North Kitsap Trail (Divide Block) Feasibility Study

November 2015

FINAL REPORT

Presented to:

Kitsap County Commissioners

Kitsap County Public Works

Presented by:

Fischer Bouma Partnership

MAP, Ltd.

Ecological Land Services

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Executive Summary

Kitsap County Public Works (KCPW), is interested in finding a cost effective alternative for constructing a shared-use path in the 662-acre "Divide Block" of the Kitsap Forest and Bay Project between Miller Bay Road to the east and Port Gamble Road to the west in North Kitsap County. North Kitsap Trail Association (NKTA) prepared a preliminary alignment and has requested the trail be included in the County Transportation Plan and the Transportation Improvement Plan (TIP) and Capital Facilities Plan (CIP). Inclusion will make the trail eligible for federal and state funding and grants. However, inclusion will require support from the County Commissioners and assurances that the trail can be designed to the applicable federal, state and local standards. The proposed shared-use path is part of a larger regional trail system, the Sound to Olympics Trail, designed to serve residents and visitors and provide transportation options and recreation opportunities. This trail location is already shown as a Priority 1 Regional Non-motorized route in PSRC Transportation 2040 and regional maps.

This feasibility study was informed by the substantive work that had been done on this project by NKTA and their volunteers; many of whom are local professionals. Their vision was well documented in the Birkenfeld Heritage Trail Grant dated March 15, 2013. The objective of this feasibility study is to closely examine the concept presented by NKTA, 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.

KCPW 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 8-month planning process for the feasibility study began in the Fall of 2014. An advisory committee was formed early in the process with representatives from NKTA and Great Peninsula Conservancy (GPC) who participated in all meetings and work sessions with KCPW. Much of the field reconnaissance of alignment alternatives was performed by NKTA volunteers during the planning process.

A majority of the Divide Block is owned by Olympic Property Group of Pope Resources (OPG). GPC acquired 175 acres on the eastern portion of the Divide Block in 2014 from OPG. A trail across the privately owned Speed property on the far western side of the study area is proposed to complete the connection of the Sound to Olympics Trail to Port Gamble Road. NKTA has purchased an option to acquire this land. An easement corridor of approximately 30' width would be obtained by the County across GPC, OPG and Speed properties. On a portion of the Speed property, the trail corridor may share an existing driveway. The specific location of the easement for properties other than Speed's will be determined during the next phase of detailed design and engineering. The 2015 state budget, proposed in Spring of 2015, had a provision within it that would have allowed DNR to purchase the 484 acres on the west half of the Divide Block from OPG to manage the land as the North Kitsap Community Forest under the DNR Community Forest Trust Program. While this was not funded, Forterra continues to hold an option to purchase these 484 acres.

The trail will pass a mix of habitats including a beaver pond, salmon-bearing Grovers Creek, wetlands, native forest with a mix of mature Sitka Spruce, Hemlock, Cedar and Fir, emerging in a bucolic farming area. The unique areas of the trail can be highlighted by signage, providing educational information about the environment, Native American culture and local history.

The early alignments were designed to full standards using Federal Highway Administration (FHWA) standards for 30 mph travel speeds, wide turning radii (78 foot radii), maximum 5% longitudinal grades and 2% cross slopes. Resulting impacts to the environment included extensive earthwork and tree removal, and anticipated high costs associated with grading and retaining walls. Best practices of other Washington communities were explored and

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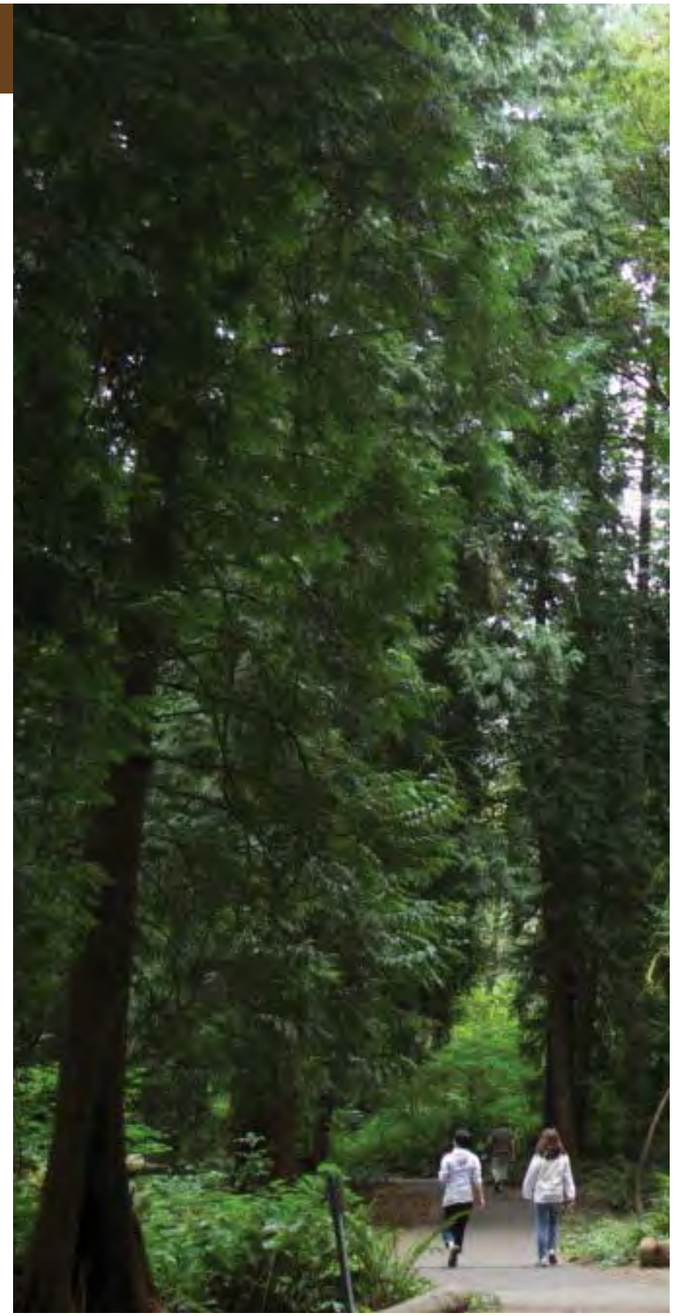

