2. ROADWAY INVENTORY AND TRAFFIC ASSESSMENT

This section describes the area road network, and assesses existing and future traffic conditions. Information is provided on traffic data collection, existing and future traffic operations on Noll Road and traffic operations at primary and secondary intersections.

2.1 ROADWAY INVENTORY

The Noll Road corridor extends from Lincoln Road to the north, to SR 305 to the south, with a portion of the roadway located inside the Poulsbo city limits and the remainder located within unincorporated Kitsap County. Primary roadways within the study area are described below.

2.1.1 Noll Road

The entire Noll Road roadway currently consists of a single travel lane in each direction with intermittent curb, gutter and sidewalk along its length. Existing intersections operate with two-way stop control on the minor approaches, with the exception of NE Mesford Road, which operates under 4-way stop control.

The majority of the Noll Road corridor is within the Poulsbo city limits (see Figure 1-1) and is classified by the City of Poulsbo as a Neighborhood Collector. Neighborhood Collectors are defined as intra-community streets which connect residential neighborhoods with centers and facilities. According to the City of Poulsbo Street Standards, a neighborhood collector shall have a 50-foot right-of-way, 12-foot lane width, 3-foot shoulders and 5-foot sidewalks on both sides.

Both the northern and southern segments of Noll Road are outside the city limits, and as a result, these segments are under Kitsap County's jurisdiction. These segments consist of Noll Road from Mesford to Lincoln, and from the 90 degree corner on south Noll Road to SR 305. According to the Kitsap County 10-year Comprehensive Plan Update dated August of 2006, the County portion of Noll Road has a federal functional classification as a Minor Arterial. Minor arterials provide primary access to the principal arterial and to or through communities of high-density residential areas. The speed limit on Noll Road is currently set at 35 mph, with 25 mph segments near Poulsbo Elementary School.

2.1.2 Washington State Route (SR) 305

SR 305 is a State Highway that runs from the SR 3/Viking Avenue interchange, generally southeast providing a connection to commercial development in Poulsbo, the community of Bainbridge Island, and eventually the State Ferry terminal in Winslow. Through the project vicinity, SR 305 has one travel lane in each direction and a posted speed limit of 55 mph. The intersection of Noll Road is at milepost 9.71. Future improvements to SR 305 may include intersection improvements and transit queue jump lanes from MP 0 to MP 7.03, which would reduce congestion between the ferry Terminal and Suquamish Way (Kitsap Transit 2006). In the near term, the WSDOT highway system plan identifies a project to add a center left turn/acceleration lane on SR 305 at Noll Road.

2.1.3 Lincoln Road

Lincoln Road is classified as a minor arterial, and runs northeast/southwest through the project vicinity. East of Noll, Lincoln Road is classified as a collector. Lincoln Road has one lane in each direction and a posted speed limit ranges from 30 mph in the city limits, to 35 mph east of Noll Road. The County has identified in their 6-Year Transportation Capital

Improvement Plan (CIP) a joint project with the City to provide intersection improvements at the Noll Road and Lincoln Road where a roundabout is currently being considered. This project is shown as relatively low priority in the County's CIP, with a ranking of 52 out of 62. A total of $100,000 in local funds is allocated to this project in the County's CIP.

2.1.4 Local Roadways

Several local roadways intersect Noll Road and make up the existing road grid network that exists in the project vicinity. The following local roadways all have one travel lane in each direction, and a speed limit of 25 mph:

- Bjorn Street
- NE Hostmark Street
- NE Mesford Road
- Languanet Lane NE
- Kevos Pond Drive

The location of these roadways is shown in Figure 1-1.

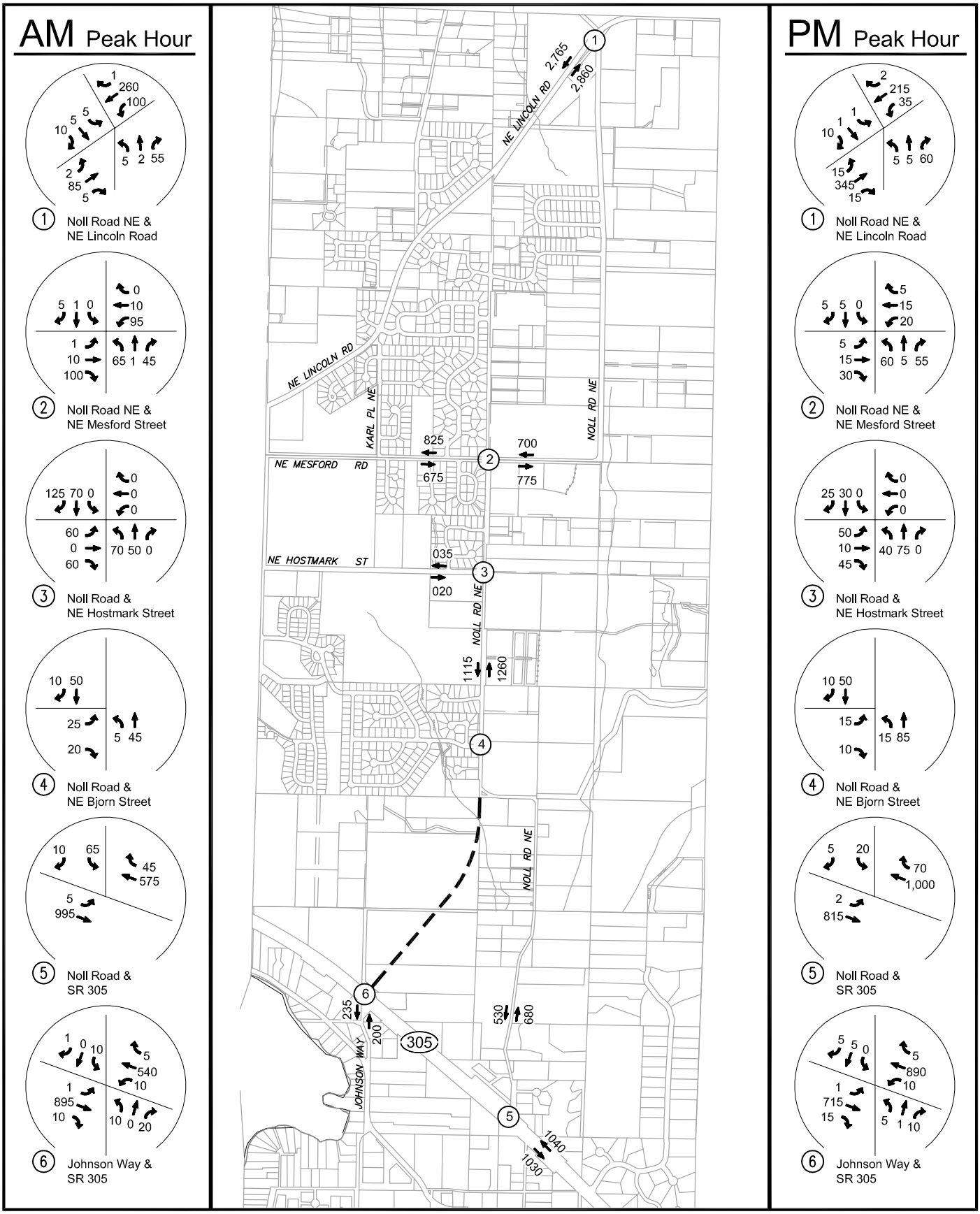
2.2 TRAFFIC DATA COLLECTION

Traffic data collection was performed in December 2007 and March 2008 and included turning movement counts at eight intersections during the AM (7 AM to 9 AM) and PM (4 PM to 6 PM) peak hours. In addition, daily traffic volume data was collected at eight mid-block locations. Table 2-1 presents details of the turning movement data collection.

