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FINAL TECHNICAL MEMORANDUM #16

October 19, 2023 Project# 23021.035

To: James Feldmann

From: Camilla Dartnell, PE; Bincy Koshy; Polina Polikakhina; and Phill Worth

RE: Final TM #16: Preliminary Scoring and Evaluation of Alternatives

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FINAL TECHNICAL MEMORANDUM #16

The draft of Technical Memorandum #16 (TM #16) was reviewed and discussed with the Technical Advisory Committee (TAC), Stakeholder Advisory Group (SAG), and the Project Management Team (PMT) in June and July of 2023. Written feedback from the TAC and SAG was also received and considered by the PMT.

The PMT determined that meetings with technical staff from the City of Corvallis and the Oregon Department of Transportation were critical to the process of selecting the preferred alternative. Separate meetings were held with each agency to obtain final input and determine their preferred alternative and underlying rationale. Consensus across the agencies was found for a preferred alternative and affirmed by the PMT.

The Agency Project Manager (APM) has determined that having reached consensus for a preferred alternative, there is no need to address comments to this memorandum that pertain to questions or calls for additional analysis of the alternatives. Thus, the preparation of this final TM #16 only addresses corrections to the presentation of information and results, as well as a limited description of the preferred alterative and its underlying rationale.

INTRODUCTION

Extensive analysis of forecast year 2040 weekday PM peak hour transportation demands has been completed and documented in Technical Memoranda #15A and #15B and informed the evaluation of alternatives. Public engagement, meetings with City and ODOT technicians, and meetings with the PMT provide the available information to complete a preliminary evaluation of the alternatives. Refinements to the alternatives have been made in response to this information for the purpose of strengthening and further differentiating them, one from another. To support the evaluation, certain assumptions have been made and are documented herein.

This memorandum documents the evaluation of the enhanced no-build alternative (Alternative A) and two long-term build alternatives (Alternative B and Alternative C) that are being considered as options for the OR 99W South Corvallis Facility Plan. The project team used the criteria and performance measures introduced in Technical Memorandum #3 (TM #3[1]) as a basis for the proposed evaluation criteria, with modifications to further reflect the project goals. The team assigned a score for each of the criteria where information is available. Preliminary recommendations are provided based on the final scoring of each alternative.

NOTE: The alternatives described in TM #16 differ from the alternatives analyzed in Technical Memoranda #15A and #15B. As a result, some analysis from TM #15A or #15B is no longer representative. As directed by the APM, no effort has been made to update the analysis or provide additional analysis to produce this final TM #16.

[1] Full name of the Technical Memorandum #3 is *Performance Based Design Decision Framework*.

SUMMARY OF FINDINGS

Three design concepts for the middle segment of the OR 99W corridor in South Corvallis are evaluated in this memorandum. Key findings from the future conditions analysis documented in TM #15A and TM #15B inform the evaluation of the concepts, applying quantitative and qualitative performance measures for nine unique evaluation criteria. A summary of the results is provided below and in Table 1:

- Based on the results from the **Equity** criterion, Alternative B achieves the best outcome. Multimodal access is improved for disadvantaged community members in the study area.
- Based on the results from the **Comfort** criterion, Alternative B achieves the best outcome with the shortest crossing distance exposure of vulnerable users to conflicting motor vehicles. The alternative also optimizes the opportunity for enhanced crossings, at intersections and midblock, due to the median and the splitter islands provided at the roundabouts.
- Based on the results from the **Convenience** criterion, Alternative B achieves the best outcome. More crossings are considered convenient than in any other alternative.
- Based on the results from the **Safety** criterion, Alternative B achieves the best outcome across the range of performance measures.
- Based on the results from the **Design** criterion, all concepts result in a medium outcome.
- Based on the results from the **Cost** criterion, Alternative A achieves the best outcome.
- Based on the results from the **Connectedness** criterion, Alternative A scores better than Alternative C, due to the assumption that audible crossing indicators are NOT provided at the roundabouts.
- Based on the results from the **Aesthetics** criterion, Alternative B achieves the best outcome with the least impervious surface area and the greatest landscaped area.
- The **Support** criterion is not yet scored, as the community and stakeholders have not been presented with technical analysis results.
- No single design concept achieves favorable scoring across all nine evaluation criteria.
- Alternatives A (5-Lane with Signals) and C (5-Lane with Roundabouts & Median) are estimated to perform best for accommodating freight vehicles, transit performance, and motor vehicle performance, and cost to construct.
- Alternative B performs best for safety, comfortable and convenient accommodation of vulnerable users, and aesthetics.

Table 1: Summary of Scoring Results[1]

Criteria	Alternative A: 5-Lane with Signals & Two-Way Left Turn Lane	Alternative B: 3-Lane with Roundabouts & Median Control	Alternative C: 5-Lane with Roundabouts & Median Control
Equity	MEDIUM	HIGH	MEDIUM
Comfort	MEDIUM	HIGH	MEDIUM
Convenience	LOW	HIGH	LOW
Safety	LOW	HIGH	MEDIUM
Design	MEDIUM	MEDIUM	MEDIUM
Cost	HIGH	LOW	MEDIUM
Connectedness	HIGH	LOW	MEDIUM
Aesthetics	LOW	HIGH	MEDIUM
Support	Not Scored at This Time	Not Scored at This Time	Not Scored at This Time
Summary	MEDIUM	HIGH	MEDIUM

1 – See description of scoring icons on page 10.

SUMMARY OF DESIGN ALTERNATIVES

The full OR 99W South Corvallis corridor extends from Western Boulevard to the south Urban Growth Boundary (UGB) of Corvallis. Earlier in the planning process, the corridor was subdivided into three segments:

- Segment 1 – Western Boulevard to SE Crystal Lake Drive (approximately 2,800 feet long)
- Segment 2 – SE Crystal Lake Drive to Goodnight Avenue (approximately 5,600 feet long)
- Segment 3 – SE Goodnight Avenue to the Southern UGB (approximately 10,500 feet long)

Solutions to overcome segment issues and achieve the vision and goals for the OR 99W South Corvallis Refinement Plan were developed and agreed to for Segments 1 and 3. Those recommendations, along with recommendations from the previously prepared OR 99W South Corvallis Road Safety Audit, will be carried forward to become part of the preferred alternative.

Solutions for Segment 1 and Segment 3

Three alternatives (A, B, and C) were developed for Segment 2. Several improvement assumptions[1] are common to all three alternatives, including:

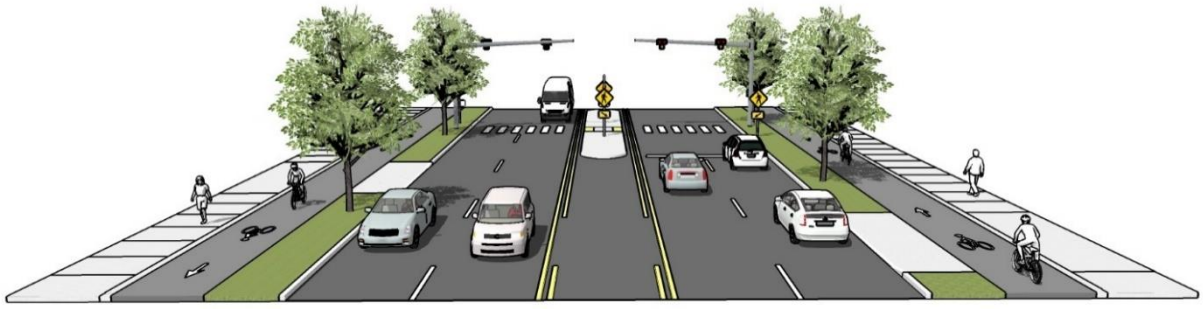
- Curbs on both sides of the highway will be relocated to reduce the ped/bike crossing distance.
- The same planted buffer and fully separated bicycle and pedestrian facilities will be constructed outside of the curbs on both sides of the highway.
- A roundabout (single-lane in Alternative B and double-lane in Alternatives A and C) will be the intersection treatment provided at Goodnight Avenue.

Three alternatives were developed for Segment 2 that represent a range of approaches to solve the challenges and respond to the vision and goals. A typical cross section diagram is provided below for each alternative, followed by a brief description of the specific features and treatments (except the common treatment of outside planted buffer and pedestrian and bicycle facilities). Refinements and assumptions deemed beneficial to support the evaluation are included and shown in ***bold italic***.

[1] Note that the City will consider access consolidation in its area plan in support of the final corridor design

Alternative A: 5-Lane with Signals & Two-Way Left-Turn Lane

The typical cross section, shown below, illustrates the basic concepts of Alternative A.



