

## Technical Memorandum

**To:** City of Kirkland

**From:** KPG

**Date:** July 28, 2020

**Re:** Transportation Analysis for Juanita Drive Intersection and Safety Improvements

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The Juanita Drive Corridor Study, completed in 2014, conducted a community outreach process, evaluated conditions along the corridor, and made planning-level recommendations for roadway cross-sections, intersection treatments, non-motorized facilities and other improvements.

The Juanita Drive Intersection and Safety Improvements Project is funded to design and construct improvements at select locations along Juanita Drive NE between NE 133rd Street and NE 112th Street. As part of these improvements, the project will construct safety and mobility improvements at the Juanita Drive NE intersections at NE 132nd Street, NE 128th Street, and NE 112th Street-80th Avenue NE. The purpose of the transportation analysis is to provide guidance for the design of these three intersections by identifying traffic control treatments, channelization, non-motorized facilities, turn pocket lengths and other design details.

### Existing Conditions

The three study intersections are located along the southwest portion of Juanita Drive NE. This segment of Juanita Drive NE has one travel lane in each direction, a posted speed limit of 35 miles per hour, and carries approximately 12,000 vehicles on an average weekday. Along this segment, sidewalks are only found at intermittent locations and there are continuous bike lanes. The bike lane on the west side of the street is typically downhill and includes a single painted line and the bike lane on the east side of the street is typically uphill and includes a striped buffer and green paint markings at intersections to indicate a mixing zone.

This section describes the characteristics of the three study intersections.

**NE 132nd Street** forms the east leg of a T-intersection with Juanita Drive NE. The northbound and southbound approaches have a single lane and the westbound approach has stop sign control and separate left turn and right turn lanes. There are sidewalks along the east side of Juanita Drive NE for approximately 300 feet north of NE 132nd Street and on the north side of NE 132nd Street between Juanita Drive NE and 84th Avenue NE, serving the Finn Hill Middle School. The sight distance from NE 132nd Street is limited to the north due to a horizontal curve in the roadway.

**NE 128th Street** forms the east leg of a T-intersection with Juanita Drive NE. Each approach has a single lane and NE 128th Street has stop sign control. There are no sidewalks in the vicinity of the intersection. NE 128th Street provides access to the Carl Sandburg Elementary School. Roadway curvature north of the intersection limits sight distance at the intersection.

**NE 112th Street-80th Avenue NE** forms a 4-leg intersection with Juanita Drive NE. The west leg is NE 112th Street and it has stop sign control, a steep grade approaching the intersection, and good sight distance to the north and south. The east leg is 80th Avenue NE and it has stop sign control and limited sight distance to the north and south. Immediately east (approximately 15 feet) of this intersection is the intersection of 80th Avenue NE and NE 112th Street, which has stop sign control on NE 112th Street. The close spacing between these intersections can lead to potential vehicle conflicts, and make it difficult for westbound vehicles on NE 112th Street to turn left onto 80th Avenue NE and properly align their vehicles to access Juanita Drive NE. The topography also makes right turns from northbound Juanita Drive NE to eastbound NE 112th Street difficult, the sharp curve and steep grade can cause vehicles to “bottom out” when making this maneuver. There are no sidewalks in the vicinity of this intersection.

## Intersection Operations

KPG collected AM and PM peak vehicle and non-motorized counts at the study intersections in September of 2019. The count data is included in Appendix A. The vehicle counts and Synchro (version 10) software were used to analyze peak hour traffic operations at the intersections. For intersections with stop control on the side streets, intersection level of service (LOS) and delay is calculated for the side street with the longest delay. Intersection LOS ranges from A to F, with LOS A assigned when minimal delays are present and LOS F when lengthy delays occur.

Currently, each of the intersections operate at LOS D or better during the AM and PM peak hours.

The analysis also evaluated traffic operations for 2040 conditions. A growth factor of 1.5% per year was applied to existing 2019 traffic volumes to develop 2040 traffic volumes. By 2040, the NE 132nd Street intersection is forecast to operate at LOS F during the AM peak hour and the NE 112th Street-80th Avenue NE intersection is forecast to operate at LOS F during the PM peak hour. At the NE 112th Street-80th Avenue NE intersection, LOS F would be experienced by approximately 30 vehicles at the east leg of the intersection. **Table 1** summarizes the intersection LOS for existing conditions and 2040 conditions without improvements.

**Table 1. Existing and 2040 AM and PM Peak Hour Intersection LOS**

Intersection	AM Peak Hour		PM Peak Hour	
	Existing	2040	Existing	2040
NE 132nd Street	D	F	C	E
NE 128th Street	B	C	C	D
NE 112th St-80th Ave NE	D	E	D	F

Note: LOS reported for the worst stop-controlled approach.

## Collision Data

WSDOT provided five years (2015-2019) of crash data at the three Juanita Drive NE intersections. There was a total of 25 reported collisions at the three intersections. There were no fatal collisions.

The NE 132nd Street intersection experienced the most collisions with 13. Of these, eight were rear-end collisions and five were entering at an angle collisions. All eight rear-end collisions were between two southbound vehicles; vehicle speeds, southbound left turns from the through lane, and limited sight distance are contributing factors in these collisions.

The 128th Street intersection experienced three collisions, all related to a distracted or intoxicated driver hitting a fixed object.

The NE 112th-80th Avenue NE intersection experienced nine collisions. Five of the collisions were rear-ends and two were vehicle-bicycle collisions. While the short distance between the Juanita Drive NE and 80th Avenue NE intersection and the 80th Avenue NE and NE 112th Street intersection is not desirable, it has not resulted in any reported collisions in the past five years.

**Table 2** summarizes the number and type of collisions that occurred at the study intersections.

**Table 2. Five-Year Intersection Collision History**

Collision Type	Rear-End	Entering at Angle	Bike/Ped	Other	Total
NE 132nd Street Intersection	8	4		1	13
NE 128th Street Intersection				3	3
NE 112th St-80th Ave NE Intersection	5	1	2	1	9

Source: WSDOT 2015-2019

## Improvement Options and Recommendations

KPG reviewed the Juanita Drive Corridor Study and the worked with City of Kirkland staff to evaluate improvements options and recommend safety and mobility improvements at the study intersections. The evaluation of improvements considered safety, non-motorized facilities, traffic operations, right of way and property impacts, environmental impacts, utilities, and the constructability and cost of improvements.

In addition to improvements at the three study intersections, the project will add a continuous pedestrian path and maintain the existing buffered bike lanes along the east side of Juanita Drive NE between NE 133rd Street and NE 124th Street. Drawings for each of the recommended intersection improvements are included in Appendix B and are included as part of the overall Juanita Drive plan set.

### NE 132nd Street Intersection

This intersection provides access to two schools, a church, and residential neighborhoods. The westbound left turn has limited sight distance in both directions. Without improvements, the westbound left turn movement is forecast to operate at LOS F during the 2040 AM peak hour.



*Looking south towards the Juanita Drive NE and NE 132nd Street intersection.*

Of the improvement alternatives, the lowest-cost option is to add a southbound left turn lane. This improvement would help reduce the exposure for southbound rear-end collisions. This option was not selected because it would not address the sight distance issue or delays for westbound left turning vehicles.

A second option would be to add a single-lane roundabout at the intersection. A roundabout would address the southbound and westbound left turn safety and operational issues, and would provide traffic calming. A roundabout would need to have a sufficient diameter to accommodate school buses without mounting the center island. The splitter island for the roundabout would likely restrict southbound left turns into the driveway located in the southeast corner of the intersection. The roundabout option was not selected because it would have the greatest property and right of way impacts and highest cost to construct the improvements.

The recommended option is a southbound left turn lane with a flying-T treatment. This option will provide safety, access, and operational improvements with fewer property impacts and a lower construction cost compared to the roundabout option. Appendix B includes a layout of the recommended option for the intersection.

The southbound left turn lane will reduce the exposure for southbound rear-end collisions. The flying-T treatment provides a receiving lane for westbound left turning vehicles to make a two-stage left turn; vehicles would first find a gap in northbound traffic, turn into the receiving lane, and then merge with southbound traffic. The two houses located on the east side of Juanita

Drive NE, south of NE 132nd Street will be able to use the southbound receiving lane to access their driveways.

The recommended length of the southbound left turn lane is 160 feet. An analysis of the left turn pocket lengths is included in Appendix C. Widening for the southbound left turn lane and receiving lane will require the acquisition of narrow strips of right of way along the east side of Juanita Drive NE, both north and south of NE 132nd Street.

This improvement is consistent with the Juanita Drive Corridor Study, which recommended the addition of a southbound left turn lane. The Juanita Drive Corridor Study also recommended a marked crossing of Juanita Drive NE at this intersection that would connect to a future trail improvement through Big Finn Hill Park providing a non-motorized connection to the segment of NE 132nd Street located to the west of the Park. Because the trail improvements are not funded and not included in the scope of this project, the recommended improvement for this intersection does not include a marked crosswalk at this time. The recommended improvement will be designed so that a marked crosswalk can be added to the north leg of the intersection as part of a future project phase.

