APPENDIX C

CORRIDOR PROFILE DETAILS

PHYSICAL CONDITIONS

This section contains detailed figures of existing physical conditions along Juanita Drive. Figures related to sub-sections in the "Physical Conditions" section of the report include:

Perteet

0 300 600
Feet

Legend

61' Roadway Width
Existing Road Edge
Right-of-Way

Slope

Steeper than 2:1
2:1 to 3:1

Juanita Drive Corridor Study
93rd Ave NE to NE 117th St
61' Roadway Width

Path: X:\Kirkland, City ofProjects\20120185 - Juanita Drive Corridor Study\GIS\Mapdocs\JuanitaDrive_BasePlot_Segment.mxd

Source: City of Kirkland; King County


Juanita Dr NE
NE 132nd St
NE 131st Pl
74th Ave NE
74th Pl NE
76th Ave NE
NE 130th Pl
NE 130th St
76th Pl NE
NE 129th St
NE 128th St
NE 128th Pl
NE 126th St
NE 125th Pl
NE 125th St
NE 124th Pl
NE 124th St
NE 123rd St
NE 122nd Pl
NE 122nd St
NE 122nd Ln
NE 121st Pl
NE 121st St
NE 120th Pl
NE 120th St
NE 119th Pl
NE 119th St
NE 118th Pl
NE 118th St
NE 117th Pl
NE 117th St
NE 116th St
71st Ave NE
72nd Ave NE
72nd Pl NE
73rd Pl NE
Holiday Dr
Holmes Point Dr NE
Holmes Point Dr NE
Private Rd
Private Rd
Private Rd
Lake Washington Jr High School Access Rd
80th Ave NE
80th Pl NE
81st Ave NE
82nd Ave NE
82nd Pl NE
83rd Ave NE
84th Ave NE
85th Ave NE
85th Pl NE
NE 129th Pl
St John Vianney AcRd
Pedestrian Walk
Perteet
0
300
600
Feet
Legend
61' Roadway Width
Existing Road Edge
Right-of-Way
Slope
Steeper than 2:1
2:1 to 3:1
Juanita Drive Corridor Study
NE 117th St to NE 132nd St
61' Roadway Width
Path: X:\Kirkland, City of\Projects\20120185 - Juanita Drive Corridor Study\GIS\Mapdocs\JuanitaDrive_BasePlot_Segment.mxd
Source: City of Kirkland; King County

Perteet

0 300 600
Feet

Legend

- 61' Roadway Width
- Existing Road Edge
- Right-of-Way

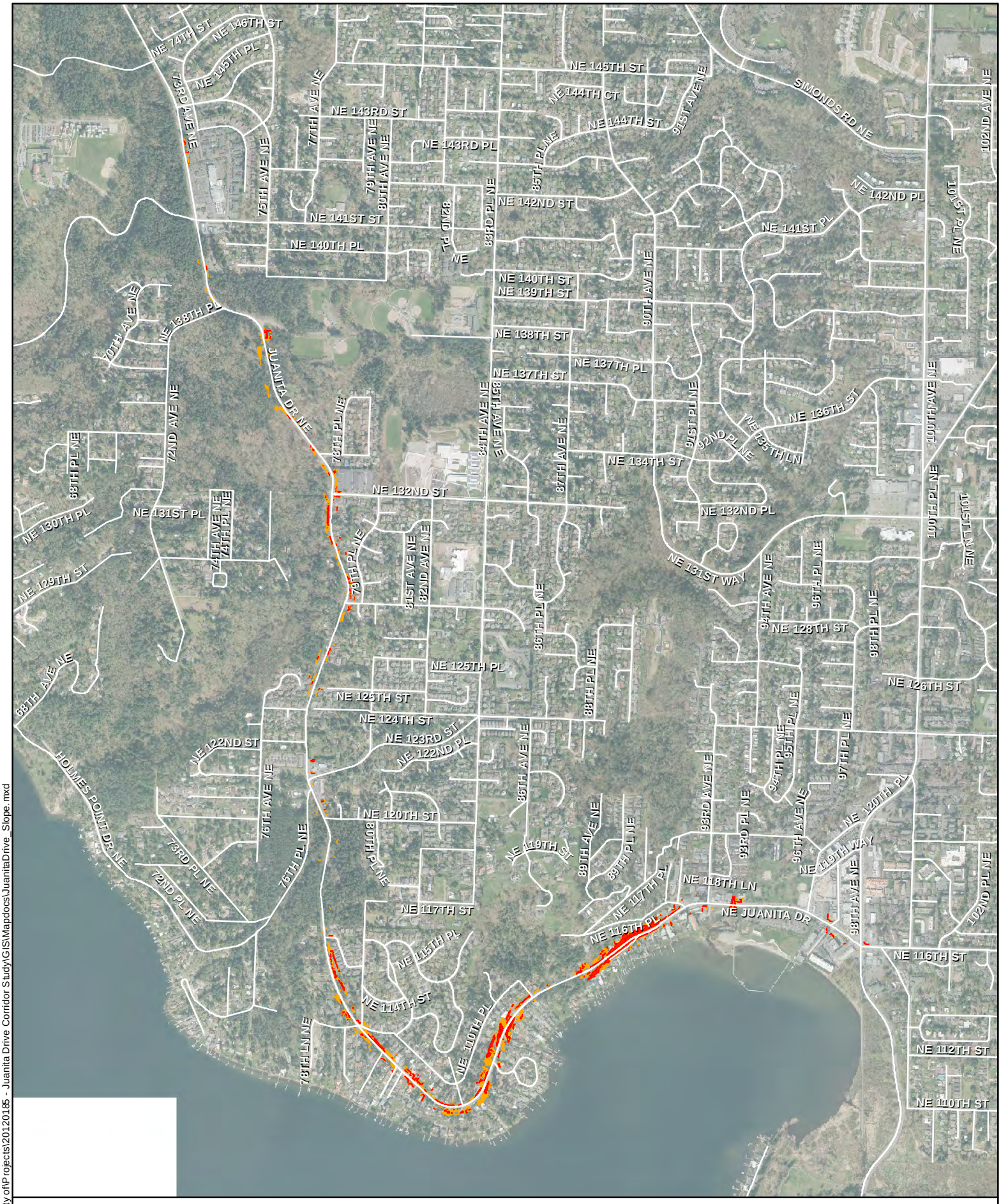
Slope

- Steeper than 2:1
- 2:1 to 3:1

Juanita Drive Corridor Study
NE 132nd St to NE 143rd St
61' Roadway Width

Path: X:\Kirkland, City of\Projects\20120185 - Juanita Drive Corridor Study\GIS\Mapdocs\JuanitaDrive_BasePlot_Segment.mxd

Source: City of Kirkland; King County



Path: X:\Kirkland_City of\Projects\20120185 - Juanita Drive Corridor Study\GIS\Mapdocs\JuanitaDrive_Slope.mxd

