

# Memorandum

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**DATE:** April 30, 2022

**PROJECT:** 2100275- City of Sherwood Hwy 99W Pedestrian Crossing      **SUBJECT:** FINAL - Alternatives Analysis Memorandum

**TO:** Bob Galati, PE, City Engineer  
City of Sherwood      **FROM:** Curtis Vanderzanden, PE, Principal  
KPFF Consulting Engineers

**EMAIL:** galatib@sherwoodoregon.gov      **EMAIL:** curt.vanderzanden@kpff.com

## Introduction

The City of Sherwood (City) executed a contract with KPFF in October 2021 to develop and evaluate alternative alignments and structure types for a proposed pedestrian bridge over Hwy 99W near its intersection with SW Sunset Blvd and SW Elwert Rd. The bridge is intended to provide a safe pedestrian route between the neighborhoods east of Hwy 99W and Sherwood High School (SHS) and future growth areas to the west. The proposed bridge will serve as a connector between the segments of the community that are separated by Hwy 99 and is intended to serve as a gateway to the community. The goal of this effort has been to assist the City with identification of a preferred alignment and structure type and development of 30% design to better inform the City about the construction costs, permitting requirements, and timelines for delivery of construction of the bridge.

The purpose of this Alternatives Analysis Memorandum is to document the development and analysis of alternative alignments, landings, and structure types considered through this early phase of work. The alternatives analysis process has been focused on identifying how the studied alternatives respond to project goals, site restraints, and stakeholder input. The alternatives evaluation included here serves to document the decision-making process, highlight differences between the studied alternatives, and provide the City with information necessary to select the alternative and structure type that best meets the project goals.

## Executive Summary

As part of our efforts, KPFF's team reviewed a total of four alternative alignments, multiple landing alternatives, and five distinct structure types. Additional detail relating to the initial screening of alternative alignments, landings, and structure types is included in the body of this memorandum.

**City Council Work Session #1:** The design team presented four alignment alternatives, multiple landing configurations, and five alternative structure types to City Council for consideration via an online work session on February 15<sup>th</sup>, 2022. See Appendix A for materials presented at this meeting. Based on the input received from Council during the meeting, two alignments (*Options B and C*) were removed from consideration due to concerns raised about potential conflicts and aesthetic concerns. Alignment Options A1 and A2, along five structure types were carried forward to the Online Open House for further consideration.

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**Online Open House #1:** Based on feedback received from City Council, the design team modified materials for presentation to the public via an on-line open house held from February 21 to March 2, 2022. The on-line open house solicited input from the public through an on-line survey. The results of that survey indicated a strong preference for three of the five structure types. See Appendix B for additional information collected through this survey.

**City Council Work Session #2:** In response to input received from City Council and the public, the KPFF team further developed and refined alternative alignments and structure types. The design team presented two alignment alternatives and three alternative structure types for each alignment to City Council for consideration via an in-person work session on March 15<sup>th</sup>, 2022. See Appendix C for materials presented at this meeting. Based on the input received from Council at that meeting, one alignment and its associated structure types were removed from consideration resulting in selection of alternative A2 as the preferred alignment. Two alternatives for the East Landing were also included in this presentation. Council indicated a strong preference for the implementation of East Landing Option 2, which will provide more accessible slopes from the existing sidewalk to the proposed bridge resulting in the elimination of East Landing Option 1 from further consideration. Council also indicated a preference for the use of steel for the structure versus wood due to long term maintenance concerns.



Figure 1: Selected Preferred Alignment

**Online Open House #2:** The design team presented to the public via a second on-line open house the preferred alignment, Option A2, the selected East Landing alternative, Option 2, and three alternative structure types selected by City Council in work session #2. The design team also provided information about structure materials and asked for feedback on a steel versus wood structure. This second online open house was from March 23 to April 4, 2022. The results of a second survey included with the open house indicated the following:

- 62% chose the Tall Arch option as their favorite option.

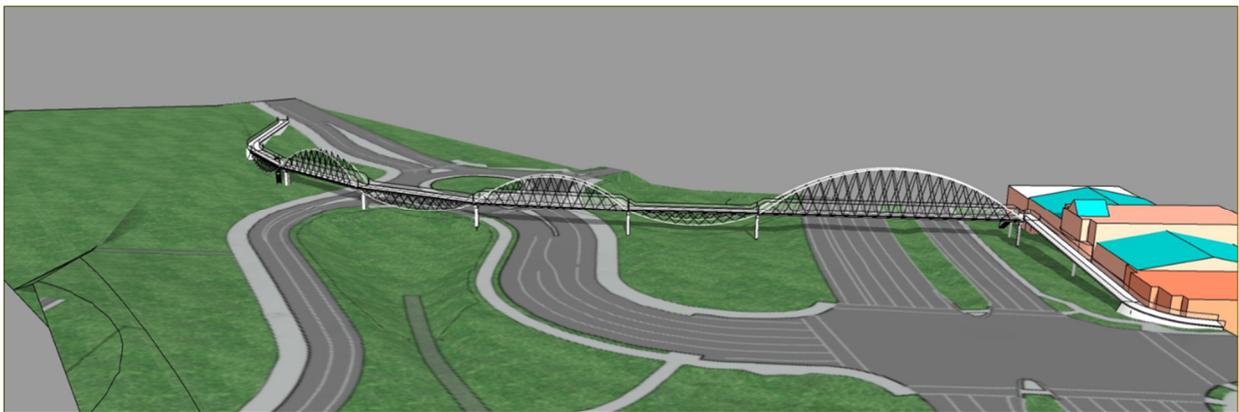
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- 28% chose Bowstring Truss as their favorite option
- Both Tall Arch and Bowstring Truss were chosen as first or second favorite option by 80% of the respondents
- 63% chose the Tall Arch with Twin Girders approach option as their least favorite option
- Participants strongly preferred a steel bridge(75%) to a wood bridge (13%)

Based on our analysis and input from City staff, City Council, and the public, **Alignment A2 (Figure 1), Landing Option 2, and the Tall Arch structure type (Figure 2) constructed with steel has been selected as the preferred alternative that will be carried into 30% design.** This scenario was selected as the preferred alternative by those responding to the second online survey and appears to be the least costly alternative under consideration.



*Figure 2: Alignment A2, Landing Option2, and Tall Arch Structure Type.*

**Next steps:** Following approval by City Council, KPFF’s team will be moving forward with development of the preferred alternative defined above to a 30% level of design over the next several months to achieve the following:

- Refine the design of the preferred alternative to incorporate additional detail,
- Finalize selection of materials,
- Better define permitting requirements and timelines,
- Refine construction cost estimates, and
- Set the stage for development of Final Design, Bid and Construction.

## **Alternatives Considered**

The design team prepared and analyzed multiple alternatives before settling on the three alternatives presented in this analysis. A narrative description of each alternative is provided in the following sub-sections and a graphical representation of each alternative is provided in the exhibits attached to the memorandum in the various appendices.

**Initial Screening:** The following documents the initial screening of alternative alignments and structure types presented in the team’s first work session with City Council on February 15, 2022. See Appendix A for the materials presented at the work session.

## Alignment Alternatives:

- **Alignment Option A:** This option most closely resembles the alignment included in an earlier study completed for the City by DKS Associates. The alignment incorporates an elevated walkway starting at the northeast corner of the Hwy 99W and SW Sunset Blvd, extending north. It would place the main bridge span over Hwy 99W approximately 350-feet north of the intersection with SW Sunset Blvd and SW Elwert Rd. Multiple spans of additional bridge would extend from Hwy 99W over the roundabout on SW Elwert Rd, ultimately landing on SHS property.

The landing alternatives for Option A included variations of a widened 'plaza' landing at the corner of Hwy 99W and SW Sunset Blvd, featuring seat walls and landscaped areas that could serve as a wayfinding location. The landing on the west end on SHS features a node where path connections would provide a stair access to SW Kruger Rd and an ADA accessible pathway to SW Elwert Rd to the north. Terraced walls would provide the grade separation required for the node to meet the elevation of the bridge while also providing an opportunity for unique landscape architecture.

*This alignment option was forwarded for further consideration to the first on-line open house.*

- **Alignment Option B:** The second alignment studied featured a curved alignment over Hwy 99W that began just north of the NE corner of the intersection of Hwy 99W and SW Sunset Blvd. An elevated switch-back ramp system running parallel to Hwy 99W adjacent to the face of the YMCA provides the elevation gain to reach an adequate clearance for the bridge over Hwy 99W. The curved structure alignment continued over existing stormwater management facilities with additional bridge spans over SW Elwert Rd and SW Kruger Rd before landing on the SHS property, similar to Alignment A.

*This alignment was dropped from further consideration based on input from City Council prior to the first on-line open house. This was primarily due to concerns over the visual impact of the massing of the proposed east landing area which would require a series of switch back ramps to achieve the necessary vertical clearance for the proposed structure.*

- **Alignment Option C:** This option shifted the Hwy 99W bridge to south of the intersection of Hwy 99W and SW Sunset Blvd, with the bridge launching from the southeast corner of SW Sunset Blvd. A ramp system would be provided in the open space on the southeast corner of this intersection before the main bridge span crosses Hwy 99W just south of the intersection. The alignment then follows the east edge of SW Kruger Rd, ramping down on a boardwalk-type supported structure to meet sidewalk grade at the southwest corner of the roundabout, connecting to the existing sidewalk.

*This alignment was dropped from further consideration based on input from City Council prior to the first on-line open house. This was primarily due to concerns over the visual impact of the massing of the proposed east landing area and more significantly, the fact that this alternative would require an at grade crossing for pedestrians and cyclists at Krueger Rd., south and west of the roundabout.*

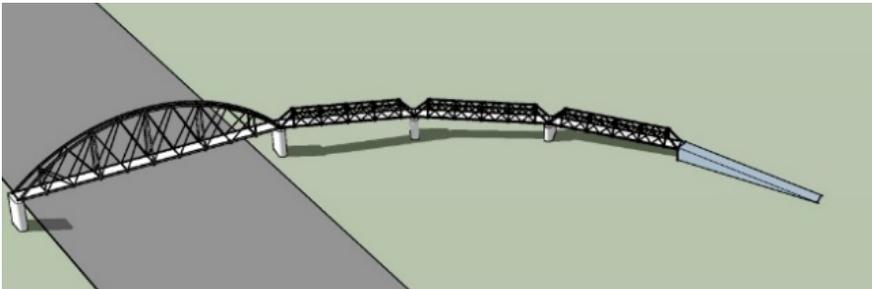
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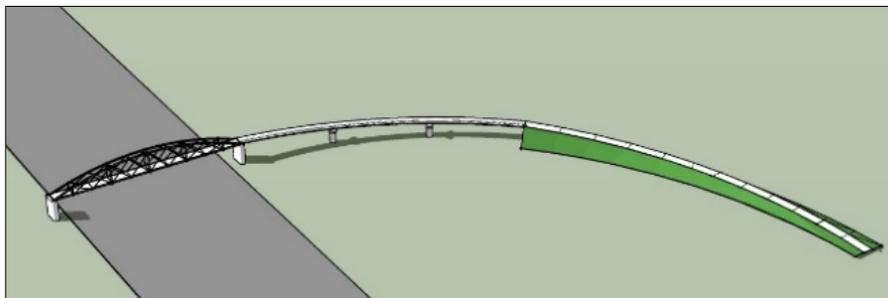


**Structure Types:** The team presented a total of five alternative structure types to City Council at our first work session including:

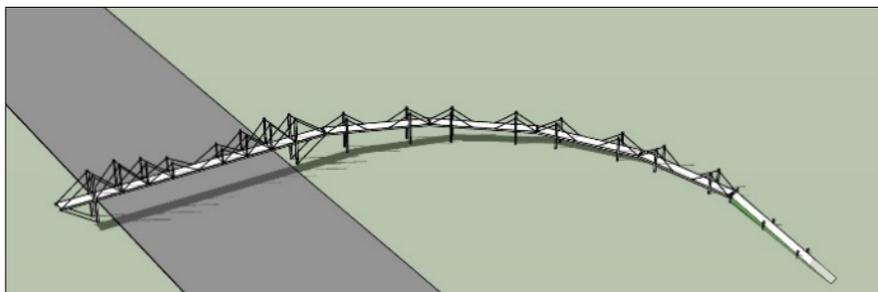
- **High Arch Truss:** The primary span across Hwy 99W is formed by a pair of forty-foot-tall arches inclined slightly inward on either side of a pedestrian deck that ties them together at their base. This type of tall tied arch (aspect ratio 1:5 = height : span) makes efficient use of material, thereby requiring less steel or wood than other options studied. The shorter approach spans to the west of the highway could be tied arches, through trusses (shown) or twin girders.



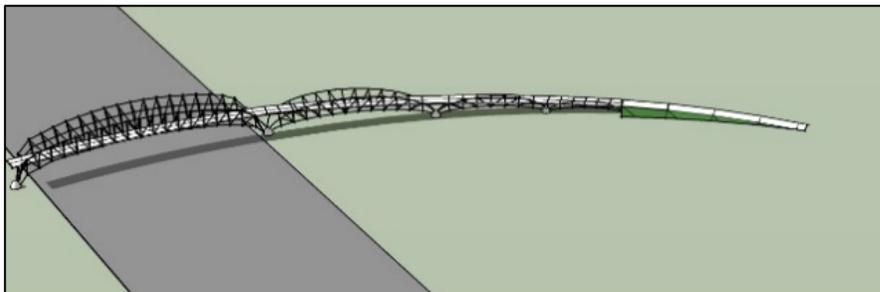
- **Bowstring Truss:** The primary span across Hwy 99W is a twenty-foot-tall through-truss structure with a curved upper cord, giving it a characteristic bowstring form, and a pedestrian deck running through the middle of the truss itself. This structural type is not as tall as the High Arch option (1:10= height: span), making it less efficient and requiring more steel or wood. The shorter approach spans to the west of the highway could be tied arches, through trusses or twin girders (shown).



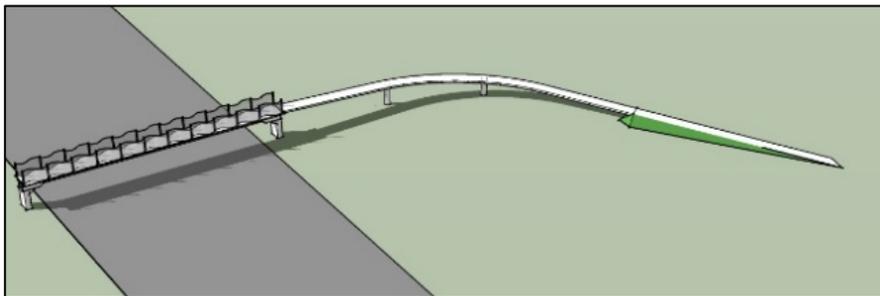
- **DaVinci Truss:** The DaVinci Truss spanning Hwy 99W uses a staggered kingpost and crossed tension cable system to support the deck. This structural type is an unusual bridge form, and a version of it appears in one of Leonardo Davinci's sketchbooks. The shorter approach spans to the west of the highway could be kingpost and tension cable spans (shown), tied arches, through trusses or twin girders.



- **Curved Triangular Section Truss:** The curved triangular truss is a structural type that can be curved in plan and uses its triangular cross-sectional form to help resist the unique forces imposed by that curvature. The truss form could also be designed to extend to the ground at the ends of the span, eliminating the need for separate vertical pier elements of the type shown in the other options. The curved triangular section truss of the main span could be repeated in smaller versions on the approach spans, creating a continuous curve in plan and a series of elegant, growing trusses that culminate in the main span.



- **Twin Girder:** The primary span across Hwy 99W is a pedestrian deck supported on top of a pair of girders to create a visually simple bridge. The required depth of the girders would push the height of the deck in this option slightly higher than other options with more of the structural system above the deck. The signature aspect of this visually simple bridge form would need to be created via an art installation that would be integrated into the main span railing. The approach spans could also be made on twin girders and could be curved in plan (shown).



*All structure types were forwarded for further consideration to the second on-line open house.*

**Secondary Screening:** The following documents a second round of screening of alternative alignments and structure types presented in the team's second work session with City Council on March 15, 2022. See Appendix C for the materials presented at the work session. The refined alternatives were based on feedback received from the City Council and the public through the on-line open house.

**Alignment / Landing Alternatives:** The design team developed two alternative alignments for further review in this secondary screening process including:

- **Alignment Option A1:** Based on feedback from the previous City Council meeting, alignment A1 is an advancement of the design of Option A outlined above. The alignment was modified to be centered on the SW Elwert Rd. roundabout which would allow for the placement of an additional bridge pier

to reduce costs. Other modifications include a new stair connection from the sidewalk along the east side of Hwy 99W to the bridge, connecting pedestrians from the residential area to the north, and further revisions to the landings at both ends of the bridge. A conceptual landing sketch and massing perspective for the landings can be found in Appendix C.

*This alignment option was removed from consideration based on input received from the City Council due to higher estimated construction costs and it being less desirable as a gateway / signature structure. It also included additional risks associated with relocation of several large underground utilities within the roundabout on SW Elwert Rd.*

- **Alignment Option A2:** Alignment Option A2 has a similar landing configuration at the northwest corner of Hwy 99W and SW Sunset Blvd as Option A1, however, the bridge span over Hwy 99W is located approximately 200' north of the intersection, rather than the 350' seen in A1. The reduced ramping distance in A2 does limit the structure type due to vertical clearance requirements over Hwy 99W but allows for an alignment that can cross SW Elwert Rd and SW Kruger Rd south of the roundabout. In this option a curved segment of the alignment passes south of the roundabout with two proposed bridge piers located in the upper edges of the existing City-owned stormwater management facility located between SW Elwert Rd and SW Kruger Rd.

The landing at the corner of Hwy 99W and SW Sunset Blvd features a stretch of sidewalk that wraps further southeast along SW Sunset Blvd, increasing the length of connection and allowing gentler longitudinal slopes that fit within ADA requirements without the need for a series of ramps and landings. A paved entry with landscape walls, plantings, and a short stair will connect the existing sidewalk at the intersection corner to the proposed bridge approach ramp. Like Option A1, an additional stair connection is proposed from the bridge deck to the existing sidewalk on Hwy 99W. As the bridge lands at SHS there is a widened pavement area providing an overlook and node where one path will continue north to the existing multi-use path on SW Elwert Rd and one path will split to the south, providing a connection to the multi-use path on SW Kruger Rd, serving multiple directions of potential user destinations. Conceptual sketches and massing diagrams for the landings are provided in Appendix C.

*This alignment option was forwarded for further consideration to the first on-line open house.*

**Structure Types:** After a preferred alignment was selected, the design team developed concepts for three different structural types based on preferences emerging from the initial structural type concepts.

- **High Arches Alternating with Inverted Arch Truss:**

The primary span across Hwy 99W is formed by a pair of forty-foot-tall arches inclined slightly inward on either side of a pedestrian deck that ties them together at their base. The spans across SW Elwert Rd and SW Kruger Rd are smaller versions of this tall arch, with the intervening spans across open spaces designed as trusses with curved bottom cords to resemble “upside down” arches.



In this approach, the inherent material efficiency and cost effectiveness of a tall arch form is exploited across the length of the entire structure. The net effect is the appearance of a single, undulating structure that increases in arch size from the west, culminating in the primary span across Hwy 99W.

- **Alternating Upright and Inverted Bowstring Trusses:**

The primary span across Hwy 99W is a twenty-foot-tall through-truss structure with a curved upper cord, giving it a characteristic bowstring form, and a pedestrian deck running through the middle of the truss itself. The spans across SW Elwert Rd and SW Kruger Rd are smaller versions of this bowstring truss, with the intervening spans across open spaces designed as inverted Bowstring Trusses.



The material efficiency of the Bowstring Truss is lower than that of the tall arch, resulting in slightly more material required and additional cost. The net effect is the appearance of a single, undulating structure along the full length of the bridge alignment at a more modest structural height than the High Arch option.

- **High Arch Main Span with Twin Girder Approach:**

The primary span across Hwy 99W is formed by a pair of forty-foot-tall arches inclined slightly inward on either side of a pedestrian deck that ties them together at their base. The approach span is a bridge deck carried on a pair of simple girders which could follow a curved path.



The tall arch main span is a materially efficient and cost-effective structural type, while the twin girder approach span is slightly less so. This bridge option features a signature arch form at the main span across Hwy 99W accompanied by a visually quiet and simple approach span.

## **Evaluation Criteria**

The project team developed evaluation criteria to use for comparing the various alternatives under consideration. The following evaluation categories were chosen to identify advantages and disadvantages between the alternatives.

**Safety Improvement** – This category evaluates how effective the alternative eliminates or reduces conflicts between vehicles and people walking, biking, or rolling.

**Connectivity**– This category is intended to examine how well the alignment integrates the proposed crossing with existing and planned trail networks in Sherwood and across Hwy 99W.

**Accessibility** – This category evaluates how well the proposed alternative ensures crossing opportunities for people of all abilities.

**Desirability** – A measure of the alignments ability to minimize out of direction travel between the YMCA and SHS properties.

**Utility Impacts** – This category evaluates impacts to existing underground and overhead utilities.

**Environmental** – This category examines each alternative’s impacts to known or suspected environmentally sensitive areas and potential environmental permitting considerations.

**Signature Structure Potential** – The ability for the selected bridge type to create a signature look that is uniquely identifiable to Sherwood.

**Gateway Design Potential** – Creating a structure that signifies to Hwy 99W users that they are entering or leaving Sherwood.

**ROM Construction Cost** – Relative Order of Magnitude (ROM) construction costs including utility relocation and estimating contingency.

A summary of how Alignment Option A2 and the alternative structure types compare against the evaluation criteria provided in Table 1, below.

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TABLE 1: Alternative Evaluation Matrix

Goals	Alignment A2		
	Bridge Type		
	Tall Arch Main Span / Arch Approaches	Bowstring Truss Main Span and Approaches	Tall Arch Main Span / Twin Girder Approaches
<b>Safety Improvement</b>	The alignment eliminates all pedestrian crossing conflicts between Hwy 99W and SHS.		
<b>Connectivity</b>	The alignment provides direct connection between the YMCA, SHS, and the multiuse trail on SW Elwert Rd and SW Kruger Rd.		
<b>Accessibility</b>	All approaches to meet ADA.		
<b>Desirability</b>	Most direct route (1280' total route length).		
<b>Utility Impacts</b>	Overhead utility line adjustments and coordination with utilities required.		
<b>Environmental Impacts</b>	Moderate potential for wetland and/or vegetated corridor impacts.		
<b>Signature Structure Potential</b>	High (Bridge would be unique to Sherwood)		Moderate (Similar bridges exist in NW)
<b>Gateway Design Potential</b>	All alternative structure types allow for a high gateway design potential.		
<b>ROM Construction Cost</b>	\$13M	\$14M	\$13M

**Environmental considerations for selected alternative:** Wetlands and vegetated corridors were delineated in the vicinity of the proposed pedestrian bridge for previous projects. Portions of these wetlands and vegetated corridors were impacted by these previous projects and mitigation was provided. Based on a field visit, it appears that there is currently the potential for wetlands and their associated vegetated corridors (wetland buffers) in the vicinity of the north end of the proposed bridge in the general area of the previously delineated and impacted wetlands and vegetated corridors. In addition, there is the potential for wetlands and vegetated corridors between Hwy 99W and SW Elwert Rd.

The project team will coordinate with the relevant regulatory Agencies to determine potential permitting and mitigation requirements given the complicated history of prior disturbance and mitigation for previous impacts at this site and the possibility of wetlands and vegetated corridors that may have persisted in this area. Overall, the preferred alignment has a moderate to high potential for wetland and/or vegetated corridor impacts that may trigger the need for environmental permitting and mitigation.

**Impacts to Sherwood High School (SHS):** Throughout the development of the alternatives the design team has coordinated with the School District to ensure the alternatives meet the safety goals of SHS and the bridge and approaches aesthetically complement the new school campus. A primary concern voiced by District representatives is maintaining a secure campus perimeter and the designed alignments intentionally do not provide direct access or egress to campus pathways. The landings on the SHS property have been designed to connect to the existing multi-use pathways on SW Kruger Rd and SW Elwert Rd, leading to

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primary SHS entry points rather than mid-campus entries. As the design is further developed, we will continue to focus on implementing design features that discourage off-trail pedestrian access to the school property.

The School District has also requested that consideration be given in the selection of a preferred alternative to how the structure would impact views of the high school and views of Mt Hood from the observation windows on the second floor of the building. The following two figures show perspectives of the proposed bridge from several locations.



*Figure 3 - View of High School from northbound Hwy 99W at SW Sunset Blvd intersection.*



*Figure 4 - View of High School from SW Elwert Rd, south of roundabout.*

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As shown in Figures 3 and 4 above, while the proposed structure is certainly visible for vehicles approaching from the south on Hwy 99W looking toward the high school, we do not believe that the impact is a negative one and may serve to draw the eye to the high school building.

Figure 5, below, taken from a snapshot in Google Earth shows that the Alignment Option A2 (in red) will not interfere with the view corridor (light blue) to Mt Hood from the face of the building.

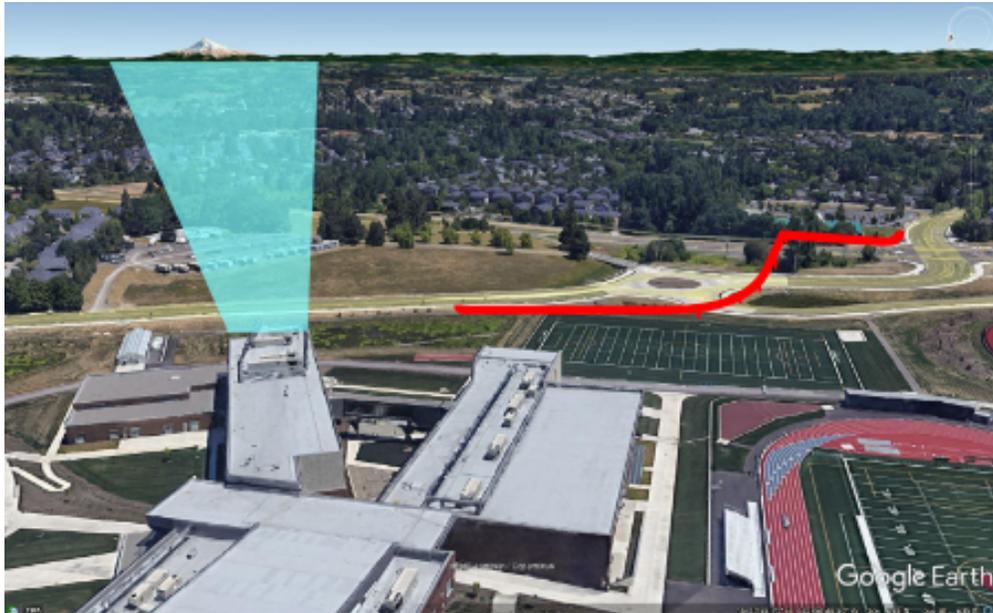


Figure 4 - View of Mt Hood from SHS

**Construction Costs:** The design team prepared relative order of magnitude estimates of construction costs for each of the structure options associated with alternatives A1 and A2. The detailed estimates used to evaluate the costs of the alternatives are provided in Appendix E – Preliminary Construction Costs.

**Alternative A1.1 – High arch main span with twin girder approaches (\$14m)**

Alternative A1.1 represented the lowest of the A1 options.

**Alternative A1.2 – Bowstring truss with twin girder approaches (\$15m)**

Alternative A1.1 represented the highest of the A1 options.

**Alternative A1.3 – Twin girder for all spans (\$15m)**

Alternative A1.1 represented the second highest of the A1 options.

*The A1 alternatives were removed from consideration after the second City Council meeting but are provided here for a comparison in costs to the A2 alignment which was selected as the preferred alignment.*

**Alternative A2.1 – Alternating tall arch main span and approach spans (\$13m)**

Alternative A2.1 represented the lowest cost of the A2 options, and the lowest total cost of all alternatives studied.

**Alternative A2.2 – Alternating bowstring main span and approach spans (\$14m)**

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Alternative A2.2 was the most expensive A2 alternative but was less expensive than any of the A1 alternatives.

## **Alternative A2.3 – Tall arch main span with twin girder approach spans (\$13m)**

Alternative A2.3 represented the middle cost within the A2 alternative.

## **Alternative Analysis and Results**

Ultimately all the bridge options for alignment A2 resonated with the design criteria and goals for this project outlined in Table 1, above. Due to the nature of the alternatives analysis process for this project, with multiple rounds of refinement and feedback from City staff and City Council, several alternative alignments and structure types were reviewed and removed from consideration at key points during the process. This process led to selecting the A2 alignment with three potential structure types that could be paired with the preferred alignment.