In addition to the intersection improvements, Juanita Drive NE has a curve north of the intersection and adding candlesticks along the west side of the curve will better delineate the southbound bike lane from the travel lane. Southbound vehicles have been observed to encroach into the bike lane. This treatment is used at another curve on Juanita Drive NE farther south near 83rd Avenue NE.

**Table 3** compares the 2040 AM and PM peak hour operations at the intersection for the improvement options. The addition of a southbound left turn lane would improve safety, but would not improve operations for the westbound left turn movement and it would operate at LOS F during the AM peak hour. The roundabout would provide the highest level of operational performance at the intersection. The flying-T treatment provides a center receiving lane that enables the westbound left turn movement to yield to one direction of traffic at a time, which will improve intersection LOS to C.

**Table 3. 2040 LOS at the NE 132nd Street Intersection by Improvement Option**

Improvement Options	2040 AM Peak Hour	2040 PM Peak Hour
No Change*	F	E
Left Turn Lane*	F	E
Roundabout**	A	A
Left Turn Lane with Flying-T Treatment*	C	C

\*LOS reported for the worst stop-controlled approach.

\*\*LOS is the average for the intersection and is calculated with Sidra software.



### NE 128th Street Intersection

NE 128th Street has approximately half the traffic volume of NE 132nd Street at the study intersections. Without improvements, the intersection is forecast to continue to operate at LOS D or better during the 2040 AM and PM peak hours.

The NE 128th Street intersection experienced three collisions in the past five years, all related to a distracted or intoxicated driver hitting a fixed object.

KPG evaluated several improvement options for the intersection. The recommended improvement is adding a 110' southbound left turn lane at the intersection. This improvement is consistent with the Juanita Drive Corridor Study. The southbound left turn lane will reduce the exposure for southbound rear-end collisions. Widening for the southbound left turn lane will require the acquisition of narrow strips of right of way along the east side of Juanita Drive NE, south of NE 128th Street. Appendix B includes a layout of the recommended option for the intersection.



*Looking south towards the Juanita Drive NE and NE 128th Street intersection.*

Other improvement options evaluated included a single-lane roundabout and a southbound left turn lane with a flying-T treatment. These options would improve safety and operations, but neither is recommended due to the low traffic volumes on NE 128th Street, relatively low collision history, and greater property impacts and construction cost. In addition, the roundabout's splitter islands would restrict approximately three nearby driveways to right in and right out movements only. The flying-T's southbound receiving lane may limit two or three westside driveways, south of NE 128th Street, to right in and right out movements only.

### NE 112nd Street/80th Avenue NE Intersection

Just east (approximately 15 feet) of the Juanita Drive NE and 80th Avenue NE intersection is the intersection of 80th Avenue NE and NE 112th Street. The spacing between these intersections can lead to potential vehicle conflicts and make select turning movements challenging.

KPG evaluated improvement options that would simplify vehicle movements by changing segments of either 80th Avenue NE or NE 112th Street to one-way operations. KPG also evaluated options that would close either 80th Avenue NE or NE 112th Street just before the intersection. Closing either of these streets would create a cul-de-sac and require sufficient space for vehicles to turn around. These options were not selected because the options would divert traffic to other neighborhood streets and result in longer travel distances.



*Looking northeast towards the Juanita Drive NE and NE 80th Avenue intersection.*

The recommended improvement will reconstruct and realign the streets east of the intersection to improve vehicle turning movements and safety. The improvement increases the space between the intersections, improves the alignment of NE 112th Street, and regrades the streets to better facilitate northbound right turns from Juanita Drive NE. Appendix B includes a layout of the recommended option for the intersection. This improvement is consistent with the Juanita Drive Corridor Study.

The improvements will require right of way from two properties east of the 80th Avenue NE and NE 112th Street intersection, removal of trees, regrading of side streets and driveways, and construction of retaining walls.

The recommended improvements do not include sidewalks or left turn lanes on Juanita Drive NE due to steep slopes, limited space at this intersection, and low turning volumes. Including sidewalks or left turn lanes would require widening the Juanita Drive NE roadway, which would significantly increase property impacts, project costs, and would cause grades on side streets to become even steeper.

## Appendix A: Intersection Count Data





Prepared for: **KPG**  
**Traffic Count Consultants, Inc.**

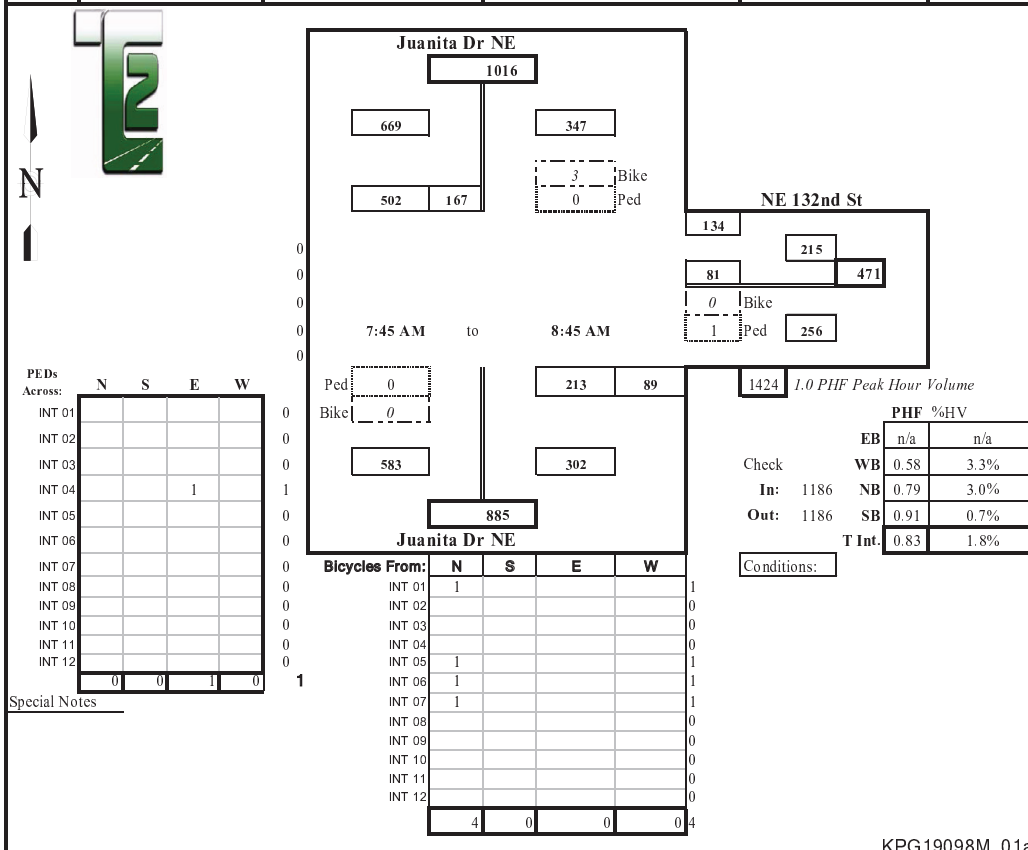
Phone: (253) 770-1407 FAX: (253) 770-1411 E-Mail: Team@TC2inc.com

WBE/DBE

**Intersection:** Juanita Dr NE & NE 132nd St  
**Location:** Kirkland, Washington

**Date of Count:** Tues 9/10/2019  
**Checked By:** Jess

Time Interval Ending at	From North on (SB) Juanita Dr NE				From South on (NB) Juanita Dr NE				From East on (WB) NE 132nd St				From West on (EB) 0				Interval Total
	T	L	S	R	T	L	S	R	T	L	S	R	T	L	S	R	
7:15 A	1	35	192	0	2	0	30	12	1	5	0	12	0	0	0	0	286
7:30 A	4	43	212	0	0	0	35	22	0	3	0	8	0	0	0	0	323
7:45 A	1	35	154	0	3	0	41	19	0	3	0	8	0	0	0	0	260
8:00 A	1	38	127	0	4	0	44	7	1	9	0	16	0	0	0	0	241
8:15 A	1	68	116	0	2	0	57	31	1	13	0	34	0	0	0	0	319
8:30 A	2	42	126	0	2	0	59	37	2	35	0	57	0	0	0	0	356
8:45 A	1	19	133	0	1	0	53	14	3	24	0	27	0	0	0	0	270
9:00 A	2	31	112	0	2	0	46	15	0	5	0	8	0	0	0	0	217
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
9:45 A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:00 A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Survey	13	311	1172	0	16	0	365	157	8	97	0	170	0	0	0	0	2272
Peak Hour: 7:45 AM to 8:45 AM																	
Total	5	167	502	0	9	0	213	89	7	81	0	134	0	0	0	0	1186
Approach	669				302				215				0				1186
%HV	0.7%				3.0%				3.3%				n/a				1.8%
PHF	0.91				0.79				0.58				n/a				0.83





