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WHAT TRANSPORTATION CAN BE.

MEMORANDUM

Date:	September 18, 2019	**TG:**	18412.00
To:	Chris Comeau, Planner, City of Bellingham		
From:	Jon Pascal, PE, Transpo Group Brett Schock, PE, AICP, RSP, Transpo Group		
Subject:	James Street Corridor Multimodal Feasibility Study		

Transpo Group was engaged by the City of Bellingham to evaluate the James Street corridor between Orchard Street and Kellogg Street. The following memorandum documents our process, in which we worked closely with City staff to achieve the multimodal mobility goals for the corridor.

Study Purpose

The purpose of the corridor study is to address the lack of active transportation and transit supporting facilities in the James Street corridor between Orchard Street and Kellogg Street. The James Street corridor is expected to see an increase in traffic, both from general growth in Bellingham and the imminent development of multiple large parcels for new residences. The corridor retains its historical rural arterial design which is inconsistent with current and future anticipated uses. Three intersection improvement projects within the study limits will address vehicle mobility, but active modes have yet to be addressed. Increasing modal choice is critical in the corridor which will need to provide mobility to a diverse population that include people of all ages, abilities and financial resources.

Study Goals

Transpo and the City agreed upon the following goals for the study at the outset of the project. The study goals were developed to help guide the process of identifying a solution for active transportation mobility along each corridor segment.

1. Evaluate a range of feasible options for increasing mobility and providing pedestrian and bicycle facilities throughout the corridor.
2. Identify a solution that maximizes ease of access and usability for active mode and mobility improvements within the City's limited funding resources.
3. Minimize all impacts to the environment, including providing adequate protection to surrounding wetlands, fish-passable culverts, and riparian habitat.

Existing Conditions

The existing James Street corridor is a rural roadway, with two asphalt paved lanes, typically with a 12-foot lane width. Most of the corridor does not have curbs, and storm drainage consists of roadside ditches. There is little catch basin and conduit stormwater infrastructure or low impact development stormwater infrastructure in or near the corridor. Three waterways, Baker Creek, and the north and south forks of Baker Creek, cross underneath James Street. Each crossing is currently in a culvert which is not fish-passable. The structural quality of the culverts was not assessed for the corridor study.

Near the creek crossings, there are wetlands and wetland buffers that cover large land areas adjacent to or crossing the roadway. The adjoining areas are typically steeply sloped off the

shoulders of James Street. The steep slopes are a concern for future improvements in the corridor and represent an impediment to active transportation mobility in the corridor.

Within the corridor limits, there are three intersection improvement projects currently in the design or entering the construction phase in the next 12 to 24 months. Each of the projects is happening independent of the improvements being studied for James Street, but will complement the preferred design alternative.

Orchard Drive Extension and Signal Improvements

Orchard Drive is being extended to the west of James Street and a new traffic signal will be installed at the intersection. The new signal will have crosswalks in all directions with pedestrian countdown heads protecting the crossings. The project is anticipated to be started in 2020.

Telegraph Road Improvements

Multimodal improvements are currently being designed for the Telegraph Road corridor from James Street to Deemer Road. At the intersection of Telegraph Road with James Street, the existing stop-controlled intersection will be replaced with a signalized intersection. New curb ramps and sidewalk will be installed in the immediate area of the intersection. The intersection will have pedestrian countdown heads protecting the crossings in all four directions. The project is anticipated to be constructed in 2021.

Bakerview Road Roundabout

The intersection of Bakerview Road and James Street will be replaced with a full-size roundabout, a project that is currently in design and anticipated for construction in 2023. This project will include sidewalks and crosswalks on all four legs of the intersection, extending 450 south and 300 feet north of the intersection along James Street. The design and funding for the project anticipates placing sidewalk on both sides of James Street within the intersection project area.

Corridor Study Process Overview

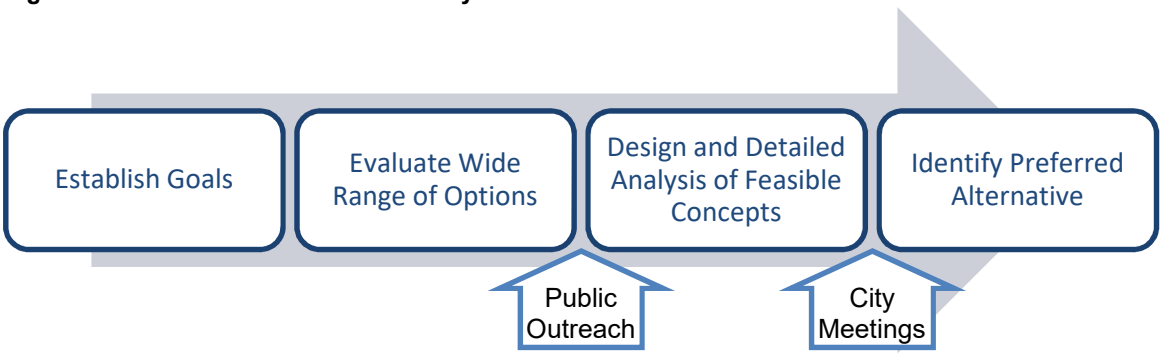
The City of Bellingham engaged Transpo Group to assist in completing the multimodal feasibility study. Transpo and our subconsultants, GeoEngineers and R&E, surveyed the existing corridor to verify the existing conditions and better understand the existing roadway, topography, wetland and wetland buffer critical areas, and soil conditions. The Consultant team and the City met to identify the goals for the corridor and the City's concerns regarding physical, environmental and financial resources. Transpo divided the James Street study corridor into four distinct segments:

- Segment 1: Orchard to McLeod
- Segment 2: McLeod to Telegraph
- Segment 3: Telegraph to Bakerview
- Segment 4: Bakerview to Kellogg

A wide range of options were evaluated to bring safe, comfortable active transportation mobility to the James Street corridor. Two concepts were identified as the most feasible, the City's standard roadway cross-section and an adjoining shared-use path. The standard cross-section concept would provide bike lanes and sidewalks on both sides of the road, and the shared-use path concept would combine the active modes in a single shared-use pathway on one side of the road. The City relied on the Consultant team to evaluate the two concepts utilizing a range of evaluation criteria. The concepts were discussed with City staff and project partners, and presented to the public in a meeting held April 30, 2019 with 120 attendees. Based on feedback received from the public and staff, the concepts were further refined and evaluated. The findings from the detailed

evaluation process of both concepts were presented to the City. A preferred alternative was selected based on the results of the second round of evaluation. The study process is depicted in Figure 1.

Figure 1. James Street Corridor Study Process



Development and Assessment of Preliminary Options

A wide range of preliminary options were identified to address the multimodal transportation needs along the corridor. The options considered a range of infrastructure elements that could accommodate walkers and cyclists, and provide for improved access to frequent transit service on the corridor. The preliminary set of options included:

- The City's standard cross section with bike lanes and sidewalks
- Sidewalks on both sides with buffered bike lanes, with and without physical barriers
- Sidewalks on both sides with a two-way cycle track on a single side of the road, separated by a physical barrier from traffic
- A single-sided shared use path that followed the grade and alignment of the road
- A single-sided shared use path that was offset from the road and followed the existing terrain
- A combination of shared use path and standard cross section, depending on the context and segment

To narrow the range of options, several high-level evaluation criteria were utilized to evaluate the feasibility of the preliminary options. The criteria included:

Right of Way

The existing 60-foot right of way of James Street is wider than the existing 24 feet of pavement. Some of the options fit within the existing right of way. Options which filled or exceeded the right of way based on curb-to-curb width and sidewalks, before the impacts of side slopes were even considered, were dismissed. The City could acquire additional right of way in the corridor, but the financial impact, impact on development, and potential wetland and critical area impacts of right of way acquisition made right of way a constraint that made some options infeasible.

Impacts to critical areas

The City's goal is to minimize the impact to existing critical areas, including the streams, adjacent wetlands and riparian borders, and steep slopes near the stream crossings of the corridor. Options which were expected to have a comparatively higher impact to critical areas were dismissed.

City financial resources

While cost alone was not a determining factor in the selection of a solution, the City wanted to be realistic about the ability to fund construction for active mode mobility in the corridor. While some options may be higher comfort or provide superior connectivity, if the City would not realistically be able to fund and construct some types or scales of improvements within a short-term planning horizon (less than 10 years), the benefit to the users of the corridor would not be sufficient to advance the option forward.

Corridor continuity for active modes

From segment-to-segment, as well as connections outside of the corridor, continuity for active modes is important for the utility and comfort of users of all ages and abilities. Ensuring that there was a familiar facility with continuity that did not require several crossings which can create risk and conflict points, decrease comfort for all users, and lengthen active mode travel time in the corridor was a consideration in dismissing some options.

A summary of the analysis of each option is shown in Figure 2.

Figure 2. High Level Evaluation of Preliminary Options

CONCEPT	Right of Way	Critical Areas	Financial	Continuity	Summary
Full standard section	●	●	●	●	●
Buffered bike lanes with sidewalks	○	○	●	●	○
Two-way cycle track with sidewalks	○	○	○	●	○
Shared use path on roadway alignment	●	●	●	●	●
Shared use path on adjacent alignment	○	●	○	●	○
Mixed shared use path and full section	●	●	●	○	●

SATISFACTION OF CRITERIA

● Exceeds desirable criteria ● Meets desirable criteria ○ Does not meet desirable criteria

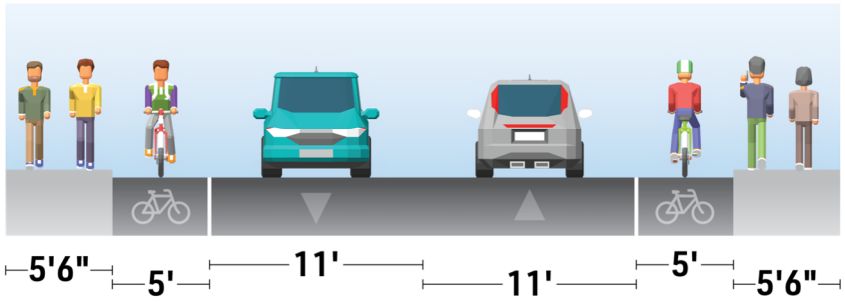
Identification of Feasible Concepts

Based on the initial evaluation of the preliminary options, two concepts were advanced forward into a more detailed alternatives analysis. The two options included a shared use path that closely followed the roadway alignment and grade, and the use of the City's full standard roadway section. A mix of the two concepts was also considered, but because of the segment-by-segment analysis, a mix of concepts was not advanced as a stand-alone concept.

Concept A: Standard Roadway Section

The standard section would implement the City's adopted arterial cross section for the full project corridor. The concept is familiar to drivers and active users in Bellingham. Each mode such as vehicles, bicycles and pedestrians, are separated by striping and/or physical barriers. The concept would be directly compatible with other transportation projects connecting to the corridor. Users on both sides of the street would have direct access to active transportation facilities and connections to transit stops and other destinations throughout the corridor. The Concept A section is shown in Figure 3.

Figure 3. Concept A: Standard Section



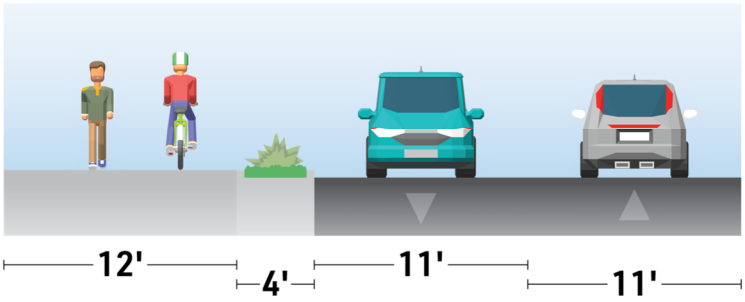
The primary features of the City of Bellingham Standard Roadway Section include:

- 11-foot vehicle lanes with 5-foot on-road bicycle lanes separated from traffic by a single stripe
- Curbed shoulders requiring full-corridor storm drainage systems
- 5-foot sidewalks immediately adjacent to curbs

Concept B: Shared Use Path

The shared use path concept provides for active mode connections physically separated from vehicle traffic but combined in a single pedestrian and bicycle facility. Concept B allows for implementation of improvements without modifying the existing roadway, limiting the costs for stormwater conveyance and additional right of way. The shared use path is a higher comfort facility but does not provide direct connections to active mode users on the opposite side of the street. Short stretches of sidewalk are needed to connect development, and users would need to access the nearest crosswalk to access the shared use path. Modifications to standard sections and intersections on the corridor would need to be modified to be compatible with the shared use path. The Concept B section is shown in Figure 4.

Figure 4. Concept B: Shared Use Path



The primary features of the Shared Use Path section include:

- 11-foot vehicle lanes with a 10 to 12-foot wide bi-directional shared use path on one side
- Vegetated planting strip between path and roadway used for stormwater conveyance and treatment and separation from traffic
- Curbed shoulders in locations where additional sidewalk is needed on the other side of the road

Evaluation of the Concepts

Several categories of impacts were evaluated of the two concepts for each of the four corridor segments. Conceptual designs were developed in CAD for each concept, including a horizontal and vertical alignment. Using the conceptual design plans, rough quantities were estimated to calculate the cost implications of grading, as well as the impacts of new side slopes on critical areas, wetlands, buffers and stream crossings. The in-depth analysis did not consider the impacts within the project limits for the three intersection improvement projects in the corridor. Each stand-alone intersection project was assumed to be in place by the time other active mode improvements would be designed and constructed. Therefore the concepts needed to be compatible with, but not necessarily consider the impacts to the intersection projects. The evaluation method for each criteria are described below.

Pedestrian Facility Access and Crosswalks

Existing development in the corridor, including existing sidewalks at residential developments and existing transit stops, was considered to ensure that access and mobility was increased, and not impaired, in the corridor. The connectivity for active modes on both the east and west side of the corridor, as well as to the north and south ends of the corridor was considered, including to other projects at intersections.

If crossings were required to ensure connectivity to an existing development, the distance to the nearest signalized intersection was considered, as well as the feasibility of new mid-block crossings with enhancements such as rectangular rapid flash beacons (RRFBs) or a pedestrian signal. The evaluation considered general mobility in each segment and was not based on a point-to-point analysis between pedestrian destinations.

Impervious Area Changes

The amount of added impervious and pollution generating surface for each concept was analyzed, along with reviewing the necessary conceptual storm drainage system. Pollution generating surfaces are those added impervious surfaces that are not physically separated from vehicle lanes, such as bike lanes. The number of wetlands and critical areas in the James Street corridor makes the impervious area criterion especially important to consider, as wetlands are very

sensitive to the impacts from new impervious surface without properly designed low impact development (LID) stormwater treatment and conveyance techniques. LID facilities can be costly and require additional right of way.

Wetlands and Critical Areas Impacts

Three water bodies cross under James Street. Each of the creeks are currently contained within a culvert designed and constructed prior to the current knowledge about the impacts these structures have on fish in our waterways. The feasibility of replacing the crossings with fish-passable culverts was considered for each segment and each concept.

The design of fish-passable culvert replacements and estimates for the crossings are included in a report from Reichhardt & Ebe in the appendix. The estimates for the new fish-passable crossings are included in the costs for both concepts as it is assumed that the improvements would be required across the full width of James Street, regardless of the selected concept.

Several wetlands and critical areas, including steep slopes and wetland buffers, are present adjacent to the existing James Street roadway. Limiting the impact to critical areas, for both construction of new facilities as well as new side slopes, was a consideration in comparing the concepts.

An assessment of the wetlands and critical areas, along with the process and costs for mitigating impacts to the areas is included in a report from GeoEngineers in the appendix.

Utility Relocations and Impacts

Utility impacts for the corridor include poles for power and other overhead utilities, water and sewer lines, and existing storm drainage culverts and open channels. The number of poles affected, water line relocations needed and required conversion of existing open channels to new storm drainage was compared between the concepts.

Details of the required wet utility relocations and cost estimates for utility relocations are included in a report from Reichhardt & Ebe in the appendix.

Right of Way Requirements

The total estimated right of way acquisition estimated for each concept was compared. Included in the assessment was the right of way needed for the improvements themselves, necessary side slopes, and potential LID stormwater facilities. The cost estimates were compared solely on a total required area basis and did not consider the feasibility of acquiring specific parcels. The need for acquisition on a single side of the roadway, as opposed to potentially alternating sides, was considered as a factor between the two concepts.

Other Engineering Factors

The vertical profile of James Street near the intersection with Gilbert Road, north of Orchard Street, is a significant vertical curve which restricts sight distance for drivers and can cause discomfort and safety concerns for active mode users, regardless of facility type. Reshaping the vertical curve near Gilbert Road and improving visibility was a consideration for both concepts.

Other engineering factors included the need for street lighting, both at vehicle and pedestrian scale, compatibility with other intersection improvement projects, and other factors related to the physical environment of the corridor.

Directionality

Connection in both directions for all active modes was used to evaluate the feasibility of a mixed alternative, using Concept A in some segments and Concept B in others.

Cost

The planning-level estimated cost of each alternative, including design and construction engineering, City costs for management of design and construction, a 30% contingency, and an inflation factor to represent likely costs in 2025, was used to compare each concept. The City's ability to program funding resources to the James Street corridor, as well as the possibility of grant funding or cost sharing with developers within the corridor was considered in ranking the impacts of the estimated cost for each concept.

Bicycle Exposure (Risk of Safety Concerns)

The two concepts represent very different types of bicycle facilities, with different levels of exposure to and conflict with vehicle traffic and pedestrians. The factors related to the comfort of users and the perceived risk of the bicycle facility were compared qualitatively between the two concepts.

Bike Facility Comfort

The qualitative level of comfort for bicycle users of all ages and abilities was considered for each concept, based on the exposure of both the typical user in Bellingham and the typical anticipated user in the James Street corridor.

Pedestrian Facility Comfort

The level of comfort and risk factors for pedestrians of all ages and abilities throughout the corridor, including connections to transit, for each concept was compared qualitatively. The factors are similar to the considerations for bikes, including proximity to and mixing with vehicle traffic, as well as mixing with bicycle users.

Transit Access

Assessment of the access to transit provided by each concept is tied to the presence of active transportation facilities serving transit stops on both sides of James Street (providing access to transit in either direction), as well as crosswalk requirements to access those facilities on either side.

Operations and Traffic Impacts

While the focus of the corridor study, and both concepts, is on active mode users, the impact of either concept on the vehicle traffic operations in the corridor is a consideration and a factor in the selection of a preferred alternative. Impacts from the added facilities, as well as any potential operational impacts at intersections was considered.

Future Development Compatibility

Future development was considered for compatibility with each concept, ensuring that connections to the James Street improvements was intuitive and feasible for known future development sites. Two sites were the focus of analysis of future development; a large residential development expected on the west side of James Street north of Orchard Street, and a multi-family residential development expected on the east side of James Street north of Telegraph Road.

Comparison of Concepts

The analysis of each concept is described in the detailed matrix included in the Appendix. Planning level cost estimates for each concept, broken out by segment, are also included. Costs for fish passable culverts and wetland mitigation are included in the reports from GeoEngineers and Reichhardt & Ebe in the Appendix.

Concept A: Standard Roadway Section

Some of the most important factors to consider for the standard roadway section concept include:

- Direct access to sidewalks and bike lanes from both sides
- Compatibility with existing and future development
- Requirement for full corridor stormwater conveyance
- The use of bike lanes next to 35 mph traffic with no buffer
- The vertical curve near Gilbert Road and the stream crossings for new fish-passable culverts are modified

The planning-level estimated cost for Concept A, across all four segments, is $24.1 million. This total includes $5.5 million cost for fish passable culvert replacements and $800,000 for wetland mitigation.

Concept B: Shared Use Path

Some of the important factors for the shared use path concept are:

- Represents a high comfort facility for users of all ages and abilities
- Does not require modification of existing roadway or stormwater conveyance
- The vertical curve near Gilbert Road and the stream crossings for new fish-passable culverts are modified
- Requires additional crossings for access to both sides of the road
- Does not preclude sidewalk on the opposite side of the road.

The planning-level estimated cost for Concept B, across all four segments, is $14.2 million. This total includes $5.5 million cost for fish passable culvert replacements and $400,000 for wetland mitigation.

A summary of the evaluation results, by segment, is shown in Figure 5.

