4. ROADWAY IMPROVEMENTS

The purpose of this chapter is to describe the proposed roadway improvement plan and costs, including stormwater management and connectivity components. The following elements are addressed in this section:

- Proposed road plan and cross sections for Noll Road, Languanet Lane and the future Johnson Way extension
- Proposed stormwater management plan, including feasibility analysis of a regional facility
- Discussion of connectivity issues related to the corridor

Each of these items is discussed in greater detail below.

4.1 ROAD CLASSIFICATION AND DESIGN STANDARDS

Portions of Noll Road are located within the city, as well as unincorporated Kitsap County. The middle segment of Noll Road between Mesford and the southern 90 degree corner is within the city limits and is classified by the City of Poulsbo as a Neighborhood Collector. Neighborhood Collectors are defined by the City as intra-community streets which connect residential neighborhoods with centers and facilities. According to the City of Poulsbo Street Standards, a neighborhood collector has a 50-foot right-of-way, 12-foot lane width, 3-foot shoulders and 5-foot sidewalks on both sides.

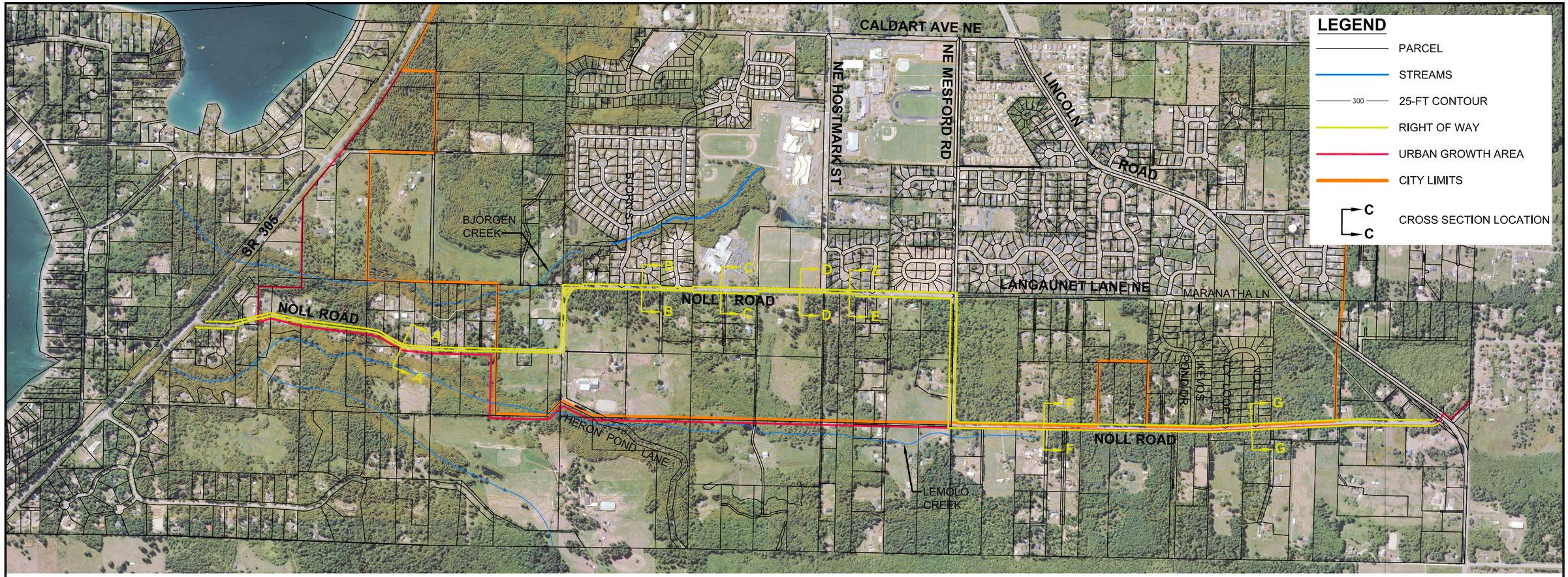
The southern segment of Noll Road just south of the 90-degree corner is outside of the UGA as is the northern segment between Mesford Road and Lincoln Road. As a result, these segments are under Kitsap County's jurisdiction. According to the Kitsap County 10-year Comprehensive Plan Update dated August of 2006, the federal functional classification of this segment of Noll Road is a Minor Arterial. Minor arterials provide primary access to the principal arterial and to or through communities of high-density residential areas.

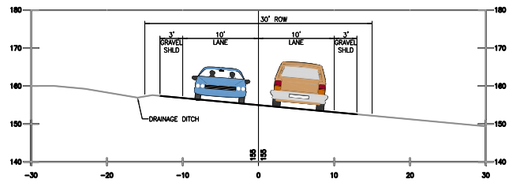
Kitsap County has adopted regulations that require development within unincorporated portions of the Poulsbo UGA to meet City standards. However, there are portions of Noll Road located outside the UGA on both the north (Mesford north to Lincoln) and south segments. Any improvements proposed in these sections would therefore be required to meet Kitsap County Road Standards which calls for a minimum roadway width of 40 feet.

For curbed sections, this width is measured from face of curb to face of curb. For shouldered sections, this width is measured from outside edge to outside edge of shoulder and includes 8-foot shoulders on both sides. Since these areas are outside the UGA, sidewalks would likely not be required. If sidewalks are required as a condition of the development approval, the sidewalk width must be 5 feet. In addition, the bicycle lane width varies based on the location per the Kitsap County Bicycle Facilities Plan. The minimum width required for a bicycle lane is 5 feet.

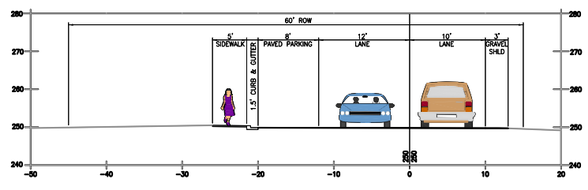
4.2 EXISTING RIGHT-OF-WAY AND ROADWAY FEATURES

The right-of-way and existing roadway sections varies along the corridor as shown in Figure 4-1. In general, the existing right-of-way varies from 30 feet to 60 feet, and the existing lane widths typically vary from 10 feet to 15 feet.

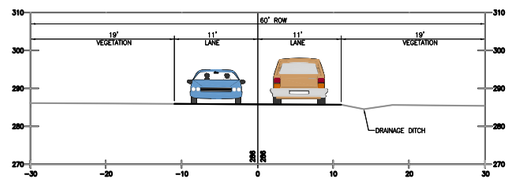




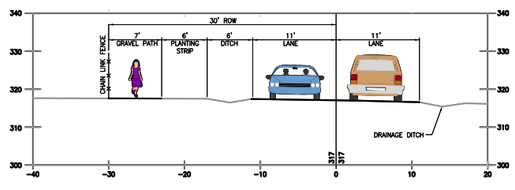
SECTION A-A



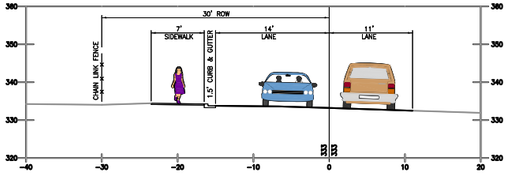
SECTION B-B



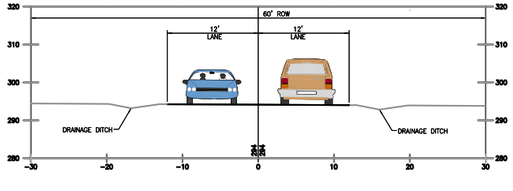
SECTION C-C



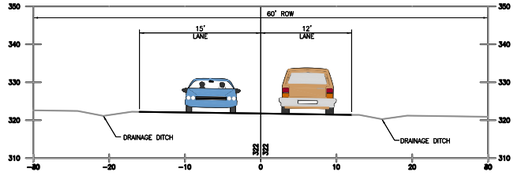
SECTION D-D



SECTION E-E



SECTION F-F



SECTION G-G

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Figure 4-1
Noll Road Improvements
Existing Right of Way and Cross Sections

Existing pedestrian facilities occur on the west side of Noll Road, in the central segment of the corridor that is located within the City limits. As shown in Sections B and E, there are existing sidewalks adjacent to areas where new developments have been constructed (i.e. to the south of Poulsbo Elementary School and north of the soccer field). There are no pedestrian facilities adjacent to the school but there is an existing gravel pedestrian trail extending the length of the soccer field along Noll Road (see Section D). The trail is separated from the roadway by a vegetated planting strip and drainage ditch. There are no pedestrian facilities within the unincorporated segments of Noll Road.

As shown in the cross sections, there are existing vegetated drainage ditches on one or both sides of the road where a sidewalk does not exist.

4.3 NOLL ROAD CROSS SECTION ALTERNATIVES

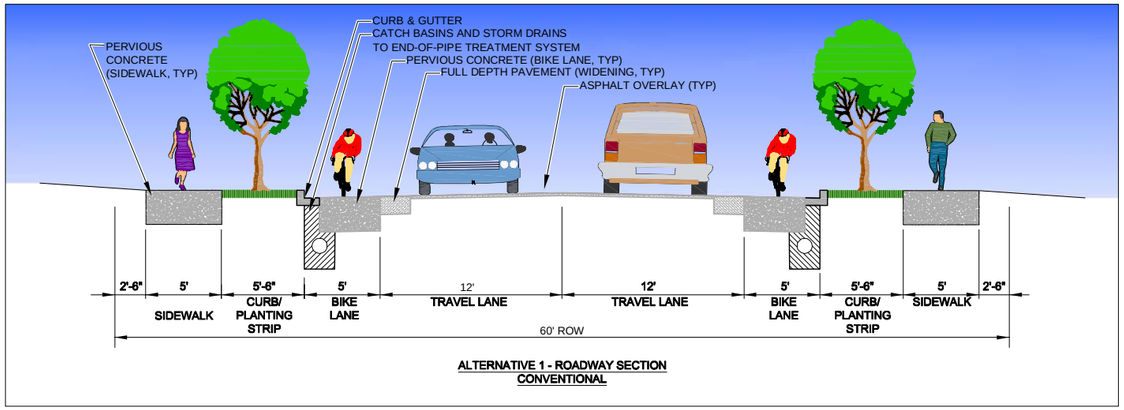
Traffic analysis has shown that Noll Road requires one lane in each direction to meet capacity requirements. In general, traffic lane width options are between 12 and 15-feet. Road cross sections and resulting right-of-way width vary largely according to the features that are located on the edge of the road; primarily bike lanes, sidewalks, landscaping and drainage. Four cross sections alternatives have been developed to show motorized and non-motorized options within the potential right-of-way. These options are shown on Figure 4-2, and are summarized in Table 4-1 below.

