POWELL BOULEVARD/FOSTER ROAD CORRIDOR TRANSPORTATION PLAN – PHASE I

Draft Initial Alternatives Evaluation Report

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INTRODUCTION

The purpose of this report is to present key findings of the Powell Boulevard/Foster Road Corridor Transportation Plan – Phase I planning level evaluation on **transportation performance, and engineering and environmental issues**. This report combines the transportation performance analysis results prepared by Metro, and the engineering and environmental analysis completed by David Evans and Associates (DEA), which are available as separate memorandum. The findings in this report will be considered for selection and refinement of alternatives to study further under Phase 2 of the Powell/Foster Corridor Transportation Plan.

This report provides a means of comparing the Powell/Foster Corridor Roadway Alternatives where they vary by individual road segment on the basis of estimated "order of magnitude" effects upon the natural and built environment, and general engineering considerations including planning-level cost estimates and relative ability to design a safe facility. This evaluation is based on information generated under four previous study tasks including:

1. **Objectives**, evaluation **criteria** and **measures** that support the overall **goal** for the first phase of the Powell/Foster Corridor Plan: ***To define and preliminarily evaluate an initial range of multi-modal alternatives that will accommodate the 2020 corridor travel demand in a way that supports the 2040 Concept Plan***. The goal, objectives, criteria and measures were developed by Metro in collaboration with the Powell/Foster Corridor Technical Advisory Committee (TAC) and DEA.
2. **Existing conditions**, based on an inventory of roadway characteristics, and general land use and environmental features, presented in the *Existing Conditions Report* (DEA, December 2002).
3. Improvements for individual roadway segments **Initial Roadway, Bicycle and Pedestrian Alternative Improvement Sets**, that consist of the "Base" (RTP 2020 Roadway, Bikeway and Pedestrian Network), "No. 1" (Expanded North/South Network), "No. 2" (Expanded East/West Network), and "No. 3" as described in the *Initial Multi-Modal Improvement Sets Memorandum* (DEA, April 2003).
4. **"Sketch level" engineering** analysis conducted for several alternative roadway segments within "areas of concern" (i.e., areas of particularly constrained rights-of-way) and presented in the *Sketch Level Engineering Memo* (DEA, May 2003), and professional engineering estimation methods employed for other subject roadway segments that were not addressed in the sketch-level engineering analysis.

This evaluation applies to individual major roadway segments within the Powell/Foster Corridor where more than one potential roadway improvement option is being considered under the four Initial Roadway, Bicycle and Pedestrian Improvements Sets (a.k.a., "Roadway Alternatives"). The evaluation does not address roadway segments (e.g., Powell Boulevard between 174th Avenue and Hogan Road) where only one roadway improvement design concept (i.e., number of travel lanes) is considered under the Roadway Alternatives.

INITIAL ROADWAY, BICYCLE AND PEDESTRIAN IMPROVEMENT SETS AND INITIAL TRANSIT IMPROVEMENT SETS

With support from the Technical Advisory Committee (TAC), Metro recommended a roadway, bicycle, and pedestrian 2020 "base" network. This network consists of priority system improvements contained in the 2020 Regional Transportation Plan, plus improvements that resulted from the Pleasant Valley Concept Plan. Metro, DEA, and the TAC developed three initial roadway, bicycle, and pedestrian improvement sets through a series of work sessions and discussions. The initial improvement sets were developed with distinct general "themes" that are intended to address certain regional travel needs while considering known transportation, land use, and environmental constraints within the Corridor.

The initial roadway, bicycle, and pedestrian improvement sets are identified as follows:

- **Roadway, Bicycle and Pedestrian "Base"** (RTP 2020)
- **Roadway, Bicycle and Pedestrian "No. 1"** (Expanded North/South Network)
- **Roadway, Bicycle and Pedestrian "No. 2"** (Expanded East/West Network)
- **Roadway, Bicycle and Pedestrian "No. 3"** (Powell Blvd.: 3 Travel Lanes with Bicycle/Pedestrian and other north-south local street improvements)

Attachment A includes **Figures 1-4** that illustrate the initial roadway, bicycle, and pedestrian improvement sets. The initial roadway, bicycle, and pedestrian improvement sets addressed in this report are described in more detail in the *Initial Multi-Modal Improvements Sets Memorandum* prepared by DEA in April 2003.

The initial transit improvement sets were developed by Metro and Tri-Met with input from the Powell/Foster Corridor TAC. These improvement sets consist of a **"Baseline Transit"** (RTP 2020 constrained transit system combined with the South Corridor Project transit system and regional bus service on Highland/190th) and a **"Transit A"** network that expands on the base transit system.

Attachment A includes **Figure 7 and 8** that illustrate the initial transit improvement sets. These two transit system improvement sets are described in more detail in the *Initial Multi-Modal Improvements Sets Memorandum* prepared by DEA in April 2003.

The **Base Transit Network** for the Powell/Foster Study is the 2020 RTP Financially Constrained Transit Network. This network includes an incremental increase in transit service throughout the region, consistent with existing revenue sources. The average annual increase in Tri-Met service hours projected to be available for the RTP Financially Constrained network is forecast to be approximately 1.5% per year. The service also would include recent transit improvements such as the Central City Streetcar and Airport MAX and planned improvements such as the Interstate MAX line and the I-205 MAX line.

The **Transit "A" Network** is based upon the Base Transit Network described above. Much of the service improvements included in this alternative are focused on providing

improved north/south transit connections through the study area. Compared with the transit services included in the Base Transit Network, Transit "A" includes more service coverage, improved headways and improved travel times within the Powell/Foster Study Area. Three of the key transit improvements in the Transit "A" Network include:

- **Powell Rapid Bus** – The Powell Rapid Bus would provide service along the existing Line 9 Powell bus route between downtown Portland and Gresham. The Rapid Bus would have less frequent stops than the standard Line 9 service and it would include intersection improvements such as transit signal priority and queue-bypass lanes.

- **Foster Rapid Bus** – The Foster Rapid Bus would provide service along the existing Line 14 Hawthorne bus route (with service extended from Lents to Damascus) between downtown Portland and Damascus. The Rapid Bus would have less frequent stops than the standard Line 14 service and it would include intersection improvements such as transit signal priority and queue-bypass lanes.

- **Division Frequent Bus** – The Division Frequent Bus provides service with enhanced frequencies, while using the same stops as the base Division service. The route will run every 10 minutes and will utilize transit signal priority, at least to the Portland city border, and enhanced passenger amenities at major bus stops (transfer points).

The four roadway, bicycle, and pedestrian improvement sets can be combined with the two transit improvement sets to create a potential of eight different transportation alternatives that could have been evaluated for travel performance by using the travel forecasting model. In order to have a more cost effective study, the TAC selected five different transportation alternatives to evaluate travel performance. The travel performance evaluation results in this report are bases on the following five alternatives:

2020 Base Alternative – Combines the Roadway, Bicycle and Pedestrian Base with the Baseline Transit Network

Alternative A – Combines the Roadway, Bicycle and Pedestrian Base with the expanded Transit "A" Network

Alternative 1 – Combines the Expanded North/South Roadway Network with the Baseline Transit Network

Alternative 2 - Combines the Expanded East/West Roadway Network with the Baseline Transit Network

Alternative 3A - Combines the 3 Travel Lanes with Bicycle/Pedestrian on Powell Boulevard with other north-south local street improvements network with the expanded Transit "A" Network

The travel performance evaluation was completed on these five alternatives and the results in this report are provided within individual roadway segments.

Attachment A figure 5 and 6 shows the potential cross-section variations by roadway segment. **Attachment B** is the "Powell/Foster Alternative Elements" **evaluation matrix,** and presents a summary of the information contained in this report, including transportation performance analysis, along with costs, and an engineering and environmental evaluation of impacts. **Attachment C** contains tables prepared by Alta Planning + Design that presents evaluation findings of the **"base" bicycle and pedestrian improvements set** incorporated under the "base" Roadway Alternative (Figure 1), and the **"enhanced" bicycle and pedestrian improvements set** incorporated under Roadway Alternatives 1-3 (Figures 2-4).

The six major roadway segments and corresponding Phase I initial improvement options addressed in this report include:

Powell Boulevard (I-205 to 174th Avenue)

- Five-lane option:
  - Widen Powell Boulevard to four lanes with a median and turn pockets where needed, plus bike lanes and sidewalks
  - Improve the I-205/Powell Boulevard interchange to accommodate all directional movements
- Three-lane option (only in Alternative 3A):
  - Widen Powell Boulevard to two lanes with a median and turn pockets where needed, plus bike lanes and sidewalks
  - Construct a new northbound access road between Foster Road and Powell Boulevard on the east side of I-205
  - Construct minor improvements (sidewalks, landscaping and paved shoulders) to SE 103rd Avenue/104th Avenue, 111th Avenue/112th Avenue and 136th Avenue, and add turn lanes where needed at the intersections of these streets and Holgate Boulevard and Harold Street
  - Add a westbound right turn lane at the southbound I-205 off-ramp approach to Division Street and add a southbound left turn lane at the westbound Division Street approach to SE 92nd Avenue

Foster Road (SE 122nd Avenue to Jenne Road)

- Three-lane option: Widen Foster Road to two lanes with a median and left turn pockets where needed, plus bike lanes and sidewalks

- Extra eastbound-lane or reversible lane option:

- Widen Foster Road to three lanes with two lanes in the eastbound direction and one lane in the westbound direction, plus bike lanes and sidewalks, or
- Widen Foster Road to three lanes with one lane in the eastbound direction and one lane in the westbound direction at all times and a reversible third lane that would accommodate travel in the AM and PM peak traffic directions, plus bike lanes and sidewalks

- Three to four-lane option (only in Alternative 2): Widen Foster Road to four lanes from 122nd Avenue to Barbara Welch Road and three lanes (two lanes plus turn pockets) from Barbara Welch Road to Jenne Road

Jenne Road and new route near 174th Avenue (Powell Boulevard to Foster Road)

- Jenne Road three-lane option: Widen Jenne Road to two lanes with left turn pockets where needed, plus bike lanes and sidewalks.
- Jenne Road extra southbound lane option (only in Alternative 2): Widen Jenne Road to three lanes with two lanes in the southbound direction and one lane in the northbound direction, plus bike lanes and sidewalks.
- New road option (only in Alternative 1):
  - Construct a new two-lane road with turn pockets where needed plus bike lanes and sidewalks from a new intersection at 174th Avenue located south of the Springwater Corridor Trail south to a new intersection at the future Giese Road proposed under the Pleasant Valley Concept Plan. Under this option, Jenne Road between Foster Road and the connection to the new road would be maintained in its existing configuration and classified as a local road.

Highland Drive/Pleasant View Drive (Powell Boulevard to Butler Road)

- Five-lane Highland Drive option: Widen Highland Drive to four lanes with a median and left turn pockets where needed, plus bike lanes and sidewalks
- Three-lane Highland Drive and Pleasant View Drive option (only in Alternative 1):
  - Widen Highland Drive to three lanes with two lanes in the southbound direction and one lane in the northbound direction, left turn pockets where needed, plus bike lanes and sidewalks
  - Widen Pleasant View Drive to three lanes with two lanes in the northbound direction and one lane in the southbound direction, left turn pockets where needed, plus bike lanes and sidewalks

Butler Road and Towle Road (190th Avenue to Powell Boulevard)

- Three-lane option: Widen Butler Road between 190th Avenue and Towle Road, and widen Towle Road between Butler Road and Powell Boulevard to two lanes with left turn pockets where needed, plus bike lanes and sidewalks
- Four-lane option (only in Alternative 1): Widen Butler Road between 190th Avenue and Towle Road, and widen Towle Road between Butler Road and Powell Boulevard to four lanes, plus bike lanes and sidewalks

242nd Avenue (Palmquist to Hwy 212)

- Three-lane option: Widen 242nd Avenue to two lanes with left turn pockets where needed, plus bike lanes and sidewalks
- Four-lane option (only in Alternative 1): Widen 242nd Avenue to four lanes, plus bike lanes and sidewalks

Based on the results of the transportation performance analysis, the engineering and environmental evaluation, and input from the Powell/Foster Corridor Technical Advisory Committee (TAC), a modified or refined set of roadway, bicycle, and pedestrian improvements from those identified above are likely to be selected for additional study.

OVERALL ALTERNATIVES EVALUATION MEASURES

REGIONAL AND STUDY AREA TRANSPORTATION MEASURES AND FINDINGS:

The following are transportation performance findings from comparisons of the initial roadway and transit alternatives at the regional and study area levels. These alternatives are described in more detail in the *Initial Multimodal Improvements Sets Memorandum*.

Generally, the roadway and transit improvements in these alternatives are not large enough to have a significant impact on travel performance at the regional level.

Vehicle miles traveled (VMT) per capita (region-wide and for study area)
This measure shows how well the alternatives contribute to achieving the Oregon Transportation Planning Rule's required 10 percent reduction in region-wide VMT per capita over the next 20-years.

2-hour PM peak period travel times between centers (Downtown Gresham, Clackamas Regional Center, Pleasant Valley, Damascus)
This measure helps determine whether the alternatives provide significantly better accessibility between Town Centers and/or Regional Centers within the study area by assessing travel times between these centers.

- For measures like VMT per capita, and PM peak travel times between centers (ie. Gresham, Clackamas Regional Center, Pleasant Valley, Damascus), there were no

significant differences between the roadway and transit alternatives on a region-wide or study area wide basis.

Lane miles of unacceptable level of service

This measure is used to determine whether an acceptable level of service on the regional motor vehicle system is maintained during peak periods, as defined by the Regional Motor Vehicle Performance Measures (Table 1.2) in the Regional Transportation Plan (RTP). The RTP requires that Table 1.2 be used to determine if an adequate transportation system is being planned to serve the planned land uses in the specific areas of the region.

At a level smaller than the entire study area (see core study area in Map A), there was a difference in the lane miles of unacceptable level of service for some of the alternatives. The following comparisons are to the 2020 Base Alternative, unless otherwise specified:

- Within the core of the study area (shown in Map A), there is no measurable difference in lane miles of unacceptable level of service (LOS) between Alternatives 1, Alternative 2, and the 2020 Base (see Table 1).

- In the core study area, the high transit alternative (Alternative A) showed a 10% improvement in lane miles of unacceptable LOS over the 2020 base, which has a lower level of transit (see Table 1).

- Conversely, with Alternative 3A (which has three lanes on Powell and the higher transit) there is an 11% increase in lane miles of unacceptable LOS than in the 2020 Base Alternative (includes 5-lanes on Powell Boulevard east of I-205 with the Base Transit Alternative). Significantly, with the higher transit, Alternative 3A has 21% more lane miles of unacceptable LOS than Alternative A, which has high transit and 5 lanes on Powell (see Table 1).

- Alternative 3A narrows Powell Boulevard (between I-205 and SE 174th) to three lanes. Volume and LOS plots of the modeled alternative show portions of eastbound Powell Boulevard (east of I-205), eastbound Holgate from I-205 to 112th and southbound 136th (south of Holgate), all go from acceptable in the 2020 Base to unacceptable or extremely unacceptable in Alternative 3A.