Figure 5. Summary of the Evaluation Results of the Feasible Concepts

CRITERIA	Segment 1		Segment 2		Segment 3		Segment 4	
	Concept A	Concept B	Concept A	Concept B	Concept A	Concept B	Concept A	Concept B
ACTIVE MODE CONNECTIVITY								
Crossings required	●	◐	◐	○	●	◐	●	◐
Both Sides (Bike)	●	○	●	◐	●	◐	●	◐
Both Sides (Pedestrian)	●	◐	●	◐	●	●	●	○
Transit Access	●	●	●	◐	●	◐	●	○
BIKE COMFORT AND SAFETY								
Users of All Ages and abilities	○	●	○	●	○	●	○	●
Mixed traffic/modes	◐	●	◐	●	◐	●	◐	●
PEDESTRIAN COMFORT AND SAFETY								
Users of All Ages and abilities	◐	●	◐	◐	◐	●	◐	●
Mixed traffic/modes	●	◐	●	◐	●	◐	●	◐
RIGHT OF WAY AND CRITICAL AREAS								
Right of Way requirements	○	●	◐	●	◐	◐	◐	◐
Wetlands Impacted	◐	●	◐	●	●	●	○	◐
Wetland buffer impacts	○	◐	○	◐	◐	●	○	○
Fish-Passable Culverts	●	●	●	●	●	●	●	●
COST	○	●	○	◐	◐	●	○	●
SUMMARY	◐	●	●	●	◐	●	◐	◐

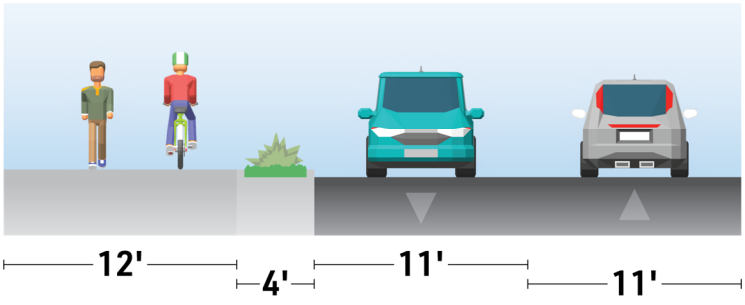
SATISFACTION OF CRITERIA

● Exceeds desirable criteria ◐ Meets desirable criteria ○ Does not meet desirable criteria

Selection of a Preferred Alternative

The six factors that most separated the two concepts and lead to the selection of a preferred alternative were cost, active mode connectivity, bike comfort and safety, pedestrian comfort and safety, right of way and critical area impacts. Based on the analysis, **the preferred alternative is Concept B, the shared use path, shown in Figure 6**. The preferred alternative meets the City's goals, and most satisfies the evaluation criteria.

Figure 6. Preferred Alternative: Shared Use Path



Next Steps

The next step for the James Street corridor is to present these findings and conclusions to the public and to begin identifying a funding program to implement the improvements. The funding strategy would involve ithe identification of a mix of local funds, grant funding and developer funding that could be used to initiate a more detailed level of design of the improvements, as well as construction. In several locations, the implementation of the shared use path would be eligible for and compete well for grant funding through the Transportation Improvement Board. If the City continues to pursue Complete Streets funding through TIB, those funds could be used for implementing the shared use path. Grant funding from the Department of Ecology could be leveraged to assist with funding fish-passable culvert replacement projects which can be used to construct segments of the shared use path near the stream crossings.

The improvements should be phased to be compatible with the intersection improvement projects at Orchard Drive, Telegraph Road and Bakerview Road. The design of the intersection improvements will need to incorporate a widened west side crossing to accommodate two-way active mode traffic. Some segments of the improvements, especially those on the west side in Segment 1 and on the east side in Segment 3, can be coordinated with the required frontage improvements for large-scale developments that have been proposed in the James Street corridor.

Appendix

James Street Multimodal Feasibility Study

- Concept Comparison Matrix
- Planning Level Cost Estimates
- Concept A Exhibits
- Concept B Exhibits
- Reichhardt & Ebe Report: Stormwater Analysis
- Reichhardt & Ebe Report: Retaining Walls, Culverts and Utilities Analysis
- GeoEngineers Critical Areas and Wetland Report

James Street Alternative Evaluations

	SEGMENT 1		SEGMENT 2		SEGMENT 3		SEGMENT 4	
	Orchard Drive to McLeod Road		McLeod Road to Telegraph Road[1]		Telegraph Road to E Bakerview Road[1,2]		E Bakerview Road to E Kellogg Road[2]	
	Section Length:	1200 LF	Section Length:	1250 LF	Section Length:	800 LF	Section Length:	1450 LF
	Standard	Shared Use	Standard	Shared Use	Standard	Shared Use	Standard	Shared Use
Cross Section Elements								
Active Modes	Sidewalks and Bike Lanes Both Directions (Full City Standard)	12' shared use path (west side)	Sidewalks and Bike Lanes Both Directions (Full City Standard)	12' shared use path (west side)	Sidewalks and Bike Lanes Both Directions (Full City Standard)	12' shared use path (west side)	Sidewalks and Bike Lanes Both Directions (Full City Standard)	12' shared use path (west side)
Roadway	Modified to fit Standard section	Unmodified	Modified to fit Standard section	Unmodified	Modified to fit Standard section	Unmodified	Modified to fit Standard section	Unmodified
Engineering Considerations								
Pedestrian Facility Access and Required Crosswalks	No mid-block crossings required for access to active facilities	Crossing provided at Orchard St signal. Crossing needed at McLeod Rd for transit access - RRFB enhance	No mid-block crossings required for access to active facilities	Crossing needed at McLeod Rd for transit access - RRFB enhance. Crossing provided at Telegraph signal.	No mid-block crossings required for access to active facilities	Up to two crossings needed to provide access to transit and facility access for future development - can be provided at Telegraph signal and Bakerview roundabout	No mid-block crossings required for access to active facilities	No mid-block crossings required for access to active facilities for east side properties. Crossings at intersections or midblock, with RRFB, required for any future east side development.
Impervious Area Changes	Adds 10-12' pollution generating surface (bike lanes) per linear foot to existing roadway for length of segment. Adds 10'+ sidewalk per linear foot impervious area for length of segment. Can be cross-sloped to drain for sheet flow (both sides - may be impacted by existing development on east side)	Maintains existing roadway, no change in pollution-generating hardscape Adds 12' path which can be reverse-sloped to drain for sheet flow (west only)	Adds 10-12' pollution generating surface (bike lanes) per linear foot to existing roadway for length of segment. Adds 10'+ sidewalk per linear foot impervious area for length of segment. Can be cross-sloped to drain for sheet flow (both sides - may be impacted by existing development on east side)	Maintains existing roadway, no change in pollution-generating hardscape Adds 12' path which can be reverse-sloped to drain for sheet flow (west only)	Adds 10-12' pollution generating surface (bike lanes) per linear foot to existing roadway for length of segment. Adds 10'+ sidewalk per linear foot impervious area for length of segment. Can be cross-sloped to drain for sheet flow (both sides)	Maintains existing roadway, no change in pollution-generating hardscape Adds 12' path which can be reverse-sloped to drain for sheet flow (west only)	Adds 10-12' pollution generating surface (bike lanes) per linear foot to existing roadway for length of segment. Adds 10'+ sidewalk per linear foot impervious area for length of segment. Can be cross-sloped to drain for sheet flow (both sides)	Maintains existing roadway, no change in pollution-generating hardscape Adds 12' path which can be reverse-sloped to drain for sheet flow (west only)
Wetlands and Critical Areas Impacts including culverts	Full width bridge structure required at S Fork Baker Creek 28,470 square feet wetland buffer impact (with walls at S Fork Baker Creek) 280 square feet wetland impact (with walls at S Fork Baker Creek)	Full width bridge structure required at S Fork Baker Creek 10,860 square feet wetland buffer impact (with walls at S Fork Baker Creek) No wetland impact	Full width bridge structure required at Baker Creek 47,340 square feet wetland buffer impact (with walls at Baker Creek) 20 square feet wetland impact (with walls at Baker Creek)	Full width bridge structure required at Baker Creek 17,450 square feet wetland buffer impact (with walls at Baker Creek) No wetland impact	No waterway crossings 12,140 square feet wetland buffer impact No wetland impact	No waterway crossings 1,180 square feet wetland buffer impact No wetland impact	Full width bridge structure required at N Fork Baker Creek 68,110 square feet wetland buffer impact (with walls at N Fork Baker Creek) 4,900 square feet wetland impact (with walls at N Fork Baker Creek)	Full width bridge structure required at N Fork Baker Creek 42,200 square feet wetland buffer impact (with walls at N Fork Baker Creek) 1,820 square feet wetland impact (with walls at N Fork Baker Creek)
Utility Relocations and Impacts	Utility poles: 5 Storm: 1,375 LF (Open Channel) 340 LF (Conduit) Driveway culverts: 200 LF Water valves: 4 Water line: 1100 LF	Utility poles: 4 Storm: 595 LF (Open channel) Driveway culverts: 45 LF Water valves: 1 Water line: 0	Utility poles: 6 Storm: 1,145 LF (Open Channel) Driveway culverts: 300 LF Water valves: Water line:	Utility poles: 3 Storm: 750 LF (Open channel) Driveway culverts: 180 LF Water valves: 0 Water line: 0	Utility poles: 2 Storm: 755 LF (Open Channel) 325 LF (Conduit) Driveway culverts: 150 LF Water valves: Water line:	Utility poles: 1 Storm: 75 LF (Open Channel) Driveway culverts: 0 Water valves: 0 Water line: 0	Utility poles: 1 Storm: 1,240 LF (Open Channel) 870 LF (Conduit) Driveway culverts: 200 LF Water valves: Water line:	Utility poles: 1 Storm: 835 LF (Open Channel) Driveway culverts: 200 LF Water valves: 1 Water line: 20-30 LF
Right of Way Requirements	15,900 SF ROW requirements on east and west side of existing	3,400 SF West only; Full width path edge of pavement is within 4' of existing ROW	4,200 SF ROW requirements on east and west side of existing	3,700 SF West only; Full width path edge of pavement is within 4' of existing ROW	6,100 SF ROW requirements on east and west side of existing	6,000 SF West only; Full width path edge of pavement is within 4' of existing ROW	4,900 SF ROW requirements on east and west side of existing	4,000 SF West only; Full width path edge of pavement is within 4' of existing ROW
Other Engineering (Lighting, existing facilties, etc.)	Lowered profile at Gilbert Drive Lighting on both sides of the road	Lowered profile at Gilbert Drive 250 LF of sidewalks needed on east side Lighting can focus on west side (SUP). Existing lighting covers east side sidewalk	Lighting on both sides of the road	Does not provide direct access to northbound transit stop 700 LF of sidewalks needed on east side (McLeod Rd to Baker Creek Bible Church) Lighting on west side (SUP) and at east side sidewalk	Fully compatible with Bakerview roundabout Lighting on both sides of the road	Combined alignment with existing sidewalks on west side north of Telegraph Does not provide direct separated/sidewalk access for new apartments north of Telegraph or northbound transit stop Compatible with Bakerview roundabout but may require some modifications Bikes already out of roadway on approach to Bakerview roundabout Lighting on both sides of the road	Lighting on both sides of the road	Avoids active transportation crossings and conflicts at oblique angle intersection with King Mountain Road Direct access to east side existing development and sidewalks on Kellogg Lighting can focus on west side
Directionality	Single-direction bike travel on each side of the street. May require crossings of vehicle lanes at trails and cross streets.	Bi-directional bike travel in a single alignment. Can directly connect to trails and cross streets on the west side. East side connections will require crossings.	Single-direction bike travel on each side of the street. May require crossings of vehicle lanes at trails and cross streets.	Bi-directional bike travel in a single alignment. Can directly connect to trails and cross streets on the west side. East side connections will require crossings.	Single-direction bike travel on each side of the street. May require crossings of vehicle lanes at trails and cross streets.	Bi-directional bike travel in a single alignment. Can directly connect to trails and cross streets on the west side. East side connections will require crossings.	Single-direction bike travel on each side of the street. May require crossings of vehicle lanes at trails and cross streets.	Bi-directional bike travel in a single alignment. Can directly connect to trails and cross streets on the west side. East side connections will require crossings.
Network and User Considerations								
Cost	$5.7 million Active & Road Improvements $1 million culvert replacement	$3.1 million Active & Road Improvements $1 million culvert replacement	$4.6 million Active & Road Improvements $3.5 million culvert replacement	$2.3 million Active & Road Improvements $3.5 million culvert replacement	$2.9 million Active & Road Improvements	$0.8 million Active & Road Improvements	$4.6 million Active & Road Improvements $1 million culvert replacement	$2.1 million Active & Road Improvements $1 million culvert replacement

	SEGMENT 1		SEGMENT 2		SEGMENT 3		SEGMENT 4	
	Orchard Drive to McLeod Road		McLeod Road to Telegraph Road[1]		Telegraph Road to E Bakerview Road[1,2]		E Bakerview Road to E Kellogg Road[2]	
	Section Length:	1200 LF	Section Length:	1250 LF	Section Length:	800 LF	Section Length:	1450 LF
	Standard	Shared Use	Standard	Shared Use	Standard	Shared Use	Standard	Shared Use
Cross Section Elements								
Active Modes	Sidewalks and Bike Lanes Both Directions (Full City Standard)	12' shared use path (west side)	Sidewalks and Bike Lanes Both Directions (Full City Standard)	12' shared use path (west side)	Sidewalks and Bike Lanes Both Directions (Full City Standard)	12' shared use path (west side)	Sidewalks and Bike Lanes Both Directions (Full City Standard)	12' shared use path (west side)
Roadway	Modified to fit Standard section	Unmodified	Modified to fit Standard section	Unmodified	Modified to fit Standard section	Unmodified	Modified to fit Standard section	Unmodified
(in Estimated 2025 Dollars)	$6.7 million Total Segment Cost	$4.1 million Total Segment Cost	$8.1 million Total Segment Cost	$5.8 million Total Segment Cost	$2.9 million Total Segment Cost	$0.8 million Total Segment Cost	$5.6 million Total Segment Cost	$3.1 million Total Segment Cost
	+$800,000 wetland mitigation (for all segments)	+$400,000 wetland mitigation (for all segments)						
Bicycle Exposure Level (Risk of Safety Concerns)	**Medium** 5' Lanes are adjacent to 35 mph vehicle lanes No buffers provided Crossings required at cross streets and/or to change directions	**Low** No mixing with vehicle traffic Mixing with pedestrians can cause conflicts West side intersections and directional changes do not require mixing with vehicle traffic						
Bike Facility Comfort	**Medium** Bike lanes are not physically separated from traffic, but exclusive space is provided Familiar treatment in Bellingham Crossings and mixing with 35 mph traffic can be intimidating to less confident riders	**High** Physical separation from vehicle traffic is comfortable for all rider types						
Pedestrian Facility Comfort	**High** Physical separation from traffic and bike traffic Added buffer from bike lanes	**Medium to High** Physical separation from traffic Reduced buffer to vehicle lanes Mixing with bike traffic can be uncomfortable for some users, especially with higher speed bicycle traffic						
Transit Access	Bike lanes could be blocked at transit stops, or require widening to accommodate alignment changes	No impact to existing operations.	Bike lanes could be blocked at transit stops, or require widening to accommodate alignment changes	No impact to existing operations. Access to northbound stops will require crossings and additonal east side facilities	Bike lanes could be blocked at transit stops	No impact to existing operations. Access to northbound stops will require crossings and additonal east side facilities	Bike lanes could be blocked at transit stops, or require widening to accommodate alignment changes	No impact to existing operations.
Operations/Traffic Impacts	Separation of uses Introduction of "side friction" can cause calming effect on speeds Crossings at intersections could cause slight delays Improved sight distance at Gilbert Road vertical curve	Improved sight distance at Gilbert Road vertical curve						
Future Development Compatibility	Fully compatible with future development - sidewalk and bike access provided on both sides	Good access to high comfort facility for west side development Requires crossings or additional infrastructure/frontage improvements for east side development						

[1] - Considerations, impacts and costs do not include future Telegraph Road signal improvements

[2] - Considerations, impacts and costs, including ROW and critical areas do not include future E Bakerview Road roundabout project

City of Bellingham
James Street Multimodal Feasibility Study

Transpo Job No. 1.18412.00

Engineer's Opinion of Probable Cost for Conceptual Design
Segment 1 - Bellingham Standard Section

Installation of sidewalk, bicycle lanes and replacement of existing roadway pavement in James Street corridor, including structures and walls, grading, storm drainage, utility relocations, right of way, design, and management costs

Date completed: 9/4/2019
Completed by: BAS

Item Description	Quantity	Unit	Unit Cost	Total
CLEARING AND GRUBBING	2	AC	$ 15,000	$ 30,000
ROADWAY EXCAVATION, INCL. HAUL	1,566	CY	$ 25	$ 39,150
CRUSHED SURFACING TOP COURSE	328	TON	$ 45	$ 14,760
HMA CL. 1/2 IN. PG 64-22	3,570	TON	$ 142	$ 506,048
CEMENT CONC. SIDEWALK	1,347	SY	$ 58	$ 78,126
CEMENT CONC. TRAFFIC CURB AND GUTTER	2,305	LF	$ 29	$ 66,845
REMOVING EXISTING ASPHALT CONCRETE	3,681	SY	$ 25	$ 92,025
DRIVEWAY/APPROACH MODIFICATIONS	8	EA	$ 10,000	$ 80,000
CEMENT CONC. CURB RAMP TYPE PARALLEL	3	EA	$ 2,750	$ 8,250
GRAVEL BORROW INCL. HAUL	3,200	TON	$ 15	$ 48,000
ILLUMINATION SYSTEM	1	LS	$ 50,000	$ 50,000
GUARDRAIL	274	LF	$ 55	$ 15,070
GUARDRAIL TERMINALS	4	EA	$ 4,500	$ 18,000
PEDESTRIAN HANDRAIL	292	LF	$ 125	$ 36,500
RETAINING WALL	3,200	FF	$ 75	$ 240,000
BRIDGE STRUCTURE	1	LS	$ 391,000	$ 391,000
CATCH BASIN - TY I	15	EA	$ 1,260	$ 18,900
STORM DRAIN PIPE	1,520	LF	$ 105	$ 159,600
DETENTION POND - EXCAVATION	900	CY	$ 50	$ 45,000
CHANNELIZATION AND SIGNING	1	LS	$ 20,000	$ 20,000
WATER LINE ADJUSTMENTS	1	LS	$ 465,000	$ 465,000
$Subtotal_1$				$2,423,000
Project Temporary Traffic Control (20% of $Subtotal_1$)				$ 485,000
Mobilization (12.5% of $Subtotal_1$)				$ 303,000
Landscaping (10% of $Subtotal_1$)				$ 243,000
Temporary Erosion and Sediment Control (3% of $Subtotal_1$)				$ 73,000
$Subtotal_2$				$1,104,000
30% Contingency (Subtotal1 + Subtotal2)				$1,059,000
CONSTRUCTION ESTIMATE ($Subtotal_1$ + $Subtotal_2$ + Contingency)				**$4,586,000**
City Construction Administration (5% of Construction Estimate)				$ 230,000
Design Engineering (15% of Construction Estimate)				$ 688,000
Construction Management (10% of Construction Estimate)				$ 459,000
CONSTRUCTION ADMIN AND DESIGN ENGINEERING ESTIMATE				**$ 918,000**
Parcels affected	11	EA	$ 20,000	$ 220,000
Right of Way - Drainage (Pond)	4326	SF	$ 12.00	$ 52,000
Right of Way - Transportation	11475	SF	$ 12.00	$ 138,000
TOTAL PROJECT ESTIMATE (2019 Dollars)				**$5,914,000**
TOTAL PROJECT ESTIMATE (2025 Dollars with 2% Annual Inflation)				**$6,700,000**

Assumptions

Unit costs were derived from bid tabs provided by City of Bellingham (ES 538, 547); WSDOT Northwest Region, low end bids used otherwise
Existing asphalt pavement will be planed and a 2.5" overlay provided in standard section areas where profile remains unchanged
The pavement structure was assumed to be: 14" of HMA CL. 1/2 IN. PG 64-22, 8" of crushed surfacing top course
Gravel borrow calculated as 1 ton per FF of retaining wall

City of Bellingham
James Street Multimodal Feasibility Study

Transpo Job No. 1.18412.00

Engineer's Opinion of Probable Cost for Conceptual Design
Segment 2 - Bellingham Standard Section

Installation of sidewalk, bicycle lanes and replacement of existing roadway pavement in James Street corridor, including structures and walls, grading, storm drainage, utility relocations, right of way, design, and management costs