Perteet

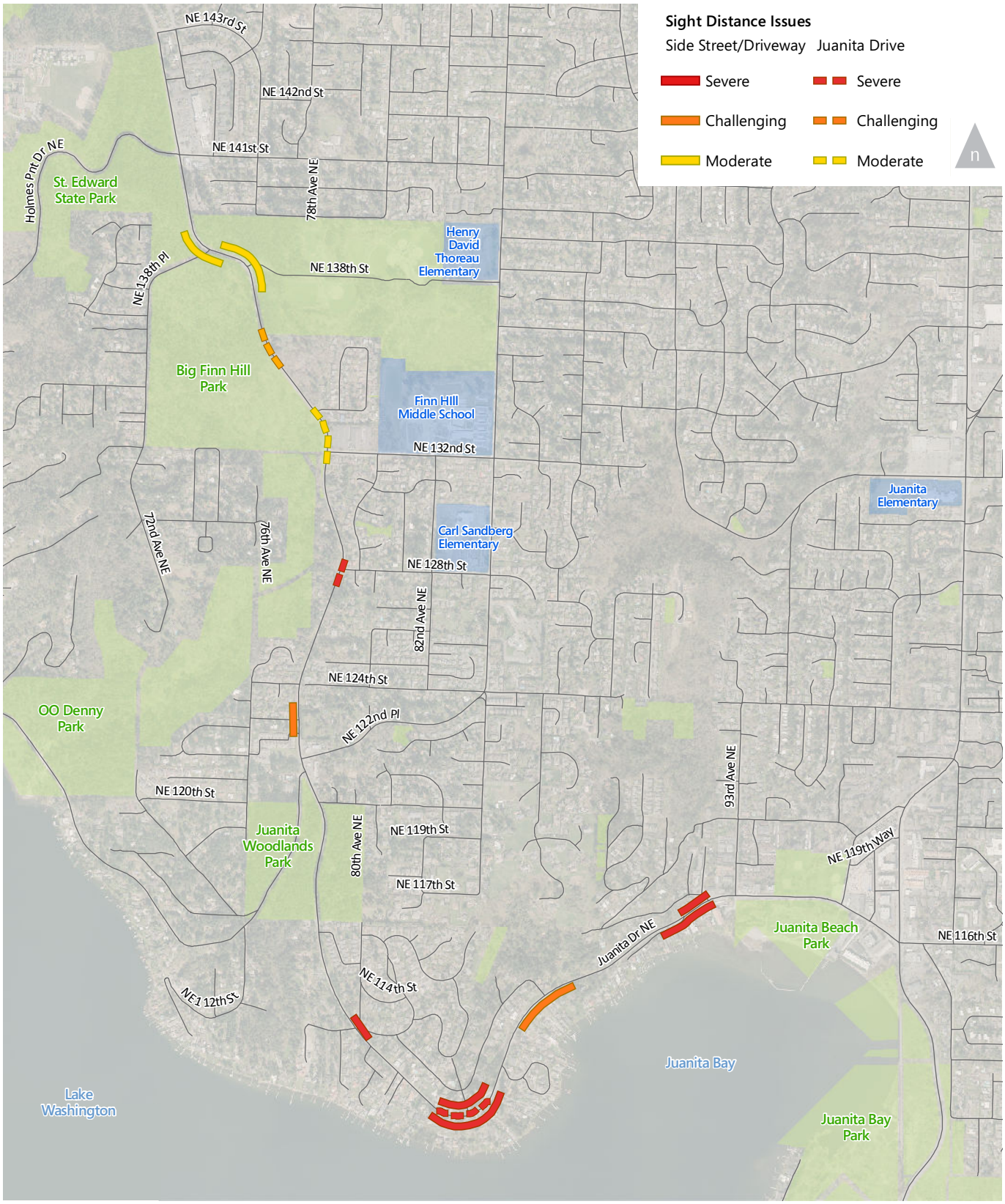
0 750 1,500
Feet

Legend

- Steeper than 2:1
- 2:1 to 3:1

Juanita Drive Corridor Study
Slope Map

Source: City of Kirkland; King County



Juanita Drive Corridor Study
Sight Distance Issues and Concerns

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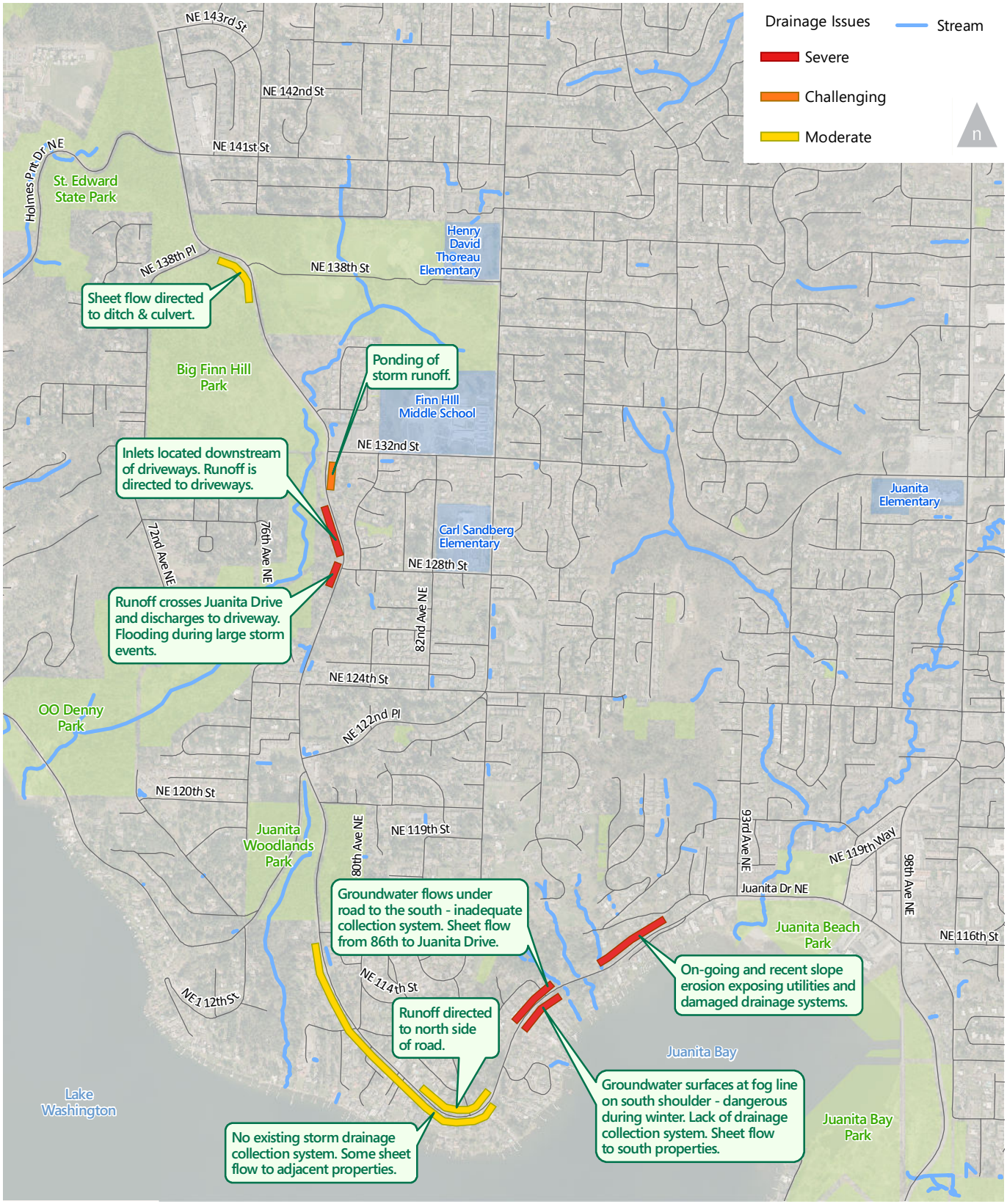
FEHR PEERS



Juanita Drive Corridor Study
Drainage Issues and Concerns

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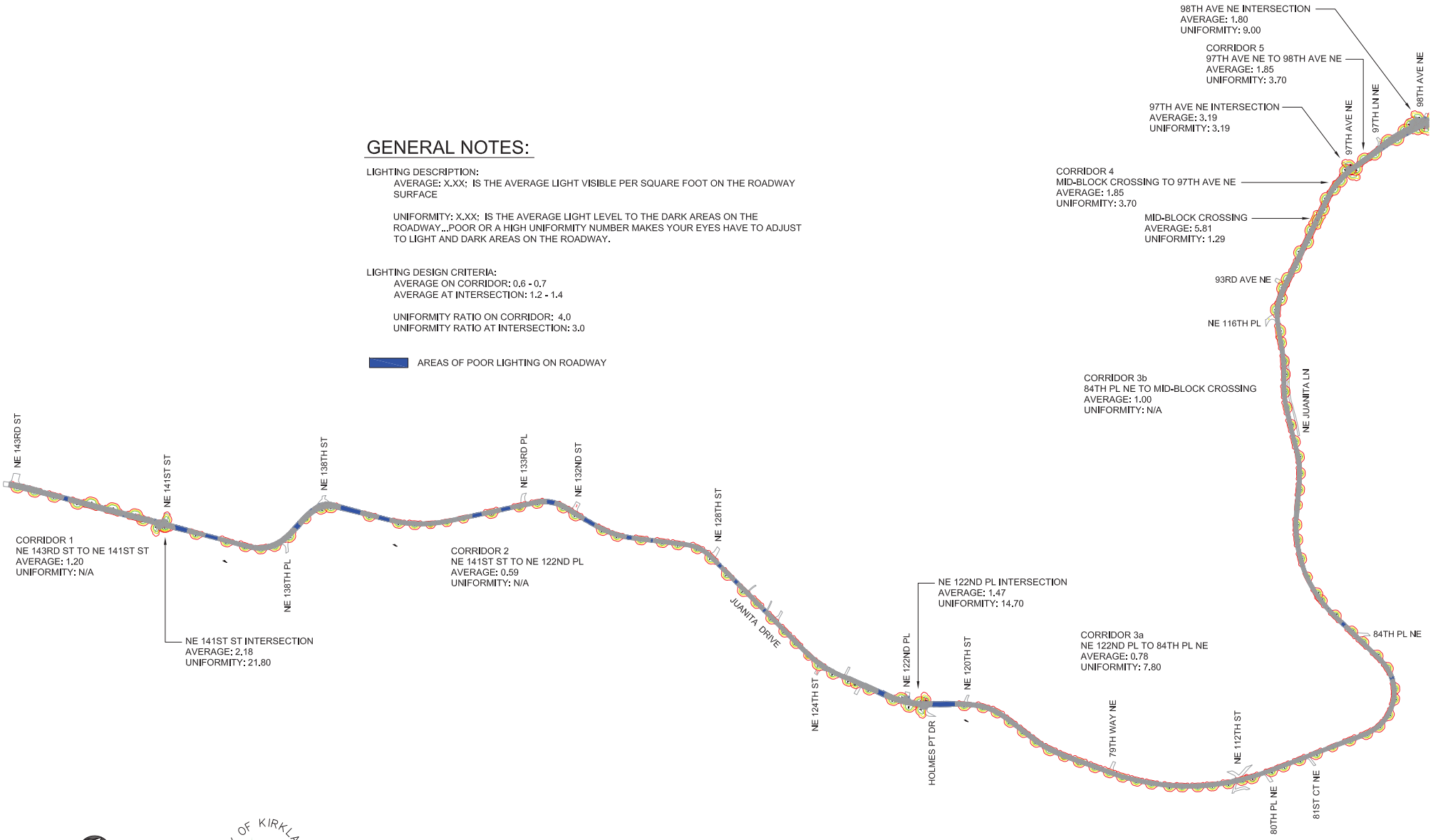
FEHR PEERS