Insert Map A

INSERT TABLE 1

INDIVIDUAL ROADWAY TRANSPORTATION PERFORMANCE MEASURES

The transportation performance measures by individual roadway segments primarily relate to accessibility and mobility. As presented in the evaluation matrix (Attachment A) and summarized as key findings in the following section, the transportation performance analysis compares each of the roadway alternatives by segment for the following measures:

Volume/Capacity (V/C) ratio
This measure takes the projected 2-hour PM peak traffic volumes (in the peak direction) and divides them by the 2-hour capacity of the roadway. It focuses on the level of congestion at the most heavily traveled parts of each roadway segment (highest V/C within each roadway segment). The volume/capacity ratio (V/C) measures how well each of the alternatives provides congestion relief at major bottlenecks along the roadway segment.

PM peak average auto travel time
This measure calculates the average 2-hour PM peak auto travel time (traveling in the peak direction) from one end of the roadway segment to the other end. PM peak auto travel times were compared to the 2020 Base to see if the alternatives provide better mobility across the roadway segment.

Lane miles of unacceptable level of service (by district)
This measure is used to determine whether an acceptable level of service on the regional motor vehicle system is maintained during peak periods, as defined by the Regional Motor Vehicle Performance Measures (Table 1.2) in the Regional Transportation Plan (RTP). Some of the alternatives result in peak traffic dispersing onto roadways that are adjacent and parallel to the designated roadway segment. Therefore, measuring lane miles of unacceptable level of service within the entire district is a better way to determine the overall congestion impact of the alternative than limiting this measurement to an individual roadway segment. The individual districts are shown in Map A.

PM peak average auto speed (by direction)
This measure calculates the average PM peak auto speed, for each direction, for the entire roadway segment. PM peak auto speeds were compared to the 2020 Base to see if the alternatives provide faster speeds and better mobility across the roadway segment.

PM peak intersection level of service
Ten intersections were chosen at locations where more detailed analysis beyond the regional travel performance analysis were considered to be necessary to determine the level of congestion and vehicle queuing at intersections.

Traffic analysis of the ten intersections was conducted using Synchro, a computer modeling tool used for analyzing traffic operations at intersections. In addition, for five of the intersections, an analysis of a second alternative intersection configuration using Synchro and SimTraffic (a traffic simulation model) was completed. All of the

intersections were considered signalized, and the intersection signal timing was optimized as part of the analysis.

Average trip length
This measure calculates the average auto trip length (in miles) of all vehicles. The average auto trip length on the roadway, for each of the alternatives, is compared to the 2020 Base. This allows for an analysis of how widening or narrowing a roadway (compared to the base) effects the average length of trips traveling on the roadway, and compares the average trip length at the selected roadway location to the regional average trip length on all facilities. This measure is applied only on selected portions of Powell Boulevard and Foster Road where the functional class of the roadway is an issue.

INDIVIDUAL ROADWAY ENGINEERING AND ENVIRONMENTAL MEASURES

As described in the following section and summarized in the evaluation matrix (Attachment B), the engineering and environmental evaluation compares each of the roadway alternatives by roadway segment against the following 11 evaluation measures:

- **Capital cost (in year 2003 dollars)**
- **Acres of new right-of-way required**
- **Number of commercial and residential properties acquired**
- **Qualitative discussion of on-street parking displacement for commercial and residential properties**
- **Improved arterial miles with potential access management (non-traversible median or turn restrictions)**
- **Qualitative discussion of potential access or turn movement restrictions**
- **Number and approximate acreage of parks and open space areas potentially affected without mitigation**
- **Approximate miles for potential "Green Streets" or other design elements to reduce and manage storm-water runoff**
- **Approximate acreage of wetlands, flood zone, and other environmentally sensitive areas (e.g., riparian habitat) affected without mitigation**
- **Qualitative assessment of the ability to design a safe facility**

The engineering and environmental evaluation generally compares the various roadway segment options against evaluation measures related to planning objectives and criteria developed early in the study process. As the roadway alternatives were developed, the initial evaluation measures were revised to reflect measures that Metro and DEA believed could provide effective comparative distinctions between the alternative road segments.

Quantitative engineering and environmental measures (i.e., acres of right-of-way acquisition, acres of park/open space impacts, and acres of environmentally sensitive areas affected) discussed in this report are based on estimates. The primary tool utilized for measuring these impacts was digital mapping and data layers incorporated into 2002

Regional Land Information System (RLIS) Geographic Information System (GIS) data provided by Metro's Data Resource Center (DRC).

The evaluation results for different design options were developed by applying a uniform width of the conceptual right-of-way sections (Figures 5 and 6) onto the roadway centerlines layer of the RLIS data and overlaying this "footprint" onto other data layers including tax lots, zoning, and "Title 3" (floodplain, wetlands, riparian areas). This conservative approach somewhat overstates the impacts. Site reconnaissance and information provided by participating jurisdictions represented on the TAC were used to supplement the RLIS-based inventory. The evaluation information presented in this report is subject to refinement based on further study or information that may not have been considered during the planning-level evaluation conducted for the Phase 1 corridor planning effort.

OVERALL ALTERNATIVES EVALUATION FINDINGS

EVALUATION OF INITIAL ROADWAY, BICYCLE AND PEDESTRIAN IMPROVEMENTS SETS

This section provides a summary of key transportation performance findings by roadway segment for seven roadway segments within the Powell/Foster Corridor (including Powell Boulevard west of I-205), and is based on the transportation measures listed above. This section also provides a summary of key engineering and environmental findings for each of the six roadway segments with more than one design concept identified under the roadway alternatives. Since the section of Powell Boulevard west of I-205 did not have any design concepts identified, it does not have any key engineering and environmental findings.

For each roadway segment, an evaluation summary table provides a qualitative evaluation of the subject design concepts compared to the engineering and environmental criteria. This evaluation summary applies a qualitative, "order of magnitude" rating of "Low", "Moderate", or "High" depending upon the relative level of impact for each design option. A Low ranking is negative, or indicates a greater level of adverse effect than a High ranking, a High ranking is positive, and a Moderate ranking has some adverse effect, but is between a Low and High ranking.

POWELL BOULEVARD WEST OF I-205 AND AT THE I-205 INTERCHANGE

Transportation Performance Evaluation

Currently, Powell Boulevard narrows to one lane in each direction just east of I-205, and certain turns are prohibited at the interchange at I-205 and Powell. Traffic using the I-205 southbound off-ramp is not allowed to turn left onto Powell Boulevard (eastbound) and traffic traveling westbound on Powell Boulevard is not allowed to turn left onto the I-205 southbound on-ramp. These turn restrictions require vehicles that are exiting southbound I-205 at Powell Boulevard or trying to access I-205 southbound from westbound Powell to use the intersection of SE 92nd and Powell Boulevard.

Alternative 3A retains the existing turn movement limitations at the I-205/Powell Boulevard interchange, while the 2020 Base Alternative provides full directional movements at this interchange.

PM peak intersection level of service

An analysis of the traffic queuing at Powell and 92nd and Powell at the I-205 interchange (using Synchro and SimTraffic) was important in determining whether these intersections could operate acceptably under the 2020 Base and Alternative 3A. Findings of the transportation impacts to Powell, SE 92nd, and I-205 are as follows:

- The intersection of SE 92nd Avenue and Powell Boulevard would be severely congested if the I-205 and Powell interchange is not re-constructed to remove the current turn restrictions and allow all turning movements. The congestion would result in southbound I-205 to westbound Powell traffic that backs up onto the freeway during peak periods. Failed operating conditions at this intersection would also cause southbound traffic on 92nd Avenue to back up to about Division Street, and northbound traffic on 92nd Avenue to back up to about Holgate Boulevard

- Failing to expand Powell Boulevard to 5-lanes east of I-205 would cause serious traffic backups at signalized intersections on Powell Boulevard west of I-205. Eastbound traffic backups during the PM peak would extend from SE 92nd Avenue to west of SE 82nd Avenue, thus negatively impacting the traffic operations of the Powell Boulevard and 82nd Avenue intersection.

- The 3-lane Powell Boulevard design option, without the improved I-205 interchange (Alternative 3A) would cause eastbound Powell Boulevard traffic to back up west of 82nd Avenue and result in a substantial diversion of traffic onto other eastbound routes including local streets.

- For Alternative 3A, traffic mitigation at SE 92nd and Powell would be extensive and is not a reasonable solution to the congestion problem. To best

mitigate the impact, the intersection of SE 92nd and Powell would need to be expanded to accommodate eight lanes on Powell as it approaches the intersection, and six-lanes on 92nd Avenue as it approaches the intersection. The impacts to existing businesses of expanding the intersection would be dramatic and the intersection would still be operating nearly at capacity.

Increases in Powell Boulevard traffic west of I-205 (Upstream impacts of widening)

- Widening Powell Boulevard to 5-lanes east of I-205 does **not** increase Powell Boulevard traffic west of I-205. The 2020 Base (with 5-lanes on Powell) has only about 100 more eastbound vehicles (50 per hour) on Powell between SE 52nd and SE 82nd Avenues (during two-hour PM peak) than Alternative 3A (with 3-lanes on Powell). Map B and Map C shows where eastbound PM peak traffic (2 hours) on Powell Boulevard just east of I-205 is coming from. Most of the increase in traffic volume on the 5-lane Powell option is coming from I-205 both northbound and southbound.

POWELL BOULEVARD (I-205 TO SE 174TH AVENUE) IMPROVEMENT OPTIONS EVALUATION

Transportation Performance Evaluation

Findings on the transportation impacts to SE Powell, SE Holgate, SE 136th, and other facilities are as follows:

Unacceptable level of service

The 5-lane Powell option (2020 Base) still has spots of congestion on eastbound Powell Boulevard. However, *the 3-lane Powell option* (Alt. 3A) would significantly increase congestion on Powell and would shift traffic to other routes including Holgate Boulevard, Division Street, and Foster Road. With *Alternative 3A*, eastbound Holgate from I-205 to SE 111th, and southbound SE 136th from Holgate to Harold both have lane miles of unacceptable LOS that is not in the 2020 Base. (See Maps D and E.)

Insert Map B

Insert Map C

Insert Map D

Insert Map E

PM peak intersection level of service

An analysis of traffic queuing at Powell/162nd and at Powell/174th (using Synchro and SimTraffic) was conducted to determine whether these intersections could operate acceptably under the 2020 Base and three other alternatives. Utilizing these intersection analysis tools was important because they provide a detailed look at traffic operations, traffic queuing, and potential mitigation at the intersections that is not available in the travel forecasting model. A traffic operations analysis (using Synchro) on Powell at the intersections of 122nd and 148th was also important in determining if these intersections could operate acceptably under Alternative 3A.

- *The 3-lane Powell option* (Alt. 3A) would significantly increase congestion along Powell and cause unacceptable traffic operations at the intersections of Powell and SE 122nd, and SE 148th. To mitigate traffic impacts at these and other intersection along Powell, extended five-lane sections at the intersection approaches would be required. The mitigation of a 3-lane Powell would likely have similar impacts to a 5-lane Powell with only short segments between intersections that would actually have 3-lane cross-sections.

- *Alternative 1 and Alternative 2* both add another southbound left turn lane at SE 162nd and Powell Boulevard. After optimizing the signal timing, the intersection is expected to operate below capacity and have an acceptable LOS.

PM peak average auto travel time and PM peak average auto speed

- *The 3-lane Powell option* (Alt. 3A) has an 8% longer eastbound travel time and has a 7% slower average travel speed (in both directions) when compared to the 2020 Base.

Volume/Capacity (V/C) ratio

- *The 3-lane Powell option* (Alt. 3A) has a maximum volume/capacity ratio on eastbound Powell Boulevard (east of SE 162nd) of 1.23. This level of congestion would represent a gridlock condition, and would likely cause a diversion of traffic onto other eastbound routes including local streets.

- The 2020 Base, with the *5-lane Powell option*, has a maximum volume/capacity ratio on eastbound Powell Boulevard (east of SE 162nd) of 1.12. Most of eastbound Powell has acceptable level of service, with a few blocks just east of I-205 and between 122nd and 136th, and between 162nd and 174th at or just above capacity.

- *Alternative 1*, with 5-lanes on Powell and additional capacity and access management improvements from SE 162nd to SE 174th, reduces the maximum

volume/capacity ratio on eastbound Powell Boulevard (east of SE 162nd) to 1.01, which significantly improves mobility in this section.

Average trip length

- The average trip length on Powell Boulevard just east of I-205 is about 9.5 miles for both the *5-lane Powell option* and the *3-lane Powell option*. The average regional trip length (on all roadways in the regional system) is significantly less at about 6.5 miles. For locations near I-205, Powell Boulevard is serving longer trips and a regional arterial type function whether it is widened to 3-lanes or 5-lanes.

- The average trip length on Powell Boulevard just west of SE 174th is about 8.5 miles for *the 5-lane Powell option*, and decreases slightly to 8.1 miles under *the 3-lane Powell option*. For locations near Gresham, Powell Boulevard is still serving longer trips and a regional arterial type function, even under the 3-lane Powell option.

Powell Boulevard – Key Conclusions

- The *3-lane Powell Boulevard option* without the improved I-205 interchange (Alternative 3A) would backup traffic in all directions at Powell Boulevard and SE 92nd during peak periods. The congestion would result in southbound I-205 to westbound Powell traffic that backs up onto the freeway during peak periods.

- *The 3-lane Powell option* (Alt. 3A) causes significant congestion problems and provides a much poorer level of mobility and travel performance on Powell Boulevard and SE 92nd than the other alternatives. It significantly increases congestion on nearby routes like Holgate Boulevard and parts of SE 136th.

- *Alternative 1*, with 5-lanes on Powell and additional capacity and access management improvements from SE 162nd to SE 174th, provides the best level of mobility and travel performance on Powell Boulevard of all the alternatives.

POWELL BOULEVARD (I-205 TO SE 174TH AVENUE) IMPROVEMENT OPTIONS EVALUATION

Engineering and Environmental Evaluation

This section provides a summary of key engineering and environmental evaluation findings for the Powell Boulevard (I-205 to SE 174th Avenue) segment. For the Powell Boulevard segment, the evaluation summary table on the next page provides a qualitative evaluation of the design concepts compared to the engineering and environmental criteria. This evaluation summary applies a qualitative, "order of magnitude" rating of "Low", "Moderate", or "High" depending upon the relative level of effect for each design option. A Low ranking is negative, or indicates a greater level of adverse effect than a High ranking, a High ranking is positive, and a Moderate ranking has some adverse effect, but is between a Low and High ranking.