Basic features include the following:

- Two travel lanes will be provided in each direction with a center, two-way left turn lane, as the typical roadway cross section.
    - Outside lanes would be 11 feet wide with a striped 2-foot shy distance from the face of curb.
    - Inside lanes would be 11 feet wide.
    - A two-way left-turn lane would be striped at 12 feet wide. Raised pedestrian refuge islands would be 10 feet wide (only provided at enhanced pedestrian crossings).
- Intersections that are signalized today (Crystal Lake and Alexander) will remain signalized.
- All other side street connections to OR 99W are assumed to be stop-sign controlled and may be limited to right-in/right-out only (such as at Tunison Avenue).
- ***For this evaluation one new signal is assumed based on Oregon Administrative Rules (OAR) 734–020–0470, Traffic Signal Spacing Requirements[2]. It is assumed to be located at a future four-legged intersection with SE Prairie Avenue.***
- ***For this evaluation it is assumed that only one enhanced crossing is achieved after each signal (a total of three), based on stated preferences from ODOT Region Traffic, most often equipped with Rectangular Rapid Flashing Beacons. Raised medians would be included with these crossings.***
- ***For this evaluation it is assumed that this complete cross section would be accomplished through a construction project that relocates both curbs and stormwater inlets and provides the planted buffer and bike/ped facilities outside of the curbs.***

Key Outcomes of Alternative A

Highlights of the benefits and impacts from implementing Alternative A are listed below and many are further documented in prior technical memoranda. These highlights have direct bearing on the evaluations reported later in this document.

[2] Also, per stated preferences from ODOT Region Traffic (spacing and operations) and the City of Corvallis (land use).

Benefits

- Roadway reconstruction presents the opportunity to:
  - Address stormwater, water quality, and potential flooding concerns.
  - Reduce the crossing exposure of pedestrians down from 72 feet to approximately 60 feet, which also reduces delay to motorists and freight at traffic signals and enhanced crossings.
  - Provide vertically and horizontally protected bicycle and pedestrian facilities outside the curbs, buffered by a landscape strip.
- Little to no additional right-of-way is anticipated to achieve Alt. A.
- Signalization of only three intersections limits the system delay that such devices create.
- Provision of raised medians at the three proposed enhanced crossings will allow installation of RRFBs.
- Alternative A provides the second best corridor motor vehicle capacity, behind Alternative C, but substantially more capacity than Alternative B.
- Alternatives A and C have similar average travel times, queue lengths, and congestion during the weekday PM peak hour for motor vehicles and transit vehicles.

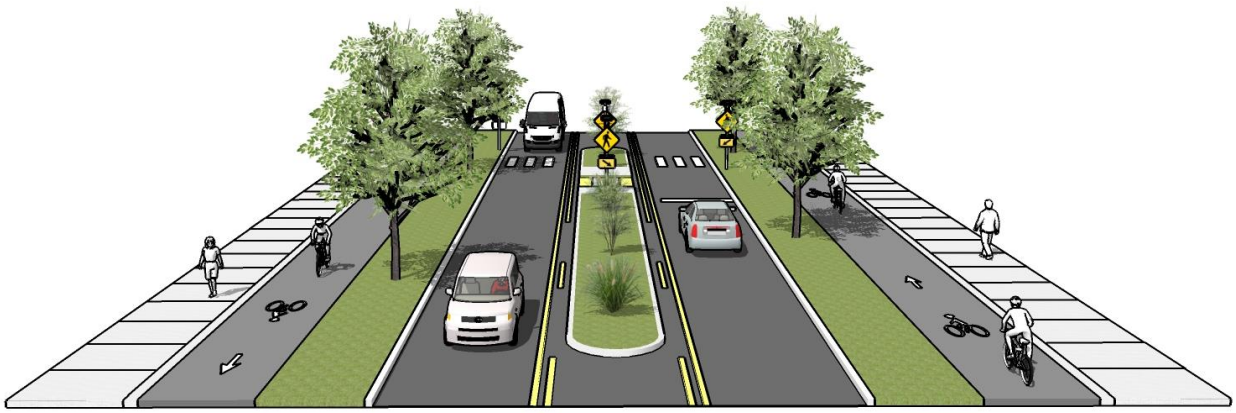
Impacts

- There are six enhanced crossing locations in this 5,600 foot segment - three at fully signalized intersections and three would be RRFBs/median island crossings.
- A 5-lane cross section remains along the Lincoln Elementary School frontage of OR 99W.
- Access to Tunison Avenue must be restricted to right-in/right-out only, due to safety concerns, the impacts of which are partially offset by connecting Alexander Avenue to Butterfield Drive but add cost to the project.
- Ineffective signal progression (see TM #15B) will contribute to congestion and delay in peak periods[3].
- Traffic signals add system delay during all hours of the day[3].
- Traffic signals do not serve as effective speed management tools, particularly when they cannot progress traffic[3].
- Narrowing the cross section will result in the curb-to-curb width for the southbound freight route being reduced from 28 feet to 25 feet (this may be a concern to the Mobility Advisory Committee).
- Alternative A provides the fewest safety-related benefits.

[3] Traffic signals may add not be as effective if they cannot be progressed which may add to congestion/delay in peak periods, and may delay during all hours of the day, and not serve as speed management tools.

Alternative B: 3-Lane with Roundabouts & Median Controls (Road Reorganization)

The typical cross section, shown below, illustrates the basic concepts of Alternative B.



Basic features include the following:

- SE Crystal Lake Drive will remain signalized.
- South of Crystal Lake Drive the 5-lane cross section will transition to a 3-lane cross section before reaching SE Alexander Avenue, with one southbound travel lane, one northbound travel lane, and a raised and planted median. The typical cross section will be equipped as follows:
    - One 11-foot travel lane in each direction with a striped 2-foot shy distance from the face of curb.
    - One 12-foot median area with a 10-foot raised and planted median that may include median breaks at intervening locations between roundabouts.
- Existing and future intersections that would benefit from more than two-way stop control will have single-lane roundabouts.
    - ***For this evaluation, four to five roundabouts are assumed, potentially at SE Bridgeway-Cummings (completing the cross section transition), SE Alexander Avenue, SE Viewmont-Tunison, SE Prairie, and at SE Park-Wake Robin before reaching the planned roundabout at SE Goodnight Avenue.***
    - ***For this evaluation, each single-lane roundabout achieves the best score for ped/bike crossing comfort.***
- Median control will be provided for improved safety, operations, speed management, and crossing accommodations.
    - ***For this evaluation, the median is assumed to be planted.***
- Enhanced crossings, most often with Rectangular Rapid Flashing Beacons, will be provided at regular intervals.
    - ***For this evaluation, three enhanced crossings (with RRFBs) are assumed (between Lily and Mayberry, between Alexander and Viewmont-Tunison, and near Richland).***
- ***For this evaluation it is assumed that this complete cross section would be accomplished through a construction project that relocates both curbs and stormwater inlets, provides the planted median, and provides the planted buffer and bike/ped facilities outside of the curbs.***

Key Outcomes of Alternative B

Highlights of the benefits and impacts from implementing Alternative B are listed below and many are further documented in prior technical memoranda. These highlights have direct bearing on the evaluations reported later in this document.

Benefits

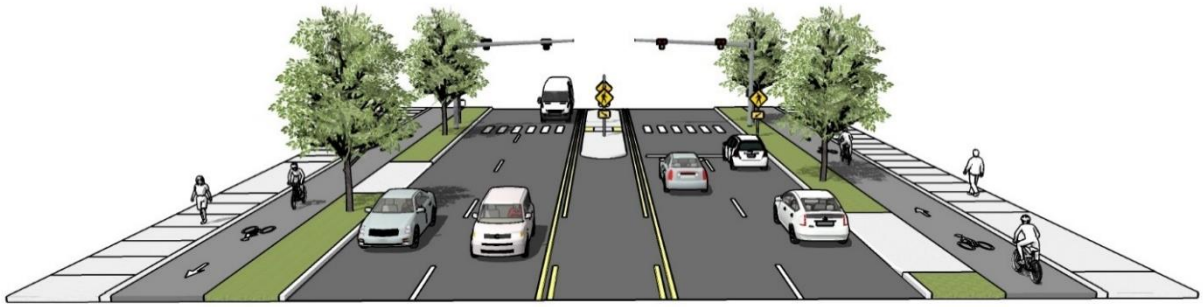
- Roadway reconstruction presents the opportunity to:
  - Address stormwater, water quality, and potential flooding concerns.
  - Provide a continuous, planted median.
  - Reduce the crossing exposure of pedestrians down from 72 feet to approximately 28 feet.
  - Provide vertically and horizontally protected bicycle and pedestrian facilities outside the curbs, buffered by a landscape strip.
- Provision of raised medians at the three proposed enhanced crossings will allow installation of RRFBs.
- Alternative B achieves a 3-lane cross section along the Lincoln Elementary School frontage on OR 99W.
- Tunison Avenue will retain full access as Alternative B assumes a roundabout at this intersection.
- Alternative B provides corridor speed management via a sequence of regularly spaced roundabouts.
- Alternative B provides the shortest crossing distances/lowest exposure of peds/bikes to motor vehicle conflicts.
- Alternative B provides the highest number of protected-enhanced crossings (single-lane roundabouts plus RRFBs).
- Alternative B provides the most safety-related benefits to all users (median control, roundabout control, protected crossings, lowest exposure).

