



Project Narrative

32nd Avenue Industrial Access Feasibility Study

City of Vancouver, Washington

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1 Executive Overview

The City of Vancouver (COV) has seen fast growth over the last few years and is likely to see much more into the future. Significant growth opportunity exists in Vancouver's west-side industrial area and, as a result, regional traffic models project a substantial increase in traffic from the industrial areas heading toward I-5. This growth will further exacerbate conflicts between freight traffic and the neighborhoods it travels through. The Westside Mobility Strategy outlined the need to re-evaluate the 32nd Avenue Extension to help provide an industrially-oriented facility that will better encourage economic development while also pulling the freight travel out of the neighborhoods.

The purpose of this 32nd Avenue Industrial Area Feasibility Study (IAFS) is to address two primary questions: 1) Is the corridor fatally flawed due to changed conditions in the project area and 2) What is the updated estimated cost estimate for construction in year of expenditure? Additionally, the project team - led by the COV and Port of Vancouver (POV) - updated the corridor alignment to account for changed policies, plans, and industry best practices.

The 32nd Avenue IAFS found no fatal flaws in the updated alignment. The estimated project cost is between \$125-130 Million (in year of expenditure). The 32nd Avenue Extension could be phased into potentially five unique phases to match funding if needed, although building the corridor at once will allow for more flexibility in delivery options.

The updated corridor alignment achieves the objectives of the project and COV policy very effectively, while also serving economic development, transportation safety, and complete street policies very well. The next steps include attaining project funding, NEPA/SEPA process, and assessing options for delivery methods.

2 Project Description and Purpose

The 32nd Avenue Extension Project will provide a connection between the growing POV and surrounding industrial areas to the 78th Avenue corridor.



Figure 1. 32nd Avenue Extension Project Area

The project includes the following project elements, listed from South to North:

- Intersection improvements at 32nd Avenue and Lower River Road

- A two or three lane cross-section from the current 32nd Avenue termination point at La Frambois Road to the Burlington Northern Santa Fe (BNSF) Railway over-crossing.
- A new structure over BNSF Railway lines near the current location with two travel lanes, bike lanes, and sidewalks.
- Roadway improvements along the Burnt Bridge Creek area that can accommodate bikes and pedestrians, as well as replacement of the current culvert with a bridge.
- Intersection improvements at Lakeshore Drive and 78th Street.

The purpose of the West 32nd Avenue Extension project is to improve freight access and mobility, while simultaneously improving multimodal transportation and livability in residential areas adjacent to the POV. The West 32nd Avenue Extension is classified as a Minor Arterial in the COV's Arterial Plan.

The primary purposes of the 32nd Avenue Industrial Access Feasibility Study are twofold:

1. Refine and update cost estimates for the project and,
2. Identify any fatal flaws based on current information and conditions.

3 Project History

The 32nd Avenue corridor has been subject to study for over 15 years. An initial feasibility assessment was performed from 2006 - 2009 by the POV that evaluated several potential alignments. Alignment 2B was selected as the preferred alternative as a result of this study. In 2016, the COV finalized the Westside Mobility Strategy that emphasized the need for the 32nd Avenue Extension project due to the potential to better serve industrial users, address long term travel demand, and improve livability in the Fruit Valley neighborhood.

2006-2009 26TH AVENUE STUDY SUMMARY (ALIGNMENT 2(B) STUDY).

The most detailed evaluation of the corridor was conducted during the Alignment 2B Study by the POV from 2006-2009. The City and Port selected the preferred alignment for the 32nd Avenue (26th Avenue West Extension as so named during this study) road corridor alignment based on purpose statements from the comprehensive plan, project goals, screening criteria, and an alternative screening matrix. The project team developed the alternative screening matrix to align a set of criteria to measure each of the alignment alternatives. The alternative screening matrix compared the alignment alternatives and the no-build alternative. The matrix was designed to be a tool to combine a large array of comparative information on a single sheet so that the alignments could be scored quantitatively and rated. In 2008, the original alternative screening matrix was revised to include Alternative 2B in order to compare it with the other alignments and the no-build option. Alternative 2B ranked higher than the other alternatives and the no-build option. This option is therefore the preferred alignment used for this 32nd Avenue Industrial Area Feasibility Study.

PREFERRED ALIGNMENT 2B DESCRIPTION FROM THE 2006-2009 STUDY

The southern terminus of the alignment would be at the current intersection of West 26th Avenue and NW Lower River Road (SR501). The 26th Avenue West extension would continue north, atop the existing berm and within existing City right-of-way (ROW), to an intersection with La Frambois Road. From this point, 26th Avenue West would continue northward along or west of an existing private road to an intersection at the west terminus of Firestone Street. The extension would then continue northward through a permitted development known as “The Wellon’s Property.” The ROW through the Wellon’s property has been dedicated to the City for the 26th Avenue West Extension project. North of the Wellon’s property, 26th Avenue will remain west of the Frito Lay and oil tank properties. The extension would continue north and eastward to an intersection with the realigned 61st Street and then begin to rise to connect with the existing BNSF Railway overpass bridge. The existing bridge may be replaced with a new and wider bridge to accommodate wider shoulders and sidewalks. North of the BNSF Railway bridge, the existing Fruit Valley Road/Lakeshore Drive will be improved to the north terminus of the project at the intersection with NW 78th Street to include facilities for all modes. Alignment 2B from 61st Avenue South is approximately 7- to 10-feet higher than the existing ground so that it is above the 100-year floodplain.