Powell Boulevard (I-205 to 174th Avenue) Improvement Options Evaluation

Powell Boulevard (I-205 to 174th Avenue) Engineering and Environmental Evaluation Summary			
Evaluation Criteria	**Five-Lane Option**	**Three-Lane Option**	**Notes***
Provide cost-effective improvement	Low	Low	<$10M - High $10-$20M - Mod. $20M+ - Low
Minimize acres of new right-of-way required	Low	Moderate	0 – 5 - High 5 - 10 - Moderate 10+ - Low
Minimize number of commercial and residential properties acquired	Low	Low	< 5 - High 5 - 10 - Moderate 10+ - Low
Minimize on-street parking displacement for commercial and residential properties	Low	Low	< 0.25 mi - High 0.25 - 1.0 mi - Mod. 1.0 mi.+ - Low
Maximize improved arterial miles with potential access management	High	Moderate	< 1.0 mi -Low 1.0 - 3.0 - Mod. 3.0 mi.+ - High
Minimize potential access or turn movement restrictions	High	Moderate	Qualitative – related to access management
Minimize number and approximate acreage of parks and open space areas potentially affected	Moderate	High	< 0.5 ac - High 0.5 - 1.0 ac.- Mod. 1.0 ac. + - Low
Maximize approximate miles for potential Green Streets or other design elements to reduce and manage storm-water runoff	High	High	< 1.0 mi. - Low 1.0 - 3.0 mi. -Mod. 3.0 mi. + - High
Minimize approximate acreage of wetlands, flood zone, and other environmentally sensitive areas affected	High	High	< 0.5 ac - High 0.5 - 1.0 ac.- Mod. 1.0 ac. + - Low
Maximize ability to design a safe facility	High	Moderate	Qualitative – Ability to address design deficiencies

* A qualitative, "order of magnitude" rating of "Low", "Moderate", or "High" describes the relative level of effect for each design option. A Low ranking is negative, or indicates a greater level of adverse effect than a High ranking, a High ranking is positive, and a Moderate ranking has some adverse effect, but is between a Low and High ranking.

Capital cost (year 2003 dollars)

The estimated capital cost of the five-lane Powell Boulevard option would be approximately **$48 million**[1]. This capital cost estimate includes construction of the widened and improved roadway at an estimated cost of approximately $22 million, and acquisition of residential and commercial right-of-way at an approximate cost of $26 million.

[1] This cost does not include the cost of improvements to or reconstruction of the I-205/Powell Boulevard interchange to provide full-direction access at a range of $15 million to $45 million. The costs assume the highest estimate of residential and commercial property acquisitions estimated on the following page.

The estimated capital cost of the three-lane Powell Boulevard option would be approximately **$51 million**. This capital cost estimate includes construction of the widened and improved roadway at an estimated cost of approximately $14 million, construction of the new northbound access road on the east side of I-205 at an estimated cost of approximately $14.5 million, construction of the other supporting roadway improvements at an estimated cost of approximately $9 million, and acquisition of residential and commercial right-of-way at an approximate cost of $13.5 million.

The cost estimates for the Powell Boulevard options would vary substantially due to the range of potentially effective improvements that may be considered for the I-205/Powell Boulevard interchange to provide full turn movement access. Initially, improvement of this interchange was considered as a construction element under the five-lane option, but not under the alternative set developed for the three-lane option. Based on the analysis of the Powell Boulevard intersections with the I-205 ramps and SE 92nd Avenue that was conducted for both the five-lane and three-lane Powell Boulevard options, the I-205/Powell Boulevard interchange improvement would be necessary. Thus, the cost range for this action is footnoted separately because it is preliminary and would be needed under either option.

ODOT has not developed this interchange improvement project to the extent that a more refined cost estimate is available. The primary variable would be whether or not the I-205 structure crossing over Powell Boulevard would need to be replaced and, if so, the construction magnitude of this project. The low end ($15 million to $25 million) of the cost range is the estimate for an interchange improvement project that would not require replacement of the structure, while the high end ($25 million to $45 million) of the cost range would address potential interchange configurations combined with a new structure.

With or without the I-205/Powell Boulevard interchange improvement, additional turn lanes would likely be needed to maintain acceptable traffic operations at the intersection of Powell Boulevard/92nd Avenue under the three-lane Powell Boulevard option. The cost of this additional intersection capacity was not included in the estimate for the three-lane Powell Boulevard option.

Acres of new right-of-way required

Limited existing rights-of-way between I-205 and 174th Avenue would require the acquisition of approximately **13 acres** of additional land, including an estimated three acres of commercial property and 10 acres of residential property for the five-lane Powell Boulevard option. It is estimated that the five-lane Powell Boulevard option would require acquisition of approximately two times the amount of additional right-of-way from adjacent commercial and residential land as the three-lane option. The three-lane Powell Boulevard option would require acquisition of approximately **six acres** of additional land, including an estimated one acre of commercial property and five acres of residential property.

Number of commercial and residential properties acquired

It is estimated that the five-lane Powell Boulevard option would require acquisition and displacement of approximately twice the number of commercial and residential properties as the three-lane option. The five-lane Powell Boulevard option would likely require acquisition and result in displacement of **between 50 and 60 properties**, including 20 to 25 commercial properties and 30 to 35 residential properties. The three-lane Powell Boulevard option would likely require acquisition and result in displacement of **between 22 and 33 properties**, including 10 to 15 commercial properties and 12 to 18 residential properties.

On-street parking displacement for commercial and residential properties

The three-lane Powell Boulevard option would require displacement of more than twice the amount of on-street parking as the five-lane option. On-street parking along approximately **2.5 miles** of roadway would be displaced under the five-lane Powell Boulevard option, and the three-lane Powell Boulevard option would result in displacement of on-street parking along approximately **5.5 miles** of roadway.

Both the five-lane and the three-lane Powell Boulevard options would displace the same amount of on-street parking on an approximately 2.5-mile length of Powell Boulevard This parking is currently available on Powell Boulevard between 103rd Avenue and 141st Avenue, and for two-three blocks east of 148th Avenue On Powell Boulevard, the on street parking displaced would predominantly front residential properties, with parking displaced at commercial properties near major intersections.

In addition to the on-street parking on Powell Boulevard that would be displaced under both options, the three-lane Powell Boulevard option would displace on-street parking that is available along the shoulder areas on 103rd/104th Avenue and 111th/112th Avenue This displaced parking primarily fronts residential properties with some parking displaced at commercial properties near major intersections.

Improved arterial miles with potential access management (non-traversible median or turn restrictions)

The five-lane Powell Boulevard option could provide greater opportunity to reduce the number of access points than the three-lane option because of the additional right-of-way and number of properties that would be acquired under this option. Access management plans could be implemented with roadway improvements and redevelopment of adjacent properties along the four-mile long segment of Powell Boulevard between I-205 and 174th Avenue under both the five-lane and three-lane Powell Boulevard options.

The 1.5-mile long section of Powell Boulevard between I-205 and 122nd Avenue is located between activity centers and features infrequent approaches (intersecting streets and driveways) and a relatively constrained right-of-way. Under both the five-lane and three-lane Powell Boulevard options, addition of a narrow, non-traversible median or

striping to restrict left turns, combined with left turn restrictions at existing driveways and control of new driveways would be effective design/access management treatments to maintain or optimize throughput capacity.

The 2.5-mile long section of Powell Boulevard between 122nd Avenue and 174th Avenue is also located between activity centers and lies within a relatively constrained right-of-way. This section features frequent approaches. Under both the five-lane and three-lane Powell Boulevard options, addition of a narrow, non-traversable median or striping to restrict left turns, combined with intersection improvements, access consolidation and left turn restrictions at existing driveways and control of new driveways would be effective design/access management treatments to maintain or optimize throughput capacity.

Qualitative discussion of potential access or turn movement restrictions

The five-lane option would require acquisition of more adjacent properties on Powell Boulevard than the three-lane option. This would result in a higher number of properties with potential access and turn movement restrictions on Powell Boulevard under the three-lane Powell Boulevard option.

Additional access and turn movement restrictions would occur under the three-lane option, but not the five-lane option as a result of the new northbound access road on the east side of I-205. This new road would require closure of the 96th Avenue approaches on the north and south sides of Holgate Boulevard and restrict local access for residents in this area. Maintaining current turn movement restrictions at the I-205/Powell Boulevard interchange under the three-lane Powell Boulevard option would result in access impacts that would not occur under the five-lane option.

Number and approximate acreage of parks and open space areas potentially affected without mitigation

The five-lane Powell Boulevard option is estimated to impact more public parkland than the three-lane option. The five-lane option could impact approximately 0.6 acre of Edward Benedict Park, compared to an impact of approximately 0.1 acre under the three-lane option.

Approximate miles for potential "Green Streets" or other design elements to reduce and manage storm-water runoff

Green streets or other "water quality friendly" designs could be applied along the four-mile segment of Powell Boulevard between I-205 and 174th Avenue under both the five-lane and the three-lane Powell Boulevard options. On Powell Boulevard, implementation of effective design elements to reduce and manage storm-water runoff could be more challenging under the five-lane option, because this option would result in greater impervious surface area and would require more right-of-way for vehicle lanes compared to the three-lane option. Managing storm-water runoff onsite would be easier under the three-lane Powell Boulevard option than it would be under the five-lane option, since this option would require addition of less impervious surface and could have a larger amount

of right-of-way available for storm-water management. The larger area and number of adjacent properties acquired under the five-lane option could provide opportunity for managing storm-water runoff from the increased impervious surface.

Due to high groundwater and flood potential, drainage and storm-water management associated with improvements to SE 103rd Avenue and SE 111th Avenue between Foster Road and Harold Street will be a challenge under the three-lane Powell Boulevard option. Improvements to these roads are not included under the five-lane option.

Approximate acreage of wetlands, flood zone, and other environmentally sensitive areas (e.g., riparian habitat) affected without mitigation

The five-lane Powell Boulevard option would not affect wetlands, flood zone, or other environmentally sensitive areas. The sections of SE 103rd Avenue and SE 111th Avenue between Foster Road and Harold Street are located within the floodplain. Improvements to these roads under the three-lane Powell Boulevard option would need to incorporate measures to not compound poor drainage, displace flood waters, or add untreated road runoff to groundwater. City of Portland Bureau of Environmental Services is restoring a wetland southeast of the SE 111th Avenue/Harold Street intersection. While no direct affects (i.e., encroachment) to environmentally sensitive areas are anticipated under the three-lane Powell Boulevard option, increasing impervious surface area and storm-water management associated with potential modifications to the 111th Avenue/Harold Street intersection could cause concern..

Qualitative assessment of the ability to design a safe facility

Under both the five-lane and three-lane Powell Boulevard options, the segment of Powell Boulevard between I-205 and 174th Avenue could be designed to meet accepted engineering standards.

The Oregon Department of Transportation (ODOT) has identified several serious safety and operations-related concerns that may not be able to be resolved with the new northbound road on the east side of I-205 between Foster Road and Powell Boulevard that is included under the three-lane Powell Boulevard option. These issues include:

- Merging northbound traffic exiting I-205 to Powell Boulevard with traffic from Holgate Boulevard also destined for Powell Boulevard will create a weaving section on the reconfigured ramp approaching Powell Boulevard These types of weaving sections have poor operations and characteristically break down over time.
- The revised ramp connections to I-205 will shorten the available weaving distance between Foster Road and Powell Boulevard This will reduce the safety and potential long-term viability of this section.
- Allowing access onto Holgate Boulevard through the interchange ramps will present a challenge for signing and directing traffic from the freeway.

Under the five-lane Powell Boulevard option, implementation of improvements at the I-205/Powell Boulevard interchange to accommodate the southbound I-205 to eastbound Powell Boulevard and westbound Powell Boulevard to southbound I-205 left-turn movements could increase potential conflict points, but would also reduce traffic congestion in this area. These improvements would result in an overall safety improvement at this location, compared to the three-lane option that did not incorporate the interchange improvements.

Pedestrians and bicyclists traveling along and across Powell Boulevard would have a safer environment under either option than the current condition. However, pedestrians and bicyclists may perceive the three-lane option to be safer than the five-lane option. The reduced amount of vehicular traffic traveling on this segment of Powell Boulevard would create a less auto-oriented environment. Pedestrians would prefer crossing Powell Boulevard under the three-lane option due to the smaller roadway width and number of vehicular lanes.

Minor improvements to SE 103rd/104th Avenue and SE 111th/112th Avenue under the three-lane option would provide overall safety improvements that are not included under the five-lane option. Addition of non-motorized facilities on under the three-lane option would provide safe north-south connections that would not be available under the five-lane option.

FOSTER ROAD (I-205 TO JENNE ROAD) IMPROVEMENT OPTIONS EVALUATION

The 3-lane Foster option widens Foster Road to one lane in each direction plus a median and turn pockets where needed between SE 136th and Jenne Road. *The extra eastbound lane option* widens Foster Road to 3-lanes with two eastbound lanes and one westbound lane between 122nd and Jenne Road. *The reversible lane option* widens Foster to one lane in each direction at all times and a reversible third lane that would serve traffic in the peak direction during the morning and evening rush hours. *The 4-lane option* widens Foster to two lanes in each direction between SE 122nd and Barbara Welch Road, and to one lane in each direction with turn pockets where needed between Barbara Welch Road and Jenne Road. Findings on the transportation impacts to SE Foster Road are as follows:

Transportation Performance Evaluation

Unacceptable level of service

- *The 3-lane Foster option* provides poor travel performance due to a lack of capacity. With the 3-lane Foster option, eastbound Foster Road from 122nd to Barbara Welch Road is generally at a grossly unacceptable level of service.

- *The extra eastbound lane option* causes the eastbound portion of Foster Road between I-205 and SE 104th to have an unacceptable level of service compared to the 2020 base.

- *The 4-lane Foster Road* between 122nd and Barbara Welch Road causes the eastbound portions of Foster Road between I-205 and SE 104th, and between SE 162nd and Jenne Road, to have an unacceptable level of service compared to the 2020 base. Foster Road at these locations is nearing an unacceptable LOS in the 2020 Base and the congestion level with a *4-lane Foster Road* between 122nd and Barbara Welch Road is still better than experiencing the severe congestion at the bottleneck, which the widening is relieving.

Volume/Capacity (V/C) ratio

- *The 3-lane Powell option* has a maximum volume/capacity ratio on eastbound Foster Road (east of SE 136th) of 1.41.

- Travel performance improves significantly by adding a lane in the peak direction. *The extra eastbound lane option* reduces the maximum volume/capacity ratio on eastbound Foster Road (east of SE 136th) from 1.4 to 1.05.

- Travel performance improves significantly with *Alternative 2*. *The 4-lane Foster Road* between 122nd and Barbara Welch Road reduces the maximum volume/capacity ratio on eastbound Foster Road (east of SE 136th) from 1.4 to 1.08.

PM peak average auto travel time and PM peak average auto speed

- *Alternative 1*, with an extra eastbound lane on Foster, provides a 15% increase in the average travel speed on Foster, and a 10% faster average auto travel time.

- *Alternative 2*, with Foster widened to 4-lanes between 122nd and Barbara Welch Road, provides a 14% increase in the average travel speed on Foster, and a 6% faster average auto travel time.