The largest distinction between the bridge types came down to the preliminary construction costs and potential for the bridge to be a signature structure for the City. The alternative featuring tall arch main spans and alternating arch approach spans was evaluated to be the lowest cost of the options while also presenting a high signature structure potential. Input gathered from Open House #2 indicated strong support for the steel alternating arch bridge design as a signature design that will serve as a gateway to Sherwood.

*Attachments: Appendix A – First City Council Presentation Materials  
Appendix B – Open House #1 Survey Results  
Appendix C – Second City Council Presentation Materials  
Appendix D – Open House #2 Survey Results  
Appendix E – Preliminary Construction Costs*

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# Sherwood Hwy 99W Pedestrian Bridge Project

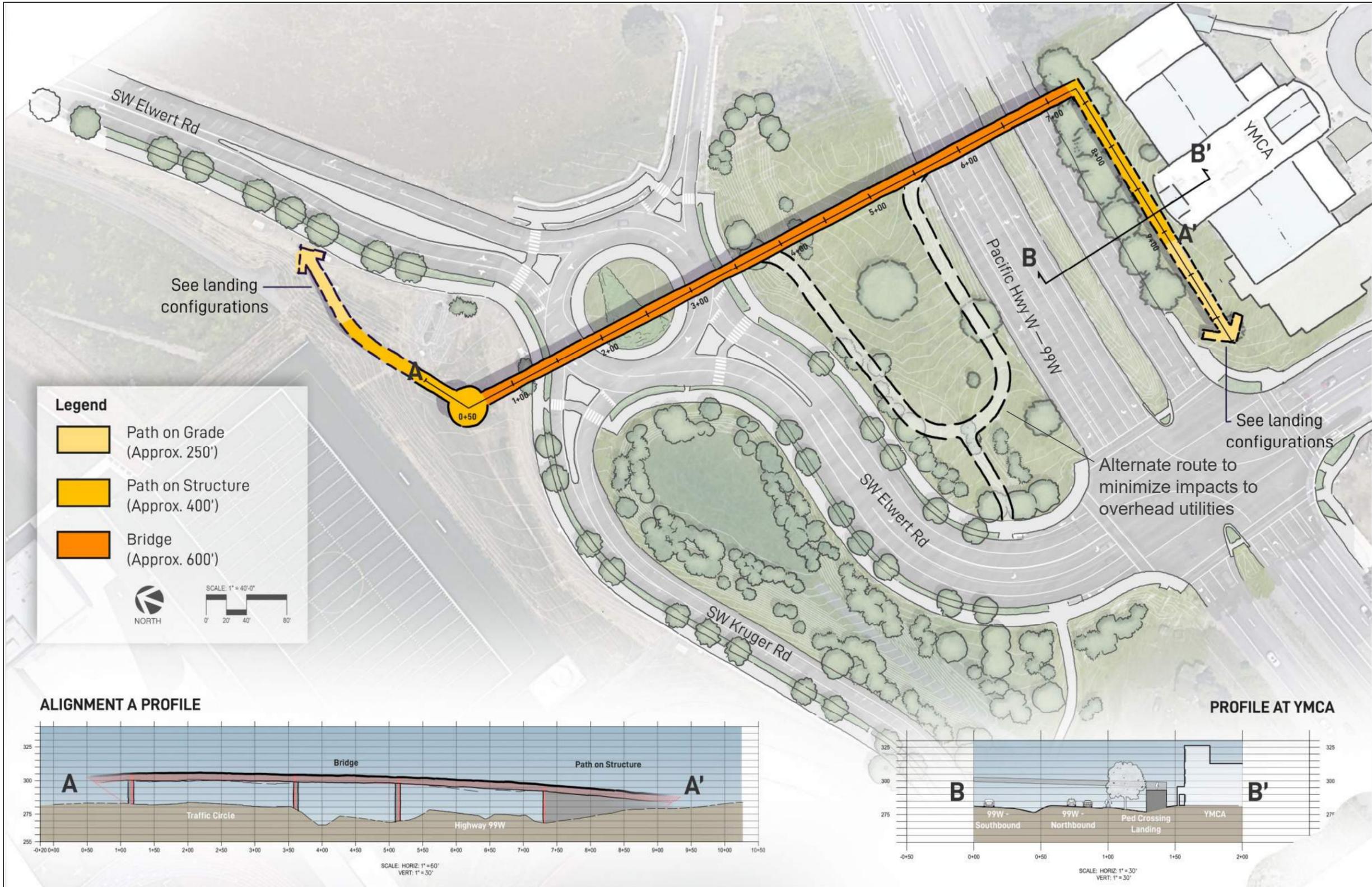
Sherwood City Council Meeting

February 15, 2022



# Agenda:

- Introductions
- Meeting Goals:
  - Provide update to City Council on progress made and solicit input on changes to presentation materials before Online Open House.
- Project Background
- Current work efforts
- Alternative Alignments and Landings
- Bridge Type Alternatives
- Preliminary Alternatives Comparison
- Next Steps
- Open Forum

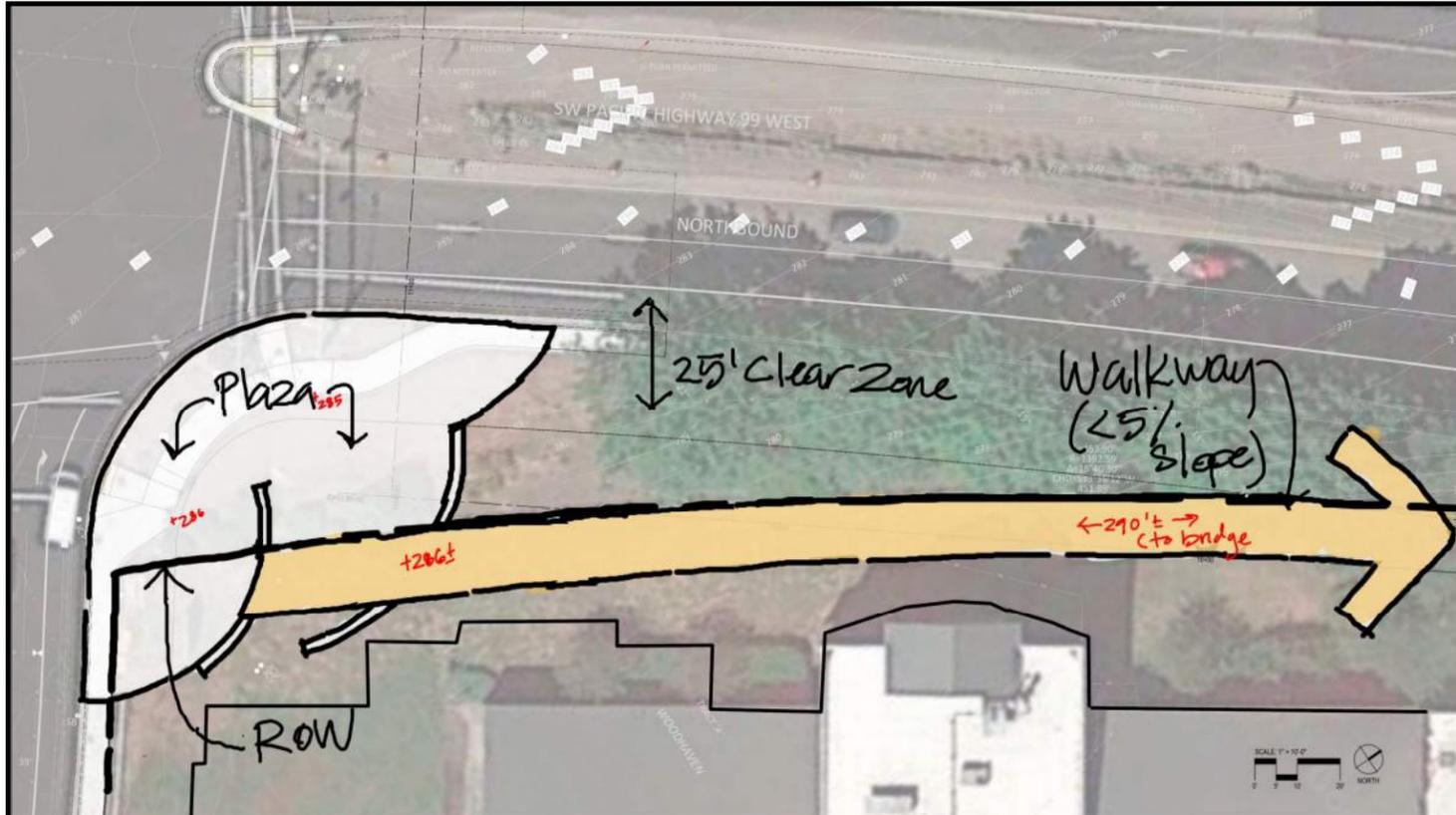


HWY 99W PEDESTRIAN BRIDGE PROJECT

Alignment Option A

City of Sherwood

Hwy 99W Pedestrian Bridge Project



plan view

massing perspective

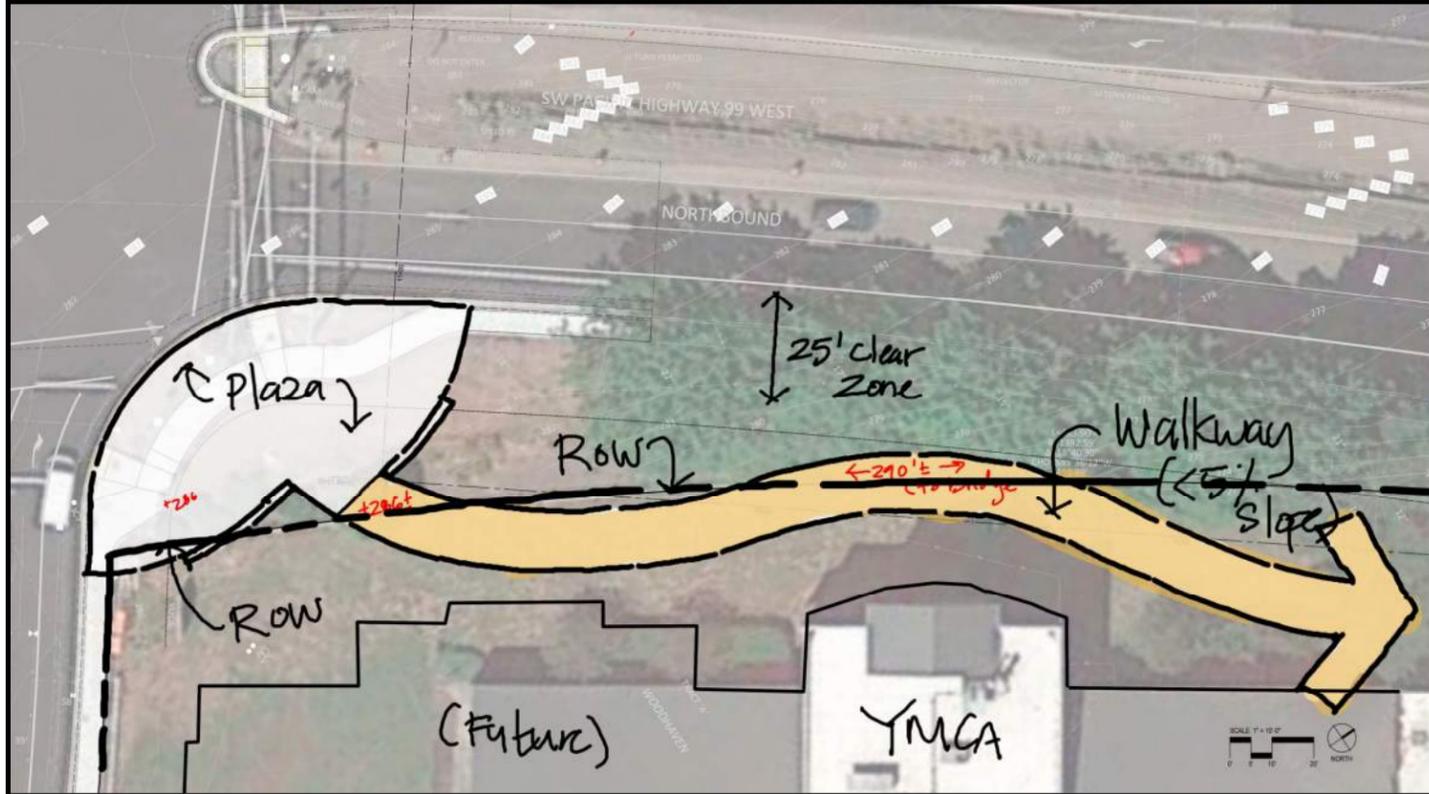


99W Landing A1 Configuration

HWY 99W PEDESTRIAN BRIDGE PROJECT

City of Sherwood

Hwy 99W Pedestrian  
Bridge Project



plan view



massing perspective

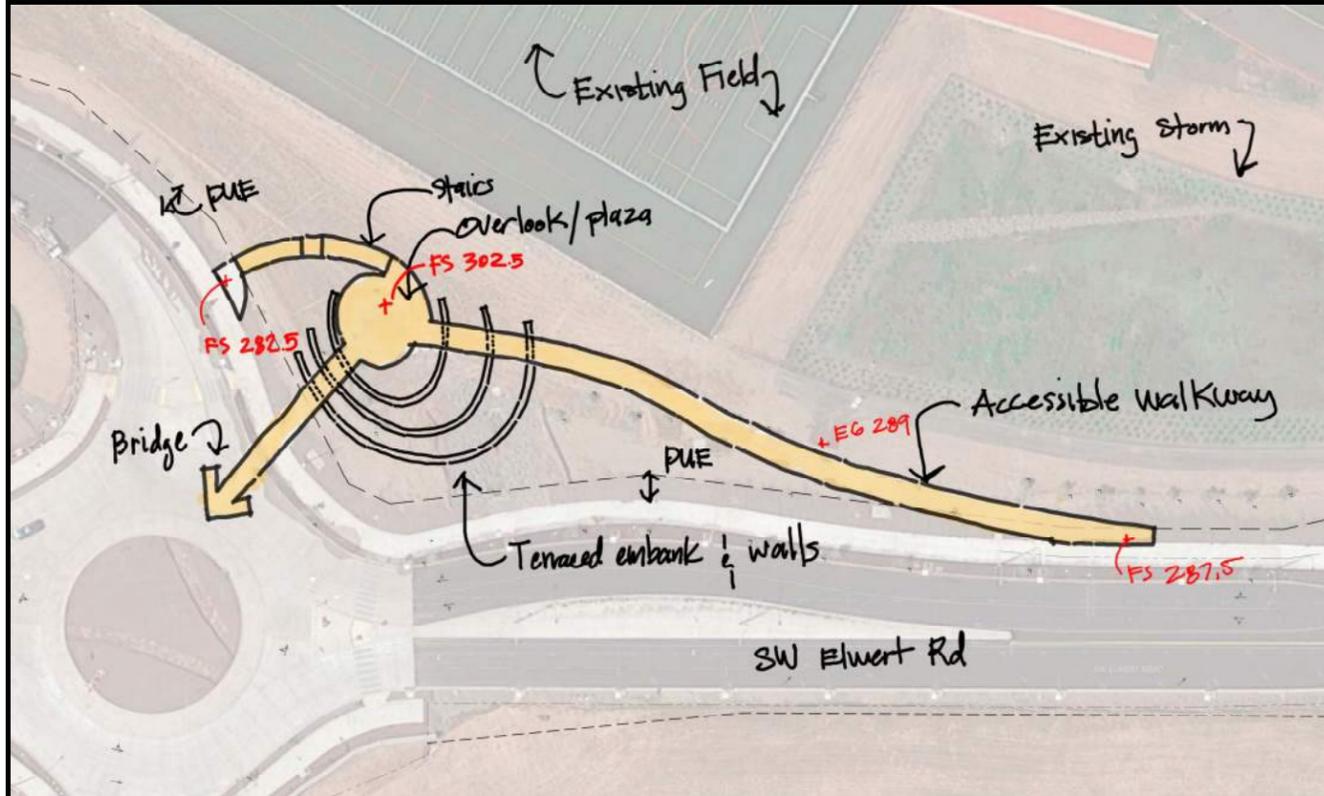


99W Landing A2 Configuration

HWY 99W PEDESTRIAN BRIDGE PROJECT

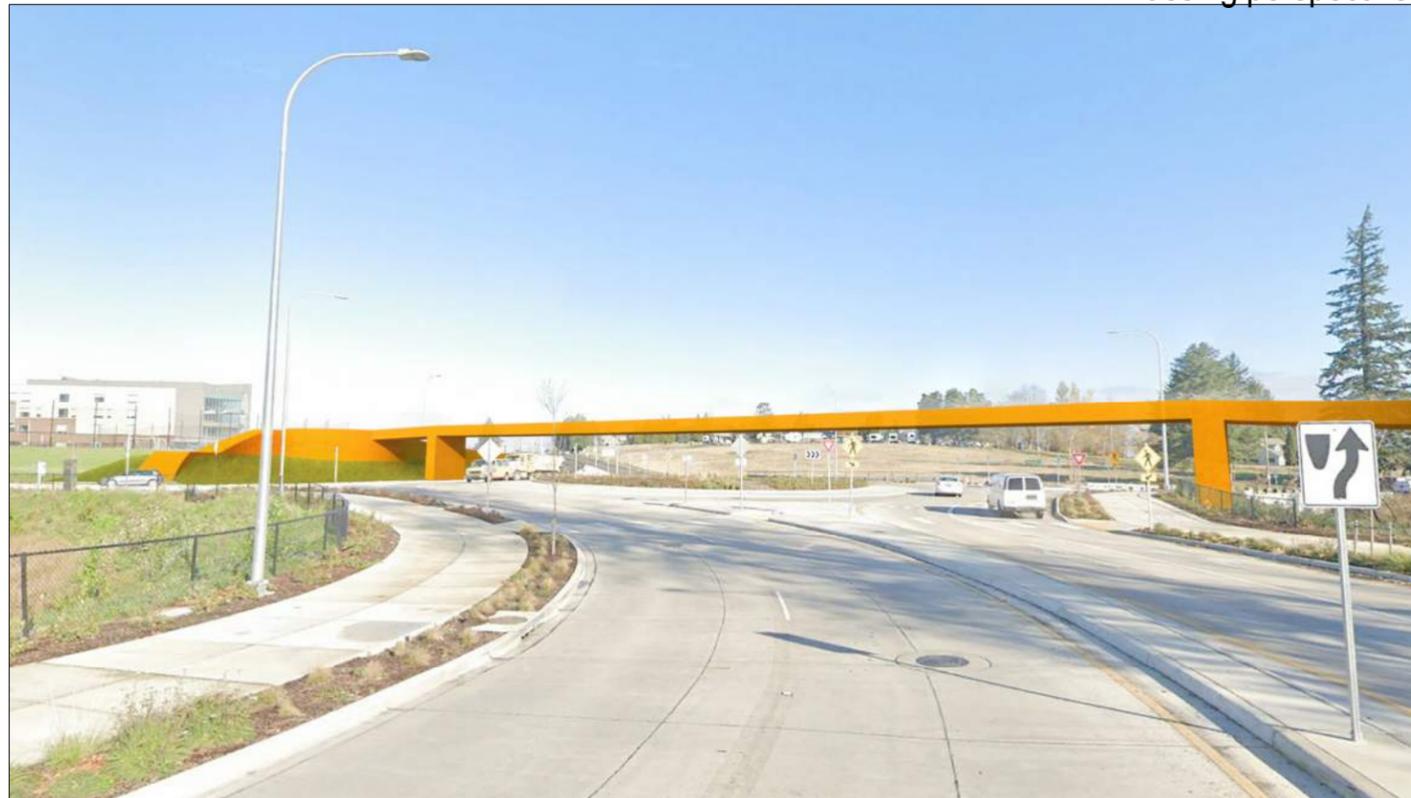
City of Sherwood

Hwy 99W Pedestrian  
Bridge Project



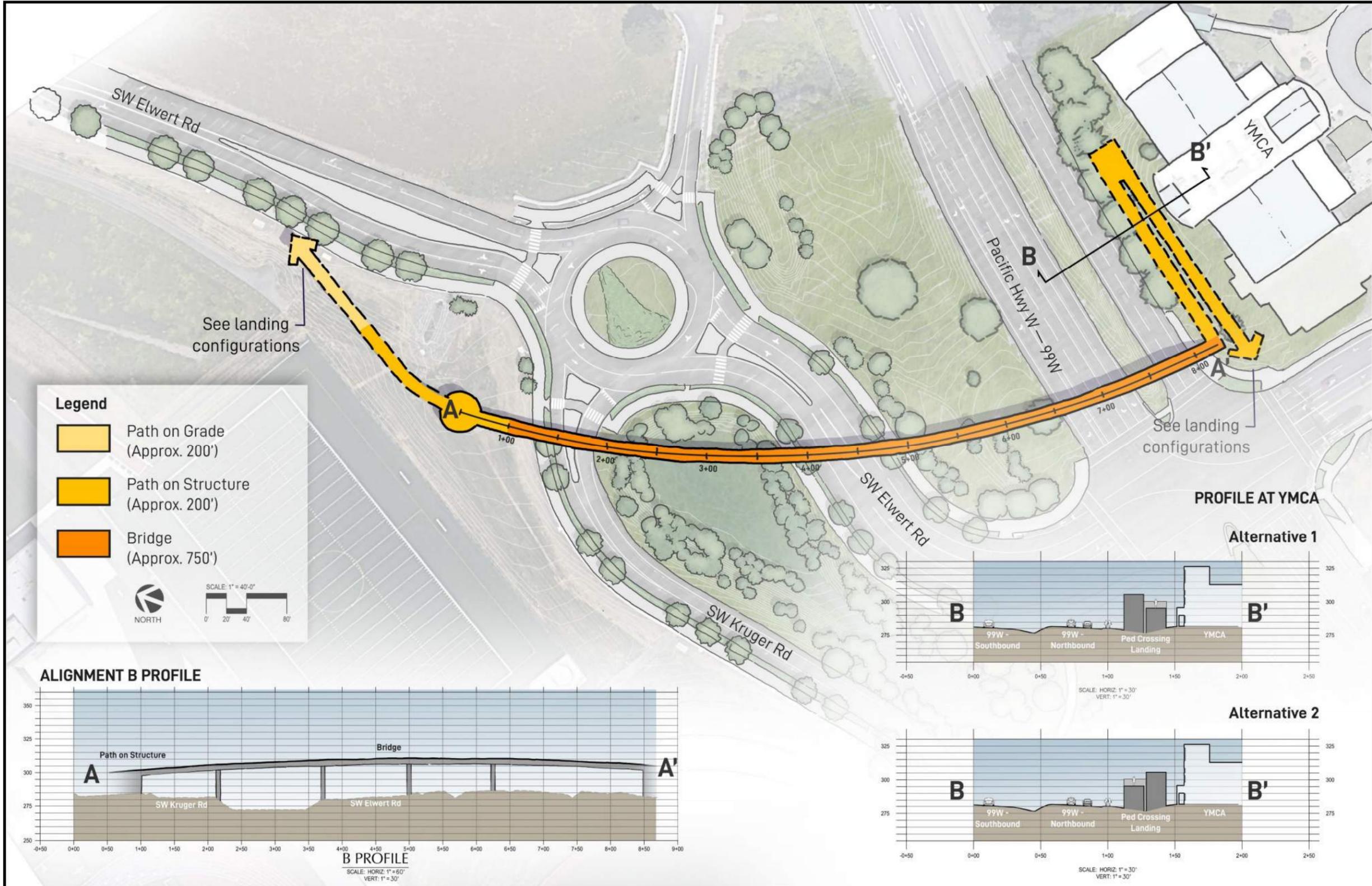
plan view

massing perspective



High School Landing A1 Configuration  
HWY 99W PEDESTRIAN BRIDGE PROJECT

City of Sherwood  
Hwy 99W Pedestrian  
Bridge Project



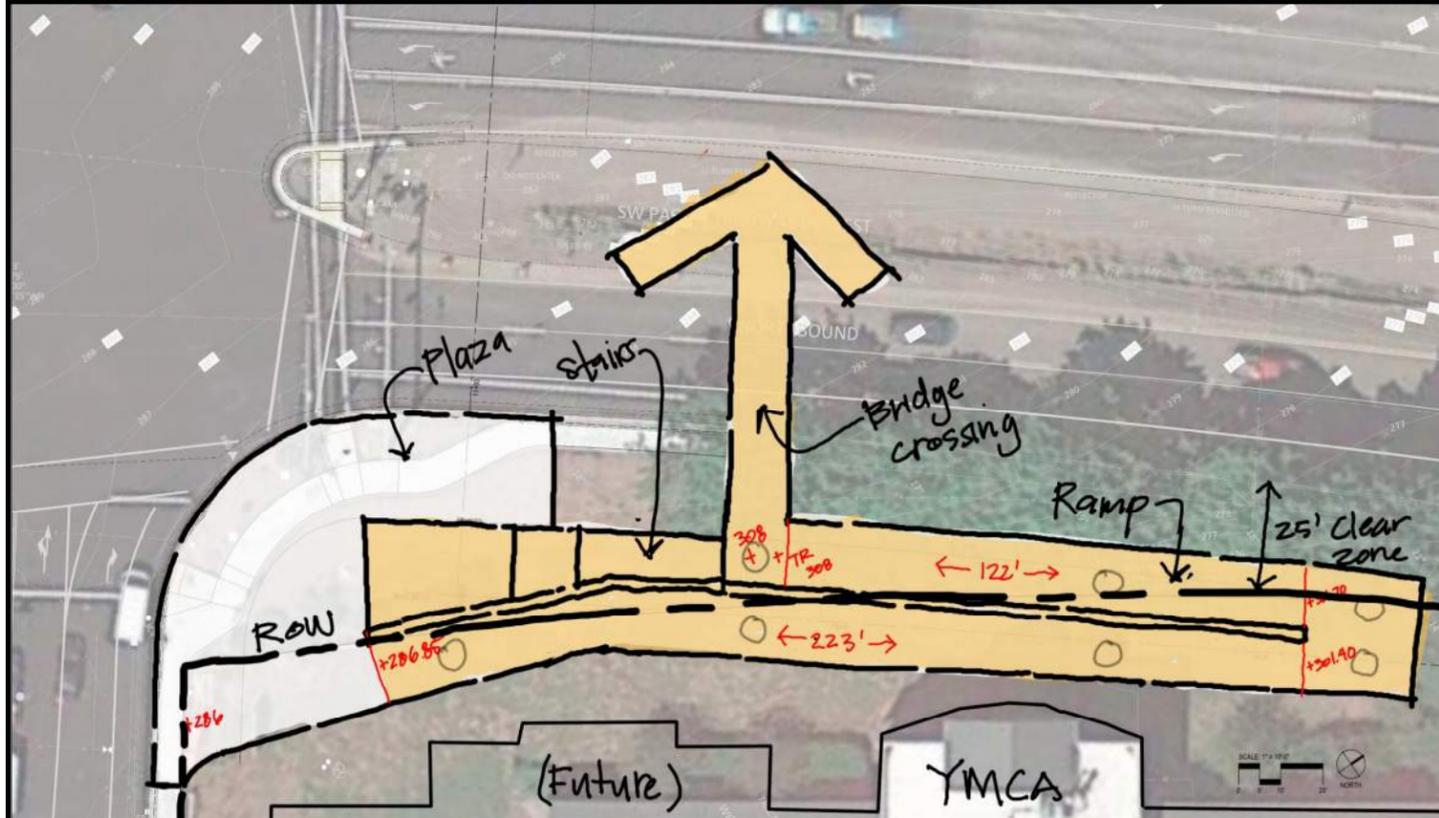
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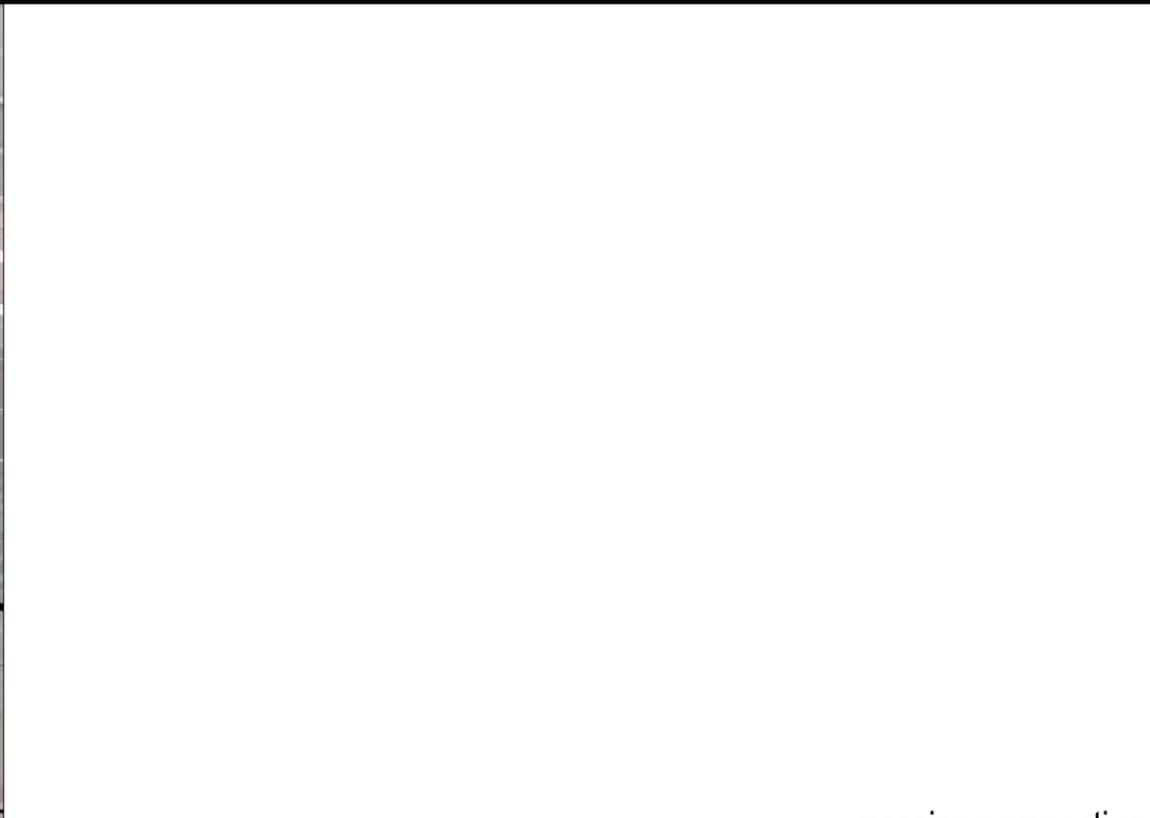
Alignment Option B

