

TECHNICAL MEMORANDUM #5 (Exit 207)

Pendleton IAMPs: Exit 207

Detailed Evaluation of Select Concepts

Date: June 17, 2020

Project #: 24043

To: Technical Advisory Committee, Citizen Advisory Committee

From: Amy Griffiths, Mark Heisinger, Nick Foster, AICP, and Matt Hughart, AICP

This memorandum describes and evaluates a select number of interchange and local circulation improvement concepts developed to provide for long-term growth in the vicinity of the Interstate 84 (I-84) Exit 207 interchange. These select concepts were rooted in the preliminary concept development and evaluation process in which two stages of concept evaluation were conducted. First, a set of five preliminary concepts, plus two accessory concepts, were developed by the project team based on input from the project's advisory committees. The project team screened these concepts and solicited feedback from the advisory committees and general public. Based on this screening, the Project Management Team selected two concepts to move forward for more detailed evaluation. These select concepts are the focus of this Technical Memorandum.

SUMMARY OF PRELIMINARY CONCEPT EVALUATION

The Exit 207 interchange and local circulation improvement ideas were initially developed by members of the project team, the Technical Advisory Committee (TAC), and the Citizen Advisory Committee (CAC) at the January 29, 2020 TAC/CAC meeting to address known, and anticipated future, geometric and traffic operations and safety conditions. Following this initial work session, the project team distilled the ideas presented at the meeting into seven unique preliminary concepts. These seven concepts were evaluated in *Technical Memorandum #5a*, which included a summary of the concept development process, a qualitative evaluation of the seven preliminary concepts, a summary of public feedback from an on-line feedback tool, and the concepts chosen to be evaluated at a more detailed level. Table 1 summarizes the results of this screening process. *Technical Memorandum #5a is included as Attachment "A."*

Table 1 Exit 207 Preliminary Concept Screening Results

Concept Description	Included for Further Evaluation?	Justification
Concept #1A – Converting existing PARCLO A interchange to a diamond interchange and widening the existing overpass structure.	No	While this concept scored well on the whole, it is a major reconstruction of the entire interchange. There is not enough evidence that the EB ramp terminals need to be completely modified.
Concept #1B – Converting the EB interchange ramps to a diamond form with a roundabout	Yes	Concept scored well and was generally supported by survey respondents. Concept better addresses known geometric issues and does not involve an unnecessary rebuild of the entire interchange.
Concept #1C– Constructing a new diamond interchange and a new overpass structure.	No	While this concept scored well on the whole, it is a major reconstruction of the entire interchange. There is not enough evidence that the EB ramp terminals need to be completely modified.
Concept #2 – Construction of a flyover ramp and modification of the WB ramp terminals	No	Flyover ramp is not necessary nor proportionate to the interchange volumes.
Concept #3 – Modification of the WB off ramp and relocation of Airport Road	Yes	Potentially the least costly option while still addressing the primary issues at the interchange.
Accessory #1 - This accessory creates new access roads on the north and south sides of US 30 (Westgate). This accessory can be paired with concepts 1A, 1B, 1C, and 2. The frontage road elements can be paired with Concept 3	No	This option requires a fairly significant amount of right of way acquisition.
Accessory #2 - This accessory creates a roundabout intersection with four legs: Airport Road, US 30 (Westgate), and a new access road behind the businesses on the north side of US 30. This accessory can be paired with concepts 1A, 1B, 1C, and 2. It improves access spacing by moving access to the northern businesses to the new access road.	Yes (paired with Concept #1B)	A new roundabout at Airport Road would result in a fully complete and modernized pedestrian and bicycle network. The roundabout could be constructed with minimal impacts to private right-of-way and easily paired with Concept #1B.

Based on the preliminary screening outlined above, the project team performed a more detailed operations, safety, and cost analysis of Concept #1B (with Accessory #2) and Concept #3. This analysis is described in the following section of this memorandum.

DETAILED EVALUATION OF SELECT CONCEPTS

Concepts #1B (with Accessory #2) and Concept #3 were further evaluated with respect to future traffic operations, safety effects, and planning-level cost estimates. Refined concept drawings were also prepared that consider the area’s topography and the geometric and traffic control needs at the study intersections. These drawings are shown in Figure 1 and Figure 2, respectively.

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Concept #1B with Accessory #2 Conceptual Drawing
Pendleton, OR

Figure
1

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Concept #3 Conceptual Drawing
Pendleton, OR

Figure
2

Future Traffic Operations

The project team analyzed year 2040 AM and PM peak hour transportation operations at the project study intersections for both concepts. The traffic operations analysis was performed in accordance with the same methodologies used for the existing conditions operations analysis, presented in the *Methodology Memorandum* (Reference 1). The initial traffic operations analysis was performed assuming that existing stop-control remained at all study intersections, except at locations where a roundabout was identified as part of the preliminary concept development process. Where this did not result in intersections meeting their mobility targets and planning-level signal warrants were met, the project team modified the concept design to include traffic signals and turn lanes. The mobility targets for the study intersections are shown in Table 2. The following sections describe the traffic operations analysis results for each concept. *Intersection operations worksheets are shown in Attachment "B".*

Table 2: Study Intersection Performance Standards

Intersection	OHP Mobility Target
I-84 Westbound Off Ramp/US 30/Airport Road Connector	0.85 ¹
I-84 Westbound On Ramp/US 30	0.90 ²
I-84 Eastbound Off Ramp/US 30	0.85 ¹
I-84 Eastbound On Ramp/US 30	0.90 ²
US 30/Airport Road	0.90 US 30 approach / 0.90 Airport Road approach
Rieth Road/NW Pioneer Place ³	-

¹ The I-84 westbound and eastbound off ramps were evaluated with a more conservative v/c of 0.85 per Action 1F.1 of the Oregon Highway Plan.

