TECHNICAL MEMORANDUM

Project: Interbay Overlay Area Plan

Subject: Transportation Analysis

Date: July 31, 2007

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This memorandum presents information to assess the potential transportation impacts and mitigation needs associated with the proposed Interbay Pilot Project Overlay District. An amendment to the City of Seattle's *Comprehensive Plan* related to the proposed Interbay zoning overlay district was approved by the Seattle City County and Mayor in October 2005. The neighborhood is now proceeding through the process to change the zoning. The zoning overlay concepts are outlined in the proposed Seattle Municipal Code (SMC) *Chapter 23.75 Interbay Pilot Project Overlay District* (DRAFT, August 10, 2005). The purpose of the overlay is "to substitute blight with a balance of industrial, residential and commercial uses, by preserving existing industrial development, encouraging new residential and mixed-use development in proximity to mass transit connections and existing open space resources, and discouraging large, single-purpose commercial development."

1. What is proposed by the Interbay Pilot Overlay District?

Details of the proposed overlay are outlined in the proposed Chapter 23.75 text. From a transportation planning perspective, the total development potential with and without the overlay will determine how traffic volumes could change. The development potential could vary depending on the height, lot coverage, and other parameters. The proposed overlay's height limits would only apply to the commercially zoned properties; heights on the existing industrial-zoned properties would not change.

The development density of the area could vary depending on application of the proposed height limits. In December 2005, the Interbay Neighborhood Association, together with Hewitt Architects, produced the *Interbay Pilot Project Urban Design Study*. That study considered, "*the ways that density can be achieved that will create a robust urban mixed-use neighborhood with a high level of urban architectural form and human experience.*" The Urban Design Study recommended a mix of 40, 65, and 125-foot heights within the parameters set forth in proposed Chapter 23.75. The resulting density would be less than if all areas were developed to the maximum height limit. Table 1 summarizes the development density under existing zoning and if developed as recommended in the *Interbay Pilot Project Urban Design Study*.

Table 1. Development Densities in Interbay Pilot Project Overlay Area

		Proposed Density at Build Out [1]	
	Zoning Height	Retail	Residential
Existing Zoning	40 feet	162,000 sf	123 units[1]
Overlay Zoning Proposal [2]	Mixed 40, 65, and 125 feet	157,000 sf [3]	1,341 units [4]
Net Change Due to Overlay		<5,000 sf>	1,218 units

1. *Source: DPD, Aug 2005.*
2. *Source: Interbay Pilot Project Urban Design Study, December 2005.*
3. *Source: Interbay Pilot Project Urban Design Study, December 2005. Retail density reduces by 5,000 SF in the existing C-1 zone due site constraints. It is worth noting that without the Overlay District it is likely the industrial area would see a substantial increase in auto-dominated retail.*
4. *Maximum density with all residential built to 125-foot height limit estimated to be 1,341 units.*

2. What land uses are in the area today?

Existing land uses within and immediately adjacent to the Interbay Pilot Overlay District were determined using King County Tax Record, July 2004. These data were separated into blocks defined by the City's plat maps. Table 2 summarizes the size of existing land uses for various blocks.

Table 2. Existing Land Uses in Interbay Area

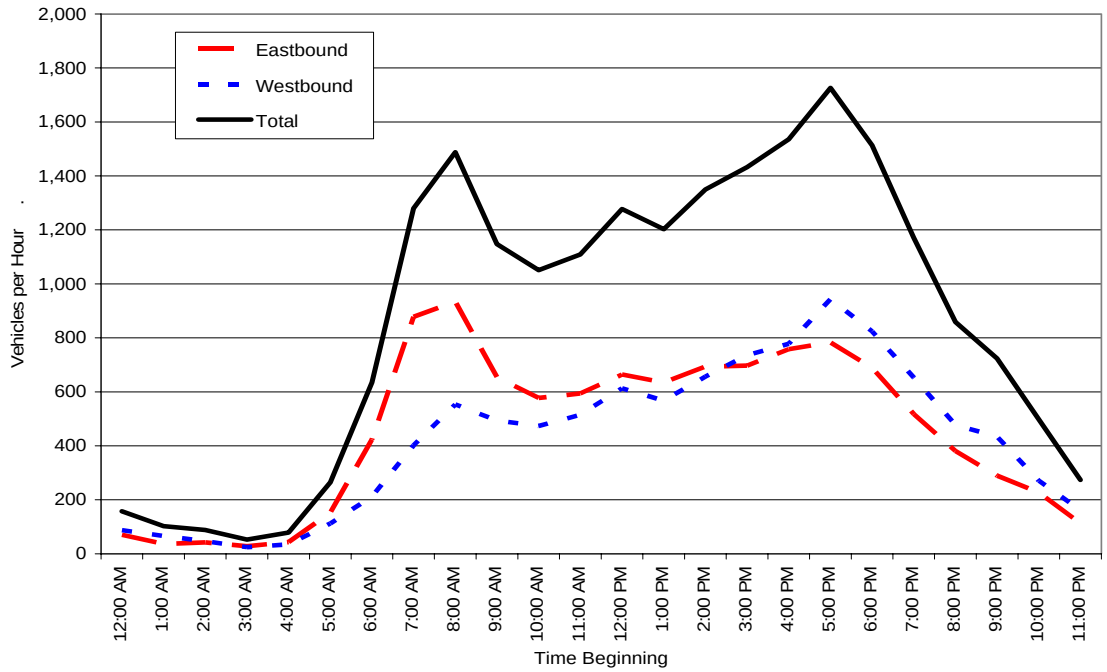
		Existing Land Use (Square footage)				
Block #	Approximate Location	Ind/Mfg/ Whse	Retail	Office	Residential	Church
19	North of Dravus Btwn 16th & 17th		27,203	47,701		
20	South of Dravus btwn 16th & 17th		9,052	10,065	7,800	
22	South of Dravus, East of 16th		1,447	19,584	980	
23	North of Dravus, East of 16th		2,400	21,112		14,438
24	North of Bertona, East of 16th	53,951		18,180		
102	North of Ruffner, East of Thorndyke	20,980		4,000		
103	North of Ruffner, West of Thorndyke	47,626				
113	North of Bertona, West of Thorndyke	44,080		26,500		
114	North of Bertone, East of Thorndyke	6,162		7,994		
115	North of Dravus, West of 17th	79,008		10,874		
Total		251,807	40,102	166,010	8,780	14,438