NOT TO SCALE

CITY OF KIRKLAND WASHINGTON

JUANITA DRIVE
EXISTING STREET LIGHTING CONDITIONS

FIGURE
10

NE JUANITA DRIVE CORRIDOR STUDY

City of Kirkland

Existing Sign Schedule

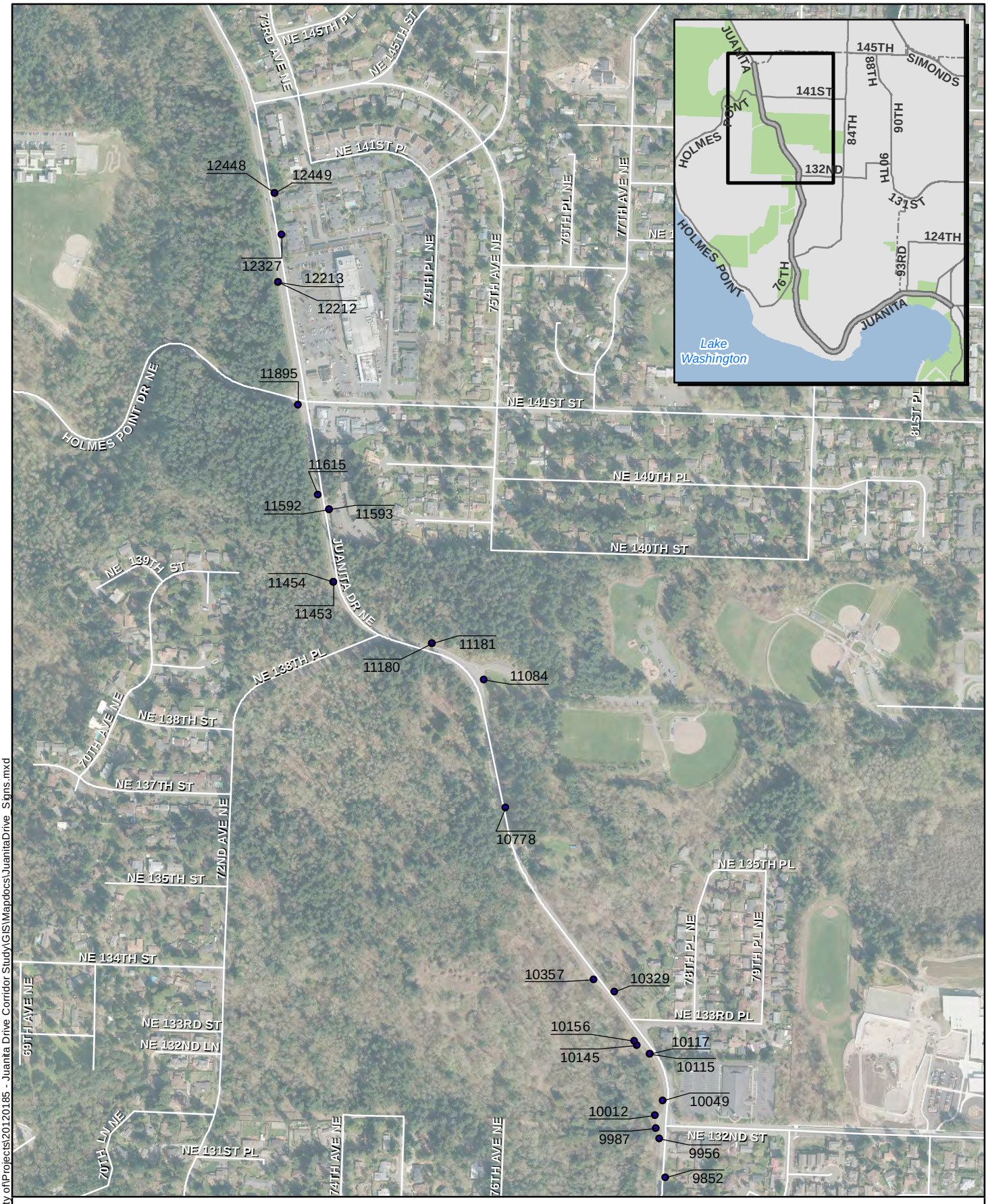
SIGN NO.	POST TYPE	SIGN SIZE	SIGN TEXT	SIGN DESCRIPTION	FIELD OBSERVATIONS
351	STEEL POST	WD: 30, HT: 30	<Null>	PEDESTRIAN ADVANCE	
353	STEEL POST	WD: 30, HT: 30	<Null>	PEDESTRIAN ADVANCE	
358	STEEL POST	WD: 30, HT: 30	<Null>	PEDESTRIAN ADVANCE	
969	STEEL POST	WD: 24, HT: 30	<Null>	KEEP RIGHT (BULL NOSE W/ ARROW)	
972	STEEL POST	WD: 24, HT: 30	<Null>	KEEP RIGHT (BULL NOSE W/ ARROW)	
973	STEEL POST	WD: 30, HT: 30	<Null>	PEDESTRIAN ADVANCE	
974	OVERHEAD	WD: 48, HT: 48	<Null>	PED CROSS SYMBOL O/H	
975	LIGHT POLE	WD: 30, HT: 30	<Null>	PEDESTRIAN ADVANCE	
976	OVERHEAD	WD: 48, HT: 48	<Null>	PED CROSS SYMBOL O/H	
977	STEEL POST	WD: 24, HT: 30	<Null>	KEEP RIGHT (BULL NOSE W/ ARROW)	
981	LIGHT POLE	WD: 30, HT: 30	<Null>	PEDESTRIAN ADVANCE	
1420	LIGHT POLE	WD: 30, HT: 30	<Null>	PEDESTRIAN ADVANCE	
1441	LIGHT POLE	WD: 30, HT: 30	<Null>	PEDESTRIAN ADVANCE	
1511	LIGHT POLE	WD: 30, HT: 30	<Null>	RIGHT LANE ENDS AHEAD (SYMBOL)	
5979	STEEL POST	WD: 24, HT: 24	<Null>	NO LEFT TURN (SYMBOL)	
5980	LIGHT POLE	WD: 30, HT: 30	<Null>	PEDESTRIAN ADVANCE	
8544	WOOD	WD: 24, HT: 24	<Null>	NO LEFT TURN (SYMBOL)	
8546	WOOD	UNKNOWN	<Null>	DEER CROSSING (SYMBOL)	
8580	WOOD	UNKNOWN	<Null>	HAIRPIN CURVE (L)	
8583	WOOD	UNKNOWN	<Null>	HAIRPIN CURVE (R)	
8586	WOOD	WD: 30, HT: 30	<Null>	INTERSECTION SYMBOL	
8601	WOOD	WD: 30, HT: 30	<Null>	PEDESTRIAN ADVANCE	
8606	WOOD	UNKNOWN	<Null>	DEER CROSSING (SYMBOL)	
8629	WOOD	WD: 30, HT: 30	<Null>	INTERSECTION SYMBOL	
8646	WOOD	WD: 30, HT: 18	<Null>	DIAGONAL ARROW POINTING TO GROUND (L)	
8647	WOOD	WD: 30, HT: 30	<Null>	PEDESTRIAN ADVANCE	
8651	WOOD	WD: 30, HT: 18	<Null>	DIAGONAL ARROW POINTING TO GROUND (L)	
8652	WOOD	WD: 30, HT: 30	<Null>	PEDESTRIAN ADVANCE	
8734	WOOD	WD: 24, HT: 24	<Null>	NO RIGHT TURN	
8774	STEEL POST	WD: 24, HT: 24	<Null>	NO TRUCKS - SYMBOL	
8861	WOOD	WD: 30, HT: 30	<Null>	SIDE ROAD 90 DEGREE (D)	
8869	WOOD	WD: 30, HT: 30	<Null>	SIGNAL AHEAD (SYMBOL)	
8881	WOOD	WD: 30, HT: 30	<Null>	FIRE STATION (SYMBOL)	
8982	WOOD	WD: 30, HT: 30	<Null>	SIGNAL AHEAD (SYMBOL)	SIGN COMPLETELY COVERED BY VEGETATION
9237	WOOD	WD: 30, HT: 30	<Null>	SIDE ROAD 90 DEGREE (D)	
9248	WOOD	WD: 30, HT: 30	<Null>	PEDESTRIAN ADVANCE	
9285	OVERHEAD	UNKNOWN	<Null>	NO LEFT TURN (WORDS)	