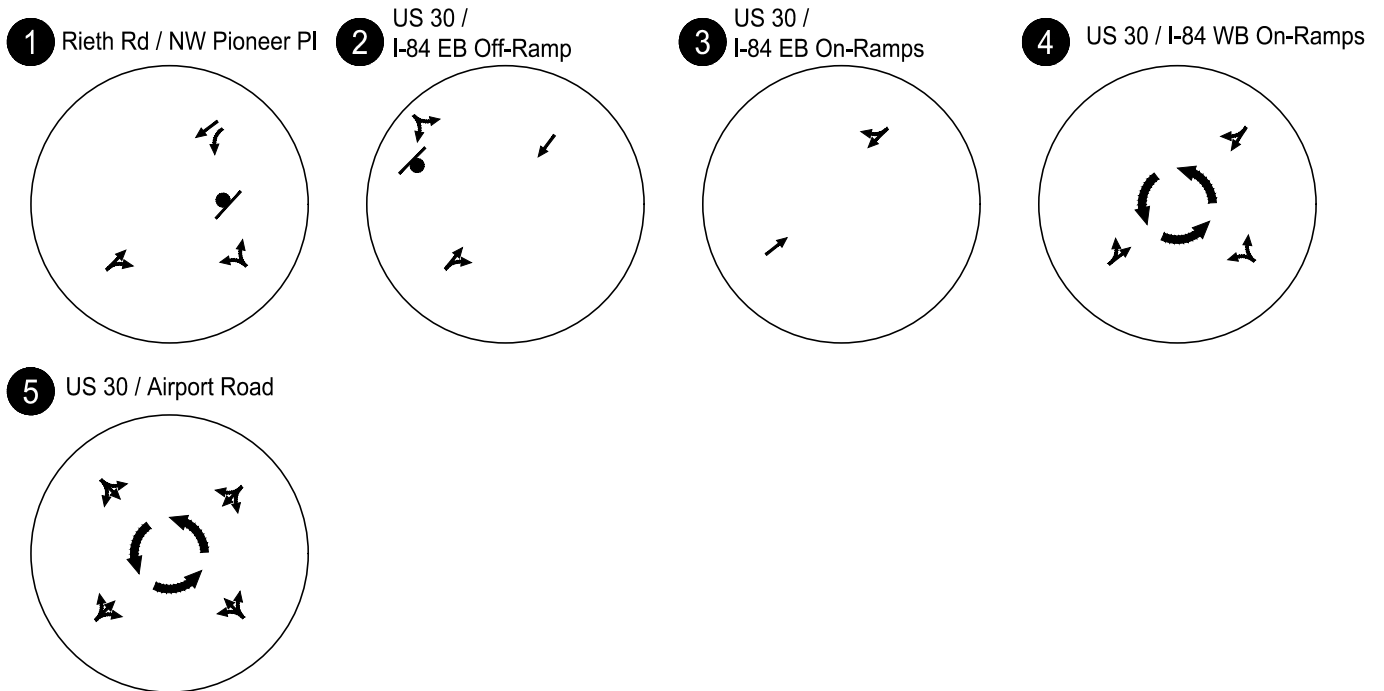
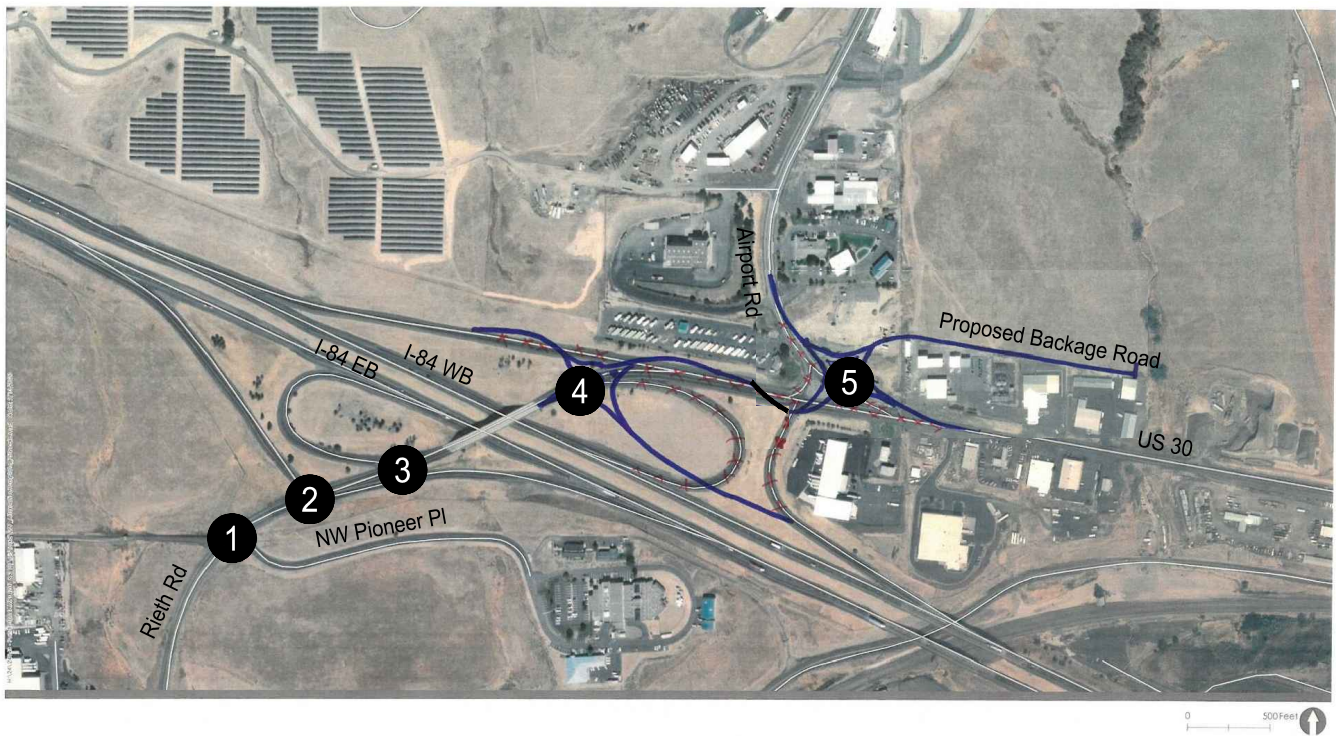
² There are no conflicting movements at the I-84 westbound and eastbound on ramp intersections. As such, the US 30 eastbound and westbound major street through movements were evaluated under the US 30 District Highway mobility target of 0.90.

³ The City of Pendleton does not have intersection or roadway performance targets – target v/c of 0.90 assumed.

Concept #1B (with Accessory #2)

Concept #1B converts the eastbound ramp terminal form from a partial cloverleaf to a diamond with a roundabout. This combines the two westbound on-ramps into one. Accessory #2 creates a roundabout intersection with four legs: Airport Road, US 30 (Westgate), and a new access road behind the businesses on the north side of US 30. It improves access spacing by moving access to the northern businesses to the new access road.

Lane configurations and traffic control for Concept #1B (with Accessory #2) are shown in Figure 3. The estimated year 2040 traffic volumes and operations for Concept #1B (with Accessory #2) are shown in Figure 4 and Figure 5 for the AM and PM peak hours, respectively. Given these lane configurations and traffic control, all study intersections in Concept #1B (with Accessory 2) meet their mobility targets and operate at LOS 'B' or better in the AM and PM peak hours.

