

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION
ROUTE DEVELOPMENT PLAN

SR 527 MP 0.00 to MP 2.69

SR 522 TO I-405

APPROVED BY:



Region Administrator, NW Region

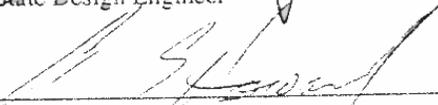
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SR 527
ROUTE DEVELOPMENT PLAN
*Section I MP 0.00 (SR 522) to MP
2.69 (I-405)*

August, 1994

Prepared for:

CITY OF BOTHELL
and
WASHINGTON STATE
DEPARTMENT OF TRANSPORTATION
Northwest Region

Prepared by:
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Milepost 0.00 (SR 522) To Milepost 2.69 (I-405)

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EXECUTIVE SUMMARY

SR 527 is a principal arterial as classified by the Washington State Department of Transportation and the city of Bothell's Comprehensive Plan. SR 527 provides access north from downtown Bothell through Mill Creek to Everett. The primary purpose of SR 527 is to accommodate through traffic and to interconnect employment centers, commercial areas and the regional freeway network. This route development plan is limited to the segment beginning at MP 0.00 (SR 522) to MP 2.69 (I-405). The previous route development plan, adopted in 1986 with a horizon year of 2000, identified a five lane section from I-405 to 240th Street SE, and a three lane section from 240th Street SE to just north of the SR 522 intersection. The route development plan did not include the intersection of SR 522/SR 527/Main Street.

A Route Development Plan (RDP) is intended to identify the improvements needed for a designated section of state highway to accommodate safety and capacity requirements at a future date, usually 20 years hence.

SR 527 is four lanes wide on the bridge crossing I-405, widening to multiple through and turn lanes at the 228th Street SE. intersection. South of the 228th Street intersection, SR 527 narrows to three lanes to approximate MP 2.05 and then narrows to two lanes. The remainder of SR 527 to MP 0.76 is two lanes wide except at 240th Street where left turn lanes have been installed on the highway at the intersection. South of MP 0.79 the highway lane configuration varies as shown in Table 3 in the body of this report. Traffic signals are located at the intersections of SR 522/SR 527/Main Street, NE 183rd Street, NE 191st Street, NE 190th Street, 240th Street SE, 228th Street SE, and at the I-405 ramps.

Since the RDP was last updated in 1986, the area of north King and south Snohomish Counties have experienced rapid and unforeseen growth. The increase in population, employment, and retail services in the area served by this section of SR 527 will lead to predicted traffic increases that will require construction of additional lanes as opposed to the three lane facility recommended in the 1986 RDP.

A Design Report was recently completed for the intersection of SR 522/SR 527/Main Street and adjoining roadways. The recommendations of this RDP are consistent with the design report. From SR 522 to Reder Way, SR 527 is proposed to be widened to a five lane facility to provide two through lanes in each direction and a center two-way left turn lane. Because of the close proximity of buildings to the right-of-way line along the east side of the street, all widening will need to be to the west. New landscaping would be provided along the west side of the street either between the curb and the new five foot wide sidewalk or behind the new sidewalk as appropriate to suit the adjoining property. A raised landscaped median boulevard section would be constructed at various locations where turning lanes are not necessary.

The recommended lane configuration at the intersection of SR 522/SR 527/Main Street is a modification of that shown in the approved FEIS, and is specifically modified to eliminate the taking of existing businesses along SR 522. The FEIS lane configuration included two right turn lanes on SR 522 for eastbound traffic while the proposed design includes only one lane for eastbound traffic. The elimination of the second eastbound turning lane along SR 522 allows construction of the improvements without removing the A-A Rentals building, minimizes impacts to other properties, and offers a shorter pedestrian crossing of the highway. The signal phasing will allow the eastbound movement on SR 522 to flow freely during most of the signal cycle, and the level of service at the intersection will not be significantly different from the level of service based on the original two eastbound lane option.

The new intersection features a landscaped island which separates eastbound right turns on SR 522 from the through and left turning traffic at the intersection. The island offers a pedestrian refuge and will be a focal point of the new landscaping at the intersection.

The need for a four/five lane facility for the entire section of SR 527 was arrived at by projecting the 1990 traffic volumes to the year 2015. Future traffic volumes were determined from information obtained from the Puget Sound Regional Council and the use of the city of Bothell's transportation model. A 2.3% growth rate

compounded annually was used. If the highway remains as is, the projected level of service for the roadway and signalized intersections will be LOS F. In addition, the latest report on accidents from the WSDOT has rated three segments along this state route as high accident locations.

Alternatives were developed and evaluated. An open house was held by the city of Bothell in which representatives from City staff, WSDOT and the consultant team were present to discuss issues and concerns that residents and businesses may have in the area. Full minutes of this meeting are in the Appendix.

Thus, to improve the traffic safety and operation of the state route, a four/five lane section from I-405 to 240th Street SE is necessary, as adopted in the previous RDP, and a four/five lane section from 240th Street SE to SR 522 is now also recommended. In addition, sidewalks on both sides of the entire length of the state route, and class 2 bikes lane from 228th Street SE to NE 191st Street are needed to be consistent with State and city of Bothell policies. Additional right-of-way will be needed, as well as possible realignment of the roadway and special design considerations at locations of steep slopes and wetlands.

The Vision 2020 Plan identifies the need for highway capital improvements including the addition of lane capacity to regional arterials and freeways, new regional arterials and freeways, new or revised interchanges, local street improvements, and other local and regional system investments, such as signalization and channelization. The draft Bothell Comprehensive Plan identifies the need for approximately 21 lane miles of additional arterial motor vehicle capacity by the year 2010. Approximately half of this capacity is needed on SR 522 and SR 527. Specific improvements include the following:

SR 522/ SR 527/ Main Street intersection and surrounding corridor improvements: The SR 522/SR 527/Main Street intersection would be widened to include additional lanes, signal modification, sidewalks, curbs and gutters. SR 522 and SR 527 would also be improved to include additional lanes, pedestrian amenities, signal improvements, and additional channelization at intersections. The estimated cost for all associated improvements is \$8 million.