During the development of the engineering drawings, it became apparent that the preferred alternative (Alignment 2B) as originally envisioned would impact an area of Oregon white oak (*Quercus garryana*) near the southern end of the project. The area had been mapped by the Washington Department of Fish and Wildlife as priority habitat. Because of its presence, several adjustments were made to the planned extension at this location:

- The roadway layout was shifted approximately 50-feet east of the priority habitat area.
- A mechanically stabilized earth wall was proposed on the west side to minimize slope grading, which would have impacted the habitat area.
- Sidewalks were eliminated on the west side of West 26th Avenue to narrow the roadway and reduce habitat impacts on private property to the east.
- A multi-use facility was identified to parallel the project on the west.

3.1 Existing Conditions Overview

The 32nd Avenue Extension is consistent with current and recently updated City policies. According to its Complete Streets Policy, the City is developing a “Complete Streets checklist” and will amend Titles 11 and 20 of the Vancouver Municipal Code to include specific design criteria.¹ The Complete Streets checklist and code amendment are awaiting adoption; therefore, the project will include multimodal improvements consistent with the vision and intent of the policy.

Design considerations for the 32nd Avenue corridor (including Fruit Valley Road between 61st and 78th Streets) are categorized by general considerations and specific segment needs. The following roadway design considerations should be prioritized based on local and regional criteria:

- Incorporate adequate bicycle lanes, sidewalks, and travel lanes to meet the intent of the Complete Streets Policy. This is especially important at the BNSF Railway over-crossing where active transportation facilities are not up to current standards.
- Design corridors to comply with the design standards of the Americans with Disabilities Act.
- Increase emergency service, freight, and vehicle capacity to meet 2035 volume-to-capacity projections.
- Develop bicycle and pedestrian trail segments, increasing public access to shoreline areas (Burnt Bridge Creek and Vancouver Lake) and the Shillapoo Wildlife Area.

The 32nd Avenue Extension study area also includes roadway segments with specific needs identified in the planning documents. These segments and needs include:

- Designate the 32nd Avenue Extension as a primary freight and intermodal corridor.
- Rebuild the Fruit Valley Road Bridge and corridor to include multimodal infrastructure with increased capacity to meet 2035 volume-to-capacity projections.
- Construct sidewalks on Fruit Valley Road between NW 61st and NW 78th Streets.
- Construct bicycle lanes on Fruit Valley Road between NW 61st and NW 78th Streets.
- Develop the main public entrance to the Vancouver Lake recreation area on 32nd Avenue/La Frambois Road.
- Connect the Burnt Bridge Creek trail and existing separated bike lane on Lower River Road.

3.1.1 Land Use Summary

The west side of Vancouver currently holds the majority of the City’s industrial and employment land. The industrial areas surrounding the project area are expected to grow by an additional 2,500 jobs by 2035, which will exacerbate the congestion issues on the

¹https://www.cityofvancouver.us/sites/default/files/fileattachments/community_and_economic_development/page/28931/complete_streets_policy_-_ord_exhibit_a.pdf

current Fruit Valley Road alignment². The Fruit Valley subarea plan supports the project by calling for the continued “planning and implementation of a 26th Avenue (now known as the 32nd Avenue Extension) Extension.” Furthermore, the plan states the “new connection will divert some truck and employee traffic from Fruit Valley Road” which, in reducing this truck traffic, would result in a “main street” feel within the community.

3.1.2 Hydrological Approach Summary

The study area surrounding the 32nd Avenue extension includes many known hydrological challenges. Fruit Valley Road has an existing stormwater system which uses infiltration for disposal of the stormwater and currently experiences flooding during larger storm events. The City, during construction of the Fruit Valley Road stormwater conveyance system, installed an overflow pipe stub out north of the Frito Lay property with the intention of extending this pipe to Vancouver Lake in the future. To help alleviate flooding along Fruit Valley Road, the project could include the extension of this pipe from Fruit Valley Road to the west side of NW 32nd Avenue and cap the pipe to allow for future extension of the overflow pipe to Vancouver Lake.

The minimum requirements of Onsite Stormwater Management and Pollution Prevention were conceptually analyzed and accounted for on a planning level. The City’s preferred type of onsite treatment is full dispersion. A full dispersion method of treatment could potentially utilize the slopes of the roadway embankment to achieve the required levels of treatment. Full dispersion would require a typical roadway shed section without curb and gutters that would allow the stormwater to sheet flow off the pavement. If the typical roadway section includes three driving lanes, two bike lanes, and is crowned in the middle, the required width of the vegetative buffer would be 11-feet with a maximum slope of 15 percent. More information can be found in Appendix A.

3.1.3 Geological Approach Summary

The geologic research indicates the anticipated subsurface conditions will have fewer impacts from geologic and seismic hazards - such as settlement, liquefaction potential, seismic induced lateral spreading, and weak roadway subgrade - if the roadway is far enough away from Vancouver Lake. The proposed roadway overcrossing at the existing BNSF Railway will consist of relatively high approaching retaining walls and the bridge. The conceptual geotechnical assessment indicates the geology and anticipated subsurface conditions should be better than the alluvial deposits close to Vancouver Lake. In general, anticipated subsurface conditions may be similar to the subsurface conditions underneath the existing 39th Street BNSF Railway overcrossing site. The approaching retaining walls may consist of MSE walls. The bridge foundations may consist of relatively large diameter (five- to six-feet) drilled shafts. The depths of the drilled shaft may be extended to 100-feet below the existing ground surface. It is recommended that geotechnical investigations occur early in the design process to help reduce cost risk during project development. Additional information can be found in the Geotechnical Conditions Summary in Appendix B.