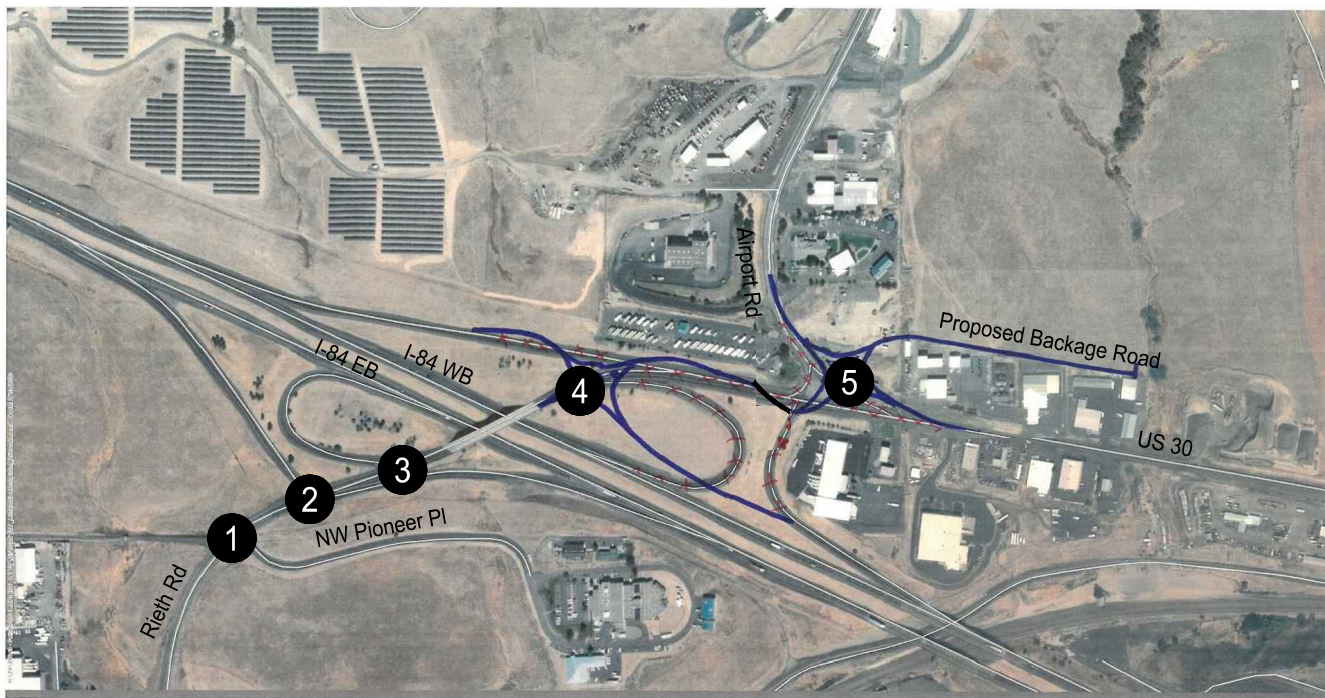


LEGEND

- Lane Movement
- Study Intersections
- Stop Sign

Concept #1B Accessory #2 Lane Configurations
Exit 207
Pendleton, OR

Figure
3



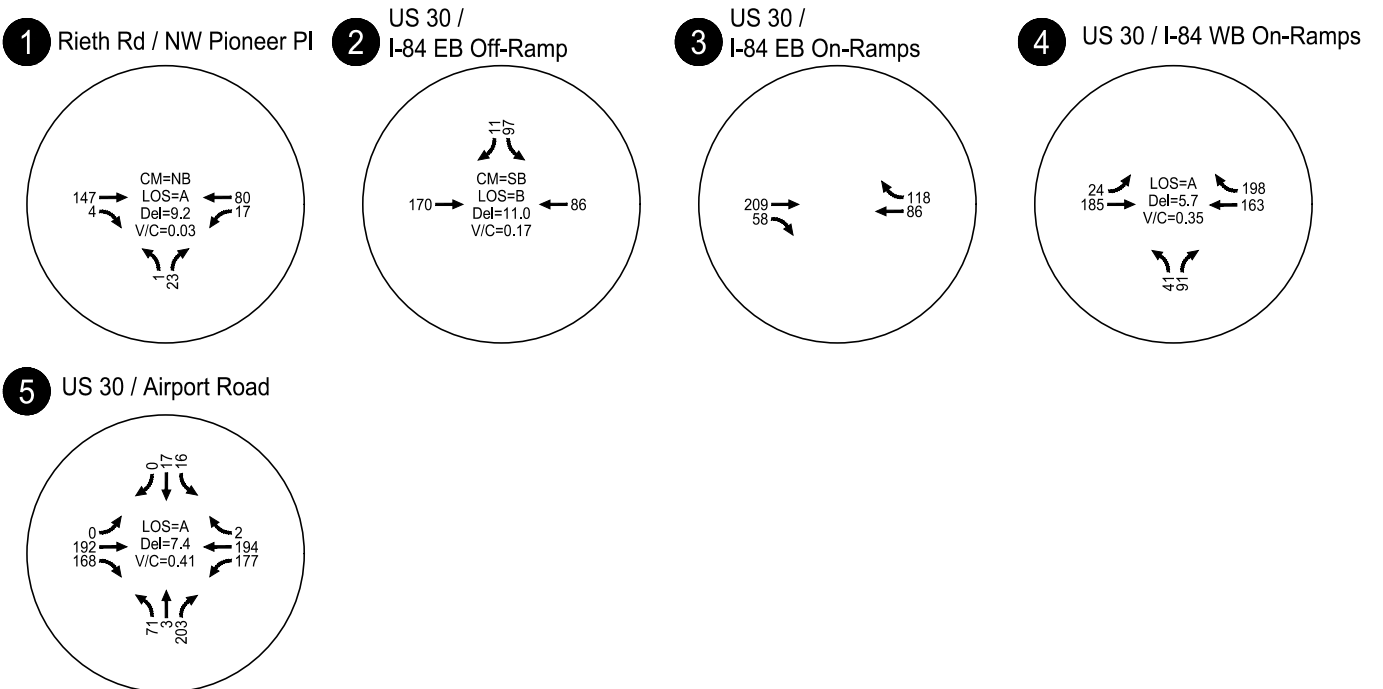
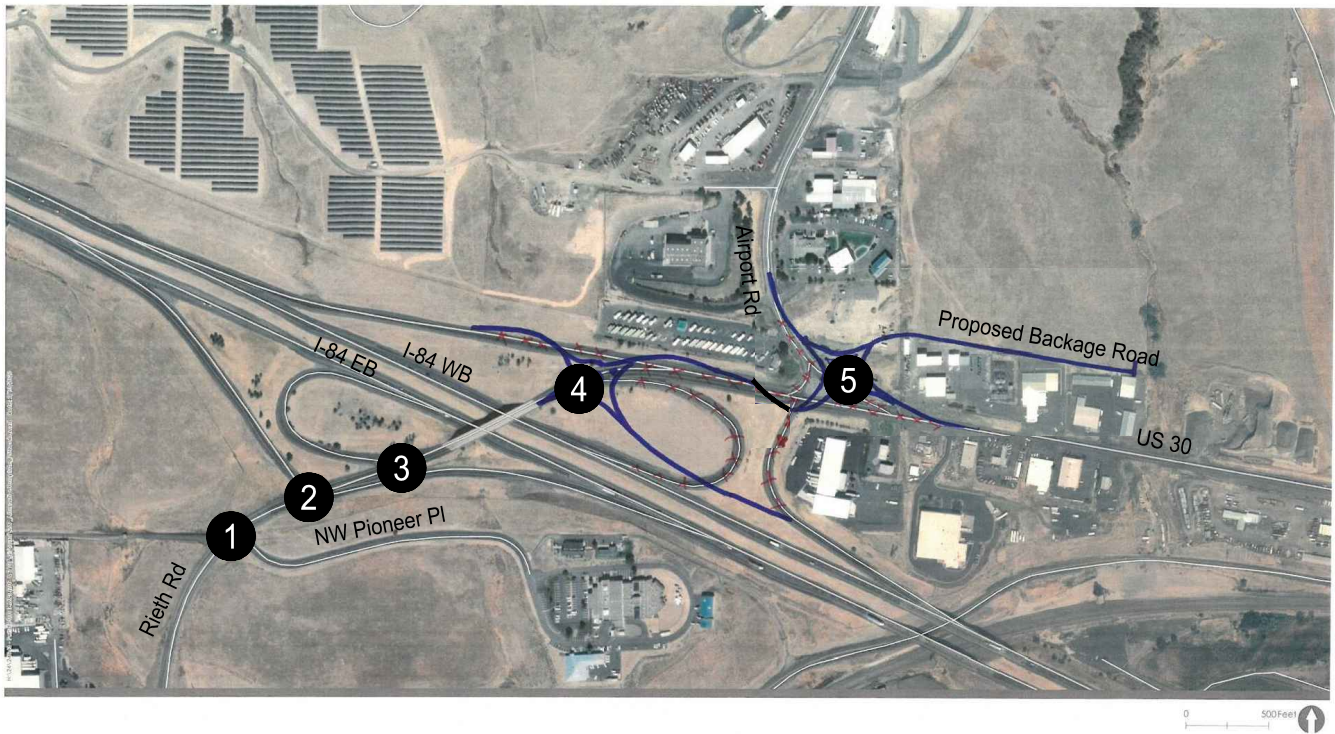
KITTELSON & ASSOCIATES