Table 2-1. Turning Movement Count Collection

Intersection	Time Period	Peak Hours	Additional Data Collected
Noll Road NE / Lincoln Road / Gala Way	March 2008	AM	Heavy Vehicles
Noll Road NE / Bjorn Street	March 2008	AM	Heavy Vehicles
Johnson Way NE / SR-305	March 2008	AM, PM	Heavy Vehicles
Noll Road NE / Lincoln Road / Gala Way	December 2007	PM	Heavy Vehicles
Noll Road NE / NE Mesford Road	December 2007	AM, PM	Pedestrian Volumes
Noll Road NE / NE Hostmark Street	December 2007	AM, PM	Pedestrian Volumes
Noll Road NE / Bjorn Street	December 2007	PM	Heavy Vehicles
Noll Road NE / SR-305	December 2007	AM, PM	Heavy Vehicles

Table 2-2 lists locations where mid-block counts were collected. Figure 2-1 presents a summary of intersection and mid-block data collection for existing traffic volumes.



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NO SCALE

Figure 2-1
Noll Road Improvements Corridor Study
Existing Volumes (2007)

DATE: Dec 15, 2008 FILE: OL2237829P01T01F-Traffic Figures_EMP2update

2.3 TRAFFIC VOLUME FORECASTING

2.3.1 Planning Model Growth Rates

The City of Poulsbo's VISUM planning model was used as the foundation for future traffic volume forecasts. This model was prepared as part of the City's Transportation Plan (CTP) update (David Evans and Associates, Inc. 2006) and includes projections for future traffic volumes.

This model was used as the basis for projecting 2010 opening year and 2030 design year traffic volumes.

Table 2-2. Mid-Block Data Collection

Street	Location	Date Collected
NE Lincoln Road	West of Noll Road NE	March 2008
Johnson Way NE	South of SR-305	March 2008
Noll Road NE	East of Languanet Lane/NE Mesford Street intersection	December 2007
NE Mesford Road	West of Noll Road NE	December 2007
NE Hostmark Street	West of Noll Road NE	December 2007
Noll Road NE	South of NE Hostmark Street[1]	December 2007
Noll Road NE	North of SR-305	December 2007
SR-305	East of Noll Road NE	December 2007

[1] Speed data was also collected at this location

When analyzing future traffic operations it is anticipated that background growth will occur within the study area that will affect future traffic volumes. Factors that contribute to background growth include both developments located outside the study area, as well as developments that may occur within the study area that are not yet defined. To estimate the non development-specific traffic growth that may occur, a compounded annual growth rate was applied to the existing year traffic volumes.

Growth rates were estimated by comparing existing (2005) VISUM model directional link volumes to future year (2030) VISUM model directional link volumes for the same sections of roadway. The total (25-year) growth for each direction of each section was found. Then an annual (compounded) growth rate was calculated that when applied to the existing volume would yield the same resulting 2030 volume. For example, at southbound Noll Road south of Mesford, the growth rate was calculated as follows:

2005 PM Peak = 110 vehicles per hour (vph)
2030 PM Peak = 347 vph
Total Growth = 215%
Compounded Annual Rate = 4.70%

The growth rate varied by location along Noll Road according to the City's VISUM model. For example, on Noll Road, the average northbound growth rate was 4.5 percent and the average southbound rate was 4.98 percent. Because the two rates were similar, they were averaged to yield a 4.74 percent rate. Other growth rates presented in this report were found using the same method.

Using the same comparison of existing and future model traffic volumes for the east-west roadways that intersect Noll Road, it was found that projected growth rates along Mesford, Hostmark and Bjorn are very similar: on average, approximately 5.3 percent, compounded annually. The model indicated that east- and westbound traffic on SR 305 and Lincoln grew much more slowly than in the residential neighborhoods, at approximately 0.8 percent compounded annually on SR 305 and slightly less on Lincoln. To be conservative, the annual east-west growth rate of 0.8 percent for SR 305 was also used on Lincoln.

The growth rates derived above were therefore also used to project future AM traffic volumes. These growth rates were then applied to existing 2007 turning movement counts and used to form the base for the projected 2010 and 2030 horizon year volumes.

2.3.2 Pipeline Development Projects

Developments in the project area that are either under construction, approved for construction, or are well along in the permitting process are referred to as "pipeline developments". In considering affects of pipeline developments, land use assumptions used in the transportation planning model were reviewed to determine the extent to which the most recent model accounts for identified pipeline developments. This review indicated that the land use anticipated in the model is less intensive than the expected growth that is reflected in Table 1-1. In particular, the four projects included in Table 2-3, below, were not fully accounted for in the model and were therefore added to both the 2010 and 2030 future year traffic projections.

Table 2-3. Pipeline Development Previously Unaccounted for in City of Poulsbo Transportation Planning Model

Project	New Peak Hour Trips	
	PM	AM
Mountain Aire	145	108
Poulsbo Meadows	46	34
Blue Heron	85	63
NK REC PFD – Strawberry Fields[1]	42	4

[1] It is anticipated that more growth can be expected from this complex at full build out. Only those funded portions were included as pipeline projects. No increase was included for items which may increase trips, such as providing lighting and all-weather surfaces on existing athletic fields.

AM peak hour project volumes were not provided for the pipeline projects, so they were estimated using standard reference sources. AM and PM peak hour traffic generation from residential developments is well documented; the AM trip generation from the proposed projects was estimated using the AM trip rates published by ITE in their Trip Generation Manual.

2.3.3 Opening (2010) and Design Year (2030) Volumes

Opening year volume projections were calculated using the existing 2007 volumes as the base, and adding the model growth rates and all pipeline traffic. Resulting 2010 opening year and design year (2030) volumes are illustrated in Figures 2-2, 2-3, 2-4 and 2-5, which show traffic volumes in 2010 and 2030 with and without the potential Johnson Way extension at both intersection and mid-block locations.

A comparison of calculated traffic volumes to those developed in the City's 2006 Transportation Plan is provided in Table 2-4. In general, traffic projections were on average

about 30 percent higher for future years than those done for the City's Transportation Plan update. After accounting for the 5 year difference (2025 versus 2030) between the dates of future projections, the actual difference is on average between 10 and 20 percent, which is within an acceptable range of variability.