SR 527/ I-405 interchange and surrounding corridor improvements: These improvements would include additional lanes and signal improvements at the interchange as well as on SR 527. Costs would be approximately \$3 million.

I. INTRODUCTION TO THE ROUTE DEVELOPMENT PLAN

The SR 527 corridor is located in King and Snohomish Counties on a meandering north/south alignment from the city of Bothell to the city of Everett. This Route Development Plan (RDP) covers the segment from milepost (MP) 0.00 (SR 522) to MP 2.69 (I-405). This section of SR 527 is located within the city of Bothell. The plan is part of the Washington State Department of Transportation (WSDOT) Northwest Region's long range route development planning program. Figure 1 shows the study location.

A. Introduction

An RDP analyzes all or a segment of a particular state highway. It is intended to describe and analyze the existing highway facility, the function it performs, local growth patterns, and projected traffic volumes. This leads to a determination of where improvements will be needed to accommodate safety and capacity requirements at a future date, usually 20 years hence. This plan encompasses many factors synthesized into a recommended highway design. When approved, this long range plan will:

- provide guidance for prioritization of the region's future projects,
- provide direction for the determination of impact mitigation measures for proposed developments,
- provide input to the statewide system planning process, and
- coordinate with local jurisdictions for growth management planning.

B. Background

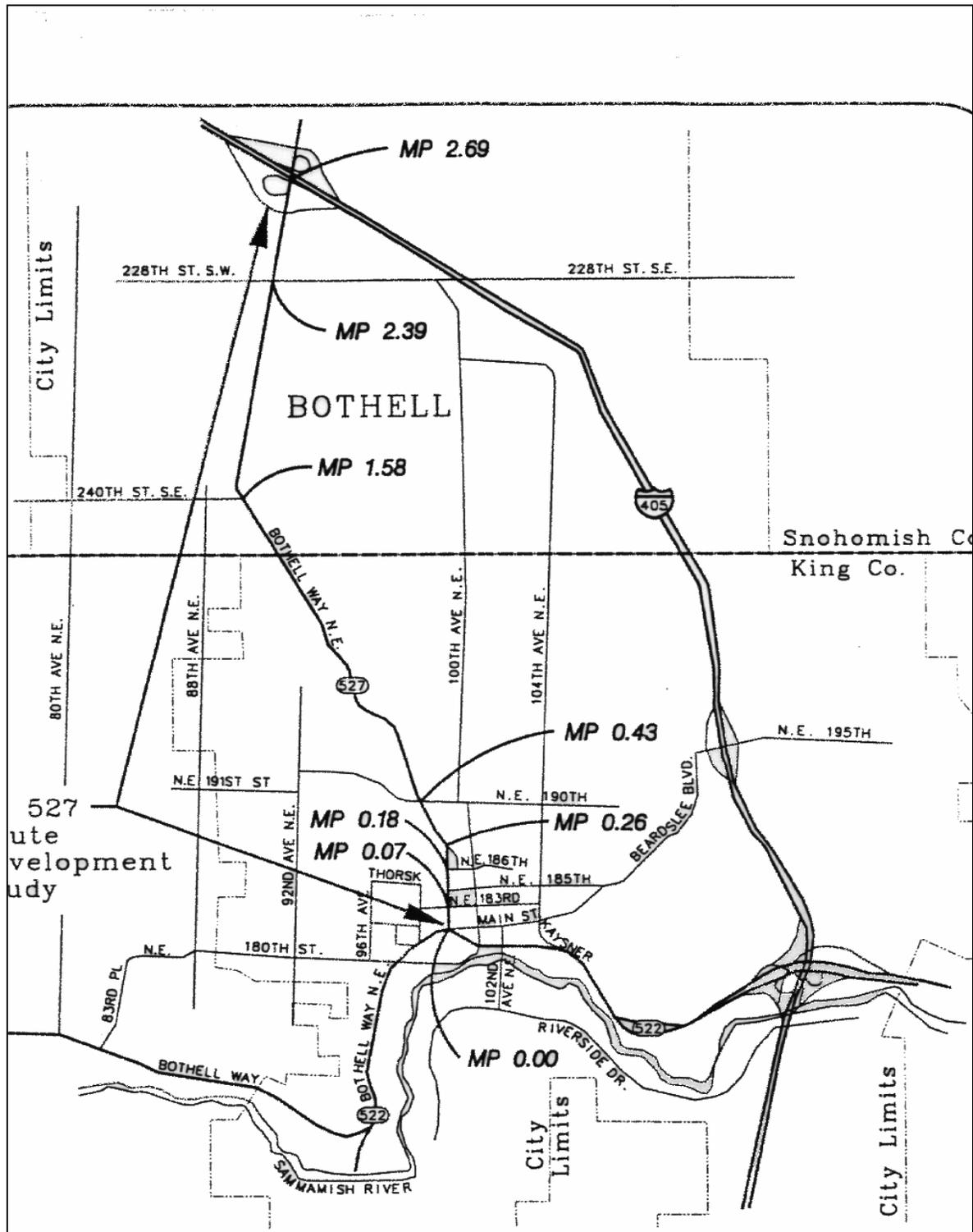
An RDP was completed in 1986 that covered SR 527 from MP 0.00 (SR: 522) to MP 2.33 (vicinity of 228th Street SE). The majority of this document will cover SR 527 between MP 0.00 (SR 522) to MP 1.58 (240th Street SE) which is generally a two lane facility with 11 foot lanes and four to six foot shoulders. At the south end of this section there are 3 and 4 lane segments of highway. The previously approved RDP recommends four and five lanes for the portion of SR 527 from MP 1.58 (240th Street SE) to MP 2.69 (I 405) and recommends three lanes from just north of MP 0.00 (SR 522/Main Street) to MP 1.58 (240th Street SE) to accommodate the traffic through the year 2000. See Table 1 showing roadway sections for the adopted 1986 Plan.