- Study Intersections
 CM - Critical Movement
 LOS - Level of Service
 Del - Vehicle Delay (s)
 V/C - Volume-To-Capacity Ratio
 ### - I-84 Peak Hour Volume

**Future AM Peak Hour Traffic Operations
 Exit 207 Concept #1B with Accessory #2
 Pendleton, OR**

**Figure
 4**



- Study Intersections
 CM - Critical Movement
 LOS - Level of Service
 Del - Vehicle Delay (s)
 V/C - Volume-To-Capacity Ratio
 ### - I-84 Peak Hour Volume

Future PM Peak Hour Traffic Operations
 Exit 207 Concept #1B with Accessory #2
 Pendleton, OR

Figure
 5



Concept #3

Concept #3 modified the westbound off-ramp, relocates Airport Road, and creates a backage road for accesses to properties along the north side of US 30. No changes are made to the operational characteristics of the ramp terminals under this concept.

Lane configurations and traffic control for Concept #3 study intersections are shown in Figure 6. The estimated year 2040 traffic volumes and operations for Concept #3 are shown in Figure 7 and Figure 8 for the AM and PM peak hours, respectively. Given these lane configurations and traffic control, all study intersections in Concept #3 meet their mobility targets and operate at LOS 'C' or better in the AM and PM peak hours.¹

The US 30 / Airport Road intersection is approaching the mobility target during the PM peak hour under stop-controlled conditions and the intersection is forecast to meet planning-level signal warrants. Concept #3 includes construction of a traffic signal at this intersection to accommodate an anticipated future need and minimize disruption to traffic by consolidating reconstruction activities.

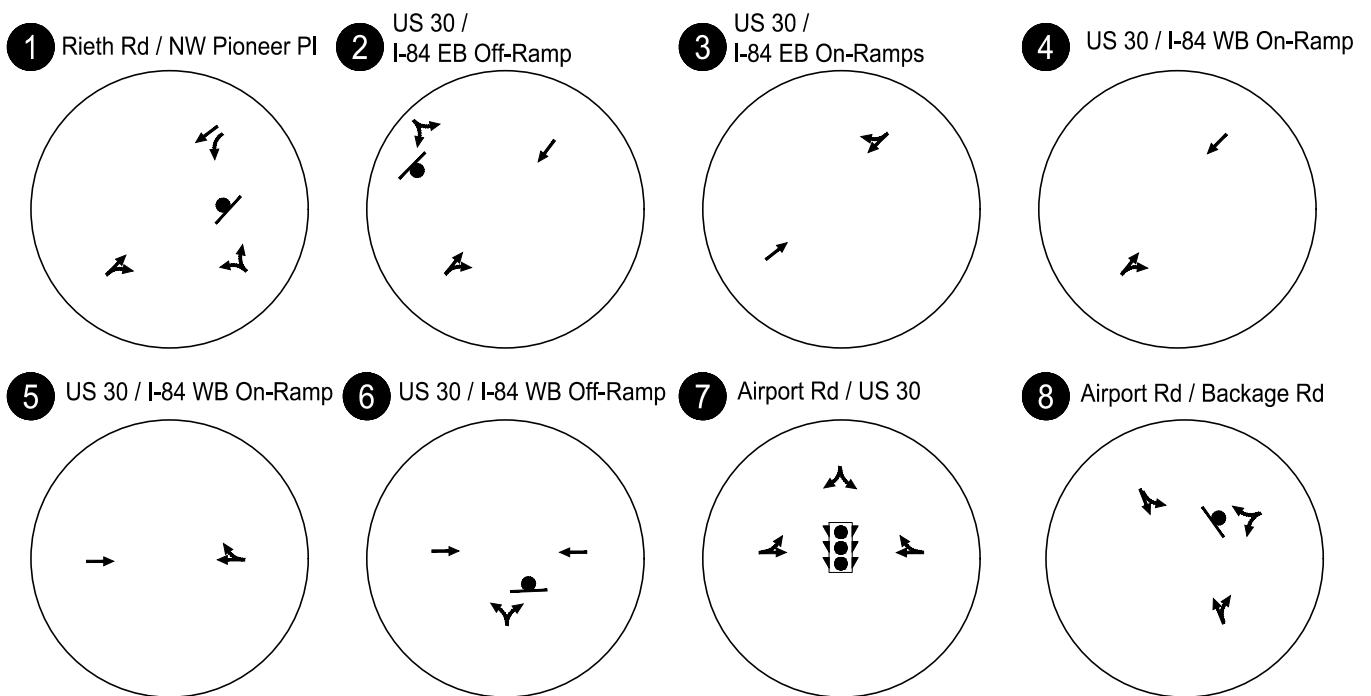
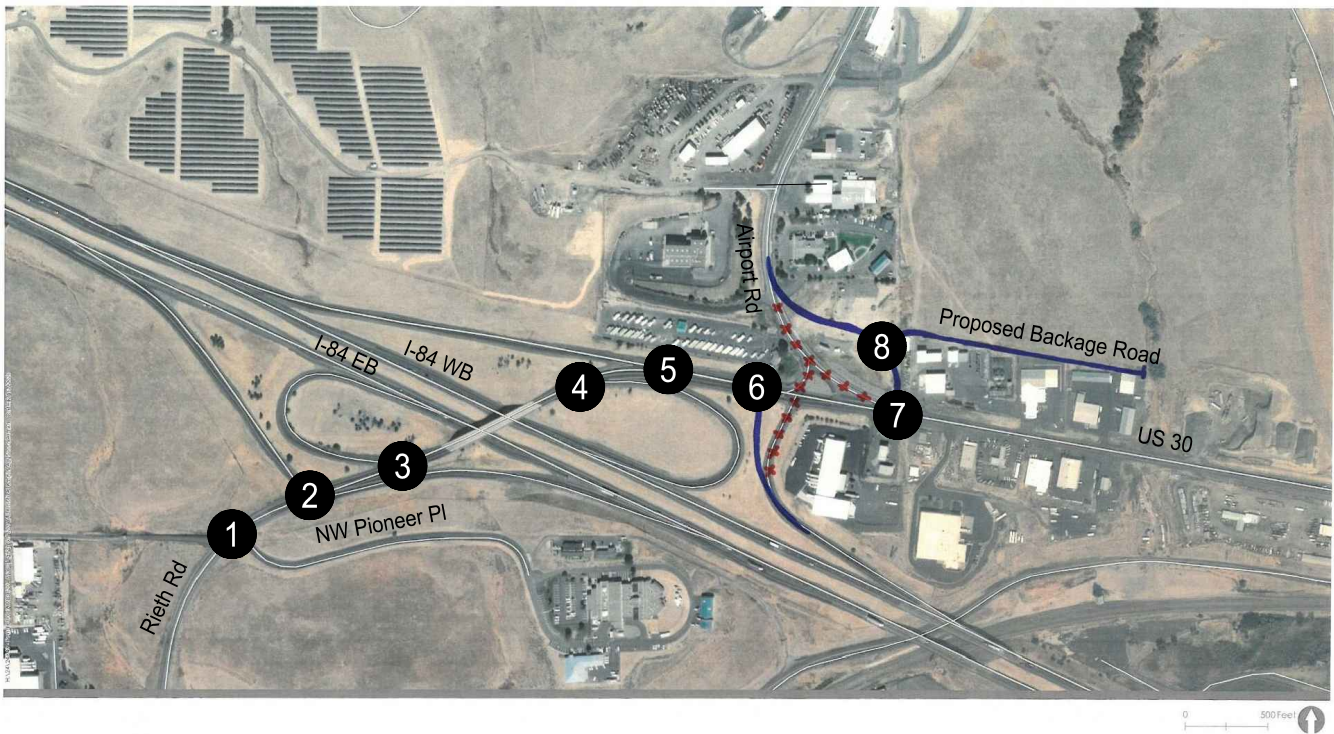
Bicycle and Pedestrian Considerations