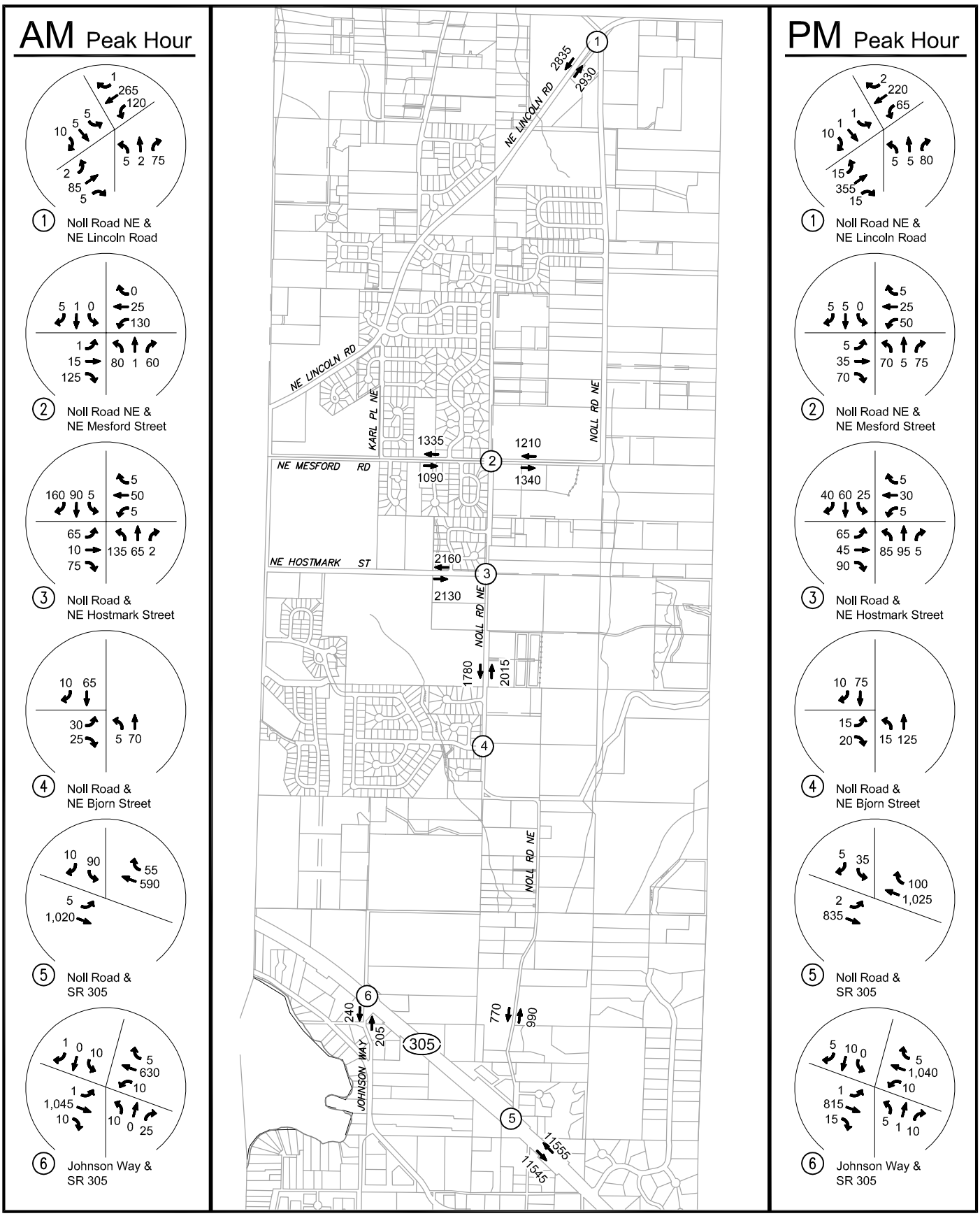

Figure 2-2
Noll Road Improvements Corridor Study
Projected Volumes (2010) Without Johnson Connection

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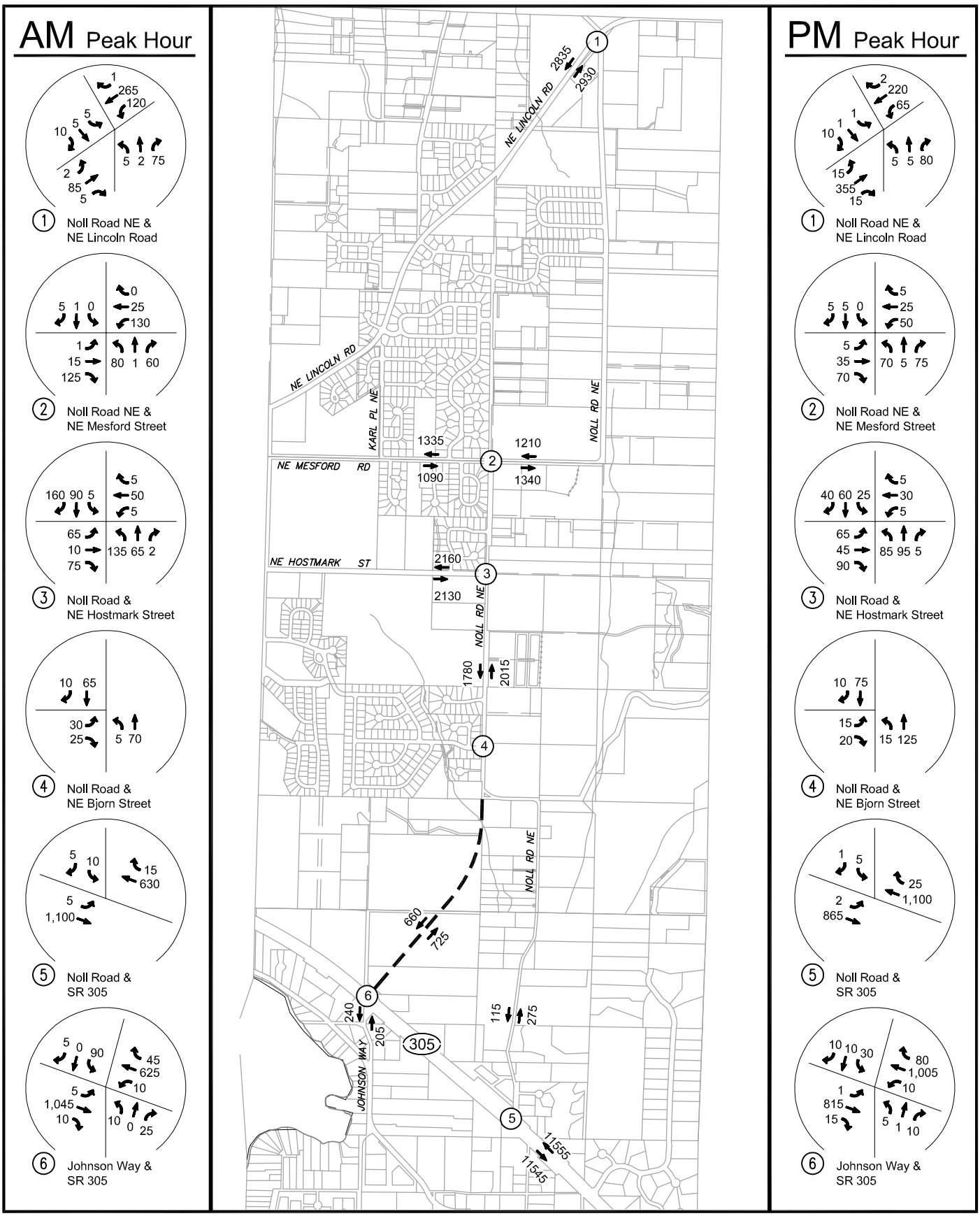

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Figure 2-3
Noll Road Improvements Corridor Study
Projected Volumes (2010) With Johnson Connection

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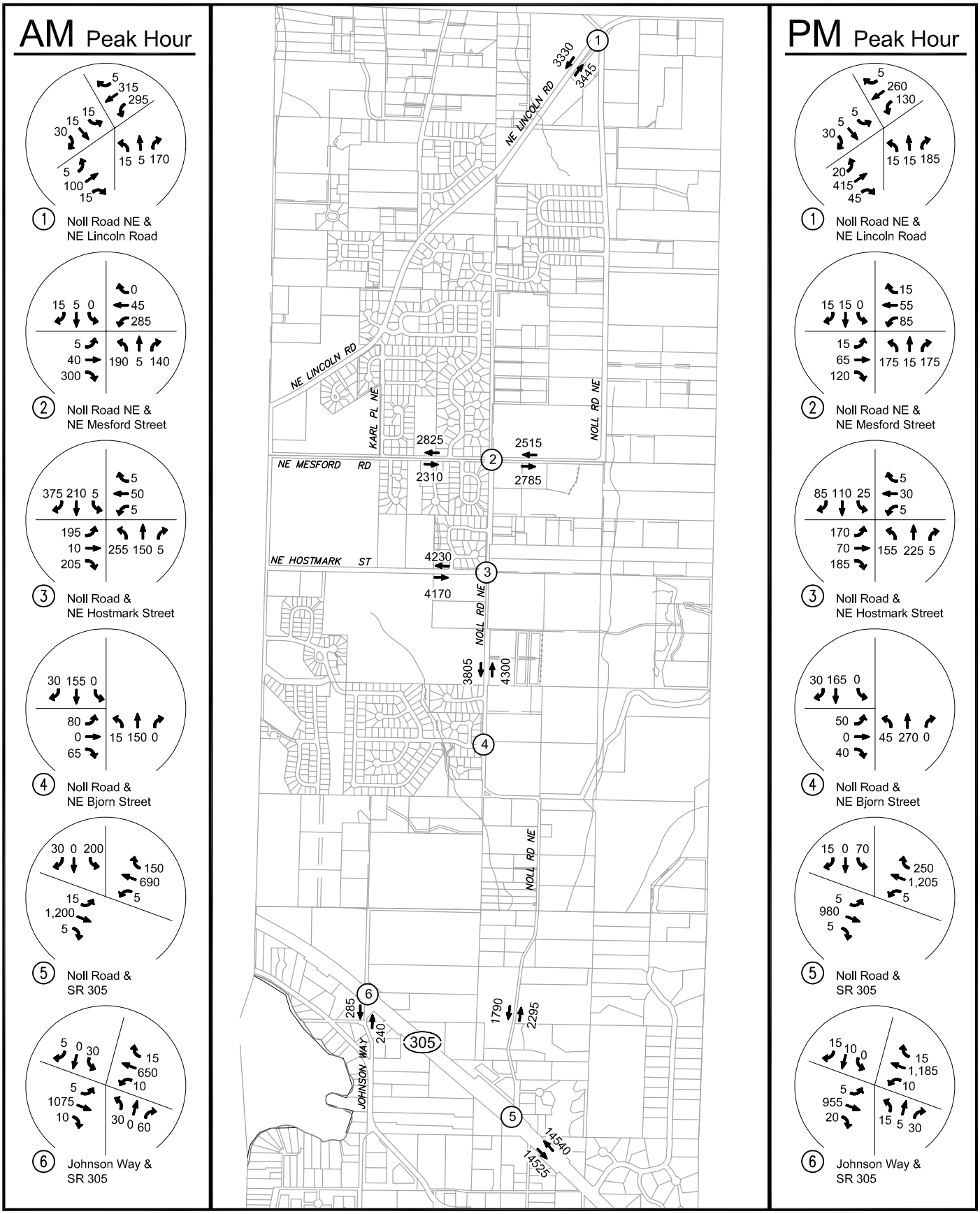