Table 1
1986 Route Development Plan Recommendations

Milepost	Roadway Section
0.00 - 0.18	4 lane
0.18 - 1.58	3 lane
1.58 - 2.69	5 lane

II. THE PURPOSE AND FUNCTION OF SR 527

The primary purpose of SR 527 is to accommodate through traffic and interconnect employment centers, commercial areas and the regional freeway network. SR 527 provides access north from downtown Bothell through Mill Creek to Everett. The segment considered in this study extends



SR 522 SECTION 1 MP 0.00 (SR 522) TO MP 2.69 (I-405)



**PERTEET
ENGINEERING, INC.**
Civil and Transportation Consultants

Vicinity Map
ROUTE DEVELOPMENT PLAN UPDA
Figure 1

from MP 0.00 (SR 522) to MP 2.69 (I-405). This segment traverses through two Subarea plans in the Bothell Comprehensive Plan. The two Subarea plans are the Downtown/190th/Riverfront Subarea Plan and the Country Village/Lake Pleasant/527 Corridor Subarea Plan. SR 527 is classified as an urban principal arterial per the 1993 State Highway Log. The 1990 Level of Development Plan calls for SR 527, in the subject area, to be designed using the 3R level design criteria. See Appendix.

WSDOT, in conjunction with the city of Bothell, has classified the segment of SR 527 within the study limits as a Class 3 highway in conformance with the recently enacted access management legislation (RCW 47.50 and WAC 468-52). A Class 3 highway should exhibit a reasonable balance between direct access and mobility needs. This class is used primarily where the existing level of development of the adjoining land is less intensive than maximum build out and where the probability of significant land use change and increased traffic demand is high. Highways in this class are typically distinguished by restricted medians where multilane facilities are warranted. Two way left turn lanes may be utilized where special conditions warrant. Development of properties with internal road networks and joint access connections are encouraged. No more than one private direct access to the state highway shall be provided to an individual parcel or to contiguous parcels under the same ownership unless it can be shown that additional access points will not affect the desired function, safety, or operation of the state highway. The minimum distance to another public or private access connection shall be 330 feet unless the parcel's highway frontage, topography, or location will not allow this condition to be met.

III. UPDATED DESCRIPTION OF EXISTING FACILITY

A. History

Portions of what now is SR 527 were originally built as early as the late 1800s or the early 1900s by Snohomish and King Counties. It later became a continuous county road.

The Washington State Department of Highways later acquired the right of way and the facility itself from Snohomish and King Counties. The Washington State Legislative Session Laws of 1957, Chapter 172, transferred jurisdiction for what eventually became SR 527 to the state. Before it became SR 527, the highway was known as Secondary State Highway No. 2J. The Washington State Legislative Session Laws of 1957 established 2J as a branch of Primary State Highway No. 2 (SR 522) according to the following description: "Beginning on Primary State Highway No. 2 (SR 522) in the vicinity of Bothell, thence in a northerly direction to a junction with Primary State Highway No. 1 (I-5) in the vicinity south of Everett."

In 1970, SR 527 formally came onto the state system by the following Revised Code of Washington State: "RCW 47.17.745" State Route No. 527. A state highway to be known as state route number 527 is established as follows: Beginning at a junction with state route number 522 in the vicinity of Bothell, thence northerly to a junction with state route number 5 in the vicinity of south Everett. [1970 ex. s. c51 & 150]."

The route development plan adopted in 1986 listed the following as major projects that occurred on SR 527 since it became a state highway:

**Table 2
Projects through 1985**

Year	Project	Improvements
1960	Snohomish Vicinity & King County Line to Junction I-405	Widening and Resurfacing
1970	Stock Show Road et. al., Intersection	Channel, Illumination and Signal
1970	Thrasher's Corner	Channelization/Illumination
1975	232nd Street SE to SR 405	Widening
1978	112th Street SE to SR 5 Silver Lake Trail Phase I	Grading, Drainage, Sewer, Wall, Paving
1980	208th Street SE Signal	Signal and Channelization
1980	228th Street SE Signal	Traffic Signal
1984	SR 522/NE 183rd/NE 190th Street Signals	Signals
1984	132nd Street SE to 112th Street SE	Shoulder, Widening, Culverts, and Paving

B. Geometric Description Update

Table 3 below and on the following page summarizes the existing roadway section within the study limits.

Table 4 on the following page is a list of projects involving changes to number and type of lanes, lane location changes, changes in right of way, changes in widths, shoulder widths, vertical and horizontal alignment, sight distance, and traffic control changes constructed since 1986:

The existing right-of-way along this segment of SR 527 is generally 60 feet. As part of the 240th Street Project, the right-of-way was increased to 100 feet.

SR 527 from MP 2.33 to MP 2.69 is basically a five lane facility with 4 lanes across the SR 527 bridge over I-405 and additional turn lanes at the intersection of 228th Street SE.

**Table 3
Existing Roadway Configuration**

Description	Milepost	Roadway Section
SR 522/ Main Street	0.00	3 lanes
183rd Street	0.07	4 lanes
	0.10	Begin TWLTL
185th Street	0.12	3 lanes
186th Street	0.18	3 lanes
Reder Way	0.26	3 lanes
188th Street	0.31	3 lanes
	0.39	End TWLTL
190th Street	0.43	3 lanes at intersection
	0.47	Begin TWLTL

**Table 3 (Cont.)
Existing Roadway Configuration**

Description	Milepost	Roadway Section
	0.52	End TWLTL
	0.62	Begin TWLTL
	0.77	End TWLTL
County Line	1.30	2 lanes
240th Street	1.58	3 lanes at intersection
	2.06	3 lanes
	2.10	Begin TWLTL
	2.22	Begin Bicycle Lanes
	2.30	End TWLTL
228th Street S.E.	2.39	Multiple
	2.47	Begin TWLTL
	2.53	End Bicycle Lanes End TWLTL

**Table 4
Projects Since 1986**

Year	Project	Improvements
1986	SR 527 Junction 240th Street SE	Drainage, Surfacing, Grading, Traffic Signal, Southbound Right Turn Lane, Eastbound Left Turn Lane and Additional Right-of-Way
1988	SR 522 to 232 nd Street SE	Paving, Drainage, Utility, Signing, Resurfacing, Two-Way Left Turn Lane extensions to existing left turn lanes

Table 5 on the following page presents a list of intersection characteristics within the study area.

