

MEMORANDUM

Date: April 13, 2021 Project #: 23021.19
To: Project Management Team
From: Nick Gross; Amy Griffiths, EIT; Alex Garbier, RSP; Marc Butorac, PE, PTOE, PMP
Project: Oregon City-West Linn Pedestrian and Bicycle Bridge Concept Plan
Subject: TM #3B: Benefits and Impacts Analysis

PURPOSE

This memorandum identifies the potential benefits and burdens of the five most promising potential bridge alignments with respect to user experience and health outcomes. The findings will be discussed and refined with the Project Advisory Committee (PAC), Project Leadership Team (PLT), Project Management Team (PMT), stakeholders, and the public to inform the preferred alignment recommendation.

MOST PROMISING POTENTIAL BRIDGE ALIGNMENTS

Fifteen initial alignments for a bridge dedicated to walking, biking, and rolling across the Willamette River between Willamette Falls and the I-205 Abernathy Bridge were identified. These alignments were identified based on a study conducted as part of the I-205 Improvements: Stafford Road to OR 213 Project¹ and input from meetings with the PAC, PLT, and PMT, stakeholder interviews, and tribal briefings.

Based on discussions with the PAC, PLT, PMT, and stakeholders and a feasibility screening conducted in *TM #2: Identify Crossing Alignments*, following five most promising (shown in Figure 1) were advanced by the PMT for additional consideration. These five alignments are the focus of this memorandum.

¹For more information about the I-205 Improvements: Stafford Road to OR 213 Project, visit:

<https://www.oregon.gov/odot/projects/pages/project->

[details.aspx?project=19786#:~:text=The%20I%2D205%20Abernathy%20Bridge,continue%20through%202026%2C%20pending%20funding.](https://www.oregon.gov/odot/projects/pages/project-details.aspx?project=19786#:~:text=The%20I%2D205%20Abernathy%20Bridge,continue%20through%202026%2C%20pending%20funding.)

Figure 1: Potential Bridge Alignments



BENEFITS AND BURDENS OF ALIGNMENTS

The following sections summarize the benefits and burdens with respect to user experience and health outcomes of the five most promising bridge alignments. The analysis includes consideration of the following elements:

- Sense of place and personal security
- Cultural and historic experience
- Health outcomes related to physical activity, air quality, social cohesion, and mental health

These elements identify which alignments support community needs and provide positive experiences for people walking, biking, and rolling in the study area.² Public and stakeholder input in the upcoming virtual open house, virtual public meeting, and stakeholder interviews will be used to refine the analysis of each alignment's benefits and burdens to user experience.

User Experience

A positive user experience means that the alignment and its approaches are comfortable for people walking, biking, and rolling as the experience relates to sense of place and personal security. It also considers the scenic, cultural, and historical experiences of people walking, biking, and rolling in the study area.

Sense of Place and Personal Security

"Sense of place and personal security" considers the experience of someone walking, biking, or rolling along the bridge and the personal security at the bridgeheads and along the bridge itself. Factors include:

- Bridge span length – longer spans take more time to traverse and can create a feeling of isolation.³
- Ramping – Bridge ramping can potentially reduce the sense of personal security by decreasing visibility to and from other users and nearby locations.⁴

² Compliance with Section 106 of the National Historic Preservation Act and Section 4(f) of the Department of Transportation Act (49 U.S.C. 303) will be considered separately.

³ "Increased visibility, open sight-lines, and access to police and emergency vehicles" improve sense of security and visibility. Washington Department of Transportation. *Pedestrian Facilities Guidebook*. 1997.

⁴ "Large columns or pillars create blind spots or voids which can threaten pedestrian safety and security." Source: Wisconsin Department of Transportation. *Wisconsin Guide to Pedestrian Best Practices*. 2010.

