FINAL REPORT

west belfair to kitsap lake

TRAIL FEASIBILITY STUDY

JUNE 2018

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Table of Contents

List of Figures and Tables

Executive Summary

INTRODUCTION

Kitsap County Public Works (County) and the City of Bremerton Public Works & Utilities (City of Bremerton) are interested in finding a cost effective alternative for constructing a paved shared-use path between the south end of Kitsap Lake Way to Otto Jarstad Park in Kitsap County. The general location for an alignment was identified in the County's 2013 Non-Motorized Facility Plan as an alternate route for the north-south spine. Kitsap County's Non-motorized Committee (NMC) and the West Sound Cycle Club (WSCC) have been working for a number of years to identify a north-south route in this area and developed a preliminary alignment that was used as the basis of study for this project. This report summarizes the preferred trail alignment and highlights the opportunities and constraints associated with the alignment. Sixty-three percent (63%) of the proposed alignment is owned by City of Bremerton Public Works and within the limits of the City of Bremerton. Thirty-seven percent (37%) of the proposed alignment is within Kitsap County on land owned by the Ueland Tree Company (Ueland). The County would obtain an easement for the trail as a transportation corridor, not a destination trail to Alexander and Heins lakes. The preferred alignment, which was selected to minimize both environmental impact and cost, is 3.16 miles in length.

GOAL

The goal for this study is to determine if this paved shared-use path is feasible and can be designed to the applicable federal, state and local standards. This will make the trail eligible for federal and state funding and grants. Design criteria that are highly applicable to this route includes connectivity, safety and ease of implementation. Objectives of this study are to closely examine the preliminary route identified by the County/City to confirm feasibility, identify applicable design standards, environmental review processes and/or mitigation requirements, and to estimate probable costs. The premise of the study was that shared-use path design standards would be applied in order for federal grant eligibility to be maintained. Please note that the term shared-use "path" and "trail" may be used interchangeably in this report, the latter meaning to imply the federal standards required for a shared-use path, unless otherwise noted.

PARTICIPANTS

The County/City retained a consultant team led by Fischer Bouma Partnership (FBP), a landscape architecture and community planning firm, to prepare the trail feasibility study. Sub consultants include MAP Limited (MAP) for civil engineering and Ecological Land Services (ELS) for wetlands science. The approximate 12-month planning process for the feasibility study began in the Fall of 2016. An advisory committee, referred to as the Working Group, was formed early in the process with representatives from the County, City of Bremerton, Kitsap County NMC and Ueland. The Working Group participated in all meetings, field visits and work sessions during the project. Ueland owns a considerable amount of the proposed trail corridor and would grant an easement to the County. The easement would not adversely impact Ueland's future development of its nearby 440-acre urban parcel.

THE SITE

The trail route examined in this feasibility study is part of a greater effort to connect regions of Kitsap County with non-motorized trails. The shared-use trail crosses both City of Bremerton properties in the south portion of the study area and Ueland private property in the north portion of the study area. The trail winds approximately 3 miles from Otto Jarstad Park (owned and managed by City of Bremerton Public Utilities) north through undeveloped forestland to the south end of Kitsap Lake Road NW. The proposed trail would primarily be located on the existing logging and maintenance roads on the Bremerton and Ueland owned properties. Alexander and Heins lakes are located within the study area east of where the trail is proposed. The proposed trail would pass through a mix of habitats and undulating terrain. Habitat consists primarily of conifer upland forest, mixed deciduous/conifer forest, recent clear cuts on Ueland property, amongst small wetland complexes in shallow depressions and over and along Heins Creek to the south.

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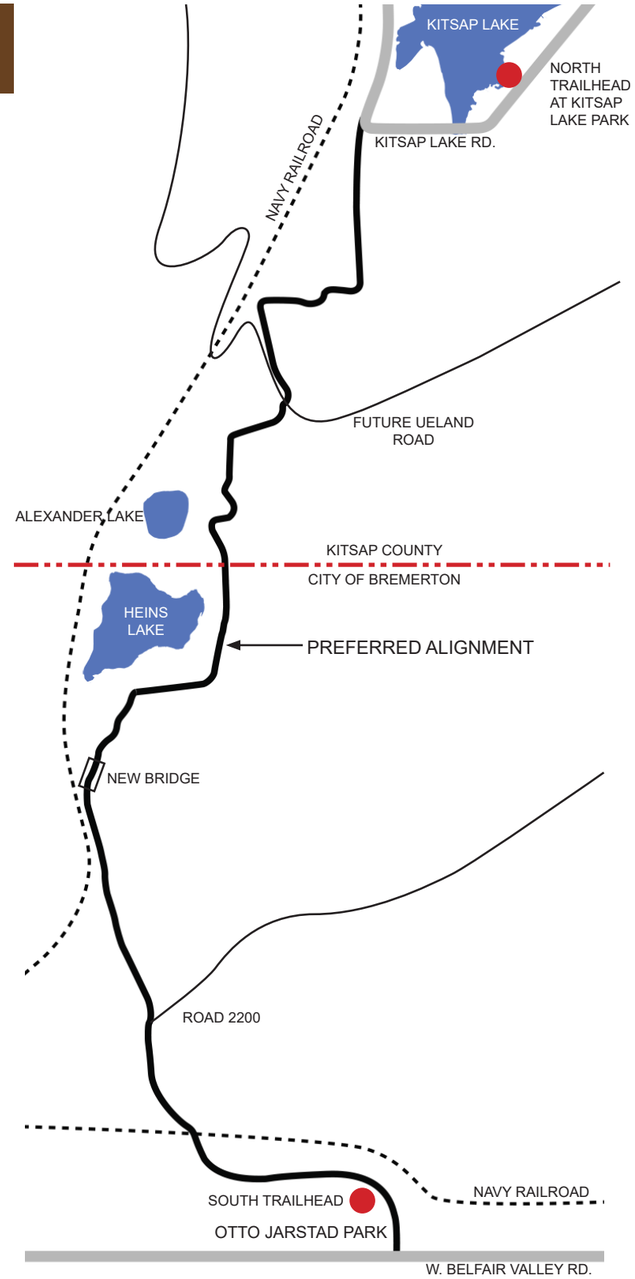

Figure A: Proposed Alignment

Due to the importance of critical areas, primarily wetlands, creeks and steep slopes, a subconsultant was retained to provide field work and an extensive summary of critical areas which can be found in Appendix A.

THE STRATEGY

To minimize implementation costs and disturbance, the study adopted a strategy to use existing logging roads as the base for the new, paved shared-use path. Active logging will periodically occur in the project area. To accommodate logging activity traffic on various segments, the width of the shared use path was increased from 10' wide to 14' wide. As such, portions of trail will need to be closed during logging operations, which would be infrequent based on discussions with Ueland and the City of Bremerton. These trails/roads would never be open to public vehicular use.

DESIGN STANDARDS

The preferred alignment is designed using American Association of State Highway and Transportation Officials (AASHTO) standards for travel speeds, turning radii, preferred 5% longitudinal grades and 2% cross slopes. The state legislature adopted HB 1700-2012 authorizing the use of AASHTO Design Standards for Shared-use Paths on Washington State Department of Transportation (WSDOT) funded projects in response to Federal Highway Administration (FHWA) shared-use path standards that are not always appropriate to the terrain of the Pacific Northwest. AASHTO acknowledges that certain conditions such as physical restraints (existing terrain or infrastructure, notable features) or regulatory restraints (such as critical areas) may prevent full compliance with the five percent maximum grade. As such, AASHTO references the Advanced Notice of Proposed Rulemaking (ANPRM) on Shared Use Path Accessibility Guidelines, which outlines mitigation measures for steeper sections of a shared-use path. AASHTO also outlines seven specific mitigation measures for excessive grade (greater then 5% slope) on shared-use paths.

The trail will be designed for an 18 mph speed. It is proposed to be either 10 feet wide or 14 feet wide, paved with a 2% maximum cross slope, and 2 foot soft surface shoulders (typically gravel). Areas of disturbance in the corridor will range from 14 feet to 40 feet in width.

THE NUMBERS

Thirty-seven percent (37%) of the paved trail is within County limits and sixty-three percent (63%) is within City limits. Seventy one percent (71%) of the paved trail will be under 5% in grade. Twenty-nine (29%) of the 3.16 mile trail will be between 5% and 8.3% in grade. None of the trail will be over 8.33%. AASHTO and ANPRM standards require that a landing be provided every 200 linear feet along steeper segments. This often occurs where existing logging roads are being used or steep slopes are being traversed. Allowing steeper gradients also allows for a more direct route, reducing costs and shorter overall trail length. This report identifies and documents our preliminary assessment of locations and deviations that may be required. These will be studied further, formally applied for and documented using WSDOT protocols during final engineering.

THE COST

Project costs are estimated in 2018 dollars and consist of both soft costs, such as design, engineering and construction management and hard costs, which are the construction costs. For the preferred alternative, the overall project cost for a 3.16 mile paved shared-use path meeting federal and state standards in the study area is estimated at $3,904,907, which includes a 20% contingency of $650,818. The overall cost includes $2,889,717 in construction costs and $1,015,190 in soft costs (35% of construction cost).

The cost for the preferred alternative is approximately $234 per linear foot for the length of the 16,700 foot long paved trail. No land acquisition costs are anticipated or included in the estimate. There will be costs associated with obtaining easements from the Navy for trail use in two different sections of railroad ROW. These are included in the estimate.

NEXT STEPS

The study will be presented to the Kitsap County Commissioners and the Bremerton City Council. Construction funding will require a partnership between the County, City and state/federal grant sources. Implementation of this segment of trail will require ongoing cooperation between the County, City of Bremerton and Ueland. A specific maintenance, operations, management and security/enforcement plan outlining strategy and responsibilities of each jurisdiction will be developed collaboratively and closer to actual implementation. Memorandum of Understandings (MOU's) will need to be developed and negotiated to clearly define these funding, management and maintenance responsibilities. Specific easements will need to be defined and executed.

The preliminary plans in this document were developed using existing LIDAR topographic information provided by the County. The horizontal and vertical trail alignments are based on 2-foot contour intervals. Final engineering of the trail alignment will require a detailed land survey and additional field work. Land use and environmental permits, easements and construction permits will need to be acquired during detailed engineering design prior to implementation.

CONCLUSION

This study demonstrates that a shared-use path within the project area can be engineered to meet local, state and federal shared-use path design standards, allowing the project to be eligible for the fullest extent of funding possible. Due to the existing terrain, steep grades will exist although the trail can be engineered and mitigation measures applied to meet applicable standards. Implementation of this 3.16 mile shared-use path would cost approximately $3,904,907 utilizing existing maintenance and logging road corridors to reduce cost and minimize environmental impact.

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PROJECT GOALS

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Figure 1A: Existing City of Bremerton Utility Road

CHAPTER 1: PROJECT GOALS

Kitsap County Public Works (County) and the City of Bremerton Public Works & Utilities (City of Bremerton) are interested in finding a cost effective alternative for constructing a paved shared-use path between the south end of Kitsap Lake Way to Otto Jarstad Park in Kitsap County. The general location for an alignment was identified in the County's 2013 Non-Motorized Facility Plan as an alternate route for the north-south spine. Kitsap County's Non-motorized Committee (NMC) and the West Sound Cycle Club (WSCC) have been working for a number of years to identify a north-south route in this area and developed a preliminary alignment that was used as the basis of study for this project. This report summarizes the preferred trail alignment and highlights the opportunities and constraints associated with the alignment. Sixty-three (63%) of the proposed alignment is owned by City of Bremerton Public Works and within the limits of the City of Bremerton. Thirty-seven percent (37%)of the proposed alignment is within Kitsap County on land owned by the Ueland Tree Company (Ueland). The County would obtain an easement for the trail as a transportation corridor, not a destination trail to Alexander and Heins lakes.

The goal for this study is to determine if this paved shared use path is feasible and can be designed to the applicable federal, state and local standards. This will make the trail eligible for federal and state funding and grants.

The County's 2013 Non-motorized Facility Plan and the Kitsap Regional Coordinating Council (KRCC) document "Looking for Linkage" published in 2010 both list several criteria that are highly applicable to this route including connectivity, safety and ease of implementation. The objectives of this study are to closely examine the preliminary route identified by the County to confirm feasibility, identify applicable design standards, environmental review processes and/or mitigation requirements, and to estimate probable costs. The study had the premise that shared-use path design standards would be used for in order for federal grant eligibility to be maintained.

1.1 Study Area

The trail route examined in this feasibility study is part of a greater effort to connect regions of Kitsap County with non-motorized trails. The shared-use trail proposed by the County, City of Bremerton and Ueland for this study crosses both Ueland property in the north portion of the study area and Bremerton properties in the south portion of the study area. Ueland timber property is located within Kitsap County. The trail winds approximately 3 miles from Otto Jarstad Park (owned and managed by City of Bremerton Public Utilities) north through forestland to the south end of Kitsap Lake Way. The proposed trail would primarily be located on the existing logging and maintenance roads on the City of Bremerton and Ueland owned properties. The study area is located in Sections 19, 20, 29, and 30, Township 24 North, Range 1 East of the Willamette Meridian, in the Bremerton area of Kitsap County, Washington.

The Ueland segment in the north portion of the study areas is situated between Archie Avenue and the City of Bremerton segment to the south. This segment is composed of sloping upland forest and areas of recent logging activities, leaving two clear-cut areas. Wetlands were identified in shallow depressions through this segment. Alexander Lake is located within the study areas east of the preferred alignment. Refer to the appendix for more detail on environmental conditions of the study area.

The City of Bremerton segment in the south portion of the study area is located between Ueland properties to the north and Otto Jarstad Park on West Belfair Highway to the south. Much of the segment is dominated by a mixed deciduous and coniferous forest. The topography is relatively level at the north end and slope down gently to the terrace of Heins Creek, then more steeply to the south end. Heins Lake is located within the study area east of where the trail is proposed.

B

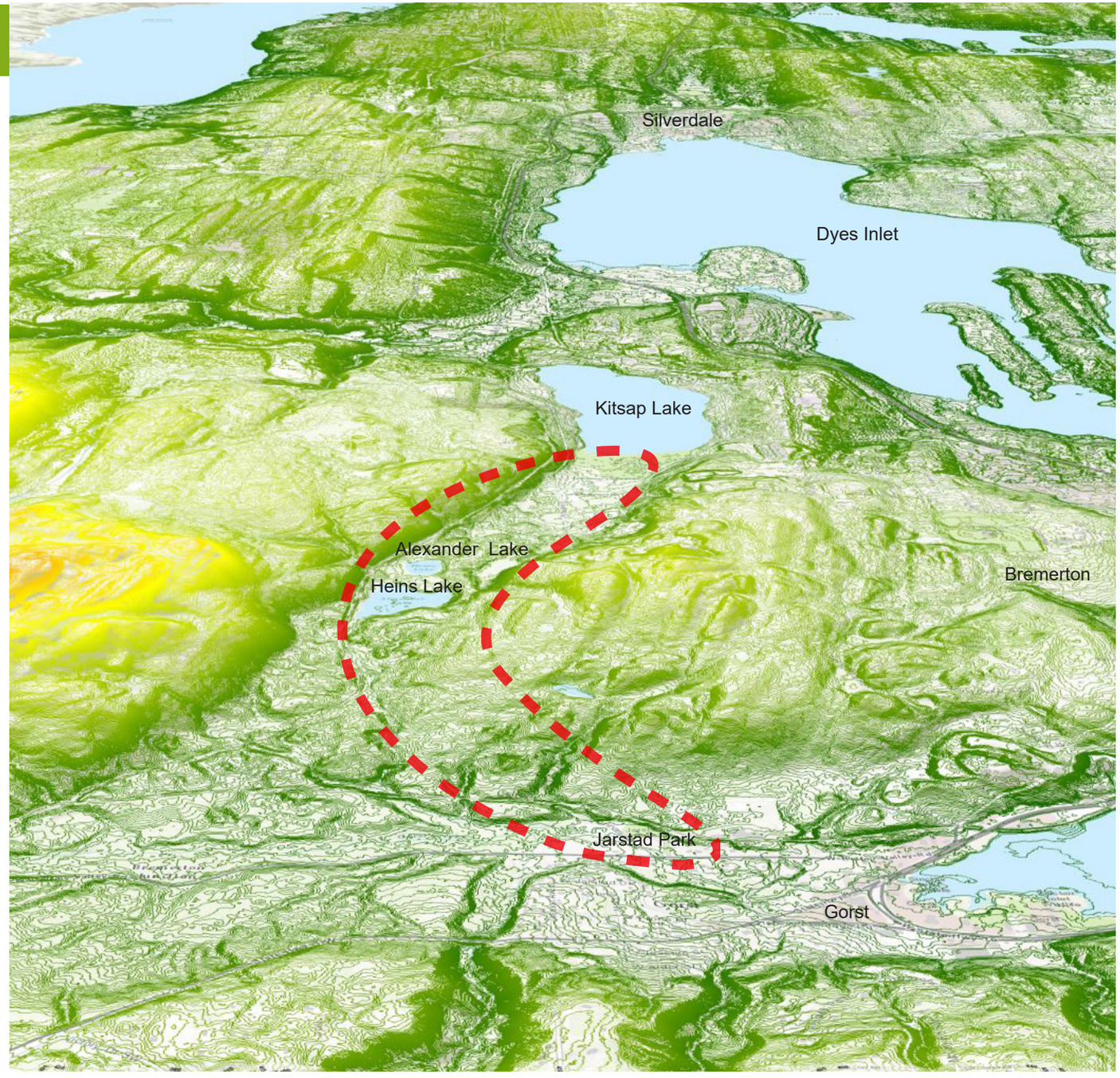

Figure 1B: Surrounding Context, Looking North

PLANNING PROCESS AND CONTEXT

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Figure 2A: Site Visit with the Working Group

CHAPTER 2: PLANNING PROCESS AND CONTEXT

The approximate 12-month planning process for the feasibility study began in the Summer of 2016. Chapter 2 presents the team that completed the study and summarizes the planning process. A summary of the planning process prior to this study is also included to provide context for this study. This chapter also summarizes the design standards that were the parameters for the planning and preliminary engineering design that occurred as part of the study. Existing conditions are discussed in detail including topography, road grades and condition, timber harvest schedules, Navy railroad easements, land ownership and ecological resources. The latter has an additional critical areas report associated with it included within Appendix A.

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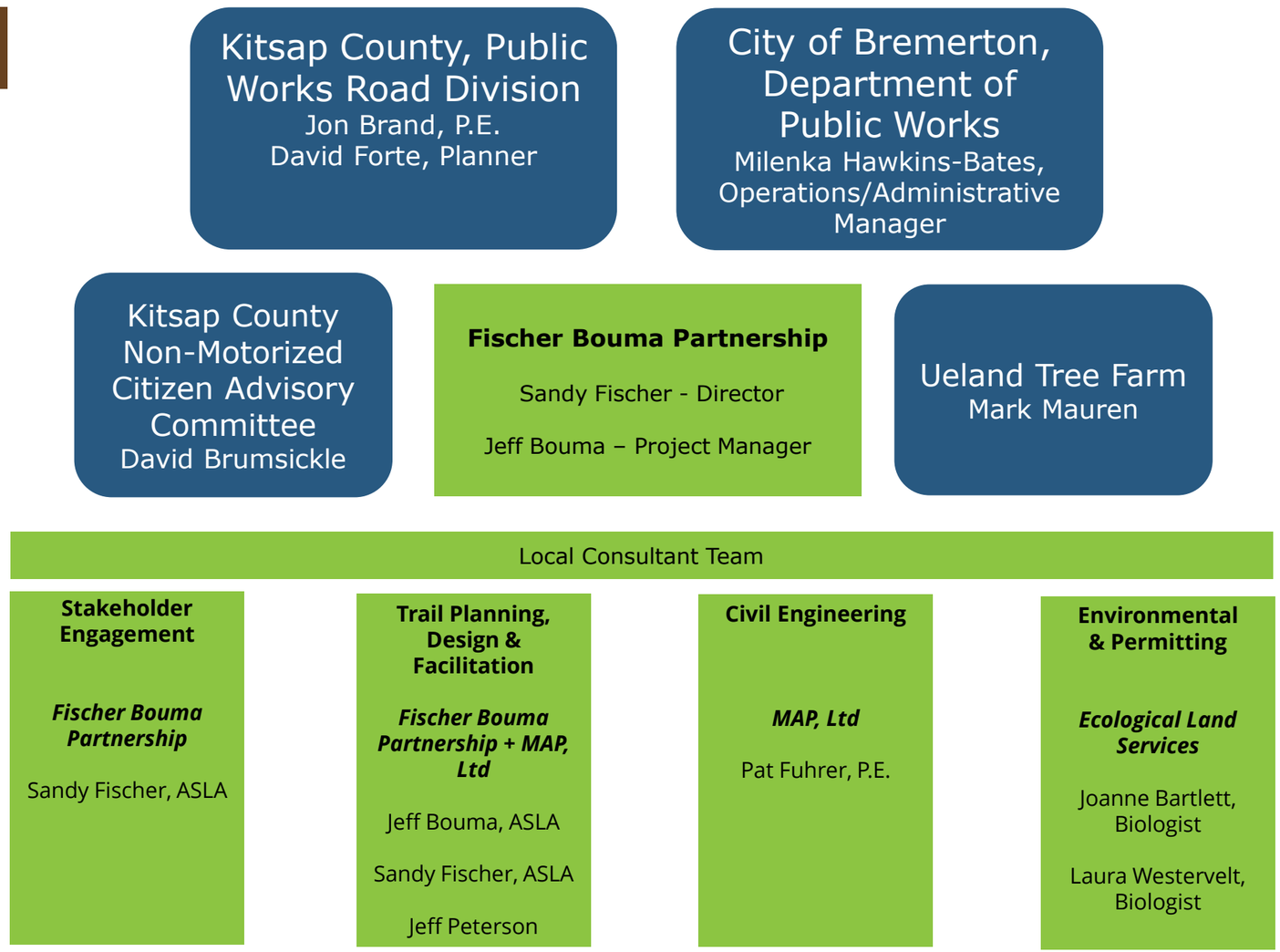

Figure 2B: Team Chart

2.1 Participants

The County/City retained a consultant team led by Fischer Bouma Partnership (FBP), a landscape architecture and community planning firm, to prepare the Trail Feasibility Study. Sub consultants included MAP Limited (MAP) for civil engineering and Ecological Land Services (ELS) for wetlands science. The contract was administered by the Kitsap County Public Works Roads Division with active participation from the City of Bremerton Public Works and Utilities (City of Bremerton), Ueland Tree Company (Ueland) and the Kitsap County Non-motorized Committee (NMC). Working Group meetings were held throughout the planning process and included members from each of these entities. The Navy, which owns a railroad line located within the study area, was consulted during the planning process with regard to the existing crossing and railroad R.O.W. that will need to be utilized for the trail. A public meeting was held in January 2017 to present the preliminary findings to County residents and to gather feedback on the proposed route.

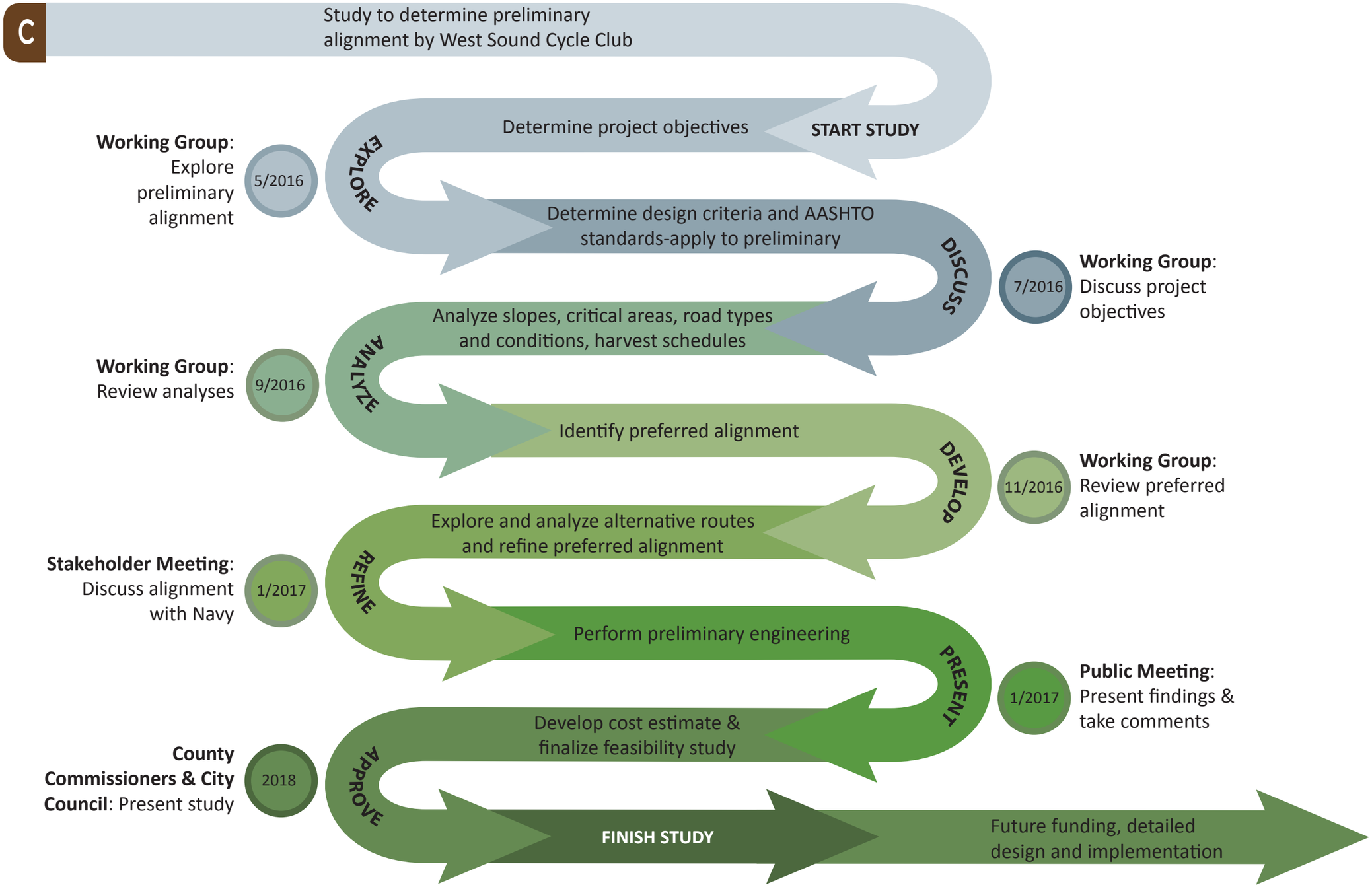

Figure 2C: Planning Process Diagram

2.2 Summary of Planning Process

A preliminary alignment, identified by the County/City and WSSC prior to this study, was used as the basis for analyses in this study. Figure 3B provides a graphic summary of the feasibility study process. The process included:

- Exploration of the preliminary alternative/field work
- Discussion of design standards to apply
- Development of base maps
- Analyses including slopes, horizontal grades, critical areas, road types and conditions, and harvest schedules
- Development of specific trail sections that apply to existing road types
- Identification of a preferred alignment based on modifications to the preliminary alignment
- Exploration of alternative segments at the "problem areas"
- Refine the preferred alignment
- Present at a public meeting
- Develop preliminary engineering
- Field verify and modify alignment
- Develop cost estimate and complete study report

The study area was divided into two areas for the purpose of organization and clarity of discussion. These areas include:

- North Segment - primarily Ueland owned lands in the unincorporated County
- South Segment - primarily City of Bremerton owned lands

The following chapter summarizes existing conditions of the study site, highlights the trail design standards used for the final alignment, summarizes each of the preliminary alignments studied, and discusses the computer modeling process that helped to refine alignment alternatives. The study was comprised of a planning phase and an engineering phase. The maps, diagrams and data tables associated with the planning phase may not correspond completely with the engineering plans that were subsequently developed. The quantities and cost information is based on the more recent and specific engineering plans.

2.3 Design Standards

The preferred alignment is designed using American Association of State Highway and Transportation Officials (AASHTO) standards for travel speeds, turning radii, preferred 5% longitudinal grades and 2% cross slopes. The state legislature adopted HB 1700-2012 authorizing the use of AASHTO Design Standards for Shared-use Path on WSDOT funded projects in response to FHWA shared-use path standards that aren't always applicable to the terrain of the Pacific Northwest. AASHTO acknowledges that certain conditions such as physical restraints (existing terrain or infrastructure, notable features) or regulatory restraints (such as critical areas) may prevent full compliance with the five percent maximum grade. As such, AASHTO references the Advanced Notice of Proposed Rulemaking (ANPRM) on Shared Use Path Accessibility Guidelines, which outlines mitigation measures for steeper sections of shared-use path. AASHTO also outlines seven specific mitigation measures for excessive grade (greater then 5% slope) on shared-use paths.

The trail will typically be designed for an 18 mph speed. It is proposed to be 10 feet wide in segments and 14' wide in other segments. It will be paved with 2% maximum cross slope, and have 2 foot wide soft surface shoulders (typically gravel) on each side. Areas of disturbance in the corridor will range from 14 feet to 40 feet in width. All sections of trail that are designed for speeds lower than 18 mph will be signed.

Ultimately, the AASHTO Standards were adopted with the understanding that technical deviations will be required in several locations where the longitudinal grade of the trail exceeds 5% but is under 8.3%. This occurs in several locations where the existing logging and maintenance roads are being used. Additional deviations may be needed where tighter turning radii will be constructed in order to minimize impacts to the trees and adjacent slopes. In these locations the trail will be signed for slower speeds as low as 12 mph. Designing with steeper grades also allows for a more direct route, reduced costs and shorter overall trail length.