City of Sherwood

Hwy 99W Pedestrian Bridge Project



plan view



massing perspective

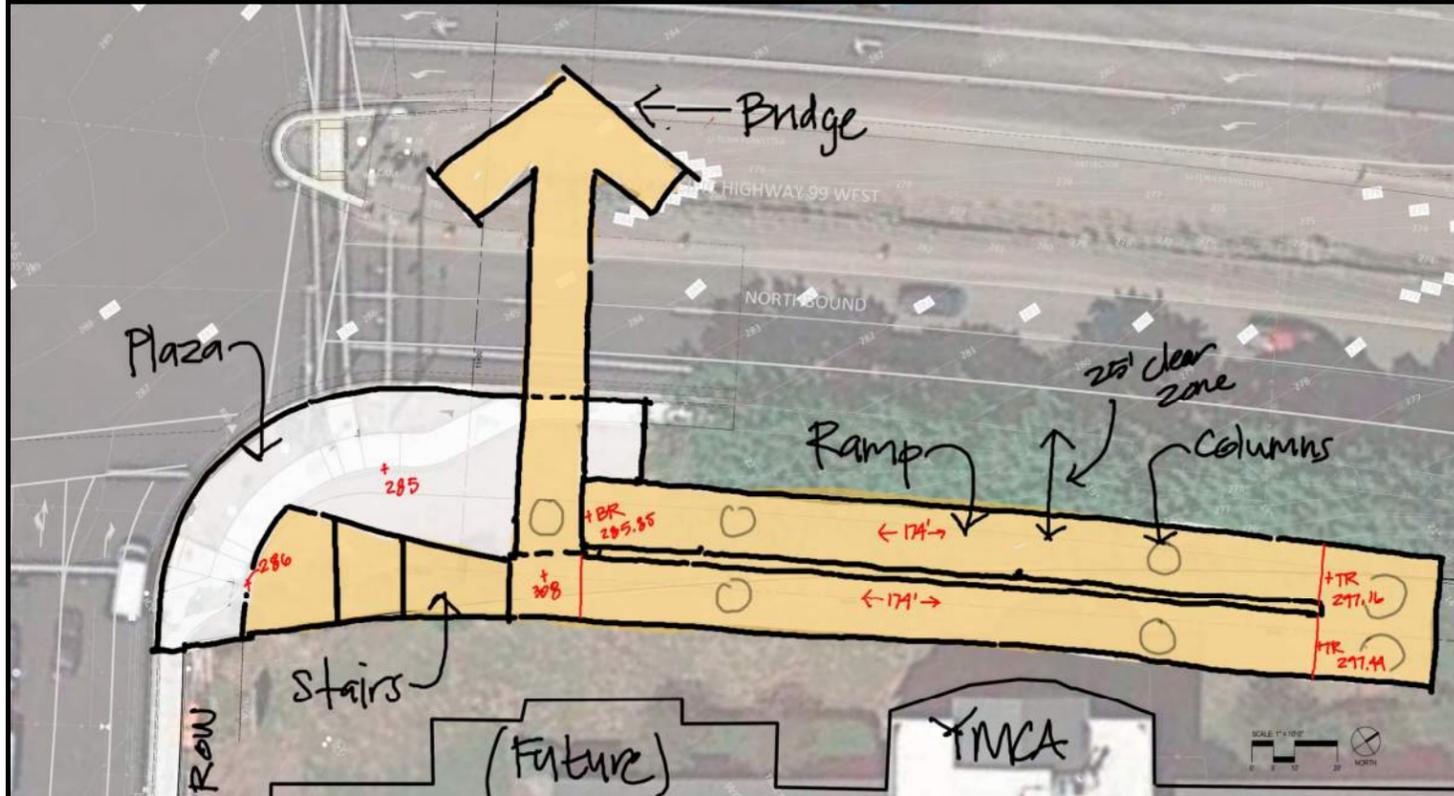


99W Landing B1 Configuration

HWY 99W PEDESTRIAN BRIDGE PROJECT

City of Sherwood

Hwy 99W Pedestrian  
Bridge Project



plan view

massing perspective

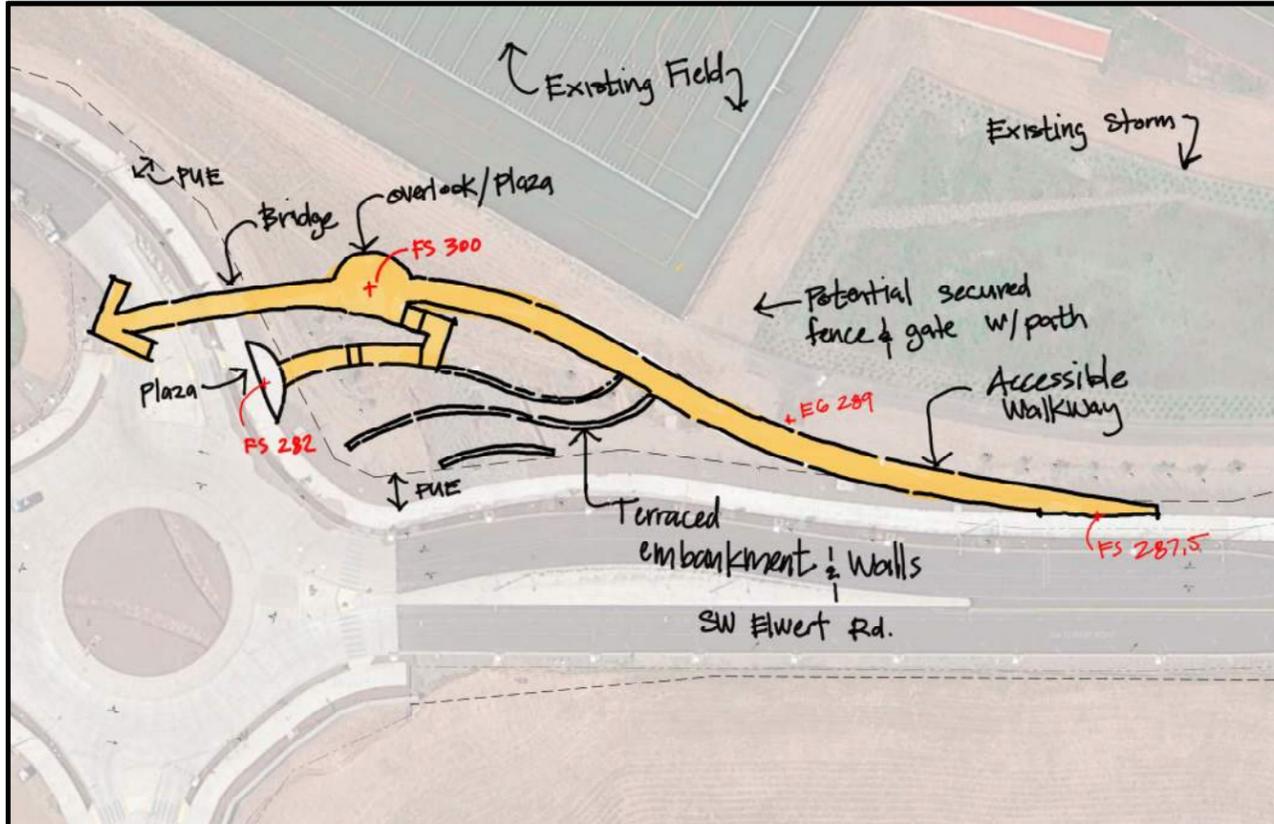


99W Landing B2 Configuration

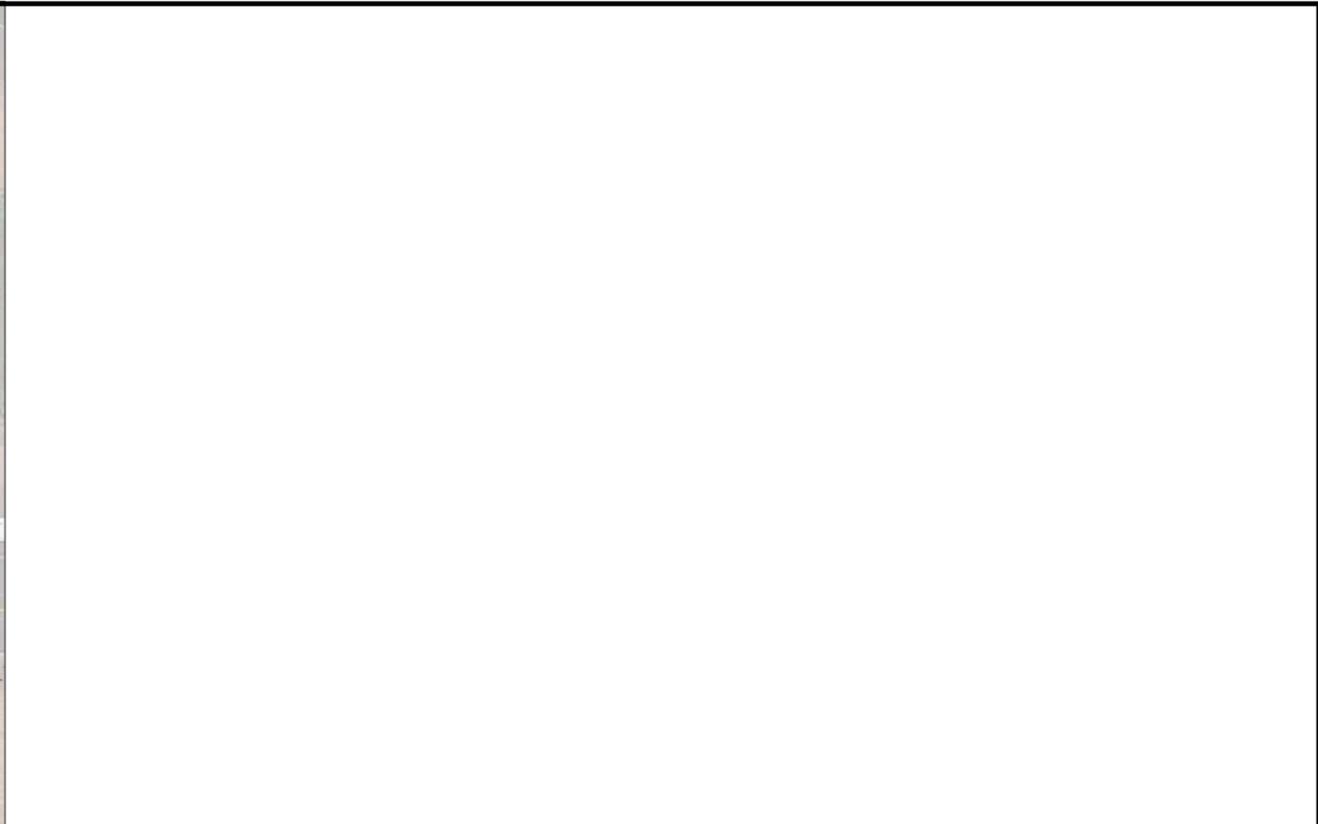
HWY 99W PEDESTRIAN BRIDGE PROJECT

City of Sherwood

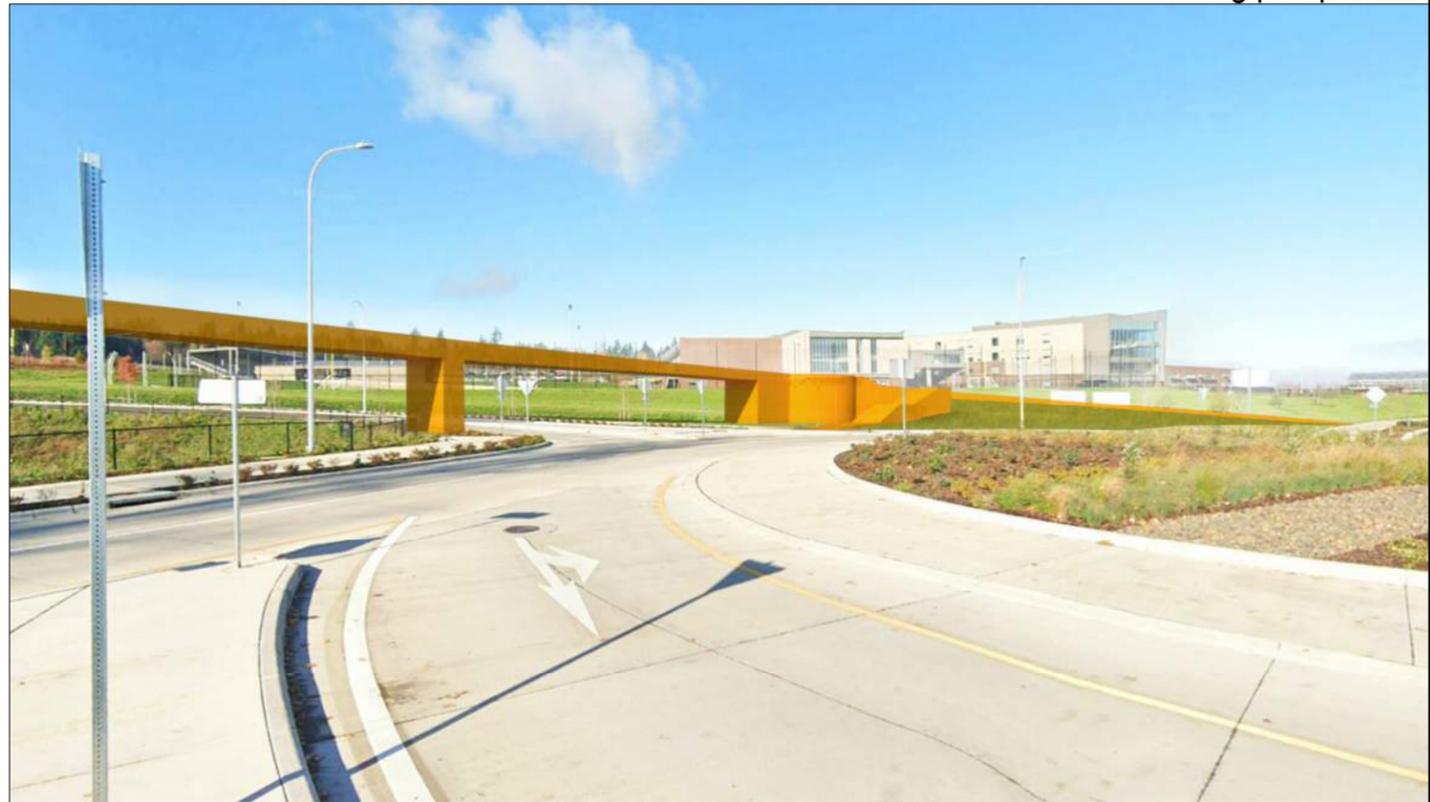
Hwy 99W Pedestrian  
Bridge Project



plan view



massing perspective



High School Landing B1 Configuration  
HWY 99W PEDESTRIAN BRIDGE PROJECT

City of Sherwood  
Hwy 99W Pedestrian  
Bridge Project



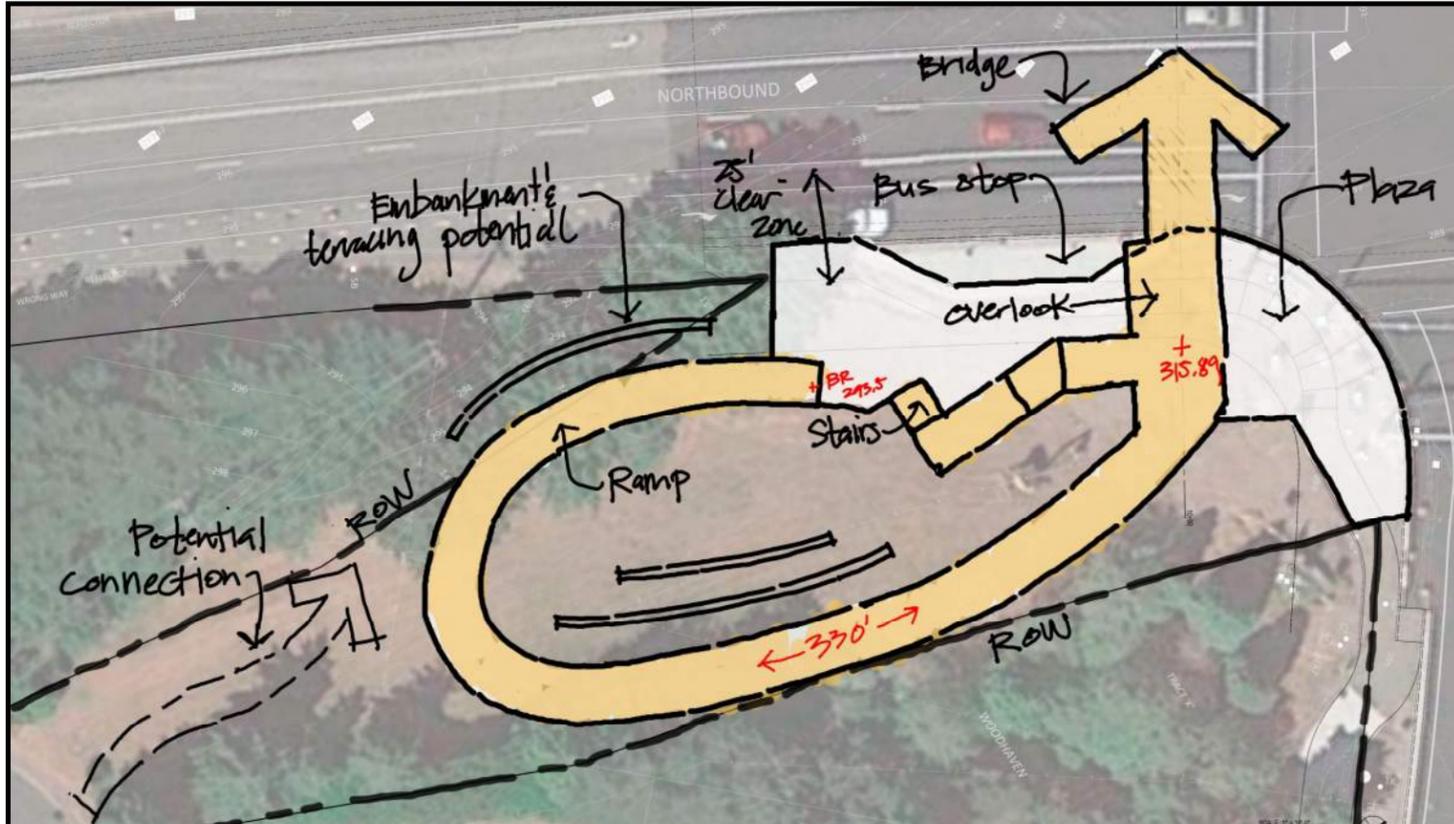
HWY 99W PEDESTRIAN BRIDGE PROJECT

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Alignment Option C

City of Sherwood

Hwy 99W Pedestrian  
Bridge Project



plan view

massing perspective

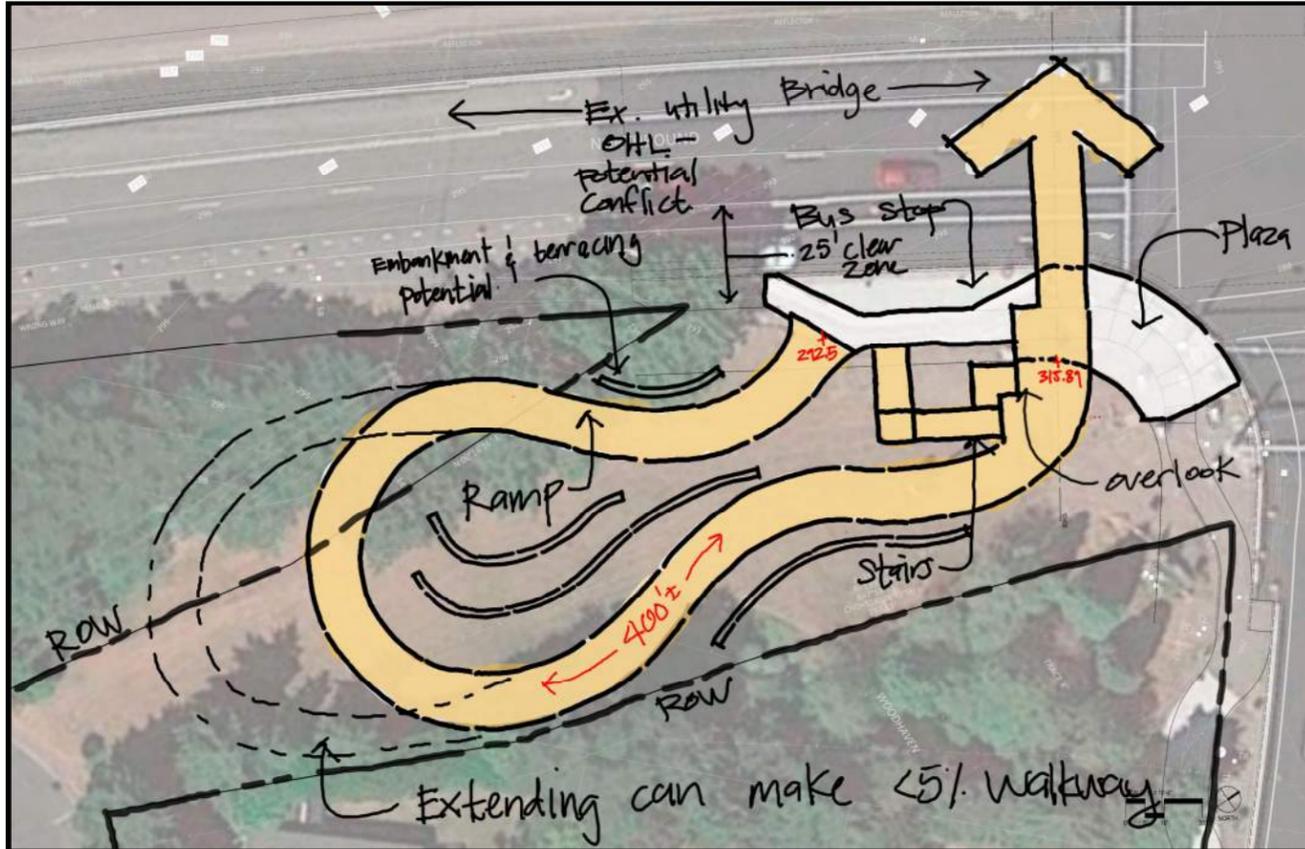


99W Landing C1 Configuration

HWY 99W PEDESTRIAN BRIDGE PROJECT

City of Sherwood

Hwy 99W Pedestrian  
Bridge Project



plan view

massing perspective

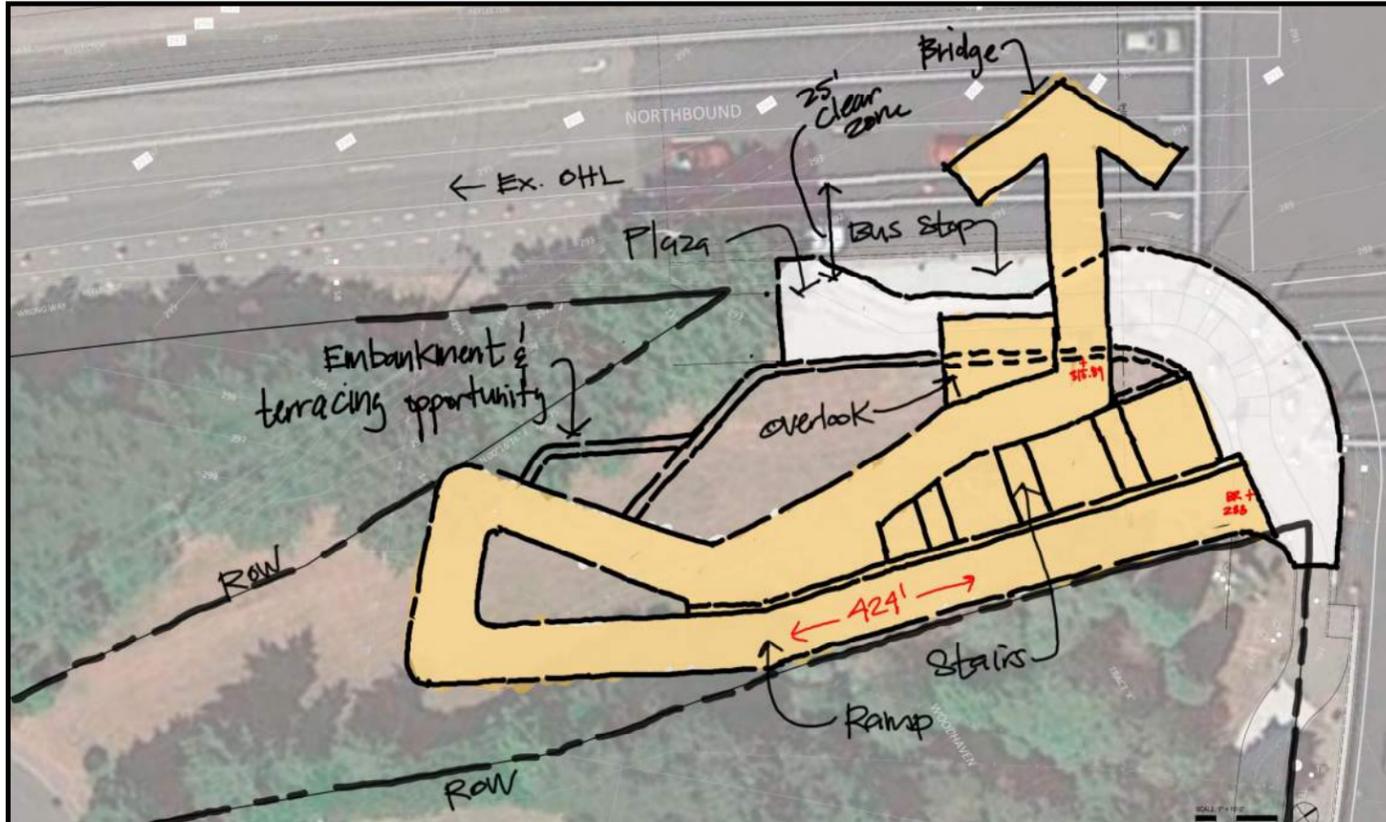


99W Landing C2 Configuration

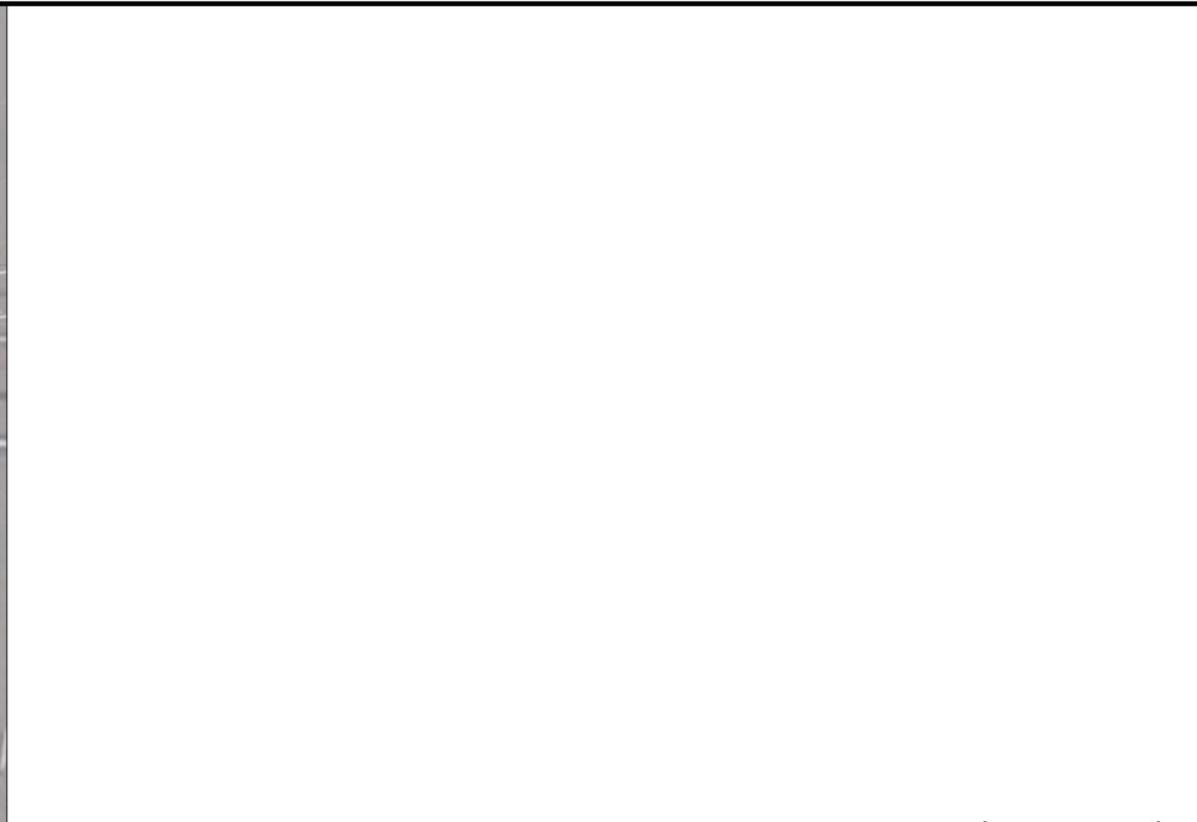
HWY 99W PEDESTRIAN BRIDGE PROJECT

City of Sherwood

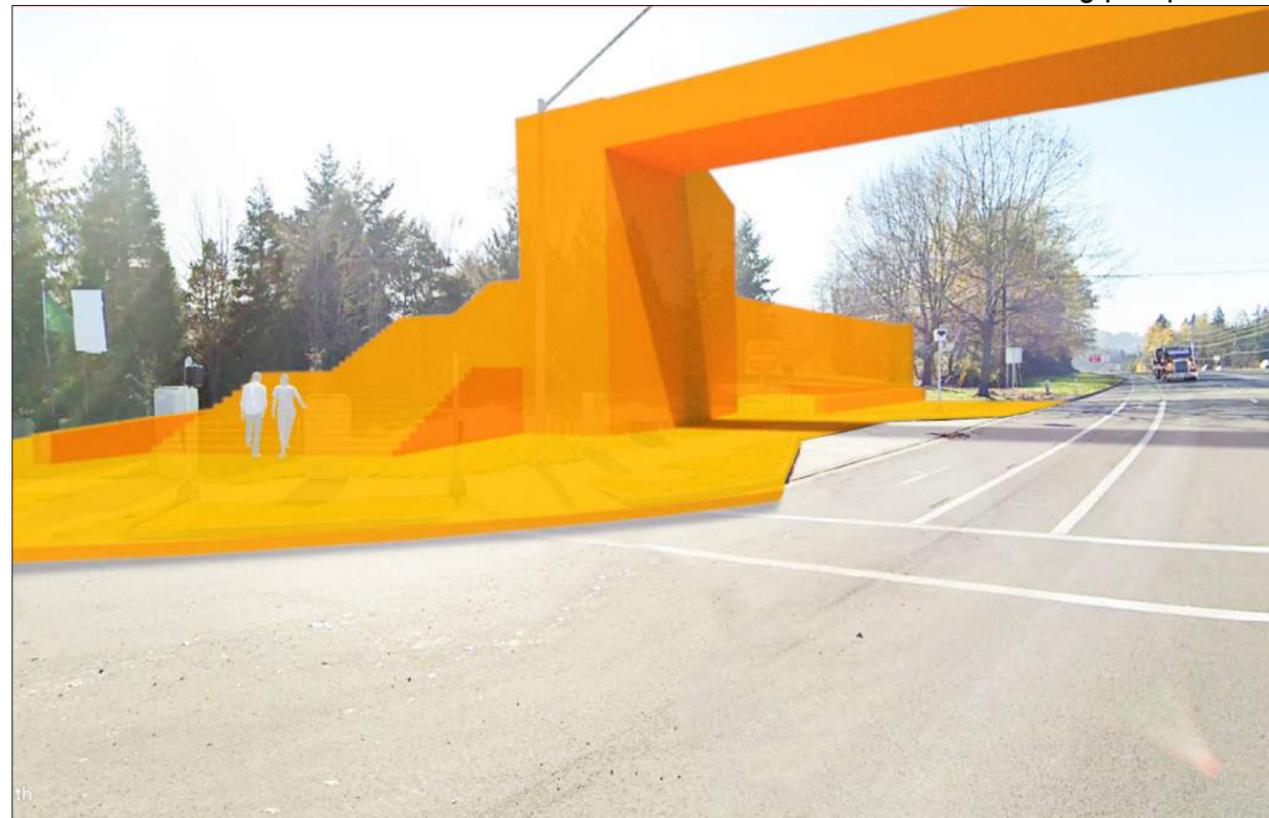
Hwy 99W Pedestrian Bridge Project



plan view



massing perspective

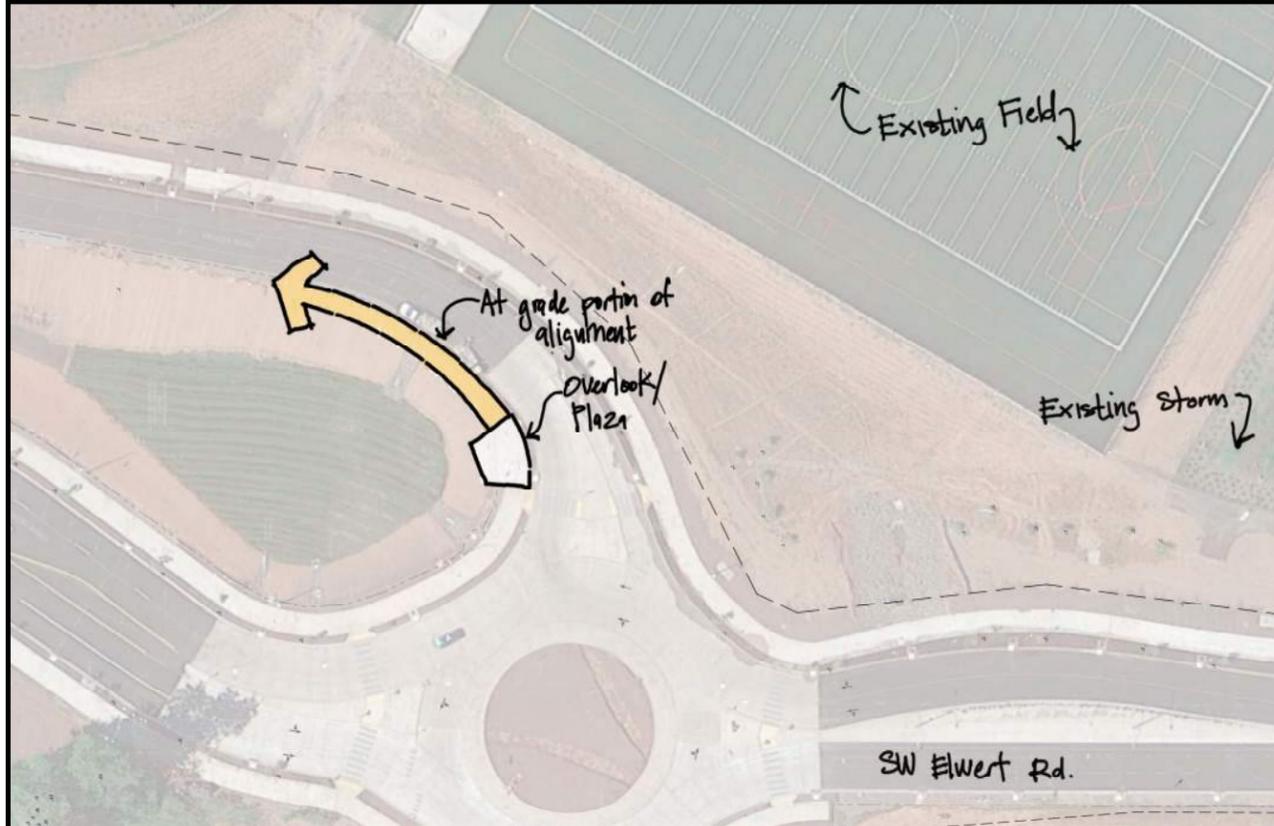


99W Landing C3 Configuration

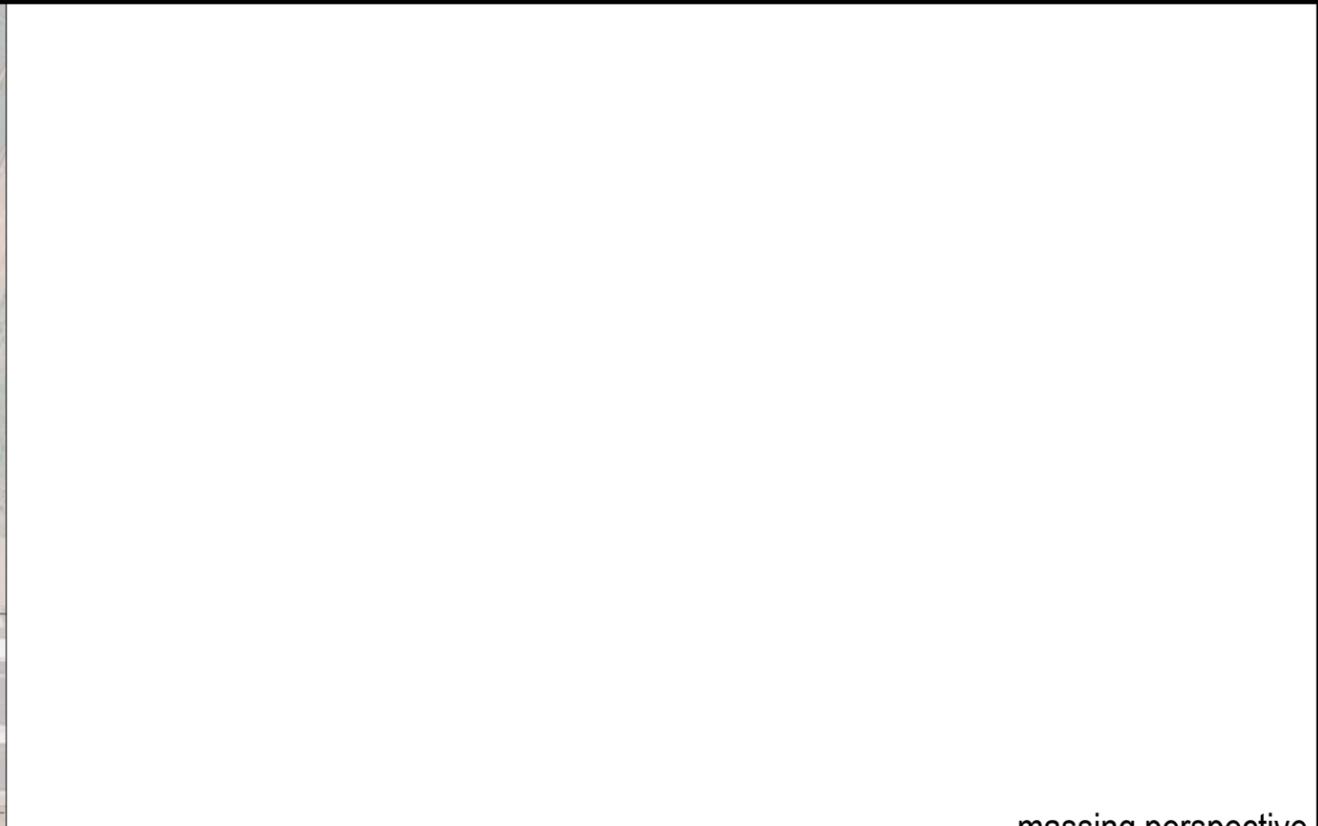