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Figure 2-4
Noll Road Improvements Corridor Study
Projected Volumes (2030) Without Johnson Connection

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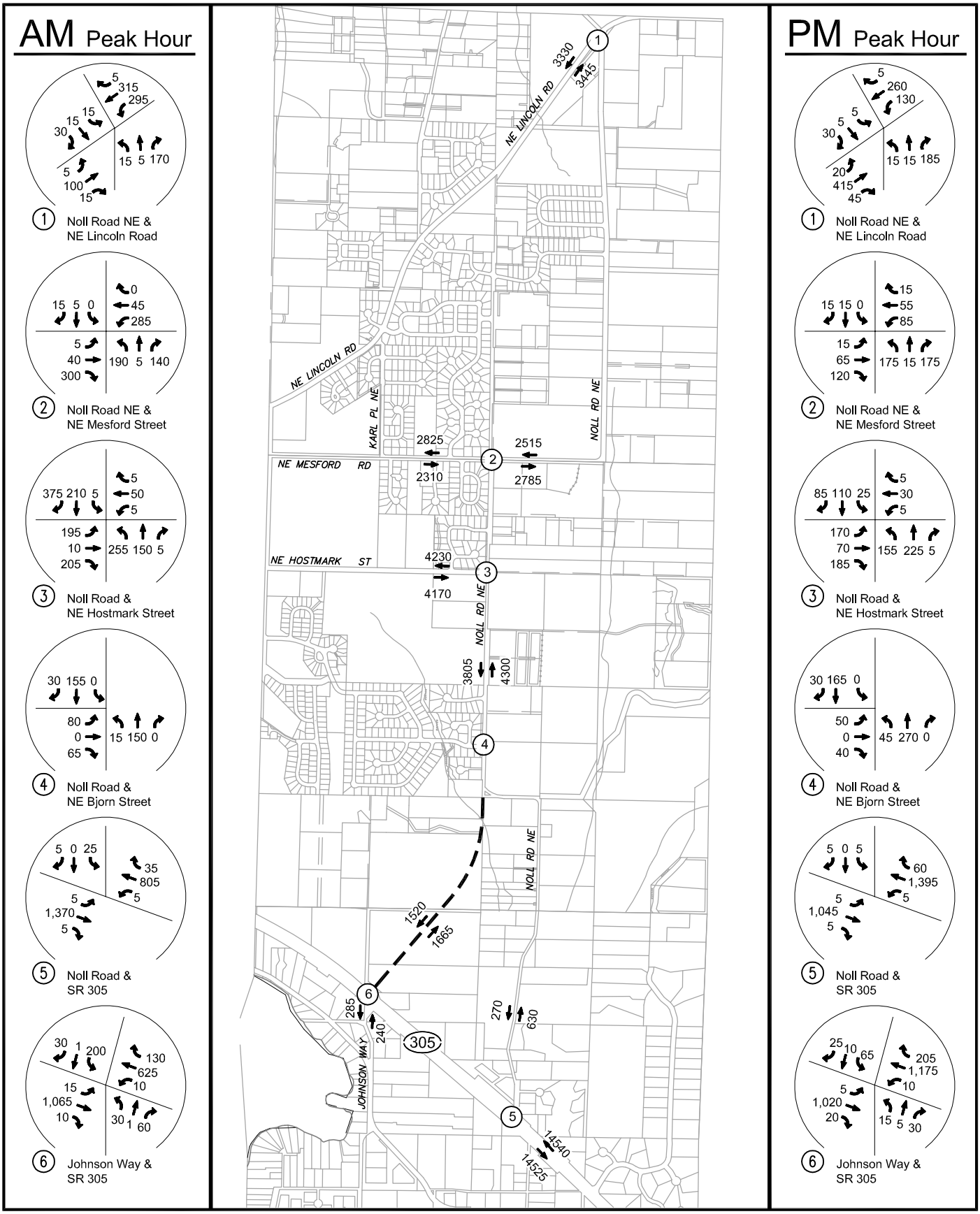


Figure 2-5
Noll Road Improvements Corridor Study
Projected Volumes (2030) With Johnson Connection

DATE: Dec 15, 2008 FILE: OL2237829P01T01F-Traffic Figures_EMP2update

Table 2-4. Comparison of Average Daily Traffic Calculations to Transportation Plan Update (2006)

	Data Source:	TPU[1]	NRCP [2]	TPU[1]	NRCP [2]
	Period:	2005	2007	2025	2030
Location	**Forecast**	**ADT**	**ADT**	**ADT**	**ADT**
Lincoln at Noll Road		8,171	6,270	10,431	8,750
Noll Road at Lincoln		2,541	1,625	3,391	5,305
Hostmark at Noll Road		3,831	2,055	6,201	8,400
Noll Road at Hostmark		2,121	2,375	2,551	7,555
SR 305 at Noll Road		ND	22,070	ND	28,625
Noll Road at SR 305		921	1,214	2,021	4,255

[1] City of Poulsbo Transportation Plan Update, David Evans and Associates November 2006.

[2] NRCD = Noll Road Corridor Plan, December 2008.

ND = No data.

2.4 OPERATIONS

In order to evaluate the ultimate capacity of the existing roadway, and estimate the roadway geometry required to maintain an acceptable LOS within the study area transportation network, the projected volumes were analyzed to first determine how many through lanes are required along the corridor, and second, where turn lanes or intersection control devices may be required.

2.4.1 Noll Road Lane Requirements

Conceptual planning models contained in the Florida Department of Transportation's (FDOT) 2002 Quality and Level of Service Handbook were used to illustrate the carrying capacity of Noll Road. This FDOT document is widely accepted as an industry-standard guideline and included in many corridor analysis software applications due to the extensive research behind the recommendations. The carrying capacity analysis provides an approximation of how well the basic cross section of the roadway will accommodate future volumes, and whether additional lanes or cross section elements could be required between intersections. In practice, most corridor delay is due to intersection delay (see following section). This tool, however, is useful for illustrating how changes to the roadway section (adding a median or turn lanes, for example) impact the ability of the corridor to accommodate traffic volumes.

Traffic volume forecasts for the 2030 horizon year indicate maximum peak directional link volumes occur between Mesford Street and Bjorn Street, and range from 315 to 400 vehicles per hour (vph) during the PM peak, and 420 and 600 vph during the AM peak. Other sections of Noll Road experience 255 vph or less in the peak direction during the PM peak, and 350 vph or less in the peak direction of the AM peak hour.