Source: INA, July 2005. Square footages were based on King County Tax records from 2004.

3. What are the existing traffic volumes and operations on W Dravus Street?

A two-day traffic count was performed on W Dravus Street at 17th Avenue W on September 13 and 14, 2004. This count was compiled to determine the average hourly volumes by direction, as shown on Figure 1. This graph shows that W Dravus Street is similar to most arterial streets in Seattle: it has two distinct peak periods—one in the morning and another in the afternoon. The AM peak hour occurred from 8:00 to 9:00 A.M. and the PM peak hour occurred from 5:00 to 6:00 P.M. The PM peak hour volumes are about 16% higher than the AM peak hour volumes, which is also typical of many areas in Seattle.

Figure 1. Existing Traffic Volumes on W Dravus Street



Over the past few years, peak period turning movement counts have been performed at the following five intersections along W Dravus Street. All five intersections were counted during the PM peak period (4:00 to 6:00 P.M.).

- W Dravus Street SB Ramps/15th Avenue W (Heffron, May 2004)
- W Dravus Street NB Ramps/15th Avenue W (Heffron, May 2004)
- W Dravus Street/20th Avenue W (Magnolia Bridge Study, June 2002)
- W Dravus Street/17th Avenue W (Heffron, September 2004)
- W Dravus Street/16th Avenue W (The Transpo Group, 2001)

These counts were examined and compiled to determine the existing PM peak hour volumes reflecting year 2004 conditions. These volumes are shown on Figure 2.