²http://www.cityofvancouver.us/sites/default/files/fileattachments/community_and_economic_development/page/18092/16_07_18_r1_final_wms_report.pdf (page 15)

3.1.4 Environmental Summary

As part of identifying an optimal corridor alignment, the project team reviewed transportation and land use planning documents to identify the local community's vision, goals, and policies. No fatal flaws were flagged, but several constraints were identified. The project area resources suggest a moderate to high complexity for obtaining permits due to the close proximity to the lowlands that provide riparian, forested, wetland and farmland habitat near Vancouver Lake.

One of the biggest risks to obtaining permits is the presence of designated Legacy Lands. The team discovered three properties in the project area subject to Washington State Recreation and Conservation Office (RCO) long-term grant obligations: The Washington Department of Fish and Wildlife ROW on La Frambois Road (RCO project number 86-605); the original Cenex and Dougan properties (91-166); and the Burnt Bridge Creek trailhead (03-1029). Altering the use of these properties to transportation would trigger the grant conversion process (Revised Code of Washington 79A.15.030[9]). Initiating and processing major element changes and/or the grant conversion process can be complex and their completion can take up to five years. More information can be found in Appendix C.

Additional permits or processes, such as NEPA/SEPA, Sections 4(f) and 6(f), COV Shoreline permits, and others are summarized in Appendix D.

3.1.5 Utilities Summary

The 32nd Avenue corridor alignment crosses a Bonneville Power Administration power line near the intersection with Fruit Valley Road. The alignment attempts to avoid the footings of the towers as well as the areas with maximum sag in between the towers. As the project moves forward, additional coordination should be conducted with Bonneville Power Administration to ensure the road can be permitted as a permanent transportation use.

3.1.6 Existing and Future Traffic Conditions Summary

The project team examined current and future conditions to help inform the conceptual design of the 32nd Avenue Extension. This assessment shows that traffic volumes will continue to grow and that, in the future, transportation facilities will no longer be able to function reliably. The following are key findings from the existing conditions and future no-build conditions assessment:

- **Imbalanced directional existing volumes on NW Fruit Valley Road.** 24-hour counts showed that there is over 30 percent more southbound travel over the course of the day than northbound travel, with AM peak southbound volumes being significantly higher than PM peak northbound volumes. This is likely indicative of southbound traffic diverting to NW Fruit Valley Road to avoid congestion on I-5 southbound in the AM peak hour.
- **Crash history at NW Lakeshore Avenue/NW 78th Street.** The crash rate at this location (over 1.5 crashes per million entering vehicles) suggests that the intersection may benefit from safety improvements to mitigate collisions between southbound left turning vehicles and northbound through vehicles.

- **Existing operations at NW Fruit Valley Road/NW 39th Street.** Westbound left turning traffic experiences significant delay due to high southbound conflicting volumes on NW Fruit Valley Road.
- **Existing operations at NW Lower River Road/W Fourth Plain Boulevard.** This intersection is experiencing high left turn volumes from W Fourth Plain Boulevard to W Mill Plain Boulevard eastbound, and the existing geometry and signal operation does not serve this volume adequately. The likely larger issue causing this is significant southbound traffic diverting through the area to access I-5 southbound or downtown Vancouver destinations.
- **Future No-Build operations along NW Fruit Valley Road.** Intersections at NW 78th Street, NW Bernie Drive, and NW 39th Street all fail to meet jurisdictional standards in the 2035 AM peak hour.
- **Future No-Build operations along NW Lower River Road.** Operations at the signalized intersection at W Fourth Plain Boulevard worsen in the 2035 AM peak hour, and side street movements at NW 26th Avenue and NW 32nd Avenue experience high delays due to significant growth in employment-related traffic on NW Lower River Road in both peak hours.
- **Future Build operations along NW Fruit Valley Road.** The build alternative significantly improves the intersection operations at all three intersections compared to the no build conditions. However, the intersection at NW 39th Street would not meet jurisdictional standard in AM peak hour under build scenario due to the delay on the westbound left turn movement.
- **Future Build operations along NW Lower River Road.** The build alternatives significantly change the traffic distribution on Lower River Road and improve the operations at all three study intersections. The operations at the signalized intersection at W Fourth Plain Boulevard would meet jurisdictional standard. Both the roundabout and signalized alternatives at NW 32nd Avenue would meet the jurisdictional standard. However, the operations at NW 26th Avenue would not meet jurisdictional standard during AM peak hour due to the delay on the northbound right turn movement. Potential mitigations for this intersection could be to add a northbound right turn slip lane or to signalize this intersection. Additional information can be found in Appendix E.

4 Proposed Alignment and Features

4.1 Conceptual Facility Design

The 32nd Avenue horizontal alignment begins at the end of the existing NW 32nd Avenue, approximately 400-feet south of the La Frambois Road intersection, at the Columbia Industrial Park. The alignment continues along the same tangent as the existing 32nd Avenue and then shifts a little east as it approaches Clark County Legacy Lands. The alignment then turns east and lines up alongside the existing BNSF Railway crossing, before turning north and following the existing alignment of Fruit Valley Road to the intersection at 78th Avenue.