9289	WOOD	UNKNOWN	<Null>	SINGLE ARROW (SYMBOL)	
9290	LIGHT POLE	WD: 18, HT: 18	<Null>	NO PEDESTRIAN CROSSING SYMBOL	
9298	WOOD	WD: 18, HT: 18	<Null>	NO PEDESTRIAN CROSSING SYMBOL	
9301	WOOD	WD: 18, HT: 18	<Null>	NO PEDESTRIAN CROSSING SYMBOL	
9304	STEEL POST	WD: 18, HT: 18	<Null>	NO PEDESTRIAN CROSSING SYMBOL	
9658	WOOD	WD: 30, HT: 30	<Null>	SIDE ROAD 90 DEGREE (D)	
9695	WOOD	WD: 30, HT: 30	<Null>	SIDE ROAD 90 DEGREE (D)	
9852	WOOD	WD: 30, HT: 30	<Null>	CURVE - LEFT	
10115	WOOD	WD: 30, HT: 30	<Null>	SIDE ROAD 90 DEGREE (D)	
10357	WOOD	WD: 30, HT: 30	<Null>	CURVE - RIGHT	
10778	WOOD	WD: 30, HT: 30	<Null>	REVERSE TURN - LEFT	
11181	WOOD	WD: 30, HT: 30	<Null>	SIDE ROAD 90 DEGREE (D)	
11453	WOOD	WD: 30, HT: 30	<Null>	SIDE ROAD 90 DEGREE (D)	
11593	WOOD	WD: 30, HT: 30	<Null>	SIGNAL AHEAD (SYMBOL)	
11615	WOOD	WD: 30, HT: 30	<Null>	REVERSE TURN - LEFT	COVERED BY VEGETATION
12212	WOOD	WD: 30, HT: 30	<Null>	SIGNAL AHEAD (SYMBOL)	
12449	WOOD	WD: 30, HT: 30	<Null>	SIDE ROAD 90 DEGREE (D)	
982	STEEL POST	WD: 12, HT: 18	<null>	HOW TO USE CROSSWALK FLAGS	
983	STEEL POST	WD: 12, HT: 18	<null>	HOW TO USE CROSSWALK FLAGS	
8587	WOOD	UNKNOWN	80 AVE NE / NE 112 ST	STREET SIGN ADVANCE	
8628	WOOD	UNKNOWN	80 AVE NE / NE 112 ST	STREET SIGN ADVANCE	
8600	WOOD	UNKNOWN	AHEAD	AHEAD (PLAQUE) - ADVANCED WARNING	
9247	WOOD	UNKNOWN	AHEAD	AHEAD (PLAQUE) - ADVANCED WARNING	
11084	WOOD	WD: 78, HT: 18	BIG FINN HILL PARK	STREET SIGN PANEL - KING COUNTY STYLE	
9293	WOOD	WD: 78, HT: 18	CHAMPAGNE PT.	STREET SIGN PANEL - KING COUNTY STYLE	
10329	WOOD	WD: 18, HT: 24	DENNY CREEK	INFO SIGN - CREEK W/FISH SYM	
8891	WOOD	WD: 24, HT: 30	DO NOT BLOCK INTERSECTION	DO NOT BLOCK INTERSECTION	
8919	WOOD	WD: 24, HT: 30	DO NOT BLOCK INTERSECTION	DO NOT BLOCK INTERSECTION	
970	STEEL POST	WD: 30, HT: 30	DO NOT ENTER	DO NOT ENTER	
5825	LIGHT POLE	WD: 24, HT: 48	ENTERING KIRKLAND	ENTERING KIRKLAND	
9565	WOOD	WD: 30, HT: 30	HIDDEN DRIVEWAY	HIDDEN DRIVEWAY	
11592	WOOD	UNKNOWN	HOLMES PT DR / NE 141 ST	STREET SIGN ADVANCE	
8868	WOOD	UNKNOWN	HOLMES PT. DR / NE 122 PL	STREET SIGN ADVANCE	
12213	WOOD	UNKNOWN	HOLMES PT. DR NE / NE 141 ST	STREET SIGN ADVANCE	
356	STEEL POST		LANE ENDS	<Null>	
1070	OVERHEAD	WD: 24, HT: 30	LEFT TURN YIELD ON GREEN	LEFT TURN MUST YIELD ON GREEN	
1071	OVERHEAD	WD: 24, HT: 30	LEFT TURN YIELD ON GREEN	LEFT TURN MUST YIELD ON GREEN	
8656	WOOD	WD: 30, HT: 30	NARROW ROAD	NARROW ROAD AHEAD	