**Table 5
Existing Intersection Characteristics**

Name	MP	Type	Traffic Control	Special Turn Lanes
SR 522/ Main Street	0.00	4 -Legged	Signal	SB, EB, WB, RT Pocket - EB LT Pocket
NE 183rd Street	0.07	4 -Legged	Signal	NB, SB LT Pocket
NE 185th Street	0.12	Eastside T	Stop Sign Side Street	NB, SB, LT Pocket-EB, RT Pocket
NE 186th Street	0.18	Eastside T	Stop Sign Side Street	NB, SB, LT Pocket
Reder Way NE	0.26	Eastside Y	Stop Sign Side Street	NB, SB, LT Pocket
NE 188th Street	0.31	Westside Y	Stop Sign Side Street	NB, SB, LT Pocket-EB LT Pocket
NE 191st Street (NE- 190th Street)	0.43	4 -Legged	Signal	NB, SB, LT Pocket-SB, RT Pocket
240th Street SE	1.58	Westside T	Signal	EB, NB, LT Pocket-EB,. RT Pocket
10th Avenue SE	2.1	Westward Y	Stop Sign Side Street	None
234th Street SE	1.95	Westside T	Stop Sign Side Street	NB, SB, LT Pocket

The interchange of SR 527 and I-405 is a partial cloverleaf interchange with loop ramps providing access from northbound SR 527 to northwest bound I-405, and southbound SR 527 to southeast bound I-405. SR 527, across I-405, is four lanes with traffic signals at each of the intersections with the northbound and southbound ramps.

The SR 527 bridge across I-405 was constructed in 1968. The structure length is 341 feet and the curb to curb width is 62 feet. The bridge sufficiency rating for this structure is "functionally obsolete."

C. Urban Section Update

The Vision 2020 Growth Management Strategy Plan identified the city of Bothell as a subregional center. As a subregional center, Bothell would be served by a regional rapid transit line and have significant connections to highways.

The Comprehensive Plan for the city of Bothell classifies SR 527 as a principal arterial. It accommodates mostly through traffic and provides connections to other jurisdictions, employment centers, commercial areas and the regional freeway network. It is intended to be the truck route through Bothell. Figure 2 on the following page provides a street classification map for this area.

Population, employment levels, and demographic characteristics were obtained from the Puget Sound Regional Council (PSRC) and refined by the city of Bothell in their transportation model. Key road segments were identified and trips generated in and destined

for Bothell were quantified. SR 527 was projected to carry approximately 57 percent through trips, with SR 522 and I-405 carrying approximately 80 percent through trips. The remainder of the trips on these routes have at least one trip end in Bothell.

The Bothell park and ride lot, located near the intersection of SR 522 and Kaysner Way, was originally constructed with 82 parking spaces. Since 1986 an additional 74 spaces have been added to this lot. In addition, a 400-stall park and ride lot will open in 1994 at the I-405/SR 527 interchange.

WSDOT indicates in their long range planning reference documents that transit or HOV lane placement on SR 522 should be studied. Accordingly, a study is currently underway which is being coordinated by WSDOT's Office of Urban Mobility to determine the feasibility of HOV lanes on SR 522.

The Burke Gilman/Sammamish River Trail is located on former Burlington Northern Railroad track right-of-way and Metro sewer pipeline right-of-way from Gas Works Park in Seattle through Bothell to Marymoor/Sammamish Regional Park in Redmond. The Bothell Comprehensive Plan identifies SR 527 as a bike route providing connections from the north to the Burke Gilman/Sammamish River Trail. The Bothell Comprehensive Plan recommends a class two bike facility be constructed on SR 527. South of NE 190th Street inadequate additional right-of-way is available to continue a bike facility. Also, the heavy traffic volumes result in a problem for bicyclists. The adjacent residential city streets provide ample opportunity south of NE 190th Street for bicyclists to ride to and from regional facilities. Sidewalks are called for in the city of Bothell's Comprehensive Plan. The draft policies from the city of Bothell's Comprehensive Plan are found in the appendix.

IV. UPDATED PRESENT OPERATING CONDITIONS

A. Traffic

SR 527 carries 13,000 to 20,000 vehicles per day between I-405 and SR 522. Daily traffic counts were made along SR 527 and manual counts were made at key intersections during PM, AM and off peak time periods. See Figure 3 for daily peak and off peak volumes. Truck classification counts were made **at three locations** as shown in the following table.

**Table 6
Truck Classification**

Location	AM Peak	TIME PERIOD PM Peak	Off Peak
SR 522/SR S27/Main Street			
Eastbound	3	2	1
Westbound	1	0	7
Northbound	5	2	4
Southbound			8
Intersection	2	1	
SR 527/ NE 183rd Street	1	1	
Eastbound	10	0	8
Westbound	2	1	7
Northbound	4	1	0
Southbound	1	1	1
Intersection	1	1	
SR 527/NE 185th Street			
Eastbound	-	-	-
Westbound	5	0	N/A*
Northbound	2	0	N/A*
Southbound	2	0	N/A*
Intersection	1	0	N/A*

N/A* = not available

Performance of streets and highways is most commonly measured in terms of delay at intersections using an alphabetical scale from A to F with A representing nearly ideal conditions and F representing forced flow over the intersection's capacity.

Using the planning level of analysis as described in the 1985 Highway Capacity Manual (HCM), the number of lanes required to accommodate given traffic conditions for fringe urban and suburban conditions can be determined. During the planning stage, details of specific grades and other geometric features usually do not exist. Thus, at the planning level, the capacity analysis is approximate and serves to give a general idea of the highway geometry required.

Using Table 7-13 HCM page 7-20, for two percent trucks, rolling terrain and free flow speed of 50 mph, the service flow rate results in 1,110 vehicles per hour per lane for LOS D. The number of lanes required in the northern section of SR 527 would be two lanes. However, the number of signalized cross streets, the commercial businesses, residential units and

services along this route results in additional conflicts reducing the theoretical capacity of the roadway section. Also, continuous left turn lanes are needed to access businesses and residences fronting SR 527.