Impacts

- Alternative B will have higher right-of-way and construction costs for roundabouts, as compared to the Alternative A traffic signals in the same locations.
- Alternative B construction costs also will be higher compared to Alternative A because more intersections will be improved.
- Alternative B will result in the highest amount of traffic diversion to adjacent streets.
- Alternative B will result in the worst congestion, longest queues, worst average travel speeds and longest corridor travel times.
- Alternative B, with the road reorganization proposed north of Alexander, may not be agreed to by ODOT Traffic, due to the significant adverse impact on motor vehicle operations.
- Narrowing the cross section will result in the curb-to-curb width for the southbound freight route being reduced from 28 feet to between 14 feet (this is likely to be a concern to the Mobility Advisory Committee).

Alternative C: 5-Lane with Roundabouts & Median Control

The typical cross section, shown below, illustrates the basic concepts of Alternative C.



The cross section of Alternative C provides two travel lanes in each direction, like Alternative A; however, a planted median is assumed, except where left-turn lanes are needed (such as at SE Crystal Lake Drive). Major intersections are treated with double-lane roundabouts. Alternative C proposes roundabouts for intersections south of Alexander that would benefit from such intersection treatments. Basic features include:

- Two travel lanes will be provided in each direction with a raised and planted median, as the typical roadway cross section.
    - Outside lanes would be 11 feet wide with a striped 2-foot shy distance from the face of curb.
    - Inside lanes would be 11 feet wide.
    - A 10-foot wide raised and planted median would be provided inside a 12-foot widen striped median area (a 1-foot shy distance from stripe to face of median curb).
- Intersections that are signalized today (Crystal Lake and Alexander) will remain signalized, due to capacity needs and right-of-way impacts that would result from double-lane roundabouts.
    - ***For this evaluation, two double-lane roundabouts are assumed, one at a future four-legged intersection with SE Prairie Avenue and the other at SE Goodnight Avenue.***
- All other side street connections to OR 99W are assumed to be stop-sign controlled and would be limited to right-in/right-out only or provided with a median break with a left-turn pocket.
- ***For this evaluation, it is assumed that only one enhanced crossing is achieved between each signal and each roundabout (a total of three), most often equipped with Rectangular Rapid Flashing Beacons, based on stated preferences from ODOT Region Traffic.***
- ***For this evaluation it is assumed that this complete cross section would be accomplished through a construction project that relocates both curbs and stormwater inlets and provides the planted buffer and bike/ped facilities outside of the curbs.***

Key Outcomes of Alternative C

Highlights of the benefits and impacts from implementing Alternative C are listed below and many are further documented in prior technical memoranda. These highlights have direct bearing on the evaluations reported later in this document.

Benefits

- Roadway reconstruction presents the opportunity to:
  - Address stormwater, water quality, and potential flooding concerns.
  - Reduce the crossing exposure of pedestrians down from 72 feet to approximately 60 feet, which also reduces delay to motorists and freight at traffic signals and enhanced crossings.
  - Provide a continuous, raised, and planted median that supports enhanced crossings.
  - Provide vertically and horizontally protected bicycle and pedestrian facilities outside the curbs, buffered by a landscape strip.
- Alternative C has lower system delay than Alternative A, but higher than Alternative B (due to the control delay each signal introduces).
- Provision of raised medians at the three proposed enhanced crossings will allow installation of RRFBs.
- Alternative C provides the best corridor motor vehicle capacity.
- Alternative C has more safety-related benefits than Alternative A, but fewer than Alternative B.
- Alternatives A and C have similar average travel times, queue lengths, and congestion during the weekday PM peak hour for motor vehicles and transit vehicles, much better than Alternative B.

Impacts

- There are six enhanced crossing locations in the 5,600 foot segment - three at fully signalized intersections and three would be RRFBs/median island crossings.
- A 5-lane cross section remains along the Lincoln Elementary School frontage of OR 99W.
- Access to Tunison Avenue must be restricted to right-in/right-out only, due to safety concerns, the impacts of which are partially offset by connecting Alexander Avenue to Butterfield Drive but add cost to the project.
- Traffic signals may add congestion/delay throughout the day and do not serve as speed management tools.
- Narrowing the cross section will result in the curb-to-curb width for the southbound freight route being reduced from 28 feet to 25 feet (this may be a concern to the Mobility Advisory Committee).

ALTERNATIVES EVALUATION

Evaluation Criteria and Performance Measures

The evaluation criteria outlined in Technical Memorandum (TM) 3 were used as a basis for the initial scoring. Features that are common to all three alternatives, such as the longitudinal pedestrian and bicycle treatments, provide no differentiation in scoring. Some scoring measures or criteria lack sufficient information for quantitative assessment. Where practical, a qualitative assessment is offered.

This section presents the final evaluation criteria, the assumptions made by the team for each of the design alternatives, and the results of the evaluation process.

The team applied the following nine criteria derived from the vision and goals to evaluate the alternatives:

- Equity
- Comfort
- Convenience
- Safety
- Design
- Cost
- Connectedness
- Aesthetics
- Support

A total of 30 quantitative and qualitative performance measures were considered across these nine criteria. Results of the measures are displayed on a scale of "Low", "Medium", and "High", as shown on the following page.

Evaluation Matrix Legend

LOW	MEDIUM	HIGH
Design concept has little or no benefit in achieving the vision and goals.	Design concept has some benefit at least compared to the No-Build.	Design concept has significant benefit in achieving the vision and goals.

Scoring Results

This section is organized by evaluation criterion and summarizes the scoring results for each measure, then the criterion, and finally for the entire alternative. Brief explanations are sometimes offered, particularly where quantitative measures are not available, to support the scoring results.

Equity

The **Equity** category uses one quantitative performance measure that captures the impacts each alternative will have on the disadvantaged, underrepresented, and/or vulnerable communities. The Oregon Department of Transportation (ODOT) measures the presence of such communities using a Transportation Disadvantaged Index (TDI). A TDI map of the study area is provided in Appendix A.

Accessibility Issue for Identified Disadvantaged Communities

The area of particular concern is between OR 99W and the Union Pacific Railroad line to the west, from south of the Mill Race to Wake Robin Avenue. This disadvantaged area of the community has transportation access barriers represented by the railroad and the Mill Race that have no available crossings, a fragmented street network, and limited highway access that includes no access to traffic signals or roundabouts.

Alternatives Assumptions & Evaluation

Each alternative applies a different approach or treatment to address the needs of this area, as summarized below:

Alternative A: Enhanced 5-Lane with Signals

- Issues at the offset intersection of SE Tunison Ave/SE Viewmont Ave would be addressed by converting the Tunison approach to right-in/right-out only. Because this degrades access to this area of concern, the west leg of Alexander Avenue would be extended to connect with Butterfield Drive, creating an alternative connection for the area, at this existing signalized intersection.

Alternative B: 3-Lane with Roundabouts & Median Control

- A single-lane roundabout would be installed at the offset intersection of SE Tunison Ave/SE Viewmont Ave to provide full access to this area, as well as an enhanced crossing for pedestrians and bicyclists at this intersection (proximate to Lincoln Elementary School).

Alternative C: 5-Lane with Roundabouts with Medians

- Right-of-way impacts of a double-lane roundabout at the offset intersection of SE Tunison Ave/SE Viewmont Ave are significant and may preclude this treatment. As such, Alternative C assumes a treatment like Alternative A (right-in/right-out + extension of Alexander to Butterfield).

Scoring Results

Table 2 summarizes the scoring of the ***Equity*** evaluation criterion.