Date completed: 9/4/2019
Completed by: BAS

Item Description	Quantity	Unit	Unit Cost	Total
CLEARING AND GRUBBING	2	AC	$ 15,000	$ 30,000
ROADWAY EXCAVATION, INCL. HAUL	2,373	CY	$ 25	$ 59,325
CRUSHED SURFACING TOP COURSE	351	TON	$ 45	$ 15,795
HMA CL. 1/2 IN. PG 64-22	1,364	TON	$ 142	$ 193,347
CEMENT CONC. SIDEWALK	1,330	SY	$ 58	$ 77,140
CEMENT CONC. TRAFFIC CURB AND GUTTER	3,086	LF	$ 29	$ 89,494
PLANING EXISTING ASPHALT PAVEMENT	4,806	SY	$ 10	$ 48,060
DRIVEWAY/APPROACH MODIFICATIONS	5	EA	$ 10,000	$ 50,000
CEMENT CONC. CURB RAMP TYPE PARALLEL	5	EA	$ 2,750	$ 13,750
GRAVEL BORROW INCL. HAUL	3,550	TON	$ 15	$ 53,250
ILLUMINATION SYSTEM	1	LS	$ 50,000	$ 50,000
GUARDRAIL	404	LF	$ 55	$ 22,220
GUARDRAIL TERMINALS	4	EA	$ 4,500	$ 18,000
PEDESTRIAN HANDRAIL	492	LF	$ 125	$ 61,500
RETAINING WALL	3,550	FF	$ 75	$ 266,250
BRIDGE STRUCTURE	1	LS	$1,317,000	$1,317,000
CATCH BASIN - TY I	12	EA	$ 1,260	$ 15,120
CATCH BASIN - TY II	2	EA	$ 3,780	$ 7,560
STORM DRAIN PIPE	1,520	LF	$ 105	$ 159,600
DETENTION POND - EXCAVATION	1,000	CY	$ 50	$ 50,000
CHANNELIZATION AND SIGNING	1	LS	$ 20,000	$ 20,000
WATER LINE ADJUSTMENTS	1	LS	$ 465,000	$ 465,000
$Subtotal_1$				$3,083,000
Project Temporary Traffic Control (20% of $Subtotal_1$)				$ 617,000
Mobilization (12.5% of $Subtotal_1$)				$ 386,000
Landscaping (10% of $Subtotal_1$)				$ 309,000
Temporary Erosion and Sediment Control (3% of $Subtotal_1$)				$ 93,000
$Subtotal_2$				$1,405,000
30% Contingency (Subtotal1 + Subtotal2)				$1,347,000
CONSTRUCTION ESTIMATE ($Subtotal_1$ + $Subtotal_2$ + Contingency)				**$ 5,835,000**
City Construction Administration (5% of Construction Estimate)				$ 292,000
Design Engineering (15% of Construction Estimate)				$ 876,000
Construction Management (10% of Construction Estimate)				$ 584,000
CONSTRUCTION ADMIN AND DESIGN ENGINEERING ESTIMATE				**$1,168,000**
Parcels affected	5	EA	$ 20,000	$ 100,000
Right of Way - Drainage (Pond)	4154	SF	$ 12.00	$ 50,000
Right of Way - Transportation	1883	SF	$ 12.00	$ 23,000
TOTAL PROJECT ESTIMATE (2019 Dollars)				**$7,176,000**
TOTAL PROJECT ESTIMATE (2025 Dollars with 2% Annual Inflation)				**$8,100,000**

Assumptions

Unit costs were derived from bid tabs provided by City of Bellingham (ES 538, 547); WSDOT Northwest Region, low end bids used otherwise
Existing asphalt pavement will be planed and a 2.5" overlay provided in standard section areas where profile remains unchanged
The pavement structure was assumed to be: 14" of HMA CL. 1/2 IN. PG 64-22, 8" of crushed surfacing top course
Gravel borrow calculated as 1 ton per FF of retaining wall

City of Bellingham
James Street Multimodal Feasibility Study

Transpo Job No. 1.18412.00

Engineer's Opinion of Probable Cost for Conceptual Design
Segment 3 - Bellingham Standard Section

Installation of sidewalk, bicycle lanes and replacement of existing roadway pavement in James Street corridor, including structures and walls, grading, storm drainage, utility relocations, right of way, design, and management costs

Date completed: 9/4/2019
Completed by: BAS

Item Description	Quantity	Unit	Unit Cost	Total
CLEARING AND GRUBBING	1	AC	$ 15,000	$ 15,000
ROADWAY EXCAVATION, INCL. HAUL	1,584	CY	$ 25	$ 39,600
CRUSHED SURFACING TOP COURSE	0	TON	$ 45	$ -
HMA CL. 1/2 IN. PG 64-22	533	TON	$ 142	$ 75,553
CEMENT CONC. SIDEWALK	1,068	SY	$ 58	$ 61,944
CEMENT CONC. TRAFFIC CURB AND GUTTER	1,899	LF	$ 29	$ 55,071
PLANING EXISTING ASPHALT PAVEMENT	3,680	SY	$ 10	$ 36,800
REMOVE EXISTING CONCRETE SIDEWALK	384	SY	$ 50	$ 19,200
DRIVEWAY/APPROACH MODIFICATIONS	5	EA	$ 10,000	$ 50,000
CEMENT CONC. CURB RAMP TYPE PARALLEL	2	EA	$ 2,750	$ 5,500
GRAVEL BORROW INCL. HAUL	0	TON	$ 15	$ -
ILLUMINATION SYSTEM	0	LS	$ 50,000	$ -
RETAINING WALL	0	FF	$ 75	$ -
CATCH BASIN - TY I	9	EA	$ 1,260	$ 11,340
CATCH BASIN - TY II	4	EA	$ 3,780	$ 15,120
STORM DRAIN PIPE	1,370	LF	$ 105	$ 143,850
DETENTION POND - EXCAVATION	1,150	CY	$ 50	$ 57,500
CHANNELIZATION AND SIGNING	1	LS	$ 10,000	$ 10,000
WATER LINE ADJUSTMENTS	1	LS	$ 465,000	$ 465,000
$Subtotal_1$				$ 1,062,000
Project Temporary Traffic Control (20% of $Subtotal_1$)				$ 213,000
Mobilization (12.5% of $Subtotal_1$)				$ 133,000
Landscaping (10% of $Subtotal_1$)				$ 107,000
Temporary Erosion and Sediment Control (3% of $Subtotal_1$)				$ 32,000
$Subtotal_2$				$ 485,000
30% Contingency (Subtotal1 + Subtotal2)				$ 465,000
CONSTRUCTION ESTIMATE ($Subtotal_1$ + $Subtotal_2$ + Contingency)				**$ 2,012,000**
City Construction Administration (5% of Construction Estimate)				$ 101,000
Design Engineering (15% of Construction Estimate)				$ 302,000
Construction Management (10% of Construction Estimate)				$ 202,000
CONSTRUCTION ADMIN AND DESIGN ENGINEERING ESTIMATE				**$ 403,000**
Parcels affected	3	EA	$ 20,000	$ 60,000
Right of Way - Drainage (Pond)	6010	SF	$ 12.00	$ 73,000
Right of Way - Transportation	0	SF	$ 12.00	$ -
TOTAL PROJECT ESTIMATE (2019 Dollars)				**$ 2,548,000**
TOTAL PROJECT ESTIMATE (2025 Dollars with 2% Annual Inflation)				**$ 2,900,000**

Assumptions

Unit costs were derived from bid tabs provided by City of Bellingham (ES 538, 547); WSDOT Northwest Region, low end bids used otherwise
Existing asphalt pavement will be planed and a 2.5" overlay provided in standard section areas where profile remains unchanged
The pavement structure was assumed to be: 14" of HMA CL. 1/2 IN. PG 64-22, 8" of crushed surfacing top course
Gravel borrow calculated as 1 ton per FF of retaining wall

City of Bellingham
James Street Multimodal Feasibility Study

Transpo Job No. 1.18412.00

Engineer's Opinion of Probable Cost for Conceptual Design
Segment 4 - Bellingham Standard Section

Installation of sidewalk, bicycle lanes and replacement of existing roadway pavement in James Street corridor, including structures and walls, grading, storm drainage, utility relocations, right of way, design, and management costs

Date completed: 9/4/2019
Completed by: BAS

Item Description	Quantity	Unit	Unit Cost	Total
CLEARING AND GRUBBING	1	AC	$ 15,000	$ 15,000
ROADWAY EXCAVATION, INCL. HAUL	3,267	CY	$ 25	$ 81,675
CRUSHED SURFACING TOP COURSE	442	TON	$ 45	$ 19,890
HMA CL. 1/2 IN. PG 64-22	1,538	TON	$ 142	$ 218,012
CEMENT CONC. SIDEWALK	1,734	SY	$ 58	$ 100,572
CEMENT CONC. TRAFFIC CURB AND GUTTER	3,104	LF	$ 29	$ 90,016
PLANING EXISTING ASPHALT PAVEMENT	4,792	SY	$ 10	$ 47,920
DRIVEWAY/APPROACH MODIFICATIONS	5	EA	$ 10,000	$ 50,000
CEMENT CONC. CURB RAMP TYPE PARALLEL	2	EA	$ 2,750	$ 5,500
GRAVEL BORROW INCL. HAUL	2,695	TON	$ 15	$ 40,425
ILLUMINATION SYSTEM	1	LS	$ 50,000	$ 50,000
GUARDRAIL	267	LF	$ 55	$ 14,685
GUARDRAIL TERMINALS	4	EA	$ 4,500	$ 18,000
PEDESTRIAN HANDRAIL	305	LF	$ 125	$ 38,125
RETAINING WALL	2,695	FF	$ 75	$ 202,125
BRIDGE STRUCTURE	1	LS	$371,000	$ 371,000
CATCH BASIN - TY I	10	EA	$ 1,260	$ 12,600
CATCH BASIN - TY II	2	EA	$ 3,780	$ 7,560
STORM DRAIN PIPE	1,280	LF	$ 105	$ 134,400
DETENTION POND - EXCAVATION	1,060	CY	$ 50	$ 53,000
CHANNELIZATION AND SIGNING	1	LS	$ 20,000	$ 20,000
WATER LINE ADJUSTMENTS	1	LS	$465,000	$ 465,000
$Subtotal_1$				$2,056,000
Project Temporary Traffic Control (20% of $Subtotal_1$)				$ 412,000
Mobilization (12.5% of $Subtotal_1$)				$ 257,000
Landscaping (10% of $Subtotal_1$)				$ 206,000
Temporary Erosion and Sediment Control (3% of $Subtotal_1$)				$ 62,000
$Subtotal_2$				$ 937,000
30% Contingency (Subtotal1 + Subtotal2)				$ 898,000
CONSTRUCTION ESTIMATE ($Subtotal_1$ + $Subtotal_2$ + Contingency)				**$3,891,000**
City Construction Administration (5% of Construction Estimate)				$ 195,000
Design Engineering (15% of Construction Estimate)				$ 584,000
Construction Management (10% of Construction Estimate)				$ 390,000
CONSTRUCTION ADMIN AND DESIGN ENGINEERING ESTIMATE				**$ 779,000**
Parcels affected	6	EA	$ 20,000	$ 120,000
Right of Way - Drainage (Pond)	4832	SF	$ 12.00	$ 58,000
Right of Way - Transportation	6834	SF	$ 12.00	$ 83,000
TOTAL PROJECT ESTIMATE (2019 Dollars)				**$4,931,000**
TOTAL PROJECT ESTIMATE (2025 Dollars with 2% Annual Inflation)				**$5,600,000**

Assumptions

Unit costs were derived from bid tabs provided by City of Bellingham (ES 538, 547); WSDOT Northwest Region, low end bids used otherwise
Existing asphalt pavement will be planed and a 2.5" overlay provided in standard section areas where profile remains unchanged
The pavement structure was assumed to be: 14" of HMA CL. 1/2 IN. PG 64-22, 8" of crushed surfacing top course
Gravel borrow calculated as 1 ton per FF of retaining wall

City of Bellingham
James Street Multimodal Feasibility Study

Transpo Job No. 1.18412.00

Engineer's Opinion of Probable Cost for Conceptual Design
Segment 1 - Shared Use Path (West Side)

Installation of 12' shared use path on the west side of James Street, including structures and walls, grading, storm drainage, right of way, design, and management costs

Date completed: 9/4/2019
Completed by: BAS

Item Description	Quantity	Unit	Unit Cost	Total
CLEARING AND GRUBBING	1	AC	$ 15,000	$ 15,000
ROADWAY EXCAVATION, INCL. HAUL	9,403	CY	$ 25	$ 235,075
CRUSHED SURFACING TOP COURSE	537	TON	$ 45	$ 24,165
HMA CL. 1/2 IN. PG 64-22	1,346	TON	$ 142	$ 190,796
CEMENT CONC. SIDEWALK	1,739	SY	$ 58	$ 100,862
CEMENT CONC. TRAFFIC CURB AND GUTTER	1,486	LF	$ 29	$ 43,094
REMOVING EXISTING ASPHALT CONCRETE	1,688	SY	$ 25	$ 42,200
DRIVEWAY/APPROACH MODIFICATIONS	2	EA	$ 10,000	$ 20,000
CEMENT CONC. CURB RAMP TYPE PARALLEL	3	EA	$ 2,750	$ 8,250
GRAVEL BORROW INCL. HAUL	1,570	TON	$ 15	$ 23,550
ILLUMINATION SYSTEM	1	LS	$ 25,000	$ 25,000
GUARDRAIL	250	LF	$ 55	$ 13,750
GUARDRAIL TERMINALS	4	EA	$ 4,500	$ 18,000
PEDESTRIAN HANDRAIL	292	LF	$ 125	$ 36,500
RETAINING WALL	1,570	FF	$ 75	$ 117,750
BRIDGE STRUCTURE	1	LS	$ 391,000	$ 391,000
CATCH BASIN - TY I	2	EA	$ 1,260	$ 2,520
STORM DRAIN PIPE	250	LF	$ 105	$ 26,250
DETENTION POND - EXCAVATION	910	CY	$ 50	$ 45,500
CHANNELIZATION AND SIGNING	1	LS	$ 5,000	$ 5,000
$Subtotal_1$				$ 1,385,000
Project Temporary Traffic Control (20% of $Subtotal_1$)				$ 277,000
Mobilization (12.5% of $Subtotal_1$)				$ 174,000
Landscaping (10% of $Subtotal_1$)				$ 139,000
Temporary Erosion and Sediment Control (3% of $Subtotal_1$)				$ 42,000
$Subtotal_2$				$ 632,000
30% Contingency (Subtotal1 + Subtotal2)				$ 606,000
CONSTRUCTION ESTIMATE ($Subtotal_1$ + $Subtotal_2$ + Contingency)				**$ 2,623,000**
City Construction Administration (5% of Construction Estimate)				$ 132,000
Design Engineering (15% of Construction Estimate)				$ 394,000
Construction Management (10% of Construction Estimate)				$ 263,000
CONSTRUCTION ADMIN AND DESIGN ENGINEERING ESTIMATE				**$ 789,000**
Parcels affected	5	EA	$ 20,000	$ 100,000
Right of Way - Drainage (Pond)	4464	SF	$ 12.00	$ 54,000
Right of Way - Transportation	1612	SF	$ 12.00	$ 20,000
TOTAL PROJECT ESTIMATE (2019 Dollars)				**$ 3,586,000**
TOTAL PROJECT ESTIMATE (2025 Dollars with 2% Annual Inflation)				**$ 4,100,000**

Assumptions

Unit costs were derived from bid tabs provided by City of Bellingham (ES 538, 547); WSDOT Northwest Region, low end bids used otherwise
Existing asphalt pavement will be planed and a 2.5" overlay provided in standard section areas where profile remains unchanged
The pavement structure was assumed to be: 14" of HMA CL. 1/2 IN. PG 64-22, 8" of crushed surfacing top course
Gravel borrow calculated as 1 ton per FF of retaining wall

City of Bellingham
James Street Multimodal Feasibility Study

Transpo Job No. 1.18412.00

Engineer's Opinion of Probable Cost for Conceptual Design
Segment 2 - Shared Use Path (West Side)

Installation of 12' shared use path on the west side of James Street, including structures and walls, grading, storm drainage, right of way, design, and management costs

Date completed: 9/4/2019
Completed by: BAS

Item Description	Quantity	Unit	Unit Cost	Total
CLEARING AND GRUBBING	2	AC	$ 15,000	$ 30,000
ROADWAY EXCAVATION, INCL. HAUL	2,926	CY	$ 25	$ 73,150
CRUSHED SURFACING TOP COURSE	612	TON	$ 45	$ 27,540
CEMENT CONC. SIDEWALK	1,983	SY	$ 58	$ 115,014
CEMENT CONC. TRAFFIC CURB AND GUTTER	1,872	LF	$ 29	$ 54,288
DRIVEWAY/APPROACH MODIFICATIONS	2	EA	$ 10,000	$ 20,000
CEMENT CONC. CURB RAMP TYPE PARALLEL	2	EA	$ 2,750	$ 5,500
GRAVEL BORROW INCL. HAUL	2,260	TON	$ 15	$ 33,900
ILLUMINATION SYSTEM	1	LS	$ 25,000	$ 25,000
GUARDRAIL	150	LF	$ 55	$ 8,250
GUARDRAIL TERMINALS	4	EA	$ 4,500	$ 18,000
PEDESTRIAN HANDRAIL	492	LF	$ 125	$ 61,500
RETAINING WALL	2,260	FF	$ 75	$ 169,500
BRIDGE STRUCTURE	1	LS	$ 1,317,000	$ 1,317,000
DETENTION POND - EXCAVATION	500	CY	$ 50	$ 25,000
CHANNELIZATION AND SIGNING	1	LS	$ 5,000	$ 5,000
$Subtotal_1$				$ 1,989,000
Project Temporary Traffic Control (20% of $Subtotal_1$)				$ 398,000
Mobilization (12.5% of $Subtotal_1$)				$ 249,000
Landscaping (10% of $Subtotal_1$)				$ 199,000
Temporary Erosion and Sediment Control (3% of $Subtotal_1$)				$ 60,000
$Subtotal_2$				$ 906,000
30% Contingency (Subtotal1 + Subtotal2)				$ 869,000
CONSTRUCTION ESTIMATE ($Subtotal_1$ + $Subtotal_2$ + Contingency)				**$ 3,764,000**
City Construction Administration (5% of Construction Estimate)				$ 189,000
Design Engineering (15% of Construction Estimate)				$ 565,000
Construction Management (10% of Construction Estimate)				$ 377,000
CONSTRUCTION ADMIN AND DESIGN ENGINEERING ESTIMATE				**$ 1,131,000**
Parcels affected	6	EA	$ 20,000	$ 120,000
Right of Way - Drainage (Pond)	3345	SF	$ 12.00	$ 41,000
Right of Way - Transportation	4094	SF	$ 12.00	$ 50,000
TOTAL PROJECT ESTIMATE (2019 Dollars)				**$ 5,106,000**
TOTAL PROJECT ESTIMATE (2025 Dollars with 2% Annual Inflation)				**$ 5,800,000**

Assumptions

Unit costs were derived from bid tabs provided by City of Bellingham (ES 538, 547); WSDOT Northwest Region, low end bids used otherwise
Existing asphalt pavement will be planed and a 2.5" overlay provided in standard section areas where profile remains unchanged
The pavement structure was assumed to be: 14" of HMA CL. 1/2 IN. PG 64-22, 8" of crushed surfacing top course
Gravel borrow calculated as 1 ton per FF of retaining wall

City of Bellingham
James Street Multimodal Feasibility Study

Transpo Job No. 1.18412.00

Engineer's Opinion of Probable Cost for Conceptual Design
Segment 3 - Shared Use Path (West Side)

Installation of 12' shared use path on the west side of James Street, including structures and walls, grading, storm drainage, right of way, design, and management costs