Table 4-1. Summary of Noll Road Cross Section Alternatives

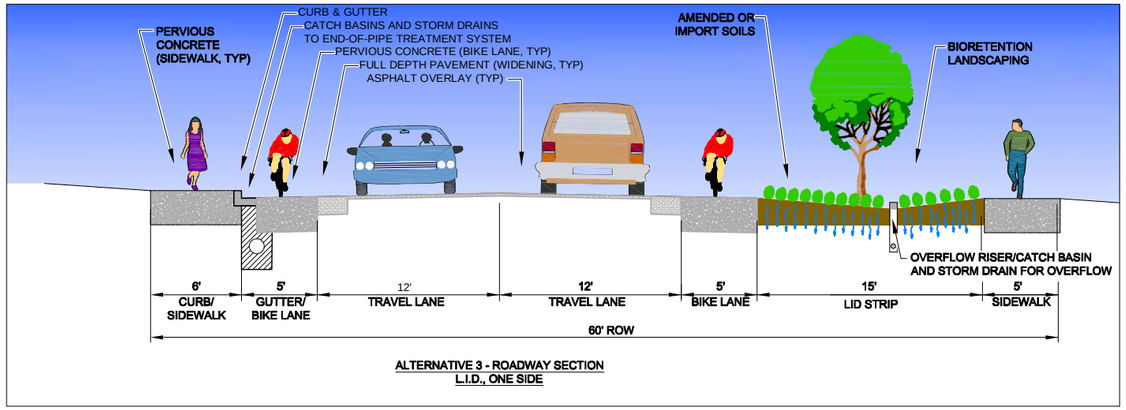
Alternative	Lane Width	Bike Lanes	Side-walks	Planting Strip	LID Strip	Right-of-Way (ft)	Est. Cost (lf)
1. Curb/Gutter/Planting Strip/Sidewalk both sides	12-ft	Yes	Yes	Yes	No	60-ft	$290
2. Bike Lane, LID Strip and Sidewalk both sides	12-ft	Yes	Yes	Yes	Yes	64-ft	$500
3. Bike Lane and Sidewalk both sides, LID Strip one side only	12-ft	Yes	Yes	No	Yes	60-ft	$360
4. Minimum City Standard – Sidewalk both sides, Planting Strip, no dedicated Bike Lane	15-ft	No	Yes	Yes	Yes	50-ft	$220

Alternative 1 consists of curb and gutter, and a planting strip and sidewalk on both sides. The planting strip is approximately 5-feet wide, consistent with City standards. Sidewalks and bike lanes are assumed to be pervious pavement to reduce stormwater run off volumes and associated treatment requirements. This option has a minimum right-of-way width of 60 feet.

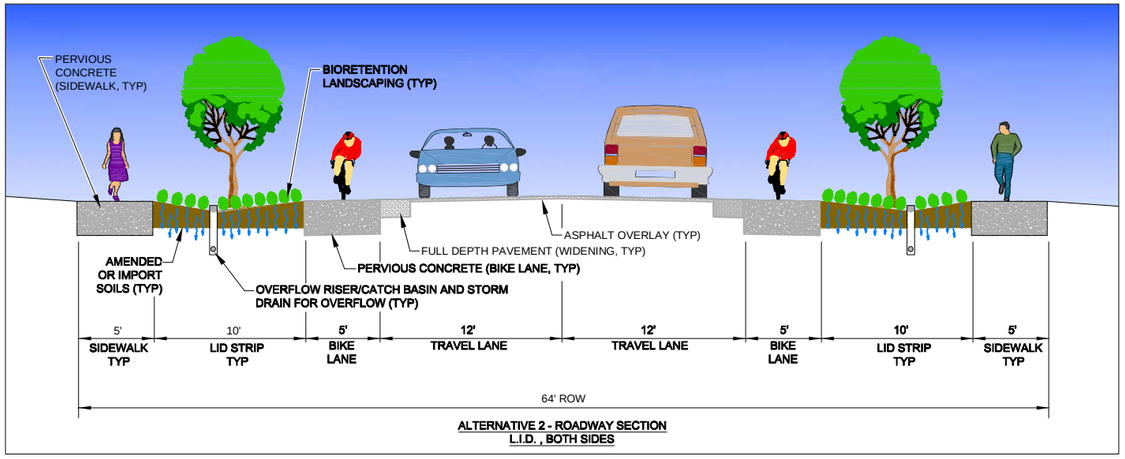
Alternative 2 also provides bike lanes and sidewalk similar to Alternative 1, but includes a minimum 10-foot landscaped “Low Impact Development” (LID) strip for bioretention. The potential benefits of the LID strip include more effective stormwater treatment and management, expanded planting and landscaping strip, and potential reduced cost due to reduced requirements for “end of pipe” stormwater treatment. A single regional stormwater facility capable of treating all stormwater from Noll Road has been estimated to cost approximately $1,100,000 (Parametrix 2008). The higher cost per lineal foot shown in Table 4-1 does not account for avoided end of pipe treatment costs. A more detailed evaluation of LID feasibility and sizing is provided in section 4.5.



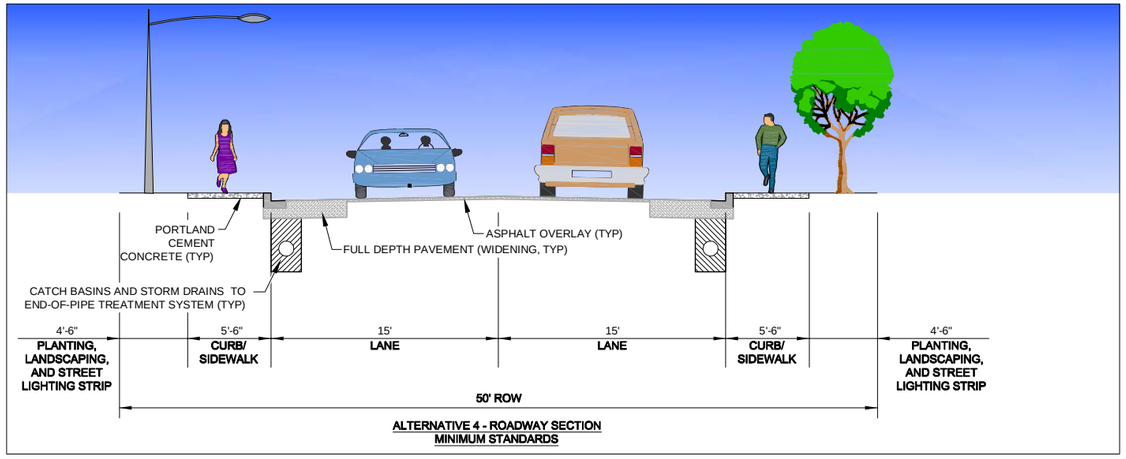
ALTERNATIVE 1 - ROADWAY SECTION
CONVENTIONAL



ALTERNATIVE 3 - ROADWAY SECTION
L.I.D., ONE SIDE



ALTERNATIVE 2 - ROADWAY SECTION
L.I.D. , BOTH SIDES



ALTERNATIVE 4 - ROADWAY SECTION
MINIMUM STANDARDS

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Figure 4-2
Noll Road Improvements
Alternative Roadway Sections

Alternative 3 has a bike lane and sidewalk both sides, with an LID strip on one side only. This option reflects that portions of the corridor may only require LID facilities on one side of the street due to the relatively small volume of new impervious surface being added to some parts of the roadway. This option has a minimum right-of-way width of 60 feet.

Alternative 4 is the City's minimum standard and consists of a minimum pavement width of 30 feet (2 lanes), sidewalk both sides, and planting strip either between the street and sidewalk or behind the sidewalk, and a bike lane. This standard is for a Neighborhood Collector within city limits with a design speed 25 MPH. This option has a minimum right-of-way width of 50 feet.

Costs for all options assume a pavement overlay over the existing 20-foot paved surface. The pavement section for the new road follows the City's Street Standards, and consists of 4-inch asphalt, 4-inch top course and 6-inch gravel base. Cost estimates were developed based on unit costs as determined from recent City and WSDOT bid tabulations. Table 4-1 provides a summary of the estimated cost per lineal foot of roadway. The costs shown in Table 4-1 do not reflect existing sidewalk and lane improvements that will be retained and should therefore be used only for relative comparison of alternatives.

4.3.1 Cross Section Alternatives Evaluation

Table 4-2 provides a qualitative comparison of cross section alternatives relative to operation, safety, cost, design guidelines, right-of-way and goals for community aesthetics and character.

Table 4-2. Summary of Cross Section Alternatives

Comments	Alt 1	Alt 2	Alt 3	Alt 4	Comments
ROW Acquisition					The greatest ROW (64 ft) is required for the LID both sides Alt 2, and the least (50-ft) for the City's minimum standard (Alt 4). Both Alt 1 and 3 require 60-ft ROW.
Pedestrian Safety					The separated sidewalks in Alt 1 and 2 provide more pedestrian safety. Alt 3 provides separation on side only. Alt 4 with no separated sidewalk provides the lease pedestrian safety.
Dedicated Bike Lanes					Alts 1, 2 and 3 provide dedicated bike lanes. Alt 4 does not provide dedicated bike lanes.
Use of LID Techniques					Alt 2 and 3 provide for LID treatment facilities. Alt 1 and 4 provide for potential pervious pavement LID methods.
Construction $					Greater landscaping costs with Alt 3, but off set by reduced end of pipe storm treatment costs.
Maintenance $					Most maintenance for LID Alt 2. Maintenance for Alts 1 and 4 is similar due to same 5 ft landscaping strip.

(Table Continues)

Table 4-2. Summary of Cross Section Alternatives (Continued)

Comments	Alt 1	Alt 2	Alt 3	Alt 4	Comments
Aesthetics					The LID alts provide the best opportunities for landscaping. Alt 4 provides the fewest options.
Speed control					All options provide potential to include speed control measures such as bulb-outs, flush curbs, median islands and landscaping. Alt 1, 2 and 3 provide the best potential due to larger ROW.
Lane Requirements					All options provide adequate lane width.
		Better		Worse	