Table 2: Equity Criteria Evaluation

Criteria	Alternative A: 5-Lane with Signals & Two-Way Left Turn Lane	Alternative B: 3-Lane with Roundabouts & Median Control	Alternative C: 5-Lane with Roundabouts & Median Control
Design Evaluation	Limits direct vehicular access for this vulnerable community at SW Tunison Avenue/Viewmont Avenue and provides signalized access at Alexander Avenue via SW Butterfield Drive.	Improves access for this vulnerable community and pedestrian / bicycle crossing opportunities near Lincoln Elementary School.	Limits direct access for this vulnerable community at SW Tunison Avenue/Viewmont Avenue and provides signalized access at Alexander Avenue via SW Butterfield Drive.
Summary	 MEDIUM	 HIGH	 MEDIUM

Comfort

This evaluation criterion measures the **Comfort** experienced by non-motorized corridor users, based on three quantitative Level of Traffic Stress (LTS) performance measures outlined in the ODOT's Analysis and Procedures Manual, Chapter 14. The three performance measures are listed below:

- Segment Bicycle Level of Traffic Stress (BLTS)
- Segment Pedestrian Level of Traffic Stress (PLTS)
- Crossing PLTS and BLTS
  - At signals
  - At roundabouts
  - At minor street intersections
  - At mid-block crossings

The segment and the crossing BLTS and PLTS measures are assigned a score based on the outcomes of the alternatives analysis presented in TM 15A: *Alternatives Analysis and Evaluation.*

Alternatives Assumptions & Evaluation

The team assumed that current ODOT policy precluding the use of Pedestrian Hybrid Beacons (PHB's) will continue and, therefore, the primary treatment options for enhanced or protected pedestrian/bicycle crossings are Rectangular Rapid Flashing Beacons (RRFBs), traffic signals, and roundabouts. Year 2040 average annual daily traffic (AADT) volumes were used in all evaluations and are forecast by ODOT to be over 9,000 per direction or over 18,000 total.

Table 3 presents additional design assumptions the team made regarding the corridor and intersection control treatment for each of the alternatives:

Table 3: Alternatives Design Assumptions for Comfort Criteria

Criteria	Alternative A: Enhanced 5-Lane with Signals	Alternative B: 3-Lane with Roundabouts & Median Control	Alternative C: 5-Lane with Roundabouts
Cross-Section of Segment 2	4-lanes with 2-way left-turn lane or dedicated left-turn pockets at intersections	2-lanes with controlled median and median breaks for left-turns in strategic locations	4-lanes with controlled median and median breaks for left-turns in strategic locations
Major intersections	Signals with permissive right turns and a double-lane roundabout	Signals with permissive right turns or single-lane roundabouts	Signals with permissive right turns or double-lane roundabouts
Minor Intersections	- Two-way stop-controlled - No median provided - Crossing a total of 5 lanes	- Two-way stop-controlled - 10-ft median provided - Crossing 1 lane per direction	- Two-way stop-controlled - 10-ft median provided - Crossing 2 lanes per direction
Mid-block crossings	– 10-ft refuge island provided – RRFB's provided – Crossing a total of 5 lanes	– 10-ft median provided – RRFB's provided – Crossing 1 lane per direction	– 10-ft median provided – RRFB's provided – Crossing 2 lanes per direction

Scoring Results

The team used the design assumptions presented above to evaluate the alternatives. TM #15A presents additional evaluation details and Table 4 summarizes the scoring of the ***Comfort*** evaluation criterion.

Table 4: Comfort Criteria Evaluation

Criteria		Alternative A: 5-Lane with Signals & Two-Way Left Turn Lane		Alternative B: 3-Lane with Roundabouts & Median Control		Alternative C: 5-Lane with Roundabouts & Median Control	
		LTS Result	Evaluation	LTS Result	Evaluation	LTS Result	Evaluation
Segment PLTS and BLTS		PLTS 1/BLTS 1	HIGH	PLTS 1/BLTS 1	HIGH	PLTS 1/BLTS 1	HIGH
Major	Signals	PLTS 2/BLTS 1	HIGH	PLTS 2/BLTS 1	HIGH	PLTS 2/BLTS 1	HIGH
	Roundabouts	PLTS 2/BLTS 3	LOW	PLTS 1/BLTS 1	HIGH	PLTS 2/BLTS 3	LOW
Minor Intersections		PLTS 4/BLTS 4	LOW	PLTS 2/BLTS 1	HIGH	PLTS 2/BLTS 2	MEDIUM
Mid-Block Crossing		PLTS 1	HIGH	PLTS 1	HIGH	PLTS 1	HIGH
Summary			MEDIUM		HIGH		MEDIUM

Convenience

This criterion considers the ***Convenience*** (frequency, location, type) of crossing locations along OR 99W. It Is focused on one key quantitative performance measure: ***pedestrian crossing spacing***. The measure considers the number and convenience of crossings, based on the crossing spacing of **comfortable** crossings for all people as well as delay for crossing. While this measure is like the ***Comfort*** measure because it identifies the comfort of crossing facilities, it is distinctly different because it is focused on **where** comfortable crossings allow for permeability of the highway for people biking and walking – allowing for convenient access to destinations.

Alternatives Assumptions & Evaluation

Community feedback throughout the project indicates that RRFBs are not considered comfortable for all members of the community to use with the existing 5-lane cross section. As previously identified in the ***Comfort*** criteria section of the document, current ODOT guidance makes an RRFB the probable midblock crossing treatment to be installed on the corridor. Each alternative was scored based on whether an RRFB installation and the controls at major intersections are likely to provide a sufficiently ***Convenient*** crossing opportunity.

Alternative A: Enhanced 5-Lane with Signals

- This alternative will retain the existing 5-lane cross section for the length of Segment 2. Because the community does not favor RRFBs at midblock crossings due to a lack of perceived comfort, the treatment does not score favorably. While pedestrians may not experience delay in the RRFB's flashing and indicating a crossing desire, they must wait for motor vehicle traffic to yield. Pedestrians also may still experience delay in crossing at signalized intersections while they wait for their walk phase.
- Traffic signals provide opportunities for protected crossings, but their spacing requirements limit the number that can be achieved on the segment. OAR Rule 734–020–0470 indicates that ½-mile is the preferred signal spacing. With signals already at Crystal Lake and Alexander (approximately 2,400 feet apart), only one more signal would meet this preferred spacing (probably at Wake Robin). This is less than the number of signalized or enhanced crossings that the HDM guidance provides for the corridor context,
- Signals also will dictate the potential locations for RRFBs, due to the disruption that RRFBs can create to a progressed signal system. It is assumed that a maximum of one RRFB after each signalized intersection would be preferred.

Alternative B: 3-Lane with Roundabouts & Median Control

- This alternative will transition from a 5-lane to a 3-lane cross section north of Alexander Avenue. While the same concerns about RRFBs remain, the 3-lane segment provides a single lane to cross and a median refuge, which offers protection and likely improves the sense of comfort provided by an RRFB. Finally, the comfort of crossing one lane of conflicting motor vehicle traffic is much higher than crossing two lanes of conflicting motor vehicle traffic at either an RRFB or a roundabout.
- Spacing of roundabouts is a lesser concern than signals, as mainline progression of traffic is more readily achieved by the yield condition on all approaches. Roundabouts also represent greater flexibility to locating RRFBs because concern over signal progression is eliminated.

Alternative C: 5-Lane with Roundabouts with Medians

- This alternative will retain the existing 5-lane cross section and introduce a raised and planted median. Because the community does not favor RRFBs at midblock crossings due to a lack of perceived comfort (even with a raised median), the treatment does not score favorably. While pedestrians may not experience delay in the RRFB's flashing and indicating a crossing desire, they must wait for motor vehicle traffic to yield. Pedestrians crossing at double-lane roundabouts will have greater exposure (less comfort) than at single-lane roundabouts but, unlike at signalized intersections, they will have a median refuge for protection before crossing the other direction of travel.
- Roundabouts are more likely to manage speeds than traffic signals, making convenience similar to signalized crossings.

Scoring Results

Table 5 presents the ***Convenience*** scoring results based on the assumptions provided above. Alternative A only achieves convenient crossings at traffic signals, which are limited by performance issues and spacing guidelines. Alternative B achieves convenient crossings with each RRFB and roundabout. Alternative C has similar crossing locations to Alternative B; however, their comfort/convenience will not be equivalent to Alternative B.

