 2008).

WSDOT and regional transportation planning organizations are working on methods and models to improve the quality of information and guidance for evaluating GHG emissions from transportation. Tools under development but not yet available will allow for GHG calculations that account for changes in VMT and other factors depending on project size and type in the future. In the meantime, guidelines for qualitative review and discussion for transportation projects under WSDOT jurisdiction have been developed and were used for this analysis (WSDOT 2010).

Impacts of the Alternatives

Methodologies

Two types of methodologies are used to estimate greenhouse gas emissions. The first employs the King County SEPA GHG spreadsheet which is used to estimate embodied and energy consumption emissions (see next section for details). The second methodology estimates on-road GHG emissions using the Fehr & Peers vehicle-miles traveled (VMT)-GHG Analysis Tool.

It should be noted that the analysis methods used in this document provide a conservative estimate of GHG emissions because they assume that additional

development would increase emissions. However, the effect of new development is more complex. From a regional perspective, local residents and employees may not have to travel as far because the new development in Lake Stevens provides a closer location to live, work, or shop. While the Fehr & Peers tool captures some of these effects, the Snohomish County travel model, which is used as an input to the VMT-GHG method, is limited in its ability to capture the trip internalization benefits of the proposed mixed-use zoning and land use regulations.

Calculating Greenhouse Gas Emissions using the King County SEPA GHG Spreadsheet

Tabulation of existing embodied and energy greenhouse gas emissions within the subarea was based on the SEPA Greenhouse Gas Emissions spreadsheet tool developed by King County[1]. The King County spreadsheet is a comprehensive tool that encompasses a variety of emissions categories that estimate GHG emissions related to building materials, and energy consumed at the development. Embodied and energy emissions as described below.

- **Embodied emissions –** Embodied emissions are related to construction and building materials. This portion of the calculation considered both the "upstream" (i.e., mining, harvest, manufacturing, and transport) and the "downstream" (i.e., subsequent, "in place" use) of building materials. The King County spreadsheet assumes the lifespan of the buildings to be 62.5 years.
- **Energy emissions –** Energy emissions are related to the day-to-day energy use in the building related to space heating, water heating, and electrical usage. Buildings were assumed to be constructed using standard materials and insulation levels. Some studies suggest that more energy efficient buildings (e.g., LEED or EnergyStar) could result in at least 20 percent reductions in overall energy usage.

To estimate the GHG emissions of the existing development within the 20th Street SE Corridor subarea, the project team used the following existing land use information:

- 50,000 square feet of retail;
- 10,000 square feet of office;
- 150,000 square feet of schools; and
- 856 dwelling units (395 single family and 461 multi-family)

Table 3.2-3 provides greenhouse gas emissions estimates from the existing development based upon the King County SEPA GHG Spreadsheet; the spreadsheet calculations are included in Appendix B. To provide more context for this data, the

[1]http://www.kingcounty.gov/property/permits/publications/~/media/property/permits/documents/forms/SEPA_GHG_EmissionsWorksheet_Bulletin26PDF.ashx

emissions per service population of the study area (service population includes both residential population and employment) is also shown.

Table 3.2-3. Existing Embodied and Energy Greenhouse Gas Emissions

Methodology	Embodied Emissions ($MTC0_2e$)	Energy Emissions ($MTC0_2e$)	Total Estimated Existing Embodied and Energy GHG Emissions ($MTC0_2e$)	Embodied and Energy Emissions per Service Population
King County SEPA GHG Emissions Worksheet	63,837	592,910	656,747	240.5

Based upon the calculations from the King County SEPA GHG Spreadsheet, the existing land uses in the Lake Stevens Center subarea are expected to generate roughly 656,747 $MTCO_2e$[2] embodied and energy GHG emissions over their lifespan. This translates into 240.5 $MTCO_2e$ per service population.

Calculating On-Road Transportation Greenhouse Gas Emissions using the Fehr & Peers VMT-GHG Analysis Tool

GHG emissions analyses for land use developments in the Puget Sound Region are typically prepared using the spreadsheet tool developed by King County (discussed above). While the spreadsheet tool encompasses a variety of emissions categories, it is designed for high-level planning and lacks the detail necessary to prepare an accurate estimate of GHG emissions for a project like the 20th Street SE Corridor Subarea Plan. The lack of detail is particularly pronounced when it comes to estimating transportation related GHG emissions.

To provide a more accurate estimate of the transportation related GHG emissions of the subarea, a more detailed tool developed by Fehr & Peers was used. In the Fehr & Peers tool, the travel demand model was used to calculate the vehicle miles traveled (VMT) generated by the study area. The VMT results are stratified by speed and emissions factors which are applied to arrive at the final emissions estimate. Since the travel demand model was only run for *Alternative 2*, Fehr & Peers factored the results to determine total VMT for *Alternative 1* and *Alternative 3* according to the trip characteristics of each alternative's land use.

The VMT-GHG tool estimates average weekday and annual GHG emissions in the form of "metric tons of carbon dioxide equivalent (CO_2e)[3]." To develop "lifetime" GHG emissions

[2] $MTCO_2e$ is defined as Metric Ton Carbon Dioxide Equivalent; equates to 2204.62 pounds of CO_2. This is a standard measure of amount of equivalent CO_2 emissions.

[3] CO_2e is commonly used in GHG analyses since it simplifies the reporting of GHG emissions to a single number. For transportation, over 95 percent of all GHG emissions are in the form of carbon dioxide.

estimates that are similar to those produced by the King County GHG Spreadsheet tool, the average building lifespan defined in the King County tool was used to factor up the annual GHG emissions estimates described above. The results of the transportation GHG emissions estimates are presented in Table 3.2-4.

Table 3.2-4. Existing Transportation Greenhouse Gas Emissions

Time Period	GHG Emissions in Metric Tons of CO_2e
Average Weekday	12.7
Annual	4,458
Lifespan	278,616
Transportation Emissions per Service Population	67.2

Source: Fehr & Peers, 2011.

Table 3.8-3 summarizes the greenhouse gas emissions estimates from the existing development within the Lake Stevens Center subarea based upon the King County Greenhouse Gas Emissions Inventory Worksheets and the Fehr & Peers VMT-GHG Analysis Tool.

Table 3.2-5. Lifespan Greenhouse Gas Emissions – Existing Conditions

Methodology	Embodied Emissions	Energy Emissions	Trans. Emissions	Total GHG Emissions	GHG Emissions per Service Population
King County Spreadsheet w/VMT-GHG Transportation Emissions	63,837	592,910	278,616	935,363	307.7

Note: GHG emissions estimates in metric tons of CO_2e
Source: Fehr & Peers, 2011.

Based on the calculations highlighted in the table above, the existing land uses in the 20th Street SE Corridor Subarea are expected to generate roughly 830,913 $MTCO_2e$[4] GHG emissions over the lifespan of the buildings, with the energy component comprising the majority of emissions.

[4] $MTCO_2e$ is defined as Metric Ton Carbon Dioxide Equivalent; equates to 2204.62 pounds of CO_2. This is a standard measure of amount of equivalent CO_2 emissions.

Future Emissions from the Alternatives

GHG emissions for the 2025 subarea plan alternatives were calculated using the methods described in the Methodologies section above. The King County SEPA GHG Emissions worksheet was used to calculate embodied and energy emissions and the Fehr & Peers VMT-GHG Analysis Tool was used to calculate the transportation emissions. Note that the vehicle GHG emissions factors used in the 2025 analysis reflect improvements to vehicle fuel economy and fuel carbon content, which tends to reduce the share of emissions generated by the transportation sector. These fuel economy and fuel carbon content assumptions are based on the California Air Resources Board EMFAC emissions factor model, which is a component of the VMT-GHG tool. Table 3.8-4 shows the total GHG emissions results for each alternative.

Table 3.2-6. Lifespan GHG Emissions – 2025 Alternatives

Scenario	Embodied Emissions	Energy Emissions	Trans. Emissions	Total GHG Emissions	GHG Emissions per Service Population
Alternative 1	156,833	1,391,271	399,580	1,947,684	281.9
Alternative 2	188,502	2,268,219	590,661	3,047,382	293.6
Alternative 3	178,625	2,011,837	557,226	2,747,688	275.1

Note: GHG emissions estimates in metric tons of CO_2e
Source: Fehr & Peers, 2011.

Table 3.2-6 shows that *Alternative 2* has both the highest total lifetime GHG emissions and the highest GHG emissions per service population. *Alternative 1/No Action* has the lowest total emissions, but *Alternative 3* has the lowest GHG emissions per service population. It should also be noted that both *Alternative 2* and *Alternative 3* will have lower emissions per service population when compared to existing conditions.

Despite the lower emissions per service population generated by *Alternative 3*, it will lead to an increase in total GHG emissions. *Alternative 2* would lead to an increase in both GHG emissions per service population and overall GHG emissions. Given the cumulative nature of GHG emissions and potential climate change effects, this is considered an impact. However, the lack of information regarding how potential climate change effects will impact the broad environment does not necessarily imply that these increased GHG emissions will have a significant or unavoidable adverse environmental impact within the study area.

Mitigation Measures

Greenhouse Gas Reduction Strategies

Based on the goals and strategies listed in the 20th Street SE Corridor Subarea Plan, some or all of the following GHG reduction strategies could be implemented:

- Adopt green building standards for new development (e.g., LEED silver or better);
- Adopt a mandatory commute trip reduction program for all applicable employers in the subarea. This commute trip reduction program could include the establishment of the following:
    - Mode split goals;
    - Mode split monitoring program;
    - Mode split goal implementation program;
    - Transportation management agency which provides resources for employers such as carpool matching, vanpool/transit information, and a guaranteed ride home program;
- In conjunction with a commute trip reduction program, expand transit options such as the Community Transit vanpool program or new fixed route bus service; or
- Implement efficient transportation design standards including the use of roundabouts and LED street and area lighting where appropriate.

Significant Unavoidable Adverse Impacts

GHG emissions would increase with any subarea plan land use alternative. Information is currently lacking, however, upon which to base a conclusion about the significance of the increased GHG emissions on climate change and the broader environment. Similarly, the potential for additional regulatory action at the state and local level in the future indicates that such impacts may not be unavoidable.

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3.3 LAND USE

3.3.1. Affected Environment

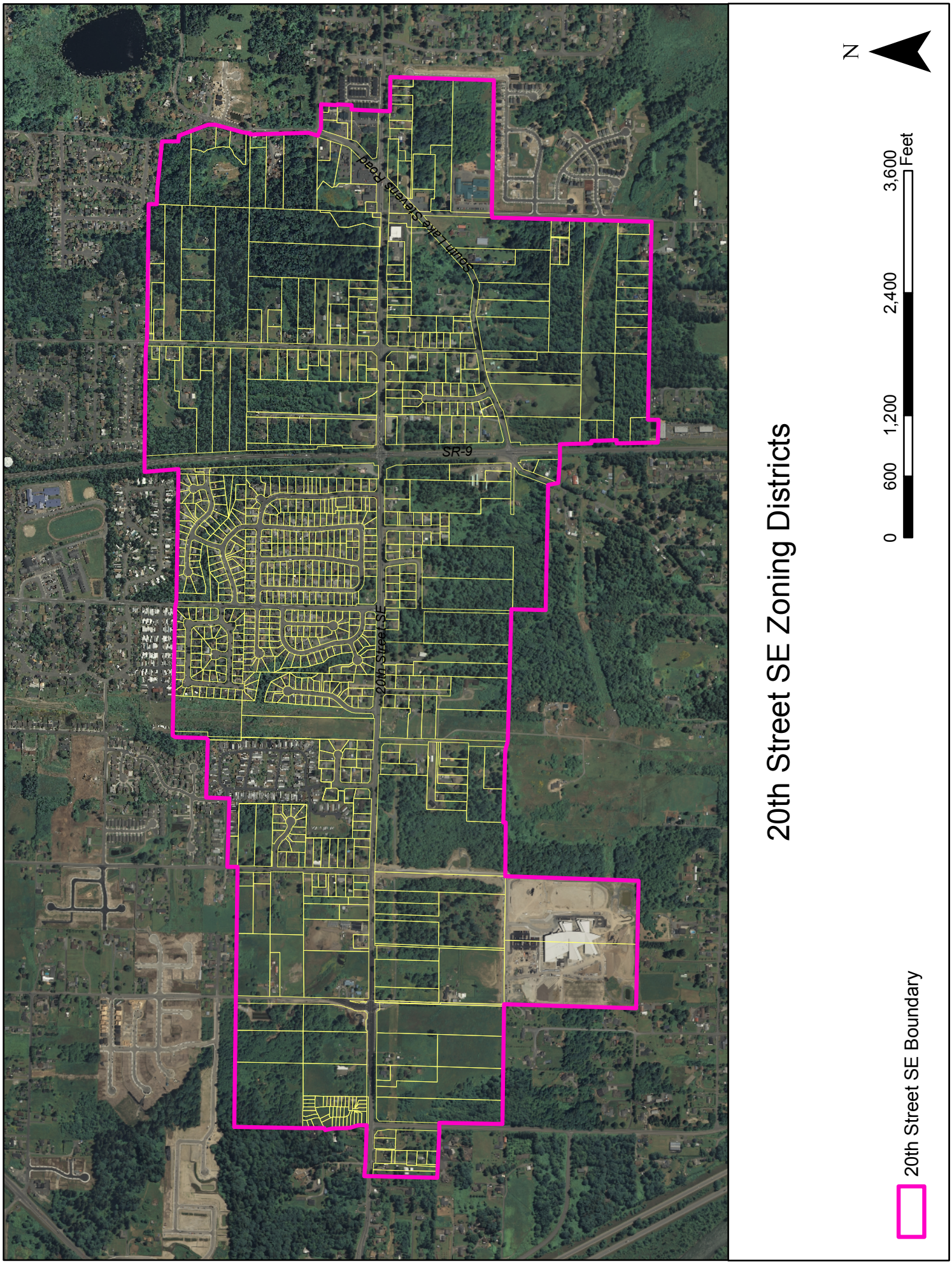
Vicinity Land Uses

The City of Lake Stevens surrounds the northeastern, northern, western and southern, sides of its namesake lake. The eastern city boundary starts on the eastern shoreline, extends southeast from the lake to 4th Street SE, north up 131st Ave NE to approximately 16th Street SE, and then continues northeast to Machias Road. The northern city boundary is primarily SR-92 and Soper Hill Road. Lake Stevens shares its northwestern boundary with the city of Marysville near SR-9 and Soper Hill Road. The City's western boundary extends roughly to SSR-204 and includes the residential areas above SR-204 up to Soper Hill Road. In the south, the city boundary skirts South Lake Stevens Road and other local roads and roughly follows platted lots. Following a series of recent annexations, the City has grown to approximately 5,761 acres (nine square miles) from approximately 2,368 acres (3.7 square miles) five years ago. Figure 3.3-1 illustrates the project vicinity and shows the proposed study area boundaries.

The predominant land use within the City (and its surrounding UGA) is single-family residential. Multifamily uses occur around the perimeter of the Central Business District (Old Town), along Grade Road, along 16th Street NE, and near Lake Stevens Center (Frontier Village). Large portions of the City have developed within the past several decades resulting in a relatively new housing stock. Until recently, the City has had limited commercial land, primarily situated around the downtown core. Following recent annexations, the City has added two commercial areas: the Frontier Village area (currently referred to as Lake Stevens Center), and the area intersecting South Lake Stevens Road and 20th Street SE. Lake Stevens has two industrial areas; the largest is on Hartford Road. Industrial uses are primarily restricted to warehouse and storage uses.

The development and uses adjacent to the City are primarily low-density and low-intensity in character. Snohomish County has designated a majority of the surrounding unincorporated parcels in the Rural Urban Transition Area (RUTA) and UGA as Rural Residential. Directly west of the City is the Snohomish River floodplain – this area consists largely of critical areas, agricultural uses, and rural residential uses, which limit future development potential. The floodplain separates Lake Stevens from the City of Everett, approximately 6 miles to the west. To the east of the City is the Pilchuck River and beyond the foothills of the Cascades. This eastern unincorporated area contains large parcels and forested lands with limited residential development. There are other rural residential areas north of Lake Stevens that also contain agricultural lands and critical areas. The areas south of the City between Lake Stevens and the City of

Figure 3.3-1. Project Vicinity



Snohomish include a patchwork of platted neighborhoods, large residential lots, small farms, and wooded areas with limited commercial areas.

Lake Stevens has direct access to the regional transportation system as several highways lie within or at the boundaries of the City limits including SR-9, SR-92, and SR-204. SR-9 is the major north-south highway, which provides connectivity to US-2 and ultimately a link to I-5. SR-204 provides an alternate connection to US-2, while SR-92 and 20th Street SE join the City to eastern Snohomish County.

The local transportation system consists of a dispersed road network reflective of past suburban development patterns; many neighborhood roads loop through residential developments and end in cul-de-sacs, limiting local traffic connections. Commercial uses are primarily adjacent to collectors and arterials with few connecting local streets.

Land Use & Zoning Designations

The City's growth strategy, as described in the Comprehensive Plan, envisions residential and employment growth occurring where infrastructure and services are available in concentrated, well designed "growth centers." Each center should have its own distinguishing character and serve the surrounding market. The 20th Street SE Corridor (also referred to as the "subarea") is located in the southern portion of the city and is one of the targeted growth centers.

Existing land use designations in the subarea include High Density Residential, Medium Density Residential, Downtown/Local Commercial, Sub-Regional Commercial, and Public/Semi-Public. The corresponding zoning districts are Suburban Residential, Urban Residential, High Urban Residential, Multi-Family Residential, Local Business, Sub-Regional Commercial, and Public/Semi-Public. The land use designations and zoning districts correspond closely to actual land uses, which is predominantly residential. Tables 3.3-1 and 3.3-2 summarize the subarea's current zoning and comprehensive plan designations by area and percentage. Figures 3.3-2 and 3.3-3 graphically illustrate the comprehensive plan designations and zoning districts found in the subarea.

Table 3.3-1 20th Street SE Corridor Comprehensive Plan Designations

Comprehensive Plan Land Use Designation	Study Area	
	Acres	Percentage
Medium Density Residential (4 to 12 units per acre)	615.75	72.86%
High Density Residential (no density limits)	71.80	8.50%
Downtown/Local Commercial	43.72	5.17%
Sub-Regional Commercial	43.05	5.09%
Public / Semi-Public	70.72	8.37%
Totals	**845.03**	**100.00%**

Source: City of Lake Stevens GIS 2009 Land Use Data

Table 3.3-2 20th Street SE Corridor Zoning Districts

Current Zoning District	Study Area	
	Acres	Percentage
Suburban Residential (9,600 sq. ft. per dwelling unit)	47.33	5.60%
Urban Residential (7,500 sq. ft. per dwelling unit)	499.75	59.14%
High Urban Residential (3,600 sq. ft. per dwelling unit)	69.12	8.18%
Multi-Family Residential	71.35	8.44%
Local Business	43.74	5.18%
Sub-Regional Commercial	43.05	5.09%
Public / Semi-Public	70.72	8.37%
Totals	**845.06**	**100.00%**

Source: City of Lake Stevens GIS 2010 Zoning Data

Existing Subarea Land Uses

The subarea encompasses approximately 845 acres in the southern portion of the City and is roughly divided into quadrants by the 20th Street SE and SR-9 intersection. Transportation access to the region and adjacent residential areas is excellent.

Existing land uses in the 20th Street SE Corridor are shown in Table 3.3-3 and Figure 3.3-4. The primary land use in the subarea is residential, which comprises roughly 46 percent of the area. The subarea contains approximately 856 single-family units that consist of detached single-family dwellings, followed by a mix of duplexes, manufactured homes, and detached condominiums. Established neighborhoods vary in age from the turn of the century to new construction. The majority of houses (53.61 percent) sampled in the study area were constructed after 1990; however, nearly 30 percent of the housing stock is over 30 years old. Comprehensive Plan and zoning designations allow a range of single-family densities from four to 12 dwelling units per

Figure 3.3-2. 20th Street SE Corridor Existing Comprehensive Plan Map

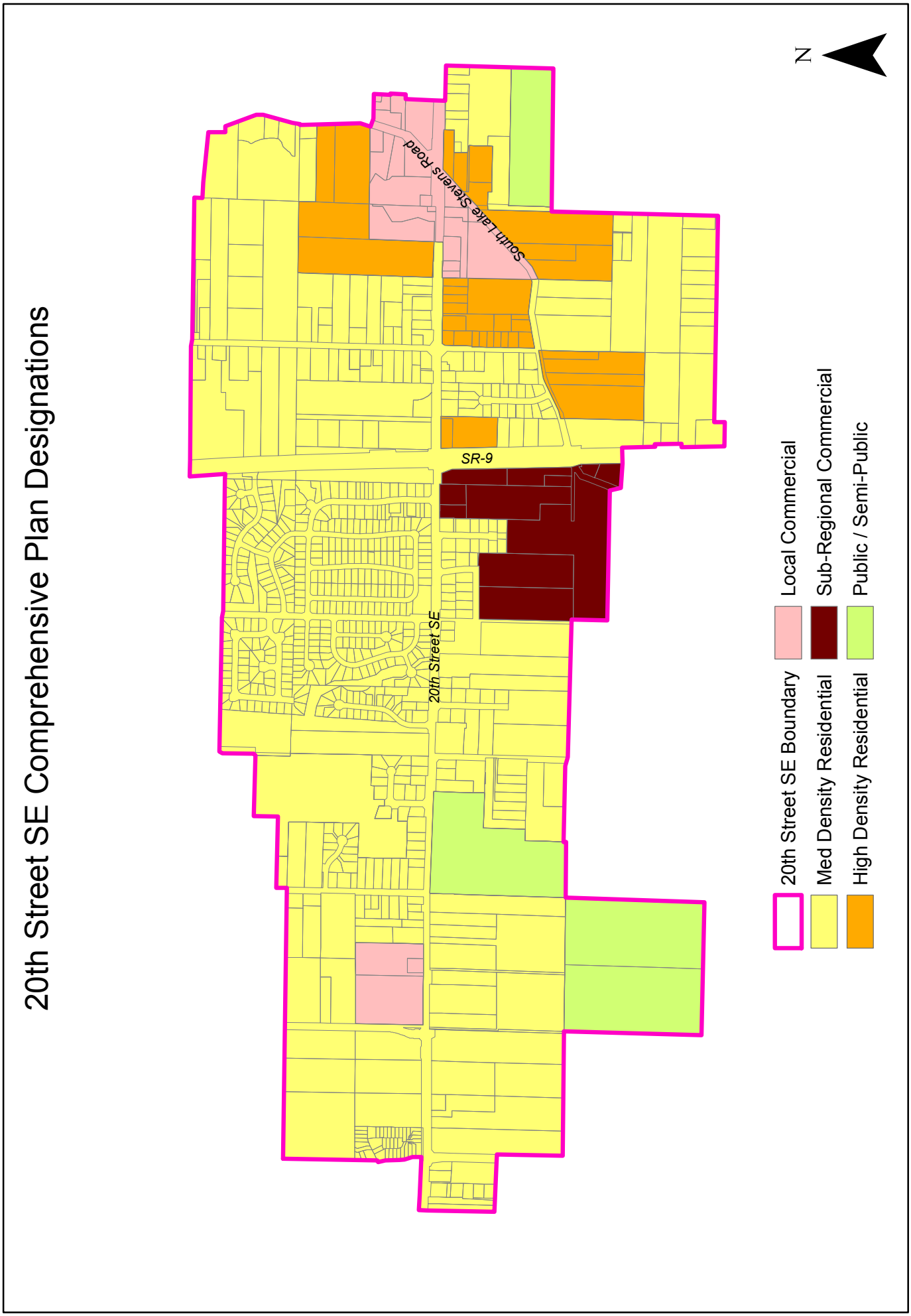
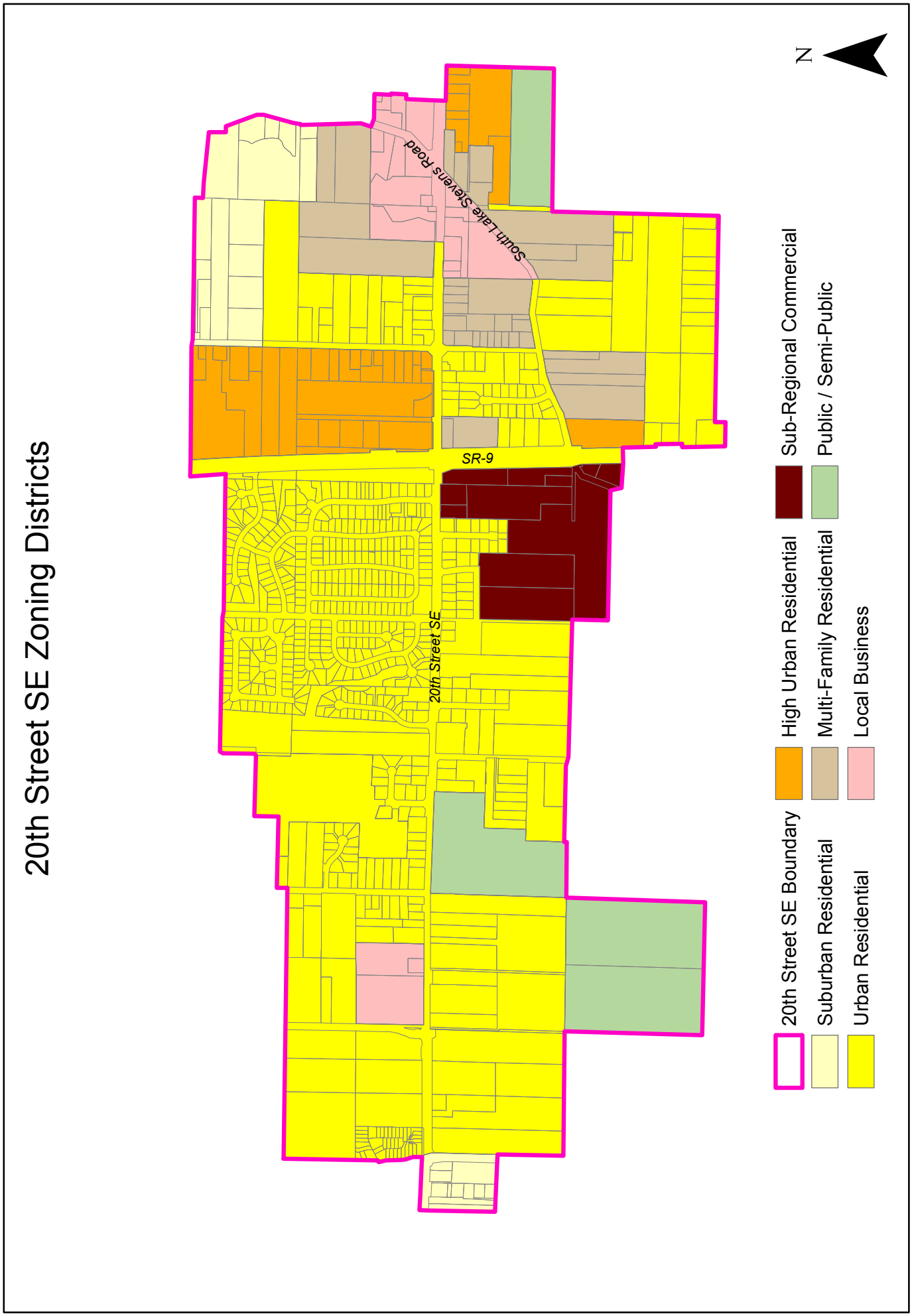


Figure 3.3-3. 20th Street SE Corridor Existing Zoning Map



acre in the subarea, but actual residential densities may be lower in the southern subarea because of the concentration of larger lots in the southern portion of the subarea.

Existing commercial uses total approximately 10 acres or one percent of the subarea. More than half of the commercial development in the area took place before 1990. There is one commercial node in the eastern portion of the study area, at the intersection of 20th Street SE and South Lake Stevens Road. The commercial uses are primarily auto-oriented retail and services (a small market, restaurants, etc.) as well as professional offices.

Aside from residential and commercial uses, combined utility and civic/government uses account for approximately 127 acres or nearly 15 percent of the area. Utilities include power transmission lines, water pipelines, stormwater detention facilities, sewer district facilities, and communications facilities. The largest contiguous utility tracts are power transmission lines located west of SR-9 and the City of Everett's water pipeline that parallels 20th Street SE approximately 150 feet south of the road's centerline. Civic and government uses include fire district offices, schools, and utility, City, or County owned properties including a partially developed County park (Cavalero Community Park).

The transmission line corridor is a significant feature of the subarea's land use pattern. Physically, it divides the subarea into east and west halves, and provides aspects both of utility infrastructure and passive open space. However, existing land uses are similar on both sides of the transmission line; similarly, current zoning does not treat the east and west halves of the subarea significantly differently. But the existence of the transmission line does limit location of most land uses within the width of the easement. Currently, no formal park or recreational uses occur within the transmission line corridor.

Based on City data, there are approximately 120 undeveloped acres and 86 partially used acres, comprising 25 percent of the study area, scattered throughout the area. This excludes the utility areas described above and other non-developable tracts, such as native growth protection areas and private access easements. The 20th Street SE Corridor also includes approximately 105 acres of wetlands, as identified in Section 3.1 (Natural Environment) of the Draft EIS. Considered together, approximately 60 percent of the subarea is undeveloped or partially developed.

Table 3.3-3 20th Street SE Actual Land Uses

20th Street Actual Land Use			City Actual Land Use[1]	
Land Use	**Acres**	**Percentage**	**Acres**	**Percentage**
Single-family Residential	389.62	46.11%	729	63.1
Multifamily Residential			78	6.7
Mobile Home Park	9.29	1.10%		
Sub-Total	**398.91**	**47.21%**	**807**	**69.8**
Commercial	10.34	1.22%	231	20.0%
Office				
Sub-Total	**10.34**	**1.22%**	**231**	**20.0%**
Civic/Government	113.43	13.42%	116	10.1%
Utilities	13.98	1.65%		
Church	8.26	0.98%		
Sub-Total	**135.67**	**16.05%**	**116**	**10.1%**
Undeveloped	120.02	14.20%		
Partially Used	86.23	10.20%		
Non-developable tract	10.22	1.21%		
ROW	83.67	9.90%		
Sub-Total	**300.15**	**35.51%**		
Totals	**845.07**	**100.00%**		

Sources: Snohomish County Assessors Data April 2011 / 2005 City of Lake Stevens Comprehensive Plan

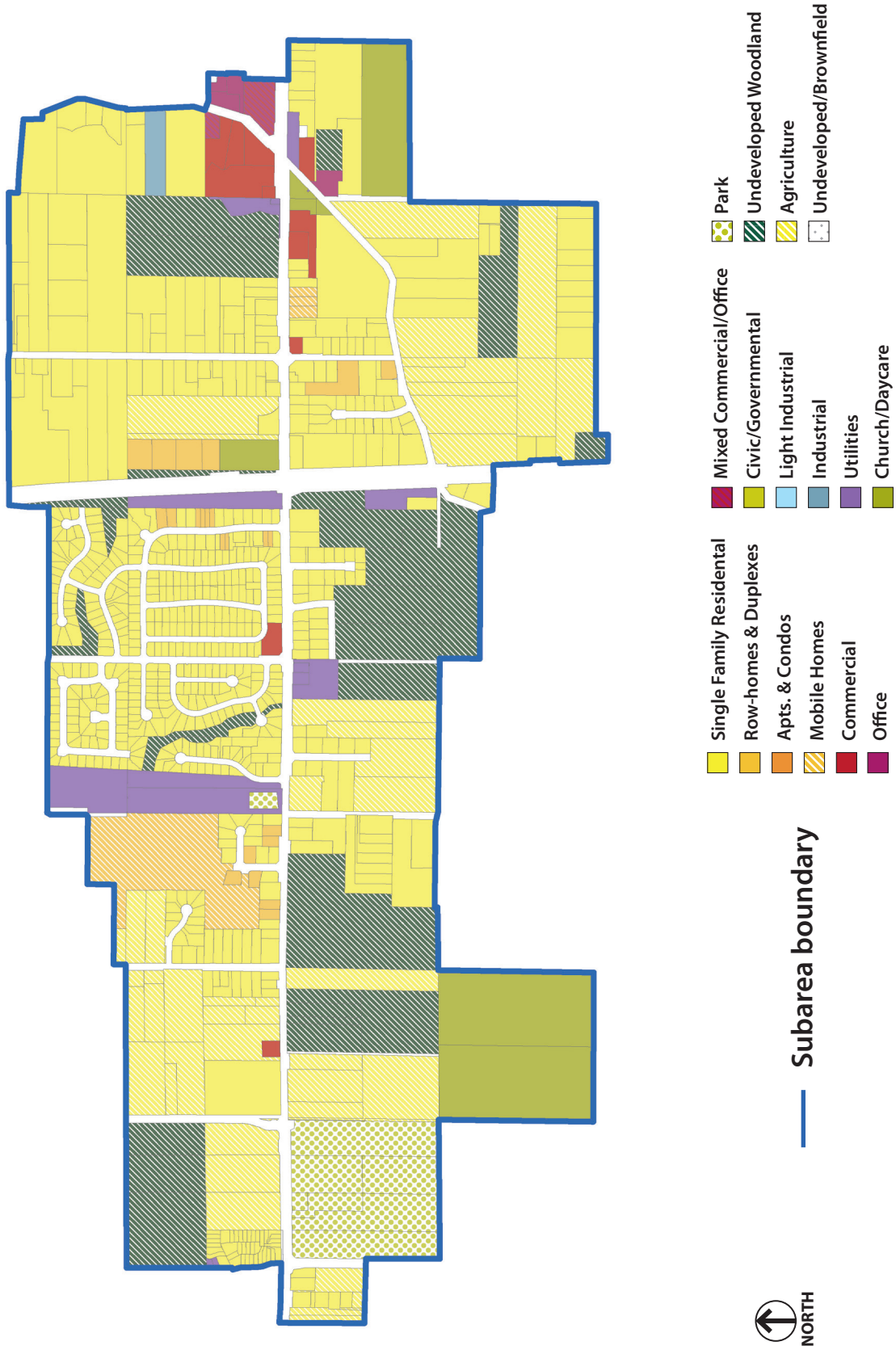
Currently, four proposed projects in the subarea are under review by the City:

- Sutherland Subdivision – 174 lot subdivision on 38 acres (31 acres within the study area)
- Jepson Short Plat – 3 duplex lot subdivision on 1 acre
- Holly Subdivision – 52 lot subdivision on 19 acres
- 20th Street Binding Site Plan – 88,072 square foot mixed multifamily residential/commercial project on 8 acres.

Because of the existing low-intensity development and availability of developable land, the City's Comprehensive Plan suggests there is potential for this area to become an expanded mixed-use center which can provide additional employment capacity and accommodate additional population growth.

[1] Adapted from Table 4-1 - Buildable Lands Analysis from the 2005 Comprehensive Plan – the acreage and percentage figures, based on the 2005 city limits, are for comparative purposes only and do not fully represent current land use patterns inside the city limits.

Figure 3.3-4. 20th Street SE Corridor Existing Land Use Map



3.3.2. Impacts of the Alternatives

The City is considering three development alternatives for the 20th Street SE Corridor to guide future land use and policy decisions. The *No Action Alternative* assumes that future development will occur under existing zoning and standards. *Alternative 2* and *Alternative 3*, the proposed action alternatives, provide different visions for the intensification and diversification of land uses that include a mix of retail, office, and residential uses.

The general development concept encourages efficient pedestrian and automobile circulation throughout the subarea. Conceptually, the 20th Street SE Corridor will connect north to the Lake Stevens Center Subarea by three main roads: 91st Avenue SE to the west, SR-9 centrally, and 99th Avenue SE to the east. In addition, a power line trail could provide another connection to tie projected land uses together. The commercial areas would connect to adjacent uses by collectors and arterial streets. Additionally, under the action alternatives the City envisions a new road that parallels 20th Street SE along the southern boundary of the subarea.

A mix of different land uses is an inherent part of urban development and does not intrinsically cause incompatibility. The subarea alternatives refine a pattern of urban development with varying intensity; however, under the action alternatives, there will be significant physical and land uses changes that will affect existing land uses. Future regulations and design guidelines will need to identify appropriate methods, such as buffering, landscaping, and/or stepping down buildings to create separations and transitions, to diminish the impacts of contrasting land uses.

Development and redevelopment under any of the subarea alternatives will result in direct, indirect, and cumulative impacts to land use within and adjacent to the study area. Together, these impacts will result in changes to the types, form and intensity of land uses and will affect the overall land use pattern of the subarea. This section addresses these impacts. Although adoption of a subarea plan in itself will have no impacts to the physical environment, the plan will provide a framework within which future growth and change will occur, which will cause the impacts.

The range of impacts considered in this section includes direct, indirect and/or cumulative impacts, which are further defined below.

- *Direct impacts* are those caused by future construction, which will entail development and consumption of undeveloped land or redevelopment of existing uses. Construction can cause short-term impacts such as noise, dust and truck traffic. Planned growth may also result in different types, forms and/or intensity of development, which may conflict with other land uses, and create a need for expanded or improved infrastructure, such as roads, stormwater facilities, and/or utilities to support planned growth.

- *Indirect impacts* are those that can result from the precedent established by a land use action (such as adoption of a subarea plan or zoning changes), from increased attractiveness of an area for development or by market opportunities for other businesses. Increasing the attractiveness of a planned area can also affect the development patterns in adjacent areas. Indirect impacts may also include increased levels of economic activity resulting from increased employment, spending and revenues.
- *Cumulative impacts* are a combination of direct and indirect impacts along with those current development projects. Any of these impacts can result in or reinforce changes to the land use pattern and character of the area.

Direct Impacts

General Impacts Common to All Alternatives

Development of Vacant Land. Future growth would occur through development of vacant, underdeveloped, or underused parcels throughout the corridor. Over time, vacant land would be converted to urban land uses including residential, retail, services, and office uses. This change would involve clearing and grading undeveloped properties, including portions of large parcels that are currently heavily vegetated. Removal of vegetation would alter the subarea's appearance, as would development and redevelopment in general. These impacts would generally be greater for the more intensive subarea alternatives – *Alternatives 2 and 3* – than for *The No Action Alternative*.

Some redevelopment of currently developed property could also occur, which would displace existing uses on those properties. The potential for redevelopment depends on a number of factors, including the value of existing structures, site location, and the relative cost, availability, suitability and desirability of other land in the same area. In general, redevelopment is less likely to occur where there are large amounts of available vacant land; this situation can change over time as vacant land is consumed. In general, displaced activities could relocate to other locations within Lake Stevens or within the subarea.

Approximately 60 percent of the subarea's land area is considered to be developable or redevelopable at full buildout (Leland Consulting Group, 2011). Development under any of the subarea alternatives would consume a portion of this capacity, and does not represent full buildout of all vacant land within the subarea. The amount of land consumed would vary by alternative and would depend on the type, form and density of future development. The *No Action Alternative* generally involves lower density and primarily single-family residential development. Other things being equal, the *No Action Alternative* would consume more land to provide a given number of housing units relative to higher density or multifamily housing, as emphasized in *Alternative 2* and *Alternative 3*. However, *Alternative 2* and *Alternative 3* would allow a greater number of

large-footprint office and retail buildings t han envisioned under *the No Action Alternative*; these developments would likely entail large surface parking areas and consume large amounts of land.

Timing of Development. Future growth within the 20th Street SE Corridor will take place over the next twenty-years or longer. The growth associated with each EIS alternative will occur during that time. Growth could occur at an even rate over this time horizon or could occur unevenly due to unforeseen national and regional economic factors. As the projected growth under all alternatives may not be even, development impacts would occur over uncertain intervals during the planning horizon.

Construction Impacts. As redevelopment and construction of new buildings and infrastructure will be incremental, construction-related impacts to the environment, including generation of dust and noise, which would affect adjacent properties, will be sporadic and short-term in nature. Future construction activities may also temporarily disrupt utility services. Likewise, truck traffic associated with construction would generate similar impacts and could create temporary traffic congestion and temporary interruptions in access. As construction impacts are limited in duration, the application of existing code requirements and project-specific conditions will mitigate construction impacts. In general, impacts would be more extensive and of greater duration for *Alternative 2* and *Alternative 3* compared to the *No Action Alternative*.

Land Use Pattern. The overall land use pattern of an area is a reflection of the types of uses, the density/intensity of development, and the spatial/structural form of development. Based on these factors, the subarea alternatives would result in significantly different land use patterns. Types and amounts of development for each alternative are shown in Table 2-1 (Chapter 2.7). To assist the reader, land use illustrations from Chapter 2 are provided again for *Alternative 2* (Figure 3.3-5) and *Alternative 3* (Figure 3.3-6).

Both action alternatives include a general mixed-use district where different combinations of land uses may be located in the same area, on the same lot, or in the same building. Under the action alternatives, retail and office nodes would be located along 20th Street SE near major intersections and on large undeveloped parcels. These commercial and employment nodes would be scaled and designed to complement the surrounding residential neighborhoods located throughout the subarea.

Under all alternatives, the number of housing units would increase. However, under *Alternative 2* and *Alternative 3*, the focus for new housing units would be predominately high-density and/or multifamily in character and may include small lot single-family, townhouses, apartments, and/or condominiums.

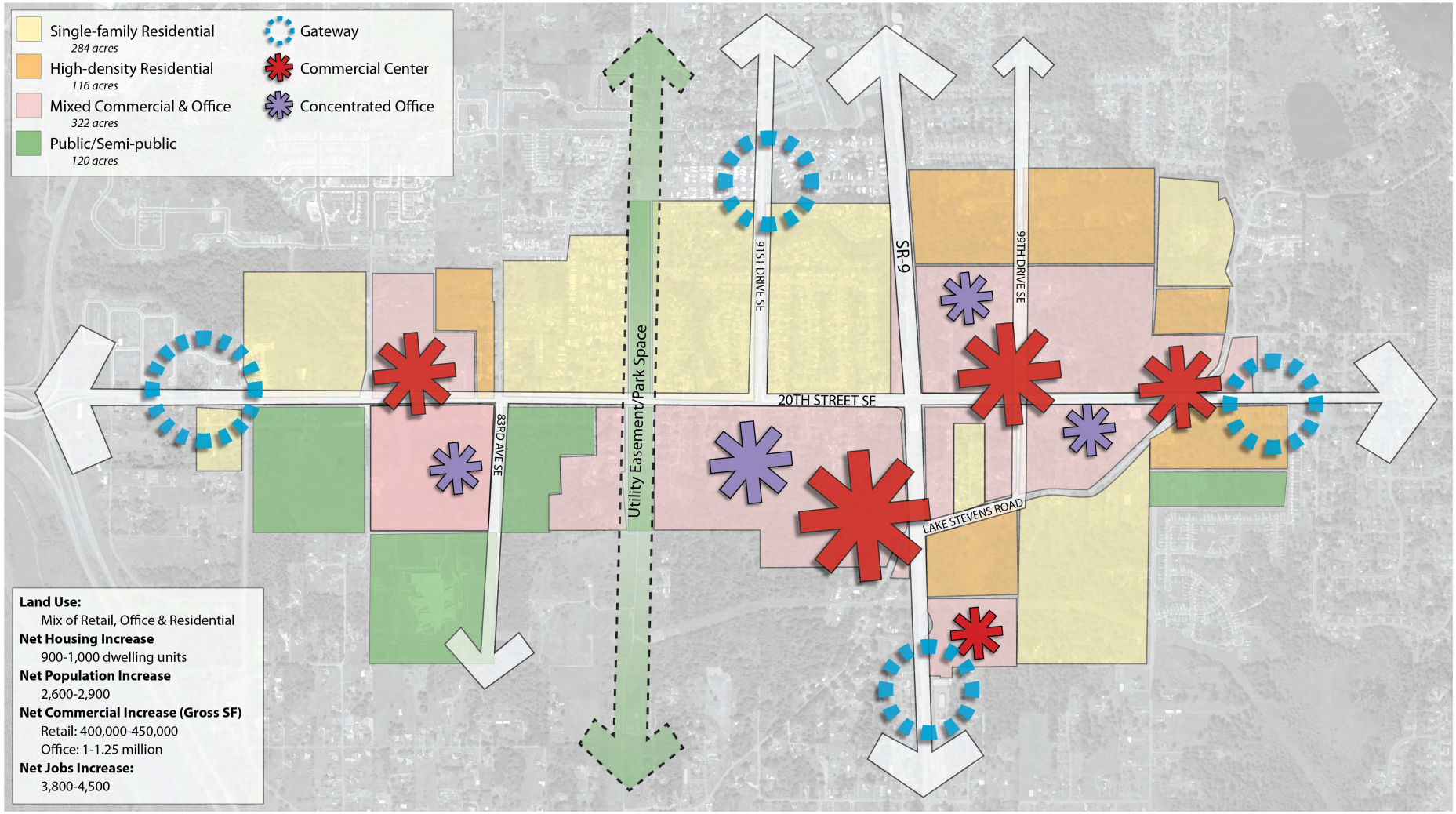


Figure 3.3-5. Alternative 2 Land Use

2oth Street Corridor Alternative 2: Intensive Employment with Residential

September 22, 2011

CITY OF LAKE STEVENS

Weinman Consulting, LLC · Fehr & Peers · AHBL · LMN

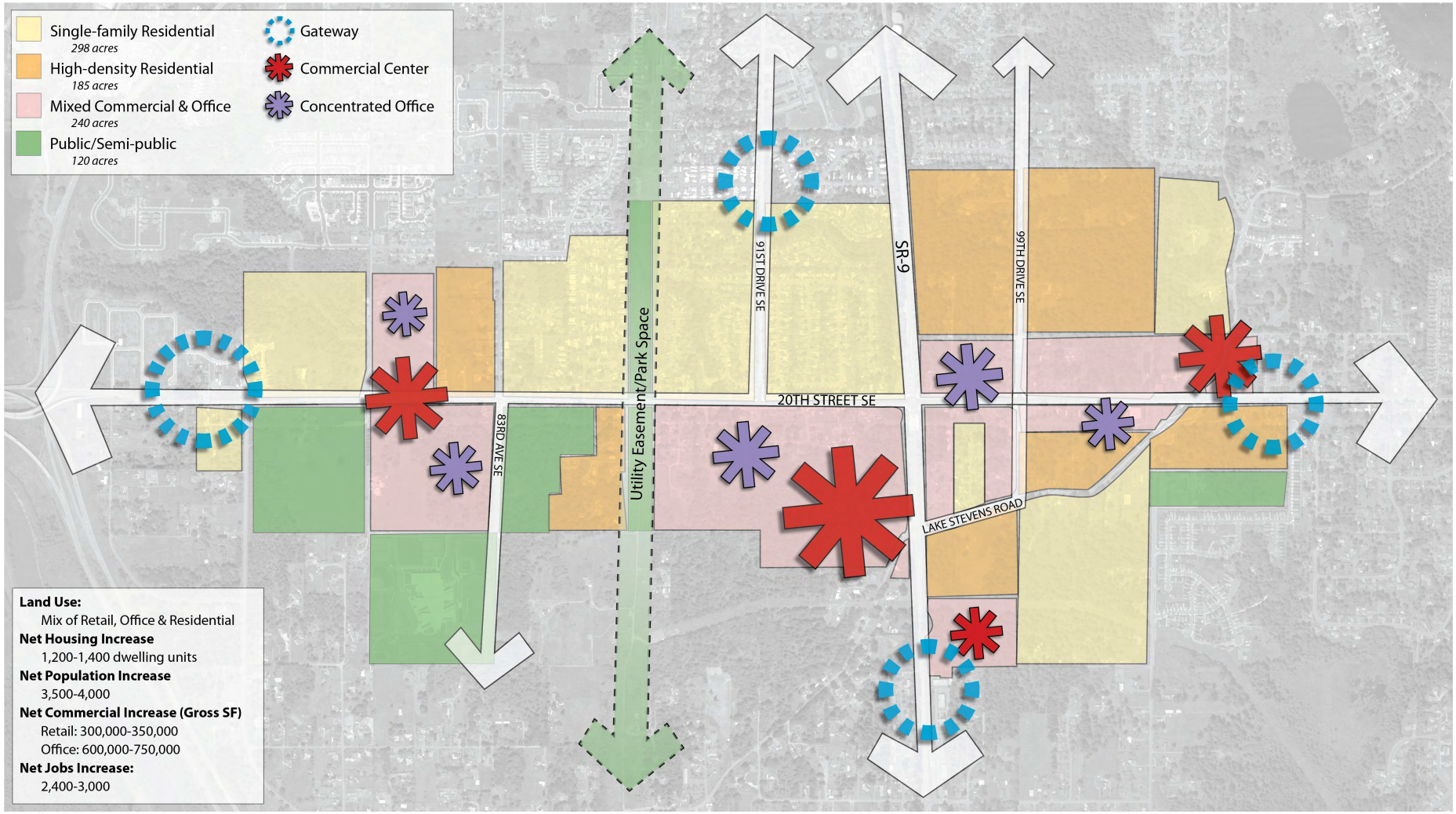


Figure 3.3-6. Alternative 3 Land Use

2oth Street Corridor Alternative 3: Enhanced Employment/Increased Residential

September 22, 2011

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The action alternatives propose to locate private, public, and semi-public recreational uses along existing utility corridors, notably the under the existing power lines, west of SR-9.

Alternative 1 – No Action Alternative

The *No Action Alternative* would not adopt a subarea plan, modify zoning or be designated as a Planned Action. Assuming no change to existing zoning, the *No Action Alternative* would essentially continue the existing low-to-mid urban density, primarily single-family residential pattern of development throughout most of the subarea. Single-family residential development would occur in subdivisions and on individual lots, mostly in the western portion of the subarea. Some intensive residential uses (e.g., high-density or multifamily residential) would be concentrated east of SR-9. Limited commercial development would occur in the three commercially zoned areas, located in the eastern, central, and western portions of the subarea. The City anticipates that a large retail development will develop on the central, commercially zoned properties southwest of the intersection of 20th Street SE and SR-9. This could take the form of a big box store or a community-scale shopping center. A smaller, neighborhood-scale center may also develop near 79th Avenue SE. Table 2-2 presents the housing, population, commercial, and job growth assumptions for the *No Action Alternative* (Chapter 2.7).

Gross residential density (total area divided by total dwelling units) would increase from just under 1 dwelling unit per acre at present, to between 1.7 (low range estimate) and 2.4 (high range estimate) dwelling units per acre.

Existing commercial zones (Sub-Regional Commercial and Local Business), which are mostly surrounded by single-family residential areas, permit a wide range of commercial uses either outright or conditionally. Therefore, specific types of businesses that will locate in the subarea are unpredictable. Land use impacts can occur where more intensive uses abut less intensive uses, and the potential for such conflicts exist for the *No Action Alternative*.

Zoning regulations would control the form and design of future development primarily through height limits, setback requirements, and impervious surface limits. Existing zoning regulations permit building heights of 60 feet in the Local Business zone and up to 85 feet in the Sub-Regional Commercial zone. Setbacks are 30 feet from the centerline of non-arterials and zero feet from the ultimate right-of-way line for arterials. Impervious surface limits apply only to single-family residential areas, while landscape and open space requirements may limit impervious surfaces in other zoning districts.

The current citywide design guidelines provide general direction for building and site design as part of the *No Action Alternative*.

Alternative 2 – Intensive Employment/Commercial Emphasis with some Residential Growth

Alternative 2 is the most concentrated action alternative presented for the 20th Street SE Corridor and would designate a Planned Action for the subarea. This alternative emphasizes significant retail, service, and employment growth along with a moderate increase in high-density residential development.

The existing land use pattern would change significantly under *Alternative 2* as shown in Figure 3.3-5. Over time, the subarea would become more urbanized, intensively developed with numerous larger buildings, and more diversified with a balanced mix of land uses. A major objective of *Alternative 2* is to attract substantial new employment, and to concentrate commercial activities in multiple "nodes" (i.e., concentrations of development) along and adjacent to the 20th Street SE Corridor in a mixed-use district. The nodes would vary in size and function, emphasizing either retail or office development. *Alternative 2* presumes that the 20th Street SE Corridor would accommodate an additional 400,000 to 450,000 square feet of retail development and 1 million to 1.25 million square feet of new office/employment space as described in Table 2-3 (Chapter 2.7).

Alternative 2 projects the subarea to include an additional 900 to 1,000 new dwelling units comprised of single-family and high-density residential housing. High-density or multifamily residential development would primarily occur adjacent to the commercial and office nodes, in transitional areas; some residential uses could also be included within the nodes as part of mixed-use projects. Single-family uses would continue to occur north of 20th Street SE with pockets located southwest of Lake Stevens Road.

In terms of land use, reflecting the employment objective of the subarea plan, the largest proportion of the subarea – 322 acres, or approximately 38 percent – would be designated for a mix of commercial and office uses. Under *Alternative 2*, the subarea could accommodate between 57 and 68 percent of the City's job target. Single-family residential use would be the next most extensive, comprising approximately 284 acres, or 33 percent of the total subarea. High-density residential use would comprise approximately 14 percent (116 acres) and public and semi-public uses would comprise a similar amount.

General illustrations of the form and scale of buildings that could locate within the mixed-use district and within the commercial and office nodes are shown in Figures 2-5 and 2-6 (Chapter 2.7). They are described in the following discussion.

Mixed-Use Districts. As discussed earlier, the action alternatives emphasize concentrated commercial growth in nodes that are oriented to particular uses and establish a particular character. Within a mixed-use district, that would include different combinations of retail, office, and service uses. The nodes would emphasize different land use combinations based on the focus of the area. For example, the commercial nodes would focus on retail development with complementary office uses, while concentrated office nodes would emphasize intensive employment uses and allow supporting retail and service uses. The different nodes may incorporate a residential component, as appropriate. Figure 3.3-5 identifies the overall Mixed Commercial and Office district as well as several commercial and office nodes along the corridor.

Major Commercial Nodes. Within the proposed mixed-use district, *Alternative 2* proposes to locate a large commercial node southwest of the intersection at 20th Street SE and SR-9. This node shares similar characteristics to the large retail center described as part of the *No Action Alternative.* This location would likely contain the most intensive development within the subarea and could be a regional draw.

This large commercial node could support a stand-alone "big box" type retail store, as shown in Figure 2-6 (Chapter 2.7), or a retail shopping center that would likely incorporate a mid-to-large retail anchor store along with several small to mid-sized retail stores. Big box retail stores are typically two or three stories (25 -35 feet) in height and box-like in shape. They are also typically auto-oriented and require extensive surface parking areas and require sites of 12-15 acres. Retail shopping centers are also large in scale, but can vary in design. Either form of development is intensive and larger in scale than what currently exists in the subarea. This large commercial node could also include an office component within or adjacent to the retail center.

All uses within the major commercial node south of 20th Street SE would be more intensive in nature and larger in scale than existing development in the subarea. The intensity and mix of uses within the node (retail, service, and office) would be generally compatible with one another and there would be small potential for on-site land use conflicts or incompatibilities. However, existing single-family residential areas located directly across 20th Street SE would contrast sharply with the overall projected intensity and scale of the commercial node. The separation provided by the 20th Street SE right-of-way, planned streetscape improvements, and landscaping surrounding the development along with the implementation of specific design standards and guidelines, would reduce potential conflicts.

It should be noted that similar or greater land use conflicts would occur under the *No Action Alternative*. As noted previously, existing zoning for the major commercial node, zoned Sub-Regional Commercial, would permit a wide range of retail and commercial uses at intensities that are potentially greater than what may occur under *Alternative 2*.

The area to the south of the major commercial node, characterized by low-density residential use (Rural 5), is located within unincorporated Snohomish County's Rural/Urban Transition Area (RUTA). As this area is inside the current RUTA boundary, it would be suitable for inclusion within the UGA when additional urban land is needed to meet future Growth Management needs.

Land use conflicts could occur between intensive commercial development in the node and adjacent existing low-density residential use. Proximity impacts could include light spillage and noise from deliveries and traffic, as well as the bulk or visibility of new buildings and site development. Such conflicts could be mitigated to a great degree through site and building design and zoning requirements that will establish sufficient setbacks, buffers, and landscaping in conjunction with area specific design guidelines and standards. Future inclusion of the RUTA into the UGA would result in infill and redevelopment of the area at higher, urban densities, which would reduce conflicts over time.

Neighborhood Commercial Nodes. Figure 3.3-5 identifies the location of several smaller commercial nodes east and west of SR-9. These smaller nodes would primarily provide local neighborhood level goods and services. The scale of development in these smaller commercial nodes would be less intense than the major node southwest of SR-9. Similar land use conflicts could occur, however. For example, the node near 79th Ave SE is adjacent to a single-family residential area and conflicts could occur because of contrasts in use and intensity between low-density residential and higher-intensity commercial uses. The same impacts would occur as part of the *No Action Alternative* with current zoning.

In addition to the node discussed above near 79th Ave SE, three smaller commercial nodes are identified east of SR-9. The existing node at the eastern end of the subarea, around the South Lake Center, could support additional growth along with diversification and intensification of land use that may include a mix of retail, office, and higher density residential uses. This mix would be typical of all identified smaller nodes. There may be some potential conflicts due to increased scale and density near existing residential areas, both within the subarea and adjacent areas. Appropriate site planning and design would help mitigate or minimize such conflicts. In general, *Alternative 2* would allow the portion of the subarea between SR-9 and South Lake Stevens Road to develop intensively with a mix of commercial and office uses adjacent to the eastern "gateway" of the subarea. Distinctive landscaping, lighting, and/or signage would demark the gateway.

The mix of development and the degree and types of impacts would generally be similar for the commercial node at 91st Ave SE in the western portion of the subarea.

Concentrated Office Nodes. The concentrated office nodes would be located within the proposed mixed-use district and would generally be located near other intensive commercial and residential uses, as shown in Figure 3.3-5. In *Alternative 2*, the subarea would contain four concentrated office nodes of varying size and intensity. Figure 2-5 (Chapter 2.7) illustrates the potential forms of office development within the subarea that would vary in height, intensity, and use depending on the size of the office concentration and abutting uses. In general, large office developments, such as business parks (two to four stories) would be located adjacent to retail developments; while smaller two to three story office complexes would be located adjacent to high-density or multifamily residential areas principally. This approach provides transitions between different uses and would help to minimize land use conflicts. Public streets would also separate and buffer most office nodes from single-family neighborhoods, throughout the corridor. However, the potential for conflict remains where office nodes abut single-family neighborhoods.

Residential Development. Gross residential density in the subarea would range from 2.1 (low range) to 2.2 (high range) dwelling units per acre. This is between the poles of the density range identified for the *No Action Alternative.* The range for residential density reflects the employment focus of *Alternative 2*. However, approximately 75 percent of the housing growth would occur within high-density residential or multifamily developments, such as apartments, condominiums, townhomes, etc. The remaining residential units would include a range of densities and single-family housing types. Single-family development would combine smaller lots, cottage housing and traditional detached single-family units.

By emphasizing high-density and multifamily residential uses, *Alternative 2* proposes to use available land more economically compared to existing development patterns. Multifamily development would generally be between three and five stories in height, with densities up to approximately 50-60 dwelling units per acre. High-density residential development would range between two and three stories. In both residential alternatives, parking would be in surface lots and/or structured within the building. (See Figure 2-7).

The housing, population, and employment capacity generated by *Alternative 2* would assist the City achieve population and employment growth targets adopted in the Comprehensive Plan.

Public/Semi-Public Zones. The subarea includes existing properties zoned as Public/Semi-Public, including public parks, schools, and public service areas. *Alternative 2* would continue the present distribution of Public/Semi-Public properties. *Alternative 2* also proposes to locate private, public, and semi-public recreational uses along existing utility corridors, notably under the existing power lines, west of SR-9.

These expanded public and/or semi-public uses would be sited and designed to avoid conflict with adjacent uses.

Alternative 3 – Moderate Employment/Commercial and Increased Residential Growth

Alternative 3 would adopt a subarea plan and designate a Planned Action for the subarea. The land use pattern for *Alternative 3,* shown in Figure 3.3-6, would be similar to *Alternative 2* in terms of types of land uses, intensity and scale of buildings, and the overall concentration of land uses within the proposed mixed-use district and use-specific nodes. However, the overall focus for *Alternative 3* would moderate commercial development and increase residential growth. Land uses would be comprised of 35 percent single-family residential (298 acres), 22 percent high density residential (185 acres), and 28 percent commercial and office (240 acres).

The retail and office growth assumptions for *Alternative 3* are below the levels proposed for *Alternative 2*, but well above the growth projections of the *No Action Alternative*. This alternative assumes an increase of 300,000-350,000 square feet of retail and 600,000-750,000 square feet of office. The average intensity for commercial development presumed by *Alternative 3* would be about 32 percent less than *Alternative 2.*

Like *Alternative 2*, the residential component of *Alternative 3* promotes an increase in high-density and multifamily development, but with a slightly larger area devoted to single-family residential uses. There would be some shifts in the locations of commercial and office nodes to accommodate and buffer increased residential uses. Residential development, pursuant to *Alternative 3* projections, would increase by approximately 37 percent over *Alternative 2* estimates and would include between 1,200-1,400 additional dwelling units. Gross residential density would range from 2.4 du per acre (low range estimate) to 2.7 du per acre (high range estimate), which would be the highest among the alternatives.

Impacts within the mixed-use district and individual nodes would be as described above for *Alternative 2*. In general, uses would be complimentary in terms of density, intensity and scale, and no significant land use conflicts are expected to occur. As identified for *Alternative 2*, the greatest potential for impacts would occur where higher-intensity commercial uses are located adjacent to low-density residential areas. These impacts could be mitigated through regulatory requirements, site planning, building orientation, design guidelines and standards, and landscaping.

Indirect Impacts

Adopting the subarea plan, rezoning the area, and adopting a Planned Action would increase opportunities for and the desirability of development within the 20th Street SE Corridor. Development of the subarea over time, and according to proposed policies,

would make Lake Stevens a more attractive place to work and live. Creating greater employment opportunities and a balance between jobs and housing is a major objective of the subarea plan and the City's overall growth strategy.

Attracting additional growth and the types of development reflected in the subarea plan could reduce growth pressure to some degree in adjacent areas, both incorporated and unincorporated. The types and amount of commercial uses anticipated in the subarea plan are intended to capture identified opportunities in the target employment sectors over the next 20 years. Future development generated by the subarea plan has the potential to displace some existing uses, internally and externally. Market and economic factors in conjunction with individual property decisions will drive infill and redevelopment within the subarea.

As noted in Section 3.5 (Population, Housing & Employment) of the Draft EIS, growth in the subarea is assumed to be within adopted 2025 growth targets in combination with planned growth in other areas and citywide. The subarea could also potentially attract an additional population growth to the City and surrounding area, as workers seek to live closer to jobs. As noted in Section 3.5 of the Draft EIS, land uses in the subarea plan are based on a market analysis and estimates of growth over the next twenty years, not land capacity. After 2025, the subarea will have remaining vacant and partially developed land and additional capacity for growth. Future updates to population forecasts and the Comprehensive Plan would reflect additional capacity and shifting growth patterns.

Any additional growth attracted to the subarea, or to Lake Stevens in general, would likely be in designated centers, such as the 20th Street SE Corridor and would not occur helter-skelter or in a strip pattern. This focused growth would be consistent with regional and local land use goals. To the extent that the 20th Street SE Corridor transforms through future redevelopment, the subarea plan could attract new businesses and residents and act as a catalyst for development in nearby areas.

The planned subarea improvements may lead to increased desirability and indirectly to greater property values within the subarea and in surrounding areas. Because changes in property value are primarily related to sales of comparable property, adoption of the subarea plan and rezoning of properties would not necessarily affect property values or taxes. Over the longer term, development could result in increased property values, reflecting the increased investments in different types of land uses and structures. The extent of any increase is uncertain and depends on a variety of factors used by the Snohomish County Assessor to calculate value. An increase in property value is not certain to increase property taxes; any such increase would depend on municipal budgeting and annual tax levies and as limited by state law.

Cumulative Impacts

This section considers potential land use impacts associated with concurrent implementation of the 20th Street SE Corridor Subarea Plan and the Lake Stevens Center Subarea Plan together. All known and proposed development projects within the subarea are included within the land use assumptions for the alternatives, and the foregoing analysis is cumulative in this respect.

Cumulatively, the 20th Street SE Corridor Subarea Plan and the Lake Stevens Center Subarea Plan are intended to increase employment and commercial land uses within the City and respective growth center. Both subareas would also create greater opportunities for providing high-density multifamily residential housing. The cumulative extent of these increases is identified in Section 3.5 of the Draft EIS.

Implementation of the subarea plans would focus growth and specific land uses in designated commercial centers at higher densities and intensities than allowed under current regulations. To the extent that concentrations occur, they would reinforce center-oriented land use policies, which are fundamental to state, regional, county and local growth management plans. Please see the policy discussion in Section 3.4.

3.3.3. Mitigation Measures

Many of the land use changes identified in the foregoing analysis – including increased density/intensity and a greater diversification and mix of land uses – are not considered adverse impacts. The change in the subarea's land use pattern would be significant, but does not require mitigation. However, to implement the subarea plan the City will develop refined development regulations and design guidelines standards.

Potential land use conflicts, such as between proximate land uses of different intensity, can be avoided or otherwise mitigated through the application of new development regulations and design guidelines and standards that ensure appropriate land uses along with adequate buffering and transitions between different abutting land uses. For example, height and bulk limits and setback requirements in zoning regulations could be tailored to address these potential conflicts. Landscaping requirements can also help to buffer and screen land uses of dissimilar intensity or scale. Design guidelines and standards would also require approaches to site planning and building design, which reduce a range of potential impacts, such as shadows, noise and visual incongruities. These techniques are an integral aspect of implementing the subarea plan.

3.3.4. Significant Unavoidable Adverse Impacts

The land use pattern of the subarea would change significantly to accomplish the objectives of *Alternative 2* or *Alternative 3.* This would result in the subarea becoming more urbanized and intensively developed, with a greater mix of uses, and would experience a significant increase in employment uses and population relative to the *No Action Alternative*. This change, while significant, is not considered to be adverse.

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3.4 PLANS & POLICIES

Lake Stevens adopted a Comprehensive Plan complying with the Growth Management Act in 1994. A major update was adopted in 2006, and the next major update is required by 2014. This section of the Draft EIS evaluates the general consistency of the 20th Street SE Subarea Corridor Subarea Plan with the vision, goals and policies of the City's Comprehensive Plan as amended through 2010.

The analysis focuses on goals and policies that are most relevant to the proposed action. Relevant goals and policies are provided verbatim, followed by a brief assessment of relative consistency of the Subarea Plan. The Land Use Element is evaluated in detail, since it best encompasses the range of issues implicit in the proposed subarea plan, followed by Housing, Economic Development and Transportation elements.

Because the proposed action will modify zoning classifications and regulations, an evaluation of existing zoning regulations is not considered necessary.

City of Lake Stevens Comprehensive Plan

Vision Statement (2006 Lake Stevens Vision)
Summary:

VG-2 The City of Lake Stevens will encourage changes that promote livability, pedestrian orientation and high-quality design, and limit stress factors, such as noise pollution and traffic congestion…VG 3 The community will focus its economic development activity in the Hartford Road Industrial Area, three Community growth centers and small neighborhood service centers.

VG-5 The City of Lake Stevens will encourage the development of the local economy by: providing a predictable development atmosphere; emphasizing diversity in the range of goods and services; encouraging non-consumptive, sustainable level markets; and ensuring that as the economy changes employment opportunities are balanced with a range of housing opportunities.

Discussion: The 20th Street SE Corridor is one of the growth centers currently designated in the Comprehensive Plan. The study area boundaries are larger than those depicted in the Comprehensive Plan for the growth center, in order to address potential impacts to existing development. The 20th Street SE Corridor reflects market opportunities identified in recent studies, contains large blocks of undeveloped land, and has the potential to create an urban district with a balance of employment uses and housing. The subarea boundaries could change as a result of ongoing planning and environmental review. Land uses planned for the subarea reflect an emphasis on increasing employment and retail opportunities and the size and vitality of the local economy. The Planned Action is part of the City's strategy to attract desired types of

development. The proposed subarea plan would be consistent with these policies and strategies.

Land Use Goals
Summary:

GOAL 4.1 ENSURE THAT LAND USES OPTIMIZE ECONOMIC BENEFIT AND THE ENJOYMENT AND PROTECTION OF NATURAL RESOURCES WHILE MINIMIZING THE THREAT TO HEALTH, SAFETY AND WELFARE;

GOAL 4.2 GROWTH MANAGEMENT: MANAGE GROWTH SO THAT THE DELIVERY OF PUBLIC FACILITIES AND SERVICES WILL OCCUR IN A FISCALLY RESPONSIBLE MANNER TO SUPPORT POSITIVE ECONOMIC ACTIVITY IN THE CITY;

GOAL 4.3 ECONOMIC DEVELOPMENT: ATTAIN THE HIGHEST LEVEL OF ECONOMIC WELL-BEING POSSIBLE FOR ALL CITIZENS IN LAKE STEVENS THROUGH THE ACHIEVEMENT OF A STABLE AND DIVERSIFIED ECONOMY OFFERING A WIDE VARIETY OF EMPLOYMENT OPPORTUNITIES;

GOAL 4.4 NEIGHBORHOOD CONSERVATION: ACHIEVE A WELL BALANCED AND WELL ORGANIZED COMBINATION OF OPEN SPACE, COMMERCIAL, INDUSTRIAL, RECREATION AND PUBLIC USES SERVED BY A CONVENIENT AND EFFICIENT TRANSPORTATION NETWORK WHILE PROTECTING THE FABRIC AND CHARACTER OF RESIDENTIAL NEIGHBORHOODS; AND

GOAL 4.5 ENVIRONMENTAL PRESERVATION AND CONSERVATION: ENSURE THE PROPER MAINTENANCE OF THE CITY'S ENVIRONMENTAL QUALITY THROUGH THE PRESERVATION AND CONSERVATION OF THE NATURAL ENVIRONMENT AND RESOURCES.