After accounting for reductions due to a lack of left-turn lanes or medians on the existing configuration, which would increase the carrying capacity of the road, the LOS C threshold for the corridor is 296 vph. The LOS D threshold is 576 vph, and LOS E is projected to occur with volumes between 576 and 616 vph. Thus, one lane in each direction is anticipated to meet the City's LOS criteria during the PM peak, but the roadway will be nearing capacity

during the AM peak. This means that any perturbation to traffic flow, such as could be caused by excessive driveways, poor geometry, or overly narrow lanes, may cause delays along the corridor. A summary of the corridor LOS is shown in Table 2-5.

Table 2-5. Noll Road Peak Directional Volumes and LOS by Segment

Roadway	From	To	Peak Directional Volume (Peak HR)	LOS
Noll Road	Lincoln Road	NE Mesford Road	340 (AM)	D
	NE Mesford Road	NE Hostmark Street	600 (AM)	E
	NE Hostmark Street	Bjorn Street	420 (AM)	D
	Bjorn Street	SR 305	350 (AM)	D

The City of Poulsbo has also established LOS D as the desired standard, and LOS E as the minimum acceptable standard. One lane in each direction meets the City's LOS D goal for all sections excepting NE Mesford to NE Hostmark. With the addition of intersection turn lanes, all roadway segments are projected to operate at an acceptable level of service.

2.4.1.1 Turn-Lane Evaluation

A continuous turn lane provides the benefit of improving operations, reducing delay, separating opposing flows, and increasing safety along the corridor. However, it also increases right-of way requirements, stormwater runoff, construction costs, and pedestrian crossing distances. While a continuous left turn lane is not required to meet corridor level of service standards, analysis was conducted to determine whether left turn lanes might occasionally be required to provide access to developments along the corridor (see section 2.4.4).

2.4.1.2 Center Turn Lanes and Medians

Projected operations at minor access points throughout the corridor do not indicate a need for a continuous two-way center left turn lane. In general, the operational benefit of a center left turn lane is small. There is, however, a safety benefit of separating opposing vehicular flows. The safety benefit is larger if the opposing flows are separated by a physical median. A raised median could also provide opportunities for pedestrian refuge islands. A six foot (or greater) median would provide sufficient protection to pedestrians using the median as a refuge island. A median could provide increased opportunities for landscaping. A median width of at least four feet would be recommended if the median was to be landscaped. Provision of a center median would however, increase costs and right-of-way. Given the relatively low operational benefits, increased right-of-way and increase in costs, a median is not proposed.

2.4.2 Intersection Traffic Operations - Noll Road

This section discusses traffic operations at primary and secondary intersections. The acknowledged source for determining overall capacity for arterial segments and independent intersections is the current edition of the Highway Capacity Manual (HCM) published by the Transportation Research Board (TRB). Parametrix used analysis methodology found in Chapter 17 for analysis of unsignalized intersections.

2.4.2.1 Traffic Analysis Methods

Stop sign-controlled intersections were analyzed using the Synchro 7 software that uses the methodology in the 2000 HCM. The capacity manual uses Level of Service (LOS) to describe the operating conditions at an intersection. LOS is a qualitative term describing operating conditions a driver will experience while traveling on a particular street or highway during a specific time interval. It ranges from "A" (very little delay) to "F" (long delays and congestion). The City of Poulsbo uses Level of Service "D" as its design standard, and LOS "E" as its concurrency standard for the study area.

Level of service calculations for intersections determines the amount of "control delay" (in seconds) that drivers will experience while proceeding through an intersection. Control delay includes all deceleration delay, stopped delay, and acceleration delay caused by the traffic control device. The level of service is directly related to the amount of delay experienced.

For intersections under minor street stop sign-control, the LOS of the most difficult movement (typically the minor street left-turn) represents the intersection level of service. Table 2-6 shows the level of service criteria for unsignalized intersections.

Table 2-6. Level of Service Criteria for Unsignalized Intersections

Level of Service	Average Control Delay (seconds/vehicle)
A	≤10
B	>10–15
C	>15–25
D	>25–35
E	>35–50
F	>50

Source: Table 17-2, p 17-s, *Highway Capacity Manual*, Transportation Research Board, Washington DC, 2000.

Capacity analyses were completed for traffic volume conditions expected to occur during the morning and evening peak period at all study intersections for the following scenarios:

- Existing 2007 traffic volumes
- Projected 2010 traffic volumes without corridor improvements
- Projected 2030 traffic volumes without corridor improvements

Operational forecasts and improvement needs for the primary intersections of Noll-Lincoln, Noll-Mesford, Noll-Hostmark and Noll-SR 305 intersections are described below and are summarized in Table 2-7.

Table 2-7. Intersection Level of Service Summary

Intersection		Existing 2007		Projected 2010		Projected 2030	
N/S	E/W	LOS (Delay)		LOS (Delay)		LOS (Delay)	
Corridor	Intersection	Worst Movement	Intersection Average	Worst Movement	Intersection Average	Worst Movement	Intersection Average
Noll Rd	Lincoln Rd	C (18.1)	A (3.4)	C (18.6)	A (3.8)	F (71.5)	B (12.2)
Noll Rd	Mesford St	A (8.3)	A (7.9)	A (8.9)	A (8.4)	C (17.8)	C (16.4)
Noll Rd	Hostmark St	B (11.3)	A (5.0) *PM*	C (17.2)	A (7.8) *PM*	F (>300)	F (>100)
Noll Rd	Bjorn St	A (9.4)	A (1.9) *PM*	A (9.6)	A (1.8) *PM*	B (13.4)	A (2.6)
Noll Rd [1]	SR-305	F (99.4)	A (4.4)	F (193.3)	B (11.0)	F (>300)	F (>100)

Red = Does not meet City LOS standard.

[1] Assumes no signalization.

2.4.2.2 Noll Road – Lincoln Road Intersection

The worst movement at the intersection of Noll and Lincoln is projected to operate at LOS F during the AM peak hour by 2030. This intersection is projected to meet traffic signal warrants by 2010. Kitsap County has identified, as a joint effort with the City of Poulsbo, an intersection improvement project at this location on their 6-year TIP. Realignment of Gala Way and Noll Road to a single intersection with Lincoln Road as a roundabout has been identified as a preferred solution, and is discussed in greater detail in the Intersection Control Alternatives section of this report.

2.4.2.3 Noll Road – Hostmark Street Intersection

As shown in Table 2-7, the worst movement at the intersection of Noll and Hostmark is projected to operate at LOS C in 2010, and LOS F during peak hours in 2030 under its current configuration. Because stop-controlled intersections are evaluated based on delay to each individual movement, this intersection is expected to fail without improvements.

2.4.2.4 Noll Road – Mesford Street Intersection

The intersection of Noll and Mesford is projected to operate well in 2030 as it is currently configured.

2.4.2.5 Noll Road – SR 305 Intersection

The southbound Noll Road approach at SR-305 currently operates at LOS F during both peak hours. The WSDOT 2007-2026 Highway System Plan (HSP) identifies a project to add a center left turn and acceleration lane on SR-305 at Noll Road. This project is identified as a Tier 1 Capacity project with a construction date between 2 and 20 years from 2007 – a specific data has not been identified. This project is currently unfunded.

Ultimately, some type of traffic control may be warranted at this location. Assuming the alternative alignment is constructed to Johnson Way, traffic volumes at Noll and SR-305 would be reduced to the point where traffic control may not be required; although the center turn lane may still be constructed as a safety and capacity improvement. With the alternative

alignment, traffic control would likely be required at Johnson Way in the future. A more detailed discussion of traffic operations for the Johnson Way extension is provided in section 2.4.3 below.

2.4.2.6 Signal Warrant Analysis – Noll Road Corridor Intersections

Traffic signal warrant analysis was conducted on the primary Noll Road intersections for the 2010 and 2030 horizon years. For those intersections with projected operations below the City's desired LOS, the 4-hour and 8-hour signal warrant criteria were evaluated using 2030 design volumes. These warrants, specified by the MUTCD, are considered basic requisites for installing a traffic signal to improve intersection operations. If the warrant conditions are not met, other measures, such as turn lanes, should be investigated. Table 2-8 summarizes the results of the 4-hour and 8-hour volume signal warrant analysis found in the latest version of the Manual of Uniform Traffic Control Devices (MUTCD).