4.4 PROPOSED NOLL ROAD PLAN

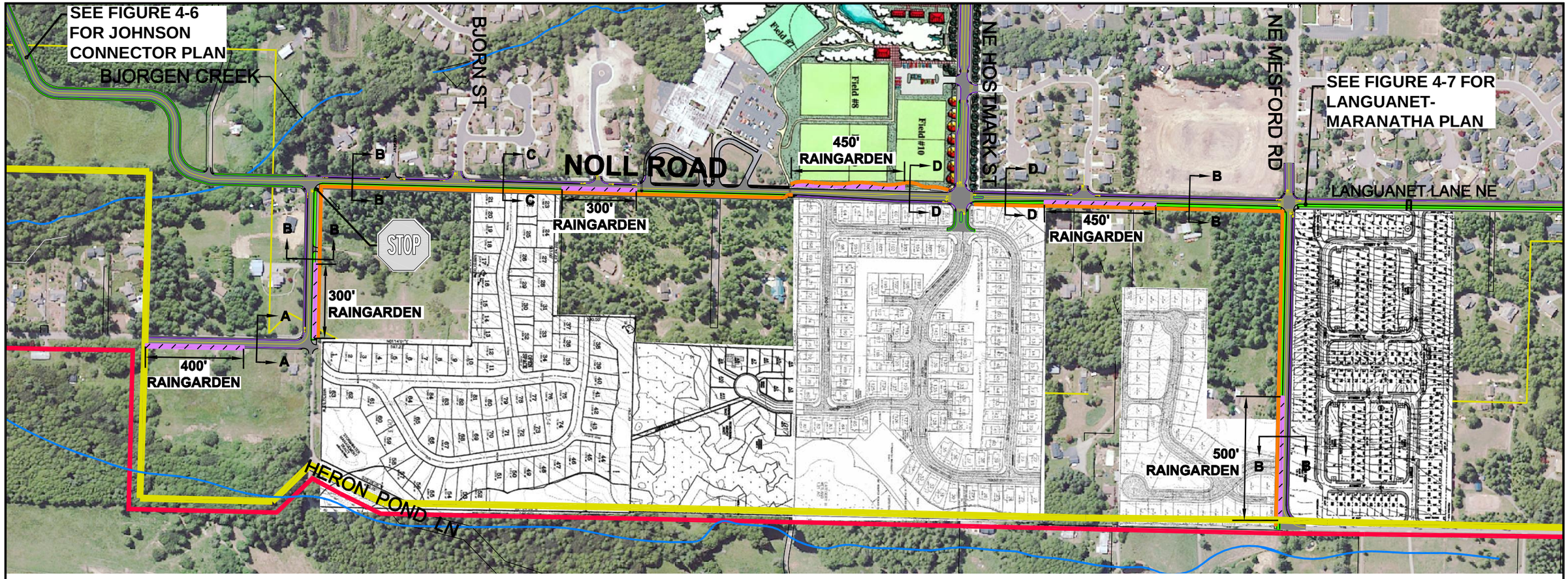
Traffic analysis has shown that Noll Road requires one lane in each direction to meet capacity requirements. Several lane width, sidewalk and bike lane alternatives were considered and evaluated relative to operation, safety, cost, design guidelines, right-of-way and goals for community aesthetics and character. Proposed roadway improvements reflect City standards, as well as stakeholder feedback with primary design objectives summarized as follows:

- Provide pedestrian safety, particularly for school children.
- Allow for efficient traffic movement, but discourage excessive speeds and "cut through" traffic.
- Provide a shared path for bicyclists and pedestrians, separate from the roadway.
- Provide a bike lane on one side of the street.
- Incorporate LID elements and treat stormwater within the right-of-way.
- Minimize right-of-way to 60 feet or less.

The proposed plan that reflects these criteria is shown in Figures 4-3 and 4.4.

Two 12-foot lanes and a 5-foot bike lane are proposed for all sections of Noll Road. A 10-foot wide shared path is proposed along all of Noll Road that is within the city limits, with the exception of a short segment between the south city limits and the future Johnson Way – Noll Road intersection where a 5-foot sidewalk is proposed. A 12-foot rain garden is proposed between the roadway and the shared path to provide stormwater management. This plan meets design objectives, and provides necessary improvements within a 60-foot right-of-way.

Table 4-3 summarizes estimated base costs for each segment of Noll Road and Table 4-4 summarizes total estimated costs for all improvements including allowances for engineering, permits, unlisted construction items (mobilization, channelization, illumination, traffic control, traffic signing, driveways, etc.) and contingencies. Cost estimates were developed based on unit costs as determined from recent City and WSDOT bid tabulations and are for improvements only within the city limits portion of the corridor. Refer to the Implementation and Funding Plan in Chapter 5 for additional cost and funding detail.



LEGEND

- PARCEL
- STREAMS
- 300 — 25-FT CONTOUR
- CITY LIMITS
- URBAN GROWTH AREA
- LANDSCAPING STRIP
- SHARED USE PATH
- RAIN GARDEN
- C — C — PROPOSED CROSS SECTION LOCATION (SEE FIGURE 4-4 FOR CROSS SECTION DETAILS)

NOTE: LOCATION OF RAINGARDENS ARE APPROXIMATE.

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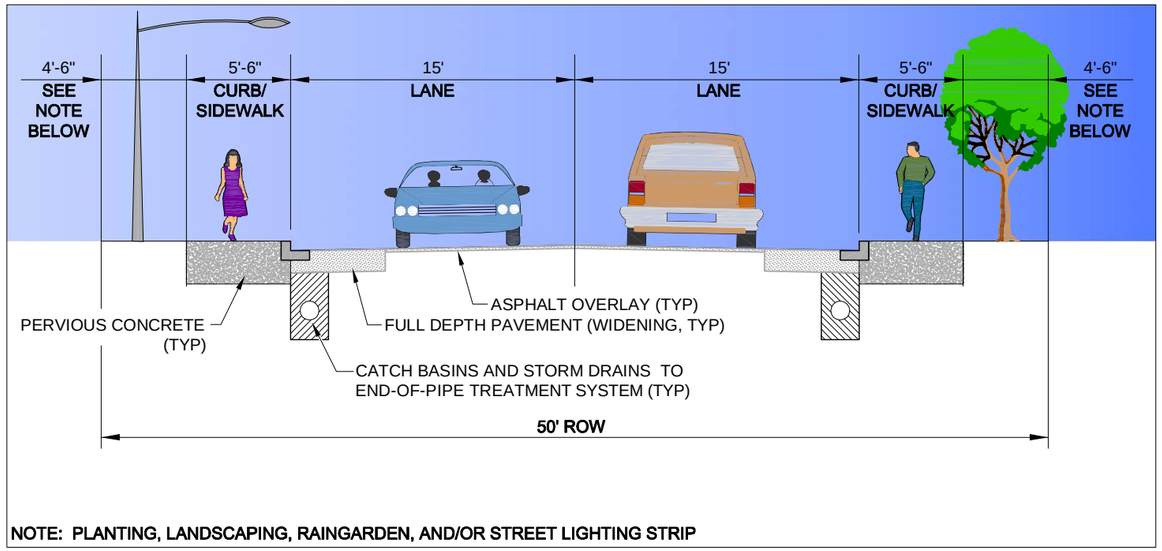
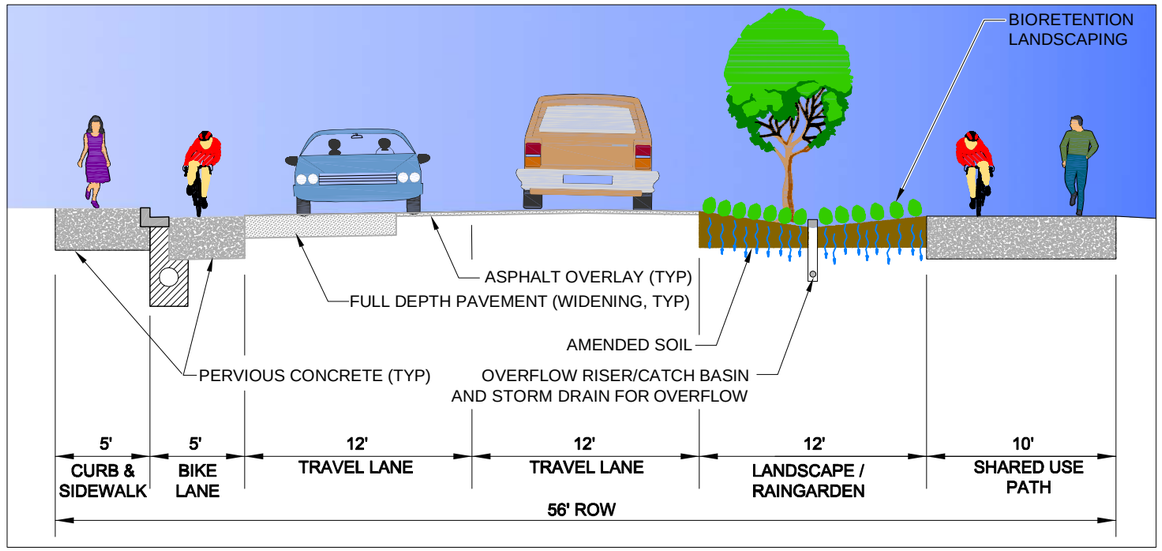
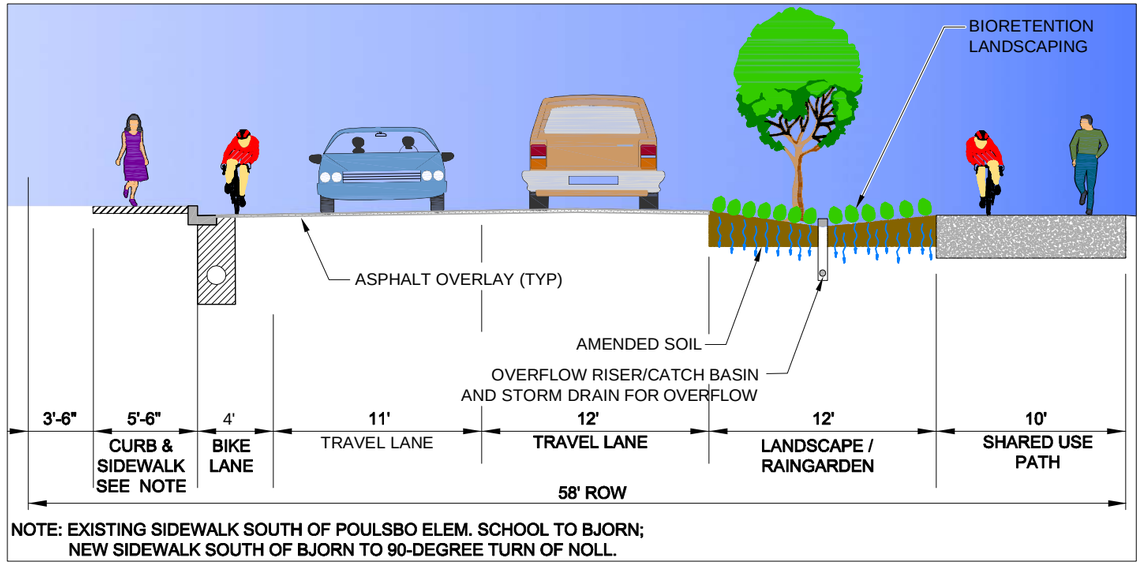
Figure 4-3
Noll Road Improvements
Proposed Plan and Cross Section Locations