HWY 99W PEDESTRIAN BRIDGE PROJECT

City of Sherwood

Hwy 99W Pedestrian  
Bridge Project



plan view

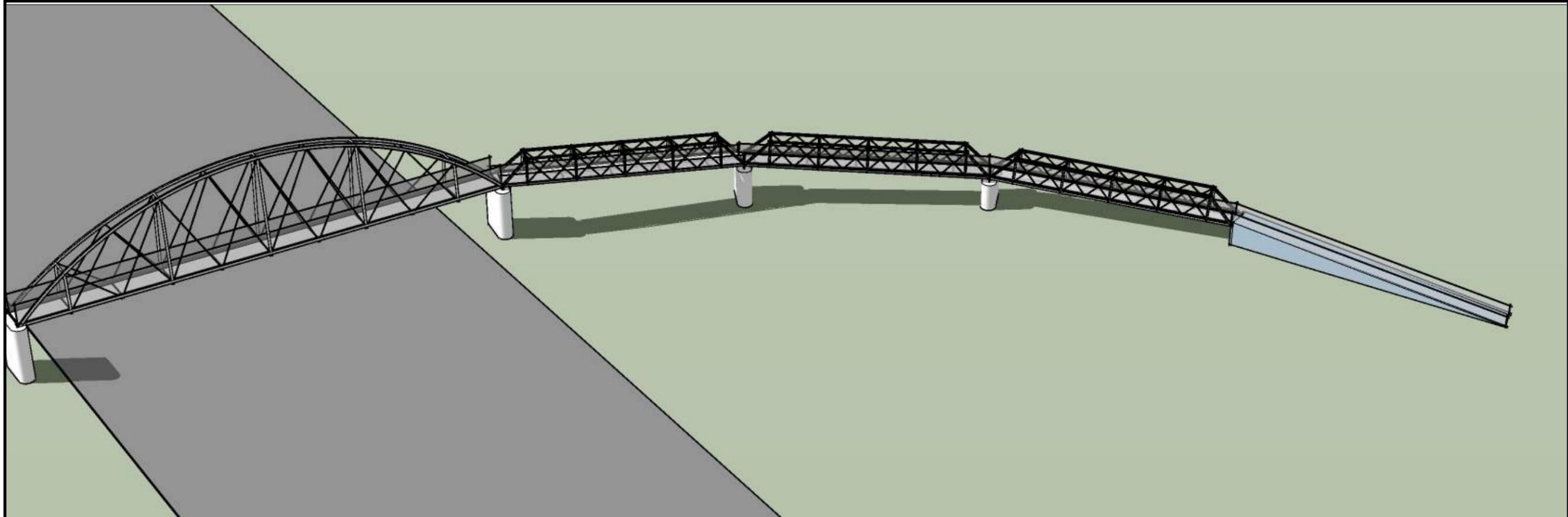


massing perspective

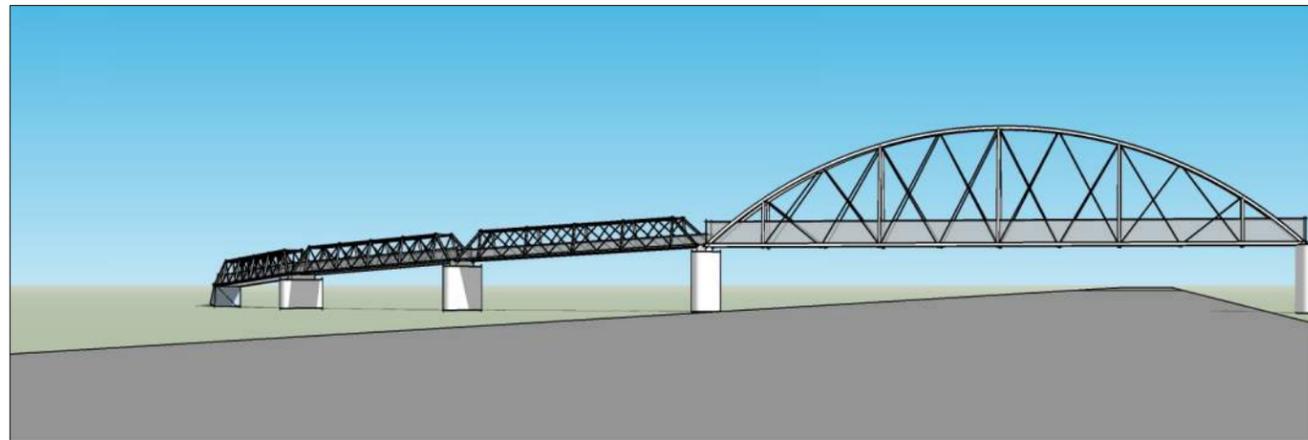


High School Landing 1C Configuration  
HWY 99W PEDESTRIAN BRIDGE PROJECT

City of Sherwood  
Hwy 99W Pedestrian  
Bridge Project



aerial perspective



highway perspective

pre-manufacture possible – see examples

Main Span – Tall Arch, ( 5:1 )  
Approach - Tied Arches in Straight Segments

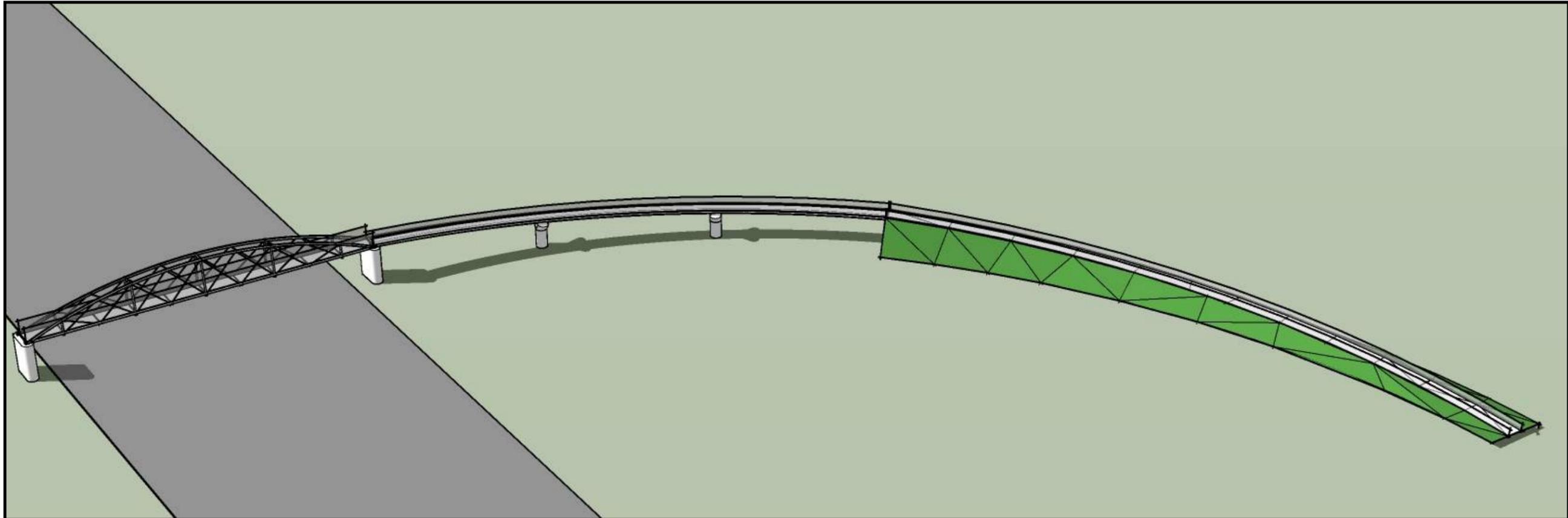
**HWY 99W PEDESTRIAN BRIDGE PROJECT**



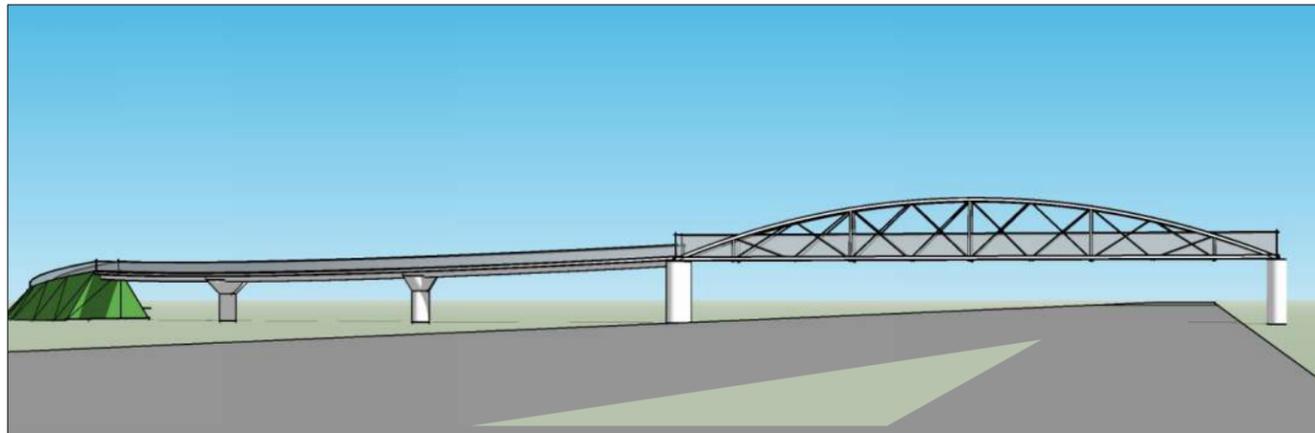
Tall Arch

City of Sherwood

Hwy 99W Pedestrian  
Bridge Project



aerial perspective



highway perspective

pre-manufacture possible – see examples



Bowstring Truss

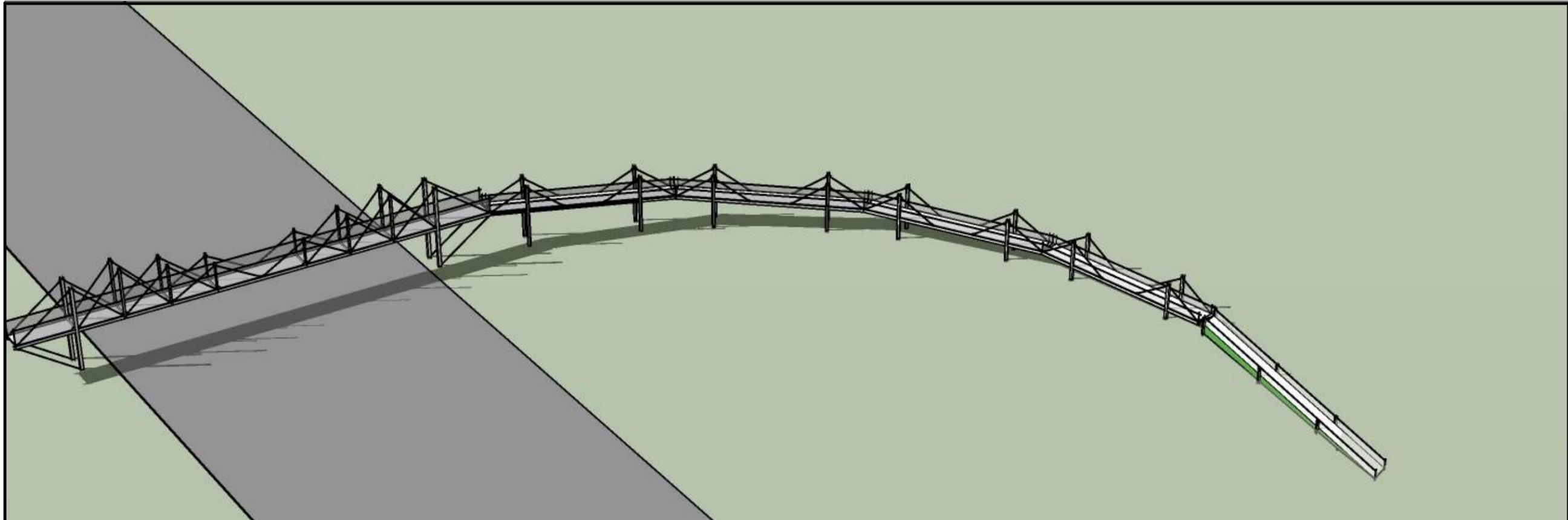
Main Span – Bowstring Truss, (10:1)  
Approach - Curved Ramp on Girders

**HWY 99W PEDESTRIAN BRIDGE PROJECT**

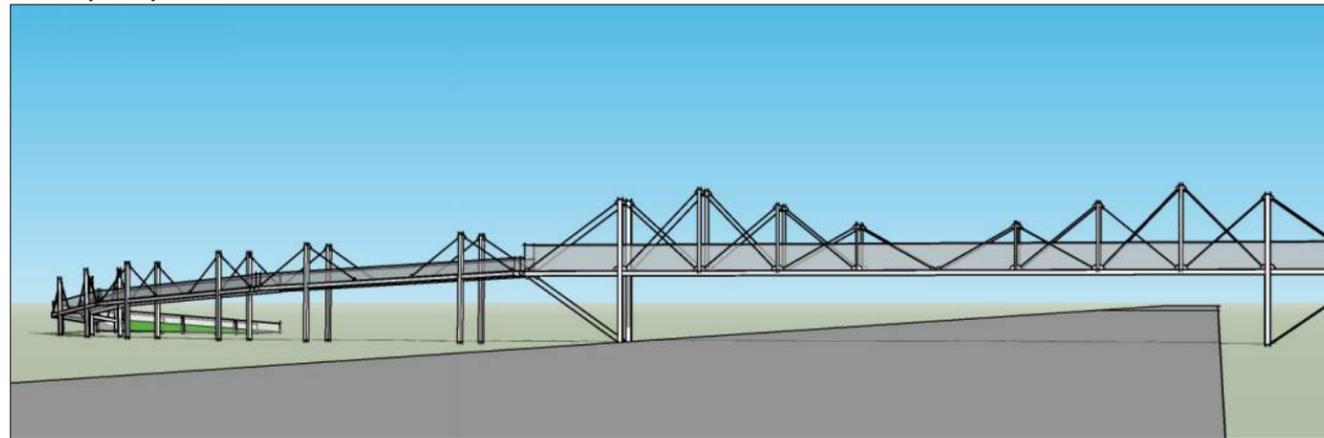


City of Sherwood

Hwy 99W Pedestrian  
Bridge Project



aerial perspective



highway perspective

Main Span – DaVinci Truss  
Approach - Cable-stayed Segmented Spans

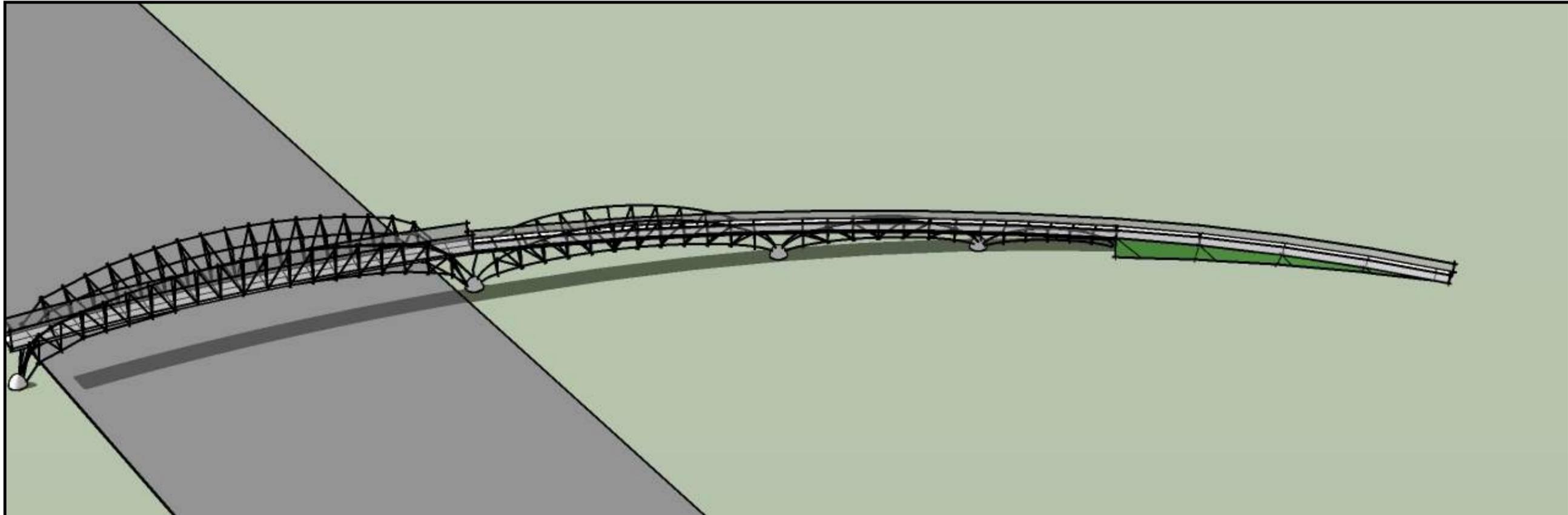
**HWY 99W PEDESTRIAN BRIDGE PROJECT**



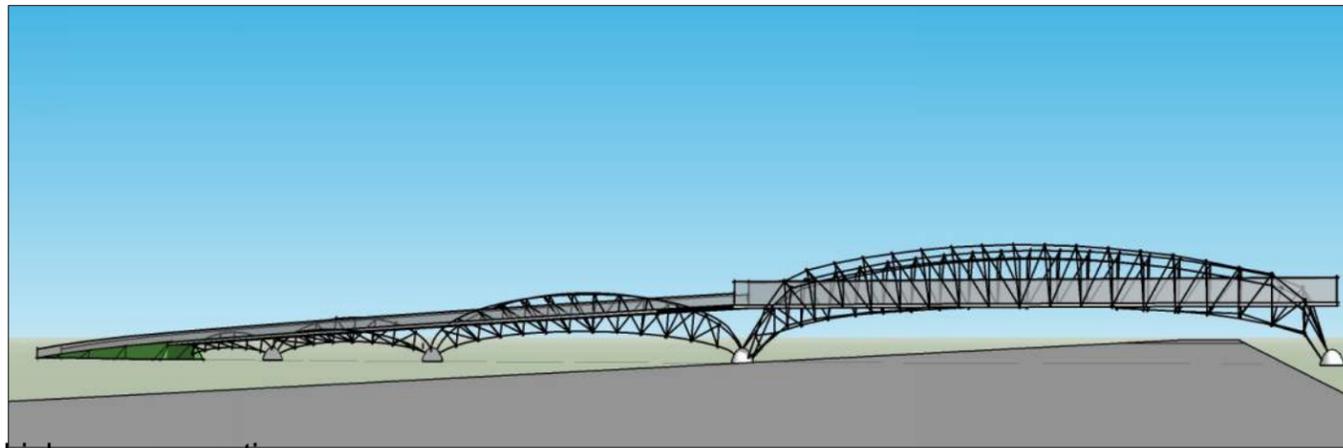
**DaVinci Truss**

**City of Sherwood**

Hwy 99W Pedestrian  
Bridge Project



aerial perspective



highway perspective

Main Span – Curved Triangular Section Truss  
Approach - Curved Triangular Section Truss