Although accommodation for equestrians is desired by the community, the referenced standards all require separated pathways. This would require additional land and would have significant impact on the landform and land cover if the equestrian path were to follow the shared-use path alignment. The 2' wide gravel shoulder can informally accommodate equestrian users. Trail management policy will not preclude use of the trail by equestrians; however, the trail will not be promoted as part of the equestrian trail system. Eventually a separate, independently aligned trail may be studied and implemented if found feasible. The City of Bremerton is interested in exploring the feasibility of providing 3' wide gravel shoulders to accommodate equestrian users. Variations to the design standards established in this planning process and associated cost differences will be explored when the preliminary engineering phase begins.

D SHARED USE PATH DESIGN GUIDANCE & BASIS OF ALIGNMENT ANALYSIS

Source: AASHTO Shared Use Path Design Standards

Design Element	Desired Standard	Minimum Standard	Notes	Implication for this Project	Techincal Deviation Required?
Design Speed	18 MPH w/ 20° lean angle	12 MPH	12 MPH lowest speed recommended w/o extensive signing	Design for 18 mph to fullest extent	No
Pavement Width	12' W desirable	8' min. for short distances	10' W acceptable	Goal is 10' width, minimum	No
Bridge Width	14' W desirable	10' min.	Design for 14' W to accommodate std size pickup truck	At least one short bridge (20'?) likely	No
Shoulders	2% cross slope desired, max. 6H:1V	2' min. each side	2' uphill and 5' downhill side to accomodate runners & horses	Design for 2' wide gravel shoulders min.	No
Cross Slope on Paved Surface	1.5%	Max. 2% slope	Crown undesirable	Will meet this standard- 2% max.	No
Cross Slope Transitions	Longer distances better	Min. 5' for each % of grade	Example: (5% = 25' transitions)	Will meet this standard	No
Radii	60' min. for 18 MPH	27'R which requires 12MPH & signage	Signage required for < 18MPH, Min. 27' radii to be used	Will meet minimum standard	Possibly- mitigate with signs
Side Slopes (shoulders)	6H:1V or greater	If steeper than 3H:1V:	provide 5' separation (5' shoulder)	Will meet this standard	No
Vertical Drop at Edge	6H:1V or greater		< 30" use 4" curb , > 30" fence or barrier required	Will meet this standard if needed	No
Gradient	5% or less	5% or less	Need 2% max. landing every 200' on or off trail if over 5%	May be a couple short segments over 5%	Possibly- mitigate with landings
Vertical Clearance	10' height	8' min. height		Will meet this standard	No
Horizontal Clearance		2' min. from pavement edge		Will meet this standard	No
Stopping Site Distance		50' uphill @ 5%-300 (downhill at 5%) feet	Refer to AASHTO tables 5-17	Will meet this standard	No
Road Separation	5' minimum without barrier	Less than 5' with physical barrier	Standard height guardrail required if less than 5'	Will meet this standard	No
Drainage			TBD in final design and in consultation with geotech	Will meet drainage standards	No
Other Standards / Guidance	**Standard**		**Notes**		
Street Crossing	PROWAG			Will meet standards for road crossings	No
Accessibility	ANPRM		see www.access-board.gov	Will meet accessibility guidelines	No
Loading	Per AASHTO by geotech & civil		Design loads for standard size pick-up/utiltiy vehicle	Will design for appropriate loading	No
Signage	MUTCD-Part 9			Will design per MUTCD	No
Striping	MUTCD-Part 9		Center line recommended on tight curves / poor site distance	Will design per MUTCD	No
Equestrian Accommodations					
2' -5' wide shoulders					
No equestrian standards that allow a formal equestrian trail to be built without separation/a buffer between paved shared-use path and equestrian path.					
A s such, recommend informal accommodation and a policy that does not prohibit use by horse riders (at rider's own risk).					

Table 2D: WSDOT Shared-Use Path Design Criteria Summary and Basis of Analysis

2.4 Planning Context

Previous Planning Efforts

One goal of the County's transportation planning has been the identification and implementation of a north to south non-motorized corridor. In the 2001 Sinclair Inlet Study, the County conceptualized a network of bike paths referred to as the Mosquito Fleet Trail. This trail system would link the south end communities of Port Orchard and Belfair with the north end communities of Silverdale and North Kitsap. As depicted in Figure E and F, a route through Gorst is shown in this pamphlet.

The general location for an alignment was identified in the County's 2013 Non-Motorized Facility Plan as an alternate route for the north-south spine (Figure G).

In 2014 the Kitsap County Department of Community Development distributed maps showing potential north-south connections between Kitsap Lake and Gorst, located within the City of Bremerton Watershed and within Ueland properties. This route connected two regional priority bike routes (Old Belfair Highway and Chico Way) and avoided safety issues along Highway 3 (Figure H).

In 2015 the WSCC and County NMC developed a proposal for an alternative route to the Gorst and Sherman Heights options, which are considered suboptimal due to safety. According to the WSCC the Mosquito Fleet trail through Gorst was never endorsed or approved by key stakeholders such as WSDOT, the Navy, the tribes or property owners (Figure I).

However, elevation challenges were identified as well as concerns about the proximity to City of Bremerton's water sources (Figure I). At this point the WSCC identified a potential route east of the Navy railroad tracks (Figure I, blue line) that utilized existing gravel roads through Ueland and City of Bremerton properties. The conclusion drawn by the WSCC became the basis for the preliminary alignment that is the focus for this feasibility study.

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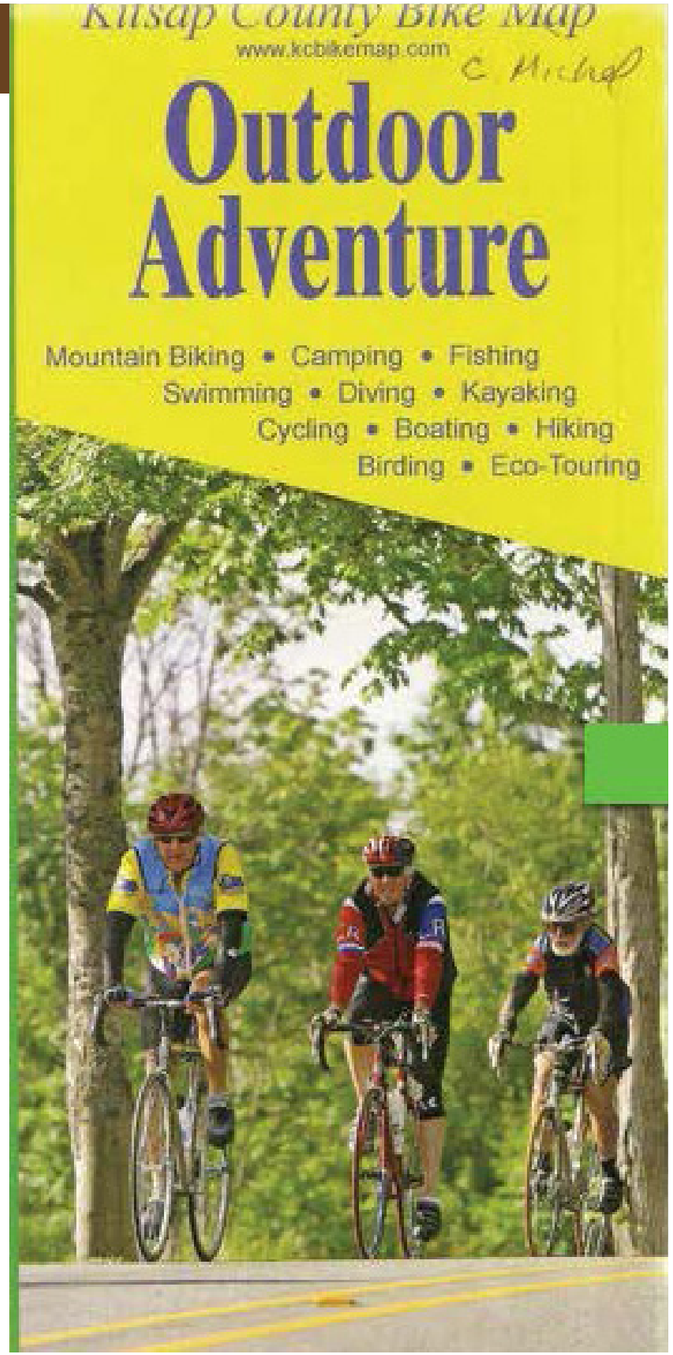

Figure 2E: 2007 County Bike Route Map

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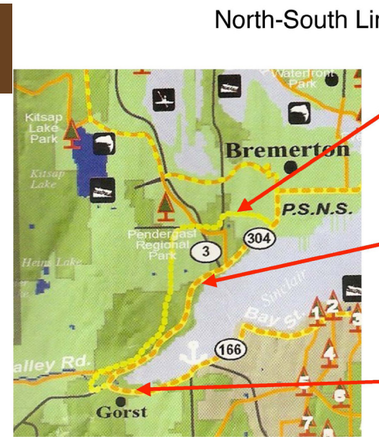

Figure 2F: Courtesy of West Sound Cycle Club Proposal

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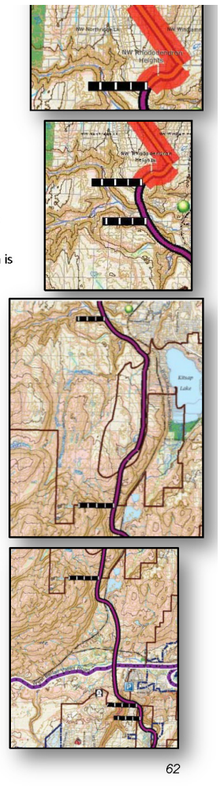

Rhododendron Heights District

The Rhododendron Heights District is defined as a rural single family development. The power line easement runs down the center of the development. The trail location remains undefined in this District. A trail easement will need to be negotiated with the underlying land owners. Kitsap will work with the land owners to determine the final alignment prior to implementation.

Chico Creek District

The Chico Creek District is a small environmentally-sensitive area with the need for a stream crossing. The trail alignment transitions across Seabeck Highway and runs adjacent to the Public Works Central Road Shed. It then is proposed to follow the utility corridor and cross Chico Creek. The trail may require transitioning around one parcel and be placed on land owned by the Mountaineers. Kitsap will work with the land owners to determine the final alignment prior to implementation.

West Ridge District

The entire length of the West Ridge District is on private ownership with one owner. The owner of these lands has agreed with the concept of locating the trail adjacent to the power line easement, provided that a mutually-agreeable trail easement can be completed. Eventually, the trail will be incorporated into the plat design of currently undeveloped single family housing within the Bremerton urban growth area. Kitsap will work with the land owner and the City of Bremerton to determine the final alignment prior to implementation. This District provides a direct link with proposed facilities in the City of Bremerton Non-Motorized Plan dated 2007.

Gorst/Watershed District

This Watershed District is entirely within the City of Bremerton Watershed Administrative Lands. The City and local citizens are incorporating the trail into Jarstad Park with a local connecting Kitsap Lake. The trail will cross the Navy Rail Line at two existing crossings in this district. There is also a crossing of State Highway 3 that will need

*Kitsap County Non-Motorized Plan – **DRAFT***
Kitsap County Special Projects
October 17, 2013

62

Figure 2G: Page from Kitsap County 2013 Non-Motorized Plan

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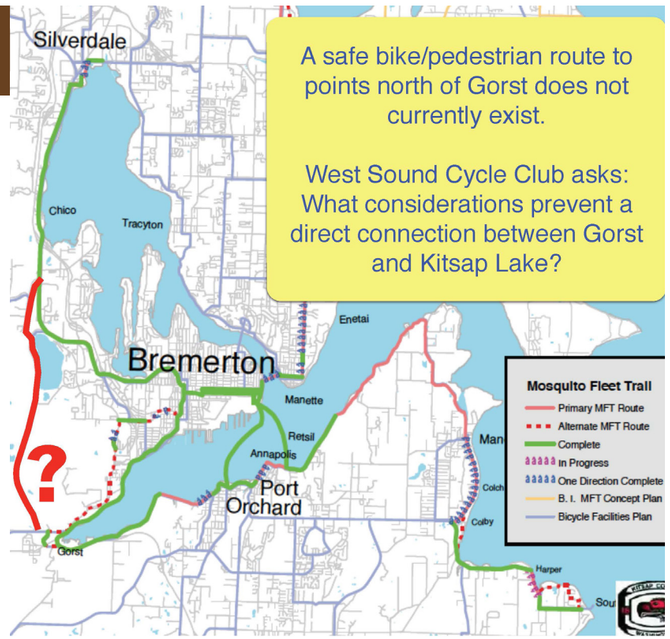

Figure 2H: Courtesy of West Sound Cycle Club Proposal

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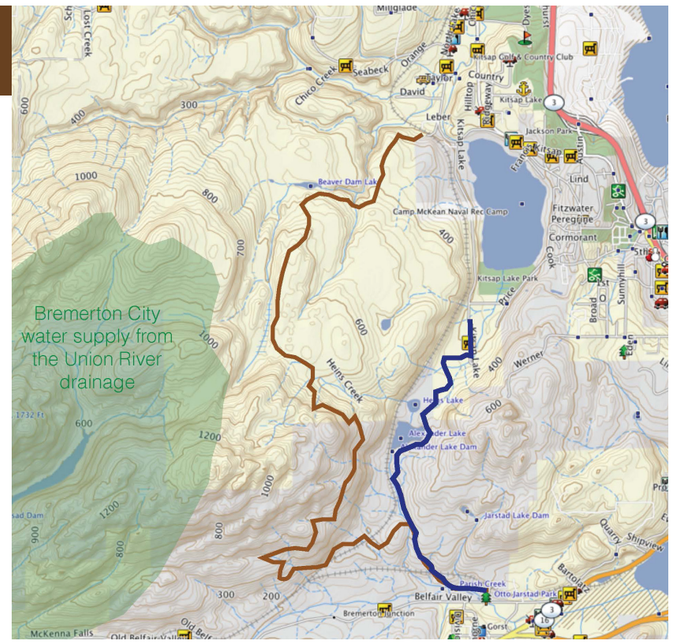

Figure 2I: Courtesy of West Sound Cycle Club Proposal

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Conclusion

A Gorst-Kitsap Lake mixed-use path east of the railroad tracks is the easiest, lowest, shortest connection to low traffic roads extending to the Hood Canal Bridge. It is the safest and shortest way from Silverdale to Belfair, and would instantly become one of the most popular shared-use paths in Bremerton upon completion.

Ueland's flexible trail easement would apply to a path east of the railroad tracks as well as to the west.

The West Sound Cycle club unanimously endorses this route. We would like the relevant property owners, City, County, and Ueland representatives, to meet to discuss the feasibility of this option.

Figure 2J: Courtesy of West Sound Cycle Club Proposal

Relevant Plans, Policies and Background Materials

A number of plans, policies and background documents were reviewed by the consultant team including:

- Kitsap County Non-Motorized Facility Plan (2013)
- WSDOT HB 1700
- West Sound Cycle Club Route Proposal
- AASHTO Guide for the Development of Bicycle Facilities, 2012, Fourth Addition
- Kitsap County Mosquito Fleet Trail Plan (2001)
- Kitsap County Greenways Plan (1996)
- Kitsap County Bicycle Facilities Plan (2001)
- Transportation 2040 - Puget Sound Regional Council
- 2008 Washington State Bicycle Facilities and Pedestrian Walkway Plan
- AASHTO Guidelines for Geometric Design of Very Low-Volume Local Roads
- ADAAG, 1991
- Wildlife and Fish Conservancy Maps
- National Wetland Inventory
- Kitsap County Critical Areas Ordinance
- Kitsap County Municipal Code
- FHWA, Publication No. FHWA-HEP-05-030 Acquiring Real Property for Federal and Federal-Aid Programs and Projects

2.5 Existing Conditions

Trail Location

The proposed trail passes through actively managed private and public forestlands in Kitsap County south of Kitsap Lake and east of downtown Bremerton. The linear, paved shared-use path would be constructed in an approximately 30-foot wide corridor, requiring an easement where it runs through private, City or Federal government property.

Land Ownership

The approximately three-mile trail will be located on lands owned by only three entities. The northern portion of the trail from the south end of Kitsap Lake Road NW to the County/City border adjacent to Alexander Lake is owned by the Ueland Tree Company, which is actively managing the land for timber. Ueland properties are located within Kitsap County. The southern portion of the trail from the County/City boundary to Otto Jarstad Park on West Belfair Valley Road is owned by the City of Bremerton and not currently open to public use. Also within the southern half of the project is a railroad right-of-way owned by the Department of Defense and used by the Navy. City-owned lands are also managed for timber and access to the City's drinking water source. Various utilities, such as natural gas and water lines, are located in the vicinity of the proposed trail within City-owned lands.

Land Acquisition and Applicable Regulations

Federal funding requires a clear designation of trail 'termini' which are access points or destinations. If federal funds are used, the County needs to control the land; preferably through fee simple ownership or permanent easement. Land acquired for Federally Funded Transportation projects must be acquired in compliance with the Uniform Relocation Assistance and Real Property Act of 1970, amended in 1987. Revised Rules for the Uniform Act were published in the Federal Register on January 4, 2005. The rules are reprinted each year in the Code of Federal Regulations (CFR), Title 49, Part 24. All Federal, State and local government agencies, as well as others receiving Federal financial assistance for public programs and projects, that require the acquisition of real property, must comply with the policies and provisions set forth in the Uniform Act and the regulation.

Security and Protection of Bremerton's Watershed for Drinking Water

The project area is in proximity to Bremerton's high quality source for drinking water. Forest lands west of the project area and Navy railroad are a significant and vital part of the City of Bremerton's water supply. This watershed is approximately 13 square miles and managed by the Bremerton Water utility. Ownership of almost the entire Union River watershed above Casad Reservoir allows the Water Utility to manage activities that maintain a safe, economic source of drinking water for Bremerton and the surrounding area. Access to portions of the watershed are located near Jarstad Park and the City-owned gravel roads on the south end of the project.

Early planning efforts explored potential north-south connections adjacent to the watershed. The City did not support these potential routes as they created security issues related to the management of the watershed. The preliminary route being analyzed in this study stays east of the Navy railroad and well away from the watershed.

Watershed protection is the first and most critical component to protecting Bremerton's water supply. It is much healthier, easier, more economical and environmentally sound to protect water quality to begin with than to treat it to remove contaminants after the fact. Without diligent safeguarding of the hydrologic boundary and other lands near the Union River Reservoir, the City would lose its unfiltered status and be required to build a water filtration plant estimated to cost $32 million with $600,000/year additional operation and maintenance costs. Much is at stake in protecting Bremerton's Union River watershed to stay in compliance with strict state and federal Surface Water Treatment Rules. DOH approves the City's Watershed Control Program, conducts annual inspections, and reviews their annual

K

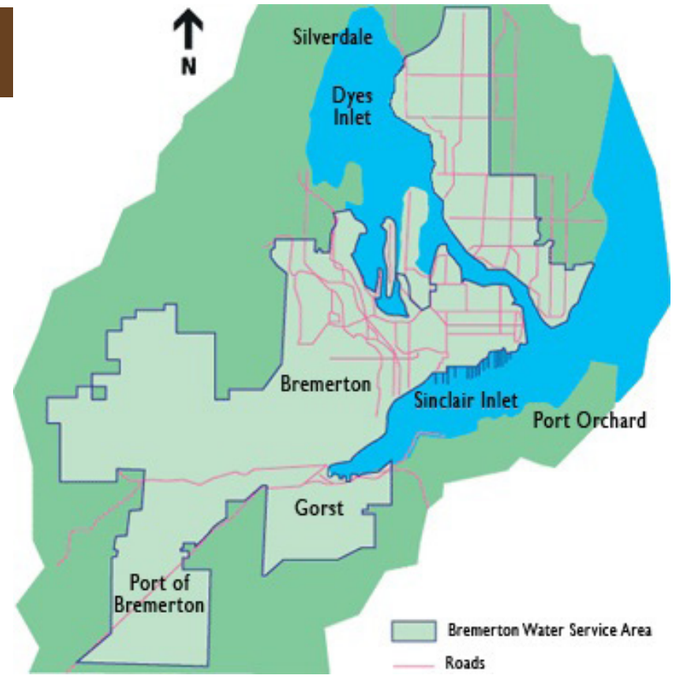

Figure 2K: Bremerton Water Service Map

reports. Bremerton's Watershed Control Program consists of:

- Land ownership – allows the City complete control of activities

- Security - access is restricted by gates, signage, cameras, and Bremerton Police patrols

- Water Quality Monitoring – a wide variety of reservoir testing provides an early warning for potential issues

- Forestry Practices – timber harvest is light in the Union River watershed with a focus on improved forest health

- Prohibition of Recreation – no recreational activities are allowed – no exceptions.

Cultural Resources / Historical Use

Land owned by the City of Bremerton and Ueland has historically been used for timber production and harvest. There are a number of existing logging and haul roads. A review of the Washington Information System for Architecture and Archeological Records Database (WISAARD) does not reveal any records of cultural resources on this land.

Visual Resources

The forested corridor is scenic and comprised predominantly of foreground and understory views of trees, vegetation, drainages and creeks. Territorial views are created within clear-cut sections; however, these view types will continue to change as new forest is planted and matures in these areas. The alignment primarily utilizes existing roadways thus preserving mature trees and minimizing the amount of clearing and earthwork required to build the shared-use pathway.

Fiscal Resources

Near-term funding to build the shared-use path is limited. The County has funded the Trail Feasibility Study. City of Bremerton, Kitsap County and Ueland are willing partners in acquiring and granting easements. If the trail segment is included in adopted City and County transportation plans, it is anticipated this Trail Feasibility Study will position Kitsap County to receive state and federal grants for implementation.

Ecological Resources

The trail would pass through a mix of habitats and undulating terrain. Habitat consists primarily of conifer upland forest, mixed deciduous/conifer forest, recent clear cuts on Ueland property, near two large lakes (Alexander and Heins), amongst small wetland complexes in shallow depressions and over and along Heins Creek to the south. Due to the importance of critical areas, primarily wetlands, creeks and steep slopes, a subconsultant was retained to provide field work and an extensive summary of critical areas which can be found in Appendix A. The wetlands report is a planning level review of how wetlands may influence possible trail alignments, design standards, and feasibility. The report is not a formal wetlands analysis; development of this trail, or any other private or public development, will require independent analysis. For the trail project, formal wetland determinations will be conducted during the preliminary engineering phase. The applicability of this wetlands report is limited to this study and should not be used beyond its identified purpose.

L

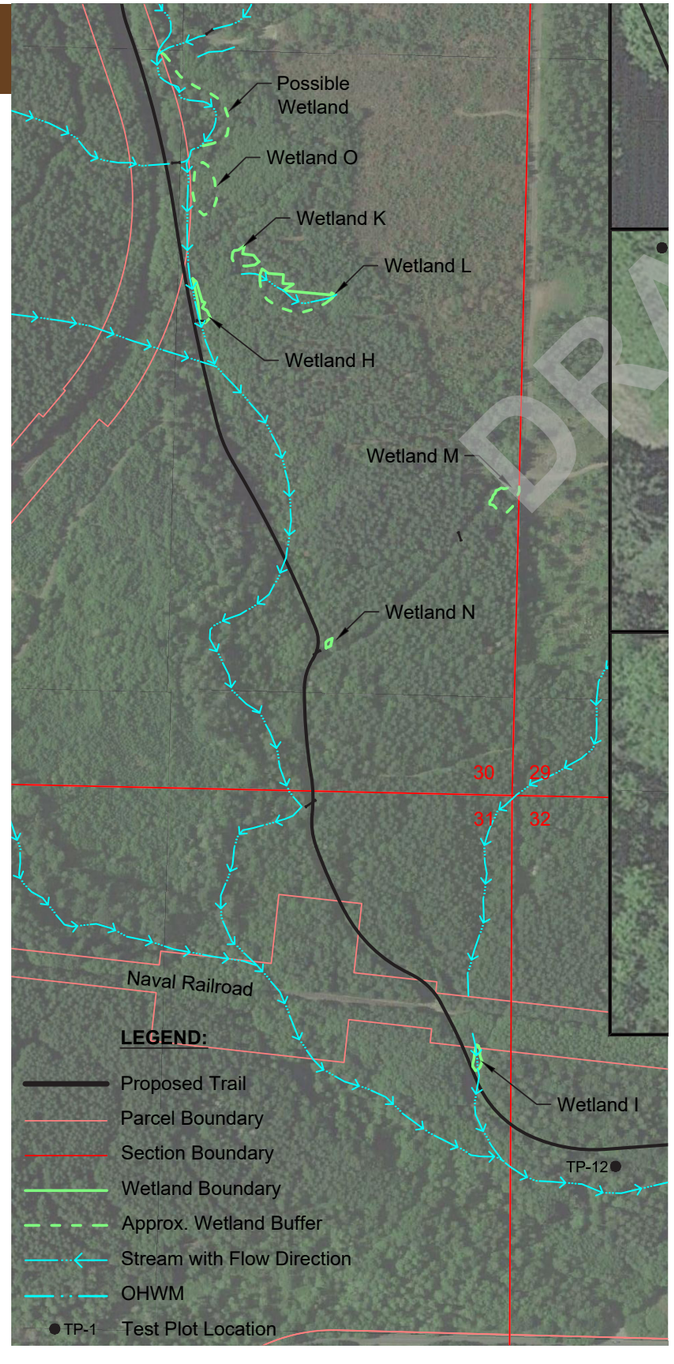

Figure 2L: Excerpt of Map from Wetland Feasibility Report

Existing Conditions

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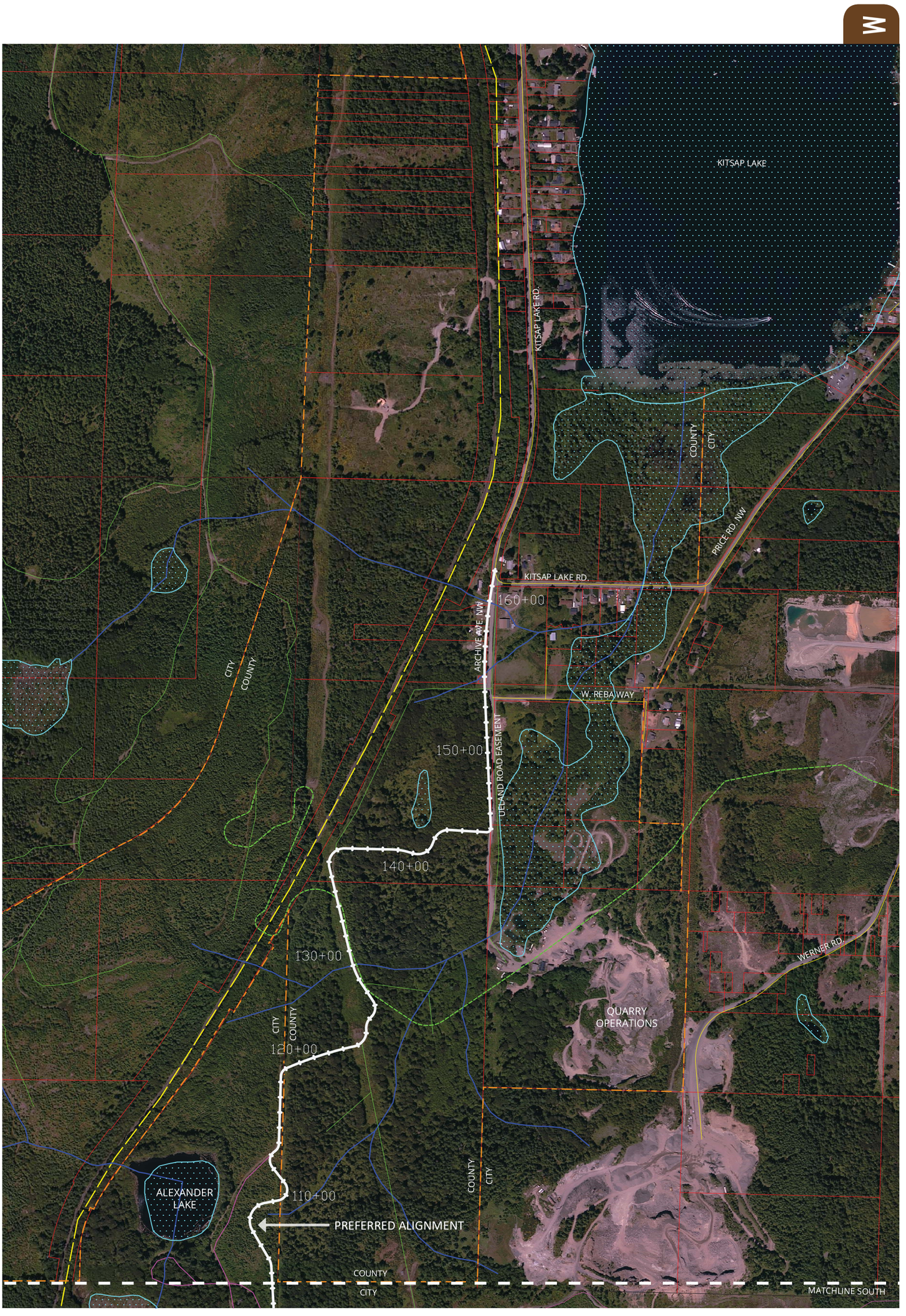

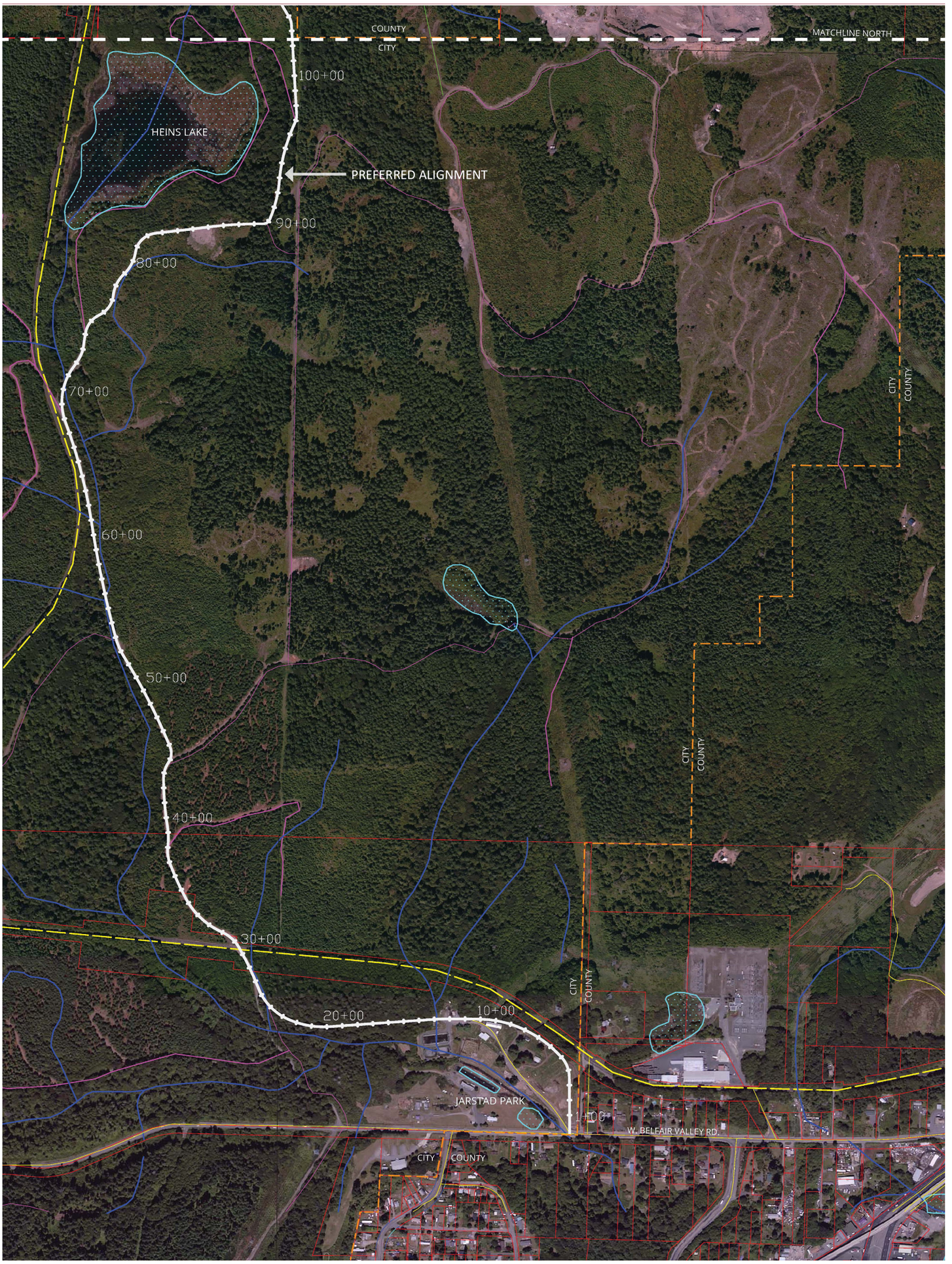

LEGEND

PREFERRED ALIGNMENT
1+00
(DISTANCES IN 100' INCREMENTS)

PUBLIC ROADS
UELAND TREE FARM ROADS (PRIVATE)
FUTURE UELAND ROAD CONNECTION
CITY OF BREMERTON ROADS (CLOSED TO PUBLIC)

5 FT. CONTOURS
PARCEL LINES
RAILROAD
COUNTY/CITY BOUNDARY

STREAMS
WETLANDS

0 200' 400'
1" = 200' ON A 36" X 48" SHEET OF PAPER

Topography & Grades

For the purpose of this feasibility study, it was assumed that the preliminary alignment was thoroughly vetted by the County, County NMC and WSCC. As such, the scope for this study did not include significant investigation of alternate alignments that deviated from the general route identified. A few minor deviations were explored, primarily in the vicinity of Heins and Alexander Lakes to see if routes could be located further east of existing logging roads to minimize impact that recreation could have on these lakes.