Date completed: 9/4/2019
Completed by: BAS

Item Description	Quantity	Unit	Unit Cost	Total
CLEARING AND GRUBBING	1	AC	$ 15,000	$ 15,000
ROADWAY EXCAVATION, INCL. HAUL	843	CY	$ 25	$ 21,075
CRUSHED SURFACING TOP COURSE	450	TON	$ 45	$ 20,250
CEMENT CONC. SIDEWALK	1,457	SY	$ 58	$ 84,506
CEMENT CONC. TRAFFIC CURB AND GUTTER	738	LF	$ 29	$ 21,402
REMOVING EXISTING CONCRETE	434	SY	$ 25	$ 10,850
DRIVEWAY/APPROACH MODIFICATIONS	2	EA	$ 10,000	$ 20,000
CEMENT CONC. CURB RAMP TYPE PARALLEL	1	EA	$ 2,750	$ 2,750
GRAVEL BORROW INCL. HAUL	0	TON	$ 15	$ -
ILLUMINATION SYSTEM	0	LS	$ 25,000	$ -
RETAINING WALL	0	FF	$ 75	$ -
DETENTION POND - EXCAVATION	500	CY	$ 50	$ 25,000
CHANNELIZATION AND SIGNING	1	LS	$ 5,000	$ 5,000
Subtotal$_1$				$ 226,000
Project Temporary Traffic Control (20% of Subtotal$_1$)				$ 46,000
Mobilization (12.5% of Subtotal$_1$)				$ 29,000
Landscaping (10% of Subtotal$_1$)				$ 23,000
Temporary Erosion and Sediment Control (3% of Subtotal$_1$)				$ 7,000
Subtotal$_2$				$ 105,000
30% Contingency (Subtotal1 + Subtotal2)				$ 100,000
CONSTRUCTION ESTIMATE (Subtotal$_1$ + Subtotal$_2$ + Contingency)				**$ 431,000**
City Construction Administration (5% of Construction Estimate)				$ 22,000
Design Engineering (15% of Construction Estimate)				$ 65,000
Construction Management (10% of Construction Estimate)				$ 44,000
CONSTRUCTION ADMIN AND DESIGN ENGINEERING ESTIMATE				**$ 131,000**
Parcels affected	3	EA	$ 20,000	$ 60,000
Right of Way - Drainage (Pond)	3345	SF	$ 12.00	$ 41,000
Right of Way - Transportation	309	SF	$ 12.00	$ 4,000
TOTAL PROJECT ESTIMATE (2019 Dollars)				**$ 667,000**
TOTAL PROJECT ESTIMATE (2025 Dollars with 2% Annual Inflation)				**$ 800,000**

Assumptions

Unit costs were derived from bid tabs provided by City of Bellingham (ES 538, 547); WSDOT Northwest Region, low end bids used otherwise
Existing asphalt pavement will be planed and a 2.5" overlay provided in standard section areas where profile remains unchanged
The pavement structure was assumed to be: 14" of HMA CL. 1/2 IN. PG 64-22, 8" of crushed surfacing top course
Gravel borrow calculated as 1 ton per FF of retaining wall

City of Bellingham
James Street Multimodal Feasibility Study

Transpo Job No. 1.18412.00

Engineer's Opinion of Probable Cost for Conceptual Design
Segment 4 - Shared Use Path (West Side)

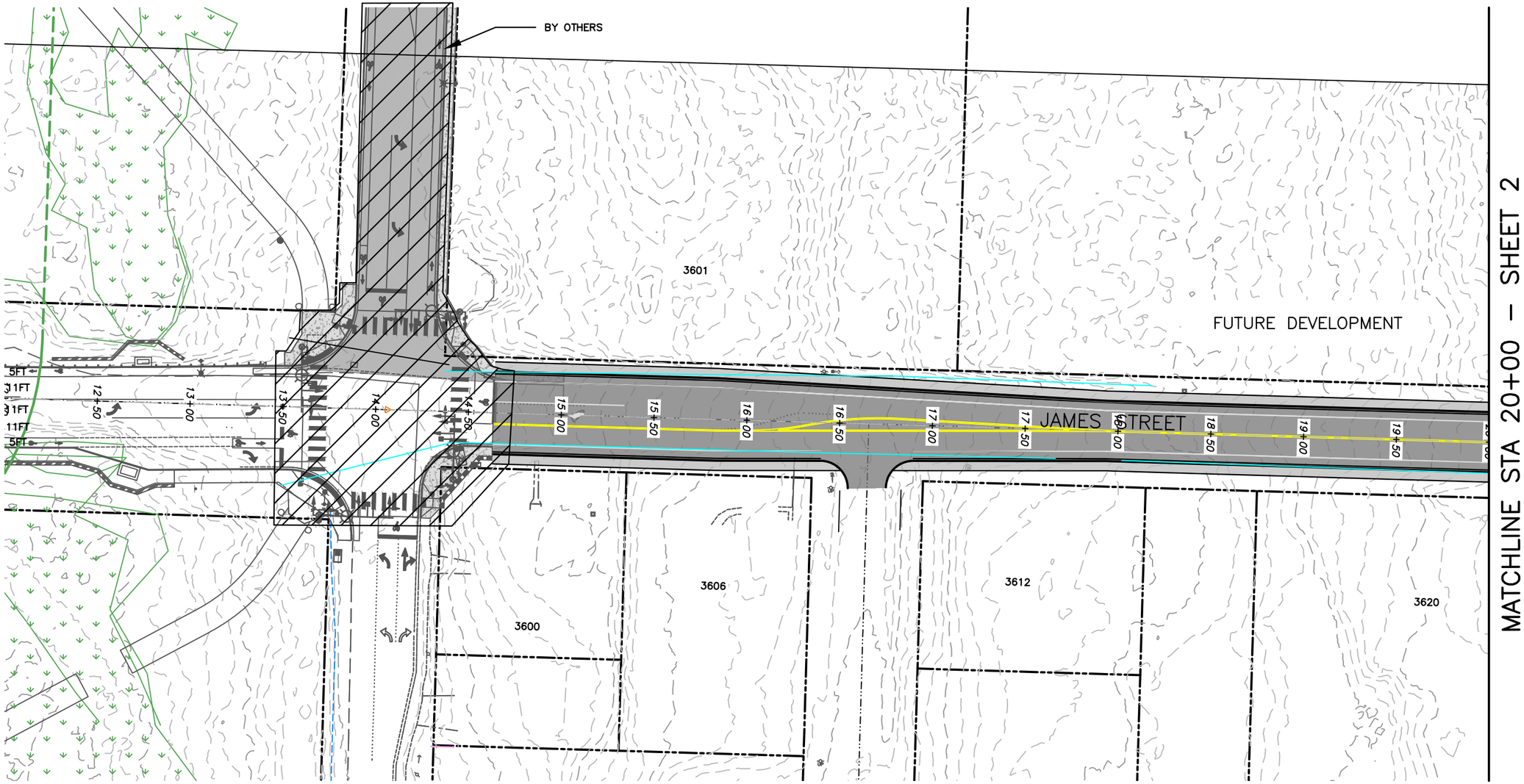
Installation of 12' shared use path on the west side of James Street, including structures and walls, grading, storm drainage, right of way, design, and management costs

Date completed: 9/4/2019
Completed by: BAS

Item Description	Quantity	Unit	Unit Cost	Total
CLEARING AND GRUBBING	2	AC	$ 15,000	$ 30,000
ROADWAY EXCAVATION, INCL. HAUL	2,700	CY	$ 25	$ 67,500
CRUSHED SURFACING TOP COURSE	561	TON	$ 45	$ 25,245
CEMENT CONC. SIDEWALK	1,818	SY	$ 58	$ 105,444
CEMENT CONC. TRAFFIC CURB AND GUTTER	1,385	LF	$ 29	$ 40,165
DRIVEWAY/APPROACH MODIFICATIONS	5	EA	$ 10,000	$ 50,000
CEMENT CONC. CURB RAMP TYPE PARALLEL	1	EA	$ 2,750	$ 2,750
GRAVEL BORROW INCL. HAUL	2,420	TON	$ 15	$ 36,300
ILLUMINATION SYSTEM	1	LS	$ 25,000	$ 25,000
PEDESTRIAN HANDRAIL	305	LF	$ 125	$ 38,125
RETAINING WALL	2,420	FF	$ 75	$ 181,500
BRIDGE STRUCTURE	1	LS	$ 371,000	$ 371,000
DETENTION POND - EXCAVATION	650	CY	$ 50	$ 32,500
CHANNELIZATION AND SIGNING	1	LS	$ 5,000	$ 5,000
$Subtotal_1$				$ 1,011,000
Project Temporary Traffic Control (20% of $Subtotal_1$)				$ 203,000
Mobilization (12.5% of $Subtotal_1$)				$ 127,000
Landscaping (10% of $Subtotal_1$)				$ 102,000
Temporary Erosion and Sediment Control (3% of $Subtotal_1$)				$ 31,000
$Subtotal_2$				$ 463,000
30% Contingency (Subtotal1 + Subtotal2)				$ 443,000
CONSTRUCTION ESTIMATE ($Subtotal_1$ + $Subtotal_2$ + Contingency)				**$ 1,917,000**
City Construction Administration (5% of Construction Estimate)				$ 96,000
Design Engineering (15% of Construction Estimate)				$ 288,000
Construction Management (10% of Construction Estimate)				$ 192,000
CONSTRUCTION ADMIN AND DESIGN ENGINEERING ESTIMATE				**$ 576,000**
Parcels affected	4	EA	$ 20,000	$ 80,000
Right of Way - Drainage (Pond)	4377	SF	$ 12.00	$ 53,000
Right of Way - Transportation	6930	SF	$ 12.00	$ 84,000
TOTAL PROJECT ESTIMATE (2019 Dollars)				**$ 2,710,000**
TOTAL PROJECT ESTIMATE (2025 Dollars with 2% Annual Inflation)				**$ 3,100,000**

Assumptions

Unit costs were derived from bid tabs provided by City of Bellingham (ES 538, 547); WSDOT Northwest Region, low end bids used otherwise
Existing asphalt pavement will be planed and a 2.5" overlay provided in standard section areas where profile remains unchanged
The pavement structure was assumed to be: 14" of HMA CL. 1/2 IN. PG 64-22, 8" of crushed surfacing top course
Gravel borrow calculated as 1 ton per FF of retaining wall



Standard Cross-Section

LEGEND

- Right-of-Way
- Waterways
- Existing Edge of Pavement
- Critical Areas/Wetlands
- Critical Areas/Wetlands Buffer
- Index Contour
- Non-Index Contour
- Future Improvements By Others
- Steep Slopes
- Proposed Pavement
- Proposed Sidewalk/Shared Use Path
- Proposed Wall
- Proposed Rectangular Rapid Flashing Beacon

N

30 120

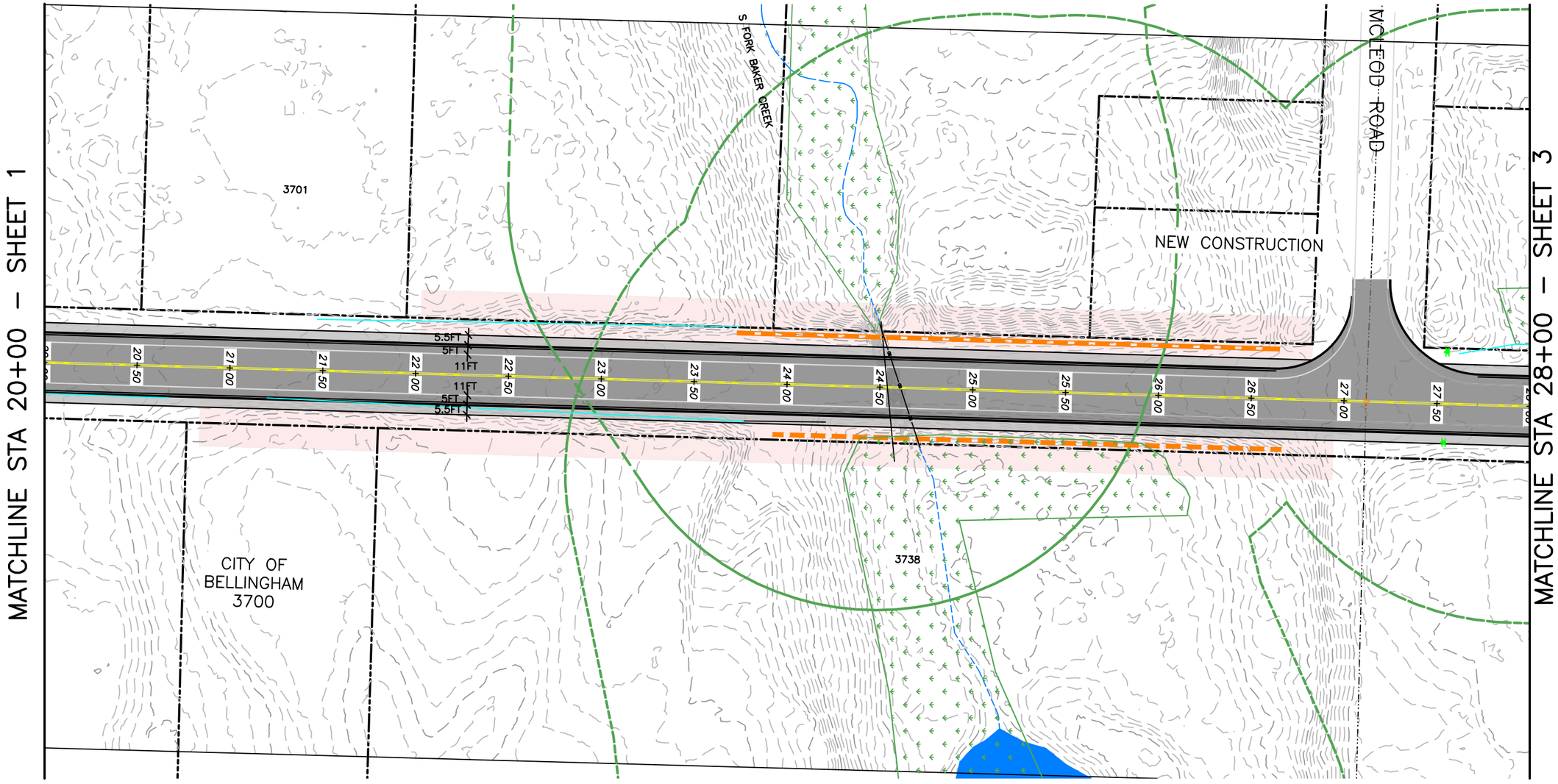
0 60 180

Segment 1 - Orchard Drive to McLeod Road

James Street Multimodal Feasibility Study

FIGURE 1

transpogroup
WHAT TRANSPORTATION CAN BE.



Standard Cross-Section

LEGEND

- Right-of-Way
- Waterways
- Existing Edge of Pavement
- Critical Areas/Wetlands
- Critical Areas/Wetlands Buffer
- Index Contour
- Non-Index Contour
- Future Improvements By Others
- Steep Slopes
- Proposed Pavement
- Proposed Sidewalk/Shared Use Path
- Proposed Wall
- Proposed Rectangular Rapid Flashing Beacon

N

30 120

0 60 180

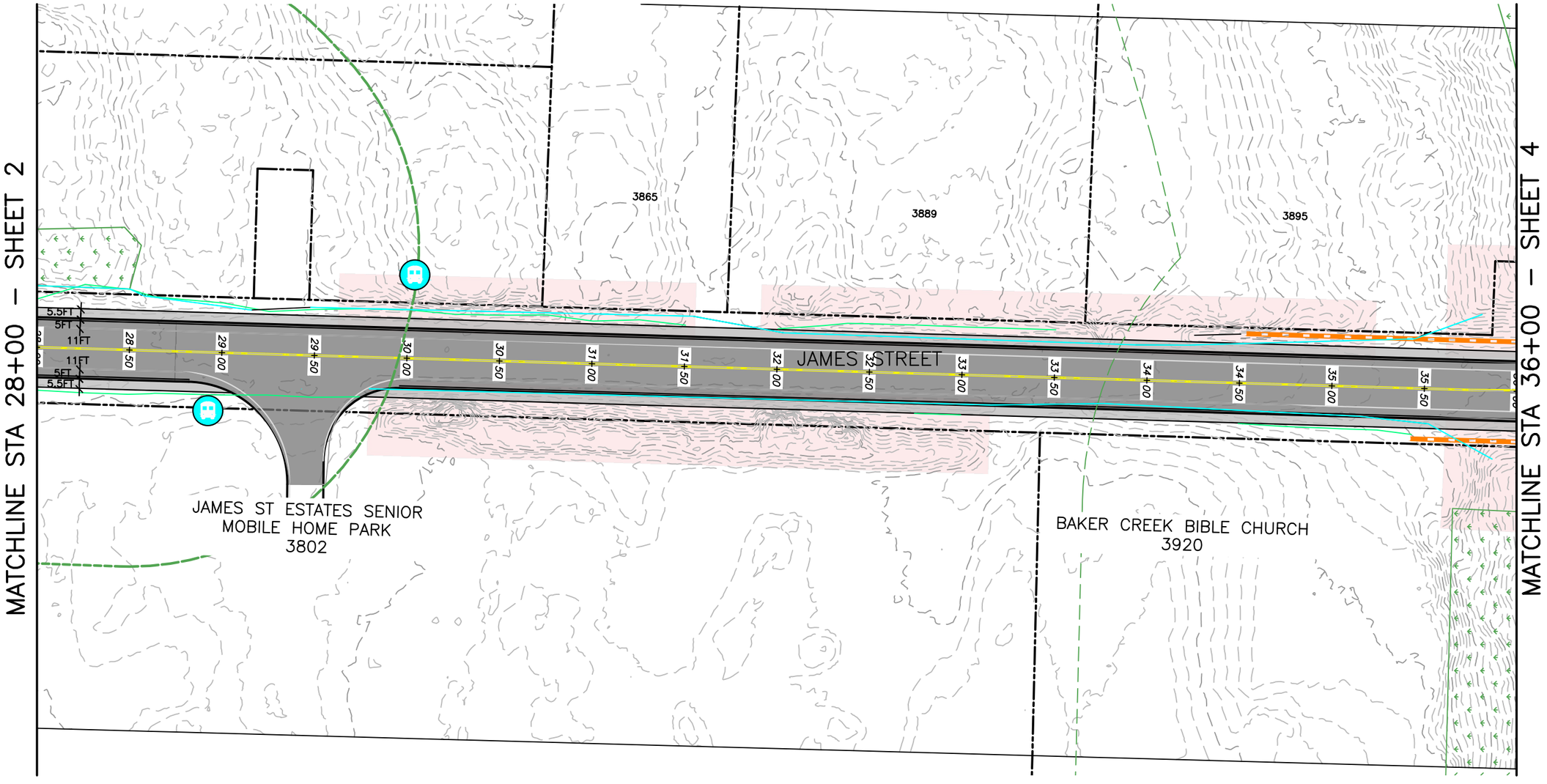
Segment 1 - Orchard Drive to McLeod Road

James Street Multimodal Feasibility Study

FIGURE **2**

transpogroup
WHAT TRANSPORTATION CAN BE.