Discussion: The Land Use Element of the Comprehensive Plan establishes the framework for evaluating the proposed land use alternatives and describes the intended purpose for each land use designation as a basis for implementing zoning regulations. Many of the goals and policies in this element focus on integrating existing neighborhoods with future infill and redevelopment of sites in planned urban centers and mixed-use developments. As a planned growth center, the 20th Street SE Corridor will provide balanced and efficient growth where infrastructure and transportation facilities are available.

Other pertinent goals and policies focus on economic development and stress responsible growth and a diverse economy with a wide variety of employment opportunities." An important objective of the two action alternatives is to attract a greater share of employment uses to the City thereby increasing the economic benefits of growth for all residents. Attracting office uses and retail development is a means to grow and diversify the local economy. The City's critical area regulations would protect

important environmental resources (wetlands, streams, steep slopes, fish and wildlife conservation areas, and frequently flooded areas) within the subarea.

The Land Use Element also accentuates the need to provide a mix of complementary land uses including "open space, commercial, industrial, recreation and public uses" along with a "diverse array of housing opportunities." As described, the action alternatives include a balanced mix of land uses – residential, office, retail and open space.

The proposed subarea plan would be consistent with these policies.

Comprehensive Plan Designations (Only designations within the study area boundary or designations being considered for inclusions within the study area are included)

Summary:

A. Residential

1. *High Density Residential* – Allows a variety of residential forms of residential structures containing three or more dwellings. Multiple structures may be located on a single parcel, and there are no density limits, provided that the project meets the site requirements of the zoning and other pertinent codes and adopted development guidelines. Also allows limited public/semi-public, community, recreational, and commercial uses.
2. *Medium Density Residential* – Allows single-family (1 du/lot) and two-family residential development with a gross density of 4 to 12 units per acre. Includes detached, attached, conversion, accessory apartments, townhouses, condominiums, duplexes, tourist homes, special service homes and some manufactured/mobile structures. Also allows limited public/semi-public, community, recreational, and neighborhood commercial uses.

B. Commercial

1. *Sub-Regional Commercial* – Allows high intensity, automobile-oriented commercial uses, including dense arrangements of retail stores, services, and professional offices which are used not only by local residents but by those of other communities. Also allows limited public/semi-public, community, and recreational uses.
2. *Downtown/Local Commercial* – Allows medium to high intensity commercial uses, including the Central Business District and other dense arrangements of professional offices and retail stores. This designation allows mixed-use development. This land use designation may be placed on lands between Sub-Regional Commercial and residential areas to act as a buffer. Also allows limited public/semi-public, community, and recreational uses.

3. *Mixed-Use* – Allows medium to high intensity mixed use (commercial and residential). It is intended that this land use designation will be placed where a "village atmosphere" is desired, or on lands between high and low intensity uses to act as a buffer (e.g., between Sub-Regional commercial and residential zones). Also allows limited public/semi-public, community, and recreational uses.

D. Public/Semi-Public

This category is intended for use on all land that is publicly owned. It allows public buildings and services, recreational uses, utilities, and transportation facilities.

***Discussion*:** The subarea plan may modify or create new Comprehensive Plan land use designations in various locations, but it will be generally consistent with the types of uses and densities described for each category. Alternatively, the Comprehensive Plan could be modified to show a more general "subarea plan" designation/overlay that is keyed to the subarea land use plan. Existing land use categories that are most relevant to the subarea plan include High Density and Medium Density Residential, Sub-Regional Commercial, Local Commercial, Mixed Use, and Public/Semi-Public. Application of the Mixed Use category would likely be more extensive, for example, but the mix of uses would be consistent with the stated intent of this category. No industrial designations apply currently or are proposed in the future.

Summary:

GOAL 4.5 PRESERVE AND ACCENTUATE THE LAKE AS THE CENTERPIECE OF LAKE STEVENS.

Policies

4.5.1 Encourage design of subdivisions and structures that maintain public lake views.

4.5.2 Structure minimum lot size, lot coverage, and setback standards within the Waterfront Residential or other zones so that public lake views between buildings on adjacent lots are possible.

4.5.3 Regulate boathouses and other dock structures to allow for reasonable public access to, and views of, the lake.

Discussion: The 20th Street SE Corridor is not contiguous or oriented to Lake Stevens and does not provide open views of the Lake.

Population Growth and Growth Management

Summary:

GOAL 4.9 ACCOMMODATE GROWTH THAT FACILITATES AND ENHANCES AN URBAN SMALL TOWN CHARACTER.

Policies

4.9.1 Accommodate new development to support a rate of growth that is consistent with the City's responsibilities under the Growth Management Act and the County-wide Planning Policies.

4.9.2 Ensure that growth is phased to maintain consistency with the City's Capital Facilities Plan for providing public facilities including streets, sidewalks, lighting systems, traffic signals, water, storm and sanitary sewer, parks and recreational facilities, and schools.

4.9.3 Assure that development provides for transportation access consistent with the level of service established for the community and is concurrent with the impacts of the development.

4.9.4 Encourage growth that is responsive to environmental concerns and that enhances the natural environment of the lake drainage basin and the areas watersheds.

4.9.5 An urban level of development shall be defined as gross densities area's of 4 dwelling units per acre or more.

4.9.6 The City will actively participate in Snohomish County Tomorrow's population monitoring strategy. The strategy will be used to amend the Plan as necessary to remain consistent with actual settlement patterns and population trends.

Discussion: Population growth associated with the subarea plan action alternatives would be consistent with the City's 2025 growth target. Growth within the subarea would be coordinated and consistent with the Comprehensive Plan's Capital Facilities Element; the element would be updated to reflect the subarea plan. As discussed in the Transportation section of the Draft EIS (3.8), planned growth would be consistent with adopted or modified level of service standards and concurrency requirements, and would provide improvements according to City standards. Planned residential densities will be urban and exceed four dwelling units per acre. Gross density for the entire subarea will be below this level for some time, however, due to the presence of existing low-density development in much of the subarea. Environmental resources would be protected pursuant to adopted critical area regulations. The draft Planned Action Ordinance (Appendix A) includes a provision for regular monitoring of growth to ensure that planned development levels are not exceeded. The subarea plan would be consistent with these goals and policies.

Summary:

GOAL 4.11 DIRECT NEW RESIDENTIAL GROWTH TO AREAS WHERE INFRASTRUCTURE AND SERVICES ARE AVAILABLE.

Policies

4.12.1 Require retention of all trees within a 30' visual/noise buffer along SR-92, SR-9, and the Hartford/Machias Road (as measured from the edge of ultimate right-of-way). Where trees need to be removed because of instability, require replanting of 5-gallon (minimum) conifers at a 3:1 ratio within the 30' buffer.

4.12.2 Ensure that design of highway accessible/visible commercial uses along SR-92, SR-9, and the Hartford/Machias Road is aesthetically pleasing from both the roadway and the local roads.

***Discussion*:** The SR-9 and 20th Street SE intersection is a key location and is identified for mixed-use development and a major concentration of retail and commercial development. Implementation of the subarea plan will include design guidelines and standards, which could supplement existing tree retention and landscaping requirements, as appropriate, and establish standards for high-quality design.

Residential Land Use

Summary:

GOAL 4.13 ACHIEVE A DIVERSE ARRAY OF HOUSING OPPORTUNITIES.

Policies

4.13.1 Allow for high density development in appropriate areas, e.g., near Central Business District.

4.13.2 Allow manufactured single-family residences on individual lots in the same zones and with the same land use permit requirements as a site built home, provided the manufacture homes are built to HUD standards, or to IBC standards and inspected by the State Department of Labor and Industries.

4.13.4 Allow accessory units in single-family residential zones by right, without requiring an increase in lot size above the minimum set for that zone.

4.13.6 Create opportunities for low-income housing when necessary and/or appropriate.

***Discussion*:** Planned residential development in the subarea would include high-density, multifamily and single-family housing. High-density rental housing could be relatively more affordable to some households. No changes to existing regulations regarding manufactured housing or accessory units are proposed.

Summary:
GOAL 4.14 PRESERVE AND PROMOTE CHARACTER OF EXISTING NEIGHBORHOODS.

Policies

4.14.1 Promote architectural design that is similar to that of historic homes (i.e., front porches, garages behind houses, gabled roofs, etc.).

GOAL 4.15 Preserve and promote "small town" character.

Policies

4.15.1 Promote architecture that is pedestrian friendly and conducive to human interaction (e.g., front porches, garages behind houses, small front yard setbacks, no "walled" neighborhoods).

4.15.2 Ensure that plat designs are pedestrian friendly (e.g., ample street trees, adequate sidewalks, walkways and paths connecting plats).

4.15.3 Require that all new residential development mitigate their impacts on demands for parks.

4.15.4 Review and revise Development Design Guidelines for Multi-Family Residential uses and Planned Residential Development.

***Discussion*:** As discussed in Section 3.3 (Land Use) of the Draft EIS, land uses of greater density and intensity would occur adjacent to existing single-family neighborhoods in some locations. Zoning regulations (e.g., setbacks, landscaping) and design guidelines and standards would be applied to mitigate potential land use conflicts and to preserve the character of existing neighborhoods. Design guidelines and standards that are specific to the 20th Street SE Corridor will be developed to establish consistent architectural design. In general, the subarea is being planned to be pedestrian friendly and to provide convenient connections between various land uses. Future demand for parks is identified in Section 3.9 (Public Services) of the Draft EIS, and will be mitigated project-by-project and on an area-wide basis. The subarea plan would be consistent with these goals and policies.

Commercial Land Use
Summary:
GOAL 4.20 PROMOTE NEIGHBORHOOD COMMERCIAL USES IN APPROPRIATE PLACES.

Policies

4.20.1 Allow the designation of property for neighborhood commercial uses on the Land Use map where the property:

a. is located at an intersection with at least one arterial street.

b. is at least one-half mile distance from other similarly designated properties.

c. results in no more than two acres of land being designated for neighborhood commercial uses at the same intersection.

4.20.2 Neighborhood Commercial is not a euphemism for "convenience store commercial." It is the intent of this policy to promote commercial uses catering to day to day needs of neighbors in locations that are easily reached by foot. Proposed uses shall clearly reflect this intent.

GOAL 4.22 APPLY COMMERCIAL LAND USE DESIGNATIONS TO PREVENT STRIP OR "LEAP-FROG" COMMERCIAL DEVELOPMENT.

Policies

4.22.1 Discourage strip development and encourage nodal development through adoption of zoning designations, specific design guidelines and development regulations.

***Discussion*:** The subarea plan would create a mixed-use district with several concentrations of retail, service, and office use. Commercial development would generally occur in high-intensity nodes and not in a strip pattern. The subarea is being planned as an integrated district. Policies related to the size and spacing of individual commercial developments would not apply. This pattern would locate commercial goods and services in convenient proximity to residences, which would make walking a feasible alternative to driving.

***Summary*:**

GOAL 4.28 REQUIRE DEVELOPMENT TO BE SENSITIVE TO SITE CHARACTERISTICS AND TO PROTECT NATURAL RESOURCES.

Policies

4.28.1 Allow the use of Planned Residential Developments (PRDs) and Cluster Subdivisions on properties with environmentally sensitive areas as a means of transferring, within the boundaries of the site, development density from the sensitive to the non-sensitive portions of the site. Avoid development in erosion areas near water bodies that would require bank stabilization.

4.28.2 City shall promote the retention of significant trees during development.

4.28.3 Preserve existing vegetation as much as possible due to its vital role in the groundwater and wildlife systems of Lake Stevens in order to prevent

additional stormwater runoff or soil erosion from new developments and to provide a habitat for wildlife.

4.28.4 Protect salmonid streams and natural drainage ways from adverse impacts of land development in order to maintain the stream flow regime necessary for continued life cycle activities, avoid unnatural bank or bed erosion and increased turbidity.

4.28.5 The City considers, and deems worthy of protection, the following sensitive resources: wetlands, streams and creeks, lakes and ponds, aquifer recharge areas, steep slopes, significant trees, fish and wildlife habitat and corridors, archaeological and historical sites and artifacts, geologically hazardous areas, and frequently flooded areas. In writing policies and regulations, the City shall consider the cumulative effects of land use and development.

GOAL 4.29 WHERE POSSIBLE, USE ELEMENTS OF THE NATURAL DRAINAGE SYSTEM TO MINIMIZE STORMWATER RUNOFF IMPACTS.

Policies

4.29.1 Encourage new developments to use natural drainage patterns and incorporate means to contain stormwater pollutants.

4.29.2 Encourage new developments to implement "low impact development" techniques which can better manage stormwater while providing cost savings in terms of land and improvements.

GOAL 4.30 ENCOURAGE ENERGY-SAVING METHODS IN TRANSPORTATION, LAND USE, AND BUILDING CONSTRUCTION.

Policies

4.30.1 Encourage the development of paths and easements for non-motorized transportation to facilitate pedestrian and bicycle use throughout the City.

4.30.2 Encourage car pooling and use of public transit as an alternative to single-person use of automobiles.

4.30.3 Encourage new developments to compliment and improve development of a grid system to reduce public and private utility and transportation costs.

4.30.5 Encourage small scale, neighborhood compatible, commercial uses to be distributed throughout the community, thus reducing the need to drive to the nearest "big-box" retailer to pick up day to day convenience items. It also provides the opportunity for pedestrian access to stores along with the health and social benefits related to pedestrian activity.

GOAL 4.31 PROTECT SPECIAL HISTORIC, ARCHITECTURAL, AESTHETIC OR CULTURAL RESOURCES THROUGH THE DESIGNATION OF HISTORIC LANDMARKS AND DISTRICTS AND THE ADOPTION OF APPROPRIATE INCENTIVES.

GOAL 4.32 PROMORE THE IDENTIFICATION, MAINTENANCE, AND PRESERVATION OF GEOGRAPHICAL AREAS OR STRUCTURES WHICH HAVE SPECIAL SIGNIFICANCE BECAUSE OF HISTORICAL, ARCHAEOLOGICAL, ARCHITECTURAL, RECREATIONAL, SOCIAL, CULTURAL AND/OR SCENIC IMPORTANCE.

Policies

4.32.2 Encourage the development of written narratives and maps for self-guided tours of significant areas and the provision for site markers to identify significant sites.

4.32.3 Encourage additions and alterations to significant architectural buildings to conform to the style and period of the initial construction as much as possible.

***Discussion*:** As discussed in Section 3.1 (Natural Environment) of the Draft EIS, the subarea contains wetlands and streams and several heavily vegetated areas. These resources would be protected by the City's critical area regulations. Planning the subarea as a whole would enable areawide mitigation strategies where appropriate.

Regarding drainage, the City would apply its adopted stormwater regulations to manage stormwater and improve water quality. New development regulations specific to the subarea would consider providing incentives for use of low impact development techniques.

The subarea would contain a network of sidewalks, paths and bikeways to encourage non-motorized travel. Mixing commercial and residential land uses in a pedestrian oriented pattern, as proposed throughout the subarea, would also facilitate walking and reduce transportation-related energy consumption. New roads and an improved street grid would be part of the subarea plan. A potential site for a transit center is planned, which could encourage greater use of public transit.

As described in Section 3.7 (Cultural Resources) of the Draft EIS, the subarea contains an identified historic building and an archaeological site. These would be protected based on local and state requirements. The location of individual sites containing archaeological resources is protected by state law.

Housing

Summary:

GOAL 3.1 SUPPORT THE NEED FOR A VARIETY OF HOUSING TYPES AND DENSITIES, AND THE NEED FOR AFFORDABLE HOUSING THROUGH REGULATIONS AND CAPITAL INVESTMENTS.

Policies

3.1.6 Permit innovative housing options as infill with specific design considerations to ensure it is compatible with the expected future development of the neighborhood.

3.1.8 Allow flexibility in setback, lot coverage and unit size standards in return for exemplary design and neighborhood amenities.

GOAL 3.2 ENCOURAGE THE NEW DEVELOPMENT OF MULTI-FAMILY HOUSING AND SMALL SINGLE FAMILY UNITS IN A MANNER THAT IS COMPATIBLE WITH EXISTING NEIGHBORHOODS.

GOAL 3.3 INCREASE THE OPPORTUNITY FOR ALL RESIDENTS TO PURCHASE OR RENT AFFORDABLE, SAFE, AND SANITARY HOUSING.

GOAL 3.4 TO ADDRESS THE NEEDS OF THE ELDERLY, A PORTION OF THE RESIDENTIAL LAND SHOULD BE ZONED FOR HIGH DENSITIES TO ENCOURAGE THE PROVISION OF COMPACT HOUSING TYPES (CLUSTER, TOWNHOUSE, APARTMENT, OR CONDOMINIUMS) AND PLANNED RESIDENTIAL DEVELOPMENTS (PRDS).

Policies

3.4.1 Support the development of housing for the elderly, handicapped, or other special-needs populations through the allowance of PRDs, mixed-use housing, group housing, and other measures in appropriate areas.

3.4.2 In siting development for the elderly, review the proximity to shopping, hospitals, public transportation routes, retail and service centers, and parks.

GOAL 3.5 STRIVE TO PROVIDE A DEVELOPMENT PATTERN WHICH PROMOTES PEDESTRIAN ACTIVITIES, A SENSE OF COMMUNITY AND SAFETY. STRIVE TO PROVIDE HOUSING IN GOOD CONDITION, WITH HIGH QUALITY DESIGNS, PROTECTIONS FROM NOISE, ODORS, AND OTHER ENVIRONMENTAL STRESSES.

GOAL 3.6 STREAMLINE AND SHORTEN PERMIT PROCESSING WHERE AND WHENEVER POSSIBLE.

***Discussion*:** Many of the goals and policies, in the Housing Element, encourage the development of varied housing types (e.g., single-family, multifamily, congregate housing) to support the needs of a diverse population. Residential development within the subarea would include medium-density and high-density housing options including apartments, condominiums, townhouses, cottage housing, small-lot detached single-family housing, and conventional standard detached single-family housing. Design guidelines and standards would promote compatibility of higher density/intensity development with existing low-density residential neighborhoods.

Zoning regulations could include incentives to encourage public amenities. Other goals emphasize the equitable distribution of affordable, well designed, and quality housing for all economic levels and age groups. As noted, the subarea would include varied housing opportunities for rent and sale. Higher density housing could include affordable housing for the elderly and other special needs populations along with different financial segments. The housing element also promotes developing residential neighborhoods that provide pedestrian activities, a sense of community and safety. The planned mix of uses would enhance access to services for the subarea's population. Zoning regulations and design guidelines and standards would ensure that development projects are compatible with existing neighborhoods. The development pattern proposed for the subarea would locate, mix and concentrate activities so as to make walking and biking feasible and comfortable.

The Planned Action technique proposed for the subarea would expedite environmental review and shorten the permit process for qualifying projects.

In general, *Alternative 2* and *Alternative 3* would be more consistent with these goals than the *No Action Alternative*.

Economic Development

Summary:

GOAL 9.2: REVITALIZE, MAXIMIZE, AND ENERGIZE THE DOWNTOWN, SOUTH LAKE AND FRONTIER VILLAGE AREAS AS THE KEY GROWTH CENTERS FOR RETAIL, OFFICE AND SERVICE CENTERS OF LAKE STEVENS.

GOAL 9.3: PROVIDE A PREDICTABLE DEVELOPMENT ATMOSPHERE, EMPHASIZE DIVERSITY OF GOODS AND SERVICES AVAILABLE, AND ENSURE EMPLOYMENT OPPORTUNITIES ARE BALANCED WITH A RANGE OF HOUSING OPPORTUNITIES.

<u>Policies</u>

9.3.1 Provide opportunities to achieve a jobs/housing balance that encourages and advances smart growth goals including financial stability, environmental integrity, and a healthy community.

9.3.2 Develop strategies and techniques to adjust the balance at an appropriate rate that the regional market can absorb.

GOAL 9.5: IMPROVE THE CITY'S ECONOMIC CONDITION FOR A HEALTHY, VIBRANT AND SUSTAINABLE COMMUNITY.

Policies

9.5.1 Develop a comprehensive economic development strategy guiding land use planning resources that will:
A. Diversify sustainable revenue sources that weather swings in economic cycles.
B. Promote job creation for its residents.
C. Provides a strategy based on an up-to-date market analysis and forecasting.
D. Identifies potential employment sectors that will flourish in the Lake Stevens environment given its location to Everett, US2, and the I-5 corridor.

9.5.2 Coordinate with other appropriate regional agencies to help advance economic development goals and policies.

9.5.3 Develop economic development recruitment strategies that take advantage of Lake Steven's community attributes and assets.

9.5.4 Coordinate and balance the economic development strategies and techniques in growth centers that complement the existing growth centers for maximum economic benefit.

***Discussion*:** The Economic Development Element stresses the need for the City to diversify its economy by promoting a balanced employment sector that increases office and retail employment with a secondary emphasis on entertainment-oriented commercial uses and industrial uses. The 20th Street SE Corridor Subarea Plan proposes to create a vibrant mixed-use district that will contain a substantial number of new jobs as well as higher density housing opportunities. The plan would leverage the availability of large development sites, identified market opportunities, and a streamlined approach to permitting to attract office, retail, services and complimentary residential development. Jobs could increase from 360 under the *No Action* Alternative (low range estimate) to as many of 4,500 (high range estimate) under *Alternative 2.* This potential increase represents 156 percent of the citywide 2025 employment increase. Economic benefits could include increased wages, greater wealth and higher levels of local spending and economic activity. Fiscal benefits accruing to the City could include increased revenues and fees, which could improve the City's fiscal stability.

In short, this element's objective is to improve the City's economic condition and provide a healthy, vibrant and sustainable community.

Transportation

The following discussion is focused on relevant goals and policies that would be affected or modified by the subarea plan and associated growth. These goals and policies generally relate to the operational efficiency of the roadway network, level of service, and non-motorized circulation.

Summary:

GOAL 6.1 PROVIDE A ROADWAY NETWORK WHICH MEETS ADOPTED LEVEL OF SERVICE STANDARDS.

Policies

6.1.1 For traffic levels of service, the City adopts LOS C for residential areas and LOS D in the central business district at peak hour for all arterial roadways.

6.1.3 Provide a safe, convenient and efficient transportation system.

6.1.7 Develop criteria for the signing of streets, with the goal of providing a smooth, efficient transportation system.

Discussion: The Draft EIS notes that it may not be financially feasible to maintain the existing Level of Service C in the 20th Street SE Corridor, and recommends that the City adopt LOS E as a measure that will balance land use with the transportation system. The subarea plan is intended to create a land use pattern and circulation system that will make walking and biking more practical and comfortable. Proposed design guidelines and standards would establish criteria for signage within the 20th Street SE Corridor.

Summary:

GOAL 6.2 STRIVE FOR CONTINUOUS AND LONG TERM EXPANSIONS TO THE TRAIL AND PEDESTRIAN SYSTEM.

Policies

6.2.1 Private property owners shall be required to install new right-of-way improvements, including curbs, gutters, sidewalks, and planting strips, for all new development projects.

6.2.3 The City will continue to incorporate regular and routine consideration of bicycles in accordance with the Washington Department of Transportation, and the American Association of State Highway and Transportation Officials (AASHTO) standards in all transportation improvements.

Discussion: Proposed zoning regulations and design guidelines and standards would supplement existing requirements for right-of-way improvements by property owners. A trail system is proposed within portions of the powerline corridor that would create connections to other portions of the City. The plan also proposes trail connections

within or through existing or new neighborhoods as feasible. The subarea plan includes improvements and would help to create an environment that is more conducive to biking and walking.

Summary:

GOAL 6.3 BY 2012, REDUCE THE ACCIDENT RATE AT REPRESENTATIVE LOCATIONS ON THE ROADWAY SYSTEM WITHIN THE CITY BY AT LEAST 5%.

Policies

6.3.1 The City shall identify specific high accident intersections on both the collector and arterial system and develop and implement appropriate plans to effectively lower the accident rate.

6.3.2 The City will develop and maintain traffic control devices in accordance with adopted guidelines.

6.3.3 Standards should be developed which enhance the safety of pedestrians and motorists in regard to sidewalk design and maintenance, lighting requirements, signs, and access to properties.

Discussion: No high accident locations have been identified within the 20th Street SE Corridor.

Summary:

GOAL 6.4 ENSURE THAT THE TRANSPORTATION SYSTEM IS ADEQUATE TO SERVE ALL EXISTING AND FUTURE LAND USES. IN ADDITION, THE CITY WILL DEVELOP A CONCURRENCY MANAGEMENT SYSTEM, EXPLORE ALTERNATIVES FOR DEMAND MANAGEMENT, AND SECURE ADEQUATE FINANCING FOR TRANSPORTATION.

Policies

6.4.1 New roads shall be routed so as to avoid traversing publicly-owned natural preserves, parks and recreation areas, and areas identified as critical wildlife habitat, except in cases of overriding public interest.

6.4.2 The City will coordinate with the Washington Department of Transportation in the selection of the criteria used to establish future right-of-way cross sections of the state highway system.

6.4.3 Traffic impacts shall be determined through project-specific impact assessment reports, which shall be required of every project for which the concurrency test must be applied.

Discussion: The specific routing of proposed new roads has not been identified at this time but would strive to avoid impacting identified critical areas. Conceptually, the new

24th Street SE could affect a number of wetlands, and would require mitigation planning and would require mitigation planning to minimize potential impacts. The City will continue to coordinate closely with WSDOT regarding improvements to SR-9. Future development proposals will prepare project-specific traffic assessments to determine whether they meet concurrency requirements and are consistent with the analysis in the EIS.

Summary:

GOAL 6.5 PROVIDE AN AFFORDABLE LEVEL OF SERVICE FOR THE ROADWAY NETWORK.

Policies

6.5.1 The City will maintain a list of annually updated road improvement priorities.

6.5.2 Upon the annual date of adoption, the City's concurrency management system may be revised as part of the annual review and amendment of the Comprehensive Plan.

6.5.3 The City will coordinate with the PSRC Regional Transportation Planning Organization to ensure consistency and compatibility between transportation plans.

6.5.4 In order to preserve the character of neighborhoods, City Council may adopt reduced road standards for built neighborhoods where necessary for the provision of safer pedestrian access.

***Discussion*:** Transportation improvements associated with the subarea plan will be adopted in the City's Transportation Improvement Program. As discussed in the Transportation section of the Draft EIS (Section 3.8), a modification to the existing level of service may be considered for the 20th Street SE Corridor.

Summary:

GOAL 6.6 ESTABLISH MECHANISMS TO REDUCE THE DEMAND FOR TRANSPORTATION FACILITIES SUCH AS CAR/VAN POOL, AND STAGGERED WORK HOURS.

Policies

6.6.2 Land use and density of development will be coordinated with transportation centers within the City to support and encourage the use of transit. Clustering and other development techniques will be encouraged near transit access area.

6.6.3 Work with Community Transit to identify the best routes, stops and scheduling to best serve the community, encourage use and maximize the efficiency of public transportation.

6.6.4 Encourage developers to consider public transportation in transportation plans submitted as part of preliminary plat consideration.

6.6.5 Coordinate public transportation corridors with Community Transit and neighboring communities.

6.6.6 Encourage and plan for "pedestrian-scale" neighborhoods and centers to enhance access and mobility for public transportation users.

6.6.7 Continue to coordinate with all agencies and neighboring jurisdictions involved with public transportation, whether they be bus, HOV lanes, light rail, heavy rail, ride sharing, van pooling, or other forms, to identify what is of best use to the citizens of the City and participate in those ventures and proposals which are of general, and/or specific, benefit to the citizens of the City.

Discussion: The subarea plan encourages compact, higher density, mixed-use development within a designated center. This land use pattern could encourage greater use of public transit. Non-motorized improvements would also make walking and biking more convenient and pleasant. There is potential to locate a transit center in the subarea.

Summary:

GOAL 6.7 ALLOW FOR ALTERNATIVE DESIGN STANDARDS, AND/OR MATERIALS FOR STREET AND PARKING AREAS.

<u>Policies</u>

6.7.1 Explore the feasibility of reducing right-of-way widths by using new materials (e.g., grasscrete) for emergency vehicle turn-around.

6.7.2 Encourage increased levels of pervious surfaces in parking lots by using new designs and/or materials (e.g., grasscrete).

6.7.3 Study the feasibility of adopting increased design standards for certain arterial "entryways" into the community.

6.7.4 Encourage low impact development projects and low impact development techniques on non-LID projects to conserve and use existing natural site features; integrate distributed, small-scale stormwater controls; and prevent measurable harm to streams, lakes, wetlands, and other natural aquatic systems from commercial, residential, or industrial development sites by maintaining a more hydrologically functional landscape.

Discussion: The draft subarea plan includes policies which encourage integration of development with natural systems and the use of LID techniques to manage stormwater. The subarea plan would also establish and guide the design of gateways to the subarea.

Summary:

GOAL 6.8 TRANSPORTATION IMPROVEMENTS SHALL BE PRIORITIZED AND FINANCED CONSISTENT WITH THE CAPITAL FACILITIES ELEMENT, AND ALL POSSIBLE AVENUES OF PAYING FOR THE IMPROVEMENTS SHOULD BE EVALUATED FOR AVAILABILITY AND FAIRNESS.

Policies

6.8.1 The City may investigate and consider creating a street utility district to share the cost of capital street improvements over all users.

6.8.2 Continue to require developers to pay for improvements related to the impacts of their developments.

6.8.3 Keep transportation improvement cost estimates current to collect appropriate shares from developers and users as established.

6.8.4 The City will investigate alternative methods of obtaining financing for transportation improvements, including: local option taxes, bonding, Local Improvement Districts, combining efforts with other agencies, investigate all possible grant and loan opportunities such as the Public Works Trust Fund, Intermodal Surface Transportation Efficiency Act funding, and interlocal agreements for mitigation costs with Snohomish County.

6.8.5 If funding is unavailable, or if development is progressing beyond the ability to provide sufficient transportation facilities, development moratoriums may be necessary until the transportation facilities can be brought into alignment with approved LOS.

6.8.6 The City will develop an annual Six Year Transportation Improvement Program (TIP) to correlate with improvements identified in the Transportation Element and the Capital Facilities Element (consistent with GMA, only funded TIP projects will be included in the Capital Facilities Element).

Discussion: The Draft EIS recommends that the City consider several approaches – including a traffic impact fee and potentially a transportation benefit district – to help fund needed transportation improvements. The City will implement adopted programs, including the transportation improvement program and concurrency requirements, to ensure that provision of facilities is coordinated with subarea growth. An update to the Comprehensive Plan Transportation Element and TIP will be considered in conjunction with adoption of a subarea plan for the 20th Street SE Corridor.

Summary:

GOAL 6.11 COMMIT TO MEETING FEDERAL AND STATE AIR QUALITY REQUIREMENTS AND WORK WITH STATE, REGIONAL, AND LOCAL AGENCIES

AND JURISDICTIONS TO DEVELOP TRANSPORTATION CONTROL MEASURES AND/OR SIMILAR MOBILE SOURCE EMISSION REDUCTION PROGRAMS THAT MAY BE WARRANTED TO ATTAIN OR MAINTAIN AIR QUALITY REQUIREMENTS.

Policies

6.11.1 Encourage residents and businesses to maintain or improve air quality by completing emissions testing, using alternative transportation, discouraging burning of yard wastes and slash, and discouraging the use of uncertified wood stoves and fireplaces.

6.11.2 Take a lead role in encouraging other modes of transportation by using more efficient vehicles and alternative-fueled vehicles in the City fleet and by encouraging employees use alternative transportation to work.

6.11.3 Encourage alternatives to automobile transportation by promoting improvements to the public transit system, increasing availability of bicycling and walking facilities, and limiting the amount of parking that may be included in some new developments.

6.11.4 Consider alternative transportation options when considering land use decisions and designations to support increased use of walking, biking, carpooling, and bus riding.

6.11.5 Encourage conservation of trees and vegetation through development regulations and incentive mechanisms.

6.11.6 Advocate with Community Transit in designing a public transportation system compatible with the City's centers growth strategy.

***Discussion*:** The air quality analysis contained in the Draft EIS (Section 3.2) indicates that growth as proposed under any of the subarea plan alternatives would satisfy federal and state air quality requirements. The compact, higher density, mixed-use land use pattern of *Alternative 2* and *Alternative 3*, and focusing growth in a designated center, could also encourage increase of public transit, walking and biking. As noted in Section 3.2, air quality conformity analysis will be performed for improvement of the SR-9 and 24th Street SE intersection after a preferred subarea alternative has been identified by the City.

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3.5 POPULATION, HOUSING & EMPLOYMENT

3.5.1 Affected Environment

Population

Population & Household Growth

In 2000, the population of Lake Stevens was 6,631. As of 2010, the WA State Office of Financial Management (OFM) estimates the population to be 26,670[1] with 10,206 housing units. The City's recent growth has been largely due to annexations; OFM estimates that between 2000 and 2010 the City annexed 18,223 people.

There are an estimated 856 residential units (households) in the 20th Street SE Corridor Subarea. Based on an average household size of 2.87 Persons per Household, the current population for the study area is nearly 2,456 (The household size estimate is the average number of people per unit in single-family units, duplexes, and manufactured homes). The study area population represents 9.21 percent of the City's total current population.

Table 3.5-1 shows the population growth for Lake Stevens and Snohomish County between 2000 and 2010. By 2025, the Comprehensive Plan projects that the City's population will be more than 46,000. The adopted 2025 population target, used for planning purposes, is 46,125, an increase of just under 17,000 people. The City will update its targets as part of its next scheduled Comprehensive Plan Update.

Table 3.5-1. Population Growth Trends

Area	2000 Population	2010 Population	Percent Change
Snohomish County	606,024	711,110	17.34%
Lake Stevens	6,361	26,670	319.27%

Source: WA State Office of Financial Management 2010 Population Trends / OFM 2010 Population Worksheet.

A recent study prepared for the City predicts that the population growth rate in Lake Stevens will be 1.63 percent between 2009-2014, which is slightly faster than Snohomish County (1.54 percent) and significantly faster than the Puget Sound region overall (1.18 percent) (Leland Consulting Group and LMN Architects, 2011a). Based on this growth rate, with current zoning, the study area could have a population of 2,656 by 2014. Extending this same growth rate to 2025 would equate to a study area population of approximately 3,132 people.

[1] The reconciled OFM and Census Bureau data for Lake Stevens is 28,069 and the reconciled population estimate for Snohomish County is 713,335. Source: OFM Fact Sheets. OFM/Forecasting Division February 24, 2011.

Between 2000 and 2010, households in Lake Stevens increased by over 356 percent, from both development and annexation, compared with a 20 percent increase in Snohomish County as a whole, as summarized in Table 3.5-2. The estimate of 856 households and 2,456 population for the study area combines all residential unit types (e.g., single-family residences, duplexes and manufactured homes).

Table 3.5-2. Household Growth Trends

Area	2000 Households	2010 Households	Percent Change
Snohomish County	236,205	283,495	20.02%
Lake Stevens	2,234	10,206	356.85%

Source: WA State Office of Financial Management 2010 Population Trends / U.S. Census Bureau, 2005-2009 American Community Survey[2]

Race and Ethnicity

The City of Lake Stevens is less diverse ethnically than Snohomish County and Washington State, as shown in Table 3.5-3. Minorities make up about 19 percent of the population in Lake Stevens, compared to nearly 25 percent in Snohomish County. The largest minority group is Hispanic/Latino (of any race), followed by mixed race, and Asian populations. Based on the 2010 Census, 4.8 percent of the City's population was born outside of the United States. The study area likely shares similar ethnic characteristics with the greater City.

Age and Gender

The majority of the City's population is over the age of 18. About 32 percent of the population is under the age of 18, which is slightly higher than in Snohomish County and Washington State; see Table 3.5-4. The percentage of the population over the age of 65 is below the County and State averages. According to the U.S. Census Bureau, the median age in Lake Stevens is 32.9 (2005-2009 American Community Survey). In comparison, the median age in Snohomish County is 36.4. The study area likely reflects similar age characteristics. The Lake Stevens population of men and women is roughly equal – 49.2 percent are male and 50.8 percent are female.

[2] The 2005-2009 American Community Survey does not include annexations completed from 2005-2010.

Table 3.5-3. Racial Characteristics (by Percent)

Race	Lake Stevens	Snohomish County	Washington	United States
White	87.4	82.1	80.04	74.5
Black or African American	1.7	2.1	3.4	12.4
American Indian, Alaska Native	1.2	1.2	1.4	0.08
Asian	3.1	7.9	6.6	4.4
Native Hawaiian, Pacific Islander	0.1	0.3	0.4	0.1
Hispanic, Latino of any race	6.2	7	9.6	15.1
Some other race	1.8	2.6	3.9	5.6
Two or more races	4.8	3.9	3.8	2.2

Source: U.S. Census Bureau, 2005-2009 American Community Survey

Table 3.5-4. Age Profiles

Age Categories	Lake Stevens	Snohomish County	Washington	United States
Under 5 years	8.7	6.9	6.7	6.9
5 to 17 years	23.1	18.3	17.3	12.4
18 and over	68.2	74.8	76.1	75.4
65 and over	5.3	9.6	11.8	12.6

Source: U.S. Census Bureau, 2005-2009 American Community Survey

Household Characteristics

As noted above, there are 10,206 households in Lake Stevens and 856 estimated households in the study area. A majority of households (73 percent) in the City are family households, while non-family households make up the remaining 27 percent. Non-family households include singles and singles with roommates. The family household make-up of Lake Stevens is greater than that of Snohomish County, which equals 68 percent. The non-family household is 32 percent in Snohomish County. Because of the high percentage of single-family residences in the study area, the family household numbers likely mirror the City average.

Income and Poverty

Generally, families in Lake Stevens and Snohomish County have higher incomes and a lower poverty rate compared to the national average. The 2009 median family income for Lake Stevens is $75,574 compared to $75,955 in Snohomish County, while the Washington median household income was $68,457.

The family poverty rate in the City is 5.4 percent, 5.6 percent in Snohomish County, and 7.9 percent statewide. Statistically, the poverty ratio increases for individuals in non-family households. Table 3.5-5 compares the income ranges for households and families in the City of Lake Stevens and summarizes the median and mean incomes for these groups.

Table 3.5-5. Median Household Incomes

Subject	Households[3]	Families	Nonfamily households
Less than $10,000	4.60%	3.80%	10.60%
$10,000 to $14,999	2.40%	0.80%	6.90%
$15,000 to $24,999	4.00%	3.20%	8.80%
$25,000 to $34,999	5.90%	5.50%	9.10%
$35,000 to $49,999	13.80%	13.70%	12.70%
$50,000 to $74,999	22.70%	22.60%	18.30%
$75,000 to $99,999	21.70%	22.10%	21.20%
$100,000 to $149,999	16.50%	17.30%	11.80%
$150,000 to $199,999	5.30%	7.00%	0.70%
$200,000 or more	3.10%	4.10%	0.00%
Median income (dollars)	$71,893	$75,574	$51,757
Mean income (dollars)	$85,591	$94,664	$54,320

Source: U.S. Census Bureau, 2005-2009 American Community Survey

The study area includes a large percentage of older homes and a 21-acre manufactured home park, described in the housing stock section. These types of units are generally more affordable to a broader population, which may affect the income and poverty profile for the study area proportionately.

Housing

Characteristics of the Housing Stock

Between 2000 and 2010, Lake Stevens experienced a dramatic increase in housing units as a result of development and large annexations. Housing growth included a measurable increase in single-family residences, multifamily units, and manufactured homes, as summarized in Table 3.5-6.

[3] The 2005-2009 American Community Survey household projection does not include annexations completed in 2010. As the income information for Snohomish County and the City of Lake Stevens are similar, the city does not anticipate significant differences in income and poverty levels for annexed households.

Table 3.5-6. Change in Housing Units by Structure Type, 2005 – 2010

Structure Type	2000	2010	Actual	Percent Change
One Unit	1,778	8,026	6248	351.41%
Two or More Units	456	1,755	1299	284.87%
Mobile Home, Trailer, Special Housing	0	425	425	
Total	**2,234**	**10,206**	**7,972**	**356.85%**

Source: State of Washington Office of Financial Management, 2010 Population Trends

Table 3.5-7 shows the City's housing stock contains a greater proportion of new units than Snohomish County as a whole. U.S. Census Bureau data and Snohomish County Assessors data for the study area show that a majority (53.61 percent) of residential construction took place after 1990. Nearly 30 percent of the existing housing stock is over 30 years old.

Table 3.5-7. Age of Housing

Year Built	Snohomish County	Lake Stevens	Study Area[4]
2000 or later	16.0%	21.2%	6.17%
1990 to 1999	22.7%	33.3%	47.44%
1980 to 1989	18.4%	15.3%	17.62%
1960-1979	27.8%	22.5%	16.11%
1959 or Before	15.2%	7.7%	12.65%

Source: U.S. Census Bureau, 2005-2009 American Community Survey / Snohomish County Assessors Data 2011

Table 3.5-8 highlights the percentage of units by structure type found in the City, County, and study area. Housing in the City of Lake Stevens is currently characterized by single-family homes and limited multifamily developments of four or more units. The City's single-family proportion is greater than Snohomish County's, while the multifamily component is less. In comparison, the proportion of single-family units in the study area is less in area, at 46.11 percent, than in the rest of the City. Additionally, as noted previously, the study area contains one large manufactured home park with approximately 100 manufactured homes. The study area includes an additional 31 manufactured homes outside of this park. In total, manufactured homes comprise just over one percent of the study area, which is close to City average of 1.2 percent.

[4] The percentages shown were the result of a survey of platted developments, where the construction of units generally occurs around the same time, along with mobile home parks and a sample of stand-alone lots. In total 664 structures on lots were sampled out of 856 lots. The greater lot number includes vacant platted lots and duplexes.

Table 3.5-8. Percentage of Units by Structure Type

Structure Type	Snohomish County	Lake Stevens	Study Area[5]
1 unit, detached	63.9%	79.7%	46.11%
1 unit, attached	4.1%	3.9%	
2 units	2.6%	7.8%	
3 or 4 units	3.5%	1.9%	0.0%
5 to 9 units	4.8%	2.2%	
10 or more units	14.6%	3.3%	
Mobile homes/other	6.5%	1.2%	1.1%

Source: U.S. Census Bureau, 2005-2009 American Community Survey / 2011 Snohomish County Assessors Data

The Lake Stevens Housing Market

Vacancy Rates and Ownership

As shown in Table 3.5-9, from 2005-2009, the vacancy rate in Lake Stevens was 5.7 percent; the State vacancy rate was 8.5 percent. A vacancy rate of five percent generally represents a balanced market, where the supply of new units or existing units meets the demand of those seeking vacant units. Vacancy rates between one and three percent indicate a "tight" housing market where demand for units is high. Lower vacancy rates are typically associated with higher housing costs based on the greater demand. High vacancy rates indicate an oversupply of available housing units and a market in which property owners are having difficulty renting units or selling properties.

Table 3.5-9. Vacancy and Occupancy Rates, 2005-2009

	Total Vacancy Rate	Owner-occupied housing units	Renter-occupied housing units
Washington State	8.5%	65.3%	34.7%
Snohomish County	5.1%	68.1 %	31.9%
Lake Stevens	5.7%	70.2 %	29.8%

Source: U.S. Census Bureau, 2005-2009 American Community Survey

The current Lake Stevens homeownership rate is 72.5 percent, compared to less than 60 percent for the Puget Sound region and Washington State. This means Lake Stevens' residents are more likely to own their own homes than are residents of comparable areas (Leland Consulting Group and LMN Architects, 2011a). From 2005 to 2009, the City occupancy rate for owner-occupied housing units was 70.2 percent and 29.8

[5] The categories summarized in the study area column approximate the single-family, multifamily, and manufactured home uses as used by the City.

percent for renter-occupied housing units, which is similar to the rates for the County and State.

Housing Costs

Table 3.5-10 shows the estimated monthly housing costs for mortgaged and rental units found in Lake Stevens and Snohomish County. Between 2005 and 2009, the median monthly housing cost in Lake Stevens was $1,879 for owner-occupied units with a mortgage and $1,941 in Snohomish County. As expected, the monthly housing cost locally is greater than in the state (Washington median monthly housing cost $1,704). The monthly housing cost for rental units was $627 in Lake Stevens, $546 in Snohomish County, and $461 statewide. The U.S. Census bureau defines the monthly housing costs as the selected monthly costs calculated from the sum of mortgage payments, real estate taxes, insurance, utilities, fuel, mobile home costs, and condominium fees. Gross rent during this time, (i.e., contract rent amount plus the cost of utilities and fuels) was higher in Lake Stevens ($1,139) than in Snohomish County ($960) and statewide ($853).

Table 3.5-10. Housing Costs for Lake Stevens and Snohomish County 2005-2009

Monthly Housing Costs 2005-2009	Mortgaged Housing Units	Renter-occupied Housing Units
City of Lake Stevens	$1,879.00	$1,139.00
Snohomish County	$1,941.00	$960.00
Washington State	$1,704.00	$853.00

Source: U.S. Census Bureau, 2005-2009 American Community Survey

Federal standards deem rental housing as "affordable" if a household pays no more than 30 percent of their income for rent and utilities. Housing affordability is often an issue for households with 30 percent (extremely low-income), 50 percent (very low-income), and 80 percent (low-income) of median income. Looking back to Table 3.5-5, the City income data suggest for households of four that 16.9 percent of City households make 30 percent or less of the Average Median Income (AMI); 30.7 percent of City households make 50 percent or less of AMI; and 53.4 percent of City households make 80 percent or less of AMI. This analysis suggests that housing costs for nearly 53 percent of households of four or more are not affordable across all income levels. Snohomish County projects that the Lake Stevens UGA will need to accommodate 4,174 low to moderate-income households by 2025. Table 3.5-11 shows the 2010 federal income limits for households in these income categories. Table 3.5-12 compares fair market and affordable rents for Snohomish County in 2010.

Table 3.5-11. Snohomish County 2010 Federal Income Limits Summary

Household Size	30% Median	50% Median	80% Median
1	$18,000	$30,000	$45,100
2	$20,600	$34,250	$51,550
3	$23,150	$38,500	$58,000
4	$25,700	$42,800	$64,400
5	$27,800	$46,250	$69,600
6	$29,850	$49,650	$74,750
7	$31,900	$53,100	$79,900
8	$33,950	$56,500	$85,050

Source: U.S. Department of Housing and Urban Development, 5/2010

Table 3.5-12. 2010 Fair Market and Affordable Rents for Snohomish County

Rate	Studio	One Bedroom	Two Bedroom	Three Bedroom	Four Bedroom
Fair Market	$770	$878	$1,056	$1,492	$1,823
30% Median	$231	$263.4	$316.8	$447.6	$546.9
50% Median	$385	$439	$528	$746	$911.5
80% Median	$616	$702.4	$844.8	$1193.6	$1458.4

Source: U.S. Department of Housing and Urban Development, 5/2010

As shown in Table 3.5-13, according to U.S. Census data, nearly 33 percent of renters in Lake Stevens and 47 percent in Snohomish County pay 30 percent or more of their income on rent and utilities. Monthly housing costs were greater in Lake Stevens (47.6 percent of household income) than in Snohomish County (44.6 percent of household income).

Table 3.5-13. Housing Costs as a Percentage of Household Income

	Snohomish County		Lake Stevens	
	Gross Rent	*Housing Costs*	*Gross Rent*	*Housing Costs*
29.9% or less	52.7%	55.5%	67.3%	52.4%
30% or more	47.3%	44.6%	32.7%	47.6%

Source: U.S. Census Bureau, 2005-2009 American Community Survey

Home Ownership

Between 2005 and 2009, as shown in Table 3.5-14, the average median home price was $330,400 in Snohomish County and $316,500 in the City of Lake Stevens (US Census Bureau, 2011). The current median price in Snohomish County is $275,000 (WCRER December 2010). Despite the relatively high cost of housing in the City, Lake Stevens is still one of the more affordable housing markets in Snohomish County (Leland Consulting Group and LMN Architects, 2011a). Based on a summary of Northwest Multiple Listing Service data compiled between June 2009 to June 2010 for NE Snohomish County, which includes Lake Stevens, housing prices have decreased by 1.7%, compared to an average decrease of 10.56 percent in the rest of Snohomish County (Leland Consulting Group and LMN Architects, 2011a).

Table 3.5-14. Housing Costs in Snohomish County and Lake Stevens

	Snohomish County	Lake Stevens
Median Home Price	$330,400	$316,500
Cost below 199,999	14.40%	12.00%
200,000 to 499,999	78.40%	69.30%
Over 500,000	9.60%	16.20%

Source: U.S. Census Bureau, 2005-2009 American Community Survey

Employment & Economics

Employment

The Puget Sound Regional Council (PSRC) estimates that there were 3,248 total jobs in the City of Lake Stevens in 2009, as shown in Table 3.5-15. Overall, employment grew during the 2005 – 2009 period by approximately 39.86 percent annually. There were notable increases in several categories, with the exception of education and manufacturing jobs that decreased during this period. The most significant increases were in the retail, FIRE[6] (finance, insurance and real estate), and services sectors. As discussed above, a portion of this growth resulted from recent annexations.

In the past, PSRC projected growth based on Forecast Analysis Zones (FAZ). These geographic areas correspond to census blocks near the closest city and therefore do not quite align to corporate boundaries and often represent trends seen in a larger area. However, the PSRC forecasts do correlate to current zoning and vacancy rates in the underlying area.

Table 3.5-15. City of Lake Stevens Employment by Job Category[7]

Job Sector[6]	2005	2009[7]	Annual Growth
Construction/Resources	132	308	33.33
FIRE	20	130	137.50
Manufacturing	78	71	<-2.24>
Retail	35	697	472.86
Services	247	1,220	98.48
WTU	54	63	4.17
Government	69	178	39.49
Education	617	581	<-1.46>
Total	**1,252**	**3,248**	**39.86**

Source: Puget Sound Regional Council, April 2010

The 2006 Forecasts of Population, Households and Employment included an analysis of FAZ 7805, the Machias/Cavalero Corner, which includes the study area, the properties east of the lake to the Machias area, and the area south to US-2. Though larger than the study area, this FAZ is generally representative of employment trends in the area. This forecast showed an overall annual growth rate of one percent, which is significantly less than the entire City's growth rate described above, for an overlapping period. The largest growth sectors in this area were manufacturing and FIRE. Table 3.5-16 provides a summary of employment trends in the Machias / Cavalero Corner FAZ for different job sectors and includes the annual growth rate for these sectors between 2000 and 2010.

Table 3.5-16. Machias / Cavalero Corner (FAZ 7805) Employment Estimate

Study Area Job Sector[8]	2000	2010	Annual Growth
Manufacturing	39	54	3.84%
WTCU	96	104	0.83%
Retail	329	351	0.67%
FIRES	441	591	3.40%
Government/Education	420	358	<-1.48%>
Total	**1,325**	**1,458**	**1.00%**

Source: Puget Sound Regional Council, October 2006.

[6] FIRE stands for Finance, Insurance and Real Estate; WTU stands for Wholesale Trade, Transportation, and Utilities, and Government includes public-sector employment, excluding education.

[7] The employment growth in 2009 reflects the addition of the Frontier Village and Southwest Annexation.

[8] The job sector categories as used in the 2006 Forecasts of Population, Households, and Employment vary slightly from the 2009 City Employment Estimates: FIRE means Services and WTCU means Wholesale Trade, Transportation Services, Communication, and Utilities.

The City's current employment target for 2025, used for planning purposes, is 6,615, which reflects an increase of approximately 3,367 jobs. The *2007 Buildable Lands Report for Snohomish County* identified an employment "deficit" of 264 employees for the Lake Stevens Urban Growth area by 2025 (Snohomish County 2007). In the context of buildable lands analysis, a deficit means there is insufficient land available to meet 2025 employment targets. Capacity is a function of land availability, development densities and estimates of reduction factors to account for infrastructure, parks, undevelopable land, and market factors. Updated land use data estimates the deficit at approximately 235 employees (Triad, 2010).

PSRC projections for the Lake Stevens Area estimate 6,785 jobs by 2020. This growth projection reflects an increase of 1,516 jobs or a 2.88 percent annual growth rate between 2010 and 2020. Comparatively, PSRC data indicates a growth rate of 3.14 percent annually for the Machias/Cavalero Corner (FAZ 7805), assuming the same zoning, and an additional 458 jobs between 2010 and 2020. The City will update these targets as part of its next scheduled Comprehensive Plan Update.

The U.S. Census Bureau evaluates employment differently, focusing on broad labor categories and different industry sectors, as detailed in Table 3.5-17. A recent economic survey for the City looked at employment in a similar manner and also included education and occupation type as variables. The report concludes that the majority of Lake Stevens' residents work in professional or "white collar" jobs (57.3 percent), with the remaining workforce works in "blue collar jobs" (26.4 percent) (Leland Consulting Group and LMN Architects, 2011a). Compared to Snohomish County, there are fewer "white collar" jobs and slightly more "blue collar" jobs. As shown in Table 3.5-17, the overall unemployment rate in 2009 was 10.60 percent, which is directly attributable to the national recession.

Table 3.5-17. Education and Employment for Lake Stevens and Snohomish County

Education and Employment		Lake Stevens	Snohomish County
Bachelors or Advanced Degree		20.90%	27.10%
Occupation	White Collar	57.30%	61.40%
	Blue Collar	26.40%	22.40%
Employment, 2009	Civilian Unemployed	89.40%	89.90%
	Civilian Employed	10.60%	10.10%

Sources: U.S. Census Bureau, 2005-2009 American Community Survey and Leland Consulting Group and LMN Architects, 2011a

Of note, despite relatively high wages regionally, Lake Stevens' residents earn fewer bachelors and advanced degrees compared to other cities and Snohomish County as a whole. This anomaly is likely attributable to the demand for regional labor in the aerospace industry. Because educational attainment continues to be one of the key indicators of income and economic growth, the economic report recommends that the

City look for ways to spur additional educational attainment (Leland Consulting Group and LMN Architects, 2011a).

The Economic Assessment report suggests that key job growth sectors regionally will be Professional Services, Education, and Health Services, driven by an aging population and growing need for health care services; Government; and with additional growth clusters in Aerospace and Clean Technology (Leland Consulting Group and LMN Architects, 2011a). They also predict employment losses for Manufacturing and Natural Resource sectors. Lake Stevens can play a role in the identified growth industries, for example, the city could target office park expansion or serve as a retail and recreation center for employees in those industries (Leland Consulting Group and LMN Architects, 2011a).

Business Climate and Market Opportunities

The City's Comprehensive Plan notes that Lake Stevens has a relatively low balance of jobs to housing, which means that people that live here generally have to commute to other areas for employment, with Everett being the primary employment destination. A significant number of employees travel further to Seattle, Bellevue, and other locations (Leland Consulting Group and LMN Architects, 2011a).

Lake Stevens' geographic location in the retail market is at a crossroads for markets with considerable pass-through traffic from residents of communities to the east and north that travel through Lake Stevens on the way west and south to other markets in the Puget Sound region. The City is, therefore, in the path of population and job growth, as the Puget Sound region intensifies to the north and east (Leland Consulting Group and LMN Architects, 2011a). Because of the proximity and convenience of Lake Stevens to the secondary market area, there is an opportunity to attract population and employment to the city (Leland Consulting Group and LMN Architects, 2011a).

One primary focus of the city's economic growth strategy is to attract more retail development (Leland Consulting Group and LMN Architects, 2011b). Benefits of expanded retail could have social and economic benefits including generating more tax revenue for the city and shopping convenience for local residents. For a retail area to be successful, it must be visible and accessible among other factors (Leland Consulting Group and LMN Architects, 2011b). The study suggests that the City can implement three strategies to attract additional retail development citywide and by reference in the study area: first capture retail "leakage" (leakage means residents are purchasing goods in another market that they could or should be purchasing locally); second, become a retail destination; and third, increase the City's tourism draw.

3.5.2 Impacts of the Alternatives

Population

Table 3.5-18 shows the total increase in population and housing for each alternative and changes relative to the *No Action Alternative*. Increases for the *No Action Alternative* are relative to existing conditions.

Table 3.5-18. Increase in Housing, Population and Employment for Alternatives

Alternative	Housing Units	Population Increase	Retail (Gross Sq. Ft)	Office (Gross Sq. Ft)	Jobs Increase
Existing	856	2,456			1,458 *
Alternative 1 – No Action	600-1,200	1,722-3,444	150,000-180,000	20,000-35,000	360-465
Alternative 2 – Office/Commercial Emphasis	900-1,000	2,600-2,900	400,000-450,000	1-1.25 million	3,800-4,500
Change from No Action	*+300/-200*	*+878/-544*	*150,000-180,000*	*980,000-1,215,000*	*3,400-4,035*
Alternative 3 – Moderate Office/Commercial and Residential Emphasis	1,200-1,400	3,500-4,000	300,000-350,000	600,000-750,000	3,500-4,000
Change from No Action	*400-480*	*920-1,370*	*150,000-170,000*	*580,000-715,000*	*2,040-2,535*

**Note that the existing jobs estimate reflects an area larger that the boundaries of the 20th Street SE Subarea.*

All alternatives would result in an increase in subarea population over the 20-year horizon of the plan. The projected population increase could vary based on economic and market conditions in addition to potential policy actions by the City. As described in the *Project Description*, the population range shown for the *No Action Alternative* reflects different growth rates and projections, but essentially represents a continuation of current growth. Based on current economic conditions, it is likely that residential growth will be relatively slow in the near term. Policy actions reflected in *Alternative 2* and *Alternative 3* emphasize employment growth in the subarea, population growth, and increased high-density and multifamily housing, with mixed-use development.

Under all alternatives, the increase in population and housing are assumed to fall within the City's 2025 population targets. The City does not allocate its overall population growth target among subareas, so there is not a specific target for the 20th Street SE Corridor other than those presented in the EIS alternatives. Currently the subarea contains approximately 9.2 percent of the City's total population. Assuming the

population increases shown in Table 3.5-18, the subarea population in 2025 could range from between 10 percent (*No Action Alternative*, low range) and approximately 24 percent (*Alternative 3*, high range) of the citywide increase in population by 2025 (17,000 total increase). The proportion of citywide population within the 20th Street SE Corridor in 2025 would increase from approximately 9.2 percent at present to 13 percent (*Alternative 1*, high range) or 14 percent (*Alternative 3*, high range) of total citywide projected population of 46,225 in 2025. As noted previously, the City will be updating its Comprehensive Plan in the next few years and will address updated population forecasts at that time.

Population growth in itself is not an adverse impact. Such growth can, however, generate a commensurate need for public services and capital facilities to accommodate additional population. These indirect impacts would provide additional tax revenues, but also require capital spending and construction of infrastructure. Construction, in turn can produce impacts to the physical environment (e.g., stormwater runoff, traffic, etc.), and these impacts are addressed in other sections of this Draft EIS.

The availability of additional higher density housing could influence the age distribution of residents. Relative to the age distribution and housing types found in the surrounding area and throughout Snohomish County, it is possible that younger adults and senior residents (65 and older) may increase in the area, but the age distribution within the 20th Street SE Corridor is likely to be within the age distribution of the surrounding area.

As the residential component of the subarea would include a variety of forms, including single-family, apartments, townhouses, and multifamily condominium units, it could support different socioeconomic segments of the population. The 20th Street SE Corridor will provide a variety of affordable units and tenures, which will encourage residents to remain in the community. The increase in housing options could diversify the area's population economically to some degree. As part of the subarea plan, the City could include inclusionary housing incentives to ensure equitable housing availability.

The extent of change in racial and ethnic diversity as a result of the subarea plan is unknown.

No significant adverse impacts to population characteristics are expected to result from the implementation of any alternative. No specific mitigation is required.

Housing

Changes in housing are shown in Table 3.5-18 above. In quantitative terms, housing changes would parallel the impacts identified above for Population. The *No Action Alternative* would result in the smallest housing increase and *Alternative 3* would result in the greatest amount of housing in the subarea. In general, housing meets a basic

human need and an increase in housing is not in itself an adverse impact. However, during construction and future redevelopment, it is possible that some older or less dense units may be demolished and replaced with higher density residences or other more intensive land uses (e.g., retail or employment) based on market factors and property owner decisions.

In qualitative terms, the alternatives would result in different forms of housing. Under the *No Action Alternative*, the subarea would continue to be characterized primarily by detached single-family housing at current densities, scattered throughout the subarea. Some multifamily housing could be developed as well. Single-family housing would be for sale at prevailing market rates; multifamily housing could also be for rent. Existing zoning regulations would continue, and housing would likely repeat the existing pattern in terms of unit size, design and cost.

In comparison, *Alternative 2* and *Alternative 3* would increase high-density residential housing (approximately 75 percent of the total), which would be focused in transitional areas between commercial and single-family neighborhoods and/or within specified mixed-use locations. The City would adopt new regulations alongside design guidelines and standards to direct the form, quality and design of higher density housing. This housing could be for rent as well as for sale, and is assumed to be market rate. Housing for elderly residents is also possible. Varied forms of smaller lot and common-wall single-family housing (e.g., townhouses, condominiums, cottage housing) is also likely.

Building housing at higher densities generally reduces construction costs, which can ultimately reduce monthly housing costs. In general, the proposed mix of multifamily and single-family housing at higher densities could provide more affordable housing options, which could attract an economically diverse population. Higher density housing would also use land more efficiently and would consume less of the subarea's land base. This would, in effect, increase the long-term development capacity of the subarea.

Cumulative Impacts

Cumulatively, considering the 20th Street SE Corridor and the Lake Stevens Center together, the City would attract and accommodate an increased proportion of forecasted housing and population growth. Cumulative increases in population range from a low of 12 percent for the *No Action Alternative*, to a high of 34 percent for *Alternative 3*. There would be an increased concentration of higher density housing in identified areas; this concentration would be consistent with the Growth Management Act and with City policy.

Employment

Total and relative employment increases for the alternatives are shown in Table 3.5-18 above. Changes in jobs would range from a small increase under *Alternative 1* (360-465 jobs) to significant increases for both *Alternative 2* (3,800-4,500) and *Alternative 3* (2,400-3,000).

Alternative 1 would likely develop one or two retail areas and an office development. Total jobs associated with this alternative (360-465) would represent between 11 percent and 14 percent of the total citywide forecasted job increase by 2025. The subarea would remain predominantly residential in character and would not be a significant generator of jobs.

*Alternative 2 and Alternative 3***,** in contrast, reflect a new vision for the 20th Street SE Corridor, one that emphasizing a mixed-use district that includes employment (retail, service, and office) centers or use-specific nodes to accommodate a significant amount of citywide job growth. *Alternative 2* emphasizes employment-related land uses, while *Alternative 3* places somewhat greater emphasis on housing. The alternatives would provide the potential to accommodate between 71 percent (*Alternative 3*, low range) and 134 percent (*Alternative 2*, high range) of the City's 2025 job forecast. The timing of jobs being realized will depend on a variety of factors, including national and regional market conditions, and the perceived attractiveness of Lake Stevens in general and the 20th Street SE Corridor in particular, as an attractive location for businesses.

Subarea development, especially pursuant to the action alternatives, would support design and building jobs during construction. Infill development could also positively affect local and regional supporting industries such as materials manufacturing, delivery, and sales.

An increase in employment is not, per se, an adverse impact. Development to accommodate these jobs could indirectly result in numerous impacts to the environment addressed throughout this Draft EIS. Indirectly, there could also be an increase in competition for jobs, locally and regionally. To the extent that there is a finite number of jobs to be shared among all jurisdictions, jobs that locate in Lake Stevens would not locate in other jurisdictions in the region.

The Leland Consulting Group provided the City with an *Economic Development Strategy* report (2011). This report estimates that revenue generated for the 20th Street SE Corridor would be a balanced mix of future property tax and sales tax in addition to temporary increases related to construction costs. Tax revenues accruing to local government are projected to increase significantly under the action alternatives. There will also be revenue and profits derived from "hard construction costs" that would benefit the local and regional economy. Hard construction costs include goods and materials, such as lumber, cement, tools, and other building products (Leland

Consulting Group, 2011). *Alternative 2* most closely matches the development, economic, and revenue assumptions presented in the Leland Consulting Group report (2011).

In general, the action alternatives would create positive economic impacts that would likely include an increase in local hiring, expansion of businesses, new business formation, and greater tax revenues. No significant adverse employment and economic impacts are expected to result from the implementation of any of the alternatives.

Cumulative Impacts

Cumulative increases in employment, for the 20th Street SE Corridor and the Lake Stevens Center together, could exceed the current citywide jobs target by 2025 (3,367 total). The combined increases for both subareas together could range from a low of 16 percent of total 2025 jobs (*No Action Alternative* , low range estimate) to 156 percent of the total (*Alternative 2*, high estimate). In the planning framework of the Growth Management Act, there is no prohibition, limitation or adverse consequence associated with a city exceeding either its population or employment target. This is not considered to be an adverse impact.

3.5.3 Mitigation Measures

Population

No significant adverse impacts have been identified and no mitigation is necessary.

Housing

No significant adverse impacts have been identified and no mitigation is necessary.

Employment

No significant adverse impacts have been identified and no mitigation is necessary.

3.5.4 Significant Unavoidable Adverse Impacts

While population growth is unavoidable, it is not necessarily an adverse impact. No significant unavoidable adverse impacts would occur.

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3.6 AESTHETICS

3.6.1 Affected Environment

Visual Character

The visual character of the 20th Street SE Corridor is established by the existing land use pattern, the types and scale of manmade structures, topography, electric transmission corridor, and several large undeveloped and densely vegetated areas. From an aesthetic perspective, buildings within the subarea and adjacent areas do not possess cohesive architecture and site design. The built environment primarily includes single-family residences at a low/ suburban density in addition to limited commercial areas with surface parking. The existing gross residential density of the subarea is just under one dwelling unit (du) per acre, because of large amounts of undeveloped land and the historical semi-rural character of much of the southeastern portion of the subarea. Existing neighborhoods reflect a combination of individually developed lots/residences and subdivisions of varying size and age. Most buildings are one or two stories at a residential scale. Larger buildings include two schools, Holy Cross Lutheran Church, a few multifamily buildings, civic buildings (fire department), and South Lake Center, a neighborhood-scale commercial area in the eastern portion of the subarea. An undeveloped Snohomish County Park (Cavalero Community Park) is located on 70th Avenue SE on the south side of 20th Street SE; it is the only public park in the subarea.

The transmission line that crosses the subarea from north-to-south, in the western/central portion of the subarea, is also a significant visual element. The transmission corridor includes large, prominent structures along a broad, linear, hilly open space.

Views

Topographically, the subarea consists of a central plateau located near 20th Street SE/SR-9, which drops in elevation to the east and west. Existing vegetation obstructs or partially obstructs views to the west, but become more open towards the US-2 trestle to the west. Varied roads and private properties west of 79th Avenue SE afford the most open views to the west. These views encompass Spencer Island, Ebey Slough and the Snohomish River Estuary Wetland Preserve, downtown Everett and the Olympic Mountains. Cavalero Community Park is the only public open space, in this portion of the subarea, to view these landscape features; however, trees partially block the views. Other streets and locations may also provide partial views of these same features. Some open views are also present from roads and subdivisions adjacent to the transmission line corridor, north and south of 20th Street SE.

In the eastern portion of the subarea, views of the Lake Stevens and the Olympic Mountains are generally blocked by existing vegetation. Peek-a-boo views through vegetation may be present from some locations. Likewise existing vegetation blocks

views to the north and east from the retail/commercial area in the eastern portion of the subarea.

Light & Glare

The subarea is currently developed primarily for low to medium density single-family residential uses. As the 20th Street SE Corridor is largely undeveloped, there are no significant sources of light pollution (light and glare). Existing light and glare results primarily from existing house lights in residential neighborhoods along with limited commercial lighting (e.g., parking lot lighting, illuminated business signs, security lighting, etc.) at the South Lake Center. Mobile sources of lighting include vehicle headlights in the project area. Current glare results from buildings, fencing, and roofs. Factors that influence the amount of glare include cloud cover, time of day, building height and size, building orientation, façade material, percentage of reflective surfaces, and landscaping. Similar factors affect onsite shadows, notably building size and height.

3.6.2 Impacts of the Alternatives

Visual Character

All of the alternatives would result in visual change in the subarea. The visual change would be the most significant and dramatic over time from development under *Alternative 2* and *Alternative 3*. Implementation of the action alternatives would help transition the site's visual character into a cohesive, planned urban area with consistent site, design, and building standards.

Alternative 1/No Action

Under the *No Action Alternative,* the subarea would continue to develop primarily as a residential area, pursuant to existing zoning. Development would be predominantly single-family in nature, scattered throughout the planning area, and similar in scale and design to what exists today. There could also be some higher density multifamily development east of SR-9, with buildings up to 60 feet in height. Retail/commercial development would be significantly larger in scale, and could include one large retail/commercial development on the properties in the southwest quadrant of the 20th Street SE/SR-9 intersection; and a neighborhood-scale center on the north side of 20th Street SE, between Cavalero Road and 79th Avenue SE. These commercial developments could be between 60 feet (in the neighborhood center) and 85 feet (in the sub-regional center). Existing regulations do not require significant public amenities in such developments; therefore, the character and quality of future development is uncertain. In addition, existing commercial zoning designations (Local Business and Sub-Regional Commercial) allow/conditionally allow a very broad range of commercial, sales and service, and recreational uses; it may be difficult, therefore, to establish a coherent pattern of uses.

With regard to single-family residential development, visual change would be incremental and dispersed. It would be substantial, however, in areas developed for retail and commercial uses, where buildings would be significantly taller and bulkier than existing development in the subarea. Development of currently undeveloped, heavily vegetated properties would also produce a noticeable change from existing visual character.

Alternative 2 and Alternative 3

The visual impacts of *Alternative 2* and *Alternative 3* would be similar and they are discussed together. Major differences are that *Alternative 2* emphasizes more intensive employment uses, while *Alternative 3*, in comparison places a relatively greater emphasis on higher density residential uses.