One of the primary directives for the study was to analyze whether existing logging road corridors could be used for the shared-use trail, either beside the existing road or by sharing an improved roadbed. Analysis of existing road slopes was one of the first tasks performed in the planning process. LIDAR topographic data provided by the County was used to grossly calculate the slope along any given segment of the proposed alignment (Figure P). For planning purposes, existing slopes were identified in three categories:

- Less than 5% (considered accessible for a shared-use path per AASHTO standards). These segments are shown on the plan in Figure P as green.
- 5% to 8% (considered acceptable for a share-use path with mitigation). These segments are shown as orange.
- Greater than 8% (not recommended for a shared-use path). These segments are shown as red.

Approximately 77% of the road to be utilized as the trail corridor had slopes under 5%. Seventeen percent (17%) of the road had slopes between 5% and 8%. Six (6%) of the road had slopes greater than 8%.

This analysis allowed us to understand, at a high level, where the significant problem areas were and to devise strategies for reducing slopes to below 8%.

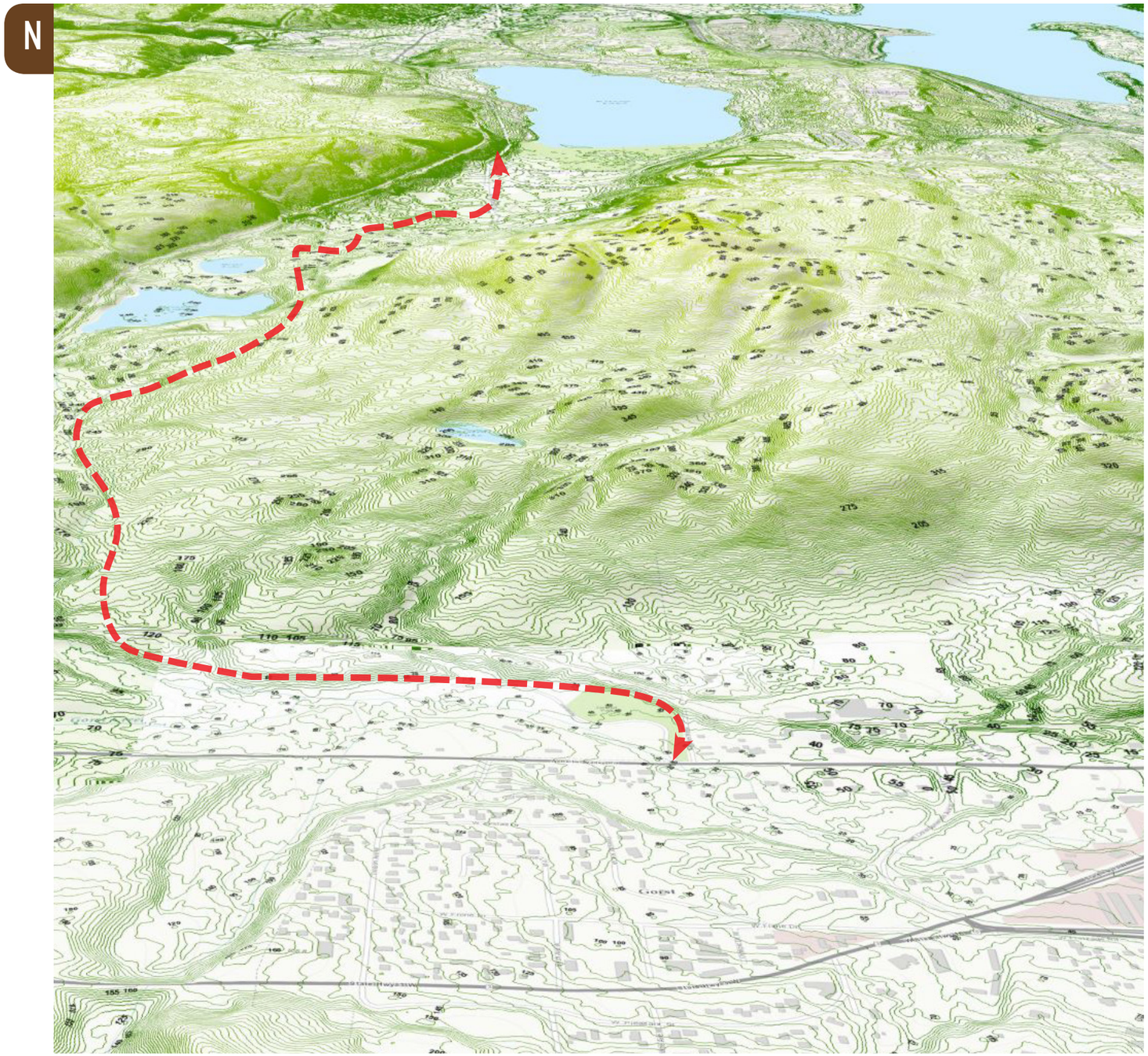

Figure 2N: Perspective of Topography, Looking North

Once the preliminary alignment was analyzed for slope (and a variety of other factors), a preferred alignment emerged. A more detailed analysis of the slope was completed as part of generating the preliminary engineering drawings.

It became apparent early in this task that the LIDAR data was insufficient to adequately engineer the trail and develop accurate cost data. LIDAR provides estimations of the grades- these estimations manifest themselves as either “dips” or “bumps” in the vertical alignment that don’t actually exist, which we knew from field study of these existing roads. If used, the resulting costs for grading and trail construction would end up being much higher than reality. Performing a detailed land survey (which will occur prior to final design and engineering if the project is funded) was out of the question due to the significant cost of this effort.

In an effort to minimize the inaccuracy of the data, the engineer was able to obtain more detailed LIDAR data from the County, process it to create a more accurate base map and perform the trail engineering on top of that.

The horizontal and vertical alignment generated during this preliminary engineering revealed that there were more segments of steep slopes than had been roughly calculated during the planning process using LIDAR data.

At this stage of engineering there were about ten very short (100 feet or less) proposed segments that were over 8% slope based on existing road grades. It was determined that these segments could be graded to achieve the goal of under 8% for horizontal lengths of less than 200 feet.

There were also about 10 long segments (200 feet or more) that were over 8% slope based on existing road grades. It was determined that these would be able to be graded to under 8% as well, but that there would need to be short landings of less than 5% slope less than every 200 linear feet.

In the end, the percentages of vertical slopes along the preferred alignment are:

- Less than 5% : 71%
- 5% to 8.33%: 29%
- Greater than 8.33%: 0%

During the engineering phase, the engineer applied parameters to the design model to restrict the area of disturbance to a 40 foot wide corridor. Where grading of the roadbed (to reduce slope) for the new trail resulted in sides lopes (either cut or fill) beyond this disturbance corridor, walls were added. The maximum side slopes will be 1.5:1 (horizontal distance: vertical distance) on cut slopes and 2:1 on fill slopes.

O

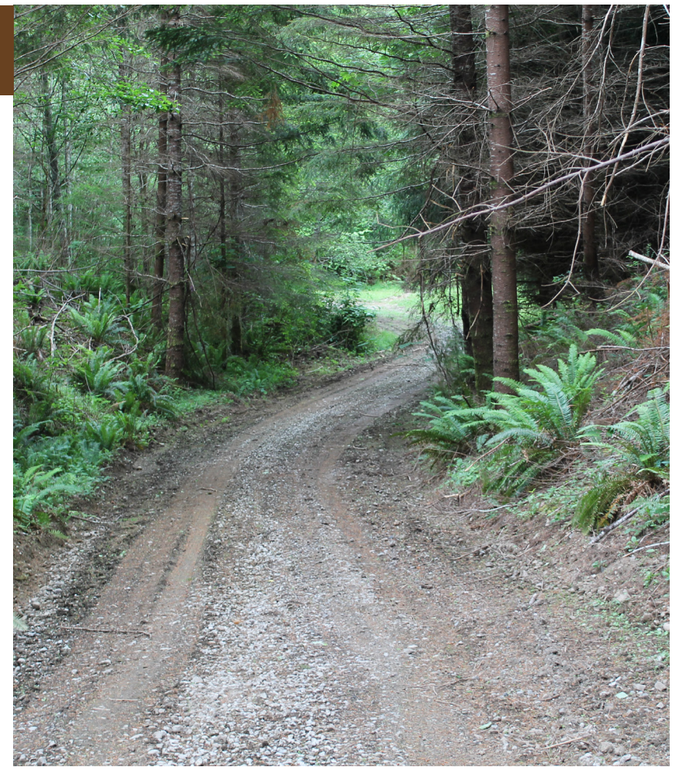

Figure 2O: Road Type 4 With a Slope Greater Than 8%

Existing Grades Along Preferred Alignment

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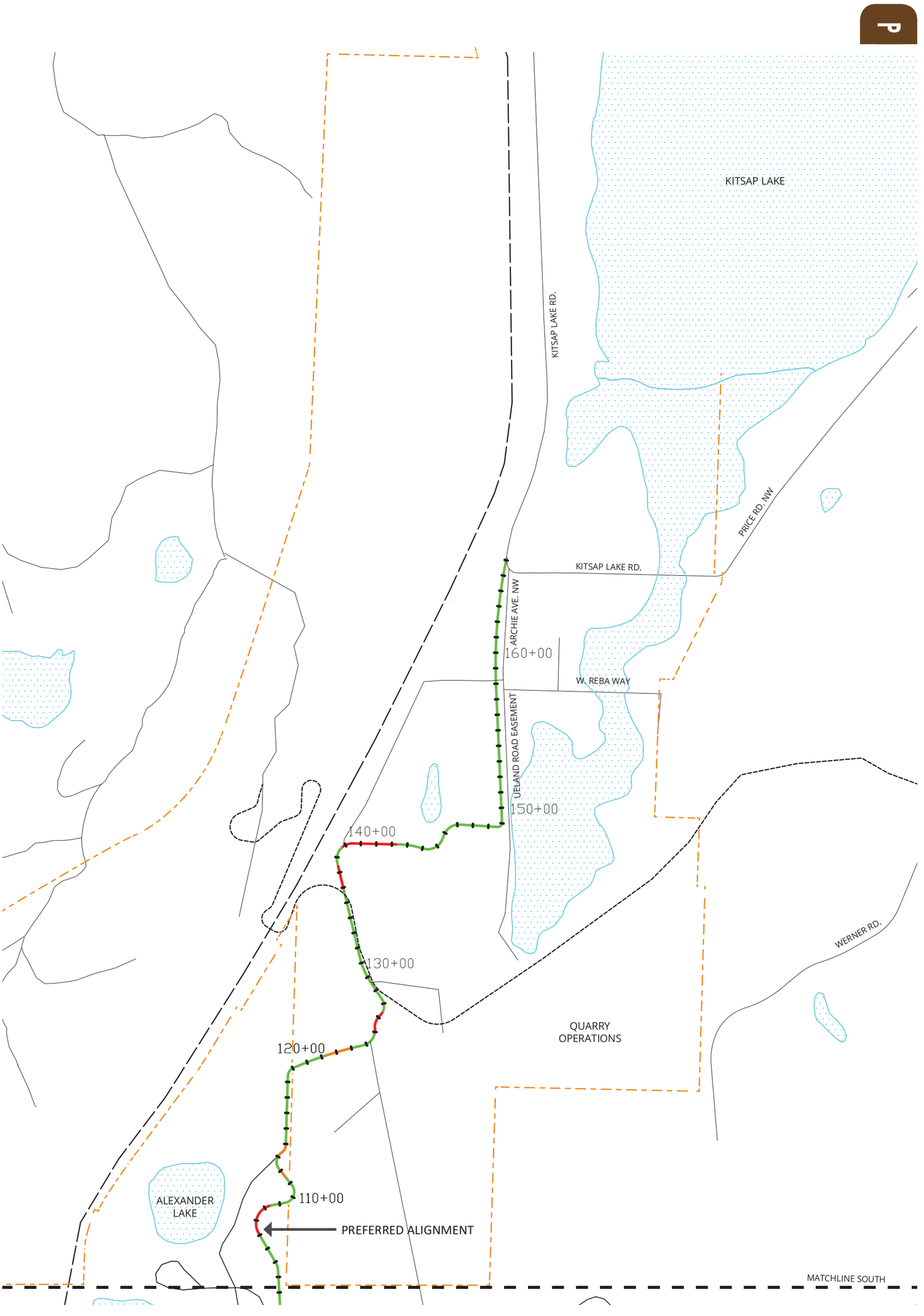

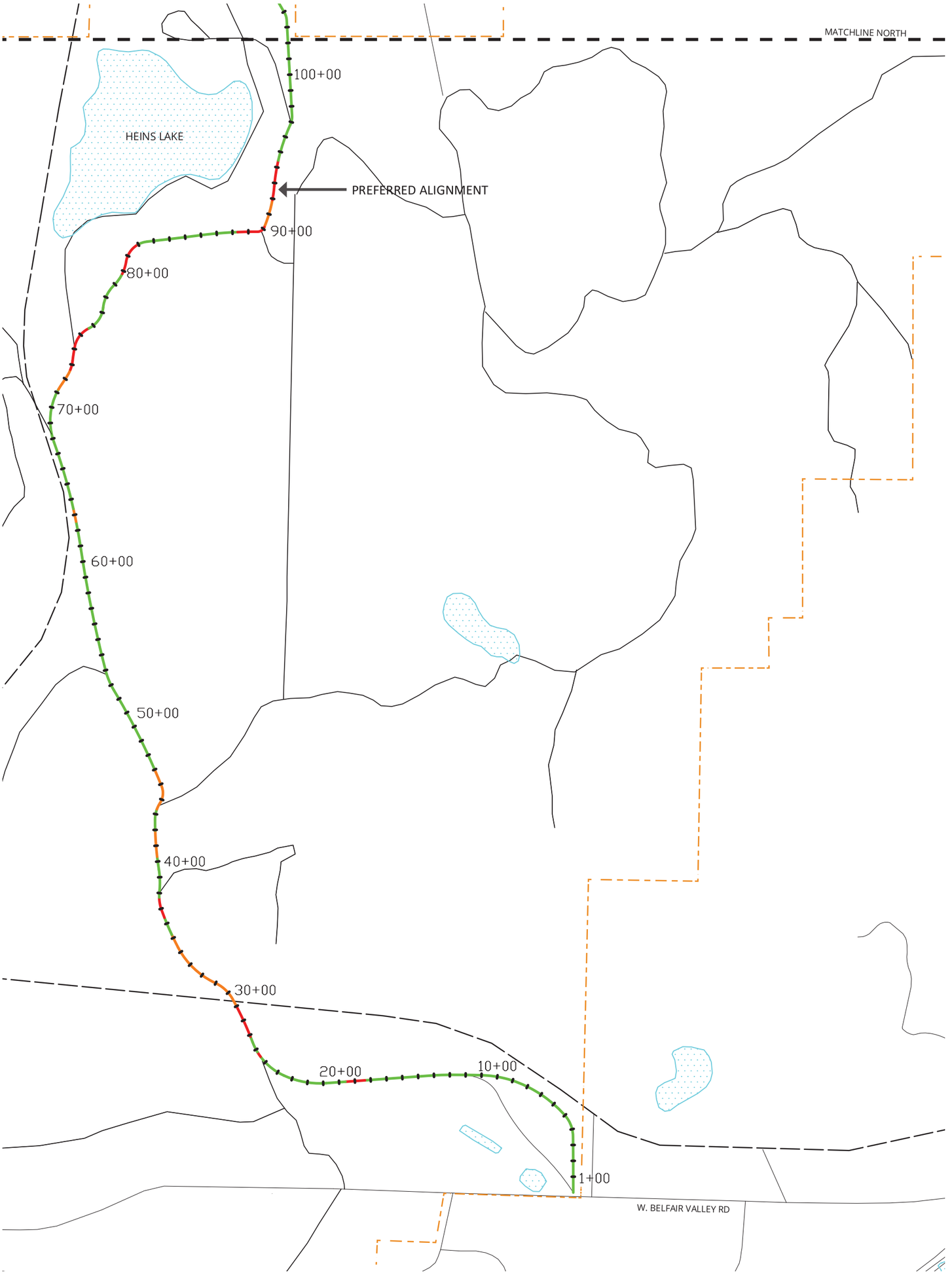
MATCHLINE NORTH
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80+00
70+00
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50+00
40+00
30+00
20+00
10+00
1+00
W. BELFAIR VALLEY RD
LEGEND
0-5% SLOPE
5-8% SLOPE
8+% SLOPE
PREFERRED ALIGNMENT
1+00
(DISTANCES IN 100' INCREMENTS)
RAILROAD
OTHER ROADS
COUNTY/CITY BOUNDARY
WETLANDS
0
200'
400'
1" = 200' ON A 36" X 48" SHEET OF PAPER

Q

Figure 2Q: Ueland Tree Farm Road

Timber Harvest Schedule & Impact

The proposed trail will pass through forestlands owned by both Ueland and City of Bremerton. The trail alignment was planned so as not impact future timber harvests or management. To minimize implementation costs and reduce environmental impacts, the Working Group adopted a strategy to use the logging road bed as the base for a new, paved shared-use path where feasible. To accommodate logging activity traffic, the width of the shared use path was increased from 12’ wide to 14’ wide.

Based on infrequency of use for logging activities, the corridor should be designated as a “trail” designed to accommodate maintenance vehicles and in identified sections to accommodate logging trucks. As such, portions of trail will need to be closed during logging operations, which would be infrequent based on discussions with Ueland and City of Bremerton.

Field investigation was done to determine the existing quality of various roads and their base courses to establish costs for changing those gravel roads to a wide paved shared-use path.

Trail pavement sections (base course plus asphalt) for trail types were also developed by the engineer to inform costs for various trail segment development. These costs are reflected in Section 3 of this report.

A majority of the trail will be a the standard 10’ paved width on the varying types of existing road grade on both Ueland and City of Bremerton properties. This will be shared with periodic maintenance vehicles. In the case of maintenance vehicles, the hours of use (Monday through Friday business hours) are generally different than hours of recreation use (evenings and weekends). In the case of logging trucks, the trail will be 14’ wide and need to be closed for short periods (see harvest schedule maps for frequency).

R

Figure 2R: Navy Railroad Crossing

Navy Railroad Easement Requirements

In January 2017 representatives from the County and City of Bremerton consultant met with representatives from the Navy to:

- Update the Navy on the planning project and feasibility study that was underway,
- Gain an understanding of the process needed for future Navy approval of a trail that crosses the railroad, and
- Determine how to best document the Navy approval process in the feasibility study so as to be eligible for funding.

The project will require two easements based on the alignment proposed in this study: one for the crossing in the south area of the study area and one for use of the logging road/trail adjacent (no crossing) to the railroad in the central area of the study area. There is a current easement in place used by the City for logging roads which cannot be used for the public trail easement as it is currently only for private City use. It takes approximately 18 months to get an easement from the Navy. Each easement will cost approximately $30,000, including filing fee of $10,600. Each easement will require a full survey, full engineering drawings and National Environmental Policy Act (NEPA). These are tasks that have not been completed as part of this feasibility study but would be completed during engineering design.

Safety and security are of the greatest concern to the Navy. Fencing and signage should be considered during the design process. An estimated 1,000 linear feet of chain link fence is recommended where the trail and Navy tracks run adjacent to each other. An upgraded rail crossing per Universal Traffic Control (UTC) and/or American Railway Engineering and Maintenance-of-Way Association (AREMA) or applicable design will need to be included. Costs for design and implementation will are incorporated into this feasibility study.

The Navy has provided the County with a list of Navy guidelines that outline what needs to happen to secure and easement from them. The list is included in Appendix C.

The consultant team analyzed the area of road the runs through Navy property on City of Bremerton easement (but not across the railroad) to determine if the trail could be relocated off the road and off the easement. It was determined that it would not be cost effective to do so due to the amount of grading that would be required and the detrimental impacts to a significant amount of wetlands in the area.

The project will seek to conditional approval of the concept from the Navy to support grants/federal funding to engineer and implement the project.

The Jarstad Park to Kitsap Lake shared-use path would provide a major transportation and recreation amenity to the Navy's Camp McKean recreation facility on Kitsap Lake.

S

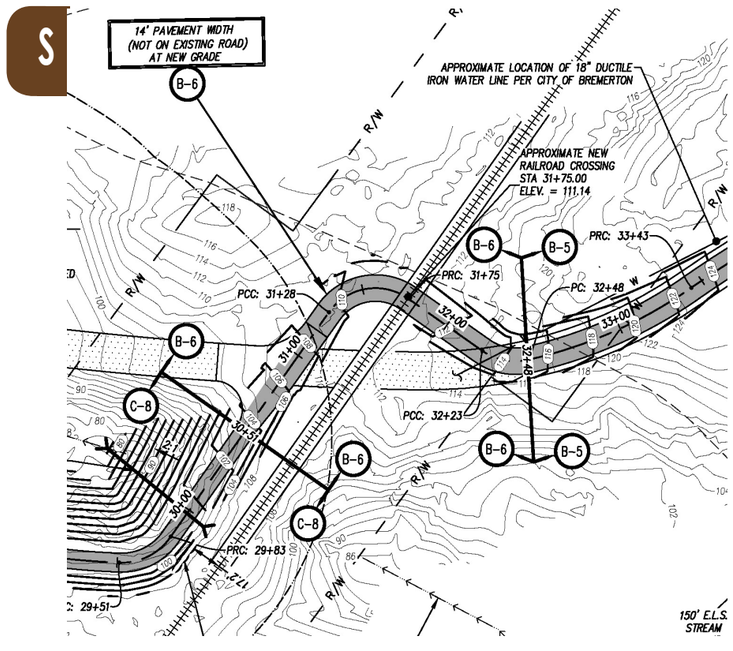

Figure 2S: Map of Crossing from Engineering Plans

Timber Harvest Schedule

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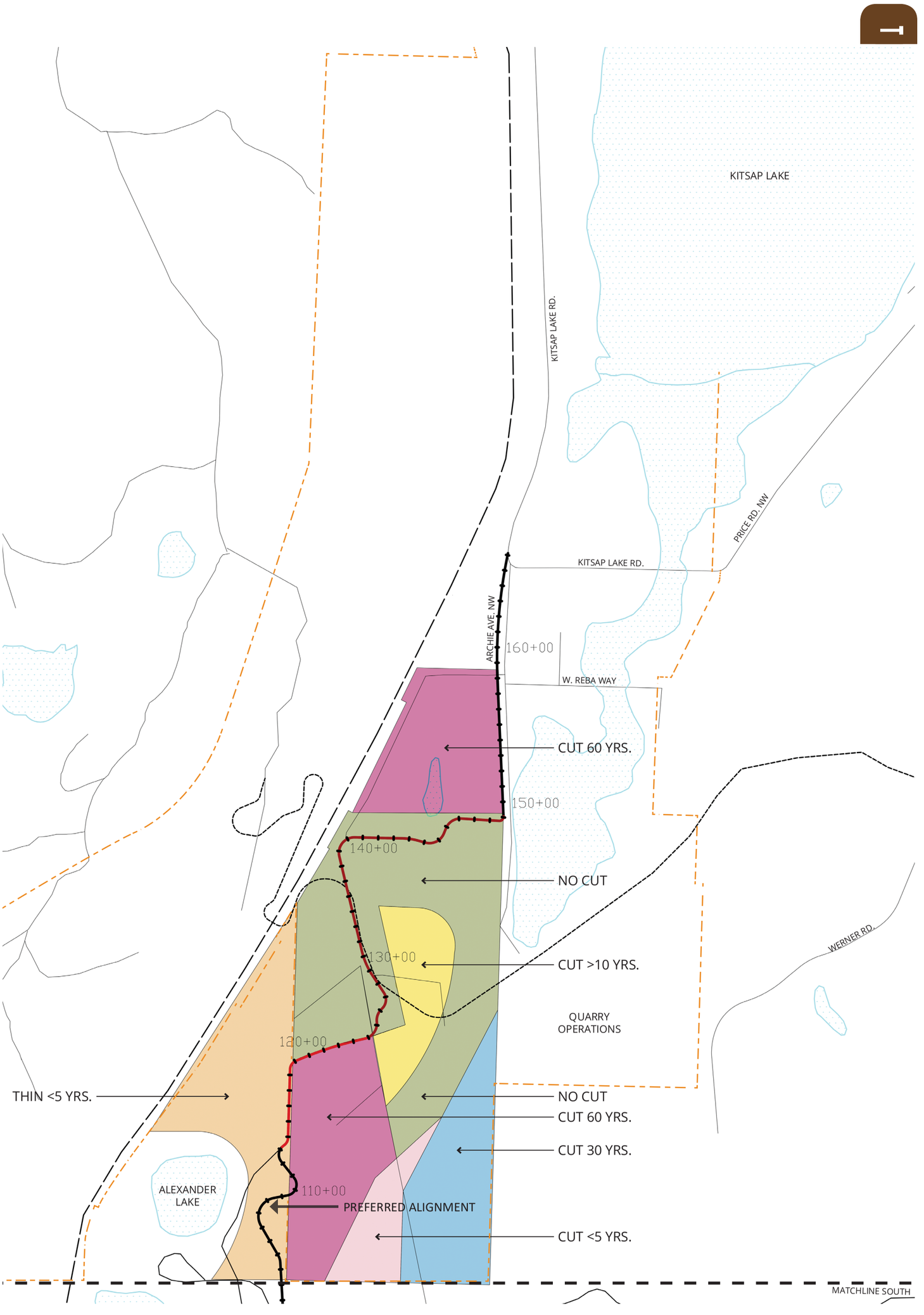

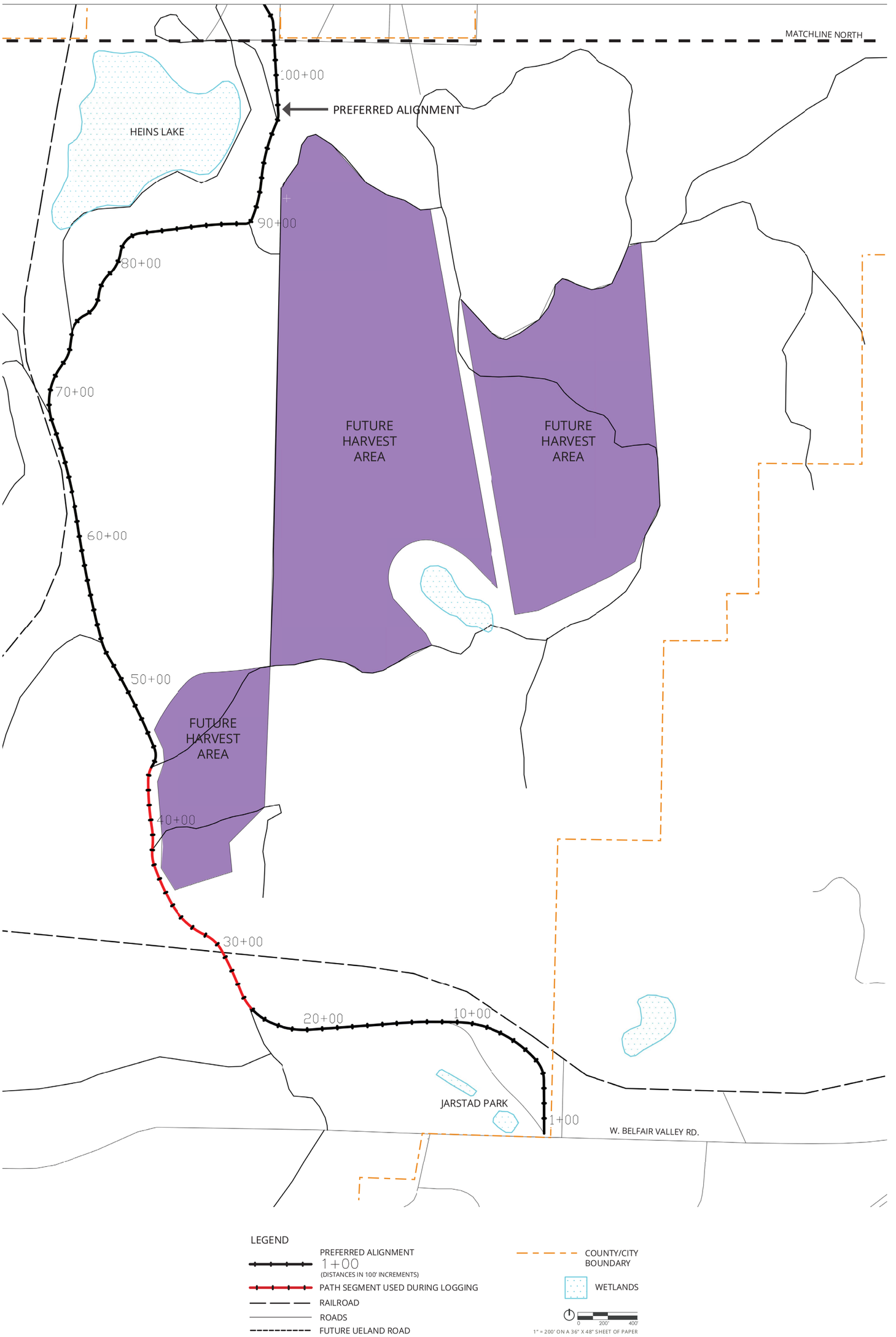
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FUTURE HARVEST AREA
FUTURE HARVEST AREA
FUTURE HARVEST AREA
JARSTAD PARK
W. BELFAIR VALLEY RD.
LEGEND
PREFERRED ALIGNMENT
1+00
(DISTANCES IN 100' INCREMENTS)
PATH SEGMENT USED DURING LOGGING
RAILROAD
ROADS
FUTURE UELAND ROAD
COUNTY/CITY BOUNDARY
WETLANDS
0
200
400
1" = 200' ON A 36" X 48" SHEET OF PAPER

Summary of Existing Road Types and Uses

A majority (approximately 68%) of the proposed trail will be built upon existing logging and maintenance roads. Another 10% will be located adjacent to existing roads with a 5 foot wide buffer. The remaining 22% is proposed to be built where no current roadbed or trail exists. This strategy should minimize cost in addition to reducing disturbance to the landscape. This is the case for both City of Bremerton and Ueland owned lands. As such, it is important to understand the current width and condition of sub-base for each existing road type. These factors will impact the cost to develop the trail on roadbeds of varying condition. The maps in Figure F of Chapter 3 show the different existing road types that were identified during the study. Table B in Chapter 4 also provides details for each of these road types. Each is discussed below.