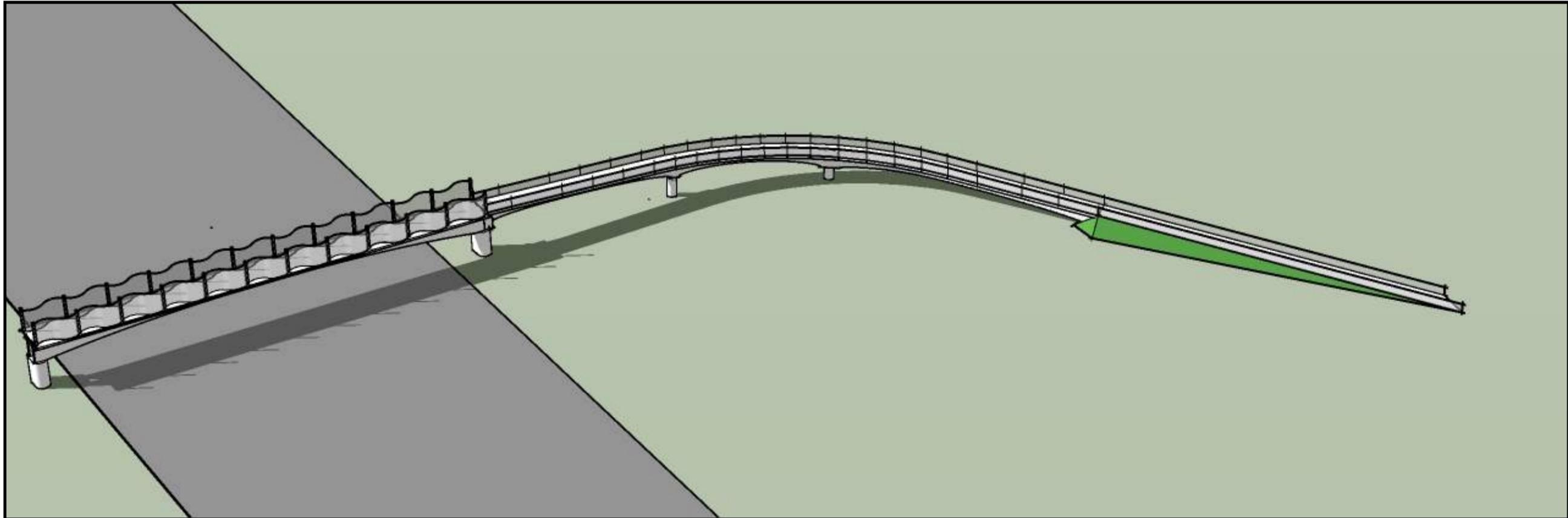
**HWY 99W PEDESTRIAN BRIDGE PROJECT**



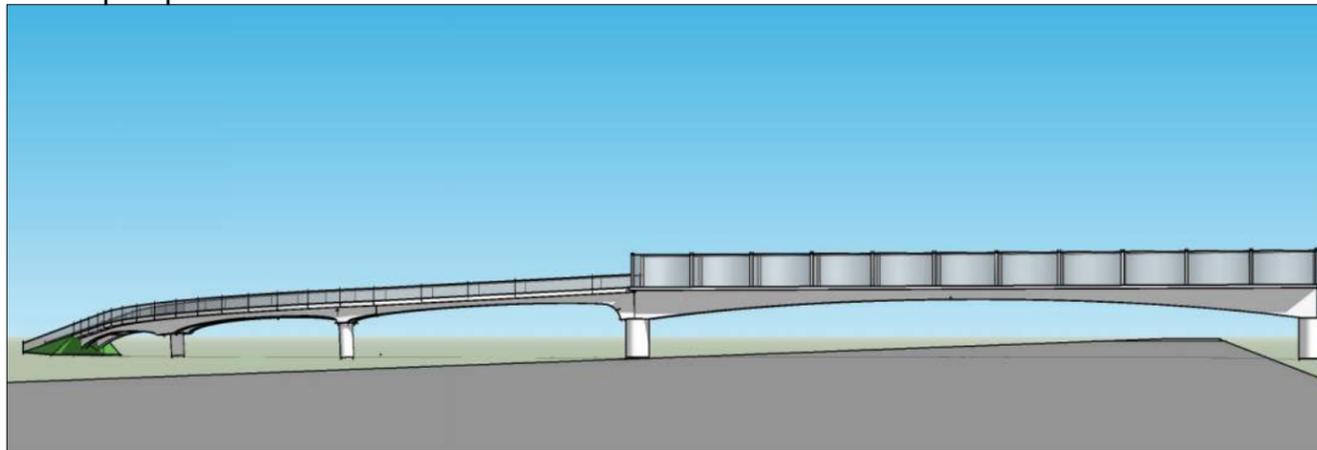
**Curved Triangular Section Truss**

City of Sherwood

Hwy 99W Pedestrian  
Bridge Project



aerial perspective



highway perspective

Main Span – Twin Girder with Feature Railing  
Approach - Twin Girder

**HWY 99W PEDESTRIAN BRIDGE PROJECT**



**Twin Girder With Feature Railing**

**City of Sherwood**

Hwy 99W Pedestrian  
Bridge Project



Pre-Manufactured Steel Arch



Pre-Manufactured Wood Arch



Pre-Manufactured Steel Bowstring Truss



Custom Designed Steel Arch



Custom Designed Wood Arch



Custom Designed Steel Bowstring Truss

City of Sherwood

Hwy 99W Pedestrian  
Bridge Project

Goals	Options		
	Option A (Over Roundabout)	Option B (South of Roundabout)	Option C (South of Sunset)
<b>Safety improvement</b>	Eliminates all at grade crossing conflicts between the YMCA and the High School.	Eliminates all at grade crossing conflicts between the YMCA and the High School.	Requires at-grade crossings of Sunset and Kruger.
<b>Desirability</b>	Route includes a few angles and favors pedestrian traffic to northbound SW Elwert Road (high school). May appear as being out of direction from YMCA.	Appears as a direct route from both approaches	May appear as out of direction from both approaches.
<b>Accessibility</b>	East side approach allows for flatter slopes (5% max.)	East side approach <b>likely</b> to require steeper slopes (8.3% max.)	East side approach <b>may</b> require steeper slopes (8.3% max.)
<b>Current and future connectivity</b>	East side approach requires at grade crossing of Sunset for multi-use trail users.	East side approach requires at grade crossing of Sunset for multi-use trail users.	Provides direct connections to multi-use trails at both east and west approaches/
<b>Cost efficiency</b>	Longest total alignment and structure Likely highest cost of Options	Second longest total alignment and structure   Likely second highest cost of Options	Shortest total alignment and structure length Likely lowest cost of Options
<b>Gateway Design Potential</b>	Lowest Visibility. Moderate potential for structural and low potential for landscape gateway features.	Moderate Visibility. Moderate potential for structural and low potential for landscape gateway features.	Highest Visibility. High potential for structural and landscape gateway features.

Legend:

<b>Safety</b>	Eliminate or reduce conflicts between vehicles and people walking, biking, and rolling.
<b>Desirability</b>	Minimize out of direction travel.
<b>Accessibility</b>	Ensure crossing opportunities for people of all abilities.
<b>Connectivity</b>	Integrate the crossing with existing and planned trail network in Sherwood across OR 99W.
<b>Cost Efficiency</b>	Ensure crossing opportunities for people of all abilities.
<b>Gateway Design</b>	Create a signature civic structure.

City of Sherwood

Hwy 99W Pedestrian Bridge Project



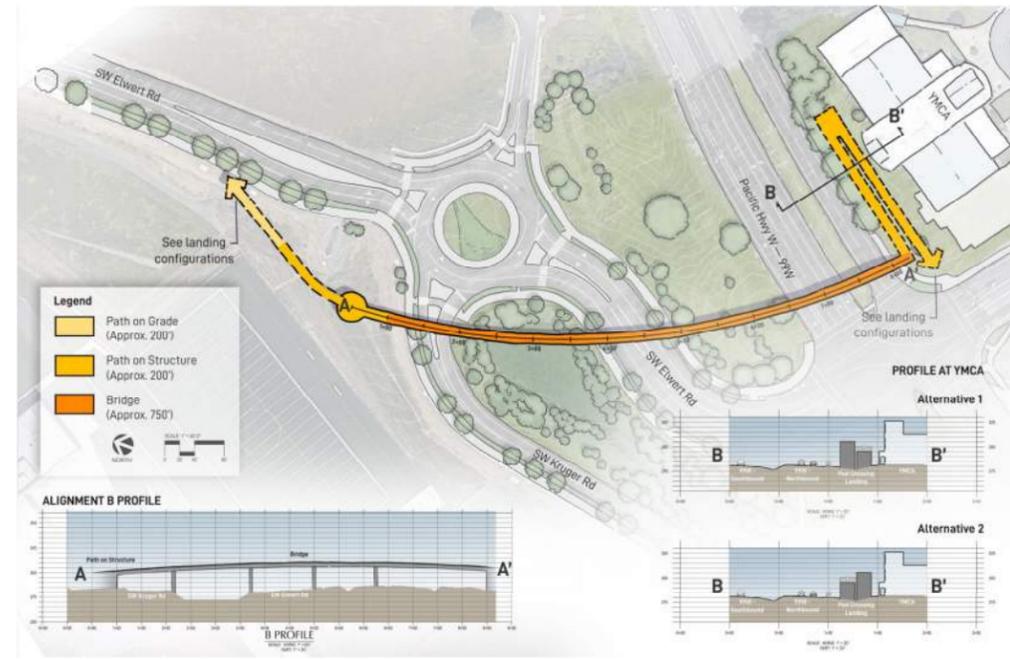
## Next Steps:

- Online Open House #1 – 2/21 to 3/2
- Alternatives Analysis
- City Council Presentation #2 – 3/15 (Tentative)
- Online Open House #2 – 3/23 to 4/1
- Select Preferred Alternative – 4/11
- Complete 30% Design / Cost Estimating – 6/20

# Open Forum:



## Alignment Option A



## Alignment Option B



## Alignment Option C



# 99W PEDESTRIAN BRIDGE PROJECT

## ONLINE OPEN HOUSE SUMMARY

Prepared by JLA Public Involvement

The online open house was open from **February 21 to March 2, 2022**, and 174 people participated. The goal was to provide early design information about the bridge and get the community's preferences on landings options and structure types and hear their art ideas and general comments.

**174**

Total Participants

### How participants would experience the bridge

**75%** In a vehicle driving under

**74%** As a pedestrian

**47%** As a bicyclist

## THE ALIGNMENT OPTION

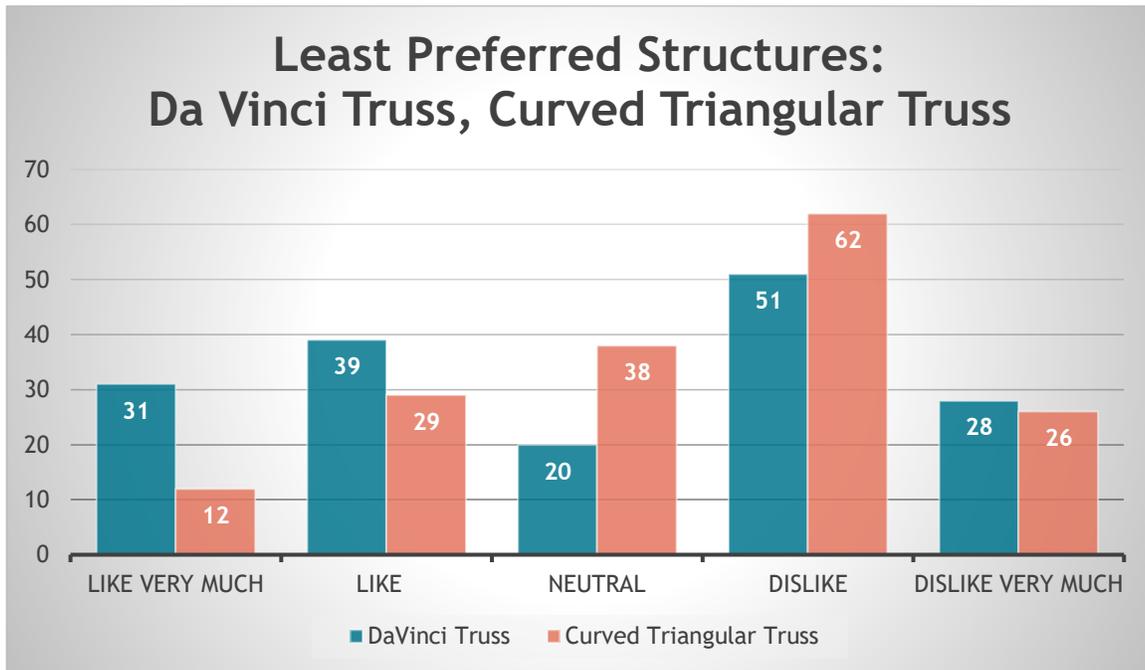
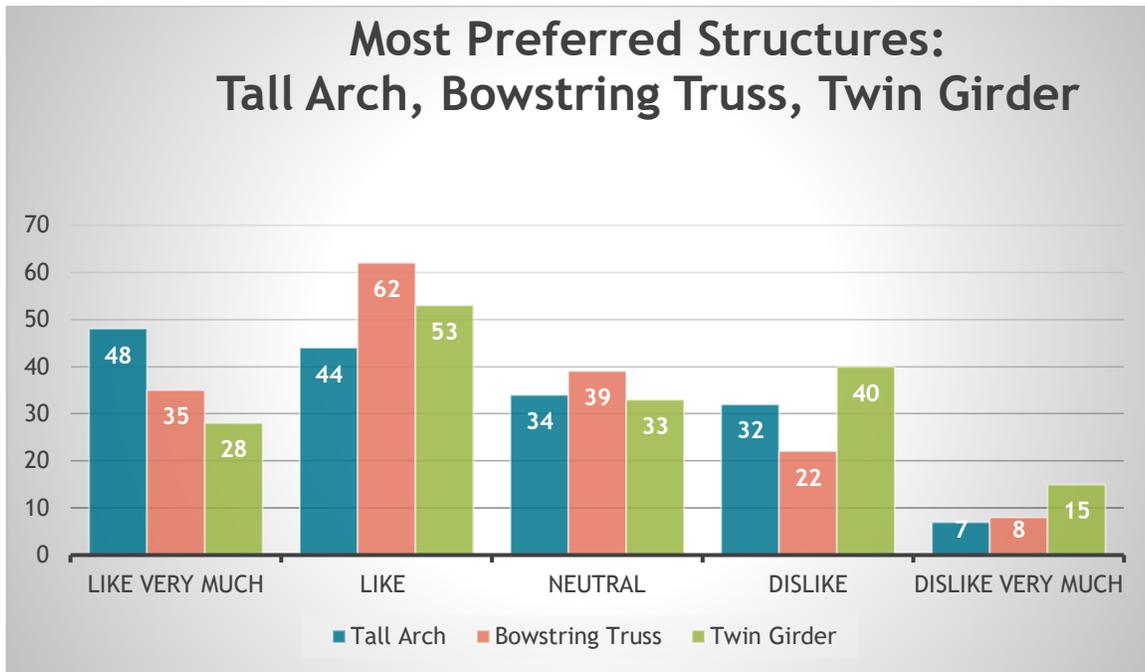
Of the 21 participants who responded to the open-ended question asking for their questions or concerns about the alignment, 8 expressed excitement and support for the bridge/alignment option, and several had questions about design details, such as the ramps, and entry/exit points.

## LANDING OPTIONS



There was only one landing option at Sherwood High School and **64%** liked it or liked very much.

## STRUCTURE TYPES



## WHAT TYPE OF ART WOULD PEOPLE LIKE TO SEE ON THE BRIDGE?

Of the 34 people who responded to this question, these were the key themes:

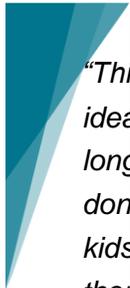
- Nature – trees, mountains, wildlife, agriculture, birds, animals
- Locally-theme art including historic references and involving local artist
- Showcase Sherwood’s history
- Artistic “Welcome to Sherwood” sign

**89%** Felt it’s very important for the bridge to feel like a gateway to Sherwood

## OTHER GENERAL FEEDBACK

Of the 28 people who wrote additional comments, these were the key themes:

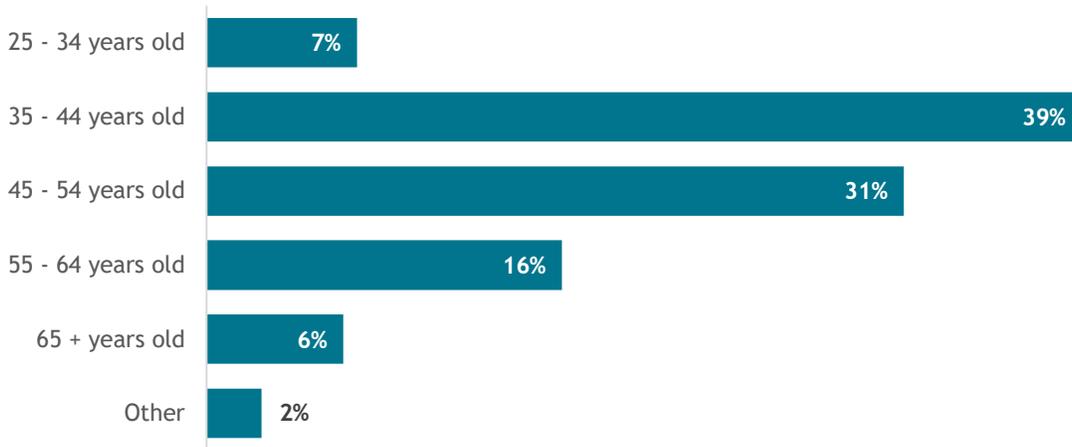
- Most offered general positive feedback and stated the bridge is necessary
- Some had safety concerns – discourage kids from jumping or throwing objects from bridge, add barrier on the sides
- Several asked the City to complete the project in timely fashion
- A few expressed the bridge is not needed and funds should be spent on other community needs
- A few asked for a cost analysis/estimate for the various structure options



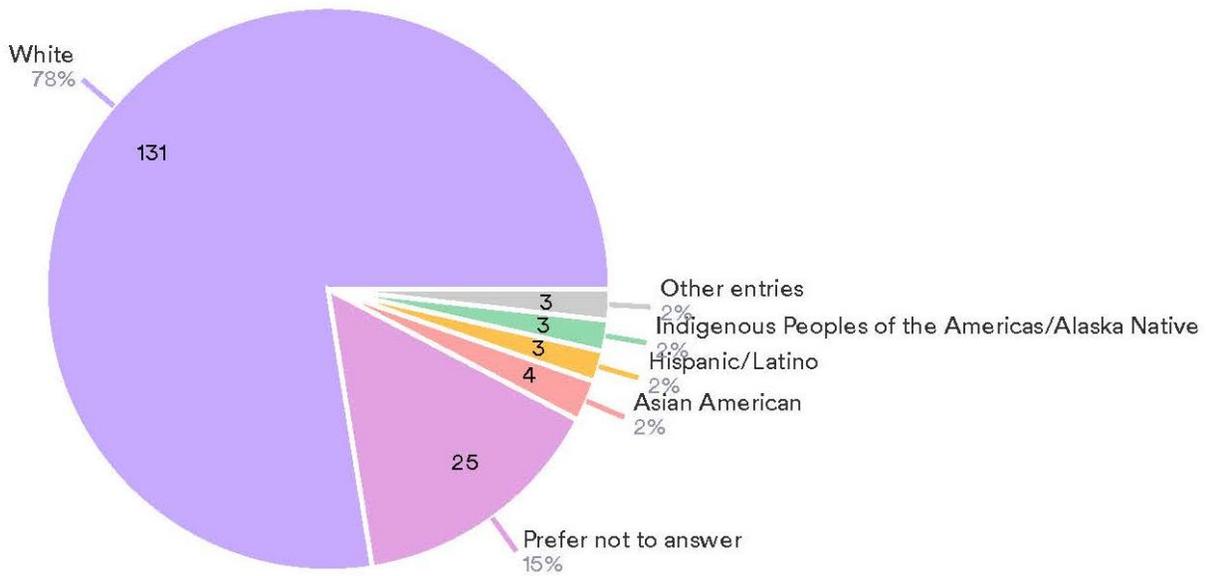
*“This is the best idea I’ve seen in a long time and I don’t even have kids that age but there is a definite need for this bridge just for the high school students alone. Plus, giving both sides access to other neighborhoods is great.”*

# WHO PARTICIPATED IN THE SURVEY

## Age



## Ethnicity



## Where Participants Live

**63%** South of 99W

**15%** North of 99W

**12%** Downtown

**10%** Outside the city limits

# Sherwood Hwy 99W Pedestrian Bridge Project

Sherwood City Council Work Session

March 15, 2022



# Meeting Goals:

Provide update to City Council on progress made and solicit input on development and evaluation of alternatives to obtain feedback on information to be shared in open house and selection of a preferred alternative.

# Agenda:

- Introductions
- Online Open House Survey Results
- Alternative Alignments and Bridge Types
- Alternatives Analysis
- Next Steps
- Open Forum

City of Sherwood

Hwy 99W Pedestrian  
Bridge Project

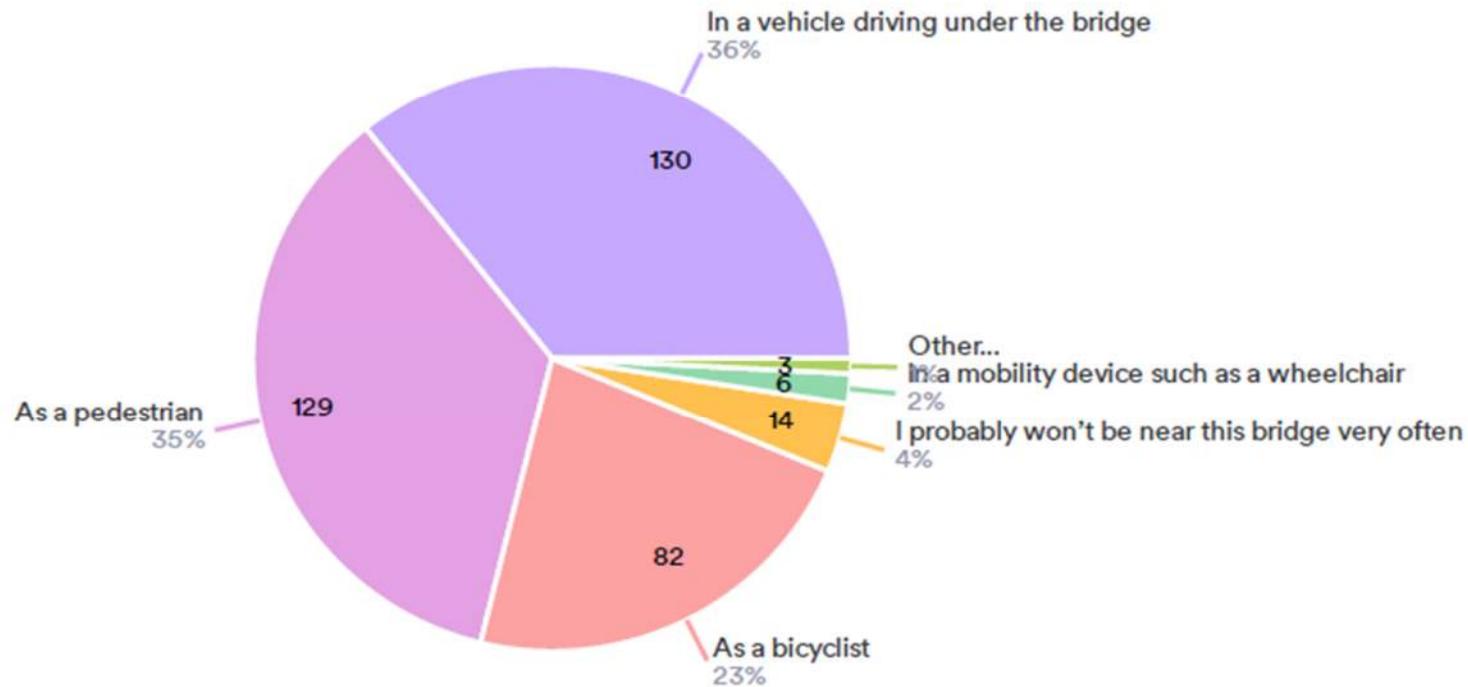
# Online Open House Survey Results

The online open house was live from February 21- March 2, 2022, and 174 people participated.