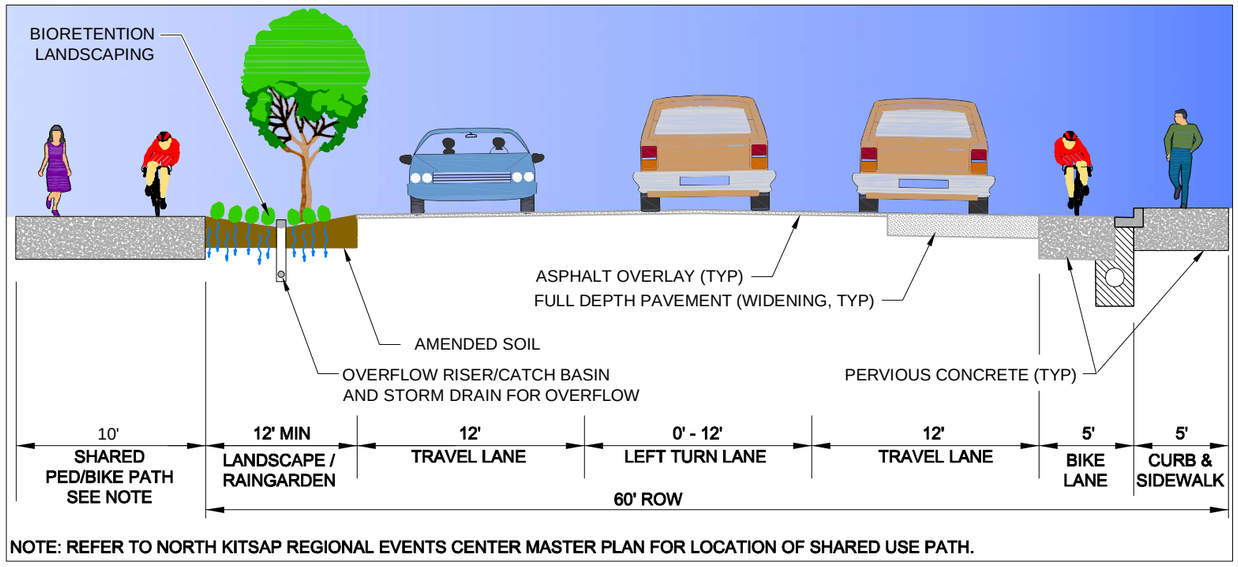
SECTION A-A
MINIMUM STANDARDS



SECTION B-B
BIKE LANE, CURB/GUTTER & SIDEWALK, LEFT SIDE
L.I.D. & SHARED PED/BIKE PATH, RIGHT SIDE



SECTION C-C
BIKE LANE, EXIST CURB/GUTTER & SIDEWALK, LEFT SIDE
L.I.D. & SHARED PED/BIKE PATH, RIGHT SIDE



SECTION D-D
L.I.D. & SHARED PED/BIKE PATH, LEFT SIDE
BIKE LANE, CURB/GUTTER & SIDEWALK, RIGHT SIDE

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Figure 4-4
Noll Road Improvements
Proposed Cross Sections

Table 4-3. Noll Road, Preliminary Cost Estimates for Roadway Cross Sections

Noll Road: East boundary UGA to Mesford Street.
Section B-B includes 16 ft overlay, 8 ft new pavement, 10 ft path, 5 ft curb/sidewalk and 5 ft bike lane one side, 12 ft raingarden one side.

Item No.	Description	Lineal Ft	Quantity	Unit	Unit Cost	Total Cost
1	2" Asphalt Overlay	1,380	400	Ton	$100	$40,000
2	4" Asphalt	1,380	400	Ton	$100	$40,000
3	4" Top Course	1,380	300	Ton	$25	$7,500
4	6" Gravel Base	1,380	800	Ton	$20	$16,000
5	Raingarden	0	0	S.Y.	$125	$0
6	Curb/Gutter	1,380	1,380	L.F.	$20	$27,600
7	Pervious concrete (Sidewalk, Shared Path, and Bike Lane)	1,380	3,100	S.Y.	$75	$232,500
					Subtotal	**$363,600**
					Cost per LF	**$270**

Noll Road: Mesford Street to Hostmark Street.
Section B-B includes 16 ft overlay, 8 ft to 20 ft new pavement, 10 ft path, 5 ft curb/sidewalk and 5 ft bike lane one side, 12 ft raingarden one side

Item No.	Description	Lineal Ft	Quantity	Unit	Unit Cost	Total Cost
1	2" Asphalt Overlay	1,370	400	Ton	$100	$40,000
2	4" Asphalt	1,370	300	Ton	$100	$30,000
3	4" Top Course	1,370	300	Ton	$25	$7,500
4	6" Gravel Base	1,370	700	Ton	$20	$14,000
5	Raingarden	450	600	S.Y.	$125	$75,000
6	Curb/Gutter	1,370	1,370	L.F.	$20	$27,400
7	Pervious concrete (Sidewalk, Shared Path, and Bike Lane)	1,370	3,100	S.Y.	$75	$232,500
					Subtotal	**$426,400**
					Cost per LF	**$320**

Noll Road: Hostmark Street to north boundary Poulsbo Elementary.
Section D-D includes 16 ft overlay, 8 ft to 20 ft new pavement, 10 ft path, 5 ft curb/sidewalk and 5 ft bike lane one side, 12 ft raingarden one side

Item No.	Description	Lineal Ft	Quantity	Unit	Unit Cost	Total Cost
1	2" Asphalt Overlay	620	200	Ton	$100	$20,000
2	4" Asphalt	620	300	Ton	$100	$30,000
3	4" Top Course	620	200	Ton	$25	$5,000
4	6" Gravel Base	620	600	Ton	$20	$12,000
5	Raingarden	450	600	S.Y.	$125	$75,000
6	Curb/Gutter	620	620	L.F.	$20	$12,400
7	Pervious concrete (Sidewalk, Shared Path, and Bike Lane)	620	1,400	S.Y.	$75	$105,000
					Subtotal	**$259,400**
					Cost per LF	**$420**

Noll Road: Poulsbo Elementary
Section B-B ilncludes 16 ft overlay, 8 ft new pavement, 10 ft path, 5 ft curb/sidewalk and 5 ft bike lane one side, 12 ft raingarden one side.

Item No.	Description	Lineal Ft	Quantity	Unit	Unit Cost	Total Cost
1	2" Asphalt Overlay	630	200	Ton	$100	$20,000
2	4" Asphalt	630	200	Ton	$100	$20,000
3	4" Top Course	630	200	Ton	$25	$5,000
4	6" Gravel Base	630	400	Ton	$20	$8,000
5	Raingarden	0	0	S.Y.	$125	$0
6	Curb/Gutter	630	630	L.F.	$20	$12,600
7	Pervious concrete (Sidewalk, Shared Path, and Bike Lane)	630	1,400	S.Y.	$75	$105,000
					Subtotal	**$170,600**
					Cost per LF	**$280**

Noll Road: South boundary Poulsbo Elementary to 250 ft south of Bjorn Street.
Section C-C includes 27 ft overlay, 10 ft path, 4 ft bike lane one side, 12 ft raingarden one side. Maintain existing curb/gutter/sidewalk west side.

Item No.	Description	Lineal Ft	Quantity	Unit	Unit Cost	Total Cost
1	2" Asphalt Overlay	1,000	400	Ton	$100	$40,000
2	4" Asphalt	1,000	0	Ton	$100	$0
3	4" Top Course	1,000	0	Ton	$25	$0
4	6" Gravel Base	1,000	0	Ton	$20	$0
5	Raingarden	300	400	S.Y.	$125	$50,000
6	Curb/Gutter	0	0	L.F.	$20	$0
7	Pervious concrete (Shared Path ONLY)	1,000	1,200	S.Y.	$75	$90,000
					Subtotal	**$180,000**
					Cost per LF	**$180**

Noll Road: 250 ft south of Bjorn Street to southern 90-degree turn of Noll Road (intersection with Johnson Way extension).
Section C-C includes 16 ft overlay, 7 ft new pavement, 10 ft path, 4 ft bike lane one side, 12 ft raingarden one side, new curb/gutter/sidewalk west side.

Item No.	Description	Lineal Ft	Quantity	Unit	Unit Cost	Total Cost
1	2" Asphalt Overlay	320	100	Ton	$100	$10,000
2	4" Asphalt	320	100	Ton	$100	$10,000
3	4" Top Course	320	100	Ton	$25	$2,500
4	6" Gravel Base	320	200	Ton	$20	$4,000
5	Raingarden	0	0	S.Y.	$125	$0
6	Curb/Gutter	320	320	L.F.	$20	$6,400
7	Pervious pavement (Sidewalk, Shared Path, and Bike Lane)	320	700	S.Y.	$75	$52,500
					Subtotal	**$85,400**
					Cost per LF	**$270**

Noll Road: Southern 90-degree turn of Noll to Eastern 90-degree turn of Noll Road.
Section B-B includes 16 ft overlay, 8 ft new pavement, 10 ft path, 5 ft curb/sidewalk and 5 ft bike lane one side, 12 ft raingarden one side.

Item No.	Description	Lineal Ft	Quantity	Unit	Unit Cost	Total Cost
1	2" Asphalt Overlay	660	200	Ton	$100	$20,000
2	4" Asphalt	660	200	Ton	$100	$20,000
3	4" Top Course	660	200	Ton	$25	$5,000
4	6" Gravel Base	660	400	Ton	$20	$8,000
5	Raingarden	300	400	S.Y.	$125	$50,000
6	Curb/Gutter	660	660	L.F.	$20	$13,200
7	Pervious concrete (Sidewalk, Shared Path, and Bike Lane)	660	1,500	S.Y.	$75	$112,500
					Subtotal	**$228,700**
					Cost per LF	**$350**

Noll Road: Eastern 90-degree turn of Noll Road to southern boundary UGA.
Section A-A includes 20 ft overlay, 10 ft new pavement, 5 ft curb/gutter/sidewalk both sides.

Item No.	Description	Lineal Ft	Quantity	Unit	Unit Cost	Total Cost
1	2" Asphalt Overlay	670	200	Ton	$100	$20,000
2	4" Asphalt	670	200	Ton	$100	$20,000
3	4" Top Course	670	200	Ton	$25	$5,000
4	6" Gravel Base	670	400	Ton	$20	$8,000
5	Raingarden	400	600	S.Y.	$125	$75,000
6	Curb/Gutter	1,340	1,340	L.F.	$20	$26,800
7	Pervious concrete (Sidewalk)	1,340	800	S.Y.	$75	$60,000
					Subtotal	**$214,800**
					Cost per LF	**$330**

NOTE:
[1] Cost estimate does not include site preparation, storm collection, erosion control, traffic signing and pavement markings, intersection controls, driveways, landscaping (beyond rain garden), cut/fill, and mobilization.
[2] Unit cost referenced from WSDOT Unit Bid Analysis, NWR

Table 4-4. Summary of Noll Road Preliminary Road Improvement Costs (2008 Dollars)

Road Segment Description	Segment Length (ft)	Base Cost per Lineal Ft[1]	Base Cost	Allowance for Unlisted Items[2]	Total Segment Cost
Noll Road - North City Limits to Mesford[3]	1,300	$270	$363,600	50%	$545,400
Noll Road - Mesford to Hostmark[3]	1,200	$320	$426,400	50%	$639,600
Noll Road - Hostmark to north boundary Poulsbo Elementary[4]	1,300	$420	$259,400	50%	$389,100
Noll Road - Poulsbo Elementary[3]	2,100	$280	$170,600	50%	$255,900
Noll Road - South boundary Poulsbo Elementary to 250 ft s/o Bjorn[5]	700	$180	$180,000	50%	$270,000
Noll Road - 250 ft s/o Bjorn to southern 90-degree turn[5]	700	$270	$85,400	50%	$128,100
Noll Road - Southern 90-degree turn to Eastern 90-degree turn[3]	700	$350	$228,700	50%	$343,100
Noll Road - Eastern 90-degree turn to south city limits[6]	700	$330	$214,800	50%	$322,200
Subtotal Noll Road			**$1,928,900**		**$2,893,400**
Noll Road – Johnson Road Connector[7]	3,520	$340	$1,176,200	50%	$1,764,300
Languanet – Maranatha Connector[8]	2,830	$330	$926,610	50%	$1,389,900
TOTALS			**$4,031,710**		**$6,047,600**

[1] Base cost includes pavement (overlay and full depth), pedestrian improvements (shared path, sidewalks, bike lane) and stormwater treatment where applicable.