- Lighting – Lighting can improve security and social cohesion by making faces and facial expressions recognizable so that people do not feel threatened by the presence of others at night.⁵
- Activity at bridgeheads – Activity at bridgeheads improves the feeling of security by increasing the opportunities of being seen (visibility) and improving a sense of place.⁶

Table 1 compares the sense of place and personal security at each of the potential bridge alignments. All alignments are assumed to be designed with the proper lighting creating a sense of safety and security. This analysis focuses on aspects of personal security that cannot be modified or would be challenging to modify including but not limited to:

- Bridge span length,
- Ramping required,
- Lighting around the bridgeheads, and
- Activity at the bridgeheads:

Appendix “A” includes models of the potential bridge alignments.

⁵ Cariboni Group. *The Social Impact of Urban Lighting*. 2019. <https://www.caribonigroup.com/en/news/the-social-impact-of-urban-lighting/>.

⁶ More activity can help deter criminal activity and improve a sense of personal security by providing more “eyes on the street.” Source: Federal Highway Administration. *Engineering Concerns and Treatments to Improve Pedestrian and Bicycle Safety*. https://safety.fhwa.dot.gov/ped_bike/ped_cmunity/ped_walkguide/sec6.cfm

Table 1: Sense of Place and Personal Security of Potential Bridge Alignments

Alignment	Bridge Span Length ¹	Bridge Ramping Length ²	Lighting ³	Activity at Bridgeheads	Sense of Place and Personal Security
Alignment 1c: 4 th Street to Mill Street (Lower Clearance)	918 feet	517 feet	<ul style="list-style-type: none"> Lighting conditions are unknown at the bridgehead locations on both sides of the river. It is likely that current lighting is limited but would be improved with development. 	<ul style="list-style-type: none"> There is a current lack of activity at the bridgeheads on both sides of the river, which negatively impacts personal security. Planned development on both sides of the river will likely improve sense of security in the future. 	<ul style="list-style-type: none"> Alignment 1c has a current negative impact on users' sense of place and personal security approaching and traveling along the bridge. This impact would turn positive with planned development. The span length is average compared to other bridgeheads; grade change requires substantial ramping on Moores Island. There is a current lack of activity and lighting in the vicinity of the bridgeheads. This impact would turn positive with planned development.
Alignment 2b: 5 th Street to Mill Street (East)	742 feet	408 feet	<ul style="list-style-type: none"> There are several luminaires near the Oregon City bridgehead. There are luminaires near the West Linn bridgehead; however, additional lighting is desirable. Lighting would be improved with planned development on the Oregon City shoreline. 	<ul style="list-style-type: none"> There is a current lack of activity at the bridgeheads on both sides of the river, which negatively impacts personal security. Planned development on both sides of the river will likely improve future sense of security. 	<ul style="list-style-type: none"> Alignment 2b has a current negative impact on users' sense of place and personal security approaching and traveling along the bridge. The span length is relatively short; a grade change requires substantial ramping on the Oregon City shoreline. There is a lack of activity and lighting in the vicinity of the bridgeheads. This impact would turn positive with planned development.
Alignment 4a: Main Street to Mill Street (West – long)	953 feet	26 feet to 230 feet ⁴	<ul style="list-style-type: none"> There are several luminaires, particularly near the Oregon City bridgehead. 	<ul style="list-style-type: none"> This alignment has commercial activity from several stores and restaurants at the bridgehead in Oregon City. There is residential activity and commercial activity from a gas station and apartments at the bridgehead in West Linn. 	<ul style="list-style-type: none"> Alignment 4a has a highly positive impact on users' sense of place and personal security approaching and traveling along the bridge. There is some lighting and activity in the area, though more is desirable. The span is average compared to the other bridgeheads and little-to-moderate ramping is required. There is good lighting and activity at both bridgeheads.
Alignment 6: 9 th Street to Willamette Drive	894 feet	206 feet	<ul style="list-style-type: none"> There is a luminaire located at the bridgehead in Oregon City. Additional lighting is desirable. There are luminaires located near the bridgehead in West Linn, but additional lighting is desirable. 	<ul style="list-style-type: none"> There is commercial activity from a restaurant at the bridgehead in Oregon City. The bridgehead in West Linn has some activity of passing cars, but no businesses or residences are in the immediate vicinity. 	<ul style="list-style-type: none"> Alignment 6 has a neutral impact on users' sense of place and personal security approaching and traveling along the bridge. The span is average compared to the other bridgeheads and there is a moderate amount of ramping required. There is some lighting and activity in the area, though more is desirable.
Alignment 7b: 10 th Street to OR 43 (West)	1,014 feet	0 feet	<ul style="list-style-type: none"> There are luminaires located at the bridgehead in Oregon City. Additional lighting is desirable. There are luminaires located near the bridgehead in West Linn, but additional lighting is desirable. 	<ul style="list-style-type: none"> There is commercial activity from a gas station at the bridgehead in Oregon City. The bridgehead in West Linn has some activity of passing cars, but no businesses or residences are in the immediate vicinity. 	<ul style="list-style-type: none"> Alignment 7b has a neutral impact on users' sense of place and personal security approaching and traveling along the bridge. The span is long, but there is no ramping required. There is some lighting and activity in the area, though more is desirable.