Both alternatives would create substantial visual change. Both subarea plan alternatives would result in transformation of the area, in terms of its land use pattern and visual character, to a mixed-use employment district containing higher density residential uses, offices and retail activity in proximity to traditional residential neighborhoods. Development would occur primarily on currently vacant/heavily vegetated sites, but also through redevelopment and infill of some existing uses. Commercial development would be concentrated in several use-specific nodes with varying intensities of retail or office uses. Building heights would generally vary from two to five stores, depending on use. Larger scale uses could include major retail facilities, office buildings and mixed-use developments (retail and office, or retail and residential). Extensive landscaping would be provided along major streets and would buffer or screen development. Design guidelines and standards would be adopted to implement the visual character identified in the subarea plan and would achieve cohesive and consistent design for future development.

A change in visual character, even if it is significant, is not necessarily an adverse impact. Change may be perceived differently by different viewers. Some residents would likely consider the direction and extent of visual change in the subarea to be adverse, while others may regard it as a sign of the City's maturation, progress or economic vitality.

Views

As noted in Section 3.6.1 above, existing open views occur primarily in the western portion of the subarea, generally west of 79th Avenue SE; development west of this location, therefore, could block some views. Public view perspectives in this general area would include streets and sidewalks, and the Cavalero Community Park.

Alternative 1/No Action

Under existing zoning, most development would be single-family residential and limited to 35-foot height by zoning, and would not be likely to block existing views from areas

upslope. However, as noted previously, commercial development under current zoning could be between 65 and 80 feet, which could affect views throughout the corridor. Similarly, development would not likely obstruct existing views from Cavalero Community Park. There are currently no other public parks or spaces within the subarea, other than roads and sidewalks.

Alternative 2 & Alternative 3

Commercial/office development in the area west of 79th Avenue SE could block some existing views, depending on building height and orientation, from certain locations along streets and sidewalks including existing commercial locations identified as part of the *No Action Alternative*. Views from Cavalero Community Park would not be affected by development in this planned node. No other public spaces are currently located in the subarea.

New development, and future planning for parks and open spaces in the subarea, could result in the creation of new public spaces with views to the west. Design guidelines and standards could provide some level of protection for these views. Views could also occur from the upper stories of taller buildings.

Light & Glare

Lighting associated with new development, including lighting of buildings, signage, parking areas, streets, and headlights from vehicular traffic, would occur under all alternatives and lighting levels in the subarea would increase..

Alternative 1/No Action

Increased lighting would be relatively more dispersed under the *No Action Alternative*, and would primarily be associated with single-family residences. A few larger retail developments could occur, based on existing zoning, and would entail lighting of buildings and parking areas. Vehicular traffic would increase lighting from vehicle headlights. Buildings with reflective surfaces, if any, could generate glare. Some light spillage, and impacts to adjacent properties, could occur in connection with commercial development projects; existing regulations do not adequately address lighting impacts. In general, however, lighting impacts are not expected to be significant.

Some shadowing of adjacent properties could occur from larger commercial buildings (i.e., those buildings up to 85 feet in the Sub-Regional Commercial zone).

Alternative 2 & Alternative 3

Lighting impacts under *Alternative 2* and *Alternative 3* would be greater than those for *Alternative 1,* but are not expected to be significant. Development would be predominantly commercial and mixed-use, higher density and more concentrated spatially compared to *Alternative 1*. Planned nodes of development would contain buildings ranging from one to five stories with surface or structured parking. Lighting

would be installed for safety and security as part of commercial development. Vehicular traffic, which would be greater than for *Alternative 1*, would also generate light. Taller buildings could cause some shadowing of adjacent properties.

Implementation of the subarea plan would include adoption of new zoning regulations and design guidelines and standards that would emphasize appropriate techniques -- such as building orientation, screening, and material choice -- to reduce impacts to surrounding areas. These regulations would provide a greater opportunity to avoid or address potential light spillage onto adjacent properties, generation of glare, and shadowing of adjacent properties. Such regulations could also embody "dark sky" principles to minimize lighting increases within the subarea.

3.6.3 Mitigation Measures

Mitigation measures to address impacts to visual character and to preserve views include a combination of existing development regulations and new implementation measures identified in the *Draft 20th Street SE Corridor Subarea Plan*.

Visual Character

- **Development Regulations**: New zoning regulations in combination with specific design guidelines and standards would be adopted to implement the subarea plan. Regulations would address appropriate uses, height, setbacks, and similar development parameters. The code could also include incentives, such as bonuses in height or intensity, in exchange for incorporating a menu of public amenities in new development. Existing landscaping standards could be modified to create the desired character for development sites, roads, and sidewalks and trails. Existing tree protection/replacement requirements could be modified to ensure the subarea maintains a desirable amount of vegetative cover.

- **Design Guidelines and Standards**: Design guidelines and standards would be adopted to ensure future development achieves a cohesive visual character and high-quality site planning, building design, lighting and signage.

Views

- **Park & Open Space Planning**: The City will be updating its *Parks & Open Space Plan* to address needs created by planned growth in the 20th Street SE Corridor. In conjunction with this planning, the City may identify new parks or open space areas that provide views of landscape features, as discussed above, and determine adequate measures that maintain or enhance specified viewpoints. New development in some portions of the subarea may also create public spaces to provide open views of the landscape.

- **Design Guidelines and Standards**: In coordination planning new parks and open spaces and identifying potential viewpoints, the City could consider adopting guidelines and standards that identify when and how site plans or building design could be modified to maintain or enhance views from parks and other public spaces.

Light & Glare

- **Development Regulations**: The City should consider adopting "dark sky" regulations to minimize lighting increases and night glow in the subarea.

- **Design Guidelines and Standards**: Design guidelines and standards would be adopted to implement the subarea plan, and could provide guidance on avoiding light spillage, glare and shadow impacts though site planning, building design and landscaping. The guidelines and standards would specifically address lighting and signage.

3.6.4 Significant Unavoidable Adverse Impacts

Visual Character

The visual character of the subarea will change significantly over time because of growth and development. The direction of change would be from a primarily single-family residential area with large lots to an area that includes a mixed-use employment district alongside residential neighborhoods. It would become more densely developed and urban in character with taller, larger scale buildings. This change could be considered adverse by some viewers and positive by others, but this change is an unavoidable consequence of implementing the subarea plan.

Views

Some existing views to the west from locations in the western portion of the subarea could be partially or completely obstructed by future development. View blockage could be mitigated through use of new development regulations, however, so this impact is not considered unavoidable. The subarea plan, and future planning for parks and open spaces, would focus on identifying future public spaces from which views would be maintained or enhanced through design guidelines and standards.

Light & Glare

Lighting will increase but will be controlled through development regulations and design guidelines and standards. No significant unavoidable adverse impacts are anticipated.

3.7 CULTURAL RESOURCES

3.7.1 Affected Environment

Regulatory Context

The National Historic Preservation Act (NHPA) of 1966, as amended, is the nation's primary historic preservation law. The Act established the National Register of Historic Places (National Register), the position of State Historic Preservation Officer (SHPO), and requires review of potential impacts of federal actions on historic properties.

Cultural resources are also protected under the Washington State Environmental Policy Act (SEPA), which requires state and local agencies to consider the potential impacts of their actions on cultural resources. Under SEPA, the Washington State Department of Archaeology and Historic Preservation (DAHP) is the state's primary cultural resource agency. DAHP does not regulate the treatment of culturally significant properties; rather, it provides technical knowledge and formal opinions on the cultural significance of historic or archaeological sites to inform local government decisions.

Methodology

ICF International performed a DAHP record search in May 2011, reviewing relevant documents for the study area, including the Washington Information System for Architectural and Archaeological Records Data (WISAARD). The search was performed to identify any previously documented archaeological, historic, or architectural resources within the study area and provide context for assessment of potential impacts.

According to the results of the record search, no National Register properties are located within the study area. A 2006 historic property inventory in the area identified one house near the western end of the study area as potentially eligible for inclusion on the register, but no further assessment of the property has been conducted, and DAHP has taken no action to add the property to the NRHP.

The study area also contains one documented archaeological site, a historic logging property. This site includes features and objects associated with past logging activities or other prior use. The specific location of archaeological sites is considered confidential pursuant to state law (RCW 42.56.300). The site is not listed on the NRHP.

3.7.2 Impacts of the Alternatives

Future development in the study area under any alternative could potentially affect identified historic resources in a variety of ways, including the following:

- Demolition or substantial alteration of historic features or archaeological sites;

- Development of adjacent properties in a manner that creates incompatible massing, size, or scale;
- Incompatible use of an existing historic structure or archaeologically significant property; and
- Loss of access to the historic property.

Because of the small number of culturally significant resources identified within the study area, overall impacts to cultural resources under all alternatives would be minor. However, where future development would potentially alter a historic property or an identified archaeological site, mitigation measures will be implemented to avoid or minimize adverse impacts.

Future development within the subarea also carries a potential for destruction of unidentified resources or discovery of undocumented cultural resources during construction in areas that have not been surveyed. Mitigation would be necessary to ensure that no significant adverse impacts to cultural resources occur.

3.7.3 Mitigation Measures

Applicable Regulations and Commitments

- **Chapter 27.53 RCW:** Washington State Law prohibits the disturbance, destruction, or removal of historic or prehistoric archaeological deposits without approval from Department of Archaeology and Historic Preservation. Persons who violate the terms of this statue are subject to both criminal and civil liability.

Additional Mitigation Measures

- **New Cultural Resources Policies:** Although the *Lake Stevens Comprehensive Plan* currently contains policies designed to protect archaeological resource and promote preservation of historic structures, this commitment could be emphasized by also including such policies in the subarea plan or in future development regulations.
- **Archaeological Survey**: As part of the development review process, the City could require an archaeological survey for properties in the same general vicinity as the known archaeological site, and for properties which display a similar history of logging activity, to determine the presence of archaeological or historic resources.
- **Development Agreements:** The City may consider the use of development agreements, per LSMC 14.16C.055, for any properties with known archaeological or historic resources. Such a development agreement could include mitigation measures to protect archaeological resources, such as a memorandum of agreement with DAHP regarding research and curation of artifacts, as well as construction monitoring by a qualified archaeologist.

- **Inadvertent Discovery Plan:** For development proposals on properties that are extensively forested, previously undeveloped, or known to be associated with the historic railroad or historic logging operations, the City should require the preparation of an inadvertent discovery plan to establish protocols for handling archaeological deposits uncovered during construction.

3.7.4 Significant Unavoidable Adverse Impacts

Although the subarea is believed to have a low probability for discovery of archaeological resources, there is some potential for undiscovered archaeological resources to be inadvertently destroyed during construction. This is neither certain to occur nor unavoidable, however. With implementation of appropriate implementation measures, no significant unavoidable adverse impacts are anticipated.

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3.8 TRANSPORTATION

3.8.1 Affected Environment

The City of Lake Stevens is located east of Everett, north of Snohomish, and southeast of Marysville, and has an estimated population of over 26,000 as of 2010. Figure 3.8-1 displays the 20th Street SE Corridor Subarea (also referred to as the "study area").

Existing Transportation Network

This section describes the key elements of the transportation system within the 20th Street SE study area. The roadway network, traffic operations, transit service, pedestrian and bicycle network, and parking conditions are described.

Existing Roadway Network

The majority of travel in the area is on the state highway system, although there are several important city roads, as described below. Figure 3.8-2 shows the functional classification of roadways within the study area.

US Highway (US) 2, also known as Stevens Pass Highway, runs along the southwestern edge of the City. US-2 is a major regional route and provides the main connection to Everett and I-5 to the west, as well as a route to Snohomish and Monroe to the south and east. This four-lane limited-access highway connects to major arterials including SR-9, SR-204 and 20th Street SE, and has an average daily traffic (ADT) volume of 72,000 vehicles west of the SR-204 junction.

State Route (SR) 9 is a north-south highway, connecting Marysville to the north and Snohomish to the south. SR-9 is an important regional route that serves as an alternative to I-5 on the east side of the Puget Sound lowlands. SR-9 is primarily a two-lane highway with wider sections in some locations, such as between Lundeen Parkway and Market Place, in the Lake Stevens Center subarea. WSDOT is currently widening SR-9 to four lanes between Lundeen Parkway and SR-92. The ADT north of SR-204 is approximately 33,000 vehicles.

SR-204 is a northeast-southwest highway that connects US-2 and SR-9. The highway has two lanes in the northeast direction and one lane in the southwest direction, and provides the most direct route between the western approach to the City and Lake Stevens Center. SR-204 is also an important route connecting Granite Falls and the northern part of Lake Stevens to US-2 and Everett. The ADT northeast of the US-2 junction is approximately 34,000 vehicles.

20th Street SE is an arterial originating at US-2 and running eastward through the City. From approximately 91st Avenue SE to South Lake Stevens Road, 20th Street SE is a five-lane roadway with sidewalks and bike lanes. The remaining portions of 20th Street SE are two to three lanes with limited pedestrian and bicycle facilities. Snohomish County recently completed the five-lane section described above; the

City intends to complete the widening project between US-2 and 91st Avenue SE as funding becomes available

91st Avenue SE is a north-south roadway connecting the 20th Street SE Corridor to Lake Stevens Center. The roadway has one through lane in each direction, with a center turn lane provided within the Lake Stevens Center area. Two transit routes run along 91st Avenue SE south of Market Place, where there are limited pedestrian facilities.

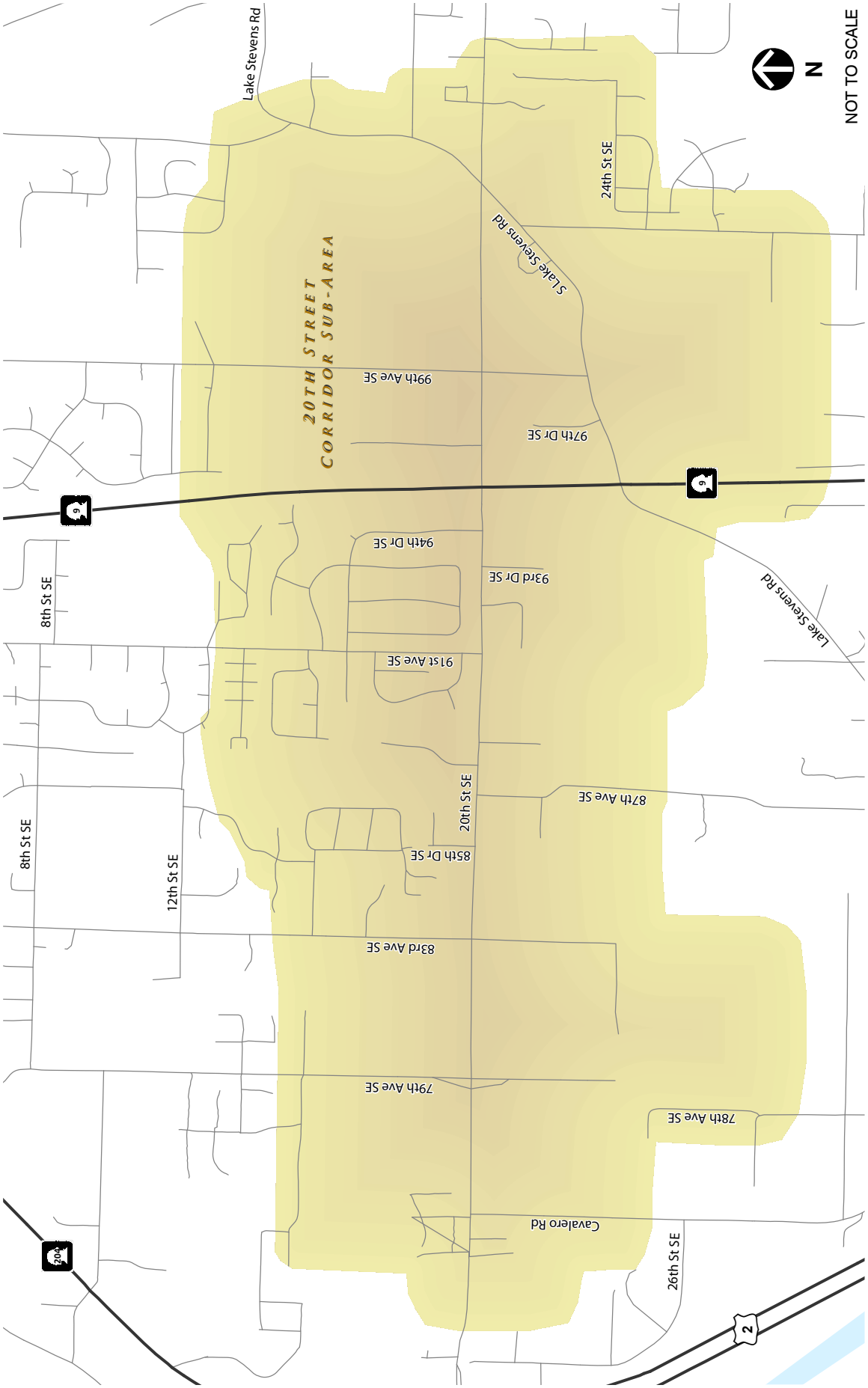
99th Avenue SE is another north-south roadway connecting the 20th Street SE Corridor to Lake Stevens Center. The roadway has one through lane in each direction. Sidewalk coverage and shoulder width vary throughout the corridor.

Existing Traffic Operations

Despite heavy volumes on all approaches of the SR-9 and 20th Street SE, no intersections along 20th Street SE were observed to be substantially congested during either the morning or afternoon peak hours during site visits in spring 2011.[1] However, during the AM peak, city staff has previously observed westbound traffic backing up to 79th Avenue SE due to congestion on west bound US 2. With the exception of SR-9, there is not a large amount of traffic crossing 20th Street SE, which allows relatively free-flow conditions along the corridor. The intersection of 20th Street SE and 83rd Avenue SE is the only access point to Cavalero Mid High School, so it experiences congestion during the morning peak. However, this congestion is fairly short in duration with the heaviest volumes occurring between 7:00 and 7:15 AM.

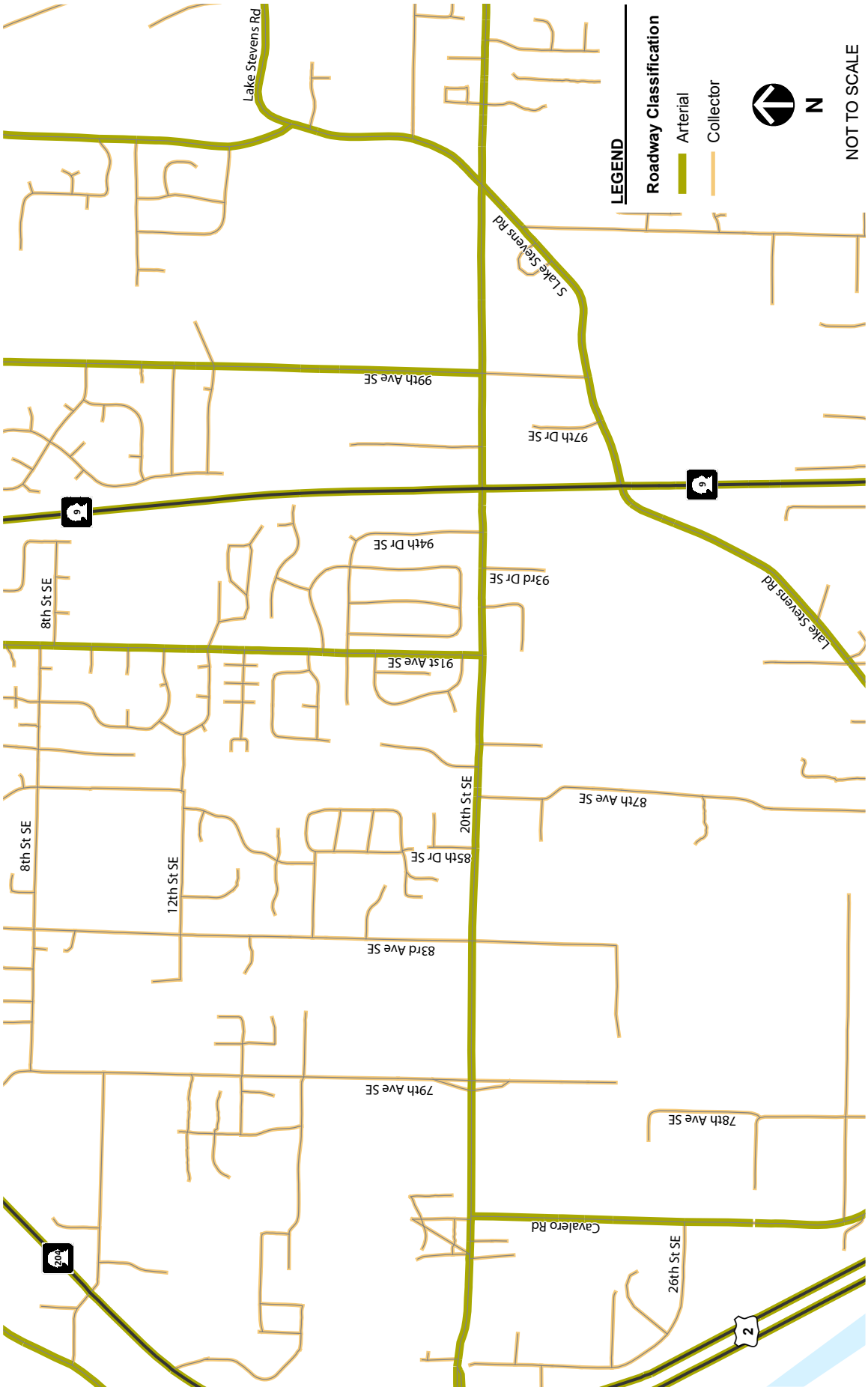
[1] Field visits to the study area occurred on Thursday, April 7th from 2 to 4 PM; Wednesday, April 13th from 4 to 6 PM; and Thursday, April 14th from 6:30 to 8:30 AM.

Figure 3.8-1. Study Area



Source: Fehr & Peers

Figure 3.8-2. Roadway Functional Classification



Source: City of Lake Stevens, Comprehensive Transportation Plan, 2010

Existing Transit Services

Figure 3.8-3. Community Transit bus stop

Community Transit provides bus service to Lake Stevens. The Lake Stevens Transit Center is located between 4th Street NE and Market Place just east of SR-9. The parking lot has 207 spaces, slightly over half of which were occupied in the mid-afternoon during a site visit in Spring 2011. The Puget Sound Regional Council (PSRC) provides park-and-ride lot utilization data for Lake Stevens Transit Center. Surveys taken in the fall of 2009 and 2010 showed parking utilization rates of 63 and 58 percent, respectively. The same surveys also provided information on the origins of riders who park at Lake Stevens Transit Center. The results indicate that approximately 13 percent of riders travel from within a one-mile radius of the transit center, another 20 percent travel from locations between one and two miles from the transit center, and the remaining two-thirds of riders travel more than two miles to reach the transit center.[2]

Two Community Transit routes serve the 20th Street SE study area, although the stops for these routes are only along 91st Avenue SE. Figure 3.8-3 above shows a typical bus stop. Figure 3.8-4 shows the bus routes and these routes are described below:

> Currently, **Route 280** connects Granite Falls, Lake Stevens Transit Center, and Everett Station six days a week. The bus continues to Boeing during designated times of the day. Weekday service headways range from approximately 30 minutes to one hour and run from early morning to late evening. Saturday service runs with one hour headways over a shorter time period than weekday service.
>
> Currently, **Route 425** is a commuter bus connecting Lake Stevens Transit Center to Downtown Seattle via Everett and Lynnwood. Four buses run from Lake Stevens to Seattle in the morning and five buses return in the afternoon.

In addition, Community Transit provides Dial-A-Ride Transit (DART) service for disabled riders. This service is available within 0.75 miles of any local bus route during the regular bus operation hours. An overlay illustrating the DART service area is shown in Figure 3.8-4.

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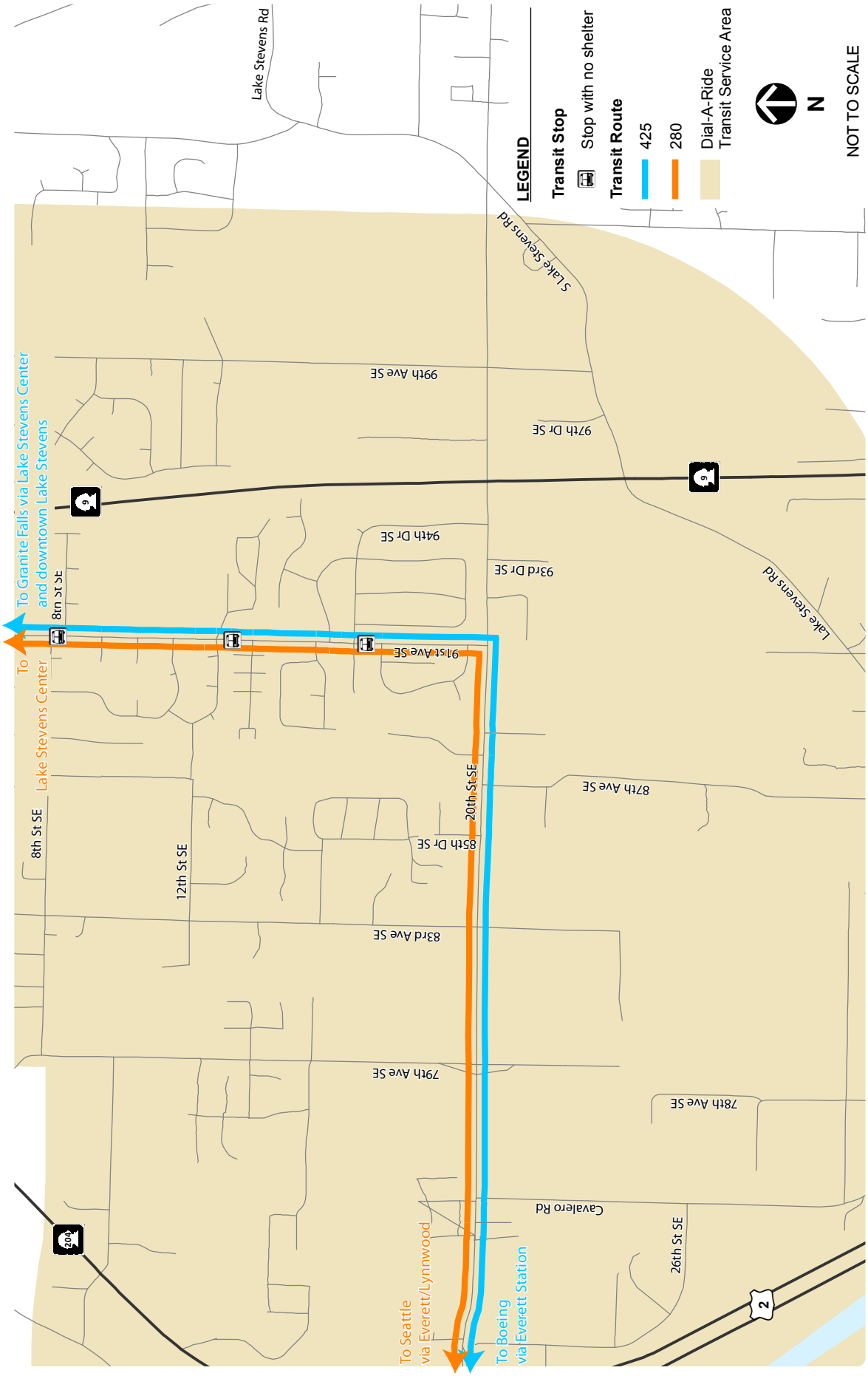
[2] *Long Range Transit Plan*, Community Transit, 2011.

Figure 3.8-4. Transit Routes and Facilities



Source: Community Transit, 2011

Pedestrian and Bicycle System

Figure 3.8-5, shows typical pedestrian and bicycle facilities on many of the arterials in the 20th Street SE study area. In addition, Figures 3.8-6 through 3.8-8 are photographic examples of typical facilities in the study area. East of approximately 88th Avenue SE, 20th Street SE has new sidewalks and bicycle lanes. West of that point, the pedestrian and bicycle network is fairly disjointed.

Many roads have wide shoulders that may accommodate pedestrians or bicyclists, but do not provide dedicated facilities. Some roads, including much of 99th Avenue SE, have little to no shoulders, making non-motorized travel difficult. In general, sidewalks are provided in residential neighborhoods on at least one side of the road. As new developments are constructed, frontage improvements are made; however, due to the piecemeal nature of development, many sidewalks do not connect to any other facilities.

Parking

20th Street SE does not offer on-street parking. Most residential streets, especially those built for newer developments, provide some on-street parking. Older streets, such as South Lake Stevens Road, are narrower and do not allow on-street parking. Off-street parking is provided in several locations along the corridor, particularly near the 20th Street SE and South Lake Stevens intersection which has a small commercial center. Overall there are no current parking shortages in the 20th Street SE Corridor.

Figure 3.8-6. 20th Street SE east of 88th Avenue SE

Figure 3.8-7. 20th Street SE west of 88th Avenue SE

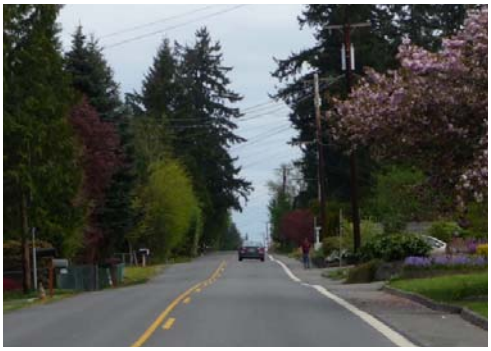
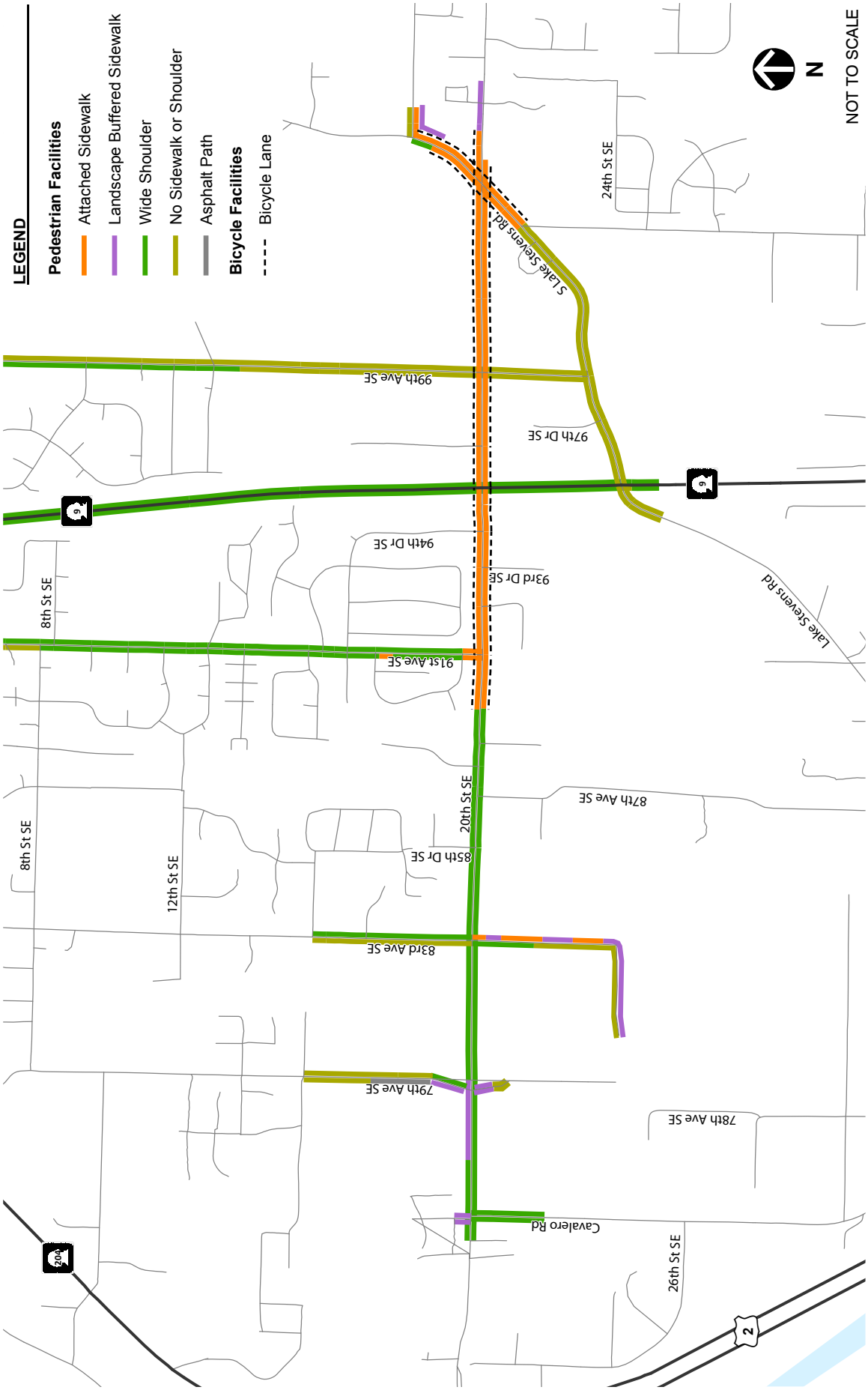


Figure 3.8-8. Facilities typical of 91st and 99th Avenues SE

Figure 3.8-5. Pedestrian and Bicycle Facilities



Source: Fehr & Peers

Traffic Collisions

WSDOT uses a new methodology for traffic safety analysis that identifies "Collision Analysis Locations" (CALs) and "Collision Analysis Corridors" (CACs). A CAL is a location that is up to a half-mile in length that has six or more injury collisions and four or more serious/fatal collisions over the past five years, as well as no planned safety improvements over the next six years. Often the CAL identifies intersections or locations in the road that have unusually high collision rates that should be addressed to improve public safety. In addition, CACs are identified as five-mile segments that have 11 or more serious/fatal collisions over the past five years. The CAL and CAC definitions are part of WSDOT's new traffic safety analysis procedures that support the agency's Target Zero goal to eliminate fatality and serious injury collisions by 2030.

WSDOT's analysis did not identify any CALs or CACs in the study area, indicating that there are no locations near 20th Street SE that have abnormally high collision rates.

Planned Improvements

This section describes planned and programmed improvements to the transportation system in the study area.

20th Street SE Transportation Improvements

In a parallel effort to this EIS, the City is seeking to extend the widening along 20th Street SE west of 91st Avenue SE to the US-2 interchange. The City is considering multiple options including continuing the signalized five-lane cross-section as constructed by Snohomish County east of 91st Avenue SE, as well as a modified design of four lanes with roundabouts.

City of Lake Stevens Comprehensive Plan Transportation Element

The City's Comprehensive Plan, adopted in 2006, last amended in December 2010, includes policies and programs intended to manage growth for the next twenty years. The Transportation Element inventories the existing transportation network, presents current street design standards, provides improvement proposals for areas with safety concerns, and sets level of service (LOS) standards for the City's roadways. The document sets the construction of sidewalks, bicycle lanes, and trails as a high priority. The following goals are set forth in the Transportation Element:

- Provide a roadway network which meets adopted level of service standards.
- Strive for continuous and long term expansions to the trail and pedestrian system.
- By 2012, reduce the accident rate at representative locations on the roadway system within the City by at least 5 percent.
- Ensure that the transportation system is adequate to serve all existing and future land uses. In addition, the City will develop a concurrency management

system, explore alternatives for demand management, and secure adequate financing for transportation.

- Provide an affordable level of service for the roadway network.
- Establish mechanisms to reduce the demand for transportation facilities such as car/van pool, and staggered work hours.
- Allow for alternative design standards, and/or materials for street and parking areas.
- Transportation improvements shall be prioritized and financed consistent with the capital facilities element, and all possible avenues of paying for the improvements should be evaluated for availability and fairness.
- Support neighborhood efforts to implement appropriate traffic calming devices and strategies.
- Update transportation element of the Comprehensive Plan to verify the existing road inventory and update with new inventory generated from annexed areas.
- Commit to meeting federal and state air quality requirements and work with state, regional, and local agencies and jurisdictions to develop transportation control measures and/or similar mobile source emission reduction programs that may be warranted to attain or maintain air quality requirements.

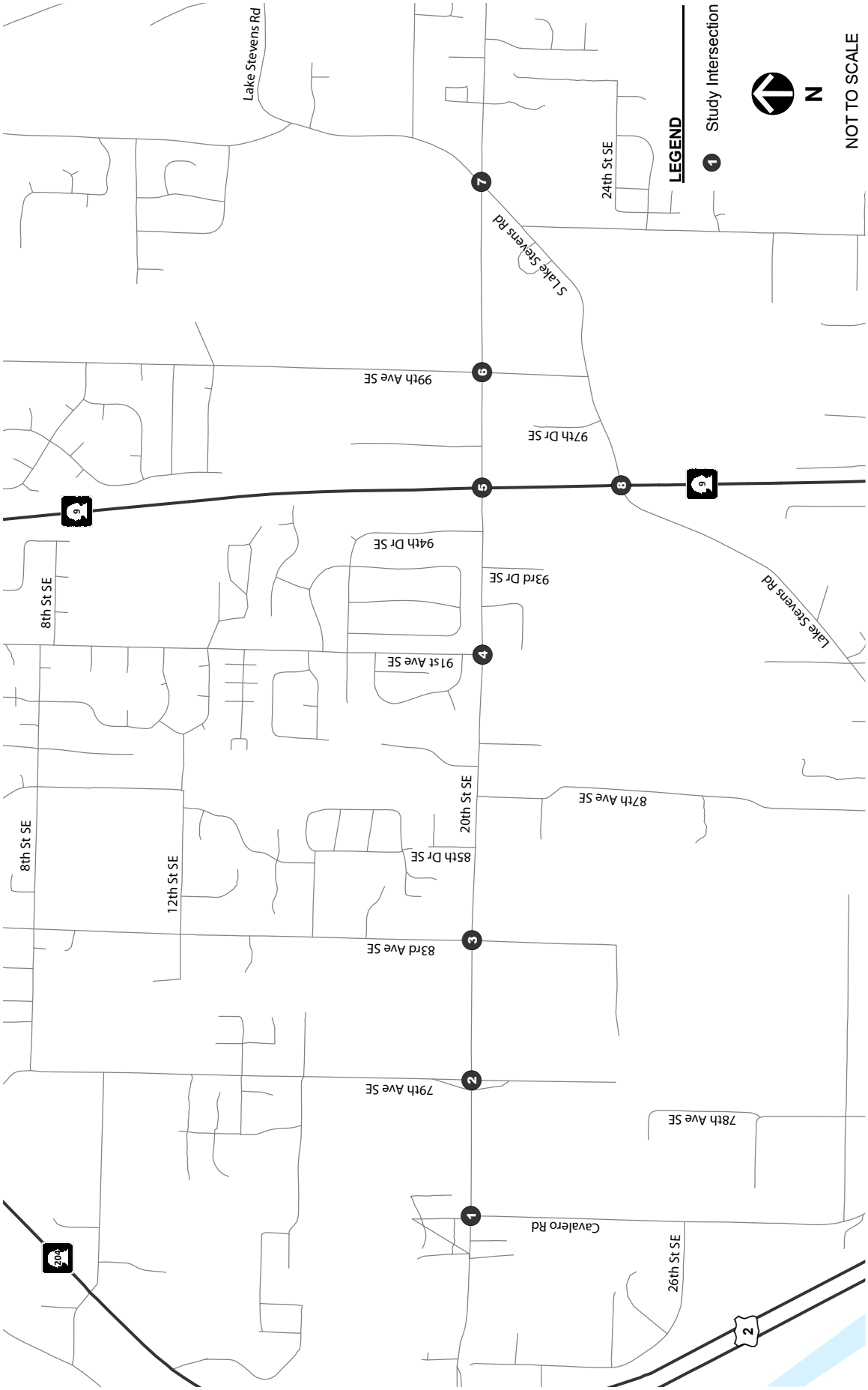
The Comprehensive Plan uses volume-to-capacity ratios for roadway segments to measure level of service (LOS). However, for the purposes of this study, individual intersections were evaluated. The City sets LOS D as the standard for acceptable operation in the central business district, and LOS C as the standard for acceptable operations in residential areas. This study will apply the residential standard; however, recommendations identified later in this analysis suggest that the City adopt a separate standard for designated centers and mixed-use areas such as the 20th Street SE Corridor.

Existing Conditions Analysis

Analysis Methodology

This section summarizes the methodology used to analyze the existing conditions of the transportation network for vehicles. Figure 3.8-9 shows the study intersections considered in this analysis. All intersections were evaluated during the PM peak hour; additionally, a subset of intersections was analyzed during the AM peak hour.

Figure 3.8-9. Study Intersections



Source: Fehr & Peers

The roadway analysis is based on the *Highway Capacity Manual* (HCM) 2000 methodology. The Synchro software package, which considers factors such as signal timing and traffic volumes, was used to analyze all study intersections. Level of service (LOS) is assigned based on the delay experienced by vehicles traveling through the intersection. For signalized intersections and unsignalized all-way stop controlled intersections, the LOS is determined by the average delay experienced by all vehicles. For unsignalized side-street stop controlled intersections, LOS is determined by the movement with the highest delay. Table 3.8-1 displays the HCM thresholds used to determine LOS at signalized and unsignalized intersections.

WSDOT sets LOS standards for state highways in the Lake Stevens area. WSDOT considers LOS D or better conditions to be acceptable. The City is currently reviewing the LOS standards for local streets and may adopt an overall standard of LOS E, with some key intersections allowed to operate at LOS F during peak hours.

Table 3.8-1. Level of Service Criteria for Signalized and Unsignalized Intersections

Level of Service	Signalized Intersection Delay per Vehicle (seconds)	Unsignalized Intersection Delay per Vehicle (seconds)
A	0-10	0-10
B	>10-20	>10-15
C	>20-35	>15-25
D	>35-55	>25-35
E	>55-80	>35-50
F	>80	>50

Source: Highway Capacity Manual, 2000.

The volumes used for both the AM and PM peak hour analyses were collected in April 2011. All study intersections were evaluated during the afternoon peak and the following four intersections were selected for additional morning peak analysis:

- 20th Street SE and 79th Avenue SE;
- 20th Street SE and 83rd Avenue SE;
- 20th Street SE and SR-9; and
- 20th Street SE and South Lake Stevens Road

Detailed traffic count sheets are provided in Appendix C. Figure 3.8-10 displays the peak hour turning movements.

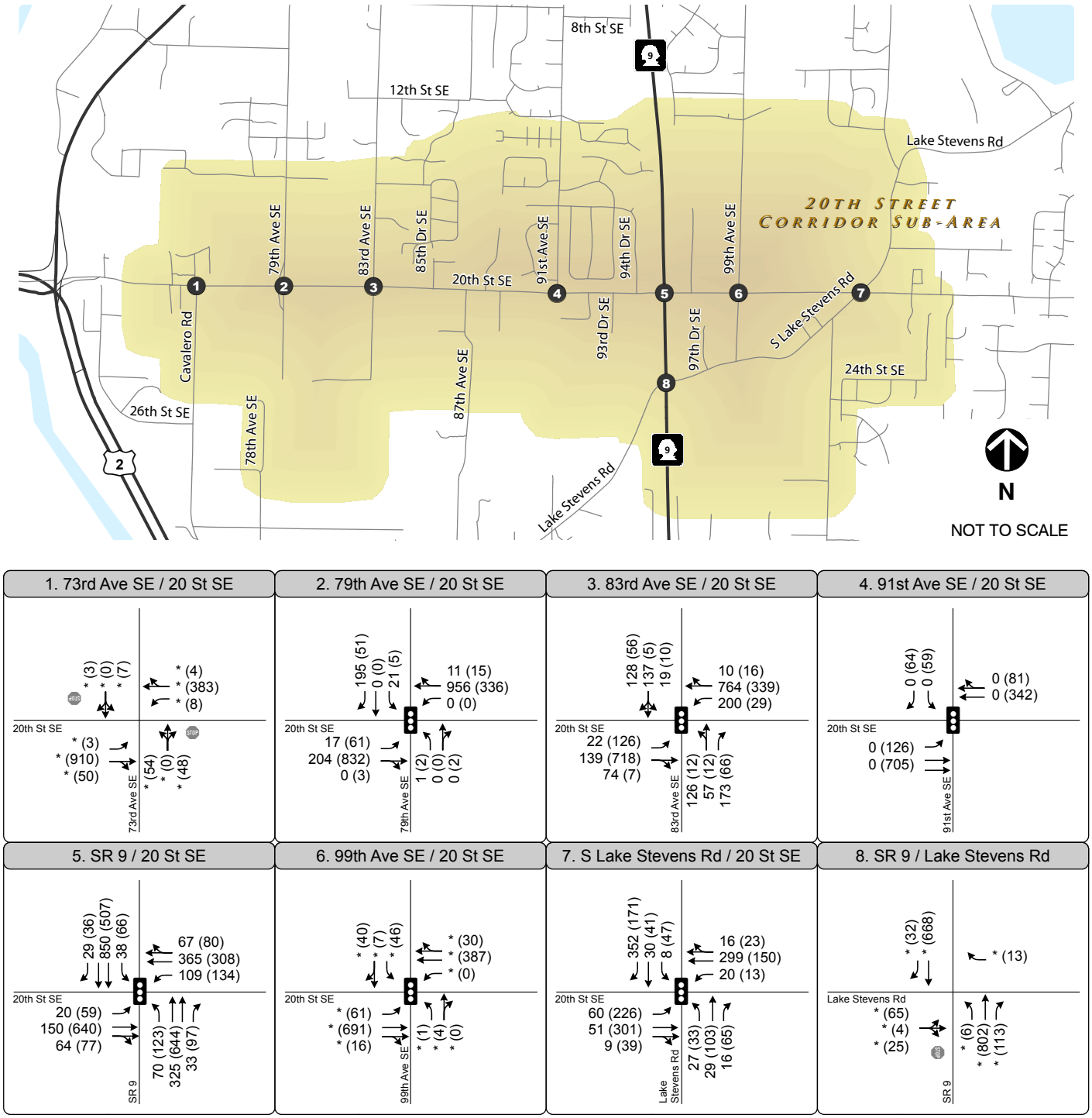
Analysis Results

The results of the intersection operations analysis are shown in Figure 3.8-11 and Table 3.8-2. Detailed LOS calculation sheets are in Appendix C.

Of the four intersections analyzed during the morning peak hour, one intersection -- 20th Street SE and 83rd Avenue SE -- operates at LOS F, falling below the City's standard. Both the northbound and southbound approaches of this signalized intersection operate at LOS F, with the northbound approach having the higher delay. This intersection provides the only access to Cavalero Mid High School, so it experiences substantial congestion during the morning drop-off period. However, based on field observations, this congested period is relatively brief (less than a half hour). During the remainder of the AM peak hour and the rest of the day, this intersection experiences relatively little traffic and operates well. It should also be noted that the planned 20th Street SE widening project would improve traffic flow at this intersection, further reducing morning congestion.

During the PM peak hour, one intersection -- 20th Street SE and Cavalero Road -- operates at LOS F. This unsignalized intersection operates well for the vehicles along 20th Street SE. However, the minor approaches operate at LOS F on the south leg and LOS E on the north leg. While this intersection operates poorly, signalization is not appropriate since it would not meet a signal warrant. Signal warrants define a set of conditions that typically must be met before a traffic signal is considered for installation.

Figure 3.8-10. Peak Hour Traffic Volumes and Lane Configurations - Existing Conditions

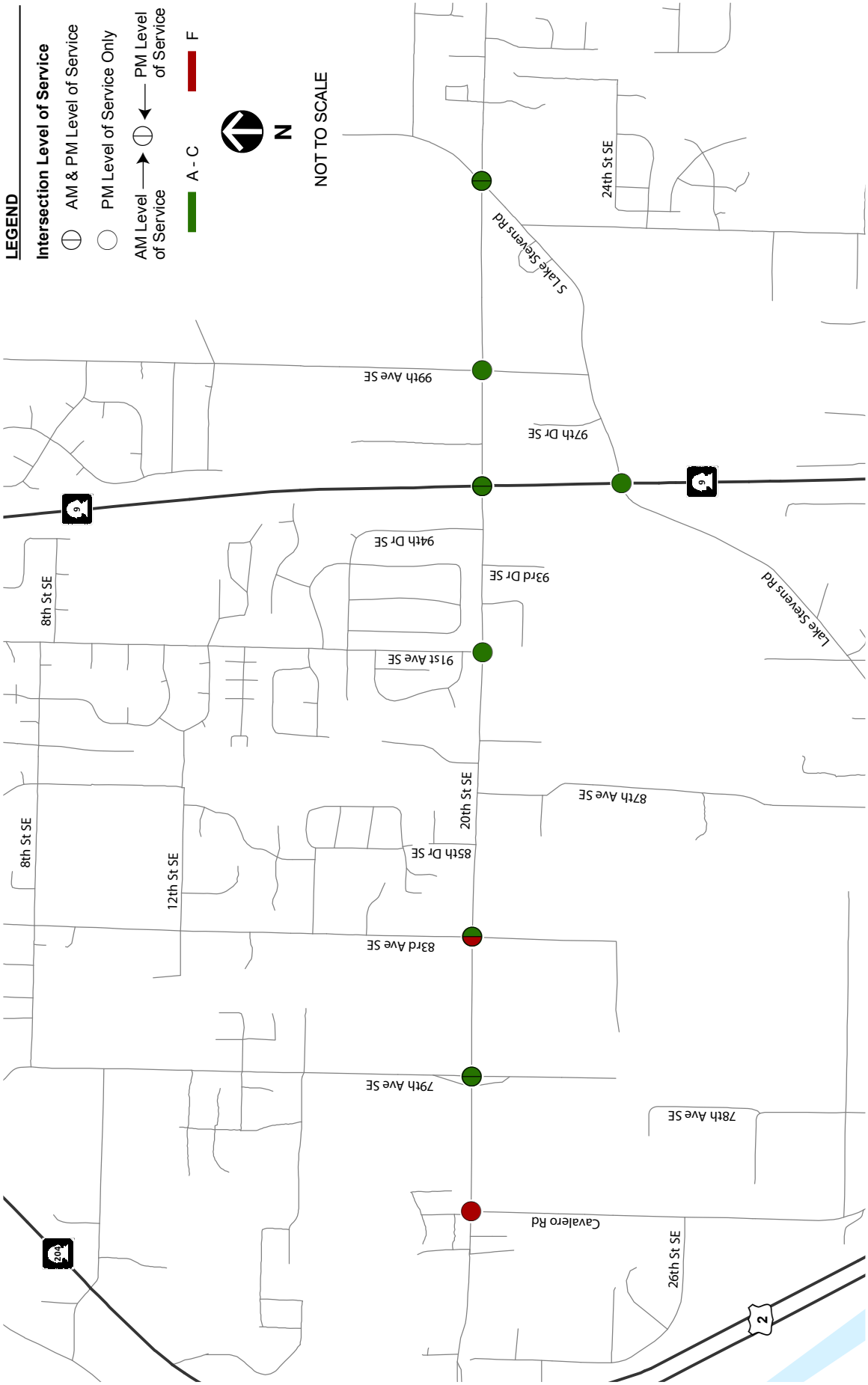


LEGEND

↱	Turn Lane
AM (PM)	Peak Hour Traffic Volume
❶	Study Intersection
	Traffic Signal
STOP	Stop Sign
*	This intersection was not studied during AM Peak Hour

Source: Fehr & Peers

Figure 3.8-11. Existing Peak Hour Level of Service



Source: Fehr & Peers

Table 3.8-2. Existing Peak Hour Intersection Level of Service

ID	Intersection	Traffic Control Device	AM		PM	
			Delay (seconds)	LOS	Delay (seconds)	LOS
1	20th Street SE and Cavalero Road	Side-street stop control	-	-	77	F
2	20th Street SE and 79th Avenue SE	Signalized	15	B	7	A
3	20th Street SE and 83rd Avenue SE	Signalized	104	F	9	A
4	20th Street SE and 91st Avenue SE	Signalized	-	-	9	A
5	20th Street SE and SR-9	Signalized	25	C	30	C
6	20th Street SE and 99th Avenue SE	Signalized	-	-	5	A
7	20th Street SE and South Lake Stevens Road	Signalized	17	B	14	B
8	SR-9 and South Lake Stevens Road	Side-street stop control	-	-	22	C

Source: Fehr & Peers, 2011.

3.8.2 Impacts of the Alternatives

Land Use Alternatives

As discussed in previous sections, this EIS analyzes three development alternatives with a horizon year of 2025. Table 3.8-3 summarizes the type and amount of new growth considered under the EIS alternatives. The travel demand modeling assumes the upper bound of the projected growth for each alternative to provide a conservative analysis. The travel modeling assumes a substantial amount of growth outside the study area. These additional projects include development in the Lake Stevens Center area, as identified in a separate draft subarea plan; new subdivisions near 79th Avenue SE and South Lake Stevens Road; and regional growth throughout Snohomish County. Note that these projections are based on the growth anticipated by 2025, and are not based on theoretical buildout capacity possible under each alternative.

Table 3.8-3. Summary of Growth Assumptions for Land Use Alternatives

Alternative	Retail (Gross Square Feet)	Office (Gross Square Feet)	Dwelling Units
No Action Alternative	150,000-180,000	20,000-30,000	600-1,200
Alternative 2 – Employment/ Commercial Emphasis	400,000-450,000	1,000,000-1,250,000	900-1,000
Alternative 3 – Employment/ Commercial & Residential Emphasis	300,000-350,000	600,000-750,000	1,200-1,400

Source: City of Lake Stevens Planning & Community Development, 2011.

Transportation Network Assumptions

Based on discussions with City staff, some transportation network changes are assumed to be made by the horizon year of 2025 to support potential development along the corridor, but are not yet included in the Six-Year Transportation Improvement Program (STIP). The widening along 20th Street SE east of 91st Avenue SE is assumed to continue west to the US-2 interchange. It is assumed that a new road would be constructed south of and parallel to 20th Street SE called 24th Street SE; the draft subarea plan would ultimately extend 24th Street SE between Cavalero Road and the intersection of SR-9 and South Lake Stevens Road. As part of the background assumptions for this analysis, the road is only anticipated to extend west of SR-9 to support new development at the northwestern corner of the SR-9and South Lake Stevens Road intersection. Associated with this new road, it is assumed that South Lake Stevens Road west of SR-9 would be realigned to the new 24th Street SE to allow for a standard four-way intersection at SR-9/South Lake Stevens Road/24th Street SE.[3]

The effectiveness of a roundabout was tested at the intersection of SR-9 and South Lake Stevens Road/24th Street SE. Two sets of traffic volumes were analyzed:

(1) The demand volumes estimated by the Snohomish County travel model; and

(2) A set of reduced northbound volumes, which may be more realistic given the metering effect of the US-2 interchange to the south.[4]

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[3] The project team confirmed with WSDOT that a full-access intersection with SR-9 was a reasonable assumption. WSDOT noted that they had concerns about a traffic signal at this location due to close spacing with the signal at 20th Street SE, and that the department prefers a roundabout.

[4] The project team assumed that 1,300 northbound vehicles could pass through the two intersections at SR-9/US-2, which is the maximum flow under ideal conditions for these single-lane intersections.

The traffic model indicates that by 2025, under *all alternatives*, a roundabout would fail to accommodate all traffic at the intersection of SR-9 and South Lake Stevens Road. However, using the reduced northbound volumes, a roundabout (with two lanes on each approach) would operate at LOS E. The analysis indicates that southbound queues would not interfere with the SR-9/20th Street SE intersection to the north. Although the roundabout configuration may be feasible under the *No Action Alternative*, it would fail with more intense land uses that generate increased traffic.

Since the roundabout option is not feasible under all alternatives considered in this EIS, a full signal is assumed at the SR-9/South Lake Stevens Road/24th Street SE intersection. The LOS results presented above reflect the following configuration at that intersection:

- Protected left turns on all approaches;
- Dual left turn pockets and a shared through/right lane on the eastbound and westbound approaches; and
- Two through lanes, and left and right turn pockets on the northbound and southbound approaches.

This configuration is assumed for all analyses presented in this document. As noted in footnote 3, WSDOT has stated they would prefer not to have a signal at this location to provide more uninterrupted travel on SR-9. If the intersection remained as an unsignalized right-in/right-out intersection (a slight variation of the current configuration which allows eastbound left turns), the through and left turns would move to the intersection of SR-9 and 20th Street SE. The project team tested how that intersection would function satisfactorily during the PM peak hour if those volumes were shifted. Under the *No Action Alternative*, the average delay at the intersection would increase by 90 seconds, causing the intersection to fall from LOS E to LOS F conditions. Note that under the full-access signal alternative, there would be no queuing between the intersections since it was assumed that the signals along SR-9 would be coordinated to facilitate progression.

Methodology

The analysis began by adjusting the trip generation in the Snohomish County travel model[5] based on the land use assumptions for the most trip-intensive land use alternative, which is *Alternative 2*. Next, a trip distribution and assignment tool was

[5] The Snohomish County travel model is a regional travel forecasting tool used by Snohomish County to forecast future traffic and transit conditions that result from new land use growth and changes to the transportation network. This travel model is a more detailed version of the travel model used by the Puget Sound Regional Council to estimate travel demand in the Central Puget Sound area and provides more accurate turning movement forecasts at the project's study intersections.

used to determine the difference in expected trips under *Alternative 2* and *Alternative 3*. Applying this difference to the Snohomish County travel demand model results in the overall expected volumes (both regional background and project-related). Intersection operations were analyzed using the Synchro software package, and roundabouts were analyzed using the SIDRA software program.

Note that the Snohomish County model only provides forecasts for the PM peak hour. AM peak hour forecasts were developed using the relationship between existing AM and PM peak hour traffic movements, as well as the PM peak hour forecasts generated from the travel demand model.

Three land use alternatives are also being considered for the Lake Stevens Center Subarea, located north of the 20th Street SE Corridor. To provide a conservative and cumulative analysis of the 20th Street SE Corridor alternatives, the most intense land use alternative is assumed to be in place in the Lake Stevens Center Subarea.

Impact Identification

The 2025 *No Action Alternative (Alternative 1)* serves as the baseline for identifying impacts to transportation facilities under *Alternative 2* and *Alternative 3*. A transportation impact is considered to occur if a subarea plan alternative would:

- Cause a study intersection that operates acceptably under the 2025 *No Action Alternative* (LOS C), to operate unacceptably (LOS D, E, or F);
- Cause a study intersection that operates unacceptably under the 2025 *No Action Alternative* to operate with higher delay;
- Interfere with any existing or planned transit service[6]; or
- Interfere with any existing or planned pedestrian or bicycle facility[7].

No Action Alternative Analysis Results

Roadway Operations

The following table summarizes the projected LOS under the 2025 *No Action Alternative*. Figure 3.8-12 displays the peak hour turning movements and Figure 3.8-13 displays the LOS results on a map of the subarea. Intersections with deficient operations are shown in bold.

[6] This includes forcing transit to re-route because of closed streets or relocated bus stops.
[7] This includes forcing pedestrians or bicyclists to alter their routes due to closed facilities.

Table 3.8-4. 2025 No Action Alternative – AM and PM Peak Hour Level of Service

ID	Intersection	Traffic Control Device	LOS / Delay (seconds)	
			AM	PM
1	20th Street SE and Cavalero Road	Side-street stop control	-	**F / >200**
2	20th Street SE and 79th Avenue SE	Signalized	C / 23	B / 18
3	20th Street SE and 83rd Avenue SE	Signalized	**E / 56**	C / 20
4	20th Street SE and 91st Avenue SE	Signalized	-	C / 29
5	20th Street SE and SR-9	Signalized	**D / 53**	**E / 73**
6	20th Street SE and 99th Avenue SE	Signalized	-	B / 15
7	20th Street SE and S Lake Stevens Road	Signalized	C / 29	C / 29
8	SR-9 and South Lake Stevens Road	Signalized[1]	-	C / 34

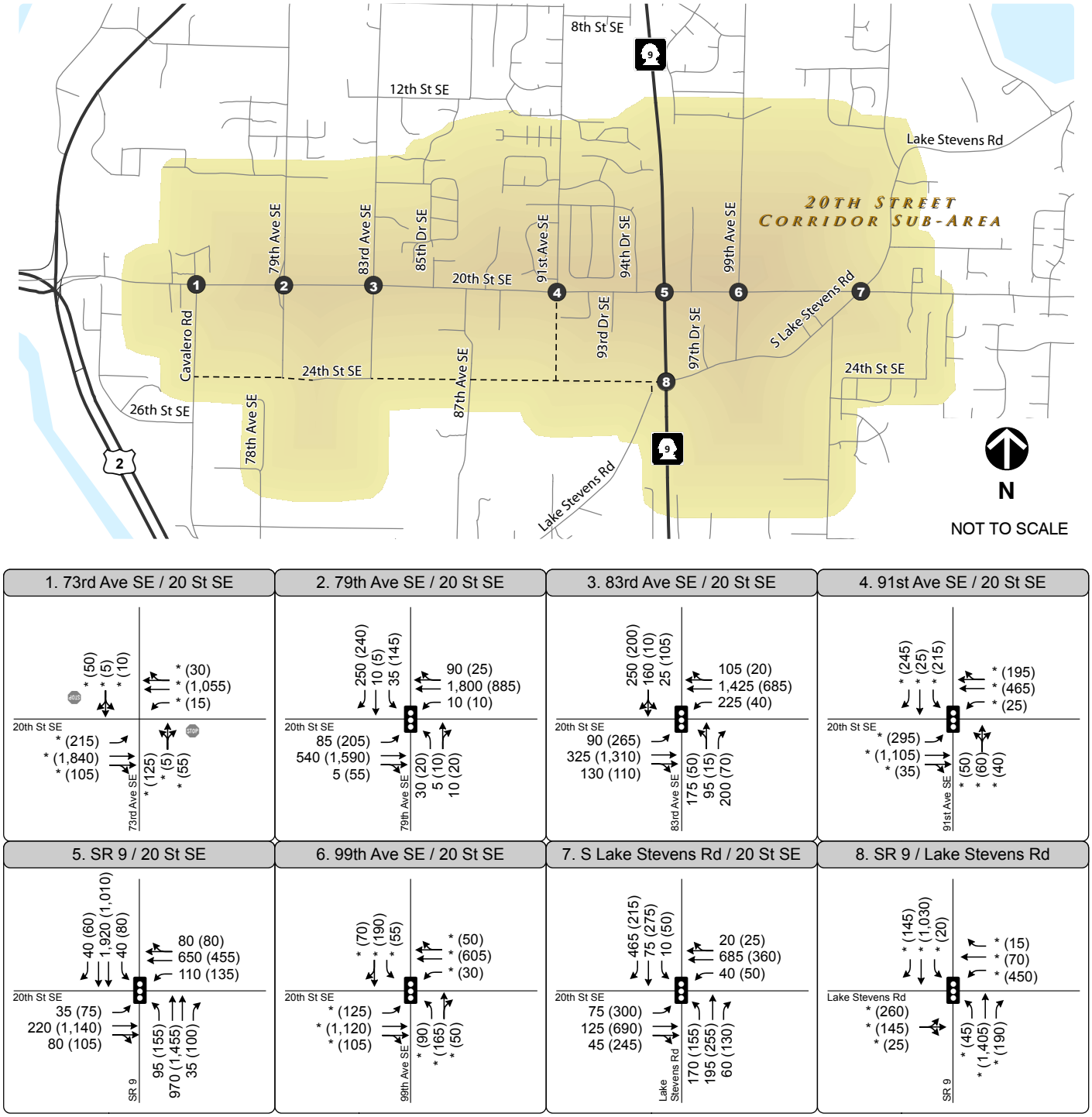
Source: Fehr & Peers, 2011.
[1] This analysis assumes a full signal, although WSDOT has indicated they would prefer to keep the intersection unsignalized. See discussion in Transportation Network Assumptions section.

Two intersections -- 20th Street SE and 83rd Avenue SE, and 20th Street SE and SR-9 -- would fall below the City's standard of LOS C during the AM peak hour. As is the case under existing conditions, the intersection of 20th Street SE and 83rd Avenue SE is problematic in the AM peak hour since it is the main access point to Cavalero Mid High School. The number of turns in and out of 83rd Avenue SE coupled with the high westbound volumes along the 20th Street SE corridor leads to LOS E conditions. Although operations at 20th Street SE and SR-9 fall below the City's LOS standard, the intersection operates reasonably well given the substantial volumes, with 53 seconds of average delay (LOS D). Note that WSDOT's level of service for SR-9 is LOS D.

Two intersections -- 20th Street SE and Cavalero Road, and 20th Street SE and SR-9 -- would fall below the City's standard during the PM peak hour. At the western end of the subarea, traffic from the stop-controlled minor street of Cavalero Road would experience substantial delays as it tries to enter or cross 20th Street SE which is uncontrolled at that location. At 20th Street and SR-9, heavy volumes on all approaches would result in LOS E operations, with the eastbound and northbound approaches most heavily congested.

It should be noted that the *No Action Alternative* forecasts presented here differ from WSDOT forecasts prepared for other projects in the general vicinity. The traffic forecasts for this project were developed using the Snohomish County travel demand model, which is based on the County's household and employment forecasts, rather than the PSRC's small area population and employment forecasts. In addition, the forecasts assume more intensive development in the Lake Stevens Center Subarea.

Figure 3.8-12. Peak Hour Traffic Volumes and Lane Configurations - Alternative 1 - No Action (2025)

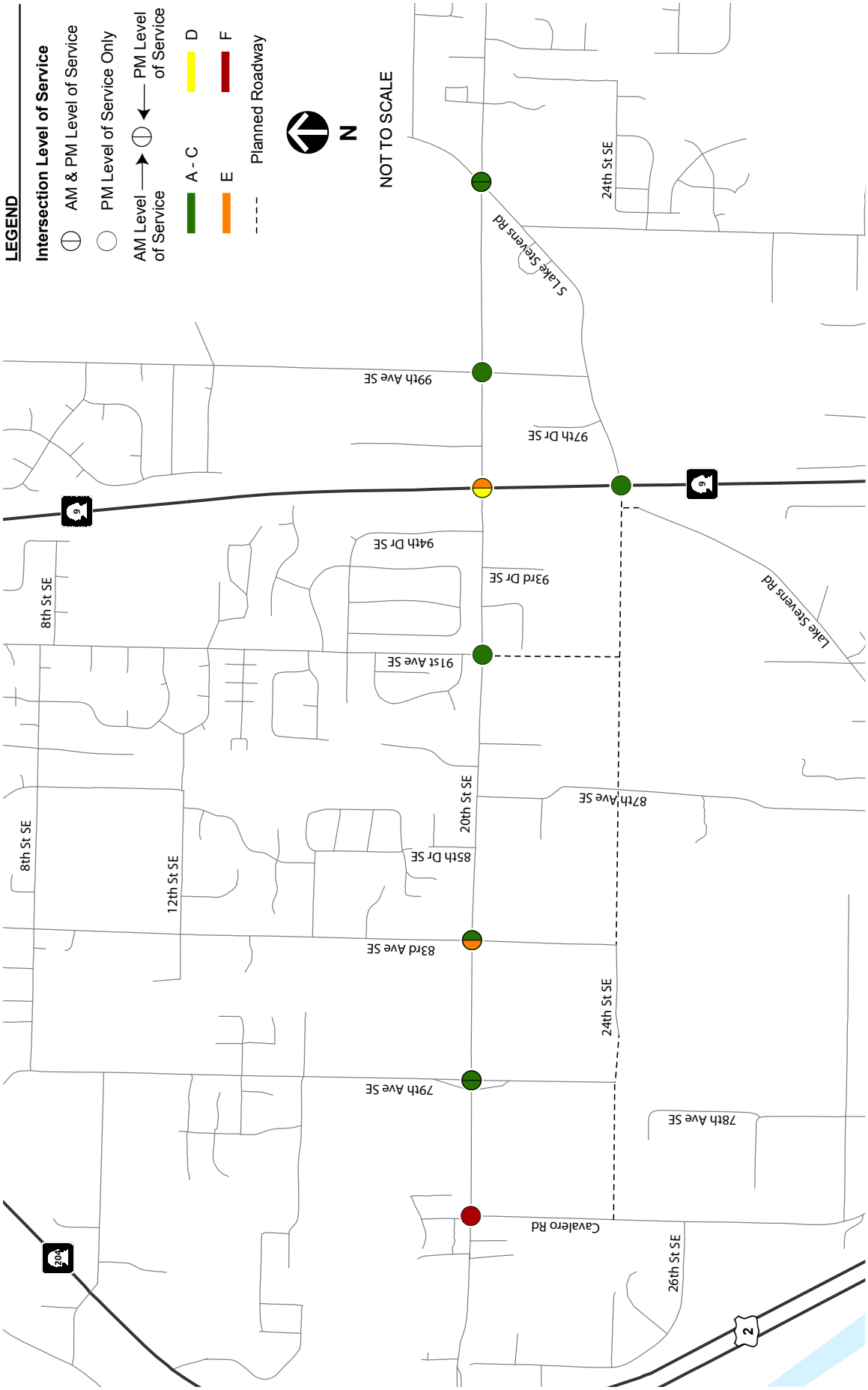


LEGEND

↱	Turn Lane
AM (PM)	Peak Hour Traffic Volume
1	Study Intersection
	Traffic Signal
STOP	Stop Sign
*	This intersection was not studied during AM Peak Hour
- - - -	Planned Roadway

Source: Fehr & Peers

Figure 3.8-13. Peak Hour Level of Service - Alternative 1 - No Action (2025)



Source: Fehr & Peers

Specifically, the Snohomish County travel demand model forecasts substantially more growth in AM and PM peak hour traffic along the US-2 westbound trestle than was estimated by WSDOT (eastbound traffic forecasts are very similar). As described earlier, the Snohomish County model was used for this project since it can more accurately forecast the turning movement volumes at the project's study intersections.