Figure A: Paved Trail in Western Washington

B

SPEED SEGMENT | WEST SLOPE SEGMENT | GRATITUDE SEGMENT | EAST SLOPE SEGMENT | WETLAND SEGMENT | MBR SEGMENT

PORT GAMBLE ROAD NE

MINDER ROAD NE

SPEED PARCEL

GRATITUDE WAY NE

TAKA LANE NE

NE GRAMFORD DRIVE

(MANSVILLE ROAD NE) (COUNTY ROAD 65)

GROVERS CREEK

MILLER BAY ROAD

NORTH KITSAP HERITAGE PARK

POTENTIAL ALIGNMENTS

- ALIGNMENT 1A (NKTA GRANT)
- PREFERRED ALIGNMENT
- PREFERRED ALIGNMENT BOARDWALK

EXISTING FEATURES

- OPG DIVIDE BOUNDARY
- WWRP RIPARIAN GRANT BOUNDARY
- LOT LINES
- GRATITUDE AND HAUL ROAD (SURVEYED 2015)
- HAUL ROADS 5% OR LESS
- HAUL ROADS GREATER THAN 5%
- CLASS 2 STREAM (WFC)
- CLASS 3 STREAM (WFC)
- CLASS 4 STREAM (WFC)
- CLASS 5 STREAM (WFC)
- CLASS 9 STREAM (WFC)
- UNCLASSIFIED STREAM (DNR)
- CLASSIFIED FORESTED BOG (SMAYDA)
- DELINEATED WETLANDS (BGE)
- DELINEATED WETLANDS (ELS)
- DELINEATED WETLANDS (PSS/FOC, PEMC AND PEMA)

0 200' 400'

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

Figure B: Preferred Alignment

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Figure C: Exploring Potential Trail Routes (Photo Courtesy of Don Willott)

representatives from WSDOT were consulted. The state legislature adopted HB 1700-2012 authorizing the use of AASHTO Design Standards for Shared-use Path on WSDOT funded projects. Following a meeting with representatives of WSDOT, where the designers learned that AASHTO standards and technical deviations would be feasible, the design standards were adjusted to reduce both environmental impacts and costs.

The trail will be designed for an 18 mph speed. It is proposed to be 10 feet wide and 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 30 feet in width. A technical deviation will be required in several locations where the longitudinal grade of the trail exceeds 5.0% but under the maximum 8.3% (1:12). Specifically, 38% of the trail from Port Gamble Road to the large boardwalk will be over 5% in grade. Overall, 30% of the 2.65 mile trail will be between 5% and 8.3% in grade. As such, FHWA standards require that a landing be provided every 200 linear feet along these steeper segments. This often occurs where the existing haul roads are being used or steep slopes being traversed. Additional deviations will 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. Allowing steeper grades also allows for a more direct route, reduced 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 report summarizes the preferred trail alignment and highlights the opportunities and constraints associated with the alignment. The preferred alignment, which was selected to minimize both environmental impact and cost, is 2.65 miles in length and would contain 0.43 miles of boardwalk through sensitive wetland area. Conceptual construction methods and materials are introduced including a discussion of the standard trail cross section in addition to trail cross sections on steep cross slopes (both with and without retaining walls) and a boardwalk section.

Project costs are estimated in 2015 dollars and consist of both soft costs, such as design, engineering and construction management and hard costs, which are the construction costs. The overall project cost for a 2.65 mile shared-use path meeting federal and state standards through the Divide Block is estimated at $6,001,000. This includes $4,846,000 in construction costs and $1,155,000 in soft costs (24% of construction cost). The soft cost percentage (relative to construction costs) appear lower than typical for a public transportation project because the design and engineering of the boardwalk and bridge, which are large cost items, are built into the materials and installation fees quoted by the boardwalk and bridge vendors.

The costs above equates to approximately $428 per linear foot for the length of 14,005 foot long trail. The cost of the boardwalk (2,266 linear feet or 16% of the trail length) is approximately $890 per linear foot (for design, delivery and install), which has a significant impact on the cost of the trail per linear foot. The portion of the trail that is not boardwalk but on-grade is approximately $271 per linear foot. Not included are any costs associated with land acquisition. It is assumed that necessary land acquisitions would be completed prior to moving into final design of the trail.

Adoption of this study by the County Commissioners will allow additional planning and implementation to commence. 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 required environmental and construction permits will need to be acquired during detailed engineering design prior to implementation.

Implementation of this 2.65 mile segment of trail through the Divide Block would come at considerable cost due to the steep terrain and a large wetland complex. However, this study demonstrates that a trail within the Divide Block 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.

PROJECT GOALS

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Figure 1A: Western Hemlock Along Proposed Trail Route (Photo Courtesy of Don Willott)

CHAPTER 1: PROJECT GOALS

The client, Kitsap County Public Works (KCPW), is interested in finding a cost effective alternative for constructing a shared-use path in the "Divide Block" in North Kitsap County. North Kitsap Trail Association (NKTA) prepared a preliminary alignment and has requested the trail be included in the County Transportation Plan and the Transportation Improvement Plan (TIP) and Capital Facilities Plan (CIP). Inclusion will make the trail eligible for federal and state funding and grants. However, inclusion will require support from the County Commissioners and assurances that the trail can be designed to the applicable federal, state and local standards. The proposed shared-use path is part of a larger regional trail system designed to serve residents and visitors and provide transportation options and recreation opportunities. This trail location is already shown as a Priority 1 Regional Non-motorized route in PSRC Transportation 2040 and regional maps.

This feasibility study was informed by the substantive work that had been done on this project by NKTA and their volunteers; many of whom are local professionals. Their vision was well documented in the unsuccessful Birkenfeld Heritage Trail Grant dated March 15, 2013. The objective of this study is to closely examine the concept presented by NKTA, 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

This feasibility study addresses three miles of multi-purpose shared-use path in Kitsap County located between Miller Bay Road to the east and Port Gamble-Suquamish Road to the west. The trail segment addressed in this study is a vital missing east-west link in a comprehensive trail system planned to connect North Kitsap's unique communities. The trail corridor will connect trails in the existing 443-acre North Kitsap Heritage Park and proposed 366-acre Park Expansion on the east (linking Kingston and Indianola), to the proposed 3,880-acre Port Gamble conservation lands and trails on the west.