Table 2-8. Signal Warrant Summary

Intersection	Projected 2010	Projected 2030
Noll Road NE / Lincoln Road / Gala Way	Yes	Yes
Noll Road NE / NE Hostmark Street	No	Yes
Noll Road NE / SR-305	No	Yes
Noll Road NE / Mesford Street	No	No
Noll Road NE / Bjorn Street	No	No

As Table 2-8 indicates, Noll Road intersections with Lincoln, Hostmark and SR 305 are projected to meet signal warrants in 2030, but only the intersection with NE Lincoln Road will warrant a signal in 2010. Meeting signal warrants does not necessarily require installation of a traffic signal. Rather, it means that the combination of conditions at the intersection (speed, queuing, LOS, etc.) are such that a signal may be considered at the location. For the intersections with SR-305, a traffic signal is the most likely form of intersection control, as it is in character with the rest of this state route. At other intersections, other traffic control strategies may prove equal to or better than a signal. Specific traffic control options at the primary intersections are discussed later in the Intersection Control Alternatives section of this document.

The intersection of Hostmark Street is not projected to meet signal warrants in 2010. This location, however, is projected to meet signal warrants in 2030. Alternative improvements may provide acceptable operations at this location including either all-way stop-control or adding left-turn lanes in the median of Noll Road along with a left-turn lane for the eastbound approach.

SR 305 and Noll Road is not projected to meet signal warrants in 2010, but is projected to meet signal warrants in 2030. Operations at SR 305 may be slightly better than shown due to the ability of right-turning vehicles to bypass the left-turn queue. Although a signal is not currently on WSDOT's highway system plan, the HSP does identify a project to construct a center left turn lane and opposing acceleration lane on SR 305. The acceleration lane, in particular, will improve operations at this intersection by allowing vehicles to accelerate and merge into traffic on SR 305. This improvement is not currently funded.

In summary, it is anticipated that intersection improvements will be required at the intersections of Noll Road with Lincoln Road, Hostmark Street, and SR 305. Lincoln Road

and SR 305 have improvement concepts proposed by the County and the State, respectively. These concepts, as well as turn lanes, stop signs, or roundabouts at the intersection of Hostmark Street and Noll Road are evaluated in Chapter 3. The potential impacts of a new intersection at Johnson Way and SR 305 are addressed in section 2.4.3 below.

2.4.3 Traffic Operations - Johnson Way Extension

The Johnson Way extension consists of a new 3,500-foot road that connects Noll Road to SR 305 via Johnson Way. This alternative alignment, referred to as the potential Johnson Way extension, is shown in Figure 2-6. If Johnson Way is extended to intersect Noll Road, a traffic shift will likely occur from Noll Road to Johnson Way. If the new alignment is relatively direct, it is projected that a large portion of the traffic that uses the southern section of Noll Road will shift to the new connection.

This shift will happen in part because the new intersection with Noll Road will align the north-south approaches as through movements. The currently aligned Noll Road would become the east leg of the intersection and operate under stop control. Southbound traffic on Noll headed southeast on SR-305 would only make one left-turn using the new alignment rather than two using the existing route. Similarly, those headed northbound on Noll Road would only be required to make one right turn instead of two.

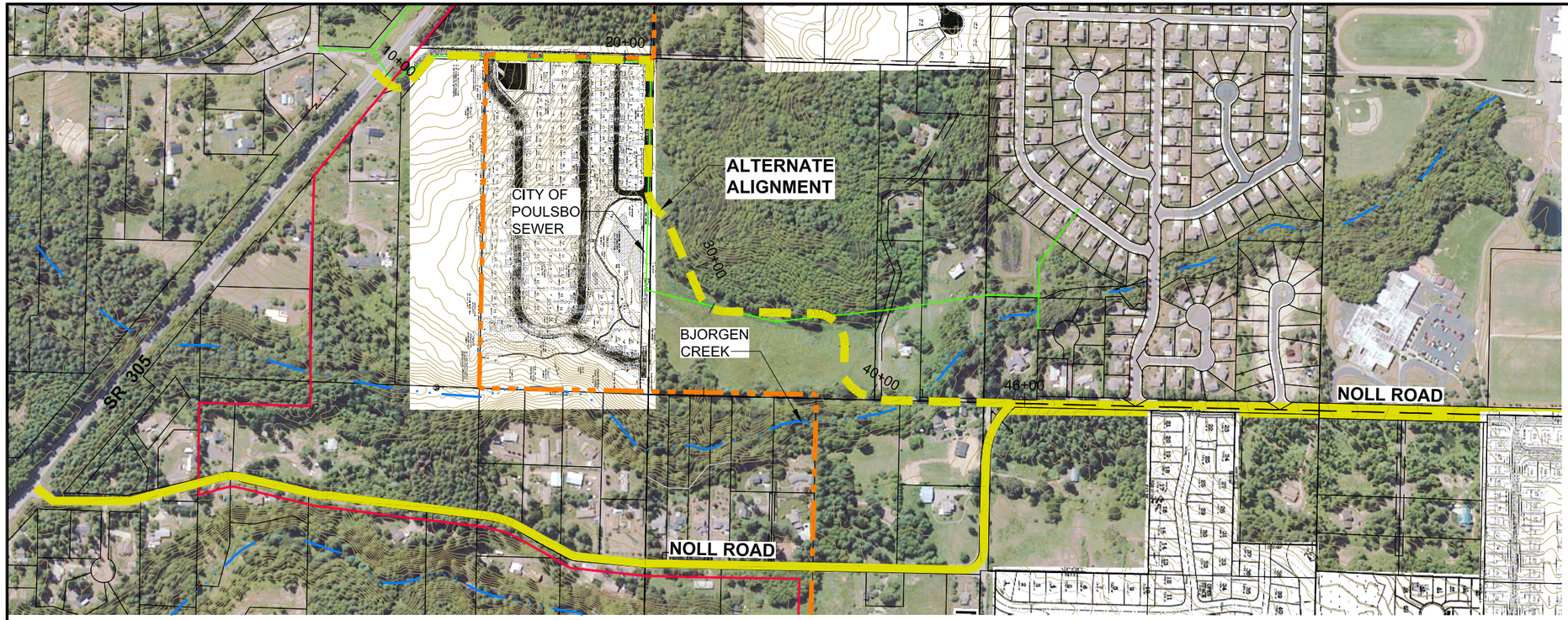
Urban residential development is anticipated along Johnson Way north of SR-305. This development, coupled with a shift of north-south traffic away from Noll Road, will require intersection improvements at Johnson Way and SR-305. The resulting intersection improvements will reduce delay for southbound left turns from Johnson Way to SR 305. The combination of these factors is projected to attract approximately 90-percent of the southbound and 75-percent of the northbound through traffic from Noll Road to the new Johnson Way connector.

To prepare a base-case scenario by which to evaluate the potential operational effectiveness of an alternative corridor alignment terminating at Johnson Way and SR-305, the existing intersection was evaluated without a connection to Noll Road. This base-case scenario includes turn lanes on SR-305; the need for turn lanes was established as an unfunded priority in the WSDOT HSP appendices and has been identified as a condition of approval for the proposed Johnson Ridge development. Other than the pipeline and background growth rates documented as part of TM 1, planned developments were not included in the analysis. The LOS analysis for this base case is provided in Table 2-9.