Pedestrian and Bicycle System

The *No Action Alternative* is not anticipated to interfere with any existing or planned pedestrian or bicycle facilities. Overall traffic growth would result in more pedestrian and bicycle interactions, and potential conflicts with vehicles, but this does not constitute an impact as defined above. This is the baseline condition under which the action alternative impacts will be assessed.

Transit

No transit routes are expected to be adversely affected under the *No Action Alternative*. Vehicle operations may be slower due to increased traffic congestion, but that does not constitute an impact as defined above. This is the baseline condition against which the action alternative impacts will be assessed. Transit vehicles that travel along SR-9 and 20th Street SE will travel slower when compared to existing conditions because of the increased background traffic growth.

Alternative 2 and Alternative 3 Analysis Results

This section presents the transportation findings related to *Alternative 2* and *Alternative 3*. The results are compared to those under the *No Action Alternative* to identify impacts related to the alternative subarea plans. Note that under these alternatives, several additional roadway projects were assumed to be constructed to support the higher levels of development along the corridor, consistent with the designs recommended in the Draft 20th Street Subarea Plan. The additional roadway projects include:

- 24th Street SE is extended between Cavalero Road and SR-9;
- 79th Avenue SE is be converted to a public road between 20th Street SE and 24th Street SE; and
- 91st Avenue SE would be extended south of 20th Street SE to 24th Street SE.

Roadway Operations

Tables 3.8-5 and 3.8-6 summarize the projected LOS for *Alternative 2* and *Alternative 3* in 2025 for the AM and PM peak hours. Figures 3.8-14 and 3.8-15 display the turning movements and LOS results for *Alternative 2*, and Figures 3.8-16 and 3.8-17 display the turning movements and LOS results for *Alternative 3*. The *No Action Alternative* is used as the baseline to identify impacts. Intersections with deficient operations under the *No Action Alternative* are shown in bold, and those with impacts are shaded.

Table 3.8-5. 2025 AM Peak Hour Level of Service – Alternatives 2 and 3

ID	Intersection	Traffic Control Device	No Action Alternative	Alternative 2	Alternative 3
2	20th Street SE and 79th Avenue SE	Signalized	C / 23	**D / 44**	**D / 40**
3	20th Street SE and 83rd Avenue SE	Signalized	**E / 56**	**F / 86**	**F / 81**
5	20th Street SE and SR-9	Signalized	**D / 53**	**F / 82**	**E / 78**
7	20th Street SE and S Lake Stevens Road	Signalized	C / 29	C / 33	C / 32

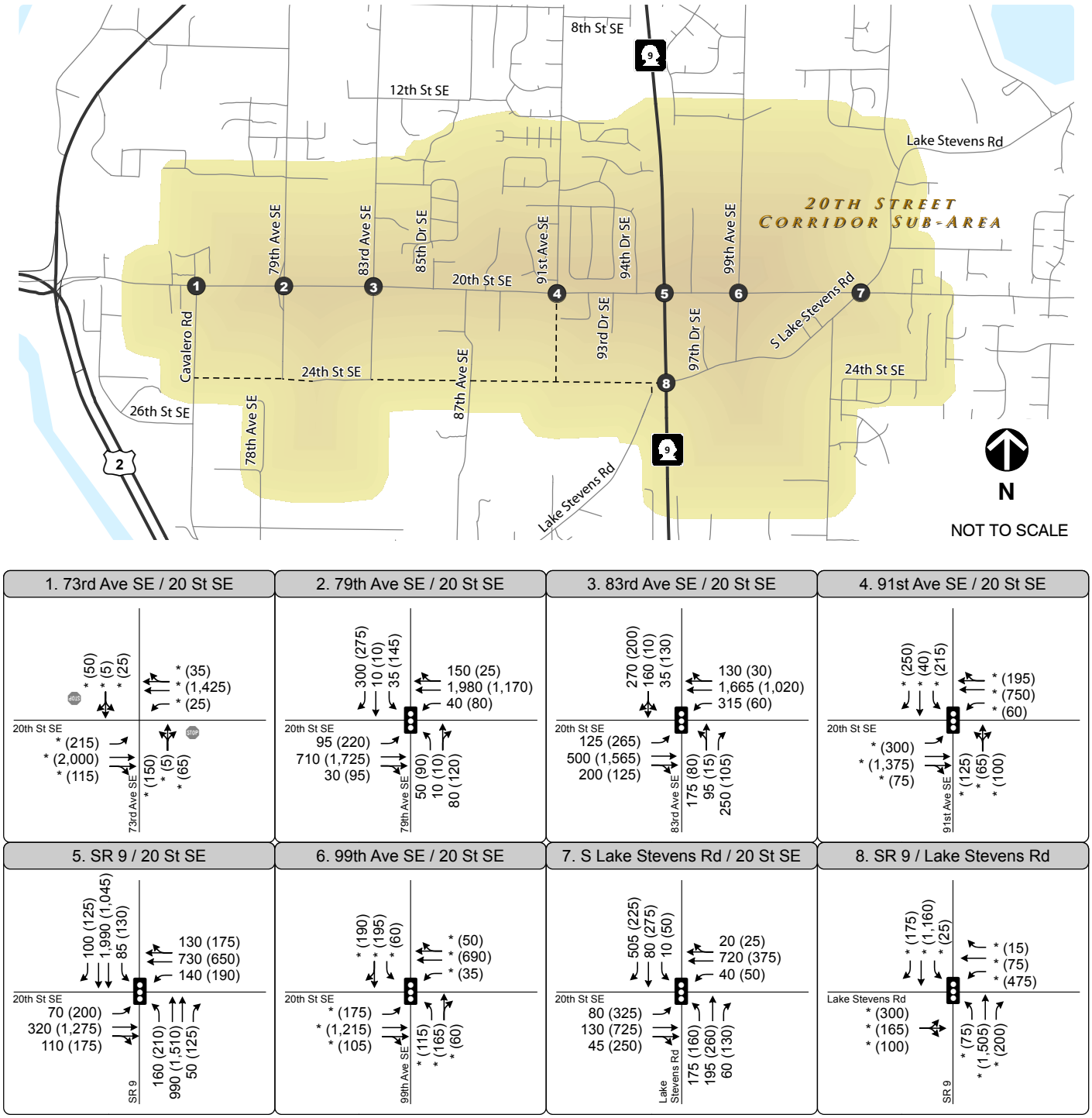
Source: Fehr & Peers, 2011.

During the AM peak hour, *Alternative 2* and *Alternative 3* would cause an impact compared to the *No Action Alternative*, at the following intersections:

- 20th Street SE and 79th Avenue SE;
- 20th Street SE and 83rd Avenue SE; and
- 20th Street SE and SR-9.

Increased volumes would cause the intersection of 20th Street SE and 79th Avenue SE to fall to LOS D conditions under both action alternatives. As was described in the *No Action Alternative* section, the intersection of 20th Street SE and 83rd Avenue SE operates poorly during the morning drop-off period at Cavalero Mid High School. The congestion is exacerbated by the additional volumes under *Alternative 2* and *Alternative 3*. Increased volumes at 20th Street SE and SR-9 would cause the intersection to worsen from LOS D under the *No Action Alternative* to LOS F under *Alternative 2* and LOS E under *Alternative 3*.

Figure 3.8-14. Peak Hour Volumes and Lane Configurations - Alternative 2 (2025)

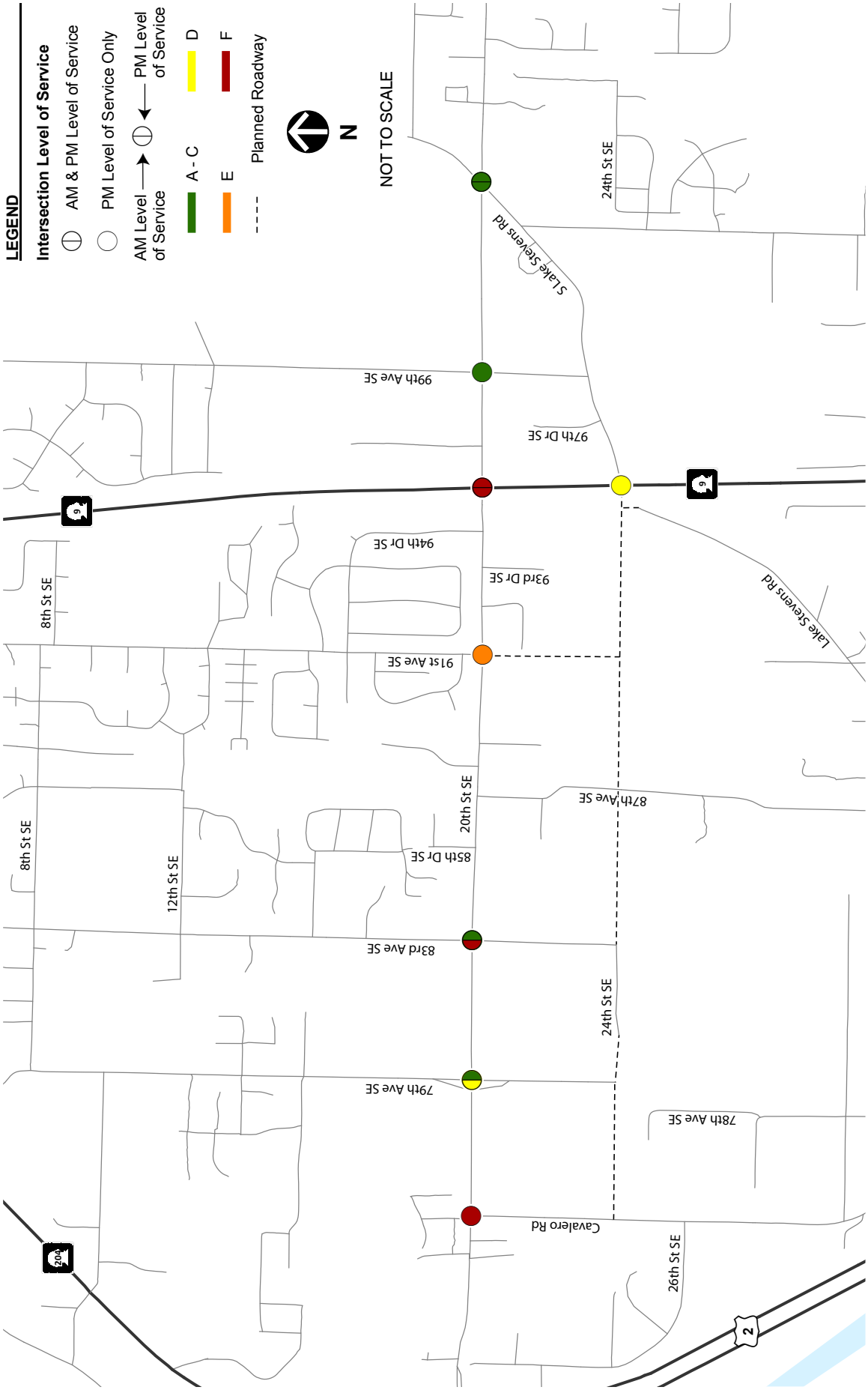


LEGEND

↱	Turn Lane
AM (PM)	Peak Hour Traffic Volume
❶	Study Intersection
	Traffic Signal
STOP	Stop Sign
*	This intersection was not studied during AM Peak Hour
- - - -	Planned Roadway

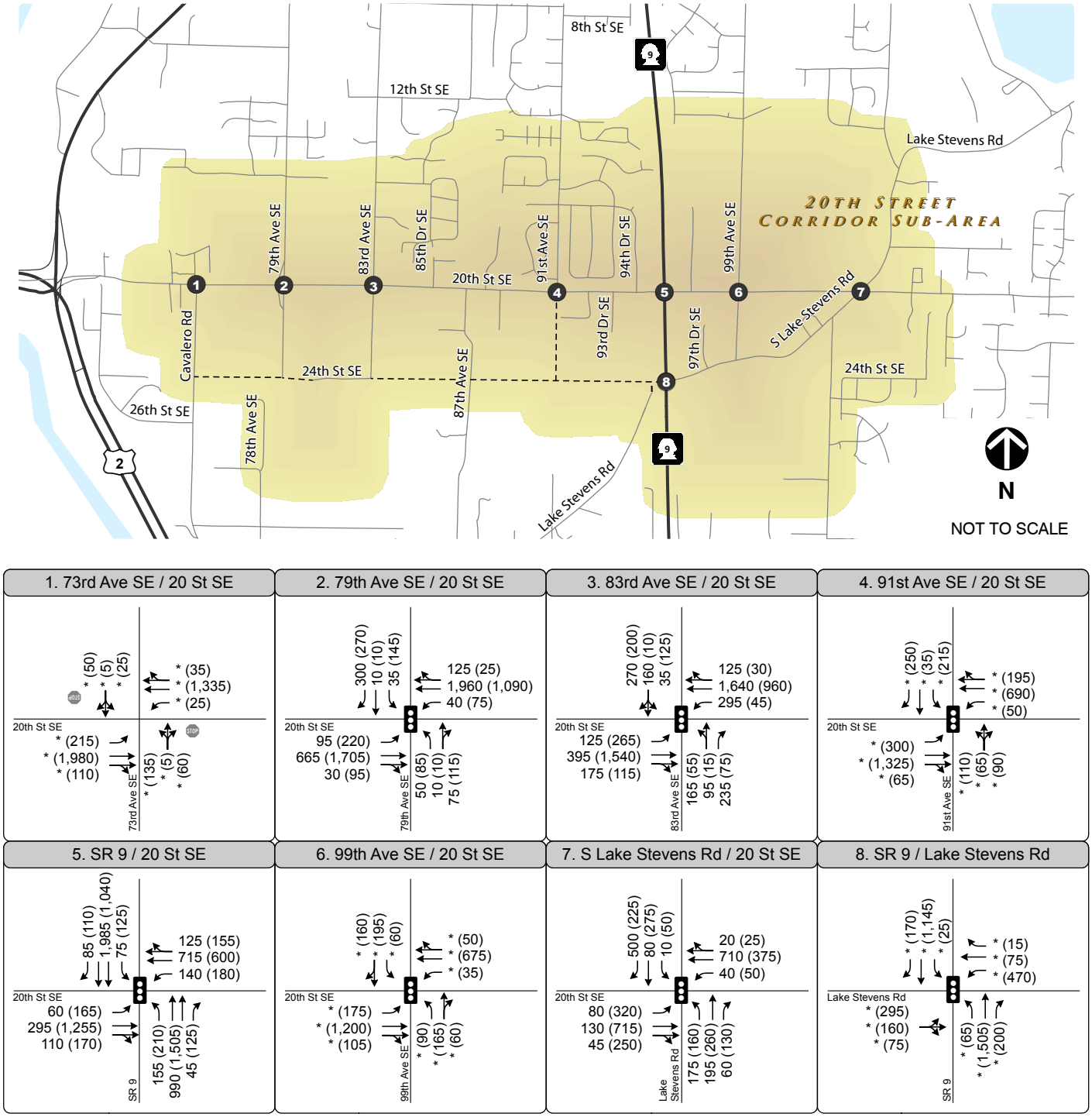
Source: Fehr & Peers

Figure 3.8-15. Peak Hour Level of Service - Alternative 2 (2025)



Source: Fehr & Peers

Figure 3.8-16. Peak Hour Traffic Volumes and Lane Configurations - Alternative 3 (2025)

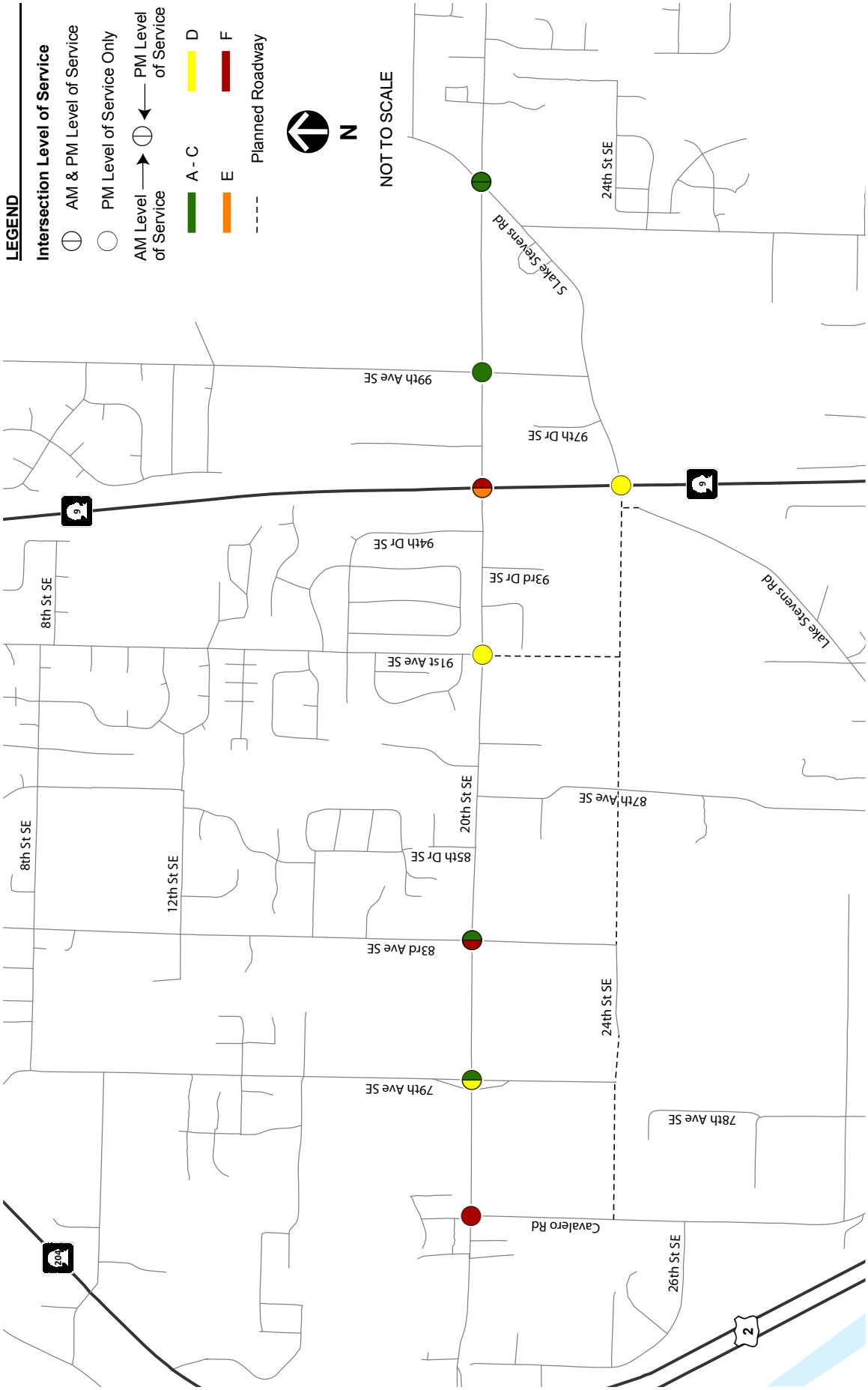


LEGEND

↗	Turn Lane
AM (PM)	Peak Hour Traffic Volume
1	Study Intersection
	Traffic Signal
STOP	Stop Sign
*	This intersection was not studied during AM Peak Hour
- - - -	Planned Roadway

Source: Fehr & Peers

Figure 3.8-17. Peak Hour Level of Service - Alternative 3 (2025)



Source: Fehr & Peers

Table 3.8-6. 2025 PM Peak Hour Level of Service

ID	Intersection	Traffic Control Device	No Action Alternative	Alternative 2	Alternative 3
1	20th Street SE and Cavalero Road	Side-street stop control	**F / >200**	**F / >200**	**F / >200**
2	20th Street SE and 79th Avenue SE	Signalized	B / 18	C / 23	C / 23
3	20th Street SE and 83rd Avenue SE	Signalized	C / 20	C / 31	C / 28
4	20th Street SE and 91st Avenue SE	Signalized	C / 29	**E / 57**	**D / 50**
5	20th Street SE and SR- 9	Signalized	**E / 73**	**F / 110**	**F / 103**
6	20th Street SE and 99th Avenue SE	Signalized	B / 15	C / 22	B / 19
7	20th Street SE and South Lake Stevens Road	Signalized	C / 29	C / 30	C / 30
8	SR-9 and South Lake Stevens Road	Signalized[1]	C / 34	**D / 44**	**D / 41**

Source: Fehr & Peers, 2011.
[1] This analysis assumes a full signal, although WSDOT has indicated they would prefer to keep the intersection unsignalized. See discussion in Transportation Network Assumptions section.

During the PM peak hour, *Alternative 2* and *Alternative 3* would cause an impact compared to the *No Action Alternative* at the following intersections:

- 20th Street SE and Cavalero Road;
- 20th Street SE and 91st Avenue SE;
- 20th Street SE and SR-9; and
- SR-9 and South Lake Stevens Road.

Delays at the already deficient intersections of 20th Street SE and Cavalero Road, and 20th Street SE and SR-9 would be exacerbated by increased volumes under *Alternative 2* and *Alternative 3*. Two intersections that operate acceptably under the *No Action Alternative* would fall to LOS D and E under *Alternative 2* and *Alternative 3*. At 91st Street SE, traffic on the minor approaches would experience the most delay as they wait to enter or cross 20th Street SE. At SR-9 and South Lake Stevens Road, the increased volumes would cause LOS to drop slightly to LOS D.

Note that the analysis results shown in Tables 3.8-4, 3.8-5, and 3.8-6 represent the LOS conditions using the traffic demand estimates from the Snohomish County travel demand model. While the model can forecast overall levels of demand for travel, this

tool is not very sensitive to bottlenecks that can meter (reduce) traffic flow. A good example of metering is the eastbound off-ramp from US-2 to 20th Street SE. The Snohomish County travel model forecasts 2,300 vehicles per hour of demand in the PM peak hour (under *Alternative 2*); however, only about 1,800 vehicles per hour can exit a freeway ramp under ideal conditions.

While it is appropriate to base the impact assessment on the more conservative (higher) demand volumes from the travel model, a limited assessment of the more realistic metered volumes was also performed using *Alternative 2* conditions. At the intersection of 20th Street SE and SR-9, the metered volumes entering eastbound 20th Street SE resulted in a reduction of 26 seconds of delay compared to the full demand volumes (110 seconds of delay). If the metered volumes coming northbound from the US-2/SR-9 interchange are also considered, the overall delay is reduced by 45 seconds, bringing the 20th Street SE/SR-9 intersection to LOS E operations.

Pedestrian and Bicycle System

Despite increased traffic volumes, neither *Alternative 2* nor *Alternative 3* is expected to interfere with any existing or planned pedestrian or bicycle facilities. In addition, the increased vehicle, pedestrian, and bicycle traffic would also increase the potential for conflicts between the modes. However, these additional conflicts would not necessarily result in unsafe conditions. Therefore, there would be no impacts to the pedestrian and bicycle system.

The Draft 20th Street SE Corridor Subarea Plan includes many improvements to the pedestrian and bicycle system, including new bicycle lanes, sidewalks, landscaping, and off-street trails. These improvements would substantially improve the quality of the pedestrian and bicycle system when compared to the *No Action Alternative*.

Transit

As was the case under the *No Action Alternative*, transit operations may be slower due to increased traffic congestion; however, this would not constitute an impact as defined previously. Therefore, no impacts to transit are expected.

Impact Timing and Thresholds

The results in Table 3.8-4 indicate that even with no change in zoning and land use in the 20th Street SE Corridor Subarea, the background growth in traffic will cause operations at several intersections in the study area to degrade to LOS D or worse conditions, falling below the current LOS C threshold set by the City. Those failing intersections include 20th Street SE and Cavalero Road during the PM peak hour, 20th Street SE and 83rd Avenue SE during the AM peak hour, and 20th Street SE and SR-9 during both the AM and PM peak hours.

The project team performed two types of analyses to evaluate when impacts would occur within the subarea. The first is a background traffic growth analysis using the existing conditions Synchro network and assuming the historic annual traffic growth rate (2000-2007) of 1.5 percent continues indefinitely. The second is an "existing-plus - project" analysis which determines if development of *Alternative 2* (the most intensive alternative for traffic generation purposes) would trigger any immediate traffic impacts. This evaluation is useful for planning purposes to determine how much development could be absorbed under existing conditions before a traffic impact is triggered and an improvement is needed (Intensive development of a subarea plan alternative is not likely to occur within a short time period). Three specific locations were evaluated: SR-9/20th Street SE, SR-9/South Lake Stevens Road, and the portion of 20th Street SE that currently has only three lanes (west of 91st Avenue SE). The results are discussed below.

SR-9 and 20th Street SE

The LOS at SR-9/20th Street SE would degrade to LOS D conditions (falling below the City's standard) if the background traffic increased 14 percent over existing conditions. Assuming historic traffic growth of 1.5 percent, this equates to an additional nine years of LOS C operations.

Under the "existing-plus-project" analysis scenario, approximately one-third of the *Alternative 2* development could be built before the SR-9/20th Street SE intersection would fall to LOS D. All of the anticipated *Alternative 2* development could be accommodated assuming WSDOT's LOS D standard (and no background growth in traffic).

Three Lane Section of 20th Street SE

The project team evaluated how long the current three-lane section of 20th Street SE west of 91st Avenue SE could adequately serve traffic along the corridor. Since the minor street traffic at Cavalero Road operates at LOS F even under existing conditions, it was assumed that intersection was improved (with either a roundabout or traffic signal). Under this assumption, the annual growth rate of 1.5 percent could still be served through the horizon year of 2025 (although the intersection at 83rd Avenue SE would continue to experience congestion in the AM school drop-off period).

Similarly, under the existing-plus-project analysis, all of the development anticipated for *Alternative* 2 could be accommodated without causing any of the three intersections along that stretch of roadway to fall below LOS C.

SR-9 and South Lake Stevens Road

The project team analyzed the intersection of SR-9/South Lake Stevens Road/24th Street SE to determine when the current unsignalized configuration would become inadequate to serve the growing background volumes. Assuming no additional

development within the 20th Street Corridor Subarea, the intersection could continue to operate at LOS C for approximately five years. Intersection operations would not fall to LOS E until approximately the horizon year of 2025.

The existing-plus-project evaluation indicates that the unsignalized intersection would fall to LOS D after building approximately one-fifth of the *Alternative 2* development. Since the majority of the traffic volumes at this intersection would be associated with the potential retail development along the west side of SR-9 between 20th and 24th Streets SE, this result can also be translated to assume that only about a fifth of the potential retail development assumed at this location could be constructed before the intersection would fall to LOS D conditions. The intersection would fall to LOS E after building approximately one-third of the *Alternative 2* development. The intersection would meet the PM peak hour signal warrant after constructing approximately one-fifth of the *Alternative 2* development.

Impact timing with the SR-9/South Lake Stevens Road intersection signalized was also considered. Again assuming historic background growth, the signalized intersection would continue to operate at LOS C through the horizon year of 2025. Under the existing plus project analysis, the signalized intersection would operate at LOS B through the 2025 horizon year.

In summary, the findings related to the timing of impacts at the three locations considered in the background (no development along the 20th Street SE Corridor) traffic growth analysis are as follows:

- If left unsignalized, SR-9/South Lake Stevens Road would fall to LOS D operations in five years, and to LOS E in fourteen years.
- If signalized, SR-9/South Lake Stevens Road would operate at LOS C through the horizon year.
- SR-9/20th Street SE would fall to LOS D conditions in nine years, where it would remain through the horizon year. If 20th Street SE/Cavalero Road is signalized, the three-lane section of 20th Street SE would operate acceptably through the horizon year.

The findings related to the timing of impacts at the three locations considered in the existing-plus-project analysis (assuming no background traffic growth).

- If left unsignalized, SR-9/South Lake Stevens Road would fall to LOS D after one-fifth of the *Alternative 2* development is built, and to LOS E after one-third of the *Alternative 2* development is built. The intersection would meet the PM peak hour signal warrant after constructing approximately one-fifth of the *Alternative 2* development.

- If signalized, SR-9/South Lake Stevens Road would operate acceptably under full development of *Alternative 2*.
- SR-9/20th Street SE would fall to LOS D conditions after one-third of the *Alternative 2* development is built. Full development of *Alternative 2* could be accommodated without triggering LOS E conditions. If 20th Street SE/Cavalero Road is signalized, the three-lane section of 20th Street SE would operate acceptably under full development of *Alternative 2*.

Perhaps the most important finding of this impact timing analysis is that a relatively small amount of development can occur near the SR-9/South Lake Stevens Road/24th Street SE intersection before some sort of improvement (traffic signal or roundabout) would be required. The earlier analysis indicated that it would be impractical to add commercial development at this location without providing improved access via the 24th Street SE intersection since access restrictions would degrade operations at the already congested SR-9/20th Street SE intersection. In addition, it seems unlikely that many businesses would be satisfied with limited access from SR-9.

The results above indicate that some sort of improvement would be required at this intersection with or without development in the 20th Street SE Corridor Subarea. Any improvements at this intersection should be a collaborative effort between the City and WSDOT.

3.8.3 Mitigation Measures

This section identifies mitigation measures and strategies that are required by state or local regulations and additional measures that could be implemented to reduce the magnitude of identified impacts.

Concurrency

Concurrency is intended to ensure that improvements are planned and constructed in phase with (i.e., within six years of) projected growth. It requires adoption of level of service standards to gauge performance of the transportation system, identification of improvements necessary to maintain the adopted level of service, and a system to ensure that concurrency is maintained. If the trips generated by a development will cause a facility to fall below the adopted LOS standard, the local government may deny permits for the project, change the LOS standard, or modify land use. Changes may be made to a development proposal to meet the concurrency requirements, such as reducing project size or employing travel demand management to reduce the number of trips generated.

Per the Growth Management Act, concurrency does not apply to highways of statewide significance, such as SR-9. Lake Stevens' adopted concurrency management system, set forth in LSMC 14.110, identifies three options an applicant may select to maintain

concurrency when mitigation is required: (1) reducing the size of the development; (2) delaying the development until needed improvements are provided by the City or others; or (3) constructing the needed facilities.

Level of Service Threshold

The City has adopted LOS C as its PM peak hour standard for all areas except the downtown. In view of the level of growth encouraged by the subarea plan, and the extent of improvements that would be required to achieve this LOS, it may not be financially feasible to maintain the current level of service threshold (LOS C) at all intersections within the study area (Fehr & Peers, 2011).

In addition, poor traffic conditions on state highways (notably US-2 and SR-9) constrain the ability of Lake Stevens to manage traffic congestion in the 20th Street SE Corridor since there are no plans to address some of the regional traffic congestion issues.

Therefore, it is recommended that the City amend its threshold for signalized intersections in designated centers and mixed-use areas to strive for a goal of LOS E. In addition, it should be acknowledged that some intersections will operate at LOS F during peak travel periods and these intersections should be exempted from the LOS E goal. For unsignalized intersections, it is recommended that an intersection be considered deficient if it falls below LOS E operations and meets a signal warrant.

This proposed level of service will be more affordable and practical and will support Comprehensive Plan policies related to centers. It is also in line with the typical traffic activity seen in economically vibrant areas. If the recommended LOS thresholds are adopted, then only the following intersections would be considered deficient or impacted:

- 20th Street SE and Cavalero Road under *all alternatives* during the PM peak hour;
- 20th Street and 83rd Avenue SE under *Alternatives 2* and *3* during the AM peak hour; and
- 20th Street SE and SR-9 under *Alternative 2* during the AM and PM peak hours, and under *Alternative 3* during the PM peak hour

Specific mitigation measures for these intersections are discussed in the next section.

LOS: What Does it Really Mean?

When considering a change to a LOS policy, it is important to consider what LOS is actually measuring. Based on the *Highway Capacity Manual*, LOS is a measure of the traffic conditions during the **peak 15 minutes of the peak hour** during a typical weekday. Therefore, when LOS E is reported in the tables above, it suggests that there will be traffic congestion during the busy commute periods; however, for the vast majority of the day the location will operate with little congestion.

While it is important to manage traffic congestion, many cities and counties have come to the conclusion that providing a relatively free-flow standard of LOS C is too expensive, requires too much right-of-way, and leads to wide highways that are not consistent with the

Intersection-Specific Mitigation Measures

20th Street SE and Cavalero Road

It is recommended that a signal or roundabout be added to the intersection of 20th Street SE and Cavalero Road. Future traffic volumes would fulfill the requirements for a peak hour signal warrant under all three land use alternatives. Under *Alternative 2* during the PM peak hour, signalizing the intersection would improve operations to LOS C. Assuming reduced eastbound traffic due to the metering effects of the I-5/US-2 and US-2/SR-204 interchanges, the roundabout would function at the threshold level of LOS E. See the Design Alternatives discussion below for additional detail on roundabouts.

20th Street SE and 83rd Avenue SE

This intersection would operate at LOS F under *Alternative 2* and *Alternative 3* during the AM peak hour. Adding a southbound right turn pocket would improve the intersection's overall LOS to D with 52 seconds of delay. If a left turn pocket could be added to the northbound approach, delay would decrease by an additional 12 seconds, although overall LOS would still remain at D. A dual-lane roundabout would also work at this intersection if the metered traffic volumes are assumed. See the Design Alternatives discussion below for additional detail on roundabouts.

20th Street SE and SR-9

This intersection is under the jurisdiction of WSDOT, not the City of Lake Stevens. While any mitigation measures would likely arise as part of the SR-9 Corridor Planning Study (WSDOT, 2011), adding dual left turn lanes to all approaches would result in LOS E (80 seconds of delay) at this intersection. To achieve additional improvements in LOS would require either additional lanes on SR-9, grade separation, or an unconventional intersection, such as a "continuous flow intersection" (CFI). It is important to note, however, that more substantial improvements at this intersection may not be necessary until SR-9 is widened to the south or an additional off-ramp lane from US-2 to 20th Street SE is added, since these bottlenecks will limit the total volume of traffic entering this intersection.

Design Alternatives

The results presented above assume that the five-lane configuration currently in place on 20th Street SE east of 91st Avenue SE will be continued westward by 2025. The City is also interested in exploring a four-lane option with roundabouts, so the project team conducted tests (using the most intense land use alternative) at the intersection of 20th Street SE and 79th Avenue SE which has the highest eastbound volumes on that section of roadway.

Two sets of volumes were analyzed. First, the demand volumes estimated by the Snohomish County travel model, as well as a set of reduced eastbound volumes that are more realistic given the metering effect of the US-2/I-5 and US-2/SR-204 interchanges to the west. Using the demand volumes, a roundabout would fail regardless of whether it had two lanes on the eastbound and westbound legs and one on the northbound and southbound legs or two lane approaches on all legs. However, using the reduced eastbound volumes with a two-lane approach on each leg of the roundabout, provides acceptable LOS with the worst movement (southbound right turns) having LOS E and the eastbound approach having LOS D.

If there is substantial development along 20th Street SE, it is recommended that access points be provided more frequently than the current quarter-mile spacing. Additional roundabouts could be built between minor streets to access driveways with an approximate spacing of 660 feet. In addition, right-in/right-out intersections/driveway access could be provided with a minimum spacing of 300 feet from adjacent intersections.

Based on the findings above, roundabouts are a viable traffic management solution for the 20th Street SE corridor between Cavalero Road and 91st Avenue SE. Some key findings and recommendations related to roundabouts are summarized below:

- To provide adequate operations, any roundabouts at the study intersections should be designed as full two-lane roundabouts with the following lane configurations:
    - One shared through-left and one shared through-right turn lane on the east/west legs; one left and one shared through-right lane on the north/south legs.
    - Right-of-way reservation for an eastbound to southbound right turn bypass lane may be prudent at the 91st Avenue SE intersection to facilitate the potential for higher traffic volumes related to a retail center near the intersection of SR-9 and 20th Street SE.
- Roundabouts between the study intersections could likely have single-lane north/south legs, although a more detailed traffic study is recommended prior to construction of any other roundabouts.

- As roundabouts tend to balance delays more evenly than signals, the queues on the busy 20th Street SE movements are likely to be longer than would be the case with traffic signals. However, overall intersection delays tend to be less for the majority of the day when compared to traffic signals.
- Queues on 20th Street SE could reach as long as 800 feet during high demand days, although the average queue would be substantially shorter. Note that roundabout queues tend to be "rolling" queues where vehicles travel slowly rather than the "stop-and-start" queues associated with traffic signals.
- The roundabouts would likely fail if a two-lane off-ramp is constructed from eastbound US-2 to 20th Street SE.
- AM peak hour congestion merging onto US-2 from 20th Street SE may cause queues to spill back into the Cavalero Road roundabout. To keep the roundabout from becoming blocked, metering lights may ultimately be necessary.

Additional Mitigation Measures

In addition to the capacity enhancing projects described above, it is recommended that the City of Lake Stevens explore the potential for other programmatic mitigation measures identified below.

Impact Fees

The improvements described above require a substantial investment of money to implement (Fehr & Peers, 2011). To generate the funds necessary to implement the mitigation measures described above, it is recommended that a traffic impact fee be established. This fee could be exclusive to the 20th Street SE Corridor Subarea, or could be part of a citywide impact fee program.

Given that the majority of the traffic impacts would occur on the state highway system, it is recommended that if any impact fee program is established, the City of Lake Stevens enter an interlocal agreement with WSDOT. The interlocal agreement would allow the City and WSDOT to share fee revenues and help construct the improvements described above.

Transportation Benefit District

Formation of a Transportation Benefit District (TBD), as authorized by RCW 36.73.120, is another approach that could be used to help finance transportation improvements. While more complex to establish and administer compared to traffic impact fees, formation of a TBD would enable the City to assess additional fees and charges within the district, including a supplemental sales tax. A TBD could apply citywide or specific to the 20th Street SE Corridor, and could be used in conjunction with a traffic impact fee.

Transportation Demand Management
Transportation demand management (TDM) strategies include mandatory commute trip reduction programs and enhanced transit service. These measures have proven to be effective at reducing trip generation even in low-density areas such as Lake Stevens (California Air Pollution Control Officers Association, 2010). While these measures will help to reduce overall trip generation and vehicle congestion impacts, their effectiveness relative to the magnitude of the congestion levels in the study area would be small.

3.8.4 Significant Unavoidable Adverse Impacts

As described above, the increased traffic volumes caused by the action alternatives (*Alternative 2* and *Alternative 3*), lead to increased delay at the 20th Street SE/SR-9 intersection. Since WSDOT has not yet defined its plan to improve traffic conditions along SR-9, specific mitigation measures cannot be identified. Given that WSDOT is actively planning to improve the SR-9 corridor and some level of mitigation is possible (although full improvement to provide LOS D conditions is unlikely because of the high costs), impacts are not necessarily inevitable or entirely unavoidable.

Similarly, Lake Stevens does not own or control the intersection of South Lake Stevens Road/24th Street SE/SR-9. While the analysis in this document showed that a traffic signal would operate acceptably at this location, this improvement has not been approved by WSDOT and there is no certainty that it will be implemented. If a full access intersection is not provided at this location, turning movements will be added to the 20th Street SE/SR-9 intersection, further exacerbating poor operations at that location.

3.9 PUBLIC SERVICES

3.9.1 Affected Environment

Police Service

The Lake Stevens Police Department (LSPD) offers multiple law enforcement services to Lake Stevens' business owners, residents, and visitors. LSPD provides law enforcement services such as patrol, criminal and collision investigation, along with marine patrol, traffic and city code enforcement. In addition, LSPD provides School Resource Officers to Lake Stevens School District, crime prevention services such as Neighborhood Crime Watch and animal control services. The department also contracts some of its services, including 911 dispatch, jail, and fleet maintenance.

From January 1, 2010 to December 31, 2010, the Police Department responded to 30,764 incidents. This was 9,861 more incidents than in 2009, following the Southwest Annexation. During the same 2009 to 2010 period reported collisions increased from 453 to 727 and DUIs increased from 342 to 456. The average response time (call entry to police arrival) from January 1, 2011 to May 31, 2011 for emergency calls was less than two minutes, for high-priority calls less than seven minutes, and for low-priority calls less than 12 minutes.

The City's adopted goal for officer coverage is to strive to maintain a ratio of one police officer per 750 people, understanding that as population increases and efficiencies increase, a lower ratio may be permitted provided that an acceptable level of service is maintained.

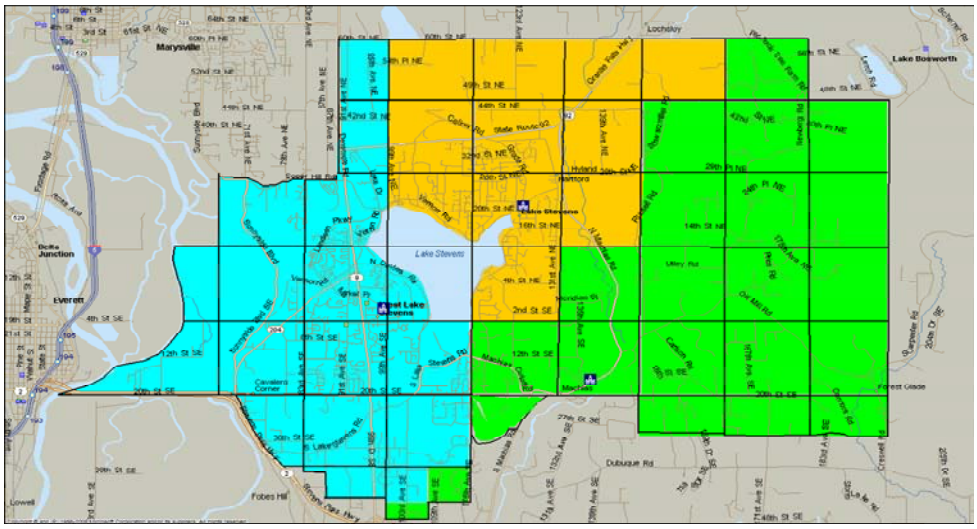
The City constructed the police department building, located at 2211 Grade Road, in 2005. The City took over law enforcement needs of the 20th Street SE Corridor area following the Southwest Annexation on December 31, 2009.

Fire & Emergency Medical Services

Lake Stevens Fire provides Fire, Emergency Medical Services (EMS), and Rescue services to an estimated 40,346 citizens in central Snohomish County. District boundaries cover approximately 42 square miles and include the City of Lake Stevens and several unincorporated communities and neighborhoods (Lake Stevens Fire, September 16, 2010 & Personal Communication). Figure 3.9-1 illustrates district boundaries, fire station locations, and related response areas. As of 2011, Lake Stevens Fire has 53 employees. District policy requires that at a minimum eight firefighters be on duty at any time. Currently, Lake Stevens Fire averages 11 firefighters and other emergency personnel on duty district wide. Lake Stevens Fire also provides fire marshal service to the City through an interlocal agreement executed in 2007.

Figure 3.9-1 Lake Stevens Fire Boundaries Stations and Primary Response Area

Station Primary Response Areas



Station 81 | Station 82 | Station 83

Lake Stevens Fire utilizes specialized apparatus in response to Fire, EMS, and Rescue calls. The Department uses class "A" fire engines outfitted with firefighting equipment in accordance with National Fire Protection Association standards. All fire engines are also equipped with medical equipment and supplies. EMS resources consist of two Advanced Life Support paramedic units and three Basic Life Support units. Lake Stevens Fire also has a 24-foot fire rescue boat moored at the northern end of Lake Stevens Lake (Lake Stevens Fire, September 16, 2010).

Lake Stevens Fire has an administration office and a conference center located at South Lake Stevens Road and 20th Street SE in the subarea; a training facility located in Machias; and three fire stations: Station 81 (12409 21st Street NE, Lake Stevens 98258); Station 82 (9811 Chapel Hill Road, Lake Stevens 98258); and Station 83 (13717 Division Street, Snohomish 98290).

In 2006, Lake Stevens Fire adopted its current level of service objectives for suburban and rural response times. According to the Lake Stevens Fire 2010 Annual Report, the adopted suburban response/travel time objective for single engine responses to residential and commercial fires is four minutes. In 2010, response time ranged from approximately four minutes to just under seven minutes depending on the type of single engine response. Comparatively, the suburban level of service for full deployments with multiple engines, and a combination of rescue, aid, and medic unit is eight minutes – the actual response time ranged from nine to 10 minutes.

Lake Stevens Fire has responded to 1,557 calls through May 18, 2011. A sample of 87 calls from May 12, 2011 through Wednesday May 18, 2011 shows that 71.26 percent of the calls (62 calls) were for EMS services (Lake Stevens Fire website June 2, 2011). Comparatively, in 2010, Lake Stevens Fire responded to 4,317 incidents. The majority of calls were also for EMS related (Lake Stevens Fire, Personal Communication 2011). Station 82 responded to a majority (45.50 percent) of dispatched calls in the district. Table 3.9-1 illustrates the 2010 allocation of dispatched calls from Station 82.

Table 3.9-1 2010 Dispatched Call Service Type for Station 82

Station 82 Service Type	Dispatched Calls
EMS	1525
Fire	168
Rescue	2
Service/Other	269
Total	**1964**

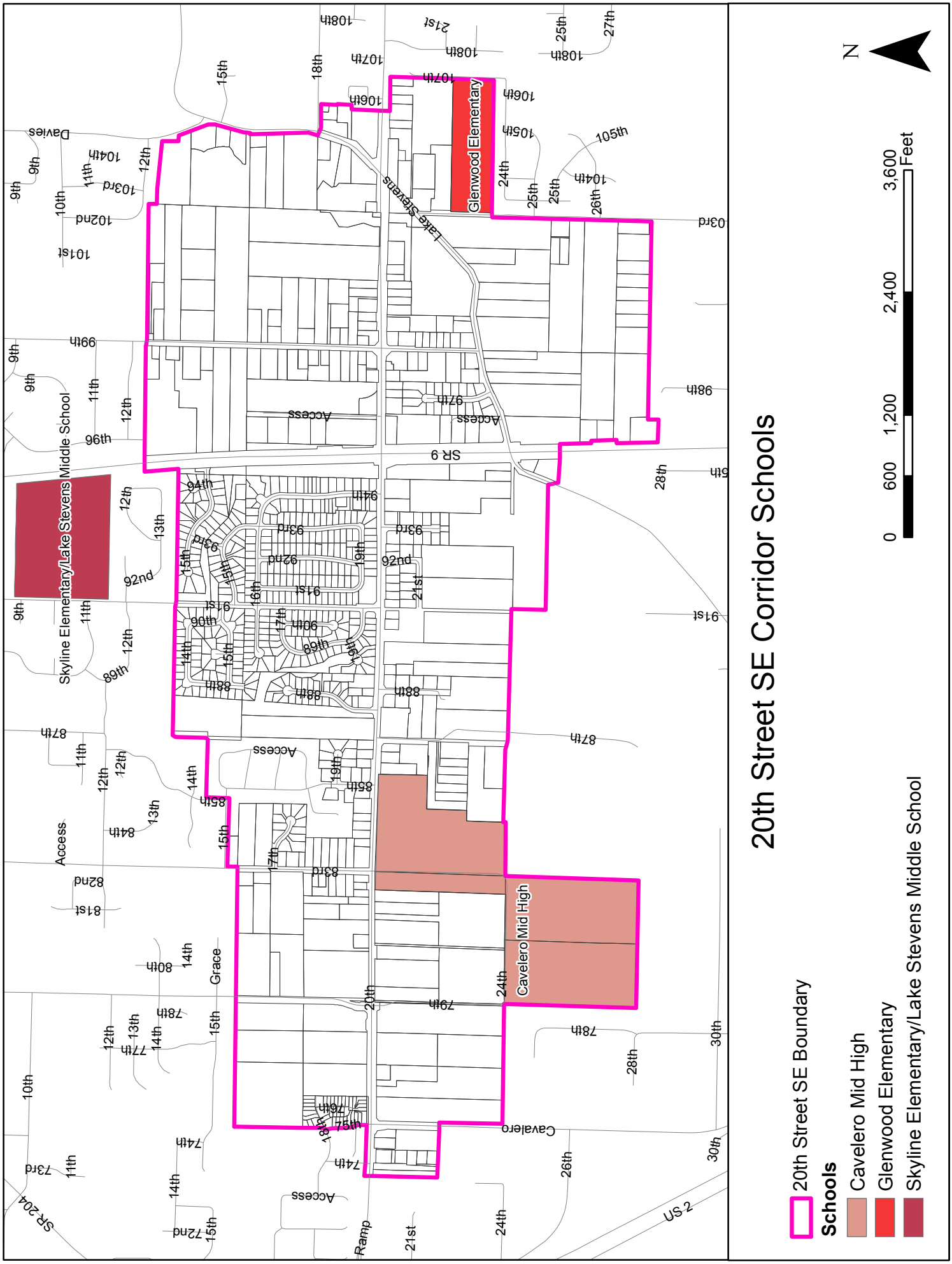
Source: Lake Stevens Fire District, 2011

Public Schools

The 20th Street SE Corridor Subarea is located within the Lake Stevens School District #4 boundaries, as illustrated in Figure 3.9-2. The Snohomish School District #201 abuts the southern boundary of the study area at the intersection of 28th St SE and 78th Ave SE. The Lake Stevens School District covers approximately 37 square miles and encompasses most of the City of Lake Stevens, portions of unincorporated Snohomish County, and a small portion of the City of Marysville. The Snohomish School District encompasses a wider boundary of approximately 165 square miles, but only includes a small portion of the Lake Stevens UGA.

Two public schools from the Lake Stevens School District are located within the 20th Street SE Corridor study area: Cavelero Mid High School (located south of 24th Street SE); and Glenwood Elementary School (located south of South Lake Stevens Road and directly east of 103rd Ave SE). Skyline Elementary and Lake Stevens Middle School share a parcel located north of the subarea boundary and west of SR-9, but they serve much of the 20th Street SE Corridor.

Figure 3.9-2. Lake Stevens School District Boundaries



Cavelero Mid High School has eighth and ninth graders. Lake Stevens Middle School has sixth and seventh graders. Glenwood and Skyline elementary schools have kindergarten through fifth graders. Cavelero Mid High School also houses Prove High School in one wing of the school. According to Public School Review, Cavelero Mid High School has 1249 students and Lake Stevens Middle School has 535 students (www.publicschoolreview.com, May 2011). Glenwood Elementary School has 615 students, while Skyline Elementary has 533 students. The student capacity for Cavelero is 1,418 students and Lake Stevens Middle School is 684 students (924 with portables). The capacity at Glenwood is 513 students to 621 students with portables (Lake Stevens School District No.4 Capital Facilities Plan, 2010). The capacity of Skyline is 513 students (620 with portables). The nearest schools in the Snohomish School District to the study area are Centennial Middle School and Machias Elementary.

The Lake Stevens School District estimates its student population to increase nearly 39 percent by 2025. It also projects that the elementary, mid high, and high schools will be over capacity by 2015. Table 3.9-3 identifies the current capacity and projected 2025 enrollment for the Lake Stevens School District.

Table 3.9-2 Lake Stevens School District Capacity

School Level	2011 Capacity	Projected 2025 Enrollment
Elementary	3,289	4,581
Middle	1,250	1,742
Mid High	1,306	1,819
High School	1,660	2,313
Total	**7,505**	**10,455**

Source: Lake Stevens School District No.4 Capital Facilities Plan, 2010

The Lake Stevens School District estimates each new single-family home will generate 0.690 students and that each new two-plus bedroom multifamily unit will generate 0.317 students (Lake Stevens School District No.4 Capital Facilities Plan, 2010). Table 3.9-4 summarizes the estimated student generation for the Lake Stevens School District.

Table 3.9-3 Lake Stevens School District Student Generation Rates

	Elementary	Middle	Mid High	High School	Total
Single Family	0.356	0.120	0.090	0.124	0.690
Multiple Family, 1 Bedroom	0.000	0.000	0.000	0.000	0.000
Multiple Family, 2+ Bedroom	0.213	0.040	0.048	0.016	0.317

Source: Lake Stevens School District No.4 Capital Facilities Plan 2010

Parks & Recreation

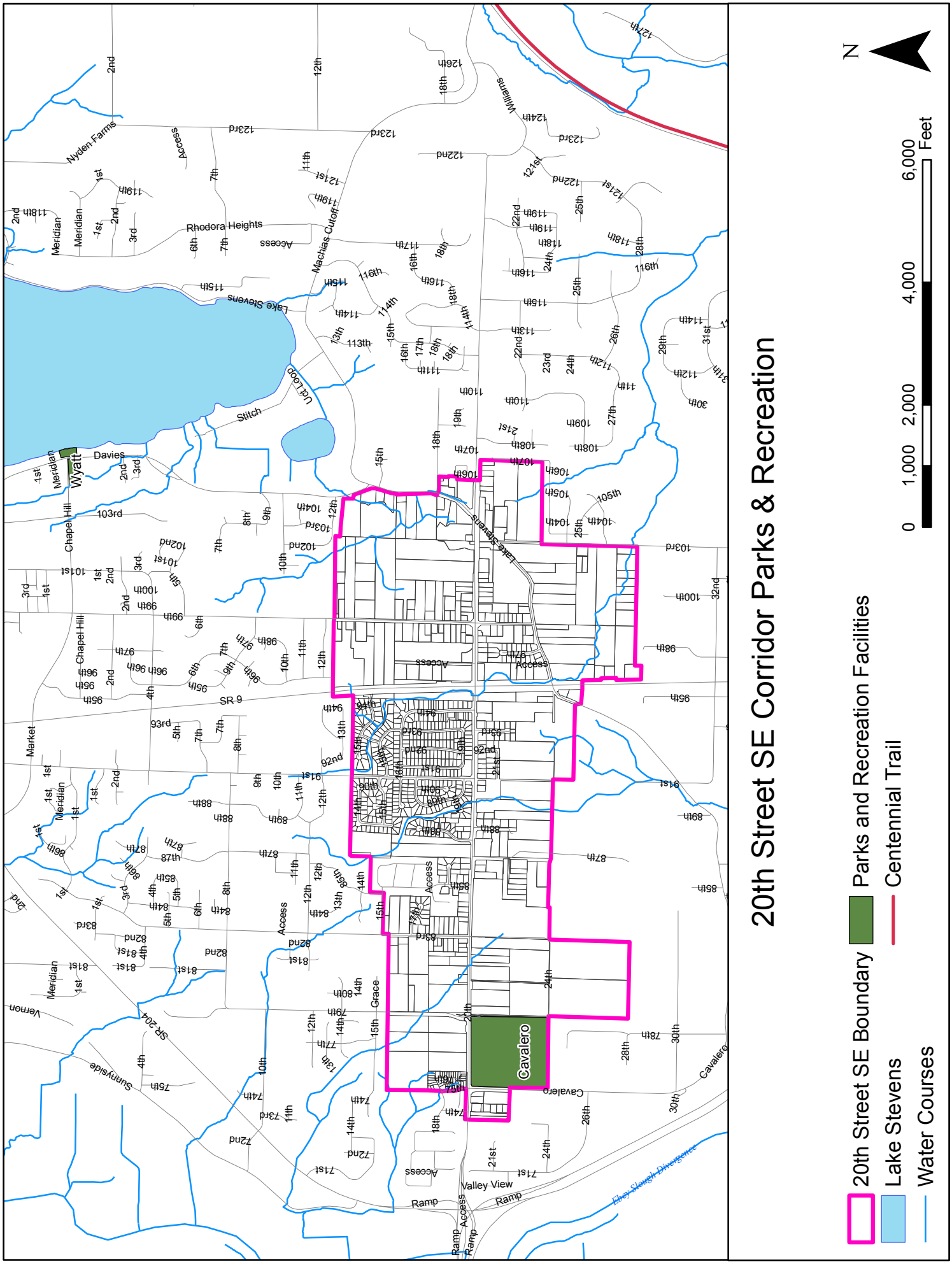
According to the Parks and Recreation Element of the Comprehensive Plan (last updated in 2006), the 2009 annexation of the Southwest UGA was expected to increase the City's population by over 10,000 residents. Including additional park property purchased by the City and County since 2006, there are currently almost 195 acres of parks, trails and open space within city limits or nearby in the Lake Stevens Urban Growth Area or unincorporated County area. These facilities translate to a current level of service of 6.9 acres of recreational land per thousand population. The City's adopted level of service is 7.5 acres per thousand. Therefore, there is a current need for an additional 15.5 acres of recreational land citywide to meet the standard.

Figure 3.9-3 shows the location of parks within or near the study area. These include Cavalero Hill Community Park, Wyatt Regional Park, and the Centennial Trail, all of which are county facilities. These facilities are described below.

Cavalero Hill Community Park, located in the western portion of the study area, is just over 35 acres. This park is largely undeveloped, with the majority of the site covered in grass meadows; however, the property currently features a 3-acre off-leash dog area and passive open space. According to the *Snohomish County Comprehensive Park & Recreation Plan*, the master plan for Cavalero Hill Community Park will include a variety of amenities, including: ball fields, open play area, walking trails, picnic shelters and open tables, children's play area, restroom facility, basketball and volleyball courts, open air amphitheater, interpretive signage, and parking. These improvements are not funded and timing is uncertain.

Wyatt Regional Park is located approximately a mile northeast of the study area on the southwestern shoreline of the lake near Davies Road and Chapel Hill Road. Wyatt Regional Park is a fully developed water-oriented three-acre park that provides swimming, fishing, and boat launch amenities. It also includes picnic, restroom, and parking facilities.

Figure 3.9-3. Park Facilities



The Centennial Trail, located about a mile east of the study area along Machias Road, is a 12-foot wide multi-use trail for walkers, bike riders, and horse riders. Currently, the developed portion of the trail runs from Arlington to Snohomish over 17 miles – 1.3 miles are within the City. According to Snohomish County, over 200,000 users enjoy the Centennial Trail annually (2007). The County plans to extend the trail north to Skagit County and southeast to King County.

Aside from these county facilities, there are additional recreational opportunities available at the schools in the area and at park facilities located throughout Lake Stevens. In addition, Frontier Heights Subdivision, located north of SR204 and west of SR9, owns a 7 acre park under the power lines, which has been offered to the City for future purchase and use.

3.9.2 Impacts of the Alternatives

The demand for public services (e.g., police, fire/EMS, schools, and parks and recreation) is typically estimated using population-based standards or ratios, i.e., an additional increment of population (usually 1,000 people) will generate a need for an additional increment of service and/or facilities, based on a locally adopted standard for providing the service. The ratio may be expressed, for example, as service personnel per 1,000 population, or additional acres of land per 1,000 population. A service standard may also be expressed as a response time when describing emergency responses, such as the Lake Stevens Fire District uses.

The analysis in the Draft EIS relies on adopted levels of service identified in existing school district and fire district capital facilities plans. Population-based ratios are used to identify police coverage (officers per 1,000 population), and parks and open space land (acres per 1,000 population).

Impacts of the alternatives to public services are generally proportionate to the amount, and to a lesser extent the type, of growth. In general, residential development typically generates greater demand for services than commercial or retail development. While commercial uses add to demand incrementally, employees do not typically generate significant demand for police and fire service or use local parks or schools extensively. If employees also live within the City, then the increase in demand correlates to population growth.

To avoid repetition, the impacts discussion provides an overview of the common types of impacts that could occur, and then identifies any difference in the degree of impacts among the alternatives. The *No Action Alternative* entails increases to existing population and employment based on current growth trends. Increases for *Alternative 2* and *Alternative 3* reflect the net change above the *No Action Alternative* based on different growth assumptions.

As discussed in Section 3.5 of the Draft EIS (Population, Housing & Employment), the population growth associated with all alternatives, including the *No Action Alternative* is within the City's 2025 population target and does not reflect an increase in overall citywide population growth. In contrast, employment growth under the subarea plan will exceed 2025 employment targets. Table 3.9-4 shows the projected subarea population, under the different alternatives as a portion of the projected citywide growth, while Table 3.9-5 shows the projected employment growth for the different alternatives using the same criteria. To the extent that projected growth coincides with Comprehensive Plan targets, population and employment increases and associated levels of services may not require additional mitigation measures. If growth specific to the subarea results in growth beyond anticipated levels and the demand for public services also increases above the adopted level of service project-level mitigation or revisions to existing capital facilities plans will need to occur.

Table 3.9-4 20th Street SE Corridor Population Growth Assumptions[1]

20th Street SE Corridor Population Growth			Subarea as Portion of Citywide Population Growth				
Alternative	Low	High	Total Low	Total High	Change Low	Low % of Target	High % of Target
Alternative 1	1,722	3,444	29,791	31,513	16,334	45.17	53.63
Alternative 2	2,600	2,900	30,669	30,969	15,456	49.60	51.06
Alternative 3	3,500	4,000	31,569	32,069	14,556	53.89	56.17

[1] The assumptions combine the alternative projections and the current City population of 28,069 and compare these to the City's 2025 growth forecast of 46,125.

Table 3.9-5 20th Street SE Corridor Employment Growth Assumptions[2]

20th Street SE Corridor Employment Growth			Subarea as Portion of Citywide Employment Growth				
Alternative	Low	High	Total Low	Total High	Change Low	Low % of Target	High % of Target
Alternative 1	360	465	5,055	5,160	1,560	69.14	71.80
Alternative 2	3,800	4,500	8,495	9,195	+1,880	122.13	128.06
Alternative 3	2,400	3,000	7,095	7,695	+480	106.77	114.04

Police Service

The City's adopted goal for police officer coverage is to strive to maintain a ratio of one police officer per 750 people. Under current forecasts, the projected citywide need for police coverage would be an additional 61.5 police officers in 2025. The proportionate demand for police coverage within the 20th Street SE Corridor, assumed for each alternative, as shown in Table 3.9-6, would be incremental in nature and consistent with population growth identified in the Comprehensive Plan. The EIS alternatives are compared to existing needs.

Table 3.9-6 Demand for Police Services

Alternative	Additional Officers Per Standard
Alternative 1/No Action	+ 2.3 – 4.6
Alternative 2	+ 3.5 - 3.9
Alternative 3	+ 4.7 – 5.3

Source: City of Lake Stevens, 2011

In general, operational impacts for all alternatives would include an increase in calls for service related to crimes against persons and property, and traffic accident investigation. Impacts would also include a need for additional equipment for additional officers and an incremental increase in needed facility space. Construction could also generate service calls related to traffic control, vandalism and responses to accidents.

Because the level of service standard is based on population, *Alternative 3*, which has the greatest population increase, would also generate the greatest relative demand for service. The existing standard only reflects increases resulting from population growth and does not reflect changes in commercial space or jobs. Where a land use is primarily

[2] The assumptions combine the alternative projections and the City's 2006 employment number and compare these to the City's 2025 growth forecast of 6,615.

commercial in nature, there could be some unquantifiable demand that is outside the population-based standard. It is also possible that the current standard reflects an average of the demand attributable to both housing and commercial development, which would mean that all or a portion of the commercially generated demand is in fact captured.

Police service impacts to serve this expected population is, therefore, already addressed in the Comprehensive Plan's Capital Facilities Element on a citywide basis. The present analysis identifies the demand more specific to a subarea of the City, which could enhance future police planning.

Retail and commercial uses will also generate some additional calls for service although they are not likely to be significant. *Alternative 2* contains the largest increment of employment-related uses and would generate the highest number of calls in this regard.

Cumulative Impacts

Cumulatively, population and employment growth associated with the 20th Street SE Corridor Subarea Plan and the Lake Stevens Center Subarea Plan taken together would increase calls for service and contribute to a need for additional officers. Table 3.9-7 shows cumulative demand for police service by 2025 that combines assumed population growth for the subarea plan alternatives compared to the citywide forecast.

Table 3.9-7 Cumulative Demand for Police Services

Alternative	Cumulative Additional Officers Standard		Citywide 2025 Forecast
	Low	High	
Alternative 1	40.11	42.48	61.5
Alternative 2	41.59	42.06	
Alternative 3	44.01	45.05	

The cumulative population increase is within the City's 2025 population growth target per the adopted Comprehensive Plan.

Fire and Emergency Medical Services

Lake Stevens Fire uses response time rather than population to determine the level of service. The adopted suburban response/travel time objective for single engine responses to residential and commercial fires is four minutes; actual response time in 2010 ranged from four to just under seven minutes. The suburban level of service for full deployments with multiple engines, and a combination of rescue, aid and medic unit is eight minutes; actual response time in 2010 ranged from nine to 10 minutes. Due to the recent annexation of over 10,000 people and the large area annexed, Lake Stevens Fire is looking for a site for a new fire station in the Southwest Annexation area and potentially within the subarea.

The general impacts of *all alternatives* would include an increase in calls related to fire suppression and medical emergencies; the latter will likely comprise the greatest proportion of calls for service. Additional firefighters and equipment would likely be needed, along with an incremental increase in facilities, to maintain the current response time. However, concentrating growth within designated centers could have a positive effect on response times, compared to a lower density, more dispersed development pattern, especially when denser developments will likely include onsite fire-suppression equipment. As discussed below, demand will increase proportionately because of the increase in housing units and commercial space within the subarea.

For *all alternatives*, the population growth that will occur, within the 20th Street SE Corridor, is consistent with the City's 2025 population target; as such, population growth is addressed on a citywide basis in the adopted Comprehensive Plan. Similarly, fire service demand associated with population growth has been addressed in the Comprehensive Plan and Lake Stevens Fire Capital Plan.

For *Alternative 2* and *Alternative 3*, future employment growth would exceed the current planning target for jobs citywide of 6,615 as shown earlier in Table 3.9-5. Demand for fire service related to commercial uses, therefore, would comprise an additional increment of demand, but this is not expected to be significant. Similarly, the cumulative impacts associated with the action alternatives for both subarea plans would also exceed the current employment forecast.

Lake Stevens Fire would continue to serve the subarea primarily from Station 82 on Chapel Hill Road. If buildings are built to the 85-foot maximum height allowed, as allowed under existing zoning for the *No Action Alternative*, Lake Stevens Fire anticipates that it will need to purchase a ladder truck or quint (dual-purpose engine and ladder truck) to reach the higher floors. Commercial buildings under *Alternative 2* and *Alternative 3* are expected to range from 2-4 stories and may not require a ladder truck.

A new fire station located within the subarea would support increased development, could serve as the main fire station for the subarea and as a backup to Station 82, and would help meet level of service response times.

Cumulative Impacts

As noted above, the cumulative population growth identified for the 20th Street SE Corridor and the Lake Stevens Center combined fall within the bounds of the City's 2025 population target; therefore, the Comprehensive Plan has addressed population impacts on a citywide basis. Focusing growth within centers could enhance response times compared to the current dispersed and low-density land use pattern. However, growth projections for cumulative commercial uses in the two areas would exceed the City's

2025 job forecast representing an incremental increase in demand for services that could affect response time. If the incremental growth affects the adopted level of service for response time, area wide or project specific mitigation would be required.

Public Schools

The Lake Stevens School District uses the number of bedrooms in multifamily units and a standard multiplier for single-family units to estimate student generation. The student generation alternatives assume a mix of multifamily and single-family housing – future market conditions will determine the ultimate size of housing units. For purposes of estimating, Table 3.9-8 assumes that multifamily units will be comprised of one-third 1-bedroom, and two-thirds 2+ bedroom units with 75 percent multifamily under the action alternatives and 25 percent under the *No Action Alternative*. Using an average derived from the Lake Stevens School District generation ratios (shown in Table 3.9-3), incremental student generation increases for single-family and multifamily units, with two or more bedrooms are identified for the subarea alternatives.

Table 3.9-8 Student Generation for Alternatives

Alternative	Housing Units		Student Generation Increase	
	Low	High	Low	High
Alternative 1	600	1200	85.59	171.19
Alternative 2	900	1000	74.68	82.97
Alternative 3	1200	1400	99.57	116.16

All alternatives would result in an increase in housing units and would generate school age students. Impacts would be proportionate to the number and type of units. As noted above, the *No Action Alternative* assumes a greater proportion of single-family housing, rather than all multifamily, resulting in a higher student generation. Whereas the action alternatives, in particular *Alternative 3*, assume increases in multifamily housing, which would result in a net reduction in student generation compared to the *No Action Alternative.*

As noted above, the cumulative population growth identified for the 20th Street SE Corridor and the Lake Stevens Center combined fall within the bounds of the City's 2025 population target. The Comprehensive Plan, and by reference the Lake Stevens School District's Capital Facilities Plan, have addressed population impacts on a citywide and district wide basis as they affect student generation and enrollment projections.

Construction within the subarea could have temporary impacts for school bus routes, which can be minimized by early communication with the school district before and during construction. New or modified bus routes may also be required to serve the new dwelling units.

Cumulative Impacts

Table 3.9-9 shows the cumulative student generation, for both the 20th Street SE Corridor and the Lake Stevens Center combined. The action alternatives for both subareas, as noted, assume an increase that emphasizes multifamily units (75 percent in 20th Street SE Corridor and 100 percent in Lake Stevens Center). Student generation impacts are generally proportionate to the amount of residential development, but also reflect the lower student generation associated with multifamily development. For this reason, the *No Action Alternative,* which contains the most single-family housing (primarily in the 20th Street SE Corridor), could generate more students and have greater impacts on schools compared to the action alternatives, in particular *Alternative 3*, which contains substantially more residential units. The greater proportions of multifamily housing contained in the subarea plans represent a divergence from Lake Stevens' historical growth pattern, which is predominately single-family. Since multifamily housing generates fewer students than single-family housing on a per unit basis, the increase in multifamily housing would generally result in lower student generation rates.

Table 3.9-9 Cumulative School District Impacts

Alternative	Combined Housing Units	Combined Student Generation
Alternative 1/No Action *(Increase from Existing)*	700-1,400	503-951
Alternative 2 *Increase from No Action*	1,080-1,200	331-451 <-172 to -500>
Alternative 3 *Increase from No Action*	1,700-2,000	597-700 -200 to +94

As noted previously, population growth estimated for the subarea plans will be within citywide estimates and does not represent an increase to the forecast. Therefore, the School District's enrollment projections already accounted for increases in student generation.

As described previously, the Lake Stevens School District estimates that its student population will increase by nearly 39 percent by 2025 under existing conditions (*No Action Alternative*). The District also predicts that its elementary schools, mid high and high schools will be over capacity by 2015. The school district adopts a new six-year capital facilities plan every two years. As the Capital Facilities plan is iterative, the school district will address changes to the district's enrollment and estimate capital needs and recalculate school mitigation fees at that time to address district needs.