The trail will extend the Sound to Olympics Trail (STO), a paved shared-use path connecting Kingston, Port Gamble, Poulsbo and Bainbridge Island to Seattle. The proposed STO would pass through the Divide Block (see Figure 1B) that is part of and an ambitious conservation Initiative to acquire 7,000 acres of private lands located in Kitsap County and currently owned by Olympic Property Group (OPG). This initiative is known as the Kitsap Forest and Bay Project. The effort has enormous community support, with over 30 community partner organizations participating. It has gathered statewide attention and had significant funding success on two other parcels, the Port Gamble block and the expansion of the North Kitsap Heritage Park. The proposed trail will connect those parcels and create a nearly continuous arc of open space, trails and wildlife habitat stretching from Kingston on Puget Sound to Port Gamble on the Hood Canal.

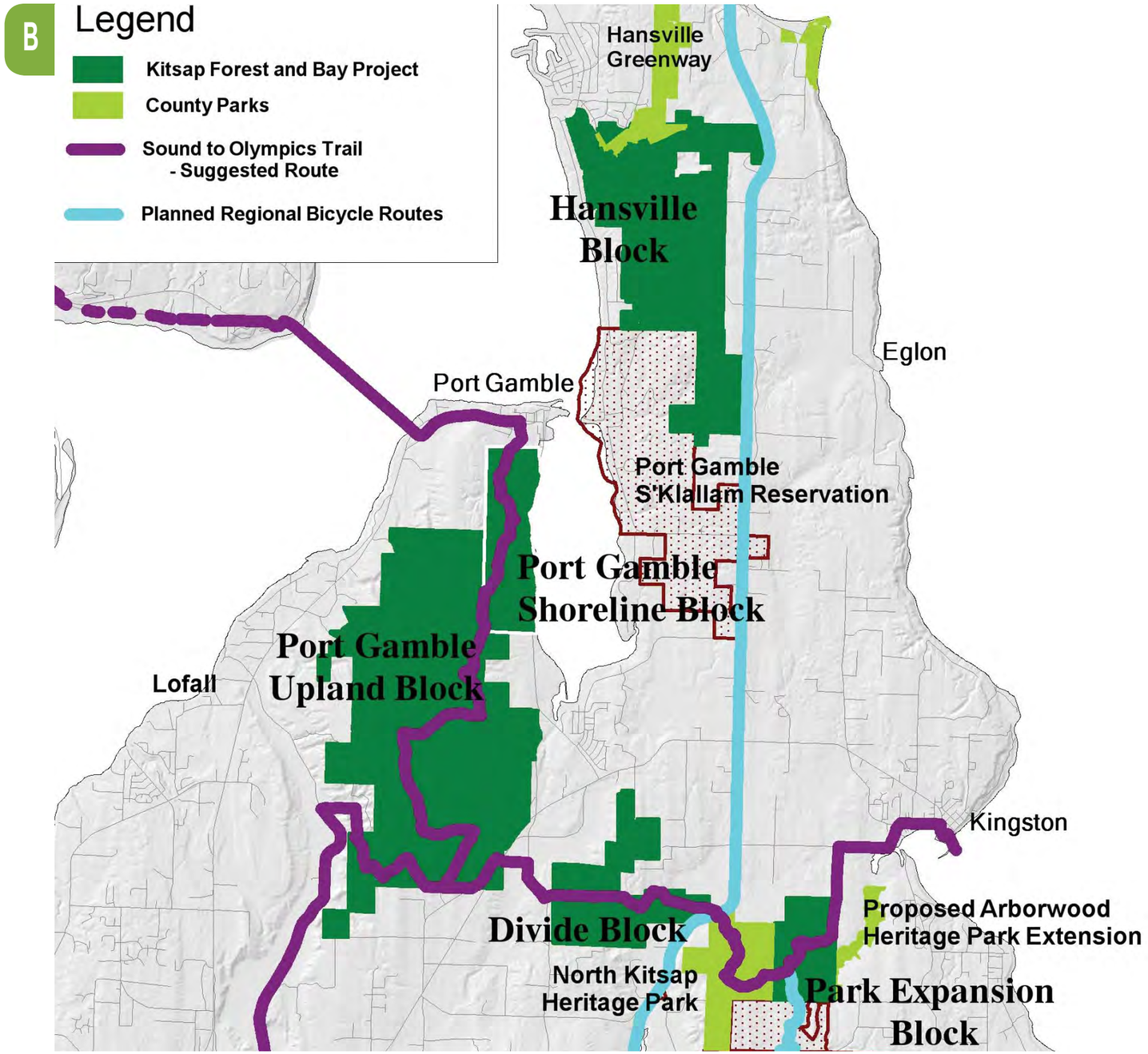

Figure 1B: North Kitsap Map (2011) Provided by NKTA

C

Figure 1C: Grovers Creek Exploration (Photo Courtesy of Don Willott)

1.2 Study Goals

Using the NKTA proposed alignment as a starting point, the feasibility study analyzed a variety of alignments to accomplish the following:

- Identify the most cost effective vertical and horizontal trail alignment for an accessible trail
- Avoid the most sensitive critical areas and address requirements for stream crossings
- Evaluate the feasibility of obtaining needed permits; addressing wetland impacts and possible mitigation requirements
- Comply with applicable standards including American Disability Act, AASHTO and WSDOT shared-use path standards
- Anticipate right-of-ways constructability and access issues

1.3 Products

The deliverables included in the consultant contract are all included in this report and are listed below:

- Summary of the planning process
- Summary of applicable federal and state engineering design standards
- Summary of trail alignment alternatives and construction techniques in critical areas
- Evaluation of critical areas associated with this Divide Block
- Preliminary engineering plans for preferred alignment
- Cost estimate for the preferred alignment
- Description of standards, pathway location and design, permitting requirements, right-of-way issues and estimated project costs