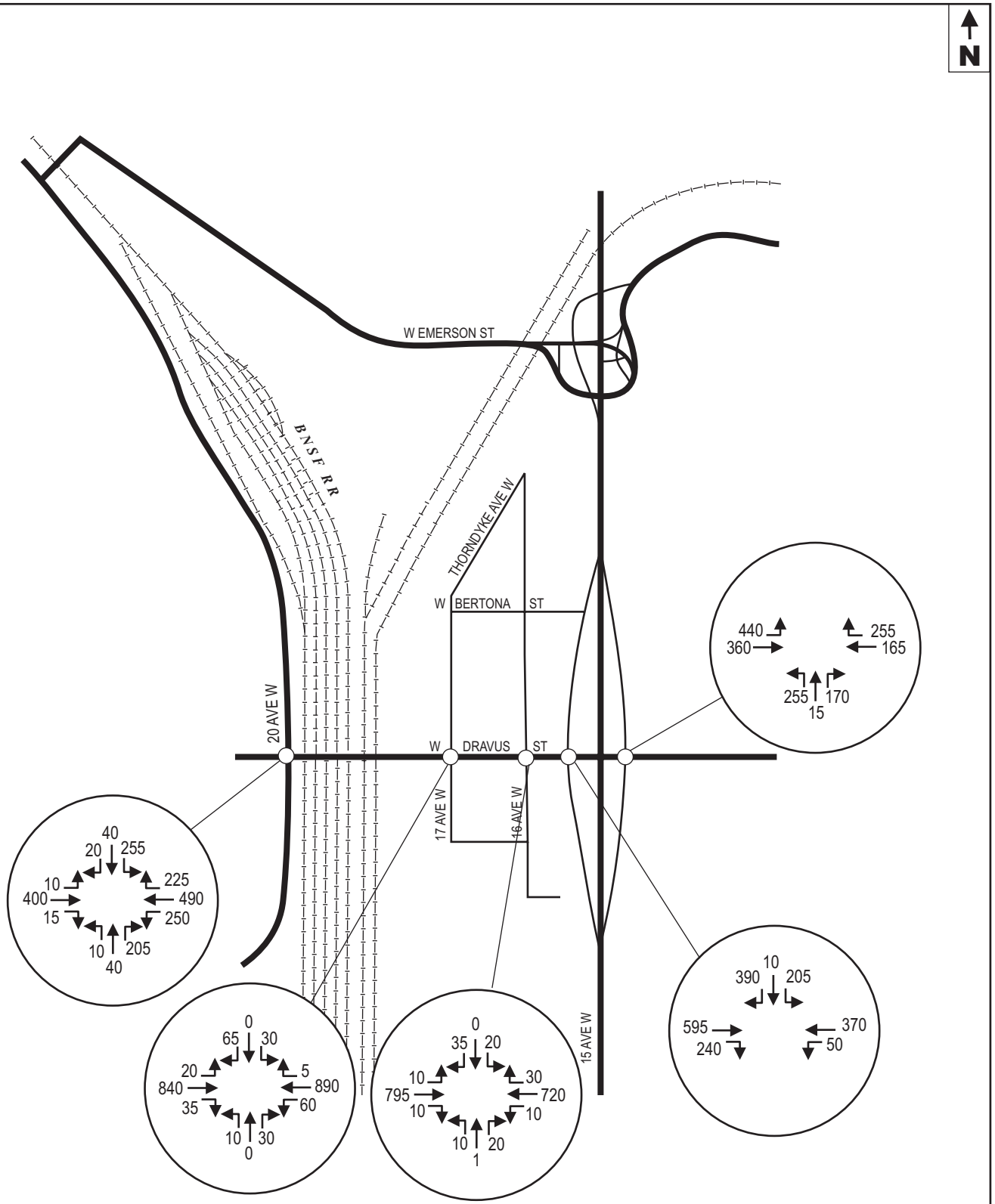


Figure 2

EXISTING (2004) TRAFFIC VOLUMES
PM PEAK HOUR

INTERBAY PILOT
OVERLAY DISTRICT

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Traffic operations are defined by level of service. Level of service (LOS) is a qualitative measure used to characterize traffic operating conditions. Six letter designations, "A" through "F," are used to define level of service. LOS A is the best and represents good traffic operations with little or no delay to motorists. LOS F is the worst and indicates poor traffic operations with long delays.

There are currently three signalized intersections along W Dravus Street in the Interbay area: one at each of the ramps with 15th Avenue W and one at 20th Avenue W. The signals at the 15th Avenue W interchange, however, operate in an all-way-flash mode during the PM peak period, which makes these intersections all-way stops. All other intersections along W Dravus Street are controlled with stop signs on the minor street approach.

Table 3 summarizes the existing levels of service for intersections along W Dravus Street. As shown, the intersection at the northbound 15th Avenue W Ramps, and turns from 17th Avenue W currently operate at LOS F during the PM peak hour. Other intersections and movements operate at LOS C or better.

4. How would other projects in the area affect traffic volumes and operations on W Dravus Street?

Even if no new development occurs in the Interbay area, traffic volumes on W Dravus Street could change due to growth in the surrounding neighborhoods. The biggest single proposed project in the area is the Port of Seattle's North Bay Redevelopment. In addition, in-fill development in both the Magnolia and Queen Anne neighborhoods could occur.

Traffic analysis performed for the Port of Seattle's North Bay project (*North Bay Master Plan Draft Environmental Impact Statement*, April 2005) determined that local traffic in Magnolia would grow at 0.5% per year during the AM peak hour and at 0.4% per year during the PM peak hour. These growth rates do not include the North Bay project and are reasonable given the area's potential for infill development. The 2000 Census determined that there were 8,878 households in Magnolia (including single-family residents, multi-family housing military housing, and senior housing). The City's long-range forecasts predict that by the year 2030 there will be 9,940 households in Magnolia, a 0.4% per year increase from the year 2000. Total employment is expected to increase from 7,513 employees in the year 2000 to 8,733 by the year 2030, a 0.5% per year increase.

The North Bay project itself is expected to add traffic to W Dravus Street with the reopening of the connection to 20th Avenue W. North Bay's Preferred Alternative is projected to add about 330 PM peak hour trips to 20th Avenue W at Thorndyke Street, of which about 120 trips would use the W Dravus Street corridor (source: *North Bay Master Plan Final EIS*, July 2005).

Level-of-service analysis was performed to determine how the intersections along W Dravus Street would operate in the year 2030 without new development of the Interbay overlay area. This analysis assumes growth in background traffic on W Dravus Street and only a small amount of growth in the Interbay overlay area. It does not assume any major development projects would occur in this area. The level of service results are summarized in Table 3. The table shows that most intersections along the corridor would experience increased congestion without the rezone. The intersections at W Dravus Street/17th Avenue W and at the W Dravus Street/15th Avenue W intersection would operate at LOS F conditions in 2030.

Table 3. PM Peak Hour Level of Service – Existing and Year 2030 Without Development

	Existing (2004)		Year 2030 Without New Development in Interbay	
Signalized Intersection	LOS[1]	Delay[2]	LOS[1]	Delay[2]
W Dravus Street/20th Avenue W	B	10.9	C	30.3
All-way Stop-Controlled Intersection	LOS	Delay	LOS	Delay
W Dravus Street/15th Avenue W – Northbound Ramps [4]	F	53.0	F	134.5
W Dravus Street/15th Avenue W – Southbound Ramps [4]	C	20.8	D	34.7
Unsignalized Intersections	LOS	Delay	LOS	Delay
17th Avenue W/W Dravus Street				
All turns from northbound 17th Avenue W	E	39.6	F	61.3
All turns from southbound 17th Avenue W	F	86.6	F	99.4
16th Avenue W/W Dravus Street				
All turns from northbound 16th Avenue W	B	15.0	C	17.8
All turns from southbound 16th Avenue W	C	15.1	C	16.5

Source: Heffron Transportation, August 2005. All levels of service reflect the HCM methodology from the Synchro 6.0 software.

1. *Level of service.*
2. *Average seconds of delay per vehicle.*
3. *For the future conditions, this intersection was evaluated as a "clustered" intersection in which the various movements at both intersections operate with a coordinated signal phasing plan.*
4. *This intersection currently operates in a "flashing mode" during the PM peak hour, which indicates all-way-stop control.*

5. How much additional traffic would the proposed overlay generate?

Trip generation for the overlay properties was determined using similar methods and assumptions as were used for the *North Bay Master Plan Draft EIS* (Port of Seattle, April 2005). The methods and assumptions were outlined in detail in Volume II of the North Bay DEIS, Appendix J. The basic steps are:

1. Use rates and equations in the Institute of Transportation Engineers (ITE) *Trip Generation* to determine the total number of person trips that would be generated by the new retail and residential uses that could be developed.