The 32nd Avenue vertical alignment ties into existing grade at 32nd Avenue and increases in elevation to provide a 1-foot free board above the flood plain elevation. The grade of the road stays above the flood plain until it approaches the bridge over BNSF Railway. The profile increases in elevation to match the existing elevation across BNSF Railway, and then comes back down and matches existing elevation along Fruit Valley Road.

To refine the conceptual design, the project team applied the alignment developed from the previous Alignment 2B study and made minor adjustments to avoid environmental or land use constraints, optimize cut and fill balances, maximize use of City right-of-way and enhance connectivity to the larger network. Evaluation criteria were applied to help the project team focus on achieving the best overall result for the corridor (See Appendix F). Many of the original project elements and alignment remained the same, however a few changes occurred since the previous alignment as a result of applying the evaluation criteria:

- At the West end of the BNSF Railway overcrossing, the Fruit Valley Road connection now holds tight to the right-of-way line with BNSF Railway instead of swinging west prior to the bridge. The result of this change was reduced overall project cost, fewer potential conflicts with utilities and better overall connectivity to the neighborhood to the north of the 32nd Avenue alignment near the bridge.
- The section along Burnt Bridge Creek was modified from the previous study to account for a bridge to replace the culvert and modifications to allow for enhanced multi-use facilities that connect to the Burnt Bridge Creek trailhead at Bernie Drive. These changes reflect updated policies related to active transportation facilities and potential environmental benefits of the bridge, as BNSF Railway now has plans to replace the nearby rail culvert with a bridge.

4.1.1 Number of Lanes

32nd Avenue

The mainline of 32nd Avenue was designed to be a three-lane collector/minor arterial standard with bike lanes. Due to lack of driveways, the section consists mostly of two lanes, except where turning movements were allowed. Between La Frambois Road and Fruit Valley Road, the bike facility will be replaced with a multi-use facility running parallel

to the primary alignment. This will better serve the higher demand for recreational travel on bicycle.

Side streets

The connecting roads between 32nd Avenue and Fruit Valley Road are built to a two-lane secondary industrial standard consistent with COV design standards.

4.1.2 Typical Sections



Figure 2. 32nd Avenue Extension Project Area / Typical Sections

4.1.2.1 Section One



Figure 3. 32nd Avenue Cross Section

The 32nd Avenue section consists of three travel lanes, bike lanes, sidewalks, and planter strips. The section (Figure 3) follows COV's three-lane collector/minor arterial with bike lanes. The sidewalk along the left side of the roadway is 10-feet wide to accommodate a multi-use path facility. The left planter strip is a proposed stormwater drainage strip between the edge of the roadway and the multi-use path. The pavement section of the road will shed towards this drainage strip.

4.1.2.2 Section Two



Figure 4. 32nd Avenue near 61st Avenue

The 32nd Avenue section consists of three travel lanes, bike lanes, sidewalks, and planter strips. The section (Figure 4) follows the COV's three-lane collector/minor arterial with bike lanes. The path along the left side of the roadway is detached and is 10-feet wide to accommodate a multi-use path facility. The middle 12-foot turn lane drops after

intersections and the roadway consists of two 11-foot travel lanes. There is no left curb through this section and the pavement section of the road will shed to the detached section between the roadway and the multi-use path.

4.1.2.3 Section Three



Figure 5. 32nd Avenue on the BNSF Railway Overcrossing

The 32nd Avenue section on the BNSF Railway overcrossing consists of two travel lanes, bike lanes, sidewalks, and planter strips. The section (Figure 5) follows the COV's three-lane collector/minor arterial with bike lanes. The path along the left side of the roadway is detached and is 10-feet wide to accommodate a multi-use facility. There is no left curb through this section and the pavement section of the road will shed to the detached section between the roadway and the multi-use path.