Both concepts will provide spot improvements for walking and biking. All new roads and intersections would be built with appropriate facilities for people biking and people walking. Neither concept reconstructs the entire interchange, which limits their ability to address the larger deficiencies in the area. Implementing the biking and walking projects from the City's Transportation System Plan, including the connection from Pioneer Place to US 30 via Murietta Road, would best improve walking and biking in this area. The Active Transportation & Transit Plan (Reference 7) includes three projects in the vicinity of the study area. The impact, if any, that the concepts will have on these projects is described in Table 3.

Table 3: Impacts to Projects Identified in the Pendleton Active Transportation & Transit Plan

TSP Project	Description	Concept Impact
P1/B23	Add a dedicated walking/biking pathway to the Old Airport Road Alignment	No direct impacts
P37/B22	Install either a multi-use pathway along the north side of US 30 or improve the highway to accommodate sidewalks and bike lanes	This project could be partially built out or right-of-way preserved, particularly at the intersections, with either concept
P38	Install sidewalks or a multi-use pathway on the south side of Murrietta Road.	The proposed concepts do not directly affect this project

¹The critical southbound Airport Road approach to the US 30/Airport Road intersection is projected to operate at a v/c of 0.83 and LOS 'E' during the PM peak hour under stop-controlled conditions. As shown in Attachment "B", this intersection meets ODOT's planning-level signal warrants. Under signalized conditions, the intersection is forecast to operate at a v/c of 0.65 and LOS 'B' during the PM hour.



LEGEND

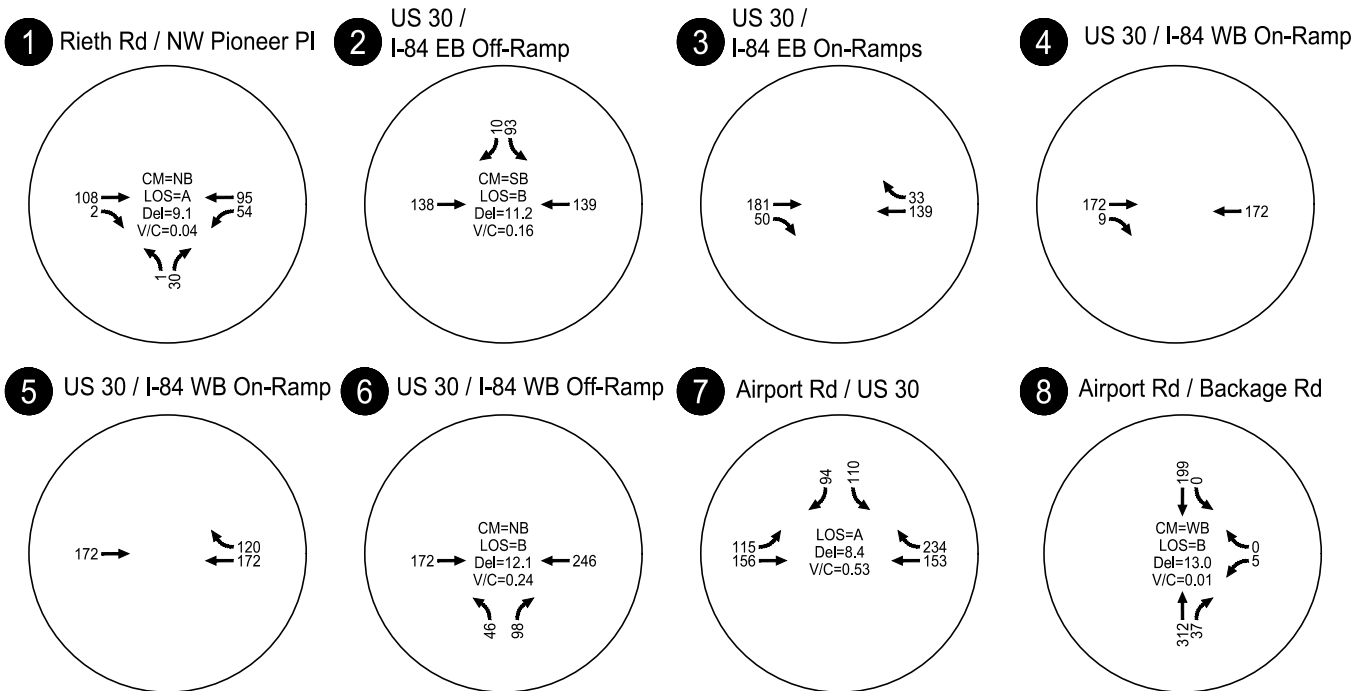
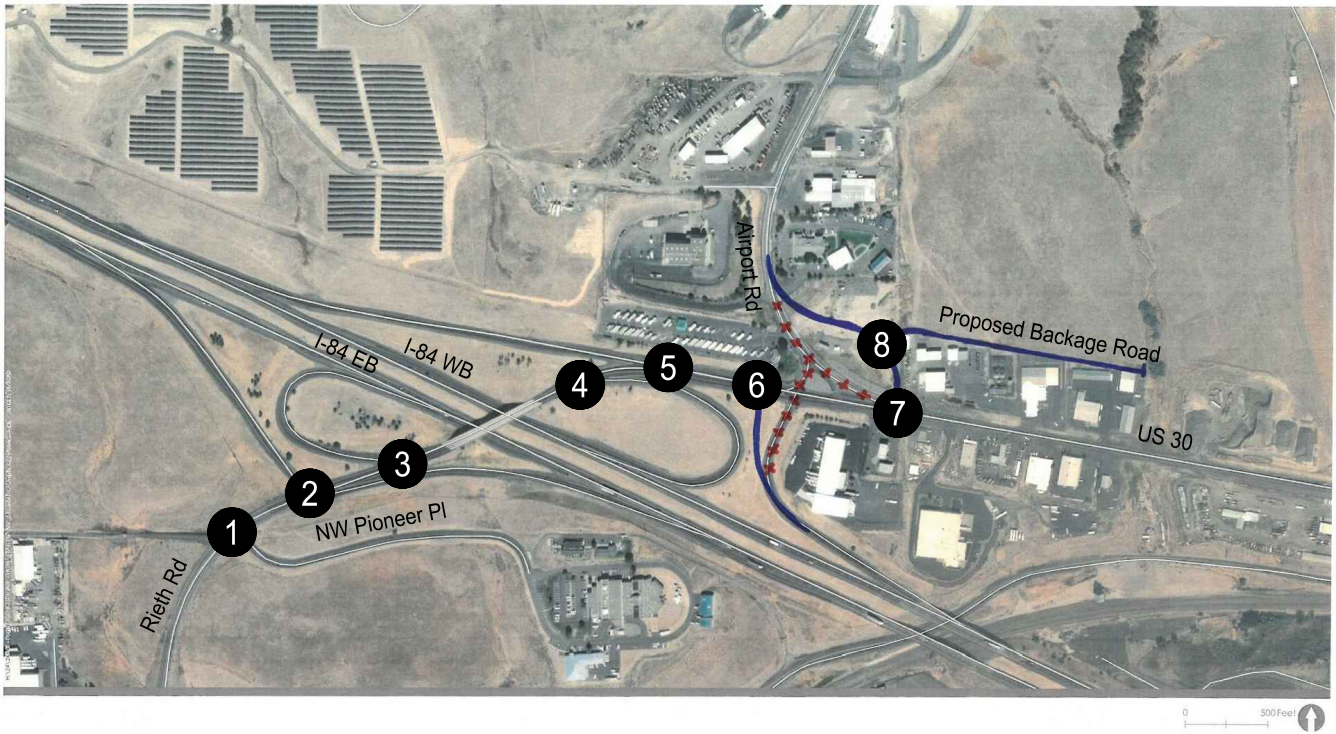
- # - Study Intersections
- 🚦 - Signal
- 🛑 - Stop Sign
- ↔ - Lane Movement