NE JUANITA DRIVE CORRIDOR STUDY

City of Kirkland

Existing Sign Schedule

SIGN NO.	POST TYPE	SIGN SIZE	SIGN TEXT	SIGN DESCRIPTION	FIELD OBSERVATIONS
8860	WOOD	UNKNOWN	NE 120 ST	STREET SIGN ADVANCE	
8981	WOOD	UNKNOWN	NE 122 PL / HOLMES PT DR	STREET SIGN ADVANCE	
9238	WOOD	UNKNOWN	NE 128 ST	STREET SIGN ADVANCE	
9659	WOOD	UNKNOWN	NE 128 ST	STREET SIGN ADVANCE	
9694	WOOD	UNKNOWN	NE 132 ST	STREET SIGN ADVANCE	
10117	WOOD	UNKNOWN	NE 132 ST	STREET SIGN ADVANCE	
11180	WOOD	UNKNOWN	NE 138 PL	STREET SIGN ADVANCE	
11454	WOOD	UNKNOWN	NE 138 PL	STREET SIGN ADVANCE	DIFFICULT TO SEE. DIRTY
12448	WOOD	UNKNOWN	NE 143 ST	STREET SIGN ADVANCE	PARTIALLY COVERED BY VEGETATION
9252	WOOD	WD: 12, HT: 18	NO PARKING	NO PARKING (NO ARROWS) - OLD STYLE	
8644	WOOD	UNKNOWN	NO PARKING ANY TIME	NO PARKING ANY TIME - OLD STYLE	
8653	WOOD	UNKNOWN	NO PARKING ANY TIME	NO PARKING ANY TIME - OLD STYLE	
9335	WOOD	WD: 12, HT: 18	NO PARKING ANY TIME	NO PARKING ANY TIME - OLD STYLE	
9339	WOOD	WD: 12, HT: 18	NO PARKING ANY TIME	NO PARKING ANY TIME - OLD STYLE	
9353	WOOD	WD: 12, HT: 18	NO PARKING ANY TIME	NO PARKING ANY TIME - OLD STYLE	
9987	WOOD	WD: 12, HT: 18	NO PARKING ANY TIME	NO PARKING ANY TIME - OLD STYLE	
10012	WOOD	WD: 12, HT: 18	NO PARKING ANY TIME	NO PARKING ANY TIME - OLD STYLE	
10145	WOOD	WD: 12, HT: 18	NO PARKING ANY TIME	NO PARKING ANY TIME - OLD STYLE	
10156	WOOD	WD: 12, HT: 18	NO PARKING ANY TIME	NO PARKING ANY TIME - OLD STYLE	
9956	WOOD	UNKNOWN	NO PARKING AREA BICYCLES PEDESTRIANS ONLY	NO CODE	
8639	WOOD	WD: 12, HT: 18	NO PARKING EAST OF HERE	NO PARKING (E,W,N,S) OF HERE	
12327	WOOD	WD: 12, HT: 18	NO PARKING NORTH OF HERE	NO PARKING (E,W,N,S) OF HERE	
8725	WOOD	WD: 12, HT: 18	NO PARKING ON PAVEMENT	NO PARKING ON PAVEMENT - OLD STYLE	
8733	WOOD	WD: 12, HT: 18	NO PARKING ON PAVEMENT	NO PARKING ON PAVEMENT - OLD STYLE	
8682	LIGHT POLE	UNKNOWN	NO PARKING ON WALKWAY	NO PARKING IN/ON ( )	
8662	WOOD	WD: 12, HT: 18	NO PARKING WEST OF HERE	NO PARKING (E,W,N,S) OF HERE	
9047	WOOD	UNKNOWN	NO SHOULDER DRIVING	NO DRIVING ON SHOULDER	
9509	WOOD	UNKNOWN	NO SHOULDER DRIVING	NO DRIVING ON SHOULDER	
10049	WOOD	UNKNOWN	NO SHOULDER DRIVING	NO DRIVING ON SHOULDER	
9310	OVERHEAD	UNKNOWN	NO TURN ON RED	NO TURN ON RED (WORDS)	
1423	OVERHEAD	WD: 30, HT: 36	ONLY	RIGHT ARROW ONLY	
1424	OVERHEAD	WD: 24, HT: 30	ONLY	LEFT ARR ONLY	
5995	STEEL POST	WD: 30, HT: 36	ONLY	RIGHT ARROW ONLY	
1389	LIGHT POLE	WD: 18, HT: 24	PEDESTRIANS LOOK FOR TURNING VEHICLES	LOOK FOR TURNING VEHICLES	
1421	LIGHT POLE	WD: 18, HT: 24	PEDESTRIANS LOOK FOR TURNING VEHICLES	LOOK FOR TURNING VEHICLES	
1442	LIGHT POLE	WD: 18, HT: 24	PEDESTRIANS LOOK FOR TURNING VEHICLES	LOOK FOR TURNING VEHICLES	
7583	LIGHT POLE	WD: 18, HT: 24	PEDESTRIANS LOOK FOR TURNING VEHICLES	LOOK FOR TURNING VEHICLES	
8698	WOOD	UNKNOWN	REDUCED SPEED 25	REDUCED SPEED __ M.P.H. (SPECIFY MILES)	
968	LIGHT POLE	WD: 30, HT: 30	RIGHT LANE ENDS	RIGHT LANE ENDS (WORDS)	
1074	STEEL POST	WD: 30, HT: 30	RIGHT LANE MUST TURN RIGHT	RIGHT LANE MUST TURN RIGHT	
355	STEEL POST	WD: 24, HT: 30	RIGHT LANE ONLY	RIGHT LANE BIKE ONLY	
1073	LIGHT POLE	WD: 24, HT: 30	RIGHT LANE ONLY	RIGHT LANE BIKE ONLY	
8549	WOOD	WD: 30, HT: 30	SCHOOL BUS STOP AHEAD	SCHOOL BUS STOP AHEAD	
8569	WOOD	WD: 30, HT: 30	SCHOOL BUS STOP AHEAD	SCHOOL BUS STOP AHEAD	
9291	LIGHT POLE	WD: 18, HT: 12	USE CROSSWALK	USE CROSSWALK W/ARR (D)	
9297	WOOD	WD: 18, HT: 12	USE CROSSWALK	USE CROSSWALK W/ARR (D)	
9300	WOOD	WD: 18, HT: 12	USE CROSSWALK	USE CROSSWALK W/ARR (D)	
9305	STEEL POST	WD: 18, HT: 12	USE CROSSWALK	USE CROSSWALK W/ARR (D)	
8953	WOOD	WD: 18, HT: 24	WARNING THIS IS A BLOCK WATCH COMMUNITY / WE IMMEDIATELY REPORT ALL SUSPICIOUS PERSONS AND ACTIVITIES TO OUR POLICE DEPARTMENT	CRIME WATCH	
11895	LIGHT POLE	WD: 24, HT: 48	WELCOME TO KIRKLAND	ENTERING KIRKLAND	



Path: X:\Kirkland, City of\Projects\20120185 - Juanita Drive Corridor Study\GIS\Mapdocs\JuanitaDrive_Signs.mxd

Perteet

0 300 600
Feet

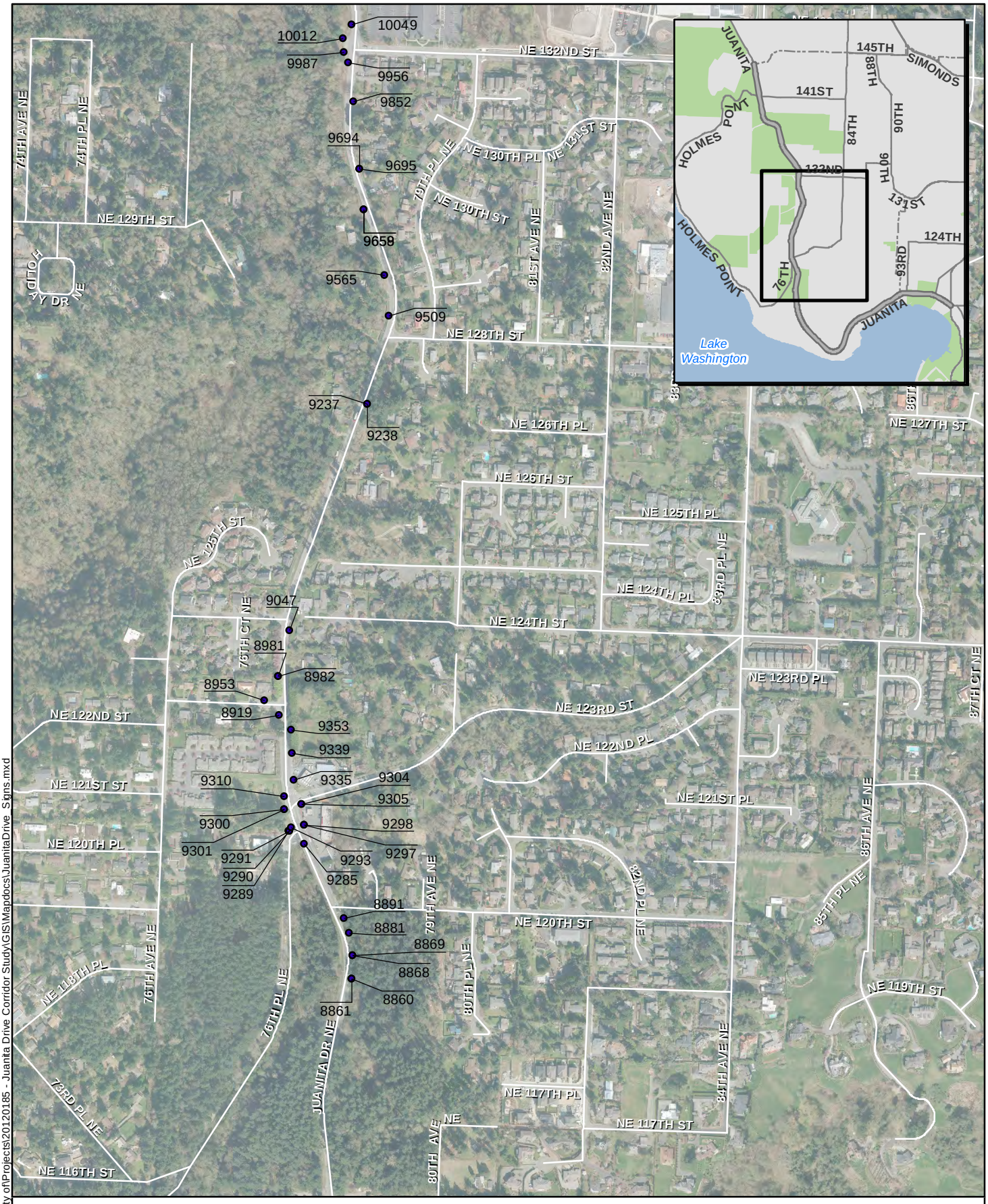
Legend

- Signs

Juanita Drive Corridor Study
Signs Map

Sheet 1 of 4

Source: City of Kirkland; King County;