4.1.2.4 Section Four

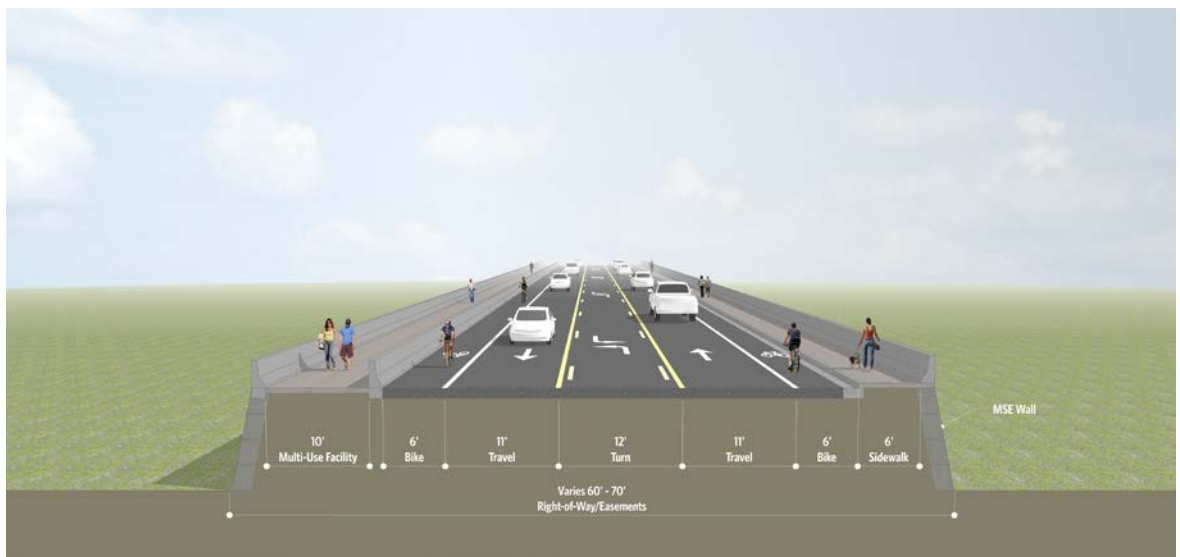


Figure 6. 32nd Avenue at West End of BNSF Railway Overcrossing

The 32nd Avenue section consists of three travel lanes, bike lanes, sidewalks, and planter strips. The section (Figure 6) follows the COV's three-lane collector/minor arterial with bike lanes. The sidewalk along the left side of the roadway is 10-feet wide to accommodate a multi-use path facility. Mechanically stabilized earth walls are used to limit impacts to adjacent properties and to limit cut and fill extents. Barriers are utilized to protect the mechanically stabilized earth walls. The middle 12-foot turn lane drops after the bridge and the roadway consists of two 11-foot travel lanes. Curb inlets will be used to accommodate drainage.

4.1.2.5 Section Five



Figure 7. 32nd Avenue in between BNSF Railway Overcrossing and Burnt Bridge Creek

The 32nd Avenue section consists of three travel lanes, bike lanes, sidewalks, and planter strips. Section five is similar to section one. The section (Figure 7) follows the COV's three-lane collector/minor arterial with bike lanes. The sidewalk along the left side of the roadway is 10-feet wide to accommodate a multi-use path facility. The left planter strip is a proposed storm water drainage strip. The pavement section of the road will shed towards this drainage strip and will collect in the drainage strip by curb cuts.

4.1.2.6 Section Six

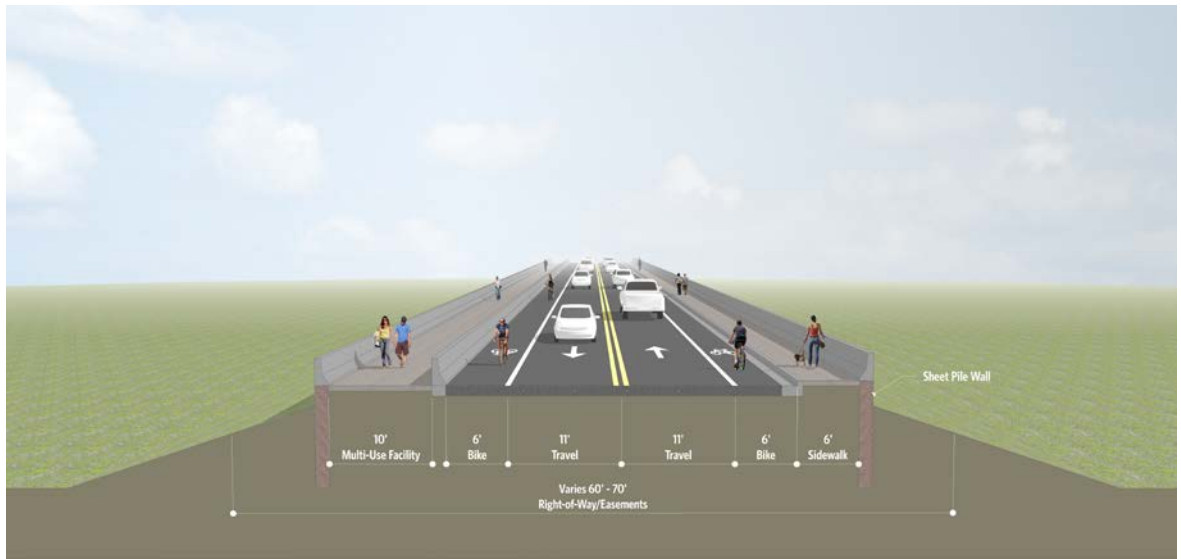


Figure 8. 32nd Avenue at Burnt Bridge Creek

The 32nd Avenue section consists of three travel lanes, bike lanes, sidewalks, and planter strips. The section (Figure 8) follows the COV's three-lane collector/minor arterial with bike lanes. The sidewalk along the left side of the roadway is 10-feet wide to accommodate a multi-use path facility. Sheet pile walls are used to limit impacts to adjacent properties and to limit cut and fill extents. Barriers are utilized to protect the sheet pile walls. The middle 12-foot turn lane drops after the bridge following the intersection and the roadway consists of two 11-foot travel lanes. Curb inlets will be used to accommodate drainage.