Foster Road – Conclusions

- *The 3-lane Foster option* provides poor travel performance and has a major traffic bottleneck on eastbound Foster Road (east of SE 136th), which will cause diversion of traffic onto other eastbound routes including local streets.

- Adding lanes to Foster Road would relieve congestion in the short-term. However, long-term congestion relief may require identification of a new east-west route south of Foster Road as part of Phase 2.

FOSTER ROAD (122ND AVENUE TO JENNE ROAD) IMPROVEMENT OPTIONS EVALUATION

Engineering and Environmental Evaluation

This section provides a summary of key engineering and environmental evaluation findings for the Foster Road (122nd to Jenne Road) segment. For the Foster Road segment, the evaluation summary table on the next page provides a qualitative evaluation of the subject design concepts compared to the engineering and environmental criteria.

Foster Road (122nd Avenue to Jenne Road) Improvement Options Evaluation

Foster Road (122nd Avenue to Jenne Road) Engineering and Environmental Evaluation Summary				
Evaluation Criteria	**Three-Lane Option**	**Extra Eastbound/ Reversible Lane Option**	**Three to Four-Lane Option**	**Notes***
Provide cost-effective improvement	High	Moderate	Moderate	<$10M - High $10-$20M - Mod. $20M+ - Low
Minimize acres of new right-of-way required	High	High	High	0 – 5 - High 5 - 10 - Moderate 10+ - Low
Minimize number of commercial and residential properties acquired	High (com. & res.)	High (com. & res.)	High (com. & res.)	< 5 - High 5 - 10 - Moderate 10+ - Low
Minimize on-street parking displacement for commercial and residential properties	Moderate	Moderate	Moderate	< 0.25 mi - High 0.25-1.0 mi - Mod. 1.0 mi.+ - Low
Maximize improved arterial miles with potential access management	Moderate	Moderate	Moderate	< 1.0 mi -Low 1.0 - 3.0 - Mod. 3.0 mi.+ - High
Minimize potential access or turn movement restrictions	High	Low	Moderate	Qualitative – related to access management
Minimize number and approximate acreage of parks and open space areas potentially affected	High	High	High	< 0.5 ac - High 0.5 - 1.0 ac.- Mod. 1.0 ac. + - Low
Maximize approximate miles for potential Green Streets or other design elements to reduce and manage storm-water runoff	Moderate	Moderate	Moderate	< 1.0 mi. - Low 1.0 - 3.0 mi. -Mod. 3.0 mi. + - High
Minimize approximate acreage of wetlands, flood zone, and other environmentally sensitive areas affected	Low	Low	Low	< 0.5 ac - High 0.5 - 1.0 ac.- Mod. 1.0 ac. + - Low
Maximize ability to design a safe facility	Moderate	Low-reversible lane Moderate- extra eastbound lane	Moderate	Qualitative – Ability to address design deficiencies

* A qualitative, "order of magnitude" rating of "Low", "Moderate", or "High" describes the relative level of effect for each design option. A Low ranking is negative, or indicates a greater level of adverse effect than a High ranking, a High ranking is positive, and a Moderate ranking has some adverse effect, but is between a Low and High ranking.

Capital cost (year 2003 dollars)

Management of impervious surface runoff from any Foster Road design option to address treatment, retention, and discharge will be required. Storm-water treatment and management will be extremely difficult within the section between Barbara Welch Boulevard and Jenne Road due to the proximity of streams including Johnson Creek and Kelley Creek adjacent to this section of Foster Road The cost estimates for each Foster Road option incorporate extra cost per square foot of reconstructed the road to capture the cost of managing storm-water along this roadway.

The estimated capital cost of the three-lane Foster Road option is approximately **$8 million**. This capital cost estimate includes construction of the widened and improved roadway at an estimated cost of approximately $7.5 million, and acquisition of residential and commercial right-of-way at an approximate cost of $0.6 million.

The estimated capital cost of the Foster Road extra eastbound-lane option is approximately **$16 million**. This capital cost estimate includes construction of the widened and improved roadway, including construction of a new bridge crossing Johnson Creek at Barbara Welch Road and new retaining wall at an estimated cost of approximately $15.5 million, and acquisition of residential and commercial right-of-way at an approximate cost of $0.6 million. The higher cost associated with this option, compared to the three-lane option is primarily due to the construction of a large retaining wall and mitigation for an impacted riparian area on the south side of Foster Road between Barbara Welch Road and Jenne Road, and construction of a new bridge at Barbara Welch Road In order to maintain the required traffic controls, the reversible lane option would likely require regular operations and maintenance costs that would be substantially higher than those required for the other options.

The estimated capital cost of the Foster Road three to four-lane option is approximately **$14 million**. This capital cost estimate includes construction of the widened and improved roadway, including construction of a new bridge crossing Johnson Creek at Barbara Welch Road at an estimated cost of $10.1 million and acquisition of residential and commercial right-of-way at an approximate cost of $3.8 million.

Acres of new right-of-way required

All options considered would have similar right-of-way acquisition requirements. Both the three-lane and the extra eastbound-lane/reversible lane options for Foster Road are estimated to require acquisition of approximately **1.4 acres** of residential property. The Foster Road three to four-lane option is estimated to require acquisition of approximately **1.6 acres** of residential property.

Number of commercial and residential properties acquired

Any option that widens Foster Road to three lanes would not require significant impacts to properties. Neither the three-lane nor the extra eastbound-lane Foster Road options are

expected to result in acquisition and displacement of commercial or residential properties. Widening Foster Road to four lanes between SE 122nd Avenue and Barbara Welch Road (three to four-lane option) may require acquisition of **three commercial properties** and **five residential properties**.

Qualitative discussion of on-street parking displacement for commercial/residential properties

Each of the three Foster Road design options would displace intermittent areas of parking allowed on both sides of Foster Road along the one-half mile long section of Foster Road between 136th Avenue and Barbara Welch Road

Improved arterial miles with potential access management (non-traversible median or turn restrictions)

Access management plans could be implemented in concert with roadway improvements and redevelopment of adjacent properties along the approximately two-mile long segment of Foster Road between 122nd Avenue and Jenne Road under each of the three Foster Road design options. The three to four-lane option has the highest potential to implement access management opportunities, because of the additional right-of-way and number of properties that would be acquired under this option.

The approximately 1.25-mile long section of Foster Road between 136th Avenue and Jenne Road is located between activity centers and features infrequent approaches (intersecting streets and driveways) and a constrained right-of-way. Under the three-lane and three to four-lane Foster Road options, addition of a narrow, non-traversible median or striping to restrict left turns, combined with left turn restrictions at existing driveways and control of new driveways would be effective design/access management treatments to maintain or optimize throughput capacity. Under the extra eastbound-lane/reversible lane option, access management could be provided by left-turn restrictions from driveways and minor street approaches if a non-traversible median is not incorporated.

The approximately 0.75-mile long section of Foster Road between 122nd Avenue and 136th Avenue is also located between activity centers and lies within a relatively constrained right-of-way. This section features frequent approaches. Under the three-lane and three to four-lane Foster Road options, addition of a narrow, non-traversible median or striping to restrict left turns, combined with left turn restrictions at existing driveways and control of new driveways would be effective design/access management treatments to maintain or optimize throughput capacity.

Qualitative discussion of potential access or turn movement restrictions

The reversible lane option on Foster Road would have significant turn movement restrictions. It would likely restrict left turns along Foster Road between 136th Avenue and Barbara Welch Road, Barbara Welch Road and 162nd Avenue, and 162nd Avenue and Jenne Road These restrictions would limit access at minor streets including 139th Avenue,

140th Avenue, 141st Avenue, 142nd Avenue, 145th Avenue 158th Avenue, and 159th Drive and at commercial and residential driveways located along this segment of Foster Road

Depending upon the access management measures implemented in concert with the roadway improvements, the three-lane, extra eastbound lane, and three to four-lane Foster Road options could have similar access and turn movement restrictions on Foster Road. The three-lane option could have the least impact to access and turn movement restrictions, since it would provide left turn pockets as necessary. The three to four-lane option would require acquisition of adjacent properties on the section of Foster Road between 122nd Avenue and Barbara Welch Road that would not be required with the other options. This could result in a lower number of properties with potential access and turn movement restrictions on Foster Road. In order to maintain efficient throughput capacity on the four-lane section of Foster Road between 122nd Avenue and Barbara Welch Road, left turn access to and from Foster Road may be limited to intersections where left turn movements could be accommodated under the three to four-lane option.

Number and approximate acreage of parks and open space areas potentially affected without mitigation

None of the Foster Road design options would impact parks or open space areas.

Approximate miles for potential "Green Streets" or other design elements to reduce and manage storm-water runoff

Green streets or other storm-water treatment and management strategies could be applied along the approximately two-mile segment of Foster Road between 122nd Avenue and Jenne Road under each of the Foster Road design options. Implementation of effective design elements to reduce and manage storm-water runoff would be most challenging under the extra eastbound-lane/reversible lane option because this option would result in the greatest impervious surface area within the most environmentally sensitive section of Foster Road between Barbara Welch Road and Jenne Road

The three-lane design option would be most supportive of green streets treatments. Managing storm-water runoff onsite would be easiest under the three-lane option, since this option would require addition of less impervious surface and could provide a larger amount of right-of-way for storm-water management. Adjacent properties acquired under the three to four-lane option could provide opportunity for managing storm-water runoff from the increased impervious surface.

Approximate acreage of wetlands, flood zone, and other environmentally sensitive areas (e.g., riparian habitat) affected without mitigation

Construction of the three-lane Foster Road option would impact approximately **one acre** of environmentally sensitive area, including approximately 0.5 acre of environmental zone land, approximately 0.2 acre of riparian zone land, and approximately 0.2 acre of flood zone land.

The Foster Road extra eastbound-lane/reversible lane option would impact approximately **two acres** of environmentally sensitive area, including approximately 0.8 acre of environmental zone land, approximately 0.4 acre of riparian zone land, and approximately 0.6 acre of flood zone land.

The Foster Road three to four-lane option would impact approximately **1.5 acre** of environmentally sensitive area, including approximately 0.7 acre of environmental zone land, approximately 0.3 acre of riparian zone land, and approximately 0.4 acre of flood zone land.

Qualitative assessment of the ability to design a safe facility

The ability to design a safe facility would be highest for the three-lane Foster Road option because this option would accommodate left turn movements at turn bays. Under the extra eastbound-lane and three to four-lane options, left turns (where allowed) would be made from a general lane that is also used for through movements, unless turn pockets are added at specific intersections (e.g., 136th Avenue). In the case of the extra eastbound lane option, westbound drivers attempting to turn left would block traffic and drivers attempting to pass on the right side could encroach into the bike lane. Drivers attempting to turn left from the eastbound left through lane on Foster Road may present a hazard for drivers behind them who are not expecting them to turn.

Operation of the reversible lane option, an unconventional design option, would present the greatest safety-related challenges of any of the Foster Road options. Turn prohibitions under any of the options, and which would be most restrictive under the reversible lane option, would require some drivers to travel out of direction, and could result in increased accidents where violations of the turn restrictions occur.
Pedestrians and bicyclists traveling along and across Foster Road may perceive the three-lane option to be more safe than the other options. The reduced amount of traffic that would be able to travel on this segment of Foster Road with the three-lane option would create less of an auto-intensive environment. Pedestrians would also prefer crossing Foster Road under the three-lane option due to the smaller roadway width and number of vehicular lanes, and opportunity to create pedestrian crossing areas by using median area. Safe crossing opportunities along Foster Road for pedestrians and bicyclists would be more limited under the four-lane section and the extra eastbound lane options.

JENNE ROAD/174TH AVENUE (POWELL BOULEVARD TO GIESE ROAD) IMPROVEMENT OPTIONS EVALUATION

The 2-lane Jenne Road option would widen Jenne Road to one lane in each direction with turn pockets as needed between Powell Boulevard and Foster Road. *The extra southbound lane option* would widen Jenne Road to three lanes with one lane northbound and two lanes southbound. *The new road option* considers constructing a new 2-lane road with turn pockets at intersections that would be an extension of SE 174th from a realigned Jenne Road to Giese Road in Pleasant Valley. *The new road option* would also add turn lanes to SE 174th between Powell Boulevard and Jenne Road. Findings on the transportation impacts to SE Foster Road are as follows:

Transportation Performance Evaluation

PM peak intersection level of service

An analysis of the traffic queuing at Powell and SE 174th Avenue (using Synchro and SimTraffic) was used to determine whether this intersection could operate acceptably under the *new road option* (Alternative 1) and *the extra southbound lane option* (Alternative 2). Alternatives 1 and 2 added eastbound and westbound through lanes at this intersection. Alternative 1 also adds an exclusive eastbound right-turn lane on Powell Boulevard. Findings of the transportation impacts to Powell and SE 174th Avenue are as follows:

- The intersection of SE 174th Avenue and Powell Boulevard would be very congested and operate over capacity under the lane configurations in both Alternative 1 and Alternative 2. Under both alternatives traffic would operate in unstable conditions and traffic queuing on eastbound Powell Boulevard would extend for more than a quarter mile as it approaches SE 174th.

- By adding a second northbound left-turn lane and a second southbound through lane on SE 174th to either Alternative 1 or 2 (and re-optimizing the signal timing), this intersection would operate well under capacity, and under both alternatives the intersection LOS would be acceptable.

Volume/Capacity (V/C) ratio and Unacceptable level of service

- The *2-lane Jenne Road option* (part of the 2020 Base) would have poor travel performance with some unacceptable level of service miles (see Map F) and a maximum volume/capacity ratio on southbound SE 174th Avenue and Jenne Road of .99.

- *The 3-lane Powell option* (Alt. 3A) would have somewhat better travel performance on SE 174th/Jenne Road compared to 2020 base, due to the higher level of transit service on Jenne Road and the constrained capacity on Powell west

Insert Map F

of SE 174th Avenue that limits accessibility to Jenne Road. The maximum volume/capacity ratio on southbound SE 174th Avenue and Jenne Road would be an acceptable .91.

- *The new road option* (part of Alt. 1) would relieve congestion and provide much better travel performance on Jenne Road by diverting trips to the new roadway. However, it would increase traffic and create more unacceptable congestion (compared to the 2020 base) on the three-lane section of SE 174th south of Powell Boulevard with a maximum volume/capacity ratio on southbound SE 174th of 1.13 (see Map G).

- *The new road option* would provide better overall travel performance by improving north-south connectivity and reduce southbound congestion on Highland Drive and SE 190th (see Map G).

- *The extra southbound lane option* would eliminate the lane miles of unacceptable level of service found in the 2020 base on 174th/Jenne Road. However, it would only address traffic congestion in the PM peak and does not address northbound AM peak period congestion.

PM peak average auto travel time and PM peak average auto speed

- *The 3-lane Powell option* would provide a 7% increase in the average travel speed on Foster, and a 4% faster average auto travel time.