Type 1 - Narrow, Paved, No Striping (Orange line on Figure F, Chapter 3)

Two short segments of this type of road exist. The first segment is located on the north end of the project- about 900 linear feet of Archie Avenue NW. It is approximately 18 feet wide, gravel pavement with no shoulders. This is a public County road. The shared-use path would be located to the west of this road and not share the road.

The second segment is located on the south end of the project within Otto Jarstad Park, owned by the City of Bremerton. It is approximately 10 feet wide, asphalt pavement with no shoulders. It was decided that the shared-use path would be located elsewhere within the park and not share the road. In both cases, the existing roadbed will not be used for the new trail.

Type 2 - Wide, Gravel, Frequent Use (Red line on Figure F, Chapter 3)

Two segments of this type of road exist. The first segment is located on the north end of the project- about 800 linear feet south of the paved segment of Archie Way NW. This is a private road owned by Ueland and used primarily for access

U

Figure 2U: Road Type 1 - Narrow, Paved, No Striping

V

Figure 2V: Road Type 2 - Wide, Gravel, Frequent Use

to and from the company's quarry and logging operations. It is approximately 20 feet wide, gravel and has no shoulders. It was determined that the shared-use path would be located as a separated path to the west of this road .

The second segment is located on the south end of the project on City of Bremerton lands and is not open for public use. It is approximately 1,900 feet in length, approximately 14 feet wide, gravel pavement with periodic shoulders. This road crosses the Navy railroad tracks and provides access for City maintenance vehicles and logging activity vehicles from West Belfair Valley Road. It was determined that the shared-use path would be located on the existing roadbed and the roadway corridor reclassified as a trail that is periodically used for City maintenance and operations. When logging occurs, the trail will be temporarily closed.

Type 3 - Narrow, Gravel (Yellow line on Figure F, Chapter 3)

One long segment of this road type exists. It is located in the central portion of the project from Heins Lake south to Road #2200. This trail segment is within City-owned lands and the road is used for maintenance access. This road is not planned to be used for access to logging activities or for large logging trucks in the future according to the City. The road segment is approximately 5,300 feet in length, approximately 11-13 feet wide gravel pavement with no shoulders. It was determined that the shared-use path would be located on the existing roadbed and the roadway corridor reclassified as a trail that is periodically used for City maintenance and operations.

Type 4 - Narrow, Gravel, Periodic Use for Logging Activities (Light blue line on Figure F, Chapter 3)

One long segment of this road type exists. It is located in the northern half of the project. It runs from the gravel Ueland quarry road west through timber harvest lands, turning south and running along the powerlines. It then turns west again through more timber harvest lands, turning south and running along the gas and water easement road to the vicinity of Alexander Lake. This trail segment is within Ueland owned lands and the road is used periodically for logging

W

Figure 2W: Road Type 3 - Narrow, Gravel, Frequent Use

X

Figure 2X: Road Type 4 - Narrow, Gravel, Periodic Logging Use

activities. The road segment is approximately 3,800 feet in length, approximately 12 feet in width, a mix of dirt, gravel and spalls with no shoulders. It was determined that the shared-use path would be located on the existing roadbed. When logging occurs, the trail will be temporarily closed. An MOU will need to be developed between Ueland and the County as to how the County will manage and maintain the trail and how the anticipated closure process would work.

Type 5 - Narrow, Dirt, No Logging Use (Dark blue line on Figure F, Chapter 3)

One segment is located in the south portion of the project within City-owned land, running from Jarstad Park uphill to the wide, frequently used gravel road south of the Navy railroad crossing. The road segment is approximately 700 feet in length, approximately 10 feet in width and primarily dirt with no shoulders. It is used very infrequently for maintenance and operations and not intended to be used for logging trucks in the future.

Y

Figure 2Y: Road Type 5 - Narrow, Dirt, Not Use for Logging

Alignment Alternatives Considered

During the planning and preliminary engineering process a number of alternative segments were considered to minimize disturbance, minimize steeps grades or avoid critical areas. This section documents and summarizes some of these segments. Eventually a preferred alternative was selected and an estimate done for that route.

Lake Route Segment

This segment, running directly adjacent to Heins Lake on City of Bremerton property and near Alexander Lake on Ueland property, was originally part of the preliminary alignment identified as an alternative in the County's 2013 Non-motorized Facility Plan and by the WSCC. This route is shown in red and labeled "A" in Figure AD.

The Working Group identified concerns about management and maintenance issues that would arise based on its proximity to the lakes. Long-term requirements to address increased impacts related to maintenance, management and enforcement around the lakes will be needed, even with the trail located out of sight from the lakes. The cost of patrolling and providing maintenance of a trail immediately adjacent to the lakes on this route is considered to be infeasible for the existing landowners- they do not have the resources to maintain and manage a facility that could easily become a destination. Without adequate resources, habitat could be degraded along the east shore of the lakes as people access the shoreline for recreation.

This project is considered to be a north-south transportation corridor and not a destination trail. Providing a trail route with direct access to each of the lakes would turn this into a destination trail and bring about a host of unintended consequences. Creating a destination mid-trail places the emphasis of the trail on recreation and could create an attractive nuisance along the trail. Without a long term agreement, there will be difficulty in getting property owner agreements (Ueland and City) on this route.

Z

Figure 2Z: Existing Road Adjacent to Lakes

AA

Figure 2AA: View From Existing Road

AB

Figure 2AB: Explored Area East of the Lakes

Segment East of Wetland Complex

As a response to the concern about the future trail's proximity to the lakes, an alignment was explored east of a large wetland complex east of the lakes. This route is shown in orange and labeled "B" in Figure AD. A representative from Ueland flagged this potential route and then members of the County and consultant team studied the route in the field. The trail route was recorded by GPS to be included in study maps. It became apparent during the field visit that grades would be too steep to accommodate a shared-use trail built to AASHTO standards. Impacts to the wetland and wetland buffers would also be significant. As this route was not on an existing logging road corridor, disturbance to the existing forest and the steep slopes would be significant. For these reasons, this alternative segment was abandoned and not studied further. However, it was during this field investigation that the team discovered a route that became the preferred alignment in this are as shown on Figure AD.

AC

Figure 2AC: Road Within Otto Jarstad Park

Otto Jarstad Park Segment

Originally it was thought that the new shared-use trail would follow the alignment of the narrow entry road from West Belfair Way to the restroom and picnic shelter area. The trail would be adjacent but separated from the road. After field study it was determined that the user experience would benefit from locating the trail further away from the road. In addition, the topography was not an impediment to relocating the trail. There is a large, flat grass area at the back (or north) of the park along the tree line that the trail can be located. The trail would then terminate at the current road entry off of West Belfair Way. There would be a short access path required from the proposed trail to amenities within the park such as restroom, picnic area and parking lot. This site was identified as the southern terminus and trailhead for the trail.

Alternative Alignments Considered

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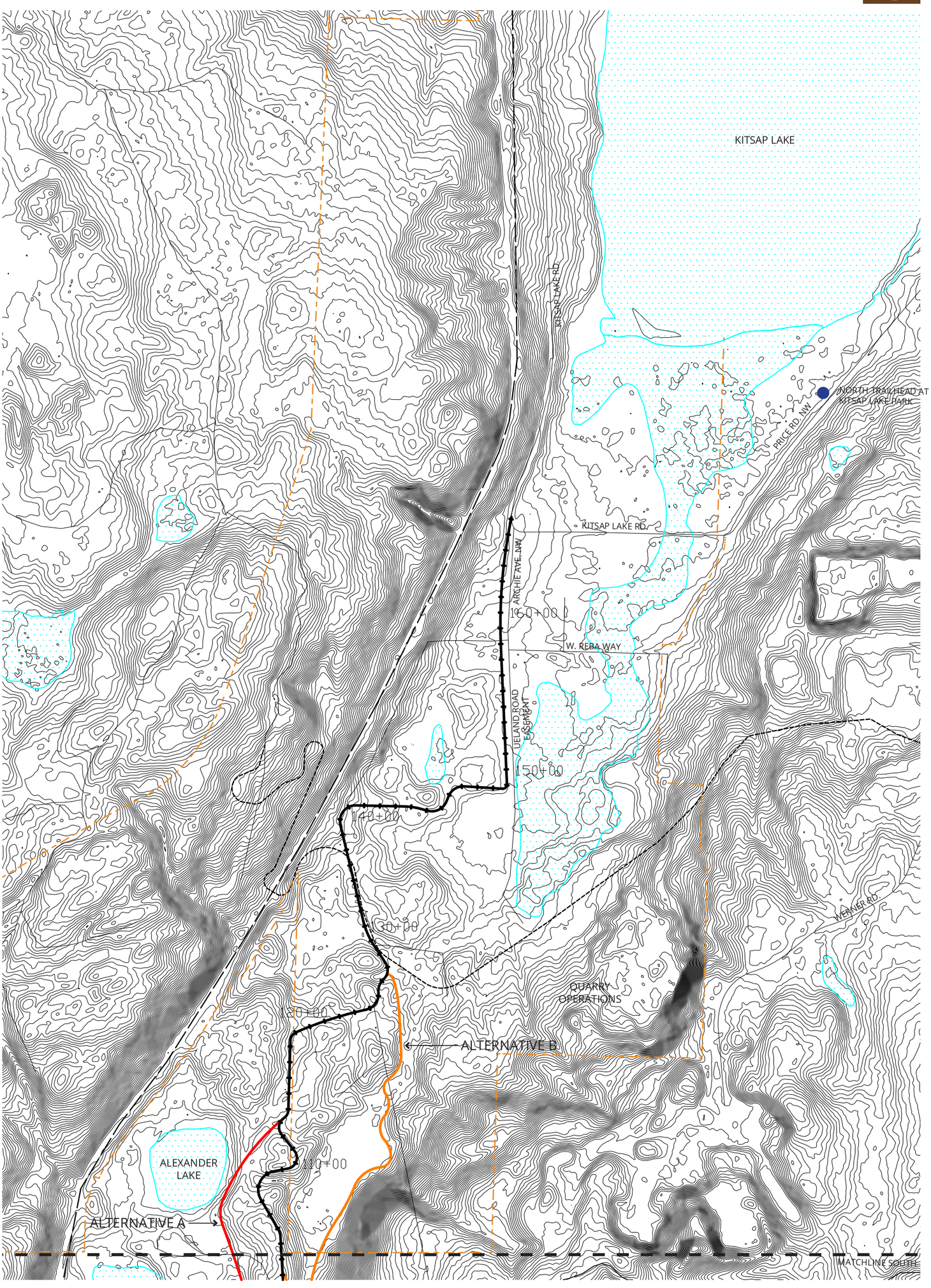

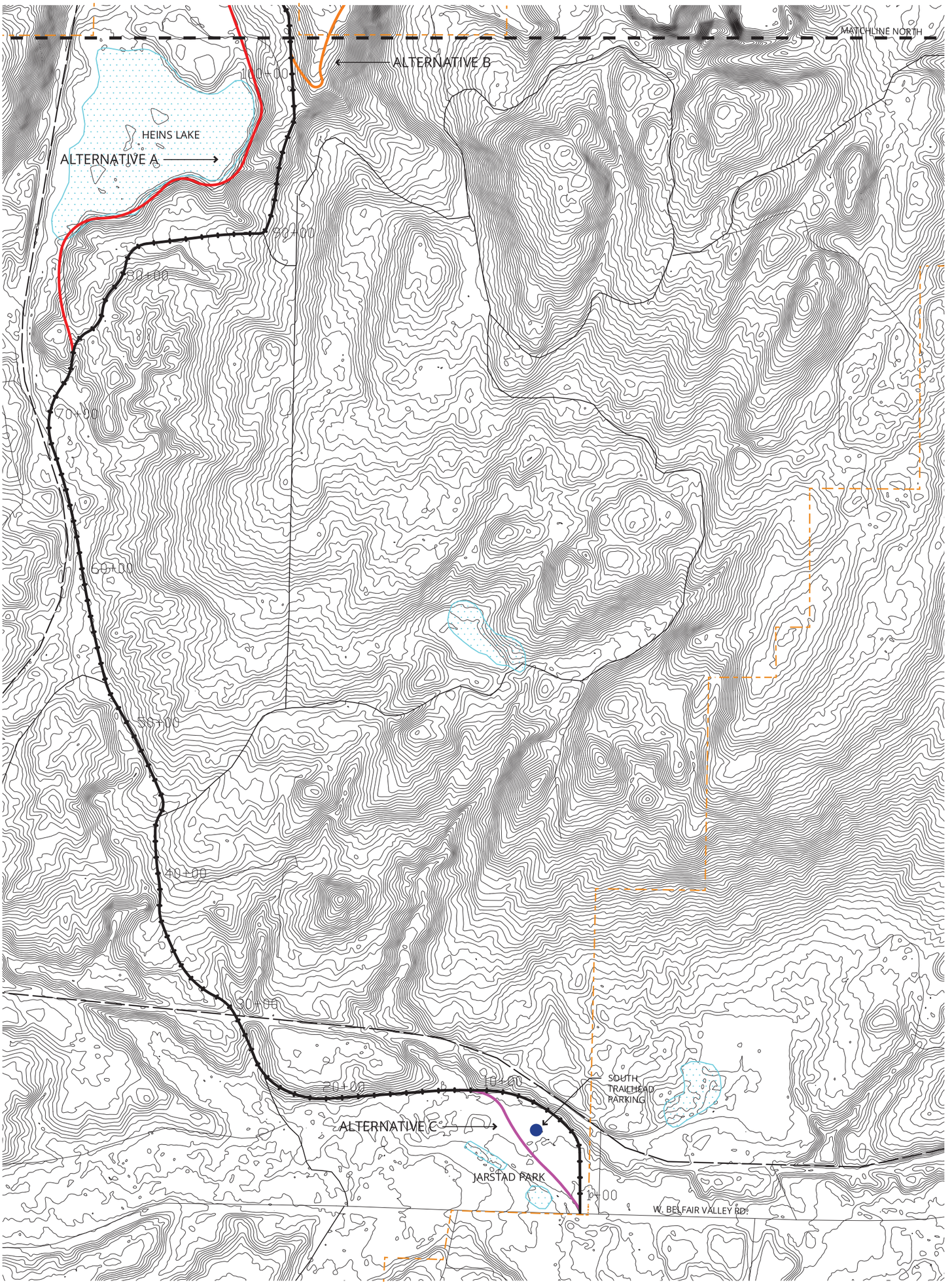
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(DISTANCES IN 100' INCREMENTS)
RAILROAD
OTHER ROADS
COUNTY/CITY BOUNDARY
WETLANDS
5 FT. CONTOURS
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1" = 200' ON A 36" X 48" SHEET OF PAPER

2.6 Preliminary Engineering/Site Optimization Software

The feasibility of routing approximately three miles of trail through hilly terrain was made efficient through the use of various softwares. The alignments were engineered using both AutoCAD Civil 3D and SiteOps. AutoCAD was used to develop horizontal and vertical profiles for trail segments proposed on existing roadbeds. In the case of SiteOps, the alignment was draped over a terrain model (Figure 2AE), and minimum/maximum longitudinal centerline profile slopes were inputted, together with the proposed cross-section template and pavement section depths. SiteOPS analyzed the minimum/maximum elevations- every point can be based on the design thresholds inputted. The design thresholds were based on AASHTO standards summarized in Table 2D and shown graphically with trail cross sections in Section 3 of the report. The final step yields a finished grading plan and a quantity of materials for that alignment. This information was then imported into AutoCAD Civil 3D software to produce the feasibility plan and profile sheets found in Appendix A. A plan and profile sheet is shown an example on the opposite facing page in Figure 2AF.

AE

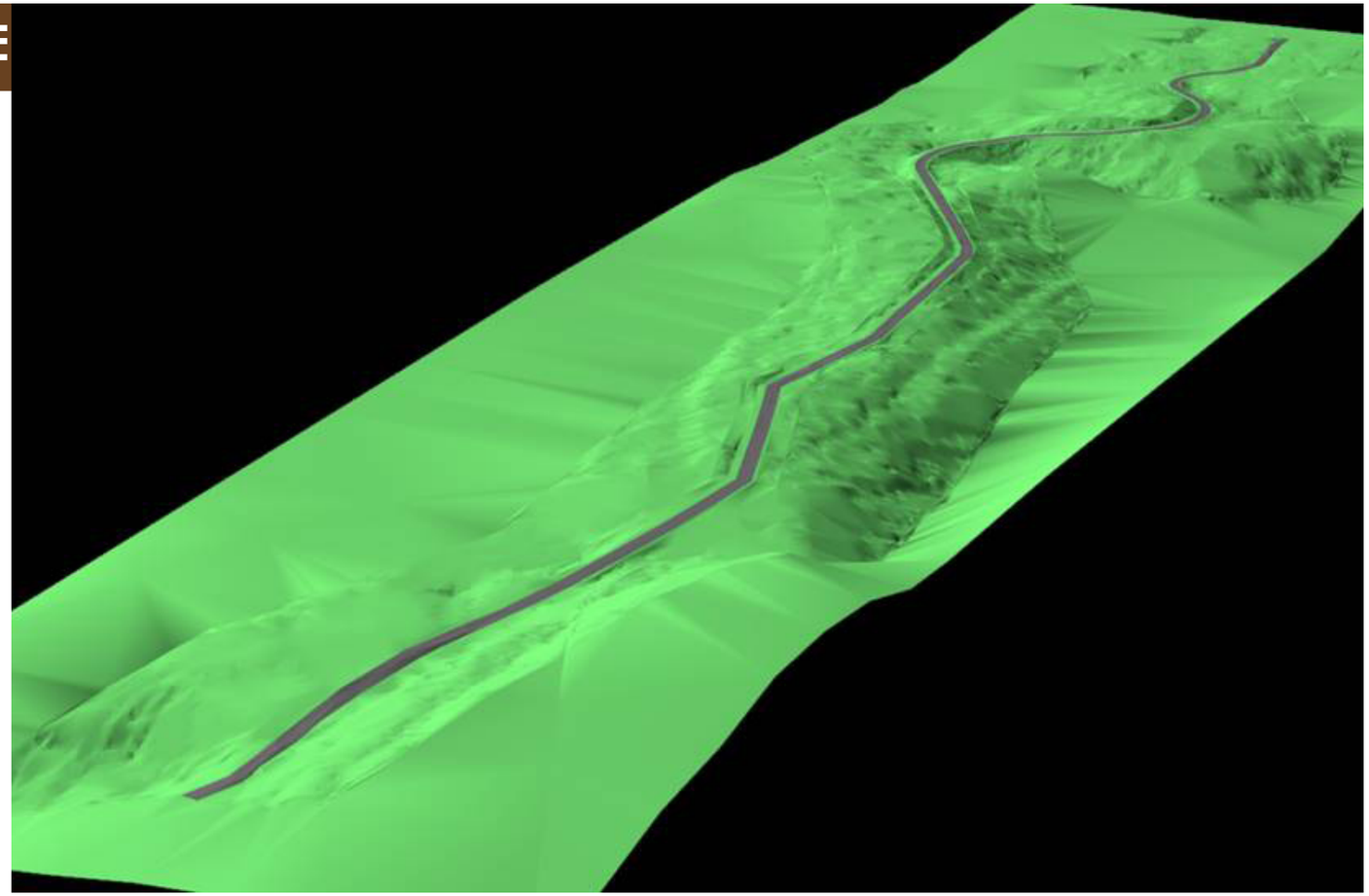

Figure 2AE: SiteOps Elevation of Proposed Alignment Looking Northwest at Ridge Between Wetland Complex on Right and Alexander Lake on Left. (Image Courtesy of MAP)

AF

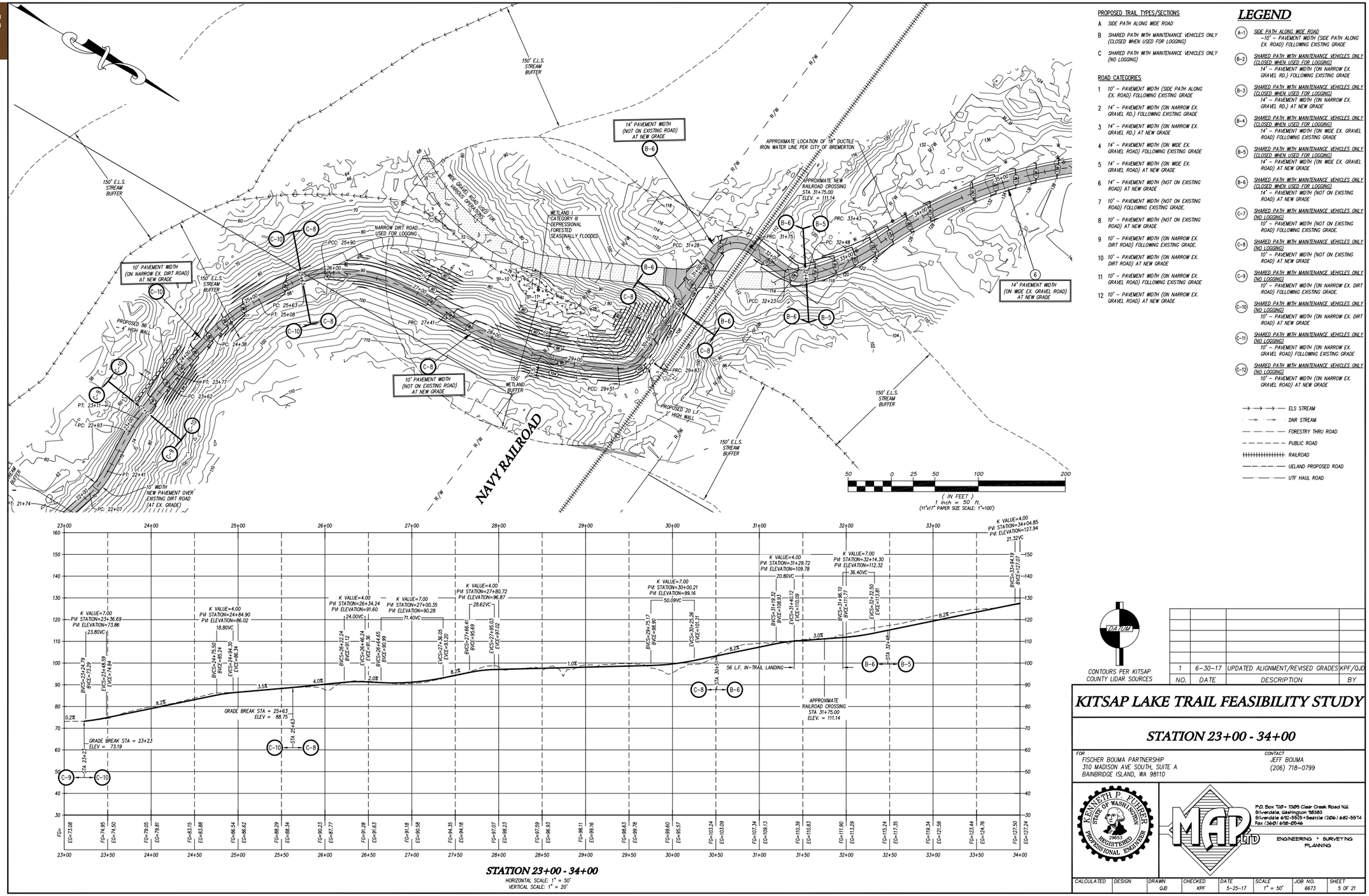

Figure 2AF: Engineering Plan and Profile Example

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FINDINGS & RECOMMENDATIONS

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A

Figure 3A: Shared-Use Trail in Western Washington

CHAPTER 3: FINDINGS AND RECOMMENDATIONS

Chapter 3 summarizes the preferred trail alignment and highlights the opportunities and constraints associated with the alignment. Conceptual construction methods and materials are introduced including a discussion of the standard trail cross sections. A summary of the probable project costs, including construction costs and soft costs, such as design and engineering, are included at the end of the chapter.

3.1 Preferred Alignment

The following section summarizes the preferred alignment and highlights some of the opportunities and constraints of the alignment. Refer to Figure 3B for a graphic of the alignment.

The Numbers (Preferred Alignment)

On-grade Asphalt Trail (10’ width):	11,701 LF	2.22 Mi.
On-grade Asphalt Trail (14’ width):	4,949 LF	0.94 Mi.
Bridge over Heins Creek:	50’ Span	
Total Trail Length:	**16,700 LF**	**3.16 Mi.**

Thirty-seven percent (37%) of the trail is within County limits and sixty-three percent (63%) is within City limits.

Seventy one percent (71%) of the trail will be under 5% in grade. Twenty-nine (29%) of the 3.16 mile trail will be between 5% and 8.3% in grade. None of the trail will be over 8.33%.

Segment Descriptions

The following describes each of the distinct segments of trail from south to north.

1 - Jarstad Park to Settling Ponds

Starting from West Belfair Way, the trail will enter the park adjacent to the entry road. Instead of following the road it will be located in the flat lawn area north of the road along the toe of the slope. The south trailhead will be located within the park. This segment of trail is very flat. This trail segment will be Type C- 10’ wide. It will not be placed on an existing roadbed but be new construction. This segment is approximately 1,100 linear feet (0.21 miles). There will not be a need for periodic closures during logging as this will only accommodate maintenance vehicles. All of this segment is on City property.

2 - Settling Ponds to Main City Access Road (near RR Xing)

Leaving Jarstad Park the trail crosses Jarstad Creek and begins to climb up the ridge until it intersects the City’s main access gravel road just below the Navy railroad crossing. This trail segment will be Type C- 10’ wide. Most will be placed on an existing roadbed that is in poor condition. The last 500 linear feet will be located off the road to the north and cross the City’s gravel road just south of the Navy railroad crossing. The grade on this segment will primarily be under 5% but there will be three sections less than 150 LF each that are up to 8% slope. This segment is approximately 1,900 linear feet (0.36 miles). There will not be a need for periodic closures during logging as this trail will only accommodate maintenance vehicles. All of this segment is on City property.