¹Length measured from bridgehead to bridgehead; for more information, see *TM #2: Identify Crossing Alignments*.

²Assumes 5% ramping grade; for more information, see *TM #2: Identify Crossing Alignments*.

³Lighting conditions are based on a review of luminaire locations on Google Earth.

⁴The amount of ramping required is dependent on whether or not building(s) are demolished at the bridgehead in Oregon City. If the buildings are preserved, up to approximately 230 feet of ramping may be required.

Cultural and Historical Experience

“Cultural and historical experience” considers the experience of someone walking, biking, or rolling along the bridge and the impact to the study area. Factors include:

- Views – Views of the waterfalls, Historic Arch Bridge, and the Willamette River enhance user experience along the alignment.
- Sounds – Sounds of vehicle traffic make traveling along the bridge less enjoyable.
- Elevation changes and ramping – Greater elevation change and ramping requires more physical exertion to use, which can negatively impact user experience.
- Historic architecture – Connection to the historic active transportation network, including the municipal elevator, positively impacts user experience.
- Connection to cultural and ethnic resources – Proximity to the Falls and development south of the Historic Arch Bridge has mixed impacts.
 - An alignment closer to Willamette Falls positively impacts user experience by providing a better view of the Falls and allowing people to experience the culturally and historic significant space around the Falls.
 - Due to the proximity to culturally and historically significant land, potential negative impacts to the tribes associated with alignments are being evaluated. A review of viewshed models and preliminary conversations with tribal representatives established that all alignments are too far from the Falls to infringe on the privacy of indigenous people using the space (e.g. fishing).⁷
 - These potential benefits and burdens are still being explored through conversations with the Tribes.
 - All alignments support the development of an active transportation culture, which provides more people “with inclusivity and connection to not only destinations and opportunities, but their communities and society at large.”⁸

Table 2 summarizes the benefits and impacts related to cultural and historical experience.

⁷ Ryan Webb, Project Manager with The Confederated Tribes of the Grand Ronde, noted that “Fishing for indigenous people occurs at the Falls, therefore with Alignment 1c being the closest to the Falls but still well over 1000 ft away [he does] not see this as an issue. Especially as the Riverwalk will be closer to the fishing areas, and this issue has not been raised by any of the Tribes.”

⁸ Rails-to-Trails Conservancy. *Active Transportation Transforms America*. “The Case for Increased Public Investment in Walking and Biking Connectivity.” 2019.