Table 2-9. Level of Service (LOS) Summary – Johnson Way/SR-305 (Without Connection)

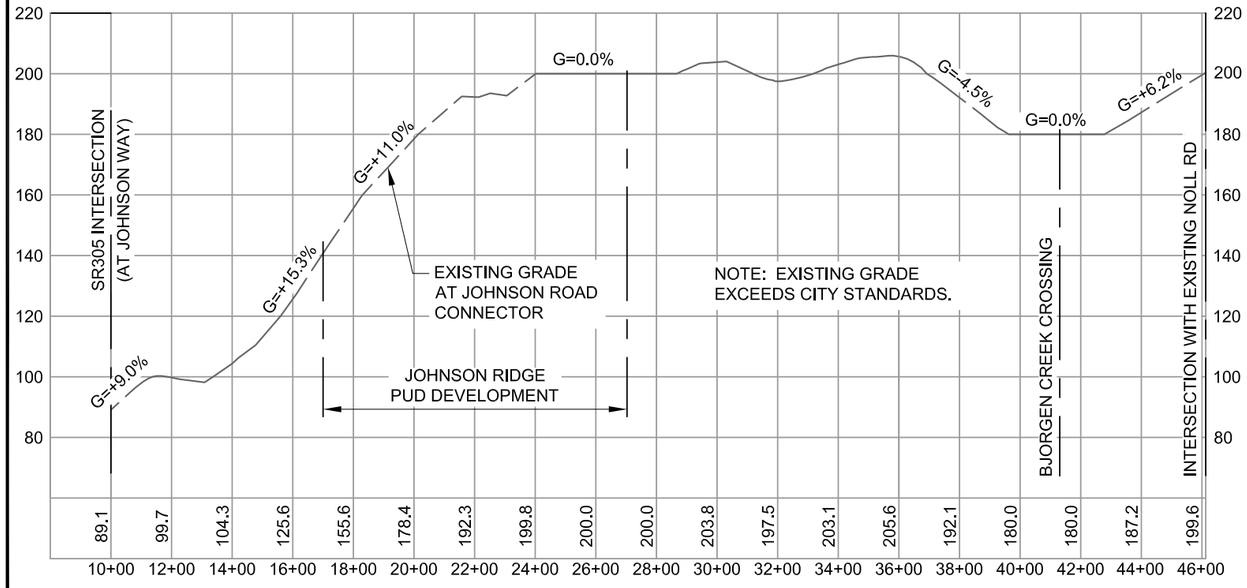
	AM Peak Hour				PM Peak Hour			
	Projected 2010		Projected 2030		Projected 2010		Projected 2030	
	LOS (Delay)		LOS (Delay)		LOS (Delay)		LOS (Delay)	
Intersection	Worst Movement	Int. Average	Worst Movement	Int. Average	Worst Movement	Int. Average	Worst Movement	Int. Average
Johnson Way / SR-305[1]	F (93.3)	A (1.6)	F (240.8)	B (10.0)	F (64.3)	A (1.1)	F (265.6)	A (6.7)

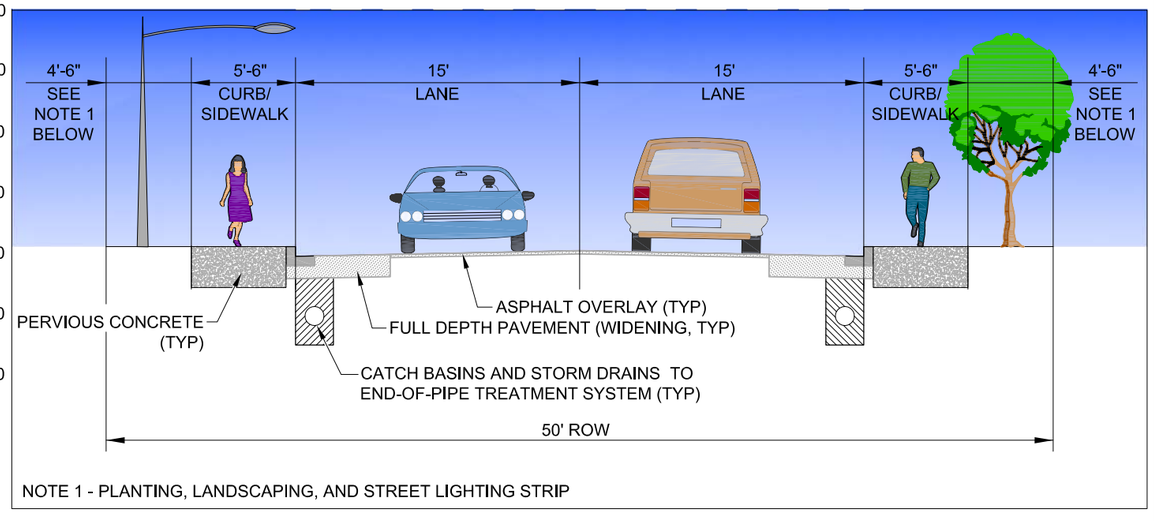
[1.] Assumes left-turn lanes on SR-305, conditioned for Johnson Ridge development. One-lane approaches assumed on Johnson Way.



LEGEND

- PARCEL
- STREAMS
- 300 — 25-FT CONTOUR
- URBAN GROWTH AREA
- NOLL ROAD
- POTENTIAL JOHNSON ROAD CONNECTOR
- CITY LIMITS
- EXISTING POULSBO SEWER





Parametrix DATE: Dec 29, 2008 FILE: BR2237829P01T01F-XX_AltAlign

PLAN SCALE: 1"=500'

PROFILE SCALE: HORIZ 1"=500'
VERT 1"=50'

CROSS SECTION SCALE: NO SCALE

Figure 2-6
Noll Road Improvements
Potential Johnson Road Connector
Plan, Profile, Proposed Cross Section

2.4.3.1 Intersection Analysis, Johnson Way Extension Alignment

Capacity analyses were completed for traffic volume conditions expected to occur during the morning and evening peak period at all three effected intersections in 2010 and 2030, assuming the Johnson Way extension is constructed. Intersection analysis results are summarized in the following Tables 2-10 and 2-11.

Table 2-10. Level of Service (LOS) Summary, Unsignalized Intersections - AM Peak Hour with New Johnson Way Connection

Intersection	Projected 2010		Projected 2030	
	LOS (Delay)		LOS (Delay)	
	Worst Movement	Int. Average	Worst Movement	Int. Average
Noll Rd / Johnson Way[1]	A (8.7)	A (2.1)	A (9.4)	A (1.5)
Johnson Way/ SR-305[2]	F (>300)	D (34.1)	F (>300)	F (>300)
Noll Rd / SR-305[3]	C (18.0)	A (0.2)	D (27.8)	A (1.3)

1. Assumes single-lane approaches.
2. Assumes left-turn lanes on SR-305, two-lane SB and one-lane NB approaches on Johnson Way.
3. Assumes planned eastbound left-turn lane and southbound left-turn receiving/acceleration lane in place.

As Tables 2-9 and 2-10 indicate, the projected delay for worst movements of the Johnson Way and SR-305 intersections is significant enough to reduce intersection average to LOS F during the AM and PM peak hour in 2030, and to LOS D during the AM peak hour in 2010. Additionally, the worst movement of the Noll Road and SR-305 intersection is expected to reach LOS E during the 2030 PM peak hour. Because stop-controlled intersections are evaluated based on delay to each individual movement, both of these intersections are expected to fail without improvements. If a signal were to be installed at Johnson Way, however, left turn movements during peak hours will likely divert to the signal from the existing Noll Road intersection. Improvements at Johnson Way and SR-305 may thus alleviate the need for additional improvements at Noll Road and SR-305.

Table 2-11. Level of Service (LOS) Summary, Unsignalized Intersections - PM Peak Hour with New Johnson Way Connection

Intersection	Projected 2010		Projected 2030	
	LOS (Delay)		LOS (Delay)	
	Worst Movement	Int. Average	Worst Movement	Int. Average
Noll Rd / Johnson Way[1]	A (9.0)	A (4.4)	B (10.4)	A (4.6)
Johnson Way / SR-305[2]	F (276.3)	A (5.5)	F (>300)	F (264.7)
Noll Rd / SR-305[3]	C (21.2)	A (0.1)	E (39.1)	A (1.3)

1. Assumes single-lane approaches.
2. Assumes left-turn lanes on SR-305, conditioned for Johnson Ridge development, and two-lane approaches on Johnson Way.
3. Assumes planned eastbound left-turn lane and southbound left-turn receiving/acceleration lane in place.