- *The new road option* would provide a shorter travel distance for many trips to Pleasant Valley, and has a 28% faster average auto travel time from Powell to Giese Road as compared to the 2020 base.

- *The extra southbound lane option* would provide better travel performance than the 2020 base. It would provide a 15% increase in the average travel speed on SE 174th and Jenne Road, and a 9% faster average auto travel time.

Insert Map G

JENNE ROAD/174TH AVENUE (POWELL BOULEVARD TO GIESE ROAD) IMPROVEMENT OPTIONS EVALUATION

Engineering and Environmental Evaluation

This section provides a summary of key engineering and environmental evaluation findings for the Jenne Road/174th Avenue (Powell Boulevard to Giese Road) segment. For the Jenne Road/174th Avenue segment, the evaluation summary table on the next page provides a qualitative evaluation of the subject design concepts compared to the engineering and environmental criteria.

Jenne Road/172nd-174th Avenue (Powell Boulevard to Giese Road) Improvement Options Evaluation

Jenne Road (Powell Boulevard to Giese Road) Engineering and Environmental Evaluation Summary				
Evaluation Criteria	**Three-Lane Option**	**Extra Southbound-Lane Option**	**New Road Option**	**Notes***
Provide cost-effective improvement	High	Moderate	Low	<$10M - High $10-$20M - Mod. $20M+ - Low
Minimize acres of new right-of-way required	High	High	Moderate	0 – 5 - High 5 - 10 - Moderate 10+ - Low
Minimize number of commercial and residential properties acquired	High-(com.) Moderate-(res.)	High-(com.) Moderate-(res.)	High-(com. & res.)	< 5 - High 5 - 10 - Moderate 10+ - Low
Minimize on-street parking displacement for commercial and residential properties	High	High	High	< 0.25 mi - High 0.25-1.0 mi - Mod. 1.0 mi.+ - Low
Maximize improved arterial miles with potential access management	Moderate	Moderate	Moderate	< 1.0 mi -Low 1.0 - 3.0 - Mod. 3.0 mi.+ - High
Minimize potential access or turn movement restrictions	High	Moderate	High	Qualitative – related to access management
Minimize number and approximate acreage of parks and open space areas potentially affected	High	High	High	< 0.5 ac - High 0.5 - 1.0 ac.- Mod. 1.0 ac. + - Low
Maximize approximate miles for potential Green Streets or other design elements to reduce and manage storm-water runoff	None	None	Moderate	< 1.0 mi. - Low 1.0 - 3.0 mi. - Mod. 3.0 mi. + - High
Minimize approximate acreage of wetlands, flood zone, and other environmentally sensitive areas affected	High	Moderate	High	< 0.5 ac - High 0.5 - 1.0 ac.- Mod. 1.0 ac. + - Low
Maximize ability to design a safe facility	Low	Low	High	Qualitative – Ability to address design deficiencies

* A qualitative, "order of magnitude" rating of "Low", "Moderate", or "High" describes the relative level of effect for each design option. A Low ranking is negative, or indicates a greater level of adverse effect than a High ranking, a High ranking is positive, and a Moderate ranking has some adverse effect, but is between a Low and High ranking.

Capital cost (2003 dollars)

The estimated capital cost of the Jenne Road three-lane option is approximately **$9 million**, including construction of a new bridge crossing over Johnson Creek, a new underpass to accommodate the Springwater Corridor Trail, and new retaining wall along the east side of Jenne Road at an estimated cost of approximately $6.9 million, and acquisition of residential right-of-way at an approximate cost of $2.3 million.

The estimated capital cost of the Jenne Road extra southbound lane option would be approximately **$12 million**. This capital cost estimate includes construction of the widened and improved roadway, a new bridge crossing over Johnson Creek, a new underpass to accommodate the Springwater Corridor Trail and new retaining wall along the east side of Jenne Road at an estimated cost of approximately $9 million, and acquisition of residential right-of-way at an approximate cost of $3.3 million. The higher cost associated with this option, compared to the three-lane option is primarily due to the cost of a large retaining wall on the east side of Jenne Road in the most constrained section of Jenne Road north of Foster Road

The estimated capital cost of the new road option would be approximately **$13 million**. This capital cost estimate includes construction of a new two-lane roadway between 174th Avenue and Giese Road with a new connection to Jenne Road, and turn bays at intersecting roads including Jenne Road, Tillstrom Road, and Giese Road at an approximate cost of $9 million, and acquisition of residential right-of-way at an approximate cost of $4 million. The higher cost associated with this option, compared to the three-lane and extra southbound lane options for Jenne Road is primarily due to the cost of constructing the new roadway through platted, developing residential land with associated right-of-way acquisition.

Acres of new right-of-way required

The three-lane Jenne Road design option would require approximately **1.3 acres** of new right-of-way from residential land. The extra southbound lane option would require approximately **3.7 acres** of new right-of-way from residential land.

The new road option would require approximately **7.5 acres** of residential land and would impact more platted, undeveloped property than the other options to improve Jenne Road This is approximately six times the amount of residential land as the three-lane Jenne Road option, and more than twice the amount of residential land required for the extra southbound lane option.

Number of commercial and residential properties acquired

Both the three-lane and extra southbound lane Jenne Road design options would require acquisition and displacement of an estimated six residential properties.

The new road option would require acquisition and displacement of an estimated three developed residential properties.

Qualitative discussion of on-street parking displacement for commercial/residential properties

No on-street parking would be displaced under any of the three Jenne Road design options.

Improved arterial miles with potential access management (non-traversible median or turn restrictions)

Access management strategies could be applied with roadway improvements and redevelopment of adjacent properties along the approximately 1.5-mile long segment of Jenne Road under both the three-lane and extra southbound lane options. The extra southbound lane option may have a higher potential to implement access management than the three-lane option because of the additional right-of-way that would be acquired under this option.

Jenne Road is located between activity centers and features infrequent approaches (intersecting streets and driveways) and a constrained right-of-way. Under the three-lane Jenne Road option, addition of a narrow, non-traversible median or striping to restrict left turns, combined with left turn restrictions at existing driveways and control of new driveways would be effective design/access management treatments to maintain or optimize throughput capacity. Under both the three-lane and extra southbound lane option, access management could be provided by left-turn restrictions from driveways and minor street approaches in sections of narrow right-of-way where a non-traversible median may not be incorporated.

The new road option would provide an opportunity to provide a limited access facility, with access points limited to intersecting roads, with shared access and/or turn movement restrictions at approaches to adjacent properties.

Qualitative discussion of potential access or turn movement restrictions

Depending upon the access management measures implemented with the roadway improvements, the three-lane and extra southbound lane Jenne Road options could have similar access and turn movement restrictions. The three-lane option could have the least impact to access and turn movement restrictions, since it would provide left turn pockets as necessary. Additional left turn restrictions may be necessary under the extra southbound lane option

Under both the three-lane and extra southbound lane options, left turn restrictions would likely be required along Jenne Road between the following intersections: Powell Boulevard and Naegeli Drive (approximately 650 feet south of Powell Boulevard), Naegeli Drive and Circle Avenue (approximately 2,400 feet south of Powell Boulevard), Circle Avenue and Jenne Lane (approximately 0.7 mile south of Powell Boulevard and 0.7 mile north of Foster Road), Jenne Lane and McKinley Road (approximately 650 feet north of Foster Road), and McKinley Road and Foster Road

Accommodating left turns at the Jenne Road intersections with Naegeli Drive, Circle Avenue, Jenne Lane, and McKinley Road may not be feasible under the extra southbound lane option given the constrained right-of-way and substandard roadway geometry along Jenne Road Turn prohibitions that may be required under the extra southbound lane option would require some drivers to travel out of direction. Drivers who are not allowed to make a left turn to or from Jenne Road may need to travel more than a mile out of direction to reach their destination due to a lack of sufficient turnaround locations along this section.

The new road option would improve access between 174th Avenue and the Pleasant Valley area with access at Giese Road Direct access to platted, undeveloped residential subdivisions east of Jenne Road could be disrupted by the new road, which would likely have limited access provisions.

Number and approximate acreage of parks and open space areas potentially affected without mitigation

Each of the Jenne Road design options, and the new road option would require approximately 0.3 acre of right-of-way from three different open space areas. This would include 0.1 acre from a Metro open space area located adjacent to the Springwater Corridor Trail, and 0.1 acre each from open space areas owned by the cities of Portland and Gresham.

Approximate miles for potential "Green Streets" or other design elements to reduce and manage storm-water runoff

Due to constrained right-of-way combined with steep topography, a Green Streets design would not be practicable under either the three-lane or extra southbound lane options for Jenne Road.

The new road option would add substantially more impervious surface area compared to the Jenne Road three-lane and extra southbound lane options. The approximately one-mile long new road option could be designed as a Green Street.

Approximate acreage of wetlands, flood zone, and other environmentally sensitive areas (e.g., riparian habitat) affected without mitigation

All three options would require a new bridge structure over Johnson Creek that would impact environmental zone land, riparian habitat, and flood zone land to various degrees depending on the size of the new structure. The Jenne Road three-lane option would impact approximately **0.3 acre** of environmentally sensitive area, including approximately 0.1 acre of environmental zone land, approximately 0.1 acre of riparian land, and approximately 0.1 acre of flood zone land.

A preliminary alignment of the new road option would impact approximately **0.4 acre** of environmentally sensitive area, including the same areas as affected by the three-lane option. In addition, this option would require crossing an environmentally sensitive

stream and riparian area located south of McKinley Road and identified in the Pleasant Valley Concept Plan. This crossing is estimated to impact an approximately 0.1 acre area of riparian habitat and would require a bridge structure that would not encroach within the high water mark of the stream.

The extra southbound lane option would impact approximately **0.8 acre** of environmentally sensitive area, including approximately 0.1 acre of environmental zone land, approximately 0.4 acre of riparian land, and approximately 0.3 acre of flood zone land.

Qualitative assessment of the ability to design a safe facility

Based on the "sketch level" engineering of a preliminary alignment of the new road, this option would provide the best opportunity to design a safe facility that would meet recommended standards.

Safety features on sections of Jenne Road are below recommended standards for a minor arterial, including signing, super-elevation of curves, stopping sight distance, residential approach road placement, and guardrail and pavement markings. The existing alignment has horizontal curves as sharp as 16 degrees and grades exceeding six percent on sections of Jenne Road south of Johnson Creek. Topography severely limits the design of any improvements to Jenne Road south of Johnson Creek, and some existing substandard curves in this section could not be brought to standards under either the three-lane or extra southbound lane design options for Jenne Road.

Turn prohibitions associated with access management associated with either of the Jenne Road design options the would require some drivers to travel out of direction, and could result in increased accidents where violations of the turn restrictions occur, and operational and safety problems at intersections on Jenne Road where left turns may need to be accommodated. This issue is of particular concern along Jenne Road where sight visibility is severely constrained by horizontal and vertical curvature of the road.
The ability to design a safe facility would be highest for the new road option, which could be constructed to meet accepted engineering standards. The existing section of Jenne Road between Foster Road and the intersection with the new road could be classified as a local road, which would be more compatible with the geometry of the road.

The three-lane Jenne Road option would likely be a safer design than the extra southbound lane option, primarily because the three-lane option would accommodate left turn movements at exclusive turn bays. Under the extra southbound lane option, left turns (where allowed) would be made from a general lane that is also used for through movements. While the demand for northbound left turns on Jenne Road is not significant due to a limited number of approaches on the west side of Jenne Road, northbound drivers attempting to turn left would block through traffic and drivers attempting to pass on the right side may encroach into the bike lane. Southbound drivers attempting to turn left from left through lane could present a hazard for drivers behind them who are not expecting them to turn.

The new road option would provide an opportunity to create a facility that is both safe and accessible to bicyclists and pedestrians. With the new road option, traffic volumes on Jenne Road would decrease substantially, and provide a more hospitable environment for pedestrians and bicyclists. Pedestrians and bicyclists traveling along and across Jenne Road may perceive the three-lane option to be safer than the extra southbound lane option. The reduced amount of vehicular traffic on Jenne Road with the three-lane option would create less of an auto-intensive environment for pedestrians and bicyclists. Pedestrians could also prefer crossing Jenne Road under the three-lane option due to the smaller roadway width and number of vehicular lanes, and opportunity to create pedestrian crossing areas by using median area.

HIGHLAND DRIVE/PLEASANT VIEW DRIVE (POWELL BOULEVARD TO BUTLER ROAD) IMPROVEMENT OPTIONS EVALUATION

The 5-lane Highland Road option would widen Highland Drive and 190th between Powell and Butler Road to 4-lanes plus a median and turn lanes where needed. *The 3-lane Highland/Pleasant View option* would widen both Highland and Pleasant View roads to 3-lanes and widens 190th Avenue to 5-lanes between Powell Boulevard and Butler Road. Specifically, Highland Drive would have one lane northbound and two lanes southbound with turn pockets, and Pleasant View Road would have two lanes northbound and one lane southbound with turn pockets. *The 3-lane Highland/Pleasant View option* was combined with the *new road option* for modeling purposes. Findings on the transportation impacts to Highland Road, Pleasant View Road, and SE 190th are as follows:

Transportation Performance Evaluation

PM peak intersection level of service

An analysis of the traffic queuing at Powell Boulevard and SE 182nd/Highland Drive (using Synchro) was important in determining whether this intersection could operate acceptably under the *5-lane Highland Road option* (2020 Base alternative). An exclusive eastbound right turn lane was added under the 2020 Base and the future intersection signal timing was optimized. Findings of the transportation impacts to Powell Boulevard and SE 182nd/Highland Drive are as follows:

- The intersection of SE 182nd/Highland Drive and Powell Boulevard would be congested, operate in unstable conditions, and operate at or over capacity under the lane configuration in the 2020 Base.

- By adding a second northbound left-turn lane and an exclusive westbound right-turn lane on Powell to the 2020 Base (and re-optimizing the signal timing), this

intersection would operate under capacity and the intersection LOS would be acceptable.

Volume/Capacity (V/C) ratio and Unacceptable level of service

- *The 5-lane Highland Road option* (2020 base) without other north-south roadway improvements would have very poor travel performance with an unacceptable level of service southbound on Highland/190th from Powell to Giese Road (see map F). This option has a maximum volume/capacity ratio of 1.04 on southbound Highland Drive north of 190th.

- The *extra southbound lane on Jenne Road option* (Alt. 2) would provide slightly better travel performance on Highland and 190th due to the added southbound capacity on both Jenne Road and Towle Road.

- When the *3-lane Highland/Pleasant View option* was combined with the *new road option* (Alt. 1) travel performance on Highland and 190th southbound improves dramatically (see Map G). These options combined would provide a reduction in the maximum volume/capacity ratio on Highland Road to only .92 (quite acceptable), and eliminates the miles of unacceptable level of service on Highland and 190th when compared to the 2020 base.

PM peak average auto travel time and PM peak average auto speed

- *Alternative 2* would provide a 7% increase in the average travel speed on Highland Road and 190th, and a 5% faster average auto travel time.