The signalized intersections were examined for lane requirements and phasing needs. For signalized intersections, LOS criteria takes into account the average time stopped per vehicle and the capacity of an intersection expressed in terms of a ratio of volume to capacity (v/c) where a v/c of more than 1.0 indicates the volume exceeds the capacity of the intersection. For unsignalized intersection LOS is based on reserve capacity in passenger cars per hour (PCPH). Appendix B lists the level of service criteria for signalized intersections and unsignalized intersections.

Table 7 below displays existing traffic in terms of average daily traffic, peak hour traffic, LOS, and total delay for key locations along the route.

**Table 7
Existing Traffic Information**

Location	ADT	PM Peak Hour	LOS	Total Delay Sec./Veh.
SR 522/SR 527/Main Street	17,600	4:30	D	30.44
SR 527/NE 183rd Street		4:45	B	12.18
SR 527/NE 190th-191st Street		5:00	D	35.99
SR 527/240th Street	17,000	4:45	A	2.94

See Appendix B for calculations.

The average daily traffic volumes for the last four years were obtained from the State's Annual Traffic Report. The following table summarizes average annual growth over the past three years for selected roadway sections.

**Table 8
Average Annual Growth**

Roadway Section	Average Annual Growth
SR 527/SR522/Main Street	4.2%
SR 527 at NE 183rd Street	1.6%
SR 527 at 240th Street SE	0.5%
SR 527 at 228th St. SE (South of intersection)	5.1%
SR 527 at 228th Street SE (North of intersection)	8.9%
I-405 at SR 527 Ramp	5.5%

B. Accident Analysis

Accident data was obtained from the Washington State Department of Transportation records for reported accidents on SR 527 from SR 522 to I-405. The accident data is for a four year time period beginning January 1, 1989 through December 31, 1992. A review of

these accidents shows that a total of 209 intersection related accidents have occurred during the four year period. A total of 79 mid block accidents occurred on SR 527 in the study area. Approximately 36 percent (103 accidents) of the accidents were rear end, 34 percent (97 accidents) right angle accidents; 12 percent (36 accidents) fixed object; 10 percent (28 accidents) sideswipe; and 8 percent (24 accidents) left turn. See Appendix B for a detailed break down of accidents.

The average accident rate for the four years on this section of SR 527 is 4.31 accidents per million vehicle miles. The state-wide average for a principal arterial in urban areas is 2.86 accidents per million vehicle miles. The overall accident rate on SR 527 within the study area is higher than the statewide average, due in large part to the high accident locations shown in Table 9.

The 1994 Review of High Accident Locations, a report published by WSDOT every two years, identifies three sections of SR 527 as high accident locations. This report examines accidents during 1991 and 1992. Table 9 summarizes the two year accident study for the critical sections.

Table 9
High Accident Locations
1991 and 1992
Accident Severity

Location	<i>Property Damage Only</i>	<i>Injury Accidents</i>	<i>Fatal Accidents</i>	<i>Economic Loss</i>
MP 0.00 - MP 0.17	13	10	0	\$290,000
MP 1.24 - MP 1.51	8	8	0	\$372,000
MP 2.28 - MP 2.49	24	14	0	\$144,000

C. Intermodal System

Currently, transit service is only provided on SR 527 south of NE 186th Street. Community Transit and Metro have one route each which travels the few short blocks between NE 186th Street and Main Street. Since 1986, additional service has been added to SR 522, there are plans to expand the Bothell park and ride lot from 74 spaces to 156, and WSDOT plans to soon open a park and ride lot at the interchange of SR 527 & I 405 (See Figure 4 for transit facilities). Currently Metro and CT are in the planning process on new routings to connect the park and ride facility at I-405 and 228th Street SE. At this time no adopted plans show any increase in transit on SR 527.

Studies were made on the siting of a new park and ride facility in Bothell. As a result, CT and WSDOT located a new park and ride lot in the Canyon Park area and Metro expanded the existing park and ride lot at SR 522 and Kaysner.

D. Planned Projects

Regional Transportation Plan

The project is located within the Regional Transit District Boundary. Rail and HOV routes in the draft plan are proposed on I-5 and I-405.

Vision 2020

Vision 2020 has been adopted as the growth and transportation strategy for the Central Puget Sound Region. It is being utilized as the regional long range planning framework for guiding growth and transportation in Central Puget Sound. The plan combines the heavy transit emphasis of the Major Centers Alternative with the job housing balance distribution of Multiple Centers to produce about fifteen centers, including Bothell, to be served by both transit and improved highways. The plan retains a transit emphasis but provides additional highway capacity in key areas to support the centers concept and to assure good movement of people and goods. The plan stresses maintenance and efficiency of existing systems and aggressive demand management to discourage single occupant vehicles and support the desired compact people-oriented urban form.

Highway capital improvements include the addition of lane capacity to regional arterials and freeways, new regional arterials and freeways, new or revised interchanges, local street improvements, and other local and regional system investments such as signalization and channelization. Operations and administrative costs for highways are assumed to continue at the current level, modified only by the differences among alternatives associated with various types of highway systems.

Washington Statewide Multimodal Transportation Plan

The state owned component of the Washington Statewide Multimodal Transportation Plan is a 20 year vision of the needs which should be addressed on state owned facilities during the next 20 years. This plan is largely conceptual, but does include the results of various planning studies completed to date. Table 10 lists the proposals for the study area found in the Multimodal Plan.

**TABLE 10
LONG RANGE IMPROVEMENT PROPOSALS**

SR	BEGIN MP	END MP	SUB-PROGRAM	DESCRIPTION
527	0.00	1.30	Mobility	[Current project - SR 522 I/S improvements] Needs Further Study - widen to 4/5 lanes, develop parallel arterial (Bothell/King Co. - 80th Ave. NE and 228th SW I/S), or?
527	1.30	6.72	Mobility	Widen remaining portion to 4/5 lanes. Park & Ride lot at I-405, dual turn lanes at I-405 NB/SB ramps.