4.1.2.7 Section Seven

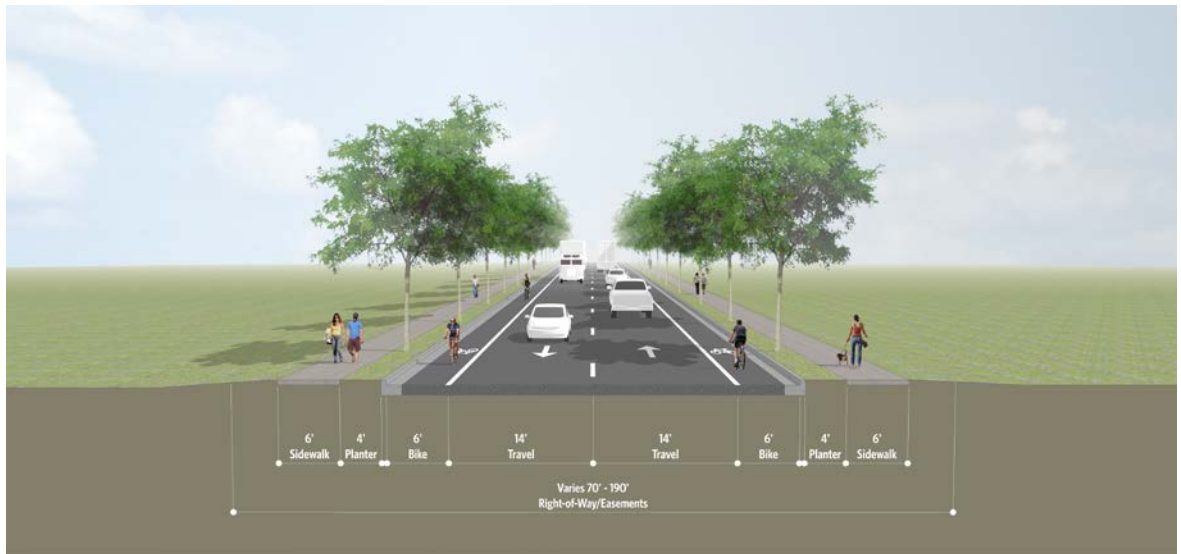


Figure 9. 61st Avenue and Future Street Connections 1-2 Cross Sections

The side street sections consist of two travel lanes, street parking, sidewalks, and planter strips. The section (Figure 9) follows the COV's two-lane secondary industrial roadway section. Pavement will be in a normal crown section and curb inlets will be used to accommodate drainage.

4.1.2.8 Section Eight



Figure 10. Fruit Valley Road

The Fruit Valley Road section consists of three travel lanes, bike lanes, sidewalks, and planter strips. The section (Figure 10) follows the COV's three-lane collector/minor arterial with bike lanes. The middle 12-foot turn lane allows for turning in and out of adjacent properties and the roadway consists of two 11-foot travel lanes. There is no left curb through this section and the pavement section of the road will shed to the detached section between the roadway and the multi-use path.

4.1.3 Bicycle and Pedestrian Facilities Context

Connections to existing facilities

The proposed multi-use path will enhance Vancouver's active transportation network and connect two currently disconnected facilities with a comfortable facility for bicyclists and pedestrians of all ages and abilities. Specifically, the multi-use path will provide a direct connection for bicyclists and pedestrians traveling from the existing NW Lower River Road multi-use path to the Burnt Bridge Creek Trail and the bike lanes on NW 78th Street.

A major gap in this part of Vancouver's bike network is the lack of a comfortable connection between the bikeways in Vancouver's Northwest neighborhood to the bike lanes on NW Lakeshore Avenue. Currently, NW Bernie Drive is the primary route for people traveling from the Northwest neighborhood to the proposed bikeway or the Burnt Bridge Creek Trail. Bernie Drive travels through a residential neighborhood, however, the curvature of the road and steep grades limit visibility and makes it a difficult connection for bicyclists. Improving the comfort on this road in tandem with the construction of the proposed multi-use path will increase access to the proposed multi-use path and its

connections to the existing bike network. NW Bernie Drive was identified as a proposed improvement to provide a bike lane in the City’s Transportation System Plan (2004) and the Comprehensive Plan (2011).

More specific design recommendations can be found in Appendix G.

4.1.4 Preliminary Intersections

32nd Avenue and Lower River Road

Both roundabout and signalized intersection treatments were examined and both would function to current (as of 2018) mobility standards. Both options should be examined further in the future. For the purpose of cost estimating, a roundabout was assumed using a lump sum amount based on similar projects in the metropolitan region including design and construction costs. A signalized intersection would likely be a lower cost and easier to stage during construction. The traditional signalized intersection option, based on conceptual estimates, is more likely in the \$450k-650k range.

32nd Avenue at 78th Avenue

Both roundabout and signalized intersection treatments were examined and both would function to current mobility standards. The roundabout option is preferred due to the ability to connect to nearby intersections (Sluman Road NW and Fruit Valley Road NW). This option also showed improved overall traffic performance. For the purposes of cost estimating, a traditional roundabout was assumed. Additional investigation on the improvement should be performed early in design, after survey is performed, to refine the location of connecting roadways. This could lead to a “dogbone” style roundabout under one consolidated intersection. The traditional signalized intersection option, based on conceptual estimates, is more likely in the range of \$350k-450k.

4.2 BNSF Railway Bridge Overcrossing Concept

The alignment (Figure 11) extends Fruit Valley Road under the BNSF Railway overcrossing bridge to connect to NW Whitney Road on the north side of the proposed 32nd Avenue. This eliminates the need for the bridge over NW Whitney Road and simplifies the construction of the roadway embankment to the south. This is one of two feasible options and was selected for the purpose of cost estimating and current preference. This preference should be re-examined after additional information, such as survey, geotechnical investigations, and constructability reviews are available, early in the design process.

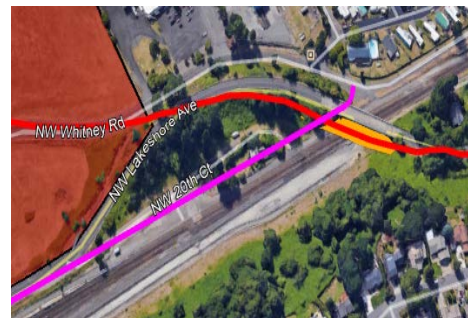


Figure 11. Alignment Alternative #2 at BNSF Railway Bridge

4.2.1 Structure Concept Overview:

BNSF Railway Structure Alignment Alternative #2 requires one bridge. A preliminary layout plan is provided in Appendix H.