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PARTICIPANTS: ROLES AND RESPONSIBILITIES

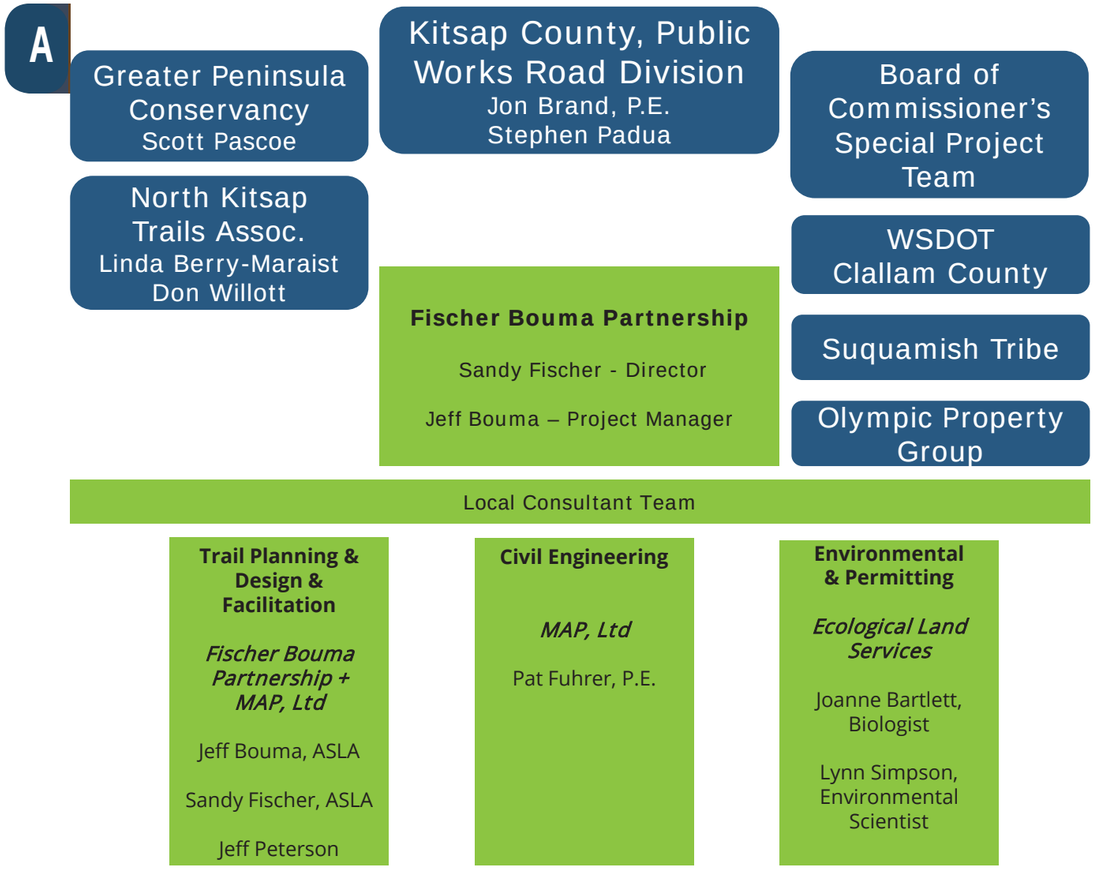

Figure 2A: Team Chart

CHAPTER 2: PARTICIPANTS: ROLES AND RESPONSIBILITIES

Kitsap County Department of Public Works (KCPW) 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 the Kitsap County Public Works Roads Division with active participation from the Board of Commissioner Special Project Team and the Department of Community Development.

2.1 Stakeholders

Key stakeholders were identified early in the process. They included the residents of Kitsap County, Great Peninsula Conservancy (GPC), North Kitsap Trail Association (NKTA), landowners including Olympic Property Group (OPG), Kitsap County, Speed Family, Kitsap Audubon Society (KAS), Port Gamble S'Klallam and Suquamish Tribes and the Kitsap Forest & Bay Coalition. WDFW was invited to participate but unable to do so due to recent staffing changes.

2.2 Advisory Committee, Technical Advisors and Stakeholders

NKTA and GPC were represented on the advisory committee. The planning process involved ongoing communication with all landowners and meetings with the stakeholders. WSDOT attended a working meeting in December 2014 to provide technical advice on design standards and the technical deviation process. A public meeting was held in May of 2015.

B

Figure 2B: Working With Stakeholders at a Public Meeting (Photo Courtesy of Don Willott)

PLANNING PROCESS AND CONTEXT

A

Figure 3A: Public Meeting, May 2015 (Photo Courtesy of Don Willott)

CHAPTER 3: PLANNING PROCESS AND CONTEXT

The approximate 8-month planning process for the feasibility study began in the Fall of 2014. The consultant team was led by Fischer Bouma Partnership and included landscape architects, planners, civil engineers, wetland scientists and biologists. An advisory committee was formed early in the process and representatives from North Kitsap Trail Association (NKTA) and Great Peninsula Conservancy (GPC) who participated in all meetings and work sessions with KCPW. Much of the field reconnaissance of alignment alternatives was performed by NKTA volunteers during the planning process.

B

① TIMEFRAME	Pre-Feasibility Study 2011	NOV 2014	NOV/DEC 2014	JAN 2015	FEB 2015	MAR/APR 2015	MAY 2015	JUN/JUL 2015
② ALIGNMENT	NKTA ALIGNMENT per Birkenfeld Grant	1A AND 1B	2	3 AND 4	5	6	7	FINAL ALIGNMENT
③ MEETINGS	Kickoff Meeting	November County Meeting	December WSDOT Meeting	January County Meeting	February County Meeting	Stakeholder Meeting	Public Meeting	County Commissioners for Approval
④ PARTICIPANTS	Consultant Team County NKTA GPC	Consultant Team County NKTA GPC	Consultant Team County NKTA GPC WSDOT Paula Reeves Rich James Neal Campbell Clallam County	Consultant Team County NKTA GPC	Consultant Team County NKTA GPC	Consultant Team County NKTA GPC OPG Tribes WDFW	Consultant Team County NKTA GPC Stakeholders Public	
⑤ TASKS	Field Reconnaisance - All	NKTA Field Reconnaisance	NKTA Field Reconnaisance	NKTA Field Reconnaisance Wetland Analysis 1	NKTA Field Reconnaisance Wetland Analysis 2 Site Ops Analysis 1 Cost Analysis 1	NKTA Field Reconnaisance Site Ops Analysis 2 Cost Analysis 2 Materials/Details Analysis 1	Site Ops Analysis 3 Cost Analysis 3 Materials/Details Analysis 2	
⑥ DECISIONS/ STRATEGY	Apply FHWA Standards	Apply AASHTO Standards	Revise AASHTO Alignment	Combine Alignments 1-4	Revise per Site Ops model results and field investigation	Revise per Comments	Revise per Comments	