Table 5: Convenience Criteria Evaluation

Criteria	Alternative A: 5-Lane with Signals & Two-Way Left Turn Lane	Alternative B: 3-Lane with Roundabouts & Median Control	Alternative C: 5-Lane with Roundabouts & Median Control
Crossing Convenience	Convenient only at signalized crossings	Convenient at all RRFBs and all single-lane roundabouts	Convenient only at roundabouts due to their benefit to speed management
Summary	LOW	HIGH	LOW

Safety

One of the primary desired outcomes of this project is to improve the **safety** of people using or crossing OR 99W. The project team have identified numerous safety concerns along the study corridor and documented them in the Roadway Safety Audit (RSA) report, TM 5 *Summary of Issues and Constraints*, TM 10 *Existing Safety and Active Transportation Inventory and Conditions*, and TM 11 *Existing Needs, Planned Improvements, Alternatives, and Recommendations.* Throughout those documents, the team has documented many recommendations that could potentially improve safety along the corridor.

This evaluation criteria uses four quantitative and three qualitative performance measures to evaluate the potential safety benefits of the proposed design alternatives:

- Quantitative:
  - Node crash reduction factor (CRF)
  - Node conflict points
  - Node crash severity
  - Crossing distance
- Qualitative
  - Speed
  - Segment conflict points
  - Segment crash severity

The quantitative performance measures summarize the results of the analysis presented in TM 15A: *Alternatives Analysis and Evaluation.* The qualitative assessment of future travel speed along the corridor is presented below.

Scoring Results

Some of the safety improvements proposed in previous memos can be incorporated along the corridor regardless of the design alternative, such as improved lighting or speed feedback signs. However, corridor cross-section or intersection control types are expected to have differing outcomes on the number and severity of crashes.

To evaluate the performance measures representing the ***Safety*** evaluation criteria, the team made the same assumptions regarding the design of the alternatives as described above in the ***Comfort*** section.

Table 6 below summarizes the scoring of the ***Safety*** evaluation criterion.

Table 6: Safety Criteria Evaluation

Criteria	Alternative A: 5-Lane with Signals & Two-Way Left Turn Lane		Alternative B: 3-Lane with Roundabouts & Median Control		Alternative C: 5-Lane with Roundabouts & Median Control	
Node CRF [1]	67%	LOW	78%	HIGH	> 67% but < 78%	MEDIUM
Segment Conflict Points	Most on a 5-lane road without refuge medians	LOW	Fewest on a 3-lane road with medians	HIGH	Less than on 5-lane road without medians but more than on 3-lane road	MEDIUM
Segment Crash Severity	Highest on roadway with highest speed and no refuge median	LOW	Lowest on a roadway with lowest travel speeds	HIGH	Medium amount on a roadway with medium speed and medians	MEDIUM
Node Conflict Points	40 (5-lane road crossing a 2-lane road)	LOW	8 (Single-lane roundabout crossing a 2-lane road)	HIGH	24 (Double-lane roundabout crossing a 2-lane road)	MEDIUM
Node Crash Severity	Highest at signals	LOW	Lowest at single-lane roundabouts	HIGH	Medium at two-lane roundabouts	MEDIUM
Crossing Distance at Major Intersections	Highest exposure due to longest crossing distance	LOW	Low exposure due to shortest crossing distance	HIGH	Moderate exposure due to multilane crossing with medians	MEDIUM
Speed	Fastest on 5-lane road with signals	LOW	Slowest on 3-lane road with roundabouts	HIGH	Medium on 5-lane road with roundabouts	MEDIUM
Summary		LOW		HIGH		MEDIUM

[1] Per TM15A, evaluates installation of a roundabout or a signal at a two-way stop-controlled intersection.

Design

The constructability of this project depends on the complexity of implementing the proposed design. The proposed corridor alternatives require distinct levels of effort to construct the design and they will have varying impacts on the adjacent properties. This evaluation criteria uses two **quantitative** and one **qualitative** performance measures:

- Quantitative
  - Right-of-way (ROW) acquisition / building impacts
  - Freight impacts
- Qualitative
  - Environmental impacts

Right-of-Way

Generally, roundabouts have larger footprints than signalized intersections unless the signalized intersection is equipped with dedicated right-turn lanes and/or dual left-turn lanes – such as at Crystal Lake Drive. For this evaluation roundabouts are assumed to have more ROW impacts. Double-lane roundabouts require larger footprints than single lane roundabouts. A wider roadway would also require more ROW than a narrower cross-section. Where ROW needs are unknown, the team used **potential impacts on nearby buildings** as a proxy for ROW acquisition.

Currently, ODOT has 80 feet of right-of-way on this segment OR 99W. Such width can accommodate up to four travel lanes, a median, and up to two turn lanes at intersections.

The Corvallis Land Development Code, referencing the Corvallis Transportation System Plan (TSP), anticipates a right-of-way width of up to 102' for a 5 lane arterial highway, plus additional width that may be required by ODOT for enhanced bike, pedestrian, or vehicle facilities. It is assumed that the additional 22+ feet would be provided with development of, and shared equally by, properties on either side of the highway. Most of this additional width is anticipated to support the construction of set-back sidewalks and landscape strips.

Freight

OR 99W is a designated state freight route per the Oregon Transportation Plan. The middle segment of the study area corridor currently provides a minimum 24 feet in the northbound direction and a minimum 28 feet in the southbound direction, measured between fixed vertical features. These minimum dimensions are of importance to the freight community and proposed reductions to them trigger a reduction review by the Mobility Advisory Committee.

The 24-foot dimension offers a two-lane design treatment that informs appropriate travel speeds, particularly within the land use contexts that this segment traverses, while 28 feet does not. Reducing the pedestrian crossing distance also leads to less delay of freight vehicles, whether at traffic signals or enhanced crossings.

Environmental

Environmental concerns include vehicle emissions, noise, amount of impervious surface, and vegetative and shade coverage, among many environmental attributes. Because traffic volumes are similar across alternatives, differences in emissions and noise occur primarily because of the start/stop conditions caused by signals and heavy congestion. Noise levels are also impacted by the same start/stop conditions, as well as the average travel speed of motor vehicles. Impervious surface is easily compared, as it can be quantified, based on number of lanes and presence of median (unless planted). Vegetation and shade are also compared, as it is either present or absent in each alternative (vegetated buffers of equal size are assumed outside of the curbs in all three alternatives).

Alternatives Evaluation

The project team made several assumptions about alternative designs to evaluate this criterion. Common to all alternatives is the intent to construct a separated bicycle facility and pedestrian facility outside of the curb lines. This will be buffered by a landscape strip between the back of curb and the bicycle facility. Unique construction requirements and anticipated vehicular performance for each alternative are briefly described below.

Alternative A: Enhanced 5-Lane with Signals

- Existing curb lines would be moved inward to reduce pedestrian crossing distances and unnecessary pavement. No additional ROW is anticipated beyond what the City would obtain through ROW dedications on proposed development.
- No building impacts are assumed.
- Major intersections will be signalized in the future when warranted and determined to be the appropriate treatment. Said intersections will provide enhanced facilities for pedestrians and bicyclists, including protected crossings and phasing.
- Planted medians will not be constructed; however, refuge islands will be provided at each RRFB/midblock crossing location. This will result in the southbound width being reduced from 28 feet to 25 feet.
- Impervious surface area will be reduced from existing conditions, as the cross section is reduced, but no planted medians are proposed.
- Future signal progression appears unlikely, resulting in stop-and-go traffic during congested periods, producing higher emissions and noise than a slow-rolling queue of vehicles controlled by roundabouts. (NOTE: The start/stop characteristic of signals occurs 24 hours a day, while rolling queues at roundabouts only occur during congested periods.)
- Average travel speeds and variation in travel speeds are estimated as highest in Alternative A, contributing to noise impacts and safety concerns.

Alternative B: 3-Lane with Roundabouts & Median Control

- Existing curb lines will be moved inward.
- The northbound and southbound widths would be reduced well below the current dimensions of 24 feet and 28 feet, respectively. (Although not evaluated, on-street parking could be provided to mitigate the impact of this width reduction.)
- Additional ROW may be needed at intersections with single-lane roundabouts, but building impacts are comparatively low relative to Alternative C.
- Major intersections will be equipped with single-lane roundabouts in the future when determined to be the appropriate treatment. Said intersections will provide enhanced facilities for pedestrians and bicyclists.
- Planted medians will be constructed.
- Impervious surface area will be substantially reduced compared to Alternatives A & B.
- Congestion during peak periods will be the highest of the three alternatives, likely with emissions similar to Alternative A (when considered throughout the day).
- Traffic noise levels throughout the day will be better than Alternative A, as speeds will be better managed than Alternative A.