Parks and Recreation

The City's adopted level of service for recreational land is 7.5 acres per thousand population. The City currently has access to 195 acres of parks, trails and open space within city limits, Urban Growth Area, and adjacent County, which translates to 6.9 acres of recreational land per thousand population, which reflects recent annexations. The 20th Street SE Corridor currently has an undeveloped County park, Cavalero Hill Community Park, with a dog park on approximately 35 acres. The City currently needs another 15.5 acres of park area to meet the adopted level of service without considering potential population increases associated with the subarea. Population growth associated with the *No Action Alternative* would increase the recreational land deficit to 28.43 acres.

Table 3.9-10 shows the amount of recreational land needed to serve the population associated with each alternative, based on the City's adopted level of service of 7.5 acres of recreational land per 1,000 people.

Table 3.9-10 Parks Needs by Alternative

Alternative	Subarea Population		Subarea Park Needs in acres	
	Low	High	Low	High
Alternative 1	1,722	3,422	12.92	25.83
Alternative 2	2,600	2,900	19.5	21.75
Alternative 3	3,500	4,000	26.25	30
Alternative	**Citywide Population[3]**		**Citywide Park Needs**	
	Low	**High**	**Low**	**High**
Alternative 1	29,271	31,513	223.43	236.35
Alternative 2	30,669	30,969	230.02	232.27
Alternative 3	31,569	32,069	236.77	240.52

General impacts from any of the alternatives would include the need for additional parks and recreational land to serve new population, created within the subarea, along with the more intensive use of existing facilities, seen in Table 3.9-10. *Alternative 3*,

[3] This table combines the alternative projections and the current City population of 28,069 to generate subarea recreational land needs and compares these to citywide recreational land needs.

which has the greatest population increase, would also generate the greatest relative demand for service.

The subarea plan for *Alternative 2* and *Alternative 3* proposes to add a multi-use trail within the north/south utility easement and public or semi-public open spaces within residential, office and commercial developments. The utility corridor within the Lake 20th Street SE Corridor is approximately 15 acres in area, which could provide approximately eight-to-10 acres of additional public parks and trails. The new residential areas would provide additional parks and open spaces. Commercial and business areas could provide additional recreational land as well that has not been traditionally accounted for under the current level of service standard.

As discussed in Section 3.5 (Population, Housing & Employment) of the Draft EIS, the population increase associated with the 20th Street SE Corridor alternatives fall within the City's 2025 population target. Park service impacts to serve this expected population is, therefore, encompassed within the established level of service adopted in the Comprehensive Plan and the needs identified there.

The potential recreation areas identified within the subarea plan may add to the citywide inventory. Commercial uses are not anticipated to generate any significant demand for park services. In addition, the subarea plan includes connectivity improvements that would assist residents and visitors to reach park areas and trails from residential, commercial and business areas easily.

Cumulative Impacts

As noted above, the cumulative population growth, identified for the 20th Street SE Corridor and the Lake Stevens Center, falls within the bounds of the City's 2025 population target and is consistent with the adopted Comprehensive Plan. Similarly, park demand associated with this cumulative growth has been addressed in the Comprehensive Plan. Parks identified within the subareas would help to address or reduce the existing citywide parks deficiency.

Table 3.9-11 identifies the cumulative park needs for the estimated population of both subarea plans combined with existing population to identify citywide recreational land needs under the current level of service. As shown, the city will need to add between 30.61 acres (combined plans' *No Action Alternative)* and 58.42 acres (combined plans' *Alternative 3)* above the existing recreational land inventory of 195 acres to meet the existing level of service in 2025.

Table 3.9-11 Cumulative Park Needs

Alternative	Combined Subarea Population		Combined Subarea Park Needs	
	Low	High	Low	High
Alternative 1	2,012	3,794	15.09	28.46
Alternative 2	3,120	3,475	23.40	26.06
Alternative 3	4,940	5,720	37.05	42.90
Alternative	**Citywide Population**		**Total Citywide Park Needs**	
	Low	High	Low	High
Alternative 1	30,081	31,863	225.61	238.97
Alternative 2	31,189	31,544	233.92	236.58
Alternative 3	33,009	33,789	247.57	253.42

3.9.3 Mitigation Measures

Under all alternatives, development would be subject to adopted development regulations, which require emergency access, fire suppression systems, and school and park impact mitigation fees to offset impacts to these services.

Alternative 2 and *Alternative 3* could incorporate the following additional measures:

- During construction, implement security measures such as onsite lighting, fencing, onsite surveillance, etc. to reduce potential criminal activity;
- Construct a well-designed internal street system that provides fast and efficient police, fire and emergency vehicle access to all areas of the subarea;
- Develop streets, sidewalks, walkways, bicycle and pedestrian paths and public spaces designed to promote public safety and visibility for residents, employees, site visitors and police;
- Design all parking areas and public spaces with specially designed no-glare security lighting to provide for security;
- Include incentives in revised development regulations for providing public spaces in new development;
- Begin a planning process to identify additional park space within the subarea. Identify land that is suitable for acquisition, and investigate the potential for acquiring easements within the utility corridor; and
- The School District could recalculate school mitigation fees to include upgrades to local schools to meet the needs of the new students.

3.9.4 Significant Unavoidable Adverse Impacts

Demand for public services would increase incrementally in conjunction with the additional population and commercial growth expected to locate in the subarea. Any additional needs would be addressed in the City's Capital Facilities Plan and are not unavoidable.

3.10 UTILITIES

3.10.1 Affected Environment

This section describes utility services and facilities available in the 20th Street SE Corridor Subarea, specifically water and sanitary sewer. Power, natural gas, and telecommunication utilities are anticipated to have minimal potential for significant impacts and are not addressed in this EIS.

Stormwater and Drainage

Drainage service in the study area is a mixture of public and private infrastructure. The City of Lake Stevens owns and maintains stormwater piping, ditches and catch basins along public streets, while smaller ditches and detention facilities created through plats or located on private property are the responsibility of individual property owners, homeowner associations, the City, or Snohomish County. There are also several regional road detention facilities maintained by WSDOT and Snohomish County.

New projects constructed in the City of Lake Stevens are required to meet the requirements of the *2005 State Department of Ecology Stormwater Management Manual for Western Washington*, in compliance with the City's National Pollutant Discharge Elimination System (NPDES) municipal stormwater permit from the Department of Ecology and municipal code.

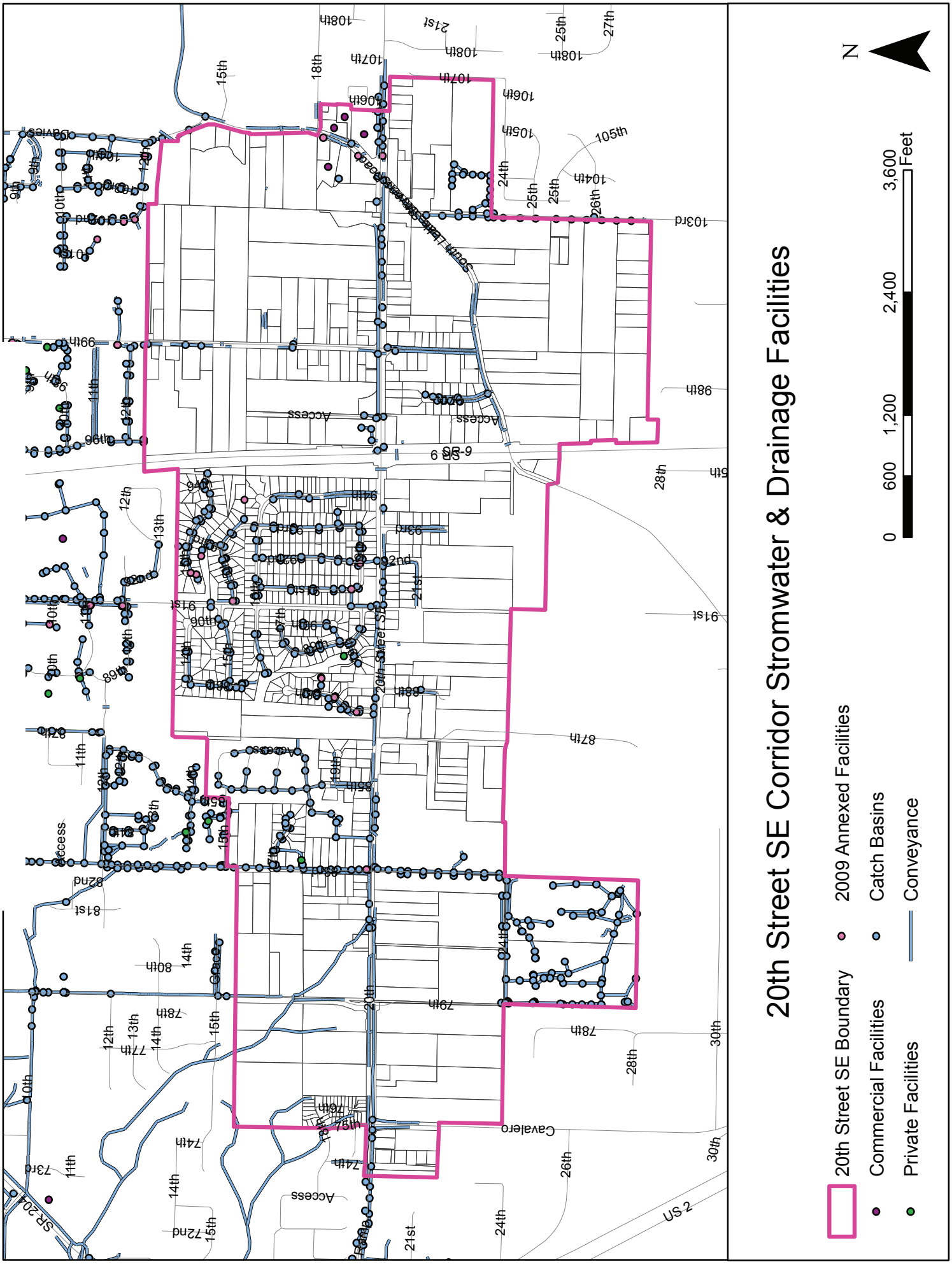
Stormwater infrastructure in the study area is concentrated in the more developed areas, particularly north of 20th Street SE, between 83rd Avenue SE and SR-9. Drainage ditches, piping, and bioswales are also located on the Cavalero Mid High School campus and east of SR-9 along South Lake Stevens Road, 99th Avenue SE, and 103rd Avenue SE. The study area contains several large areas that are relatively undeveloped and contain little drainage infrastructure, including the area south of 20th Street SE between 83rd Avenue SE and SR-9, the area north of 20th Street SE and east of 99th Avenue SE, and the area south of South Lake Stevens Road and east of SR-9. Figure 3.10-1 illustrates the conveyance and stormwater facilities located within the 20th Street SE Corridor.

Water

Water Supply

Snohomish County Public Utility District (PUD) #1, through its Lake Stevens Water System, provides public water service in the City of Lake Stevens, as well as its Urban Growth Area to approximately 20,000 water customers. The PUD purchases its water from the City of Everett and maintains five permanent connections to the City of Everett's water system. The PUD also maintains two permanent interties to the City of Marysville's water system. Emergency standby supply consists of one intertie to the City of Marysville water system and two groundwater wells, located in the northeastern

Figure 3.10-1. 20th Street SE Corridor Stormwater Facilities



corner of the city (City of Lake Stevens, 2010). These wells each have a capacity of 1,200 gallons per minute (Snohomish County PUD, 2011, Department of Health, 2011). Snohomish PUD plans to convert the two emergency groundwater wells to a full-time source, increasing available water and reducing reliance on flow from the City of Everett system.

While the PUD is not limited in how much water it is allowed to draw from the City of Everett water system, the combined physical capacity of the system pumps is 8,500 gallons per minute (gpm), which translates to a Limiting Supply Rate of 12.24 million gallons daily (MGD). Based on an average household daily demand of 188 gallons and maximum household demand of 386 gallons per day, the Lake Stevens water system is capable of serving up to 31,710 Equivalent Residential Units (ERUs). As of 2009, the system served 24,281 ERUs, resulting in supply capacity to serve an additional 7,429 ERUs.

Water Storage

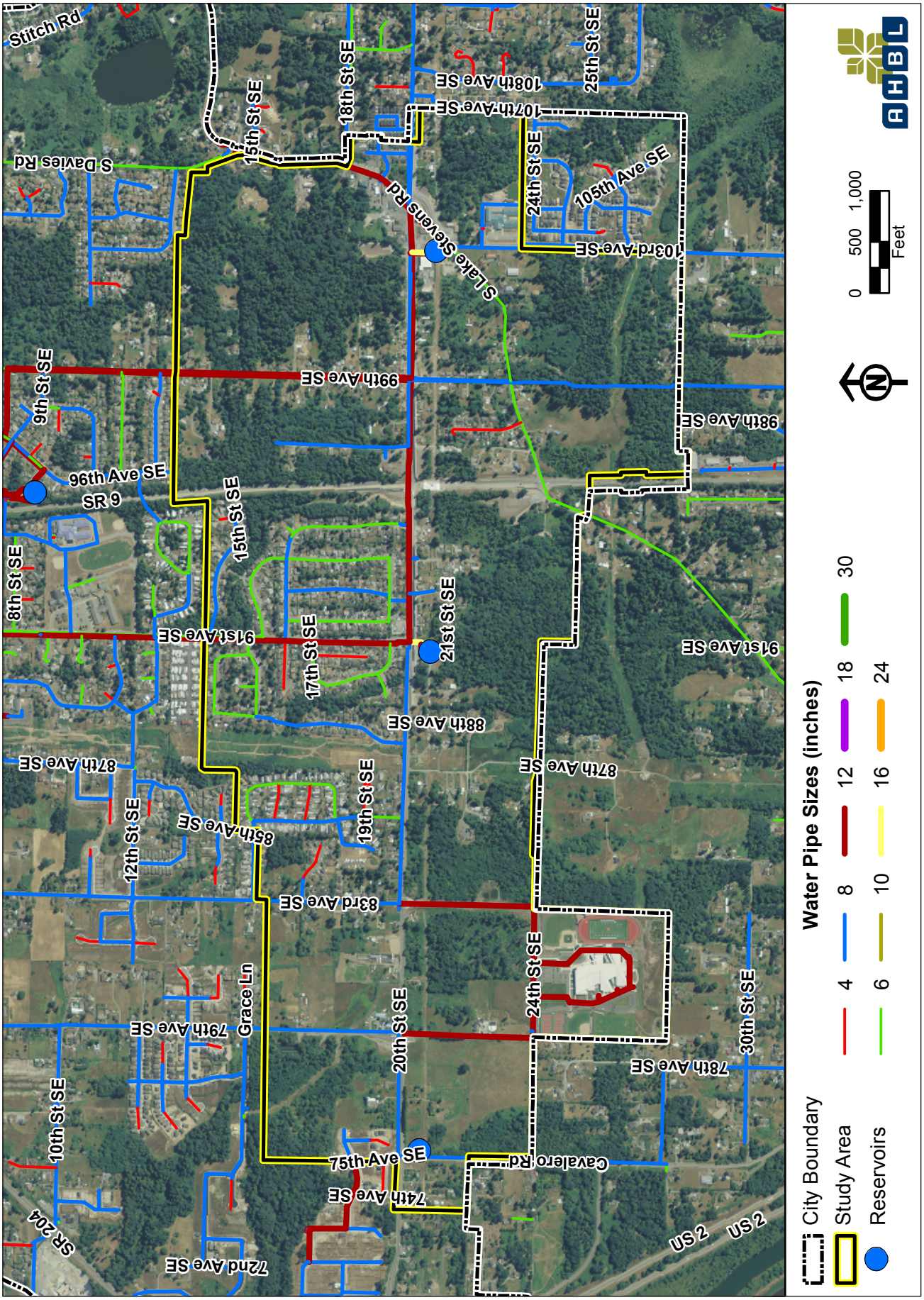
The Lake Stevens Water System includes three reservoirs for water storage with a combined capacity of approximately 10 million gallons (MG). The Walker Hill Reservoir consists of a pair of 2.0 MG storage tanks located near the northern end of the lake, on the eastern side of Cedar Road. The Hillcrest Reservoir consists of a pair of storage tanks on the eastern side of SR-9, south of 4th Street SE and north of 20th Street SE with a combined capacity of approximately 6.0 MG (Snohomish County PUD, 2009). An additional 9.2 MG reservoir, located outside the study area, but serving the pressure zone in which 20th Street SE Corridor lies, is planned for construction in 2018 (Snohomish County PUD, 2011).

Based on average daily water demand and equalizing storage needed to replenish storage tanks during periods when demand exceeds supply capacity, the PUD has established a storage requirement of 387 gallons per day. The amount of water storage available in the Lake Stevens system is enough for 25,377 ERUs. As of 2009, the system provided storage for 21,555 ERUs, resulting in storage capacity for an additional 3,822 ERU's. Review of overall water system capacity indicates that water storage is the limiting factor for future growth within the water service area.

Water Distribution

Large portions of the land south of 20th Street SE are currently undeveloped. Therefore, most of the water distribution infrastructure in the subarea is concentrated on the northern side of the street. 20th Street SE serves as the central utility "spine" of the subarea, and service lines for surrounding properties branch off the mains that are located under 20th Street SE. Due to the mostly residential character of the area, water pipes are relatively small in diameter. Existing water distribution infrastructure for the subarea is summarized below, and the location of water distribution infrastructure in the study area is shown in Figure 3.10-2 (Snohomish County PUD, 2011):

Figure 3.10-2. Water Distribution Facilities



- 2.3 feet of 1-inch water line
- 30.5 feet of 3-inch water line
- 3,654.5 feet of 4-inch water line
- 14,709.9 feet of 6-inch water line
- 27,919.5 feet of 8-inch water line
- 19,435 feet of 12-inch water line
- 624.2 feet of 16-inch water line

The PUD recently relocated a portion of the water main under 20th Street SE in support of a City of Lake Stevens road-widening project. Additional line relocations are planned for 2012, and capacity improvements at the East Hewitt pump station (intersection of 20th Street SE and 91st Avenue SE) are planned for 2018-19.

Sewer

The Lake Stevens Sewer District (LSSD), established in 1957, provides sewer service to the entire Lake Stevens UGA and portions of surrounding areas. Since 2005, the City and the District have operated as a Unified Sewer District, and capital facilities planning for the sewer system is conducted jointly (City of Lake Stevens, 2010).

Collection

The LSSD wastewater system includes a variety of facilities: collection and transmission lines, pump stations and force mains, wastewater treatment, effluent disposal and biosolids reuse citywide. Sewer infrastructure is available in approximately half of the 20th Street SE Corridor Subarea. Piping is generally located on the northern side of 20th Street SE; very little infrastructure is available south of 20th Street SE, aside from a connection to the school district property on 24th Street SE. Large diameter piping is concentrated along 20th Street SE, though a force main runs north-south under 91st Avenue SE. Existing collection infrastructure for the subarea is summarized below (Gray & Osborne, 2011):

- 166.1 feet of 6-inch diameter gravity pipe
- 30,726.7 feet of 8-inch diameter gravity pipe
- 72.9 feet of 10-inch diameter gravity pipe
- 80.2 feet of 12-inch diameter gravity pipe
- 917.1 feet of 21-inch diameter gravity pipe
- 3,262.1 feet of 24-inch diameter gravity pipe

- 2,058.2 feet of 30-inch diameter gravity pipe
- 5,554 feet of force main of the following diameters:
    - 1,122 feet of 4-inch force main
    - 219 feet of 6-inch force main
    - 2,315 feet of 8-inch force main
    - 18 feet of 10-inch force main
    - 1,880 feet of 14-inch force main

The location of sewer collection infrastructure in the study area is shown in Figure 3.10-3.

The 20th Street SE Corridor Subarea also contains three sewer lift stations for pumping effluent uphill in areas where gravity piping is not possible. The types and capacities of these pump stations are summarized in Table 3.10-1 below.

Table 3.10-1 20th Street SE Corridor Pump Station Capacity

Name	Year Online	Pump Type	Capacity (gpm)
Lift Station 1	1969	Wet/dry well	73
Lift Station 11	1983	Wet well with sump	280
Lift Station 14	2001	Wet well	275

Source: Gray & Osborne, 2007

The district had imposed a connection moratorium due to a lack of adequate capacity in the force main for Lift Station 11, which runs under 91st Avenue SE. In 2000, the sewer district partially rescinded a connection moratorium that had been in place for the portion of the service area tributary to Lift Station 11. In 2000, the district determined that the lift station and associated force main could adequately serve a total of 500 connections in their current configuration. The district amended the moratorium to authorize up to 487 connections in the area served by Lift Station 11 (100 more than the 387 connections at that time). As of the publication of the district's 2007 Comprehensive Plan, the connection moratorium was still in effect. Lift Station 11 generally serves the portion of the study area north of 20th Street SE between 83rd Avenue SE and SR-9, as well those properties fronting on the south side of 20th Street SE between 91st Avenue SE and SR-9 (Gray & Osborne, 2007).

LSSD's 2007 Comprehensive Plan and 2010 Amendment contain a list of scheduled capital improvements, including the following projects within or near the 20th Street SE Corridor:

- Construction of 1,000 linear feet of 8-inch gravity pipe from Lift Station 11 to the southwest interceptor and decommissioning of Lift Station 110;
- Construction of 200 linear feet of 8-inch gravity pipe from Lift Station 1 to Manhole 1305 and decommissioning of Lift Station 1;
- Upgrade of Lift Station 14 capacity from 480 to 580 gpm;
- Rerouting of flows from Lift Station 14 to the southwest interceptor via construction of 2,600 linear feet of 8-inch force main;
- Upgrade of Lift Station 17 capacity from 390 to 1,085 gpm and construction of 1,650 linear feet of force main to the southwest interceptor;
- Construction of Southwest Interceptor Phase II – to be constructed concurrently with 20th Street SE phased improvements within ROW. This project consists of 2,000 linear feet of 24-inch sewer main between approximately 83rd and 88th Avenues SE; and
- Construction of 700 linear feet of 10-inch pipe in 79th Avenue SE following construction of new Lift Station G3.

Treatment

The Sewer District's treatment plant on Ebey Slough, west of the city limits, receives all sewer flows from the City of Lake Stevens. This plant was originally constructed in the 1960's and has been subject to periodic upgrades and redesigns. The last significant update was completed in 2000. The existing plant is an activated sludge facility with a maximum treatment capacity of 4.07 MGD. Growth projections indicate that wastewater flows will exceed the capacity of the existing wastewater treatment plant (WWTP) by 2017. The existing Ebey Slough wastewater treatment plant is scheduled for decommissioning in 2013. The sewer district is constructing a replacement wastewater treatment on 14-acres between Sunnyside Boulevard and SR-204 on 9th Street SE with greater treatment capacity. The new plant should be operational in 2012 with phased improvements to accommodate capacity increases from future development and growth in the service area. The phased improvements also anticipate new connections when existing septic systems convert to sanitary sewer following expanded sewer availability or when older systems fail. Phase I of the new treatment facility will have a treatment capacity of 5.01 MGD, which is adequate to meet projected demand through 2019. Phase II of the project will increase treatment capability to 6.36 MGD, which is anticipated to provide adequate capacity through 2028 (Gray & Osborne, 2007). Table 3.10-2 provides capacity estimates for phased improvements to the new wastewater treatment plant.

Figure 3.10-3. Sewer Collection Facilities

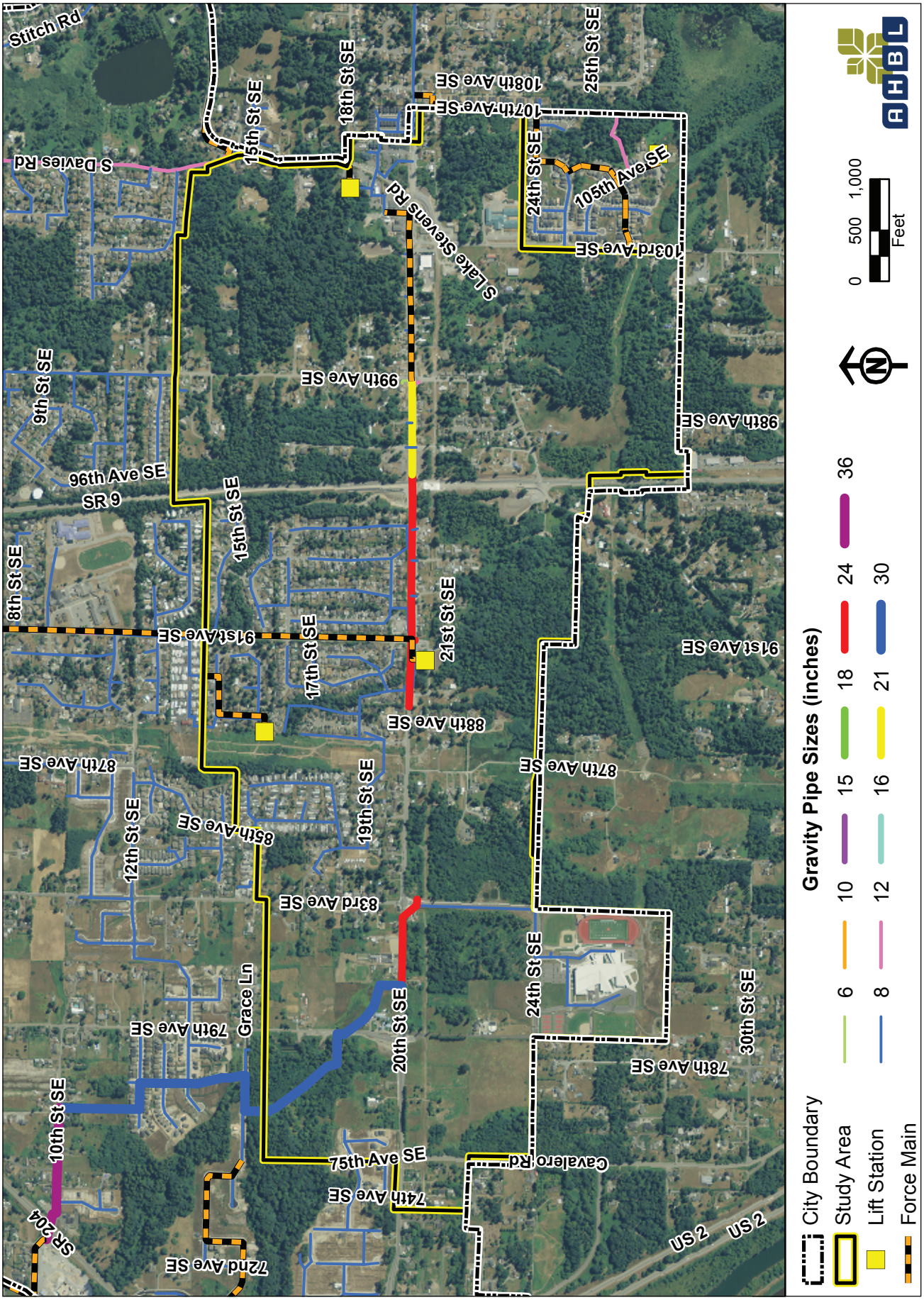


Table 3.10-2 Lake Stevens Sewer District Wastewater Treatment Plant Capacity

Flow Type[1]	Phase 1	Phase 2
Maximum Month Flow (MGD)	5.01	6.36
Peak Hour Flow (MGD)	11.53	14.43
Approximate Total ERUs	15,978	19,997

Source: Personal Communication Gray and Osborne, June 2011

3.10.2 Impacts of the Alternatives

Impacts Common to All Alternatives

Drainage

Implementation of any of the alternatives is anticipated to result in increased impervious surface coverage and increased clearing of existing vegetation to accommodate new development. Increased impervious surface and reduced vegetative cover would result in increased stormwater flows from the study area. Stormwater runoff from developed areas often contains pollutants, such as pesticides, fertilizers, and petroleum products that can degrade water quality in both groundwater and surface water bodies.

To avoid and minimize stormwater impacts, individual project review will be required at the time of development permit application. Under the City's adopted Stormwater Management Ordinance, any project that meets or exceeds the thresholds established in the Department of Ecology's 2005 Stormwater Manual for Western Washington will be reviewed by the City to ensure that adequate stormwater treatment is provided.

Alternative 1 – No Action

Water

Water Supply

As described in Section 3.10.1 above, the Lake Stevens water system has supply capacity for an additional 7,429 ERUs, based on a current daily supply of 12.24 MG. The 2011 Water System Plan for Snohomish PUD estimates the average daily demand per ERU in the Lake Stevens system at 188 gallons per day. Based on this demand, the *No Action Alternative* would increase demand on water supply by approximately 134,040 – 253,035 gallons per day, which equates to approximately 713 – 1,346 ERUs. Growth under the *No Action Alternative* would account for approximately 18% of the currently available supply capacity. Because the PUD has planned for growth in the Lake Stevens

[1] Maximum Month Flow means the highest flow occurring during a one-day period in a calendar year. Peak Hour Flow means the highest hourly flow during a calendar year. MGD means millions of gallons per day.

service area under existing development regulations and has forecast sufficient supply to meet planning horizon year needs, the *No Action Alternative* is not anticipated to result in any significant impacts to water supply.

Water Storage

As described in Section 3.10.1, storage capacity is a potential limiting factor for future growth in the Lake Stevens water system service area. Growth projections by Snohomish County PUD indicate that required standby and equalizing storage requirements are anticipated to increase over time in response to continued growth in the service area. Based on a storage requirement of 387 gallons per ERU, development under the *No Action Alternative* would require an additional 275,923 – 520,875 gallons of equalizing and standby storage by 2025.

Snohomish County PUD's 2011 Water System Plan projected a storage surplus of approximately 243,421 gallons for the year 2010. By 2029, this surplus is projected to increase to 1.2 MG, provided that the system's emergency groundwater wells are converted to full-time sources in 2012 and that the planned Getchell reservoir (9.2 MG) is completed on-schedule in 2018. Given the large surplus anticipated as a result of these planned improvements, the increased demand for storage capacity generated under the *No Action Alternative* is relatively small and is not anticipated to result in any significant impacts to water storage.

Water Distribution

As described under Section 3.10.1, the 2011 Water System Plan identified no current or future deficiencies for the existing distribution system in the study area within the PUD's 20-year planning period. Future growth would increase demand for water service and is likely to require construction of additional distribution infrastructure to serve development, which would be installed by developers as development occurs. With implementation of the planned capacity upgrades to the East Hewitt pump station in 2018-19, the *No Action Alternative* is not anticipated to result in any significant impacts to the water distribution system.

Fire Flow

Fire Flow Storage. Fire flow storage is necessary to respond to a fire emergency within the water service area, and Snohomish County PUD has committed to varying levels of fire flow in different portions of its service area, due to existing development levels and the fact that different land uses and development typologies require differing levels of fire flow. For example, a low-density residential development may only require 1,000 gpm of fire flow, while a regional commercial center may require 3,000-4,000 gpm of fire flow. The PUD has adopted a fire flow design criteria for the Lake Stevens water system of 0-3,000 gpm for 1-3 hours. Because the design criteria cover a wide range, the PUD's demand projections calculate future required fire flow storage on the basis of 1,500 gpm for 2 hours. This equates to 180,000 gallons of fire flow storage. The

projected demand for fire flow storage is relatively small when compared with the overall storage requirements for the water system, and the PUD design criteria nest this fire flow storage within the standby storage requirement. As discussed under *Water Storage*, above, the currently projected storage surplus is anticipated to provide sufficient water storage under the *No Action Alternative*. The City, in cooperation with the Lake Stevens Fire Marshal, evaluates each proposed development project to determine its specific fire flow requirements, and available fire flow is confirmed by the PUD.

Fire Flow Conveyance. In addition to storage, adequate conveyance infrastructure is necessary to provide sufficient fire flow to a given site. Undersized distribution piping can prevent adequate flow from reaching a site without exceeding velocity limits. In preparing its 2011 Water System Plan, Snohomish County PUD classified water mains with recorded velocities greater than 10 feet per second as potentially requiring upgrades. As described in Section 3.10.1, most of the water mains in the study area are 8-inch or 12-inch pipes. At a velocity of 10 feet per second, an eight-inch line can provide approximately 1,579 gallons of flow per minute, and a 12-inch line can provide up to 3,529 gallons per minute. Based on these flow values and generally accepted fire flow requirements, an eight-inch main would likely provide sufficient flow for most low- and medium-density residential development, as well as low-intensity commercial and office development. A 12-inch main would likely provide sufficient fire flow for high-density residential development and most commercial and office uses, though industrial uses or large, regional-scale commercial centers may require higher flows, based on individual project characteristics. The City, in cooperation with the Lake Stevens Fire Marshal, reviews each project to determine its fire flow requirements. The PUD confirms what flows are available at the development site and, when there is a deficiency, provides technical guidance on methods to reduce needed fire flow or increase available flow through piping improvements.

Developed residential portions of the study area, specifically north of 20th Street SE between 83rd Avenue SE and SR-9, are generally served by lines 4-6 inches in diameter. Also, the water main under South Lake Stevens Road is a 6-inch line west of 103rd Avenue SE. Fire flow in these areas is approximately 1,000 gpm. Intensification of residential density in these areas or conversion to commercial development may create fire flow deficiencies without improvements to the system. Fire flows of 1,500 gpm are available along 20th Street SE west of 79th Avenue SE and between 83rd Avenue SE and 91st Avenue SE. 1,500 gpm flows are also available along 83rd Avenue SE north of SE 20th Street SE. 2,000 gpm fire flows are available south of 20th Street SE along 83rd Avenue SE and 79th Avenue SE, as well as at the Cavalero Mid High School campus. 3,000 gpm fire flows are available along 20th Street SE east of 91st Avenue SE, along South Lake Stevens Road north of 20th Street SE, and along 91st Avenue SE and SR-9 north of 20th Street SE. Water mains of appropriate size would need to be installed in those portions of the study area not currently served as future development occurs.

Sewer

Collection

Wastewater from the study area flows to the Lake Stevens Sewer District (LSSD) treatment plant through two routes. Flows from properties east of 83rd Avenue SE are collected in the 24-inch gravity main under 20th Street SE. This main transmits wastewater flows to Lift Station 11 at the intersection of 20th Street SE and 91st Avenue SE. Flows then travel north through the force main under 91st Avenue SE, eventually reaching the current wastewater treatment plant. As described in Section 3.10.1, this force main was previously identified as being over-capacity, resulting in a connection moratorium in the area. Wastewater flows from properties west of 83rd Avenue SE are collected in 24-inch gravity main under 20th Street SE not connected to the eastern main discussed above (see Figure 3.10-3). These flows are transmitted northwest to a 30-inch gravity main leading out of the study area to a force main under Sunnyside Boulevard, and ultimately, to the existing wastewater treatment plant. No deficiencies were identified in these transmission mains.

Future development in the area would exacerbate the capacity deficiencies identified above for Lift Station 11 and its collection area, negatively impacting sewer service. However, several capital improvements have been planned for the study area, including the construction of a new interceptor, which will connect the two gravity mains under 20th Street SE and allow flows from the eastern portion of the study area to flow to the new treatment plant more directly, eliminating the need for Lift Station 11, which will be decommissioned. The district will also install additional piping to connect Lift Station 1 to Manhole 1305, which will allow flows from the neighborhood north of 16th Street SE and west of 91st Avenue SE to travel south to the new gravity interceptor in 20th Street SE, rather than being pumped north through a force main.

With construction of these improvements, which are scheduled for 2013, impacts to wastewater collection in areas already served by sewer infrastructure are anticipated to be less than significant under *Alternative 1/No Action*. However, as described in Section 3.10.1, large portions of the study area are not currently served by sewer infrastructure, most notably the area north of 20th Street SE and east of SR-9, as well as all areas south of 20th Street SE, with the exception of Cavalero Mid High School. Installation of additional collection lines will be necessary to adequately serve future development, and this infrastructure will be provided at the time that new development is approved, by the LSSD, by private developers, or by a combination of both.

Treatment

Development under *Alternative 1/No Action* would increase wastewater flows and place additional demands on the District's wastewater treatment plant, consistent with growth projections contained in the LSSD's Comprehensive Plan. The LSSD models wastewater flows based on Equivalent Residential Units (ERU), which allows the wastewater flows of non-residential land uses to be expressed as an equivalent number of residential customers. A single ERU represents an average single-family residence of approximately 2.9 persons. Based on the design criteria established in the District's Comprehensive Plan, each ERU contributes approximately 203 additional gallons of wastewater flow per day. Per capita Biochemical Oxygen Demand (BOD_5) and Total Suspended Solids (TSS) loading is estimated to be approximately 0.235 pounds and 0.188 pounds per day, respectively. Based on a household size of 2.9 persons, daily BOD_5 and TSS loading per ERU is approximately 0.682 pounds and 0.545 pounds, respectively. The District models commercial and industrial uses at 2,700 gallons per acre per day, which is equivalent to approximately 13.3 ERU's.

Growth under the *No Action Alternative* is anticipated to increase average wastewater flows by 132,300 – 257,000 gallons per day. Biochemical Oxygen Demand loading is projected to increase by approximately 444 – 863 pounds per day, and Total Suspended Solids loading would increase by approximately 355 – 690 pounds per day.
The estimated levels of growth under the *No Action Alternative* are consistent with the sewer district's growth projections for the area, and projected increases in wastewater flows and loading would be within the capacity of the existing treatment plant. Completion of the new wastewater treatment facility in 2012 would further increase the ability to treat additional flows. The *No Action Alternative* is not anticipated to result in any significant adverse impacts to wastewater treatment.

Alternative 2 – Employment Emphasis

Water

Water Supply

As described in Section 3.10.1, the Lake Stevens water system has supply capacity for an additional 7,429 ERUs, based on a current daily supply of 12.24 MG. The 2011 Water System Plan for Snohomish PUD estimates the average daily demand per ERU in the Lake Stevens system at 188 gallons per day. Based on this demand, *Alternative 2* would increase demand on water supply by approximately 393,400 – 453,500 gallons per day, which equates to approximately 2,093 – 2,412 ERUs. Growth under *Alternative 2* would account for approximately 32.5% of the currently available supply capacity. As such, *Alternative 2* is not anticipated to result in any immediate impacts to water supply. However, with nearly one-third of remaining capacity anticipated to be consumed by this one portion of the Lake Stevens water system, additional sources of water supply

may be necessary to adequately serve long-term growth throughout the PUD service area.

Water Storage

As described in Section 3.10.1, storage capacity is a potential limiting factor for future growth in the Lake Stevens water system service area. Growth projections by Snohomish County PUD indicate that required standby and equalizing storage requirements are anticipated to increase over time in response to continued growth in the service area. Based on a storage requirement of 387 gallons per ERU, development under *Alternative 2* would require an additional 808,818 – 933,535 gallons of equalizing and standby storage by 2025.

Snohomish County PUD's 2011 Water System Plan projected a storage surplus of approximately 243,421 gallons for the year 2010. By 2029, this surplus is projected to increase to 1.2 MG, provided that the system's emergency groundwater wells are converted to full-time sources in 2012 and that the planned Getchell reservoir (9.2 MG) is completed on-schedule in 2018. While implementation of *Alternative 2* is not anticipated to create a water storage deficiency, it would consume a large portion of the PUD's projected surplus for the system and could result in the need for construction of additional storage facilities earlier than originally projected. At the same time, concentrating a greater proportion of growth in the 20th Street SE Subarea could reduce growth in other portions of the service area.

Water Distribution

As described in Section 3.10.1, the 2011 Water System Plan identified no current or future deficiencies for the existing distribution system in the study area within the PUD's 20-year planning period. Future growth would increase demand for water service and is likely to require construction of additional distribution infrastructure to serve development, which would be installed by developers or the City as development occurs. With implementation of the planned capacity upgrades to the East Hewitt pump station in 2018-19, *Alternative 2* is not anticipated to result in any significant impacts to the water distribution system.

Fire Flow Storage. As described under the *No Action Alternative*, fire flow storage is necessary to respond to a fire emergency within the water service area, and Snohomish County PUD has committed to varying levels of fire flow in different portions of its service area. The PUD has adopted a fire flow design criteria for the Lake Stevens water system of 0-3,000 gpm for 1-3 hours. Because the design criteria cover a wide range, the PUD's demand projections calculate future required fire flow storage on the basis of 1,500 gpm for 2 hours. This equates to 180,000 gallons of fire flow storage. The projected demand for fire flow storage is relatively small when compared with the overall storage requirements for the water system, and the PUD design criteria nest this fire flow storage within the standby storage requirement. As discussed under Water Storage above, the currently projected storage surplus is anticipated to provide sufficient water storage under *Alternative 2*. The City, in cooperation with the Lake Stevens Fire Marshal, evaluates each proposed development project to determine its specific fire flow requirements, and available fire flow is confirmed by the PUD.

Fire Flow Conveyance. In addition to storage, adequate conveyance infrastructure is necessary to provide sufficient fire flow to a given site. Undersized distribution piping can prevent adequate flow from reaching a site without exceeding velocity limits. As described under the *No Action Alternative*, an 8-inch main would likely provide sufficient flow for most low- and medium-density residential development, as well as low-intensity commercial and office development. A 12-inch main would likely provide sufficient fire flow for high-density residential development and most commercial and office uses, though industrial uses and large, regional-scale commercial centers may require higher flows, based on individual project characteristics. The City, in cooperation with the Lake Stevens Fire Marshal, reviews each project to determine its fire flow requirements. The PUD confirms what flows are available at the development site and, when there is a deficiency, provides technical guidance on methods to reduce needed fire flow or increase available flow through piping improvements.

The retail and office development planned under *Alternative 2* would require higher levels of fire flow than the existing residential development in the study area. Currently, 12-inch water mains are located in the northeastern and southwestern portions of the study area, and fire flows of 3,000 gpm are available along 20th Street SE east of 91st Avenue SE and north of 20th Street SE along 91st Avenue SE, SR-9, and South Lake Stevens Road. Developed residential portions of the study area, specifically the areas north of 20th Street SE between 83rd Avenue SE and SR-9, are generally served by lines four to six inches in diameter. The water main under South Lake Stevens Road is a six-inch line west of 103rd Avenue SE. Fire flow in these areas is approximately 1,000 gpm. As shown in Figure 2-3, development under *Alternative 2* would create several commercial and office centers in areas with fire flow capacity below the 3,000 gpm threshold necessary to support most commercial development, thereby potentially creating fire flow deficiencies requiring improvements to the system to ensure adequate fire flow. Installation of upgraded distribution infrastructure would be necessary along

the 20th Street SE corridor, along primary side streets, and at commercial/office nodes, particularly along 20th Street SE west of 91st Avenue SE, as well as along both 79th Avenue SE and 83rd Avenue SE north of 20th Street SE. Mitigation in the form of installation of new water distribution infrastructure and upsizing of existing pipes to provide adequate fire flow, would be the responsibility of individual developers as development occurs. Likewise, water mains of appropriate size would need to be installed as future development occurs in those portions of the study area not currently served by existing lines.

Sewer

Collection

As described under *Alternative 1*, wastewater from the study area flows to the LSSD treatment plant through two routes. A capacity deficiency was identified at Lift Station 11 and the associated force main under 91st Avenue SE as early as 2000. This deficiency could be exacerbated by additional growth in the study area. However, the Southwest Interceptor project, planned for 2012, will eliminate the need for Lift Station 11 and provide additional collection capacity throughout the study area. With implementation of this and other planned capital improvements described under *Alternative 1*, impacts to wastewater collection in those areas already served by sewer infrastructure are anticipated to be less than significant.

However, as described in Section 3.10.1, large portions of the study area are not currently served by sewer infrastructure, most notably the area north of 20th Street SE and east of SR-9, as well as all areas south of 20th Street SE, with the exception of Cavalero Mid High School. Installation of additional collection lines will be necessary to adequately serve future development, and this infrastructure will be provided at the time that new development is approved, by the LSSD, by private developers, or by a combination of both.

Treatment

Additional growth in the study area under *Alternative 2* would increase flows to the wastewater treatment facility. Each additional ERU would contribute 203 gallons of wastewater flow per day, as well as 0.682 pounds of BOD_5 loading and 0.545 pounds of TSS loading per day. Based on the levels of growth projected for *Alternative 2*, wastewater flows from the study area would increase by 269,400 – 308,400 gallons per day. BOD_5 loading would increase by 905 – 1,035 pounds per day, and TSS loading would increase by 724 – 828 pounds per day. Compared to the *No Action Alternative*, which is equivalent to the baseline for which the District's new wastewater treatment plant has been designed, *Alternative 2* represents an increase in flows and loadings of up to 104%. Although this is within the capacity of the planned wastewater treatment plant, increased demand for treatment in the study area could potentially reduce the ability of the plant to adequately treat future flows from the sewer district as a whole, which could result in the need for upgrades and expansions to the plant sooner than

originally anticipated. At the same time, concentrating a greater proportion of city-wide growth in the 20th Street SE Subarea could reduce growth in other portions of the service area.

Alternative 3 – Retail and Residential Emphasis

Water

Water Supply

The Lake Stevens water system has supply capacity for an additional 7,429 ERUs, based on a current daily supply of 12.24 MG. The 2011 Water System Plan for Snohomish PUD estimates the average daily demand per ERU in the Lake Stevens system at 188 gallons per day. Based on this demand, *Alternative 3* would increase demand on water supply by approximately 367,200 – 440,200 gallons per day, which equates to approximately 1,953 – 2,341 ERUs. Growth under *Alternative 3* would account for approximately 31.5% of the currently available supply capacity. However, with nearly one-third of remaining capacity anticipated to be consumed by this one portion of the Lake Stevens water system, additional sources of water supply may be necessary to adequately serve long-term growth throughout the PUD service area.

Water Storage

Storage capacity is a potential limiting factor for future growth in the Lake Stevens water system service area. Growth projections by Snohomish County PUD indicate that required standby and equalizing storage requirements are anticipated to increase over time in response to continued growth in the service area. Based on a storage requirement of 387 gallons per ERU, development under *Alternative 3* would require an additional 755,885 – 906,156 gallons of equalizing and standby storage by 2025.

Snohomish County PUD's 2011 Water System Plan projected a storage surplus of approximately 243,421 gallons for the year 2010. By 2029, this surplus is projected to increase to 1.2 MG, provided that the system's emergency groundwater wells are converted to full-time sources in 2012 and that the planned Getchell reservoir (9.2 MG) is completed on-schedule in 2018. While implementation of *Alternative 3* is not anticipated to create a water storage deficiency, it would consume a large portion of the PUD's projected surplus for the system and could result in the need for construction of additional storage facilities earlier than originally projected. At the same time, concentrating a greater proportion of growth in the 20th Street SE Subarea could reduce growth in other portions of the service area.

Water Distribution

As described in Section 3.10.1, the 2011 Water System Plan identified no current or future deficiencies for the existing distribution system in the study area within the PUD's 20-year planning period. Future growth would increase demand for water service and is likely to require construction of additional distribution infrastructure to serve development, which would be installed by developers as development occurs.

With implementation of the planned capacity upgrades to the East Hewitt pump station in 2018-19, *Alternative 3* is not anticipated to result in any significant impacts to the water distribution system.

Fire Flow

Fire Flow Storage. As described under the *No Action Alternative*, fire flow storage is necessary to respond to a fire emergency within the water service area, and Snohomish County PUD has committed to varying levels of fire flow in different portions of its service area. The PUD has adopted a fire flow design criteria for the Lake Stevens water system of 0-3,000 gpm for 1-3 hours. Because the design criteria cover a wide range, the PUD's demand projections calculate future required fire flow storage on the basis of 1,500 gpm for 2 hours. This equates to 180,000 gallons of fire flow storage. The projected demand for fire flow storage is relatively small when compared with the overall storage requirements for the water system, and the PUD design criteria nest this fire flow storage within the standby storage requirement. As discussed under Water Storage above, the currently projected storage surplus is anticipated to provide sufficient water storage under *Alternative 3*. The City, in cooperation with the Lake Stevens Fire Marshal, evaluates each proposed development project to determine its specific fire flow requirements, and available fire flow is confirmed by the PUD.

Fire Flow Conveyance. In addition to storage, adequate conveyance infrastructure is necessary to provide sufficient fire flow to a given site. Undersized distribution piping can prevent adequate flow from reaching a site without exceeding velocity limits. As described under the *No Action Alternative* and *Alternative 2*, an eight-inch main can provide sufficient flow for most low- and medium-density residential development, as well as low-intensity commercial and office development. A 12-inch main can provide sufficient fire flow for high-density residential development and most commercial and office uses, though industrial uses and large, regional-scale commercial centers may require higher flows, based on individual project characteristics. The City, in cooperation with the Lake Stevens Fire Marshal, reviews each project to determine its fire flow requirements. The PUD confirms what flows are available at the development site and, when there is a deficiency, provides technical guidance on methods to reduce needed fire flow or increase available flow through piping improvements.

Alternative 3 would focus on providing high-density residential uses with a lower level of retail and office development relative to *Alternative 2*. The proposed residential development would require increased levels of fire flow above the existing residential development in the study area. New retail and office uses would generally require greater levels of fire flow than residential uses. As described under the *No Action Alternative* and *Alternative 2,* twelve-inch water mains are currently located in the northeastern and southwestern portions of the study area, and fire flows of 3,000 gpm are available along 20th Street SE east of 91st Avenue SE and north of 20th Street SE along 91st Avenue SE, SR-9, and South Lake Stevens Road.

Developed residential portions of the study area, specifically those areas north of 20th Street SE between 83rd Avenue SE and SR-9, are generally served by lines four to six inches in diameter. The water main under South Lake Stevens Road is a six-inch line west of 103rd Avenue SE. Fire flow in these areas is approximately 1,000 gpm. As shown in Figure 2-4, development under *Alternative 3* would create a series of commercial and office centers, several of which are located in areas with fire flow capacity below the 3,000 gpm threshold necessary to support most forms of commercial development. Combined with increased residential density adjacent to 20th Street SE west of 91st Avenue SE and along South Lake Stevens Road, *Alternative 3* has the potential to create fire flow deficiencies that would require improvements to the system to ensure adequate fire flow. Installation of upgraded distribution infrastructure would be necessary along the 20th Street SE corridor, along primary side streets, and at commercial/office nodes, particularly along 20th Street SE west of 91st Avenue SE, as well as along both 79th Avenue SE and 83rd Avenue SE north of 20th Street SE. Mitigation in the form of installation of new water distribution infrastructure and upsizing of existing pipes to provide adequate fire flow, would be the responsibility of individual developers as development occurs. Likewise, water mains of appropriate size would need to be installed as future development occurs in those portions of the study area not currently served by existing lines.

Sewer

Collection

As described under *Alternatives 1 and 2*, wastewater from the study area flows to the LSSD treatment plant through two routes. A capacity deficiency was identified at Lift Station 11 and the associated force main under 91st Avenue SE as early as 2000. This deficiency could be exacerbated by additional growth in the study area. However, the Southwest Interceptor project, planned for 2012, will eliminate the need for Lift Station 11 and provide additional collection capacity throughout the study area. With implementation of this and other planned capital improvements described under *Alternatives 1 and 2*, impacts to wastewater collection in those areas already served by sewer infrastructure are anticipated to be less than significant. However, as described in Section 3.10.1, large portions of the study area are not currently served by sewer infrastructure, most notably the area north of 20th Street SE and east of SR-9, as well as all areas south of 20th Street SE, with the exception of Cavalero Mid High School. Installation of additional collection lines will be necessary to adequately serve future development, and this infrastructure will be provided at the time that new development is approved, by the LSSD, by private developers, or by a combination of both.

Treatment

Additional growth in the study area under *Alternative 3* would increase flows to the wastewater treatment facility. Each additional ERU would contribute 203 gallons of wastewater flow per day, as well as 0.682 pounds of BOD_5 loading and 0.545 pounds of

TSS loading per day. Based on the levels of growth projected for *Alternative 3*, wastewater flows from the study area would increase by 299,400 – 352,400 gallons per day. BOD_5 loading would increase by 1,005 – 1,183 pounds per day, and TSS loading would increase by 804 – 946 pounds per day. Compared to the *No Action Alternative*, which is equivalent to the baseline for which the District's new wastewater treatment plant has been designed, *Alternative 3* represents an increase in flows and loadings of up to 126%. While within the capacity of the planned wastewater treatment plant, increased demand for treatment in the study area could potentially reduce the ability of the plant to adequately treat future flows from the sewer district as a whole, which could result in the need for upgrades and expansions to the plant sooner than originally anticipated. At the same time, concentrating a greater relative proportion of city-wide growth in the 20th Street SE Subarea could reduce demand in other portions of the service area.

Cumulative Impacts

Cumulative impacts to utilities include the effects of the 20th Street SE Corridor Subarea Plan combined with those of the Lake Stevens Center Subarea Plan on utility systems and infrastructure. The City will be considering adopting plans for both subareas and development could occur concurrently. The Draft EIS for the Lake Stevens Center Subarea was published in December, 2011, and the following analysis incorporates information from that document.

Water Distribution, Fire Flow Conveyance and Sewer Collection

Impacts and needs associated with water distribution, fire flow conveyance and sewer collection are based primarily on conveyance pipe size and localized conditions. These issues would be evaluated in the context of individual project proposals. Mitigation measures identified in the EISs for both subarea plans includes upgrading of pipes, and are typically required as conditions of development approval. Since these impacts are localized and project-specific, cumulative impacts would not be greater or different that direct impacts.

Water Supply

Combined water demand of the 20th Street SE Corridor Subarea Plan and the Lake Stevens Center Subarea Plan are shown in Table 3.10-3 below. As indicated, the most intensive combination of development among the alternatives would consume approximately 42 percent of available water supply in 2025.

Table 3.10-3. Cumulative Water Demand

Combined Subareas	No Action	Alternative 2	Alternative 3
Equivalent Residential Units (ERU)	873-1,541 ERU	2,492-2,847 ERU	2,635-3,145 ERU
Gallons Per Day (gpd)	164,040-290,035 gpd	164,040-290,035 gpd	495,420-591,940 gpd
Proportion of Available Supply	20.6%	38.4%	42.4%

Water Storage

Combined water storage of the 20th Street SE Corridor Subarea Plan and the Lake Stevens Center Subarea Plan are shown in Table 3.10-4 below. As indicated in the table, the action alternatives together would consume a significant portion, or exceed the currently planned capacity in 2025. The District will, therefore, need to plan and construct additional storage facilities to meet the expected demand from the subarea alternatives.

Table 3.10-4. Cumulative Water Storage Demand

Combined Subareas	No Action Alternative	Alternative 2	Alternative 3
Storage (gallons)	337,623-596,425	963,418-1,102,035	1,019,827-1,218,514
Proportion of 2012 Surplus (1.2 MG)	28%-50%	80%-92%	85%-102%

Sewer Service

Combined sewer flows of the 20th Street SE Corridor Subarea Plan and the Lake Stevens Center Subarea Plan are shown in Table 3.10-5 below. As indicated in the table, the action alternatives together would consume a minor portion of treatment capacity in 2025.

3.10-5. Cumulative Sewer Flows

Combined Subareas	No Action Alternative	Alternative 2	Alternative 3
Flows (gallons per day)	157,300-287,600 gpd	323,300-367,600 gpd	415,700-490,900 gpd
Proportion of Existing Flow Treatment Capacity	3.86%-7.07%	7.94%-9.03%	10.21%-12.06%
Proportion of Upgraded Flow Treatment Capacity (6.36 MGD)	2.47%-4.52%	5.08%-5.78%	6.54%-7.72%

3.10.3 Mitigation Measures

Drainage

Applicable Regulations and Commitments

- **City of Lake Stevens Stormwater Ordinance:** Chapter 11.06 and Chapter 14.64 (Part II) of the Lake Stevens Municipal Code adopt the *Department of Ecology's 2005 Stormwater Management Manual for Western Washington*. Any project that meets or exceeds the thresholds defined in the manual for new impervious area, drainage system modifications, or redevelopment is subject to City review and permit approval.
- **Ecology Stormwater Manual Adopted:** The City has adopted the *Department of Ecology's 2005 Stormwater Management Manual for Western Washington* as its minimum design standard for stormwater infrastructure. All development meeting the minimum thresholds is required to design associated stormwater infrastructure to be consistent with these standards.
- **Low Impact Development Encouraged:** The City's stormwater ordinance states that Low Impact Development solutions, as defined and listed in the LID Technical Guidance Manual for Puget Sound, are acceptable and encouraged alternative standards for management of stormwater.

Additional Mitigation Measures

- **Permitting Incentives for Low Impact Development:** To reduce the need for new stormwater conveyance infrastructure and protect water quality, the City should incentivize the use of LID techniques for onsite stormwater treatment and detention for appropriate projects. Incentives could include expedited development permit review or reduced permit fees.

Water

Applicable Regulations and Commitments

- **Supply Upgrades:** Snohomish County PUD's 2011 Water System Plan identifies necessary capital improvements to provide adequate water supply for the next 20 years. Planned and budgeted supply improvements include conversion of the system's two emergency groundwater wells to a full-time source, increasing system supply by approximately 1.2 MG per day.
- **Storage Upgrades:** The PUD's 2011 Water System Plan identifies the following planned and budgeted capital improvements to storage capacity:
    - Walker Hill Booster Zone Intertie: Eliminates dead storage in the Walker Hill tanks, making this water available to the Lake Stevens 500 zone for emergency use. (2012)

- Getchell Reservoir: New 9.2 MG reservoir serving the Lake Stevens 500 pressure zone.

- **Distribution Upgrades:** The PUD's ongoing water main replacement program annually evaluates aging pipes for replacement with a focus on the replacement of galvanized iron/steel and asbestos cement pipes.

Additional Mitigation Measures

- **Joint Planning with Snohomish County PUD:** Upon adoption of a preferred alternative, the City should consult with Snohomish County PUD to establish a joint planning process for capital improvements necessary to serve anticipated development in the subarea.
- **Design Review for Fire Flow:** The City and developers should coordinate development permit application with Snohomish County PUD and the Lake Stevens Fire Marshal to determine fire flow requirements based on project design. Upgrades to existing lines should be coordinated with Snohomish County PUD. Installation of new water lines adequate to provide required fire flows should be the responsibility of the developer, in accordance with the fire flow design thresholds established below.
    - Commercial, Office, and High-Density Residential**:** 12-inch pipes and 3,000 gpm.
    - Existing Medium and Low-Density Residential Areas**:** 8-inch pipes and 1,500 gpm.
    - All Other Areas and Development Types**:** 10-inch pipes and 2,000 gpm.
- **Water Storage.** The City should work with the PUD to identify the amount and timing of development that will trigger the need for additional water storage facilities. These facilities could be needed to address the cumulative demands created by growth in the 20th Street SE Corridor Subarea and the Lake Stevens Center Subarea. The PUD should revise its facilities plan to incorporate any needed facilities.

Sewer

Applicable Regulations and Commitments

- **Planned Capital Improvements:** As described in the impact analysis, the Lake Stevens Sewer District adopted updates to its Comprehensive Plan in 2007 and 2010, describing the capital improvements planned for the near future, including several pipeline expansions, decommissioning of several lift stations, pump upgrades, and construction of a new wastewater treatment plant. These improvements are designed to relieve existing system deficiencies and create the capacity necessary to serve future development.

Additional Mitigation Measures

- **Joint Planning with Lake Stevens Sewer District:** Upon adoption of a preferred alternative, the City should consult with the Lake Stevens Sewer District to establish a joint planning process for capital improvements necessary to serve anticipated development in the subarea, including new wastewater collection infrastructure and future expansions to the new treatment plant that may be necessary to accept projected flows from development under the subarea plan.
- **Design Review for Wastewater Flows and Loads:** Because planned improvements to the wastewater system will be implemented in phases over several years, the Planned Action should establish size thresholds for new development that, when met or exceeded, would require developers to initiate consultation with Lake Stevens Sewer District. Consultation would confirm that projected wastewater flows and loads from any proposed project would not exceed the treatment or conveyance capacity of the wastewater system existing at that time.

3.10.4 Significant Unavoidable Adverse Impacts

All alternatives are anticipated to result in additional development within the subarea, proportionate to population and commercial growth, which would increase demand for water, sewer, and drainage services. An increase in population and employment in the study area could exacerbate existing water and wastewater system deficiencies and increase demand for services beyond the capacity of existing infrastructure in some limited areas. However, with application of identified mitigation measures, which include both regulatory measures and planned capital improvements, no significant unavoidable adverse impacts are anticipated.

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5. ACRONYMS AND ABBREVIATIONS

ADT	Average daily traffic
AMI	Average monthly income
BMP	Best Management Practices
BOD	Biochemical Oxygen Demand
CIP	Capital Improvement Program
CO	Carbon monoxide
COE	U.S. Army Corps of Engineers
CO2	Carbon dioxide
CO2e	Carbon dioxide equivalent
DART	Dial-A-Ride Transit
DNR	Washington Department of Natural Resources
DOE	Washington Department of Ecology
DEIS	Draft environmental impact statement
DS	Determination of significance
DU	Dwelling units
EIS	Environmental impact statement
EMS	Emergency medical services
EPA	U.S. Environmental Protection Agency
ERU	Equivalent residential unit
ESA	Endangered Species Act
FAZ	Forecast analysis zone
FEIS	Final environmental impact statement
FEMA	Federal Emergency Management Administration
FIRE	Finance, insurance and real estate
GHG	Greenhouse gases
GMA	The Washington Growth Management Act, RCW 36.70A
GPM	Gallons per minute
GSF	Gross square feet
HCM	Highway Capacity Manual
LEED	Leadership in Energy and Environmental Design
LID	Low impact development
LOS	Level of service
LSMC	Lake Stevens Municipal Code

LSPD	Lake Stevens Police Department
LSSD	Lake Stevens Sewer District
MG	Million gallons
MGD	Million gallons daily
MLS	Multiple Listing Service
MTCO2e	Metric ton carbon equivalent
NAAQS	National Ambient Air Quality Standards
NHP	Washington Natural Heritage Program
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
OFM	Washington Office of Financial Management
PHS	Priority Habitat and Species database
PM10	Particulate matter equal to or less than 10 micrometers in diameter
PM2.5	Particulate matter equal to or less than 2.5 micrometers in diameter
PPM	Parts per million
PSCAA	Puget Sound Clean Air Agency
PSRC	Puget Sound Regional Council
PUD#1	Public Utility District # 1
RCW	Revised Code of Washington
RUTA	Rural Urban Transition Area
SEPA	State Environmental Policy Act, RCW 43.21C and WAC 197-11
SR	State Route
TBD	Transportation Benefit District
TDM	Transportation demand management
TIP	Transportation Improvement Program
TOD	Transit-oriented development
TSS	Total Suspended Solids
UGA	Urban Growth Area
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
V/C	Volume to capacity ratio
WAC	Washington Administrative Code
WASIST	Washington State Department of Transportation screening tool

WCTU	Wholesale trade, communication and utilities
WDFW	Washington Department of Fish and Wildlife
WSDOT	Washington Department of Transportation
WWTP	Wastewater Treatment Plant

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6. DISTRIBUTION LIST

The following parties were provided with a notice of availability of the Draft EIS. Those entities denoted with an asterisk (*) received a copy of the document.

Federal Agencies
U.S. Army Corps of Engineers *
U.S. Environmental Protection Agency *
U.S. Fish & Wildlife Service *
National Atmospheric and Oceanic Administration *

State Agencies
Washington Department of Archaeology & Historic Preservation *
Washington Department of Commerce *
Washington Department of Ecology SEPA Unit *
Washington Department of Fish & Wildlife *
Interagency Commission on Outdoor Recreation
Washington Department of Natural Resources *
Washington State Department of Transportation *

Tribes
Tulalip Tribes *
Stillaguamish Tribe
Sauk-Suiattle Tribe *

Regional and Local Governments
City of Arlington *
City of Everett *
City of Lake Stevens *
City of Marysville *
City of Snohomish *
Community Transit *
Snohomish County Planning & Development Services *
Snohomish Health District *
Puget Sound Clean Air Agency *
Puget Sound Regional Council *

Special Purpose Districts
Lake Stevens Fire District *
Lake Stevens Sewer District *
Lake Stevens School District *
Marysville School District *
Puget Sound Energy *

Snohomish County PUD *
Snohomish School District *

Public Libraries
Lake Stevens Library *

Community Organizations
Economic Development Council of Snohomish County *
Lake Stevens Chamber of Commerce *

Media
Everett Herald *
Lake Stevens Journal *

Private Firms & Individuals
Sue Ambler
Camie Anderson
Merle Ash
Erik Ashlie
Janet Backus
Tom Bahr
Jerry Bayha
Stephanie Baron
Russ Bosanko
Will Brandt
Bart Brynestad
Carla Busby
Jim Busby
John C. Cannon
George Capestany
James & Christina Chapin
Steve Clagett
Comcast Cable (Casey Brown) *
Ron Cushman
Lorrie Davidson
Gloria Davis
Matt Dixon
Crystal Donner
Doug Ecklund
Jess Eline
Chris Fenwick
Jessica Fenwick
Futurewise (Kristen Kelly, Tim Trahimovich) *
Ruth Fletcher

Debe Franz
Kathleen Friend
David Gibson
David Graef
Mike Hansen
Tom Hoban
Dave & Wendy Hueser
Steve Iblings
Mike Jauhola
Kimco Realty
Laana Larson
Larsen Financial Services (Jim Larsen)
Brad Lincoln
Jonette Limantzakis
Chief Dave Lingenfelter
Don Lundquist
Tom Matlack
Master Builders Association (Mike Pattison) *
David Matulich
Kevin McDaniel
Glenn McLoughlin
Barry Miller
Kathy Milton
Robert Milton
Darrell Moore
Barbara Mounsey
Leigh Nelson
Jim Nottoli
Steve & Darlene Owens
James B. Potter
Keith & Corrie Perry
Steve Pesce
Darron Pyper
Chris Radosovich
Noah Reandeau
Richard Reese
Republic Services (Don Frey)
Ridgeline Management Company
Scott Ritterbush
Brittney Rourke
Dennis & Meri Scafe
James & Elaine Schroedel
Paula Simonson
Darwin Smith

Jozette Smith
John Spaulding
Joel St. Marie
Robb Stanton
Tracy Stevens
Steve Smith
Alan Tandy
Team Fitness
Tom Thorleifson
Laurey Tobiason
Kate Tourtellot
Michael & Stacy Turner
Keith Tyson
Marilyn Webber
Mary Wicklund
Kevyn Williams
Ken Withrow
Jean Wrona
Peter Zuvela

Appendix A

Draft Planned Action Ordinance

ORDINANCE NO._____

AN ORDINANCE OF THE CITY OF LAKE STEVENS, WASHINGTON ESTABLISHING A PLANNED ACTION FOR THE 20TH STREET SE CORRIDOR SUBAREA PURSUANT TO THE STATE ENVIRONMENTAL POLICY ACT (RCW 43.21C.031 AND WAC 197-11-164)

WHEREAS, the State Environmental Policy Act (SEPA) (RCW 43.21C.031) and implementing rules (WAC 197-11-164) provide for the integration of environmental review with land use planning and project review through designation of "Planned Actions" by jurisdictions planning under the Growth Management Act (GMA) (Chapter 36.70a RCW); and

WHEREAS, on July 27, 2006 the Lake Stevens City Council enacted Ordinance No. 726 adopting an updated Comprehensive Plan for the City of Lake Stevens complying with the GMA; and

WHEREAS, on November 27, 2006, Ordinance No. 739 was adopted to adopt Comprehensive Plan provisions consistent with the incomplete provisions adopted in Ordinance No. 726; and

WHEREAS, the Growth Management Act allows jurisdictions to amend comprehensive plans once a year, except in those situations enumerated in RCW 36.70A.130(2)(a); and

WHEREAS, RCW 36.70A.130(2)(a)(i) and (v) allows jurisdictions to amend the comprehensive plan with initial adoption of a subarea plan and adoption of comprehensive plan amendments necessary to enact a planned action under RCW 43.21C.031(2); and

WHEREAS, the City held numerous workshops and open houses to elicit public input including March 29, July 14 and _____, 2011; and

WHEREAS, the City has prepared an initial subarea plan for the 20th Street SE Corridor, which is referred to as the Planned Action Area; and

WHEREAS, the City issued a Determination of Significance and request for comments on the scope of the environmental impact statement on June 28, 2011 and held a Scoping Meeting on July 14, 2011; and

WHEREAS, on _____, 2011 the City issued a Draft environmental impact statement (EIS) for the 20th Street SE Corridor Subarea Plan which identifies impacts and mitigation measures associated with planned development in the subarea; and

WHEREAS, on ____, 2012 the City issued a Final environmental impact statement (EIS) for the 20th Street SE Corridor Subarea Plan which identifies impacts and mitigation measures associated with planned development in the subarea; and

WHEREAS, in taking the actions set forth in this ordinance, the City has complied with the requirements of the State Environmental Policy Act, Ch. 43.21C RCW; and

WHEREAS, on _____, 2012 the City submitted the proposed 20th Street SE Corridor Subarea Plan, Comprehensive Plan Land Use Map and Zoning Map amendments, and other text amendments to the Washington State Department of Commerce for its 60-day review and received a letter dated _____, 2012 stating the procedural requirement was met.

WHEREAS, the Department of Commerce's 60-day review period was completed on _____, 2012; and

WHEREAS, on _____, 2012 the Lake Stevens Planning Commission, after review of the proposed 20th Street SE Corridor Subarea Plan, Comprehensive Plan Land Use Map and Zoning Map amendments, and other text amendments, held a duly noticed public hearing on the amendment, and all public testimony was given full consideration before making a recommendation to the City Council to approve the proposed Subarea Plan, map amendments, and other text amendments; and

WHEREAS, on _____ and _____, 2012, the Lake Stevens City Council reviewed the Planning Commission's recommendation relating to the proposed 20th Street SE Corridor Subarea Plan, Comprehensive Plan Land Use Map and Zoning Map amendments, and other text amendments, and held a duly noticed public hearing, and all public testimony and arguments have been given full consideration.