- Alternative #1 is recommended as the best value for this project. Concrete superstructures of medium span ranges, such as these, generally provide the most cost effective bridges in this region and are a very low maintenance bridge type. The estimated probable construction cost for this bridge, based on a \$220 per square-foot unit price, is approximately \$4 Million, in today's (2019) dollars and without contingencies.
- Alternative #2 – three-span (110-feet, 160-feet, 110-feet) bridge, 53-feet 4-inch out-out width; continuous structural steel girder superstructure supported on driven pile or drilled shaft supported abutments and multi-column intermediate bents founded on drilled shafts. Superstructure depth could be up to one-foot shallower than the concrete superstructure, reducing approach embankment fill heights. The end spans are longer in order to maintain reasonable span balance ratios for continuous girders. Weathering steel is recommended to eliminate the need for future repainting.
- The proposed structure types are relatively low-maintenance bridges. The proposed alternative will be jointless, using a continuous concrete deck and integral or semi-integral abutments. The structural steel alternative requires expansion joints (per WSDOT bridge design criteria). Bridge expansion joints are a leading source of bridge maintenance problems.

4.3 32nd Avenue Extension Embankment Widening at Burnt Bridge Creek

The project requires widening of the existing embankment of NW Lakeshore Avenue at Burnt Bridge Creek and a culvert replacement (Figure 12). The existing culvert can be replaced with a single span slab girder bridge enclosed by sheet pile walls. Preliminary layout plans are provided in Appendix H. As of October 2018, BNSF Railway is planning to remove the culvert immediately downstream from this structure.



Figure 12. Burnt Bridge Creek embankment widening with bridge

4.3.1 Retaining Walls

Weathering steel sheet pile walls along both sides of the existing embankment are recommended as the best value wall type for this site. Sheet piles can be driven, or vibrated, from the roadway - thereby avoiding construction impacts in the waterway or wetlands. Construction along one side of the embankment at a time will facilitate staged construction and traffic management. Depending on the exposed height of the wall, deadman or ground anchors may be necessary for wall stability.

The estimated probable construction cost for the sheet pile retaining walls enclosing the bridge abutments and supporting the roadway over Burnt Bridge Creek Embankment - based on a \$75 per square-foot unit price - is approximately \$1.58 Million, in today's (2018) dollars and without contingencies.

4.3.2 Culvert Replacement

The existing culvert can be replaced by a single span (30-feet), 53-foot- 4-inches out to out deck width; precast, pre-stressed concrete slab-girder bridge, comprised of shallow 18-inch slab girders. Abutment pile caps founded on driven piles or drilled shafts are constructed in shallow excavations behind the sheet pile walls. The sheet pile walls provide an excellent means of isolating abutment work from the environmentally sensitive sites. Sheet piles can be driven and set below grade in front of the abutments, thereby isolating the abutment construction. This can be done in stages to accommodate traffic management. The culvert and underlying soil can be left in place with minimal excavation during the construction to facilitate effective staging. The existing culvert can be removed after the completion of the second stage wall construction and before the remainder of the bridge is in place. This will help to minimize potential environmental impacts on wetlands and water bodies.

The estimated probable construction cost of the new bridge, based on a \$180 per square-foot unit price, is approximately \$0.29M, in today's (2018) dollars and without contingencies.

The proposed structure types and techniques readily accommodate flexibility in construction staging scenarios and allow for the vast majority of construction work to be isolated from the environmentally sensitive areas. Removal of the existing culvert would be the most significant environmental impact, however the sheet pile isolation to either side will also minimize impacts to adjacent land.

Weathering steel sheet pile walls are low maintenance structures. A precast concrete slab span bridge is also a relatively low maintenance structure.

5 Project Phasing and Schedule

5.1.1 Proposed Construction Phasing

The 32nd Avenue corridor project has varied levels of consideration for constructability. Segments of the corridor can be built with no temporary traffic detours, space for temporary lay down, and work space, while others are very limited.

City of Vancouver - West 32nd Avenue IAFS
Project Sections



Figure 13. Project Area with Sections

Much of the future corridor between La Frambois Road and NW 61st Street (Section B, Figure 13) runs on currently vacant and city-owned property, which provides significant opportunity for lay down space, work space, and ability to work with no disruptions to travel. This could be constructed over time as funding becomes available with no disruption to traffic. Due to the flood plain, a major component of construction will involve large amounts of fill to raise the roadway elevation. This will require compaction of large areas and large amounts of fill which, due to City ownership of the corridor, would allow for the accumulation of clean fill over time resulting in a reduction of the project cost and bid estimates from contractors.

The BNSF Railway Bridge (Section C, Figure 13) itself will be built on a new alignment immediately to the South of the current structure. Much of the bridge could be built with traffic still moving on the current bridge. The recently purchased parcel to the West of the bridge could provide a lay down spot for major bridge elements and storage. One important consideration will be maintaining access during construction to the businesses and homes to the west of the bridge. As the new access to the area will run under the new and old bridge, some temporary access is likely warranted elsewhere, as the new connection can only be open to traffic after the demo of the previous bridge. This temporary access should be investigated early in final design to ensure there are no right-of-way impacts required to accommodate the temporary access.