Alternative C: 5-Lane with Roundabouts with Medians

- As with Alternative A, existing curb lines would be moved inward.
- Additional ROW is likely needed at intersections with double-lane roundabouts, with the most building impacts of the alternatives.

- Major intersections will be equipped with double-lane roundabouts in the future when determined to be the appropriate treatment. Said intersections will provide enhanced facilities for pedestrians and bicyclists.
- Planted medians will be constructed, reducing the southbound width from 28 feet to 25 feet.
- Impervious surface area will be slightly reduced, similar to Alternative A.
- Congestion will be approximately equal to Alternative A, due to similarities in signalization.
- Speeds and traffic flow will be slightly better managed than Alternative A and much better than Alternative B, leading to the lowest emissions among the alternatives.
- Traffic noise levels will be better than Alternative A but worse than Alternative B.

Scoring Results

The team used the design assumptions and motor vehicle performance results summarized above (and detailed in TM #15A) to evaluate the alternatives. Table 7 summarizes the scoring of the ***Design*** evaluation criterion.

Table 7: Design Criteria Evaluation

Criteria		Alternative A: 5-Lane with Signals & Two-Way Left Turn Lane		Alternative B: 3-Lane with Roundabouts & Median Control		Alternative C: 5-Lane with Roundabouts & Median Control	
Segment ROW and Building Impacts		Least ROW impact	HIGH	Some ROW impacts	MEDIUM	Most ROW impacts	LOW
Freight Impacts		Change to the southbound clearance constraint	MEDIUM	Significant change to both clearance constraints	LOW	Change to the southbound clearance constraint	MEDIUM
Environmental Impact	Emissions Impacts	Medium emissions due to start/stop	MEDIUM	High emissions due to congestion	LOW	Medium emissions due to start/stop	MEDIUM
	Traffic Noise	Highest level due to high speeds and lack of medians	LOW	Lowest level due to low speeds and presence of medians	HIGH	Median level due to medium speeds and presence of medians	MEDIUM
	Impervious Surface Impacts	Highest amount of impervious surface	LOW	Lowest amount of impervious surface	HIGH	Moderate amount of impervious surface	MEDIUM
	Vegetative Buffer	No vegetative buffer (between the curbs)	LOW	Vegetative median + potential for more outside of curbs	HIGH	Vegetated median + roundabouts	MEDIUM
Environmental Impact Summary		Highest impacts	LOW	Lowest impacts	HIGH	Moderate impacts	MEDIUM
Summary			MEDIUM		MEDIUM		MEDIUM

Cost

Cost to achieve the alternative is important. Only relative costs were available at the time of this evaluation. The team assumed that:

- ODOT would retain ownership of the current 80-foot ROW, regardless of alternative.
- The City would obtain 22 feet of additional ROW through dedications, as noted in the Land Development Code.
- Improvements would be built on the ROW centerline.
- All three alternatives result in reconstruction of curb (moving inward) and revision to stormwater inlets.
- Planted medians would be constructed in Alternatives B and C at equivalent cost.

Alternatives Assumptions & Evaluation

Alternative A: Enhanced 5-Lane with Signals

Curbs are moved inward (approximately 6 feet on each side), affecting stormwater connections. No planted medians are assumed, and all major intersections would be equipped with traffic signals, with little or no ROW requirements.

Alternative B: 3-Lane with Roundabouts & Median Control

Curbs are moved inward (approximately 17 feet) for evaluation purposes, providing for greater planted buffer outside of the curbs. ***(NOTE: Although not analyzed, on-street parking could be provided, resulting in the curbs moving inward approximately 6 feet on each side.)*** Medians are anticipated and assumed to be planted. Some ROW may be needed with some single-lane roundabouts.

Alternative C: 5-Lane with Roundabouts & Median Control

Curbs are moved inward (approximately 6 feet on each side), affecting stormwater connections. Medians are anticipated and assumed to be planted. Double-lane roundabouts will require more ROW than single-lane roundabouts.

Scoring Results

The team used the design assumptions described above to produce the ***Cost*** scoring results reported in Table 8.

Table 8: Cost Criteria Evaluation

Criteria	Alternative A: 5-Lane with Signals & Two-Way Left Turn Lane	Alternative B: 3-Lane with Roundabouts & Median Control	Alternative C: 5-Lane with Roundabouts & Median Control
Cost	Lowest cost for revising cross section and providing signals at major intersections	Highest cost due to significant change to typical cross section & intersections	Moderate cost due to change to cross section & intersections
Summary	 HIGH	 LOW	 MEDIUM

Connectedness

This category captures the ***connectedness*** of walking and biking across OR 99W. Key quantitative and qualitative performance measures include:

- Quantitative
  - Proximity of protected pedestrian crossing to transit stop
  - Percent of transit stops connected to pedestrian and bicycle routes with a level of traffic stress of 2 or better
  - Travel time
  - Mode Split
- Qualitative
  - Quality of Transit
  - Navigation for Visually Impaired Populations

The quantitative performance measures summarize the results of the analysis presented in TM 15A: *Alternatives Analysis and Evaluation* and TM 15B: *Future Alternatives Motor Vehicle Conditions Intersection Analysis.* The assessment of the quality of transit and navigation for visually impaired populations along the corridor is presented below.

Alternatives Evaluation

To evaluate the performance measures representing ***Connectedness***, the team made the same assumptions with regard to the design of the corridor alternatives as described above in the *Comfort* section in Table 3.

Each alternative intends to provide protected pedestrian crossings to each transit stop, resulting in this measure not being a differentiator. The same is true for the percentage of transit stops connected to pedestrian and bicycle routes with a level of traffic stress of 2 or better, as well as the mode split performance measure. Hence, these three measures are not considered to be differentiators across the alternatives.

Quality of transit refers to transit service along the corridor, how it is accommodated, and how it interacts with adjacent motor vehicle traffic. Transit operators prefer to remain in the travel lane during boarding and alighting, to optimize travel times and reliability; however, this delays all motor vehicles in the same travel lane. Bus pullouts allow the bus to leave the travel lane, avoiding delay to motor vehicles; the delay to buses at pullouts is minimized with the Oregon law that buses can signal the intent to enter the lane and vehicles have to yield to the bus.

Alternative A: Enhanced 5-Lane with Signals

This alternative will continue to have a similar 5-lane cross section through Segment 2 of the corridor.

- Based on the study conducted by the Transportation Planning and Analysis Unit (TPAU), installing a signal system along the corridor does not achieve signal progression benefits.
- During peak and off-peak conditions, Alternatives A and C are expected to have similar travel times, much better than Alternative B.
- Transit service is least impactful on a 5-lane cross section because vehicles in the adjacent through lane experience little to no delay.
- Navigating intersection crossings for visually impaired populations would be easier in comparison to Alternative B and Alternative C. At signalized intersections, audible aid will be available for visually impaired persons to guide them. Moreover, crossings are aligned to traverse the roadway in a straight manner.

Alternative B: 3-Lane with Roundabouts & Median Control

This alternative will transition from a 5-lane to a 3-lane cross section in Segment 2 of the corridor.

- Travel time and unreliability during peak periods along a 3-lane cross section will be noticeably higher compared to the other alternatives, due to the reduced capacity along a narrower cross section.

- Transit service along a 3-lane cross section will either require a bus pullout or the vehicle to stop in the travel lane. Stopping in lane will add delay to all through vehicles, while a bus pullout treatment often leads to delayed transit performance during congested periods.
- For this evaluation it is assumed that no audible device is installed to assist the visually impaired with crossing at roundabouts.

Alternative C: 5-Lane with Roundabouts

This alternative will continue to have a similar 5-lane cross section through Segment 2 of the corridor.

- Travel time along a 5-lane cross section with roundabouts will be better compared to the other two alternatives, as roundabouts can manage greater volumes of traffic more efficiently than traffic signals. Daily delay will be lower along a corridor with roundabouts compared to a corridor with signals that are poorly progressed.
- Transit service along a 5-lane cross section allows the vehicle to serve a transit stop along the travel lane without needing a bus pullout. Moreover, most traffic is not anticipated to be delayed by transit service along a 5-lane cross section and hence no minimal delays and drops in speed are expected.
- For this evaluation it is assumed that no audible device is installed to assist the visually impaired with crossing at roundabouts.

Scoring Results

Table 9 summarizes the scoring of the ***Connectedness*** evaluation criterion.