3 - Main City Access Road to Road 2200 Cutoff

This segment primarily runs on the City’s main access gravel road from the Navy railroad crossing to where Road 2200 splits off from the road. This trail segment will be Type B- 14’ wide. It will be placed on an existing roadbed that is in good condition. The grade on this segment approaches 5% much of the way and there are seven sections up to 8% slope, each of which is between 100 and 200 LF. This segment is approximately 1,500 linear feet (0.28 miles). There will be a need for periodic closures during logging activities as this is the City’s main access into their timber properties. All of this segment is on City property.

4 - Road 2200 Cutoff to Lake or Ridge Segments

This segment runs along Road 2000 from the Road 2200 cutoff, past the Road 3000 cutoff, along the Navy railroad tracks (and within their ROW), across Heins Creek on a new bridge, and to the cutoff road to the lakes. This trail segment will be Type C- 10’ wide. It will be placed on an existing roadbed that is mostly in good condition. A new bridge will be required over Heins Creek. There is one section that is over 5% and up to 8% slope, up to 199 LF in length. This segment is approximately 3,100 linear feet (0.59 miles). There will not be a need for periodic closures during logging as this

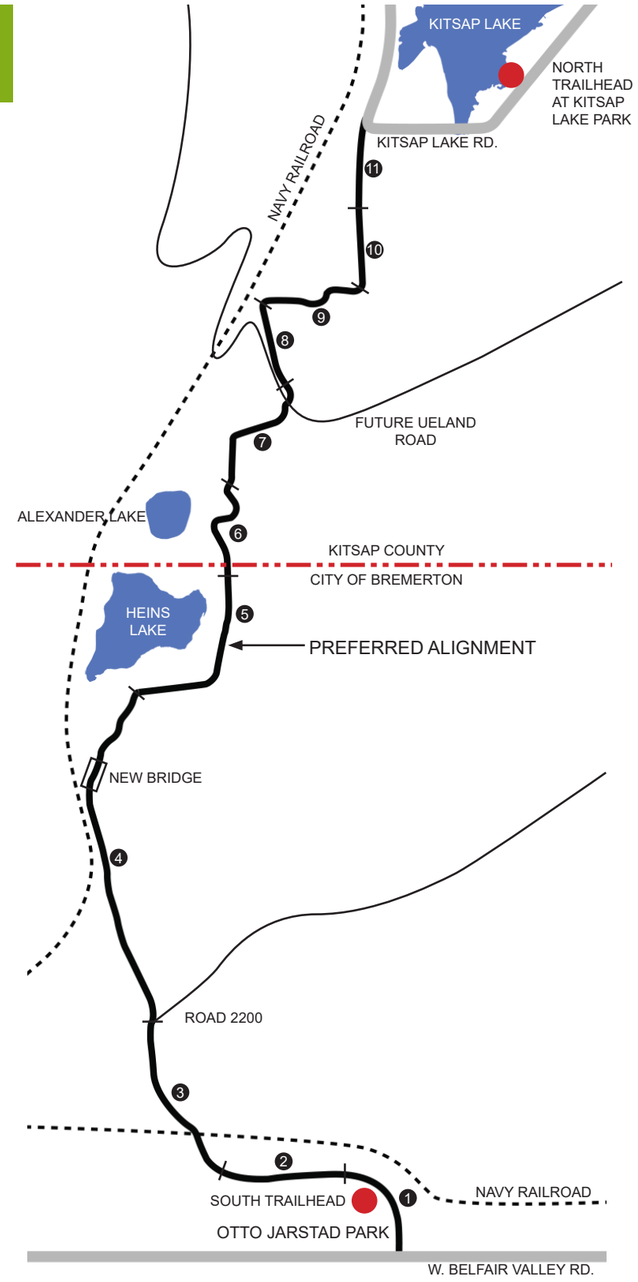


Figure 3B: Preferred Alignment

trail will only accommodate maintenance vehicles. Most of this segment is on City property. A portion of the trail south of the bridge over Heins creek will run adjacent to the Navy railroad and within the ROW, requiring an easement from the Navy. Safety and security are of the greatest concern to the Navy. Fencing and signage will need to be considered during the design process. An estimated 1,000 linear feet of chain link fence is recommended where the trail and Navy tracks run adjacent to each other. An upgraded rail crossing per Universal Traffic Control (UTC) and/or American Railway Engineering and Maintenance-of-Way Association (AREMA) or applicable design will need to be included in this segment.

5 - Ridge Route

This segment splits off from the lake side route originally considered and goes up the hill on an existing road, ending on the transmission line road where the new trail segment starts. This segment contains the highest point of elevation along the trail. This trail segment will be Type C- 10' wide. It will be placed on an existing roadbed that is mostly in good condition. There are nine sections that are over 5% and up to 8% slope, up to 199 LF in length. This segment is approximately 3,800 linear feet (0.72 miles). There will not be a need for periodic closures during logging as this trail will only accommodate maintenance vehicles. All of this segment is on City property.

6 - New Path Segment to Upper Lake Cutoff

This segment does not utilize an existing roadbed. It is located in young forest east of the road along the lakes and west of the 8" high pressure natural gas transmission line. This segment was identified over the course of several field visits and the general route was located with GPS prior to preliminary engineering. This trail segment will be Type C- 10' wide. It will not be placed on an existing roadbed but be new construction. The grade on this segment will primarily be under 5% but there will be a one section of less than 200 LF that is up to 8% slope. This segment is approximately 1,400 linear feet (0.27 miles). There will not be a need for periodic closures during logging as this trail will only accommodate maintenance vehicles. The boundary between City lands and Ueland property exists along this segment.

7 - Upper Lake Cutoff to Ueland Development Road

This segment runs north along the natural gas transmission line road on Ueland property. The trail then turns east and runs under the powerlines before turning north again and running adjacent to the powerlines. This trail segment will be Type B- 14' wide. It will be placed on an existing roadbed that is in medium condition. Some portions are overgrown with grass and rarely used while others have recently been cut in for timber harvesting. The grade on this segment will primarily be under 5% but there will be a four sections, less than 200 LF each, that are up to 8% slope. This segment is approximately 1,500 linear feet (.27 miles). There will be a need for periodic closures during logging activities as this is Ueland's main access into their timber properties. All of this segment is on Ueland property.

8 - Along Ueland Development Road

This segment of trail may run along a private development road that Ueland is proposing. This proposed road is shown in Figure 3B. The design of the road has not yet occurred so it is unclear if the new road will utilize the existing roadbed or not. For purposes of this study, we are assuming a separated trail that will not be located on the existing roadbed. If this is the case, up to 800 linear feet of the trail would be Type A - 10' wide. This segment is all under 5% slope. This segment is approximately 700 linear feet (0.13 miles). There will not be a need for periodic closures during logging as this trail will only accommodate maintenance vehicles. All of this segment is on Ueland property.

9 - Ueland Development Road to Ueland Quarry Road

From the Ueland development road, the trail will need to cross the Ueland development road. This segment then turns back to the east and ends at the wide gravel road Ueland uses to access the quarry. This trail segment will be Type B- 14' wide. It will be placed on an existing roadbed that is in medium condition, having recently been cut in for timber harvesting. The grade on this segment will primarily be under 5% but there will be three sections, each less than 200 LF, that are up to 8% slope. This segment is approximately 1,350 linear feet (0.26 miles). There will be a need for periodic closures during logging activities as this is Ueland's main access into their timber properties. All of this segment is on Ueland property.

10 - Along Ueland Quarry Road to W. Reba Way

This segment will parallel, on the west side, the wide gravel road Ueland uses to access the quarry. This trail segment will be Type C- 10' wide. It will not be placed on an existing roadbed but be new construction adjacent to the existing road. The grade on this segment is all well under 5%. This segment is approximately 900 linear feet (0.17 miles). There will not be a need for periodic closures during logging. All of this segment is on Ueland property.

11 - W. Reba Way to Kitsap Lake Road

This segment will parallel, on the west side, Archie Way NW, a narrow paved road. This trail segment will be Type C- 10' wide. It will not be placed on an existing roadbed but be new construction adjacent to the existing road. The trail will be located within the ROW of the road and cross several private driveways. The grade on this segment is all well under 5%. This segment is approximately 800 linear feet (0.15 miles). There will not be a need for periodic closures during logging. This segment is within the ROW of a County owned road.

Regional Trail Connections

One goal of the County's transportation planning has been the identification and implementation of a north to south non-motorized corridor that would link the south end communities of Port Orchard and Belfair with the north end communities of Silverdale and North Kitsap. Specifically, this route would connect two regional priority bike routes (Old Belfair Highway and Chico Way) and avoided safety issues along busy Highway 3. The following paragraphs discuss the north and south end connections of this study's preferred route into this regional trail network.

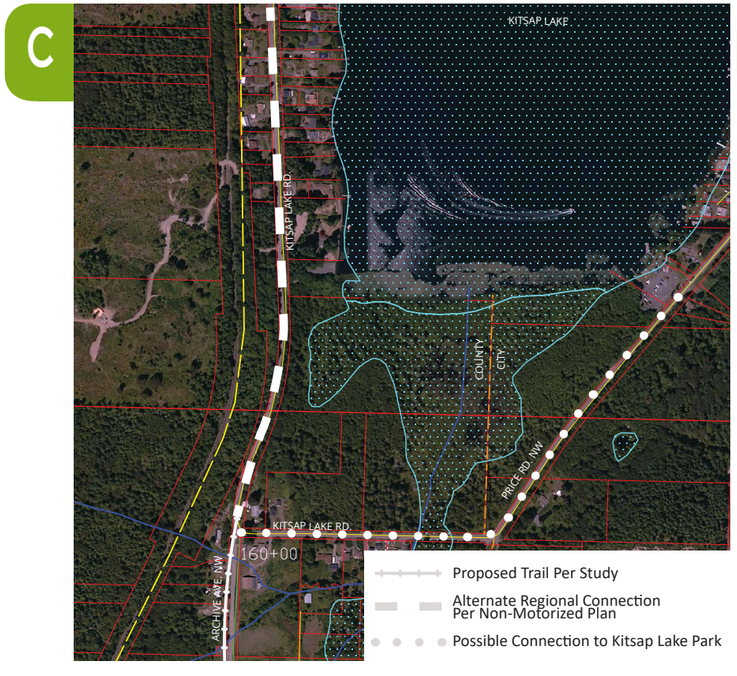


Figure 3C: North End Connection

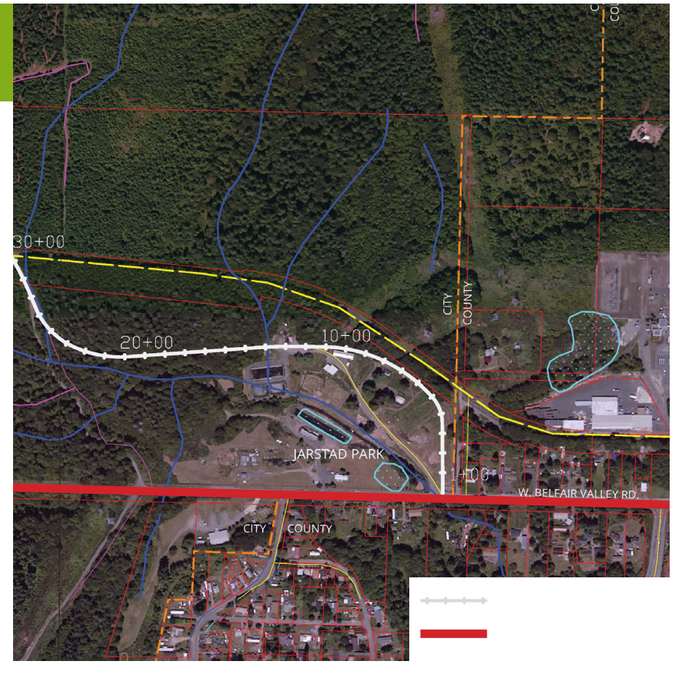


Figure 3D: South End Connection

North

The north end of the trail in this study will connect into Kitsap Lake Road at Archie Avenue NW. From there, roads run north on either side of Kitsap Lake. On the east side, Price Road NW connects to Kitsap Lake Park and Chico Way and Bike Route 31. On the west side, Kitsap Lake Road also connects to Chico Way to the north. The access along the west side has been designated as a alternate regional connection per the County's non-motorized plan although implementation of improvements has not yet occurred along the route up to Chico Way.

South

The south end of the trail in this study will connect to West Belfair Valley Road at Otto Jarstad Park. Following this road to the west and south will connect users to Mason County. Following this road to the east will connect users to the Highway 3 corridor around Sinclair Inlet to Port Orchard.

The current 4-acre park is actually owned and managed by the City of Bremerton's Department of Public Works and Utilties, not the City's Park Department. It is typically closed with a locked gate across the road. It is available for public use on a reservation basis. It contains parking, restrooms, a picnic shelter and other recreation amenities. The parking lot has a gravel surface and is approximately 60' wide by 140' long.

E

	EXISTING					PROPOSED								
PREFERRED TRAIL ALIGNMENT SEGMENT STATIONS*	TRAIL ON EXISTING ROADBED?	EXISTING ROAD CATEGORY**	EXISTING ROAD CONDITION***	EXISTING WIDTH	EXISTING USERS	PROPOSED TRAIL TYPE/SECTION	PROPOSED PAVED WIDTH	OWNERSHIP	PROPOSED BIKE SPEED LIMIT	MAINT. VEHICLES (Daily, Weekly, Monthly)	LOGGING TRUCKS (years)	BICYCLE	PEDESTRIANS	NOTES
0-11+00	N	6	Poor	Doesn't exist	n/a	C	10'	City	18 mph	Never	Never	Y	Y	New road separated trail through lawn area
11+00-25+00	Y	5	Poor	10	City maintenance	C	10'	City	18 mph	Never	Never	Y	Y	
25+00-44+00	Y	2	Good	14	City logging/maintenance	B	14'	City	18 mph	Daily	TBD	Y	Y	Railroad crossing at 28+00, Trail closes during logging activities
44+00-97+00	Y	3	Good	13	City logging/maintenance	B	12'	City	18 mph	Weekly	TBD	Y	Y	New bridge required at 69+00
97+00-113+00	N	6	Poor	Doesn't exist	Doesn't exist	C	10'	City/Ueland	18 mph	Never	Never	Y	Y	
113+00-128+00	Y	4	Medium	12	Ueland operations	B	14'	Ueland	18 mph	Weekly	<5	Y	Y	Powerlines at 123+00
128+00-135+00	N	4	Poor	n/a	New Ueland road	A	10'	Ueland	18 mph	Weekly	n/a	Y	Y	New Ueland development road along this segment likely to use roadbed
135+00-149+00	Y	4	Medium	12	Ueland operations	B	14'	Ueland	18 mph	Weekly	<5	Y	Y	
149+00-157+00	N	2	Poor	20	Ueland operations	A	10'	Ueland	25 mph	Daily	<5	Y	Y	Trail will be separated from existing road Electrical poles on the east side of the road
157+00-166+00	N	1	Poor	18	Public road	A	18'	County	25 mph	Daily	<5	Y	Y	Trail will be separated from existing road Electrical poles on the east side of the road, enters Kitsap Lake Rd. at 159+00

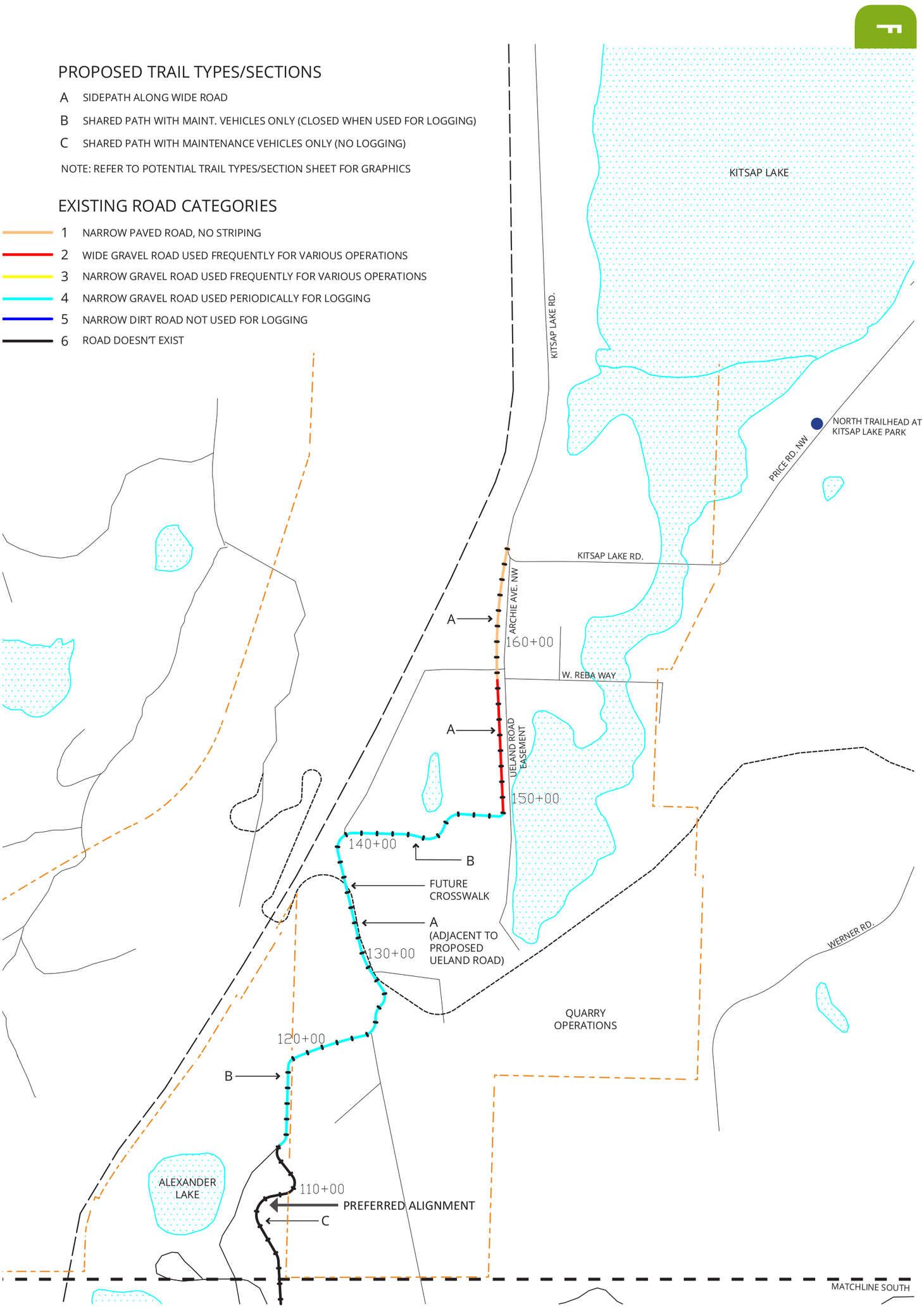
*NOTE: STATION POINTS IN TABLE & PLANNING MAPS MAY DIFFER SLIGHTLY FROM STATION POINTS IN PRELIMINARY ENGINEERING DRAWINGS.

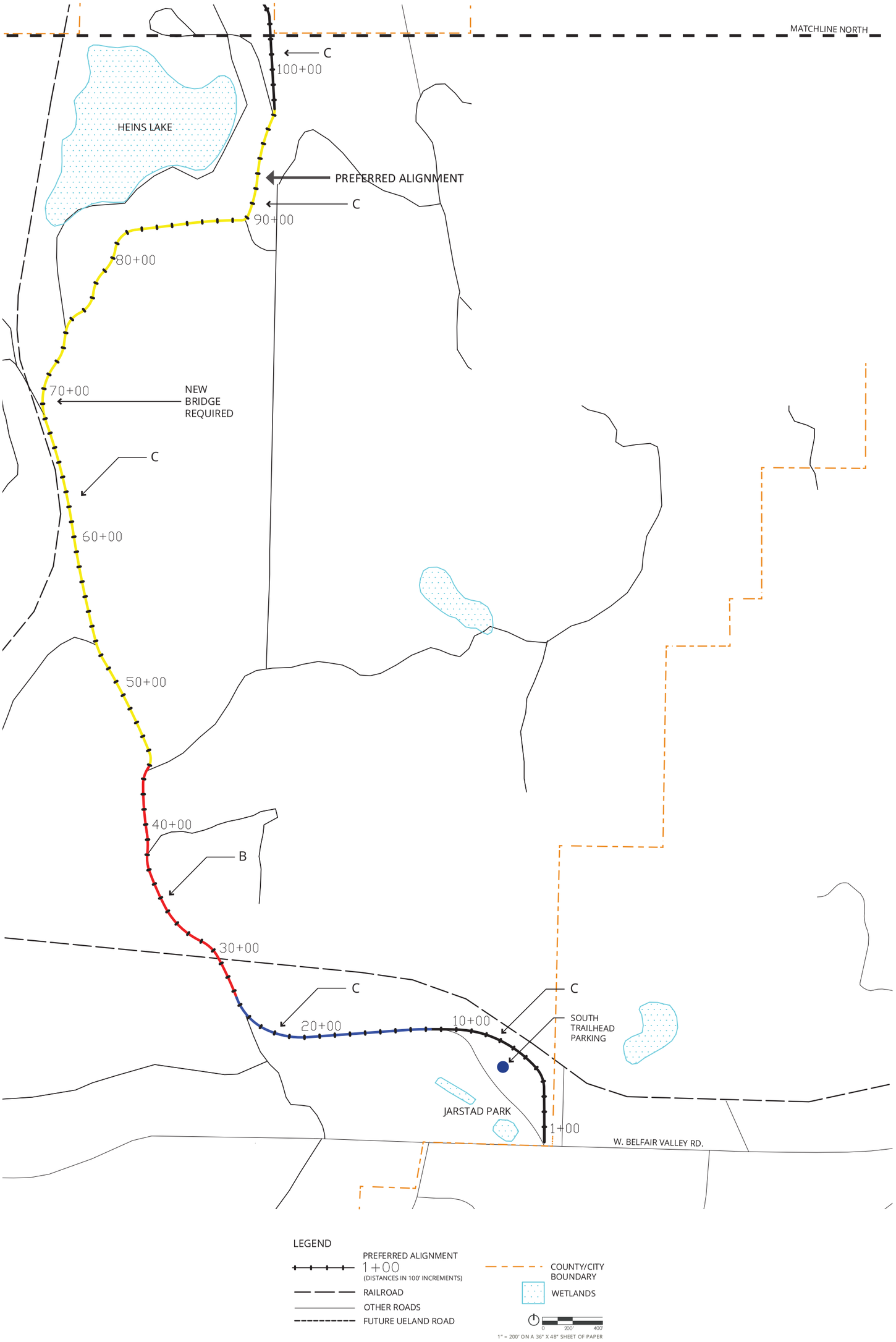
**EXISTING ROAD CATEGORY DESCRIPTIONS
1) Narrow paved road, no striping
2) Wide, gravel road used frequently for various operations
3) Narrow gravel road used frequently for various operations
4) Narrow, gravel road used periodically for logging activities
5) Narrow dirt road not used for logging activities
6) Doesn't currently exist

***EXISTING ROAD CONDITION DESCRIPTIONS
Good - Solid road base exists, little improvement prior to asphalt
Medium - Road base currently exists but regrading and more material needed prior to asphalt
Poor - No road base currently exists

Table 3E: Existing Road Analysis & Trail Opportunities

Existing Road Categories & Potential Trail Types/Sections




MATCHLINE NORTH
C
100+00
HEINS LAKE
PREFERRED ALIGNMENT
C
90+00
80+00
70+00
NEW
BRIDGE
REQUIRED
C
60+00
50+00
40+00
B
30+00
C
20+00
10+00
C
SOUTH
TRAILHEAD
PARKING
JARSTAD PARK
1+00
W. BELFAIR VALLEY RD.
LEGEND
PREFERRED ALIGNMENT
1+00
(DISTANCES IN 100' INCREMENTS)
RAILROAD
OTHER ROADS
FUTURE UELAND ROAD
COUNTY/CITY
BOUNDARY
WETLANDS
0
200'
400'
1" = 200' ON A 36" X 48" SHEET OF PAPER

3.2 Trail Types/Sections

During the course of the study, various trail sections applicable to site conditions were presented and discussed. Once site conditions were fully understood and a strategy developed for co-use of the trail for logging activities, three trail types (represented as sections) emerged as practical for the trail within the study area. These sections were used in the preliminary engineering of the trail and development of the cost estimate.

Type A - Sidepath Along Road

For roads where public use occurs or where the volume of traffic is frequent, the shared-use path will be located adjacent to the road with a 5 foot buffer as required by AASHTO standards. If this buffer is less than 5 feet then a physical barrier must be provided between the road and trail. The trail will be 10 feet wide in this case and have 2 foot minimum shoulders. The shoulders count as part of the 5 foot buffer, as does the curb if it exists. This trail will not be open for use to any vehicles, including maintenance or emergency vehicles as they will be able to access areas of the trail from the adjacent road. The area of disturbance outside of the trail would be between 17 and 21 feet depending on the width of the shoulders. Figure 3G on this page provides an image similar to this condition and Figure 3I on the following page provides a section of this condition.

Type B - Shared Path (14’ Width)

The Working Group determined that the existing road corridor should be used for the shared-use path as well whenever possible. It is currently used for logging activities and maintenance by both the City and Ueland. These roads are not open to the public and used infrequently. The shared use path would be constructed on top of the existing roadbed. Use of the shared-use path will be restricted during periodic logging operations. As such, the increased width (4 feet wider than the AASHTO minimum standard) is meant to accommodate the largest anticipated vehicle which is a logging truck. The wider path will minimize damage to the edges of the path. The area of disturbance outside of the trail would be between 18 and 26 feet depending on the width of the shoulders. Figure 3J on the following page provides a section of this condition.

Type C - Shared Path (10’ Width)

This is the same cross-section as Type B except that it is 10 feet wide instead of 14 feet wide. This trail section will be able to accommodate maintenance and the periodic emergency vehicles but not large logging trucks. The area of disturbance outside of the trail would be between 14 and 22 feet depending on the width of the shoulders. Figure 3H on this page provides an image similar to this condition and Figure 3K on the following page provides a section of this condition.

For a majority of the trail, these sections will be integrated with the existing roadbed. The roadbed conditions range from poor (dirt) to good (solid sub-base and gravel top course). Table 3E identifies the conditions of each of the roads. The cost estimate was generated based not only on the type/section being proposed but the condition of the existing roadbed upon which it would be built.

G

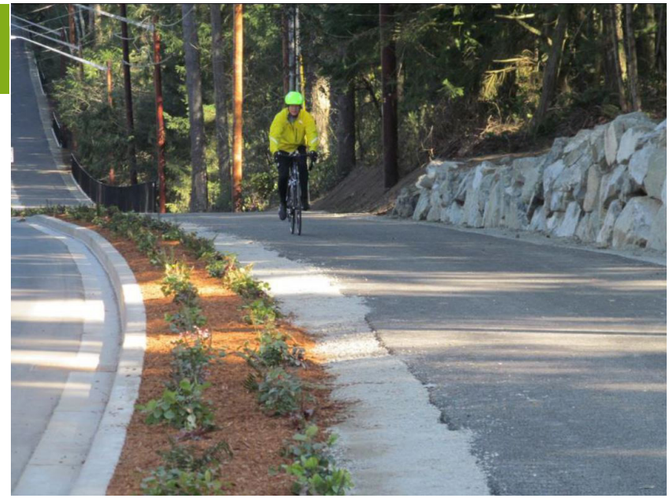


Figure 3G: Type A Trail Example

H

Figure 3H: Type C Trail Example

I

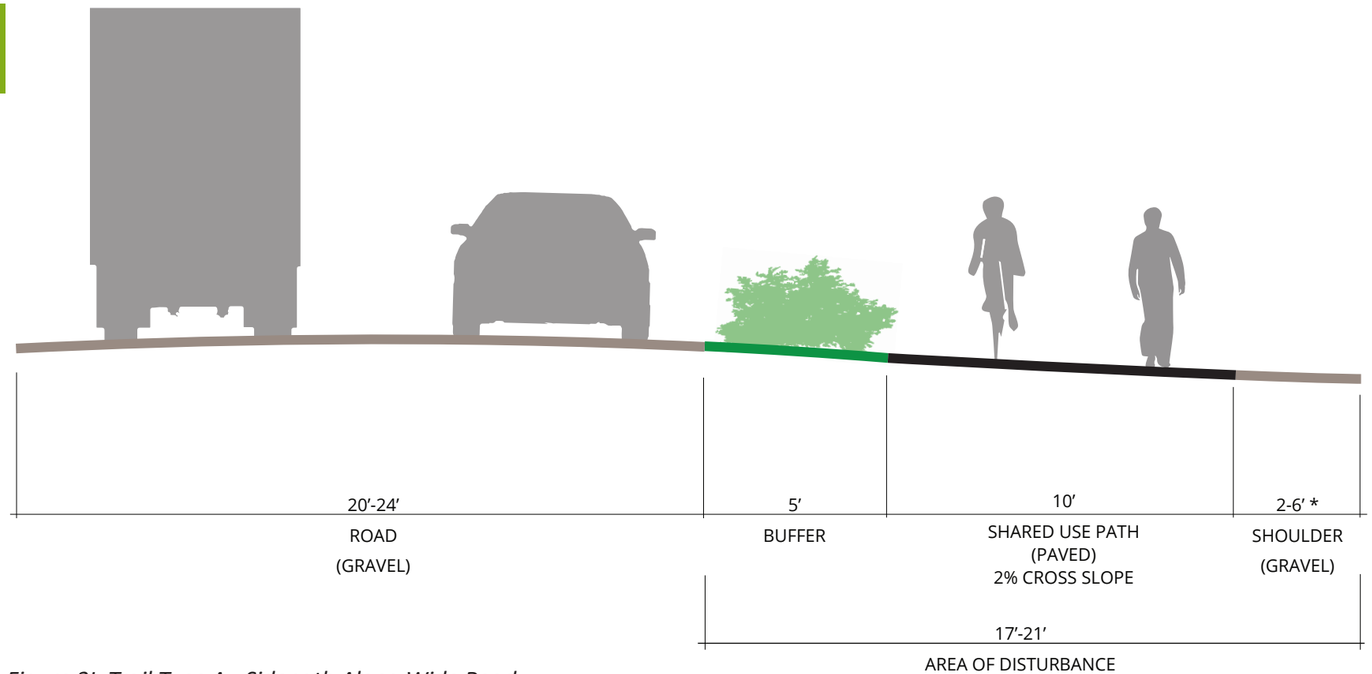


Figure 3I: Trail Type A - Sidepath Along Wide Road

J

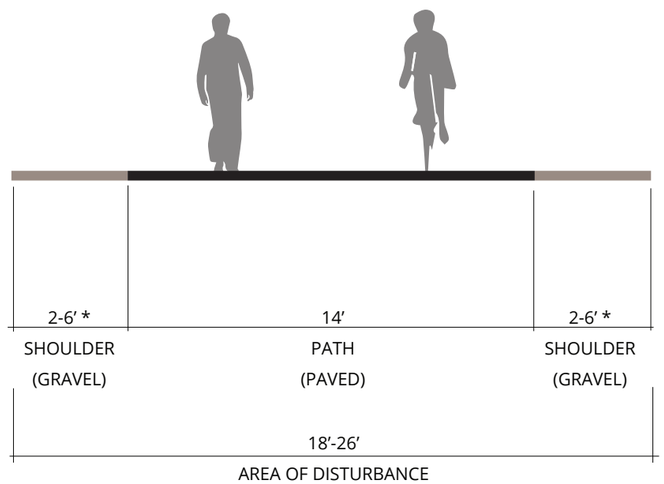


Figure 3J: Trail Type B - Shared Path (Closed When Used for Logging Activities)

K

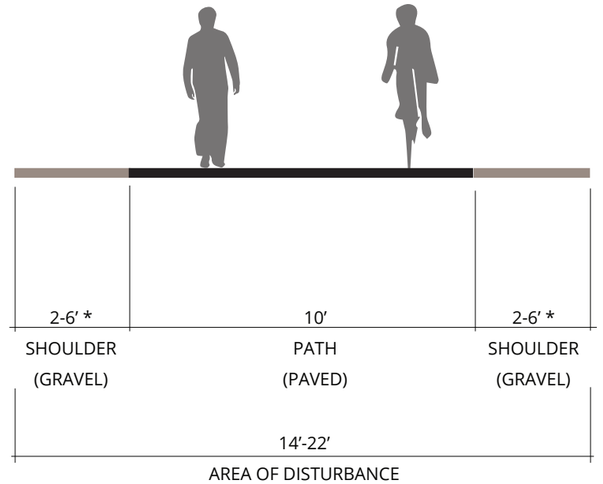


Figure 3K: Trail Type C- Shared Path (With Maintenance Vehicles Only)

3.3 Conceptual Construction Methods and Materials

Introduction

While the previous section described the alignment and site specific features along the preferred route, the following section describes in more detail construction methods, materials and other features that will be required to implement the trail and provide the whole user experience. A summary is provided for the element, method or material assumed to be best suited for the context of this particular project, which is reflected in the cost estimate. Additional methods or materials may also be discussed as a consideration by the County or design team during final engineering and implementation.