Figure 3B: Planning Process Diagram

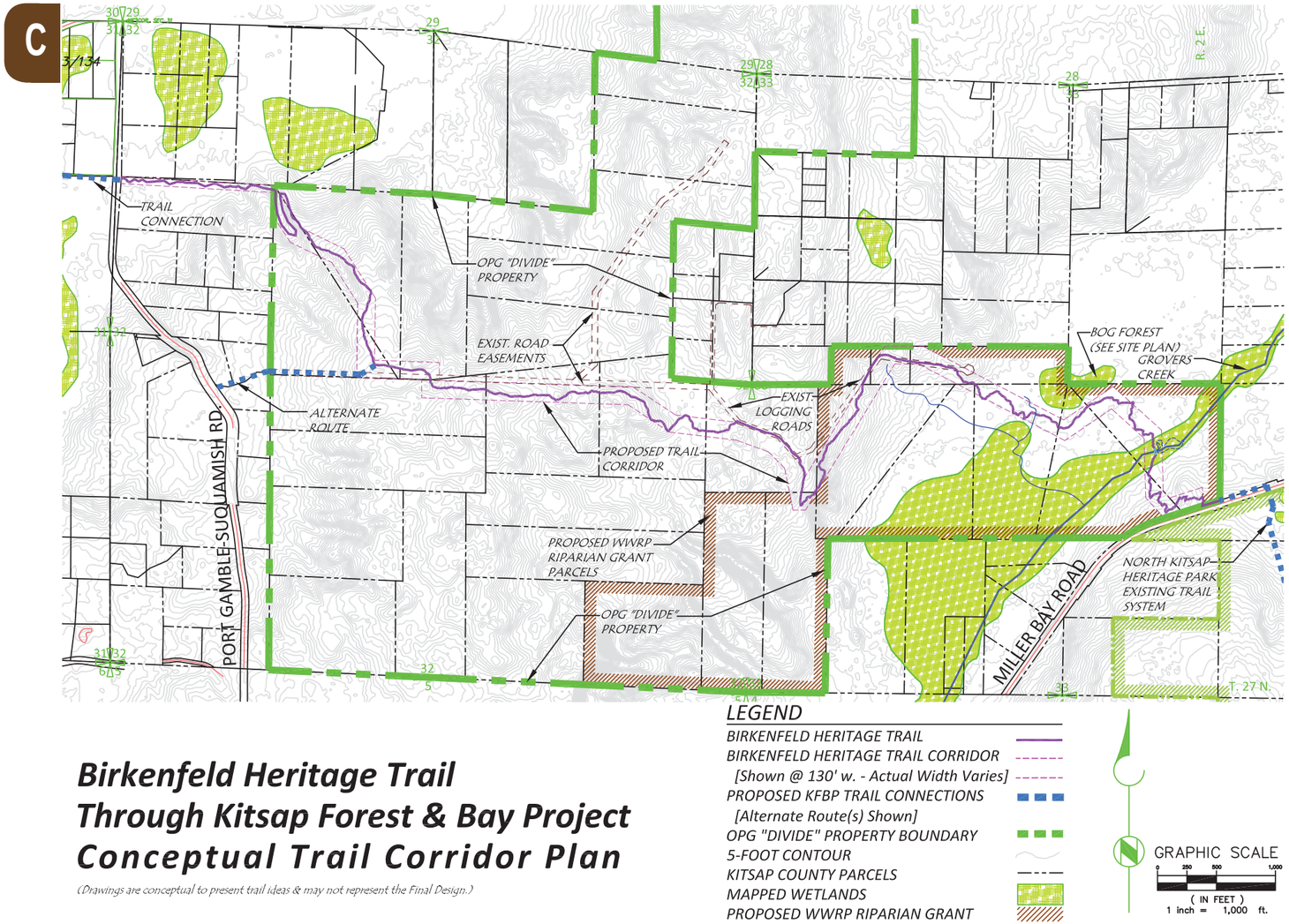

Figure 3C: Birkenfeld Heritage Trail Proposed Alignment

3.1 Summary of Planning Process

Several trail alignments alternatives were sequentially identified, analyzed, field tested and refined- resulting in the recommended alignment. The initial alignment analyzed was based on the NKTA alignment included in the Birkenfeld Grant in 2011 (Figure 3C). Figure 3B provides a graphic summary of the feasibility study process including the evolution of the alignment alternative and development of the design standards. For each alignment, the process included a refinement of design standards, desktop engineering, field investigation, working meetings and revisions to the alignment based on findings. As alignments became more refined over time, wetland analysis, computer modeling, and cost analysis were performed.

The study area was divided into six segments for the purpose of organization and clarity of discussion. These segments, running west (Port Gamble Road) to east (Miller Bay Road) and shown in Figure 3G on page 18 include:

- Speed Segment
- West Slope Segment
- Gratitude Segment
- East Slope Segment
- Wetland Segment
- Miller Bay Road Segment

The following chapter summarizes existing conditions of the project 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 later alignment alternatives.

3.2 Planning Context

Previous Planning Efforts

Trail planning efforts were initiated by NKTA with deep grass roots support. NKTA, a non-profit that was formed in 2007 shortly after the OPG announced they would be divesting themselves of their North Kitsap properties. NKTA adopted a mission "To unite North Kitsap County with a regional system of land and water trails that promotes stewardship of natural resources and enhances our communities' livability." The North Kitsap String of Pearls Trail Plan (adopted 2011) focuses on connecting communities, open space, trails and connecting people to nature and each other. The trail addressed in this feasibility study will create a missing link in a system of trails and open space connecting North Kitsap communities in this vision described as "The String of Pearls." NKTA's top priority is to conserve public access to and through the nearly 7,000 acres of OPG's land; private land that makes up the majority of the open space and trails in North Kitsap properties.