Sep 06, 2019 – 1:44pm janetl \\srv-dfs-wa\Projects\18\1.18412.00 – James Street Study\Engineering\CAD\Conceptual\James St – Roll Plot – Segments with Corridors.dwg Layout: Segment 1 – 2



Standard Cross-Section

LEGEND

- Right-of-Way
- Waterways
- Existing Edge of Pavement
- Critical Areas/Wetlands
- Critical Areas/Wetlands Buffer
- Index Contour
- Non-Index Contour
- Future Improvements By Others
- Steep Slopes
- Proposed Pavement
- Proposed Sidewalk/Shared Use Path
- Proposed Wall
- Proposed Rectangular Rapid Flashing Beacon

N

30 0 60 120 180

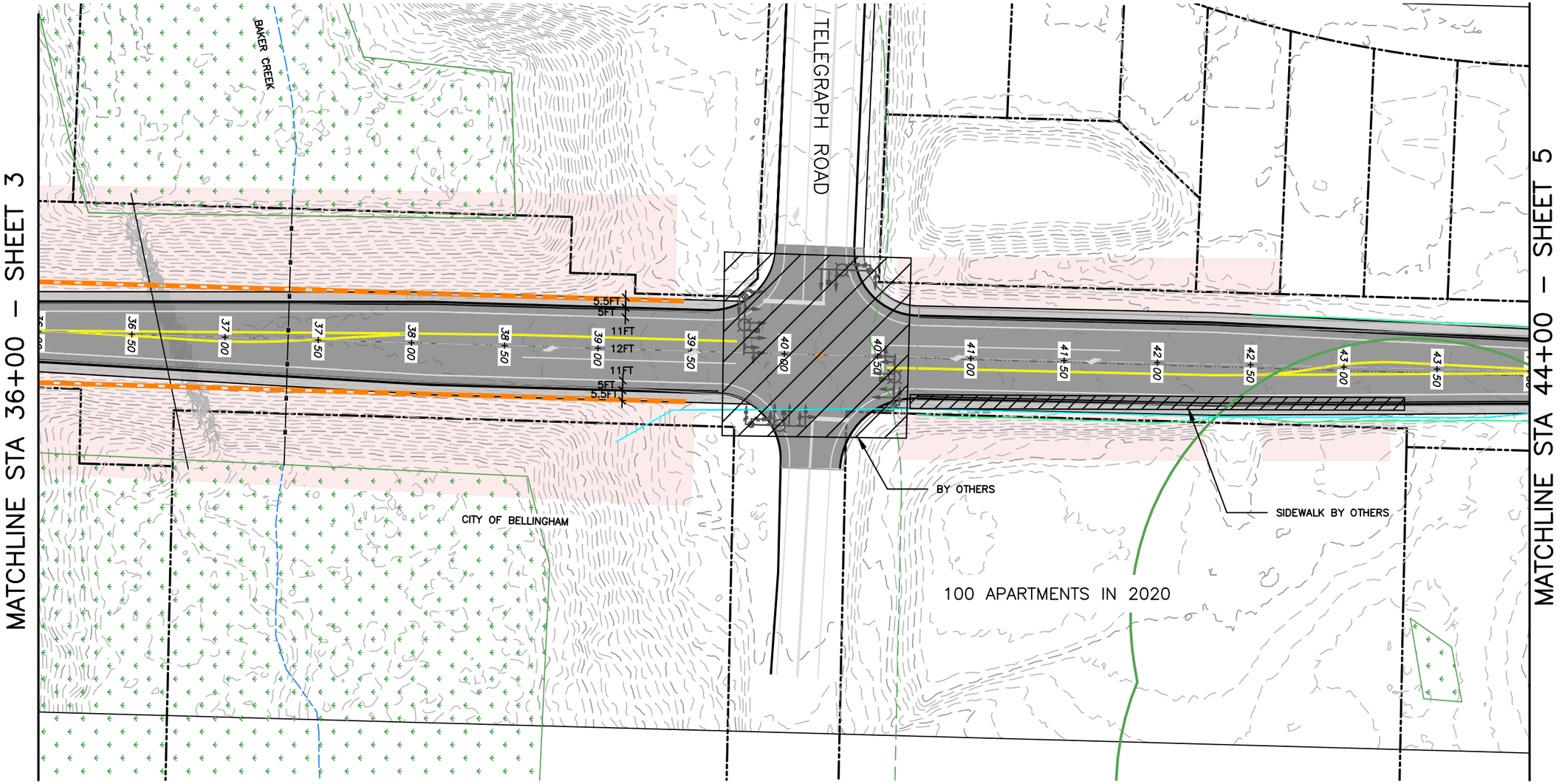
Segment 2 - McLeod Road to Telegraph Road

James Street Multimodal Facility Study

FIGURE 3

transpogroup
WHAT TRANSPORTATION CAN BE.

Sep 06, 2019 – 1:44pm janetl \\srv-dfs-wa\Projects\18\1.18412.00 – James Street Study\Engineering\CAD\Conceptual\James St – Roll Plot – Segments with Corridors.dwg Layout: Segment 2 – 3



Standard Cross-Section

LEGEND

- Right-of-Way
- Waterways
- Existing Edge of Pavement
- Critical Areas/Wetlands
- Critical Areas/Wetlands Buffer
- Index Contour
- Non-Index Contour
- Future Improvements By Others
- Steep Slopes
- Proposed Pavement
- Proposed Sidewalk/Shared Use Path
- Proposed Wall
- Proposed Rectangular Rapid Flashing Beacon

N

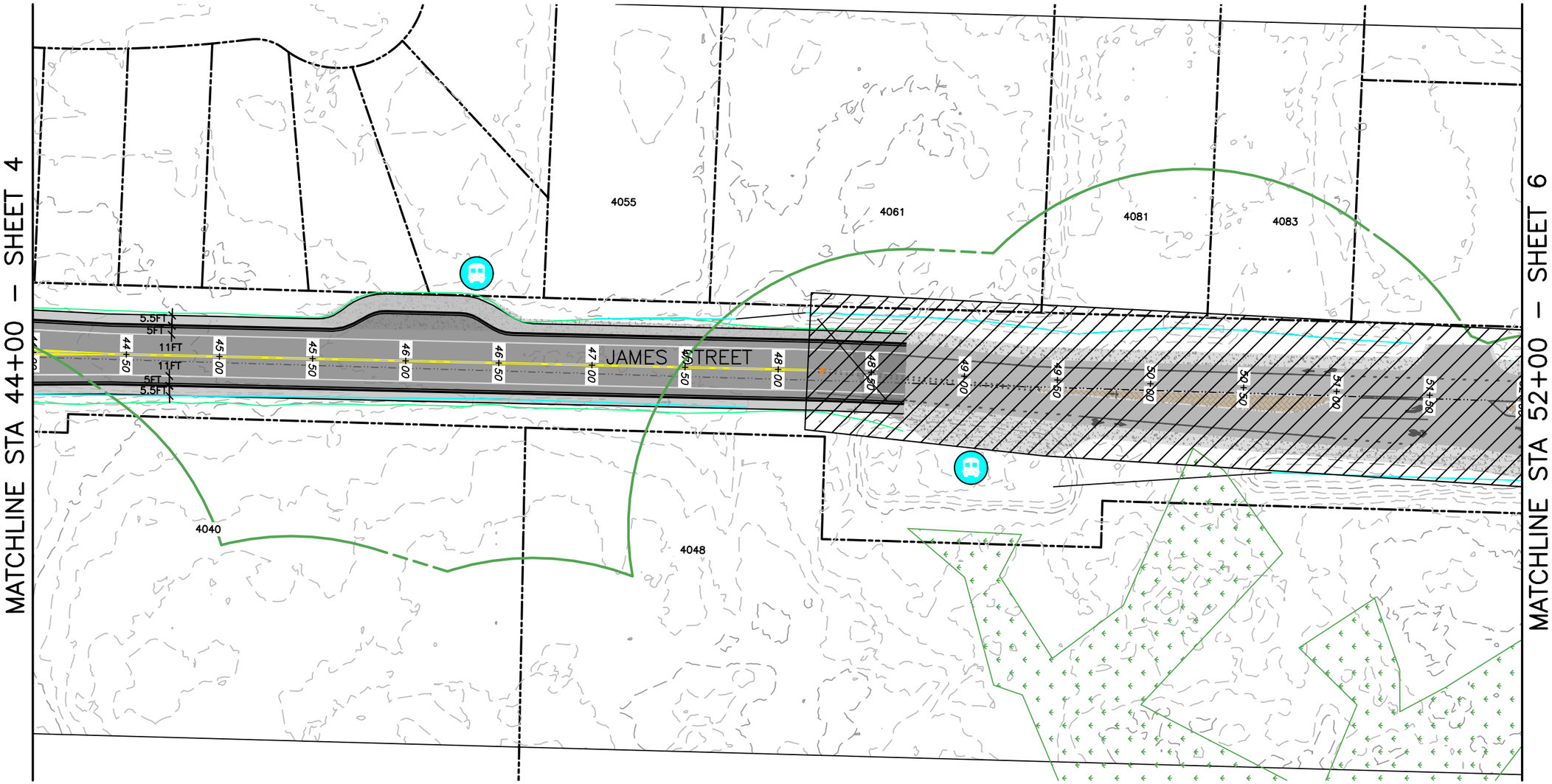
30 0 60 120 180

Segment 2 - McLeod Road to Telegraph Road

James Street Multimodal Facility Study

FIGURE **4**

transpogroup
WHAT TRANSPORTATION CAN BE.



Standard Cross-Section

LEGEND

- Right-of-Way
- Waterways
- Existing Edge of Pavement
- Critical Areas/Wetlands
- Critical Areas/Wetlands Buffer
- Index Contour
- Non-Index Contour
- Future Improvements By Others
- Steep Slopes
- Proposed Pavement
- Proposed Sidewalk/Shared Use Path
- Proposed Wall
- Proposed Rectangular Rapid Flashing Beacon

N

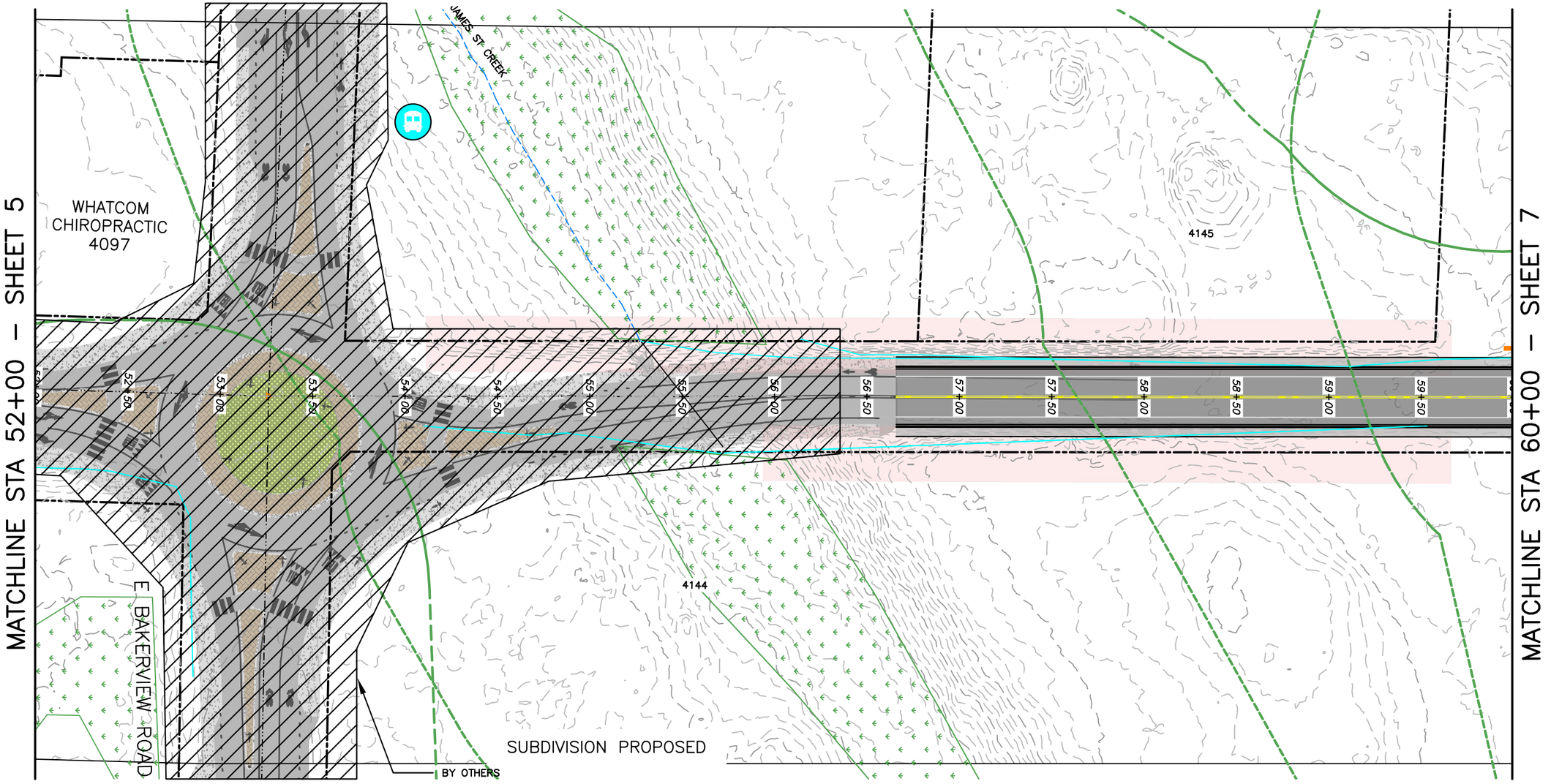
30 120
0 60 180

Segment 3 - Telegraph Road to E Bakerview Road

James Street Multimodal Feasibility Study

FIGURE **5**

transpogroup
WHAT TRANSPORTATION CAN BE.



Standard Cross-Section

LEGEND

- Right-of-Way
- Waterways
- Existing Edge of Pavement
- Critical Areas/Wetlands
- Critical Areas/Wetlands Buffer
- Index Contour
- Non-Index Contour
- Future Improvements By Others
- Steep Slopes
- Proposed Pavement
- Proposed Sidewalk/Shared Use Path
- Proposed Wall
- Proposed Rectangular Rapid Flashing Beacon

N

30 120
0 60 180

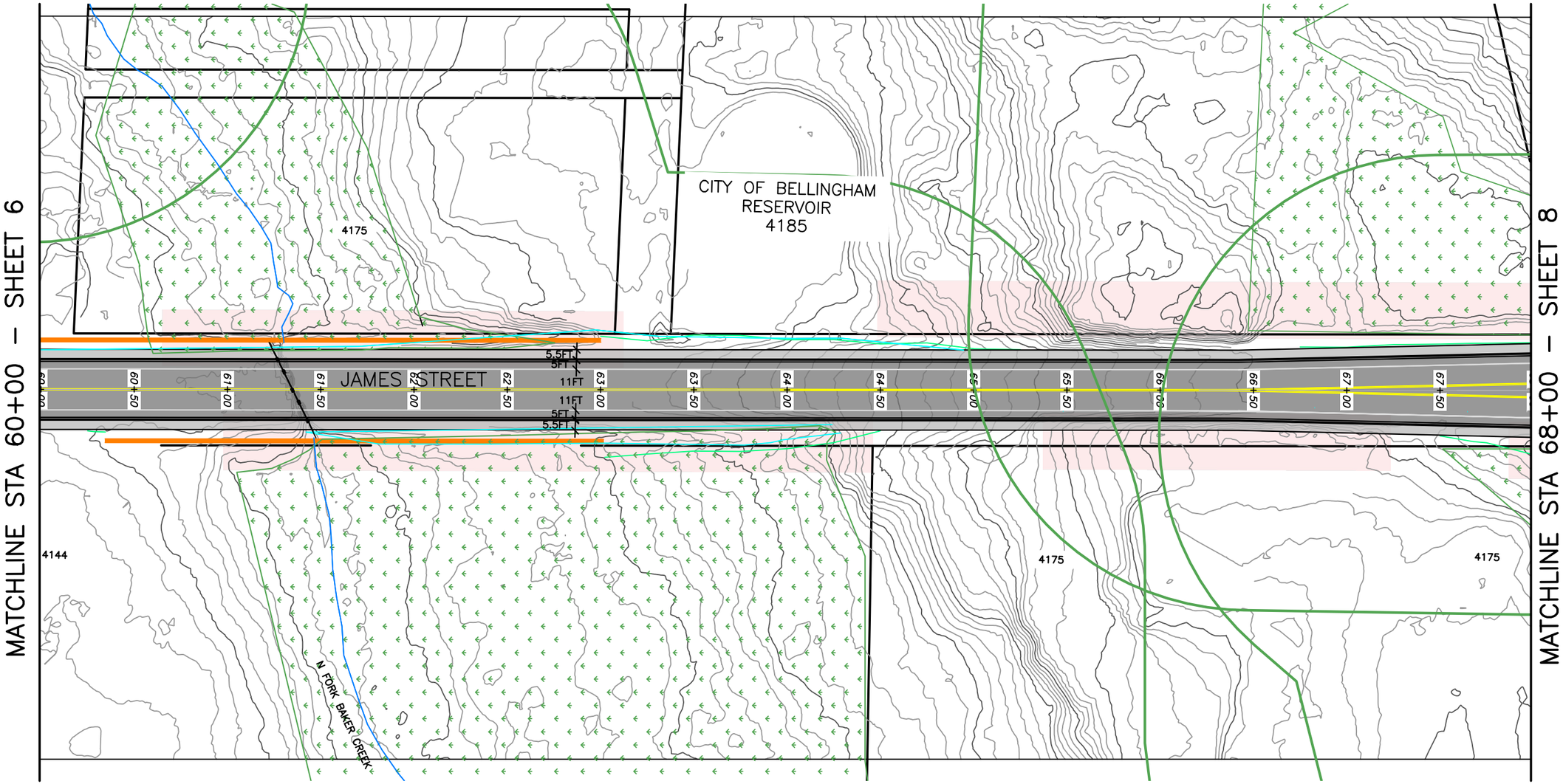
Segment 3 - Telegraph Road to E Bakerview Road

James Street Multimodal Feasibility Study

FIGURE 6

transpogroup
WHAT TRANSPORTATION CAN BE.

Sep 06, 2019 – 1:45pm janetl \\srv-dfs-wa\Projects\18\1.18412.00 – James Street Study\Engineering\CAD\Conceptual\James St – Roll Plot – Segments with Corridors.dwg Layout: Segment 3 – 6



Standard Cross-Section

LEGEND

- Right-of-Way
- Waterways
- Existing Edge of Pavement
- Critical Areas/Wetlands
- Critical Areas/Wetlands Buffer
- Index Contour
- Non-Index Contour
- Future Improvements By Others
- Steep Slopes
- Proposed Pavement
- Proposed Sidewalk/Shared Use Path
- Proposed Wall
- Proposed Rectangular Rapid Flashing Beacon

N

30 120

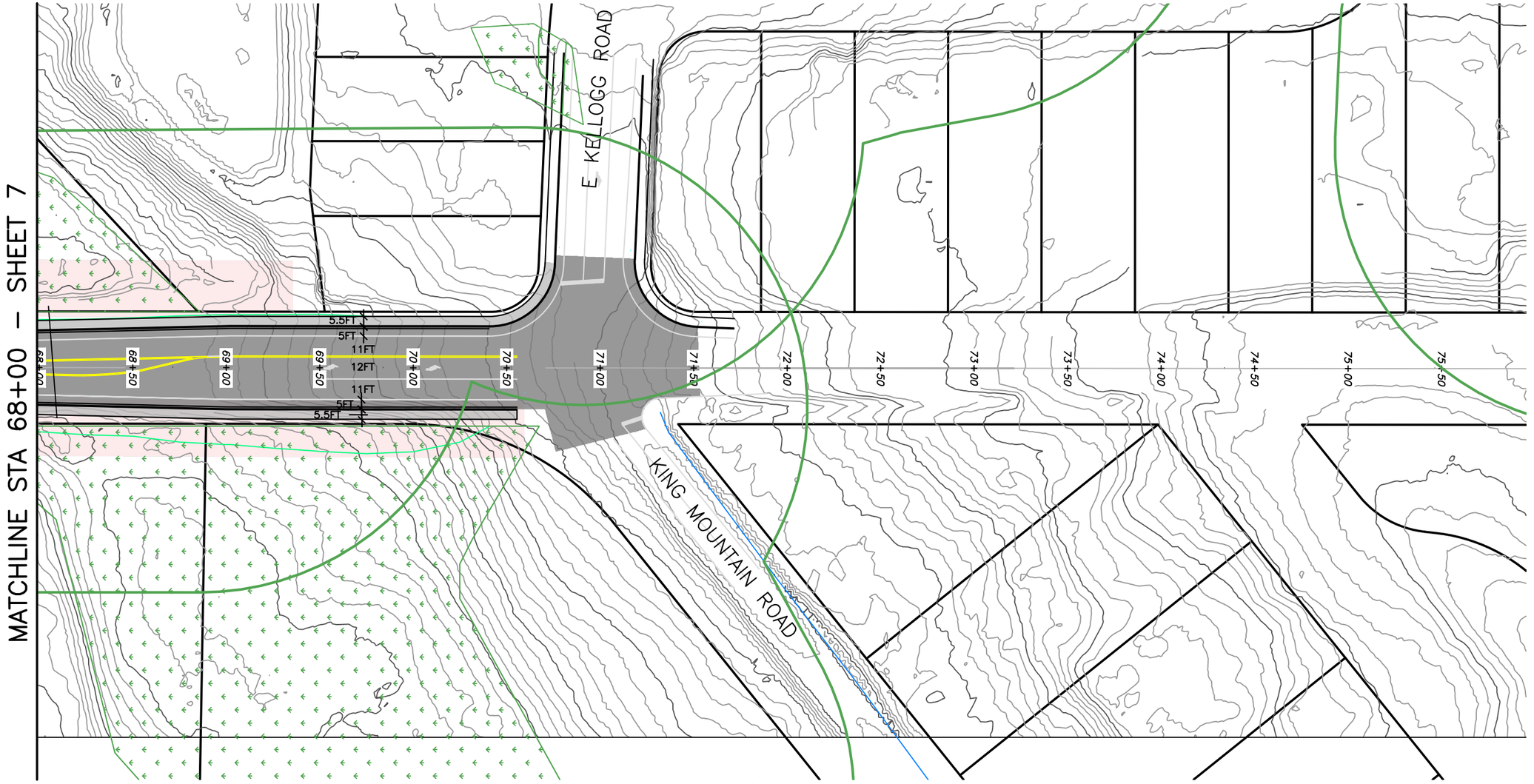
0 60 180

Segment 4 - E Bakerview Road to E Kellogg Road

James Street Multimodal Feasibility Study

FIGURE 7

transpogroup
WHAT TRANSPORTATION CAN BE.