Path: X:\Kirkland, City of\Projects\20120185 - Juanita Drive Corridor Study\GIS\Mapdocs\JuanitaDrive_Signs.mxd

Perteet

0 300 600
Feet

Legend

- Signs

Juanita Drive Corridor Study
Signs Map

Sheet 2 of 4

Source: City of Kirkland; King County;

Path: X:\Kirkland, City of\Projects\20120185 - Juanita Drive Corridor Study\GIS\Mapdocs\JuanitaDrive_Signs.mxd

Perteet

0 250 500
Feet

Legend

- Signs

Juanita Drive Corridor Study
Signs Map

Sheet 3 of 4

Source: City of Kirkland; King County;

Path: X:\Kirkland, City of\Projects\20120185 - Juanita Drive Corridor Study\GIS\Mapdocs\JuanitaDrive_Signs.mxd

Perteet

0 250 500
Feet

Legend

- Signs

Juanita Drive Corridor Study
Signs Map

Sheet 4 of 4

Source: City of Kirkland; King County;

TRANSPORTATION OPERATIONS

This section provides detailed information about existing transportation operations along Juanita Drive, including traffic flow, safety, and vehicle speeds. The section is organized as follows:

TRAFFIC FLOW

Traffic flow operations were characterized by two measures, corridor traffic volume and intersection level of service.

CORRIDOR TRAFFIC VOLUMES

Data Collection and Methodology

Traffic counts were collected by tube counter at five locations along Juanita Drive:

- West of 98th Avenue NE (February 2013; collected for City of Kirkland)
- West of 93rd Avenue NE (May 2013; collected for Fehr & Peers)
- North of NE 112th Street / 80th Avenue NE (May 2013; collected for Fehr & Peers)
- North of NE 138th Street (May 2013; collected for Fehr & Peers)
- North of NE 141st Street (February 2013; collected for City of Kirkland)

These counts occurred for consecutive 24-hour periods on Tuesday, Wednesday, and Thursday, which represent the most typical weekday traffic conditions. Daily traffic totals for the three days were averaged to obtain the average weekday traffic (AWDT) volumes. AM and PM peak hour traffic counts were calculated by identifying the highest traffic volume each day over a one-hour period between 6 to 9 AM

for AM peak and 3 to 6 PM for PM peak. As with the AWDT measure, peak hour volumes were averaged for the three-day collection period.

Existing 2013 Volumes

The traffic counts show that the southern portion of the corridor experiences the highest traffic demand, with 17,700 AWDT in the vicinity of Juanita Village. Continuing north, demand decreases to 11,100 AWDT in the vicinity of Big Finn Hill Park before increasing to 12,700 AWDT near the shopping center at NE 141st Street.

Peak hour traffic counts show that morning commute traffic on Juanita Drive is heaviest in the southbound direction. Comparable demand occurs northbound during the PM peak hour. In accordance with the daily counts, AM and PM peak hour demand is heaviest near Juanita Village.

2030 Forecast Volumes

By 2030, the number of households in the vicinity of Juanita Drive is expected to increase from 8,000 to 8,700, representing a total increase of 9%. The household growth will be spread throughout the greater Finn Hill area. Employment is expected to increase by a total of 34%, from 1,120 in 2013 to 1,500 in 2030. Most of this employment growth will be concentrated along 100th Avenue NE rather than Juanita Drive.

Based on the expected land use growth, traffic demand along Juanita Drive could grow by 15 to 20 percent during the peak commute period by 2030. It should be noted that traffic growth along the central portion of the corridor will be constrained by the traffic throughput capacity at the southern and northern ends of the corridor. Because traffic demand is already saturated entering Juanita Drive at the 98th Avenue NE intersection at the southern end of the corridor and at Simonds Road NE (in the City of Kenmore) at the northern end, total peak period traffic demand on most portions of the corridor would likely increase by only 5 to 10 percent.

INTERSECTION LEVEL OF SERVICE

Data Collection and Methodology

Intersection turning movement counts were collected at the following Juanita Drive intersections during the AM and PM peak hours:

- NE 141st Street / Holmes Point Drive NE
- NE 132nd Street *(PM peak only)*

- NE 128th Street *(PM peak only)*
- NE 122nd Street
- 76th Place NE / Holmes Point Drive NE
- NE 112th Street/80th Avenue NE
- 97th Avenue NE
- 98th Avenue NE

The counts at NE 132nd Street, NE 128th Street, and NE 112th Street/80th Avenue NE were commisioned in Summer 2013. All other counts were collected in 2011. Collectively, these volumes were used to calculate the level of service (LOS) for each intersection by the methods described below.

The City of Kirkland Comprehensive Plan establishes peak hour intersection level of service (LOS) standards based on a ratio of entering traffic volume to intersection capacity (V/C ratio). The calculation of these V/C ratios has been determined by the City using planning methods from *Transportation Research Circular 212*. For development proposals that stand to add more than a small amount of traffic to City streets, the accompanying traffic impact analysis must use the City's V/C ratio LOS system. By contrast, the Juanita Drive Master Plan is not a development-driven project, so a formal traffic impact analysis with V/C ratio-based is not necessary. Instead, intersection operations along Juanita Drive were calculated in terms of Highway Capacity Manual (HCM) LOS. This measure ranks intersection operating conditions from A to F in terms of total delay per entering vehicle. **Table C-1** provides a detailed summary of these rankings for signal and all-way stop-controlled intersections. It should be noted that LOS at side-street stop-controlled intersections is determined by the movement with the highest average delay per vehicle.

The HCM LOS rankings were calculated using a software package called Syncrho/SimTraffic 7. The Synchro program component calculates delay on an individual intersection basis, while SimTraffic is a more labor-intensive program used to simulate traffic flow through a system of adjacent intersection. Between NE 122nd Street and 98th Avenue NE, intersections were analyzed using SimTraffic because we observed that peak period vehicle queues at certain intersections along this segment often back-up to adjacent intersections. The remaining intersections were analyzed with Synchro.

TABLE C-1: SIGNALIZED AND ALL-WAY STOP INTERSECTION LOS CRITERIA

Level of Service	Description	Delay in Seconds per vehicle
A	Progression is extremely favorable and most vehicles arrive during the green phase. Most vehicles do not stop at all. Short cycle lengths may also contribute to low delay.	< 10.0
B	Progression is good, cycle lengths are short, or both. More vehicles stop than with LOS A, causing higher levels of average delay.	> 10.0 to 20.0
C	Higher congestion may result from fair progression, longer cycle lengths, or both. Individual cycle failures may begin to appear at this level, though many still pass through the intersection without stopping.	> 20.0 to 35.0
D	The influence of congestion becomes more noticeable. Longer delays may result from some combination of unfavorable progression, long cycle lengths, or high V/C ratios . Many vehicles stop, and the proportion of vehicles not stopping declines. Individual cycle failures are noticeable.	> 35.0 to 55.0
E	This level is considered by many agencies to be the limit of acceptable delay. These high delay values generally indicate poor progression, long cycle lengths, and high V/C ratios. Individual cycle failures are frequent occurrences.	> 55.0 to 80.0
F	This level is considered unacceptable with oversaturation, which is when arrival flow rates exceed the capacity of the intersection. This level may also occur at high V/C ratios below 1.0 with many individual cycle failures. Poor progression and long cycle lengths may also be contributing factors to such delay levels.	> 80.0

Source: 2000 Highway Capacity Manual.

Existing 2013 Operations

Results from the existing-year intersection LOS analysis are summarized in **Table C-2**.

The LOS analysis confirms high levels of congestion near Juanita Village. During the AM peak hour, 98th Avenue NE and 97th Avenue NE operate at LOS E and F, respectively. In most jurisdictions that use HCM-based LOS standards, these rankings would exceed the acceptable LOS threshold. During the PM peak hour, the 98th Avenue NE intersection is also heavily congested, but the delay is not as heavy at 97th Avenue NE. This occurs because peak-direction traffic is metered by the heavy congestion at 98th Avenue NE. All other intersections operate at reasonable congestion levels during the AM and PM peak hours, though slow moving, rolling traffic queues are commonly encountered heading southbound towards Juanita Village in the AM peak period and northbound towards the traffic signal at 76th Place NE / Holmes Point Drive NE during the PM peak period.