The Kitsap Forest and Bay Coalition includes Kitsap County, Port Gamble S'Klallam Tribe, Suquamish Tribe, Pope Resources, Forterra, GPC, and 30 local and state agencies, business and community groups. During the planning process, 175 acres of the Divide Block property was acquired by GPC.

The Sound to Olympics Trail is consistent with Puget Sound Regional Council's Vision 2040 goal of regional trail development as part of a larger strategy to develop regional green space and transportation alternatives. Vision 2040 is a regional strategy for accommodating the five million people expected to live in the region by 2040.

Relevant Plans, Policies and Background Materials

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

- Heritage Park Master Plan
- WSDOT HB 1700
- Birkenfeld Heritage Trail Grant, Dated March 5, 2013
- North Kitsap String of Pearls Trail Plan (adopted by Kitsap County in 2011)
- Sound to Olympics Trail Master Plan
- Great Peninsula Land Acquisition Studies
- OPG Haul Road surveys,
- Wildlife and Fish Conservancy Maps
- Biological Assessments by NKTA
- National Wetland Inventory
- Kitsap County Critical Areas Ordinance
- FHWA, Publication No. FHWA-HEP-05-030 Acquiring Real Property for Federal and Federal-Aid Programs and Projects
- WISAARD the Washington Information System for Architecture and Archeological Records Database

D

Figure 3D: Site Exploration, October 2015 (Photo courtesy of Don Willott)

3.3 Existing Conditions

Trail Location

The proposed trail passes through the 662-acre "Divide Block" of the Kitsap Forest and Bay Project between Miller Bay Road to the east and Port Gamble Road to the west. The linear, paved shared-use path will be constructed in an approximately 30-foot wide corridor proposed to be acquired fee simple.

Land Ownership

A majority of the Divide Block is owned by Olympic Property Group of Pope Resources (OPG). GPC acquired 175 acres on the eastern portion of the Divide Block in 2014 from OPG. A trail across the privately owned Speed property on the far western side of the study area is proposed to complete the connection of the Sound to Olympics Trail to Port Gamble Road. NKTA has purchased an option to acquire this land. An easement corridor of approximately 30' width would be obtained by the County across GPC, OPG and Speed properties. On a portion of the Speed property, the trail corridor may share an existing driveway. The specific location of the easement for properties other than Speed's will be determined during the next phase of detailed design and engineering. The 2015 state budget, proposed in Spring of 2015, had a provision within it that would have allowed DNR to purchase the 484 acres on the west half of the Divide Block from OPG to manage the land as the North Kitsap Community Forest under the DNR Community Forest Trust Program. Kitsap County, OPG, Forterra, GPC and DNR were partners in supporting this proposal. While this was not funded, Forterra continues to hold an option to purchase these 484 acres.

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 long-term 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.

E

Figure 3E: Grovers Creek (Photo Courtesy of Don Willott)

F

Figure 3F: OPG Timber Haul Road (Photo Courtesy of Don Wilott)

Ecological Resources

The trail will pass a mix of habitats including a beaver pond, salmon-bearing Grovers Creek, wetlands, native forest with a mix of mature Sitka Spruce, Hemlock, Cedar and Fir, emerging in a bucolic farming area. The unique areas of the trail will be highlighted by signage, providing educational information about the environment, Native American culture and local history. An extensive summary of critical areas, particularly wetlands, within the Divide Block are included in the Wetland Feasibility Report which can be found in Appendix A.

Cultural Resources / Historical Use

Land owned by the OPG has historically been used for timber production. There are a number of existing and overgrown logging and haul roads. In 2007, OPG announced they planned to discontinue forest operation and dispose of the land. The land has been subdivided into 10-acre tracts and is likely to develop into large lot residential home sites if the Forest to Bay Coalition is not successful in acquiring the land as community forest and public open space. To the extent possible, the alignment utilizes the already disturbed haul roads and respects parcel lines and attempts to retain buildable sites. 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. The Tribes (S'Klallam and Suquamish) have been

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SPEED SEGMENT | WEST SLOPE SEGMENT | GRATITUDE SEGMENT | EAST SLOPE SEGMENT | WETLAND SEGMENT | MBR SEGMENT

MINDER ROAD NE

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NE CRAWFORD DRIVE

(MANSVILLE ROAD NE) (COUNTY)

NORTH KITSAP HERITAGE PARK

GROVERS CREEK

MILLER BAY ROAD

MILLER BAY ROAD NE

NE BOO AVE

EXISTING FEATURES

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Figure 3G: Existing Conditions

H

Figure 3H: Western Red Cedar and Salal Along Proposed Trail Route (Photo Courtesy of Don Willott)

consulted and have not voiced objections to the acquisition or proposed use of the land. In fact, letters of support were provided by each of the Tribes and were included in the Birkenfeld grant application (2011).

Visual Resources

The forested corridor is scenic and comprised predominantly of foreground and understory views of trees, vegetation, drainages and creeks. From the Gratitude and West Slope segments of the trail there are territorial views to the north. From the haul road on the East Slope segment there are territorial views to the southeast over Grovers Creek. The alignment is sensitive to 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 are limited. The County has funded the Trail Feasibility Study. NKTA and their partners and volunteers have donated substantial resources to the master plan, grant applications, field studies and have led efforts to acquire land. OPG, GPC and Kitsap County are willing partners in land acquisition. It is anticipated this Trail Feasibility Study will position Kitsap County to receive state and federal grants for implementation.

Accessibility

The alignment design seeks to balance accessibility requirements with protection of existing resources. Seven alignment alternatives were evaluated over the course of the planning process. The recommended alternative will be accessible. However, it will include significant segments with gradients in excess of 5% but under the maximum of 8.33% (1:12). Level landing areas spaced at intervals not greater than 200’ will provide resting areas where slopes are greater than 5% per FHWA Standards. Discussions with WSDOT suggest that with proper documentation, technical deviations will be granted given the challenges associated with the topography and critical areas.