Standard Cross-Section

LEGEND

- Right-of-Way
- Waterways
- Existing Edge of Pavement
- Critical Areas/Wetlands
- Critical Areas/Wetlands Buffer
- Index Contour
- Non-Index Contour
- Future Improvements By Others
- Steep Slopes
- Proposed Pavement
- Proposed Sidewalk/Shared Use Path
- Proposed Wall
- Proposed Rectangular Rapid Flashing Beacon

N

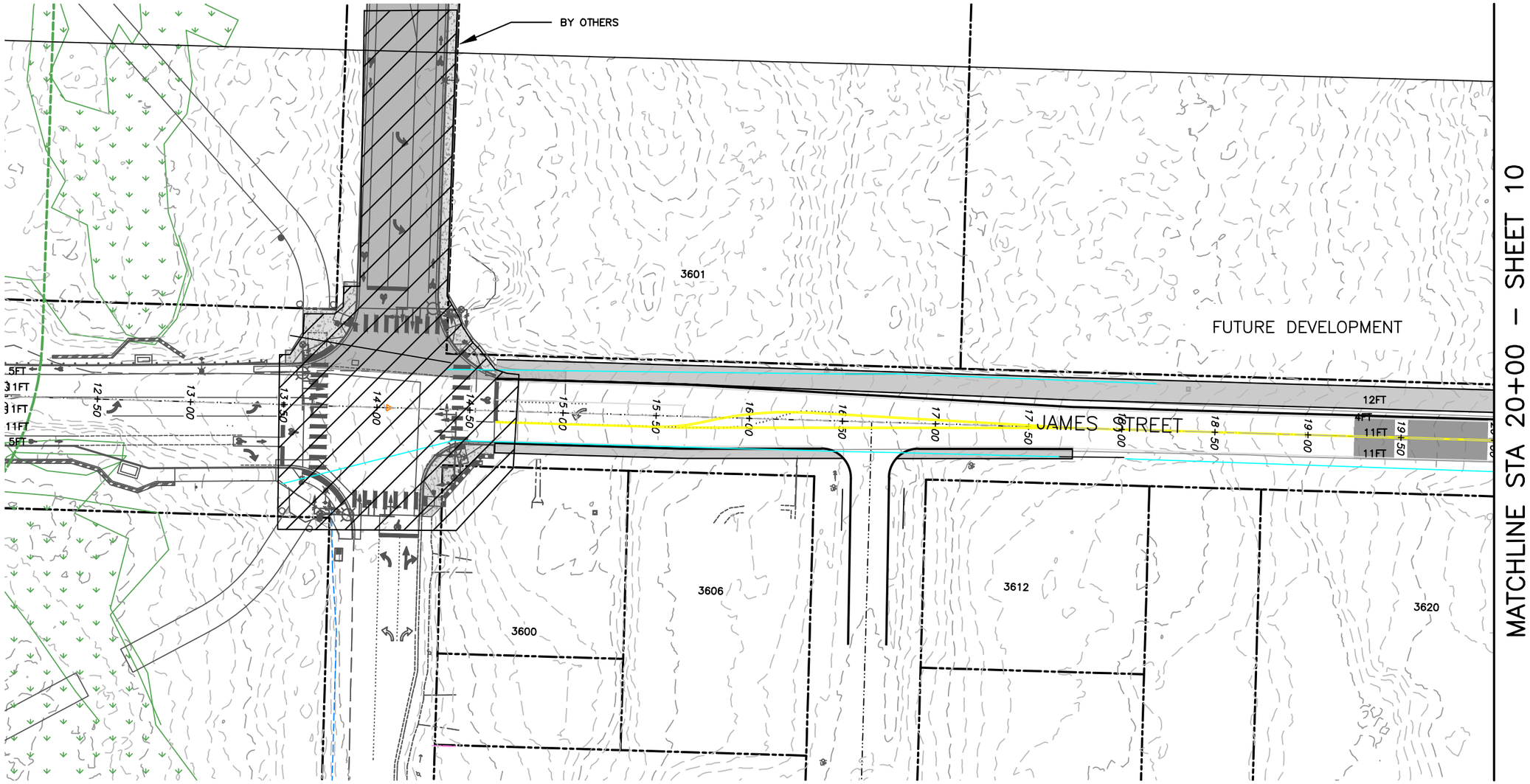
30 0 60 120 180

Segment 4 - E Bakerview Road to E Kellogg Road

James Street Multimodal Feasibility Study

FIGURE **8**

transpogroup
WHAT TRANSPORTATION CAN BE.



Shared Use Path Cross-Section

LEGEND

- Right-of-Way
- Waterways
- Existing Edge of Pavement
- Critical Areas/Wetlands
- Critical Areas/Wetlands Buffer
- Index Contour
- Non-Index Contour
- Future Improvements By Others
- Steep Slopes
- Proposed Pavement
- Proposed Sidewalk/Shared Use Path
- Proposed Wall
- Proposed Rectangular Rapid Flashing Beacon

N

30 120

0 60 180

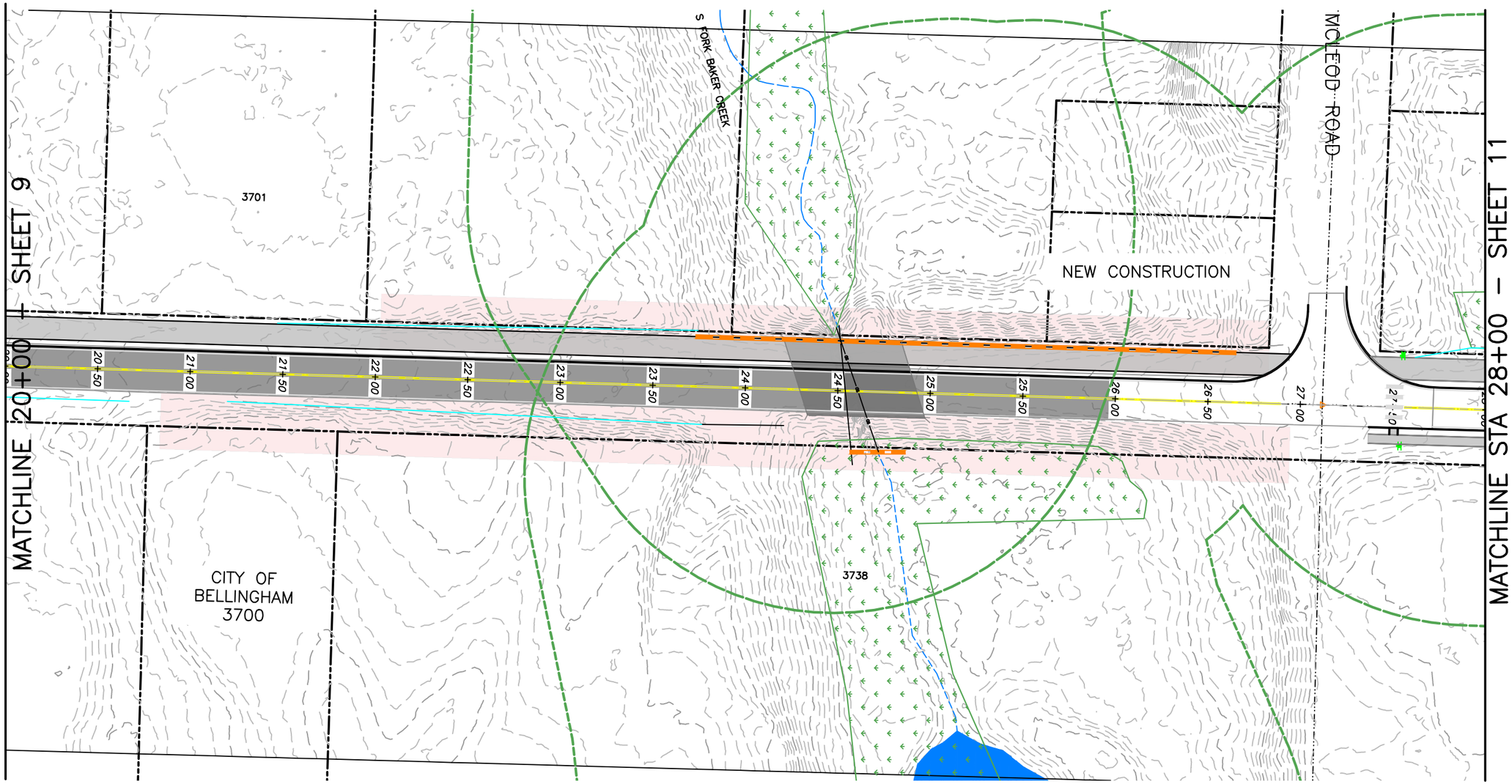
Segment 1 - Orchard Drive to McLeod Road

James Street Multimodal Feasibility Study

FIGURE **9**

transpogroup
WHAT TRANSPORTATION CAN BE.

Sep 06, 2019 – 1:31pm janetl \\srv-dfs-wa\Projects\18\1.18412.00 – James Street Study\Engineering\CAD\Conceptual\James St – Roll Plot – Segments with Corridors.dwg Layout: Segment 1 – 9



LEGEND

- Right-of-Way
- Waterways
- Existing Edge of Pavement
- Critical Areas/Wetlands
- Critical Areas/Wetlands Buffer
- Index Contour
- Non-Index Contour
- Future Improvements By Others
- Steep Slopes
- Proposed Pavement
- Proposed Sidewalk/Shared Use Path
- Proposed Wall
- Proposed Rectangular Rapid Flashing Beacon

Shared Use Path Cross-Section

N

30 120

0 60 180

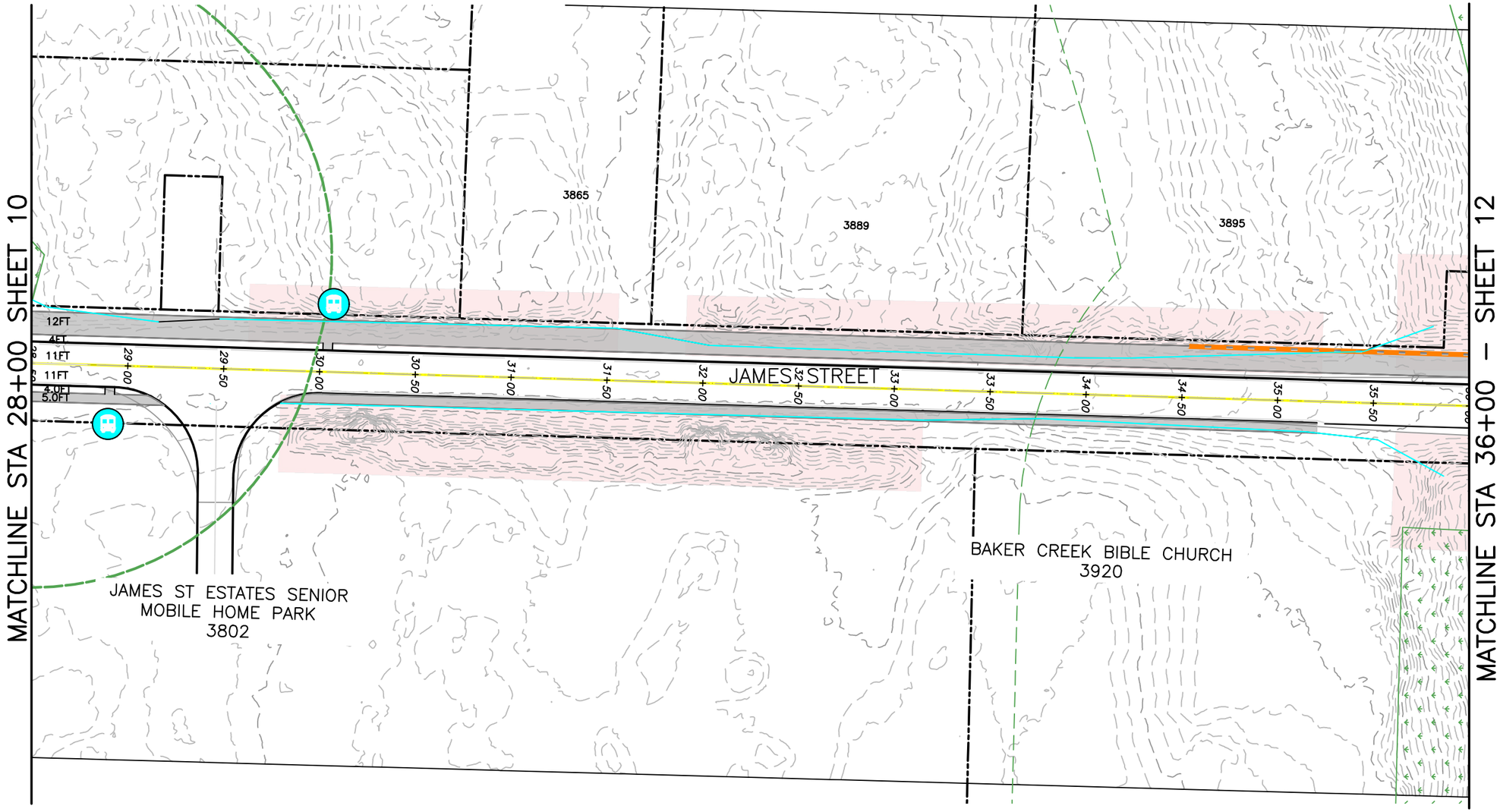
Segment 1 - Orchard Drive to McLeod Road

James Street Multimodal Feasibility Study

FIGURE **10**

transpogroup
WHAT TRANSPORTATION CAN BE.

Sep 06, 2019 – 1:31pm janetl \\srv-dfs-wa\Projects\18\1.18412.00 – James Street Study\Engineering\CAD\Conceptual\James St – Roll Plot – Segments with Corridors.dwg Layout: Segment 1 – 10



Shared Use Path Cross-Section

LEGEND

- Right-of-Way
- Waterways
- Existing Edge of Pavement
- Critical Areas/Wetlands
- Critical Areas/Wetlands Buffer
- Index Contour
- Non-Index Contour
- Future Improvements By Others
- Steep Slopes
- Proposed Pavement
- Proposed Sidewalk/Shared Use Path
- Proposed Wall
- Proposed Rectangular Rapid Flashing Beacon

N

30 120
0 60 180

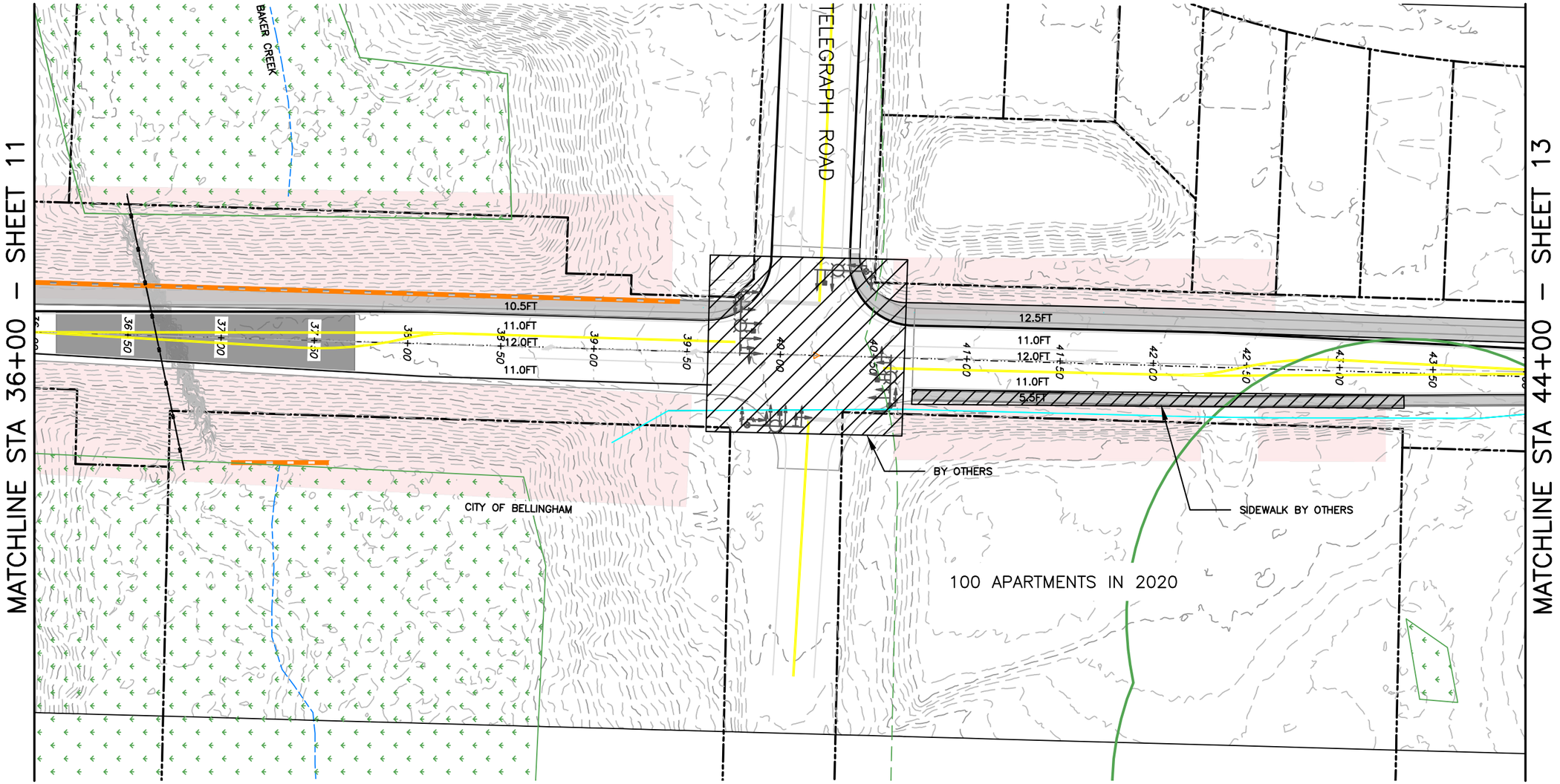
Segment 2 - McLeod Road to Telegraph Road

James Street Multimodal Facility Study

FIGURE 11

transpogroup
WHAT TRANSPORTATION CAN BE.