TABLE C-2: INTRSECTION LEVEL OF SERVICE AND DELAY – EXISTING AM/PM PEAK PERIOD

#	Intersection	AM		PM	
		LOS/Delay[1]	Highest Delay Approach[2]	LOS/Delay[1]	Highest Delay Approach[2]
1	NE 141st Street / Holmes Point Drive NE	B/15		B/14	
2	NE 132nd Street	no data	-	C/19	Westbound
3	NE 128th Street	no data	-	C/21	Westbound
4	NE 122nd Street	**C/28**		**B/13**[4]	
5	76th Pl NE / Holmes Point Drive NE	**A/8**		**C/23**[5]	
6	NE 112th Street/80th Avenue NE	**C/23**	**Westbound**	**C/24**	**Westbound**
7	97th Avenue NE	**F/130**		**B/19**	
8	98th Avenue NE	**E/63**		**E/61**	

[1] In seconds.
[2] Used to calculate LOS and delay at side-street stop sign controlled intersections.
Bolded results were calculated with SimTraffic simulation analysis. Non-bolded results were calculated with Synchro7.

2030 PM Forecast Operations

Based on existing year counts and traffic data from the 2010 and 2030 BKR models, Fehr & Peers developed PM peak hour turning movement forecast for the eight study intersections. The final 2030 turning movement forecasts were calculated by adding the growth between the 2010 and 2030 models to the existing year counts. **Table C-3** summarizes 2030 intersection LOS compared to existing year results.

In 2030, the signalized intersections at 98th Avenue NE and 97th Avenue NE are expected to continue operating at LOS E. Congestion at the 76th Place NE / Holmes Point Drive NE intersection would increase during the commute peak, resulting in longer traffic queues approaching the signal.

TABLE C-3: INTRSECTION LEVEL OF SERVICE AND DELAY – EXISTING AND 2030 PM PEAK HOUR

#	Intersection	Existing		2030 Forecast[3]	
		LOS/Delay[1]	Highest Delay Approach[2]	LOS/Delay[1]	Highest Delay Approach[2]
1	NE 141st Street / Holmes Point Drive NE	B/14		B/17	
2	NE 132nd Street	C/19	Westbound	C/23	Westbound
3	NE 128th Street	C/21	Westbound	D/26	Westbound
4	NE 122nd Street	**B/13[4]**		**B/18[4]**	
5	76th Pl NE / Holmes Point Drive NE	**C/23[5]**		**D/44[5]**	
6	NE 112th Street/80th Avenue NE	**C/24**	**Westbound**	**D/27**	**Westbound**
7	97th Avenue NE	**B/19**		**E/51**	
8	98th Avenue NE	**E/61**		**E/66**	

[1] In seconds.
[2] Used to calculate LOS and delay at side-street stop sign controlled intersections.
[3] Estimate based on corridor travel demand growth in 2030 model compared to 2010 model.
Bolded results were calculated with SimTraffic simulation analysis. Non-bolded results were calculated with Synchro7.

SAFETY – COLLISION ANALYSIS

Juanita Drive traverses steep topography with many twists and turns. The existing roadway geometry, multiple driveway access points, and limited sight distance complicate overall safety conditions along the corridor. Vehicle collision data were collected to determine where these design concerns might translate into safety deficiencies.

DATA COLLECTION AND METHODOLOGY

Vehicle collision data were obtained from the Washington State Department of Transportation (WSDOT) and the City of Kirkland for the entire portion of the Juanita Drive corridor within City limits. The reports provided collision data over a period of four years (January 2009 – December 2012), indicating a total of 142 collisions, an average of 36 collisions per year. The reports also provided various details about the individual collisions, including type, probable cause, severity, time of day, and weather conditions.

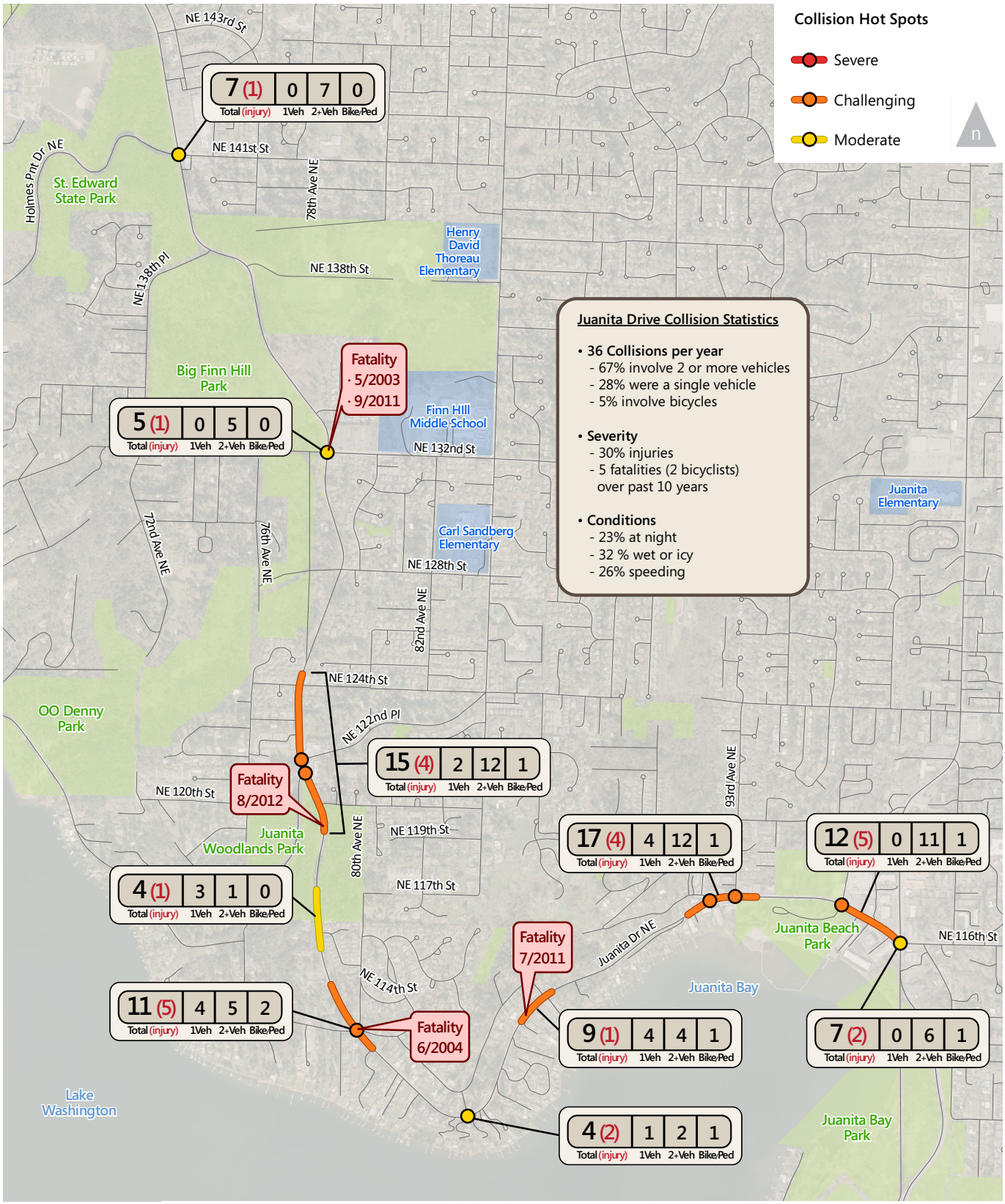
RESULTS

Roadway segments and intersections with at least four collision events over the four year data period are shown as collision "hot spots" in the figure on page C-23. For each hot spot location, the total number of collisions is broken down by the parties involved (i.e., single vehicle; two or more vehicles; or at least one bicycle and/or pedestrian). The number of collisions resulting in at least one injury is listed for each hot spot location. Collisions from 2001 to 2012 that resulted in a fatality are also pinpointed along the corridor. The dates, locations, and contributing circumstances of these collisions are listed below:

- **August 7, 2012, 8:45 PM** – 280 feet S. of NE 120th Street; dry, nighttime conditions; driver under influence traveling southbound, head-on collision with northbound vehicle.
- **September 28, 2011, 11:19 PM** – Near NE 132nd Street intersection; dry, nighttime conditions; single vehicle, exceeding safe speed limit, collides with fixed object outside roadway.
- **July 22, 2011, 3:45 PM** – 400 feet SW of 86th Avenue NE; dry, daylight conditions; heavy vehicle traveling eastbound collides with bicyclist.
- **June 19, 2004, 3:10 PM** – At 112th Street/80th Avenue intersection; dry, daylight conditions; motorcyclist traveling northbound, exceeding safe speed limit, collides with stopped northbound vehicle.
- **May 10, 2003, 3:23 PM** – At NE 132nd Street intersection; dry, daylight conditions; vehicle traveling southbound, exceeding safe speed limit, collides with bicyclist.