Table 9. Connectedness Criteria Evaluation

Criteria	Alternative A: 5-Lane with Signals & Two-Way Left Turn Lane		Alternative B: 3-Lane with Roundabouts & Median Control		Alternative C: 5-Lane with Roundabouts & Median Control	
Proximity of Protected Pedestrian Crossing to Transit Stop	**No Differentiation**					
Quality of Transit	Nominal delay to vehicles on inside travel lane; nominal delay to vehicles in outside lane, except during congested periods	**HIGH**	Delay to all vehicles following bus, two to four times each hour of transit operations	**LOW**	Nominal delay to vehicles on inside travel lane; nominal delay to vehicles in outside lane, except during congested periods	**HIGH**
Percent of transit stops connected to pedestrian and bicycle routes with an LTS of 2 or better	**No Differentiation**					
Travel Time for Motor Vehicles (daily basis)	Second best travel time because traffic signals cannot be progressed	**MEDIUM**	Worst travel time due to constrained capacity and heavy congestion	**LOW**	Best travel time due to lower delay at roundabouts	**HIGH**
Mode Split	**No Differentiation**					
Navigation for Visually Impaired Populations	At signalized intersections, audible aid will be available for visually impaired persons to guide them.	**HIGH**	At intersections with single-lane roundabouts, there is no audible assistance to guide visually impaired person, but the crossing distance is the shortest	**MEDIUM**	At intersections with multi-lane roundabouts, there is no audible assistance to guide visually impaired person, moreover, there are more lanes to cross compared to single-lane roundabouts	**LOW**
Summary	**HIGH**		**LOW**		**MEDIUM**	

Aesthetics

The ***aesthetics*** of the OR 99W corridor will vary depending on the alternatives. Due to difference in right-of-way constraints and median restrictions, the proposed corridor alternatives will have varying levels of opportunity to accommodate aesthetics, which will benefit the surroundings. This evaluation criteria uses one qualitative performance measure:

- Qualitative
  - Presence of vegetative landscaping

Per TM 11: Existing Needs, Planned Improvements, Alternatives, and Recommendations, the OR 99W corridor currently does not include a buffer strip between the roadway and the sidewalk for much of the corridor. Community members and stakeholders expressed a great desire to have more greenery along the roadway (Source: Community Input and RSA Observations).

Alternatives Assumptions & Evaluation

To evaluate the performance measures representing the ***Aesthetics***, the team made the same assumptions regarding the design of the corridor alternatives as described above in the *Comfort* section in Table 3.

Alternative A: Enhanced 5-Lane with Signals

- As mentioned in the *Design* section, this alternative will keep the current 5-lane cross section. No planted median is proposed. Only additional landscape area is proposed outside of the curbs, which is consistent across all alternatives. This alternative proposes the least amount of net new landscaping.

Alternative B: 3-Lane with Roundabouts & Median Control

- As mentioned in the *Design* section, this provides a 3-lane cross section with median control that can provide most net new landscape area. Plantings are also assumed within the central island of each roundabout. Planned improvements to the landscape buffer outside the curbs, combined with the added ROW not needed for impervious surface, allows this alternative to provide the greatest amount of net new landscaping.

Alternative C: 5-Lane with Roundabouts & Median Control

- As mentioned in the *Design* section, this alternative will provide a planted median with the 5-lane cross section. For evaluation purposes, plantings are also assumed within the central island of each roundabout. Alternative C will have more landscape area than Alternative A but much less than Alternative B.

Scoring Results

Table 10 summarizes the scoring of the ***Aesthetics*** evaluation criterion.

Table 10. Aesthetics Criteria Evaluation

Criteria	Alternative A: 5-Lane with Signals & Two-Way Left Turn Lane	Alternative B: 3-Lane with Roundabouts & Median Control	Alternative C: 5-Lane with Roundabouts & Median Control
Presence of planted areas	Least landscaping due to lack of planted medians	Most potential for wider landscape strips, planted medians, and planted roundabouts	Medians and roundabouts allow for landscaping
Summary	 LOW	 HIGH	 MEDIUM

Support

Community and stakeholder outreach has presented features of these three concepts; however, they have not seen the level of detail for each alternative that was necessary to complete this preliminary evaluation. Generally, the community has expressed support for a narrower cross section, with more enhanced crossings, better speed management, and more landscaping. However, the community has not been presented with the implications these changes would have on motor vehicle performance, diversion of traffic onto neighborhood streets, and vehicle emissions. As such, the Support criterion is not scored currently.

SUMMARY OF RESULTS

Three design concepts for the middle segment of the OR 99W corridor in South Corvallis are evaluated in this memorandum. Key findings from the future conditions analysis documented in TM #15A and TM #15B inform the evaluation of the concepts, applying quantitative and qualitative performance measures for nine unique evaluation criteria. A summary of the results is provided below:

- Based on the results from the **Equity** criterion, Alternative B achieves the best outcome. Multimodal access is improved for disadvantaged community members in the study area.
- Based on the results from the **Comfort** criterion, Alternative B achieves the best outcome with the shortest crossing distance exposure of vulnerable users to conflicting motor vehicles. The alternative also optimizes the opportunity for enhanced crossings, at intersections and midblock, due to the median and the splitter islands provided at the roundabouts.
- Based on the results from the **Convenience** criterion, Alternative B achieves the best outcome. More crossings are considered convenient than in any other alternative.
- Based on the results from the **Safety** criterion, Alternative B achieves the best outcome across the range of performance measures.
- Based on the results from the **Design** criterion, all concepts result in a medium outcome.
- Based on the results from the **Cost** criterion, Alternative A achieves the best outcome.
- Based on the results from the **Connectedness** criterion, Alternative A scores better than Alternative C, due to the assumption that audible crossing indicators are NOT provided at the roundabouts.
- Based on the results from the **Aesthetics** criterion, Alternative B achieves the best outcome with the least impervious surface area and the greatest landscaped area.
- The **Support** criterion is not yet scored, as the community and stakeholders have not been presented with technical analysis results.
- No single design concept achieves favorable scoring across all nine evaluation criteria.
- Alternatives A (5-Lane with Signals) and C (5-Lane with Roundabouts & Median) are estimated to perform best for accommodating freight vehicles, transit performance, and motor vehicle performance, and cost to construct.
- Alternative B performs best for safety, comfortable and convenient accommodation of vulnerable users, and aesthetics, based upon the evaluation criteria used for this project.

Scoring Results

Table 11 summarizes the scoring of all evaluation criteria.

Table 11: Summary of All Scoring Criteria

Criteria	Alternative A: 5-Lane with Signals & Two-Way Left Turn Lane	Alternative B: 3-Lane with Roundabouts & Median Control	Alternative C: 5-Lane with Roundabouts & Median Control
Equity	MEDIUM	HIGH	MEDIUM
Comfort	MEDIUM	HIGH	MEDIUM
Convenience	LOW	HIGH	LOW
Safety	LOW	HIGH	MEDIUM
Design	MEDIUM	MEDIUM	MEDIUM
Cost	HIGH	LOW	MEDIUM
Connectedness	HIGH	LOW	MEDIUM
Aesthetics	LOW	HIGH	MEDIUM
Support	Not Scored at This Time		
Summary	MEDIUM	HIGH	MEDIUM

CONCLUSION

Technical analysis results reported in TM #15A and #15B provide valuable insight to the evaluation process and were used to inform the alternatives in this memorandum[4]. In addition, several critical assumptions were necessary to enable the evaluation documented in this memorandum. Key insights gained from the analysis, assumptions, scoring effort, and outcomes are listed below:

- Reducing pedestrian crossing exposure improves safety for these vulnerable users but could lead to a reduction in the freight accommodation, at least in the southbound direction.
- Providing a raised median with a RRFB could lead to a reduction in the freight accommodation, at least in the southbound direction.
- Reducing the number from four travel lanes to two travel lanes has several implications, depending on where the reduction occurs and what, if any, additions or improvements to City streets are made.
    - Significant delay, queueing, and diversion of traffic occur if the lane reduction occurs north of Alexander; however, these negative results diminish the further south the lane reduction occurs.
    - Delay and queueing would be substantially mitigated, if a new north-south parallel street were constructed between Avery Avenue and Alexander Avenue, but the new street would carry motor vehicle volumes like those anticipated for a collector-level facility.
- Providing a continuous, raised, and planted median improves traffic flow, improves safety for all users along and across the facility, and improves aesthetics, but adds costs to construct and cost to maintain.
- Single-lane and double-lane roundabouts provide speed management capabilities not afforded by signals with poor progression and spacing distances as long as those considered in this evaluation. Signals with limited or poor progression can also add delay to daily system operations that would not occur at roundabouts.
- Signals can be equipped to provide protected pedestrian crossings, while roundabouts are only able to provide enhanced crossings.