WHEREAS, the City has adopted development regulations which will help protect the environment; and

WHEREAS, designation of a Planned Action expedites the permitting process for subsequent, implementing projects whose impacts have been previously addressed in a Planned Action EIS, and thereby encourages desired growth and economic development; and

WHEREAS, the 20th Street SE Corridor Subarea is deemed to be appropriate for designation of a Planned Action.

NOW, THEREFORE, THE CITY COUNCIL OF THE CITY OF LAKE STEVENS, WASHINGTON, DO ORDAIN AS FOLLOWS:

SECTION 1. Purpose**.** The City Council declares that the purpose of this ordinance is to:

A. Combine analysis of environmental impacts with the City's development of plans and regulations;

B. Designate the 20th Street SE Corridor Subarea as a Planned Action for purposes of environmental review and permitting of subsequent, implementing projects pursuant to the State Environmental Policy Act (SEPA), RCW 43.21C.031;

C. Determine that the EIS prepared for the subarea plan meets the requirements of a Planned Action EIS pursuant to SEPA;

D. Establish criteria and procedures, consistent with state law, that will determine whether subsequent, implementing projects qualify as Planned Actions;

E. Provide the public with information about Planned Actions and how the City will process applications for implementing projects;

F. Streamline and expedite the land use review and approval process for qualifying projects by relying on the environmental impact statement (EIS) completed for the Planned Action; and

G. Apply the City's development regulations together with the mitigation measures described in the EIS and this Ordinance to address the impacts of future development contemplated by the Planned Action.

SECTION 2. Findings**.** The City Council finds as follows:

A. The City is subject to the requirements of the Growth Management Act, RCW 36.70A, and is located within an Urban Growth Area;

B. The City has adopted a Comprehensive Plan complying with the GMA, and is amending the Comprehensive Plan to incorporate a subarea element specific to the 20th Street SE Corridor Planned Action Area;

C. The City is adopting development regulations concurrent with the subarea Plan to implement said Plan;

D. The City has prepared an EIS for the 20th Street SE Corridor Subarea and finds that this EIS adequately addresses the probable significant environmental impacts associated with the type and amount of development planned to occur in the designated Planned Action Area;

E. The mitigation measures identified in the Planned Action EIS and attached to this ordinance as Exhibit B, together with adopted City development regulations,

will adequately mitigate significant impacts from development within the Planned Action area;

F. The subarea plan and Planned Action EIS identify the location, type and amount of development that is contemplated by the Planned Action;

G. Future projects that are implemented consistent with the Planned Action will protect the environment, benefit the public and enhance economic development within the City;

H. The City has provided numerous opportunities for meaningful public involvement in the proposed Planned Action; has considered all comments received; and, as appropriate, has modified the proposal or mitigation measures in response to comments;

I. The 20th Street SE Corridor Subarea Plan is not an essential public facility as defined by RCW 36.70A.200(1). Future improvements to state highways within the subarea are not eligible for review or permitting as Planned Actions. However, such future proposals may use the information contained in the Planned Action EIS, consistent with SEPA;

J. The Planned Action Area is a defined area that is smaller than the overall City boundaries; and

K. Public services and facilities are adequate to serve the proposed Planned Action, with implementation of mitigation measures identified in the EIS.

SECTION 3. Procedures and Criteria for Evaluating and Determining Projects as Planned Actions.

A. *Planned Action Area*. The Planned Action designation shall apply to the area shown in Exhibit A.

B. *Environmental Document*. A Planned Action determination for a site-specific implementing project application shall be based on the environmental analysis contained in the Draft EIS issued by the City on _____and the Final EIS published on _____. The Draft and Final EISs together shall comprise the Planned Action EIS. The mitigation measures contained in Exhibit B are based upon the findings of the Planned Action EIS and shall, along with adopted City regulations, provide the framework that the City will use to impose appropriate conditions on qualifying Planned Action projects.

C. *Planned Action Designated*. Land uses and activities described in the Planned Action EIS, subject to the thresholds described in subsection 3.D and the mitigation measures contained in Exhibit B, are designated Planned Actions or Planned Action Projects pursuant to RCW 43.21C.031. A development application

for a site-specific project located within the 20th Street SE Corridor Subarea shall be designated a Planned Action if it meets the criteria set forth in subsection 3.D of this ordinance and applicable laws, codes, development regulations and standards of the City.

D. *Planned Action Qualifications*. The following thresholds shall be used to determine if a site-specific development proposed within the 20th Street SE Corridor Subarea is contemplated by the Planned Action and has had its environmental impacts evaluated in the Planned Action EIS:

(1) Land Use. The following general categories/types of land uses, which are permitted or conditionally permitted in zoning districts applicable to the 20th Street SE Corridor Planned Action Area, are considered Planned Actions:

(a) Retail and service activities;
(b) Civic and cultural uses which are not defined as essential public facilities;
(c) Office uses;
(d) Commercial uses;
(e) Residential dwelling units; and
(f) Infrastructure improvements identified in the EIS to support planned land uses.

Individual land uses considered to be Planned Actions shall include those uses specifically listed in development regulations applicable to the zoning classifications applied to properties within the Planned Action Area.

(2) Development Thresholds.

(a) The following amount of various new land uses are contemplated by the Planned Action:

Land Use	Development Amount
Residential	_____units
Retail/Service	_____gross square feet
Office	_____gross square feet
Commercial	_____gross square feet

(b) Shifting the total build out between categories of uses may be permitted so long as the total build out does not exceed the aggregate amount of development and the trip generation reviewed in the EIS, and so long as the impacts of that development have been identified in the Planned Action EIS and are mitigated consistent with Exhibit B.

(c) If future development proposals in the 20th Street SE Corridor Planned Action Area exceeds the development thresholds specified in this ordinance, further environmental review may be required pursuant to WAC 197-11-172. In addition, if proposed development would alter the assumptions and analysis in the Planned Action EIS, further environmental review may be required.

(3) Building Height. Building height shall not exceed those permitted in the underlying zoning district(s) pursuant to the standards of the Lake Stevens City Code.

4) Transportation.

(a) *Trip Ranges & Thresholds*. The number of new PM peak hour trips anticipated in the Planned Action Area and reviewed in the EIS are as follows:

Total PM Peak Hour Trips	Tbd

Uses or activities that would exceed these maximum trip levels will require additional SEPA review.

(b) *Concurrency*. The determination of transportation impacts shall be based on the City's concurrency management program contained in Chapter 14.110 LSMC.

(c) *Off-Site Mitigation*. As provided in the EIS and Chapter 14.110 LSMC in order to mitigate transportation related impacts, all Planned Action Projects shall pay a traffic impact mitigation fee to participate in and pay a proportionate share of off-site improvements. Off-site improvements are identified in Attachment B.

(d) *Director Discretion*. The Director of Public Works shall have discretion to determine incremental and total trip generation, consistent with the latest edition of the Institute of Traffic Engineers (ITE) Trip Generation Manual or an alternative manual accepted by the Director of Public Works at his or her sole discretion, for each project permit application proposed under this Planned Action.

(5) Elements of the Environment and Degree of Impacts. A proposed project that would result in a significant change in the type or degree of impacts to any of the elements of the environment analyzed in the Planned Action EIS, or that causes significant impacts to an element of the environment that was not considered in the Planned Action EIS, would not qualify as a Planned Action.

(6) Changed Conditions. Should environmental conditions change significantly from those analyzed in the Planned Action EIS, the City's SEPA Responsible Official may determine that the Planned Action designation is no longer applicable until supplemental environmental review has been conducted.

E. **Planned Action Review Criteria**.

(1) The City's SEPA Responsible Official may designate as "Planned Actions", pursuant to RCW 43.21C.030, applications that meet all of the following conditions:

(a) the proposal is located within the Planned Action Area identified in Exhibit A of this ordinance;

(b) the proposed uses and activities are consistent with those described in the Planned Action EIS and Section 3.D of this ordinance;

(c) the proposal is within the Planned Action thresholds and other criteria of Section 3.D of this ordinance;

(d) the proposal is consistent with the City of Lake Stevens Comprehensive Plan;

(e) the proposal's significant adverse environmental impacts have been identified in the Planned Action EIS;

(f) the proposal's significant impacts have been mitigated by application of the measures identified in Exhibit B, and other applicable city regulations, together with any modifications or variances or special permits that may be required;

(g) the proposal complies with all applicable local, state and/or federal laws and regulations, and the Responsible Official determines that these constitute adequate mitigation; and

(h) the proposal is not an essential public facility as defined by RCW 36.70A.200(1).

(2) The City shall base its decision on review of a SEPA checklist, or an alternative form approved by the Department of Ecology, and review of the application and supporting documentation.

(3) A proposal that meets the criteria of this section shall be considered to qualify and be designated as a Planned Action, consistent with the requirements or RCW 43.21C.030, WAC 197-11-164 et seq, and this ordinance.

F. **Effect of Planned Action**

(1) Designation as a Planned Action project means that a qualifying proposal has been reviewed in accordance with this ordinance and found to be consistent with its development parameters and thresholds, and with the environmental analysis contained in the Planned Action EIS.

(2) Upon determination by the City's SEPA Responsible Official that the proposal meets the criteria of Section 3.D and qualifies as a Planned Action, the proposal shall not require a SEPA threshold determination, preparation of an EIS, or be subject to further review pursuant to SEPA.

G. **Planned Action Permit Process**. Applications for Planned Actions shall be reviewed pursuant to the following process.

(1) Development applications shall meet all applicable requirements of the Lake Stevens Municipal Code (LSMC). Applications for Planned Actions shall be made on forms provided by the City and shall include a SEPA checklist, or an approved Planned Action checklist.

(2) The City's Director of Planning and Community Development or designee shall determine whether the application is complete as provided in LSMC 14.16A.220(f).

(3) If the application is for a project within the Planned Action Area defined in Exhibit A, the application will be reviewed to determine if it is consistent with the criteria of this ordinance and thereby qualifies as a Planned Action Project. The SEPA Responsible Official shall notify the applicant of his/her decision. If the project is determined to qualify as a Planned Action, it shall proceed in accordance with the applicable permit review procedures specified in 14.16B LSMC, except that no SEPA threshold determination, EIS or additional SEPA review shall be required. The decision of the SEPA Responsible Official regarding qualification as a Planned Action shall be final.

(4) Public notice and review for projects that qualify as Planned Actions shall be tied to the underlying permit. The review process for the underlying permit shall be as provided in Chapter 14.16B LSMC. If notice is otherwise required by Chapter 14.16B LSMC for the underlying permit, in addition to the noticing requirements in LSMC 14.16A.225, the notice shall state that the project has qualified as a Planned Action. If notice is not otherwise required for the underlying permit, no special notice is required by this ordinance.

(5) Development Agreement. To provide additional certainty about applicable requirements, the City or an applicant may request consideration and execution of a development agreement for a Planned Action Project. The development agreement may address review procedures applicable to a Planned Action Project, permitted uses, mitigation measures, payment of impact fees or provision of improvements through other methods, design standards, phasing, vesting of development rights, or any other topic that may properly be considered in a development agreement consistent with RCW 36.70B.170 et seq.

(6) If a project is determined to not qualify as a Planned Action, the SEPA Responsible Official shall so notify the applicant and prescribe a SEPA review procedure consistent with the City's SEPA regulations and the requirements of state law. The notice shall describe the elements of the application that result in failure to qualify as a Planned Action.

(7) Projects that fail to qualify as Planned Actions may incorporate or otherwise use relevant elements of the Planned Action EIS, as well as other relevant SEPA documents, to meet their SEPA requirements. The SEPA Responsible Official

may limit the scope of SEPA review for the non-qualifying project to those issues and environmental impacts not previously addressed in the Planned Action EIS.

SECTION 4. Monitoring and Review.

A. The City shall monitor the progress of development in the designated Planned Action Subarea to ensure that it is consistent with the assumptions of this ordinance and the Planned Action EIS regarding the type and amount of development and associated impacts, and with the mitigation measures and improvements planned for the 20th Street SE Corridor Planned Action Area.

B. This Planned Action Ordinance shall be reviewed by the SEPA Responsible Official no later than five years from its effective date to determine the continuing relevance of its assumptions and findings with respect to environmental conditions in the Planned Action Area, the impacts of development, and required mitigation measures. Based upon this review, the City may propose amendments to this ordinance or may supplement or revise the Planned Action EIS.

SECTION 5. Conflict. In the event of a conflict between this Ordinance or any mitigation measure imposed thereto, and any ordinance or regulation of the City, the provisions of this ordinance shall control, EXCEPT that the provision of any International Code shall supersede.

SECTION 6. Severability. If any section, clause, phrase, or term of this ordinance is held for any reason to be invalid or unconstitutional, such decision shall not affect the validity of the remaining portions of this ordinance, and the remaining portions shall be in full force and effect.

SECTION 7. Effective Date and Publication. A summary of this ordinance consisting of its title shall be published in the official newspaper of the City. This ordinance shall take effect and be in full force five days after the date of publication.

PASSED by the City Council of the City of Lake Stevens this _____ day of , 2011.

_____
Vern Little, Mayor

ATTEST/AUTHENTICATION:

_____
Norma J. Scott, City Clerk/Admin Asst

APPROVED AS TO FORM:

_____
Grant K. Weed, City Attorney

First Reading:
Published:
Effective Date:

DRAFT

EXHIBIT A
PLANNED ACTION AREA

DRAFT

EXHIBIT B
PLANNED ACTION EIS MITIGATION MEASURES

DRAFT

Appendix B

Greenhouse Gas Emission Worksheets

20TH STREET SE CORRIDOR GHG SUMMARY

Scenario	Type of GHG Emissions			Service Population		Total Emissions/ Service Population
	Embodied	Energy	Total	Population	Employment	
Existing	63,837	592,910	656,747	2,456	275	240.5
Alternative 1 Growth	92,996	798,361	891,357	3,480	449	
Alternative 1 Total	156,833	1,391,271	1,548,104	5,936	724	232.4
Alternative 2 Growth	124,665	1,675,309	1,799,974	2,900	4,500	
Alternative 2 Total	188,502	2,268,219	2,456,721	5,356	4,775	242.5
Alternative 3 Growth	114,788	1,418,927	1,533,715	4,000	3,000	
Alternative 3 Total	178,625	2,011,837	2,190,462	6,456	3,275	225.1

Source: Embodied and Energy Emissions from King County SEPA GHG Worksheet.

20th Street SE Corridor - EXISTING CONDITIONS

Section I: Buildings

			Emissions Per Unit or Per Thousand Square Feet (MTCO2e)			Lifespan Emissions by Type (MTCO2e)	
Type (Residential) or Principal Activity (Commercial)	# Units	Square Feet (in thousands of square feet)	Embodied	Energy	**Lifespan Emissions (MTCO2e)**	Embodied	Energy
Single-Family Home.....	395		98	672	**304152**	38645	265507
Multi-Family Unit in Large Building	369		33	357	**143957**	12100	131856
Multi-Family Unit in Small Building	92		54	681	**67584**	4962	62622
Mobile Home.....	0		41	475	**0**	0	0
Education		150.0	39	646	**102638**	5807	96831
Food Sales		0.0	39	1,541	**0**	0	0
Food Service		0.0	39	1,994	**0**	0	0
Health Care Inpatient		0.0	39	1,938	**0**	0	0
Health Care Outpatient		0.0	39	737	**0**	0	0
Lodging		0.0	39	777	**0**	0	0
Retail (Other Than Mall).....		50.0	39	577	**30798**	1936	28863
Office		10.0	39	723	**7618**	387	7230
Public Assembly		0.0	39	733	**0**	0	0
Public Order and Safety		0.0	39	899	**0**	0	0
Religious Worship		0.0	39	339	**0**	0	0
Service		0.0	39	599	**0**	0	0
Warehouse and Storage		0.0	39	352	**0**	0	0
Other		0.0	39	1,278	**0**	0	0
Vacant		0.0	39	162	**0**	0	0
						63837	592910

Section II: Pavement.....

Pavement.....		0.00			**0**

Total Project Emissions: **656747**

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20th Street SE Corridor - ALTERNATIVE 1 GROWTH

Section I: Buildings

Type (Residential) or Principal Activity (Commercial)	# Units	Square Feet (in thousands of square feet)	Emissions Per Unit or Per Thousand Square Feet (MTCO2e) Embodied	Energy	**Lifespan Emissions (MTCO2e)**	Lifespan Emissions by Type (MTCO2e) Embodied	Energy
Single-Family Home.....	665		98	672	**512053**	65060	446993
Multi-Family Unit in Large Building	428		33	357	**166974**	14035	152939
Multi-Family Unit in Small Building	107		54	681	**78603**	5771	72833
Mobile Home.....	0		41	475	**0**	0	0
Education		0.0	39	646	**0**	0	0
Food Sales		0.0	39	1,541	**0**	0	0
Food Service		0.0	39	1,994	**0**	0	0
Health Care Inpatient		0.0	39	1,938	**0**	0	0
Health Care Outpatient		0.0	39	737	**0**	0	0
Lodging		0.0	39	777	**0**	0	0
Retail (Other Than Mall).....		180.0	39	577	**110874**	6969	103905
Office		30.0	39	723	**22853**	1161	21691
Public Assembly		0.0	39	733	**0**	0	0
Public Order and Safety		0.0	39	899	**0**	0	0
Religious Worship		0.0	39	339	**0**	0	0
Service		0.0	39	599	**0**	0	0
Warehouse and Storage		0.0	39	352	**0**	0	0
Other		0.0	39	1,278	**0**	0	0
Vacant		0.0	39	162	**0**	0	0
						92996	798361

Section II: Pavement.....

Pavement.....		0.00			**0**

Total Project Emissions: **891357**

Version 1.7 12/26/07

20th Street SE Corridor - ALTERNATIVE 2 GROWTH

Section I: Buildings

Type (Residential) or Principal Activity (Commercial)	# Units	Square Feet (in thousands of square feet)	Emissions Per Unit or Per Thousand Square Feet (MTCO2e) Embodied	Energy	**Lifespan Emissions (MTCO2e)**	Lifespan Emissions by Type (MTCO2e) Embodied	Energy
Single-Family Home.....	359		98	672	**276432**	35123	241309
Multi-Family Unit in Large Building	513		33	357	**200135**	16822	183312
Multi-Family Unit in Small Building	128		54	681	**94030**	6903	87127
Mobile Home.....	0		41	475	**0**	0	0
Education		0.0	39	646	**0**	0	0
Food Sales		0.0	39	1,541	**0**	0	0
Food Service		0.0	39	1,994	**0**	0	0
Health Care Inpatient		0.0	39	1,938	**0**	0	0
Health Care Outpatient		0.0	39	737	**0**	0	0
Lodging		0.0	39	777	**0**	0	0
Retail (Other Than Mall).....		450.0	39	577	**277185**	17422	259763
Office		1,250.0	39	723	**952192**	48395	903798
Public Assembly		0.0	39	733	**0**	0	0
Public Order and Safety		0.0	39	899	**0**	0	0
Religious Worship		0.0	39	339	**0**	0	0
Service		0.0	39	599	**0**	0	0
Warehouse and Storage		0.0	39	352	**0**	0	0
Other		0.0	39	1,278	**0**	0	0
Vacant		0.0	39	162	**0**	0	0
						124665	1675309

Section II: Pavement.....

Pavement.....		0.00			**0**

Total Project Emissions: **1799974**

20th Street SE Corridor - ALTERNATIVE 3 GROWTH

Section I: Buildings

Type (Residential) or Principal Activity (Commercial)	# Units	Square Feet (in thousands of square feet)	Emissions Per Unit or Per Thousand Square Feet (MTCO2e) Embodied	Energy	**Lifespan Emissions (MTCO2e)**	Lifespan Emissions by Type (MTCO2e) Embodied	Energy
Single-Family Home.....	335		98	672	**257952**	32775	225177
Multi-Family Unit in Large Building	852		33	357	**332388**	27939	304449
Multi-Family Unit in Small Building	213		54	681	**156472**	11487	144984
Mobile Home.....	0		41	475	**0**	0	0
Education		0.0	39	646	**0**	0	0
Food Sales		0.0	39	1,541	**0**	0	0
Food Service		0.0	39	1,994	**0**	0	0
Health Care Inpatient		0.0	39	1,938	**0**	0	0
Health Care Outpatient		0.0	39	737	**0**	0	0
Lodging		0.0	39	777	**0**	0	0
Retail (Other Than Mall).....		350.0	39	577	**215589**	13550	202038
Office		750.0	39	723	**571315**	29037	542279
Public Assembly		0.0	39	733	**0**	0	0
Public Order and Safety		0.0	39	899	**0**	0	0
Religious Worship		0.0	39	339	**0**	0	0
Service		0.0	39	599	**0**	0	0
Warehouse and Storage		0.0	39	352	**0**	0	0
Other		0.0	39	1,278	**0**	0	0
Vacant		0.0	39	162	**0**	0	0
						114788	1418927

Section II: Pavement.....

Pavement.....		0.00			**0**

Total Project Emissions: **1533715**

Transportation GHG Emissions Calculations

Step 1: Existing GHG Emissions from Travel Demand Model

2005-Existing Conditions		
	Annual Tonnes CO2e	Lifespan Tonnes CO2e
II	12	750
Half of IXXI	4,448	278,000
Sum	4,460	**278,750**
	From SnoCo 2005 Model	
	Population	3,985
	Employment (including MANU, WTCU & GOVED)	166
	Total Service Population	**4,151**
	GHG per service pop	67.15
	MANU, WTCU, GOVED emp	2
	GHG attributed to MANU, WTCU, GOVED	134
	Total GHG emissions to be reported	278,616
	Adjusted Service Population	4,149
	GHG per Adjusted Service Population	67.15

Step 2: 2025 Alternative 2 GHG Emissions from Travel Demand Model

2025-Alternative 2		
	Annual Tonnes CO2e	Lifespan Tonnes CO2e
II	23	1,438
Half of IXXI	9,514	594,594
Sum	9,537	**596,031**
	SnoCo 2005 Model+City's Proposed Growth	
	Population	6,885
	Employment (including MANU, WTCU & GOVED)	4,769
	Total Service Population	**11,654**
	GHG per service pop	51.14
	MANU, WTCU, GOVED emp	105
	GHG attributed to MANU, WTCU, GOVED	5,370
	Total GHG emissions to be reported	590,661
	Adjusted Service Population	11,549
	GHG per Adjusted Service Population	51.14

Step 3: Compare land use for each alternative

Land Use			
Alternative	Retail	Office	Dwelling Units
Alt 1	180,000	30,000	1,200
Alt 2	450,000	1,250,000	1,000
Alt 3	350,000	750,000	1,400

Step 4: Compare service populations for each alternative

Service Population Equivalents				Service Population per ksf and dwelling unit assumptions	
Alternative	Retail	Office	Dwelling Units		
Alt 1	360	89	3,480	2	emp/retail ksf
Alt 2	900	3,688	2,900	2.95	emp/office ksf
Alt 3	700	2,213	4,060	2.9	pop/DU
Service Population Proportions					
Alternative	Retail	Office	Dwelling Units		
Alt 1	9%	2%	89%		
Alt 2	12%	49%	39%		
Alt 3	10%	32%	58%		

Step 5: Determine VMT factor based on mix of land use/service population relative to Alternative 2 model results

VMT/serv pop equivalents	
1.75	Retail
0.75	Office
0.75	DU

Alternative	Relative VMT	VMT Factor
Alt 1	0.842	0.967
Alt 2	0.870	1.000
Alt 3	0.850	0.977

Step 6: Apply VMT factor to Alternative 2 model results to determine total GHG emissions for Alternatives 1 and 3

Alternative	VMT Factor	GHG/Service Population	Service Population	Total GHG Emissions
Alt 1	0.967	49.465	8078	399,580
Alt 2	1.000	51.144	11549	590,661
Alt 3	0.977	49.980	11149	557,226

Existing Internal Trips

PM VMT By Speed Bin	Existing	EMFAC	Daily tonnes
0-5 MPH	0	1167.456	0
5-10 MPH	0	891.3495	0
10-15 MPH	0	706.5965	0
15-20 MPH	0	581.8555	0
20-25 MPH	0	499.5845	8.3858E-05
25-30 MPH	14	444.2145	0.006140217
30-35 MPH	0	408.532	4.76711E-05
35-40 MPH	0	388.249	0
40-45 MPH	0	381.085	0
45-50 MPH	0	386.3035	0
50-55 MPH	0	404.5695	0
55-60 MPH	0	438.0805	0
60-65 MPH	0	491.015	0
65-70 MPH	0	495.7775	0
70+ MPH	0	503.256	0

TOTAL VMT	**14**	Total Daily Tonnes CO2e	0.033009189
		Annual Tonnes	**11.61923469**
Pop	3985	Annual Tonnes per Serv POP	0.002799141
Jobs	166		
Service Population	4151		
		Building Lifespan	62.5
Daily VMT Estimate	0.033985	Total Lifetime Trans GHG	726

Existing Internal-External Trips

PM VMT By Speed Bin	Existing	EMFAC	Daily tonnes
0-5 MPH	0	1154.107	0
5-10 MPH	0	880.077	0
10-15 MPH	6	696.736	0.004228819
15-20 MPH	2	572.974	0.001247035
20-25 MPH	72	491.402	0.035487514
25-30 MPH	2,600	436.519	1.134955514
30-35 MPH	3,851	401.17	1.544840959
35-40 MPH	1,105	381.105	0.421140985
40-45 MPH	2,027	374.066	0.758354102
45-50 MPH	497	379.331	0.188701721
50-55 MPH	240	397.572	0.09550106
55-60 MPH	659	430.986	0.2842197
60-65 MPH	376	483.747	0.181931151
65-70 MPH	309	489.044	0.151112337
70+ MPH	0	497.335	0

TOTAL VMT	**11,746**	Total Daily Tonnes CO2e	25.27221576
		Annual Tonnes	**8895.819948**
Pop	3985	Annual Tonnes per Serv POP	2.143054673
Jobs	166		
Service Population	4151		
		Building Lifespan	62.5
Daily VMT Estimate	28.29658	Total Lifetime Trans GHG	555,989

2025 Alternative 2 Internal Trips

PM VMT By Speed Bin	Alt 2	EMFAC	Daily tonnes
0-5 MPH	0	858.04	0
5-10 MPH	0	655.17	0
10-15 MPH	0	519.22	0
15-20 MPH	0	427.38	0
20-25 MPH	0	367.07	0.000169456
25-30 MPH	38	326.45	0.012410108
30-35 MPH	0	300.25	9.63558E-05
35-40 MPH	0	285.34	0
40-45 MPH	0	280.06	0
45-50 MPH	0	283.88	0
50-55 MPH	0	297.30	0
55-60 MPH	0	321.92	0
60-65 MPH	0	360.82	0
65-70 MPH	0	364.73	0
70+ MPH	0	370.82	0

TOTAL VMT	**39**	Total Daily Tonnes CO2e	0.066715365
		Annual Tonnes	**23.48380837**
Pop	6885	Annual Tonnes per Serv POP	0.002015086
Jobs	4769		
Service Population	11654		
		Building Lifespan	62.5
Daily VMT Estimate	0.033292	Total Lifetime Trans GHG	1,468

2025 Alternative 2 Internal-External Trips

PM VMT By Speed Bin	Alt 2	EMFAC	Daily tonnes
0-5 MPH	0	858.0411	0
5-10 MPH	0	655.1659	0
10-15 MPH	9	519.2158	0.00448456
15-20 MPH	115	427.3836	0.049221579
20-25 MPH	455	367.0722	0.167156998
25-30 MPH	22,443	326.4489	7.326545278
30-35 MPH	4,360	300.2477	1.309024645
35-40 MPH	3,479	285.3395	0.992560099
40-45 MPH	723	280.0621	0.2025371
45-50 MPH	334	283.8828	0.094906059
50-55 MPH	51	297.2961	0.01526444
55-60 MPH	103	321.9173	0.033150969
60-65 MPH	104	360.8186	0.037643332
65-70 MPH	103	364.7258	0.037565587
70+ MPH	0	370.8205	0

TOTAL VMT	**32,280**	Total Daily Tonnes CO2e	54.05295185
		Annual Tonnes	**19026.63905**
Pop	6885	Annual Tonnes per Serv POP	1.632627343
Jobs	4769		
Service Population	11654		
		Building Lifespan	62.5
Daily VMT Estimate	27.6985	Total Lifetime Trans GHG	1,189,165

Appendix C

20th Street SE Corridor Subarea Traffic Counts

Prepared for: **Fehr & Peers**

Traffic Count Consultants, Inc.

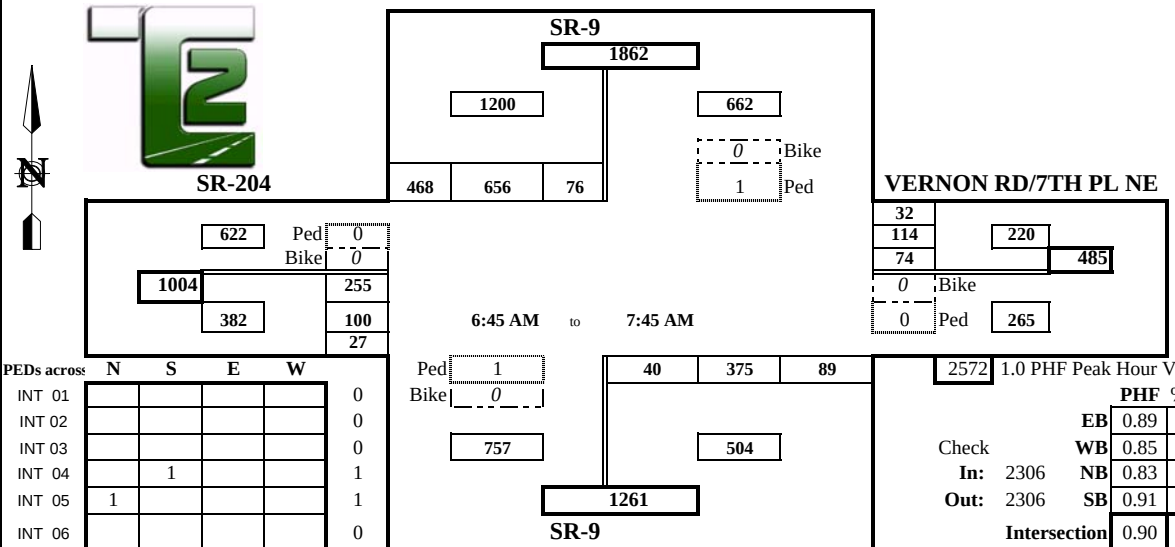
Phone: (425) 861-8866 FAX: (425) 861-8877 E-Mail: Team@tc2inc.com

WBE/DBE

Intersection: SR-9 & SR-204 (VERNON RD/7TH PL NE)
Location: LAKE STEVENS, WASHINGTON

Date of Count: Wed 4/13/11
Checked By: J.H

Time Interval	From North on (SB) SR-9				From South on (NB) SR-9				From East on (WB) VERNON RD/7TH PL NE				From West on (EB) SR-204				Interval Total
Ending at	T	L	S	R	T	L	S	R	T	L	S	R	T	L	S	R	
6:45 A	13	14	129	124	5	18	49	5	5	10	29	24	10	69	13	1	485
7:00 A	16	24	169	138	10	6	73	19	2	11	25	3	10	69	17	10	564
7:15 A	20	15	186	119	15	8	110	33	3	15	40	10	4	76	28	3	643
7:30 A	13	21	152	119	12	16	108	23	3	27	24	5	5	51	27	8	581
7:45 A	19	16	149	92	10	10	84	14	2	21	25	14	14	59	28	6	518
8:00 A	18	18	110	103	11	20	75	24	0	16	36	8	18	62	36	8	516
8:15 A	22	32	124	119	12	20	78	14	4	15	30	11	13	57	28	8	536
8:30 A	25	18	114	113	14	13	72	21	1	8	29	8	15	50	24	7	477
8:45 A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:00 A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:15 A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:30 A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Survey	146	158	1133	927	89	111	649	153	20	123	238	83	89	493	201	51	4320
Peak Hour:							6:45				to				7:45		
Total	68	76	656	468	47	40	375	89	10	74	114	32	33	255	100	27	2306
Approach	1200				504				220				382				2306
%HV	5.7%				9.3%				4.5%				8.6%				6.9%
PHF	0.91				0.83				0.85				0.89				0.90



PEDs across	N	S	E	W	
INT 01					0
INT 02					0
INT 03					0
INT 04		1			1
INT 05	1				1
INT 06					0
INT 07					0
INT 08		2			2
INT 09					0
INT 10					0
INT 11					0
INT 12					0
	1	3	0	0	4

Bicycles From:	N	S	E	W	
INT 01					0
INT 02					0
INT 03					0
INT 04					0
INT 05					0
INT 06					0
INT 07			1		1
INT 08					0
	0	0	1	0	1

2572 1.0 PHF Peak Hour Volume

		PHF	%HV
	EB	0.89	8.6%
Check	WB	0.85	4.5%
In: 2306	NB	0.83	9.3%
Out: 2306	SB	0.91	5.7%
	Intersection	0.90	6.9%

Special Notes:

FnP11101_10301a

Prepared for: **Fehr & Peers**

Traffic Count Consultants, Inc.

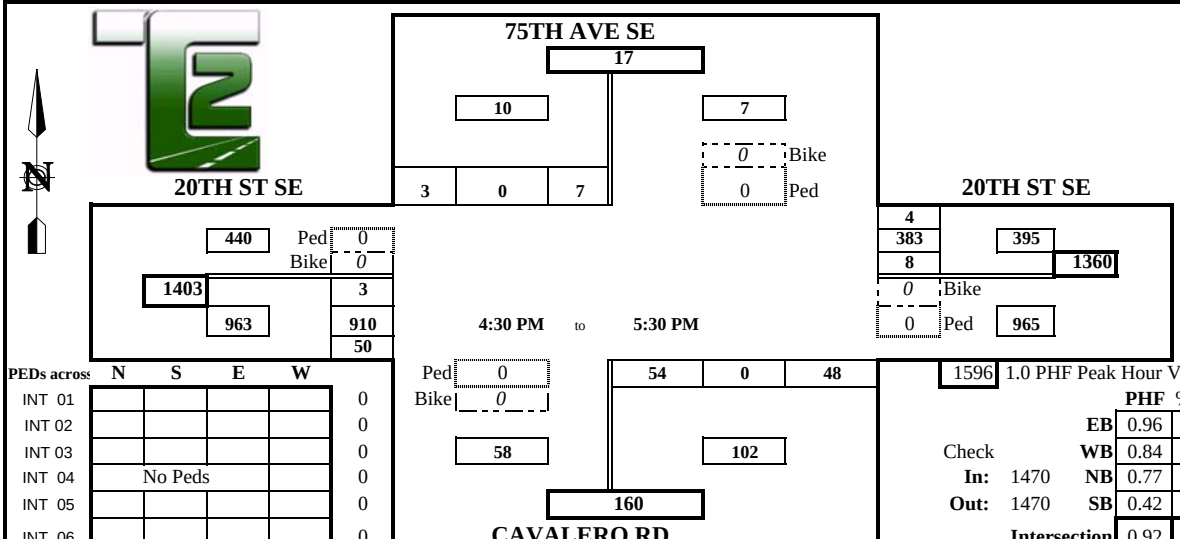
Phone: (425) 861-8866 FAX: (425) 861-8877 E-Mail: Team@tc2inc.com

WBE/DBE

Intersection: 75TH AVE SE (CAVALERO RD) & 20TH ST SE
Location: LAKE STEVENS, WASHINGTON

Date of Count: Thurs 4/14/11
Checked By: J.H

Time Interval	From North on (SB) 75TH AVE SE				From South on (NB) CAVALERO RD				From East on (WB) 20TH ST SE				From West on (EB) 20TH ST SE				Interval Total
Ending at	T	L	S	R	T	L	S	R	T	L	S	R	T	L	S	R	
4:15 P	0	0	0	2	0	14	0	12	3	5	120	0	8	0	216	17	386
4:30 P	0	0	0	0	1	9	0	11	4	1	103	1	2	1	201	14	341
4:45 P	0	0	0	0	0	17	0	16	2	3	91	0	1	0	206	9	342
5:00 P	0	6	0	0	0	9	0	11	3	2	84	1	6	1	230	14	358
5:15 P	0	0	0	2	1	13	0	7	4	1	95	1	2	2	236	14	371
5:30 P	0	1	0	1	0	15	0	14	1	2	113	2	6	0	238	13	399
5:45 P	0	0	0	1	1	10	0	9	2	2	95	0	3	2	209	13	341
6:00 P	0	1	0	2	0	10	0	14	4	4	83	0	4	0	214	12	340
6:15 P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:00 P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Survey	0	8	0	8	3	97	0	94	23	20	784	5	32	6	1750	106	2878
Peak Hour:					16:30				to		17:30						
Total	0	7	0	3	1	54	0	48	10	8	383	4	15	3	910	50	1470
Approach	10				102				395				963				1470
%HV	n/a				1.0%				2.5%				1.6%				1.8%
PHF	0.42				0.77				0.84				0.96				0.92



PEDs across	N	S	E	W	
INT 01					0
INT 02					0
INT 03					0
INT 04	No Peds				0
INT 05					0
INT 06					0
INT 07					0
INT 08					0
INT 09					0
INT 10					0
INT 11					0
INT 12					0
	0	0	0	0	0

Bicycles From:	N	S	E	W	
INT 01					0
INT 02					0
INT 03	No Bicycles				0
INT 04					0
INT 05					0
INT 06					0
INT 07					0
INT 08					0
	0	0	0	0	0

1596 1.0 PHF Peak Hour Volume

	PHF	%HV
EB	0.96	1.6%
WB	0.84	2.5%
NB	0.77	1.0%
SB	0.42	n/a
Intersection	0.92	1.8%

Check In: 1470 Out: 1470

Special Notes:

FnP11101_10402p

Prepared for: **Fehr & Peers**

Traffic Count Consultants, Inc.

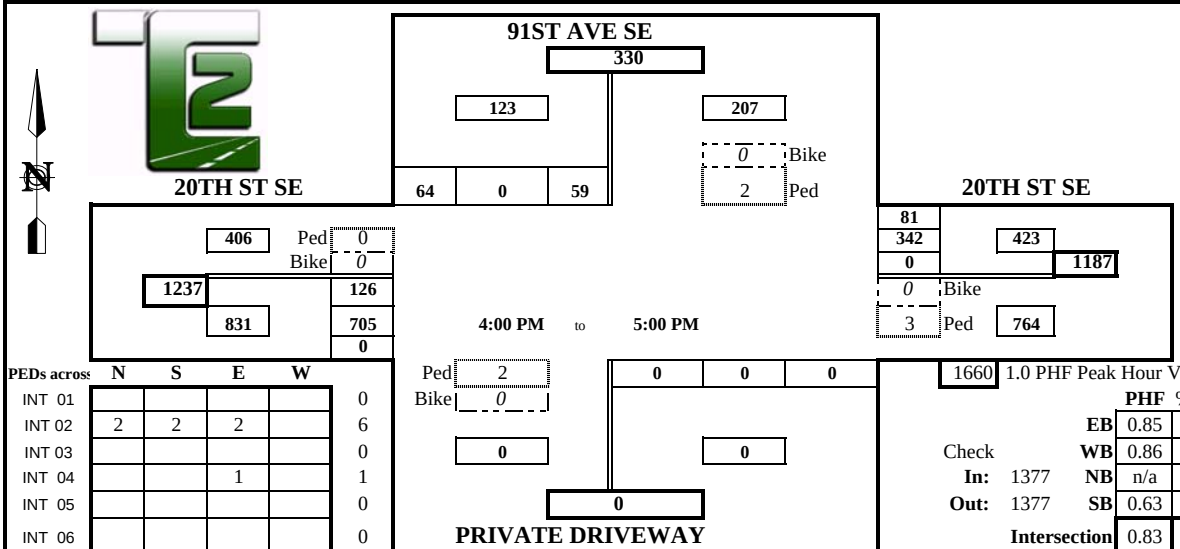
Phone: (425) 861-8866 FAX: (425) 861-8877 E-Mail: Team@tc2inc.com

WBE/DBE

Intersection: 91ST AVE SE & 20TH ST SE
Location: LAKE STEVENS, WASHINGTON

Date of Count: Wed 4/13/11
Checked By: J.H

Time Interval Ending at	From North on (SB) 91ST AVE SE				From South on (NB) PRIVATE DRIVEWAY				From East on (WB) 20TH ST SE				From West on (EB) 20TH ST SE				Interval Total
	T	L	S	R	T	L	S	R	T	L	S	R	T	L	S	R	
4:15 P	0	28	0	21	0	0	0	0	5	0	95	28	5	40	203	0	415
4:30 P	0	10	0	12	0	0	0	0	3	0	78	10	5	28	149	0	287
4:45 P	2	5	0	13	0	0	0	0	1	0	101	19	3	32	164	0	334
5:00 P	1	16	0	18	0	0	0	0	0	0	68	24	3	26	189	0	341
5:15 P	1	17	0	17	0	0	0	0	2	0	77	20	3	33	197	0	361
5:30 P	0	18	0	13	0	0	0	0	0	0	81	26	4	28	171	0	337
5:45 P	0	5	0	12	0	0	0	0	1	0	69	13	3	31	168	0	298
6:00 P	1	16	0	13	0	0	0	0	5	0	85	23	4	42	146	0	325
6:15 P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:00 P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Survey	5	115	0	119	0	0	0	0	17	0	654	163	30	260	1387	0	2698
Peak Hour:					16:00				to		17:00						
Total	3	59	0	64	0	0	0	0	9	0	342	81	16	126	705	0	1377
Approach	123				0				423				831				1377
%HV	2.4%				n/a				2.1%				1.9%				2.0%
PHF	0.63				n/a				0.86				0.85				0.83



PEDs across	N	S	E	W	
INT 01					0
INT 02	2	2	2		6
INT 03					0
INT 04			1		1
INT 05					0
INT 06					0
INT 07		1	1		2
INT 08					0
INT 09					0
INT 10					0
INT 11					0
INT 12					0
	2	3	4	0	9

Bicycles From:	N	S	E	W	
INT 01					0
INT 02					0
INT 03	No Bicycles				0
INT 04					0
INT 05					0
INT 06					0
INT 07					0
INT 08					0
	0	0	0	0	0

1660 1.0 PHF Peak Hour Volume

		PHF	%HV
	EB	0.85	1.9%
Check	WB	0.86	2.1%
In: 1377	NB	n/a	n/a
Out: 1377	SB	0.63	2.4%
	Intersection	0.83	2.0%

Special Notes:

FnP1101_10303p

Prepared for: **Fehr & Peers**

Traffic Count Consultants, Inc.

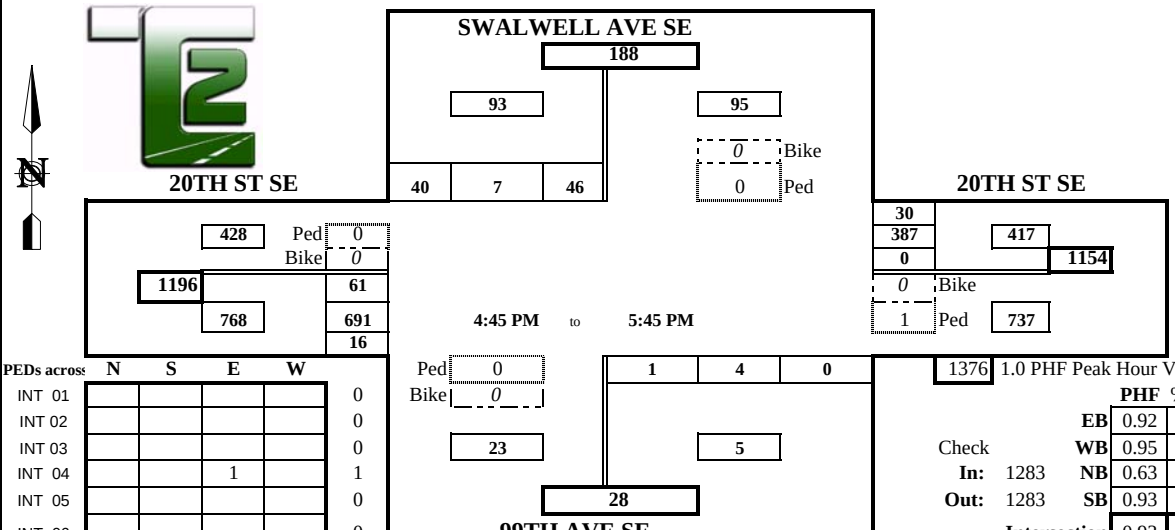
Phone: (425) 861-8866 FAX: (425) 861-8877 E-Mail: Team@tc2inc.com

WBE/DBE

Intersection: SWALWELL AVE SE/99TH AVE SE & 20TH ST SE
Location: LAKE STEVENS, WASHINGTON

Date of Count: Wed 4/13/11
Checked By: J.H

Time Interval Ending at	From North on (SB) SWALWELL AVE SE				From South on (NB) 99TH AVE SE				From East on (WB) 20TH ST SE				From West on (EB) 20TH ST SE				Interval Total
	T	L	S	R	T	L	S	R	T	L	S	R	T	L	S	R	
4:15 P	0	11	0	16	0	0	0	0	1	1	92	9	0	23	175	1	328
4:30 P	0	15	5	11	0	1	1	0	1	0	80	9	0	9	167	4	302
4:45 P	0	12	3	13	0	4	1	0	0	0	93	10	0	15	146	2	299
5:00 P	0	11	1	7	0	0	2	0	0	0	89	7	0	17	169	5	308
5:15 P	0	11	3	10	0	1	1	0	1	0	94	12	0	17	164	4	317
5:30 P	0	12	0	13	0	0	1	0	0	0	99	6	0	14	166	3	314
5:45 P	0	12	3	10	0	0	0	0	0	0	105	5	0	13	192	4	344
6:00 P	0	6	2	7	0	2	2	0	1	0	89	7	1	18	147	2	282
6:15 P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:00 P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Survey	0	90	17	87	0	8	8	0	4	1	741	65	1	126	1326	25	2494
Peak Hour:	16:45	to	17:45														
Total	0	46	7	40	0	1	4	0	1	0	387	30	0	61	691	16	1283
Approach	93				5				417				768				1283
%HV	n/a				n/a				0.2%				n/a				0.1%
PHF	0.93				0.63				0.95				0.92				0.93



PEDs across	N	S	E	W	
INT 01					0
INT 02					0
INT 03					0
INT 04			1		1
INT 05					0
INT 06					0
INT 07					0
INT 08					0
INT 09					0
INT 10					0
INT 11					0
INT 12					0
	0	0	1	0	1

Bicycles From:	N	S	E	W	
INT 01					0
INT 02					0
INT 03	No Bicycles				0
INT 04					0
INT 05					0
INT 06					0
INT 07					0
INT 08					0
	0	0	0	0	0

1376 1.0 PHF Peak Hour Volume

		PHF	%HV
	EB	0.92	n/a
Check	WB	0.95	0.2%
In: 1283	NB	0.63	n/a
Out: 1283	SB	0.93	n/a
	Intersection	0.93	0.1%

Special Notes:

FnP1101_10304p

Prepared for: **Fehr & Peers**

Traffic Count Consultants, Inc.

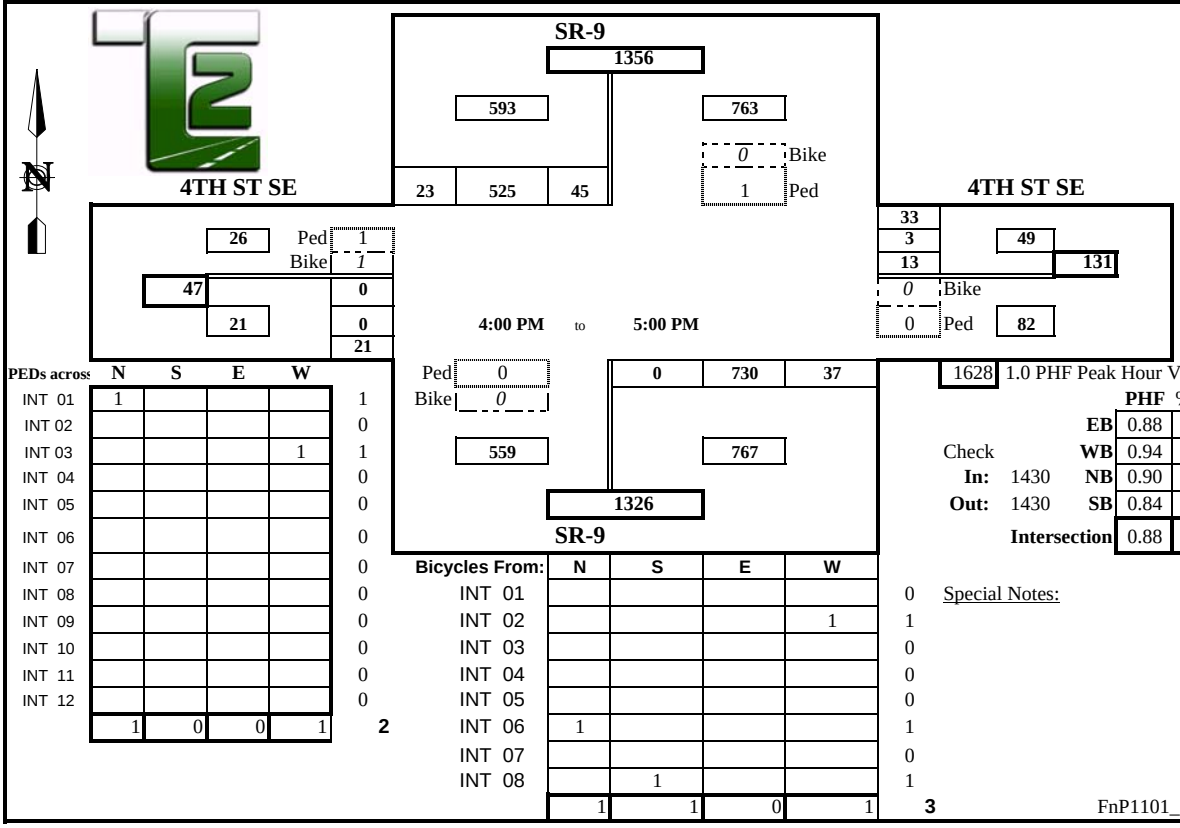
Phone: (425) 861-8866 FAX: (425) 861-8877 E-Mail: Team@tc2inc.com

WBE/DBE

Intersection: 4TH ST SE & SR-9
Location: LAKE STEVENS, WASHINGTON

Date of Count: Wed 4/13/11
Checked By: J.H

Time Interval	From North on (SB) SR-9				From South on (NB) SR-9				From East on (WB) 4TH ST SE				From West on (EB) 4TH ST SE				Interval Total
Ending at	T	L	S	R	T	L	S	R	T	L	S	R	T	L	S	R	
4:15 P	6	11	159	6	13	0	203	11	1	4	3	6	0	0	0	4	407
4:30 P	8	11	125	7	4	0	179	8	0	2	0	9	0	0	0	5	346
4:45 P	4	6	108	6	7	0	169	11	0	3	0	10	0	0	0	6	319
5:00 P	7	17	133	4	6	0	179	7	0	4	0	8	0	0	0	6	358
5:15 P	1	13	116	3	3	0	166	15	0	10	0	13	0	0	0	20	356
5:30 P	3	13	123	5	5	0	173	14	0	6	0	5	0	0	0	4	343
5:45 P	2	13	120	6	6	0	155	12	0	1	0	10	0	0	0	8	325
6:00 P	2	14	97	11	4	0	161	19	0	3	1	12	0	0	1	6	325
6:15 P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:00 P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Survey	33	98	981	48	48	0	1385	97	1	33	4	73	0	0	1	59	2779
Peak Hour:					16:00				to		17:00						
Total	25	45	525	23	30	0	730	37	1	13	3	33	0	0	0	21	1430
Approach			593				767				49				21		1430
%HV			4.2%				3.9%				2.0%				n/a		3.9%
PHF			0.84				0.90				0.94				0.88		0.88



Prepared for: **Fehr & Peers**

Traffic Count Consultants, Inc.

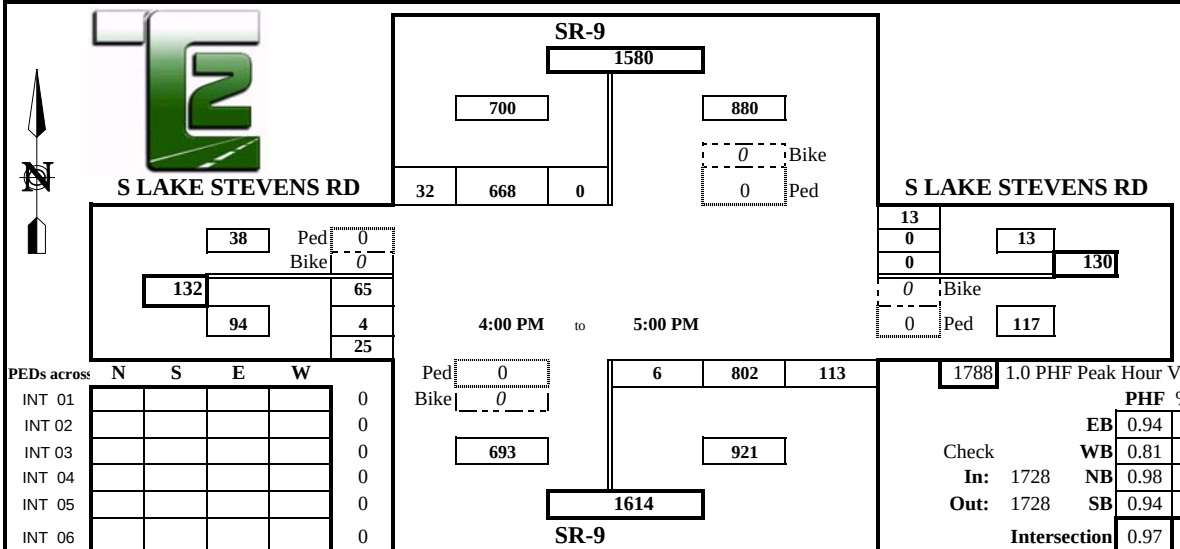
Phone: (425) 861-8866 FAX: (425) 861-8877 E-Mail: Team@tc2inc.com

WBE/DBE

Intersection: SR-9 & S LAKE STEVENS RD
Location: LAKE STEVENS, WASHINGTON

Date of Count: Wed 4/13/11
Checked By: J.H

Time Interval Ending at	From North on (SB) SR-9				From South on (NB) SR-9				From East on (WB) S LAKE STEVENS RD				From West on (EB) S LAKE STEVENS RD				Interval Total
	T	L	S	R	T	L	S	R	T	L	S	R	T	L	S	R	
4:15 P	3	0	175	12	2	2	197	35	0	0	0	3	1	16	1	6	447
4:30 P	4	0	180	6	2	2	198	33	0	0	0	4	0	13	1	9	446
4:45 P	0	0	146	7	0	2	210	20	0	0	0	2	0	22	0	3	412
5:00 P	1	0	167	7	1	0	197	25	0	0	0	4	0	14	2	7	423
5:15 P	0	0	177	8	0	0	200	35	0	0	0	1	0	18	0	6	445
5:30 P	0	0	163	7	0	1	186	27	0	0	0	1	0	25	3	8	421
5:45 P	0	0	166	8	1	1	165	38	0	0	0	6	0	12	0	4	400
6:00 P	0	0	135	7	1	1	191	36	0	0	0	0	0	27	1	4	402
6:15 P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:00 P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Survey	8	0	1309	62	7	9	1544	249	0	0	0	21	1	147	8	47	3396
Peak Hour:							16:00			to					17:00		
Total	8	0	668	32	5	6	802	113	0	0	0	13	1	65	4	25	1728
Approach			700				921				13				94		1728
%HV			1.1%				0.5%				n/a				1.1%		0.8%
PHF			0.94				0.98				0.81				0.94		0.97



PEDs across	N	S	E	W	
INT 01					0
INT 02					0
INT 03					0
INT 04					0
INT 05					0
INT 06					0
INT 07					0
INT 08					0
INT 09					0
INT 10					0
INT 11					0
INT 12					0
	0	0	0	0	**0**

Bicycles From:	N	S	E	W	
INT 01					0
INT 02					0
INT 03					0
INT 04					0
INT 05					0
INT 06					0
INT 07					0
INT 08	1				1
	1	0	0	0	**1**

1788 1.0 PHF Peak Hour Volume

		PHF	%HV
	EB	0.94	1.1%
Check	WB	0.81	n/a
In: 1728	NB	0.98	0.5%
Out: 1728	SB	0.94	1.1%
	Intersection	0.97	0.8%

Special Notes:

FnP1101_10306p

Prepared for: **Fehr & Peers**

Traffic Count Consultants, Inc.

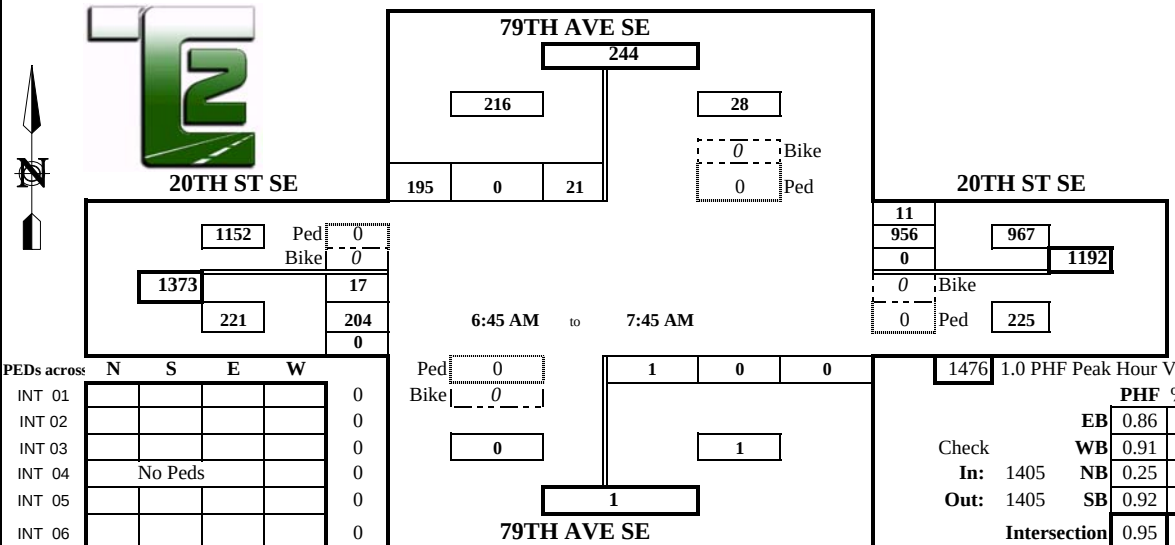
Phone: (425) 861-8866 FAX: (425) 861-8877 E-Mail: Team@tc2inc.com

WBE/DBE

Intersection: 79TH AVE SE & 20TH ST SE
Location: LAKE STEVENS, WASHINGTON

Date of Count: Tue 4/12/11
Checked By: J.H

Time Interval	From North on (SB) 79TH AVE SE				From South on (NB) 79TH AVE SE				From East on (WB) 20TH ST SE				From West on (EB) 20TH ST SE				Interval Total
Ending at	T	L	S	R	T	L	S	R	T	L	S	R	T	L	S	R	
6:45 A	3	3	0	28	0	0	0	0	5	0	188	0	5	5	39	0	263
7:00 A	2	4	0	42	0	0	0	0	3	0	264	1	4	3	53	0	367
7:15 A	1	10	0	47	0	1	0	0	2	0	228	5	3	5	59	0	355
7:30 A	3	4	0	50	0	0	0	0	5	0	254	4	3	3	54	0	369
7:45 A	0	3	0	56	0	0	0	0	4	0	210	1	4	6	38	0	314
8:00 A	3	4	0	50	0	0	0	2	6	2	195	0	3	5	45	0	303
8:15 A	0	0	0	35	0	0	0	0	4	1	146	0	5	0	41	0	223
8:30 A	2	2	0	22	0	0	0	1	8	0	180	1	4	1	49	0	256
8:45 A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:00 A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:15 A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:30 A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Survey	14	30	0	330	0	1	0	3	37	3	1665	12	31	28	378	0	2450
Peak Hour:	6:45	to	7:45														
Total	6	21	0	195	0	1	0	0	14	0	956	11	14	17	204	0	1405
Approach	216				1				967				221				1405
%HV	2.8%				n/a				1.4%				6.3%				2.4%
PHF	0.92				0.25				0.91				0.86				0.95



PEDs across	N	S	E	W	
INT 01					0
INT 02					0
INT 03					0
INT 04	No Peds				0
INT 05					0
INT 06					0
INT 07					0
INT 08					0
INT 09					0
INT 10					0
INT 11					0
INT 12					0
	0	0	0	0	0

Bicycles From:	N	S	E	W	
INT 01					0
INT 02					0
INT 03					0
INT 04					0
INT 05					0
INT 06					0
INT 07			1		1
INT 08					0
	0	0	1	0	1

1476 1.0 PHF Peak Hour Volume

		PHF	%HV
	EB	0.86	6.3%
Check	WB	0.91	1.4%
In: 1405	NB	0.25	n/a
Out: 1405	SB	0.92	2.8%
	Intersection	0.95	2.4%

Special Notes:

FnP1101_10207a

Prepared for: **Fehr & Peers**

Traffic Count Consultants, Inc.

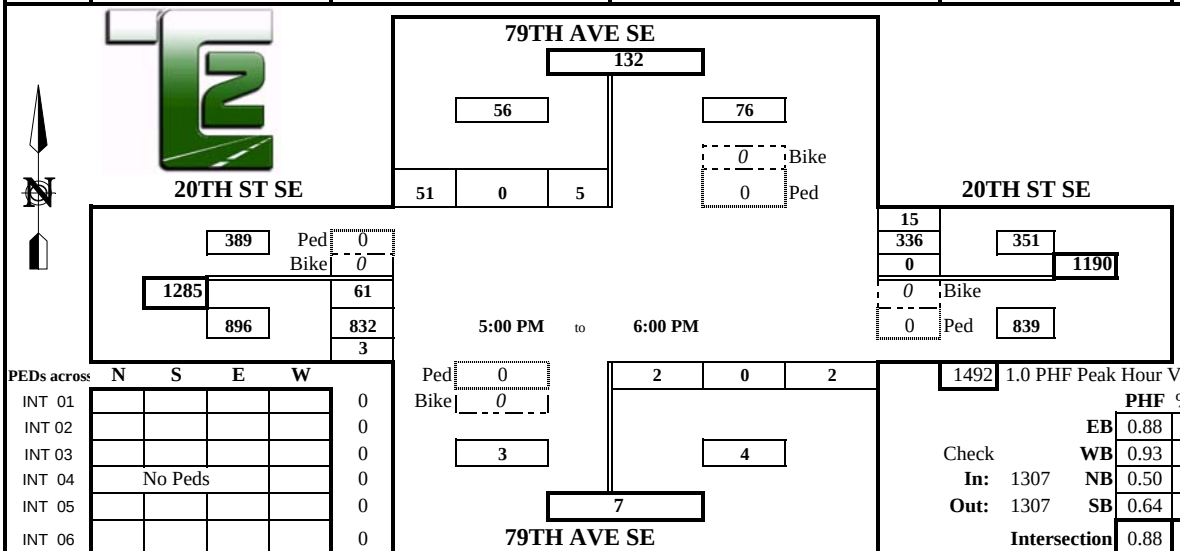
Phone: (425) 861-8866 FAX: (425) 861-8877 E-Mail: Team@tc2inc.com

WBE/DBE

Intersection: 79TH AVE SE & 20TH ST SE
Location: LAKE STEVENS, WASHINGTON

Date of Count: Thurs 4/14/11
Checked By: J.H

Time Interval Ending at	From North on (SB) 79TH AVE SE				From South on (NB) 79TH AVE SE				From East on (WB) 20TH ST SE				From West on (EB) 20TH ST SE				Interval Total
	T	L	S	R	T	L	S	R	T	L	S	R	T	L	S	R	
4:15 P	1	4	1	14	0	0	0	0	2	0	107	6	5	18	186	1	337
4:30 P	0	0	0	10	0	1	0	0	4	0	95	2	2	11	210	1	330
4:45 P	0	4	0	10	0	0	0	1	2	0	80	3	2	16	168	0	282
5:00 P	1	1	0	15	0	0	0	0	1	1	70	4	4	12	204	0	307
5:15 P	0	1	0	10	0	0	0	1	4	0	87	7	4	17	214	0	337
5:30 P	0	3	0	19	0	2	0	0	1	0	89	5	4	23	231	1	373
5:45 P	0	0	0	9	0	0	0	1	2	0	85	1	1	9	184	0	289
6:00 P	1	1	0	13	0	0	0	0	4	0	75	2	3	12	203	2	308
6:15 P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:00 P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Survey	3	14	1	100	0	3	0	3	20	1	688	30	25	118	1600	5	2563
Peak Hour:					17:00				to		18:00						
Total	1	5	0	51	0	2	0	2	11	0	336	15	12	61	832	3	1307
Approach	56				4				351				896				1307
%HV	1.8%				n/a				3.1%				1.3%				1.8%
PHF	0.64				0.50				0.93				0.88				0.88



PEDs across	N	S	E	W	
INT 01					0
INT 02					0
INT 03					0
INT 04	No Peds				0
INT 05					0
INT 06					0
INT 07					0
INT 08					0
INT 09					0
INT 10					0
INT 11					0
INT 12					0
	0	0	0	0	0

Bicycles From:	N	S	E	W	
INT 01					0
INT 02					0
INT 03	No Bicycles				0
INT 04					0
INT 05					0
INT 06					0
INT 07					0
INT 08					0
	0	0	0	0	0

1492 1.0 PHF Peak Hour Volume

	PHF	%HV
EB	0.88	1.3%
WB	0.93	3.1%
NB	0.50	n/a
SB	0.64	1.8%
Intersection	0.88	1.8%

Check
In: 1307
Out: 1307

Special Notes:

FnP11101_10407p

Prepared for: **Fehr & Peers**

Traffic Count Consultants, Inc.

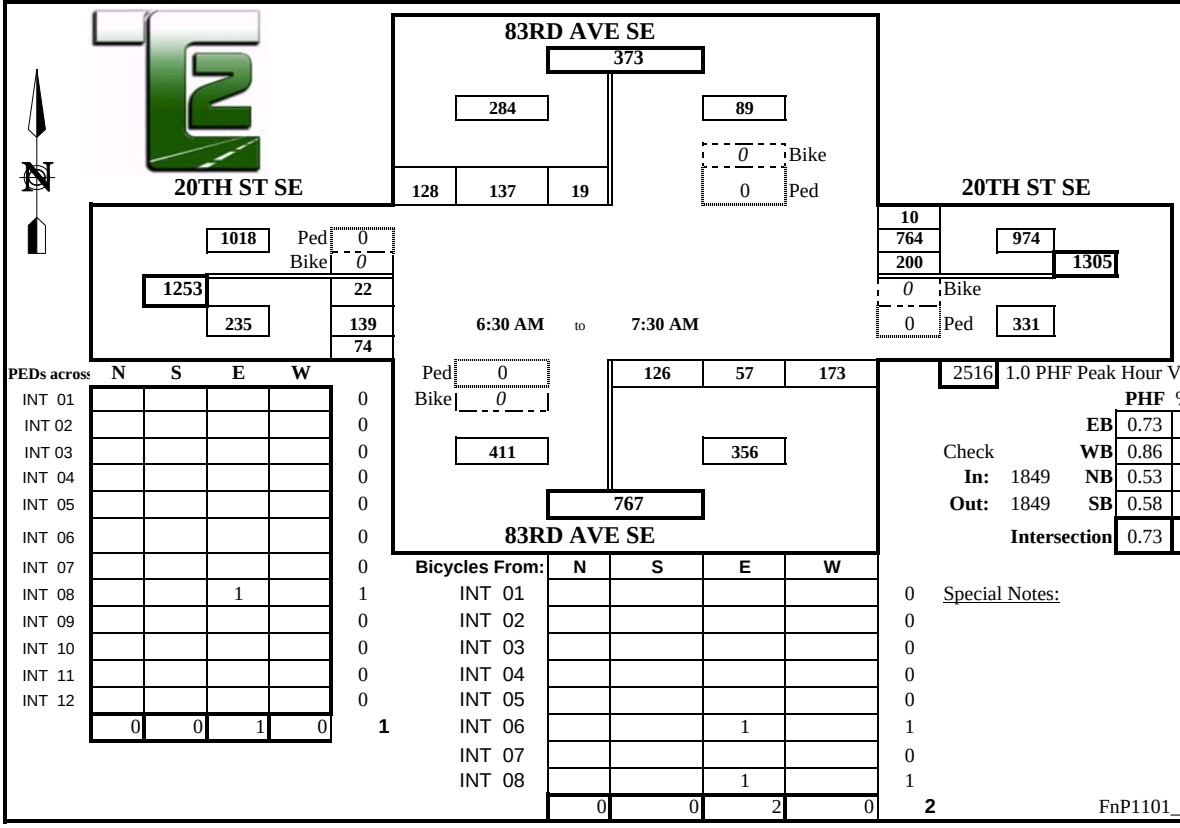
Phone: (425) 861-8866 FAX: (425) 861-8877 E-Mail: Team@tc2inc.com

WBE/DBE

Intersection: 83RD AVE SE & 20TH ST SE
Location: LAKE STEVENS, WASHINGTON

Date of Count: Tue 4/12/11
Checked By: J.H

Time Interval Ending at	From North on (SB) 83RD AVE SE				From South on (NB) 83RD AVE SE				From East on (WB) 20TH ST SE				From West on (EB) 20TH ST SE				Interval Total
	T	L	S	R	T	L	S	R	T	L	S	R	T	L	S	R	
6:45 A	1	6	9	35	1	13	2	9	10	21	197	2	3	5	28	10	337
7:00 A	6	1	39	31	2	24	10	32	17	76	201	5	2	6	29	20	474
7:15 A	2	5	88	30	15	46	29	93	2	90	168	0	5	3	35	42	629
7:30 A	0	7	1	32	3	43	16	39	5	13	198	3	5	8	47	2	409
7:45 A	0	6	1	29	0	2	1	5	3	9	210	2	5	5	43	1	314
8:00 A	0	8	2	13	0	0	0	6	9	6	155	6	5	8	37	0	241
8:15 A	0	1	1	16	0	1	0	1	3	0	119	0	5	1	30	1	171
8:30 A	2	8	6	22	0	3	1	2	9	3	132	4	4	5	46	0	232
8:45 A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:00 A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:15 A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:30 A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Survey	11	42	147	208	21	132	59	187	58	218	1380	22	34	41	295	76	2807
Peak Hour:							6:30		to		7:30						
Total	9	19	137	128	21	126	57	173	34	200	764	10	15	22	139	74	1849
Approach	284				356				974				235				1849
%HV	3.2%				5.9%				3.5%				6.4%				4.3%
PHF	0.58				0.53				0.86				0.73				0.73



PEDs across	N	S	E	W	
INT 01					0
INT 02					0
INT 03					0
INT 04					0
INT 05					0
INT 06					0
INT 07					0
INT 08			1		1
INT 09					0
INT 10					0
INT 11					0
INT 12					0
	0	0	1	0	1

Bicycles From:	N	S	E	W	
INT 01					0
INT 02					0
INT 03					0
INT 04					0
INT 05					0
INT 06			1		1
INT 07					0
INT 08			1		1
	0	0	2	0	2

2516 1.0 PHF Peak Hour Volume

		PHF	%HV
	EB	0.73	6.4%
Check	WB	0.86	3.5%
In: 1849	NB	0.53	5.9%
Out: 1849	SB	0.58	3.2%
	Intersection	0.73	4.3%

Special Notes:

FnP1101_10208a

Prepared for: **Fehr & Peers**

Traffic Count Consultants, Inc.