Sep 06, 2019 – 2:25pm melissaw M:\18\1.18412.00 – James Street Study\Engineering\CAD\Conceptual\James St – Roll Plot – Segments with Corridors.dwg Layout: Segment 2 – 11



Shared Use Path Cross-Section

LEGEND

- Right-of-Way
- Waterways
- Existing Edge of Pavement
- Critical Areas/Wetlands
- Critical Areas/Wetlands Buffer
- Index Contour
- Non-Index Contour
- Future Improvements By Others
- Steep Slopes
- Proposed Pavement
- Proposed Sidewalk/Shared Use Path
- Proposed Wall
- Proposed Rectangular Rapid Flashing Beacon

N

30 120
0 60 180

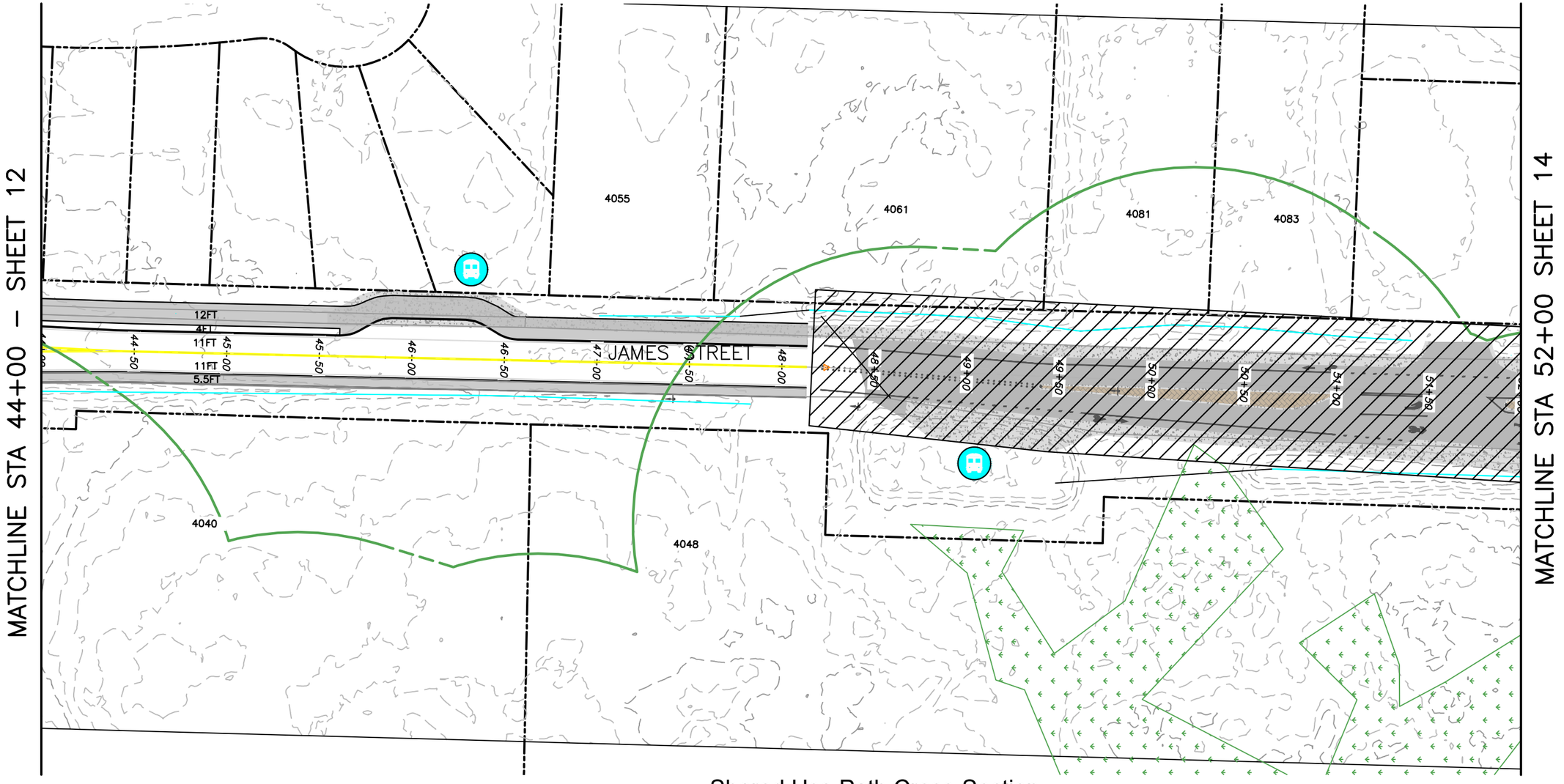
Segment 2 - McLeod Road to Telegraph Road

James Street Multimodal Facility Study

FIGURE **12**

transpogroup
WHAT TRANSPORTATION CAN BE.

Sep 06, 2019 – 1:32pm janetl \\srv-dfs-wa\Projects\18\1.18412.00 – James Street Study\Engineering\CAD\Conceptual\James St – Roll Plot – Segments with Corridors.dwg Layout: Segment 2 – 12



Shared Use Path Cross-Section

LEGEND

- Right-of-Way
- Waterways
- Existing Edge of Pavement
- Critical Areas/Wetlands
- Critical Areas/Wetlands Buffer
- Index Contour
- Non-Index Contour
- Future Improvements By Others
- Steep Slopes
- Proposed Pavement
- Proposed Sidewalk/Shared Use Path
- Proposed Wall
- Proposed Rectangular Rapid Flashing Beacon

N

30 120
0 60 180

Segment 3 - Telegraph Road to E Bakerview Road

James Street Multimodal Feasibility Study

FIGURE **13**

transpogroup
WHAT TRANSPORTATION CAN BE.

Sep 06, 2019 – 1:33pm janetl \\srv-dfs-wa\Projects\18\1.18412.00 – James Street Study\Engineering\CAD\Conceptual\James St – Roll Plot – Segments with Corridors.dwg Layout: Segment 3 – 13

MATCHLINE STA 52+00 – SHEET 13

MATCHLINE STA 60+00 – SHEET 15

WHATCOM CHIROPRACTIC 4097

JAMES ST CREEK

4145

4144

E BAKERVIEW ROAD

52+50 53+00 53+50 54+00 54+50 55+00 55+50 56+00 56+50 57+00 57+50 58+00 58+50 59+00 59+50

SUBDIVISION PROPOSED

BY OTHERS

Shared Use Path Cross-Section

LEGEND

- Right-of-Way
- Waterways
- Existing Edge of Pavement
- Critical Areas/Wetlands
- Critical Areas/Wetlands Buffer
- Index Contour
- Non-Index Contour
- Future Improvements By Others
- Steep Slopes
- Proposed Pavement
- Proposed Sidewalk/Shared Use Path
- Proposed Wall
- Proposed Rectangular Rapid Flashing Beacon

N

30 120

0 60 180

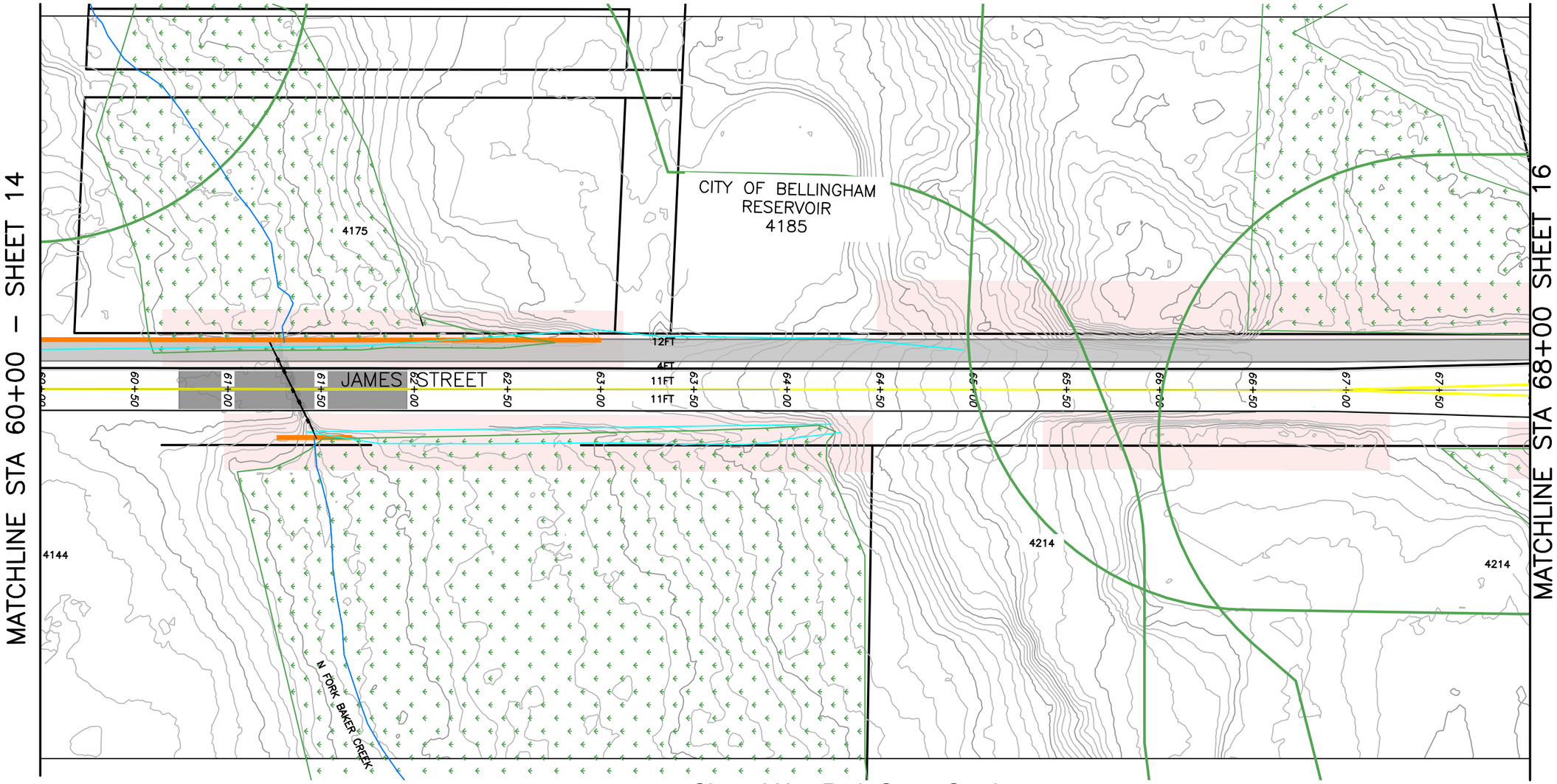
Segment 3 - Telegraph Road to E Bakerview Road

James Street Multimodal Feasibility Study

FIGURE 14

transpogroup
WHAT TRANSPORTATION CAN BE.

Sep 06, 2019 – 1:33pm janetl \\srv-dfs-wa\Projects\18\1.18412.00 – James Street Study\Engineering\CAD\Conceptual\James St – Roll Plot – Segments with Corridors.dwg Layout: Segment 3 – 14



Shared Use Path Cross-Section

LEGEND

- Right-of-Way
- Waterways
- Existing Edge of Pavement
- Critical Areas/Wetlands
- Critical Areas/Wetlands Buffer
- Index Contour
- Non-Index Contour
- Future Improvements By Others
- Steep Slopes
- Proposed Pavement
- Proposed Sidewalk/Shared Use Path
- Proposed Wall
- Proposed Rectangular Rapid Flashing Beacon

N

30 120
0 60 180

Segment 4 - E Bakerview Road to E Kellogg Road

James Street Multimodal Feasibility Study

FIGURE **15**

transpogroup
WHAT TRANSPORTATION CAN BE.

Sep 06, 2019 – 1:34pm janetl \\srv-dfs-wa\Projects\18\1.18412.00 – James Street Study\Engineering\CAD\Conceptual\James St – Roll Plot – Segments with Corridors.dwg Layout: Segment 4 – 15

Shared Use Path Cross-Section

LEGEND

- Right-of-Way
- Waterways
- Existing Edge of Pavement
- Critical Areas/Wetlands
- Critical Areas/Wetlands Buffer
- Index Contour
- Non-Index Contour
- Future Improvements By Others
- Steep Slopes
- Proposed Pavement
- Proposed Sidewalk/Shared Use Path
- Proposed Wall
- Proposed Rectangular Rapid Flashing Beacon

N

30 120

0 60 180

Segment 4 - E Bakerview Road to E Kellogg Road

James Street Multimodal Feasibility Study

FIGURE **16**

transpogroup
WHAT TRANSPORTATION CAN BE.

Reichhardt & Ebe
ENGINEERING INC

June 17, 2019

Transpogroup
12131 113th Ave NE #203
Kirkland, WA 98034

RE: James St Multimodal Facility Study

To: Jon Pascal, P.E.

Thank you for the opportunity to support you in this exiting evaluation of an important corridor for the City of Bellingham. In accordance with Task 3 of our agreement we are providing the following information for you to incorporate into evaluation of initial corridor concepts.

Retaining Walls

We have evaluated the expected extent and size of retaining walls to minimize the environmental impacts to critical areas, also as an effort to minimize the crossing improvement costs. The first objective in dealing with critical areas impacts is avoidance. The estimated walls assist in achieving that to the highest level. Included in the cost estimates are wall estimates for the crossing locations, minimizing critical area impacts, for both the Standard and Shared Use Path alternatives.

The wall systems which we feel would likely be utilized are Structural Earth Walls. We have made this assumption based on the following facts:

1) They are an adaptive system that can be used in many different configurations.
2) They are a cost-effective soil retention system.

Stream Crossings

We have evaluated 3 locations where significant water courses cross the project corridor. The southernmost two crossings are in fairly deep ravine sections. The northernmost is substantially shallower. In discussions with GeoEngineers, it appears to be highly likely that if the project has impacts below the Ordinary High Water (OHW) crossing replacements will need to meet Fish Passage standards. This drastically increases the scope of the project. R&E determined the likely method of crossing the water courses.

Crossings were evaluated based on a site reconnaissance completed by Dale Buys and Nathan Zylstra on May 29, 2019. The S. fork, main stem, and N. fork of Baker Creek crossings with James St. were evaluated. Basic measurements of bank full width were taken in the immediate vicinity of the existing culvert crossings.

The upstream portion of Baker Creek was inaccessible due to an existing beaver dam. The downstream reach of the N. Fork of Baker Creek was inaccessible due to extremely heavy brush.

No information is currently available for high and low flow rates, or 100-yr. water surface elevation for the three crossings. Therefore, the structure widths were assumed based on the bank full width of the existing channel as measured in the field. For estimation purposes, the measured bank full width was multiplied by 1.2 and 2 additional feet were added. This estimation resulted in structure widths as follows:

S. Fork Baker Creek	10 ft.
Baker Creek	22 ft.
N. Fork Baker Creek	10 ft.

Structure widths of the above sizes do not lend themselves to conventional circular culvert pipe. Pipe arch and arch culverts may be a consideration, but were not chosen due to service life expectations. Bottomless precast concrete box culverts were chosen for cost estimating purposes due to the long service life, wide range of span and rise options, ability to accommodate skew angle, and to provide an open bottom structure lined with streambed aggregates for fish passage reasons.

Cost estimates provided in this report should be considered preliminary and assume the following:

- Culverts are constructed in conjunction with the James St. corridor roadway improvements
- Culverts extend the full width of the ROW or the full length of the existing culvert if currently outside of the ROW.
- Water Main can be cut and capped during culvert excavation, installation and backfill.
- Sanitary Sewer will be bypassed by mechanical pump during culvert excavation, installation and backfill.
- Retaining walls necessary for roadway improvements are included in the roadway cost estimate.

Stormwater Analysis

Stormwater is a large consideration with any roadway project. Mitigating the impacts of urban development is essential for the protection of the environment in which we live. For this portion of the feasibility study we are going to focus on the segment breakdown of the stormwater infrastructure. Threshold Discharge Areas (TDA's) is the proper way to evaluate mitigation efforts. However, since this high-level feasibility analysis is based on decisions based on defined roadway segments, we want to be consistent in the evaluation. Once a preferred alternative has been selected and reasonable phasing of the segments has been defined, we may switch to the TDA methodology.

Updated in memorandum dated August 10, 2019

A preliminary evaluation of likely minimum requirements for mitigation, based on Bellingham Municipal Code (BMC) 15.42, for each roadway segment and the Standard Section (Standard) and Shared Use Path (SUP) alternatives has been completed. Below, Table 1 demonstrates this analysis, and its conclusions.

street tree requirement may be a viable alternative to meet two requirements. In an effort to minimize ROW requirements from a project, it may be advisable to consider Media Filter options. These filters provide numerous alternatives of placement, including within the roadway prism. For our current cost estimating purposes, it will be assumed that the cost of these options is equal to conventional methods.

Updated in memorandum dated August 10, 2019

Utility Conflicts

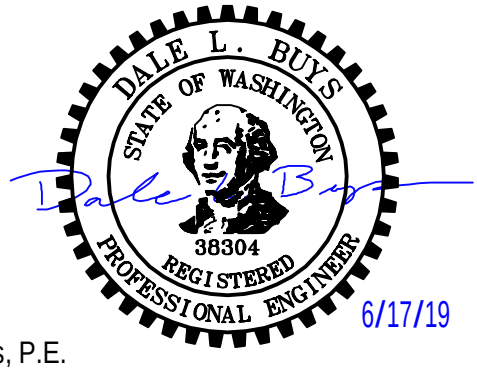
Utility conflicts can be a large factor in the cost of any roadway improvement. Because of this, we have performed a high-level analysis of the utilities needing replaced as a part of the two different street section alternatives. This section will focus on the general corridor utilities. Utility conflicts specific to the stream crossings will be made a part of that analysis.

Franchise Utilities – It is assumed that this project, similar to other roadway projects, that franchise utilities will be required to accommodate the transportation improvement. Therefore, the maximum cost that would be required of the City would be the excavation of a common utility trench, if the City so chose to help coordinate the undergrounding and relocation of said franchise utilities.

City Sewer – Based on the available information, consisting of the base map data provided and the City's online map tool, we have analyzed the potential conflicts with the City Sanitary Sewer utility. It appears that the existing 12-inch diameter PVC sewer main is at sufficient depth that even with the profile adjustment for the Standard cross section alternative all that would have to be done is to modify (4) four manhole structures. A summary of this analysis can be seen on the Sanitary Sewer Exhibit.

City Water - Based on the available information, consisting of the base map data provided and the City's online map tool, we have analyzed the potential conflicts with the City Water utility. It appears that there is a 20-inch diameter water line, constructed of numerous materials over the years, within the corridor. With an assumed installed depth of cover of 3-feet, it can be surmised that this water line would need to be replaced at a lower elevation from approximate station 13+00 to 24+00 to accommodate the profile adjustments for the Standard cross section alternative.

Sincerely,



Dale L. Buys, P.E.
Reichhardt & Ebe Engineering, Inc.

Reichhardt & Ebe ENGINEERING INC
25 YEARS
423 Front Street
Lynden, WA 98264
Phone: (360) 354-3687

Called By:	City of Bellingham
For:	**James St. Corridor**
	PRELIMINARY ENGINEER'S ESTIMATE
By:	Nathan Zylstra, P.E.
Date:	June 15, 2019

South Fork Baker Creek

Item No.	Item Description	Quantity	Unit	Unit Price	Amount
1	Removal of Structures and Obstructions	1	LS	$ 2,500.00	$ 2,500.00
2	Structure Excavation Class A Incl. Haul	473	CY	$ 40.00	$ 18,920.00
3	Shoring or Extra Excavation Class A	1	LS	$ 78,140.00	$ 78,140.00
4	Temporary Sanitary Sewer Bypass	1	LS	$ 58,000.00	$ 58,000.00
5	Gravel Base	928	TON	$ 15.00	$ 13,920.00
6	Prefabricated Conc. Box Culvert	1	LS	$ 132,000.00	$ 132,000.00
7	PVC Pipe for Water Main 20 In. Diam	100	LF	$ 330.00	$ 33,000.00
8	Gate Valve 20 In. Diam.	2	EA	$ 25,000.00	$ 50,000.00
9	Streambed Aggregates	90	TON	$ 50.00	$ 4,500.00
	TOTAL				**$ 390,980.00**

This estimate was prepared without a complete design and shall therefore be considered preliminary and subject to change due to actual quantities of work incorporated into the project and changes in unit prices over time.

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25 YEARS
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Lynden, WA 98264
Phone: (360) 354-3687

Called By:	City of Bellingham
For:	**James St. Corridor**
	PRELIMINARY ENGINEER'S ESTIMATE
By:	Nathan Zylstra, P.E.
Date:	June 15, 2019

Baker Creek

Item No.	Item Description	Quantity	Unit	Unit Price	Amount
1	Removal of Structures and Obstructions	1	LS	$ 2,500.00	$ 2,500.00
2	Structure Excavation Class A Incl. Haul	2,158	CY	$ 40.00	$ 86,320.00
3	Shoring or Extra Excavation Class A	1	LS	$ 384,704.00	$ 384,704.00
4	Temporary Sanitary Sewer Bypass	1	LS	$ 58,000.00	$ 58,000.00
5	Gravel Base	4,222	TON	$ 15.00	$ 63,330.00
6	Prefabricated Conc. Box Culvert	1	LS	$ 616,000.00	$ 616,000.00
7	PVC Pipe for Water Main 20 In. Diam	100	LF	$ 330.00	$ 33,000.00
8	Gate Valve 20 In. Diam.	2	EA	$ 25,000.00	$ 50,000.00
9	Streambed Aggregates	447	TON	$ 50.00	$ 22,350.00
	TOTAL				**$ 1,316,204.00**

This estimate was prepared without a complete design and shall therefore be considered preliminary and subject to change due to actual quantities of work incorporated into the project and changes in unit prices over time.