WSDOT 6-Year Program

A Project is currently scheduled which will improve the operation of the SR 522/SR 527/Main Street intersection. The intersection will be widened to include additional lanes, sidewalks, curb and gutter, and signal modification. Additional lane capacity will be added to SR 527 as far north as the Reder Way intersection and this intersection will be realigned to eliminate the extreme skew angle now in existence. In addition to the five lane widening and the intersection improvements, pedestrian amenities, channelization improvements at other intersections, and signal improvements on SR 527 are included in this project.

The WSDOT is in the final stage of preparing a contract to install new signal controllers at each of the existing signalized intersections along SR 522 and SR 527 within the boundaries of the study area. As part of this work an interconnect cable will be installed to link each intersection with the WSDOT on-street master signal coordination system. The interconnect cable will generally be installed overhead on existing utility poles. The interconnect cable in the vicinity of the SR 522/SR 527/Main Street project will be placed underground to improve reliability. Completion of this project will provide for full signal coordination along the SR 522 and SR 527 corridor from Kenmore to Canyon Park.

Bothell Capital Improvement Plan

Table 11 lists the 1993 Bothell Capital Improvement Projects in the study area:

Table 11
Bothell Capital Improvement Plan

Project	Estimated Completion Date	Estimated Cost
NE 185 th Street widening and installation of curbs, gutters, sidewalks and landscaping	1997-1998	\$274,000
SR 522 pedestrian bridge near SR 522/SR 527 intersection	1997-1998	\$340,000
102 nd Avenue NE bridge reconstruction	1997-1998	\$858 000
102 nd Avenue NE improvements south of reconstructed bridge	1997-1998	\$292 000
SR 522 pedestrian bridge near Brackett's Landing	1998+	\$150,000
East Riverside Drive improvements, including widening and installation of curbs, gutters, sidewalks, and landscaping	1998+	\$961,000
Replacement of existing water main on Bothell Way NE from NE 188th Street to Main Street	1995	N/A
Upsize storm drain pipes on Bothell Way NE between Ormbrek Street and NE 180th Street	1995	N/A
Construct sidewalk on south side of SR 522 from SR 527 to Kaysner Way	1993-1998	\$38,000

"Alternative D-modified" (Riverside Parkway/Bothell Bypass)

In addition to the projects listed above, Bothell has adopted the "Alternative Dmodified" project. The following is a summary of the key features of "Alternative D-modified" as they pertain to SR 527:

The right-of-way on SR 527 would be increased to eighty feet at its intersection with SR 522 and transition to the present 60 foot right-of-way at NE 190th Street, the north project limit. An emergency signal would be installed at NE 185th Street and SR 527.

Landscape improvements would be continuous on SR 527 between SR 522 and the project terminus in the vicinity of NE 190th Street. Planter strips would be provided on both sides and an intermittent landscaped median would be provided in the center turn lane where space for left turns is not needed.

Bicycle Routes

The City's Comprehensive Plan designates the following bicycle routes in the study area:

Class I (separated from streets)

- Sammamish River Trail

Class II (striped and signed for semi-exclusive use of bicyclists)

- SR 527 from NE 191st Street to 228th Street SE .
- Beardslee Boulevard

Class III (signed as bike route, but shared right-of-way with motor vehicles)

- NE 180th Street
- 102nd Avenue NE
- NE 185th Street

- 104th Avenue NE
- NE 190th Street

The Sammamish River trail is a completed class I bikeway. The other designated bicycle routes have not yet been improved to the point where they meet the desired standards as stated in the city's comprehensive plan.

V. **UPDATED ROUTE DEVELOPMENT PLAN**

A. **Year 2000 LOS vs. Year 2015 LOS**

Future traffic volumes for the year 2015 were calculated for the Route Development Plan based on data received from the Puget Sound Regional Council (PSRC) transportation model and from the City of Bothell's EMME -2 transportation model. The transportation models referenced provide good indications of future traffic growth over a wide geographic area but do not necessarily predict local street intersection volumes by movement without making adjustments to account for existing congestion, signal timing constraints, and conflicts such as pedestrian and access points near intersections. Future volumes were calculated by applying the PSRC growth factors (2.3% per year compounded) to existing traffic volumes. Future travel distribution factors were derived from the City's model.

A level of service analysis was then conducted which tested various lane and signal timing alternatives. Table 12 compares level of service for the "Do Nothing" and Five-Lane Alternative.

Table 12
Alternative Analysis

Location	Alternative <i>Do Nothing</i> LOS	Seconds/ Vehicle	Alternative <i>5-Lane</i> LOS	Seconds / Vehicle
SR 522/SR 527/Main Street	F	169.56	F	125.60
SR 527/NE 183 RD Street	F	248.31	B	14.00
SR 527/NE 190 th -191 st Street	F	463.21	C	15.01
SR 527/240 th Street SE	F	122.72	B	10.26

See Appendix B for calculations.

Using 2015 traffic volumes the LOS for the existing roadway section drops to LOS F at the major intersections. By widening SR 527 to five lanes the LOS improves to C or better except at the intersection of SR 522/ SR 527/ Main Street. Without major purchase of numerous businesses along SR 527, the LOS will remain at F at this particular intersection. A recent design report which addresses channelization improvements at the SR 522/SR 527/Main Street intersection recommends some widening for additional turn lanes which would improve the operation at this intersection. In addition to widening SR 527 to five lanes, side street improvements are recommended to facilitate traffic flows at the intersections as shown on Table 13.

Table 13
SR 527 Side Street Improvements

Intersection	Side Street Improvements
SR 527/SR522/Main Street	Add EB left turn pocket on SR 522
SR 527/NE 183rd Street	Add EB and WB left turn pocket to NE 183rd Street
SR 527/NE 185th Street	Add WB left turn pocket to NE 185th Street
SR 527/NE 186th Street	Add WB left turn pocket to NE 186th Street
SR 527/NE 188th Street	Add EB left turn pocket to NE 188th Street
SR 527/NE 191st Street	Add EB and WB through lanes to NE 191st Street

The 1986 Route Development Plan proposed a three lane section for SR 527 between SR 522 and 240th Street SE. Given the projected traffic volumes for the year 2015 a five lane section is now proposed for this section (See Appendix A for a Typical Roadway Section). There is no change in

the previously recommended five lane section proposed for the area between 240th Street SE and 228th Street SE.