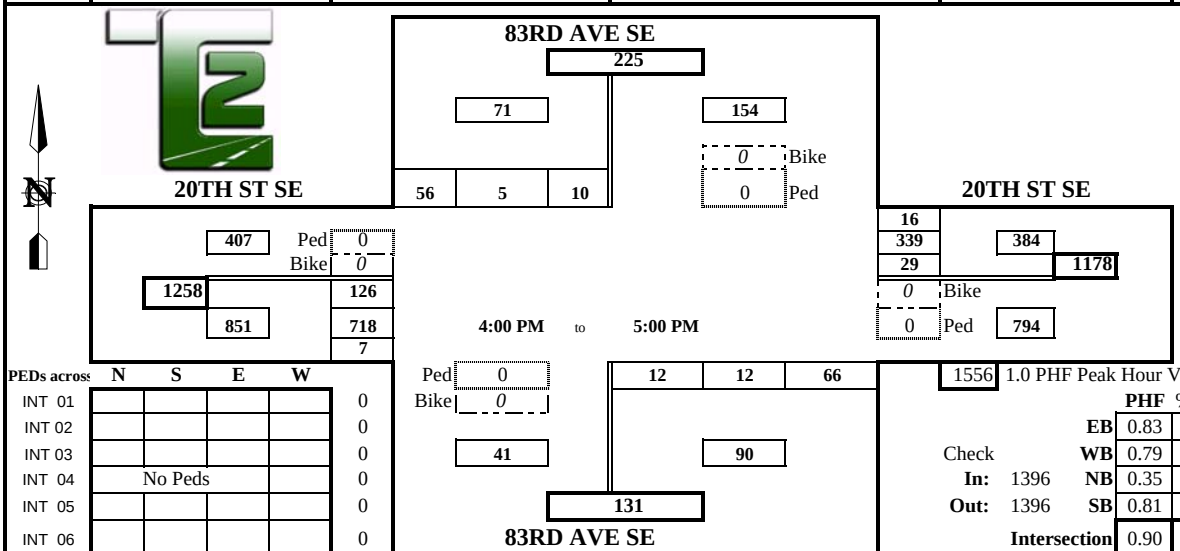
Phone: (425) 861-8866 FAX: (425) 861-8877 E-Mail: Team@tc2inc.com

WBE/DBE

Intersection: 83RD AVE SE & 20TH ST SE
Location: LAKE STEVENS, WASHINGTON

Date of Count: Thurs 4/14/11
Checked By: J.H

Time Interval	From North on (SB) 83RD AVE SE				From South on (NB) 83RD AVE SE				From East on (WB) 20TH ST SE				From West on (EB) 20TH ST SE				Interval Total
Ending at	T	L	S	R	T	L	S	R	T	L	S	R	T	L	S	R	
4:15 P	0	2	3	10	0	7	8	50	1	16	103	2	6	22	165	1	389
4:30 P	0	0	2	20	0	0	2	9	3	7	91	2	1	33	178	1	345
4:45 P	0	7	0	9	0	3	1	5	2	2	76	7	1	40	152	3	305
5:00 P	1	1	0	17	0	2	1	2	1	4	69	5	6	31	223	2	357
5:15 P	1	6	1	16	0	0	0	3	2	2	84	1	2	28	177	2	320
5:30 P	0	3	0	14	0	5	8	17	2	2	76	2	6	35	194	5	361
5:45 P	0	1	2	17	0	0	2	0	2	6	78	5	1	29	157	3	300
6:00 P	4	4	5	17	0	3	4	9	1	16	59	6	4	41	159	18	341
6:15 P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:00 P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Survey	6	24	13	120	0	20	26	95	14	55	636	30	27	259	1405	35	2718
Peak Hour:					16:00				to		17:00						
Total	1	10	5	56	0	12	12	66	7	29	339	16	14	126	718	7	1396
Approach	71				90				384				851				1396
%HV	1.4%				n/a				1.8%				1.6%				1.6%
PHF	0.81				0.35				0.79				0.83				0.90



PEDs across	N	S	E	W	
INT 01					0
INT 02					0
INT 03					0
INT 04	No Peds				0
INT 05					0
INT 06					0
INT 07					0
INT 08					0
INT 09					0
INT 10					0
INT 11					0
INT 12					0
	0	0	0	0	0

Bicycles From:	N	S	E	W	
INT 01					0
INT 02					0
INT 03	No Bicycles				0
INT 04					0
INT 05					0
INT 06					0
INT 07					0
INT 08					0
	0	0	0	0	0

1556 1.0 PHF Peak Hour Volume

		PHF	%HV
	EB	0.83	1.6%
Check	WB	0.79	1.8%
In: 1396	NB	0.35	n/a
Out: 1396	SB	0.81	1.4%
	Intersection	0.90	1.6%

Special Notes:

FnP11101_10408p

Prepared for: **Fehr & Peers**

Traffic Count Consultants, Inc.

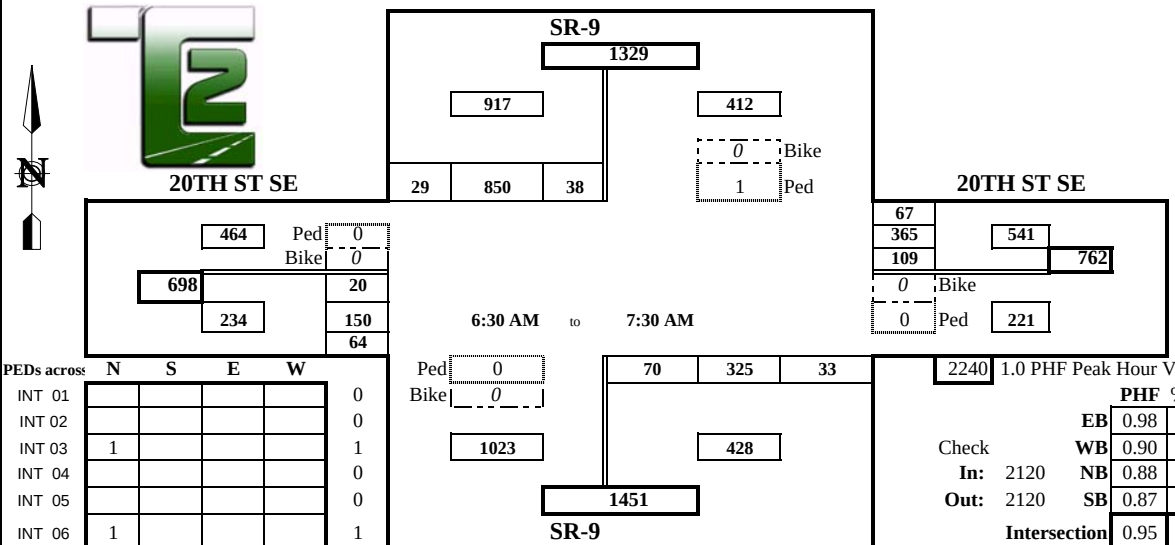
Phone: (425) 861-8866 FAX: (425) 861-8877 E-Mail: Team@tc2inc.com

WBE/DBE

Intersection: SR-9 & 20TH ST SE
Location: LAKE STEVENS, WASHINGTON

Date of Count: Tue 4/12/11
Checked By: J.H

Time Interval Ending at	From North on (SB) SR-9				From South on (NB) SR-9				From East on (WB) 20TH ST SE				From West on (EB) 20TH ST SE				Interval Total
	T	L	S	R	T	L	S	R	T	L	S	R	T	L	S	R	
6:45 A	2	10	199	7	2	15	67	4	1	26	108	16	0	4	44	12	512
7:00 A	2	7	176	6	5	15	88	9	1	27	86	22	0	5	40	15	496
7:15 A	2	9	248	6	4	21	75	12	0	27	82	18	0	10	26	18	552
7:30 A	8	12	227	10	2	19	95	8	0	29	89	11	0	1	40	19	560
7:45 A	6	9	215	9	3	19	72	5	0	25	71	14	0	5	35	14	493
8:00 A	8	7	179	16	2	13	69	7	1	22	77	11	1	3	33	11	448
8:15 A	5	12	166	14	7	17	84	10	1	20	70	9	0	6	25	15	448
8:30 A	3	9	159	13	2	10	79	14	2	30	43	10	1	6	55	8	436
8:45 A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:00 A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:15 A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:30 A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Survey	36	75	1569	81	27	129	629	69	6	206	626	111	2	40	298	112	3945
Peak Hour:					6:30				to		7:30						
Total	14	38	850	29	13	70	325	33	2	109	365	67	0	20	150	64	2120
Approach			917				428				541				234		2120
%HV			1.5%				3.0%				0.4%				n/a		1.4%
PHF			0.87				0.88				0.90				0.98		0.95



PEDs across	N	S	E	W	
INT 01					0
INT 02					0
INT 03	1				1
INT 04					0
INT 05					0
INT 06	1				1
INT 07					0
INT 08					0
INT 09					0
INT 10					0
INT 11					0
INT 12					0
	2	0	0	0	2

Bicycles From:	N	S	E	W	
INT 01					0
INT 02					0
INT 03	No Bicycles				0
INT 04					0
INT 05					0
INT 06					0
INT 07					0
INT 08					0
	0	0	0	0	0

2240 1.0 PHF Peak Hour Volume

	PHF	%HV
EB	0.98	n/a
WB	0.90	0.4%
NB	0.88	3.0%
SB	0.87	1.5%
Intersection	0.95	1.4%

Check In: 2120
Out: 2120

Special Notes:

FnP1101_10209a

Prepared for: **Fehr & Peers**

Traffic Count Consultants, Inc.

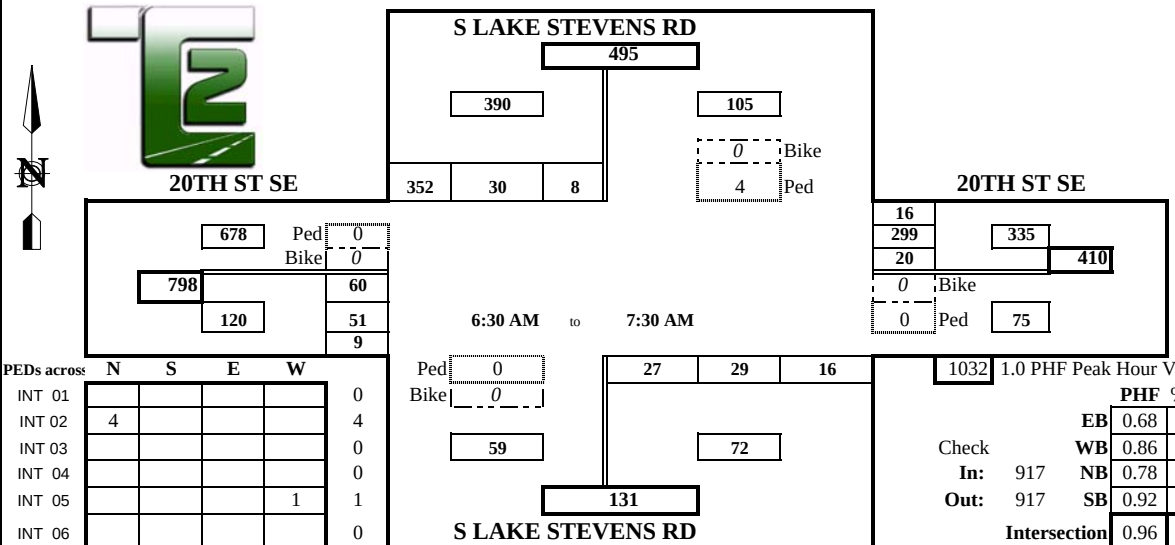
Phone: (425) 861-8866 FAX: (425) 861-8877 E-Mail: Team@tc2inc.com

WBE/DBE

Intersection: S LAKE STEVENS RD & 20TH ST SE
Location: LAKE STEVENS, WASHINGTON

Date of Count: Wed 4/13/11
Checked By: J.H

Time Interval	From North on (SB) S LAKE STEVENS RD				From South on (NB) S LAKE STEVENS RD				From East on (WB) 20TH ST SE				From West on (EB) 20TH ST SE				Interval Total
Ending at	T	L	S	R	T	L	S	R	T	L	S	R	T	L	S	R	
6:45 A	2	1	5	90	1	11	8	4	4	5	83	4	2	4	9	2	226
7:00 A	3	4	6	80	1	4	0	6	4	6	83	8	3	13	15	1	226
7:15 A	2	2	8	96	0	9	8	4	2	6	71	2	7	17	13	2	238
7:30 A	2	1	11	86	1	3	13	2	2	3	62	2	2	26	14	4	227
7:45 A	8	1	18	78	0	2	5	4	0	7	5	4	2	13	22	5	164
8:00 A	1	5	15	64	3	3	9	6	2	7	55	4	3	9	20	11	208
8:15 A	4	1	8	76	1	3	7	3	2	7	55	4	4	8	14	7	193
8:30 A	5	8	24	64	0	15	9	6	2	11	68	4	4	19	20	10	258
8:45 A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:00 A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:15 A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:30 A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Survey	27	23	95	634	7	50	59	35	18	52	482	32	27	109	127	42	1740
					Peak Hour:		6:30		to		7:30						
Total	9	8	30	352	3	27	29	16	12	20	299	16	14	60	51	9	917
Approach	390				72				335				120				917
%HV	2.3%				4.2%				3.6%				11.7%				4.1%
PHF	0.92				0.78				0.86				0.68				0.96



PEDs across	N	S	E	W	
INT 01					0
INT 02	4				4
INT 03					0
INT 04					0
INT 05				1	1
INT 06					0
INT 07					0
INT 08		2		2	4
INT 09					0
INT 10					0
INT 11					0
INT 12					0
	4	2	0	3	9

Bicycles From:	N	S	E	W	
INT 01					0
INT 02					0
INT 03					0
INT 04					0
INT 05					0
INT 06			1		1
INT 07					0
INT 08					0
	0	0	1	0	1

1032 1.0 PHF Peak Hour Volume

	PHF	%HV
EB	0.68	11.7%
WB	0.86	3.6%
NB	0.78	4.2%
SB	0.92	2.3%
Intersection	0.96	4.1%

Check In: 917 Out: 917

Special Notes:

FnP11101_10310a

Prepared for: **Fehr & Peers**

Traffic Count Consultants, Inc.

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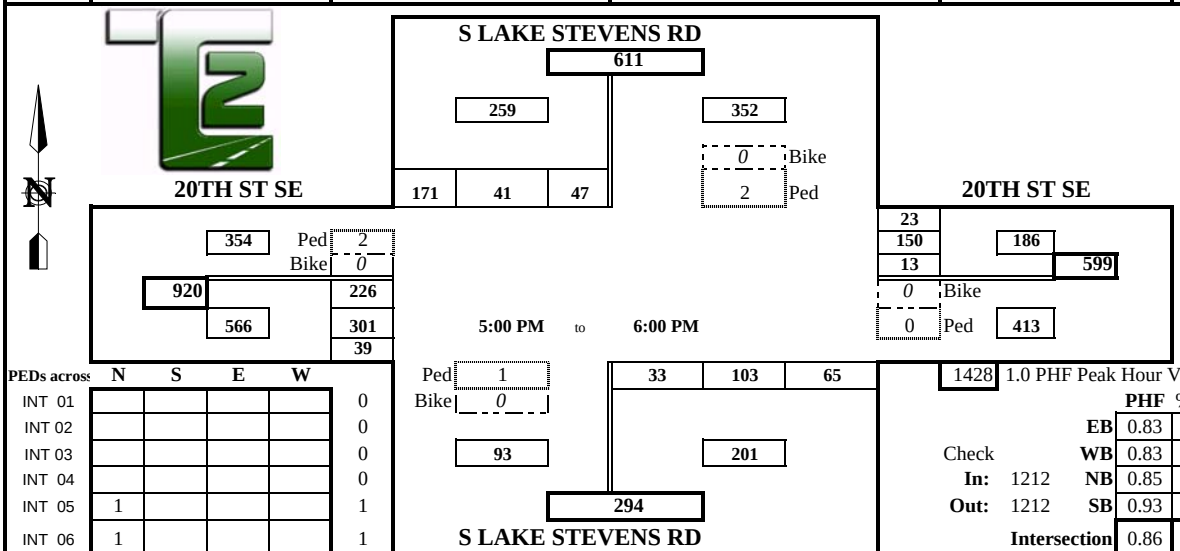
WBE/DBE

Intersection: S LAKE STEVENS RD & 20TH ST SE
Location: LAKE STEVENS, WASHINGTON

Date of Count: Thurs 4/14/11
Checked By: J.H

Time Interval	From North on (SB) S LAKE STEVENS RD				From South on (NB) S LAKE STEVENS RD				From East on (WB) 20TH ST SE				From West on (EB) 20TH ST SE				Interval Total
Ending at	T	L	S	R	T	L	S	R	T	L	S	R	T	L	S	R	
4:15 P	3	10	7	41	0	9	32	21	2	5	53	2	3	59	66	5	310
4:30 P	1	11	6	34	2	12	22	15	1	5	57	7	2	71	103	14	357
4:45 P	2	4	4	35	4	10	33	18	1	6	37	5	1	55	60	5	272
5:00 P	1	9	9	39	0	3	20	18	1	6	30	2	3	49	64	8	257
5:15 P	1	7	7	41	1	11	18	15	0	3	31	3	4	49	62	8	255
5:30 P	1	17	14	39	0	11	23	9	2	3	41	3	2	58	59	11	288
5:45 P	2	8	8	50	0	5	29	21	1	3	35	8	0	51	90	7	315
6:00 P	1	15	12	41	0	6	33	20	0	4	43	9	1	68	90	13	354
6:15 P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:00 P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Survey	12	81	67	320	7	67	210	137	8	35	327	39	16	460	594	71	2408
Peak Hour:							17:00		to		18:00						
Total	5	47	41	171	1	33	103	65	3	13	150	23	7	226	301	39	1212
Approach	259				201				186				566				1212
%HV	1.9%				0.5%				1.6%				1.2%				1.3%
PHF	0.93				0.85				0.83				0.83				0.86



PEDs across	N	S	E	W	
INT 01					0
INT 02					0
INT 03					0
INT 04					0
INT 05	1				1
INT 06	1				1
INT 07		1		2	3
INT 08					0
INT 09					0
INT 10					0
INT 11					0
INT 12					0
	2	1	0	2	5

Bicycles From:	N	S	E	W	
INT 01					0
INT 02					0
INT 03	No Bicycles				0
INT 04					0
INT 05					0
INT 06					0
INT 07					0
INT 08					0
	0	0	0	0	0

1428 1.0 PHF Peak Hour Volume

	PHF	%HV
EB	0.83	1.2%
WB	0.83	1.6%
NB	0.85	0.5%
SB	0.93	1.9%
Intersection	0.86	1.3%

Check
In: 1212
Out: 1212

Special Notes:

FnP11101_10410p

Prepared for: **Fehr & Peers**

Traffic Count Consultants, Inc.

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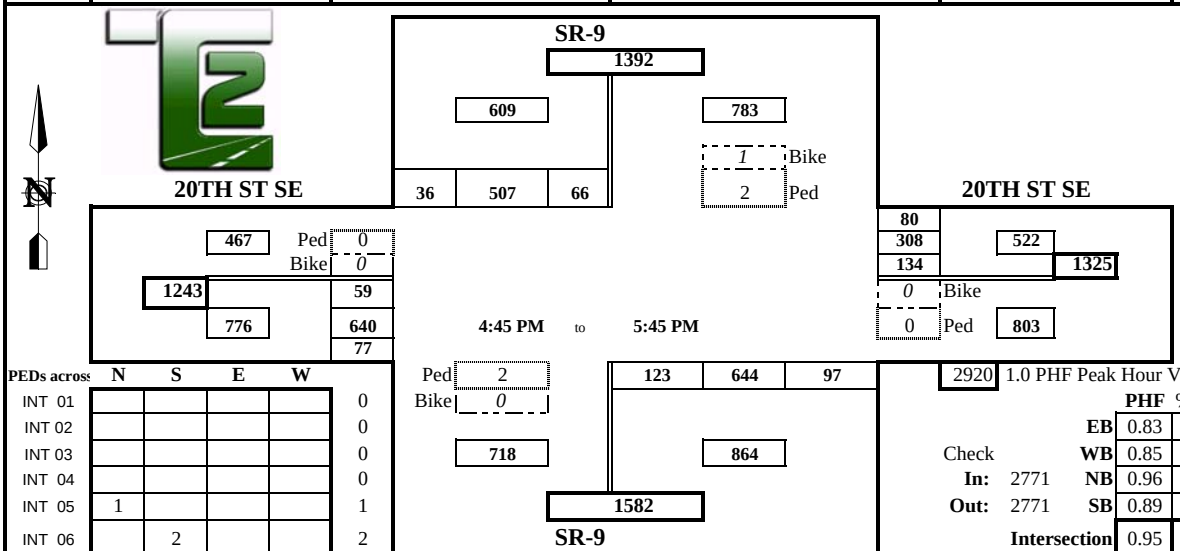
WBE/DBE

Intersection: SR-9 & 20TH ST SE
Location: LAKE STEVENS, WASHINGTON

Date of Count: Tues 4/12/11
Checked By: J.H

Time Interval Ending at	From North on (SB) SR-9				From South on (NB) SR-9				From East on (WB) 20TH ST SE				From West on (EB) 20TH ST SE				Interval Total
	T	L	S	R	T	L	S	R	T	L	S	R	T	L	S	R	
4:15 P	0	14	116	16	2	19	169	26	0	20	73	21	0	7	158	17	656
4:30 P	2	18	117	13	0	39	161	22	0	27	67	21	0	21	157	29	692
4:45 P	1	17	120	17	0	41	136	21	0	28	58	14	1	23	151	29	655
5:00 P	0	18	97	7	1	26	165	27	0	37	94	23	0	14	164	24	696
5:15 P	3	9	153	9	1	37	161	26	1	34	71	27	1	11	144	19	701
5:30 P	1	21	136	5	0	27	160	22	0	26	65	15	0	13	142	12	644
5:45 P	1	18	121	15	1	33	158	22	0	37	78	15	1	21	190	22	730
6:00 P	0	20	88	10	0	34	153	31	0	31	81	21	0	12	154	35	670
6:15 P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:00 P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Survey	8	135	948	92	5	256	1263	197	1	240	587	157	3	122	1260	187	5444
Peak Hour:						16:45			to		17:45						
Total	5	66	507	36	3	123	644	97	1	134	308	80	2	59	640	77	2771
Approach	609				864				522				776				2771
%HV	0.8%				0.3%				0.2%				0.3%				0.4%
PHF	0.89				0.96				0.85				0.83				0.95



PEDs across	N	S	E	W	
INT 01					0
INT 02					0
INT 03					0
INT 04					0
INT 05	1				1
INT 06		2			2
INT 07	1				1
INT 08					0
INT 09					0
INT 10					0
INT 11					0
INT 12					0
	2	2	0	0	4

Bicycles From:	N	S	E	W	
INT 01					0
INT 02					0
INT 03					0
INT 04					0
INT 05					0
INT 06	1				1
INT 07					0
INT 08					0
	1	0	0	0	1

2920 1.0 PHF Peak Hour Volume

		PHF	%HV
	EB	0.83	0.3%
Check	WB	0.85	0.2%
In: 2771	NB	0.96	0.3%
Out: 2771	SB	0.89	0.8%
	Intersection	0.95	0.4%

Special Notes:

FnP1101_10209p

Prepared for: **Fehr & Peers**

Traffic Count Consultants, Inc.

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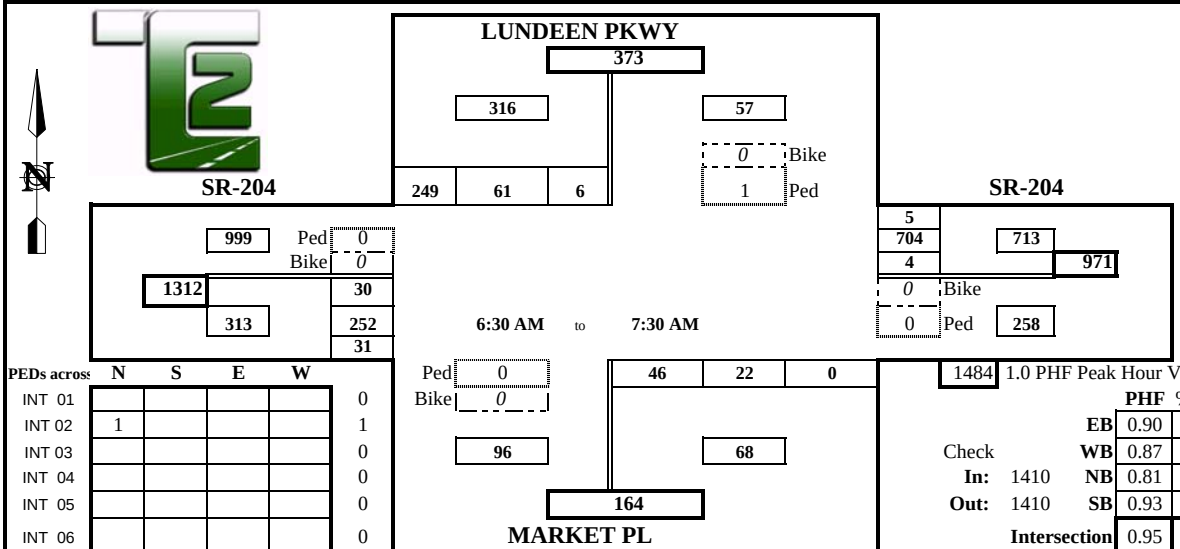
WBE/DBE

Intersection: LUNDEEN PKWY (MARKET PL) & SR-204
Location: LAKE STEVENS, WASHINGTON

Date of Count: Wed 4/13/11
Checked By: J.H

Time Interval Ending at	From North on (SB) LUNDEEN PKWY				From South on (NB) MARKET PL				From East on (WB) SR-204				From West on (EB) SR-204				Interval Total
	T	L	S	R	T	L	S	R	T	L	S	R	T	L	S	R	
6:45 A	0	1	13	59	0	9	7	0	0	2	203	1	6	5	58	9	367
7:00 A	0	1	14	59	0	9	3	0	0	1	174	1	4	6	64	5	337
7:15 A	0	3	18	63	0	14	7	0	5	0	177	2	2	6	74	7	371
7:30 A	0	1	16	68	0	14	5	0	6	1	150	1	1	13	56	10	335
7:45 A	0	1	23	49	0	11	7	0	4	0	135	0	7	12	64	13	315
8:00 A	0	3	16	45	1	16	6	0	3	0	131	1	6	6	77	17	318
8:15 A	0	1	15	62	0	18	6	1	4	0	151	0	8	12	70	7	343
8:30 A	0	2	10	55	0	13	7	0	3	0	165	4	10	7	56	16	335
8:45 A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:00 A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:15 A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:30 A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Survey	0	13	125	460	1	104	48	1	25	4	1286	10	44	67	519	84	2721
					Peak Hour:		6:30		to		7:30						
Total	0	6	61	249	0	46	22	0	11	4	704	5	13	30	252	31	1410
Approach	316				68				713				313				1410
%HV	n/a				n/a				1.5%				4.2%				1.7%
PHF	0.93				0.81				0.87				0.90				0.95



PEDs across	N	S	E	W	
INT 01					0
INT 02	1				1
INT 03					0
INT 04					0
INT 05					0
INT 06					0
INT 07					0
INT 08					0
INT 09					0
INT 10					0
INT 11					0
INT 12					0
	1	0	0	0	1

Bicycles From:	N	S	E	W	
INT 01					0
INT 02					0
INT 03					0
INT 04					0
INT 05					0
INT 06					0
INT 07					0
INT 08				1	1
	0	0	0	1	1

1484 1.0 PHF Peak Hour Volume

	PHF	%HV
EB	0.90	4.2%
WB	0.87	1.5%
NB	0.81	n/a
SB	0.93	n/a
Intersection	0.95	1.7%

Check In: 1410 Out: 1410

Special Notes:

FnP11101_10311a

HCM Signalized Intersection Capacity Analysis
102: 20th Street SE & 79th Ave SE

4/20/2011

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	17	204	0	0	956	11	1	0	0	21	0	195
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5			4.5		3.5			3.5		3.5
Lane Util. Factor	1.00	1.00			1.00		1.00			1.00		1.00
Frt	1.00	1.00			1.00		1.00			1.00		0.85
Flt Protected	0.95	1.00			1.00		0.95			0.95		1.00
Satd. Flow (prot)	1736	1827			1824		1770			1770		1583
Flt Permitted	0.14	1.00			1.00		1.00			0.62		1.00
Satd. Flow (perm)	254	1827			1824		1863			1146		1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	18	215	0	0	1006	12	1	0	0	22	0	205
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	185
Lane Group Flow (vph)	18	215	0	0	1018	0	1	0	0	22	0	20
Heavy Vehicles (%)	4%	4%	4%	4%	4%	4%	2%	2%	2%	2%	2%	2%
Turn Type	pm+pt			pm+pt			pm+pt			pm+pt		Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2			6			8			4		4
Actuated Green, G (s)	65.4	65.4			59.9		3.7			12.7		8.5
Effective Green, g (s)	65.4	65.4			59.9		3.7			12.7		8.5
Actuated g/C Ratio	0.76	0.76			0.70		0.04			0.15		0.10
Clearance Time (s)	4.5	4.5			4.5		3.5			3.5		3.5
Vehicle Extension (s)	2.0	3.0			3.0		2.0			2.0		2.0
Lane Grp Cap (vph)	210	1388			1269		79			214		156
v/s Ratio Prot	0.00	c0.12			c0.56		0.00			c0.01		
v/s Ratio Perm	0.06						0.00			0.01		c0.01
v/c Ratio	0.09	0.15			0.80		0.01			0.10		0.13
Uniform Delay, d1	9.5	2.8			9.0		39.5			31.7		35.4
Progression Factor	1.00	1.00			1.00		1.00			1.00		1.00
Incremental Delay, d2	0.1	0.1			3.7		0.0			0.1		0.1
Delay (s)	9.6	2.9			12.8		39.5			31.8		35.6
Level of Service	A	A			B		D			C		D
Approach Delay (s)		3.4			12.8			39.5			35.2	
Approach LOS		A			B			D			D	

Intersection Summary			
HCM Average Control Delay	14.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	86.1	Sum of lost time (s)	12.5
Intersection Capacity Utilization	76.8%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
103: 20th Street SE & 83rd Ave SE

4/20/2011

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	22	139	74	200	764	10	126	57	173	19	137	128
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5		4.5	4.5			4.0	4.0		4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00	1.00		1.00	
Frt	1.00	0.95		1.00	1.00			1.00	0.85		0.94	
Flt Protected	0.95	1.00		0.95	1.00			0.97	1.00		1.00	
Satd. Flow (prot)	1736	1732		1736	1823			1766	1553		1710	
Flt Permitted	0.08	1.00		0.49	1.00			0.25	1.00		0.92	
Satd. Flow (perm)	149	1732		895	1823			466	1553		1587	
Peak-hour factor, PHF	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73
Adj. Flow (vph)	30	190	101	274	1047	14	173	78	237	26	188	175
RTOR Reduction (vph)	0	13	0	0	0	0	0	0	148	0	22	0
Lane Group Flow (vph)	30	278	0	274	1061	0	0	251	89	0	367	0
Heavy Vehicles (%)	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%
Turn Type	pm+pt			pm+pt			pm+pt		Perm	Perm		
Protected Phases	5	2		1	6		3	8			4	
Permitted Phases	2			6			8		8	4		
Actuated Green, G (s)	52.7	49.2		63.7	55.7			21.1	21.1		21.1	
Effective Green, g (s)	52.7	49.2		63.7	55.7			21.1	21.1		21.1	
Actuated g/C Ratio	0.56	0.53		0.68	0.60			0.23	0.23		0.23	
Clearance Time (s)	4.5	4.5		4.5	4.5			4.0	4.0		4.0	
Vehicle Extension (s)	2.0	3.0		2.0	3.0			2.0	2.0		2.0	
Lane Grp Cap (vph)	144	913		701	1088			105	351		359	
v/s Ratio Prot	0.01	0.16		c0.04	c0.58							
v/s Ratio Perm	0.11			0.23				c0.54	0.06		0.23	
v/c Ratio	0.21	0.30		0.39	0.97			2.39	0.25		1.02	
Uniform Delay, d1	19.1	12.4		6.1	18.1			36.1	29.6		36.1	
Progression Factor	1.00	1.00		1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2	0.3	0.2		0.1	21.2			653.9	0.1		53.6	
Delay (s)	19.4	12.6		6.2	39.3			690.0	29.8		89.7	
Level of Service	B	B		A	D			F	C		F	
Approach Delay (s)		13.2			32.5			369.4			89.7	
Approach LOS		B			C			F			F	

Intersection Summary			
HCM Average Control Delay	103.8	HCM Level of Service	F
HCM Volume to Capacity ratio	1.33		
Actuated Cycle Length (s)	93.3	Sum of lost time (s)	13.0
Intersection Capacity Utilization	84.4%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
105: 20th Street SE & SR 9

4/20/2011

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	20	150	64	109	365	67	70	325	33	38	850	29
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.6	4.3		6.6	4.3		5.6	3.0	3.0	5.5	3.0	3.0
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	0.96		1.00	0.98		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3381		1770	3456		1770	3539	1583	1770	3539	1583
Flt Permitted	0.49	1.00		0.44	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	912	3381		820	3456		1770	3539	1583	1770	3539	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	21	158	67	115	384	71	74	342	35	40	895	31
RTOR Reduction (vph)	0	31	0	0	9	0	0	0	20	0	0	11
Lane Group Flow (vph)	21	194	0	115	446	0	74	342	15	40	895	20
Turn Type	pm+pt			pm+pt			Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8					2			6
Actuated Green, G (s)	22.5	20.5		35.6	27.6		7.4	37.9	37.9	4.3	34.8	34.8
Effective Green, g (s)	21.3	21.5		35.0	28.6		6.8	40.9	40.9	3.8	37.8	37.8
Actuated g/C Ratio	0.23	0.23		0.37	0.30		0.07	0.43	0.43	0.04	0.40	0.40
Clearance Time (s)	6.0	5.3		6.0	5.3		5.0	6.0	6.0	5.0	6.0	6.0
Vehicle Extension (s)	2.0	3.5		2.0	3.5		2.0	4.0	4.0	2.0	4.0	4.0
Lane Grp Cap (vph)	219	772		391	1050		128	1538	688	71	1422	636
v/s Ratio Prot	0.00	0.06		c0.03	c0.13		c0.04	c0.10		0.02	c0.25	
v/s Ratio Perm	0.02			0.08					0.01			0.01
v/c Ratio	0.10	0.25		0.29	0.42		0.58	0.22	0.02	0.56	0.63	0.03
Uniform Delay, d1	28.5	29.7		20.2	26.2		42.3	16.6	15.2	44.3	22.5	17.1
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.1	0.2		0.2	0.3		3.9	0.1	0.0	6.0	1.0	0.0
Delay (s)	28.6	29.9		20.3	26.5		46.2	16.7	15.2	50.3	23.5	17.1
Level of Service	C	C		C	C		D	B	B	D	C	B
Approach Delay (s)		29.8			25.3			21.5			24.4	
Approach LOS		C			C			C			C	

Intersection Summary			
HCM Average Control Delay	24.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	94.1	Sum of lost time (s)	22.5
Intersection Capacity Utilization	60.0%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
107: 20th Street SE & S Lake Stevens Rd

4/20/2011

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	60	51	9	20	299	16	27	29	16	8	30	352
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.0		4.0	5.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.98		1.00	0.99		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1736	3396		1736	3444		1736	1827	1553	1736	1827	1553
Flt Permitted	0.45	1.00		0.71	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	813	3396		1305	3444		1736	1827	1553	1736	1827	1553
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	62	53	9	21	311	17	28	30	17	8	31	367
RTOR Reduction (vph)	0	5	0	0	3	0	0	0	15	0	0	281
Lane Group Flow (vph)	62	57	0	21	325	0	28	30	2	8	31	86
Heavy Vehicles (%)	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%
Turn Type	pm+pt			pm+pt			Prot		pm+ov	Prot		pm+ov
Protected Phases	5	2		1	6		3	8	1	7	4	5
Permitted Phases	2			6					8			4
Actuated Green, G (s)	27.5	22.0		17.9	16.4		0.7	3.5	5.0	0.5	3.3	10.4
Effective Green, g (s)	27.5	22.0		17.9	16.4		0.7	3.5	5.0	0.5	3.3	10.4
Actuated g/C Ratio	0.62	0.49		0.40	0.37		0.02	0.08	0.11	0.01	0.07	0.23
Clearance Time (s)	4.0	5.0		4.0	5.0		4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	2.0	4.0		2.0	4.0		2.0	2.5	2.0	2.0	2.5	2.0
Lane Grp Cap (vph)	650	1679		539	1269		27	144	314	20	135	503
v/s Ratio Prot	0.02	0.02		0.00	c0.09		c0.02	0.02	0.00	0.00	0.02	c0.03
v/s Ratio Perm	0.04			0.01					0.00			0.03
v/c Ratio	0.10	0.03		0.04	0.26		1.04	0.21	0.01	0.40	0.23	0.17
Uniform Delay, d1	3.6	5.8		8.0	9.8		21.9	19.2	17.5	21.9	19.4	13.6
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.0	0.0		0.0	0.1		184.9	0.5	0.0	4.7	0.6	0.1
Delay (s)	3.6	5.8		8.1	9.9		206.8	19.7	17.5	26.6	20.0	13.7
Level of Service	A	A		A	A		F	B	B	C	C	B
Approach Delay (s)		4.7			9.8			89.1			14.4	
Approach LOS		A			A			F			B	

Intersection Summary			
HCM Average Control Delay	17.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.23		
Actuated Cycle Length (s)	44.5	Sum of lost time (s)	13.0
Intersection Capacity Utilization	44.7%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
101: 20th Street SE & 73rd Ave SE/Cavalero Rd

4/20/2011

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	3	910	50	8	383	4	54	0	48	7	0	3
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	3	989	54	9	416	4	59	0	52	8	0	3
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)					1154							
pX, platoon unblocked												
vC, conflicting volume	421			1043			1460	1461	1016	1484	1486	418
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	421			1043			1460	1461	1016	1484	1486	418
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			99			44	100	82	91	100	99
cM capacity (veh/h)	1138			667			105	127	289	83	122	635

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	3	1043	9	421	111	11
Volume Left	3	0	9	0	59	8
Volume Right	0	54	0	4	52	3
cSH	1138	1700	667	1700	150	113
Volume to Capacity	0.00	0.61	0.01	0.25	0.74	0.10
Queue Length 95th (ft)	0	0	1	0	111	8
Control Delay (s)	8.2	0.0	10.5	0.0	77.0	40.3
Lane LOS	A		B		F	E
Approach Delay (s)	0.0		0.2		77.0	40.3
Approach LOS					F	E

Intersection Summary			
Average Delay	5.7		
Intersection Capacity Utilization	63.9%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	61	832	3	0	336	15	2	0	2	5	0	51
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5			4.5		3.5	3.5		3.5		3.5
Lane Util. Factor	1.00	1.00			1.00		1.00	1.00		1.00		1.00
Frt	1.00	1.00			0.99		1.00	0.85		1.00		0.85
Flt Protected	0.95	1.00			1.00		0.95	1.00		0.95		1.00
Satd. Flow (prot)	1770	1862			1851		1770	1583		1770		1583
Flt Permitted	0.45	1.00			1.00		0.76	1.00		0.76		1.00
Satd. Flow (perm)	835	1862			1851		1410	1583		1409		1583
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	69	945	3	0	382	17	2	0	2	6	0	58
RTOR Reduction (vph)	0	0	0	0	1	0	0	2	0	0	0	53
Lane Group Flow (vph)	69	948	0	0	398	0	2	0	0	6	0	5
Turn Type	pm+pt			pm+pt			pm+pt			pm+pt		Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2			6			8			4		4
Actuated Green, G (s)	59.3	59.3			49.9		7.7	6.9		7.7		6.9
Effective Green, g (s)	59.3	59.3			49.9		7.7	6.9		7.7		6.9
Actuated g/C Ratio	0.76	0.76			0.64		0.10	0.09		0.10		0.09
Clearance Time (s)	4.5	4.5			4.5		3.5	3.5		3.5		3.5
Vehicle Extension (s)	2.0	3.0			3.0		2.0	2.0		2.0		2.0
Lane Grp Cap (vph)	689	1407			1177		142	139		142		139
v/s Ratio Prot	0.01	c0.51			0.22		0.00	0.00		c0.00		
v/s Ratio Perm	0.07						0.00			c0.00		0.00
v/c Ratio	0.10	0.67			0.34		0.01	0.00		0.04		0.04
Uniform Delay, d1	2.9	4.8			6.6		32.0	32.7		32.0		32.8
Progression Factor	1.00	1.00			1.00		1.00	1.00		1.00		1.00
Incremental Delay, d2	0.0	1.3			0.2		0.0	0.0		0.0		0.0
Delay (s)	2.9	6.1			6.8		32.0	32.7		32.1		32.8
Level of Service	A	A			A		C	C		C		C
Approach Delay (s)		5.9			6.8			32.3			32.7	
Approach LOS		A			A			C			C	

Intersection Summary			
HCM Average Control Delay	7.3	HCM Level of Service	A
HCM Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	78.5	Sum of lost time (s)	11.5
Intersection Capacity Utilization	61.9%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	126	718	7	29	339	16	12	12	66	10	5	56
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5		4.5	4.5			4.0	4.0		4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00	1.00		1.00	
Frt	1.00	1.00		1.00	0.99			1.00	0.85		0.89	
Flt Protected	0.95	1.00		0.95	1.00			0.98	1.00		0.99	
Satd. Flow (prot)	1770	1860		1770	1850			1817	1583		1654	
Flt Permitted	0.42	1.00		0.30	1.00			0.90	1.00		0.95	
Satd. Flow (perm)	785	1860		556	1850			1675	1583		1584	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	140	798	8	32	377	18	13	13	73	11	6	62
RTOR Reduction (vph)	0	0	0	0	1	0	0	0	65	0	56	0
Lane Group Flow (vph)	140	806	0	32	394	0	0	26	8	0	23	0
Turn Type	pm+pt			pm+pt			pm+pt		Perm	Perm		
Protected Phases	5	2		1	6		3	8			4	
Permitted Phases	2			6			8		8	4		
Actuated Green, G (s)	46.2	40.1		35.1	33.5			6.3	6.3		6.3	
Effective Green, g (s)	46.2	40.1		35.1	33.5			6.3	6.3		6.3	
Actuated g/C Ratio	0.76	0.66		0.58	0.55			0.10	0.10		0.10	
Clearance Time (s)	4.5	4.5		4.5	4.5			4.0	4.0		4.0	
Vehicle Extension (s)	2.0	3.0		2.0	3.0			2.0	2.0		2.0	
Lane Grp Cap (vph)	727	1223		352	1016			173	163		164	
v/s Ratio Prot	c0.03	c0.43		0.00	0.21							
v/s Ratio Perm	0.12			0.05				c0.02	0.00		0.01	
v/c Ratio	0.19	0.66		0.09	0.39			0.15	0.05		0.14	
Uniform Delay, d1	2.5	6.3		5.9	7.9			24.9	24.6		24.9	
Progression Factor	1.00	1.00		1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2	0.0	1.3		0.0	0.2			0.1	0.0		0.1	
Delay (s)	2.6	7.6		5.9	8.1			25.1	24.7		25.0	
Level of Service	A	A		A	A			C	C		C	
Approach Delay (s)		6.9			8.0			24.8			25.0	
Approach LOS		A			A			C			C	

Intersection Summary			
HCM Average Control Delay	9.2	HCM Level of Service	A
HCM Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	61.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	63.3%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	126	705	0	0	342	81	0	0	0	59	0	64
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.0			5.0					4.0		4.0
Lane Util. Factor	1.00	0.95			0.95					1.00		1.00
Frt	1.00	1.00			0.97					1.00		0.85
Flt Protected	0.95	1.00			1.00					0.95		1.00
Satd. Flow (prot)	1770	3539			3437					1770		1583
Flt Permitted	0.35	1.00			1.00					0.95		1.00
Satd. Flow (perm)	660	3539			3437					1770		1583
Peak-hour factor, PHF	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Adj. Flow (vph)	152	849	0	0	412	98	0	0	0	71	0	77
RTOR Reduction (vph)	0	0	0	0	13	0	0	0	0	0	0	62
Lane Group Flow (vph)	152	849	0	0	497	0	0	0	0	71	0	15
Turn Type	pm+pt			pm+pt			pm+pt			Prot		Over
Protected Phases	5	2		1	6		3	8		7		5
Permitted Phases	2			6			8					
Actuated Green, G (s)	30.3	30.3			16.4					4.1		9.9
Effective Green, g (s)	30.3	30.3			16.4					4.1		9.9
Actuated g/C Ratio	0.61	0.61			0.33					0.08		0.20
Clearance Time (s)	4.0	5.0			5.0					4.0		4.0
Vehicle Extension (s)	2.0	4.0			4.0					2.0		2.0
Lane Grp Cap (vph)	623	2158			1134					146		315
v/s Ratio Prot	0.05	c0.24			0.14					c0.04		0.01
v/s Ratio Perm	0.10											
v/c Ratio	0.24	0.39			0.44					0.49		0.05
Uniform Delay, d1	4.4	5.0			13.0					21.8		16.1
Progression Factor	1.00	1.00			1.00					1.00		1.00
Incremental Delay, d2	0.1	0.2			0.4					0.9		0.0
Delay (s)	4.5	5.1			13.4					22.7		16.1
Level of Service	A	A			B					C		B
Approach Delay (s)		5.0			13.4			0.0			19.3	
Approach LOS		A			B			A			B	

Intersection Summary			
HCM Average Control Delay	8.9	HCM Level of Service	A
HCM Volume to Capacity ratio	0.40		
Actuated Cycle Length (s)	49.7	Sum of lost time (s)	15.3
Intersection Capacity Utilization	37.0%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	59	640	77	134	308	80	123	644	97	66	507	36
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.6	4.3		6.6	4.3		5.6	3.0	3.0	5.5	3.0	3.0
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	0.98		1.00	0.97		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3482		1770	3430		1770	3539	1583	1770	3539	1583
Flt Permitted	0.50	1.00		0.17	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	934	3482		312	3430		1770	3539	1583	1770	3539	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	62	674	81	141	324	84	129	678	102	69	534	38
RTOR Reduction (vph)	0	5	0	0	12	0	0	0	59	0	0	26
Lane Group Flow (vph)	62	750	0	141	396	0	129	678	43	69	534	12
Turn Type	pm+pt			pm+pt			Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8					2			6
Actuated Green, G (s)	37.9	32.3		45.7	36.2		12.4	31.4	31.4	7.3	26.3	26.3
Effective Green, g (s)	36.7	33.3		44.5	37.2		11.8	34.4	34.4	6.8	29.3	29.3
Actuated g/C Ratio	0.36	0.32		0.43	0.36		0.11	0.33	0.33	0.07	0.29	0.29
Clearance Time (s)	6.0	5.3		6.0	5.3		5.0	6.0	6.0	5.0	6.0	6.0
Vehicle Extension (s)	2.0	3.5		2.0	3.5		2.0	4.0	4.0	2.0	4.0	4.0
Lane Grp Cap (vph)	374	1128		261	1241		203	1184	530	117	1009	451
v/s Ratio Prot	0.01	c0.22		c0.05	0.12		c0.07	c0.19		0.04	0.15	
v/s Ratio Perm	0.05			c0.19					0.03			0.01
v/c Ratio	0.17	0.66		0.54	0.32		0.64	0.57	0.08	0.59	0.53	0.03
Uniform Delay, d1	22.0	29.9		20.2	23.7		43.4	28.1	23.4	46.6	30.9	26.5
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.1	1.6		1.2	0.2		4.7	0.8	0.1	4.8	0.7	0.0
Delay (s)	22.1	31.5		21.5	23.8		48.2	29.0	23.5	51.5	31.6	26.5
Level of Service	C	C		C	C		D	C	C	D	C	C
Approach Delay (s)		30.8			23.2			31.1			33.4	
Approach LOS		C			C			C			C	

Intersection Summary			
HCM Average Control Delay	30.0	HCM Level of Service	C
HCM Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	102.8	Sum of lost time (s)	26.1
Intersection Capacity Utilization	66.0%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	61	691	16	0	387	30	1	4	0	46	7	40
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	5.0			5.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95			0.95		1.00	1.00		1.00	1.00	
Frt	1.00	1.00			0.99		1.00	1.00		1.00	0.87	
Flt Protected	0.95	1.00			1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	3527			3501		1770	1863		1770	1627	
Flt Permitted	0.41	1.00			1.00		0.72	1.00		0.76	1.00	
Satd. Flow (perm)	771	3527			3501		1348	1863		1407	1627	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	66	743	17	0	416	32	1	4	0	49	8	43
RTOR Reduction (vph)	0	1	0	0	6	0	0	0	0	0	38	0
Lane Group Flow (vph)	66	759	0	0	442	0	1	4	0	49	13	0
Turn Type	pm+pt			pm+pt			Perm			Perm		
Protected Phases	5	2		1	6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	30.2	30.2			23.5		5.7	5.7		5.7	5.7	
Effective Green, g (s)	30.2	30.2			23.5		5.7	5.7		5.7	5.7	
Actuated g/C Ratio	0.67	0.67			0.52		0.13	0.13		0.13	0.13	
Clearance Time (s)	4.5	5.0			5.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	2.0	4.0			4.0		2.5	2.5		2.5	2.5	
Lane Grp Cap (vph)	568	2372			1832		171	237		179	207	
v/s Ratio Prot	0.01	c0.22			0.13			0.00			0.01	
v/s Ratio Perm	0.07						0.00			c0.03		
v/c Ratio	0.12	0.32			0.24		0.01	0.02		0.27	0.07	
Uniform Delay, d1	2.7	3.1			5.8		17.1	17.1		17.7	17.3	
Progression Factor	1.00	1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.0	0.1			0.1		0.0	0.0		0.6	0.1	
Delay (s)	2.8	3.2			5.9		17.1	17.2		18.3	17.4	
Level of Service	A	A			A		B	B		B	B	
Approach Delay (s)		3.1			5.9			17.2			17.8	
Approach LOS		A			A			B			B	

Intersection Summary			
HCM Average Control Delay	5.2	HCM Level of Service	A
HCM Volume to Capacity ratio	0.31		
Actuated Cycle Length (s)	44.9	Sum of lost time (s)	9.0
Intersection Capacity Utilization	43.4%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	226	301	39	13	150	23	33	103	65	47	41	171
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.0		4.0	5.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.98		1.00	0.98		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3479		1770	3468		1770	1863	1583	1770	1863	1583
Flt Permitted	0.49	1.00		0.52	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	908	3479		967	3468		1770	1863	1583	1770	1863	1583
Peak-hour factor, PHF	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Adj. Flow (vph)	263	350	45	15	174	27	38	120	76	55	48	199
RTOR Reduction (vph)	0	5	0	0	9	0	0	0	59	0	0	114
Lane Group Flow (vph)	263	390	0	15	192	0	38	120	17	55	48	85
Turn Type	pm+pt			pm+pt			Prot		pm+ov	Prot		pm+ov
Protected Phases	5	2		1	6		3	8	1	7	4	5
Permitted Phases	2			6					8			4
Actuated Green, G (s)	32.1	24.4		17.8	14.1		2.2	9.1	12.8	3.8	10.7	24.7
Effective Green, g (s)	32.1	24.4		17.8	14.1		2.2	9.1	12.8	3.8	10.7	24.7
Actuated g/C Ratio	0.55	0.42		0.31	0.24		0.04	0.16	0.22	0.07	0.18	0.43
Clearance Time (s)	4.0	5.0		4.0	5.0		4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	2.0	4.0		2.0	4.0		2.0	2.5	2.0	2.0	2.5	2.0
Lane Grp Cap (vph)	711	1464		348	843		67	292	459	116	344	783
v/s Ratio Prot	c0.09	0.11		0.00	0.06		0.02	c0.06	0.00	c0.03	0.03	0.03
v/s Ratio Perm	c0.12			0.01					0.01			0.03
v/c Ratio	0.37	0.27		0.04	0.23		0.57	0.41	0.04	0.47	0.14	0.11
Uniform Delay, d1	7.0	11.0		14.1	17.6		27.4	22.0	17.8	26.1	19.8	10.0
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.1	0.1		0.0	0.2		6.4	0.7	0.0	1.1	0.1	0.0
Delay (s)	7.1	11.1		14.1	17.8		33.8	22.7	17.8	27.3	19.9	10.0
Level of Service	A	B		B	B		C	C	B	C	B	B
Approach Delay (s)		9.5			17.5			22.9			14.7	
Approach LOS		A			B			C			B	

Intersection Summary			
HCM Average Control Delay	14.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.37		
Actuated Cycle Length (s)	58.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	38.5%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	65	4	25	0	0	13	6	802	113	0	668	32
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Hourly flow rate (vph)	67	4	26	0	0	13	6	827	116	0	689	33
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			TWLTL	
Median storage veh)											2	
Upstream signal (ft)											1279	
pX, platoon unblocked	0.79	0.79	0.79	0.79	0.79		0.79					
vC, conflicting volume	1528	1528	689	1556	1528	827	689			827		
vC1, stage 1 conf vol	689	689		839	839							
vC2, stage 2 conf vol	839	839		716	689							
vCu, unblocked vol	1535	1535	470	1571	1535	827	470			827		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)	6.1	5.5		6.1	5.5							
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	76	99	94	100	100	96	99			100		
cM capacity (veh/h)	275	294	467	266	292	372	860			804		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	97	13	6	827	116	689	33
Volume Left	67	0	6	0	0	0	0
Volume Right	26	13	0	0	116	0	33
cSH	310	372	860	1700	1700	1700	1700
Volume to Capacity	0.31	0.04	0.01	0.49	0.07	0.41	0.02
Queue Length 95th (ft)	33	3	1	0	0	0	0
Control Delay (s)	21.8	15.1	9.2	0.0	0.0	0.0	0.0
Lane LOS	C	C	A				
Approach Delay (s)	21.8	15.1	0.1			0.0	
Approach LOS	C	C					

Intersection Summary				
Average Delay	1.3			
Intersection Capacity Utilization	60.9%	ICU Level of Service	B	
Analysis Period (min)	15			

HCM Signalized Intersection Capacity Analysis
102: 20th Street SE & 79th Ave SE

11/8/2011

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	85	540	5	10	1800	90	30	5	10	35	10	250
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5		4.5	4.5		3.5	3.5		3.5	3.5	3.5
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	1.00
Frt	1.00	1.00		1.00	0.99		1.00	0.90		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1736	3467		1736	3446		1770	1671		1770	1863	1583
Flt Permitted	0.05	1.00		0.44	1.00		0.75	1.00		0.59	1.00	1.00
Satd. Flow (perm)	94	3467		797	3446		1398	1671		1095	1863	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	89	568	5	11	1895	95	32	5	11	37	11	263
RTOR Reduction (vph)	0	0	0	0	3	0	0	10	0	0	0	94
Lane Group Flow (vph)	89	573	0	11	1987	0	32	6	0	37	11	169
Heavy Vehicles (%)	4%	4%	4%	4%	4%	4%	2%	2%	2%	2%	2%	2%
Turn Type	pm+pt			pm+pt			pm+pt			pm+pt		Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2			6			8			4		4
Actuated Green, G (s)	83.5	78.3		73.7	73.0		15.2	12.9		22.4	16.6	16.6
Effective Green, g (s)	83.5	78.3		73.7	73.0		15.2	12.9		22.4	16.6	16.6
Actuated g/C Ratio	0.73	0.69		0.65	0.64		0.13	0.11		0.20	0.15	0.15
Clearance Time (s)	4.5	4.5		4.5	4.5		3.5	3.5		3.5	3.5	3.5
Vehicle Extension (s)	2.0	3.0		2.0	3.0		2.0	2.0		2.0	2.0	2.0
Lane Grp Cap (vph)	155	2383		521	2209		194	189		251	272	231
v/s Ratio Prot	c0.03	0.17		0.00	c0.58		0.00	0.00		c0.01	0.01	
v/s Ratio Perm	0.39			0.01			0.02			0.02		c0.11
v/c Ratio	0.57	0.24		0.02	0.90		0.16	0.03		0.15	0.04	0.73
Uniform Delay, d1	23.3	6.7		7.1	17.3		43.6	44.9		37.6	41.8	46.5
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	3.2	0.1		0.0	5.4		0.1	0.0		0.1	0.0	9.8
Delay (s)	26.4	6.7		7.1	22.7		43.7	45.0		37.7	41.8	56.3
Level of Service	C	A		A	C		D	D		D	D	E
Approach Delay (s)		9.4			22.6			44.1			53.6	
Approach LOS		A			C			D			D	

Intersection Summary			
HCM Average Control Delay	23.3	HCM Level of Service	C
HCM Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	113.9	Sum of lost time (s)	16.0
Intersection Capacity Utilization	81.9%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
103: 20th Street SE & 83rd Ave SE

11/8/2011

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	90	325	130	225	1425	105	175	95	200	25	160	250
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5		4.5	4.5			4.0	4.0		4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00	1.00		1.00	
Frt	1.00	0.96		1.00	0.99			1.00	0.85		0.92	
Flt Protected	0.95	1.00		0.95	1.00			0.97	1.00		1.00	
Satd. Flow (prot)	1736	3323		1736	3435			1770	1553		1680	
Flt Permitted	0.08	1.00		0.36	1.00			0.40	1.00		0.97	
Satd. Flow (perm)	151	3323		650	3435			739	1553		1634	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	98	353	141	245	1549	114	190	103	217	27	174	272
RTOR Reduction (vph)	0	33	0	0	4	0	0	0	107	0	35	0
Lane Group Flow (vph)	98	461	0	245	1659	0	0	293	110	0	438	0
Heavy Vehicles (%)	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%
Turn Type	pm+pt			pm+pt			pm+pt		Perm	Perm		
Protected Phases	5	2		1	6		3	8			4	
Permitted Phases	2			6			8		8	4		
Actuated Green, G (s)	53.6	48.3		66.5	56.7			50.0	50.0		50.0	
Effective Green, g (s)	53.6	48.3		66.5	56.7			50.0	50.0		50.0	
Actuated g/C Ratio	0.43	0.39		0.53	0.45			0.40	0.40		0.40	
Clearance Time (s)	4.5	4.5		4.5	4.5			4.0	4.0		4.0	
Vehicle Extension (s)	2.0	3.0		2.0	3.0			2.0	2.0		2.0	
Lane Grp Cap (vph)	132	1284		465	1558			296	621		654	
v/s Ratio Prot	c0.03	0.14		0.06	c0.48							
v/s Ratio Perm	0.29			0.22				c0.40	0.07		0.27	
v/c Ratio	0.74	0.36		0.53	1.06			0.99	0.18		0.67	
Uniform Delay, d1	29.9	27.3		16.9	34.1			37.2	24.2		30.7	
Progression Factor	1.00	1.00		1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2	17.7	0.2		0.5	42.2			48.9	0.1		2.0	
Delay (s)	47.6	27.5		17.4	76.3			86.1	24.3		32.7	
Level of Service	D	C		B	E			F	C		C	
Approach Delay (s)		30.8			68.8			59.8			32.7	
Approach LOS		C			E			E			C	

Intersection Summary			
HCM Average Control Delay	56.1	HCM Level of Service	E
HCM Volume to Capacity ratio	1.02		
Actuated Cycle Length (s)	125.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	101.7%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
105: 20th Street SE & SR 9

11/3/2011

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	35	220	80	110	650	80	95	970	35	40	1920	40
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.6	4.3		6.6	4.3		5.6	3.0	3.0	5.5	3.0	3.0
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	0.96		1.00	0.98		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3398		1770	3481		1770	3539	1583	1770	3539	1583
Flt Permitted	0.11	1.00		0.43	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	211	3398		804	3481		1770	3539	1583	1770	3539	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	37	232	84	116	684	84	100	1021	37	42	2021	42
RTOR Reduction (vph)	0	24	0	0	6	0	0	0	12	0	0	6
Lane Group Flow (vph)	37	292	0	116	762	0	100	1021	25	42	2021	36
Turn Type	pm+pt			pm+pt			Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8					2			6
Actuated Green, G (s)	38.2	35.9		39.6	36.6		9.6	85.4	85.4	6.6	82.4	82.4
Effective Green, g (s)	37.0	36.9		38.4	37.6		9.0	88.4	88.4	6.1	85.4	85.4
Actuated g/C Ratio	0.24	0.24		0.25	0.25		0.06	0.58	0.58	0.04	0.56	0.56
Clearance Time (s)	6.0	5.3		6.0	5.3		5.0	6.0	6.0	5.0	6.0	6.0
Vehicle Extension (s)	2.0	3.5		2.0	3.5		2.0	4.0	4.0	2.0	4.0	4.0
Lane Grp Cap (vph)	68	818		217	854		104	2042	913	70	1973	882
v/s Ratio Prot	0.01	0.09		c0.01	c0.22		c0.06	c0.29		0.02	c0.57	
v/s Ratio Perm	0.12			0.13					0.02			0.02
v/c Ratio	0.54	0.36		0.53	0.89		0.96	0.50	0.03	0.60	1.02	0.04
Uniform Delay, d1	54.8	48.3		52.3	55.8		71.9	19.3	13.9	72.3	33.9	15.4
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	4.7	0.3		1.3	11.8		75.2	0.3	0.0	8.9	26.7	0.0
Delay (s)	59.5	48.6		53.6	67.7		147.1	19.5	13.9	81.2	60.6	15.4
Level of Service	E	D		D	E		F	B	B	F	E	B
Approach Delay (s)		49.8			65.8			30.4			60.1	
Approach LOS		D			E			C			E	

Intersection Summary			
HCM Average Control Delay	52.8	HCM Level of Service	D
HCM Volume to Capacity ratio	0.97		
Actuated Cycle Length (s)	153.2	Sum of lost time (s)	18.2
Intersection Capacity Utilization	99.3%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
107: 20th Street SE & S Lake Stevens Rd

11/3/2011

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	75	125	45	40	685	20	170	195	60	10	75	465
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.0		4.0	5.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.96		1.00	1.00		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1736	3333		1736	3456		1736	1827	1553	1736	1827	1553
Flt Permitted	0.19	1.00		0.64	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	345	3333		1169	3456		1736	1827	1553	1736	1827	1553
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	78	130	47	42	714	21	177	203	62	10	78	484
RTOR Reduction (vph)	0	24	0	0	1	0	0	0	42	0	0	80
Lane Group Flow (vph)	78	153	0	42	734	0	177	203	20	10	78	404
Heavy Vehicles (%)	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%
Turn Type	pm+pt			pm+pt			Prot		pm+ov	Prot		pm+ov
Protected Phases	5	2		1	6		3	8	1	7	4	5
Permitted Phases	2			6					8			4
Actuated Green, G (s)	52.6	45.5		32.1	29.0		15.5	25.9	29.0	0.5	10.9	30.5
Effective Green, g (s)	52.6	45.5		32.1	29.0		15.5	25.9	29.0	0.5	10.9	30.5
Actuated g/C Ratio	0.57	0.49		0.35	0.32		0.17	0.28	0.32	0.01	0.12	0.33
Clearance Time (s)	4.0	5.0		4.0	5.0		4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	2.0	4.0		2.0	4.0		2.0	2.5	2.0	2.0	2.5	2.0
Lane Grp Cap (vph)	494	1648		427	1089		292	514	557	9	216	582
v/s Ratio Prot	0.03	0.05		0.00	c0.21		c0.10	0.11	0.00	0.01	0.04	c0.15
v/s Ratio Perm	0.06			0.03					0.01			0.11
v/c Ratio	0.16	0.09		0.10	0.67		0.61	0.39	0.04	1.11	0.36	0.69
Uniform Delay, d1	10.5	12.3		20.0	27.4		35.4	26.7	21.8	45.8	37.3	26.7
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.1	0.0		0.0	1.8		2.4	0.4	0.0	342.2	0.8	2.9
Delay (s)	10.5	12.4		20.0	29.2		37.9	27.1	21.8	388.0	38.1	29.6
Level of Service	B	B		C	C		D	C	C	F	D	C
Approach Delay (s)		11.8			28.7			30.7			37.0	
Approach LOS		B			C			C			D	

Intersection Summary			
HCM Average Control Delay	29.3	HCM Level of Service	C
HCM Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	92.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	68.6%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
101: 20th Street SE & 73rd Ave SE/Cavalero Rd

11/5/2011

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	215	1840	105	15	1055	30	125	5	55	10	5	50
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	234	2000	114	16	1147	33	136	5	60	11	5	54
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)					1154							
pX, platoon unblocked	0.84						0.84	0.84		0.84	0.84	0.84
vC, conflicting volume	1179			2114			3188	3736	1057	2726	3777	590
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	828			2114			3224	3878	1057	2673	3927	125
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	65			94			0	0	73	0	0	93
cM capacity (veh/h)	670			255			0	2	221	0	2	757

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	SB 1
Volume Total	234	1333	781	16	764	415	201	71
Volume Left	234	0	0	16	0	0	136	11
Volume Right	0	0	114	0	0	33	60	54
cSH	670	1700	1700	255	1700	1700	0	0
Volume to Capacity	0.35	0.78	0.46	0.06	0.45	0.24	Err	Err
Queue Length 95th (ft)	39	0	0	5	0	0	Err	Err
Control Delay (s)	13.2	0.0	0.0	20.1	0.0	0.0	Err	Err
Lane LOS	B			C			F	F
Approach Delay (s)	1.3			0.3			Err	Err
Approach LOS							F	F

Intersection Summary			
Average Delay	Err		
Intersection Capacity Utilization	84.8%	ICU Level of Service	E
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	205	1590	55	10	885	25	20	10	20	145	5	240
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5		4.5	4.5		3.5	3.5		3.5	3.5	3.5
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.99		1.00	1.00		1.00	0.90		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1736	3454		1736	3457		1770	1679		1770	1863	1583
Flt Permitted	0.18	1.00		0.11	1.00		0.80	1.00		0.47	1.00	1.00
Satd. Flow (perm)	323	3454		193	3457		1490	1679		877	1863	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	216	1674	58	11	932	26	21	11	21	153	5	253
RTOR Reduction (vph)	0	2	0	0	2	0	0	20	0	0	0	207
Lane Group Flow (vph)	216	1730	0	11	956	0	21	12	0	153	5	46
Heavy Vehicles (%)	4%	4%	4%	4%	4%	4%	2%	2%	2%	2%	2%	2%
Turn Type	pm+pt			pm+pt			pm+pt			pm+pt		Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2			6			8			4		4
Actuated Green, G (s)	54.4	49.4		38.3	37.8		6.3	5.0		19.7	14.9	14.9
Effective Green, g (s)	54.4	49.4		38.3	37.8		6.3	5.0		19.7	14.9	14.9
Actuated g/C Ratio	0.66	0.60		0.47	0.46		0.08	0.06		0.24	0.18	0.18
Clearance Time (s)	4.5	4.5		4.5	4.5		3.5	3.5		3.5	3.5	3.5
Vehicle Extension (s)	2.0	3.0		2.0	3.0		2.0	2.0		2.0	2.0	2.0
Lane Grp Cap (vph)	422	2078		99	1592		119	102		332	338	287
v/s Ratio Prot	c0.08	c0.50		0.00	0.28		0.00	0.01		c0.06	0.00	
v/s Ratio Perm	0.26			0.05			0.01			c0.05		0.03
v/c Ratio	0.51	0.83		0.11	0.60		0.18	0.12		0.46	0.01	0.16
Uniform Delay, d1	8.3	13.0		13.7	16.5		35.4	36.5		26.0	27.6	28.3
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.4	3.0		0.2	0.6		0.3	0.2		0.4	0.0	0.1
Delay (s)	8.8	16.1		13.9	17.2		35.7	36.7		26.4	27.6	28.4
Level of Service	A	B		B	B		D	D		C	C	C
Approach Delay (s)		15.3			17.1			36.3			27.7	
Approach LOS		B			B			D			C	

