

TO: City of Wilsonville
BY: Bob Goodrich, P.E.
REVIEWED BY: Nick Robertson, P.E., S.E.
DATE: February 2021
SUBJECT: Boeckman Dip Studies – Comprehensive Executive Summary

Since at least 2014 the City of Wilsonville (City) has been studying alternatives to widen and improve the vertical alignment of Boeckman Road between Canyon Creek Road and Stafford Road (Boeckman Dip). Over the past six years some assumptions and project objectives have changed, which affects previous studies’ analyses and conclusions. This memorandum synthesizes the following studies into a set of findings and recommended next steps (Table 1):

Study	Focus of the Study
Planning-level layout of a new bridge (DOWL, 2014)	Evaluated two bridge layouts to replace the overflow culvert and remove fill to the intermediate terrace. No work was considered below the overflow culvert and terrace.
Bridge construction traffic analysis and staging (DOWL & DKS, 2019)	Evaluated staging layouts to construct the bridge and road closure traffic impacts. Briefly considered removing most of the embankment below the overflow culvert.
Fish passage assessment (PHS, 2020)	Completed a fish passage assessment of the existing culvert.
Existing culvert condition assessment (AIMS Companies, 2020)	Conducted a condition assessment of the existing culvert.
Planning-level layout of embankment options (DOWL, 2020)	Evaluated two embankment layouts to replace both the primary and overflow culvert with new culverts and confirmed fish passage requirements are likely triggered for any bridge or embankment alternative studied.

Table 1 – Prior Studies

Due to assumptions that have changed in the last six years, some of the costs, durations, findings, and recommendations herein will not be consistent with the findings of the previous studies. The formative project findings that inform the major decisions of structure type (bridge versus culvert) and traffic staging (on-site detour versus road closure) include:

- Boeckman Creek’s active channel width (ACW) is approximately 12 feet
- Fish passage requirements are likely triggered for any of the proposed alternatives
- Boeckman Creek receives hundreds of acres of out-of-basin runoff upstream of this site
- Replacing the culvert and removing the flow control structure will affect downstream flows

- A detailed hydraulic analysis is necessary to evaluate downstream flood risks and detrimental impacts to Boeckman Creek
- Closing Boeckman Road results in only minor impacts along anticipated detour routes except at the Stafford Road-65th Avenue intersection, which requires a temporary signal

The previous studies considered several bridge alternatives, culvert and embankment alternatives, and multiple ways to stage or detour traffic. Through that process, many alternatives were eliminated from consideration. Related to structure types, alternatives no longer under consideration are rehabilitation of the existing culvert and the previous alternative of a bridge which spans only the overflow terrace – because neither of these alternatives are likely to be permitted. Related to traffic staging, alternatives no longer under consideration are an on-site detour south of Boeckman Road and one-lane, two-way staged construction.

Table 2 on the next page summarizes the structure type and traffic staging alternatives still under consideration compared across three criteria. The information provided in Table 2 is based on the best available information but is subject to change as the project advances. The alternatives and the criteria are briefly described below:

Structure Type Alternatives

New bridge: This alternative will remove the existing culverts and flow control structure, reestablish the ACW by removing existing embankment material to the elevation of the flow control structure, and construct a bridge while improving the vertical profile of the road. The bridge will accommodate wildlife passage and a future regional trail. Retaining walls will reduce the bridge length, limit property impacts, and protect trees to the extent practical. Based on a cursory analysis of the new channel section, the western abutment of the bridge can be moved approximately 40 feet to the east, which will result in an overall bridge length of 340 feet. The costs in this summary reflect this change from the previous study.

New culvert: This alternative will remove the existing culverts and flow control structure, reestablish the ACW, and install a new culvert that meets fish passage requirements while improving the vertical profile of the road. Two additional reinforced concrete box culverts will also be installed to accommodate wildlife passage and pedestrian access for a future regional trail. Retaining walls will limit property impacts and protect trees to the extent practical. This alternative is considered a minimum cost alternative that meets the overall project goals. Compared to the bridge it may result in increased levels of permitting risk and a lower overall benefit for trail users, maintenance staff, and fish and wildlife.

Traffic Staging Alternatives

On-site detour: This traffic staging scenario will construct a temporary road north of Boeckman Road using fill, a culvert extension, and retaining walls. A full road closure will be necessary to complete the roadway widening at the tie-in points east and west of the dip.

Full road closure: This traffic staging scenario will close Boeckman Road during construction. Traffic will be detoured to Elligsen Road and/or Wilsonville Road for most of the construction.

Criteria

Cost: Project costs, in 2023 dollars, include construction, preliminary and construction engineering, a 40% contingency, a 2% aesthetics allowance, and right-of-way (ROW) acquisition. Inflation should be applied based on the anticipated year of construction.

Durations: Two durations are presented: total construction time and the length of time Boeckman Road will be closed. Durations are instructive for comparing alternatives but are subject to change as design progress.

Impacts: Approximate property and tree impacts are presented. Natural resource impacts are not quantified since there is little differentiation and all alternatives result in long-term benefits.

		Cost*	Construction Duration	Closure Duration	Property Impacts	Tree Impacts
Bridge	On-Site Detour	\$22.8M	24 months	5 months	41,300 sq. ft.	130 trees
	Road Closure	\$20.7M	15 months	15 months	22,500 sq.ft.	120 trees
Embankment	On-Site Detour	\$18.8M	33 months	15 months	56,700 sq. ft.	135 trees
	Road Closure	\$16.9M	20 months	20 months	33,500 sq. ft.	125 trees

*Costs do not match those in previous reports. Table 2 costs are presented in 2023 dollars and include shortening the bridge structure by 40’.

Table 2 – Comparison Matrix

Based on these findings, our recommendation for traffic staging is to close the road during construction. The closure saves money, reduces impacts, and shortens construction. Detoured traffic has feasible alternative routes that do not result in significant delay.

Our recommendation for structure type is not as definitive and needs to consider both qualitative and quantitative (see Table 2) measures. The embankment alternative is the least cost alternative that meets the goals of improving the vertical profile of Boeckman Road, providing a wildlife and pedestrian undercrossing, and addressing fish passage requirements. Based on the preliminary evaluations the bridge alternative may cost up to 20% more than the embankment alternative. However, in addition to longer construction and road closure durations, greater property impacts and more tree removal, the embankment alternative includes several disadvantages to the bridge, including:

- Increased risk that permitting agencies will not approve of the final design of a 12-ft wide culvert. This would result in a project cost increase.
- Compared to an open channel, a new culvert would limit the ability to mitigate downstream hydraulic impacts within the current project footprint. This could increase impacts and project cost.
- The proposed 180-ft long pedestrian tunnel will not provide the same trail experience for users. This reduces user safety and could decrease the number of citizens using this recreational amenity.
- The proposed 240-ft long wildlife tunnel will not provide the same level of environmental benefit. This could limit the number and size of wildlife that uses the tunnel.

- Maintenance access on the south side of the embankment will be limited by the 12x12 tunnel. This could restrict specific maintenance activities or increase project costs to accommodate those activities

Addressing any of these disadvantages would decrease the price difference between the bridge and embankment alternatives.

Moving forward, there are still unknowns and unverified assumptions that could affect the project scope and budget. Most notably is the need to complete a downstream analysis, regardless of the preferred alternative. If that analysis determines there are adverse effects to downstream properties, there will be additional project costs and impacts to mitigate those effects.

Pending City Council approval of funding, it is recommended to proceed with completing a comprehensive 30% design that verifies assumptions and resolves unknowns to position the project for final design, permitting, and right-of-way acquisition.