Table 2: Cultural and Historic Experience of Potential Bridge Alignments

Alignment	Views from Alignment	Sounds	Elevation Change and Ramping ¹	Historic Architecture	Connection to Cultural and Ethnic Resources	Cultural and Historical Experience
Alignment 1c: 4 th Street to Mill Street (Lower Clearance)	<ul style="list-style-type: none"> Willamette Falls Historic Arch Bridge Willamette River 	<ul style="list-style-type: none"> No loud traffic sounds are anticipated along this alignment. 	<ul style="list-style-type: none"> 72-foot ground elevation difference between bridgeheads 517 feet of ramping 	<ul style="list-style-type: none"> Overlooks historic power generation and the Willamette Falls locks. Provides best connection to McLoughlin Promenade, a historic walk overlooking Willamette Falls and the Blue Heron Mill. 	<ul style="list-style-type: none"> Supports access to the culturally significant space around Willamette Falls. Supports development of active transportation culture. 	<ul style="list-style-type: none"> This alignment has some of the best views and provides access to historic and cultural resources. No loud traffic sounds are anticipated. The grade change and ramping may be challenging for some users.
Alignment 2b: 5 th Street to Mill Street (East)	<ul style="list-style-type: none"> Willamette Falls Historic Arch Bridge Willamette River 	<ul style="list-style-type: none"> No loud traffic sounds are anticipated along this alignment. 	<ul style="list-style-type: none"> 58-foot ground elevation difference between bridgeheads 408 feet of ramping 	<ul style="list-style-type: none"> Overlooks historic power generation and the Willamette Falls locks. 	<ul style="list-style-type: none"> Supports access to the culturally significant space around Willamette Falls. Supports development of active transportation culture. 	<ul style="list-style-type: none"> This alignment has some of the best views and provides access to historic and cultural resources. No loud traffic sounds are anticipated. The grade change and ramping may be challenging for some users.
Alignment 4a: Main Street to Mill Street (West – long)	<ul style="list-style-type: none"> Willamette Falls Willamette River 	<ul style="list-style-type: none"> Loud vehicle sounds are anticipated along this alignment from traffic on the Historic Arch Bridge. 	<ul style="list-style-type: none"> 49-foot ground elevation difference between bridgeheads 26 to 230 feet of ramping² 	<ul style="list-style-type: none"> Provides best connection to the historic municipal elevator. 	<ul style="list-style-type: none"> Supports development of active transportation culture. 	<ul style="list-style-type: none"> This alignment has good views and provides connection to the municipal elevator. It has moderate grade changes that are accessible for most users. The loud traffic sounds from vehicles traveling along the Historic Arch Bridge may be unpleasant.
Alignment 6: 9 th Street to Willamette Drive	<ul style="list-style-type: none"> Historic Arch Bridge Willamette River 	<ul style="list-style-type: none"> No loud traffic sounds are anticipated along this alignment. 	<ul style="list-style-type: none"> 55-foot ground elevation difference between bridgeheads 206 feet of ramping 	<ul style="list-style-type: none"> Does not provide direct connection to historic architecture. 	<ul style="list-style-type: none"> Supports development of active transportation culture. This alignment may have archaeological impacts at the bridgehead in Oregon City.³ 	<ul style="list-style-type: none"> This alignment has good views. It has moderate grade changes that are accessible for most users. No loud traffic sounds are anticipated. It does not provide direct connection to historic architecture.
Alignment 7b: 10 th Street to OR 43 (West)	<ul style="list-style-type: none"> Historic Arch Bridge Willamette River 	<ul style="list-style-type: none"> No loud traffic sounds are anticipated along this alignment. 	<ul style="list-style-type: none"> 51-foot ground elevation difference between bridgeheads No ramping required 	<ul style="list-style-type: none"> Does not provide direct connection to historic architecture. 	<ul style="list-style-type: none"> Supports development of active transportation culture. This alignment may have archaeological impacts at the bridgehead in Oregon City.³ 	<ul style="list-style-type: none"> This alignment has good views. It has moderate grade changes that are accessible for most users. No loud traffic sounds are anticipated. It does not provide direct connection to historic architecture.

¹Assumes 5% ramping grade; for more information, see *TM #2: Identify Crossing Alignments*.