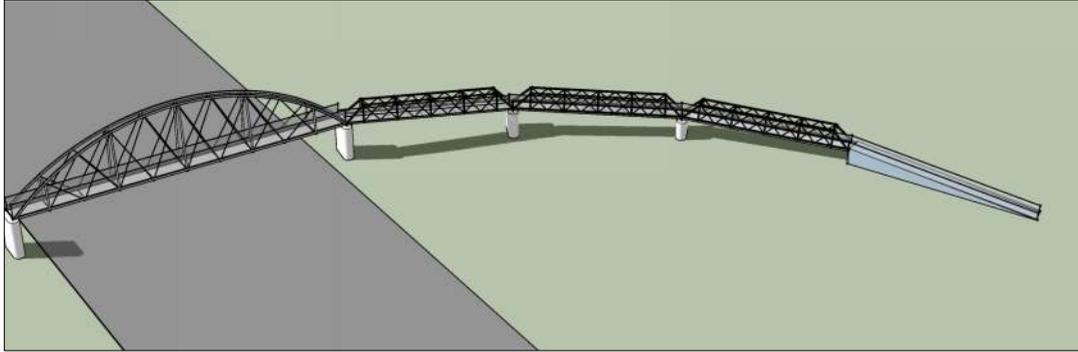
- 74% said they would use the bridge as a pedestrian and 47% said they would use it as a bicyclist.
- 63% live on the south side of 99W in Sherwood, 15% live on the north side of 99W and 12% live downtown

How would you or your family experience this bridge? (Select all that apply)

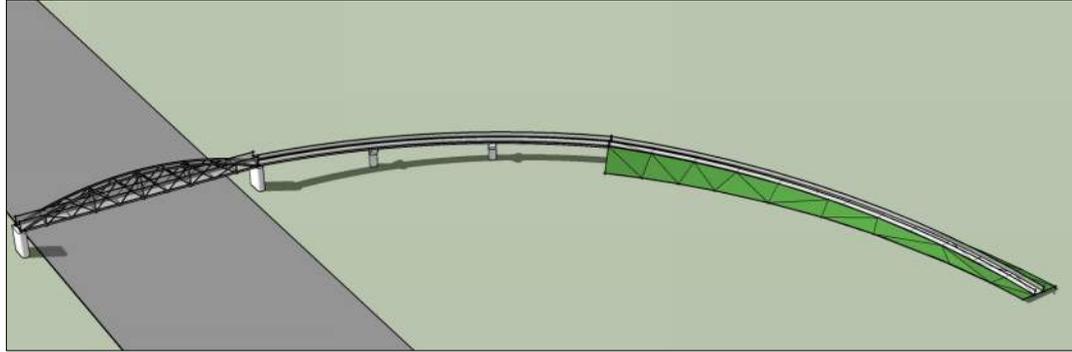
364 Responses- 15 Empty



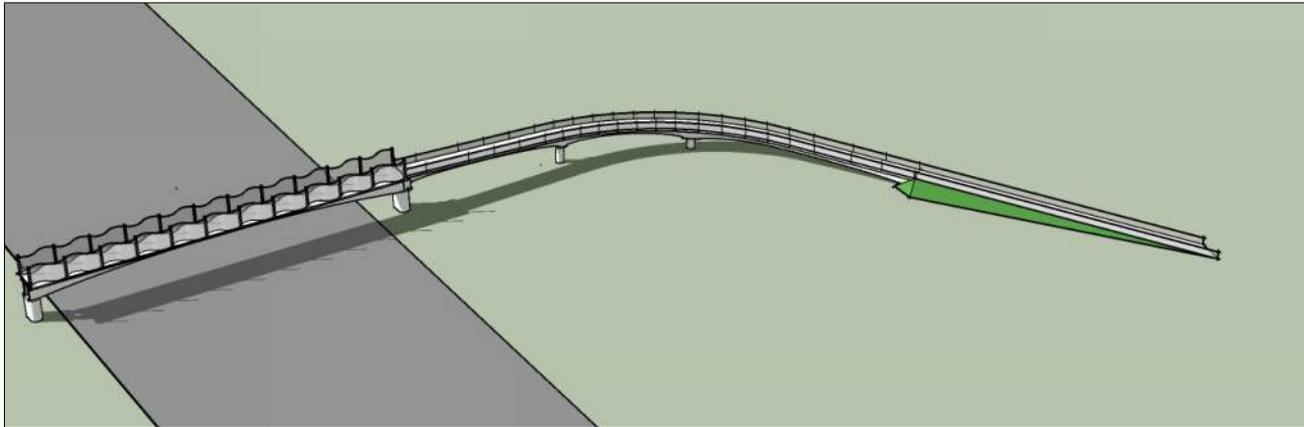
# Online Open House Survey Results



56% Like Very Much / Like  
Tall Arch



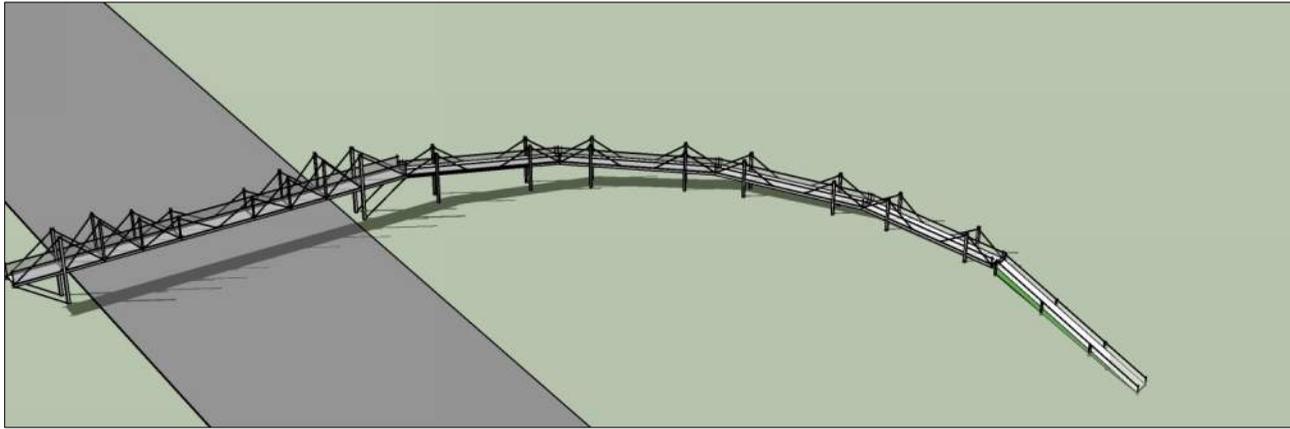
58% Like Very Much / Like  
Bowstring Truss



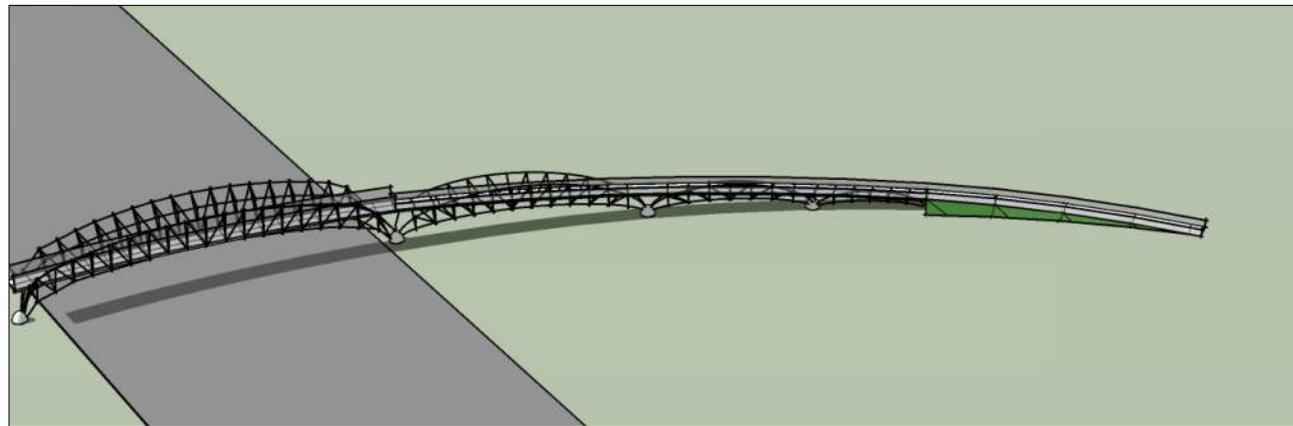
48% Like Very Much / Like  
Twin Girder With Feature Railing



# Online Open House Survey Results



47% Dislike Very Much /Dislike  
DaVinci Truss



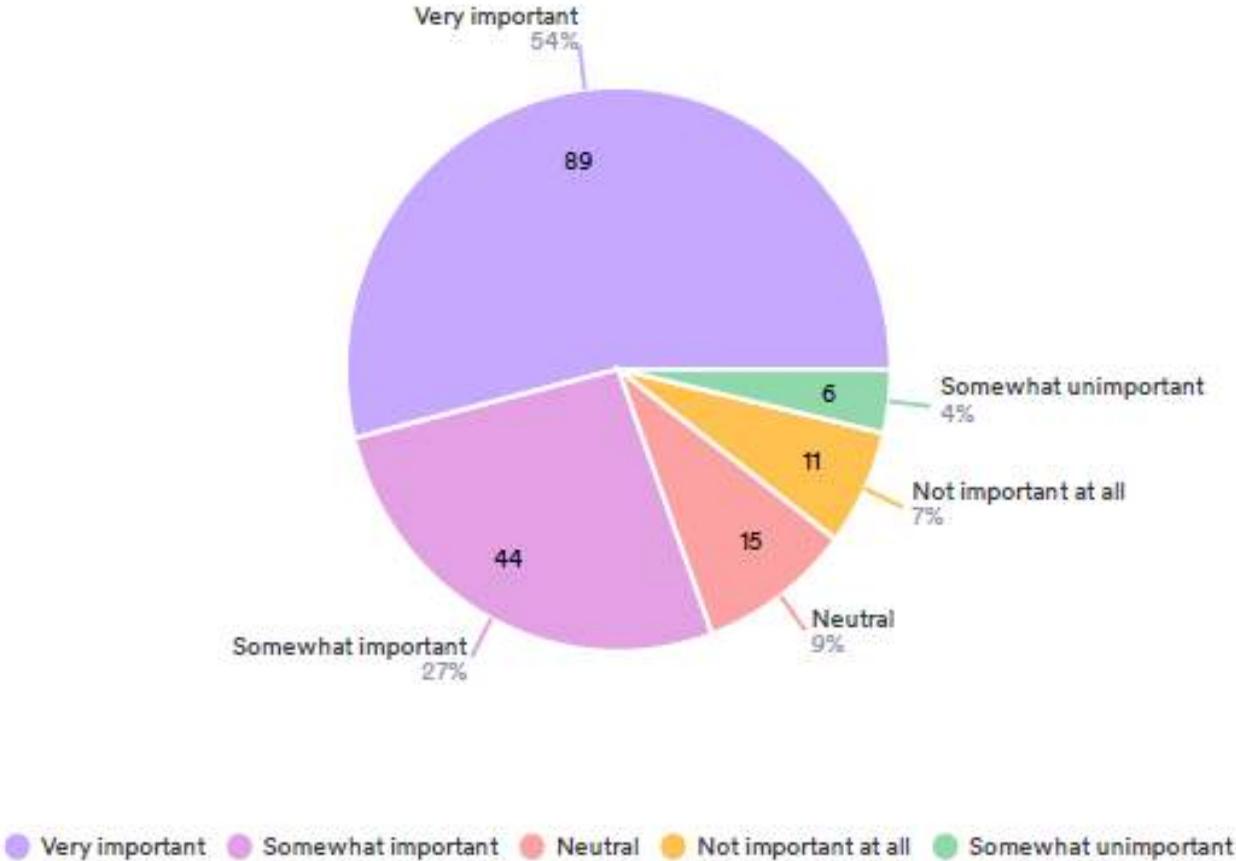
53% Dislike Very Much /Dislike  
Curved Triangular Section Truss

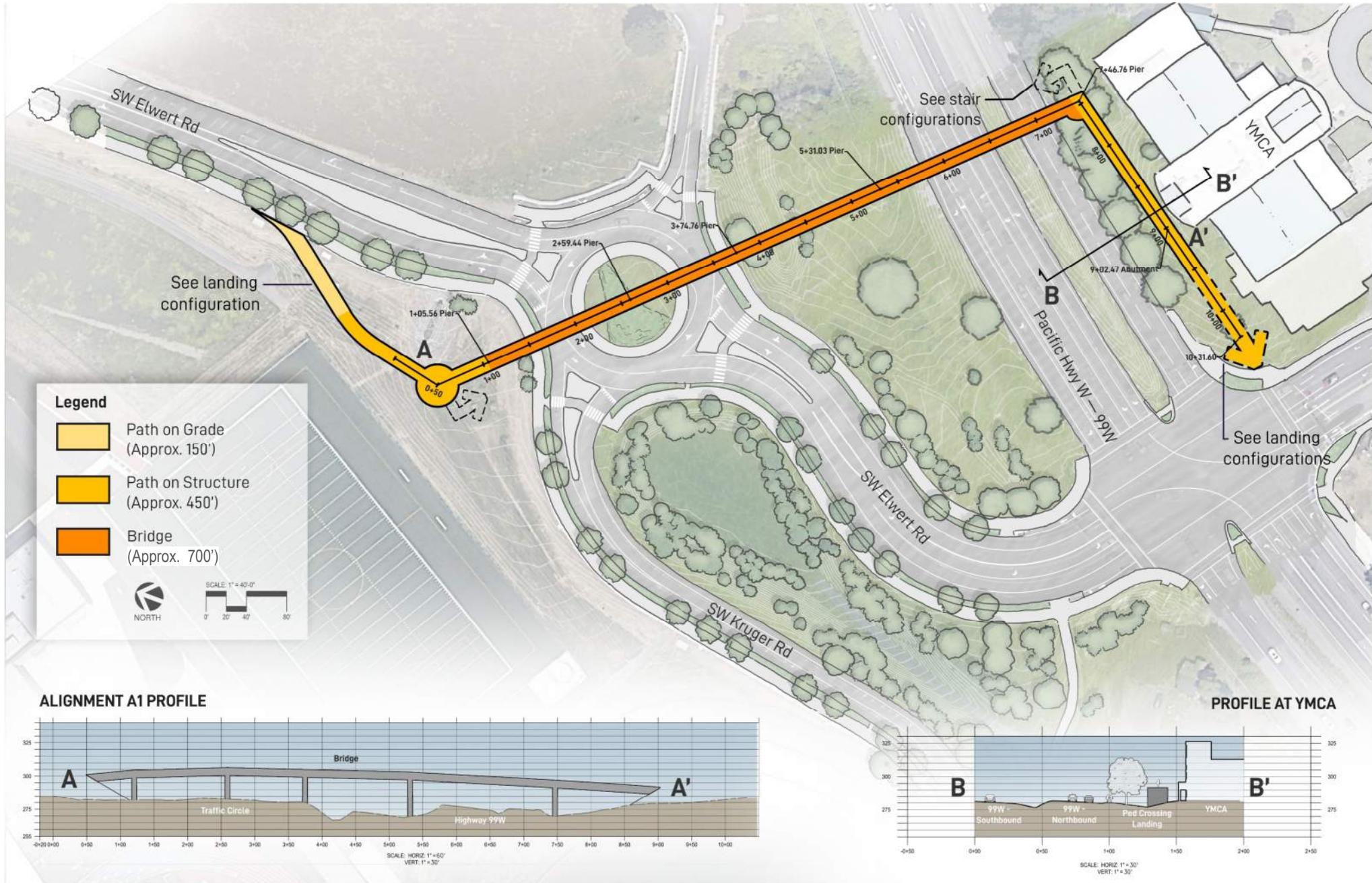
# Online Open House Survey Results

81% felt that it was very important or somewhat important that the bridge feel like a gateway

With this in mind, how important is it for this bridge to feel like a gateway for Sherwood? (Rate using the scale below)