Prepared for: **KPG**  
**Traffic Count Consultants, Inc.**

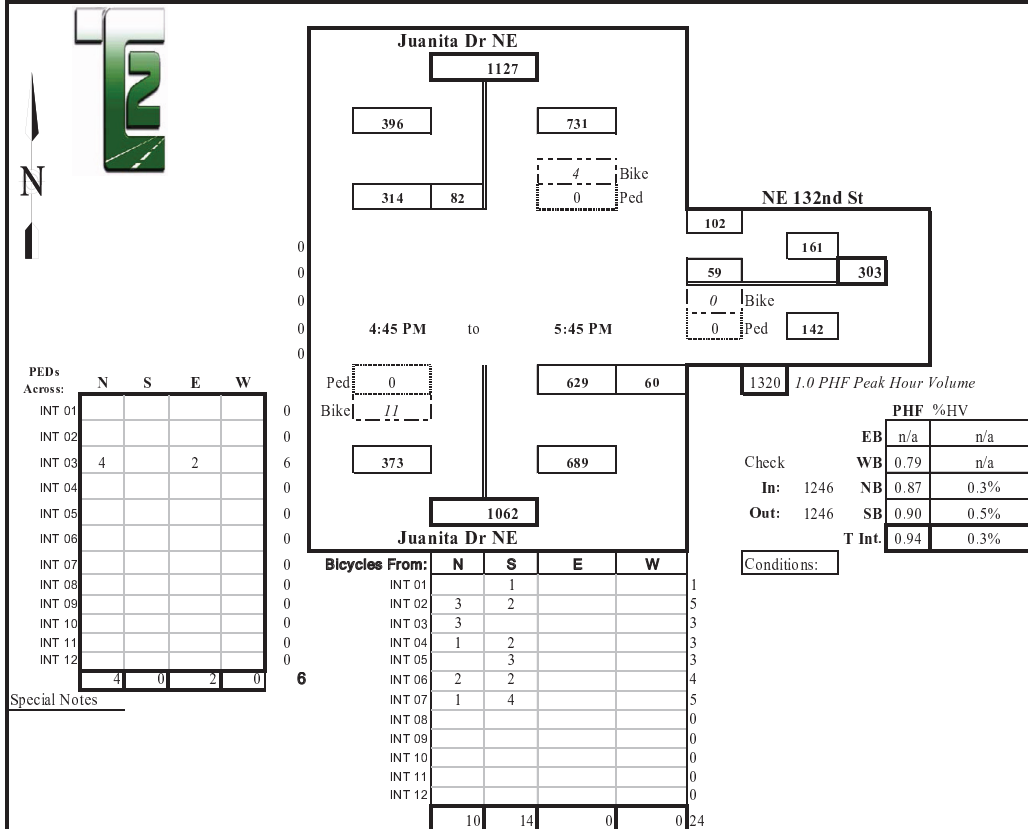
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WBE/DBE

**Intersection:** Juanita Dr NE & NE 132nd St  
**Location:** Kirkland, Washington

**Date of Count:** Tues 9/10/2019  
**Checked By:** Jess

Time Interval Ending at	From North on (SB) Juanita Dr NE				From South on (NB) Juanita Dr NE				From East on (WB) NE 132nd St				From West on (EB) 0				Interval Total
	T	L	S	R	T	L	S	R	T	L	S	R	T	L	S	R	
4:15 P	3	21	77	0	1	0	157	10	3	11	0	23	0	0	0	0	299
4:30 P	1	13	85	0	0	0	172	16	0	3	0	17	0	0	0	0	306
4:45 P	0	14	76	0	1	0	157	26	0	3	0	16	0	0	0	0	292
5:00 P	0	17	75	0	0	0	160	15	0	21	0	30	0	0	0	0	318
5:15 P	0	17	93	0	0	0	144	14	0	6	0	25	0	0	0	0	299
5:30 P	2	25	70	0	2	0	181	16	0	15	0	23	0	0	0	0	330
5:45 P	0	23	76	0	0	0	144	15	0	17	0	24	0	0	0	0	299
6:00 P	1	23	72	0	0	0	169	9	0	1	0	27	0	0	0	0	301
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
Total Survey	7	153	624	0	4	0	1284	121	3	77	0	185	0	0	0	0	2444
Peak Hour: 4:45 PM to 5:45 PM																	
Total	2	82	314	0	2	0	629	60	0	59	0	102	0	0	0	0	1246
Approach	396				689				161				0				1246
%HV	0.5%				0.3%				n/a				n/a				0.3%
PHF	0.90				0.87				0.79				n/a				0.94



Prepared for:

**KPG**

*Traffic Count Consultants, Inc.*

Phone: (253) 770-1407 FAX: (253) 770-1411 E-Mail: [Team@TC2inc.com](mailto:Team@TC2inc.com)

WBE/DBE

<b>Intersection:</b>	Juanita Dr NE & NE 128th St
<b>Location:</b>	Kirkland, Washington

**Date of Count:** Tues 9/10/2019  
**Checked By:** Jess

[illegible]

Total Survey	14	56	1202	0	16	0	479	45	2	35	0	40	0	0	0	0	1857
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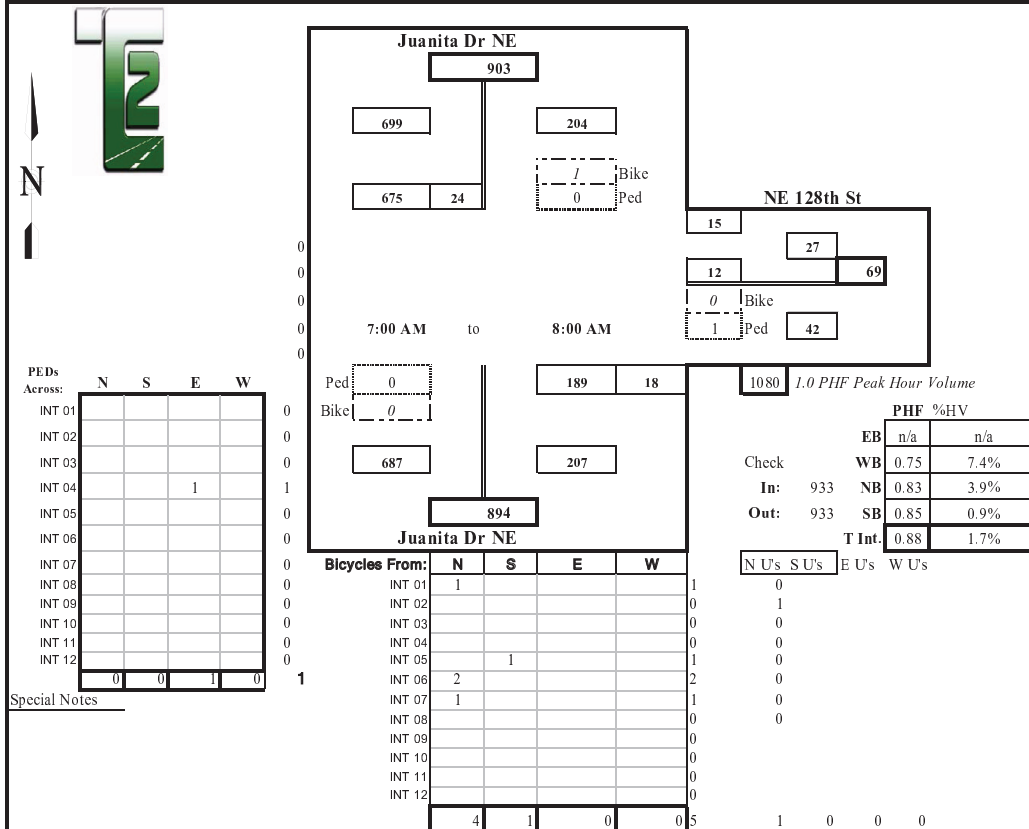
	Peak Hour: 7:00 AM to 8:00 AM
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Total	6	24	675	0	8	0	189	18	2	12	0	15	0	0	0	0	933
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Approach	699	207	27	0	933
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%HV	0.9%	3.9%	7.4%	n/a	1.7%
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PHF	0.85	0.83	0.75	n/a	0.88
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Prepared for:

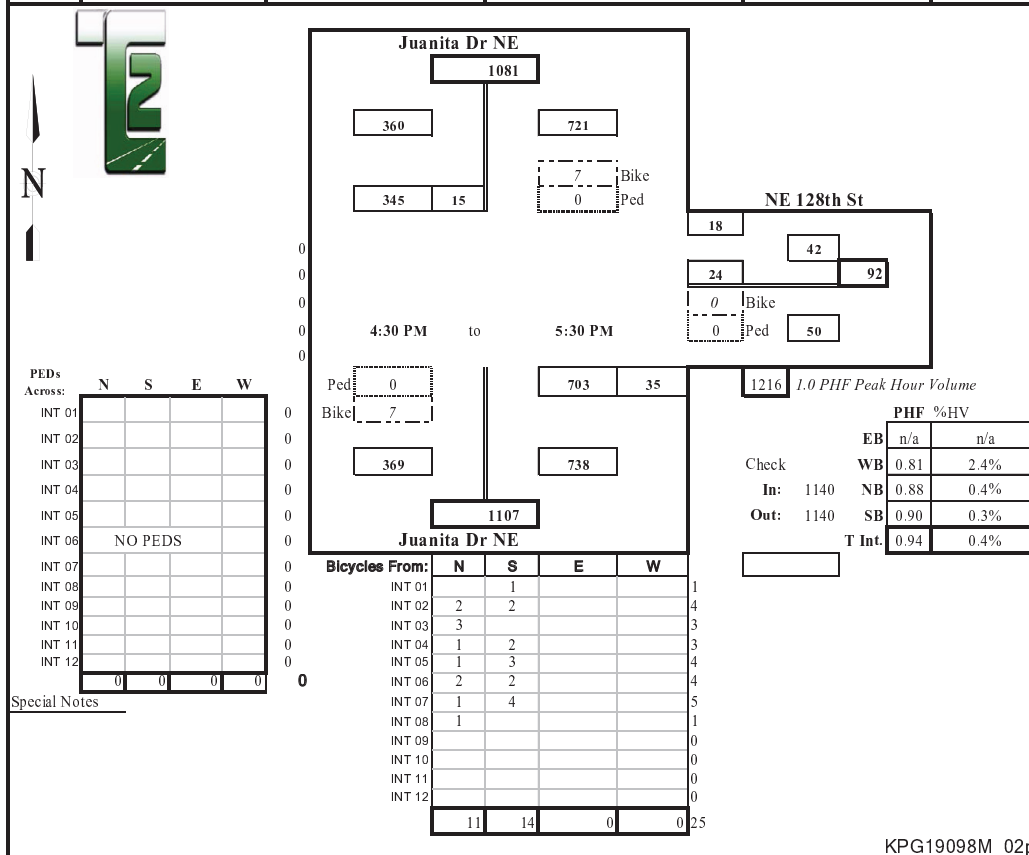
**KPG****Traffic Count Consultants, Inc.**

Phone: (253) 770-1407 FAX: (253) 770-1411 E-Mail: Team@TC2inc.com

WBE/DBE

**Intersection:** Juanita Dr NE & NE 128th St**Date of Count:** Tues 9/10/2019**Location:** Kirkland, Washington**Checked By:** Jess

Time Interval Ending at	From North on (SB) Juanita Dr NE				From South on (NB) Juanita Dr NE				From East on (WB) NE 128th St				From West on (EB) 0				Interval Total
	T	L	S	R	T	L	S	R	T	L	S	R	T	L	S	R	
4:15 P	2	5	90	0	1	0	162	5	0	13	0	13	0	0	0	0	288
4:30 P	0	4	85	0	0	0	177	13	0	7	0	2	0	0	0	0	288
4:45 P	0	2	77	0	1	0	184	7	0	6	0	6	0	0	0	0	282
5:00 P	0	3	94	0	0	0	165	9	1	2	0	4	0	0	0	0	277
5:15 P	0	4	96	0	0	0	154	10	0	9	0	4	0	0	0	0	277
5:30 P	1	6	78	0	2	0	200	9	0	7	0	4	0	0	0	0	304
5:45 P	0	4	91	0	0	0	156	8	0	5	0	3	0	0	0	0	267
6:00 P	0	4	68	0	0	0	186	6	0	4	0	0	0	0	0	0	268
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
Total Survey	3	32	679	0	4	0	1384	67	1	53	0	36	0	0	0	0	2251
Peak Hour: 4:30 PM to 5:30 PM																	
Total	1	15	345	0	3	0	703	35	1	24	0	18	0	0	0	0	1140
Approach	360				738				42				0				1140
%HV	0.3%				0.4%				2.4%				n/a				0.4%
PHF	0.90				0.88				0.81				n/a				0.94



KPG19098M\_02p



Traffic Count Consultants, Inc.

## Vehicle Volume Summary

DBE/WBE

Phone: (253) 770-1407 E-Mail: Team@TC2inc.com

Date of Count:

Tues 9/10/2019

Checked By:

Jess

Intersection: Juanita Dr NE & 80th Ave NE & NE 112th St

Location: Kirkland, Washington

Time Interval	From North (SB) Juanita Dr NE						From NE (SWB) 80th Ave NE						From E (WB) NE 112th St						From South (NB) Juanita Dr NE						From W (EB) NE 112th St						0						Interval Total		
Ends at	T	O	R	Thru	SL	HL	T	HR	O	SR	SL	HL	T	HR	SR	O	Thru	L	T	HR	SR	Thru	O	L	T	R	Thru	SL	HL	O	O	O	O	O	O	O	O		
7:15 A	3	0	0	245	0	6	0	1	0	0	1	0	0	0	2	0	0	3	1	0	2	34	0	0	0	4	0	0	2	0	0	0	0	0	0	0	0	0	300
7:30 A	4	0	0	191	3	0	1	1	0	0	2	3	0	1	2	0	0	1	1	0	1	43	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	251	
7:45 A	0	0	0	221	1	1	0	1	0	0	2	2	0	0	2	0	0	0	3	0	2	53	0	1	0	3	2	0	1	0	0	0	0	0	0	0	0	292	
8:00 A	2	0	0	179	2	2	0	1	0	0	2	3	0	0	1	0	0	1	3	0	0	53	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	245	
8:15 A	0	0	1	169	8	1	1	0	0	0	5	2	0	0	5	0	0	2	4	0	2	91	0	0	0	2	0	0	2	0	0	0	0	0	0	0	0	290	
8:30 A	2	0	0	186	1	0	2	1	0	0	3	0	0	1	3	0	0	0	5	0	1	89	0	0	0	1	0	0	2	0	0	0	0	0	0	0	0	288	
8:45 A	0	0	2	162	6	0	1	1	0	0	3	5	0	0	3	0	1	1	0	2	0	53	0	1	0	2	0	0	1	0	0	0	0	0	0	0	0	243	
9:00 A	1	0	2	168	2	1	1	1	0	0	4	2	0	1	1	0	0	1	1	1	1	64	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	251	
9:15 A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	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	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
9:45 A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
10:00 A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		

Total Survey	12	0	5	1521	23	11	6	7	0	0	22	17	0	3	19	0	1	9	18	3	9	480	0	4	0	16	2	0	8	0	0	0	0	0	0	0	0	0	2160
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						7:30 A		to		8:30 A		Peak Hour Summary																																			
Total	4	0	1	755	12	4	3	3	0	0	12	7	0	1	11	0	0	3	15	0	5	286	0	1	0	7	2	0	5	0	0	0	0	0	0	0	1115										
Approach						772						22						15						292						14						0						1115					
%HV	0.5%						13.6%						n/a						5.1%						n/a						n/a						2.0%										
PHF						0.87						0.79						0.54						0.78						0.58						n/a						0.95					
Peds Total Survey						0						0						3						0						0						0						3					
Prepared For:						KPG																								KPG19098M_03a																	

### Pedestrians

Int'l...	N	S	E	W	NE	Totals
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	3	0	0	3
6	0	0	0	0	0	0
7	0	0	0	0	0	0
8	0	0	0	0	0	0
9	0	0	0	0	0	0
10	0	0	0	0	0	0
11	0	0	0	0	0	0
12	0	0	0	0	0	0
	0	0	3	0	0	3

### Bicycles

Int'l...	N	S	E	W	NE	Totals
1	0	0	0	0	0	0
2	2	0	0	0	0	2
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	1	0	0	0	1
6	3	0	0	0	0	3
7	1	0	0	0	0	1
8	0	0	0	0	0	0
9	0	0	0	0	0	0
10	0	0	0	0	0	0
11	0	0	0	0	0	0
12	0	0	0	0	0	0
	6	1	0	0	0	7