Additional corridor-wide collision statistics are summarized in **Table C-4**, including measures of collision severity, collision type, probable cause, weather conditions, and time of day.

The preceding results suggest a number of specific issues that the Corridor Master Plan could address. For example, most of the rear-end collisions occurred at major cross streets where vehicles on Juanita Drive were stopped, waiting to turn left. Examples include the NE 132nd Street and NE 112th Street intersections. Angle collisions occur throughout the corridor where drivers attempt to turn out of side streets or driveways onto Juanita Drive, facing high speed traffic and limited sight distance. Single vehicle and head-on collisions often occurred along segments where speeds exceed safe conditions (see next section). One example location is along the Juanita Woodlands Park.



DRAFT (June 12, 2013)

Juanita Drive Corridor Study
Collisions (2009 - 2012)

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FEHR PEERS

TABLE C-4: JUANITA DRIVE COLLISION STATISTICS

Measure	Number of Collisions (January 2009 – December 2012)	Percent of Total
Total collisions	142	100.0%
Single vehicle collisions	38	26.8%
Rear-end collisions	62	43.7%
Collisions due to speeding	37	26.1%
Bike collisions	7	4.9%
Pedestrian collisions	1	0.7%
Injury collisions	42	29.6%
Fatality collisions	3	2.1%
Driving under the influence (DUI)	9	6.3%
Nighttime collisions	32	23%
Wet/ice/snow conditions	45	32%

Sources: WSDOT (January 2009 – December 2011) and City of Kirkland (January 2012 – December 2012).

SPEED

DATA COLLECTION AND METHODOLOGY

Speed studies were conducted at three locations along Juanita Drive in both the northbound and southbound directions – west of 93rd Avenue NE, north of NE 112th Street / 80th Avenue NE, and north of NE 138th Street. In general northbound travel is uphill and southbound is downhill.

The raw speed data was used to calculate the following measures:

- **Average daily speed –** average travel speed of all motorists over the course of 24 hour day
- **50th percentile speed** – half of motorists travel below this speed, and half of motorists exceed this speed.
- **85th percentile speed** – 85 percent of motorists travel below this speed, and 15 percent of motorists exceed this speed. Typically, the 85th percentile speed is used to establish posted speed limits.

- **Percent of drivers exceeding the speed limit**
- **Percent of drivers traveling at extreme speed** – the percentage of motorists exceeding the speed limit by at least 10 mph)

RESULTS

The figure on page C-26 summarizes directional speed measures at the three data collection locations, including the variation of the 85th percentile speed over the course of 24 hours, the occurrence of drivers traveling at extreme speeds, and the average daily speed. **Table C-5** summarizes the posted speed limit and daily observed 50th and 85th percentile speeds.

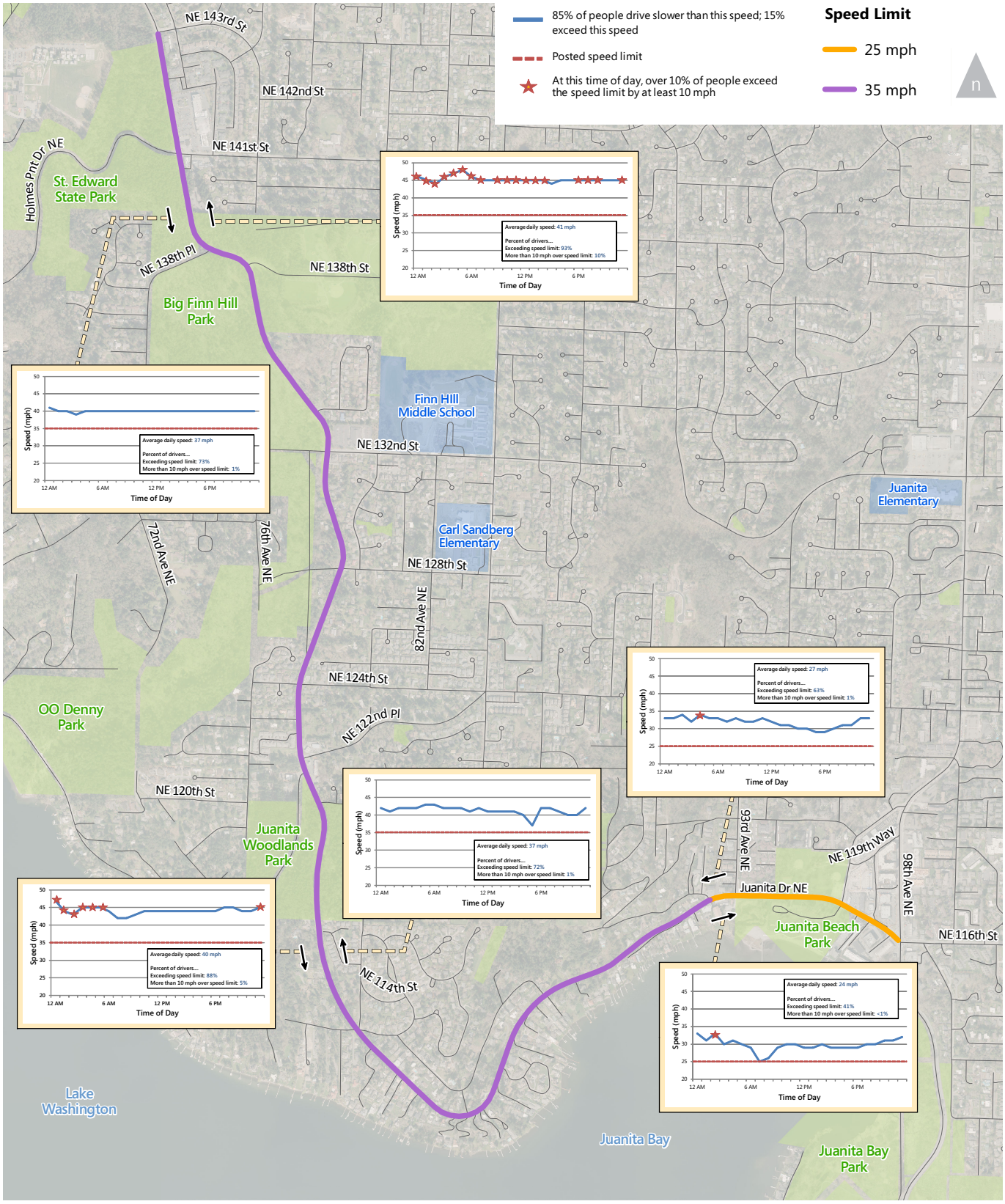
TABLE C-5: OBSERVED CORRIDOR SPEEDS

Location on Juanita Drive	Posted Speed Limit (mph)	50th Percentile Speed (mph)		85th Percentile Speed (mph)	
		Southbound	Northbound	Southbound	Northbound
North[1]	35	37	41	40	45
Central[2]	35	39	38	44	41
South / Juanita Village[3]	25	25	27	29	31

[1] Recorded directly north of NE 138th Street
[2] Recorded directly north of NE 112th Street / 80th Avenue NE
[3] Recorded directly west of NE 93rd Street
Source: Fehr & Peers, 2013.

Results show that the majority of drivers exceed the posted speed limit throughout the study area. Speeding is particularly prevalent in the north and central areas of the corridor, where over 70 percent of drivers exceed the posted speed. Over 10 percent of drivers travel at extreme speeds (10 mph or more over the posted speed) northbound near Big Finn Hill Park and southbound (downhill) in the vicinity of Juanita Woodlands Park. Time of day data associated with the observations indicate that most extreme speeding occurs at night.

The large share of drivers exceeding 40 mph conflicts with the established 35 mph posted speed of Juanita Drive. All of the horizontal curves meet the safety standards of the established 35 mph posted speed, but several curves do not meet the standards for 40 mph travel.



DRAFT (June 12, 2013)

Juanita Drive Corridor Study
Weekday Vehicle Speeds

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