B. Environmental Issues

This portion of SR 527 lies within three drainage basins. The northern most portion of SR 527 drains to North Creek. The west side of the central portion contains the headwaters of Little Swamp Creek, which drains into Swamp Creek. The remainder of the route contains the headwaters of and drains to Horse Creek. These creeks all eventually drain into the Sammamish River. Adjacent to SR 527 are several wetlands and a small lake, Lake Pleasant, created by the excavation of a peat bog. The wetlands are located and classified in the following table.

**Table 14
Wetlands**

Location	Approximate Area	Class (1, 2, or 3)
West of SR 527, between NE 195th and NE 203rd	11.8 ac	2
East of SR 527, between Lake Pleasant and Canyon Park Place Shopping Center	14.4 ac	2
West of SR 527, South of 240th Street	1.1 ac	2
West of SR 527, north of 240th Street	2.4 ac	2
West of SR 527, north of Barfod's Nursery	5.0 ac	1

See Appendix G for description of wetlands rating system.

The topography of the SR 527 corridor is varied, and for the most part severe. SR 527 follows the valley floor with extensive slopes on each side of 35 percent or steeper. The southern terminus is at an elevation of approximately 100 feet and rises to an elevation of 220 feet at the King-Snohomish County line (MP 1.30). SR 527 then descends the hill to the northern outlet of the valley near 228th Street SE. The highest point in the area is along the east side of the highway at about 236th Street with an elevation of approximately 280 feet.

C. Recommended Alternative

General

Since the RDP was last updated in 1986, the area of north King and south Snohomish Counties experienced rapid and unforeseen growth. Canyon Park Terrace, a 120,000 square foot shopping center located at 228th Street SE and SR 527 was opened in late 1989. Country Village, located near MP 1.7, has greatly expanded the number and diversity of shops located there. There has been a significant amount of new shopping and residential development throughout the Canyon Park area, the northern terminus of this route development plan.

The increase in population, employment, and retail services in the area served by this portion of SR 527 lead to predicted traffic increases that will require construction of a four to five lane roadway as opposed to the three lane facility recommended in the 1986 study.

Posted speed limits vary from 30 miles per hour in and near downtown Bothell to 45 miles per hour north of MP 1.3.

SR 527 is classified by WSDOT as a principal arterial, special multilane, category P6. The city of Bothell also classifies the road as a principal arterial.

Design Standards

According to the WSDOT Design Manual, chapter 4, Section 440.04:

"When a state highway is coincident with and is a portion of a local agency roadway, the design features shall be developed in cooperation with the local agency. The applicable local agency guidelines may be used as minimum design criteria. The use of DOT standards is encouraged where feasible."

Design Speed

MP 0.00 to MP 0.43

In the section of SR 527 which begins at the intersection with SR 522 (MP 0.0) and extends approximately 0.5 miles north (just north of the NE 190th/191st Street intersection), the route has definite "street-like" characteristics. The operational and physical conditions of the street (i.e., closely spaced intersections, driveways, traffic signals, and other constraints) limit vehicle speeds, and make it unnecessary to define a design speed. The posted speed limit is 30 mph.

MP 0.43 to MP 0.90

This section of SR 527 currently has a posted speed of 30 mph which is also the calculated design speed. Sight distance restrictions and tight curve geometries are the reason for the low calculated design speed. Generally speaking, the design speed for a segment of highway should be five to ten miles per hour higher than the posted speed. Therefore, the design speed should be upgraded to 40 mph on this section of roadway in order to maintain a safe posted speed of 30 mph.

MP 0.90 to MP 2.56

This section of SR 527 currently has a posted speed limit of 45 mph. A design speed of 50 mph is appropriate for this section of the highway.

Roadway Section

In order to meet future capacity considerations, SR 527 should be constructed to provide two through lanes in each direction, with left turn lanes at all intersecting streets. Two way left turn lanes should be provided along the Country Village frontage, and as required in areas of high access densities. Where the two way left turn lane is not needed, the median should be planted with appropriate landscaping materials in conformance with the city of Bothell's Comprehensive Plan. Care should be exercised where curbing is to be installed in the median. A shy distance of at least two feet should be provided between the edge of traveled lane and the face of the curb and only plantings which will not create a clear zone hazard should be considered. All planted medians and landscaped areas separating the roadway from sidewalks will be maintained by the city of Bothell.

North of NE 190th Street provisions for bus pullouts should be planned with appropriate right-of-way acquired as road plans are implemented. Stops should be located far side, relative to directions of travel at signalized intersections. Other likely locations for bus pullouts would be access points to neighborhoods. Continuing coordination with both CT and METRO is required to determine bus pullout locations.

On street bicycle lanes are required to comply with the City's Comprehensive Plan, as are sidewalks along both sides of the highway. South of NE 190th Street, it is recommended that the bike lanes divert to adjacent side streets already identified in the comprehensive plan rather than continue south along SR 527 due to restricted right-of-way, high traffic volumes, and driveway conflicts. Equestrian facilities are not recommended along the route due to the difficulties which would be encountered in construction of the recommended cross-section, and right-of-way acquisition costs. Bicycle lanes will be five feet wide, measured from the face of curb to the edge of the traveled lane. Sidewalks will also be five feet wide. Wherever possible, a five foot landscaped planting strip will be provided between the back of curb and the sidewalk.

Within the downtown Bothell area, from SR 522 (MP 0.00) through the NE 190th/191st Street intersection (MP 0.43), all through lanes will be 11 feet in width. Due to the high right of way cost and the impact to the numerous businesses located along this section of SR 527, the outside lanes must be constructed without the 2 foot shy distance to the face of the curb as recommended in the 3R standards. Left turn lanes will be 12 feet wide.

North of the NE 190th/191st Street intersection through lanes will be 11 feet wide and left turn lanes will be 12 feet wide. Throughout this section the five foot bicycle lanes will provide the required curb to lane shy distance.