Typical Cross Sections

Standard Trail Cross Section

Figure 3L shows a typical shared-use path cross section where there is little cross slope. The dimensions are based on AASHTO standards and decisions by the County and consultant team during the design process. A summary narrative and table of the applicable AASHTO design standards was provided in Section 2.3 of the report. In this cross section, the paved trail is 10 foot wide with a 2% cross slope in the direction of the downhill side of the path. Gravel shoulders will be 2 feet wide on each side, except where the downhill slope exceeds 6:1 in which case the gravel shoulder on that side will be 5 feet wide. This cross section results in a disturbed width of 14 feet to 17 feet.

Cross Section on Steep Slope Without Retaining Walls

Figure 3M shows a shared-use path cross section where there is a significant cross slope without retaining walls. The dimensions are based on AASHTO standards and decisions by the County and consultant team during the design process. The implication of this cross section is that the width of potential disturbance can be up to 30 feet in width. A summary narrative and table of the applicable AASHTO design standards was provided in Section 2.3 of the report. In this cross section, the paved trail is 10 feet wide with a 2% cross slope in the direction of the downhill side of the path. Gravel shoulders will be 2 feet wide on each side, except where the downhill slope exceeds 6:1 in which case the gravel shoulder on that side will be 5 feet wide. This cross section results in a disturbed width of 25 feet to 30 feet based on having to accommodate the steep cross slopes and providing a 1V:2H slope on the uphill side of the trail. In addition, a rail may be required on the downhill side of the trail if the shoulder is less than 5 feet width and the side slope is 1V:3H or steeper with a drop of 6 feet, 1V:2H or steeper with a drop of 4 feet, or 1V:1H or steeper with a drop of 1 foot (AASHTO Section 5.2.1).

Trail Cross Section on Steep Slope With Retaining Walls

Figure 3N shows a shared-use path cross section where there is significant cross slope using retaining walls to minimize site disturbance on either side of the trail. The dimensions are based on AASHTO standards and decisions by the County and consultant team during the design process. A summary narrative and table of the applicable AASHTO design standards was provided in Section 2.3 of the report. In this cross section, the paved trail is 10 feet wide with a 2% cross slope in the direction of the downhill side of the path. Gravel shoulders will be 2 feet wide on each side. This cross section results in a disturbed width of only 20 feet compared to 25 feet to 30 feet when retaining walls are not used. A rail is required on the downhill side of the trail.

Each of the three previous scenarios, which are based on a Type C trail (10’ width) as described in the prior section, are also applicable to the Type B trail (14’ width). In this latter case, the width of potential disturbance is simply increased by 4 feet.

Criteria for Engineering Modeling Using Retaining Walls

There is usually a trade-off between cost and impact to habitat that is considered when determining where to use each one of these two sections (wall versus no wall). The engineering modeling software that was discussed previously in Section 2 had to be told which areas to constrain with retaining walls and which areas did not need to be constrained. It was determined to only use retaining walls when it would result in less cost, meaning less cut and fill would be required relative to the cost of the wall. Very few walls resulted from the modeling and engineering as a result of this criteria. Since much of the project area will be logged in the future, preserving adjacent forest was determined as less critical.

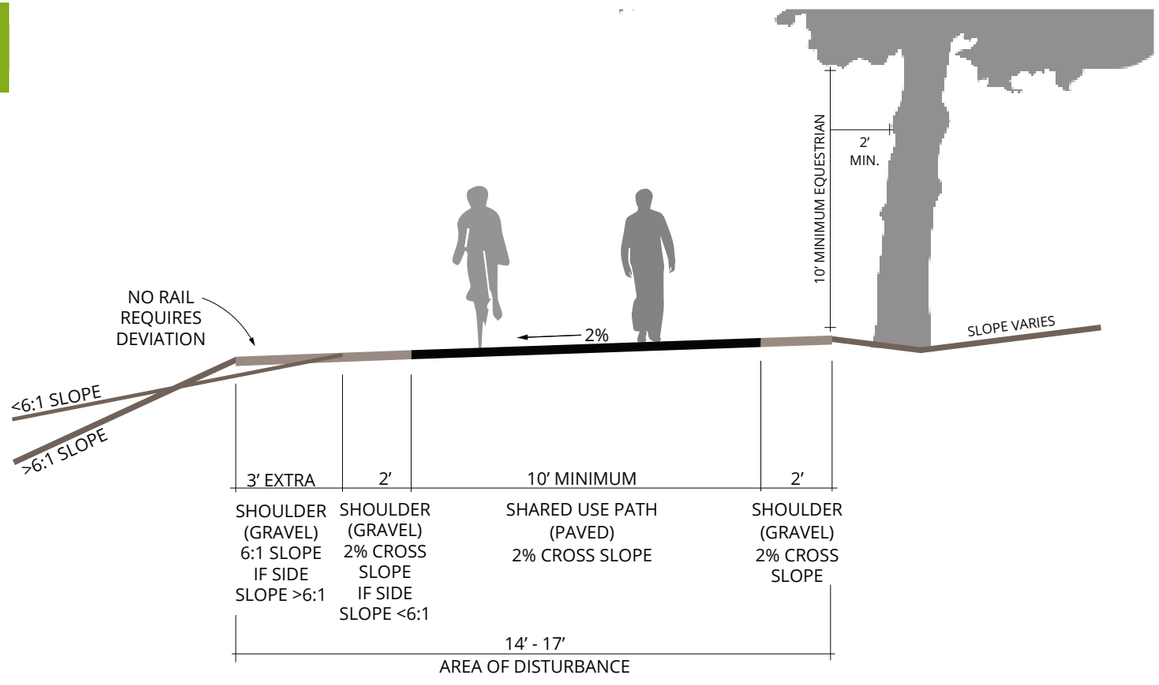


Figure 3L: Trail Type D - Typical on Minimal Cross-slope

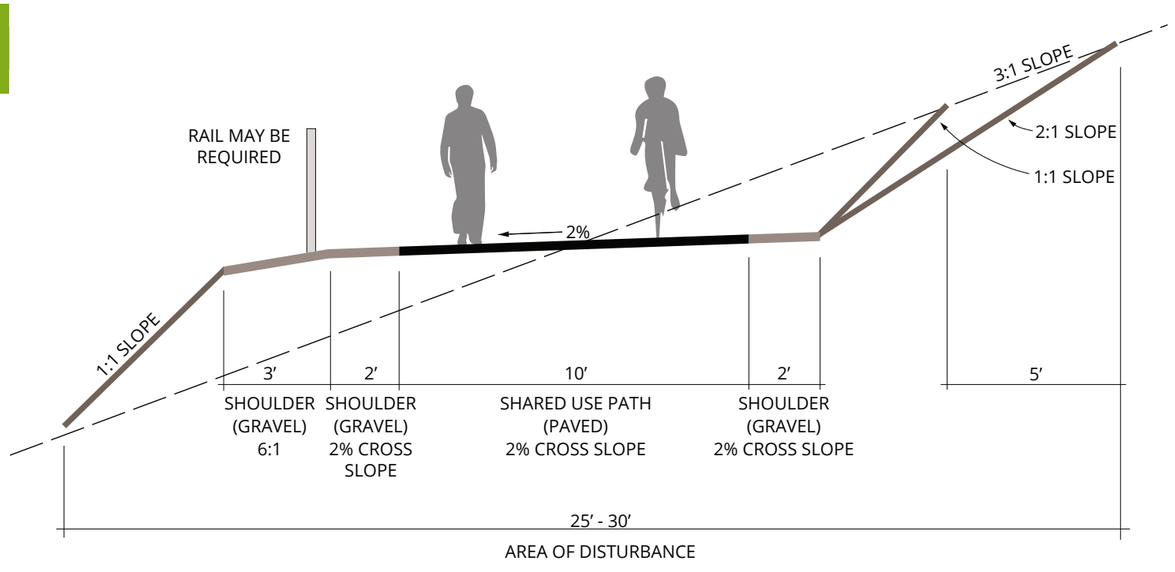


Figure 3M: Trail Type E - Typical on 3:1 Cross-slope with No Walls

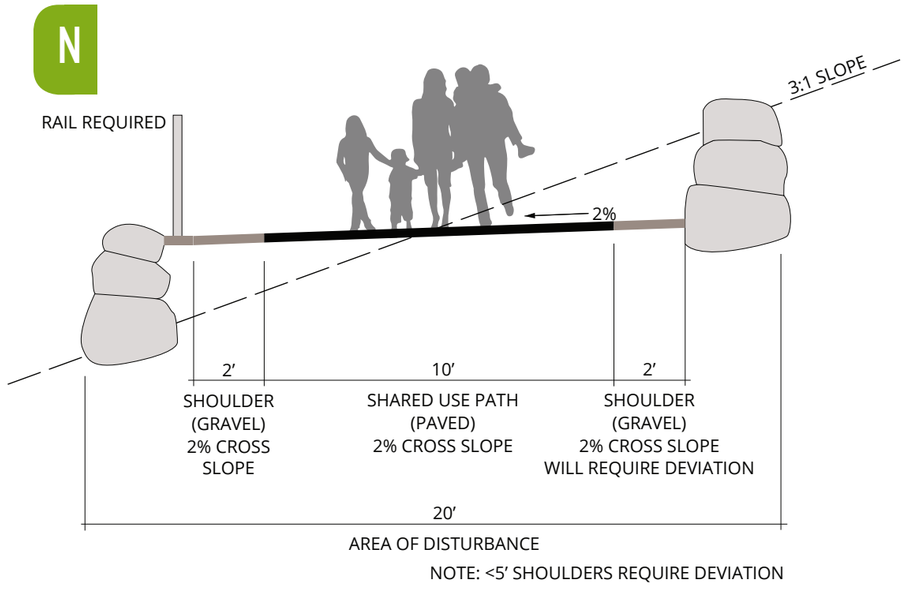


Figure 3N: Trail Type F -Typical on 3:1 Cross-slope with Walls

O

Figure 3O: Typical Asphalt Pavement Surfacing

Trail Surfacing

For the purpose of this feasibility study, we have assumed that asphalt would be used as the pavement surface. Asphalt is easier to install and less expensive. However, asphalt is less durable than concrete with a life expectancy of 15-20 years. Asphalt requires more interim maintenance than concrete. The location of this path in a forest may make the asphalt path susceptible to heave from root growth beneath. Concrete has a higher installation cost but has a longer service life and reduced susceptibility to cracking and heaving from roots. For purpose of developing the cost estimate, the asphalt depth is assume to be 2 inch with a base course aggregate of 6 inch depth. Gravel shoulders would be 4" depth over compacted subgrade. This is the assumed pavement section for all trail/road types- whether used by logging trucks or not.

P

Figure 3P: Sketch of Trail Pullout

In-trail Landings

Several segments of the trail will have a grade over 5% but under the maximum 8.3% (1:12). There are no segments of trail over 8.3%. As such, FHWA standards require that a landing be provided every 200 linear feet along these steeper segments. These landings need to be level (2% cross slope) and under 5% in running slope. There are no pull-outs proposed along the trail as mitigation for steep slopes as there are no trail segments between 5% and 8.3% greater than 199 feet in length. There are instances where segments of steep slope (between 5% and 8.3%) occur back to back with a short segment of gentle (<5%) slope between them. For user enjoyment and convenience, we may want to consider pull-outs or viewpoints in these locations.

Q

Figure 3Q: Example of Trail Crossing

Road Crossings

A majority of the proposed trail would also be used periodically for logging activity access. The trail would be closed to users at that time. This trail system does not currently cross any public roads; however, Ueland has been planning a residential development and it is likely the proposed trail would need to cross the main road servicing that development, if and when it becomes a reality. Also, there is frequent use by large gravel trucks coming and going from the nearby quarry. Crossing the gravel road to access the north trailhead parking area will be necessary. For the purpose of this study and cost estimate, an activated warning crossing (such as flashing lights within the crosswalk surface) is assumed to be the minimum that would be installed for safety. Guidance on the need for a signal and other traffic control devices is provided in the MUTCD and FHWA sources.

R

Figure 3R: Nearby Bridge

S

Figure 3S: Example of Trailhead Parking

T

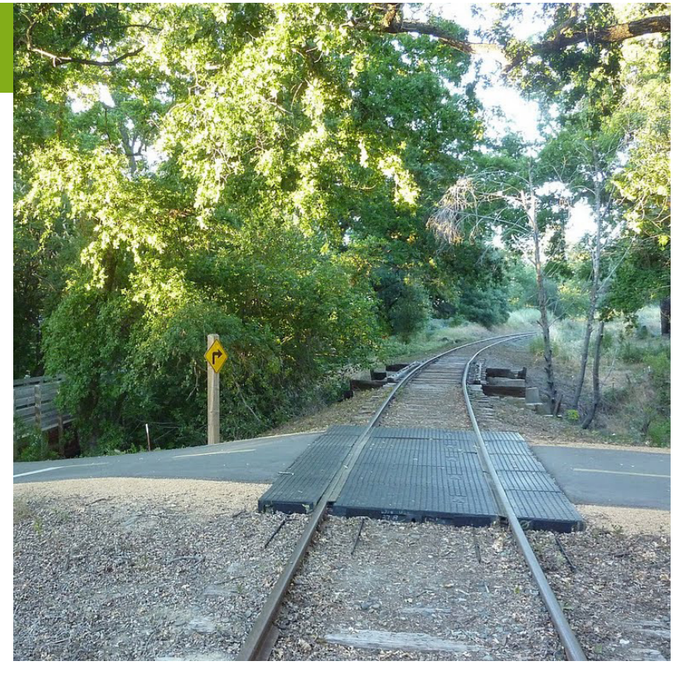


Figure 3T: Example of a Rubber Surface Railroad Crossing

Bridges & Culverts

One 50-foot minimum span bridge over Heins Creek will be required. It would be similar to other bridges (shown in Figure 3R) installed on the creek by the City. The bridge would need to be wide enough to accommodate service trucks in this location, not logging trucks. Decking on the bridge would be paved similar to the adjacent trail. This bridge including abutments will require design and engineering.

The preliminary engineering plans identify the need for six new culverts. These occur where the existing road is being significantly regraded or where new roads Several other culverts already exist under existing roads and are not included in the estimate for replacement.

Trailheads and Parking

A trailhead would be located at the south end of the trail at Jarstad Park. Jarstad Park is currently owned by the Water Utility, is open by reservation only and gated most of the time. If this is to be the trailhead, there may be a transfer of ownership required; however, City Parks currently has limited resources to manage or maintain it. The trailhead could take advantage of existing parking and restroom facilities, although upgrades would be needed to the facilities. For the purpose of the cost estimate, only a kiosk has been included. It is understood that additional funds will be needed to upgrade the parking and restrooms.

Parking at the north end of the trail may be available at Kitsap Lake City Park on the southeast side of the lake and the Navy park on the west side of the lake. Both locations have restrooms. Access to the proposed trail from each of these facilities on the north end would require a short ride on road and/or road shoulder. Locations are shown on the planning maps such as Figure J. For purposes of cost estimating, only a small kiosk is included in the budget.

Railroad Crossing

Guidance is provided in AASHTO's Guide for the Development of Bicycle Facilities (2012, Fourth Edition) Section 4.12. The crossing angle should be between 60 and 90 degrees. Crossing surface can be concrete, rubber, asphalt or timber. Appropriate signage, per MUTCD Part 9, should be included for user safety. Traffic signals or crossing signals are not expected to be required for this low volume rail and trail crossing.

U

Figure 3U: Example of Trailhead Kiosk

V

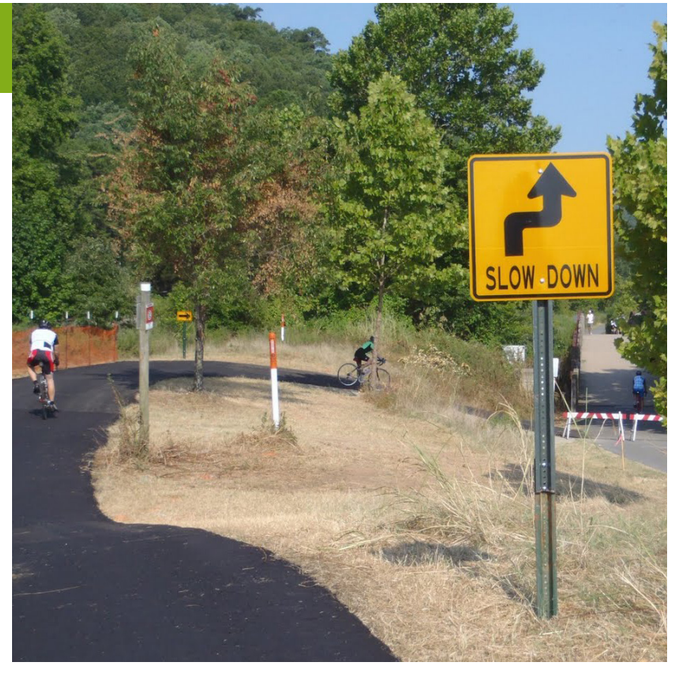


Figure 3V: Typical Regulatory Sign Along Trail

W

Figure 3W: Example of Wayfinding Sign Along Trail

Signage

Signs play an important role in the safety and enjoyment of a shared-use path. In a beautiful natural setting such as this, care should be taken not to install too many signs that could detract from the rural feel of the place. Three types of signs, described below, are required or would be appropriate for this section of path. They include regulatory signs, wayfinding signs and interpretation and education signs. Guidance is provided in AASHTO's Guide for the Development of Bicycle Facilities (2012, Fourth Edition).

Regulatory and Warning Signage

Regulatory and warning signs will be according to the MUTCD Part 9 which regulates the design and use of all traffic control devices. Regulatory signs, such as speed limit, yield, stop and others should be retroreflective and conform to the color, legend, and shaped requirements described in the MUTCD. Signs along the path may be reduced in size per Table 9B-1 of the MUTCD. Use of signs for shared-use paths are summarized in AASHTO Section 5.4.2. Regulatory signs have been included in the cost estimate.

Wayfinding Signage

Wayfinding is the process of navigating through a built or natural landscape whether familiar or unfamiliar, using information as provided. People navigate the environment based on a variety of queues; signage is only a portion of the information the user relies on to navigate the world. By thoughtfully designing and strategically locating wayfinding elements, confusion can be eliminated, thereby enhancing the use experience. Wayfinding signs should be:

- Simple and unobtrusive, not distracting from the user's experience
- Easy to find and comprehend
- Located primarily at intersections or decision points along pathways

X

Figure 3X: Typical Interpretive Sign Along Trail

Interpretation & Education (I & E) Signage

Interpretation provides an explanation or perspective to an experience. Interpretive signs should make visible and available any information that is not obvious while also emphasizing connections and patterns. The natural environment of the site and the timber production that occurs there provides several opportunities to educate the public and interpret the world around them. It is recommended that several interpretive signs be placed along this trail segment. A recreation signage plan for the trail system within Kitsap County is recommended to provide a consistent messaging and similar environmental graphics such as materials, colors, fonts, icons among all wayfinding and interpretive signs. This latter recommendation is not reflected in the cost estimate, although the design, fabrication and installation of interpretive signs for this segment of trail is included.

Y

Figure 3Y: Example of a Trail Overlook

Overlooks

Signs play an important role in the safety and enjoyment of a shared-use path. In a beautiful natural setting such as this, care should be taken not to install too many signs that could detract from the rural feel of the place. Three types of signs, described below, are required or would be appropriate for this section of path. They include regulatory signs, wayfinding signs and interpretation and education signs.

Z

Figure 3Z: Example of Equestrian Trail Use

Equestrian Use

The assumption is that the shoulders of trail could be used by horses. AASHTO recommends a separated trail as a paved shared-use trail that accommodates bicyclists isn't ideal for horses. However, planning for a separated equestrian trail was beyond the scope of this project. Equestrian use would not be prohibited on the trail.

A A

Figure AA: Example of Rockery Retaining Wall

Retaining Walls

Retaining walls along the trail were assumed, for the purposes of planning and costing, to be basalt fabric-tieback rockery in “fill” conditions or gravity wall in “cut” conditions. The rockeries proposed are less than four feet in height.

A B

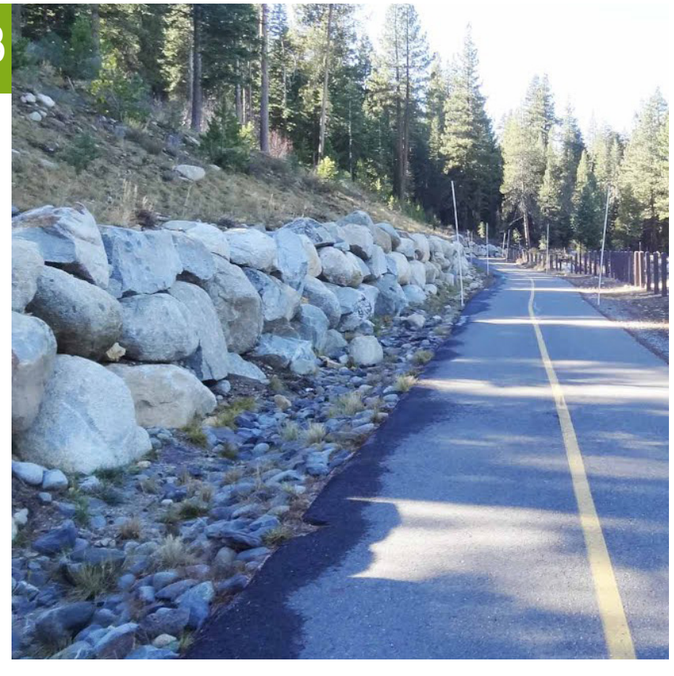


Figure AB: Example of Trail Drainage

Drainage

Cross slopes of the paved path section are recommended at 2% and will drain to the downhill side of the path to minimize ditches and other conveyance features on the uphill side of the path. The general strategy for this rural trail segment is to use dispersed drainage strategies. Where the path is constructed on the side of a slope that has considerable runoff, a ditch of suitable dimensions will be placed on the uphill side of the path to intercept the slope’s drainage. For purposes of the cost estimate, it was assumed that storm water would be concentrated only where necessary and that sheetflow through native vegetation would occur per BMPs T5.11 and T5.12.

AC

Figure 3AC: Paved Trail Construction

3.4 Summary of Estimates of Probable Costs

Project costs are estimated in 2018 dollars and consist of both soft costs, such as design, engineering and construction management and hard costs, which are the construction costs. For the preferred alternative, the overall project cost for a 3.16 mile shared-use path meeting federal and state standards in the study area is estimated at $3,904,907, which includes a 20% contingency of $650,818. The overall cost includes $2,889,717 in construction costs and $1,015,190 in soft costs (35% of construction cost).

The cost for the preferred alternative is approximately $234 per linear foot for the length of the 16,700 foot long trail. No land acquisition costs are anticipated or included in the estimate. There will be costs associated with obtaining easements from the Navy for trail use in two different sections of railroad ROW. These are included in the estimate. The trail would be funded by and through the efforts of each of the land owning jurisdictions. Cost inflation will be significant by the time the project is implemented, likely 10 to 20 years from now. Costs will be updated as needed at major planning and design milestones as needed for decision making and funding. Quantities of several items were generated within the SiteOps engineering modeling program and costs were based on inputted unit costs from MAP. Other costs were generated based on comparable construction costs.

Soft Costs

Soft costs are non-construction related costs and for this estimate are 35% of the construction cost and are 26% of the total project cost. They include:

- Engineer and Consultant Design Fees
- Owner Consultants – Survey, Geotechnical, Other
- Washington State Sales Tax
- Testing and Inspection
- Easements (Navy Railroad)
- Permits
- Construction Administration Management
- Construction Contingency

Hard Costs

Hard costs are construction costs. Construction costs account for 35% of the total project cost. For this shared-use path, the following construction costs are the most significant:

- Site Clearing
- Grading- Cut and Fill
- Retaining Walls
- Asphalt Paving including Gravel Base Course
- Revegetation
- Erosion Control
- Bridge
- Crosswalk
- Drainage & Culverts
- Signs
- Parking

AD

CONSTRUCTION COSTS (Hard Costs)

ON-SITE PREPARATION						
Work Activity	**QUANTITY**	**UNIT**	**UNIT COST**	**SUBTOTAL**	**TOTAL**	**NOTES**
Site Clearing						
Clearing	7.20	AC	$10,400.00	$74,880		
Total Site Clearing				$74,880	$74,880	Quantities and costs per MAP
Grading Cut						
Earth Cut	9,100	CY	$15.60	$141,960		
Total Grading Cut				$141,960	$141,960	Quantities and costs per MAP
Grading Fill						
Earth Fill	6,870	CY	$26.00	$178,620		
Total Grading Fill				$178,620	$178,620	Quantities and costs per MAP
Grading Export						
Earth Export	4,300	CY	$26.00	$111,800		
Total Grading Export				$111,800	$111,800	Quantities and costs per MAP
Retaining Wall	1,660	SF	$39.00		$64,740	Quantities and costs per MAP
Other Preparation						
Fine Grading Sub-Grade Prep	20,615	SY	$4.16	$85,758		
Erosion Control	12.5	AC	$4,160.00	$52,000		
Seeding/Slope Stabilization	3.6	AC	$20,800.00	$74,880		
Total Other Preparation				$212,638	$212,638	Quantities and costs per MAP
TOTAL ON-SITE PREPARATION					**$784,638**	

Table 3AD: Summary of Cost Estimate for the Preferred Alternative

AE

ON-SITE IMPROVEMENTS						
Work Activity	**QUANTITY**	**UNIT**	**UNIT COST**	**SUBTOTAL**	**TOTAL**	**NOTES**
Paving - Trail Section						
Asphalt Paving - Trail on Existing Road	10,830	SY	$22.30	$241,509		2" CSTC and 2" HMA
Asphalt Paving - New Trail / Trail new graded road	9,800	SY	$23.55	$230,790		6" CSBC, 2" CSTC, and 2" HMA
CSTC Gravel Shoulders	2,310	Ton	$41.60	$96,096		
Total Paving - Asphalt				$568,395	$568,395	Quantities and costs per MAP
Bridges						
Bridge- Heins Creek- Steel Truss Delivered	1	LS	$52,000.00	$52,000		$1,000/LF for 12' width based on costs from Continental Bridge (CB), includes design fee
Abutments	2	LS	$7,800.00	$15,600		
Install + Crane	1	LS	$156,000.00	$156,000		Install cost is 2.5 times bridge + abutment cost per CB
Total Bridges				$223,600	$223,600	
Other On-Site Improvements						
140'x 60' Gravel Parking Area South End (Jarstand Park)	8,400	SF	$3.12	$26,208		
Trail Signage						
Regulatory Allowance	1	LS	$9,360.00	$9,360		Allowance
Wayfinding Allowance	1	LS	$7,800.00	$7,800		Allowance
Interpretive Allowance	1	LS	$15,600.00	$15,600		Allowance
Trailhead Kiosks	2	EA	$7,800.00	$15,600		Allowance
Railroad Crossing	1	EA	$12,480.00	$12,480		No crossing signal assumes, rubberized mat surface, easement costs below
Viewpoint or Overlook	1	EA	$10,400.00	$10,400		Includes paving (12' x 12' min), walls, clearing, grading, bench, fence
Crosswalk- at Ueland Development Road	1	LS	$520.00	$520		
Trail Storm Drainage	11,650	LF	$12.50	$145,625		Concentrated and Sheetflow Dispersion Through Native Vegetation per BMP's T5.11 and T5.12
Other Storm Drainage	1	LS	$52,000.00	$52,000		Miscellaneous culverts
Lower/Relocate City Watermain	200	LF	$208.00	$41,600		At Preferred Route/Lake Route intersection
Lighting	-	-	-	-		No lighting allowance included
Wetland Mitigation- per ELS report	1	LS	$379,600.00	$379,600		Cost per wetland mitigation report by ELS, worst case scenario for wetland and buffers
Total - Other On-Site Improvements				$716,793	$716,793	
TOTAL ON-SITE IMPROVEMENTS				**TOTAL**	**$1,508,788**	
Contractor Mobilization @ 5%	1	LS	$114,671.32	$114,671		Industry standard percentage
TOTAL Construction Costs (Hard Costs)				**TOTAL**	**$2,408,098**	
Construction Contingency - 20%					$481,620	
TOTAL Construction Costs with Contingency				**TOTAL**	**$2,889,717**	
DESIGN & CONSTRUCTION MANAGEMENT COSTS (Soft Costs)						
Engineering/Design Consultants 20%	1	LS	$440,019.54	$440,020		Excludes 20% of Bridge Cost - Design & Enginnering are included in cost
Construction Management 12%	1	LS	$288,971.73	$288,972		
Creation of Easements + MOUs with City & Ueland	1	LS	$21,000.00	$21,000		
Navy Easements, including filing fees	2	EA	$32,000.00	$64,000		Cost provided by Navy in Jan. 2017
Conditional Use, SEPA, SDAP Permitting Fees	1	LS	$32,000.00	$32,000		
TOTAL Design and Construction Management Costs (Soft Costs)				**TOTAL**	$845,991	
Design & Construction Management Contingency - 20%					$169,198	
TOTAL Design and Construction Management Costs with Contingency				**TOTAL**	**$1,015,190**	
TOTAL PROJECT COSTS					**$3,254,089**	
Design & Construction Management Contingency - 20%					$650,818	
TOTAL PROJECT COSTS WITH CONTINGENCY					**$3,904,907**	

Table 3AE: Summary of Cost Estimate for the Preferred Alternative

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IMPLEMENTATION AND NEXT STEPS

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A

Figure 4A: Riders along a shared-use path

CHAPTER 4: IMPLEMENTATION & NEXT STEPS

The study will be presented to the Kitsap County Commissioners and the Bremerton City Council. Construction funding will require a partnership between the County, City and state/federal grant sources. Implementation of this segment of trail will require ongoing cooperation between the County, City of Bremerton and Ueland. A specific maintenance, operations, management and security/ enforcement plan outlining strategy and responsibilities of each jurisdiction will be developed collaboratively closer to actual implementation. Memorandum of Understandings (MOU's) will need to be developed and negotiated to clearly define these funding, management and maintenance responsibilities. Specific easements will need to be defined and executed.