The most complicated segment is 32nd Avenue/Lakeshore Drive from approximately N W Bernie Drive to 78th Street (Section D, Figure 13. Maintenance of Traffic (MOT) will be very challenging, including at the NW Bernie Drive intersection at 32nd Avenue. The MOT will require staged construction at NW Bernie Drive or long detours for auto and bike traffic that would normally use the intersection. This could involve an examination of the trade-offs of a short duration closure with high impact full closures as compared to a staged operation with flaggers over a long duration.

The Burnt Bridge Creek segment is also very constrained. In order to drive the sheet pile to accommodate widening to the East along 32nd Avenue, some lane closures are likely to be required to place pile driving equipment. If possible, some grading could occur to the east of 32nd Avenue, allowing equipment to be placed outside of the travel lanes (in the footprint of the future multi-use path). There are no convenient detours nearby, so lane closures will require a traffic management plan to account for a larger area than normal. It should also be noted that requiring night time work, the limited contractor work space, working in traffic, and the required railway flagging are all likely to drive up contractor bid prices. There is equipment that can drive sheet pile with limited space, such as the Giken option shown below, that could be employed to reduce space needed for equipment as compared to typical pile driving cranes (Figure 14). It is recommended that the BNSF Railway Bridge and Burnt Bridge Creek segment be bid together as doing so will likely offer cost savings and better coordinated traffic control.



Figure 14. Example of narrow-profile equipment for driving sheet pile

The intersection improvements at 32nd Avenue and Lower River Road at 78th Street and Lakeshore Drive and could both be bid separately (Section A and E respectively, Figure 13). The current estimate assumes roundabouts which will require more complicated staging as compared to traditional intersections.

5.1.2 Proposed Construction Schedule

The proposed construction schedule includes an assumption of 78th Street intersection being constructed in 2022, which would likely require design beginning in 2020 (Figure 15). All other project components were assumed to start in 2025. 2025 was assumed due to the current lack of funding for design and construction, as well as acknowledgement of potential environmental phases. A 2025 construction date for the larger pieces would likely need environmental phases (if required) to begin in 2021, with design beginning in 2023 and completion in late 2024. The construction phases were generally assumed to be one or two seasons, which will be determined by funding availability and whether the projects are bid together or separately.

PROJECT SEGMENT	Est Cost (2018)	2019	2020	2021	2022	2023	2024	2025	2026
78th Street Intersection/Roundabout	\$1.2M			Design	Construction				
32nd Ave (with side street connections)	\$53M						Design	Construction	
Burnt Bridge Creek/BNSF Overcrossing	\$48M						Design	Construction	
SR 501/32nd Avenue	\$1.2M						Design	Construction	
TOTAL (no escalation, 2019)	\$103M								
TOTAL (with escalation, 2025)	\$128M								

Figure 15. Assumed Schedule for Project Design and Construction

6 Estimate of Probable Cost

After updating the refined corridor costs, the project team estimates the corridor cost to be approximately \$125-130 Million in year of expenditure (2022 and 2025) dollars. This is slightly lower than previous cost estimates close to \$150 Million. This estimate could change substantially over time with a projected competitive bidding environment, changes in commodity and material costs, and increasing land prices.

A detailed cost estimate break down is provided in Appendix I.

7 Project Delivery Strategy

In the State of Washington, alternative delivery is becoming more popular as agencies are delivering larger capital programs. Large dollar (over \$25-50 Million) volume contracts lend themselves well to alternative delivery, as the agency is able to customize risk allocation to lower the agencies overall risk for contract change due to design constructability and owner caused delays. Early contractor involvement assists the agency in finding innovative ways to reduce construction duration and reduce changes during construction. These forms of alternative delivery do require expertise in alternative delivery project development, procurement, and management, as well as agency commitment to developing in-house resources for agency policy and technical decisions. If in-house expertise does not exist, many agencies in similar situations hire an outside contractor.

In order to move ahead, the COV would require the approval of the Capital Projects Advisory Review Board to be allowed to use either Design-Build or a General Contractor/Construction Manager with this project. The program cash flow is a critical consideration for the choice of delivery method, as it will directly affect the suitability of different methods and contractor interest and risk. Some elements of the 32nd Avenue Corridor project lend themselves to early contractor involvement, namely the structural work over BNSF Railway and at Burnt Bridge Creek, but the project sizes on their own may not warrant alternative delivery. Should the project be fully funded and advertised as a single project, alternative delivery is worth consideration. Alternative delivery could help drive innovation relative to construction staging and maintenance of traffic, which will be an important consideration as the project moves ahead.

8 Recommended Next Steps

This study found no fatal flaws for the alignment proposed. Due to the early stage of design, several next steps are critical to moving the project ahead with cost durability. When the COV looks to move the project forward, the following next steps are advised:

Seek Project Funding – The project will need significant funding moving forward, and the availability of funding will drive decisions related to alternative delivery, public engagement, and project phasing.



Identify Project Phases – Pending the availability of funding, identify potential project phases that align to funding. For example, the intersections at 78th Street and Lakeshore Drive and Lower River Road and 32nd Avenue could both proceed prior to building the entire 32nd Avenue Extension.

Protect Alignment ROW – Much of the updated alignment travels across City ROW. This ROW should be protected to allow streamlined project development when funding becomes available.

Conduct Project Survey – Conducting survey for the whole corridor will be very important to further refining project costs and quantities, and will assist in better assessing permitting risks, especially near Legacy Lands.

Early Regulatory Coordination - After the project elements are better defined and survey is complete, early regulatory coordination should begin in order to streamline the permitting process. This is especially critical for the RCO Lands, NEPA, SEPA, ESA Section 7 and Section 4(f) and 6 (f) processes.