2. Use the methodology in the ITE *Trip Generation Handbook* to determine the percentage of trips that may be made between uses in Interbay. This would include trips between the residential and the retail uses. Using this methodology, it was determined that about 11% of the trips would be made between the residential and retail uses in Interbay. This does not account for additional walk-in trips that might come from existing industrial uses or the nearby parks. These were accounted for separately in the mode-of-travel analysis described below.

3. Apply mode-of-travel assumptions to determine the number of trips that would be made by automobile. It was assumed that 85% of the retail trips and 65% of the residential trips would occur by automobile. The remaining trips would be walking, bicycle, or transit trips.

4. Separate the retail trips based on various trip-making characteristics. This includes estimating the number of pass-by trips that would come from existing traffic passing by the site on W Dravus Street, and diverted-linked trips that may divert off of 15th Avenue W to shop in Interbay. It was assumed that 26% of the retail trips would be pass-by trips and 20% would be diverted-linked trips.

Table 4 summarizes the resulting trip generation for the overlay properties. This calculation uses the recommended development densities described previously. This includes constructing 157,000 sf of retail space plus 1,341 residential units. The detailed trip generation calculation is attached.

Table 4. Vehicular Trips Generated by Full Development of Interbay Overlay Area

Land Use	Trip Component %	Daily Vehicle Trips	AM Peak Hour Vehicle Trips			PM Peak Hour Vehicle Trips		
			In	Out	Total	In	Out	Total
Retail – 157,000 sf								
Primary Trips	54%	3,764	68	18	86	198	148	346
Diverted-Linked Trips	20%	1,394	16	16	32	64	64	128
Pass-by Trips	26%	1,812	21	21	42	83	83	166
Total Retail Trips	100%	6,970	105	55	160	345	295	640
Residential – 1,341 Units								
Primary Trips	100%	5,280	85	350	435	315	170	485
Diverted-Linked Trips	0%	0	0	0	0	0	0	0
Pass-by Trips	0%	0	0	0	0	0	0	0
Total Residential Trips	100%	5,280	85	350	435	315	170	485
Total Project								
Primary Trips		9,044	153	368	521	513	318	831
Diverted-Linked Trips		1,394	16	16	32	64	64	128
Pass-by Trips		1,812	21	21	42	83	83	166
Total Project Trips		12,250	190	405	595	660	465	1,125

Source: Heffron Transportation, Inc. March 2006.

The above table shows that the overlay properties could generate up to about 12,250 vehicles per day, of which 595 would occur during the AM peak hour and 1,125 would occur during the PM peak hour. These are the total number of trips that would be generated by the properties, and does not account for any reduction in trips associated with uses that might be removed from those properties. Because the overlay would generate almost twice as many trips during the PM peak hour as during the AM peak hour, and because existing volumes are already higher during the PM peak hour, all subsequent operations analysis focuses on this time period.

6. How would the area's traffic change due to the Overlay?

Growth in the area is also possible under the existing zoning. As previously shown in Table 1, the proposed overlay would increase the potential development density by about 1,218 residential dwelling units. The amount of retail space would be about the same for the overlay as for existing zoning. The net change in trips with and without the overlay is summarized in Table 5. This shows that the proposed overlay would generate about 4,220 more vehicle trips per day than if the area built out under existing zoning. Of these increased trips, about 405 would occur during the AM peak hour and about 385 would occur in the PM peak hour.

Table 5. Net Change in Trip Generation Due to Overlay

	Daily	AM Peak Hour Trips			PM Peak Hour Trips		
	Trips	In	Out	Total	In	Out	Total
Trips generated by build-out of existing zoning	8,030	115	75	190	375	365	740
Trips generated by build-out of proposed overlay zoning	12,250	190	405	595	660	465	1,125
Net change due to overlay zoning	4,220	75	330	405	285	100	385