165 Responses- 9 Empty



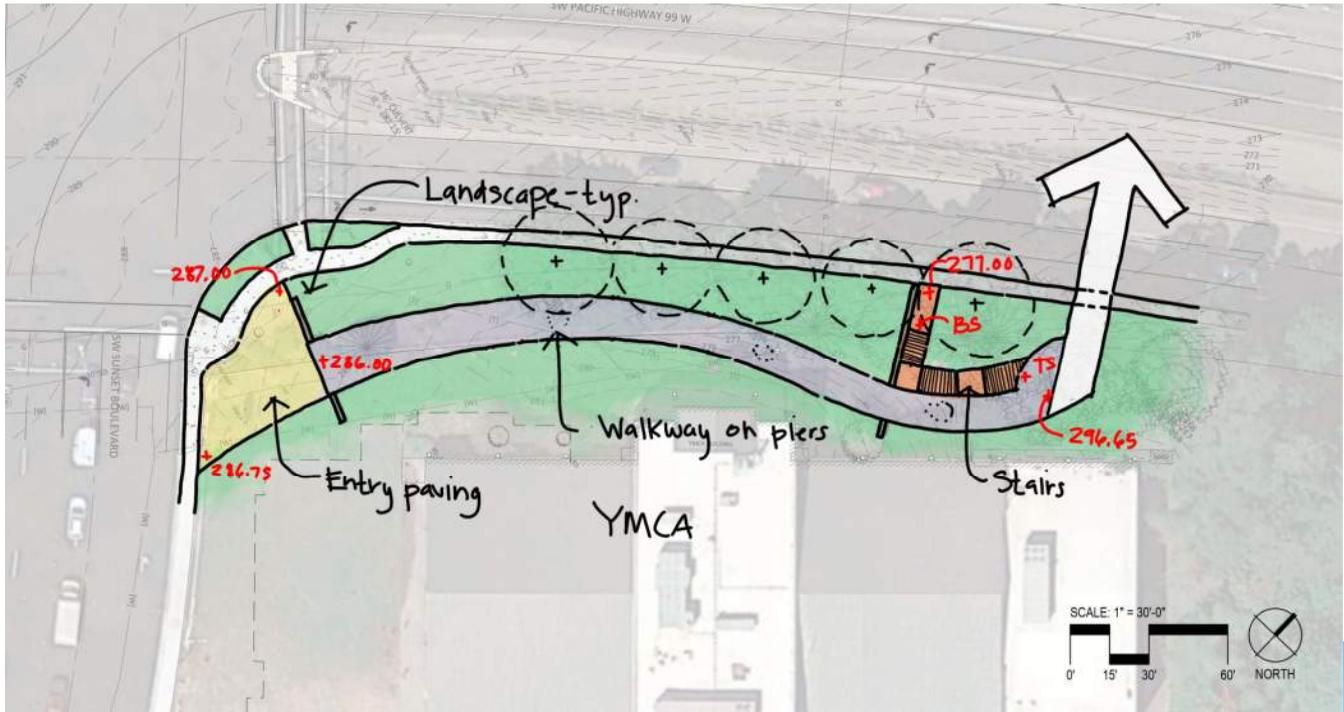


HWY 99W PEDESTRIAN BRIDGE PROJECT

Alignment Option A1

City of Sherwood

Hwy 99W Pedestrian Bridge Project



Plan View

Massing Perspective

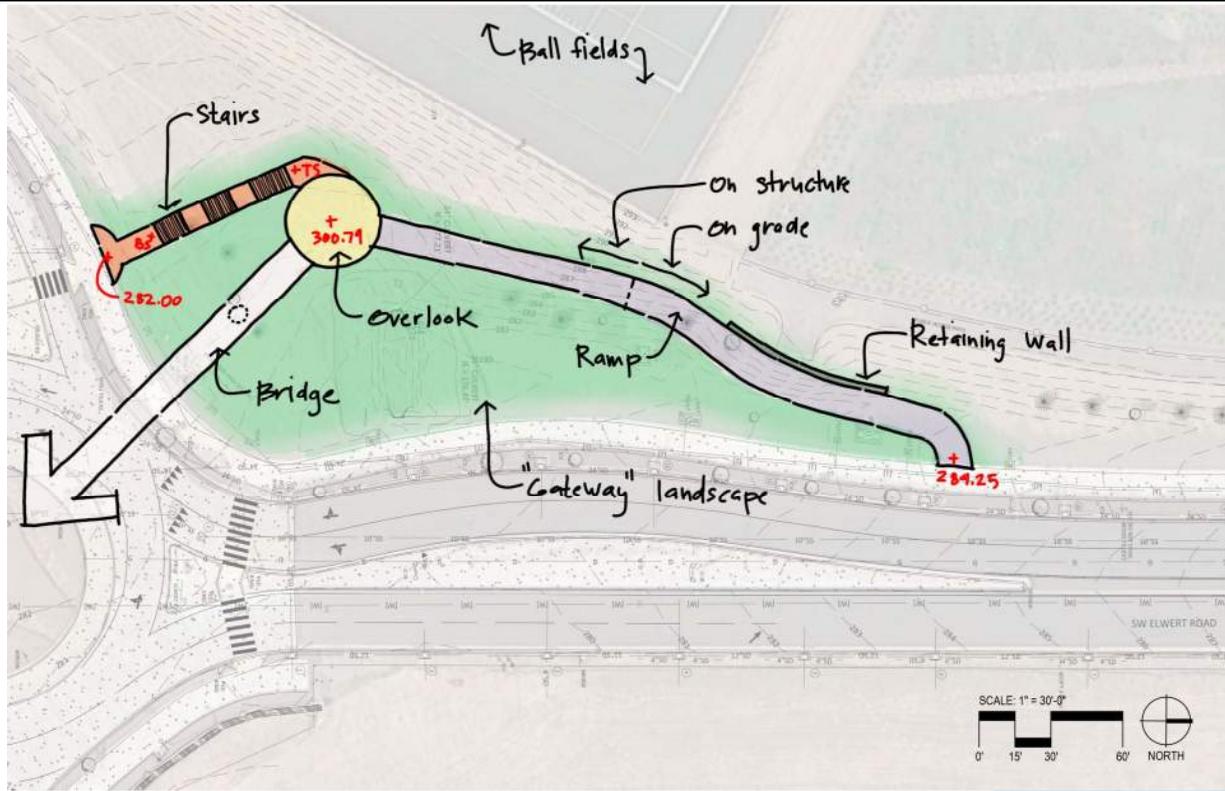


Alignment A1 - East Landing

HWY 99W PEDESTRIAN BRIDGE PROJECT

City of Sherwood

Hwy 99W Pedestrian Bridge Project



Plan View

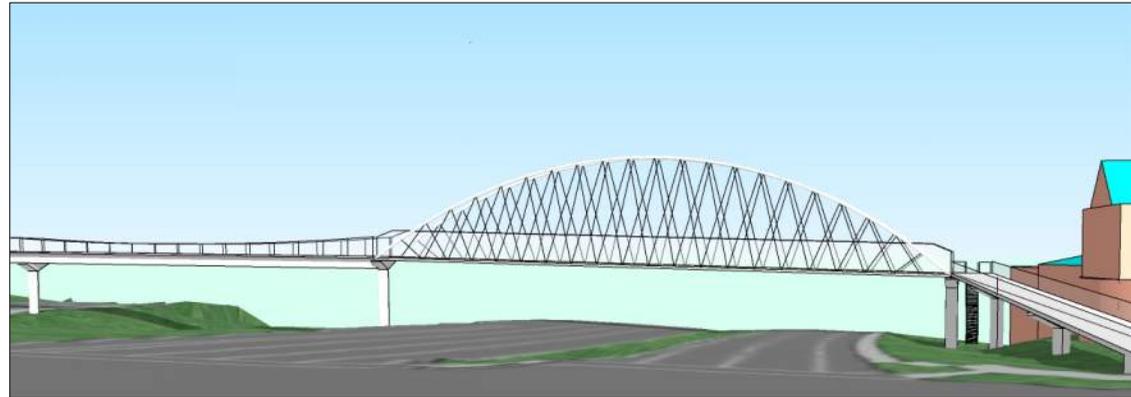
Massing Perspective



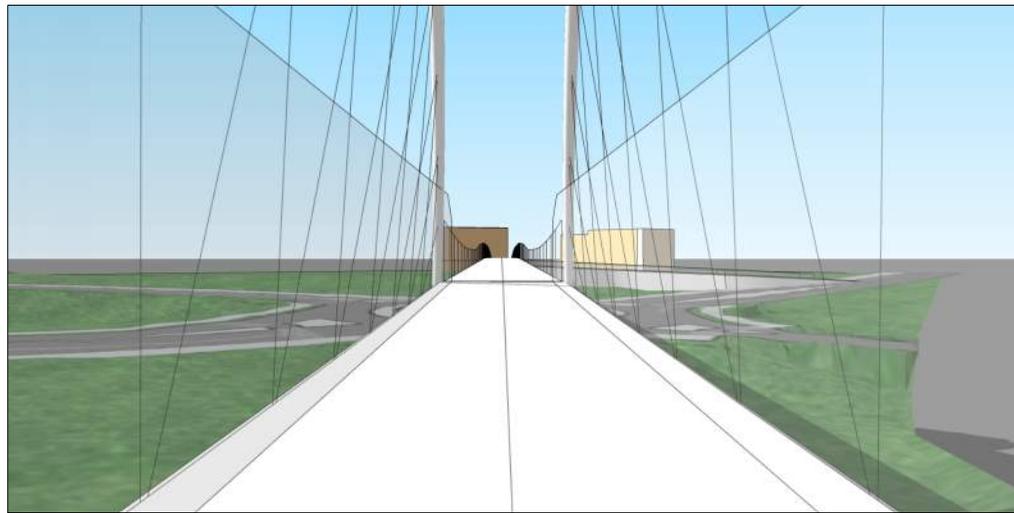
Alignment A1 - West Landing



aerial perspective



HW99 northbound perspective



On Bridge - westbound perspective

Main Span – Tall Arch  
Approach Spans – Twin Girders

### SHERWOOD 99W PEDESTRIAN CROSSING

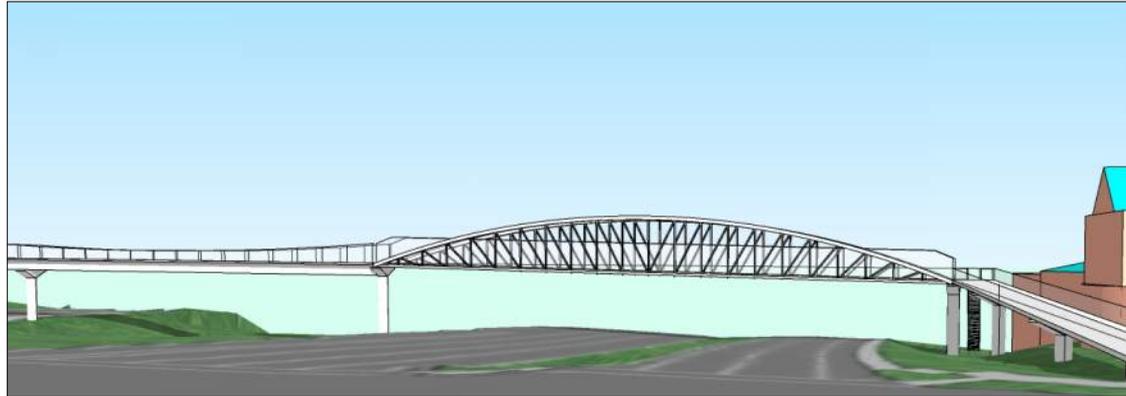
### | Alignment A1 – Option 1

City of Sherwood

Bicycle/Pedestrian  
Crossing over Highway 99  
at Sunset



aerial perspective



HW99 northbound perspective

Main Span – Bowstring Truss  
Approach Spans – Twin Girders



On Bridge - westbound perspective

**SHERWOOD 99W PEDESTRIAN CROSSING**

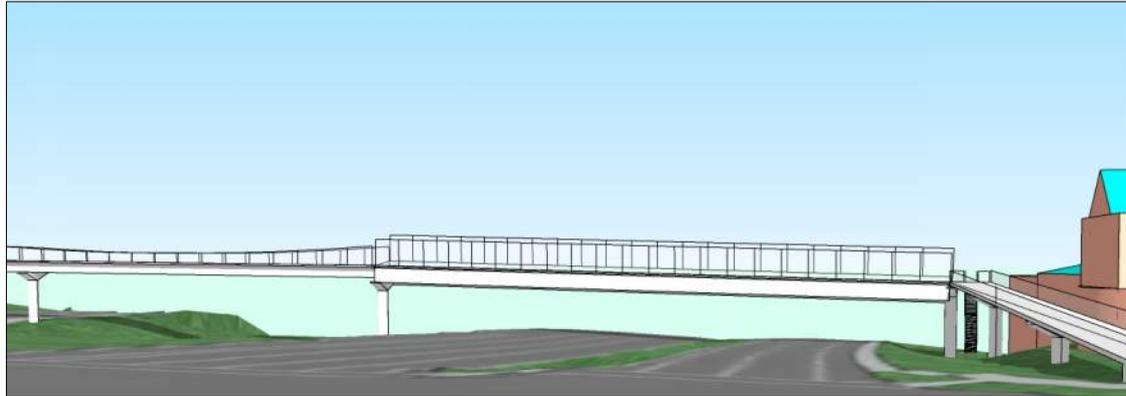
**| Alignment A1 – Option 2**

City of Sherwood

Bicycle/Pedestrian  
Crossing over Highway 99  
at Sunset



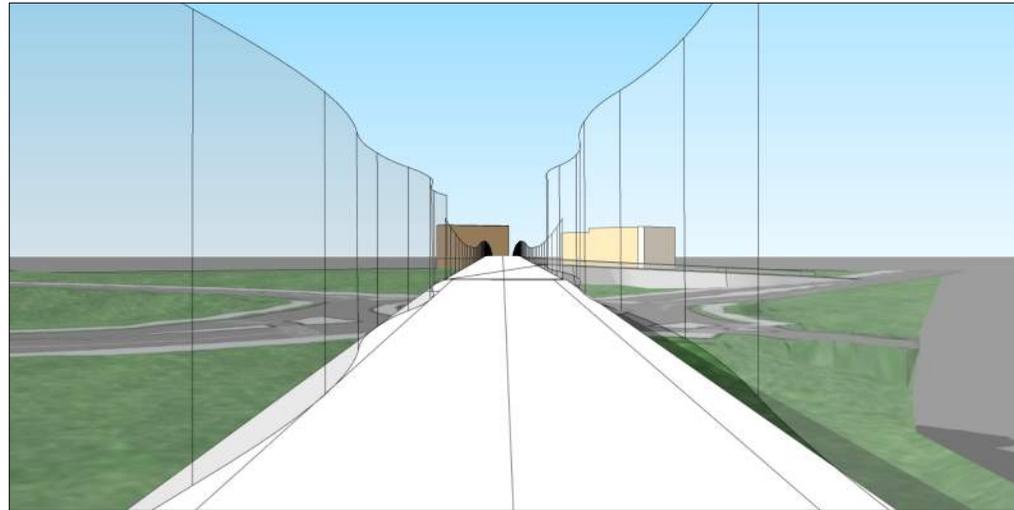
aerial perspective



HW99 northbound perspective

Main Span – Twin Girder  
Approach Spans – Twin Girders

**SHERWOOD 99W PEDESTRIAN CROSSING**

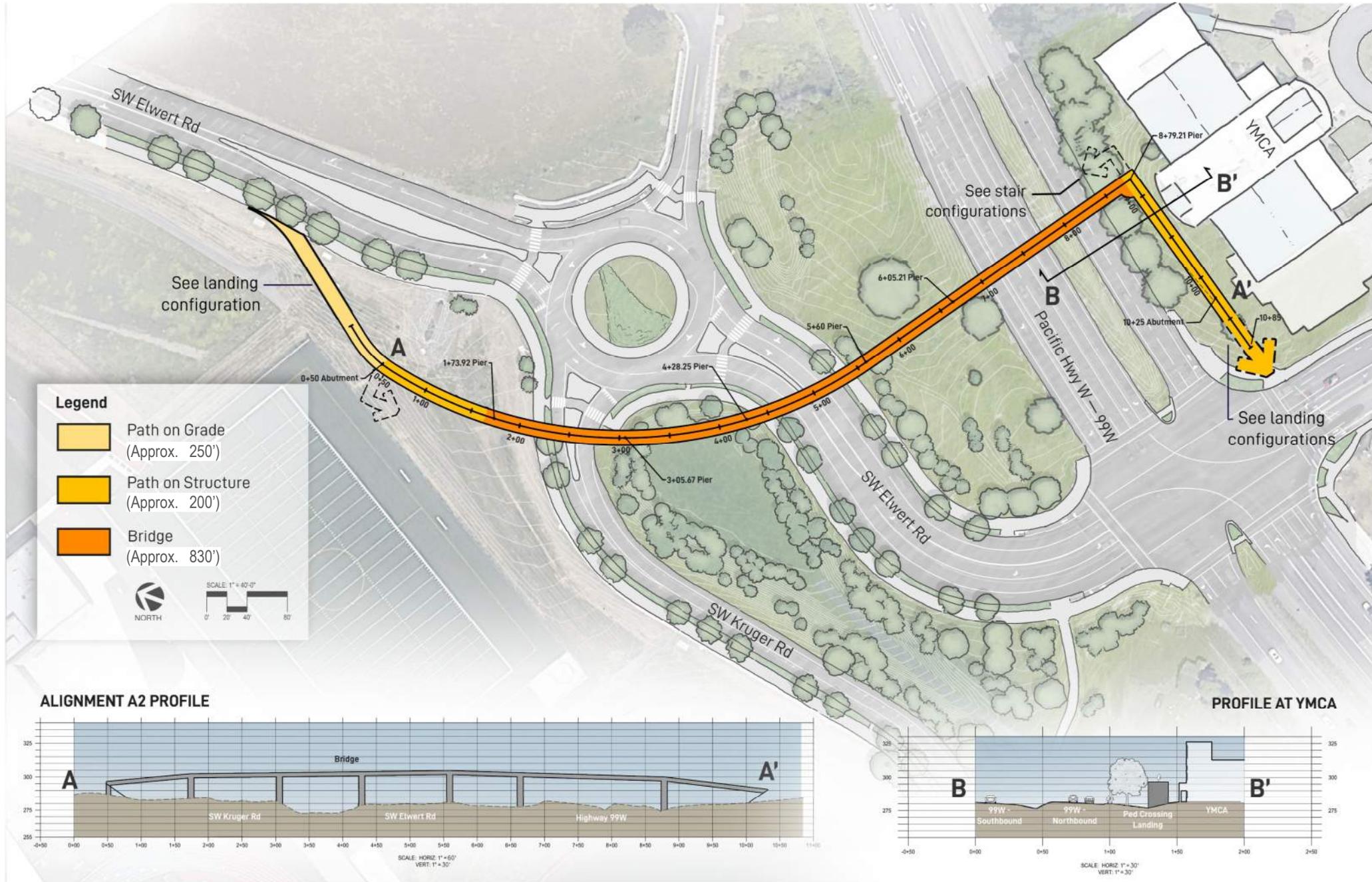


On Bridge - westbound perspective

**| Alignment A1 – Option 3**

City of Sherwood

Bicycle/Pedestrian  
Crossing over Highway 99  
at Sunset

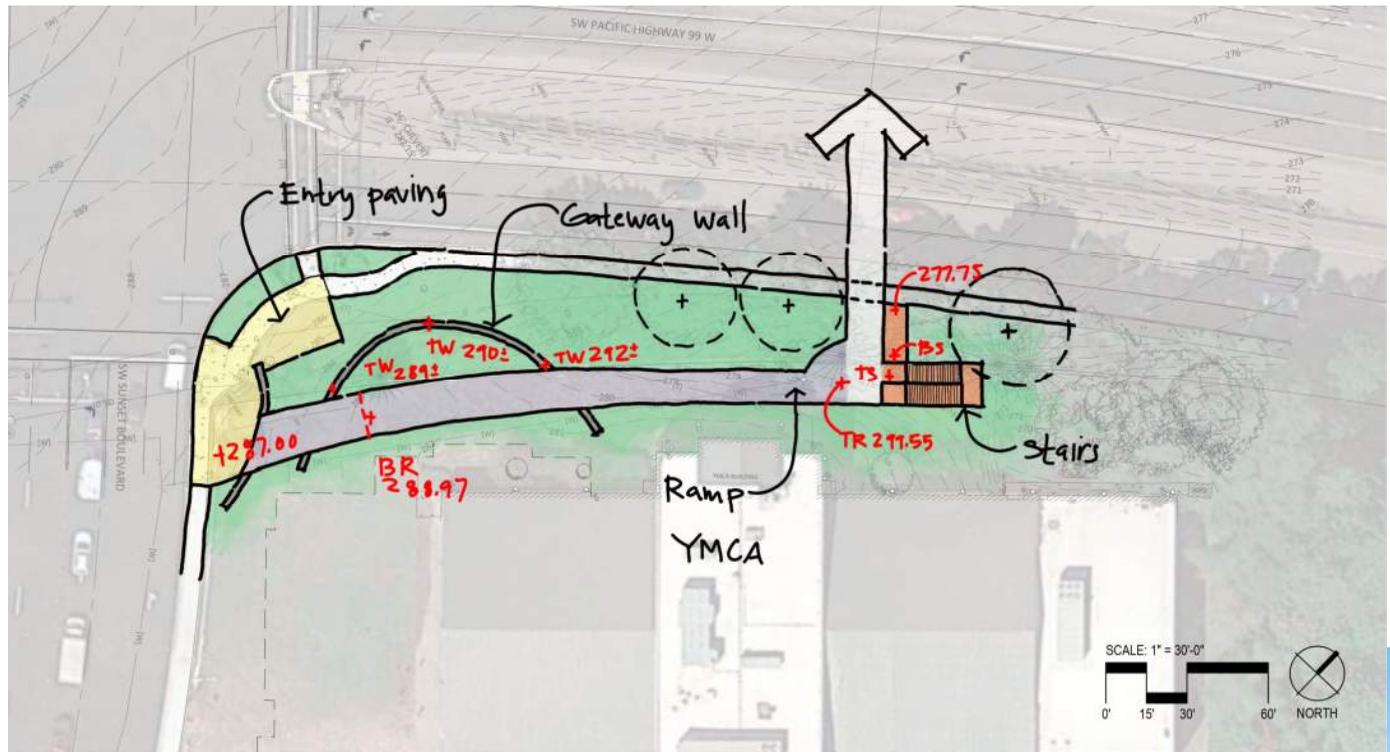


HWY 99W PEDESTRIAN BRIDGE PROJECT

Alignment Option A2

City of Sherwood

Hwy 99W Pedestrian Bridge Project

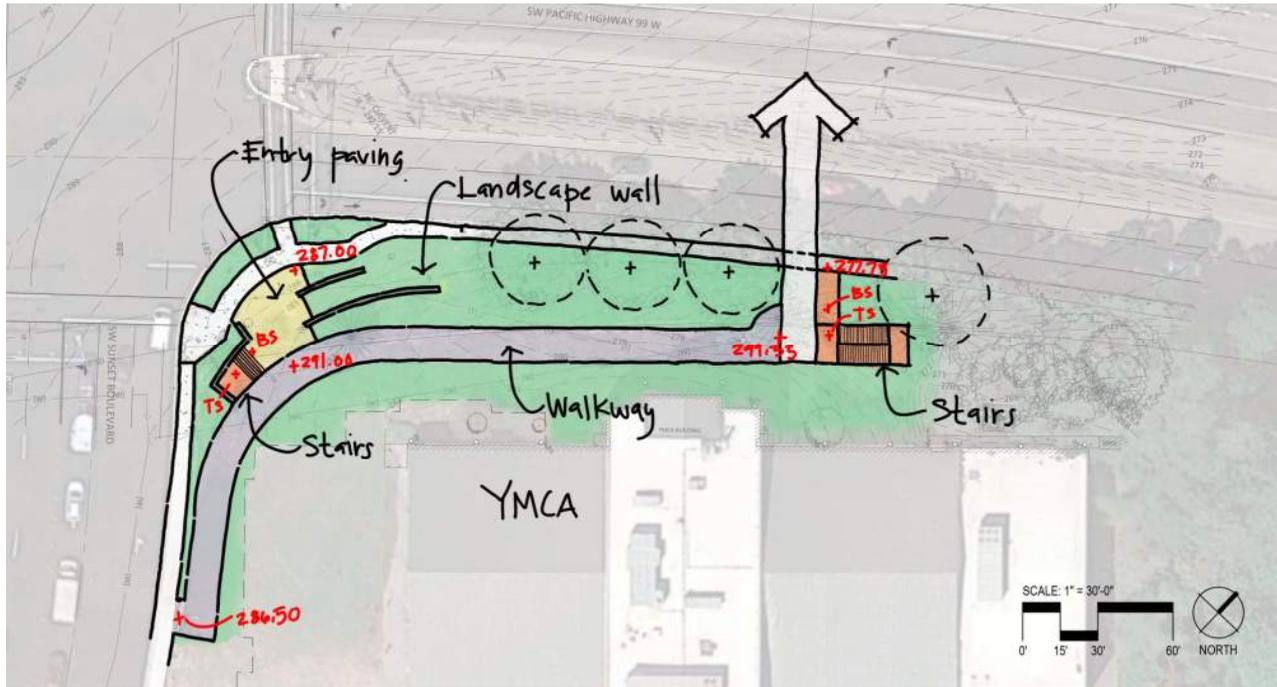


Plan View

Massing Perspective



Alignment A2 – East Landing – Option 1



Plan View

Massing Perspective

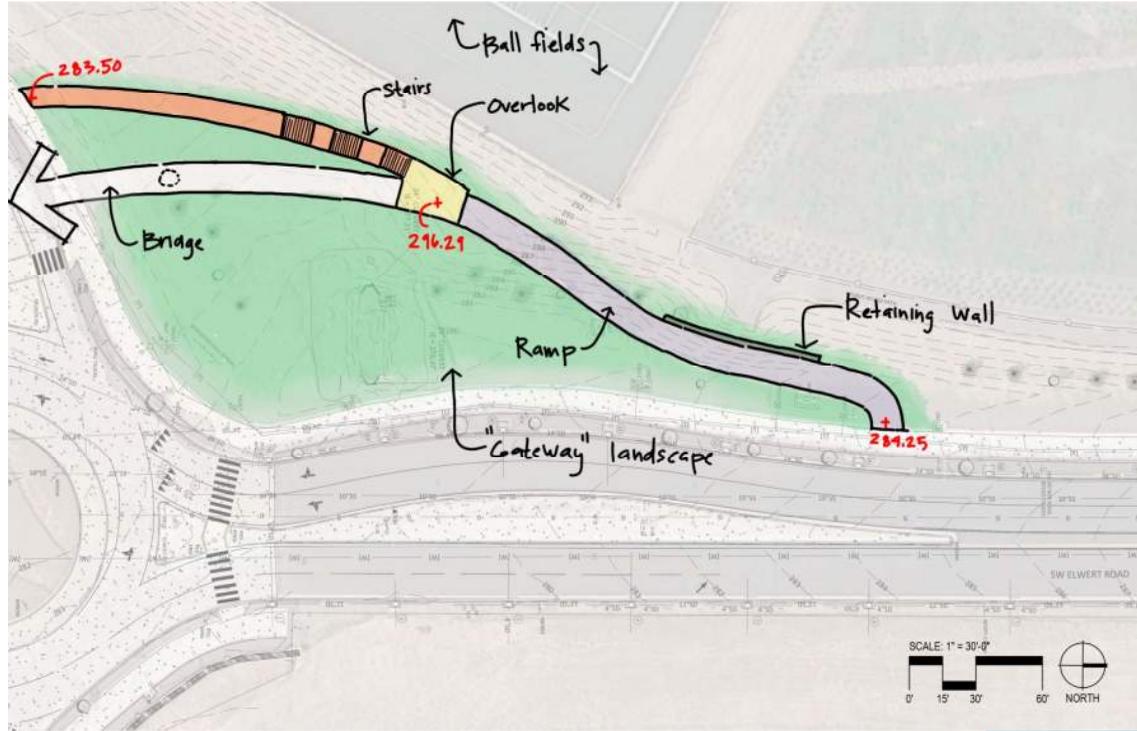


Alignment A2 – East Landing – Option 2

HWY 99W PEDESTRIAN BRIDGE PROJECT

City of Sherwood

Hwy 99W Pedestrian Bridge Project

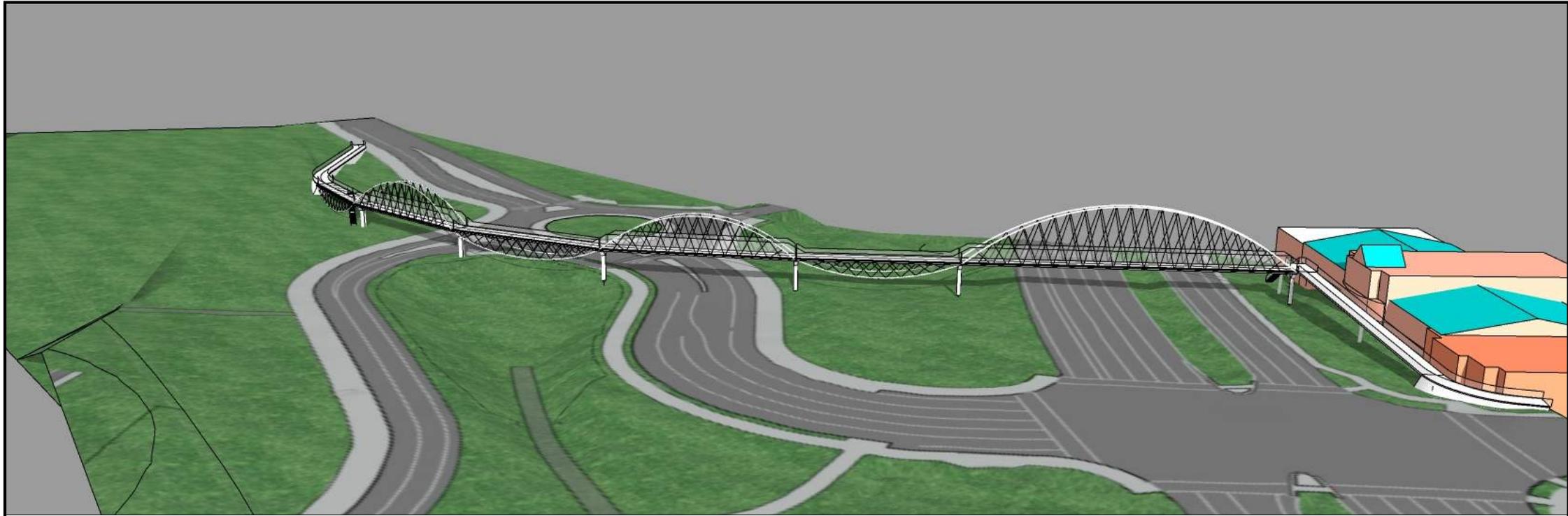


Plan View

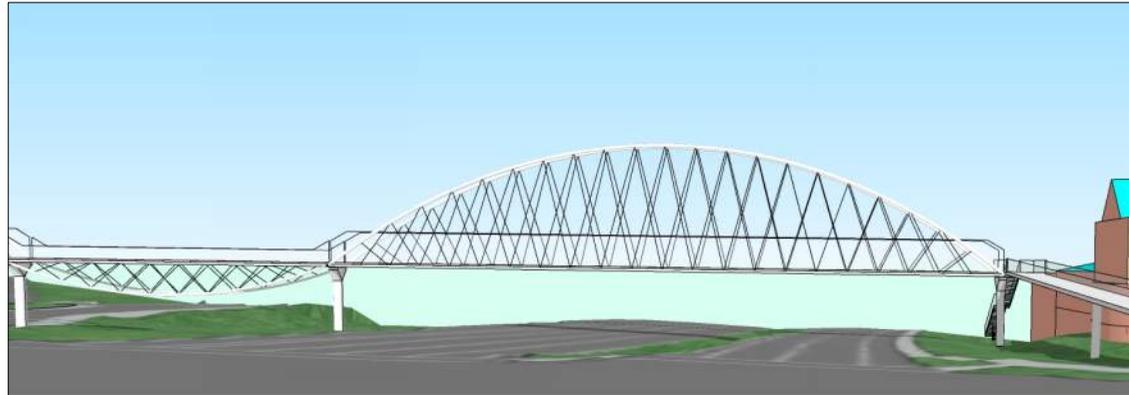
Massing Perspective



Alignment A2 - West Landing



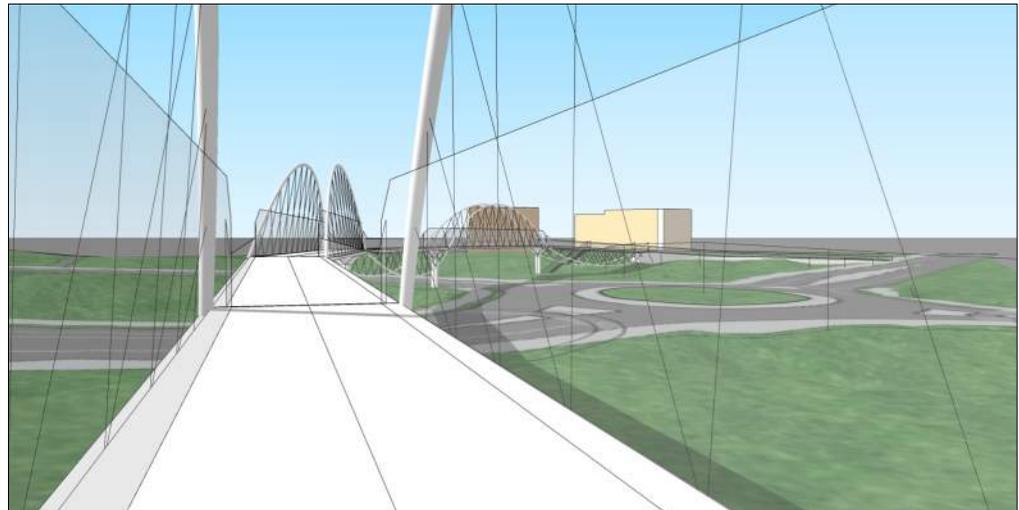
aerial perspective



HW99 northbound perspective

Main Span – Tall Arch  
Approach Spans – Tall Arches

**SHERWOOD 99W PEDESTRIAN CROSSING**



On Bridge - westbound perspective

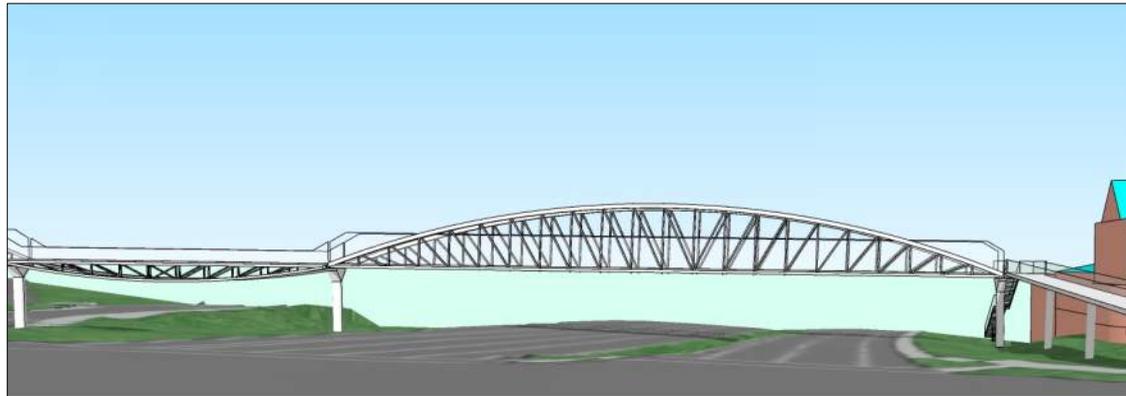
**| Alignment A2 – Option 1**

City of Sherwood

Bicycle/Pedestrian  
Crossing over Highway 99  
at Sunset



aerial perspective



HW99 northbound perspective

Main Span – Bowstring Truss  
Approach Spans – Bowstring Trusses

**SHERWOOD 99W PEDESTRIAN CROSSING**

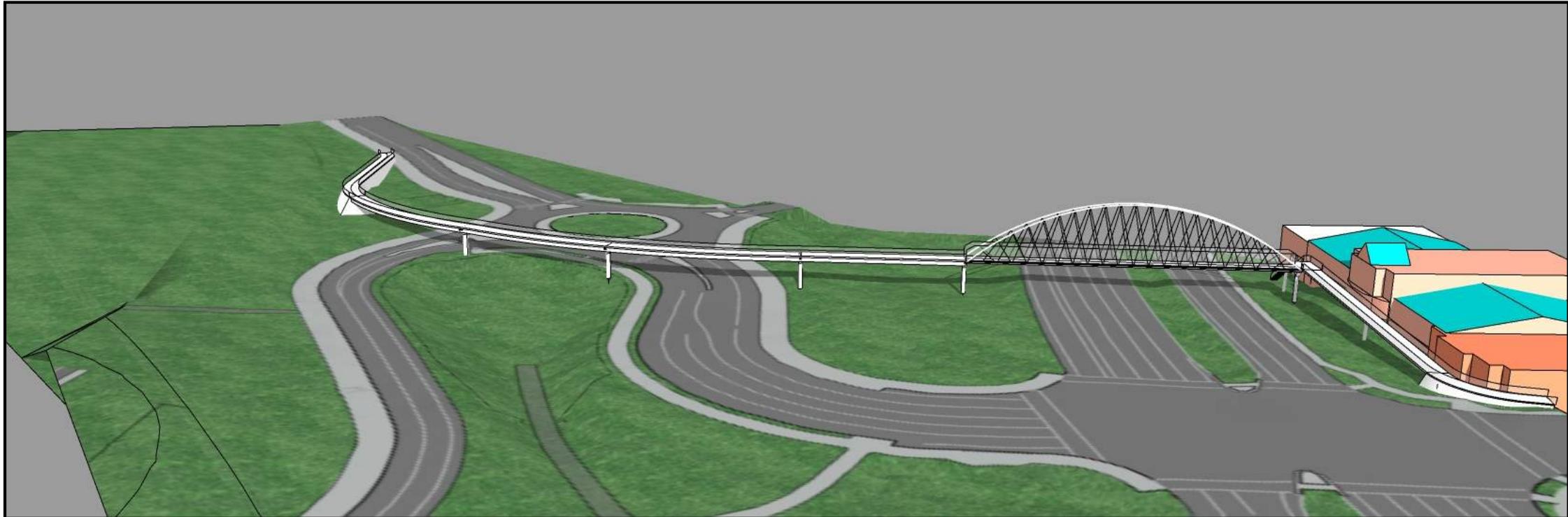


On Bridge - westbound perspective

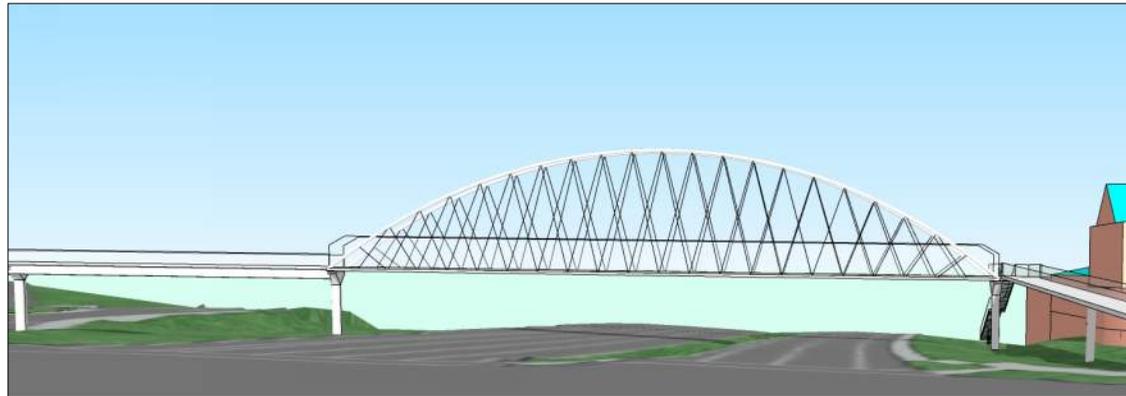
**| Alignment A2 – Option 2**

City of Sherwood

Bicycle/Pedestrian  
Crossing over Highway 99  
at Sunset



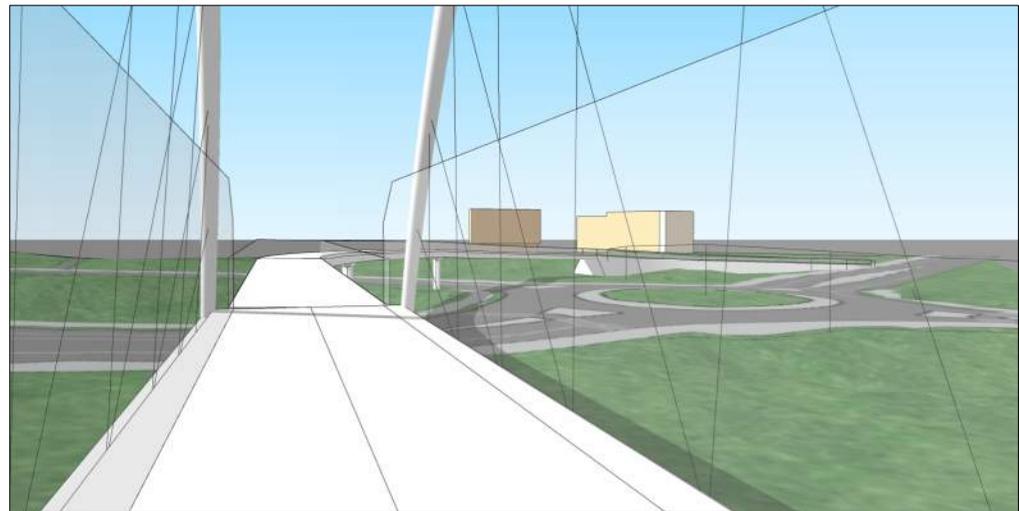
aerial perspective



HW99 northbound perspective

Main Span – Tall Arch  
Approach Spans – Twin Girders

**SHERWOOD 99W PEDESTRIAN CROSSING**



On Bridge - westbound perspective

**| Alignment A2 – Option 3**

City of Sherwood

Bicycle/Pedestrian  
Crossing over Highway 99  
at Sunset



Pre-Manufactured Steel Arch



Pre-Manufactured Wood Arch



Pre-Manufactured Steel Bowstring Truss



Custom Designed Steel Arch



Custom Designed Wood Arch



Custom Designed Steel Bowstring Truss

City of Sherwood

Hwy 99W Pedestrian Bridge Project

Goals	Alternatives					
	Alignment A1 (Over Roundabout)			Alignment A2 (South of Roundabout)		
	Bridge Type			Bridge Type		
	Tall Arch Main Span / Twin Girder Approaches	Bowstring Truss Main Span / Twin Girder Approaches	Twin Girder Full Length	Tall Arch Main Span / Arch Approaches	Bowstring Truss Main Span and Approaches	Tall Arch Main Span / Twin Girder Approaches
Safety improvement	Both alignments eliminate all pedestrian crossing conflicts between 99W and the high school.					
Connectivity	No change between alternatives. Both provide direct connection between the YMCA, the high school and the multiuse trail on Elwert and Kruger.					
Accessibility	All approaches to meet ADA (4.5% max. running slopes)			All approaches to meet ADA. East approach may require ramps (8.3% max.) and landings depending on design solution at intersection.		
Desirability	Route includes a few angles and is slightly longer than A2.			Most direct route, but only slightly less length than A1.		
Utility Impacts	Overhead utility line adjustments and coordination with utilities required. Water and gas relocations likely required to accommodate pier in roundabout median.			Overhead utility line adjustments and coordination with utilities required.		
Environmental	No anticipated wetland or significant resource impacts. One pier located within edge of stormwater facility on southeast leg of roundabout.			No anticipated wetland or significant resource impacts. Two piers located within edge of regional stormwater facility on west leg of roundabout.		