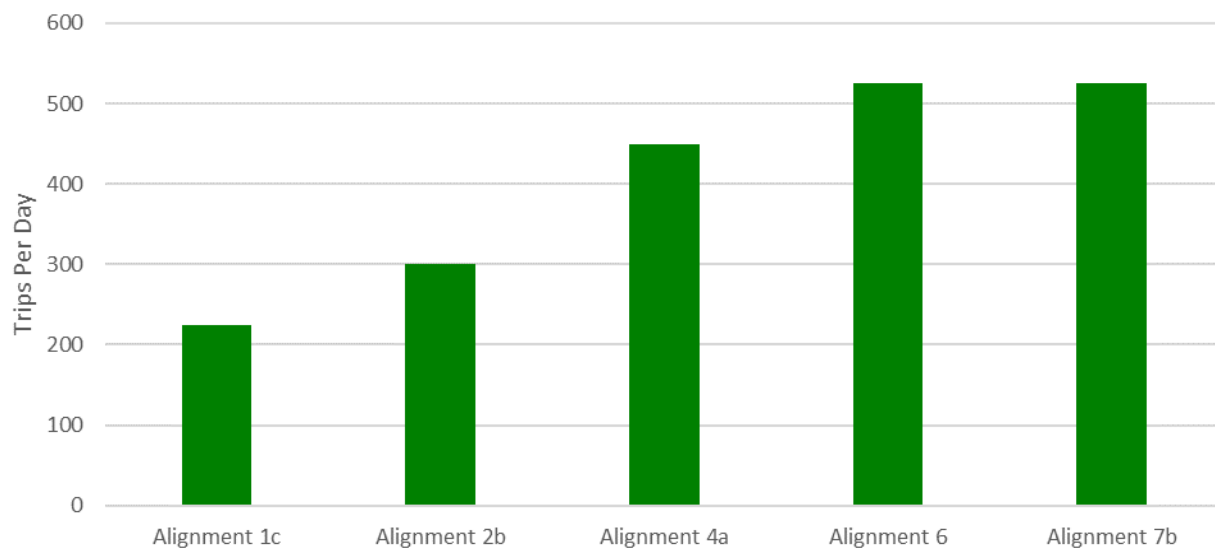
²The amount of ramping required is dependent on whether or not building(s) are demolished at the bridgehead in Oregon City. If the buildings are preserved, up to approximately 230 feet of ramping may be required.

³Additional investigation may be required to understand this impact.

Health

The benefits and burdens related to health are considered with respect to the projected increase in the active trips (e.g., people walking, biking, and rolling) and decrease in driving trips associated with each alignment. These changes are associated with physical, social, and mental health benefits from increased activity and decreased vehicle emissions. Chart 1 shows the projected mode shift from vehicular trips to active trips (e.g., walking, biking, and rolling) for each potential bridge alignment. It should be noted that a portion of active trips will continue to utilize the Historic Arch Bridge. A new bridge separated from the Historic Arch Bridge also provides the recreational benefit of creating an active loop route (similar to the green loop in Portland) including the Historic Arch Bridge.

Chart 1: Mode Shift from Vehicular Trips to Active Trips



Source: Kittelson & Associates, Inc. *TM #4: Active Transportation Analysis*.

Physical and Mental Health Benefits

Commuting by active modes, rather than by driving, has physical and mental health benefits. People who walk and bike regularly are less likely to suffer from depression, anxiety, and other mental health issues than those leading inactive lifestyles.⁹ Active commuting is directly correlated with aerobic fitness and inversely correlated with body mass index, obesity, triglyceride levels, resting blood pressure, and fasting

⁹ Sharma, Ashish et al. "Exercise for Mental Health," *Primary Care Companion to the Journal of Clinical Psychiatry*, Vol. 8,2, 2006, 106. doi:10.4088/pcc.v08n0208a.

insulin.¹⁰ Providing a dedicated walking and biking bridge accessible by low-stress routes enhances these benefits by further reducing stress and limiting exposure to vehicle pollution.