7. How would the proposed overlay affect traffic operations on W Dravus Street?

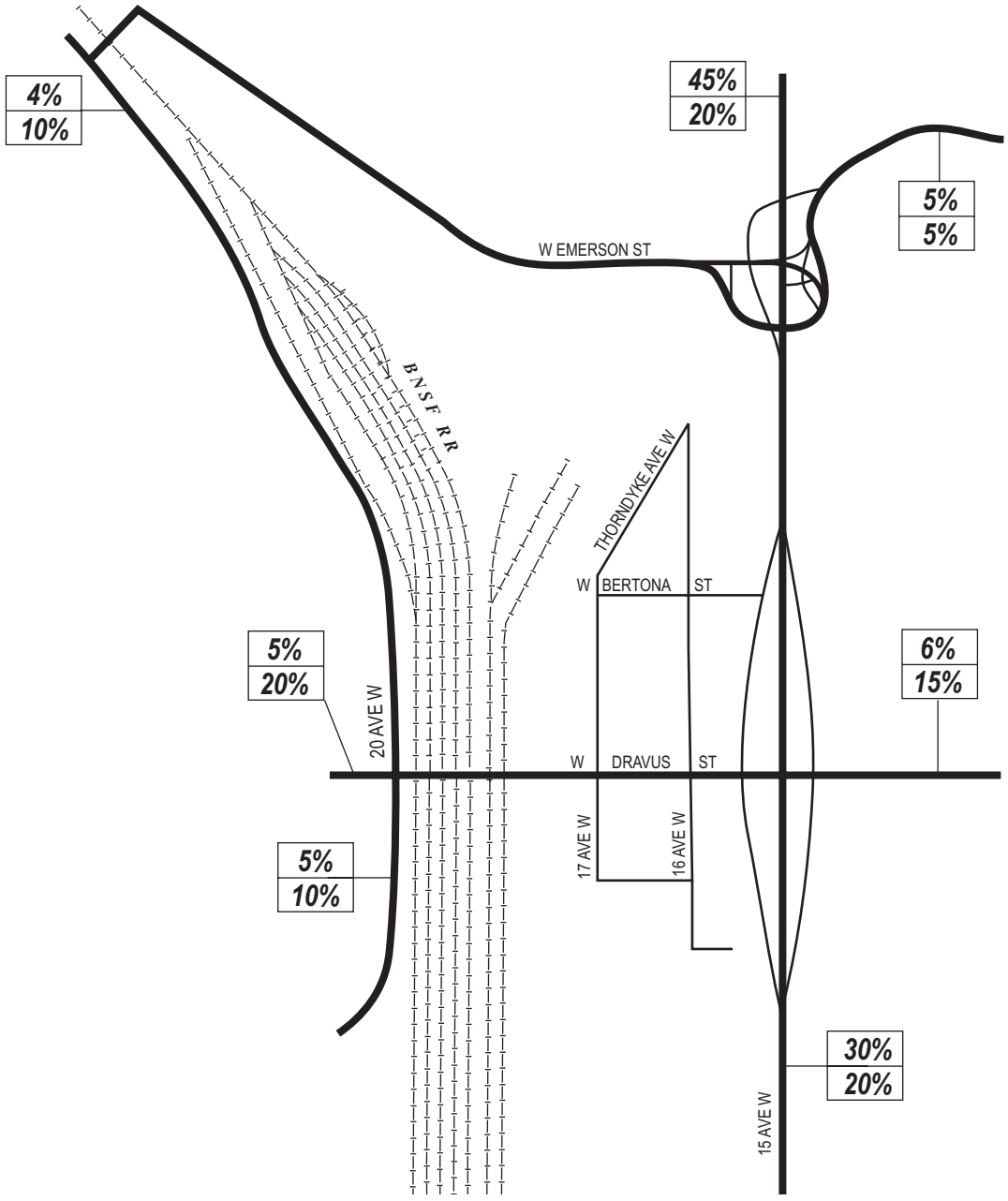
The total number of PM peak hour trips (not the net increase) that could be generated by the overlay properties were assigned to the roadway network using the trip distribution pattern shown on Figure 3. The trips from the properties in the overlay area are shown on Figure 4.

As described above, the trip generation calculation does not take credit for trips that are already being generated by the properties in the overlay district. To present a worst-case condition, the existing traffic generated by these properties was not removed from the street network. Instead, this traffic is assumed to reflect growth in the industrial properties surrounding the commercial area. The amount of traffic is about equal to a doubling of traffic for the industrial zoned properties within the proposed overlay area.

Level-of-service analysis was performed for the Dravus Street corridor for forecast year 2030 conditions with the overlay. One of the improvement recommendations with the overlay district is to signalize the W Dravus Street/17th Avenue W intersection. A signal warrant analysis for this intersection is presented below, and shows that a signal would be warranted with even a small portion of the potential development. With the activation of this signal, it is recommended that left-turn movements from 16th Avenue W to W Dravus Street be prohibited and that traffic be redirected to the new signal (these changes are described below).

Another recommended improvement is to upgrade and activate the traffic signals at the W Dravus Street/15th Avenue W interchange. The existing signals do not have the ability to accommodate peak hour traffic and so are now operated in an "all-flash" mode during the peak hours. Operation with the recommended signals are summarized in Table 6.

For comparison, level of service analysis was also performed assuming build out of the commercial properties under the existing zoning. These results are also summarized in Table 6.