- Legend:**
- Safety improvement** Eliminate or reduce conflicts between vehicles and people walking, biking, and rolling.
  - Connectivity** Integrate the crossing with existing and planned trail network in Sherwood across OR 99W.
  - Accessibility** Ensure crossing opportunities for people of all abilities.
  - Desirability** Minimizes out of direction travel between YMCA and High School properties.
  - Utility Impacts** Impacts to existing underground and overhead utilities
  - Environmental** Impacts to environmentally sensitive areas and environmental permitting considerations

City of Sherwood  
Hwy 99W Pedestrian Bridge Project

Goals	Alternatives					
	Alignment A1 (Over Roundabout)			Alignment A2 (South of Roundabout)		
	Bridge Type			Bridge Type		
	Tall Arch Main Span / Twin Girder Approaches	Bowstring Truss Main Span / Twin Girder Approaches	Twin Girder Full Length	Tall Arch Main Span / Arch Approaches	Bowstring Truss Main Span and Approaches	Tall Arch Main Span / Twin Girder Approaches
Alignment Length - Path on Grade - Path on Structure - Bridge	1,300' (includes Elwert Connection) 150' 450' 700'			1280' (includes Elwert Connection) 250' 200' 830'		
Signature Structure Potential	Moderate (Similar Bridges exist. in NW)			High (Bridge would be unique to Sherwood)		Moderate (Similar Bridges exist. in NW)
Gateway Design Potential	High		Moderate	High		
ROM Construction Cost	\$14M	\$15M	\$15M	\$13M	\$14M	\$13M

**Legend:**  
**Signature Structure Potential** Create a signature that is uniquely identifiable to Sherwood.  
**Gateway Design Potential** Create a structure that let's Hwy 99W users know that they are entering / leaving Sherwood.  
**Construction Cost** Relative Order of Magnitude (ROM) construction costs including utility relocation and estimating contingency.

City of Sherwood  
Hwy 99W Pedestrian Bridge Project

# Next Steps:

- Online Open House #2 – 3/23 to 4/1
- Select Preferred Alternative – 4/11
- Complete 30% Design / Cost Estimating – 6/20

# Open Forum:



## Alignment Option A1



## Alignment Option A2

# 99W PEDESTRIAN BRIDGE PROJECT



## ONLINE OPEN HOUSE #2 SUMMARY

Prepared by JLA Public Involvement

The online open house was open from **March 23 to April 4, 2022**, and the site received 287 views and 58 survey submissions during that time. The goal was to share the results from the previous online open house in February 2022 and to gather feedback on the updated alignments, landings, and bridge options.

**58**

Survey Participants

## THE ALIGNMENT

When asked if they had any other thoughts or concerns about the final alignment, **participants showed general support**. Of the 17 comments submitted, several people said they like the alignment and/or have no concerns. See a sampling of unique comments below.

- The alignment looks good but may want to do a safety risk assessment for anyone that may have a health issue and how to reach them in the middle.
- Current alignment starts/ends in center of YMCA but doesn't provide good YMCA or trail access. Shifting alignment to the north allows for closer direct connection to nearby trail (north of YMCA), the YMCA itself (a path could go alongside the north of the building to the main entrance) while the existing landing at the NE corner of Sunset and 99W could be maintained.
- I like the alignment as long as folks can get to the bridge from Krugger (west side of bridge) and from Woodhaven condos (north of YMCA).
- I feel, as an empty nester looking back, this is a great design. There is no need to drop off closer to Krugger as it leads to kids having ability to go where areas are fenced off and get in trouble. Ending on Elwert puts pedestrians on the sidewalk where car traffic can be a deterrent to possible goofing off and other teen misbehaviors.
- Are there any issues with the piers landing in the detention basin for stormwater? Has Clean Water Services been solicited for their input on this preferred alignment?
- I prefer this alignment than going over the traffic circle.

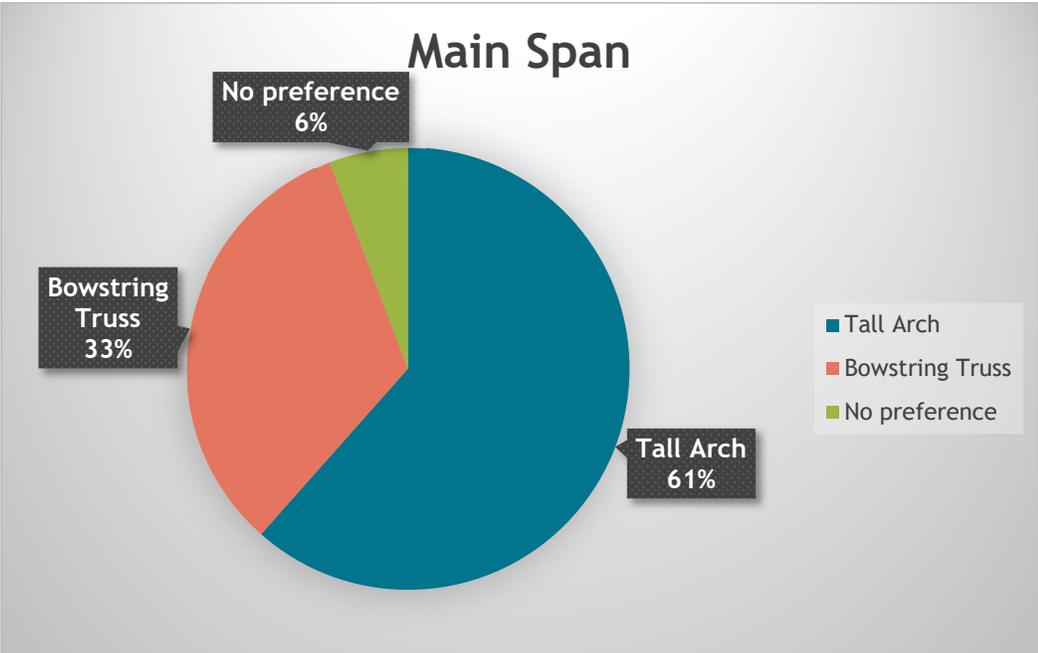
# THE LANDINGS

Of the 18 people who responded to the question, “Do you have any thoughts or concerns about either landing?” the majority said they liked the landings. Below is a sampling of other unique comments:

- I like the addition of the landscape wall at Sunset which will add some protection for pedestrians from possible vehicle collision hazards.
- I don't think this will be useful to cyclists at all. The landings are too awkward to use. It may work for parents who ride on the sidewalks with their kids, but it's not good for serious cyclists.
- I like the landing at the high school and the stairs option the other direction. Looks good.
- Looks Awesome. Can we have a food cart area around the base of the high school landing?
- Seems like a missed opportunity not connecting bridge directly (ramp or separated path) with nearby trail north of YMCA. A stated purpose of the bridge is to avoid crossing busy 99W but the fact is many users, particularly students, will access the bridge from that trail. Connecting to the bridge from the trail will require a .1 mile walk on a narrow sidewalk that directly abuts 99W (no planter/separation and a fence makes part of sidewalk largely unusable). It's not a comfortable (or safe?) experience for pedestrians. If pedestrians aren't comfortable getting to the bridge they will be much less likely to use it.

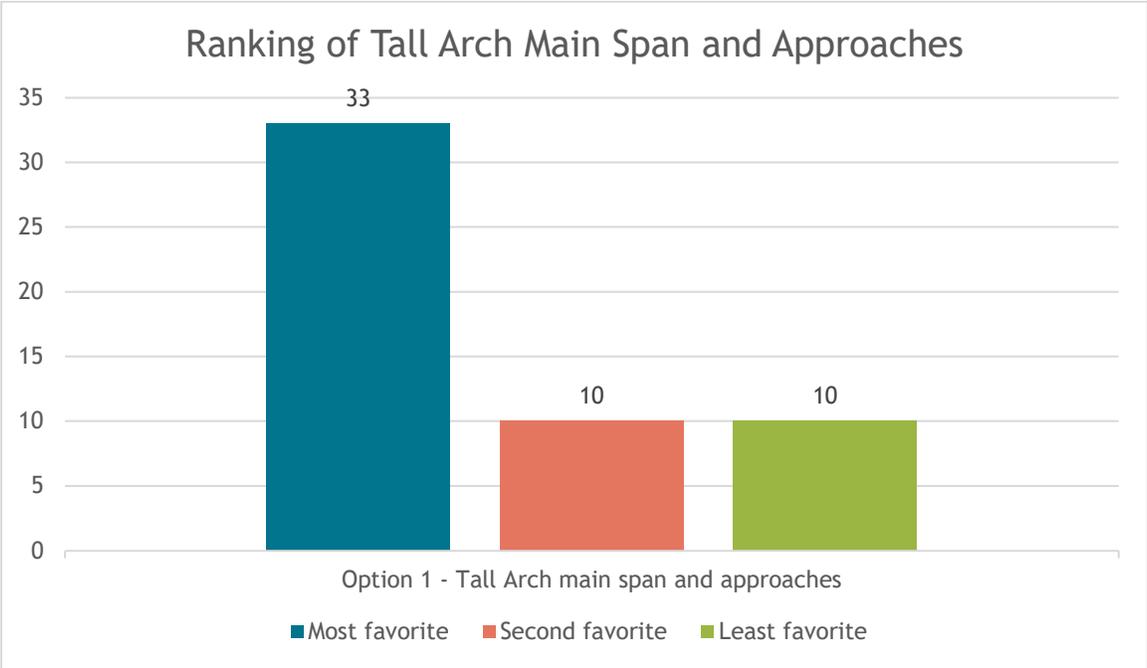
# MAIN SPAN

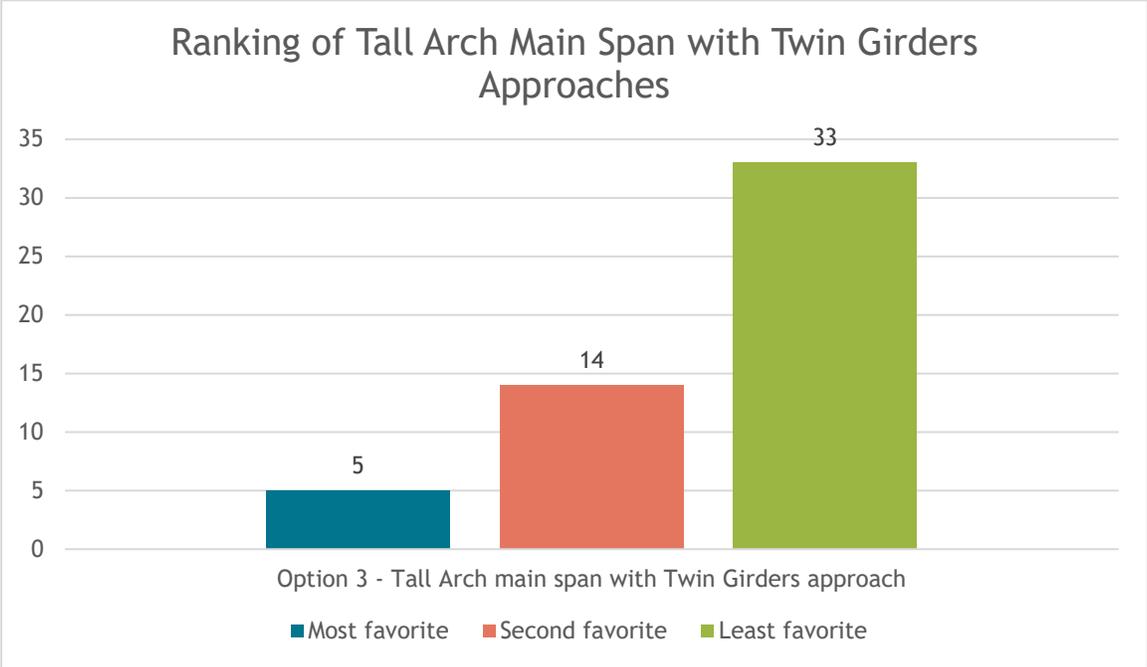
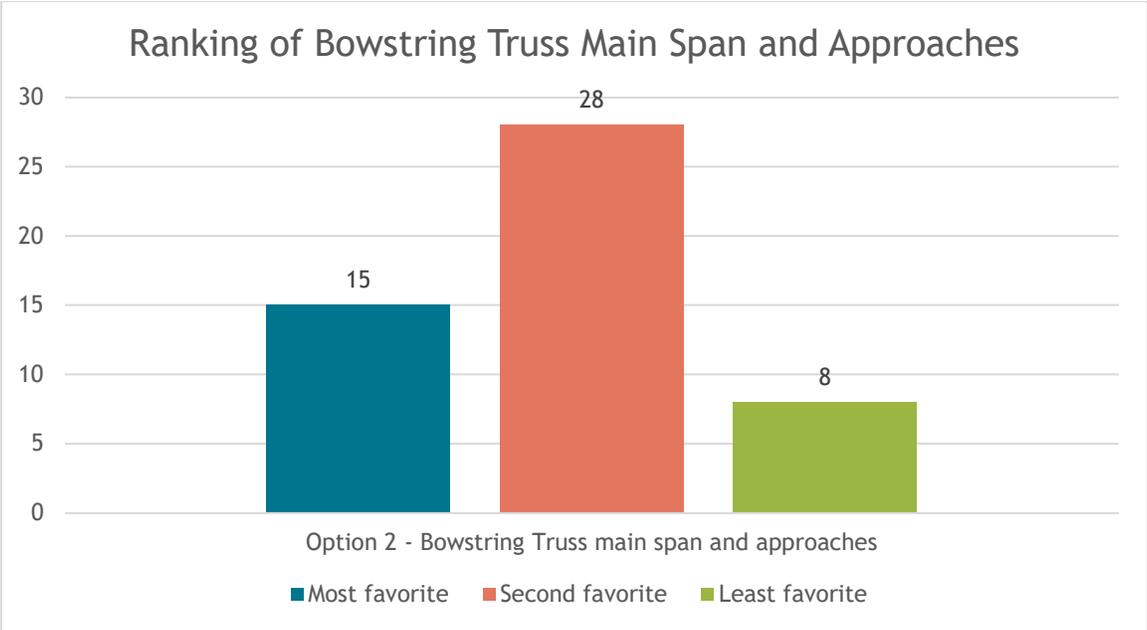
The majority of participants, **62%**, preferred the **Tall Arch main span** to the Bowstring Truss main span (33%).



# BRIDGE OPTIONS

Participants' favorite options were the Tall Arch structure main span and approaches and the Bowstring Truss main span and approaches. Although 62% chose the Tall Arch option as their the most favorite option, **an equal number of people ultimately favored the Tall Arch option and the Bowstring Truss option**, as 43 people chose the Tall Arch as their first or second favorite and 43 people chose the Bowstring Truss as their first or second favorite option. People didn't like the Tall Arch with Twin Girders approach option as much, as 63% chose it as their least favorite option.





**Other comments** regarding span configurations included:

- I am in favor of the option that is more affordable. Any of these will look nice, so let's go ahead and save the extra \$1 million (give or take 30%).
- Have a strong unified design. Don't mix and match so it looks irregular. Make it iconic - especially if that is lower cost vs. other options. Love the up/down wave of the design potential - just don't let folks reach "bottom" arch from ground.

- The twin girders look like a freeway ramp. The tall arches make it look less small town and too much like something seen in a more urban area.

## AESTHETICS

**Participants strongly preferred a steel bridge (75%)** to a wood bridge (13%), although 13% had no preference. A few people shared their concerns about the premature weathering of wood, but a couple of people said a custom wood arch would be most attractive.

“As a resident for 22 years, I see this as a very important project for Sherwood. It can enhance the appearance, safety, and use for our community. This website has been set up perfectly and I/we appreciate the hard work and effort to get this right. I like the appearance of the wood arch, but for longevity and strength, steel is hard to beat.”

### How Important is it for the bridge to have a unique signature to Sherwood?

**57%** felt it was important or very important  
**26%** were neutral  
**16%** felt it was not very important or not important at all

*“The opportunity to create a signature bridge at roughly the same cost as more typical/mundane designs makes a unique design a no-brainer.”*

## OTHER GENERAL FEEDBACK

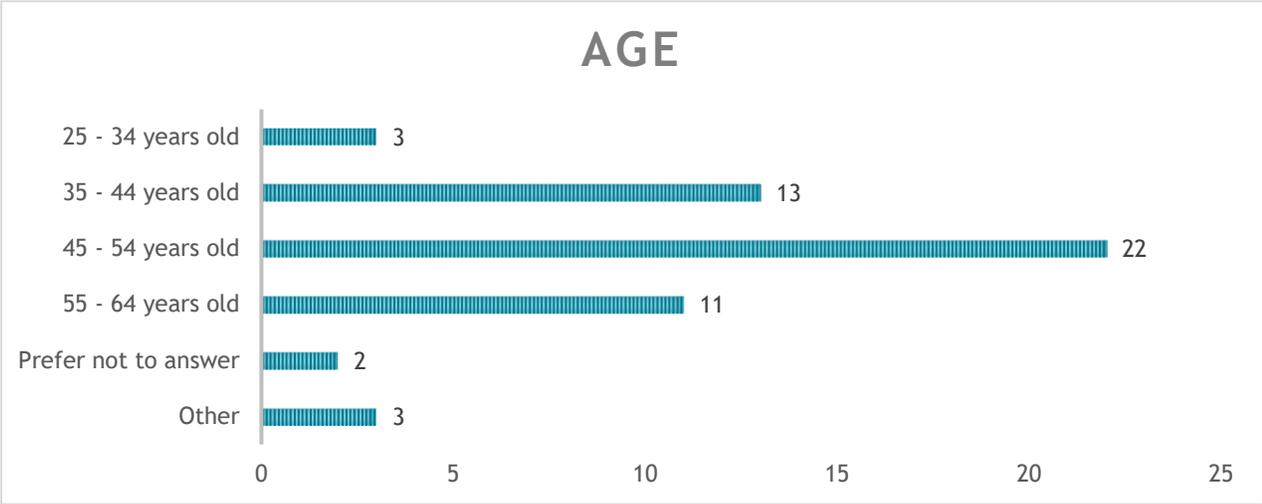
The following are participants’ general comments for the project team:

- Add color changing lighting.
- Artwork/look is not a high priority. Getting the project accomplished in a reasonable time for our kids is.
- As a parent with kids in SSD, I am very much in favor of this entire project.

- Certainly consider part wood and part steel. i.e. steel platform/wood truss or similar combination. This will be the most recognizable feature in the entire city for years to come, let's make it as attractive as functional.
- Don't include entering/exiting Sherwood signage on the bridge. This may be the gateway to Sherwood today. It won't be in the future as the City continues to grow. A simple/elegant Sherwood sign (if signage is desired) seems like the more future proof alternative.
- Great job. Look forward to the final outcome.
- Great progress. it isn't a road for the school but to connect the community - especially as the west side develops more.
- I am excited to see this come together, thank you for asking for my input.
- It is really coming together – impressive.
- Let's get it done :)
- Long term sustainability, safety, traffic flow (tall enough for semi's), affordability and esthetically pleasing are my top concerns.
- Low profile and simple is best.
- Pick a less expensive option that will get the job done and use the extra money to build a dog agility arena!
- Please provide opportunities for Tualatin River Wildlife Refuge to give suggestions on incorporating potential habitat elements for raptors or other birds
- Steel preferred material for maintenance issues - especially graffiti resistance/clean-up
- Structural corrosion protection coating requirements and frequency for recoating should be addressed. contractor should be required to apply the first and second coatings cost in the original cost proposal.
- Thank you for such a good online open house! Well designed and informative.
- It has been brought up to honor the two girls killed in the accident on Edy. I do not feel it appropriate to blast their photos on the bridge like a billboard-- maybe a small placard at a tree at the ends of the bridge or a bench with their names an honor at the school end. NO need to advertise a tragedy.
- Why not a tunnel?

# WHO PARTICIPATED IN THE SURVEY

## Age



## Where Participants Live

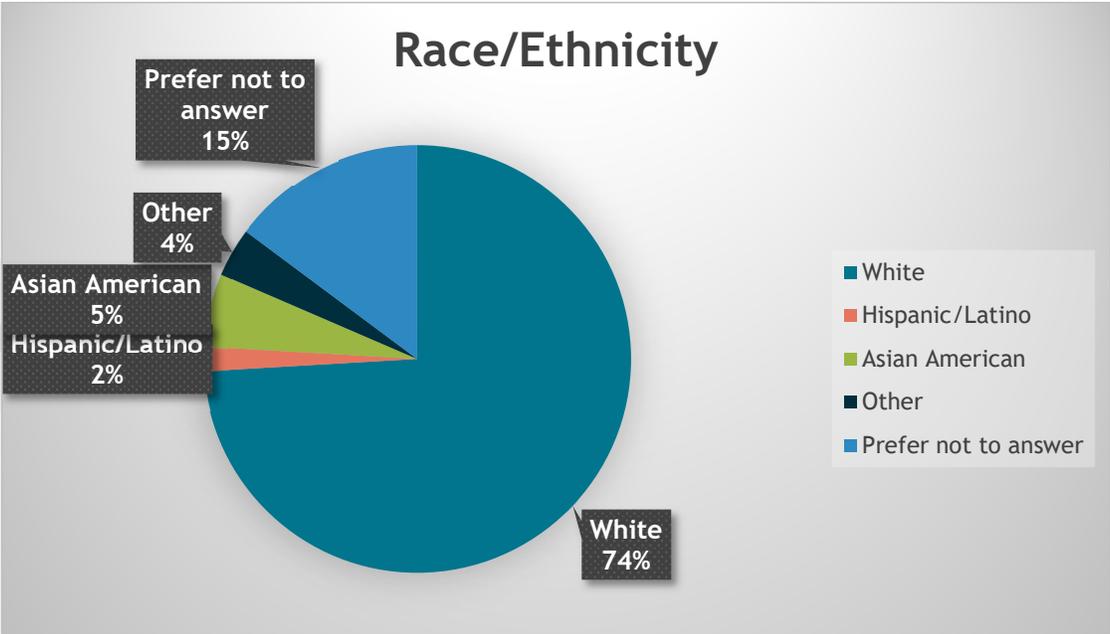
62% South of 99W

21% North of 99W

8% Downtown

10% Outside the city limits

## Ethnicity





ID	Description	Construction Estimate	Rounded
Over Roundabout Alternatives			
A1.1	High Arch & Twin Girders	\$ 14,472,640	\$ 14,500,000
A1.2	Bowstring Truss & Twin Girders	\$ 15,253,280	\$ 15,300,000
A1.3	Twin Girder (All Spans)	\$ 15,155,700	\$ 15,200,000
South Alternatives			
A2.1	Alternating Tall Arch	\$ 12,512,080	\$ 12,500,000
A2.2	Alternating Bowstring	\$ 13,672,680	\$ 13,700,000
A2.3	Twin Girder and Tall Arch	\$ 13,208,440	\$ 13,200,000

**Alternative A1 - Cost Estimate**

Station		Length (LF)	A1.1 - Over Roundabout w/ Tail Arch & Twin Girders			A1.2 - Over Roundabout w/ Bowstring Truss & Twin Girders			A1.3 - Over Roundabout w/ Twin Girder (All Spans)					
From	To		Description	Cost per LF	Amount	% of Estimate	Description	Cost per LF	Amount	% of Estimate	Description	Cost per LF	Amount	% of Estimate
Elvert	Retained Path	100	14' Paved trail on grade	\$ 2,000	\$ 200,000	2%	2% 14' Paved trail on grade	\$ 2,000	\$ 200,000	2%	2% 14' Paved trail on grade	\$ 2,000	\$ 200,000	2%
	Plaza	170	14' Paved trail on retained grade	\$ 3,000	\$ 510,000	5%	5% 14' Paved trail on retained grade	\$ 3,000	\$ 510,000	5%	5% 14' Paved trail on retained grade	\$ 3,000	\$ 510,000	5%
Plaza	+50	7+47	Plaza Improvements (retained fill)	Allowance	\$ 400,000	4%	4% Plaza Improvements (retained fill)	Allowance	\$ 400,000	4%	4% Plaza Improvements (retained fill)	Allowance	\$ 400,000	4%
			697 High Arch + Girder	\$ 9,800	\$ 6,830,600	66%	66% Low Arch + Girder	\$ 10,600	\$ 7,388,200	68%	68% Girder + Girder	\$ 10,500	\$ 7,318,500	68%
10+32 Plaza	7+47	10+32	285 Approach Girder	\$ 4,200	\$ 1,197,000	12%	12% Approach girder	\$ 4,200	\$ 1,197,000	11%	11% Approach Girder	\$ 4,200	\$ 1,197,000	11%
			43 Plaza Improvements	Allowance	\$ 200,000	2%	2% Plaza Improvements	Allowance	\$ 200,000	2%	2% Plaza Improvements	Allowance	\$ 200,000	2%
			Lighting	Allowance	\$ 300,000	3%	3% Lighting	Allowance	\$ 300,000	3%	3% Lighting	Allowance	\$ 300,000	3%
			Reroute Natural Gas & Water	Allowance	\$ 200,000	2%	2% Reroute Natural Gas & Water	Allowance	\$ 200,000	2%	2% Reroute Natural Gas & Water	Allowance	\$ 200,000	2%
			Reroute Power Lines	Allowance	\$ 500,000	5%	5% Reroute Power Lines	Allowance	\$ 500,000	5%	5% Reroute Power Lines	Allowance	\$ 500,000	5%
			<b>Subtotals</b>			\$ 10,337,600			\$ 10,895,200		\$ 10,825,500			\$ 10,825,500
Contingency (40%)					\$ 4,135,040				\$ 4,358,080				\$ 4,330,200	
Construction Estimate					\$ 14,472,640				\$ 15,253,280				\$ 15,155,700	

**Alternative A2 - Cost Estimate**

Station		Length (LF)	A2.1 - South of Roundabout w/ Alternating Tail Arch			A2.2 - South of Roundabout w/ Alternating Bowstring			A2.3 - South of Roundabout w/ Twin Girder and Tail Arch					
From	To		Description	Cost per LF	Amount	% of Estimate	Description	Cost per LF	Amount	% of Estimate	Description	Cost per LF	Amount	% of Estimate
Elvert	Retained Path (0+	220	14' Paved trail on grade	\$ 2,000	\$ 440,000	4%	4% 14' Paved trail on grade	\$ 2,000	\$ 440,000	3%	3% 14' Paved trail on grade	\$ 2,000	\$ 440,000	3%
	+50	8+79	829 Alternating High Arch	\$ 8,000	\$ 6,632,000	53%	53% Alternating Low Arch	\$ 9,000	\$ 7,461,000	55%	55% Twin Girder	\$ 8,600	\$ 7,129,400	54%
10+85 Plaza	8+79	10+85	206 Approach Girder	\$ 4,200	\$ 865,200	7%	7% Approach Girder	\$ 4,200	\$ 865,200	6%	6% Approach Girder	\$ 4,200	\$ 865,200	7%
			35 Plaza Improvements	Allowance	\$ 200,000	2%	2% Plaza Improvements	Allowance	\$ 200,000	1%	1% Plaza Improvements	Allowance	\$ 200,000	2%
			Lighting	Allowance	\$ 300,000	2%	2% Lighting	Allowance	\$ 300,000	2%	2% Lighting	Allowance	\$ 300,000	2%
			Reroute Power Lines	Allowance	\$ 500,000	4%	4% Reroute Power Lines	Allowance	\$ 500,000	4%	4% Reroute Power Lines	Allowance	\$ 500,000	4%
<b>Subtotals</b>					\$ 8,937,200				\$ 9,766,200				\$ 9,434,600	
Contingency (40%)					\$ 3,574,880				\$ 3,906,480				\$ 3,773,840	
Construction Estimate					\$ 12,512,080				\$ 13,672,680				\$ 13,208,440	