The preliminary plans in this document were developed using existing LIDAR topographic information provided by the County. The horizontal and vertical trail alignments are based on 2-foot contour intervals. Final engineering of the trail alignment will require a detailed land survey and additional field work. Land use and environmental permits, easements and construction permits will need to be acquired during detailed engineering design prior to implementation.

4.1 Implementation

Potential Funding Sources

- State and County Transportation Funds and/or Grants; TAP and STP funds
- Capital Campaigns
- Kitsap County Transportation or Parks Funds
- Grants from private foundations
- Assistance from Non-Governmental Agencies such as Trust for Public Land, Forterra, or Great Peninsula Conservancy
- State Recreation, Conservation Grants including RCO, and WWRP
- Puget Sound Acquisition and Restoration Fund (PSAR)
- Special Assessments
- Tax Assessments or Bonds

Required Permits

Land Use Permits

A Conditional Use Permit (CUP) will likely be required by the County for the project in Ueland owned lands to the north. The trail would be on land within the Rural Wooded Zone. The trail would be considered a Public Recreational Facility use under the Recreational/Cultural Uses section of Table 17.381.040E of the Kitsap County Code. The CUP process can be expected to take approximately 8 months to gain approval. A majority of the City-owned parcels to the south are zoned City Utility Lands (CUL). Jarstad Park is in a parcel zoned as Low Density Residential (R-10). A CUP is likely for a trail in these zones as well.

Wetland & Buffer Permits

The permits needed for construction of the trail through wetlands and buffers vary depending on the level of impact on the wetlands and buffers. Wetland impacts are regulated by the U.S. Army Corps of Engineers (Corps), Washington Department of Ecology (Ecology), City of Bremerton (city) and Kitsap County (county), when proposing filling, ditching, and/or dredging. Wetland impacts are mitigated to achieve a no net loss of wetland acreage and/or function to compensate for the loss of acreage and function in the impacted wetland. Buffer impacts do not result in direct impacts to wetland areas so are usually regulated only by local agencies. Activities in and adjacent to streams are regulated by the Washington Department of Fish and Wildlife (WDFW) and Hydraulic Project Approvals (HPA) are required for bridge crossings and culvert replacements.

Kitsap County- Impacts to wetlands and buffers are regulated by county and the city codes. Each jurisdiction will require submittal of appropriate development permits for the sections that occur in the county or city. The county requires submittal of a Site Development Activity Permit (SDAP) as well as a State Environmental Policy Act (SEPA) checklist, which is also required by the city. Wetland delineation and wetland/buffer mitigation plan reports are required as part of the permits. Mitigation for wetland impacts varies depending on the category of wetland and the method of mitigation (creation/reestablishment, rehabilitation, and/or enhancement). The lowest ratio for mitigation is 1.5:1 for wetland impacts to Category IV wetlands and the highest are 4:1 for Category I wetland impacts when proposing creation/reestablishment. The highest range of ratios is required when enhancement is proposed as compensation for wetland impacts because it does not result in a no-net-loss of wetland acreage. City and county will likely defer to the Corps and Ecology for mitigation of wetland impacts but require submittal mitigation and delineation reports. Buffer impacts are mitigated at a ratio of 1:1.

U.S. Army Corps of Engineers- The Corps regulates direct impacts to wetland through Section 401 of the Clean Water Act, Nationwide Permit (NWP) process, which requires submittal of wetland delineation and mitigation plan reports along with the Joint Aquatic Resources Permit Application (JARPA). The list of possible NWPs for which a project can apply is extensive and the NWP for a specific project dependent on the type of activity and project proposed. This trail project will likely meet the criteria for NWP 14-Linear Transportation Project or NWP 18-Minor Discharges depending on the extent of impact and whether it meets all of the criteria. Although the project does not propose direct fill of wetlands at this time, it may become necessary upon development of final construction plans that wetland impacts are unavoidable, a permit application must be submitted to the Corps. As part of the Corps process, cultural resources and biological assessment reports may be required if features of cultural importance are identified in the project area and if there will be impacts to endangered or threatened wildlife species, respectively. The Corps determine if these additional reports will be required. Consultation with the U.S. Fish and Wildlife Service (USFWS) and NOAA Fisheries (NOAA) will be necessary if a biological assessment is required to concur with the results of the assessment.

Washington Department of Ecology (Ecology)- Ecology regulates direct wetland impacts through the Water Quality Certification (WQC) process. The WQC is issued following issuance of the NWP and is sometimes issued as part of the NWP by the Corps who determines if the project meets the criteria of the WQC. The delineation and mitigation reports submitted to the Corps are also submitted to Ecology during the permitting process.

Washington Department of Fish and Wildlife (WDFW)- The WDFW issues Hydraulic Project Approval (HPA) for projects proposing to cross or otherwise disturb streams below the Ordinary High Water Mark (OHWM) or critical habitat. An HPA may be required for the bridge crossings of state regulated streams to ensure that the crossings will not have adverse impacts on the stream and habitat areas.

B

Figure 4B: Shared-Use Trail

Construction Permits

A Site Development Activity Permit (SDAP) is a permit that the Department of Community Development reviews for land disturbing activities for a major development or a development in critical drainage areas on County lands. It provides a mechanism to ensure stormwater quantity and quality, as well as other infrastructure, including roads, utilities and landscape are addressed. A temporary erosion and sediment control plan for construction activities is required as part of the SDAP review, as well as site development construction plans and other stormwater design documents. The SDAP process can be expected to take approximately 6 months to gain approval.

A National Pollution Discharge Elimination System (NPDES) Construction Stormwater Permit will be required by the Washington State Department of Ecology because more than 1 acre will be disturbed.

Other Permits That May Be Required

- Permit to Work in a County or City Right-of-Way (Public Works Permit)
- Permit to Use, Alter, and/or Improve Unopened County or City Right-of-Way (Public Works Permit)
- Forest Practice Application (FPA)
- Building Permit (for Structures, Lighting, Detention Vaults, Retaining Walls)
- Appropriate Land Use Approvals (as needed)

Next Steps

- Review and acceptance of Plan by Kitsap County Commissioners and the City of Bremerton City Council
- Integrate Plan into County and City Comprehensive Plans as needed- Transportation, Land Use, Rural and Resource Lands, Park, Recreation and Open Space elements
- Integrate Plan into the Capital Facilities Plan and annual work plans for County and City Departments
- Begin negotiations with Ueland to secure easements in manner that conforms to federal regulations
- Draft, negotiate and finalize an MOU amongst the County, City and Ueland on resource allocation and responsibilities for funding, implementation, management, maintenance and enforcement of the trail
- Begin process to secure easements from the Navy for trail access within and across the railroad
- Develop Funding Plan- Continue partnerships, submit grant applications and explore other funding sources
- Design development, final engineering and environmental documentation
- Permits- Develop a comprehensive strategy and complete the required documentation

Conclusion

This study demonstrates that a shared-use path within the project area can be engineered to meet local, state and federal shared-use path design standards, allowing the project to be eligible for the fullest extent of funding possible. Due to the existing terrain, steep grades will exist although the trail can be engineered and mitigation measures applied to meet applicable standards. Implementation of this 3.16 mile shared-use path would cost approximately $3,904,907 utilizing existing maintenance and logging road corridors to reduce cost and minimize environmental impact.

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APPENDICES

Appendix A: PRELIMINARY ENGINEERING PLANS - SEPARATE DOCUMENT

The alignments were engineered using both AutoCAD Civil 3D and SiteOps. AutoCAD was used to develop horizontal and vertical profiles for trail segments proposed on existing roadbeds. In the case of SiteOps, the alignment was draped over a terrain model (Figure 2AE), and minimum/maximum longitudinal centerline profile slopes were inputted, together with the proposed cross-section template and pavement section depths. SiteOPS analyzed the minimum/maximum elevations- every point can be based on the design thresholds inputted. The design thresholds were based on AASHTO standards summarized in Table 2D and shown graphically with trail cross sections in Section 3 of the report. The final step yields a finished grading plan and a quantity of materials for that alignment. This information was then imported into AutoCAD Civil 3D software to produce the feasibility plan and profile sheets found in this appendix.

Appendix B: WETLAND FEASIBILITY STUDY - SEPARATE DOCUMENT

The wetlands report is a planning level review of how wetlands may influence possible trail alignments, design standards, and feasibility. The report is not a formal wetlands analysis; development of this trail, or any other private or public development, will require independent analysis. For the trail project, formal wetland determinations will be conducted during the preliminary engineering phase. The applicability of this wetlands report is limited to this study and should not be used beyond its identified purpose.

Appendix C: NAVY EASEMENT REQUEST GUIDELINES

NAVFAC NW – NAVAL BASE KITSAP
NAVY RAILROAD
Easement Request Guidelines
March 2015

This guidance is provided to assist requests for easements on the Navy-owned Shelton-Bangor-Bremerton Railroad. Each request will have its own specific details, but the information requested here is necessary for the Navy to start a review. Our objective is to protect the overall safety, security, and structural integrity of the Navy Railroad. Application for an easement does not guarantee approval. Please note that easement renewals require the same amount of documentation as a new request even though there may be no changes to the facility in the field. Do not submit applications through Puget Sound and Pacific Railroad (PSAP) or Genesee & Wyoming Railroad (GWRR).

1. Written request for easement, addressed to the NAVFAC NW Railroad Engineer at 467 W Street, Bremerton, WA 98314-5240, Code PRB211Y. Describe what you need and why, and why you can't utilize a similar nearby easement. The justification must be more than "because it's the cheapest", you should describe why this is the only viable option. Identify the actual easement holder, point of contact, and address even if we are to work with an engineering firm for the documentation. We must be able to verify if you are financially able to comply with the terms of the agreement. Any communication or revisions after the initial letter may be by Email to simplify and speed up the process, so please provide a telephone number and Email address for your point of contact.

2. Site map showing the general railroad area, specific railroad location and right-of-way, plan and profile of the proposed usage, proposed easement width and area, railroad centerline stationing, roadway material and design, overhead clearances, pipe casing information (diameter, thickness, material, depth), ditch and culvert locations, necessary grading and earthwork, and existing and proposed utility information. Ideally, these should be similar to construction plans.
   a. Public road crossings must also meet requirements of the Washington Utilities and Transportation Commission (WUTC). Signals or crossing gates may be required for public crossings, and will probably require a traffic study. The requester is responsible for all approvals.
   b. All designs must meet requirements of the American Railway Engineering & Maintenance-of-Way Association (AREMA) and GWRR for utilities, road crossings, signals, etc. There are specific additional requirements for use of fiber optics. See www.gwrr.com/realestate for guidance.
   c. Power and communication lines must meet the latest version of the National Electric Code (NEC).
   d. Identify any existing utilities or other use in the area. You must coordinate your installation with current easement holders and utilities.

3. Depending on the size of the easement and the proposed use an environmental assessment or other document may be required. We must review environmental, archeological, and historical suitability in our recommendation, and may need to address land use changes that are driving the need for an easement. Simple crossings such as utility extensions or connections are usually fairly easy and require a minimum of additional documentation. We will notify you if we need any additional information.

4. You will be responsible for designation, management, and disposal of waste per Washington State regulations. Storage, treatment, or disposal of toxic hazardous materials is prohibited. In addition, the Navy may inspect the premises for compliance with environmental, safety, and health regulations, which will be done prior to approval of an easement and may be done at any time during the term of the easement.

5. To cover our administrative, assessment, and review expenses the Navy charges from $8000-$10,000 for each easement, but may be more for larger easements. The cost of the easement title itself is in addition to that cost, is based on the appraised fair market value of the encumbrance, and is usually granted for 20 to 50 years. Therefore, it is advantageous for both of us to consolidate easements at a particular location, such as road and utility crossings. You will be notified of the cost and where to send it when we begin our initial review.

6. A metes and bounds survey by a licensed land surveyor will be necessary to complete the easement, but do not submit it until requested. That will normally be after the general approval is received when we start preparation of the easement documents. The survey must meet Washington State recording requirements, and must be tied to the Railroad centerline and right-of-way.

7. Please be aware that processing of a typical easement document may take about a year after we have agreed on the technical requirements. The technical portion includes all of the information necessary in Paragraphs 1 through 4. If you don't comply with the provisions of the easement or if you do not use the easement for longer than 2 years the easement may be terminated.

8. If the proposed use of Navy property is of limited time or activity then a license (or revocable permit) may be issued. These can be approved locally and require less documentation and expense. Generally, these are for temporary use of the property for less than 5 years, and may require restoration of the site (removal of any improvements, re-grading, erosion control, hydroseeding, reforestation, etc.).

Standard Easement Provisions

9. Construction, installation, maintenance or use of any easement must not interfere with train traffic.

10. The operating railroad is Puget Sound & Pacific (PSAP). They must be notified in advance of any construction or maintenance for an approved easement and may require a Right of Entry permit (see the GWRR website). For any work within 25 feet of the tracks they will require a flagman, to be paid by the easement holder. Construction of road crossing surface at the track is normally done by your contractor with railroad oversight and approval by PSAP.

11. Maintenance and repair of easement improvements are the responsibility of the easement holder, and must be coordinated with PSAP. This includes signal maintenance, track crossing repairs, and utility replacement. The easement holder is responsible for the cost of repair or maintenance of Navy property and structures disturbed or damaged due to the installation or construction.

12. Damage, clearing or removal of any timber or forest products from Navy property must be reviewed and approved by the Navy Forester. The Navy will require reimbursement for the value of any merchantable timber that is removed, which will be through an agreement separate from the easement. If logging of adjacent property is to be performed we encourage working with the Forester for additional cutting of Navy timber in order to avoid windfall loss due to storms. If merchantable timber is removed without prior permission from the Navy then it will be treated as theft and we may charge up to triple the value of the timber.

Appendix D: LAKE ROUTE SEGMENT INFORMATION

The Lake Route Segment

During the planning and preliminary engineering process of the trail feasibility study, a number of alternative segments were considered to minimize disturbance, minimize steeps grades or avoid critical areas. Eventually a preferred alternative was selected and an estimate done for that route. This is documented in the main body of the report. There was one alternate route that was considered more seriously and engineering plans and a cost estimate were generated for this alternate segment. Ultimately, this segment was determined to be infeasible at the current time due to reasons discussed below.

History

This segment, running directly adjacent to Heins Lake on City of Bremerton property and near Alexander Lake on Ueland property, was originally part of the preliminary alignment identified as an alternative in the County's 2013 Non-motorized Facility Plan and by the WSCC. This route is shown in red and labeled "A" in Figure AD in the Trail Feasibility Study.

Existing Condition

The existing road that this trail would be located on is in the central portion of the project and spans both Ueland-owned lands in the north and City-owned lands in the south. This segment is located east of Alexander Lake and runs directly along the eastern shore of Heins Lake. The road segment is approximately 3,200 feet in length, approximately 10 feet in width and primarily dirt and grass or duff, with no shoulders. It is used very infrequently for maintenance and operations by either entity and is not intended to be used for logging trucks in the future.

Potential for a Shared-use Trail

This segment of proposed trail would replace segments 5A and 6 of the preferred alternative described in the report. This trail segment would be Type C- 10' wide. It would be placed on an existing roadbed that is in poor condition, primarily dirt and forest duff. The grade on this segment would primarily be under 5% but there would be three sections, each less than 200 LF, up to 8% slope. This segment would be approximately 3,880 linear feet (0.73 miles). There would not be a need for periodic closures during logging as this trail would only accommodate maintenance vehicles. The boundary between City lands and Ueland property exists along this segment.

Issues

The Working Group identified concerns about management and maintenance issues that would arise based on its proximity to the lakes. Long-term requirements to address increased impacts related to maintenance, management and enforcement around the lakes will be needed, even with the trail located out of sight from the lakes. The cost of patrolling and providing maintenance of a trail immediately adjacent to the lakes on this route is considered to be infeasible for the existing landowners- they do not have the resources to maintain and manage a facility that could easily become a destination. Without adequate resources, habitat could be degraded along the east shore of the lakes as people access the shoreline for recreation.

View From Existing Road

This project is considered to be a north-south transportation corridor and not a destination trail. Providing a trail route with direct access to each of the lakes would turn this into a destination trail and bring about a host of unintended consequences. Creating a destination mid-trail places the emphasis of the trail on recreation and could create an attractive nuisance along the trail. Without a long term agreement, there will be difficulty in getting property owner agreements (Ueland and City) on this route.

Comparison of the Lake Segment to the Corresponding Preferred Alternative Segment

This alternative segment is 68 linear feet longer than the preferred alignment segment to the east and has less steep slope sections (575 linear feet between 5% and 8% versus 1,650 linear feet between 5% and 8%) than the preferred segment to the east. Implementing this segment would result in less earthwork and a reduction in the overall cost of the project in the amount of $92,811. However, the costs do not include fencing, spur trails or overlooks that could mitigate or manage for impacts.

This route received significant support during the public meeting held in January 2017. It was felt that the potential negative operational impacts could be mitigated by good planning and site design and minimized through appropriate enforcement by the City and/or County. A detailed Memorandum of Understanding (MOU) would need to be negotiated and in place for all entities, defining resource allocation and strategy for management, maintenance and enforcement.

Cost of Alignment Segment

Project costs for the preferred alternative are estimated in 2017 dollars and consist of both soft costs, such as design, engineering and construction management and hard costs, which are the construction costs. The table on this page and the next outline the cost for implementation of a trail using the existing road along Heins and Alexander lakes.

Preliminary Engineering Plans

Preliminary engineering plans were developed for this segment of trail along the lakes. These four sheets are provided in this appendix. Costs were developed based on the quantities generated during this engineering effort.

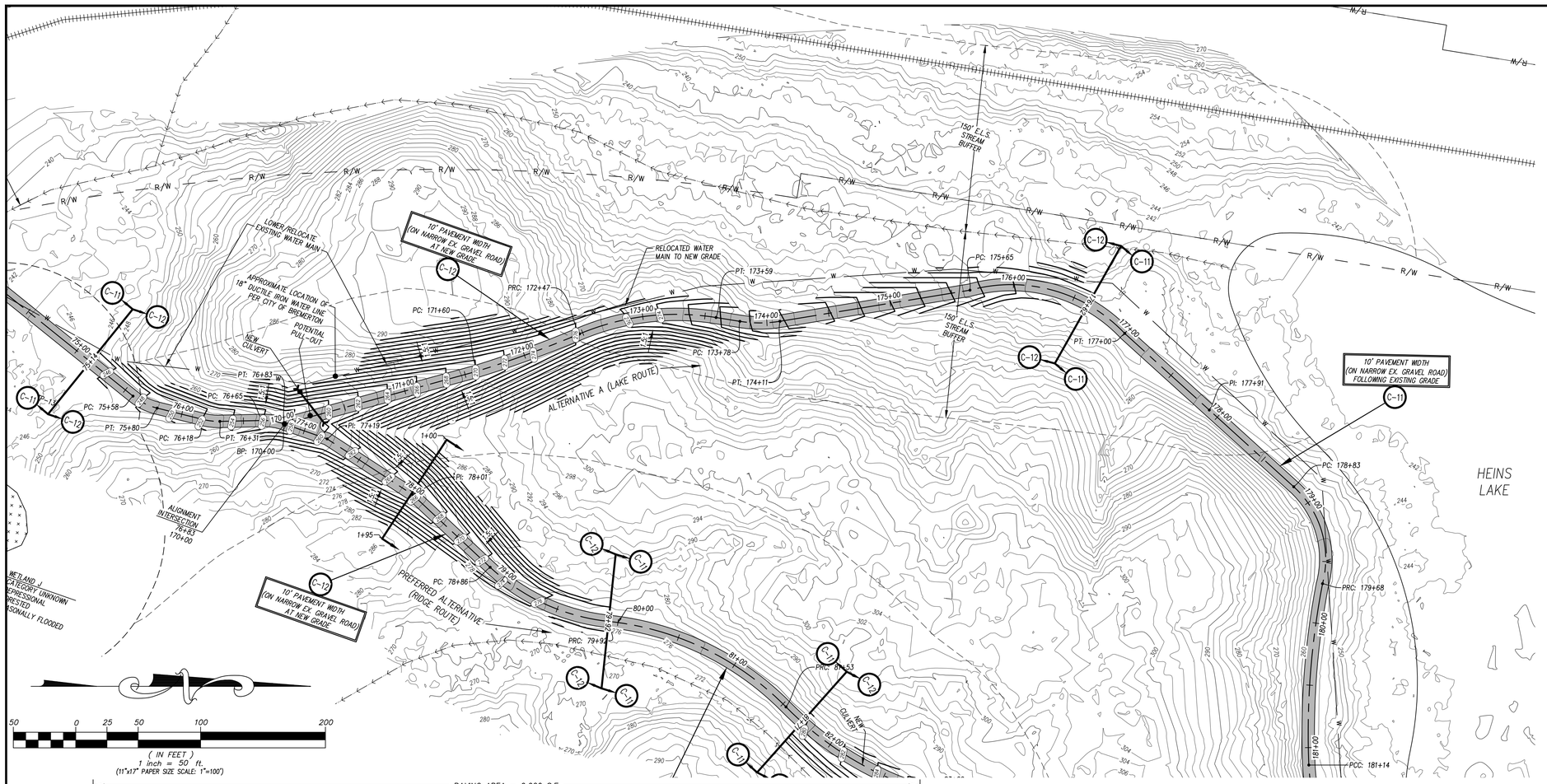
ESTIMATE OF PROBABLE PROJECT COSTS FOR THE KITSAP LAKE TRAIL FEASIBILITY STUDY
ALTERNATIVE A (LAKE ROUTE)
2018 Dollars

CONSTRUCTION COSTS (Hard Costs)						
ON-SITE PREPARATION						
Work Activity	**QUANTITY**	**UNIT**	**UNIT COST**	**SUBTOTAL**	**TOTAL**	**NOTES**
Site Clearing						
Clearing	4.91	AC	$10,400.00	$51,064		
Total Site Clearing				$51,064	$51,064	Quantities and costs per MAP
Grading Cut						
Earth Cut	7,450	CY	$15.60	$116,220		
Total Grading Cut				$116,220	$116,220	Quantities and costs per MAP
Grading Fill						
Earth Fill	2,900	CY	$26.00	$75,400		
Total Grading Fill				$75,400	$75,400	Quantities and costs per MAP
Grading Export						
Earth Export	6,610	CY	$26.00	$171,860		
Total Grading Export				$171,860	$171,860	Quantities and costs per MAP
Retaining Wall	300	SF	$39.00		$11,700	Quantities and costs per MAP
Other Preparation						
Fine Grading Sub-Grade Prep	20,860	SY	$4.16	$86,778		
Erosion Control	12	AC	$4,160.00	$49,920		
Seeding/Slope Stabilization	3	AC	$20,800.00	$62,400		
Total Other Preparation				$199,098	$199,098	Quantities and costs per MAP
TOTAL ON-SITE PREPARATION					**$625,342**	

Summary of Cost Estimate with Alternative A (Lake Segment)

ON-SITE IMPROVEMENTS						
Work Activity	**QUANTITY**	**UNIT**	**UNIT COST**	**SUBTOTAL**	**TOTAL**	**NOTES**
Paving - Trail Section						
Asphalt Paving - Trail on Existing Road	13,645	SY	$22.30	$304,284		2" CSTC and 2" HMA
Asphalt Paving - New Trail/Trail new graded road	7,214	SY	$23.55	$169,890		6" CSBC, 2" CSTC, and 2" HMA
CSTC Gravel Shoulders	2,320	Ton	$41.60	$96,512		
Total Paving - Asphalt				$570,685	$570,685	Quantities and costs per MAP
Bridges						
Bridge- Heins Creek- Steel Truss Delivered	1	LS	$52,000.00	$52,000		$1,000/LF for 12' width based on costs from Continental Bridge (CB), includes design fee
Abutments	2	LS	$7,800.00	$15,600		
Install + Crane	1	LS	$156,000.00	$156,000		Install cost is 2.5 times bridge + abutment cost per CB
Total Bridges				$223,600	$223,600	
Other On-Site Improvements						
140'x 60' Gravel Parking Area South End (Jarstand	8,400	SF	$3.12	$26,208		Base exists. Includes compaction, top course, drainage. Signage included below
Trail Signage						
Regulatory Allowance	1	LS	$9,360.00	$9,360		Allowance
Wayfinding Allowance	1	LS	$7,800.00	$7,800		Allowance
Interpretive Allowance	1	LS	$15,600.00	$15,600		Allowance
Trailhead Kiosks	2	EA	$7,800.00	$15,600		Allowance
Railroad Crossing	1	EA	$12,480.00	$12,480		No crossing signal assumes, rubberized mat surface, easement costs below
Viewpoint or Overlook	1	EA	$10,400.00	$10,400		Includes paving (12' x 12' min), walls, clearing, grading, bench, fence
Crosswalk- at Ueland Development Road	1	LS	$520.00	$520		
Trail Storm Drainage	11,650	LF	$12.50	$145,625		Concentrated and Sheetflow Dispersion Through Native Vegetation per BMP's T5.11 and T5.12
Other Storm Drainage	1	LS	$52,000.00	$52,000		Miscellaneous culverts
Lower/Relocate City Watermain	620	LF	$208.00	$128,960		At Preferred Route/Lake Route intersection
Lighting	-	-	-	-		No lighting allowance included
Wetland Mitigation- per ELS report	1	LS	$379,600.00	$379,600		Cost per wetland mitigation report by ELS, worst case scenario for wetland and buffers
Total - Other On-Site Improvements				$804,153	$804,153	
TOTAL ON-SITE IMPROVEMENTS				**TOTAL**	**$1,598,438**	
Contractor Mobilization @ 5%	1	LS	$111,188.99	$111,189		Industry standard percentage
TOTAL Construction Costs (Hard Costs)				**TOTAL**	**$2,334,969**	
Construction Contingency - 20%					$466,994	
TOTAL Construction Costs with Contingency				**TOTAL**	**$2,801,963**	
DESIGN & CONSTRUCTION MANAGEMENT COSTS (Soft Costs)						
Engineering/Design Consultants 20%	1	LS	$463,873.76	$463,874		Excludes 20% of Bridge Cost - Design & Enginnering are included in cost
Construction Management 12%	1	LS	$280,196.25	$280,196		
Creation of Easements + MOUs with City & Ueland	1	LS	$21,000.00	$21,000		
Navy Easements, including filing fees	2	EA	$32,000.00	$64,000		Cost provided by Navy in Jan. 2017
Conditional Use, SEPA, SDAP Permitting Fees	1	LS	$32,000.00	$32,000		
TOTAL Design and Construction Management Costs (Soft Costs)				**TOTAL**	$861,070	
Design & Construction Management Contingency - 20%					$172,214	
TOTAL Design and Construction Management Costs with Contingency				**TOTAL**	**$1,033,284**	
TOTAL PROJECT COSTS					**$3,196,039**	
Design & Construction Management Contingency - 20%					$639,208	
TOTAL PROJECT COSTS WITH CONTINGENCY					**$3,835,247**	

Summary of Cost Estimate with Alternative A (Lake Segment)



PROPOSED TRAIL TYPES/SECTIONS

A SIDE PATH ALONG WIDE ROAD

B SHARED PATH WITH MAINTENANCE VEHICLES ONLY (CLOSED WHEN USED FOR LOGGING)

C SHARED PATH WITH MAINTENANCE VEHICLES ONLY (NO LOGGING)

ROAD CATEGORIES

1 10' – PAVEMENT WIDTH (SIDE PATH ALONG EX. ROAD) FOLLOWING EXISTING GRADE

2 14' – PAVEMENT WIDTH (ON NARROW EX. GRAVEL RD.) FOLLOWING EXISTING GRADE

3 14' – PAVEMENT WIDTH (ON NARROW EX. GRAVEL RD.) AT NEW GRADE

4 14' – PAVEMENT WIDTH (ON WIDE EX. GRAVEL ROAD) FOLLOWING EXISTING GRADE

5 14' – PAVEMENT WIDTH (ON WIDE EX. GRAVEL ROAD) AT NEW GRADE

6 14' – PAVEMENT WIDTH (NOT ON EXISTING ROAD) AT NEW GRADE

7 10' – PAVEMENT WIDTH (NOT ON EXISTING ROAD) FOLLOWING EXISTING GRADE.