I

Description	Desired Shared Use Path Standard		Minimum Standard	Notes	Techincal Deviation
Design Speed- 18MPH	18 MPH w/ 20° lean angle		12 MPH	Slowest speed recommended w/o extensive signing	No
Pavement Width	12' W desirable	10' W acceptable	8' min. for short distances	Design for 10' W	No
Bridge Width	14' W desirable		10' min.	Design for 14' W to accommodate std size pickup truck	No
Switch Backs/ Tight Curves				Add 4' W of pavement width	No
Shoulders	2' min. each side	2% cross slope desired, max. 6H:1V	Design 2' w/ 2% cross slope	2' uphill and 5' downhill side to accomodate runners & horses	No
Cross Slope on Paved Surface	1.5%		Max. 2% slope	Crown undesirable	No
Cross Slope Transitions				Min. 5' for each % of grade (5% = 25' transitions)	No
Radii	60' min. for 18 MPH		60'R-18 MPH, 27'R-12MPH	Signage required for < 18MPH, Min. 27' radii to be used	27' R requiring 12 MPH and necessary signage
Side Slopes (shoulders)	6H:1V or greater		If steeper than 3H:1V then provide 5' separation (5' shoulder)		No
Vertical Drop at Edge	6H:1V or greater	< 30" use 4" curb , > 30" fence or barrier required			No
Gradient	5% or less		5% or less	Need 2% max. landing every 200' on or off trail	8.33% for 200' segments with landings
Vertical Clearance	10' Ht recommended	designed for users	8' min. height		No
Horizontal Clearance			2' min. from pavement edge		No
Stopping Site Distance		50' uphill @ 5%-300 (downhill at 5%)feet		Refer to AASHTO tables 5-17	No
Drainage				TBD in refined design and In consultation with geotech	No
Other Standards / Guidance					
Steep Side Slopes	Barrier and/or 5' shoulder recommended where side slopes exceed 3H:1V			3H:1V w/ drop of 6' OR 2H:V1 w/ drop 4' OR > 1:1 w/ drop of 1' or more	No
Barrier	2' off pavement desired	1' off pavement required		parallel to water	No
Street Crossing	PROWAG				No
Accessibility	ANPRM			see www.access-board.gov	No
Loading				Design for "Gator Vehicle"	No
Signage	MUTCD-Part 9				No
Striping	MUTCD-Part 9			Center line recommended on tight curves / poor site distance	No

TYPICAL DESIGN SECTION FOR ALIGNMENT STUDY -Refer to Graphic Cross Section

Typical Section without Grade Transitions

Shoulder	Path	Shoulder	Uphill Drainage	Note:
2' wide @ 2% typical*	10' W @2%	2' W @ 2%	TBD	When constructed on 3H:1V or 4H:1V slopes additional width req'd
Gravel	Paved	Gravel		for grade transitions and/or walls and railings
Typical Boardwalk / Bridge	Min. 12' wide with 11' clearance between railings, railings 42" height			

* add 3' shoulder at 5% max grade or add rail if side slopes exceed 6H:1V

Equestrian Accommodations

2' wide shoulder

We have identified no equestrian standards that allows a formal equestrian trail to be built without separation/a buffer between paved path and equestrian path.
A s such, we are recommending informal accommodation and a policy that does not prohibit use by horse riders (at rider's own risk).

Table 3I: WSDOT Shared-Use Path Design Criteria Summary and Basis of Analysis

J

Figure 3J: Site Exploration (Photo Courtesy of Don Willott)

3.4 Design Standards Summary

The early alignments were designed to optimum standards using Federal Highway Administration (FHWA) standards for 30 mph travel speeds, wide turning radii (78 foot radii), maximum 5% longitudinal grades and 2% cross slopes. The impacts to the environment included extensive earthwork and tree removal and anticipated high costs associated with grading and retaining walls.

Best practices of other Washington communities were explored and representatives from WSDOT were consulted. The state legislature has adopted HB 1700-2012 authorizing the use of AASHTO Design Standards for Shared-use Path on WSDOT funded projects. Following a meeting with representatives of WSDOT, where the designers learned that AASHTO standards and technical deviations would be feasible, the design standards were adjusted to reduce both environmental impacts and costs. Table 3I summarizes and describes the design standards used on the recommended and preferred alignment.

The trail will be designed for an 18 mph speed. It is proposed to be 10 feet wide and paved with 2% maximum cross slope, and 2 foot wide soft surface shoulders (typically gravel). The areas of impact will be adjusted based on adjacent landscape characteristics. Areas of disturbance in the corridor will range from 14 feet to 30 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 where the existing haul roads are being used. Additional deviations will 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 and NKTA, 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 decision was made to include a 2' wide gravel shoulder to 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.

3.5 Alignments Considered

The NKTA Birkenfeld Grant (2011) included a proposed trail alignment through the Divide Block. NKTA spent a significant amount of time investigating the most practical route through this area over the course of several years. This resulted in a route that was recorded by GPS in the field and which was converted to a digital CADD file. As such, this alignment was the starting point for this analysis of trail options through the area. The following pages describe and show the various alignments that were considered during the planning process.

Alignments 1A & B

The first step was to establish design standards for the trail. Alignment 1, consisting of two alignment studies (A & B), took the NKTA alignment and applied FHWA standards for shared-use paths to see the implication of applying those standards. Existing topographic maps, aerial photos, parcel lines, and other ground information was were provided by the County and an desktop engineering exercise was performed to apply the FHWA standards to a route that followed the same general corridor as Alignment 1A.

Figure 3K shows the result of Alignment 1A where only horizontal standards were applied, meaning that minimum turning radii were applied to the NKTA alignment. The result of this study demonstrated that significant portions of the NKTA alignment would not meet vertical standards, meaning allowable longitudinal slopes of 5% or less. Figure 3L also shows the result of Alignment 1B where both horizontal and vertical standards were applied, meaning that the trail was designed to meet maximum turning radii and have longitudinal slopes of 5% or less. The result of this study demonstrated that significant disturbance would occur to steep forested areas, particularly on the West Slope and East Slope segments.

As a result of this analysis, NKTA provided additional field reconnaissance and the consultant team met with the County and the Advisory Committee to discuss the implications of these analyses. It was at this time that the team decided to proceed with an alignment study based on American Association of State Highway and Transportation Officials (AASHTO) standards as allowed by Washington State House Bill 1700 (2012). Additional details about the decision-making process have been documented in the meeting minutes for each meeting and can be found in Appendix C.