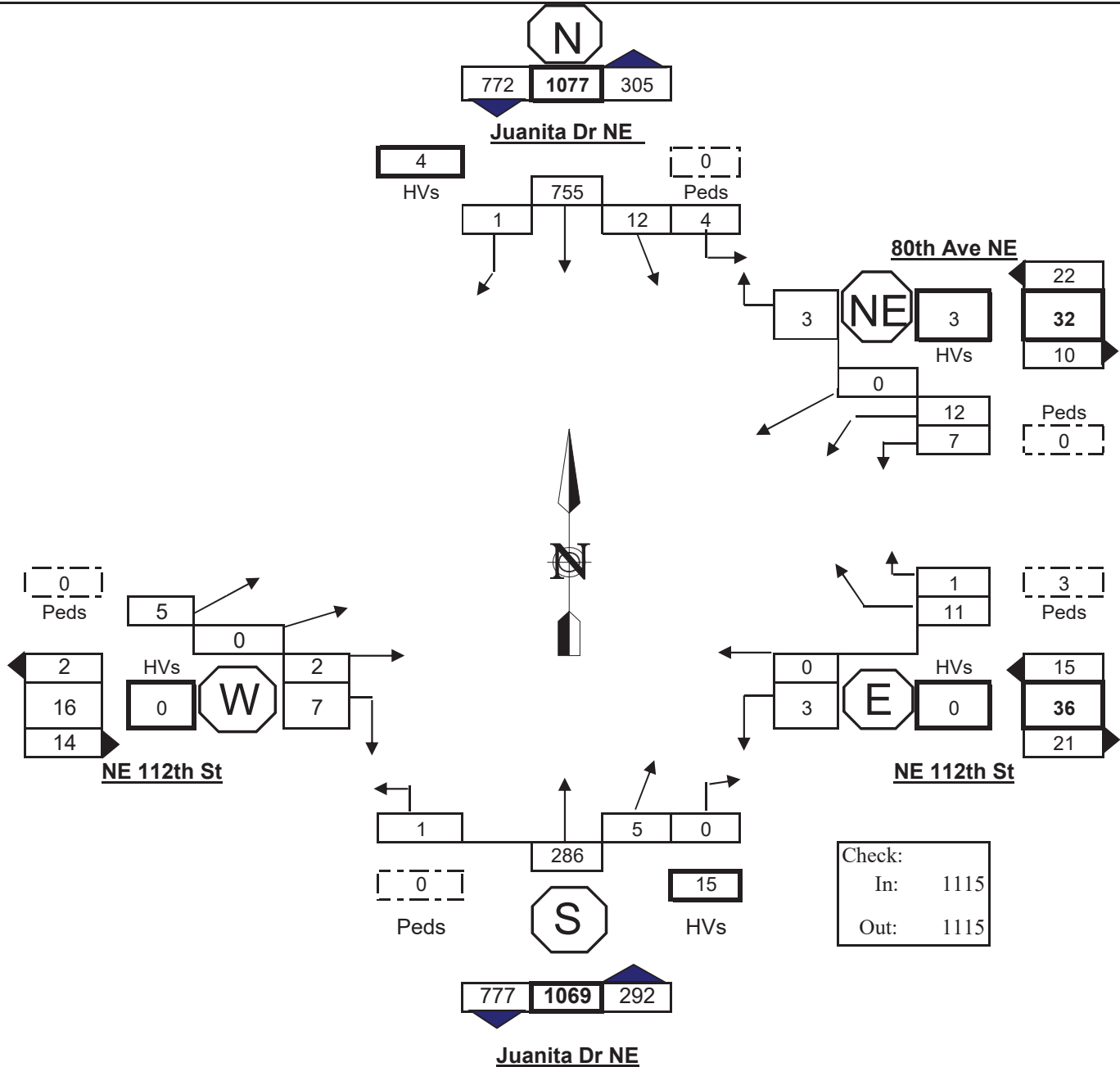


**Traffic Count Consultants, Inc.**

DBE/WBE

Phone: (253) 770-1407

E-Mail: Team@TC2inc.com



**Intersection:** Juanita Dr NE & 80th Ave NE & NE 112th St

**Location:** Kirkland, Washington

**Date of Count:** Tues 9/10/2019

**Peak Period:** 7:30 A - 8:30 A

**Checked By:** Jess

**Prepared For:** KPG

	%HV	PHF
SB	0.5%	0.87
SWB	13.6%	0.79
WB	n/a	0.54
NB	5.1%	0.78
EB	n/a	0.58
	n/a	n/a
Intersection	2.0%	0.95

KPG19098M\_03a



Traffic Count Consultants, Inc.

## Vehicle Volume Summary

DBE/WBE

Phone: (253) 770-1407 E-Mail: Team@TC2inc.com

Date of Count:

Tues 9/10/2019

Checked By:

Jess

Intersection: Juanita Dr NE & 80th Ave NE & NE 112th St

Location: Kirkland, Washington

Time Interval Ends at	From North (SB) Juanita Dr NE						From NE (SWB) 80th Ave NE						From E (WB) NE 112th St						From South (NB) Juanita Dr NE						From W (EB) NE 112th St						0						Interval Total		
	T	O	R	Thru	SL	HL	T	HR	O	SR	SL	HL	T	HR	SR	O	Thru	L	T	HR	SR	Thru	O	L	T	R	Thru	SL	HL	O	O	O	O	O	O	O			
4:15 P	2	0	2	139	3	0	0	0	0	0	2	0	0	0	1	0	0	0	0	0	0	1	202	0	2	0	3	0	0	2	0	0	0	0	0	0	0	0	357
4:30 P	1	0	0	111	2	0	1	0	0	0	2	0	0	0	3	0	0	0	2	2	3	238	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	362	
4:45 P	1	0	0	95	2	0	0	1	0	0	3	0	0	0	1	0	0	0	2	1	5	229	0	2	0	1	0	0	1	0	0	0	0	0	0	0	0	341	
5:00 P	0	0	1	102	1	0	0	1	0	0	2	0	0	0	2	0	0	0	0	3	13	215	0	5	0	1	0	0	0	0	0	0	0	0	0	0	0	346	
5:15 P	1	0	1	127	3	0	1	0	0	0	2	0	0	0	2	0	0	3	1	0	8	229	0	5	0	1	0	0	0	0	0	0	0	0	0	0	0	381	
5:30 P	1	0	0	109	1	0	2	0	0	0	3	0	0	0	1	0	0	1	1	3	9	249	0	3	0	2	0	0	2	0	0	0	0	0	0	0	0	383	
5:45 P	0	0	1	106	4	0	1	2	0	0	1	0	0	1	1	0	0	1	1	2	8	237	0	3	0	1	0	0	0	0	0	0	0	0	0	0	0	368	
6:00 P	1	0	2	79	1	1	1	0	0	0	1	0	0	0	1	0	0	0	0	2	6	250	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	345	
6:15 P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
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6:45 P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	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	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		

Total Survey	7	0	7	868	17	1	6	4	0	0	16	0	0	1	12	0	0	5	7	13	53	1849	0	23	0	9	0	0	5	0	0	0	0	0	0	0	0	2883
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						4:45 P	to			5:45 P	Peak Hour Summary																																				
Total	2	0	3	444	9	0	4	3	0	0	8	0	0	1	6	0	0	5	3	8	38	930	0	16	0	5	0	0	2	0	0	0	0	0	0	1478											
Approach	456					11					12					992					7					0					1478																
%HV	0.4%					36.4%					n/a					0.3%					n/a					n/a					0.6%																
PHF	0.87					0.92					0.60					0.94					0.44					n/a					0.96																
Peds Total Survey						1					0					2					1					0					0					4											
Prepared For:						KPG																							KPG19098M_03p																		

### Pedestrians

Int'l...	N	S	E	W	NE	Totals
1	0	0	0	0	0	0
2	0	1	0	0	0	1
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	1	0	0	0	0	1
6	0	0	0	0	0	0
7	0	0	0	0	0	0
8	0	0	2	0	0	2
9	0	0	0	0	0	0
10	0	0	0	0	0	0
11	0	0	0	0	0	0
12	0	0	0	0	0	0
	1	1	2	0	0	4

### Bicycles

Int'l...	N	S	E	W	NE	Totals
1	0	3	0	0	0	3
2	2	0	0	0	0	2
3	5	1	0	0	0	6
4	1	2	0	0	0	3
5	1	7	0	0	0	8
6	0	3	0	0	0	3
7	1	2	0	0	0	3
8	0	4	0	0	0	4
9	0	0	0	0	0	0
10	0	0	0	0	0	0
11	0	0	0	0	0	0
12	0	0	0	0	0	0
	10	22	0	0	0	32