8 10' – PAVEMENT WIDTH (NOT ON EXISTING ROAD) AT NEW GRADE

9 10' – PAVEMENT WIDTH (ON NARROW EX. DIRT ROAD) FOLLOWING EXISTING GRADE.

10 10' – PAVEMENT WIDTH (ON NARROW EX. DIRT ROAD) AT NEW GRADE

11 10' – PAVEMENT WIDTH (ON NARROW EX. GRAVEL ROAD) FOLLOWING EXISTING GRADE

12 10' – PAVEMENT WIDTH (ON NARROW EX. GRAVEL ROAD) AT NEW GRADE

LEGEND

A-1 SIDE PATH ALONG WIDE ROAD – 10' – PAVEMENT WIDTH (SIDE PATH ALONG EX. ROAD) FOLLOWING EXISTING GRADE

B-2 SHARED PATH WITH MAINTENANCE VEHICLES ONLY (CLOSED WHEN USED FOR LOGGING) 14' – PAVEMENT WIDTH (ON NARROW EX. GRAVEL RD.) FOLLOWING EXISTING GRADE

B-3 SHARED PATH WITH MAINTENANCE VEHICLES ONLY (CLOSED WHEN USED FOR LOGGING) 14' – PAVEMENT WIDTH (ON NARROW EX. GRAVEL RD.) AT NEW GRADE

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B-5 SHARED PATH WITH MAINTENANCE VEHICLES ONLY (CLOSED WHEN USED FOR LOGGING) 14' – PAVEMENT WIDTH (ON WIDE EX. GRAVEL ROAD) AT NEW GRADE

B-6 SHARED PATH WITH MAINTENANCE VEHICLES ONLY (CLOSED WHEN USED FOR LOGGING) 14' – PAVEMENT WIDTH (NOT ON EXISTING ROAD) AT NEW GRADE

C-7 SHARED PATH WITH MAINTENANCE VEHICLES ONLY (NO LOGGING) 10' – PAVEMENT WIDTH (NOT ON EXISTING ROAD) FOLLOWING EXISTING GRADE.

C-8 SHARED PATH WITH MAINTENANCE VEHICLES ONLY (NO LOGGING) 10' – PAVEMENT WIDTH (NOT ON EXISTING ROAD) AT NEW GRADE

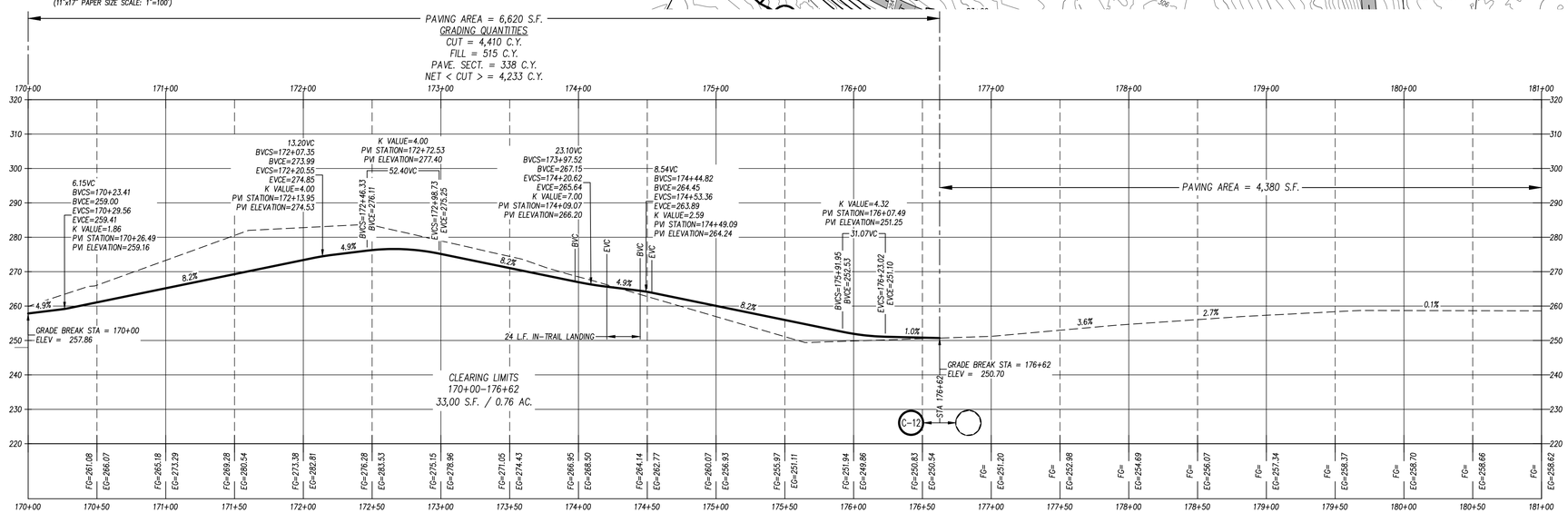
C-9 SHARED PATH WITH MAINTENANCE VEHICLES ONLY (NO LOGGING) 10' – PAVEMENT WIDTH (ON NARROW EX. DIRT ROAD) FOLLOWING EXISTING GRADE.

C-10 SHARED PATH WITH MAINTENANCE VEHICLES ONLY (NO LOGGING) 10' – PAVEMENT WIDTH (ON NARROW EX. DIRT ROAD) AT NEW GRADE

C-11 SHARED PATH WITH MAINTENANCE VEHICLES ONLY (NO LOGGING) 10' – PAVEMENT WIDTH (ON NARROW EX. GRAVEL ROAD) FOLLOWING EXISTING GRADE

C-12 SHARED PATH WITH MAINTENANCE VEHICLES ONLY (NO LOGGING) 10' – PAVEMENT WIDTH (ON NARROW EX. GRAVEL ROAD) AT NEW GRADE

ELS STREAM
DNR STREAM
FORESTRY THRU ROAD
PUBLIC ROAD
RAILROAD
UELAND PROPOSED ROAD
UTF HAUL ROAD



STATION 170+00 - 181+00

HORIZONTAL SCALE: 1" = 50'
VERTICAL SCALE: 1" = 20'

DATUM

CONTOURS PER KITSAP COUNTY LIDAR SOURCES

NO.	DATE	DESCRIPTION	BY
2	9-22-17	REVISED PER COMMENTS	KPF/QJD
1	6-30-17	UPDATED ALIGNMENT/REVISED GRADES	KPF/QJD

KITSAP LAKE TRAIL FEASIBILITY STUDY

STATION 170+00 - 181+00

FOR
FISCHER BOUMA PARTNERSHIP
310 MADISON AVE SOUTH, SUITE A
BAINBRIDGE ISLAND, WA 98110

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(206) 718-0799

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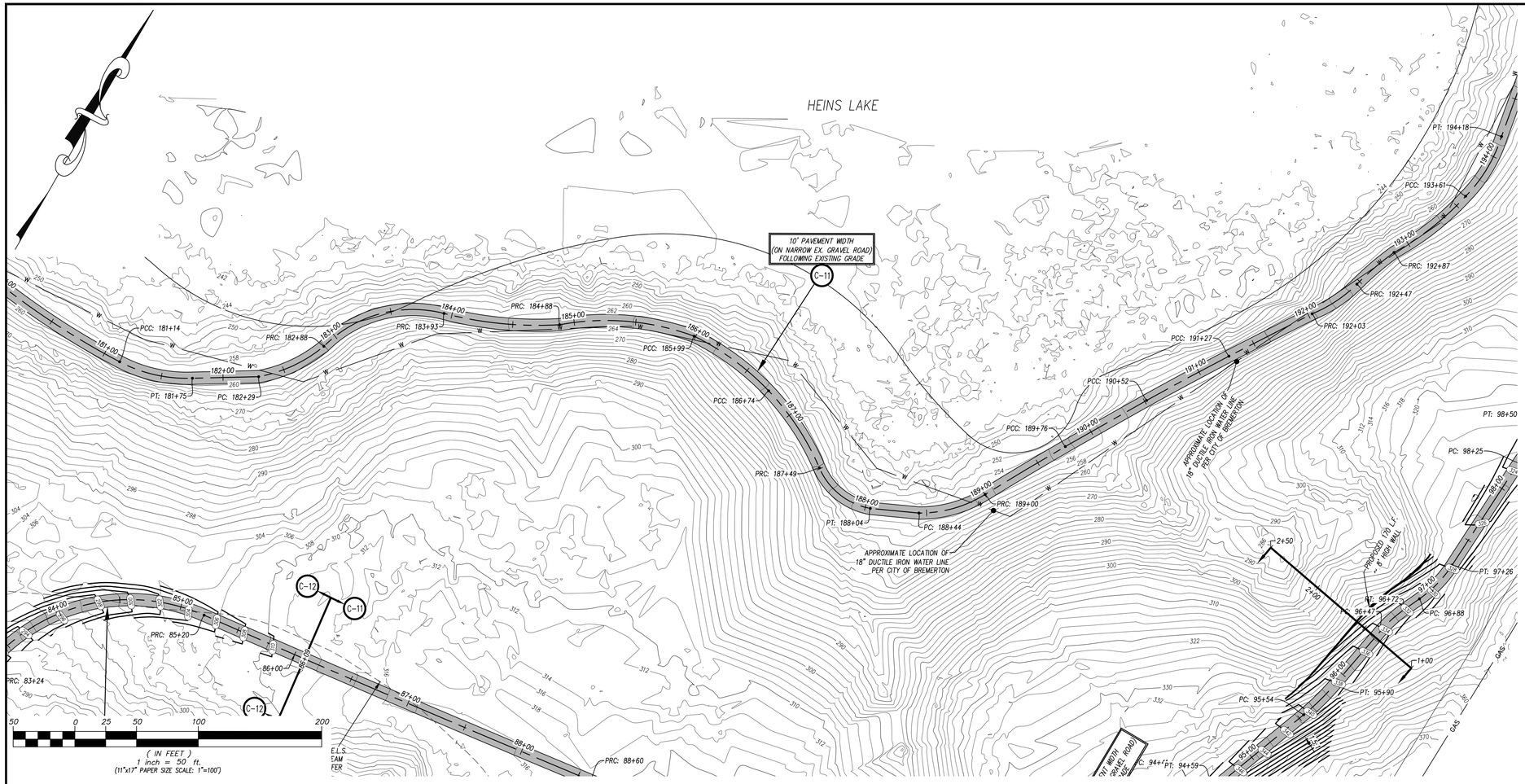
CALCULATED	DESIGN	DRAWN	CHECKED	DATE	SCALE	JOB NO.	SHEET
		QJD	KPF	5-25-17	1" = 50'	6673	18 OF 21



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LEGEND

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C–11 SHARED PATH WITH MAINTENANCE VEHICLES ONLY (NO LOGGING)
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C–12 SHARED PATH WITH MAINTENANCE VEHICLES ONLY (NO LOGGING)
10' – PAVEMENT WIDTH (ON NARROW EX. GRAVEL ROAD) AT NEW GRADE

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DNR STREAM
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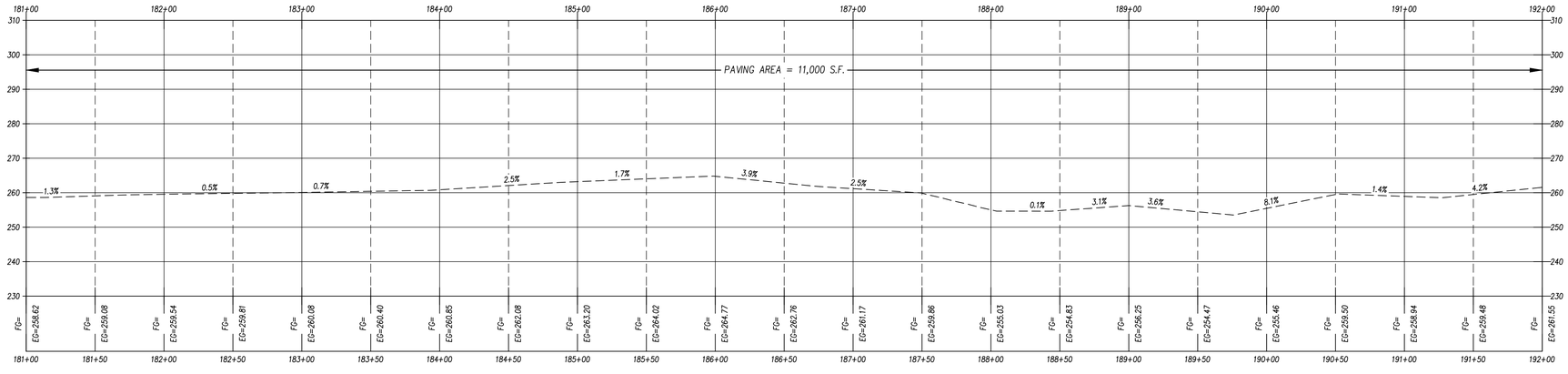

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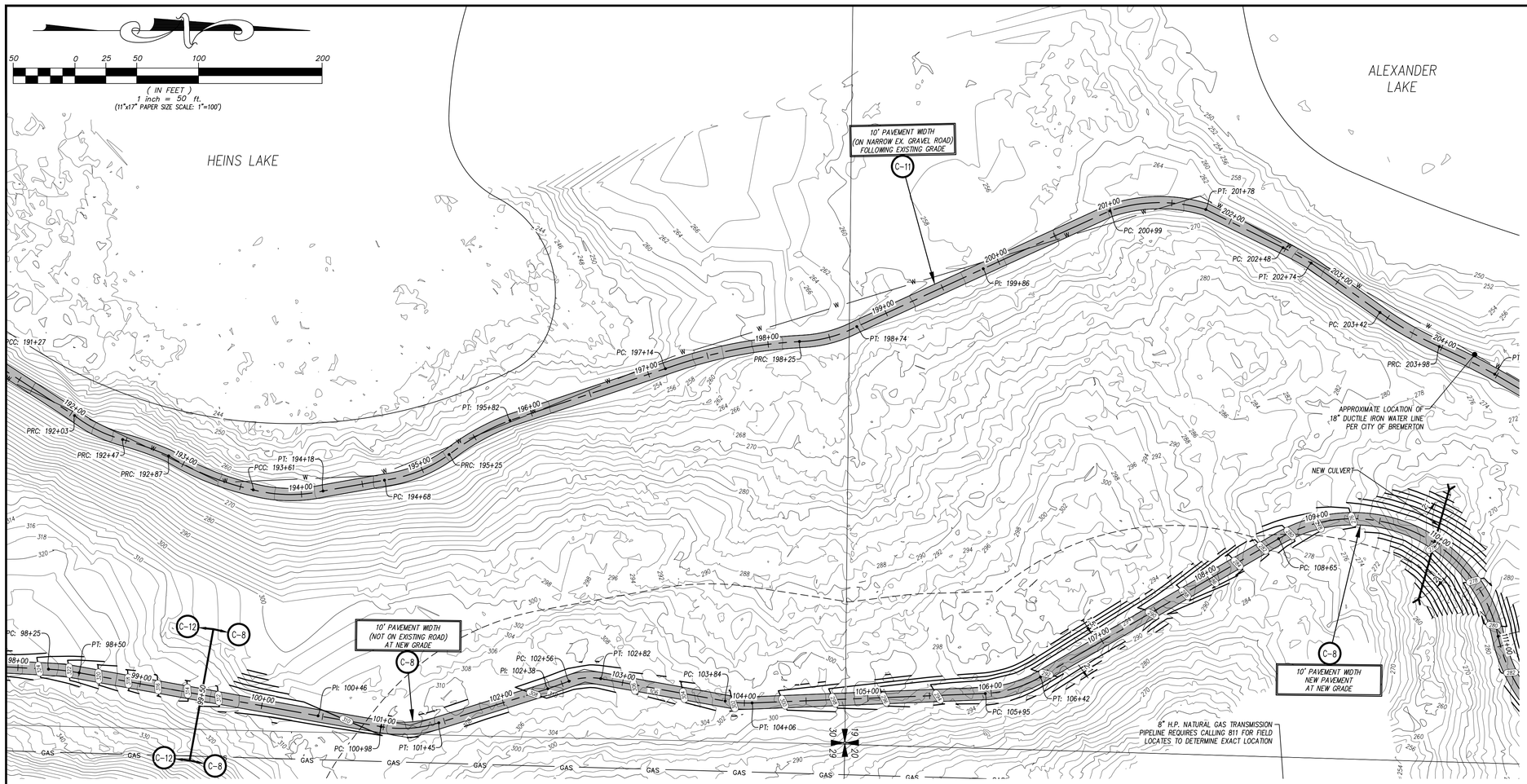

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ROAD CATEGORIES

1. 10' – PAVEMENT WIDTH (SIDE PATH ALONG EX. ROAD) FOLLOWING EXISTING GRADE
2. 14' – PAVEMENT WIDTH (ON NARROW EX. GRAVEL RD.) FOLLOWING EXISTING GRADE
3. 14' – PAVEMENT WIDTH (ON NARROW EX. GRAVEL RD.) AT NEW GRADE
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6. 14' – PAVEMENT WIDTH (NOT ON EXISTING ROAD) AT NEW GRADE
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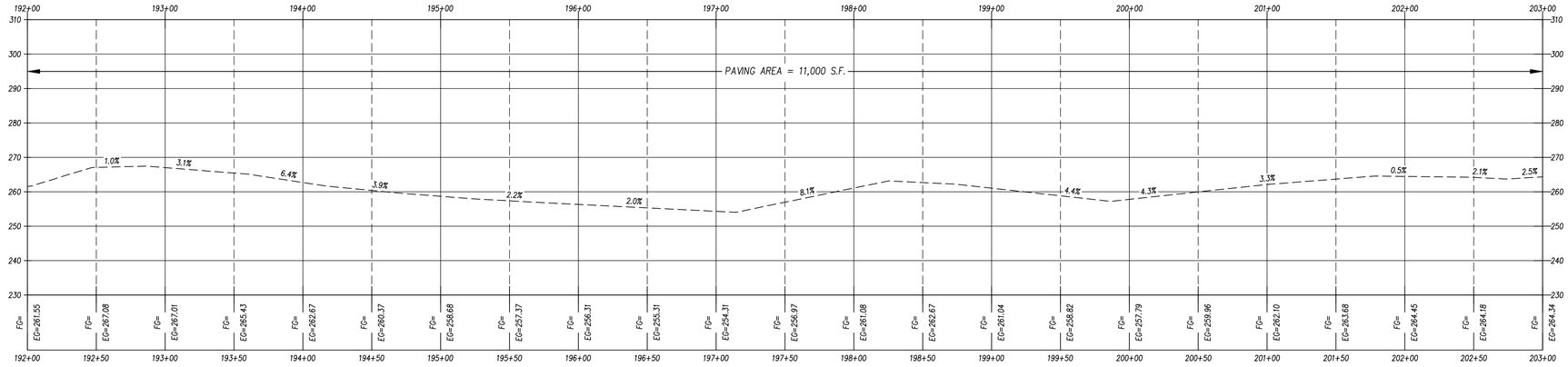
12. 10' – PAVEMENT WIDTH (ON NARROW EX. GRAVEL ROAD) AT NEW GRADE

LEGEND

- A-1 — SIDE PATH ALONG WIDE ROAD — 10' – PAVEMENT WIDTH (SIDE PATH ALONG EX. ROAD) FOLLOWING EXISTING GRADE
- B-2 — SHARED PATH WITH MAINTENANCE VEHICLES ONLY (CLOSED WHEN USED FOR LOGGING) — 14' – PAVEMENT WIDTH (ON NARROW EX. GRAVEL RD.) FOLLOWING EXISTING GRADE
- B-3 — SHARED PATH WITH MAINTENANCE VEHICLES ONLY (CLOSED WHEN USED FOR LOGGING) — 14' – PAVEMENT WIDTH (ON NARROW EX. GRAVEL RD.) AT NEW GRADE
- B-4 — SHARED PATH WITH MAINTENANCE VEHICLES ONLY (CLOSED WHEN USED FOR LOGGING) — 14' – PAVEMENT WIDTH (ON WIDE EX. GRAVEL ROAD) FOLLOWING EXISTING GRADE
- B-5 — SHARED PATH WITH MAINTENANCE VEHICLES ONLY (CLOSED WHEN USED FOR LOGGING) — 14' – PAVEMENT WIDTH (ON WIDE EX. GRAVEL ROAD) AT NEW GRADE
- B-6 — SHARED PATH WITH MAINTENANCE VEHICLES ONLY (CLOSED WHEN USED FOR LOGGING) — 14' – PAVEMENT WIDTH (NOT ON EXISTING ROAD) AT NEW GRADE
- C-7 — SHARED PATH WITH MAINTENANCE VEHICLES ONLY (NO LOGGING) — 10' – PAVEMENT WIDTH (NOT ON EXISTING ROAD) FOLLOWING EXISTING GRADE.
- C-8 — SHARED PATH WITH MAINTENANCE VEHICLES ONLY (NO LOGGING) — 10' – PAVEMENT WIDTH (NOT ON EXISTING ROAD) AT NEW GRADE
- C-9 — SHARED PATH WITH MAINTENANCE VEHICLES ONLY (NO LOGGING) — 10' – PAVEMENT WIDTH (ON NARROW EX. DIRT ROAD) FOLLOWING EXISTING GRADE.
- C-10 — SHARED PATH WITH MAINTENANCE VEHICLES ONLY (NO LOGGING) — 10' – PAVEMENT WIDTH (ON NARROW EX. DIRT ROAD) AT NEW GRADE
- C-11 — SHARED PATH WITH MAINTENANCE VEHICLES ONLY (NO LOGGING) — 10' – PAVEMENT WIDTH (ON NARROW EX. GRAVEL ROAD) FOLLOWING EXISTING GRADE
- C-12 — SHARED PATH WITH MAINTENANCE VEHICLES ONLY (NO LOGGING) — 10' – PAVEMENT WIDTH (ON NARROW EX. GRAVEL ROAD) AT NEW GRADE

- ELS STREAM
- DNR STREAM
- FORESTRY THRU ROAD
- PUBLIC ROAD
- RAILROAD
- UELAND PROPOSED ROAD
- UTF HAUL ROAD



STATION 192+00 - 203+00

HORIZONTAL SCALE: 1" = 50'
VERTICAL SCALE: 1" = 20'

DATUM

CONTOURS PER KITSAP COUNTY LIDAR SOURCES

NO.	DATE	DESCRIPTION	BY
2	9-22-17	REVISED PER COMMENTS	KPF/QJD
1	6-30-17	UPDATED ALIGNMENT/REVISED GRADES	KPF/QJD

KITSAP LAKE TRAIL FEASIBILITY STUDY

STATION 192+00 - 203+00

FOR
FISCHER BOUMA PARTNERSHIP
310 MADISON AVE SOUTH, SUITE A
BAINBRIDGE ISLAND, WA 98110

CONTACT
JEFF BOUMA
(206) 718-0799

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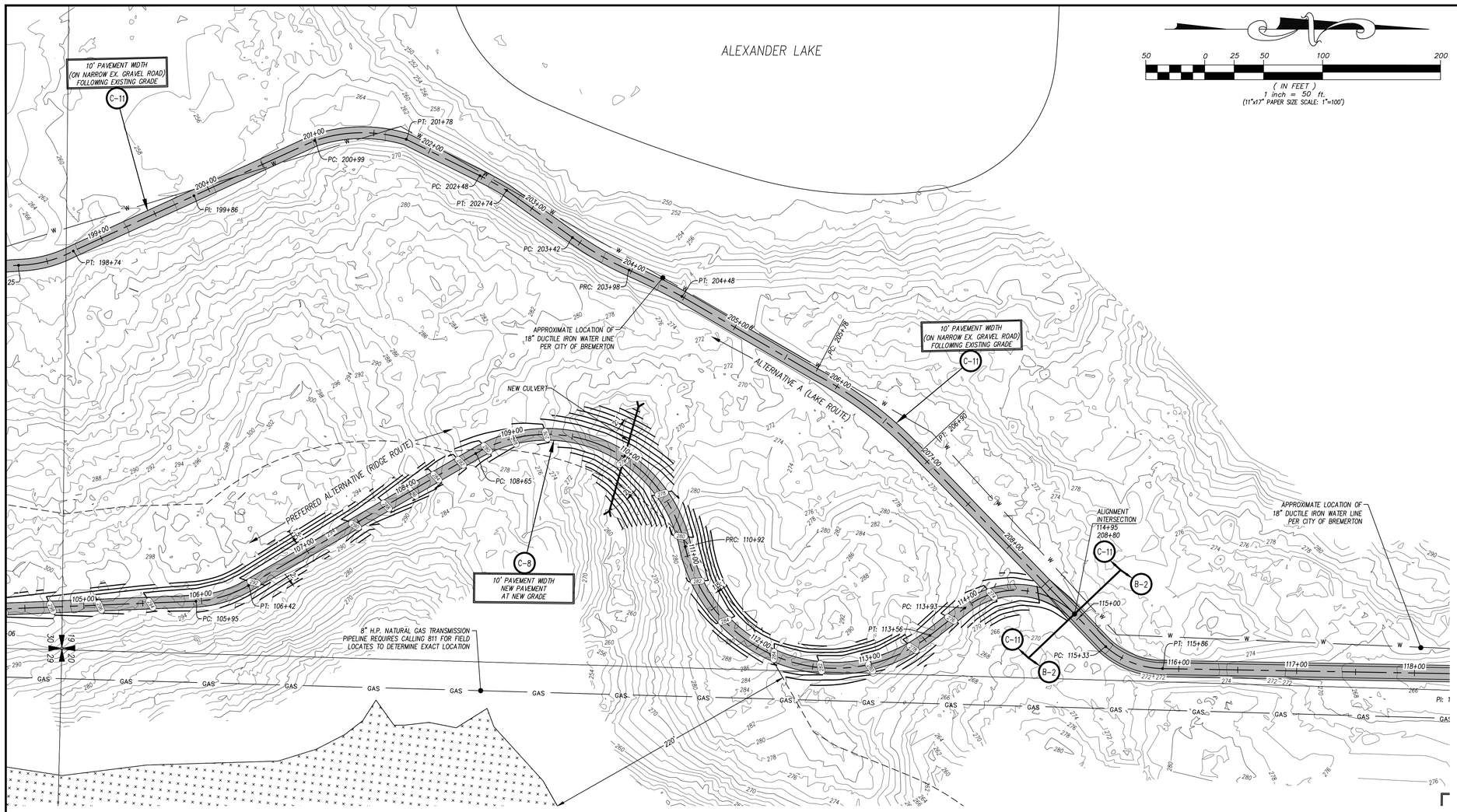
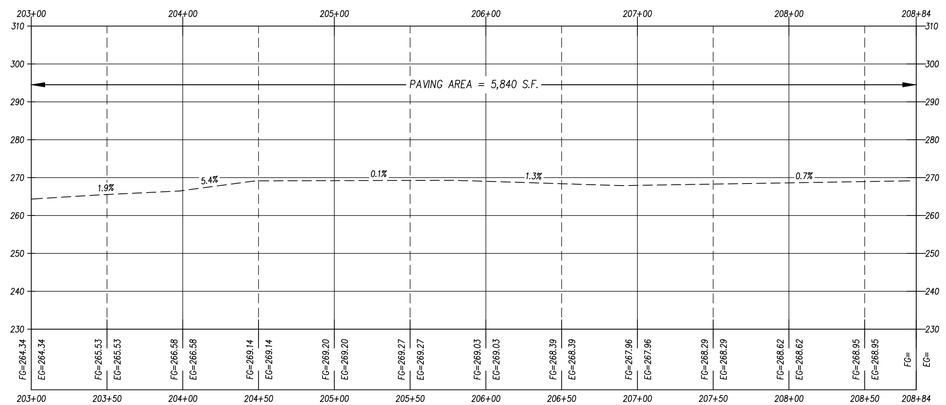
CALCULATED	DESIGN	DRAWN	CHECKED	DATE	SCALE	JOB NO.	SHEET
		QJD	KPF	5-25-17	1" = 50'	6673	20 OF 21





STATION 203+00 - 208+80

HORIZONTAL SCALE: 1" = 50'
VERTICAL SCALE: 1" = 20'

DATUM

CONTOURS PER KITSAP COUNTY LIDAR SOURCES

NO.	DATE	DESCRIPTION	BY
2	9-22-17	REVISED PER COMMENTS	KPF/QJD
1	6-30-17	UPDATED ALIGNMENT/REVISED GRADES	KPF/QJD

KITSAP LAKE TRAIL FEASIBILITY STUDY

STATION 203+00 - 208+84

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CALCULATED	DESIGN	DRAWN	CHECKED	DATE	SCALE	JOB NO.	SHEET
		QJD	KPF	5-25-17	1" = 50'	6673	21 OF 21