XX% Trip Pattern for Residential Trips
XX% Trip Pattern for Retail Primary Trips

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Figure 3

TRIP DISTRIBUTION PATTERN

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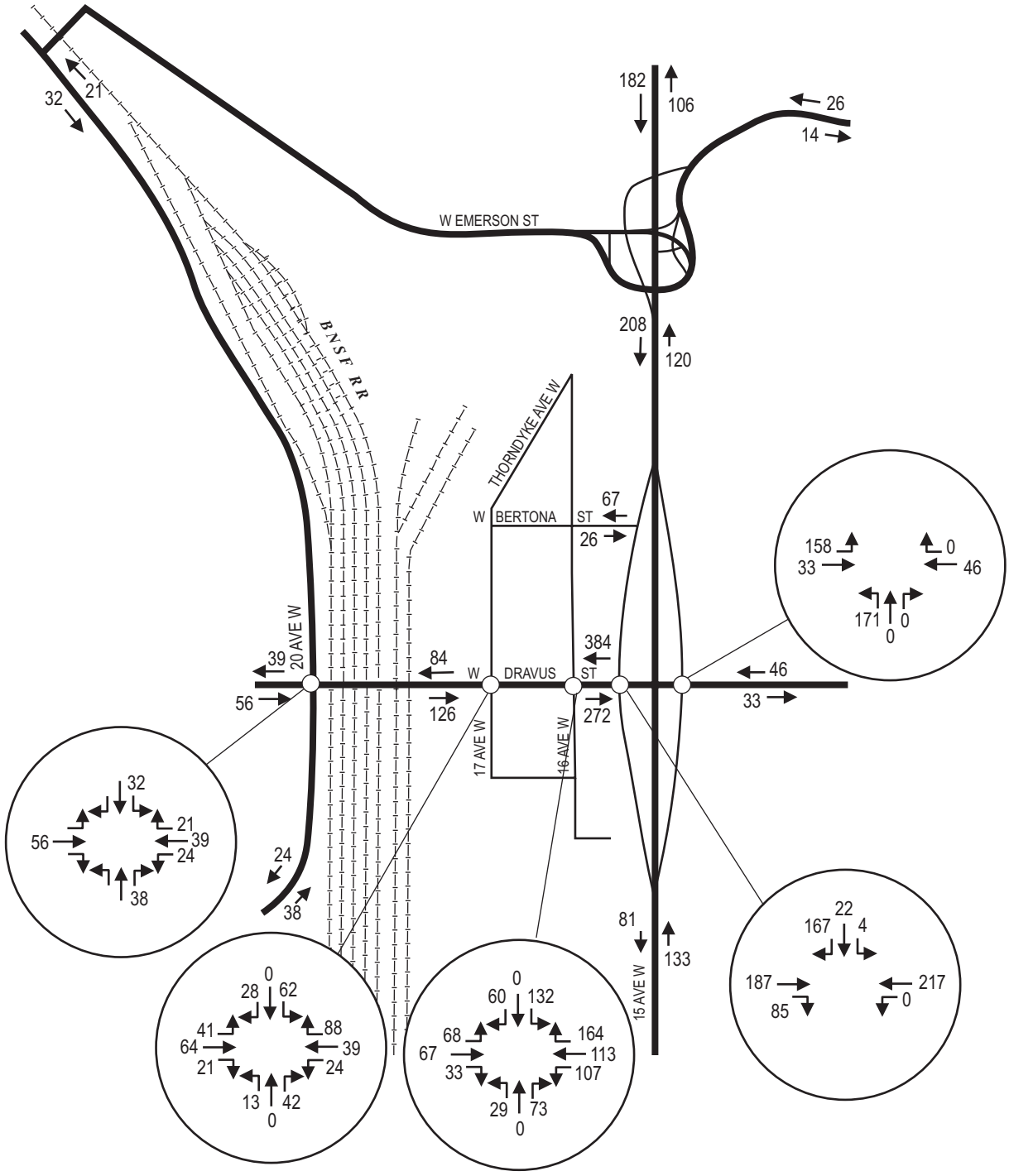

Note: These reflect the total trips generated by the properties in the overlay area, not the net increase in trips compared to existing conditions.

INTERBAY PILOT OVERLAY DISTRICT

Figure 4

TRIPS GENERATED BY PROPERTIES IN OVERLAY AREA

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Table 6. PM Peak Hour Level of Service –Year 2030 Without and With Overlay

	Year 2030 With Build-out under Existing Zoning		Year 2030 With Full Build under Overlay	
Signalized Intersection	LOS[1]	Delay[2]	LOS[1]	Delay[2]
W Dravus Street/15th Avenue W – Northbound Ramps[3]	All-way stop (see below)		F	90.6
W Dravus Street/15th Avenue W – Southbound Ramps[3]	All-way stop (see below)		C	30.1
W Dravus Street/17th Avenue W	Unsignalized		C	36.6
W Dravus Street/20th Avenue W	C	29.9	C	25.6
All-way Stop-Controlled Intersection	LOS	Delay	LOS	Delay
W Dravus Street/15th Avenue W – Northbound Ramps[4]	F	134.5	To be signalized (see above)	
W Dravus Street/15th Avenue W – Southbound Ramps[4]	D	34.7	To be signalized (see above)	
Unsignalized Intersections	LOS	Delay	LOS	Delay
17th Avenue W/W Dravus Street			To be signalized (see above)	
All turns from northbound 17th Avenue W	F	>200		
All turns from southbound 17th Avenue W	F	>200		
16th Avenue W/W Dravus Street				
All turns from northbound 16th Avenue W	E	37.1	C	16.3
All turns from southbound 16th Avenue W	F	>200	C	16.2

Source: Heffron Transportation, August 2005. All levels of service reflect the HCM methodology from the Synchro 6.0 software.

1. *Level of service.*
2. *Average seconds of delay per vehicle.*
3. *For future conditions, this intersection was evaluated as a "clustered" intersection in which the various movements at both intersections operate with a coordinated signal phasing plan.*

This analysis shows that the proposed signals at W Dravus Street/15th Avenue W interchange and at W Dravus Street/17th Avenue W would improve operations even with the additional growth resulting from the rezone. Although the northbound ramps at W Dravus Street/15th Avenue W would continue to operate at LOS F, these conditions reflect growth through the year 2030 as well as extensive development that the Port of Seattle had proposed for North Bay. The intersection would likely operate at acceptable levels of service for a very long time.

All other intersections would operate at LOS D or better with the suggested improvements listed later in Section 11. Improvements proposed for 17th Avenue W and 16th Avenue W would dramatically improve conditions above those that could exist without the Overlay.

8. Is a signal warranted for the W Dravus Street/17th Avenue W intersection?

Heffron Transportation evaluated the need for a traffic signal at the W Dravus Street and 17th Avenue W intersection. The need for this signal was evaluated using traffic signal warrants in the *Manual on Uniform Traffic Control Devices (MUTCD),* 2003 Edition, (US Department of Transportation, Federal Highway Administration, 2003). The Appendix to this report presents the traffic signal warrant analysis.