2.4.3.2 Signal Warrant Analysis - Johnson Way Extension Alignment

Traffic signal warrant analysis was conducted on the Noll Road and Johnson Way intersections with SR-305 for the 2010 and 2030 horizon years. It was assumed that the daily

profile of traffic fluctuation seen in the existing tube counts would remain constant to the peak hours as future year volumes were projected. Table 2-12 summarizes the results of the 4-hour and 8-hour volume signal warrant analysis found in the latest version of the Manual of Uniform Traffic Control Devices (MUTCD). The analysis assumes that Johnson Way is extended to Noll Road NE.

Table 2-12. Signal Warrant Summary

Intersection	Projected 2010	Projected 2030
Noll Road NE / SR-305	No	No
Johnson Way NE / SR-305	No	Yes

As Table 2-12 indicates, with the new alignment, a signal is no longer warranted at the Noll Road-SR 305 intersection. Instead, a traffic signal will be warranted at the intersection of SR-305 and Johnson Way. Also, while signal spacing for either intersection option is relatively good, the two intersections are too close together for both to be signalized. The intersection of Johnson Way and SR-305 would be a preferred location for a signal because this location would have one more approach leg than at Noll and SR-305, and this signal will serve more motorists.

A signal is warranted sometime between 2010 and 2030 at Johnson Way and SR 305. A signal would also be required at Noll Road and SR 305 during the same period if the Johnson Way extension is not constructed. Only one signal will ultimately be warranted. Additional analysis would be required to determine at what point (what year) a signal will likely be warranted. This analysis only evaluates traffic volume projections for the corridor for opening and horizon years; the signal will be warranted somewhere in between. If development occurs such that the Johnson Way extension is built, then the signal will be installed there since this is a better location along SR-305 and will serve more people.

2.4.4 Traffic Operations at Secondary Intersections

This section summarizes the operational forecasts and potential improvement needs for the secondary intersections of Noll-Bjorn, Noll-Kevos Pond Drive, Noll – Johnson Way (alternative alignment), and Noll – developments.

Traffic volume projections at minor secondary streets were projected for the 2030 horizon year along the Noll Road corridor using compounded annual growth rates found by comparing peak hour volumes of the existing and horizon year regional models. Supplemental traffic count data was collected for the AM peak hour at the intersection of Bjorn Street and Noll Road to provide a complete analysis.

The volumes at the Bjorn Street intersection with Noll Road are higher than at other residential access points within the study area. For this reason, the intersection of Bjorn Street and Noll Road is used as the test case for determining the need for secondary turn lanes along the corridor. For the purpose of the intersection analysis, it was also conservatively assumed that a future roadway was constructed on Noll Road opposite the existing Bjorn Road, and that this future roadway has volumes comparable to the existing volumes at Bjorn.

At the intersection of Noll Road and NE Bjorn Street the growth rate used for the north- and southbound approaches is 4.7-percent and the growth rate for the eastbound approach is 5.3-percent. This results in a projected northbound left-turn (NBLT) volume of 45 vehicles-per-hour (vph) during the PM peak, up from the existing volume of 17 vph. Because the NBLT is not a major through or attractive cut-through route, and primarily serves the Bjorn Street

neighborhood, the NBLT movement will likely grow more slowly than the through movement—and 45 vph is therefore thought to be a conservative estimate for this analysis. It should be noted, however, that this development has an alternate access via Caldart/Hostmark; if this route were to become less attractive due to congestion on those corridors, the Bjorn Street access may become more heavily used.

Review of operations at the test case intersection of Bjorn and Noll shows no capacity or delay deficiencies in the design year 2030. The worst movement at that intersection is expected to operate at LOS C, with a projected average delay of 16.3 seconds per vehicle.

The need for turn lanes was also evaluated using two alternate methods--the WSDOT Design Manual, and City of Olympia guidelines. With 16.7-percent of the 2030 NB approach volume, and with an opposing volume of 195 vph projected for the PM peak hour, the combination of left-turn and opposing volume would warrant further analysis in a 40 mph zone according to Figure 910-8a in the WSDOT Design Manual. The subject intersection is not in a 40 mph zone, which indicates that left-turn storage is not warranted.

In summary, the analysis does not show a need for providing left turn lanes at secondary intersections. Should left turn pockets be required at any locations in the future, providing a reduced-width median would make addition of any required storage pockets more practicable. Future developments should be evaluated on a case-by case basis to determine the need for left turn storage. It is anticipated that any location with greater than 50 left turns expected during a peak hour will warrant a left turn lane; each situation should be evaluated based on safety and operations at that time.

2.5 ACCIDENT DATA

Crash statistics from WSDOT for the City and County roadways in the study area were reviewed for the 2004 to 2006 period. Although the number of collisions is too small to determine if any locations in the study area have a high collision rate, roadway improvements could correct some of the collisions types which have been recorded.

Typically, crash rates are higher at intersections, where volumes are higher and the number of potential conflict points is greater. Within the Noll Road study area, both traffic volumes and the number of crashes are relatively low, making it difficult to discern patterns in the data that might indicate areas where improvements might be needed. Therefore, future analysis of potential improvement options will not quantify the effectiveness of each improvement as a countermeasure to existing collisions.

The data does indicate that the proposed design for corridor improvements should include those safety features that are typically provided on new construction within the City. Such safety improvements will serve as countermeasures for some of the crash types exhibited in the data. Features to consider include:

- Improvements to the clear zone and addition of curb to reduce object strikes.
- Consistency in street lighting, and provision of street lighting at intersections.
- Provision of sidewalks and bicycle lanes to separate bicyclists and pedestrians from vehicular traffic.

2.5.1 SR 305 Accident Data

The WSDOT Transportation Data Office maintains a statewide database which tracks crash statistics for state highways. This information is used in part to prioritize safety improvement projects, rank proposed improvements based on the collision cost per mile per year, and

calculate the expected benefit/cost ratio for each improvement. The rankings are commonly conducted for the following three location categories:

- High Accident Location (HAL) – location with a higher than average rate of severe accidents in the previous 2 years.
- Pedestrian Accident Location (PAL) – locations with four accidents involving pedestrians in a 6-year period.
- High Accident Corridor (HAC) – state highway roadway segments, greater than or equal to one mile long, with a higher than average rate of severe accidents.

WSDOT does not classify any part of SR 305 near Noll Road as HAL, PAL or HAC.

2.6 SPEED LIMIT CONSIDERATIONS

The existing speed limit on Noll Road is 35 miles per hour (mph). Speed data was collected for both northbound and southbound traffic on Noll Road, south of Hostmark, for three 24-hour periods in December of 2007. The speed measurements indicate that average speeds along the corridor are approximately 31 miles per hour. However, speed study results are generally considered terms of the 85th percentile; the rationale being that in any given situation 85 percent of the driving population typically operates their vehicles in a safe and reasonable manner.

The results of the speed studies show that the 85th percentile speeds were generally 37-38 mph, or 2-3 mph above the posted speed. Differences between posted speeds and operating speeds of approximately 5 mph are common, and, depending on other variables, can be considered acceptable. This is one indication that existing speed limits may be set at an appropriate level. Moreover, speed alone does not necessarily indicate an unsafe condition — indeed; crash statistics do not show any obvious problem areas. When the City determines the design speed for the proposed improvements, they should also consider other factors, such as consistency with other collectors of similar size and design characteristics, and the speed limits on nearby streets. Doing this will help better meet driver expectations, and can improve safety.

Posted speeds on surrounding streets are lower than the existing 35 mph limit on Noll: both Hostmark and Mesford have a posted speed of 25 mph, Lincoln is 30 mph. Consistency among roadways of similar design and functional classification will provide better safety by better meeting driver expectations.

With the presence of existing schools, the plans to provide more community recreation opportunities along the corridor, and the plans for new residential developments, pedestrian and bicyclist volumes can be expected to increase along the corridor. Lower operating speeds could improve safety for non-motorized users. These factors should be considered by the City as the design speed for the new corridor is determined.