Intersection Summary			
HCM Average Control Delay	17.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	82.1	Sum of lost time (s)	12.5
Intersection Capacity Utilization	74.6%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	265	1310	110	40	685	20	50	15	70	105	10	200
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5		4.5	4.5			4.0	4.0		4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00	1.00		1.00	
Frt	1.00	0.99		1.00	1.00			1.00	0.85		0.91	
Flt Protected	0.95	1.00		0.95	1.00			0.96	1.00		0.98	
Satd. Flow (prot)	1736	3431		1736	3456			1759	1553		1643	
Flt Permitted	0.23	1.00		0.11	1.00			0.61	1.00		0.87	
Satd. Flow (perm)	423	3431		195	3456			1110	1553		1445	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	288	1424	120	43	745	22	54	16	76	114	11	217
RTOR Reduction (vph)	0	4	0	0	2	0	0	0	55	0	50	0
Lane Group Flow (vph)	288	1540	0	43	765	0	0	70	21	0	292	0
Heavy Vehicles (%)	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%
Turn Type	pm+pt			pm+pt			pm+pt		Perm	Perm		
Protected Phases	5	2		1	6		3	8			4	
Permitted Phases	2			6			8		8	4		
Actuated Green, G (s)	56.8	50.1		39.7	37.5			24.2	24.2		24.2	
Effective Green, g (s)	56.8	50.1		39.7	37.5			24.2	24.2		24.2	
Actuated g/C Ratio	0.63	0.56		0.44	0.42			0.27	0.27		0.27	
Clearance Time (s)	4.5	4.5		4.5	4.5			4.0	4.0		4.0	
Vehicle Extension (s)	2.0	3.0		2.0	3.0			2.0	2.0		2.0	
Lane Grp Cap (vph)	486	1921		124	1448			300	420		391	
v/s Ratio Prot	c0.10	c0.45		0.01	0.22							
v/s Ratio Perm	0.28			0.14				0.06	0.01		c0.20	
v/c Ratio	0.59	0.80		0.35	0.53			0.23	0.05		0.75	
Uniform Delay, d1	9.4	15.7		15.7	19.4			25.4	24.1		29.8	
Progression Factor	1.00	1.00		1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2	1.3	2.5		0.6	0.4			0.1	0.0		6.6	
Delay (s)	10.7	18.2		16.3	19.8			25.6	24.2		36.5	
Level of Service	B	B		B	B			C	C		D	
Approach Delay (s)		17.0			19.6			24.8			36.5	
Approach LOS		B			B			C			D	

Intersection Summary			
HCM Average Control Delay	20.2	HCM Level of Service	C
HCM Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	89.5	Sum of lost time (s)	13.0
Intersection Capacity Utilization	79.2%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	295	1105	35	25	465	195	50	60	40	215	25	245
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.0		4.0	5.0			4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00		1.00	1.00	
Frt	1.00	1.00		1.00	0.96			0.96		1.00	0.86	
Flt Protected	0.95	1.00		0.95	1.00			0.98		0.95	1.00	
Satd. Flow (prot)	1770	3523		1770	3382			1767		1770	1609	
Flt Permitted	0.20	1.00		0.16	1.00			0.79		0.95	1.00	
Satd. Flow (perm)	364	3523		306	3382			1424		1770	1609	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	321	1201	38	27	505	212	54	65	43	234	27	266
RTOR Reduction (vph)	0	2	0	0	30	0	0	9	0	0	166	0
Lane Group Flow (vph)	321	1237	0	27	687	0	0	153	0	234	127	0
Turn Type	pm+pt			pm+pt			pm+pt			Prot		
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2			6			8					
Actuated Green, G (s)	56.6	50.5		35.5	33.4			16.7		19.1	39.8	
Effective Green, g (s)	56.6	50.5		35.5	33.4			16.7		19.1	39.8	
Actuated g/C Ratio	0.54	0.48		0.34	0.32			0.16		0.18	0.38	
Clearance Time (s)	4.0	5.0		4.0	5.0			4.0		4.0	4.0	
Vehicle Extension (s)	2.0	4.0		2.0	4.0			2.5		2.0	3.0	
Lane Grp Cap (vph)	452	1688		132	1072			226		321	608	
v/s Ratio Prot	c0.13	c0.35		0.00	0.20					c0.13	0.08	
v/s Ratio Perm	0.25			0.06				c0.11				
v/c Ratio	0.71	0.73		0.20	0.64			0.68		0.73	0.21	
Uniform Delay, d1	16.6	22.0		24.0	30.9			41.8		40.7	22.2	
Progression Factor	1.00	1.00		1.00	1.00			1.00		1.00	1.00	
Incremental Delay, d2	4.3	1.8		0.3	1.5			7.1		6.9	0.2	
Delay (s)	21.0	23.8		24.2	32.3			48.9		47.6	22.3	
Level of Service	C	C		C	C			D		D	C	
Approach Delay (s)		23.2			32.0			48.9			33.5	
Approach LOS		C			C			D			C	

Intersection Summary			
HCM Average Control Delay	28.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	105.4	Sum of lost time (s)	12.0
Intersection Capacity Utilization	74.4%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	75	1140	105	135	455	80	155	1455	100	80	1010	60
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.6	4.3		6.6	4.3		5.6	3.0	3.0	5.5	3.0	3.0
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	0.99		1.00	0.98		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3494		1770	3460		1770	3539	1583	1770	3539	1583
Flt Permitted	0.34	1.00		0.07	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	641	3494		132	3460		1770	3539	1583	1770	3539	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	79	1200	111	142	479	84	163	1532	105	84	1063	63
RTOR Reduction (vph)	0	5	0	0	9	0	0	0	24	0	0	18
Lane Group Flow (vph)	79	1306	0	142	554	0	163	1532	81	84	1063	45
Turn Type	pm+pt			pm+pt			Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8					2			6
Actuated Green, G (s)	59.9	54.0		66.1	57.1		17.2	61.1	61.1	8.6	52.5	52.5
Effective Green, g (s)	58.7	55.0		64.9	58.1		16.6	64.1	64.1	8.1	55.5	55.5
Actuated g/C Ratio	0.38	0.35		0.42	0.37		0.11	0.41	0.41	0.05	0.36	0.36
Clearance Time (s)	6.0	5.3		6.0	5.3		5.0	6.0	6.0	5.0	6.0	6.0
Vehicle Extension (s)	2.0	3.5		2.0	3.5		2.0	4.0	4.0	2.0	4.0	4.0
Lane Grp Cap (vph)	281	1240		144	1297		190	1464	655	92	1267	567
v/s Ratio Prot	0.01	c0.37		c0.05	0.16		c0.09	c0.43		0.05	0.30	
v/s Ratio Perm	0.10			c0.36					0.05			0.03
v/c Ratio	0.28	1.05		0.99	0.43		0.86	1.05	0.12	0.91	0.84	0.08
Uniform Delay, d1	31.8	50.0		40.6	36.1		68.0	45.5	28.1	73.1	45.7	32.9
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.2	40.9		70.1	0.3		28.8	36.7	0.1	64.8	5.3	0.1
Delay (s)	32.0	90.9		110.7	36.3		96.8	82.1	28.2	137.9	50.9	33.0
Level of Service	C	F		F	D		F	F	C	F	D	C
Approach Delay (s)		87.6			51.3			80.3			56.0	
Approach LOS		F			D			F			E	

Intersection Summary			
HCM Average Control Delay	72.5	HCM Level of Service	E
HCM Volume to Capacity ratio	1.11		
Actuated Cycle Length (s)	155.0	Sum of lost time (s)	26.1
Intersection Capacity Utilization	104.0%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	125	1120	105	30	605	50	90	165	50	55	190	70
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	5.0		4.5	5.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	0.99		1.00	0.97		1.00	0.96	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	3494		1770	3499		1770	1798		1770	1788	
Flt Permitted	0.29	1.00		0.14	1.00		0.39	1.00		0.48	1.00	
Satd. Flow (perm)	540	3494		258	3499		719	1798		891	1788	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	136	1217	114	33	658	54	98	179	54	60	207	76
RTOR Reduction (vph)	0	8	0	0	7	0	0	12	0	0	15	0
Lane Group Flow (vph)	136	1323	0	33	705	0	98	221	0	60	268	0
Turn Type	pm+pt			pm+pt			Perm			Perm		
Protected Phases	5	2		1	6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	40.8	35.2		32.2	30.9		15.6	15.6		15.6	15.6	
Effective Green, g (s)	40.8	35.2		32.2	30.9		15.6	15.6		15.6	15.6	
Actuated g/C Ratio	0.62	0.54		0.49	0.47		0.24	0.24		0.24	0.24	
Clearance Time (s)	4.5	5.0		4.5	5.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	2.0	4.0		2.0	4.0		2.5	2.5		2.5	2.5	
Lane Grp Cap (vph)	441	1875		157	1648		171	428		212	425	
v/s Ratio Prot	c0.03	c0.38		0.00	0.20			0.12			c0.15	
v/s Ratio Perm	0.17			0.10			0.14			0.07		
v/c Ratio	0.31	0.71		0.21	0.43		0.57	0.52		0.28	0.63	
Uniform Delay, d1	5.7	11.3		9.5	11.5		22.1	21.7		20.4	22.4	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.1	1.3		0.2	0.2		3.8	0.8		0.5	2.7	
Delay (s)	5.9	12.7		9.8	11.7		25.8	22.5		21.0	25.1	
Level of Service	A	B		A	B		C	C		C	C	
Approach Delay (s)		12.0			11.7			23.5			24.4	
Approach LOS		B			B			C			C	

Intersection Summary			
HCM Average Control Delay	14.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	65.6	Sum of lost time (s)	13.5
Intersection Capacity Utilization	71.5%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	300	690	245	50	360	25	155	255	130	50	275	215
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.0		4.0	5.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.96		1.00	0.99		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1736	3335		1736	3437		1736	1827	1553	1736	1827	1553
Flt Permitted	0.36	1.00		0.21	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	665	3335		393	3437		1736	1827	1553	1736	1827	1553
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	312	719	255	52	375	26	161	266	135	52	286	224
RTOR Reduction (vph)	0	25	0	0	4	0	0	0	83	0	0	125
Lane Group Flow (vph)	312	949	0	52	397	0	161	266	52	52	286	99
Heavy Vehicles (%)	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%
Turn Type	pm+pt			pm+pt			Prot		pm+ov	Prot		pm+ov
Protected Phases	5	2		1	6		3	8	1	7	4	5
Permitted Phases	2			6					8			4
Actuated Green, G (s)	49.0	38.8		32.4	26.2		15.4	32.5	38.7	6.2	23.3	42.1
Effective Green, g (s)	49.0	38.8		32.4	26.2		15.4	32.5	38.7	6.2	23.3	42.1
Actuated g/C Ratio	0.49	0.39		0.32	0.26		0.15	0.32	0.38	0.06	0.23	0.42
Clearance Time (s)	4.0	5.0		4.0	5.0		4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	2.0	4.0		2.0	4.0		2.0	2.5	2.0	2.0	2.5	2.0
Lane Grp Cap (vph)	524	1285		209	894		265	590	659	107	423	711
v/s Ratio Prot	c0.11	c0.28		0.02	0.12		c0.09	0.15	0.00	0.03	c0.16	0.03
v/s Ratio Perm	0.18			0.06					0.03			0.04
v/c Ratio	0.60	0.74		0.25	0.44		0.61	0.45	0.08	0.49	0.68	0.14
Uniform Delay, d1	16.8	26.6		24.2	31.2		39.8	27.0	19.7	45.7	35.3	18.1
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.2	2.4		0.2	0.5		2.7	0.4	0.0	1.3	3.9	0.0
Delay (s)	18.0	29.0		24.4	31.6		42.5	27.4	19.7	47.0	39.1	18.1
Level of Service	B	C		C	C		D	C	B	D	D	B
Approach Delay (s)		26.3			30.8			29.9			31.5	
Approach LOS		C			C			C			C	

Intersection Summary			
HCM Average Control Delay	28.8	HCM Level of Service	C
HCM Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	100.7	Sum of lost time (s)	17.0
Intersection Capacity Utilization	67.5%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	260	145	25	450	70	15	45	1405	190	20	1030	145
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	1.00		0.97	1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	0.98		1.00	0.97		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3502	1858		3502	1850		1770	3539	1583	1770	3539	1583
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3502	1858		3502	1850		1770	3539	1583	1770	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	283	158	27	489	76	16	49	1527	207	22	1120	158
RTOR Reduction (vph)	0	4	0	0	5	0	0	0	97	0	0	57
Lane Group Flow (vph)	283	181	0	489	87	0	49	1527	110	22	1120	101
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	2%	2%	2%	2%	2%	2%
Turn Type	Prot			Prot			Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases									2			6
Actuated Green, G (s)	15.9	18.0		23.7	25.8		6.4	67.9	67.9	2.5	64.0	64.0
Effective Green, g (s)	15.9	18.0		23.7	25.8		6.4	67.9	67.9	2.5	64.0	64.0
Actuated g/C Ratio	0.12	0.14		0.19	0.20		0.05	0.53	0.53	0.02	0.50	0.50
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	435	261		648	373		88	1876	839	35	1768	791
v/s Ratio Prot	0.08	c0.10		c0.14	0.05		c0.03	c0.43		0.01	0.32	
v/s Ratio Perm									0.07			0.06
v/c Ratio	0.65	0.69		0.75	0.23		0.56	0.81	0.13	0.63	0.63	0.13
Uniform Delay, d1	53.5	52.4		49.4	42.9		59.5	24.9	15.2	62.3	23.5	17.1
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	3.5	7.7		5.0	0.3		7.4	2.8	0.1	30.3	0.7	0.1
Delay (s)	56.9	60.1		54.4	43.2		66.9	27.7	15.3	92.7	24.2	17.2
Level of Service	E	E		D	D		E	C	B	F	C	B
Approach Delay (s)		58.2			52.7			27.3			24.5	
Approach LOS		E			D			C			C	

Intersection Summary			
HCM Average Control Delay	33.5	HCM Level of Service	C
HCM Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	128.1	Sum of lost time (s)	16.0
Intersection Capacity Utilization	70.8%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
102: 20th Street SE & 79th Ave SE

11/8/2011

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	95	710	30	40	1980	150	50	10	80	35	10	300
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5		4.5	4.5		3.5	3.5		3.5	3.5	3.5
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.99		1.00	0.99		1.00	0.87		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1736	3450		1736	3434		1770	1616		1770	1863	1583
Flt Permitted	0.05	1.00		0.33	1.00		0.72	1.00		0.65	1.00	1.00
Satd. Flow (perm)	89	3450		600	3434		1342	1616		1211	1863	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	100	747	32	42	2084	158	53	11	84	37	11	316
RTOR Reduction (vph)	0	2	0	0	4	0	0	69	0	0	0	84
Lane Group Flow (vph)	100	777	0	42	2238	0	53	26	0	37	11	232
Heavy Vehicles (%)	4%	4%	4%	4%	4%	4%	2%	2%	2%	2%	2%	2%
Turn Type	pm+pt			pm+pt			pm+pt			pm+pt		Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2			6			8			4		4
Actuated Green, G (s)	87.8	82.3		83.4	80.1		26.0	22.5		24.2	21.6	21.6
Effective Green, g (s)	87.8	82.3		83.4	80.1		26.0	22.5		24.2	21.6	21.6
Actuated g/C Ratio	0.69	0.65		0.66	0.63		0.21	0.18		0.19	0.17	0.17
Clearance Time (s)	4.5	4.5		4.5	4.5		3.5	3.5		3.5	3.5	3.5
Vehicle Extension (s)	2.0	3.0		2.0	3.0		2.0	2.0		2.0	2.0	2.0
Lane Grp Cap (vph)	133	2241		425	2171		287	287		243	318	270
v/s Ratio Prot	c0.03	0.23		0.00	c0.65		c0.01	0.02		0.00	0.01	
v/s Ratio Perm	0.49			0.06			0.03			0.03		c0.15
v/c Ratio	0.75	0.35		0.10	1.03		0.18	0.09		0.15	0.03	0.86
Uniform Delay, d1	34.9	10.0		7.8	23.3		41.3	43.5		42.4	43.8	51.1
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	18.9	0.1		0.0	27.7		0.1	0.0		0.1	0.0	22.6
Delay (s)	53.9	10.1		7.8	51.0		41.4	43.6		42.5	43.9	73.6
Level of Service	D	B		A	D		D	D		D	D	E
Approach Delay (s)		15.1			50.2			42.8			69.6	
Approach LOS		B			D			D			E	

Intersection Summary			
HCM Average Control Delay	43.5	HCM Level of Service	D
HCM Volume to Capacity ratio	1.00		
Actuated Cycle Length (s)	126.7	Sum of lost time (s)	20.5
Intersection Capacity Utilization	91.8%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
103: 20th Street SE & 83rd Ave SE

11/8/2011

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	125	500	200	315	1665	130	175	95	250	35	160	270
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5		4.5	4.5			4.0	4.0		4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00	1.00		1.00	
Frt	1.00	0.96		1.00	0.99			1.00	0.85		0.92	
Flt Protected	0.95	1.00		0.95	1.00			0.97	1.00		1.00	
Satd. Flow (prot)	1736	3322		1736	3434			1770	1553		1678	
Flt Permitted	0.09	1.00		0.20	1.00			0.37	1.00		0.96	
Satd. Flow (perm)	158	3322		370	3434			675	1553		1609	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	136	543	217	342	1810	141	190	103	272	38	174	293
RTOR Reduction (vph)	0	33	0	0	5	0	0	0	134	0	36	0
Lane Group Flow (vph)	136	727	0	342	1946	0	0	293	138	0	469	0
Heavy Vehicles (%)	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%
Turn Type	pm+pt			pm+pt			pm+pt		Perm	Perm		
Protected Phases	5	2		1	6		3	8			4	
Permitted Phases	2			6			8		8	4		
Actuated Green, G (s)	51.8	46.3		69.5	59.5			47.0	47.0		47.0	
Effective Green, g (s)	51.8	46.3		69.5	59.5			47.0	47.0		47.0	
Actuated g/C Ratio	0.41	0.37		0.56	0.48			0.38	0.38		0.38	
Clearance Time (s)	4.5	4.5		4.5	4.5			4.0	4.0		4.0	
Vehicle Extension (s)	2.0	3.0		2.0	3.0			2.0	2.0		2.0	
Lane Grp Cap (vph)	135	1230		410	1635			254	584		605	
v/s Ratio Prot	0.04	0.22		c0.12	c0.57							
v/s Ratio Perm	0.37			0.34				c0.43	0.09		0.29	
v/c Ratio	1.01	0.59		0.83	1.19			1.15	0.24		0.77	
Uniform Delay, d1	33.9	31.7		19.5	32.8			39.0	26.7		34.3	
Progression Factor	1.00	1.00		1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2	79.4	0.8		13.0	92.1			104.3	0.1		5.6	
Delay (s)	113.3	32.5		32.6	124.8			143.3	26.8		40.0	
Level of Service	F	C		C	F			F	C		D	
Approach Delay (s)		44.8			111.1			87.2			40.0	
Approach LOS		D			F			F			D	

Intersection Summary			
HCM Average Control Delay	85.5	HCM Level of Service	F
HCM Volume to Capacity ratio	1.17		
Actuated Cycle Length (s)	125.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	112.9%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
105: 20th Street SE & SR 9

11/3/2011

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	70	320	110	140	730	130	160	990	50	85	1990	100
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.6	4.3		6.6	4.3		5.6	3.0	3.0	5.5	3.0	3.0
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	0.96		1.00	0.98		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3403		1770	3459		1770	3539	1583	1770	3539	1583
Flt Permitted	0.10	1.00		0.32	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	194	3403		598	3459		1770	3539	1583	1770	3539	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	74	337	116	147	768	137	168	1042	53	89	2095	105
RTOR Reduction (vph)	0	22	0	0	10	0	0	0	17	0	0	15
Lane Group Flow (vph)	74	431	0	147	895	0	168	1042	36	89	2095	90
Turn Type	pm+pt			pm+pt			Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8					2			6
Actuated Green, G (s)	42.0	39.0		42.0	39.0		13.0	78.8	78.8	11.9	77.7	77.7
Effective Green, g (s)	40.8	40.0		40.8	40.0		12.4	81.8	81.8	11.4	80.7	80.7
Actuated g/C Ratio	0.26	0.26		0.26	0.26		0.08	0.53	0.53	0.07	0.52	0.52
Clearance Time (s)	6.0	5.3		6.0	5.3		5.0	6.0	6.0	5.0	6.0	6.0
Vehicle Extension (s)	2.0	3.5		2.0	3.5		2.0	4.0	4.0	2.0	4.0	4.0
Lane Grp Cap (vph)	75	878		176	893		142	1868	835	130	1843	824
v/s Ratio Prot	c0.02	0.13		0.01	c0.26		c0.09	0.29		0.05	c0.59	
v/s Ratio Perm	0.24			0.21					0.02			0.06
v/c Ratio	0.99	0.49		0.84	1.00		1.18	0.56	0.04	0.68	1.14	0.11
Uniform Delay, d1	61.5	48.8		58.0	57.5		71.3	24.5	17.7	70.0	37.1	18.9
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	98.4	0.5		26.5	30.8		133.1	0.4	0.0	11.3	68.8	0.1
Delay (s)	159.9	49.4		84.5	88.3		204.4	24.9	17.7	81.3	105.9	19.0
Level of Service	F	D		F	F		F	C	B	F	F	B
Approach Delay (s)		64.9			87.7			48.5			101.0	
Approach LOS		E			F			D			F	

Intersection Summary			
HCM Average Control Delay	81.6	HCM Level of Service	F
HCM Volume to Capacity ratio	1.10		
Actuated Cycle Length (s)	155.0	Sum of lost time (s)	19.5
Intersection Capacity Utilization	109.2%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
107: 20th Street SE & S Lake Stevens Rd

11/3/2011

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	80	130	45	40	720	20	175	195	60	10	80	505
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.0		4.0	5.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.96		1.00	1.00		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1736	3337		1736	3457		1736	1827	1553	1736	1827	1553
Flt Permitted	0.16	1.00		0.64	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	294	3337		1164	3457		1736	1827	1553	1736	1827	1553
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	83	135	47	42	750	21	182	203	62	10	83	526
RTOR Reduction (vph)	0	22	0	0	1	0	0	0	44	0	0	69
Lane Group Flow (vph)	83	160	0	42	770	0	182	203	18	10	83	457
Heavy Vehicles (%)	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%
Turn Type	pm+pt			pm+pt			Prot		pm+ov	Prot		pm+ov
Protected Phases	5	2		1	6		3	8	1	7	4	5
Permitted Phases	2			6					8			4
Actuated Green, G (s)	60.5	53.5		34.1	31.1		16.2	27.1	30.1	0.5	11.4	36.8
Effective Green, g (s)	60.5	53.5		34.1	31.1		16.2	27.1	30.1	0.5	11.4	36.8
Actuated g/C Ratio	0.60	0.53		0.34	0.31		0.16	0.27	0.30	0.00	0.11	0.36
Clearance Time (s)	4.0	5.0		4.0	5.0		4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	2.0	4.0		2.0	4.0		2.0	2.5	2.0	2.0	2.5	2.0
Lane Grp Cap (vph)	538	1766		410	1063		278	490	524	9	206	627
v/s Ratio Prot	0.04	0.05		0.00	c0.22		c0.10	0.11	0.00	0.01	0.05	c0.18
v/s Ratio Perm	0.05			0.03					0.01			0.11
v/c Ratio	0.15	0.09		0.10	0.72		0.65	0.41	0.04	1.11	0.40	0.73
Uniform Delay, d1	10.7	11.8		22.8	31.2		39.8	30.5	25.2	50.3	41.7	27.8
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.0	0.0		0.0	2.6		4.2	0.4	0.0	342.2	0.9	3.6
Delay (s)	10.7	11.8		22.8	33.8		44.0	30.9	25.2	392.5	42.6	31.4
Level of Service	B	B		C	C		D	C	C	F	D	C
Approach Delay (s)		11.5			33.3			35.4			38.8	
Approach LOS		B			C			D			D	

Intersection Summary			
HCM Average Control Delay	32.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	101.1	Sum of lost time (s)	13.0
Intersection Capacity Utilization	72.3%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
101: 20th Street SE & 73rd Ave SE/Cavalero Rd

11/5/2011

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	215	2000	115	25	1425	35	150	5	65	25	5	50
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	234	2174	125	27	1549	38	163	5	71	27	5	54
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)					1154							
pX, platoon unblocked	0.75						0.75	0.75		0.75	0.75	0.75
vC, conflicting volume	1587			2299			3590	4345	1149	3250	4389	793
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1106			2299			3790	4803	1149	3335	4861	42
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	50			87			0	0	63	0	0	93
cM capacity (veh/h)	468			216			0	0	192	0	0	760

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	SB 1
Volume Total	234	1449	850	27	1033	554	239	87
Volume Left	234	0	0	27	0	0	163	27
Volume Right	0	0	125	0	0	38	71	54
cSH	468	1700	1700	216	1700	1700	0	0
Volume to Capacity	0.50	0.85	0.50	0.13	0.61	0.33	Err	Err
Queue Length 95th (ft)	68	0	0	11	0	0	Err	Err
Control Delay (s)	20.1	0.0	0.0	24.1	0.0	0.0	Err	Err
Lane LOS	C			C			F	F
Approach Delay (s)	1.9			0.4			Err	Err
Approach LOS							F	F

Intersection Summary				
Average Delay	Err			
Intersection Capacity Utilization	91.5%	ICU Level of Service	F	
Analysis Period (min)	15			

HCM Signalized Intersection Capacity Analysis
102: 20th Street SE & 79th Ave SE

11/5/2011

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	220	1725	95	80	1170	25	90	10	120	145	10	275
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5		4.5	4.5		3.5	3.5		3.5	3.5	3.5
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.99		1.00	1.00		1.00	0.86		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1736	3444		1736	3460		1770	1606		1770	1863	1583
Flt Permitted	0.12	1.00		0.07	1.00		0.75	1.00		0.35	1.00	1.00
Satd. Flow (perm)	227	3444		125	3460		1398	1606		648	1863	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	232	1816	100	84	1232	26	95	11	126	153	11	289
RTOR Reduction (vph)	0	3	0	0	1	0	0	110	0	0	0	226
Lane Group Flow (vph)	232	1913	0	84	1257	0	95	27	0	153	11	63
Heavy Vehicles (%)	4%	4%	4%	4%	4%	4%	2%	2%	2%	2%	2%	2%
Turn Type	pm+pt			pm+pt			pm+pt			pm+pt		Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2			6			8			4		4
Actuated Green, G (s)	76.2	67.2		63.0	58.5		12.7	8.0		21.7	13.5	13.5
Effective Green, g (s)	76.2	67.2		63.0	58.5		12.7	8.0		21.7	13.5	13.5
Actuated g/C Ratio	0.72	0.63		0.59	0.55		0.12	0.08		0.20	0.13	0.13
Clearance Time (s)	4.5	4.5		4.5	4.5		3.5	3.5		3.5	3.5	3.5
Vehicle Extension (s)	2.0	3.0		2.0	3.0		2.0	2.0		2.0	2.0	2.0
Lane Grp Cap (vph)	351	2185		143	1911		184	121		241	237	202
v/s Ratio Prot	c0.08	c0.56		0.02	0.36		0.02	0.02		c0.06	0.01	
v/s Ratio Perm	0.39			0.33			0.04			c0.07		0.04
v/c Ratio	0.66	0.88		0.59	0.66		0.52	0.22		0.63	0.05	0.31
Uniform Delay, d1	13.6	15.9		17.4	16.7		43.3	46.0		36.9	40.6	42.0
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	3.6	4.3		3.9	0.8		1.0	0.3		4.0	0.0	0.3
Delay (s)	17.2	20.2		21.3	17.5		44.4	46.4		40.9	40.6	42.3
Level of Service	B	C		C	B		D	D		D	D	D
Approach Delay (s)		19.9			17.7			45.5			41.8	
Approach LOS		B			B			D			D	

Intersection Summary			
HCM Average Control Delay	23.0	HCM Level of Service	C
HCM Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	105.9	Sum of lost time (s)	12.5
Intersection Capacity Utilization	85.3%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	265	1565	125	60	1020	30	80	15	105	130	10	200
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5		4.5	4.5			4.0	4.0		4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00	1.00		1.00	
Frt	1.00	0.99		1.00	1.00			1.00	0.85		0.92	
Flt Protected	0.95	1.00		0.95	1.00			0.96	1.00		0.98	
Satd. Flow (prot)	1736	3433		1736	3456			1753	1553		1650	
Flt Permitted	0.12	1.00		0.08	1.00			0.51	1.00		0.80	
Satd. Flow (perm)	211	3433		141	3456			927	1553		1351	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	288	1701	136	65	1109	33	87	16	114	141	11	217
RTOR Reduction (vph)	0	5	0	0	2	0	0	0	61	0	40	0
Lane Group Flow (vph)	288	1832	0	65	1140	0	0	103	53	0	329	0
Heavy Vehicles (%)	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%
Turn Type	pm+pt			pm+pt			pm+pt		Perm	Perm		
Protected Phases	5	2		1	6		3	8			4	
Permitted Phases	2			6			8		8	4		
Actuated Green, G (s)	73.4	65.6		55.0	51.7			29.8	29.8		29.8	
Effective Green, g (s)	73.4	65.6		55.0	51.7			29.8	29.8		29.8	
Actuated g/C Ratio	0.66	0.59		0.49	0.46			0.27	0.27		0.27	
Clearance Time (s)	4.5	4.5		4.5	4.5			4.0	4.0		4.0	
Vehicle Extension (s)	2.0	3.0		2.0	3.0			2.0	2.0		2.0	
Lane Grp Cap (vph)	373	2016		117	1600			247	414		360	
v/s Ratio Prot	c0.12	c0.53		0.02	0.33							
v/s Ratio Perm	0.39			0.26				0.11	0.03		c0.24	
v/c Ratio	0.77	0.91		0.56	0.71			0.42	0.13		0.92	
Uniform Delay, d1	23.6	20.4		21.4	24.0			33.8	31.1		39.7	
Progression Factor	1.00	1.00		1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2	8.7	6.5		3.2	1.5			0.4	0.1		26.6	
Delay (s)	32.3	26.9		24.6	25.6			34.2	31.1		66.3	
Level of Service	C	C		C	C			C	C		E	
Approach Delay (s)		27.6			25.5			32.6			66.3	
Approach LOS		C			C			C			E	

Intersection Summary			
HCM Average Control Delay	30.9	HCM Level of Service	C
HCM Volume to Capacity ratio	0.92		
Actuated Cycle Length (s)	111.7	Sum of lost time (s)	13.0
Intersection Capacity Utilization	88.1%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	300	1375	75	60	750	195	125	65	100	215	40	250
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.0		4.0	5.0			4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00		1.00	1.00	
Frt	1.00	0.99		1.00	0.97			0.95		1.00	0.87	
Flt Protected	0.95	1.00		0.95	1.00			0.98		0.95	1.00	
Satd. Flow (prot)	1770	3512		1770	3430			1739		1770	1621	
Flt Permitted	0.08	1.00		0.08	1.00			0.72		0.95	1.00	
Satd. Flow (perm)	142	3512		154	3430			1276		1770	1621	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	326	1495	82	65	815	212	136	71	109	234	43	272
RTOR Reduction (vph)	0	3	0	0	15	0	0	13	0	0	139	0
Lane Group Flow (vph)	326	1574	0	65	1012	0	0	303	0	234	176	0
Turn Type	pm+pt			pm+pt			pm+pt			Prot		
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2			6			8					
Actuated Green, G (s)	77.1	70.0		51.4	48.3			32.9		20.9	57.8	
Effective Green, g (s)	77.1	70.0		51.4	48.3			32.9		20.9	57.8	
Actuated g/C Ratio	0.54	0.49		0.36	0.34			0.23		0.15	0.40	
Clearance Time (s)	4.0	5.0		4.0	5.0			4.0		4.0	4.0	
Vehicle Extension (s)	2.0	4.0		2.0	4.0			2.5		2.0	3.0	
Lane Grp Cap (vph)	357	1708		90	1151			292		257	651	
v/s Ratio Prot	c0.16	c0.45		0.02	0.29					c0.13	0.11	
v/s Ratio Perm	0.33			0.24				c0.24				
v/c Ratio	0.91	0.92		0.72	0.88			1.04		0.91	0.27	
Uniform Delay, d1	45.0	34.4		39.2	45.0			55.5		60.6	28.9	
Progression Factor	1.00	1.00		1.00	1.00			1.00		1.00	1.00	
Incremental Delay, d2	26.5	8.8		21.3	8.1			62.7		32.9	0.2	
Delay (s)	71.5	43.2		60.6	53.1			118.2		93.5	29.1	
Level of Service	E	D		E	D			F		F	C	
Approach Delay (s)		48.1			53.6			118.2			56.5	
Approach LOS		D			D			F			E	

Intersection Summary			
HCM Average Control Delay	56.6	HCM Level of Service	E
HCM Volume to Capacity ratio	0.93		
Actuated Cycle Length (s)	143.9	Sum of lost time (s)	12.0
Intersection Capacity Utilization	91.9%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	200	1275	175	190	650	175	210	1510	125	130	1045	125
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.6	4.3		6.6	4.3		5.6	3.0	3.0	5.5	3.0	3.0
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	0.98		1.00	0.97		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3475		1770	3427		1770	3539	1583	1770	3539	1583
Flt Permitted	0.11	1.00		0.08	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	202	3475		151	3427		1770	3539	1583	1770	3539	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	211	1342	184	200	684	184	221	1589	132	137	1100	132
RTOR Reduction (vph)	0	7	0	0	15	0	0	0	29	0	0	37
Lane Group Flow (vph)	211	1519	0	200	853	0	221	1589	103	137	1100	95
Turn Type	pm+pt			pm+pt			Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8					2			6
Actuated Green, G (s)	71.4	55.7		60.0	50.0		20.0	57.0	57.0	10.0	47.0	47.0
Effective Green, g (s)	70.2	56.7		58.8	51.0		19.4	60.0	60.0	9.5	50.0	50.0
Actuated g/C Ratio	0.45	0.37		0.38	0.33		0.13	0.39	0.39	0.06	0.32	0.32
Clearance Time (s)	6.0	5.3		6.0	5.3		5.0	6.0	6.0	5.0	6.0	6.0
Vehicle Extension (s)	2.0	3.5		2.0	3.5		2.0	4.0	4.0	2.0	4.0	4.0
Lane Grp Cap (vph)	244	1271		155	1128		222	1370	613	108	1142	511
v/s Ratio Prot	0.08	c0.44		c0.08	0.25		c0.12	c0.45		0.08	0.31	
v/s Ratio Perm	0.31			0.41					0.06			0.06
v/c Ratio	0.86	1.20		1.29	0.76		1.00	1.16	0.17	1.27	0.96	0.19
Uniform Delay, d1	34.4	49.1		40.9	46.4		67.8	47.5	31.1	72.8	51.6	37.8
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	25.0	95.8		170.3	3.0		58.7	80.5	0.2	175.2	18.4	0.2
Delay (s)	59.4	144.9		211.1	49.5		126.5	128.0	31.3	247.9	70.0	38.1
Level of Service	E	F		F	D		F	F	C	F	E	D
Approach Delay (s)		134.5			79.7			121.2			84.7	
Approach LOS		F			E			F			F	

Intersection Summary			
HCM Average Control Delay	109.6	HCM Level of Service	F
HCM Volume to Capacity ratio	1.19		
Actuated Cycle Length (s)	155.0	Sum of lost time (s)	19.5
Intersection Capacity Utilization	117.3%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	175	1215	105	35	690	50	115	165	60	60	195	190
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	5.0		4.5	5.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	0.99		1.00	0.96		1.00	0.93	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	3497		1770	3504		1770	1788		1770	1725	
Flt Permitted	0.21	1.00		0.13	1.00		0.24	1.00		0.49	1.00	
Satd. Flow (perm)	399	3497		241	3504		454	1788		916	1725	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	190	1321	114	38	750	54	125	179	65	65	212	207
RTOR Reduction (vph)	0	7	0	0	5	0	0	15	0	0	41	0
Lane Group Flow (vph)	190	1428	0	38	799	0	125	229	0	65	378	0
Turn Type	pm+pt			pm+pt			Perm			Perm		
Protected Phases	5	2		1	6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	44.6	38.0		33.0	30.9		23.2	23.2		23.2	23.2	
Effective Green, g (s)	44.6	38.0		33.0	30.9		23.2	23.2		23.2	23.2	
Actuated g/C Ratio	0.58	0.49		0.43	0.40		0.30	0.30		0.30	0.30	
Clearance Time (s)	4.5	5.0		4.5	5.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	2.0	4.0		2.0	4.0		2.5	2.5		2.5	2.5	
Lane Grp Cap (vph)	396	1730		145	1410		137	540		277	521	
v/s Ratio Prot	c0.06	c0.41		0.01	0.23			0.13			0.22	
v/s Ratio Perm	0.22			0.11			c0.28			0.07		
v/c Ratio	0.48	0.83		0.26	0.57		0.91	0.42		0.23	0.73	
Uniform Delay, d1	9.3	16.6		14.6	17.8		25.8	21.4		20.1	24.0	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.3	3.5		0.4	0.6		51.0	0.4		0.3	4.7	
Delay (s)	9.6	20.1		14.9	18.4		76.9	21.8		20.4	28.6	
Level of Service	A	C		B	B		E	C		C	C	
Approach Delay (s)		18.9			18.2			40.5			27.5	
Approach LOS		B			B			D			C	

Intersection Summary			
HCM Average Control Delay	22.4	HCM Level of Service	C
HCM Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	76.8	Sum of lost time (s)	13.5
Intersection Capacity Utilization	83.1%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	325	725	250	50	375	25	160	260	130	50	275	225
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.0		4.0	5.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.96		1.00	0.99		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1736	3338		1736	3439		1736	1827	1553	1736	1827	1553
Flt Permitted	0.35	1.00		0.21	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	638	3338		377	3439		1736	1827	1553	1736	1827	1553
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	339	755	260	52	391	26	167	271	135	52	286	234
RTOR Reduction (vph)	0	24	0	0	3	0	0	0	84	0	0	114
Lane Group Flow (vph)	339	991	0	52	414	0	167	271	51	52	286	120
Heavy Vehicles (%)	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%
Turn Type	pm+pt			pm+pt			Prot		pm+ov	Prot		pm+ov
Protected Phases	5	2		1	6		3	8	1	7	4	5
Permitted Phases	2			6					8			4
Actuated Green, G (s)	51.7	41.5		33.4	27.2		16.0	33.6	39.8	6.3	23.9	44.4
Effective Green, g (s)	51.7	41.5		33.4	27.2		16.0	33.6	39.8	6.3	23.9	44.4
Actuated g/C Ratio	0.49	0.40		0.32	0.26		0.15	0.32	0.38	0.06	0.23	0.42
Clearance Time (s)	4.0	5.0		4.0	5.0		4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	2.0	4.0		2.0	4.0		2.0	2.5	2.0	2.0	2.5	2.0
Lane Grp Cap (vph)	531	1324		201	894		266	587	650	105	417	719
v/s Ratio Prot	c0.13	c0.30		0.02	0.12		c0.10	0.15	0.00	0.03	c0.16	0.03
v/s Ratio Perm	0.19			0.07					0.03			0.04
v/c Ratio	0.64	0.75		0.26	0.46		0.63	0.46	0.08	0.50	0.69	0.17
Uniform Delay, d1	17.3	27.1		25.3	32.6		41.5	28.3	20.7	47.6	36.9	18.6
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.9	2.5		0.2	0.5		3.3	0.4	0.0	1.3	4.2	0.0
Delay (s)	19.2	29.6		25.5	33.1		44.8	28.7	20.7	48.9	41.2	18.7
Level of Service	B	C		C	C		D	C	C	D	D	B
Approach Delay (s)		27.0			32.2			31.5			32.7	
Approach LOS		C			C			C			C	

Intersection Summary			
HCM Average Control Delay	29.8	HCM Level of Service	C
HCM Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	104.6	Sum of lost time (s)	17.0
Intersection Capacity Utilization	68.9%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	300	165	100	475	75	15	75	1505	200	25	1160	175
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	1.00		0.97	1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	0.94		1.00	0.98		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3502	1792		3502	1853		1770	3539	1583	1770	3539	1583
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3502	1792		3502	1853		1770	3539	1583	1770	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	326	179	109	516	82	16	82	1636	217	27	1261	190
RTOR Reduction (vph)	0	14	0	0	5	0	0	0	99	0	0	60
Lane Group Flow (vph)	326	274	0	516	93	0	82	1636	118	27	1261	130
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	2%	2%	2%	2%	2%	2%
Turn Type	Prot			Prot			Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases									2			6
Actuated Green, G (s)	18.3	25.5		24.6	31.8		10.7	75.7	75.7	3.0	68.0	68.0
Effective Green, g (s)	18.3	25.5		24.6	31.8		10.7	75.7	75.7	3.0	68.0	68.0
Actuated g/C Ratio	0.13	0.18		0.17	0.22		0.07	0.52	0.52	0.02	0.47	0.47
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	443	316		595	407		131	1850	828	37	1662	743
v/s Ratio Prot	0.09	c0.15		c0.15	0.05		c0.05	c0.46		0.02	0.36	
v/s Ratio Perm									0.07			0.08
v/c Ratio	0.74	0.87		0.87	0.23		0.63	0.88	0.14	0.73	0.76	0.18
Uniform Delay, d1	60.9	58.0		58.5	46.4		65.1	30.7	17.8	70.5	31.6	22.2
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	6.3	21.3		12.7	0.3		9.0	5.4	0.1	52.2	2.0	0.1
Delay (s)	67.2	79.3		71.2	46.7		74.1	36.1	17.9	122.7	33.7	22.3
Level of Service	E	E		E	D		E	D	B	F	C	C
Approach Delay (s)		72.9			67.3			35.7			33.8	
Approach LOS		E			E			D			C	

Intersection Summary			
HCM Average Control Delay	44.2	HCM Level of Service	D
HCM Volume to Capacity ratio	0.88		
Actuated Cycle Length (s)	144.8	Sum of lost time (s)	16.0
Intersection Capacity Utilization	86.6%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
102: 20th Street SE & 79th Ave SE

11/8/2011

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	95	665	30	40	1960	125	50	10	75	35	10	300
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5		4.5	4.5		3.5	3.5		3.5	3.5	3.5
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.99		1.00	0.99		1.00	0.87		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1736	3448		1736	3440		1770	1617		1770	1863	1583
Flt Permitted	0.05	1.00		0.35	1.00		0.72	1.00		0.66	1.00	1.00
Satd. Flow (perm)	89	3448		638	3440		1342	1617		1236	1863	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	100	700	32	42	2063	132	53	11	79	37	11	316
RTOR Reduction (vph)	0	2	0	0	3	0	0	65	0	0	0	84
Lane Group Flow (vph)	100	730	0	42	2192	0	53	25	0	37	11	232
Heavy Vehicles (%)	4%	4%	4%	4%	4%	4%	2%	2%	2%	2%	2%	2%
Turn Type	pm+pt			pm+pt			pm+pt			pm+pt		Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2			6			8			4		4
Actuated Green, G (s)	88.0	82.3		83.2	79.9		26.0	22.5		24.2	21.6	21.6
Effective Green, g (s)	88.0	82.3		83.2	79.9		26.0	22.5		24.2	21.6	21.6
Actuated g/C Ratio	0.69	0.65		0.66	0.63		0.21	0.18		0.19	0.17	0.17
Clearance Time (s)	4.5	4.5		4.5	4.5		3.5	3.5		3.5	3.5	3.5
Vehicle Extension (s)	2.0	3.0		2.0	3.0		2.0	2.0		2.0	2.0	2.0
Lane Grp Cap (vph)	136	2240		448	2169		287	287		247	318	270
v/s Ratio Prot	c0.03	0.21		0.00	c0.64		c0.01	0.02		0.00	0.01	
v/s Ratio Perm	0.48			0.06			0.03			0.03		c0.15
v/c Ratio	0.74	0.33		0.09	1.01		0.18	0.09		0.15	0.03	0.86
Uniform Delay, d1	34.9	9.9		7.8	23.4		41.3	43.5		42.4	43.8	51.1
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	16.2	0.1		0.0	21.9		0.1	0.0		0.1	0.0	22.6
Delay (s)	51.0	10.0		7.8	45.3		41.4	43.6		42.5	43.9	73.6
Level of Service	D	A		A	D		D	D		D	D	E
Approach Delay (s)		14.9			44.6			42.8			69.6	
Approach LOS		B			D			D			E	

Intersection Summary			
HCM Average Control Delay	40.2	HCM Level of Service	D
HCM Volume to Capacity ratio	0.98		
Actuated Cycle Length (s)	126.7	Sum of lost time (s)	20.5
Intersection Capacity Utilization	90.5%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
103: 20th Street SE & 83rd Ave SE

11/8/2011

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	125	395	175	295	1640	125	165	95	235	35	160	270
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5		4.5	4.5			4.0	4.0		4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00	1.00		1.00	
Frt	1.00	0.95		1.00	0.99			1.00	0.85		0.92	
Flt Protected	0.95	1.00		0.95	1.00			0.97	1.00		1.00	
Satd. Flow (prot)	1736	3311		1736	3434			1771	1553		1678	
Flt Permitted	0.08	1.00		0.28	1.00			0.37	1.00		0.96	
Satd. Flow (perm)	153	3311		513	3434			683	1553		1611	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	136	429	190	321	1783	136	179	103	255	38	174	293
RTOR Reduction (vph)	0	36	0	0	5	0	0	0	130	0	36	0
Lane Group Flow (vph)	136	583	0	321	1914	0	0	282	125	0	469	0
Heavy Vehicles (%)	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%
Turn Type	pm+pt			pm+pt			pm+pt		Perm	Perm		
Protected Phases	5	2		1	6		3	8			4	
Permitted Phases	2			6			8		8	4		
Actuated Green, G (s)	53.2	47.7		69.5	59.5			47.0	47.0		47.0	
Effective Green, g (s)	53.2	47.7		69.5	59.5			47.0	47.0		47.0	
Actuated g/C Ratio	0.43	0.38		0.56	0.48			0.38	0.38		0.38	
Clearance Time (s)	4.5	4.5		4.5	4.5			4.0	4.0		4.0	
Vehicle Extension (s)	2.0	3.0		2.0	3.0			2.0	2.0		2.0	
Lane Grp Cap (vph)	135	1263		454	1635			257	584		606	
v/s Ratio Prot	c0.04	0.18		0.10	c0.56							
v/s Ratio Perm	0.38			0.30				c0.41	0.08		0.29	
v/c Ratio	1.01	0.46		0.71	1.17			1.10	0.21		0.77	
Uniform Delay, d1	33.1	29.0		17.1	32.8			39.0	26.5		34.3	
Progression Factor	1.00	1.00		1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2	79.4	0.3		4.1	83.8			84.6	0.1		5.6	
Delay (s)	112.5	29.3		21.2	116.5			123.6	26.5		39.9	
Level of Service	F	C		C	F			F	C		D	
Approach Delay (s)		44.3			102.9			77.5			39.9	
Approach LOS		D			F			E			D	

Intersection Summary			
HCM Average Control Delay	80.7	HCM Level of Service	F
HCM Volume to Capacity ratio	1.13		
Actuated Cycle Length (s)	125.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	111.4%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
105: 20th Street SE & SR 9

11/3/2011

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	60	295	110	140	715	125	155	990	45	75	1985	85
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.6	4.3		6.6	4.3		5.6	3.0	3.0	5.5	3.0	3.0
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	0.96		1.00	0.98		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3395		1770	3460		1770	3539	1583	1770	3539	1583
Flt Permitted	0.10	1.00		0.34	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	194	3395		642	3460		1770	3539	1583	1770	3539	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	63	311	116	147	753	132	163	1042	47	79	2089	89
RTOR Reduction (vph)	0	24	0	0	9	0	0	0	15	0	0	13
Lane Group Flow (vph)	63	403	0	147	876	0	163	1042	32	79	2089	76
Turn Type	pm+pt			pm+pt			Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8					2			6
Actuated Green, G (s)	42.0	39.0		42.0	39.0		12.0	79.8	79.8	10.9	78.7	78.7
Effective Green, g (s)	40.8	40.0		40.8	40.0		11.4	82.8	82.8	10.4	81.7	81.7
Actuated g/C Ratio	0.26	0.26		0.26	0.26		0.07	0.53	0.53	0.07	0.53	0.53
Clearance Time (s)	6.0	5.3		6.0	5.3		5.0	6.0	6.0	5.0	6.0	6.0
Vehicle Extension (s)	2.0	3.5		2.0	3.5		2.0	4.0	4.0	2.0	4.0	4.0
Lane Grp Cap (vph)	75	876		186	893		130	1891	846	119	1865	834
v/s Ratio Prot	c0.01	0.12		0.01	c0.25		c0.09	0.29		0.04	c0.59	
v/s Ratio Perm	0.21			0.20					0.02			0.05
v/c Ratio	0.84	0.46		0.79	0.98		1.25	0.55	0.04	0.66	1.12	0.09
Uniform Delay, d1	58.9	48.4		56.9	57.1		71.8	23.8	17.2	70.6	36.6	18.2
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	51.1	0.5		18.8	25.5		162.4	0.4	0.0	10.3	61.9	0.1
Delay (s)	110.0	48.9		75.8	82.6		234.2	24.3	17.2	80.9	98.6	18.3
Level of Service	F	D		E	F		F	C	B	F	F	B
Approach Delay (s)		56.7			81.6			51.3			94.8	
Approach LOS		E			F			D			F	

Intersection Summary			
HCM Average Control Delay	77.6	HCM Level of Service	E
HCM Volume to Capacity ratio	1.09		
Actuated Cycle Length (s)	155.0	Sum of lost time (s)	19.5
Intersection Capacity Utilization	107.6%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
107: 20th Street SE & S Lake Stevens Rd

11/3/2011

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	80	130	45	40	710	20	175	195	60	10	80	500
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.0		4.0	5.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.96		1.00	1.00		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1736	3337		1736	3457		1736	1827	1553	1736	1827	1553
Flt Permitted	0.17	1.00		0.64	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	304	3337		1164	3457		1736	1827	1553	1736	1827	1553
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	83	135	47	42	740	21	182	203	62	10	83	521
RTOR Reduction (vph)	0	23	0	0	1	0	0	0	43	0	0	75
Lane Group Flow (vph)	83	159	0	42	760	0	182	203	19	10	83	446
Heavy Vehicles (%)	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%
Turn Type	pm+pt			pm+pt			Prot		pm+ov	Prot		pm+ov
Protected Phases	5	2		1	6		3	8	1	7	4	5
Permitted Phases	2			6					8			4
Actuated Green, G (s)	58.5	51.5		33.4	30.4		16.3	27.0	30.0	0.5	11.2	35.3
Effective Green, g (s)	58.5	51.5		33.4	30.4		16.3	27.0	30.0	0.5	11.2	35.3
Actuated g/C Ratio	0.59	0.52		0.34	0.31		0.16	0.27	0.30	0.01	0.11	0.36
Clearance Time (s)	4.0	5.0		4.0	5.0		4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	2.0	4.0		2.0	4.0		2.0	2.5	2.0	2.0	2.5	2.0
Lane Grp Cap (vph)	528	1736		410	1062		286	498	533	9	207	616
v/s Ratio Prot	0.04	0.05		0.00	c0.22		c0.10	0.11	0.00	0.01	0.05	c0.18
v/s Ratio Perm	0.05			0.03					0.01			0.11
v/c Ratio	0.16	0.09		0.10	0.72		0.64	0.41	0.04	1.11	0.40	0.72
Uniform Delay, d1	10.7	12.0		22.3	30.5		38.6	29.5	24.3	49.2	40.8	27.6
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.1	0.0		0.0	2.5		3.4	0.4	0.0	342.2	0.9	3.6
Delay (s)	10.8	12.0		22.3	32.9		42.0	29.9	24.3	391.5	41.7	31.2
Level of Service	B	B		C	C		D	C	C	F	D	C
Approach Delay (s)		11.6			32.4			34.0			38.5	
Approach LOS		B			C			C			D	

Intersection Summary			
HCM Average Control Delay	31.9	HCM Level of Service	C
HCM Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	99.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	71.8%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
101: 20th Street SE & 73rd Ave SE/Cavalero Rd

11/5/2011

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	215	1980	110	25	1335	35	135	5	60	25	5	50
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	234	2152	120	27	1451	38	147	5	65	27	5	54
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)					1154							
pX, platoon unblocked	0.77						0.77	0.77		0.77	0.77	0.77
vC, conflicting volume	1489			2272			3516	4223	1136	3136	4264	745
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1050			2272			3666	4578	1136	3175	4631	89
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	54			88			0	0	67	0	0	93
cM capacity (veh/h)	510			221			0	0	196	0	0	737

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	SB 1
Volume Total	234	1435	837	27	967	522	217	87
Volume Left	234	0	0	27	0	0	147	27
Volume Right	0	0	120	0	0	38	65	54
cSH	510	1700	1700	221	1700	1700	0	0
Volume to Capacity	0.46	0.84	0.49	0.12	0.57	0.31	Err	Err
Queue Length 95th (ft)	59	0	0	10	0	0	Err	Err
Control Delay (s)	17.9	0.0	0.0	23.5	0.0	0.0	Err	Err
Lane LOS	C			C			F	F
Approach Delay (s)	1.7			0.4			Err	Err
Approach LOS							F	F

Intersection Summary			
Average Delay	Err		
Intersection Capacity Utilization	89.6%	ICU Level of Service	E
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	220	1705	95	75	1090	25	85	10	115	145	10	270
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5		4.5	4.5		3.5	3.5		3.5	3.5	3.5
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.99		1.00	1.00		1.00	0.86		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1736	3444		1736	3460		1770	1607		1770	1863	1583
Flt Permitted	0.14	1.00		0.07	1.00		0.75	1.00		0.31	1.00	1.00
Satd. Flow (perm)	258	3444		134	3460		1398	1607		582	1863	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	232	1795	100	79	1147	26	89	11	121	153	11	284
RTOR Reduction (vph)	0	3	0	0	1	0	0	104	0	0	0	242
Lane Group Flow (vph)	232	1892	0	79	1172	0	89	28	0	153	11	42
Heavy Vehicles (%)	4%	4%	4%	4%	4%	4%	2%	2%	2%	2%	2%	2%
Turn Type	pm+pt			pm+pt			pm+pt			pm+pt		Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2			6			8			4		4
Actuated Green, G (s)	71.9	63.0		59.1	54.7		12.6	9.3		21.7	14.9	14.9
Effective Green, g (s)	71.9	63.0		59.1	54.7		12.6	9.3		21.7	14.9	14.9
Actuated g/C Ratio	0.71	0.62		0.58	0.54		0.12	0.09		0.21	0.15	0.15
Clearance Time (s)	4.5	4.5		4.5	4.5		3.5	3.5		3.5	3.5	3.5
Vehicle Extension (s)	2.0	3.0		2.0	3.0		2.0	2.0		2.0	2.0	2.0
Lane Grp Cap (vph)	367	2136		147	1863		185	147		228	273	232
v/s Ratio Prot	c0.08	c0.55		0.02	0.34		0.02	0.02		c0.06	0.01	
v/s Ratio Perm	0.37			0.29			0.04			c0.08		0.03
v/c Ratio	0.63	0.89		0.54	0.63		0.48	0.19		0.67	0.04	0.18
Uniform Delay, d1	11.2	16.3		17.0	16.4		41.1	42.7		34.7	37.2	38.0
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	2.6	4.8		1.9	0.7		0.7	0.2		6.0	0.0	0.1
Delay (s)	13.8	21.1		18.9	17.0		41.8	42.9		40.7	37.2	38.1
Level of Service	B	C		B	B		D	D		D	D	D
Approach Delay (s)		20.3			17.2			42.5			39.0	
Approach LOS		C			B			D			D	

Intersection Summary			
HCM Average Control Delay	22.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.83		
Actuated Cycle Length (s)	101.6	Sum of lost time (s)	12.5
Intersection Capacity Utilization	84.1%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	265	1540	115	45	960	30	55	15	75	125	10	200
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5		4.5	4.5			4.0	4.0		4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00	1.00		1.00	
Frt	1.00	0.99		1.00	1.00			1.00	0.85		0.92	
Flt Protected	0.95	1.00		0.95	1.00			0.96	1.00		0.98	
Satd. Flow (prot)	1736	3435		1736	3455			1758	1553		1649	
Flt Permitted	0.14	1.00		0.08	1.00			0.57	1.00		0.84	
Satd. Flow (perm)	248	3435		146	3455			1040	1553		1419	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	288	1674	125	49	1043	33	60	16	82	136	11	217
RTOR Reduction (vph)	0	4	0	0	2	0	0	0	60	0	42	0
Lane Group Flow (vph)	288	1795	0	49	1074	0	0	76	22	0	322	0
Heavy Vehicles (%)	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%
Turn Type	pm+pt			pm+pt			pm+pt		Perm	Perm		
Protected Phases	5	2		1	6		3	8			4	
Permitted Phases	2			6			8		8	4		
Actuated Green, G (s)	71.0	63.3		53.3	50.1			28.7	28.7		28.7	
Effective Green, g (s)	71.0	63.3		53.3	50.1			28.7	28.7		28.7	
Actuated g/C Ratio	0.66	0.59		0.49	0.46			0.27	0.27		0.27	
Clearance Time (s)	4.5	4.5		4.5	4.5			4.0	4.0		4.0	
Vehicle Extension (s)	2.0	3.0		2.0	3.0			2.0	2.0		2.0	
Lane Grp Cap (vph)	388	2010		119	1600			276	412		376	
v/s Ratio Prot	c0.11	c0.52		0.01	0.31							
v/s Ratio Perm	0.37			0.19				0.07	0.01		c0.23	
v/c Ratio	0.74	0.89		0.41	0.67			0.28	0.05		0.86	
Uniform Delay, d1	18.5	19.5		19.8	22.6			31.5	29.6		37.8	
Progression Factor	1.00	1.00		1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2	6.6	5.5		0.8	1.1			0.2	0.0		16.6	
Delay (s)	25.1	25.0		20.6	23.8			31.7	29.6		54.4	
Level of Service	C	C		C	C			C	C		D	
Approach Delay (s)		25.0			23.6			30.6			54.4	
Approach LOS		C			C			C			D	

Intersection Summary			
HCM Average Control Delay	27.7	HCM Level of Service	C
HCM Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	108.2	Sum of lost time (s)	13.0
Intersection Capacity Utilization	86.8%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	300	1325	65	50	690	195	110	65	90	215	35	250
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.0		4.0	5.0			4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00		1.00	1.00	
Frt	1.00	0.99		1.00	0.97			0.95		1.00	0.87	
Flt Protected	0.95	1.00		0.95	1.00			0.98		0.95	1.00	
Satd. Flow (prot)	1770	3514		1770	3422			1741		1770	1618	
Flt Permitted	0.08	1.00		0.09	1.00			0.73		0.95	1.00	
Satd. Flow (perm)	153	3514		166	3422			1294		1770	1618	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	326	1440	71	54	750	212	120	71	98	234	38	272
RTOR Reduction (vph)	0	3	0	0	17	0	0	12	0	0	159	0
Lane Group Flow (vph)	326	1508	0	54	945	0	0	277	0	234	151	0
Turn Type	pm+pt			pm+pt			pm+pt			Prot		
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2			6			8					
Actuated Green, G (s)	73.6	66.6		47.8	44.8			30.3		21.2	55.5	
Effective Green, g (s)	73.6	66.6		47.8	44.8			30.3		21.2	55.5	
Actuated g/C Ratio	0.53	0.48		0.35	0.32			0.22		0.15	0.40	
Clearance Time (s)	4.0	5.0		4.0	5.0			4.0		4.0	4.0	
Vehicle Extension (s)	2.0	4.0		2.0	4.0			2.5		2.0	3.0	
Lane Grp Cap (vph)	372	1695		92	1110			284		272	650	
v/s Ratio Prot	c0.16	c0.43		0.01	0.28					c0.13	0.09	
v/s Ratio Perm	0.31			0.19				c0.21				
v/c Ratio	0.88	0.89		0.59	0.85			0.97		0.86	0.23	
Uniform Delay, d1	41.4	32.4		34.1	43.5			53.5		57.0	27.2	
Progression Factor	1.00	1.00		1.00	1.00			1.00		1.00	1.00	
Incremental Delay, d2	19.5	6.3		6.0	6.7			45.8		22.5	0.2	
Delay (s)	60.9	38.8		40.1	50.2			99.3		79.5	27.4	
Level of Service	E	D		D	D			F		E	C	
Approach Delay (s)		42.7			49.7			99.3			49.8	
Approach LOS		D			D			F			D	

Intersection Summary			
HCM Average Control Delay	50.1	HCM Level of Service	D
HCM Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	138.1	Sum of lost time (s)	12.0
Intersection Capacity Utilization	88.5%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	165	1255	170	180	600	155	210	1505	125	125	1040	110
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.6	4.3		6.6	4.3		5.6	3.0	3.0	5.5	3.0	3.0
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	0.98		1.00	0.97		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3476		1770	3430		1770	3539	1583	1770	3539	1583
Flt Permitted	0.14	1.00		0.08	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	267	3476		151	3430		1770	3539	1583	1770	3539	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	174	1321	179	189	632	163	221	1584	132	132	1095	116
RTOR Reduction (vph)	0	7	0	0	14	0	0	0	29	0	0	33
Lane Group Flow (vph)	174	1493	0	189	781	0	221	1584	103	132	1095	83
Turn Type	pm+pt			pm+pt			Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8					2			6
Actuated Green, G (s)	68.5	54.7		58.9	49.9		20.2	59.0	59.0	10.0	48.8	48.8
Effective Green, g (s)	67.3	55.7		57.7	50.9		19.6	62.0	62.0	9.5	51.8	51.8
Actuated g/C Ratio	0.43	0.36		0.37	0.33		0.13	0.40	0.40	0.06	0.33	0.33
Clearance Time (s)	6.0	5.3		6.0	5.3		5.0	6.0	6.0	5.0	6.0	6.0
Vehicle Extension (s)	2.0	3.5		2.0	3.5		2.0	4.0	4.0	2.0	4.0	4.0
Lane Grp Cap (vph)	244	1249		144	1126		224	1416	633	108	1183	529
v/s Ratio Prot	0.06	c0.43		c0.07	0.23		c0.12	c0.45		0.07	0.31	
v/s Ratio Perm	0.25			c0.42					0.06			0.05
v/c Ratio	0.71	1.20		1.31	0.69		0.99	1.12	0.16	1.22	0.93	0.16
Uniform Delay, d1	32.0	49.6		41.2	45.3		67.6	46.5	29.8	72.8	49.7	36.3
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	7.9	96.0		181.3	1.9		55.7	63.5	0.2	158.0	12.3	0.2
Delay (s)	40.0	145.6		222.5	47.2		123.3	110.0	30.0	230.8	62.0	36.5
Level of Service	D	F		F	D		F	F	C	F	E	D
Approach Delay (s)		134.6			80.9			106.0			76.4	
Approach LOS		F			F			F			E	

Intersection Summary			
HCM Average Control Delay	103.2	HCM Level of Service	F
HCM Volume to Capacity ratio	1.24		
Actuated Cycle Length (s)	155.0	Sum of lost time (s)	26.1
Intersection Capacity Utilization	115.6%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	175	1200	105	35	675	50	90	165	60	60	195	160
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	5.0		4.5	5.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	0.99		1.00	0.96		1.00	0.93	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	3497		1770	3503		1770	1788		1770	1737	
Flt Permitted	0.23	1.00		0.13	1.00		0.25	1.00		0.47	1.00	
Satd. Flow (perm)	436	3497		237	3503		459	1788		878	1737	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	190	1304	114	38	734	54	98	179	65	65	212	174
RTOR Reduction (vph)	0	7	0	0	6	0	0	15	0	0	34	0
Lane Group Flow (vph)	190	1411	0	38	782	0	98	229	0	65	352	0
Turn Type	pm+pt			pm+pt			Perm			Perm		
Protected Phases	5	2		1	6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	44.9	38.4		33.5	31.5		19.9	19.9		19.9	19.9	
Effective Green, g (s)	44.9	38.4		33.5	31.5		19.9	19.9		19.9	19.9	
Actuated g/C Ratio	0.61	0.52		0.45	0.43		0.27	0.27		0.27	0.27	
Clearance Time (s)	4.5	5.0		4.5	5.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	2.0	4.0		2.0	4.0		2.5	2.5		2.5	2.5	
Lane Grp Cap (vph)	426	1820		149	1495		124	482		237	468	
v/s Ratio Prot	c0.05	c0.40		0.01	0.22			0.13			0.20	
v/s Ratio Perm	0.22			0.11			c0.21			0.07		
v/c Ratio	0.45	0.78		0.26	0.52		0.79	0.47		0.27	0.75	
Uniform Delay, d1	7.7	14.2		12.5	15.6		25.0	22.6		21.3	24.7	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.3	2.3		0.3	0.4		27.3	0.5		0.5	6.4	
Delay (s)	8.0	16.5		12.9	16.0		52.3	23.1		21.7	31.1	
Level of Service	A	B		B	B		D	C		C	C	
Approach Delay (s)		15.5			15.9			31.5			29.7	
Approach LOS		B			B			C			C	

Intersection Summary			
HCM Average Control Delay	19.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	73.8	Sum of lost time (s)	13.5
Intersection Capacity Utilization	79.5%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	320	715	250	50	375	25	160	260	130	50	275	225
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.0		4.0	5.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.96		1.00	0.99		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1736	3336		1736	3439		1736	1827	1553	1736	1827	1553
Flt Permitted	0.35	1.00		0.21	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	635	3336		381	3439		1736	1827	1553	1736	1827	1553
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	333	745	260	52	391	26	167	271	135	52	286	234
RTOR Reduction (vph)	0	24	0	0	3	0	0	0	83	0	0	114
Lane Group Flow (vph)	333	981	0	52	414	0	167	271	52	52	286	120
Heavy Vehicles (%)	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%
Turn Type	pm+pt			pm+pt			Prot		pm+ov	Prot		pm+ov
Protected Phases	5	2		1	6		3	8	1	7	4	5
Permitted Phases	2			6					8			4
Actuated Green, G (s)	50.9	40.7		32.9	26.7		15.9	33.4	39.6	6.3	23.8	44.0
Effective Green, g (s)	50.9	40.7		32.9	26.7		15.9	33.4	39.6	6.3	23.8	44.0
Actuated g/C Ratio	0.49	0.39		0.32	0.26		0.15	0.32	0.38	0.06	0.23	0.42
Clearance Time (s)	4.0	5.0		4.0	5.0		4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	2.0	4.0		2.0	4.0		2.0	2.5	2.0	2.0	2.5	2.0
Lane Grp Cap (vph)	527	1311		202	886		266	589	654	106	420	720
v/s Ratio Prot	c0.12	c0.29		0.02	0.12		c0.10	0.15	0.00	0.03	c0.16	0.03
v/s Ratio Perm	0.19			0.07					0.03			0.04
v/c Ratio	0.63	0.75		0.26	0.47		0.63	0.46	0.08	0.49	0.68	0.17
Uniform Delay, d1	17.3	27.0		25.1	32.4		41.1	27.9	20.4	47.1	36.4	18.5
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.8	2.5		0.2	0.5		3.3	0.4	0.0	1.3	4.1	0.0
Delay (s)	19.1	29.6		25.4	33.0		44.4	28.3	20.4	48.4	40.6	18.5
Level of Service	B	C		C	C		D	C	C	D	D	B
Approach Delay (s)		27.0			32.1			31.1			32.2	
Approach LOS		C			C			C			C	

Intersection Summary			
HCM Average Control Delay	29.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	103.6	Sum of lost time (s)	17.0
Intersection Capacity Utilization	68.6%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	295	160	75	470	75	15	65	1505	200	25	1145	170
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	1.00		0.97	1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	0.95		1.00	0.98		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3502	1809		3502	1853		1770	3539	1583	1770	3539	1583
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3502	1809		3502	1853		1770	3539	1583	1770	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	321	174	82	511	82	16	71	1636	217	27	1245	185
RTOR Reduction (vph)	0	11	0	0	5	0	0	0	99	0	0	57
Lane Group Flow (vph)	321	245	0	511	93	0	71	1636	118	27	1245	128
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	2%	2%	2%	2%	2%	2%
Turn Type	Prot			Prot			Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases									2			6
Actuated Green, G (s)	18.1	23.5		24.8	30.2		8.4	74.7	74.7	3.0	69.3	69.3
Effective Green, g (s)	18.1	23.5		24.8	30.2		8.4	74.7	74.7	3.0	69.3	69.3
Actuated g/C Ratio	0.13	0.17		0.17	0.21		0.06	0.53	0.53	0.02	0.49	0.49
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	446	299		612	394		105	1862	833	37	1727	773
v/s Ratio Prot	0.09	c0.14		c0.15	0.05		c0.04	c0.46		0.02	0.35	
v/s Ratio Perm									0.07			0.08
v/c Ratio	0.72	0.82		0.83	0.24		0.68	0.88	0.14	0.73	0.72	0.17
Uniform Delay, d1	59.5	57.2		56.6	46.3		65.5	29.7	17.2	69.1	28.7	20.2
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	5.5	15.9		9.6	0.3		15.9	5.1	0.1	52.2	1.5	0.1
Delay (s)	65.0	73.1		66.2	46.7		81.3	34.7	17.3	121.3	30.2	20.3
Level of Service	E	E		E	D		F	C	B	F	C	C
Approach Delay (s)		68.6			63.1			34.5			30.7	
Approach LOS		E			E			C			C	

Intersection Summary			
HCM Average Control Delay	41.4	HCM Level of Service	D
HCM Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	142.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	84.7%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group