Concept #3 Lane Configurations
Exit 207
Pendleton, OR

Figure
6

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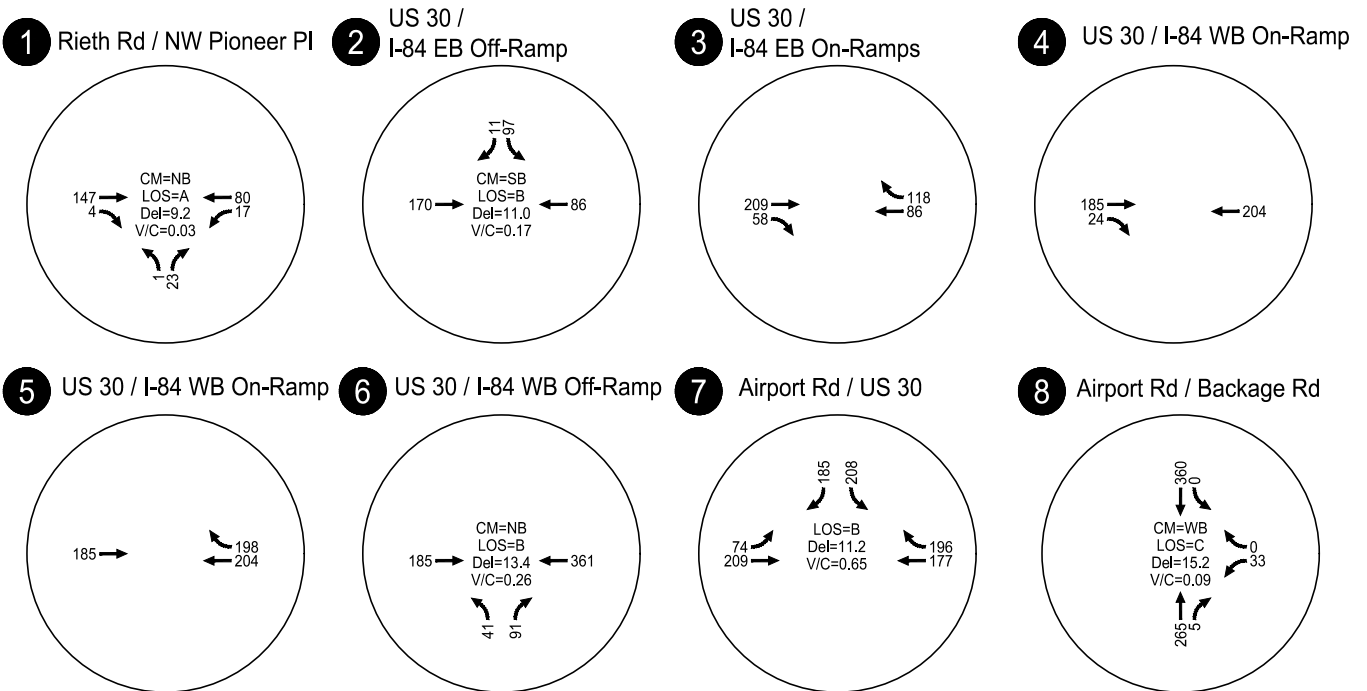
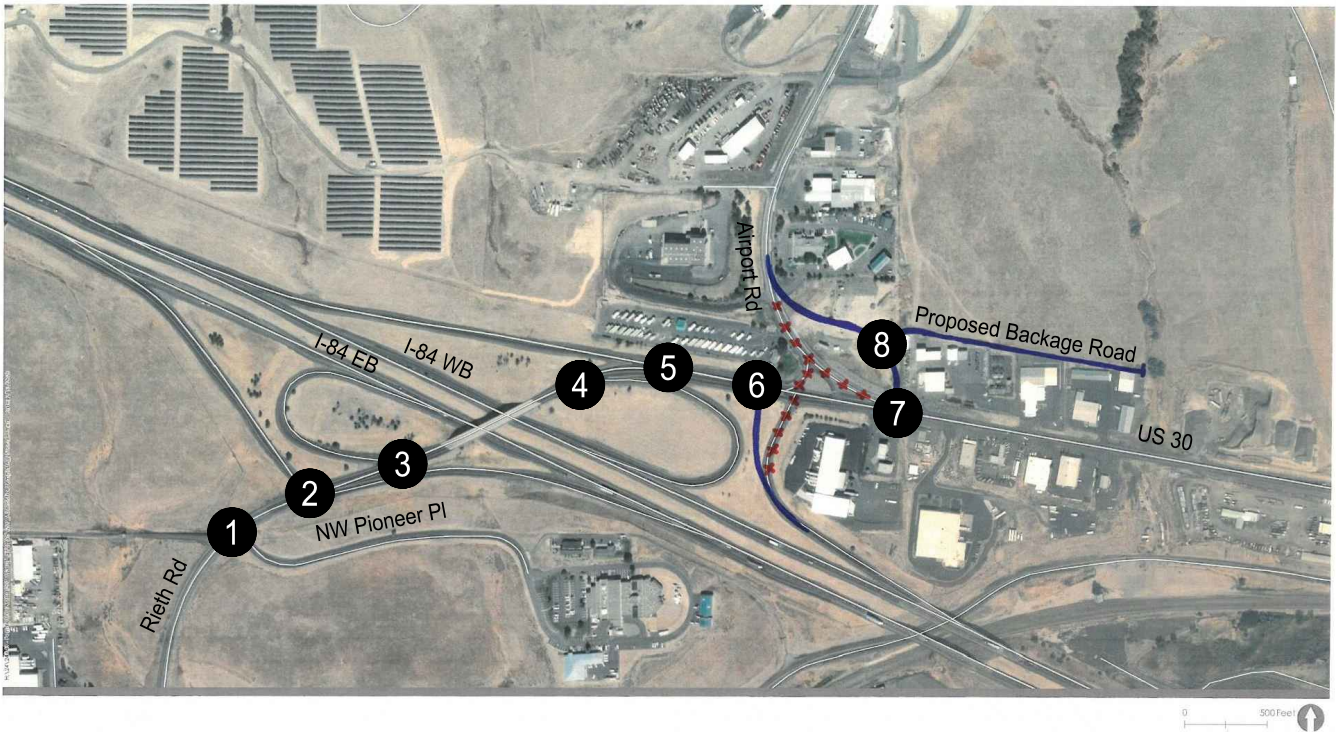
- Study Intersections
 CM - Critical Movement
 LOS - Level of Service
 Del - Vehicle Delay (s)
 V/C - Volume-To-Capacity Ratio
 ### - I-84 Peak Hour Volume