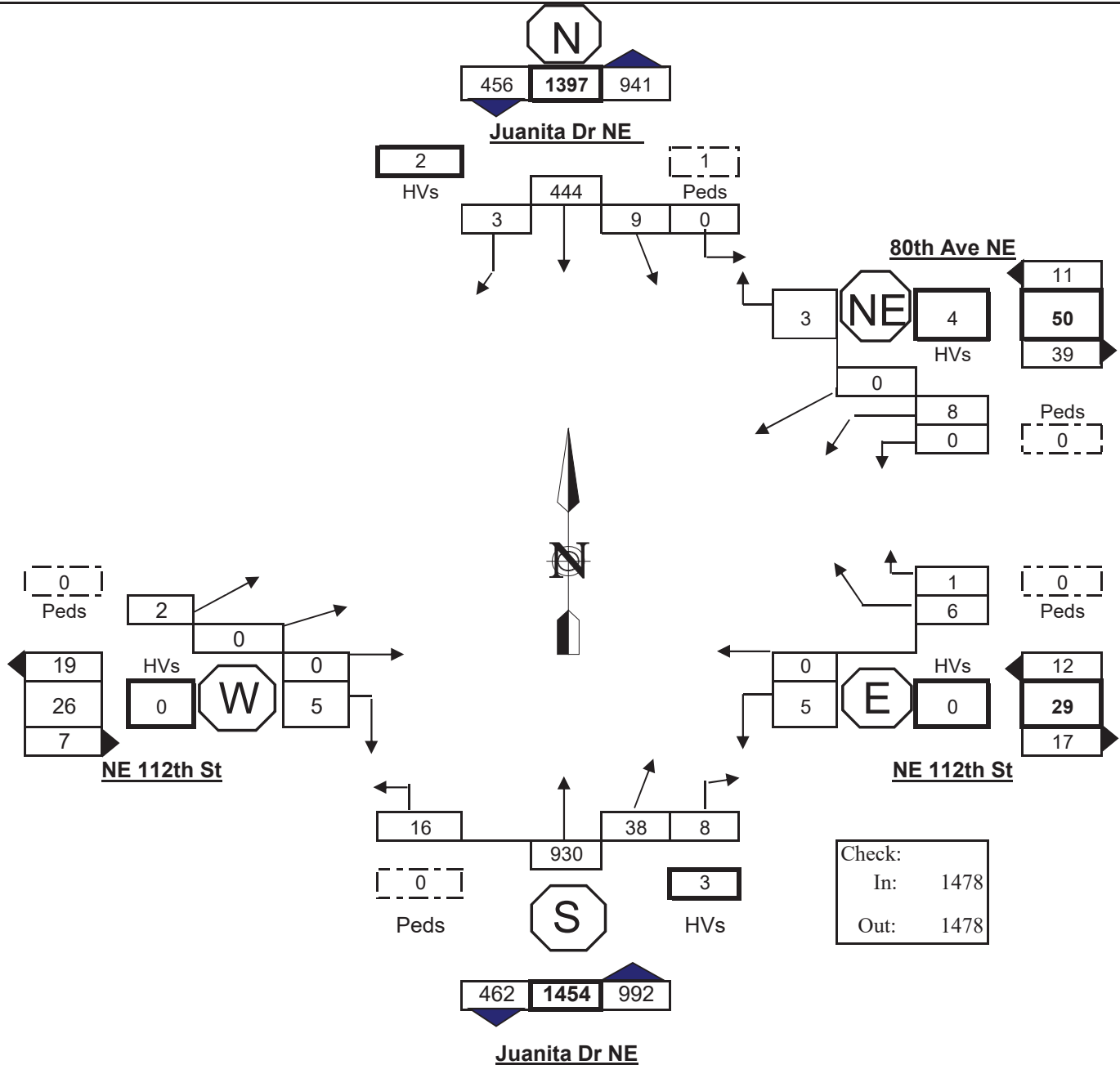


**Traffic Count Consultants, Inc.**

DBE/WBE

Phone: (253) 770-1407

E-Mail: Team@TC2inc.com



**Intersection:** Juanita Dr NE & 80th Ave NE & NE 112th St

**Location:** Kirkland, Washington

**Date of Count:** Tues 9/10/2019

**Peak Period:** 4:45 P - 5:45 P

**Checked By:** Jess

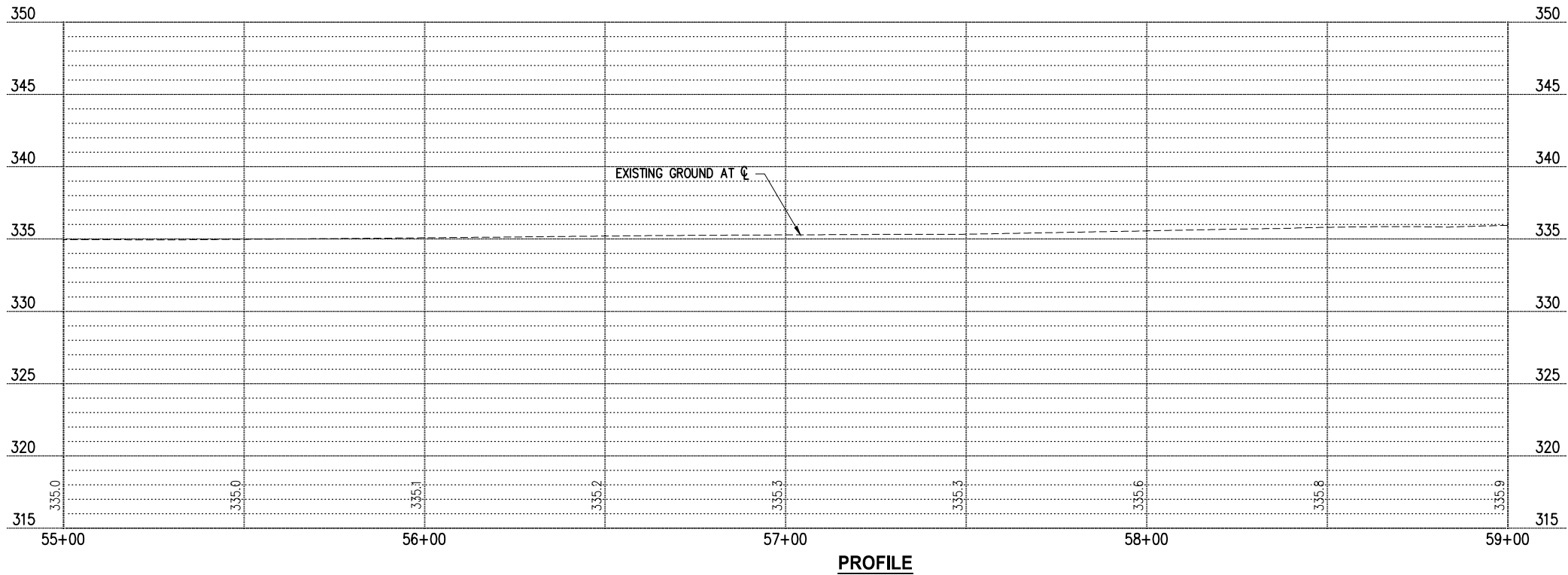
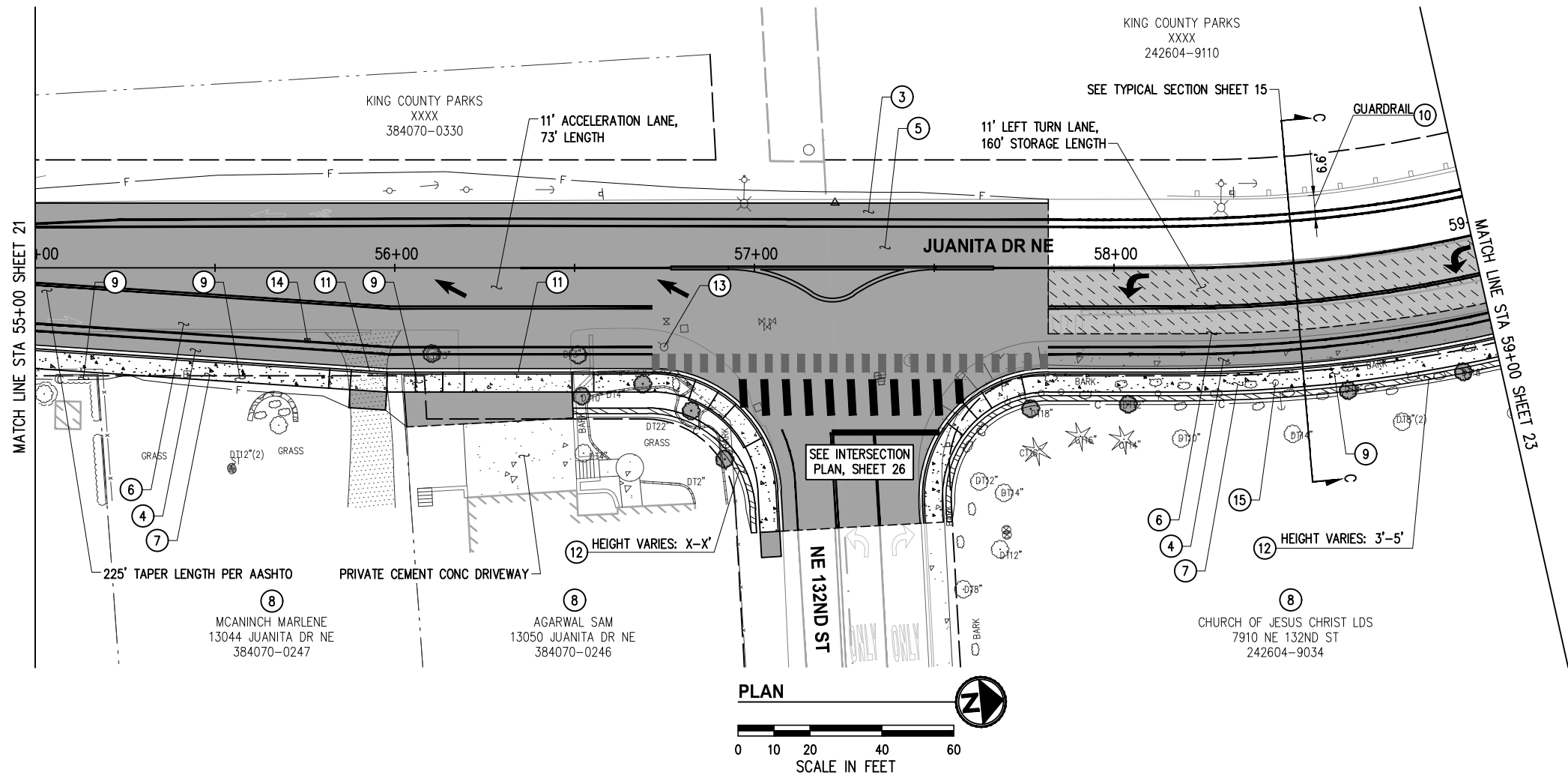
**Prepared For:** KPG

	%HV	PHF
SB	0.4%	0.87
SWB	36.4%	0.92
WB	n/a	0.60
NB	0.3%	0.94
EB	n/a	0.44
	n/a	n/a
Intersection	0.6%	0.96

KPG19098M\_03p

## Appendix B: Conceptual Designs

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### GENERAL NOTES

- DESIGN OF NEW STORMWATER CONVEYANCE SYSTEM TO BE INCLUDED IN FINAL DESIGN PHASE.
- WHERE EXISTING CENTERLINE RUMBLE STRIPS ARE IN CONFLICT WITH PROPOSED CHANNELIZATION, EXTEND GRIND & OVERLAY AS SHOWN TO REMOVE RUMBLE STRIPS.
- WIDEN PEDESTRIAN PATH AT VERTICAL OBSTRUCTIONS & GARBAGE COLLECTION AREAS PER DETAIL 1, SHEET 15, WHERE APPLICABLE.