[2] Allowance includes engineering and permits (12%), mobilization (8%), unlisted construction items (20%) and contingencies (10%).

[3] Section B-B includes 16 ft overlay, 8 ft to 20 ft new pavement, 10 ft path, 5 ft curb/sidewalk and 5 ft bike lane (incl 1 ft gutter width) one side, 12 ft bioretention one side

[4] Section D-D includes 16 ft overlay, 8 ft to 20 ft new pavement, 10 ft path, 5 ft curb/sidewalk and 5 ft bike lane (incl 1 ft gutter width) one side, 12 ft bioretention one side

[5] Section C-C includes 27 ft overlay, 10 ft path, 4 ft bike lane (incl 1 ft gutter width) one side, 12 ft rain garden one side. Assumes existing sidewalk on west side to remain.

[6] Section A-A includes 20 ft overlay, 10 ft new pavement, 5 ft curb/gutter/sidewalk both sides.

[7] Includes 30 ft new pavement, 5 ft curb/gutter/sidewalk, 5 ft planting strip, no bioretention.

[8] Includes 20 ft pavement, 5 ft curb/gutter/sidewalk on west side, 10 ft shared-use path & bioretention strip on one side.

4.5 POULSBO ELEMENTARY SCHOOL VICINITY IMPROVEMENTS

Improvements at Poulsbo Elementary School were identified by stakeholders as a key project objective. To evaluate potential traffic control requirements, traffic counts were conducted during the PM peak hour (3:00 to 4:00 PM). During this period, a total of 80 vehicles entered the site and 75 vehicles exited the site. The majority of vehicles (75 percent) turn right from Noll Road into the school. A total of 42 vehicles (52 percent) had a NBLT movement when exiting the school site. The majority of traffic occurred during the 30 minute period between 3:15 and 3:45 PM. Based on these traffic volumes, no significant traffic delay is expected and a left turn channel is not required to meet LOS standards.

To improve circulation and pedestrian safety, several alternatives were considered, including:

- Provide a drop off zone north of school on Noll Road,
- Allow right in and right out from Noll Road only,

- Combine the existing road loops on the school site into one loop, and separate bus and car traffic,
- Have students that take the bus load first prior to release of students that walk or have car pick up,
- Conduct school bus loading in parking lot, and
- Construct channelization in Noll Road and install a new signal.

The North Kitsap School District has determined that there is currently no plan for major circulation improvements on school property, and that transportation patterns may change significantly over time due to changes in school operations, as well as changes in driving and walking patterns. Given these uncertainties, a phased plan is proposed with Phase 1 consisting of the improvements within the right-of-way, with no changes in access points. Phase 2 may consist of Noll Road channelization and/or a signal at later date, with consideration of on school improvements.

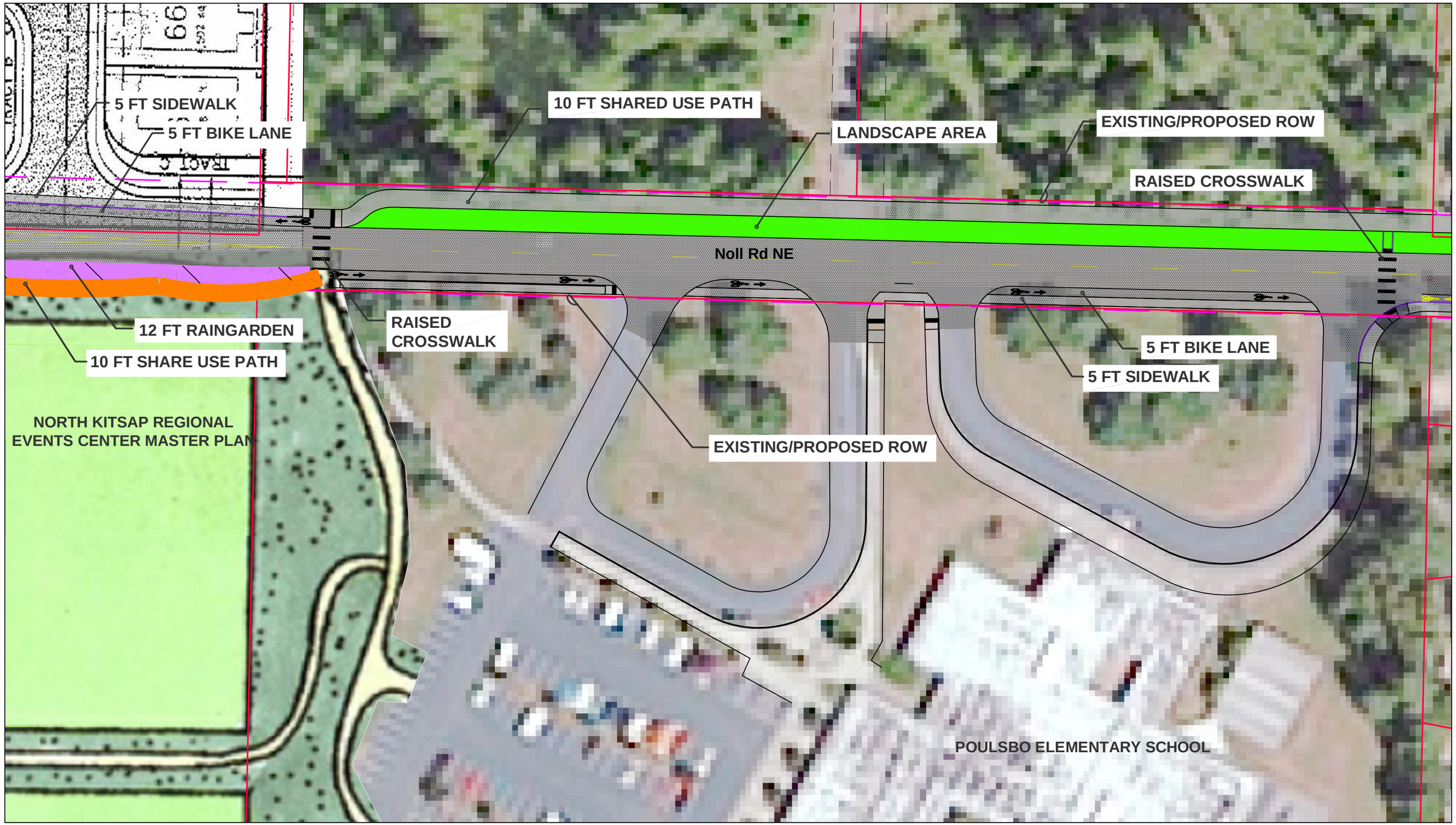
Recommended circulation and pedestrian improvements include eliminate on-street parking, add sidewalks along Noll Road to improve pedestrian safety, add signs to direct vehicle traffic and improve pedestrian safety, and add a raised crosswalk on each end of the school property to improve pedestrian safety. Proposed improvements within the right-of-way adjacent to Poulsbo Elementary School are shown in Figure 4-5.

4.6 PRELIMINARY STORMWATER ANALYSIS

The objective of the preliminary stormwater analysis is to identify stormwater management requirements for the project, and potential methods for mitigating stormwater quality and quantity impacts. The preliminary stormwater analysis assumes roadway and intersection improvements are constructed as recommended, described as follows:

- Expand Noll Road asphalt width by approximately 9 feet to accommodate two 12-foot lanes and a 5-foot bike lane.
- Construct a 5-foot sidewalk and 10-foot shared path of pervious pavement.

For the purposes of preliminary sizing of stormwater facilities, it was assumed that the center road crown results in approximately half the width of Noll Road draining to the stormwater treatment facility. Consistent with existing stormwater standards, it was also assumed that the project would be designed to provide treatment for the new net impervious surfaces created by the project. Table 4-5 summarizes stormwater volumes generated in each segment of Noll Road, as well as required detention volumes and rain garden dimensions. Figures 4-6 and 4-7 show existing drainage conditions and surface water resources in the project area, as well as the location of existing and potential future stormwater treatment facilities.



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CITY of POULSBO VIKING CITY

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Figure 4-5
Noll Road Improvements
Poulsbo Elementary School
Proposed Right-of-Way Improvement

MATCH TO FIGURE 4-7

NE HOSTMARK ST
NE MESFORD RD
LINCOLN ROAD
NOLL ROAD AREA THAT COULD DISCHARGE TO REGIONAL FACILITY
EXISTING PSE STORMWATER POND
NOLL ROAD
LANGAUNET LANE NE
MARANATHA LN
POTENTIAL REGIONAL STORMWATER FACILITY
FUTURE ROAD
PROPOSED POND
PROPOSED POND
VLY LOOP
NOLL
LINCOLN ROAD
WETLAND
COUNTY LINE
NOLL ROAD
18" CMP
18" CMP
EXISTING NATURAL POND
STORMWATER POND (EXISTING)
DITCH FROM POND, ROAD AND ADJACENT PROPERTY
EXISTING NOLL VALLEY LOOP POND

LEGEND

- DRAINAGE BASINS
- STREAMS
- STORMWATER PONDS
- WETLANDS
- FLOW DIRECTION
- PARCELS
- EXISTING 5' CONTOURS
- CITY LIMITS
- PROPOSED RAIN GARDEN

Parametrix DATE: Dec 29, 2008 FILE: BR2237829P01T01F-14

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Figure 4-6
Noll Road Improvements
Existing and Proposed
Stormwater Facilities - NORTH

SR 305

FUTURE ROAD

BJORGEN CREEK

BJORN ST

NOLL ROAD

NOLL ROAD

SR 305

WETLAND

COUNTY LINE

POND

LEMOLO CREEK

MATCH TO FIGURE 4-6

LEGEND

- DRAINAGE BASINS
- STREAMS
- STORMWATER PONDS
- WETLANDS
- FLOW DIRECTION
- PARCELS
- EXISTING 5' CONTOURS
- CITY LIMITS
- PROPOSED RAIN GARDEN

Parametrix DATE: Dec 29, 2008 FILE: BR2237829P01T01F-14

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SCALE IN FEET

Figure 4-7
Noll Road Improvements
Existing and Proposed
Stormwater Facilities - SOUTH

Table 4-5. Summary of Preliminary Stormwater Volumes, Treatment, and Detention Requirements

Road Segment Description	Segment Length (ft)	Existing Impervious (sq ft)[1]	Impervious After Improvements (sq ft)[2, 3]	Net Additional Impervious (sq ft)[4, 5]	Detention Volume (cf)	Rain Garden Length (ft)
Noll Road – Mesford to County right-of-way	1,300	26,000	46,800	20,800	10,908	474
Noll Road – Mesford to Poulsbo Elementary[6]	1,200	24,000	43,200	19,200	10,069	438
Noll Road – Mesford to Poulsbo Elementary[6]	1,300	26,000	46,800	20,800	10,908	474
Noll Road – Poulsbo Elementary to UGA	2,100	42,000	75,600	33,600	17,620	766
Noll Road – Poulsbo Elementary to UGA	700	14,000	25,200	11,200	5,873	255
Languanet – Maranatha connector	3,250	0	71,500	71,500	37,495	1,631

[1] Existing impervious includes road and adjacent curb/gutter/sidewalk where present.