- *Alternative 1* would provide a 40% increase in the average travel speed on Highland Road and 190th, and a 10% faster average auto travel time.

- *The 3-lane Powell option* (Alt. 3A) would have slightly better travel performance on Highland and 190th southbound due to higher transit service. *The 3-lane Powell option* would have a 5% faster southbound travel time compared to the 2020 base.

HIGHLAND DRIVE/PLEASANT VIEW DRIVE (POWELL BOULEVARD TO BUTLER ROAD) IMPROVEMENT OPTIONS EVALUATION

Engineering and Environmental Evaluation

This section provides a summary of key engineering and environmental evaluation findings for the Highland Drive/Pleasant View Drive (Powell Boulevard to Butler Road) segment. For the Highland Drive/Pleasant View Drive segment, the evaluation summary table on the next page provides a qualitative evaluation of the design concepts compared to the engineering and environmental criteria.

Highland Drive/Pleasant View Drive (Powell Boulevard to Butler Road)
Improvement Options Evaluation

Highland Drive/Pleasant View Drive (Powell Boulevard to Butler Road) Engineering and Environmental Evaluation Summary			
Evaluation Criteria	**Five-Lane Highland Drive Option**	**Three-Lane Highland Drive and Pleasant View Drive Option**	**Notes***
Provide cost-effective improvement	High	High	<$10M - High $10-$20M - Mod. $20M+ - Low
Minimize acres of new right-of-way required	High	High	0 – 5 - High 5 - 10 - Moderate 10+ - Low
Minimize number of commercial and residential properties acquired	High-(com. & res.)	High-(com. & res.)	< 5 - High 5 - 10 - Moderate 10+ - Low
Minimize on-street parking displacement for commercial and residential properties	High	High	< 0.25 mi - High 0.25-1.0 mi - Mod. 1.0 mi.+ - Low
Maximize improved arterial miles with potential access management	Moderate	Moderate	< 1.0 mi -Low 1.0 - 3.0 - Mod. 3.0 mi.+ - High
Minimize potential access or turn movement restrictions	High	High	Qualitative – related to access management
Minimize number and approximate acreage of parks and open space areas potentially affected	High	Moderate	< 0.5 ac - High 0.5 - 1.0 ac.- Mod. 1.0 ac. + - Low
Maximize approximate miles for potential Green Streets or other design elements to reduce and manage storm-water runoff	Low	Low	< 1.0 mi. - Low 1.0 - 3.0 mi. -Mod. 3.0 mi. + - High
Minimize approximate acreage of wetlands, flood zone, and other environmentally sensitive areas affected	Moderate	Moderate	< 0.5 ac - High 0.5 - 1.0 ac.- Mod. 1.0 ac. + - Low
Maximize ability to design a safe facility	High	High	Qualitative – Ability to address design deficiencies

* A qualitative, "order of magnitude" rating of "Low", "Moderate", or "High" describes the relative level of effect for each design option. A Low ranking is negative, or indicates a greater level of adverse effect than a High ranking, a High ranking is positive, and a Moderate ranking has some adverse effect, but is between a Low and High ranking.

Capital cost (2003 dollars)

The estimated capital cost would be approximately **$12.5 million** for the five-lane Highland Drive option. This capital cost estimate includes construction of the widened and improved roadway at an estimated cost of approximately $11 million, widening the deck of the Highland Drive bridge spanning Johnson Creek at an approximate cost of $1.2 million, and acquisition of residential and commercial right-of-way at an approximate cost of $1.3 million.

The estimated capital cost is approximately **$12.5 million** for the three-lane Highland Drive and Pleasant View Drive option includes construction of the widened and improved roadways at an estimated cost of approximately $11.7 million ($3 million for Highland Drive and $2.3 million for Pleasant View Drive, and 4.8 million for 190th Avenue), widening the deck of the Pleasant View Drive bridge spanning Johnson Creek at an approximate cost of $1.1 million, reconfiguration and control of the Highland Drive/Pleasant View Drive/190th Avenue intersection at an estimated cost of $0.4 million and acquisition of residential and commercial right-of-way at an approximate cost of $0.7 million.

Acres of new right-of-way required

It is estimated that the five-lane Highland Drive option would require acquisition of approximately **1.7 acres** of additional land, including an estimated 0.2 acres of commercial property and 1.5 acres of residential property.

The three-lane Highland Drive and Pleasant View Drive option would require acquisition of approximately **1.8 acres** of additional land, including an estimated 0.1 acre of commercial property and 1.7 acres of residential property.

Number of commercial and residential properties acquired

It is estimated that the five-lane Highland Drive option would require acquisition and displacement of approximately two residential properties, and no commercial properties. The three-lane Highland Drive and Pleasant View Drive option would not likely require acquisition and displacement any commercial or residential properties.

On-street parking displacement for commercial and residential properties

Both the five-lane and the three-lane Highland Drive and Pleasant View Drive options would displace intermittent on-street parking along an approximately **one mile** section of 190th Avenue between Highland Drive and Butler Road This parking fronts some residential properties on the west side of this section of 190th Avenue

Improved arterial miles with potential access management (non-traversable median or turn restrictions)

Access management strategies could be applied with roadway improvements and redevelopment of adjacent properties along the approximately 1.5-mile long segment of Highland Drive and 190 Avenue between Powell Boulevard and Butler Road under the five-lane Highland Drive option. Similarly, access management strategies could be applied along that section of Highland Drive and 190th Avenue, plus the approximately 0.5-mile section of Pleasant View Drive under the three-lane Highland Drive and Pleasant View Drive option. The three-lane Highland Drive and Pleasant View Drive option could allow better access management than the five-lane Highland Drive option because of the additional roadway segment that is included in this option, and the potential need for turn restrictions on both Highland Drive and Pleasant View Drive between intersections where left turn bays are provided.

The sections of Highland Drive, Pleasant View Drive and 190th Avenue are located between activity centers and feature relatively infrequent approaches (intersecting streets and driveways) and relatively constrained rights-of-way. Under both the five-lane Highland Drive and three-lane Highland Drive and Pleasant View Drive options, addition of a narrow, non-traversible median or striping to restrict left turns, combined with left turn restrictions at existing driveways and control of new driveways would be effective design/access management treatments to maintain or optimize throughput capacity.

Qualitative discussion of potential access or turn movement restrictions

Both the three-lane Highland Drive and Pleasant View Drive and the five-lane Highland Drive options would result in minimal access and turn movement restrictions because access points are relatively limited on Highland Drive and on 190th Avenue south of Highland Drive. Both options would improve access on Highland Drive and 190th Avenue compared to existing conditions by providing left-turn pockets at intersecting streets. In addition, the three-lane option would improve access on Pleasant View Drive compared to existing conditions.

Number and approximate acreage of parks and open space areas potentially affected without mitigation

The five-lane Highland Drive option would effect an approximate area of **0.4 acre** of park/open space land. This includes approximately 0.1 acre of the Springwater Corridor Trail area, and 0.3 acre of City of Gresham open space.

The three-lane Highland Driveand Pleasant View Drive option would effect an approximate area of **0.5 acre** of park/open space land. This includes approximately 0.3 acre of the Springwater Corridor Trail area, 0.1 acre of Hollybrook Park, and 0.1 acre of City of Gresham open space.

Approximate miles for potential "Green Streets" or other design elements to reduce and manage storm-water runoff

Green streets or other "water quality friendly" designs could be applied along the approximately 0.7-mile segment of 190th Avenue between Highland Drive and Butler Road under both the five-lane Highland Drive and the three-lane Highland Drive and Pleasant View Drive options. Implementation of effective Green Street design elements to reduce and manage storm-water runoff on Highland Drive may not be practicable on Highland Drive, and would be most challenging under the five-lane option, because this option would result in greater impervious surface area and would require more right-of-way for vehicle lanes compared to the three-lane option. Green Streets application on Pleasant View Drive may be practicable, but would be challenging on Pleasant View Drive under the three-lane Highland Drive and Pleasant View Drive option because of constrained right-of-way that would limit ability to provide on-site storm-water management.

Approximate acreage of wetlands, flood zone, and other environmentally sensitive areas (e.g., riparian habitat) affected without mitigation

Each of the options for Highland Drive and Pleasant View Drive are estimated to affect approximately 0.5 acre of environmentally sensitive area. This includes 0.3 of flood zone, and 0.2 acre of riparian area affected by each option.

Qualitative assessment of the ability to design a safe facility

Either option could be designed to meet accepted engineering geometric standards. The five-lane Highland Drive option would be a conventional arterial roadway design with an equal number of travel lanes and turn bays to accommodate left turns where needed. Pedestrians and bicyclists traveling along Highland Drive and Pleasant View Drive may perceive the three-lane option to be safer than the five-lane option. Bicycle and pedestrian facilities would be included in the three-lane option. The five-lane option would result in more substantial traffic congestion at the intersection of Powell Boulevard with 182nd Avenue/Highland Drive than the three-lane option. This increased congestion would make crossing Powell Boulevard and Highland Drive less safe and convenient for pedestrians.

The three-lane Highland Drive and Pleasant View Drive option would provide a smaller roadway width on Highland Drive than the five-lane option, and crossing Highland Drive and Pleasant View Drive may be safer for bicyclist and pedestrians than the five-lane Highland Drive option.

BUTLER ROAD/TOWLE AVENUE (POWELL BOULEVARD TO 190TH AVENUE) IMPROVEMENT OPTIONS EVALUATION

The 3-lane option would add turn pockets as needed to both Towle Avenue and Butler Road between Powell Boulevard and SE 190th. *The 4-lane option* widens both Towle Avenue and Butler Road (between Towle and 190th) to two lanes in each direction. Findings on the transportation impacts to Towle Avenue, and Butler Road are as follows:

Transportation Performance Evaluation

- *The 3-lane option* (2020 base) would generally have good travel performance with the exception of a bottleneck on Butler Road west of Towle Avenue. This option has a maximum volume/capacity ratio of .97 on westbound Butler Road.

- *The 4-lane option* (Alt. 2) would have slightly better travel performance, with the maximum volume/capacity ratio reduced to less than .70 on westbound Butler Road. *Alternative 2* would have a 12% increase in the average travel speed on Towle Avenue and Butler Road.

- *The new road option* (Alt. 1) would eliminate the unacceptable level of service on Butler at the bottleneck due to the added north-south capacity provided by the new road.

- The *4-lane option* would not address the overall north-south congestion as well as building a new road at SE 174th between Jenne Road and Giese Road.

Engineering and Environmental Evaluation

This section provides a summary of key engineering and environmental evaluation findings for the Butler Road/Towle Avenue (Powell Boulevard to 190th Avenue) segment. For the Butler Road/Towle Avenue segment, the evaluation summary table on the next page provides a qualitative evaluation of the design concepts compared to the engineering and environmental criteria.

Butler Road/Towle Avenue (Powell Boulevard to 190th Avenue) Improvement Options Evaluation

Butler Road/Towle Avenue (Powell Boulevard to 190th Avenue) Engineering and Environmental Evaluation Summary			
Evaluation Criteria	**Three-Lane Option**	**Four-Lane Option**	**Notes***
Provide cost-effective improvement	Moderate	Low	<$10M - High $10-$20M - Mod. $20M+ - Low
Minimize acres of new right-of-way required	High	Moderate	0 – 5 - High 5 - 10 - Moderate 10+ - Low
Minimize number of commercial and residential properties acquired	High-(com.) Moderate-(res.)	High-(com.) Low-(res.)	< 5 - High 5 - 10 - Moderate 10+ - Low
Minimize on-street parking displacement for commercial and residential properties	High	High	< 0.25 mi - High 0.25-1.0 mi - Mod. 1.0 mi.+ - Low
Maximize improved arterial miles with potential access management	Not Applicable	Moderate	< 1.0 mi -Low 1.0 - 3.0 - Mod. 3.0 mi.+ - High
Minimize potential access or turn movement restrictions	High	Moderate	Qualitative – related to access management
Minimize number and approximate acreage of parks and open space areas potentially affected	High	Moderate	< 0.5 ac - High 0.5 - 1.0 ac.- Mod. 1.0 ac. + - Low
Maximize approximate miles for potential Green Streets or other design elements to reduce and manage storm-water runoff	High	Low	< 1.0 mi. - Low 1.0 - 3.0 mi. -Mod. 3.0 mi. + - High
Minimize approximate acreage of wetlands, flood zone, and other environmentally sensitive areas affected	High	Moderate	< 0.5 ac - High 0.5 - 1.0 ac.- Mod. 1.0 ac. + - Low
Maximize ability to design a safe facility	Moderate	Moderate	Qualitative – Ability to address design deficiencies

* A qualitative, "order of magnitude" rating of "Low", "Moderate", or "High" describes the relative level of effect for each design option. A Low ranking is negative, or indicates a greater level of adverse effect than a High ranking, a High ranking is positive, and a Moderate ranking has some adverse effect, but is between a Low and High ranking.

Capital cost (2003 dollars)

The estimated capital cost of the Butler Road/Towle Avenue three-lane option would be approximately **$16 million**, including construction of roadway improvements at an estimated cost of approximately $12.5 million, and acquisition of commercial and residential right-of-way at an approximate cost of $3.5 million.

The estimated capital cost of the Butler Road/Towle Avenue four-lane option would be approximately **$33.5 million**, including construction of roadway improvements at an estimated cost of approximately $21 million, construction of widened stream crossings in

three locations (two on Towle Avenue and one on Butler Road) at an estimated cost of $2.5 million, and acquisition of commercial and residential right-of-way at an approximate cost of $10 million.

Acres of new right-of-way required

The Butler Road/Towle Avenue three-lane option would require an estimated **3.9 acres** of new right-of-way. This includes an estimated 0.5 acre of commercial right-of-way and an estimated 3.4 acres of residential right-of-way.

The Butler Road/Towle Avenue four-lane option would require an estimated **8.7 acres** of new right-of-way, more than twice the amount required for the three-lane option. This includes an estimated 0.9 acre of commercial right-of-way and an estimated 7.8 acres of residential right-of-way.

Number of commercial and residential properties acquired

The Butler Road/Towle Avenue three-lane option would require acquisition and displacement of an estimated six residential properties.

The Butler Road/Towle Avenue four-lane option would require acquisition and displacement of an estimated 21 properties, including one commercial property and 20 residential properties.

Qualitative discussion of on-street parking displacement for commercial/residential properties

No on-street parking would be displaced under either of the Butler Road/Towle Avenue design options.

Improved arterial miles with potential access management (non-traversible median or turn restrictions*)*

Access management strategies could be applied with roadway improvements and redevelopment of adjacent properties along the approximately three-mile long segment of Butler Road and Towle Avenue under both the three-lane and four-lane options. Implementing the strategies may be easier in the four-lane option because of the additional right-of-way that would be acquired.

This segment of Butler Road/Towle Avenue is located between activity centers and features sections with frequent and infrequent approaches (intersecting streets and driveways) and a constrained right-of-way. Under both design options, addition of a narrow, non-traversible median or striping to restrict left turns, combined with left turn restrictions at existing driveways and control of new driveways would be effective design/access management treatments to maintain or optimize throughput capacity.