### CONSTRUCTION NOTES

- 5' MIN. SOUTHBOUND NON-BUFFERED BIKE LANE, EXCEPT AS NOTED.
- 5' NORTHBOUND NON-BUFFERED BIKE LANE.
- 7' MIN. SOUTHBOUND BUFFERED BIKE LANE (INCLUDING 2' BUFFER).
- 7' NORTHBOUND BUFFERED BIKE LANE (INCLUDING 2' BUFFER).
- 11'± TRAVEL LANE.
- 11' TRAVEL LANE.
- 5' PEDESTRIAN PATH.
- PRIVATE PROPERTY IMPACTS, SEE SHEET 32.
- ANTICIPATED RIGHT-OF-WAY ACQUISITION, SEE SHEET 32.
- AVAILABLE BIKE LANE WIDTH AT PINCH POINT, DISTANCE FROM EXISTING EDGE LINE TO EXISTING FEATURE NOTED.
- CEMENT CONC. DRIVEWAY ENTRANCE TYPE 1 PER WSDOT STD PLAN F-80.10.
- CUT WALL, APPROX. HEIGHT RANGE NOTED.
- RELOCATE HYDRANT.
- RELOCATE MAILBOX.
- UTILITY TO BE ADJUSTED/RELOCATED BY OTHERS.

### LEGEND

- PROPERTY LINE
- RIGHT OF WAY LINE
- CUT LINE
- FILL LINE
- SAWCUT
- CURB AND GUTTER PER C.O.K. STD PLAN CK-R.17
- CUT WALL
- PEDESTRIAN PATH
- HMA
- 2" GRIND & OVERLAY
- GRAVEL RESTORATION
- REMOVE DECIDUOUS / CONIFEROUS TREE

NO.	DATE	BY	APPR.	REVISIONS

Approved By		19065_R6_ALN.dwg
ENGINEERING MANAGER	DATE	FILENAME
PROJECT MANAGER	DATE	EEO
PROJECT ENGINEER	DATE	DESIGNED BY
		DG
		DRAWN BY
		EEO
		CHECKED BY
		DATE



PRELIMINARY  
REVIEW  
SUBMITTAL



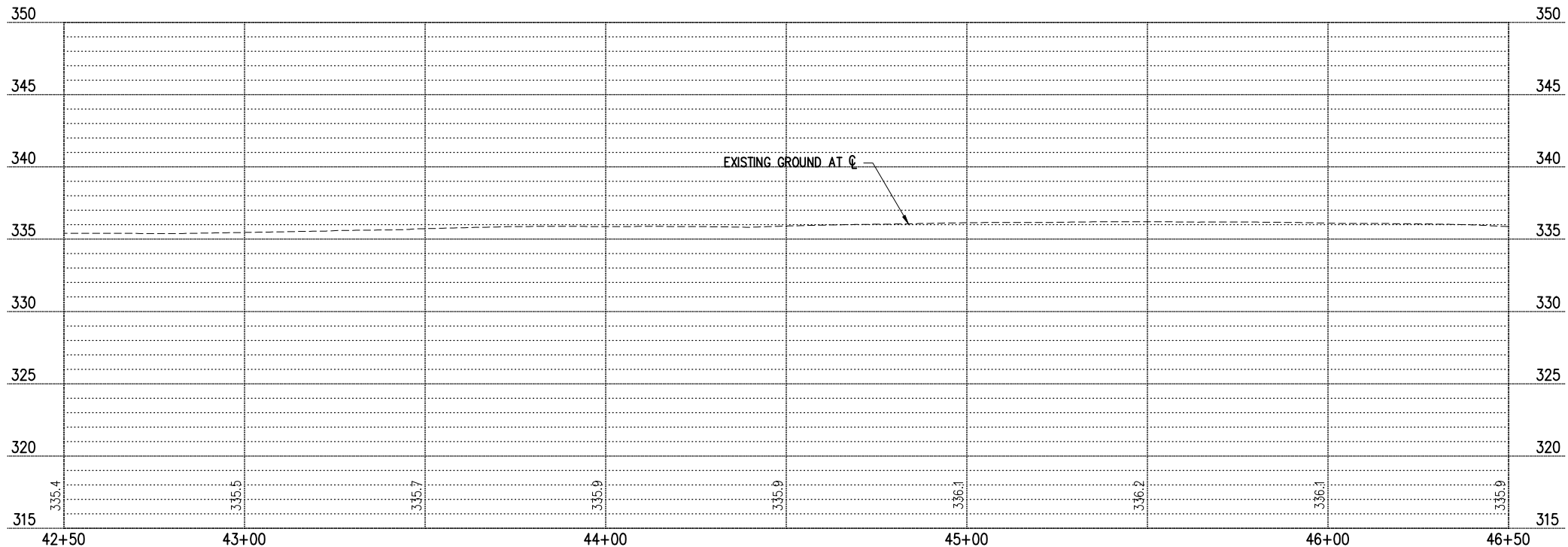
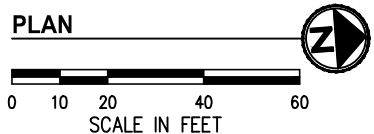
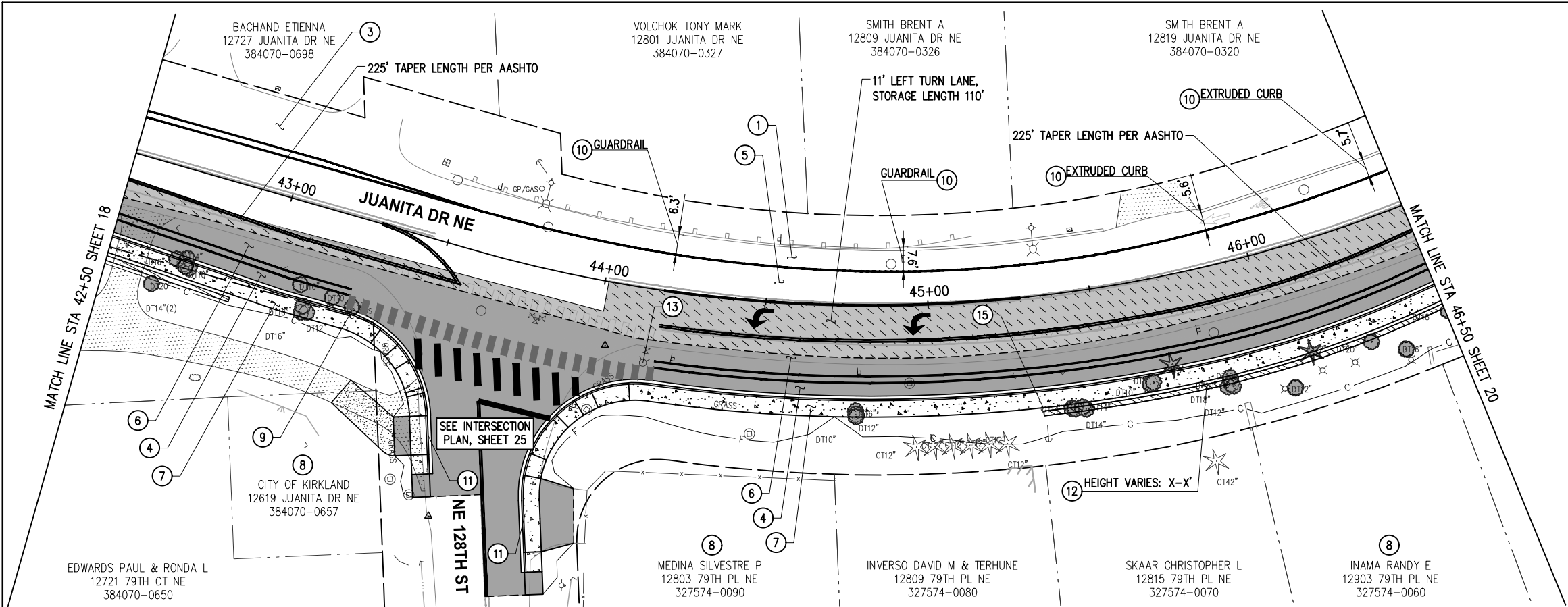
CITY OF KIRKLAND  
JUANITA DRIVE INTERSECTION  
& SAFETY IMPROVEMENTS  
PHASE 1 - PRELIMINARY DESIGN

SITE I6  
ROADWAY PLAN  
STA 55+00 TO STA 59+00

KPG PROJECT No. 19065 SHT 22 OF 32



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### GENERAL NOTES

- DESIGN OF NEW STORMWATER CONVEYANCE SYSTEM TO BE INCLUDED IN FINAL DESIGN PHASE.
- WHERE EXISTING CENTERLINE RUMBLE STRIPS ARE IN CONFLICT WITH PROPOSED CHANNELIZATION, EXTEND GRIND & OVERLAY AS SHOWN TO REMOVE RUMBLE STRIPS.
- WIDEN PEDESTRIAN PATH AT VERTICAL OBSTRUCTIONS & GARBAGE COLLECTION AREAS PER DETAIL 1, SHEET 15, WHERE APPLICABLE.