[2] New impervious includes 4 ft new asphalt road and 5 ft new asphalt bike lane. Assumes existing road and sidewalks to remain.

[3] New impervious does not include porous concrete or asphalt sidewalk and bike path to replace existing grass and brush.

[4] Assumes net 12 ft wide impervious surface discharges to rain garden. Includes new 4 ft pavement and 5 ft bike lane.

[5] Includes detention volume allowance for conversion of existing grass and brush to rain garden.

[6] Segments that could potentially be routed to regional stormwater pond.

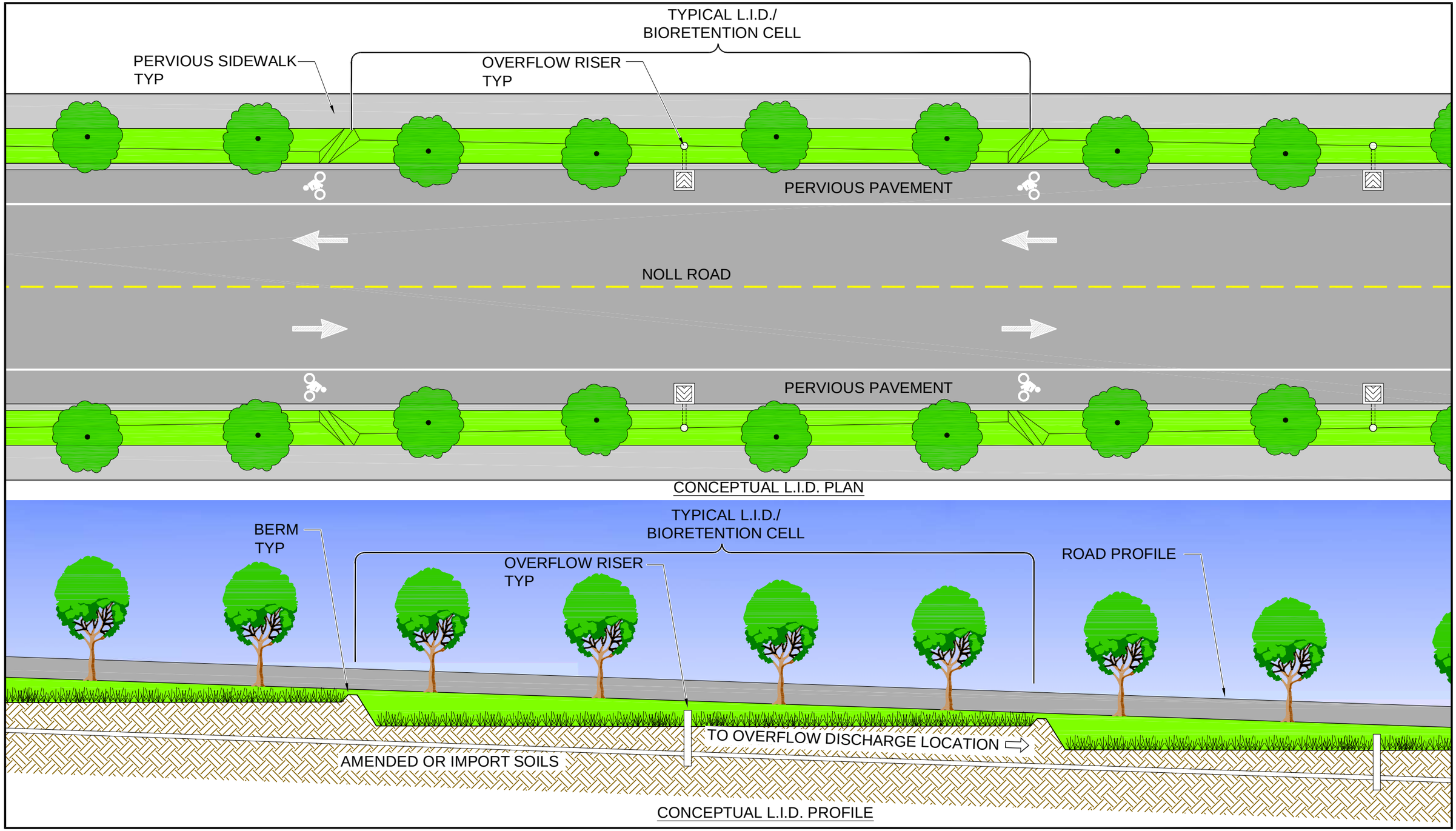
4.6.1 Stormwater Management Options

Two options were considered for meeting stormwater management needs of the project; 1) a linear rain garden adjacent to Noll Road designed using Low Impact Development (LID) techniques, and 2) a combination of a regional stormwater detention system and rain garden. Each of these options is described in greater detail below.

4.6.1.1 Rain Garden (Bioretention) Option

This option consists of a 12-foot wide rain garden constructed adjacent to Noll Road and Languanet Lane. The rain garden option was selected due to the underlying soil (Poulsbo gravelly sandy loam), ability to fit stormwater facilities within the right-of-way, as well as the compatibility associated with the proposed separated shared pathway. As shown in Table 7, sufficient frontage is available to meet rain garden requirements along Noll Road (2,407 feet estimated to be required) and Languanet Lane (1,631 feet estimated to be required). The rain garden option is not expected to be a feasible option for the Johnson Way extension area due to the poor (hydric) soils in this segment, and the larger impervious surface created by the ne roadway.

The rain garden would provide both water quality and quantity control. It would generally consist of gently sloped sides down to a 2-foot wide bottom area filled with a compost amended soil mixture. An equivalent treatment design approach would be used that allows the rain garden to be placed where it is most feasible given right-of-way, underlying soil and shared path locations. Landscaping would be provided for aesthetics. Figure 4-8 shows typical plan and profile for LID stormwater facilities. Figure 4-9 shows examples of typical rain garden installations.



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Parametrix

Figure 4-8
Noll Road Improvements
L.I.D. Plan View

Figure 4-9. Typical Rain Garden Installed Next to Residential Collector, City of Tacoma

Construction costs for rain garden construction are expected to be in the range of $125 per square yard (SY). Rain garden costs are therefore in the range of $400,000 for Noll Road and $270,000 for Languanet Lane. This compares to a regional facility cost estimate of $1.1 million developed for the City's Stormwater Management Plan (Parametrix 2008). Maintenance costs for the rain garden are typically similar to other stormwater facilities and would be dependant upon landscaping, litter control and repairs due to damage.

4.6.1.2 Regional Stormwater Facility and Rain Garden Option

This option consists of routing a portion of Noll Road stormwater to a regional detention facility located within a development south of Mountain Aire. Under this option, the regional facility would be constructed by a private developer, with sufficient capacity made available to the City on a proportionate cost basis, or other similar arrangement.

The feasibility of the regional stormwater option is affected primarily by basin transfer limitations which generally require that post-development discharge points be maintained no further than one-quarter mile from pre-development discharge points. Figures 4-6 and 4-7 show that approximately 2,500 lineal feet of Noll Road may be able to discharge to a regional facility. As shown in Table 4-5, this segment corresponds to approximately 912 feet of rain garden, and a detention requirement of 21,000 cubic feet. Based on the estimated cost of $125 per SY, costs for this segment of rain garden would be in the range of $150,000.

4.6.1.3 Summary of Stormwater Management Options

Both the rain garden only option and the combined rain garden-regional facility option appear technically and financially feasible. A regional stormwater facility only option is not considered feasible due to basin transfer regulatory prohibitions. The combined rain garden-regional facility option does provide potential cost savings; however, these savings are reduced by increased stormwater conveyance costs, and would be offset by costs for a landscaping strip to replace the rain garden. Overall, the cost of the new conveyance system and landscaping would reduce cost savings from regionalization to less than $50,000. The potential benefits of the rain garden option include more effective stormwater treatment and management, improved road aesthetics via an expanded planting and landscaping strip, and potential reduced cost due to lower requirements for "end of pipe" stormwater treatment.

Additionally, recent rulings by the State Pollution Control Hearings Board indicate that the City will be required in the near future to adopt rules that make LID techniques the preferred stormwater management approach when feasible. For these reasons, the proposed rain garden option is proposed as the preferred method for stormwater management for new impervious surfaces within the right-of-way.

4.7 LANGUANET LANE – MARANATHA LANE PLAN

The City's Transportation Plan and Comprehensive Plan Circulation Plan Map show a future Languanet Lane and Maranatha Lane connecting road between Noll Road and Lincoln Road. This future roadway is classified in the City's Transportation Plan as a Neighborhood Collector (NC), which is intended to connect residential neighborhoods with centers and facilities. Under City standards, the required right-of-way for a NC is 50 feet, and the roadway should include two 12-foot lanes, a 3-foot shoulder, 5-foot sidewalks each side, and a 5-foot landscape and street lighting strip on each side.

Neighborhood residents have expressed concern that this new road will become a preferred by-pass route for traffic traveling between Lincoln Road and SR 305, and that traffic volumes will therefore increase significantly and result in negative impacts to the neighborhood and pedestrians.

The stakeholder committee evaluated options for providing access, and how to mitigate and prevent cut-thorough traffic that might be associated with motorists looking for a by-pass route between Lincoln Road and SR 305. These options included connecting Languanet Lane to Lincoln Road via the future Lone Pine development, reclassifying the future Languanet Lane to a Residential Collector, providing connection to existing cross roads, and implementing a variety of traffic calming measures to discourage cut-through traffic and excess speeds.

After evaluating options, the majority of stakeholders agreed that a Neighborhood or Residential Collector designation was appropriate, and that connection to existing cross roads was important to ensure consistency with City policy and standards for neighborhood connectivity. Furthermore, the option of Languanet Lane access to Lincoln Road via Lone Pine was determined not feasible due to the conflicts created by connecting a Neighborhood or Residential Collector (Languanet Lane) to a Residential Access (Lone Pine). These conflicts include different right-of-way standards, street design criteria, driveway access and parking use.