The analysis determined that a traffic signal is not currently warranted at this intersection. However, if even a small portion of the potential development were to occur along 17th Avenue W north or south of W Dravus Street, the additional traffic generated by these developments would likely cause the intersection to meet at least one of the volume-related traffic signal warrants. For example, in order for the intersection to meet the four-hour warrant (Warrant #2), 28 or fewer vehicles would need to be added to one of the 17th Avenue W approaches for four hours during a day. This is likely for a development that generates between 300 and 400 vehicle trips per day.

Along W Dravus Street, the intersection with 17th Avenue W is located approximately 550 feet from the signalized intersection with 15th Avenue W and over 800 feet from the signalized intersection with 20th Avenue W. There are two city streets between the two signals that provide access to all of the commercial and industrial development in this area of Interbay: 16th Avenue W and 17th Avenue W. Turns from both side streets onto W Dravus Street operate at LOS F today. A signal should not be considered for 16th Avenue W because it is located too close to 15th Avenue W. The 17th Avenue W intersection is located far enough from 15th Avenue W and 20th Avenue W such that a new signal at the intersection would not adversely affect operations at these nearby signals. If a signal were installed at 17th Avenue W, it could help organize side street traffic movements in the neighborhood, and provide an access onto W Dravus Street that would operate better than existing conditions. The grid of streets north and south of W Dravus Street would allow motorists access to a new signal, which in turn would reduce traffic on 16th Avenue W where congestion now exists.

One final benefit of a traffic signal at the W Dravus Street/17th Avenue W intersection is that it would serve the off-peak event and recreational traffic needs associated with the Interbay Stadium. Access to this stadium is provided from 17th Avenue W south of W Dravus Street. It is the home soccer stadium for Seattle Pacific University and has a seating capacity of 900 persons. Extreme congestion exists in the area before and after events at the stadium as vehicles circulate through the neighborhood to find parking or exit the neighborhood after an event. Because parking in the immediate stadium vicinity is limited, most event attendees park in areas north of W Dravus Street and cross this street to the stadium. Counts performed after a sold-out event at the stadium determined that about 200 pedestrians crossed W Dravus Street in the 15-minute period following the game. Although large events at the stadium occur infrequently, a signal would improve vehicular flows and pedestrian crossing safety for such events.

9. What streetscape and pedestrian improvements are proposed?

The Interbay Pilot Overlay District includes substantial streetscape improvements and pedestrian amenities. In addition, the Overlay District proposes limits on site-access driveways, particularly those located along major pedestrian streets, which include W Dravus Street from 15th Avenue W to 17th Avenue W and 16th Avenue W from W Barrett Street to W Bertona Street.

10. Is transit service adequate to accommodate the overlay?

The most-intensive development under the proposed overlay is expected to generate about 330 transit trips during the peak hour. The overlay is intended to be compatible with the designation of this area as a transit hub in the Regional Transit Plan. Even though the proposed Monorail station in this location will not happen, there are still two major King County Metro routes on 15th Avenue W that provide service between Ballard and downtown Seattle: Route 15 and Route 18. In addition, Route 33 with service between Discovery Park and downtown, and Route 31, with service between Magnolia and the University District, use 20th Avenue W near the site. There are no existing transit routes that use W Dravus Street through Interbay, except during adverse weather when W Dravus Street is used to bypass the Magnolia Bridge.

11. What other transportation improvements would be needed to accommodate the overlay and other traffic growth?

The traffic analysis described in prior sections of this memorandum was used to determine transportation improvements that should be considered to accommodate additional traffic. These are listed below:

- **Install traffic signal at the W Dravus Street/17th Avenue W intersection.** This intersection nearly meets signal warrant requirements today, and would certainly meet them with the additional traffic generated by new development. A signal at this location would also facilitate access control measures for vehicles and pedestrian crossings on W Dravus Street.

- **Provide left turn lanes on 17th Avenue W approaching the intersection of W Dravus Street.** Consider providing for a dual-left-turn movement on the southbound approach to this intersection (one left-turn lane and one left-thru-right lane). This would require that the intersection have "split phasing" for the northbound and southbound movements. This configuration was evaluated and would result in LOS C operating conditions. The intersection would have the same level of service with single left turn lanes and conventional signal phasing, but the dual-left-turn movement would reduce queue lengths.

- **Restrict left turn movements from 16th Avenue W onto W Dravus Street.** This intersection is too close to the interchange at 15th Avenue W to be signalized. Without a signal, left-turn movements could experience long delays and queues. With the proposed signal at 17th Avenue W, these movements can be diverted to that location, which would improve operations and safety. The LOS C condition at W Dravus Street/17th Avenue W assumes the additional traffic associated with this restriction. Left turns from W Dravus Street to both directions of 16th Avenue W should be retained.

- **Control access to W Dravus Street between 16th and 17th Avenues W.** Driveways on W Dravus Street should be restricted to right-turn only for exiting movements. Depending on the separation from adjacent intersections, left-turn movements from W Dravus Street could be allowed. To the extent possible, all access should be directed to 17th Avenue W.

- **Improve the intersection at W Bertona Street/15th Avenue W southbound ramp.** This intersection is located at the diverge area for the 15th Avenue W off-ramp. If possible, inbound (westbound) movements to W Bertona Street should be striped and separated from through movements and the corner radii should be enlarge to accommodate higher-speed maneuvers. Outbound (eastbound) movements should either be prohibited or restricted to right-turn-only onto the ramp. If needed, the ramp gore area should be extended or curbed to prevent eastbound turns directly to the mainline of 15th Avenue W.