Right of Way

The existing right-of-way along SR 527 is generally 60 feet in width. In certain areas additional right-of-way has been acquired for slopes and as development has occurred. Within the downtown area of Bothell (south of NE 190th Street), the recommended right-of-way width is 75 feet. This width corresponds to the five lane roadway section without bicycle lanes. All overhead utilities will be located in the proposed planter strip along the west side of the street.

North of NE 190th Street, the recommended right-of-way width is 100 feet, with the minimum right-of-way width set at 90 foot. This width is necessary to encompass the five lane section with bicycle lanes, sidewalks and planter strips on both sides of the street.

Slope easements will be required to construct the completed facility.

Alignment

From the intersection with SR 522 through the Reder Avenue intersection (MP 0.26) the centerline of the roadway for the recommended alignment must shift four feet to the west of the existing centerline. This roadway shift is necessitated due to the close proximity of buildings and parking lots to the east side of the road which make widening to the east infeasible. The recommended roadway widening will allow the east curb line to remain in its current position.

From Reder Avenue through the NE 190th/191st Street intersection, roadway widening will be symmetrical about the existing right-of-way centerline. North of the NE 190th/191st Street intersection, the route traverses rolling terrain with steep slopes adjacent to the road along much of the route. The design of this section of roadway must examine shifts in the alignment to minimize the need to construct deep excavations, high embankments, and extensive retaining walls. Widening of the road should be symmetrical about the existing centerline except for those locations where an alignment shift can substantially reduce construction costs, ease access difficulties, and/or minimize environmental conflicts.

The 1986 Route Development Plan recommended the realignment of two horizontal curves located between approximate MP 0.60 and MP 0.80. The existing curves have a radius of 286.5 feet which is sufficient for 30 a mile per hour design speed when a super elevation of six percent is provided. Assuming the six percent super elevation rate is used, the radii should be increased to 510 feet to accommodate the desired 40 mph design speed. These realignments should be investigated for feasibility during final design of the road when detailed topography and environmental information is available.

Traffic Control

The city of Bothell is submitting an application for installation of a new emergency traffic signal at the intersection of SR 527 and NE 185th Street. The modernization and interconnection of existing signals along SR 527 are the only other changes to traffic control currently envisioned along the route.

Constructibility

Construction along much of the route will require relatively deep cuts or construction of retaining walls. Maintaining grades on existing driveways may prove difficult.

The realignment of the curve near MP 0.6 will pull the roadway away from a drainage course and should ease construction of that section of roadway.

It is anticipated that finding an acceptable design will be difficult in the vicinity of Lake Pleasant (MP 1.35) due to the steep slopes encountered.

When Snohomish County constructed improvements to SR 527 in the vicinity of 228th Street SE (MP 2.39), they found it necessary to modify their design in order to maintain access to a property along the west side of the road (approximate MP 2.2). They constructed an eight to ten foot high gabion wall to protect a driveway and single family residence. It will be difficult to construct the recommended roadway section in this area.

Tenth Avenue SE is a short section of two-way roadway connecting single family homes with SR 527. It parallels the west side of SR 527 at the top of an eight to ten foot high retaining wall and intersects at approximate MP 2.1. The street meets SR 527 at an extremely flat angle, and does not meet standards for width or sight distance. Since the homes have other accesses, it appears possible to close the street and intersection. This closure would allow construction of the recommended roadway section. Without closure of the road, construction of the recommended roadway section is unlikely.

Interim Improvements

The accident "hot spot" identified by WSDOT between MP 1.24 and 1.51 is south of the NE 240th Street intersection, and is in an area of sparse development and adequate sight distance. The accidents in this area are overwhelmingly driveway related. There are several methods available to address the accident problem in this area. One method is to restrict all left turn movements except at well spaced, signalized intersections. At these locations U-turn areas would be provided to allow traffic to access opposite side of the road developments. Another method is to construct a two way left turn lane through this section to help facilitate left turn movements without disrupting through traffic.

The Country Village shopping area has been developed along the west side of the highway in the area immediately north of NE 240th Street (MP). The development is characterized by numerous uncontrolled driveways, parking immediately adjacent to the highway, high turning volumes and inadequate lighting. As traffic volumes increase along the roadway and as the commercial development continues to mature, the potential for increased accident hazard is seen. It is recommended that a center two way left turn lane be constructed in the vicinity of the Country Village shopping area to stave off possible accident problems in this area. Early construction of the ultimate roadway section is desirable to define access and parking patterns along SR 527 before further development occurs.

VI. PUBLIC INVOLVEMENT AND AGENCY COORDINATION

A. Open House

The city of Bothell held an Open House to present preliminary findings of the SR 527 Route Development Plan and the SR 522/SR527/Main Street Intersection Improvements Design Report. Representatives from the City, Washington State Department of Transportation and the Consultants were present to answer questions and discuss design options. Notices were sent to all

businesses fronting the two state highways and advertisements were placed in the local paper. On display were aerial photos with overlays showing existing right-of-way and future right-of-way needs. Cross sections of future roadway widening were displayed including landscaping, sidewalks, bikeways and treatment of intersection of SR 522/SR 527/Main Street.

Approximately twenty-seven people signed on the sign-up sheet with a number of people not signing as they entered. Information sheets were handed out with questionnaires attached asking for input on the two projects. See Appendix C for a detailed report on the open house.

B. Regional Transportation Planning Organization

Meetings were held with the Puget Sound Regional Council to obtain information about the area surrounding SR 527 from Vision 2020 and to obtain employment, population and travel demand forecasts for SR 527. Growth rates were obtained and compared to existing trends and the City of Bothell's Transportation Model to develop detailed intersection projections for the year 2015. See Appendix B for details on future demands.

C. Technical Advisory Committee

A technical advisory committee was formed to identify issues and develop alternatives and evaluate solutions for SR 527 between SR 522 and I-405. The committee was comprised of staff from WSDOT, City of Bothell, Community Transit, Metro Transit and the Consultant. Meetings were held to discuss SR 527 existing conditions, future needs, alternatives and to receive comments on recommended roadway revisions. See Appendix B for details of the TAC meetings.

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APPENDIX A
Typical Roadway Sections