Future AM Peak Hour Traffic Operations
Exit 207 Concept #3
Pendleton, OR

Figure
7



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- Study Intersections
 CM - Critical Movement
 LOS - Level of Service
 Del - Vehicle Delay (s)
 V/C - Volume-To-Capacity Ratio
 ### - I-84 Peak Hour Volume

Future PM Peak Hour Traffic Operations
Exit 207 Concept #3
Pendleton, OR

Figure
8

C:\Users\agriffiths\appdata\local\temp\AcPublish_4888\Lane Configurations Exit 207_AEG.dwg Jun 03, 2020 - 10:06am - agriffiths Layout Tab: Future PM Concept 3



Future Safety Effects

The crash histories at the study intersections and along the study area roadways were reviewed in the *Existing Conditions: Transportation System Operations* memorandum (Reference 4). This section identifies crash reduction factors (CRFs) for the roadway and intersection treatments proposed in the two select concepts. The CMFs are used to estimate the potential reduction in crashes that could occur with the implementation of the proposed concepts.

Table 4 shows the countermeasures considered in developing the CRF for each scenario.

Table 4 Crash Modification Factors

Scenario	Countermeasures Considered	Crash Reduction Factor (CRF)	Appropriate Intersections/Segments
Concept #1B with Accessory #2	Convert interchange ramp terminal to roundabout ¹	24% (All Crashes)	<ul style="list-style-type: none"> US 30 / I-84 WB On-Ramp
	Convert intersection with minor-road stop control to modern roundabout ²	82% (Injury/Fatal Crashes)	<ul style="list-style-type: none"> US 30 / I-84 WB Off-Ramp / Airport Road
	Change in driveway density ³	16% (All Crashes)	<ul style="list-style-type: none"> US 30
Concept #3	Convert four-leg intersection into two three-leg intersections ⁴	33% (Injury/Fatal Crashes)	<ul style="list-style-type: none"> US 30 / I-84 WB Off-Ramp / Airport Road
	Change in driveway density ³	16% (All Crashes)	<ul style="list-style-type: none"> US 30

¹<http://www.cmfclearinghouse.org/detail.cfm?facid=9445>

²ODOT Crash Reduction Factor List H16

³Change in driveway density from 8 to 3 driveways in ¼ mile; <http://www.cmfclearinghouse.org/detail.cfm?facid=2507>

⁴ODOT Crash Reduction Factor List H23

Converting interchange ramp terminals and minor-road stop control intersections to roundabouts typically results in a decrease in overall crash frequency and severity. Relocating the north-side driveways along US 30 onto a backage road is expected to reduce the frequency of crashes along US 30.

As shown in Table 5, both concepts are expected to reduce crashes in the study. The adjusted crash reduction is slightly greater under Concept #1B with Accessory #2 than it is under Concept #3 when the CRFs from Table 4 are applied to the reported crashes for the most recent five year period for which data is available.

Table 5: Crash Reduction Assessment

Study Intersection or Segment	Observed Crashes/Year ¹	Adjusted Crashes/Year Under Concept #1B with Accessory #2	Adjusted Crashes/Year Under Concept #3
Reith Road / NW Pioneer Place	0.00	0.00 ²	0.00 ²
Rieth Road / I-84 EB Off-Ramp	0.20	0.20	0.20
US 30 / I-84 EB On-Ramp	0.00	0.00 ²	0.00 ²
US 30 / I-84 WB On-Ramp	0.00	0.00 ²	0.00 ²
US 30 / I-84 WB Off-Ramp / Airport Road	0.60	0.27	0.47
Airport Road / US 30	0.00	0.00 ²	0.00 ²
Rieth Road (within Operation and Access Study Area)	0.40	0.40	0.40
US 30 (within Operation and Access Study Area)	0.40	0.33	0.33
Total	1.60	1.20	1.40

¹Observed crashes per year from 2013 to 2017.

²The number of crashes per year in the long-term is likely more than 0; however, no crashes were reported at this intersection from 2013 to 2017.

Cost Estimates

Planning-level cost estimates for Concept #1B (with Accessory #2) and Concept #3 are provided in Table 6. The concepts are expected to cost about the same amount at this stage of analysis. *The full planning level cost-estimates for each concept can be found in Attachment “C”.*

Table 6: Cost Estimates

Concept	Total Estimated Project Cost
Concept #1B (with Accessory #2)	\$4.7 - \$5.2 Million
Concept #3	\$4.8 – 5.3 Million

EVALUATION RESULTS

Table 7 summarizes the results of evaluating Concepts #1B and #3 against the evaluation criteria set forth in the *IAMP Definition and Background Memorandum* (Reference 2). These concepts were previously evaluated against these criteria at a high level as part of the screening evaluation summarized in Technical Memorandum #5a. This evaluation takes that screening one step further by refining the criteria and conducting a comparative analysis. Green shading indicates which concept performs best under that evaluation criteria. Orange shading indicates which concept performs worst under that evaluation criteria.