4.7.1 Proposed Roadway Design

Traffic analysis conducted for the City Transportation Plan has shown that Languanet Lane requires only one lane in each direction to meet capacity requirements. Peak PM traffic volumes in 2025 are estimated at between 40 and 50 vehicles in each direction. Based on a combination of traffic volumes, City street standards and neighborhood concerns, the following general design criteria were identified:

- Provide pedestrian safety, particularly for school children,
- Discourage excessive speeds and “cut through” traffic,
- Provide a shared path for bicyclists and pedestrians that is separate from the roadway,
- Incorporate LID elements and treat stormwater within the right-of-way, and
- Keep right-of-way needed to 50 feet.

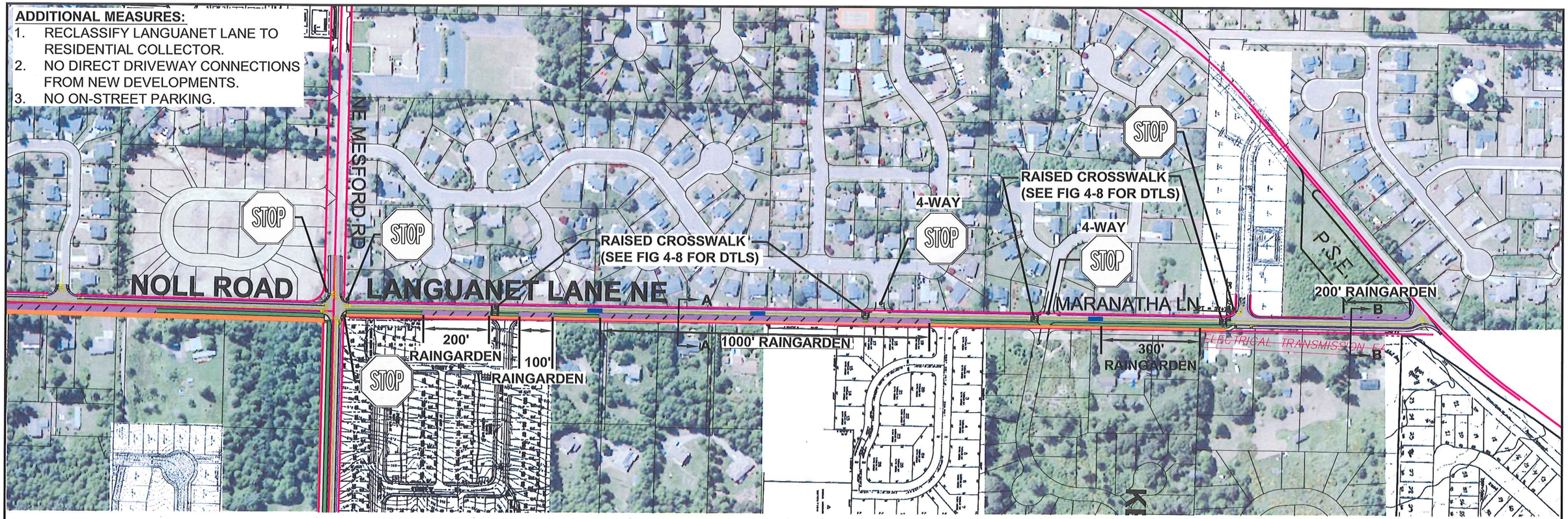
The proposed connector road is currently classified as NC and surrounding development has been planned accordingly. Design standards for a road classification cannot be decreased from the minimum required by City code; however, design can be increased from the minimum requirement. Therefore, it is recommended that new road be reclassified as a Residential Collector, with the following enhancements to the minimum RC design to provide for additional traffic calming and safety:

- No driveway access to road from future developments and no parking on street
- 11-foot lanes and 10-foot shared path for pedestrians on east side of road, separated from street by 10-foot rain garden strip. Provide flat curbs to the adjacent rain garden
- 3 to 5-foot landscaping strip on west side of roadway that alternates from behind sidewalk to center of street (landscape islands)
- 4 way stop at 23rd Street connection and at Kevos Pond Drive
- Raised sidewalks at four crossings

The proposed plan that reflects these criteria is shown in Figures 4-10 and 4-11.

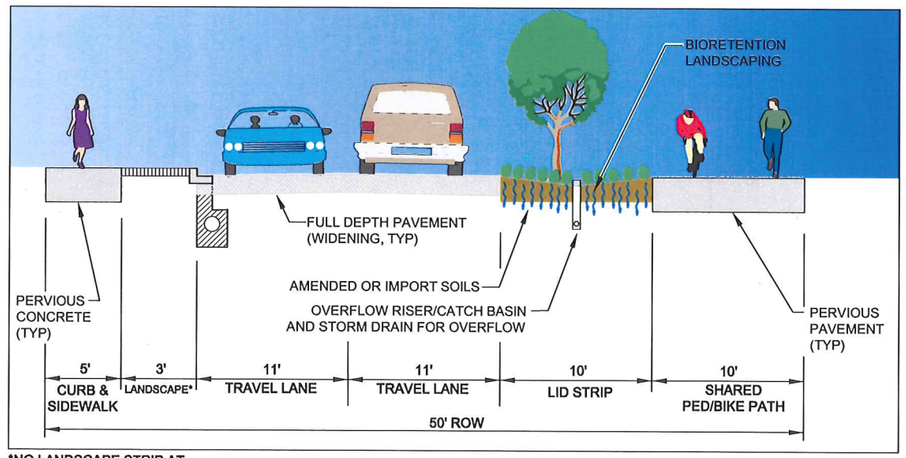
ADDITIONAL MEASURES:

1. RECLASSIFY LANGUANET LANE TO RESIDENTIAL COLLECTOR.
2. NO DIRECT DRIVEWAY CONNECTIONS FROM NEW DEVELOPMENTS.
3. NO ON-STREET PARKING.



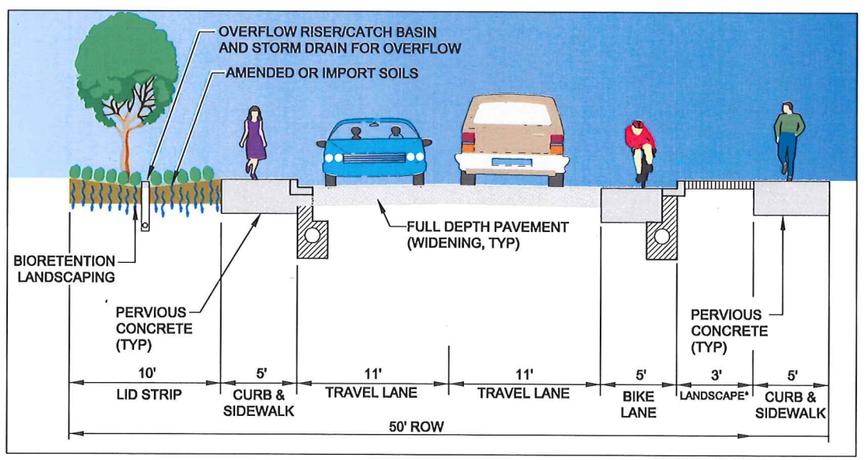
LEGEND

- PARCEL
- STREAMS
- 300 — 25-FT CONTOUR
- CITY LIMITS
- URBAN GROWTH AREA
- LANDSCAPING STRIP
- SHARED USE PATH
- RAINGARDEN
- TRAFFIC ISLAND (SEE FIGURE 4-8 FOR DETAILS)



*NO LANDSCAPE STRIP AT TRAFFIC ISLAND SECTIONS.

SECTION A-A



SECTION B-B

*NO LANDSCAPE STRIP AT TRAFFIC ISLAND SECTIONS.

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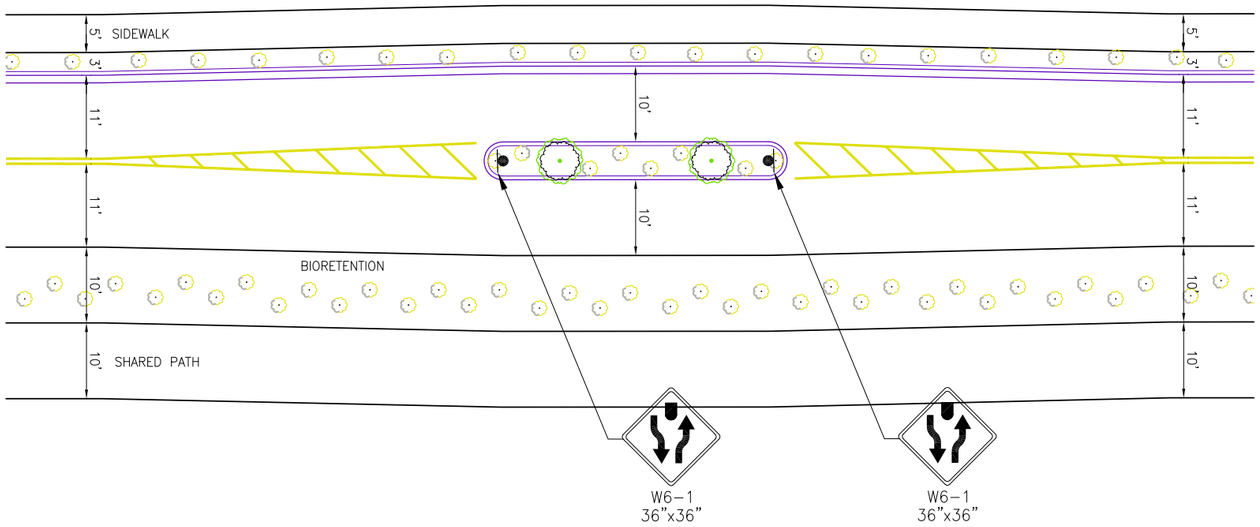
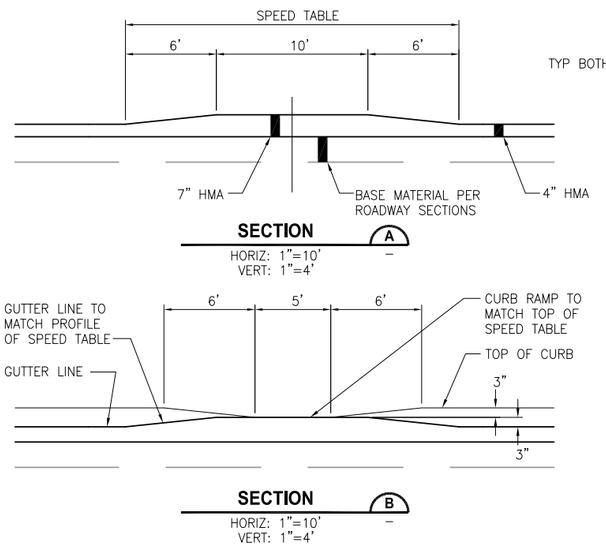
Figure 4-10
Noll Road Improvements
Languanet Lane NE/Maranatha Lane
Proposed Right-of-Way Improvement