Qualitative discussion of potential access or turn movement restrictions

Depending upon the access management measures implemented in concert with the roadway improvements, the three-lane option could have the least impact with regard to access and turn movement restrictions, since it would provide left turn pockets as necessary. Additional left turn restrictions may be necessary under the four-lane option to reduce potential incidents attributed to drivers turning left from the left through lane.

Number and approximate acreage of parks and open space areas potentially affected without mitigation

The three-lane Butler Road/Towle Avenue design option would require approximately 0.3 acre of right-of-way from three different open space areas. This would include 0.1 acre of right-of-way from the Springwater Corridor Trail area, 0.1 acre of right-of-way from a Metro open space area, and 0.1 acre of right-of-way each from an open space area owned by the City of Gresham.

The four-lane Butler Road/Towle Avenue design option would require approximately 0.6 acre of right-of-way that would consist of approximately 0.2 acre from each of the same three open space areas identified above.

Approximate miles for potential "Green Streets" or other design elements to reduce and manage storm-water runoff

Management of impervious surface runoff from any roadway construction project on Butler Road/Towle Avenue to include treatment and retention will be required. Storm-water treatment and management will be challenging for sections of the subject roads due to the proximity of streams including Johnson Creek and a tributary that cross Towle Avenue, and a Johnson Creek tributary with substantial riparian habitat area near Butler Road.

Green streets or other storm-water treatment and management strategies could be applied along the approximately three-mile segment of Butler Road/Towle Avenue under each of the design options. Managing storm-water runoff onsite would be less cumbersome under the three-lane option, since this option would require addition of less impervious surface and could provide more right-of-way for storm-water management. Implementation of effective design elements to reduce and manage storm-water runoff would be most challenging under the four-lane option because this option would have the most impervious surface area. Adjacent properties acquired under both design options could provide opportunities for managing storm-water runoff.

Approximate acreage of wetlands, flood zone, and other environmentally sensitive areas (e.g., riparian habitat) affected without mitigation

The Butler Road/Towle Avenue three-lane option would impact approximately **0.3 acre** of environmentally sensitive riparian area, and the four-lane option would impact approximately **0.7 acre** of environmentally sensitive riparian area.

Qualitative assessment of the ability to design a safe facility

The roadway geometry of Butler Road and the southern end of Towle Avenue is characterized by a narrow roadway with no shoulders, short sections with steep grades, and sharp horizontal and vertical curves which limit sight distance. Topography severely limits the design of any improvements to Butler Road and a section of Towle Avenue just north of Butler Road Some existing curves could not be feasibly brought to desirable engineering standards under any of the design options.

The Butler Road/Towle Avenue three-lane design option would likely be a safer design than the four-lane option, primarily because the three-lane option would accommodate left turn movements at exclusive turn bays. Under the extra southbound lane option, left turns (where allowed) would be made from a general lane that is also used for through movements. Drivers attempting to turn left may present a hazard for drivers behind them who are not expecting them to turn.

Pedestrians and bicyclists traveling along and across Butler Road and Towle Avenue may perceive the three-lane option to be safer than the four-lane option. The reduced amount of vehicular traffic traveling on these road sections with the three-lane option would create less of an auto-intensive environment for pedestrians and bicyclists. Pedestrians could also prefer crossing Butler Road and Towle Avenue under the three-lane option due to the smaller roadway width and number of vehicular lanes, and opportunity to create pedestrian crossing areas by using median area.

242ND AVENUE (PALMQUIST TO HIGHWAY 212) IMPROVEMENT OPTIONS EVALUATION

Transportation Performance Evaluation

The 3-lane option would widen SE 242nd/Hogan Road to include turn lanes at some intersections between Palmquist Road and Highway 212. The 4-lane option would widen SE 242nd/Hogan Road to two lanes in each direction between Palmquist Road and Highway 212. Findings on the transportation impacts to 242nd/Hogan Road are as follows:

- *Both the 3-lane option* (2020 base) and the *4-lane option* (Alt. 1) would generally have very good travel performance.

- The *2-lane option* would have a maximum volume/capacity ratio of .75, while the *4-lane option* would have a maximum volume/capacity ratio of .76.

- The need for widening SE 242nd will not be clear until planning work (that a may redefine household and employment assumptions) in Damascus and the Springwater area in Gresham is completed.

Engineering and Environmental Evaluation

This section provides a summary of key engineering and environmental evaluation findings for the Butler Road/Towle Avenue (Powell Boulevard to 190th Avenue) segment. For the Butler Road/Towle Avenue segment, the evaluation summary table below provides a qualitative evaluation of the design concepts compared to the engineering and environmental criteria.

242nd Avenue (Palmquist to Hwy. 212) Improvement Options Evaluation

242nd Avenue (Palmquist to Hwy. 212) Engineering and Environmental Evaluation Summary			
Evaluation Criteria	**Three-Lane Option**	**Four-Lane Option**	**Notes***
Provide cost-effective improvement	Low	Low	<$10M - High $10-$20M - Mod. $20M+ - Low
Minimize acres of new right-of-way required	Moderate	Low	0 – 5 - High 5 - 10 - Moderate 10+ - Low
Minimize number of commercial and residential properties acquired	High-(com.) Moderate-(res.)	Moderate-(com.) Low-(res.)	< 5 - High 5 - 10 - Moderate 10+ - Low
Minimize on-street parking displacement for commercial and residential properties	High	High	< 0.25 mi - High 0.25-1.0 mi - Mod. 1.0 mi.+ - Low
Maximize improved arterial miles with potential access management	High	High	< 1.0 mi -Low 1.0 - 3.0 - Mod. 3.0 mi.+ - High
Minimize potential access or turn movement restrictions	High	Moderate	Qualitative – related to access management
Minimize number and approximate acreage of parks and open space areas potentially affected	High	Low	< 0.5 ac - High 0.5 - 1.0 ac.- Mod. 1.0 ac. + - Low
Maximize approximate miles for potential Green Streets or other design elements to reduce and manage storm-water runoff	High	TBD	< 1.0 mi. - Low 1.0 - 3.0 mi. -Mod. 3.0 mi. + - High
Minimize approximate acreage of wetlands, flood zone, and other environmentally sensitive areas affected	Moderate	Low	< 0.5 ac - High 0.5 - 1.0 ac.- Mod. 1.0 ac. + - Low
Maximize ability to design a safe facility	High	High	Qualitative – Ability to address design deficiencies

* A qualitative, "order of magnitude" rating of "Low", "Moderate", or "High" describes the relative level of effect for each design option. A Low ranking is negative, or indicates a greater level of adverse effect than a High ranking, a High ranking is positive, and a Moderate ranking has some adverse effect, but is between a Low and High ranking.

Capital Cost (2003 dollars)

The estimated capital cost of the 242nd Avenue three-lane option would be approximately **$27 million**, including construction of roadway improvements at an estimated cost of approximately $21 million, and acquisition of commercial, residential, and agricultural right-of-way at an approximate cost of $6 million.

The estimated capital cost of the 242nd Avenue four-lane option would be approximately **$53 million**, including construction of roadway improvements at an estimated cost of approximately $35 million, with bridge crossings at an estimated cost of $4 million, and acquisition of commercial, residential, and agricultural right-of-way at an approximate cost of $14 million.

Acres of new right-of-way required

The 242nd Avenue three-lane option would require an estimated **9.1 acres** of new right-of-way. This includes an estimated 0.2 acre of commercial right-of-way, an estimated 4.6 acres of residential right-of-way, and an estimated 4.3 acres of agricultural right-of-way.

The 242nd Avenue four-lane option would require an estimated **20.6 acres** of new right-of-way, more than twice the amount required for the three-lane option. This includes an estimated 1.1 acre of commercial right-of-way, an estimated 12.7 acres of residential right-of-way, and an estimated 6.8 acres of agricultural right-of-way.

Number of commercial and residential properties acquired

The 242nd Avenue three-lane option would require acquisition and displacement of an estimated 11 properties, including 3 commercial properties and 8 residential properties.

The 242nd Avenue four-lane option would require acquisition and displacement of an estimated 22 properties, including 8 commercial and 14 residential properties.

Qualitative discussion of on-street parking displacement for commercial/residential properties

No on-street parking would be displaced under either of the 242nd Avenue design options.

Improved arterial miles with potential access management (non-traversible median or turn restrictions*)*

Access management strategies could be applied with roadway improvements and redevelopment of adjacent properties along the approximately five-mile long segment of 242nd Avenue under both the three-lane and four-lane options. The four-lane option may have better opportunities to implement access management strategies than the three-lane option because of the additional right-of-way that would be acquired.

242nd Avenue is located between activity centers and features sections with frequent and infrequent approaches (intersecting streets and driveways) and a constrained right-of-

way. Under both design options, addition of a narrow, non-traversible median or striping to restrict left turns, combined with left turn restrictions at existing driveways and control of new driveways would be effective design/access management treatments to maintain or optimize throughput capacity.

Qualitative discussion of potential access or turn movement restrictions

Depending upon the access management measures implemented with the roadway improvements, the three-lane option could have the least impact with regard to access and turn movement restrictions, since it would provide left turn pockets as necessary. Additional left turn restrictions could be necessary under the four-lane option to reduce potential incidents attributed to drivers turning left from the left through lane.

Number and approximate acreage of parks and open space areas potentially affected without mitigation

The three-lane 242nd Avenue design option would require approximately one acre of right-of-way from three different open space areas. This would include 0.1 acre of right-of-way from the Springwater Corridor Trail area, 0.8 acre of right-of-way from an open space area owned by the City of Gresham, and 0.1 acre of open space land owned by the Damascus School District. In addition, the four-lane design option could require approximately 0.1 acre of right-of-way from the Persimmons Country Club.

Approximate miles for potential "Green Streets" or other design elements to reduce and manage storm-water runoff

Management of impervious surface runoff from any roadway construction project on 242nd Avenue to include treatment and retention could be required. Storm-water treatment and management will be challenging for sections of the subject roads due to the proximity of streams including Johnson Creek and its tributaries that cross 242nd Avenue, as well as a tributary of the Clackamas River that crosses 242nd Avenue north of Hwy. 212.

Green streets or other storm-water treatment and management strategies could be applied along the approximately five-mile segment of 242nd Avenue under each of the design options. Managing storm-water runoff onsite would be less difficult under the three-lane option since this option would require addition of less impervious surface and could provide a larger amount of right-of-way for storm-water management. Implementation of effective design elements to reduce and manage storm-water runoff would be most challenging under the four-lane option, because this option would result in the greatest impervious surface area. Adjacent properties acquired under both design options could provide opportunity for managing storm-water runoff from the increased impervious surface.

Approximate acreage of wetlands, flood zone, and other environmentally sensitive areas (e.g., riparian habitat) affected without mitigation

The 242nd Avenue three-lane option would impact approximately **0.6 acre** of environmentally sensitive area, including 0.3 acre of flood zone and 0.3 acre of riparian area.

The four-lane option would impact approximately **2.1 acre** of environmentally sensitive area, including 1.1 acre of flood zone and one acre of riparian area.

Qualitative assessment of the ability to design a safe facility

The roadway geometry of sections of 242nd Avenue are characterized by a narrow roadway with no shoulders, steep grades, and sharp vertical curves which limit sight distance. Topography may limit the design of any improvements to feasibly construct the roadway to desirable engineering standards.

The 242nd Avenue three-lane design option would likely be a safer design than the four-lane option, primarily because the three-lane option would accommodate left turn movements at exclusive turn bays. Under the extra southbound lane option, left turns (where allowed) would be made from a general lane that is also used for through movements. Drivers attempting to turn left could present a hazard for drivers behind them who are not expecting them to turn.

Pedestrians and bicyclists traveling along and across 242nd Avenue may perceive the three-lane option to be safer than the four-lane option. The reduced amount of vehicular traffic that would be able to travel on the subject road sections with the three-lane option would create less of an auto-intensive environment for pedestrians and bicyclists. Pedestrians would also prefer crossing 242nd Avenue under the three-lane option due to the smaller roadway width and number of vehicular lanes, and opportunity to create pedestrian crossing areas by using median area.

TRANSIT FINDINGS

The Base Transit network was modeled with three roadway alternatives; the 2020 Base Roadway, Alternative 1 and Alternative 2. The Transit "A" network (enhanced transit network and service) was modeled with two roadway alternatives; the 2020 Base Roadway and Alternative 3.

The 2020 Base transit network incorporates the 2020 Financially Constrained RTP transit network. This represents a substantial increase in both transit service and route coverage compared to the existing system in portions of the Powell/Foster Corridor. Thus, many of the ridership gains that could be expected from providing improved transit service to the Damascus/Pleasant Valley/Happy Valley area are already captured within the 2020 Base alternative.

- With both transit alternatives (Base and Transit A) there are no appreciable differences between the performance of the transit alternative based on which highway alternative was modeled with it.

- Transit A would result in approximately 5,400 additional system wide transit trips in 2020 compared with the Base Transit. Within the Powell-Foster Study Area Transit A results in a 3.3% increase in transit ridership. Within the area east of I-205 (districts 1, 2, 3, 5 & 6) transit ridership would increase by approximately 9.1% with Transit A compared to Base Transit.

- Many gains in transit ridership are captured within the 2020 Base transit network. For example, Line 14 averaged 8,950 boarding rides on a weekday during Winter 2002-2003. The Base, with its increased service, results in 15,707 boarding rides. Similarly, Line 4 (6,800 today versus 21,362 in the Base) and Line 9 (7,820 today versus 15,668 in the Base). The comparatively lower ridership gains between the Base Transit and Transit A may be explained by the fact that the Base network already captures a significant portion of the growth in transit demand.

- The bus system in Transit A would require an additional 90 buses and would result in an increase of 90% in corridor transit vehicle miles in the study area and 62% increase in revenue hours in the study area.

Powell-Foster Rapid Bus Findings

- Transit A would include a concept for the Powell and Foster Rapid bus lines that has identical service between downtown Portland and 50th and Powell. Because the Foster Rapid Bus uses the Ross Island Bridge and Powell Boulevard, there is a corresponding reduction in service frequency on the Line 14 bus on Hawthorne. Transit A also includes improved service frequency on Division (Frequent Bus).

- There is a strong relationship between service improvements on Powell (based on 2 Rapid Bus lines) and the ridership demand on the Division bus. Particularly west of 50th Avenue transit service on Powell becomes considerably more attractive due to improved frequency and travel time associated with the Rapid Bus. Even with the Frequent Bus improvements on Division, there is a decrease in the ridership on the Line 4 Division Bus when Rapid Bus service is implemented on Powell.

- The Powell Rapid Bus would have approximately 11,200 daily boardings in 2020. This would be approximately 1,300 more boardings than on the line 9 Powell bus in the Base Alternative.

- The Powell Rapid Bus would primarily serve trips within the City of Portland. Less than 10% of the daily boardings and alightings would occur east of 182nd Avenue.