Table 7 Refined Concept Evaluation Results

Category	Evaluation Criteria	Concept Performance		Best Performing Concept
		Concept #1B with Accessory #2	Concept #3	
Transportation	Addresses the identified operational and safety concerns at the interchange: 1) Location of Airport Road across from I-84 WB off-ramp 2) Slide-offs along the I-84 WB off-ramp	The existing WB off ramp is relocated further to the west. This addresses the existing geometric slide-off deficiencies and eliminates the connection across from Airport Road.	The existing WB off ramp is relocated to the west (with minimal embankment to address slide-off deficiencies) and the Airport Road intersection is relocated to the east. These relocations eliminate the ramp terminal connection across from Airport Road. It does not provide the same level of separation as Concept #1B, though.	Concept #1B with Accessory #2
	Improves walking and biking access	Both concepts will provide spot improvements for walking and biking. However, neither concept reconstructs the entire interchange, which limits their ability to address the larger deficiencies in the area. Implementing the biking and walking projects from the City's Transportation System Plan, including the connection from Pioneer Place to US 30 via Murietta Road, would best improve walking and biking in this area.		Both Concepts perform the same
	Reduces crash potential	The estimated crash reduction is slightly greater with this concept and accessory than with Concept #3.	This concept is expected to reduce crashes, but not by as much as Concept #1B.	Concept #1B with Accessory #2
Land Use/ Economic Development	Accommodates future growth and minimizes right-of-way impacts	The backage road paralleling the north side of Highway 30 would require right-of-way acquisition. It is anticipated that the roundabouts could be constructed with minimal impacts to privately-owned right-of-way.	The backage road paralleling the north side of Highway 30 will require right-of-way acquisition. The Airport Road realignment can potentially be constructed through a public right-of-way	Both Concepts perform the same
Accessibility	Moves in the direction of ODOT access spacing requirements	This concept moves the WB ramp terminal further to the west, thereby increasing the spacing distance to Airport Road and other private accesses along Highway 30. The backage road along the north side of Highway 30 would further improve access management.	This concept moves the WB ramp terminal to the west, thereby increasing the spacing distance to Airport Road and other private accesses along Highway 30. The backage road along the north side of Highway 30 would further improve access management.	Both Concepts perform the same
Cost	Cost relative to other concepts	\$4.7 – \$5.2 Million	\$4.8 – \$5.3 Million	Both Concepts perform about the same
Implementation	Constructability	Construction of a roundabout at the WB ramp terminal would be difficult to implement while maintaining existing traffic flow. Likewise, the Airport Road connection to US 30 may need to be closed while the new intersection is constructed, which would require rerouting traffic to Barnhart Road.	The entire project could be constructed while maintaining existing traffic flow between I-84 and Airport Road. Some restrictions on Airport Road may be necessary to construct the new alignment.	Concept #3

Concept #1B slightly outperforms Concept #3 on more criteria. However, Concept #3 significantly outperforms Concept #1B with respect to the implementation criterion. Traffic flow would need to be significantly altered during the construction period for Concept #1B and traffic traveling to/from the airport area would need to travel out-of-direction through Barnhart Road. Concept #3 would have some impacts during its construction period, but traffic at the interchange could likely be mostly maintained during the construction period.

PRELIMINARY ACCESS MANAGEMENT PLAN

The project team has developed preliminary access management plans for the Operations and Access Study Area (OASA). The plan aims to move access locations in the OASA towards ODOT's access spacing standards through consolidation of driveways and relocation of public streets. Implementation of access management is anticipated to occur through the development and redevelopment of properties over time.

As Table 8 shows, there are 21 accesses within the OASA. Table 8 also summarizes the proposed access management plan for the Exit 207 OASA for accesses located within ODOT's ¼-mile spacing standard. Accesses shaded grey are located within ¼ mile of the interchange ramp terminals.

Table 8 Access Management Plan for Exit 207 Interchange

Access Number	Roadway	Approach Type	Side of Roadway	Access Width (ft) ¹	Proposed Access Management Plan Action Under Concept Alternatives
1	Rieth Rd	Private	West	52	No changes are proposed to accesses located outside of ODOT's ¼-mile spacing standard.
2	Rieth Rd	Private	East	400	
3	Rieth Rd	Private	West	72	
4	Rieth Rd	Private	West	20	
5	Rieth Rd	Public	East	90	
6	Rieth Rd	Private	East	45	
7	Rieth Rd	Private	East	45	
8	Rieth Rd	Public	West	47	Revisit access location and configuration when property redevelops.
9	Rieth Rd	Private	West	43	Revisit access location and configuration when property redevelops.
10	Rieth Rd	Public	East	35	Revisit access location and configuration when property redevelops.
11	US 30	Public	North	60	Both concepts relocate this access to a backage road
12	US 30	Public	North	240	Both concepts relocate this access to a backage road
13	US 30	Private	South	55	Consider consolidating accesses 13 and 14 as part of property redevelopment or through negotiation with the property owner.
14	US 30	Private	South	35	Consider consolidating accesses 13 and 14 as part of property redevelopment or through negotiation with the property owner.
15	US 30	Private	North	94	Both concepts relocate this access to a backage road
16	US 30	Private	South	900	Reduce access width to standards as part of property redevelopment or through negotiation with the property owner
17	US 30	Private	North	66	Both concepts relocate this access to a backage road
18	US 30	Private	North	37	Both concepts relocate this access to a backage road
19	US 30	Private	North	65	No changes are proposed to accesses located outside of ODOT's ¼-mile spacing standard.
20	US 30	Private	South	900	
21	US 30	Public	North	54	

NEXT STEPS

Based on the TAC and CAC meetings conducted on June 10, the preferred concept is Concept #1B paired with Accessory #2, pending further investigation of the feasibility of the roundabout at US 30/Airport Road. If the roundabout at this intersection is determined to be infeasible or too costly, it would be replaced with the Airport Road/US 30 intersection treatments and backage road from Concept #3. The results of this investigation will be reflected in Technical Memorandum #6 in July.

REFERENCES

1. Kittelson and Associates, Inc. *Pendleton IAMPs: Methodology Memorandum*. 2019.
2. Kittelson and Associates, Inc. *Pendleton IAMPs: Exit 207 – IAMP Definition and Background*. 2019.
3. Kittelson and Associates, Inc. *Pendleton IAMPs: Exit 207 – Existing Conditions: System Inventory*. 2019.
4. Kittelson and Associates, Inc. *Pendleton IAMPs: Exit 207 – Existing Conditions: Transportation System Operations*. 2019.
5. Kittelson and Associates, Inc. *Pendleton IAMPs: Exit 207 – Future Baseline Conditions: Transportation System Operations*. 2020.
6. Oregon Department of Transportation. *Analysis Procedures Manual – Version 2*. 2019.
7. City of Pendleton. *City of Pendleton Active Transportation & Transit Plan*. June 2016.

8. U.S. Department of Transportation Federal Highway Administration. *Crash Modification Factors Clearinghouse*. Publication Date Varies by Countermeasure.

ATTACHMENTS

- A. Technical Memorandum #5A – Concepts Evaluation and Screening
- B. Intersection Operations Worksheets and Signal Warrants
- C. Planning Level Cost Estimates