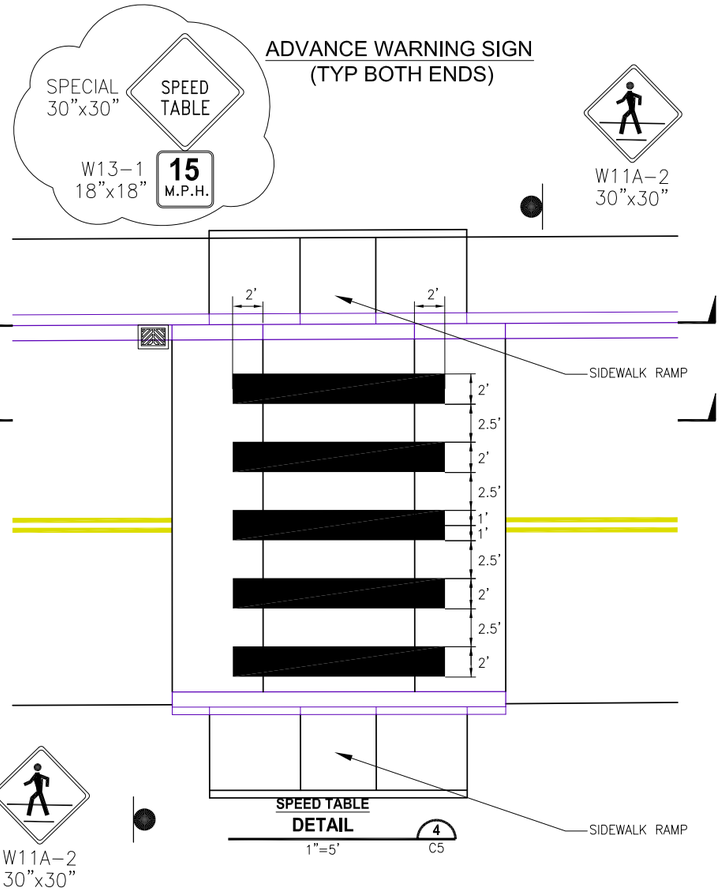


Figure 4-11
Noll Road Improvements
Languanet Lane Traffic Islands
and Raised Crosswalks - DETAIL

This plan meets design objectives, and provides necessary improvements within the 50-foot right-of-way. In general, the road would consist of two 10-foot lanes, a 5-foot sidewalk, and a 10-foot wide shared path. Sidewalks and the shared path are assumed to be pervious concrete or pavement to reduce stormwater runoff volumes and associated treatment requirements. A 10-foot rain garden is proposed between the roadway and the shared path to provide stormwater management. No on-street parking would be provided.

4.7.2 Proposed Intersection Improvements

Improvements proposed at the Languanet Lane - Noll Road intersection consist of the following:

- Remove stop control on north bound Noll Road to encourage traffic to stay on Noll Road rather than Languanet Lane.
- Further discourage through-traffic from using Languanet Lane by restricting the entrance at Mesford Street with bulb outs.

At the Maranatha Lane – Lincoln Road intersection, the approach at Maranatha Lane will discourage cut-through traffic by restricting the entrance with bulb outs and aligning only a short portion of Maranatha Lane perpendicular to Lincoln Road.

4.7.3 Preliminary Cost Estimate – Languanet Lane Improvements

Table 4-6 summarizes estimated base costs, not including a 50 percent allowance for engineering, permits, unlisted construction items (mobilization, channelization, illumination, traffic control, traffic signing, driveways, etc.) and contingencies. Including allowances, the preliminary cost estimate for all Languanet Lane improvements is $1,389,900.

Table 4-6. Languanet Lane Extension, Preliminary Base Cost Estimate for Cross Section

Languanet Lane: Includes 22 ft pavement, 5 ft curb/gutter/sidewalk and 5 ft landscape strip on west side, 10 ft shared-use path & 10 ft bioretention strip on east side.

Item No.	Description	Lineal Feet	Unit	Unit Cost	Total Cost
1	2" Asphalt Overlay	2,830	Ton	$100	$0
2	4" Asphalt	2,830	Ton	$100	$180,000
3	4" Top Course	2,830	Ton	$25	$37,500
4	6" Gravel Base	2,830	Ton	$20	$44,000
5	Concrete Curb and Gutter	2,830	L.F.	$17	$48,110
6	Rain garden	1,600	S.Y.	$125	$225,000
7	Landscape	2,830	S.Y.	$20	$32,000
8	Pervious pavement (Sidewalk and Shared Path)	2,830	S.Y.	$75	$360,000
				Subtotal	**$926,610**
				Cost LF	**$330**

NOTE: Cost estimate does not include site preparation, storm collection, erosion control, traffic controls, intersection controls, driveways, cut/fill or mobilization.

4.8 ALTERNATE ALIGNMENT – JOHNSON WAY EXTENSION

A potential alternate or supplemental alignment for the south Noll Road area is being considered due to several factors. These factors include potential critical areas limitations in

the existing south Noll Road segment, configuration of the City limits, and proposed development patterns in the southeast City area that suggest an alternate access to SR 305 may be a preferred alternative to the existing Noll Road – SR 305 connection.

In order to identify a potential alternate alignment for Noll Road from SR 305, a preliminary plan and profile has been prepared that shows an alternate alignment beginning at the intersection at Johnson Way and connecting to Noll Road at the northern leg of the 90 degree corner (see Figure 2-6). This potential alignment reflects plans for the proposed plat of Johnson Ridge, and reflects available topographic and critical areas mapping. The alignment shown in Figure 2-6 has not been surveyed, and should therefore be considered as a general concept at this time.

The Johnson Way extension consists of a new 3,500-foot road that connects Noll Road to SR 305 via Johnson Road. The Johnson Way extension is part of the City's circulation plan, and it is envisioned that the road would be implemented by developers that need the road to serve their development. The alternate alignment starts at SR 305, in the vicinity of the State right-of-way located near MP 10.12. From this intersection, the alignment continues in the northerly direction along existing Johnson Way, then the alignment proceeds easterly following the City's right-of-way for approximately 500 lineal feet and then continues northbound, paralleling the City of Poulsbo's existing sanitary sewer line, until it reaches the 90-degree bend on Noll Road. The alignment is assumed to be a minimum of 50 feet in right-of-way width. The existing profile grade along the alignment has a slope that varies from 0 percent to 15 percent which exceeds the City of Poulsbo's maximum grade of 12 percent. As a result, the existing topography may require additional grading in order to reduce the existing grades and meet the City's requirement.

Base costs for the Johnson Way extension are shown in Table 4-7. Total costs including allowances are approximately $1,764,000, not including fish passage improvements under Bjorgen Creek, which would be funded by the City. The City's Stormwater Comprehensive Plan estimates the cost for these fish passage improvements at $160,000.

Table 4-7. Johnson Way Extension, Preliminary Cost Estimate for Roadway Cross Section

Johnson Way: Noll Road to SR-305. Includes 30 ft new pavement, 5 ft curb/gutter/sidewalk, 5 ft planting strip, no bioretention.

Item No.	Description	Lineal Feet	Unit	Unit Cost	Total Cost
1	2" Asphalt Overlay	3,520	Ton	$100	$0
2	4" Asphalt	3,520	Ton	$100	$300,000
3	4" Top Course	3,520	Ton	$25	$62,500
4	6" Gravel Base	3,520	Ton	$20	$74,000
5	Concrete Curb and Gutter	7,040	L.F.	$17	$239,700
6	Stormwater Treatment	0	L.S.	$200,000	$200,000
7	Pervious Concrete (Sidewalk)	7,040	S.Y.	$75	$300,000
				Subtotal	**$1,176,200**
				Cost per LF	**$340**

NOTE: Cost estimate does not include right-of-way, site preparation, storm collection, erosion control, traffic controls, intersection controls, driveways, landscaping, cut/fill or mobilization.

4.8.1 Noll Road – Johnson Way Intersection

With construction of the Johnson Way extension, the majority of traffic would be expected to use the new alignment due to the safety and LOS improvements provided by the signalized intersection at the Johnson Way – SR 305 intersection. Traffic projections estimate that approximately 90-percent of the southbound and 75-percent of the northbound through traffic from Noll Road would use the new Johnson Way extension. Therefore, it is assumed that the northbound leg of Noll Road would become stop controlled when the Johnson Way extension is constructed. Funding for the Johnson Way – Noll Road intersection would be provided by the developer(s) of the property served by the new roadway. The potential alternate alignment would require the improvement of the current intersection of Noll Road and Johnson Way.

4.9 CONNECTIVITY

Connectivity refers to the interconnection of streets, sidewalks and trails such that there is safe and efficient access to residents and development. The City's Street Standards (C.1) address connectivity of streets to neighborhoods, as follows:

> "The policy of the city is to connect adjacent neighborhoods to one another to the extent safe and practical in conformance with the City's adopted Comprehensive Transportation Plan. The purpose is to provide safe, redundant and efficient access and egress to both residents and emergency and safety equipment."

The City adopted Ordinance 2007-19, which includes a number of transportation policies. Policy #5 requires that each "development's site access and circulation plan shall include frontage improvements and other relevant features of the Comprehensive Plan Circulation Plan Map..." The comprehensive plan map includes "connections" between developments, as well as connections between Johnson Way and Meredith Heights, Languanet Lane and Maranatha Lane, and Noll Road and Johnson Road. These connections are implemented by the City as specific developments are proposed and approved.

The City's Preliminary Draft Comprehensive Plan also includes potential policies that address connectivity – both vehicular and pedestrian. It should be noted that these are "potential policies" that are being considered, and that therefore may or may not be included in the City's Preliminary Draft Comprehensive Plan. The vehicular policies support the long-standing neighborhood connectivity policy of the City; non-motorized connectivity will primarily be through sidewalks that are constructed by new development as part of road frontage improvement. Other "trail connections" policies are more general, but still supportive of a city-wide trail system. The Preliminary Draft Comprehensive Plan policies being considered are as follows:

Transportation Chapter - Policy TR-1.3

All new street construction shall implement the City's Comprehensive Plan Transportation Circulation Plan Map either as depicted on the map or if unfeasible due to topography, ownership or other challenges shall provide an alternative alignment and/or connection that meet the intent of the Transportation Circulation Plan Map.

Transportation Chapter - Policy TR-3.4

All new residential developments shall be required to provide through connections with adjacent existing or future residential developments. When requiring a connection to undeveloped property which is zoned for residential development, the City shall require a sign be posted at the connection point indicating future road connection.

Land Use Chapter - Policy LU-2.10

To the extent possible, new residential development amenities, such as walkways, paths, or bike paths, should be connected, and if appropriate, consistent with the City's trail plan.

Community Character Chapter - Policy CC-4.1

Design and create sidewalks, bikeways and paths to increase connectivity for people by providing safe and direct, or convenient links throughout the City.

Parks, Recreation and Open Space Chapter - Policy PRO- 3.1

Implement the City's trail map and utilize for future planning for trail, park and open space acquisition. Acquire land for trails and trail connections when such lands become available and affordable.