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25 YEARS
423 Front Street
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Phone: (360) 354-3687

Called By:	City of Bellingham
For:	**James St. Corridor**
	PRELIMINARY ENGINEER'S ESTIMATE
By:	Nathan Zylstra, P.E.
Date:	June 15, 2019

North Fork Baker Creek

Item No.	Item Description	Quantity	Unit	Unit Price	Amount
1	Removal of Structures and Obstructions	1	LS	$ 2,500.00	$ 2,500.00
2	Structure Excavation Class A Incl. Haul	285	CY	$ 40.00	$ 11,400.00
3	Shoring or Extra Excavation Class A	1	LS	$ 78,896.00	$ 78,896.00
4	Temporary Sanitary Sewer Bypass	1	LS	$ 58,000.00	$ 58,000.00
5	Gravel Base	557	TON	$ 15.00	$ 8,355.00
6	Prefabricated Conc. Box Culvert	1	LS	$ 124,000.00	$ 124,000.00
7	PVC Pipe for Water Main 20 In. Diam	100	LF	$ 330.00	$ 33,000.00
8	Gate Valve 20 In. Diam.	2	EA	$ 25,000.00	$ 50,000.00
9	Streambed Aggregates	90	TON	$ 50.00	$ 4,500.00
	TOTAL				**$ 370,651.00**

This estimate was prepared without a complete design and shall therefore be considered preliminary and subject to change due to actual quantities of work incorporated into the project and changes in unit prices over time.

Reichhardt & Ebe ENGINEERING INC
25 YEARS

423 Front Street
Lynden, WA 98264
Phone: (360) 354-3687

City of Bellingham
James St Multimodal Facility Study

MISCELLANIOUS COSTS

Water Main Replacement Sta 13+00 to 24+00

Item Description	Quantity	Unit	Unit Price	Amount
PVC Water Main 20-inch	1,100	LF	$ 330	$ 363,000
Gate Valve 20-inch	3	EA	$ 25,000	$ 75,000
Gate Valve 6-inch	1	EA	$ 850	$ 850
Connect to Existing Main	3	EA	$ 10,000	$ 30,000
			Subtotal	$ 468,850
			20% Contingency	$ 93,770
			Grand Total	$ 562,620

Storm Drain

Storm Drain Segment 1 - Orchard to McLoed

Item Description	Quantity	Unit	Unit Price	Amount
Corrugated Polyethylene Storm Sewer Pipe 12 In. Diam.	1,520	LF	$ 40	$ 60,800
Catch Basin Type 1	15	EA	$ 1,500	$ 22,500
			Subtotal	$ 83,300
			20% Contingency	$ 16,660
			Grand Total	$ 99,960

Storm Drain Segment 2 - McLoed to Telegraph

Item Description	Quantity	Unit	Unit Price	Amount
Corrugated Polyethylene Storm Sewer Pipe 12 In. Diam.	1,220	LF	$ 40	$ 48,800
Corrugated Polyethylene Storm Sewer Pipe 18 In. Diam.	300	EA	$ 50	$ 15,000
Catch Basin Type 1	12	EA	$ 1,500	$ 18,000
Catch Basin Type 2 48 In. Diam.	2	EA	$ 3,500	$ 7,000
			Subtotal	$ 88,800
			20% Contingency	$ 17,760
			Grand Total	$ 106,560

Storm Drain Segment 3 - Telegraph to Bakerview

Item Description	Quantity	Unit	Unit Price	Amount
Corrugated Polyethylene Storm Sewer Pipe 12 In. Diam.	920	LF	$ 40	$ 36,800
Corrugated Polyethylene Storm Sewer Pipe 18 In. Diam.	450	EA	$ 50	$ 22,500
Catch Basin Type 1	9	EA	$ 1,500	$ 13,500
Catch Basin Type 2 48 In. Diam.	4	EA	$ 3,500	$ 14,000
			Subtotal	$ 86,800
			20% Contingency	$ 17,360
			Grand Total	$ 104,160

Storm Drain Segment 4 - Bakerview to Kellog

Item Description	Quantity	Unit	Unit Price	Amount
Corrugated Polyethylene Storm Sewer Pipe 12 In. Diam.	880	LF	$ 40	$ 35,200
Corrugated Polyethylene Storm Sewer Pipe 24 In. Diam.	400	EA	$ 65	$ 26,000
Catch Basin Type 1	10	EA	$ 1,500	$ 15,000
Catch Basin Type 2 48 In. Diam.	2	EA	$ 3,500	$ 7,000
			Subtotal	$ 83,200
			20% Contingency	$ 16,640
			Grand Total	$ 99,840

Retaining Walls

Segment 1 - Orchard to McLoed - S Fork Baker Cr - Standard Section

Item Description	Quantity	Unit	Unit Price	Amount
Structural Earth Wall Including Backfill - W Side	730	FF	$ 55	$ 40,150
Structural Earth Wall Including Backfill - E Side	2,470	FF	$ 55	$ 135,850
			Subtotal	$ 176,000
			25% Contingency	$ 44,000
			Grand Total	$ 220,000

Updated in cost estimates dated September 5, 2019

Reichhardt & Ebe
ENGINEERING INC

August 10, 2019

Transpogroup
12131 113th Ave NE #203
Kirkland, WA 98034

RE: James St Multimodal Facility Study

To: Jon Pascal, P.E.

Thank you for the opportunity to support you in this exciting evaluation of an important corridor for the City of Bellingham. In accordance with Task 3 of our agreement we are providing the following information for you to incorporate into evaluation of initial corridor concepts.

Provided is a supplement to the report submitted on June 17, 2019. The first section in an amended overall Stormwater Analysis with updated tables. The sections that follow are evaluations of desired alternatives, the feasibility of a Bioretention Swale and limited roadway reconstruction, respectively. The alternative evaluations incorporate considerations and design changes for the shared use path (SUP).

Stormwater Analysis

Stormwater is a large consideration with any roadway project. Mitigating the impacts of urban development is essential for the protection of the environment in which we live. For this portion of the feasibility study we are going to focus on the segment breakdown of the stormwater infrastructure. Threshold Discharge Areas (TDA's) is the proper way to evaluate mitigation efforts. However, since this high-level feasibility analysis is based on decisions surrounding defined roadway segments, we want to be consistent in the evaluation. Once a preferred alternative has been selected, and reasonable phasing of the segments has been defined, we may switch to the TDA methodology.

A preliminary evaluation of likely minimum requirements for mitigation, based on Bellingham Municipal Code (BMC) 15.42, for full reconstruction of each roadway segment including the Standard Section (Standard) and Shared Use Path (SUP) alternatives has been completed. Below, Table 1 demonstrates this analysis, and its conclusions.

Table 1: Likely Minimum Requirements

			>35% Ex Imp			Mitigation Requirements		
Project	Standard or Shared Use	Existing Impervious	% Ex Imp.	Yes or No	New + Replaced Hard Surface	Redevelopment or New Development	New or N&R	Minimum Requirements (according to 15.42)
Segment 1 : Orchard to McLeod	Standard	35,670	38.6%	Yes	57,291	Redevelopement	N&R	1-9
	Shared Use	35,670	42.2%	Yes	46,750	Redevelopement	N&R	1-9
Segment 2 : McLeod to Telegraph	Standard	44,460	40.4%	Yes	62,262	Redevelopement	N&R	1-9
	Shared Use	44,460	43.0%	Yes	53,543	Redevelopement	N&R	1-9
Segment 3 : Telegraph to Bakerview	Standard	33,362	54.2%	Yes	42,579	Redevelopement	N&R	1-9
	Shared Use	26,576	46.1%	Yes	37,234	Redevelopement	N&R	1-9
Segment 4 : Bakerview to Kellogg	Standard	36,879	36.3%	Yes	68,986	Redevelopement	N&R	1-9
	Shared Use	34,691	35.2%	Yes	56,345	Redevelopement	N&R	1-9

Once the likely applicable minimum requirements have been identified, it is important to determine how those requirements potentially could be met. To do so we have evaluated the potential to use Low Impact Development (LID) methods to perform that mitigation. An important note is that, although it was not within GeoEngineers scope to perform any site-specific explorations, they have informed us that the entire alignment is mapped as being glaciomarine drift. This material has low to very low permeability with low potential for infiltration. The exception is the crossing of Baker Creek, south of Telegraph road. However, this appears to be a large fill embankment which would not be advisable to infiltrate within. During project specific design, comprehensive geotechnical evaluations should be performed to verify our summary findings. See Table 2 below for the documentation of the feasibility of utilizing LID facilities.

Table 2: LID Facility Feasibility

Low Impact Development Performance Standards			
BMP Number	**BMP Name**	**Feasible?**	**Reason for Infeasibility**
BMP T5.10A	Downspout Full Infiltration	No	No Proposed Buildings
BMP T5.10B	Downspout Dispersion Systems	No	No Proposed Buildings
BMP T5.10C	Perforated Stub-out Connections	No	No Proposed Buildings
BMP T5.11	Concentrated Flow Dispersion	No	Inadequate vegetative dispersion area
BMP T5.12	Sheet Flow Dispersion	No	Inadequate vegetative dispersion area
BMP T5.13	Post-Construction Soil Quality and Depth	Yes	
BMP T5.14A	Rain Gardens	No	Does not meet LID Performance Standards per SWMMWW 2014.
BMP T5.14B	Bioretention	No	Inadequate Infiltration capacity, Inadequate space
BMP T5.15	Permeable Pavements	No	Inadequate Infiltration capacity, High Traffic Volume
BMP T5.16	Tree Retention and Tree Planting	No	Inadequate available planting area
BMP T5.17	Vegetated Roofs	No	No Proposed Buildings
BMP T5.18	Reverse Slope Sidewalks	Yes	
BMP T5.19	Minimal Excavation Foundations	No	No Proposed Foundations
BMP T5.20	Rainwater Harvesting	No	No Proposed Buildings
BMP T5.30	Full Dispersion	No	More than 65% of site developed
BMP T5.40	Preserving Native Vegetation	Yes	
BMP T5.41	Better Site Design	Yes	

Conventional Methods – In the absence of feasibility of LID methods for stormwater mitigation measures, conventional methods may still be utilized. These often require the most Right of Way (ROW) to be purchased. For that reason, we have roughly estimated the size of standard detention/flow control and wetponds (BMP T10.10) for treatment, creating a Combined Detention and Wetpool Facility (BMP T10.40). We have done this for each segment and alternative street section. This allows the estimation of ROW required for that scenario. Wetponds are utilized to meet Basic Treatment requirements. If it is found that

Enhanced Treatment is required, the footprint of a Stormwater Treatment Wetland (BMP T10.30) is generally the same as a Wetpond. Therefore, the ROW requirement would remain the same to achieve a higher level of treatment. Table 3 below demonstrates the preliminary size of a conventional Combined Detention and Wetpool Facility for each segment and alternative.

Table 3: Preliminary Pond Sizing

Project	Standard or Shared Use	Detention Volume @ Riser Head (AC-FT)	Water Quality Volume (AC-FT)	Water Quality Depth (FT) +1 ft Sediment Storage	Pond Detention Depth (FT) +1 ft Freeboard	Total Pond Depth (WQ + Detention) (FT)	Pond Top Area (SF) + 20% Contingency	Pond Top Area (AC) + 20% Contingency
Segment 1 : Orchard to McLeod	Standard	0.183	0.1358	5.00	3.25	8.25	6705.30	0.15
	Shared Use	0.121	0.1102	5.00	3	8.00	5760.00	0.13
Segment 2 : McLeod to Telegraph	Standard	0.175	0.1471	5.00	3	8.00	6793.20	0.16
	Shared Use	0.137	0.1267	5.00	2.75	7.75	5899.50	0.14
Segment 3 : Telegraph to Bakerview	Standard	0.118	0.1008	5.00	2.75	7.75	5214.30	0.12
	Shared Use	0.108	0.0874	5.00	2.75	7.75	4832.70	0.11
Segment 4 : Bakerview to Kellogg	Standard	0.243	0.1626	5.00	3.5	8.50	7788.00	0.18
	Shared Use	0.179	0.1328	5.00	3	8.00	6420.00	0.15

Practical Methods – There are a few practical methods that should be considered as a part of the stormwater mitigation strategy within this corridor. One of which is Reverse Slope Sidewalks (BMP T5.18). This BMP allows the runoff generated from Sidewalks and Shared Use Paths to sheet flow onto adjacent properties. As these pedestrian facilities are Non-Pollution-generating hard surfaces (NPGIS) they do not require treatment unless the runoff is comingled with runoff which does require treatment. Therefore, by allowing it to sheet flow onto adjacent areas it minimizes the size of the required treatment facility. Furthermore, Reverse Slope Sidewalks may be modeled as lawn/landscape rather than impervious surfaces, minimizing the flow control facilities required.

Another practical method that should be considered is the discharge of the completed projects runoff directly to the adjacent wetlands without prior flow control mitigation. This can accomplish a number of things, as long as specific conditions have been met. Wetland hydrology must not be negatively impacted by a project. This not only means that you should not redirect water from a wetland to a stormwater facility and then discharge to a stream, thereby reducing he hydrology of the wetland, but conversely, the project should not direct additional water to a wetland in an amount that would adversely impact the habitat, value and function of that wetland. Therefore, a hydrologic analysis would need to be prepared and a qualified biologist would need to evaluate the condition and extent of the receiving wetland and its ability to accept the additional volume of water.

If it is found that the runoff generated from the project can be discharged to wetlands without flow control, treatment would be required prior to said discharge. This can be accomplished in a number of different ways.

One method of treatment that may be considered is Bioretention Cells (BMP T7.30). Bioretention is a method of providing Enhanced Treatment in what can be a more aesthetically pleasing manner. Due to the apparent lack of infiltrative capacity, bioretention cells would require underdrains, which would be routed to flow control facilities if required, or conveyed to suitable wetland outfalls. These cells can have varying footprints, meaning that they can be fitted to available space that is sufficient in size. With the current planter strip width proposed in the Shared Use Path alterative there does not appear to be sufficient space for bioretention cells.

Other Stormwater Considerations – Creative methods for stormwater mitigation may be considered for this project. For example, Street Tree Treatment Pods or Media Filters. Often times street trees are a requirement of street improvement. There are manufactured basins that allow the direct inflow of street runoff for treatment in soils that also include a street tree for additional pollutant uptake. Providing treatment while meeting the

street tree requirement may be a viable alternative to meet two requirements. In an effort to minimize ROW requirements from a project, it may be advisable to consider Media Filter options. These filters provide numerous alternatives of placement, including within the roadway prism. For our current cost estimating purposes, it will be assumed that the cost of these options is equal to conventional methods.

Stormwater Analysis – Bioretention Treatment Alternative

As an alternative to the Combined Detention and Wetpool Facility (BMP T10.40), the feasibility and preliminary size of a Bioretention Swale in conjunction with a detention pond will be evaluated. For the purpose of this evaluation the of Bioretention Swale will only be considered for the shared use path (SUP) design in the full construction condition as stated in the previous section.

The evaluation for the bioretention facilities is based on the following assumptions:

1) The swale will not be continuous along the entire corridor.
2) Only a percentage of the total corridor length is needed to provide treatment.

Through the use of continuous hydraulic modeling (WWHM2012), alongside requirements for Bioretention Cells (BMPT 7.30), it was determined that 15% of the total corridor length, with a minimum 8-ft top of facility width, will be needed to provide adequate treatment for the entire SUP design. The modeled bioretention facility consisted of a 2-ft bottom width, 3:1 side slopes, 0.5-ft ponding depth, and 0.5-ft of freeboard. If bioretention facilities are utilized in each segment the detention ponds can be adjusted from Table 3 to reflect the removal of water quality depth. See Table 4 below for the updated preliminary pond sizing.

Table 4: Preliminary Pond Sizing Without Water Quality Requirements

Project	Standard or Shared Use	Detention Volume @ Riser Head (AC-FT)	Pond Detention Depth (FT) +1 ft Freeboard	Total Pond Depth (Detention + 1 ft Sediment Sorage) (FT)	Pond Top Area (SF) + 20% Contingency	Pond Top Area (AC) + 20% Contingency
Segment 1 : Orchard to McLeod	Shared Use	0.121	3	4	5760.00	0.13
Segment 2 : McLeod to Telegraph	Shared Use	0.137	2.75	3.75	5899.50	0.14
Segment 3 : Telegraph to Bakerview	Shared Use	0.108	2.75	3.75	4832.70	0.11
Segment 4 : Bakerview to Kellogg	Shared Use	0.179	3	4	6420.00	0.15

Stormwater Analysis – SUP Limited Reconstruction Alternative

As an alternative to the overall pond evaluation presented above, we will look at the likely minimum requirements for mitigation, based on Bellingham Municipal Code (BMC) 15.42, for each roadway segment of the Shared Use Path (SUP) with road reconstruction limited to specific areas. As you can see in Table 5, the limited reconstruction will reduce the area of roadway requiring treatment and mitigation needs. It is important to note that much like the above evaluation, we looked at each segment instead of TDA's. After an alternative is selected, the use of the TDA's may be necessary to provide a more complete mitigation strategy.

In order to evaluate the new condition, the following assumptions were made:

1) Areas requiring reconstruction are the following:
    a. Culvert crossings at Baker Creek, N. Fork Baker Creek, and S. Fork Baker Creek

b. The vertical curve adjustment
c. Existing sidewalk/road sections that will be converted to the new shared use path

2) Reverse Slope Sidewalks will be utilized for all sidewalks over the entire project, assuming full dispersion is applicable.

Table 5: Likely Minimum Requirements with Limited Reconstruction

			>35% Ex Imp				Mitigation Requirements		
Project	Standard or Shared Use	Existing Impervious	% Ex Imp.	Yes or No	New + Replaced Hard Surface	Effective Pollution Generating Hard Surface	Redevelopment or New Development	New or N&R	Minimum Requirements (according to 15.42)
Segment 1 : Orchard to McLeod	Shared Use	35,670	42.2%	Yes	30,835	15,188	Redevelopement	N&R	1-9
Segment 2 : McLeod to Telegraph	Shared Use	44,460	43.0%	Yes	20,948	3,120	Redevelopement	N&R	1-5, 7-9
Segment 3 : Telegraph to Bakerview	Shared Use	26,576	46.1%	Yes	13,109	-	Redevelopement	N&R	1-5, 7-9
Segment 4 : Bakerview to Kellogg	Shared Use	34,691	35.2%	Yes	18,459	2,100	Redevelopement	N&R	1-5, 7-9

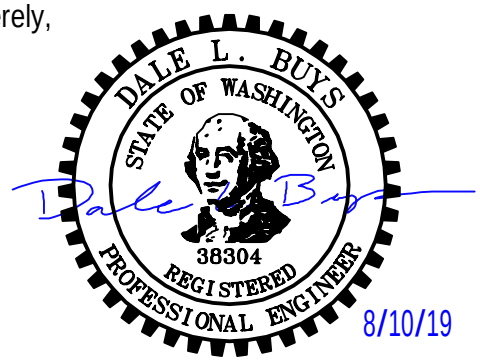
It is important to note that in the case of limited reconstruction, the effective pollution generating hard surface areas are drastically reduced for Segments 2 – 4. As stated in a previous section, this is due to the Reverse Slope Sidewalks (BMP T5.18) being classified as a non-pollution generating hard surface (NPGIS) and thus reducing the effective hard surface value. Per BMC 15.42, if the effective hard surface for each segment is less than 5,000 square feet, the segment does not need to comply with minimum requirement #6 and is not subject to stormwater treatment. Therefore, stormwater treatment is not required for Segments 2-4.

Although Segments 2 – 4 appear to avoid the need for treatment, they will still have to provide a form of flow control per minimum requirement #7. Preliminary sizes for the detention/flow control facilities were estimated using the new areas and are presented in Table 6 below.

Table 6: Preliminary Pond Sizing with Limited Reconstruction

Project	Standard or Shared Use	Detention Volume @ Riser Head (AC-FT)	Water Quality Volume (AC-FT)	Water Quality Depth (FT) +1 ft Sediment Storage	Pond Detention Depth (FT) +1 ft Freeboard	Total Pond Depth (WQ + Detention) (FT)	Pond Top Area (SF) + 20% Contingency	Pond Top Area (AC) + 20% Contingency
Segment 1 : Orchard to McLeod	Shared Use	0.090	0.0417	2.50	3	5.50	4464.00	0.10
Segment 2 : McLeod to Telegraph	Shared Use	0.070	-	1.00	3	4.00	3345.60	0.08
Segment 3 : Telegraph to Bakervie	Shared Use	0.070	-	1.00	3	4.00	3345.60	0.08
Segment 4 : Bakerview to Kellogg	Shared Use	0.098	-	1.00	3	4.00	4377.60	0.10

Sincerely,



Dale L. Buys, P.E.
Reichhardt & Ebe Engineering, Inc.