- I**mprove the W Dravus Street/15th Avenue W interchange.** The intersection at the northbound ramps is projected to operate at a poor LOS F in the future if it continues to operate in the all-flash mode during the PM peak hour. The LOS F condition would occur with or without the proposed rezone. The project should contribute towards to cost of upgrading the signal system at the W Dravus Street/15th Avenue W interchange. With the signal, the intersection would operate at better than the no action conditions.

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Attachments

APPENDIX

Signal Warrant Analysis for W Dravus Street/17th Avenue W

Heffron Transportation evaluated the need for a traffic signal at the W Dravus Street and 17th Avenue W intersection. The need for this signal was evaluated using traffic signal warrants in the *Manual on Uniform Traffic Control Devices (MUTCD)*, 2003 Edition, (US Department of Transportation – Federal Highway Administration, 2003).

Existing (2004) traffic volumes were examined with the signal warrants published in the *MUTCD.* The manual states, "A traffic control signal should not be installed unless one or more of the factors described in this section are met." The eight (8) warrants for traffic signal installation are listed below:

- Warrant 1 – Eight-Hour Vehicular Volume (minimum volumes over eight hours)
- Warrant 2 – Four-Hour Vehicular Volume (minimum volumes over four hours)
- Warrant 3 – Peak Hour (minimum volume over one hour period)
- Warrant 4 – Pedestrian Volume
- Warrant 5 – School Crossing (adequacy of gaps near school crossing location)
- Warrant 6 – Coordinated Signal System (platooning for one-way or two-way streets)
- Warrant 7 – Crash Experience (number and type of accidents)
- Warrant 8 – Roadway Network (for organized traffic flow networks)

Traffic Data Collection

Machine traffic counts were taken on the north, south, and east legs of the W Dravus Street/17th Avenue W intersection for two days (September 13 and 14, 2004). The machine traffic counters collected traffic data for both directions of travel on each roadway. In addition, a PM peak hour turning movement count was performed at this intersection on September 14, 2004.

A traffic and pedestrian count was also performed on Friday, October 8, 2004 between 6:00 and 9:30 P.M. when Seattle Pacific University had a home soccer game against Seattle University at the Interbay Stadium. According to observations and press reports, the stadium seats were full (about 900 people) with about 100 more spectators standing around the field.

Traffic Volume Warrants

The applicable traffic signal warrants were reviewed based on the existing (2004) data collected. For this intersection, volume Warrants 1 (Eight Hour), 2 (Four Hour), and 3 (Peak Hour) are most relevant. The existing year-2004 conditions were evaluated against these traffic-volume warrants as summarized in Table A (attached). Existing traffic volumes at the intersection would not meet any of the traffic signal warrants.

The main street traffic volumes on W Dravus Street would meet the minimum volume threshold for all of the traffic volume warrants, and would meet these volumes for the required eight or four hours in a day. The side-street volumes on 17th Avenue W are not yet high enough to cause the warrants to be triggered. However, even a small amount of growth located either north or south of W Dravus Street would trigger one or more of the warrants.

The warrant that is closest to being met is the Four-Hour Warrant (Warrant #2). In order for the intersection to meet this warrant, 28 or fewer vehicles would need to be added to one of the 17th Avenue W approaches for four hours during a day. This is likely for a development that generates between 300 and 400 vehicle trips per day. The warrants should continue to be monitored as individual building permits are submitted in the Interbay area.

Pedestrian Volume Warrant

Warrant 4 (Pedestrian Volume) was examined based on pedestrian volume counts performed before and after an event at the Interbay Stadium. Counts were performed on Friday, October 8, 2004 between 6:00 P.M. and 9:30 P.M. A men's soccer game between Seattle Pacific University and Seattle University was held on this night with about 1,000 spectators in attendance. Parking is limited south of W Dravus Street, and most spectators park in the area north of W Dravus Street.

The thresholds for Warrant 4 are 100 or more pedestrians for each of any four hours, or 190 pedestrians or more during any one hour. In the hour before the game, a total of 378 pedestrians crossed W Dravus Street (133 across the west leg of the intersection where no marked crosswalk exists, and 245 across the east leg of the intersection where there is a marked crosswalk). After the game, most of the spectators left the area within 30 minutes. In the peak 15-minutes following the game, a total of about 200 pedestrians (equivalent to 800 per hour) crossed W Dravus Street. These volumes exceed the peak one-hour volume needed to satisfy the pedestrian crossing warrant. It is acknowledged that this pedestrian crossing event may occur only once or twice per week during soccer season. However, these pedestrians were crossing W Dravus Street during darkness. Safety of these pedestrian movements would be enhanced with the installation of a signal.

Other Warrants

Warrant 5 (School Crossing) was not evaluated since there are no schools in close proximity to this site.

Warrant 6 (Coordinated Signal System) was determined to not be applicable in this location, since platooning at adjacent signals is not necessary.

Warrant 7 (Crash Experience) was evaluated using accident data provided by the City of Seattle. One of the triggers for this warrant is that five or more accidents, of the type susceptible to correction with a signal, have occurred within a 12-month period. The accident data for the intersection determined that there have only been a total of five reported accidents at this location during the past three years. Since 2002, there has been no more than one reported accident per year. Thus, this warrant would not be met.

Warrant 8 (Roadway Network) is intended to encourage concentration and organization of traffic flow on a roadway network. The intersection would meet the thresholds established by this warrant, including that the existing intersection have an entering volume of at least 1,000 vehicles per hour, and that it is projected to meet one or more of Warrants 1, 2, and 3 during an average weekday.