- The Foster Rapid Bus would have approximately 12,200 daily boardings in 2020. This would be approximately 8,300 more boardings than on the Line 14 Hawthorne bus in the Base Alternative.

- In the PM peak, a transit trip from downtown Portland to Lents would save approximately 8 minutes on the Foster Rapid Bus compared to the Base Alternative with a trip on the Line 14. Between Lents and Damascus the Rapid Bus would save an additional 9 minutes compared with the Base Alternative Line 14 extension to Damascus.

- Taking into account the Hawthorne, Division and Powell buses all together, the Base Alternative would have approximately 6,600 fewer daily boardings than the Transit A Alternative. The differences in transit boardings with Transit A include:
    - 8,300 more boardings on the Foster Rapid Bus/Hawthorne buses;
    - 1,300 more boardings on the Powell buses; and
    - 2,700 fewer boardings on the Division buses.

- With Transit A there would be a reduction of approximately 1,100 daily boardings on I-205 Light Rail. This would be due to the Rapid Bus service improvements (travel times and frequency) included in the Transit A network.

Powell-Foster Rapid Bus – Conclusions

- The Powell-Foster Rapid Bus concept that was analyzed for this study would improve transit travel times and frequencies in the corridor. This improvement would be most evident on Powell Boulevard west of 50th Avenue where frequent service would be provided by both routes.

- The Foster Rapid Bus would significantly improve transit travel times between central Portland and the planned development areas in Pleasant Valley and Damascus.

- The Powell Rapid Bus would primarily serve trips within the City of Portland. The 2020 travel time via Rapid Bus between downtown Portland and central Gresham would be approximately 13 minutes slower than the same trip via the Blue Line MAX train.

Local Bus Findings

- **Line 162 162nd Avenue –** This would be a new north/south bus route connecting Sandy Boulevard at 162nd to Clackamas Regional Center via 162nd, Powell, Jenne Road (or new roadway), 172nd, Sunnyside Road, 152nd, Highway 224, 132nd, Lawnfield, 97th and Monterey. This bus would improve north/south transit connectivity between outer NE Portland, Pleasant Valley and Clackamas Regional

Center. With the Transit A Alternative, Line 162 would have approximately 2,600 daily boardings in 2020.

- **Line 448 148th** – This route would be a new north/south bus route connecting Airport Way, Happy Valley and Clackamas Regional Center via 148th, Powell, 136th, Foster, Barbara Welch, Clatsop, 132nd, King, 129th and Sunnyside. This bus would provide improved coverage in outer NE Portland and Happy Valley and improve north/south service. With the Transit A Alternative, Line 448 would have approximately 4,700 daily boardings in 2020.

- **Line 82/87 181st –** This route would combine portions of the existing routes 82 and 87 and extend service south of Powell to Damascus via Highland, 190th, Borges and Foster. This route would provide the primary north/south service on 190th and would connect Damascus/Pleasant Valley residential areas with the Columbia Corridor. With the Transit A Alternative, Line 82/87 would have approximately 3,900 daily boardings in 2020.

- **Line 702 Damascus-Gresham –** This would be a new route connecting the Gresham Regional Center with the Damascus Town Center via Eastman Parkway, Towle, Butler, 190th, Borges and Foster. This route would provide the primary direct connection between Gresham and Damascus. With the Transit A Alternative, Line 702 would have approximately 400 daily boardings in 2020.

- **Line 242 242nd Avenue –** This would be a new route connecting Gresham Regional Center with the Damascus Town Center via Powell, 242nd Avenue and Highway 212. This route would improve service coverage in the eastern portions of the study area. With the Transit A Alternative, Line 242 would have approximately 990 daily boardings in 2020.

- **Line 81 Troutdale** – This route would be extended north of Troutdale to serve the planned Technology Center at the Reynolds Aluminum site. With the Transit A Alternative, Line 81 would have approximately 7,500 daily boardings in 2020.

- **Line 603 Jennifer –** This would be a new route connecting Damascus Town Center and Oregon City Town Center via Jennifer Street and Highway 212. This route would improve service coverage in the southern portions of the study area. With the Transit A Alternative, Line 603 would have approximately 1,000 daily boardings in 2020.

- **Line 80 Happy/Pleasant Valley –** This route connecting Troutdale and Gresham would extend service to Pleasant Valley and Happy Valley via Towle Road, Butler Road, 90th Avenue, Clatsop Street, and King Road. This route would provide additional service on Butler and Towle Road and would connect Happy Valley and Pleasant Valley residential areas with Gresham and Troutdale. With the Transit A Alternative, Line 80 would have approximately 3,400 daily boardings in 2020.

- **Line 402 Gresham Loop –** This would be a new local route providing service to East Gresham and Powell Valley via Palmquist Road, Palmblad Road, Hillyard and Chase Road, 282nd Avenue, and Troutdale Road/Division Street. This route would improve service coverage in the eastern portions of the study area. With the Transit A Alternative, Line 402 would have approximately 1,100 daily boardings in 2020.

Local Bus – Conclusions

- New north-south bus routes on 148th and 162nd serving the Columbia Corridor, East County, Pleasant Valley, Damascus and CTC appear to be providing important connections. These routes provide service to new (previously under-served) areas and provide new connectivity among East County activity centers.

- New bus connections between downtown Gresham and Pleasant Valley/Damascus on 190th/Foster and 242nd do not perform as well as the north-south routes on 148th and 162nd. Route modifications or consolidation should be considered as transit connections in this area are studied further.

PUBLIC OUTREACH FINDINGS

Metro, in cooperation with the cities of Portland and Gresham, Clackamas and Multnomah counties, TriMet and ODOT, engaged the community through a range of public outreach activities to support the Powell/Foster Corridor Study. The goals of the public involvement effort during this phase of the study included:

- Informing the project's analysis of travel needs and community preferences;
- Supporting development of project alternatives; and
- Gauging the public acceptance of the project alternatives during the refinement phase.

A variety of public involvement techniques were used to reach the diverse communities in the corridor. In many cases, public involvement for the Powell/Foster Corridor Study was closely coordinated with related planning efforts such as the Downtown Lents Revitalization Strategy Plan, the Inner Foster Streetscape Plan, the City of Gresham's study of Powell Boulevard and the Pleasant Valley Concept Plan. In other areas, such as inner Southeast Portland and areas along Powell Boulevard between I-205 and Gresham, Metro was responsible for developing independent public outreach strategies and forums.

In general, outreach was broad and consistent with the corridor-wide approach and range of options being considered. However, throughout the study outreach efforts were targeted where roadway projects were being considered. These included Powell/I-205 interchange, Powell from I-205 to 174th Avenue and the Pleasant Valley area.

Metro employed many corridor-wide public involvement and outreach techniques, including:

- *Media coordination*. Metro worked closely with community news sources in areas throughout the corridor to ensure reporting on the study and advertising for study events.
- *Transportation Hotline*. The Metro Transportation Hotline (503/ 797-1900) was used to provide up-to-date information about public involvement opportunities and key decision points as well as offering community members a convenient method for requesting information about the Foster/Powell Corridor and commenting on the study.
- *Web Site*. Metro staff maintained a portion of the Metro web site dedicated to the Foster/Powell Corridor. Given that 70 percent of Metro area households have access to the Internet, it is an important means of communication with the broader public, especially those who might not attend meetings or public hearings. The web site included the purpose of the Foster/Powell study, information about alternatives and evaluation, opportunities for public involvement and a schedule of meetings. The web site used accessible technology. The web site also offered the opportunity to submit comments and request further information about the study. The web site was an important method of communicating findings to the general public.
- *Informational Materials*. Newsletters were published to describe the alternatives under study, to review the needs analysis, and to share the study findings. Two fact sheets were also developed to share key information early in the study.
- *Meetings with community groups*. Study staff met with neighborhood and community groups throughout the corridor to share study information. Staff met with each neighborhood association in the study area at least once. Staff also met with other community groups regularly.
- *Qualitative interviews*. About 30 interviews were held early in the process to assist staff in identifying the existing conditions and defining potential alternatives throughout the corridor.
- *Web-based survey*. Web-based surveys were developed both early in the study to help us better understand needs and preferences and at the end of the study to help us refine our alternatives. The first survey had about 400 respondents and the second survey had 230 respondents.
- *Scientific survey*. Metro contracted with Riley Research to conduct a scientific telephone survey of 600 households early in the study. The survey focused on travel needs and preferences.
- *AIM High School Project*. Metro collaborated with high school students at AIM High School to survey parents at elementary school conferences in the David Douglas School District. Metro worked with the students throughout the fall semester to develop the survey, implement the survey, analyze data, and present findings. The survey focused on issues related to Powell Boulevard east of I-205.

The students talked with more than 400 parents and Metro was able to share study information with more than 1600 parents.

- *Open houses*. Two open houses were held to share preliminary findings about alternatives and seek input about which alternatives should be considered in subsequent study phases. Open houses were held in East Portland and in inner Southeast Portland. Metro partnered with the City of Gresham and Pleasant Valley planning efforts to provide information and obtain input at public meetings in these areas. A newsletter and response forms were developed to support the open houses and other public meetings.
- *Mailings*. Newsletters and surveys were mailed to residents of Pleasant Valley and Gresham during the refinement phase to ensure that people in that area had an opportunity to provide input. A meeting notice was mailed to community members on the study mailing list and to residents along Powell Boulevard from I-205 to SE 174th Avenue. Neighborhood newsletters and e-mail lists were also used to solicit participation in study meetings and on-line surveys.

During the first phase of the study, public outreach focused on understanding how residents, business owners and users of Powell and Foster defined transportation problems and defined potential solutions. The public outreach efforts found:

1. **Many people think that traffic in their neighborhood is a problem.** Many respondents to both surveys as well as participants at meetings noted that traffic in their neighborhood was a problem. Sixty-five percent of respondents to the telephone survey rated traffic on the poor end of a 1 to 10 scale.

2. **Strong support for increasing road capacity.** Two-thirds of respondents to the scientific survey said that expanding existing roadways was important or somewhat important to improving the corridor. When asked to prioritize the most important type of improvement in the corridor on a separate question, the highest proportion of respondents to both surveys selected adding new lanes (33 to 37 percent). Residents of inner Southeast Portland were somewhat more likely than other respondents to answer that adding lanes was not important at all while residents of outer Southeast Portland, East Multnomah County and Gresham were somewhat more likely answer that adding new lanes was very important.

   Building new roads was not as popular with respondents in either of the surveys. Fifty percent said that building new roads was important (21 percent said very important) while 43 percent said it was unimportant with 27 percent saying it was not important at all. People living in East Multnomah County and Gresham south of Powell and parts of outer Southeast Portland were more likely to say that building new roads was very important while people living in inner Southeast Portland (west of SE 39th Avenue) were more likely to say not important at all. Concerns about additional traffic due to "up-stream and down-stream" traffic impacts were expressed by residents from inner Southeast Portland.

3. **Support for improving transit, bike and pedestrian facilities.** Many respondents to the scientific survey thought that improving pedestrian facilities (73 percent) and improving public transit (70 percent) was somewhat or very important. There was also some support for adding bike lanes. Sixty percent said it was somewhat or very important, however 30 percent of respondents said it was not important at all.

   When respondents to the scientific survey were asked what type of improvements were most important, improving public transit received the second most support (19 percent), after adding new lanes, followed by adding sidewalks (13 percent) and adding bicycle lanes (11 percent).

4. **Strong support for many types of transit improvements.** Improving existing bus stops was the most popular type of transit fix. Eighty percent of respondents to the scientific survey thought it was important while only 16 percent thought it was unimportant. More than 60 percent supported light rail, express buses and adding north-south bus routes. Support of streetcar and bus-only lanes was polarized with about half answering that each was important and half answering that each was not important.

5. **Many respondents support widening Powell.** Sixty-one percent of respondents to the web-based survey and 76 percent of respondents to the scientific survey supported or strongly supported adding an additional lane to Powell Boulevard east of I-205.

6. **Strong support for improving the interchange at Powell and I-205.** Sixty-two percent of respondents to the scientific survey and nearly every stakeholder interviewed said that access to I-205 from Powell has a significant impact on their travel patterns.

7. **Mixed opinions about expanding Foster Road.** Fifty-six percent of respondents to the scientific survey supported the idea of adding lanes to Foster Road between 122nd and 165th. About 22 percent either somewhat or strongly opposed adding a lane to Foster. Residents of outer Southeast Portland, East Multnomah County and Gresham were more likely to strongly support adding a lane while residents of inner Southeast Portland were most likely to strongly oppose it. Residents in Gresham, East Multnomah County and outer Southeast Portland (east of I-205) were most likely to strongly support expansion of Foster while residents of inner Southeast Portland were most likely to strongly oppose it.

During the evaluation phase, the public outreach effort focused the discussion with the community around questions about acceptability of the options (i.e. "how acceptable are the following options"). Community members were encouraged to note options that should not be considered in the next phase rather than select a favorite option. From this effort it was discovered that:

- Nearly all participants thought that the interchange at Powell and I-205 ought to be improved to include access from all directions.

- Most people who live east of I-205 preferred the five-lane Powell Boulevard option to the three-lane option with north-south improvements. People who preferred the three-lane option generally wanted to reduce auto travel in the corridor rather than disperse traffic to other routes.
- Most people did not think that the reversible lane or the single extra eastbound lane options on Foster Road should be studied in the next project phase. People had safety concerns about the reversible lane option and were concerned that the extra eastbound lane option would only improve traffic flow in one direction.
- Participants generally preferred the new road option to adding a southbound lane to Jenne Road. Some people were concerned about the property or environmental impacts of constructing a new road.
- More than 80 percent of participants in the open houses and web-based survey thought that additional transit on both Powell and Foster should be considered. More than 70 percent thought that additional north-south bus routes are needed.

Conclusion

Given the scope and preliminary nature of the Powell/Foster Corridor Study public outreach, more public participation will be needed in the next project phase.

Roadway widening or construction of new roadways will require significant efforts to engage stakeholders and ensure project decisions reflect community preferences and vision. These projects include:

- Widening Powell Boulevard to five lanes will require additional outreach to property owners, business owners and residents. Engaging these stakeholders in the design of a five-lane roadway will be crucial to its public acceptance.

- Constructing a new minor arterial near Southeast 174th Avenue will require close coordination with the Johnson Creek Watershed Council and other environmental advocates, the Pleasant Valley community and property owners along the proposed alignment. Locating and designing the roadway will require significant public involvement efforts.

- Determining an appropriate cross-section for Foster Road between Barbara Welch Road and Jenne Road will require careful coordination with the Pleasant Valley, Lents and Damascus communities as well as adjacent property owners and the Johnson Creek Watershed Council.

As project development studies or refinement plans are developed, public outreach needs should be carefully considered and integrated into project plans.

Attachment C

Attachment C (part 2)

Attachment C (part 3)

Attachment A

Attachment A

Attachment A

Attachment A

Attachment A

Figure 7

Attachment A

Figure 8