All alignments are projected to increase active commuting for people in the study area. This mode shift, and the associated health benefits, is projected to be greatest for Alignments 6 and 7b. Additional information about health benefits associated with active commuting is provided in *TM #4: Active Transportation Analysis*.

Air Quality Benefits

According to the U.S. Environmental Protection Agency, transportation is the largest contributor to U.S. greenhouse gas emissions. Transportation accounts for 28 percent of total U.S. greenhouse gas emissions.¹¹ Air pollution negatively impacts health: Acute exposure to air pollution causes upper respiratory tract irritation and aggravates asthma. Chronic exposure to air pollution is associated with reduced lung function, heart disease, and premature death.¹²

Mode shift from vehicle trips to active trips improves air quality by reducing vehicle emissions. The Oregon Health Authority recommends driving less by walking and biking to help reduce air pollution.⁹

All alignments are projected to shift over 200 trips daily from vehicle trips to active trips. As shown in Chart 1, the mode shift (and the associated air quality benefits), is projected to be greatest for Alignments 6 and 7b¹³.

¹⁰ Gordon-Larsen, P., Boone-Heinonen, J., Sidney, S., Sternfeld, B., Jacobs, D.R., and Lewis, C.E. "Active Commuting and Cardiovascular Disease Risk: The CARDIA Study." *Arch Intern Med.*, 2009, 169(13):1216–1223. Crossref, Medline, Google Scholar.

¹¹ U.S. Environmental Protection Agency. *Carbon Pollution from Transportation*. 2020.

¹² Oregon Health Authority. *Outdoor Air Quality*.

¹³ Air quality benefits for this project should be considered in other Oregon Department of Transportation projects in the study area that influence air quality.

CONCLUSION

Each alignment provides unique benefits and burdens with respect to user experience and health outcomes:

- Alignments 1c and 2b provide the greatest views: People traveling along the alignment can view Willamette Falls, the Historic Arch Bridge, and the Willamette River. These alignments may also negatively impact users' sense of security in the near-term due to the current lack of lighting and activity in the vicinity of the bridgeheads. However, future planned development, which will likely be completed in advance of bridge construction, will likely provide a comfortable and welcoming environment for users.
- Alignment 4a has the most positive impact on users' sense of place and personal security approaching and traveling along the bridge due to the existing lighting and activity in the vicinity of the proposed bridgeheads. The close proximity of the proposed alignment negatively impacts views of the Historic Arch Bridge and the loud traffic sounds from vehicles traveling along the Historic Arch Bridge may be unpleasant.
- Alignments 6 and 7b are projected to create the greatest mode shift from vehicular trips to active trips. This mode shift provides numerous health and environmental benefits. The alignments have a neutral impact on users' sense of place and personal security due to a moderate amount of lighting and activity in the vicinity of the proposed bridgeheads. These alignments do not provide as direct a connection to cultural and historic resources as the other alignments and offer no views of Willamette Falls.

Based on preliminary consideration of user experience and health outcomes, Alignments 6 and 7b are the strongest candidates for a new bridge alignment. Additional input from the public and stakeholders and consideration compliance with Section 106 of the National Historic Preservation Act and Section 4(f) of the Department of Transportation Act (49 U.S.C. 303) will provide additional context for the cultural and historic impacts of each potential bridge alignment.

NEXT STEPS

The benefits and impacts analysis has been reviewed by the PMT and updated to produce the final *TM #3B: Benefits and Impacts Analysis*.

The information presented in this memorandum, *TM #3A: Preliminary Bridge Concept Plans*, and *TM #4: Active Transportation Analysis* informs the evaluation and recommendations for the preferred crossing alignment identified in *TM #5: Executive Summary and Recommendations*.

Appendix A Bridge Alignment
Models Perspectives

Alignment 1c: 4th Street to Mill Street (Lower Clearance) and Alignment 2b: 5th Street to Mill Street (East)



Alignment 4a: Main Street to Mill Street (West – long)



Alignment 6: 9th Street to Willamette Drive and Alignment 7b: 10th Street to OR 43 (West)