### CONSTRUCTION NOTES

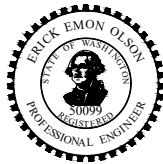
- 5' MIN. SOUTHBOUND NON-BUFFERED BIKE LANE, EXCEPT AS NOTED.
- 5' NORTHBOUND NON-BUFFERED BIKE LANE.
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- 11'± TRAVEL LANE.
- 11' TRAVEL LANE.
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- PRIVATE PROPERTY IMPACTS, SEE SHEET 32.
- ANTICIPATED RIGHT-OF-WAY ACQUISITION, SEE SHEET 32.
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- CEMENT CONC. DRIVEWAY ENTRANCE TYPE 1 PER WSDOT STD PLAN F-80.10.
- CUT WALL, APPROX. HEIGHT RANGE NOTED.
- RELOCATE HYDRANT.
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- UTILITY TO BE ADJUSTED/RELOCATED BY OTHERS.

### LEGEND

- PROPERTY LINE
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- CUT LINE
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- CUT WALL
- PEDESTRIAN PATH
- HMA
- 2" GRIND & OVERLAY
- GRAVEL RESTORATION
- REMOVE DECIDUOUS / CONIFEROUS TREE

NO.	DATE	BY	APPR.	REVISIONS

Approved By		19065_R6_ALN.dwg
ENGINEERING MANAGER	DATE	FILENAME
PROJECT MANAGER	DATE	DESIGNED BY
PROJECT ENGINEER	DATE	DG
		DRAWN BY
		EEO
		CHECKED BY
		DATE



PRELIMINARY  
REVIEW  
SUBMITTAL

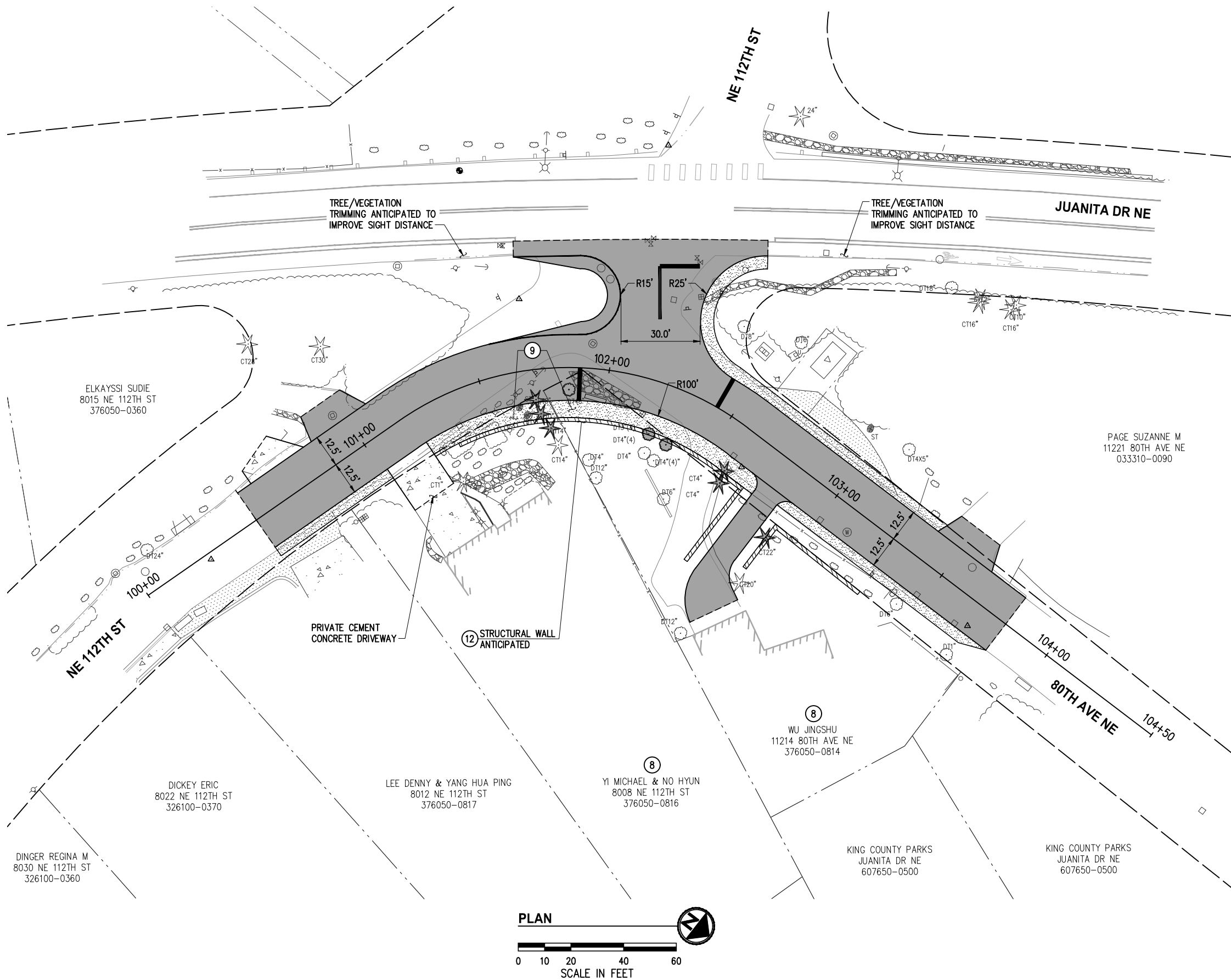


CITY OF KIRKLAND  
JUANITA DRIVE INTERSECTION  
& SAFETY IMPROVEMENTS  
PHASE 1 - PRELIMINARY DESIGN

SITE I5  
ROADWAY PLAN  
STA 42+50 TO STA 46+50

KPG PROJECT No. 19065 SHT 19 OF 32

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### GENERAL NOTES

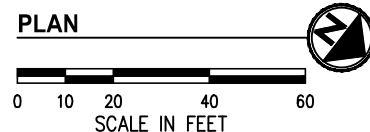
- DESIGN OF NEW STORMWATER CONVEYANCE SYSTEM TO BE INCLUDED IN FINAL DESIGN PHASE.
- WHERE EXISTING CENTERLINE RUMBLE STRIPS ARE IN CONFLICT WITH PROPOSED CHANNELIZATION, EXTEND GRIND & OVERLAY AS SHOWN TO REMOVE RUMBLE STRIPS.
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### CONSTRUCTION NOTES

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- 7' NORTHBOUND BUFFERED BIKE LANE (INCLUDING 2' BUFFER).
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- AVAILABLE BIKE LANE WIDTH AT PINCH POINT, DISTANCE FROM EXISTING EDGE LINE TO EXISTING FEATURE NOTED.
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### LEGEND

	PROPERTY LINE
	RIGHT OF WAY LINE
	CUT LINE
	FILL LINE
	SAWCUT
	CURB AND GUTTER PER C.O.K. STD PLAN CK-R.17
	CUT WALL
	PEDESTRIAN PATH
	HMA
	2" GRIND & OVERLAY
	GRAVEL RESTORATION
	REMOVE DECIDUOUS / CONIFEROUS TREE



NO.	DATE	BY	APPR.	REVISIONS

Approved By		19065_13_INT.dwg
ENGINEERING MANAGER	DATE	FILENAME
PROJECT MANAGER	DATE	DESIGNED BY
PROJECT ENGINEER	DATE	DRAWN BY
		CHECKED BY



PRELIMINARY  
REVIEW  
SUBMITTAL



CITY OF KIRKLAND  
JUANITA DRIVE INTERSECTION  
& SAFETY IMPROVEMENTS  
PHASE 1 - PRELIMINARY DESIGN

SITE I3 ROADWAY PLAN 80TH AVE NE & NE 112TH ST	
KPG PROJECT No. 19065	SHT <u>5</u> OF <u>32</u>

## Appendix C: Analysis of Left Turn Lane Lengths

## Analysis of Left Turn Lane Lengths

The recommended improvements include adding a southbound left turn lane at both the NE 132nd Street intersection and at the NE 128th Street intersection. KPG analyzed left turn lane lengths using Synchro software, SimTraffic simulation software and the 2040 AM and PM peak hour traffic volumes. Both of these intersections provide access to schools, and the recommended left turn pocket lengths accommodate the 10-15 minute peak periods before and after school. **Table 4** shows the AM and PM peak hour southbound left turn volumes and recommended left turn storage lengths at NE 132nd Street and NE 128th Street.

**Table 4. Juanita Drive NE Southbound Left Turn Volume and Recommended Storage Length**

Intersection	Southbound Left Turn Peak Hour Volume				Recommended Left Turn Storage Length
	Existing		2040		
	AM	PM	AM	PM	
NE 132nd Street	167	82	220	110	160'
NE 128th Street	24	15	40	20	110'

Source: Synchro and SimTraffic analysis.