Final Summary

The draft of Technical Memorandum #16 (TM #16) was reviewed and discussed with the Technical Advisory Committee (TAC), Stakeholder Advisory Group (SAG), and the Project Management Team (PMT) in June and July of 2023. Following review of written feedback from the TAC and SAG, the PMT determined that meetings with technical staff from the City of Corvallis and the Oregon Department of Transportation were critical to the process of selecting the preferred alternative. Separate meetings were held with each agency in August of 2023 to obtain final input and determine their preferred alternative and underlying rationale. Consensus across the agencies was found for a preferred alternative and affirmed by the PMT.

[4] NOTE: The alternatives described in the memorandum are different from the alternatives analyzed in Technical Memoranda #15A and #15B. Refinements have been made and additional features have been added that make these incomparable. The alternatives (Alternative A, Alternative B, and Alternative C) proposed in this memorandum were not analyzed. Per our review of the comments received and based on subsequent meetings with agency staff, only corrections have been made and all other comments are considered overridden. Please refer to the Final Summary for details.

The Agency Project Manager (APM) determined that, having reached consensus for a preferred alternative, there is no need to address comments to this memorandum that pertain to questions or calls for additional analysis of the alternatives. Thus, the preparation of this final TM #16 only addresses corrections to the presentation of information and results, as well as a limited description of the preferred alternative and its underlying rationale.

Summary of Agency Meetings

The Kittelson project team facilitated the following meetings with agency staff:

- Meeting with City of Corvallis (August 3, 2023)
- Meeting with ODOT (August 15, 2023)

The purpose of each meeting was to obtain input regarding the preferred alternative for the OR99W South Corvallis Facility Plan. Prior meetings established a list of modifications and improvements to be included in the preferred alternative for Segments 1 and 3. As such, much of the discussion was focused on Segment 2 and transitions from Segment 2 to Segment 3.

This serves as a summary of critical input provided and decisions made by each agency that informs the preferred alternative.

City Input

Vital input to the decision-making process from the City included the following topics:

- The City is open to considering short-term pilot projects to demonstrate a roadway reconfiguration, if parameters are first established for judging the effectiveness of the pilot and a plan is developed for what occurs once the pilot is over or corridor performance is degraded below allowable levels
- The City will not allow the assumption of new city streets not shown in the current Corvallis. Transportation System Plan (TSP), due to lack of funding and the implications for compliance with the Transportation Planning Rule (TPR).
- The City will not amend its current TSP to reclassify or expand existing city streets to be consistent with a higher functional classification in the South Corvallis area, due to concerns for additional motor vehicle demands on city streets and the implications for compliance with the TPR.
- The City does support the assumption that planned improvements contained in the Corvallis TSP and pertinent to the South Corvallis area will be constructed within the 20-year planning horizon
- The City lacks the certainty of funding to commit to maintaining planted medians (temporary or permanent), if provided on OR99W, between the curbs.
- The City is in favor of providing additional enhanced/protected crossings of the corridor.
- The City supports revisions to Intersection controls and treatments that result in improvements for pedestrian and bicycle crossings and/or the progression of motor vehicles along the corridor.
- The City is supportive of obtaining sufficient ROW to create a 102-ft cross-section with longitudinal pedestrian and bicycle facilities and planter strips outside the roadway curbs.

ODOT Input

Vital input to the decision-making process from ODOT included the following topics:

- ODOT will move forward with certain recommendations contained in the preferred alternative that can be accomplished with the planned and funded near-term resurfacing and restriping project.

Those recommendations include narrowing the travel lanes to create a buffer between the bike lanes and vehicular lanes and evaluating new crossing locations.

- ODOT remains responsible for ensuring the long-term capacity of the corridor and must have a facility plan that supports this responsibility.
- Without an effective network of parallel city streets to help support north-south motor vehicle travel in South Corvallis, ODOT must size OR 99W to accommodate forecast motor vehicle and freight demands at established performance thresholds.
- ODOT maintenance budgets are too constrained to support plans for planted medians unless they can be maintained by the City of Corvallis.
- ODOT is committed to providing additional enhanced/protected crossings of the corridor, where they meet planning and design guidelines and standards.
- ODOT is committed to ensuring that appropriate intersection controls are determined through analysis and provided by the responsible parties and/or agencies.
- ODOT is committed to providing pedestrian and bicycle facilities along and across OR 99W, consistent with current plans, policies, standards, and guidelines.

Appendix B documents the summary of the meetings.

Road Reorganization

A reduction in the number of vehicle travel lanes on OR 99W north of Prairie Avenue is not feasible at this time due to the inability and unwillingness to develop a complete parallel city street network. Without City agreement to accept more local trips remaining on the parallel streets or construct new parallel streets from Avery Ave. to the Tunison neighborhood south of the Mill Race, ODOT is unable to support a road reorganization except on sections where horizon year analysis shows adequate capacity and manageable queueing.

- A network of proposed new streets, generally south of Goodnight Ave., is included in the TSP. Future highway performance is dependent on these streets being constructed. The Preferred Alternative should include only those new roadways the City is committed to completing.

Additional Enhanced/Protected Corridor Crossings

The City acknowledges that community members seek additional crossings of the highway that are perceived to be safe and comfortable. In community discussions these are frequently referred to as crossings with red devices, such as traffic signals.

- Conceptually, the City is open to the idea of additional intersections on the corridor being signalized, where warranted and approved by the State. However, it is understood that future conditions analysis has shown an inability to efficiently progress traffic through a sequence of signals on Segments 2 and 3. Thus, it is understood that the opportunity for additional signalized crossings is limited and may not prove possible.
- The City remains concerned that rectangular rapid flashing beacons (RRFBs), as presently provided on the 5-lane segment of OR99W in South Corvallis, do not fully address the community's perceptions of safe and comfortable crossings.
- The City is supportive of additional enhanced/protected crossings being considered in the preferred alternative, particularly if they limit or avoid the disruption of progressed traffic.

Per ODOT, the Facility Plan should recommend locations for potential new (or relocated) enhanced crossings. The type of treatment provided at each crossing will be determined at a later time including whether it will be equipped with enhancements or protection since it is too early to stipulate what

treatment constitutes an enhanced crossing this early in the conceptual planning process. Locations on the 5-lane sections will require median islands and should consider potential impacts to horizontal clearance. Spacing of potential crossings should consider land use context, anticipated queueing areas, and pedestrian/bicycle origins and destinations (desire lines).

PREFERRED ALTERNATIVE

A decision has been made regarding the preferred alternative for the OR 99W South Corvallis project taking into consideration the above factors.

SEGMENT 1

- Intersection improvements on Western at 4th Street & 3rd Street.
- Conversion of Westbound Bypass off-ramp terminal to signalized intersection with 4th Street.
- Construction of Eastbound Bypass off-ramp to double-lane roundabout ramp terminal south of the Marys River.
- Construction of TSP-planned improvements at Crystal Lake Drive (remains signalized).
- Enhanced pedestrian crossings.
- Adding new and improving existing protected bicycle/pedestrian facilities through the interchange area.

SEGMENT 2

- Typical 5-lane cross section from Crystal Lake Drive to the vicinity between Prairie Avenue and Goodnight Avenue, with two-way left-turn lane treatment and left-turn pockets at key intersections.
- No new north-south city streets that will create a complete parallel network to the highway.
- The signal remains at Alexander Avenue, with the west leg of Alexander extended to connect with Butterfield Drive.
- Conversion of Tunison to right-in/right-out (RI/RO) only intersection with OR 99W.
- If a single-lane roundabout has been shown to provide adequate capacity at Goodnight Avenue, then assume the taper from 5 lanes to 3 lanes occurs before the intersection. If not, assume a double-lane roundabout with taper to 3 lanes south of the intersection.
- Enhanced pedestrian crossings.

SEGMENT 3

- Typical 3-lane cross section to the southern City Urban Growth Boundary.
- Single-lane roundabouts or side-street stop controls at all intersections south of Goodnight Avenue.
- Construction of TSP-planned pedestrian/bike and roadway improvements and extensions.
- No new north-south city streets beyond those in the City TSP that will create a complete parallel network to the highway.
- Enhanced pedestrian crossings.

Appendix A

ODOT Transportation Disadvantaged Index

Appendix B

Summary of the ODOT and City Meeting Notes