Table 3M provides a comparison of the quantitative measures for each of the seven alignments studied during the planning process. Alignments 2 through 7 are described on the following pages. Appendix E provides a detailed comparison of the first four alignments.

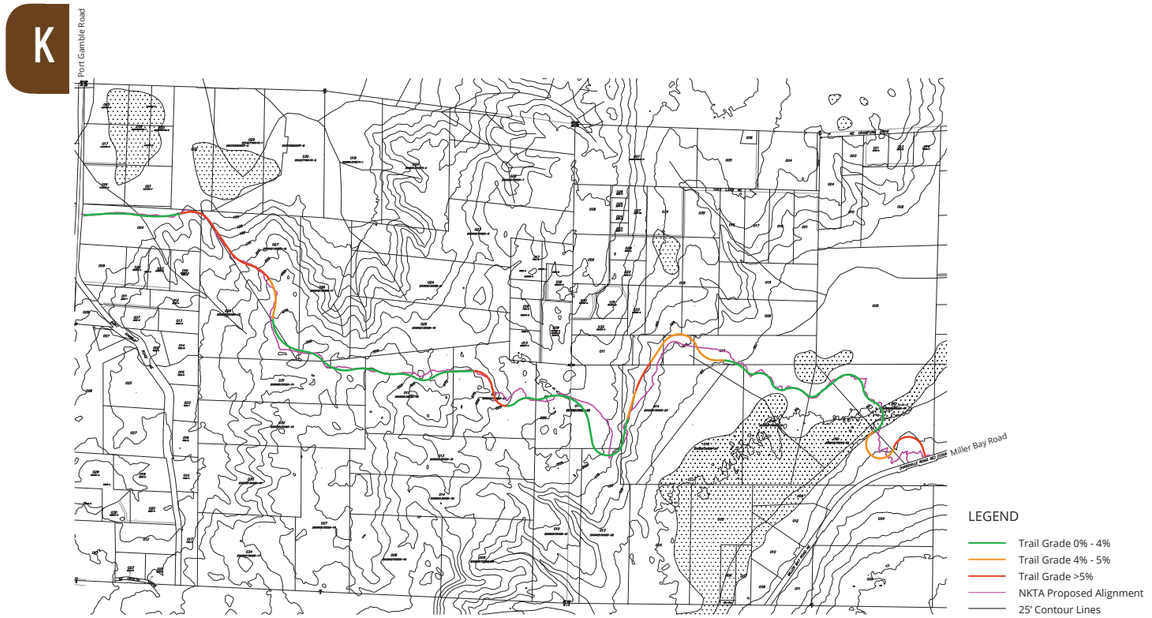

Figure 3K: Alignment 1A

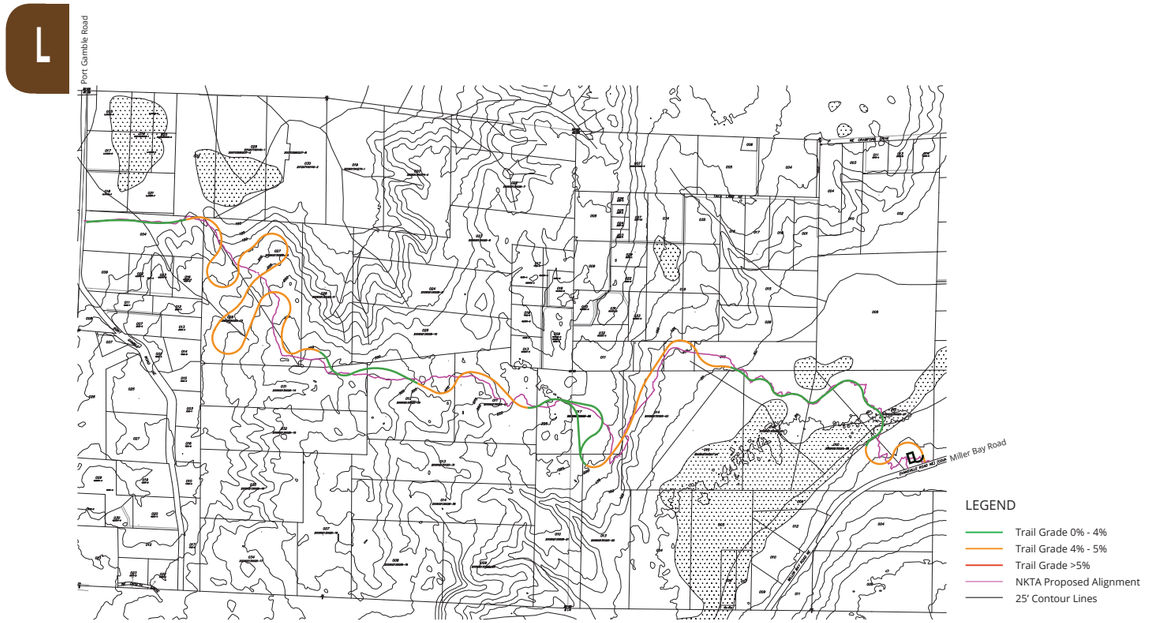

Figure 3L: Alignment 1B

M

NORTH KITSAP TRAIL FEASIBILITY STUDY

TRAIL ALIGNMENT ALTERNATIVES COMPARISONS

Date	Alt	Author	Source	Standards	Design Speed	Grade	Min Radius	Length Speed	Length W Slope	Length Gratitude	Length E Slope	Length Wetland	Length MBR	Total Length Ft	Miles
Nov-14	**1A**	NKTA Assoc		Unknown	Unknown	>5%	78 < 4%								
	1B	FBP	1A refined	FHWA	30 MPH	5% or <	174 > 4%	1,269	6,306	2,300	3,807	1,679	1,655	17,016	3.22
11/24/2014	**2A**	NKTA Assoc		Unknown	Unknown	>5%									
	2B	FBP	2A refined	AASHTO	18MPH	5% or <	60'	1,427	6,338	2,819	5,003	1,654	1,561	18,802	3.56
12/14/2014	**3A**	NKTA Assoc		Unknown	Unknown	>5%									
	3B	FBP	3A refined	AASHTO	18MPH	5% or <	60'	1,555	3,183	2,841	5,003	1,654	1,561	15,797	2.99
12/22/2014	**4A**	NKTA Assoc		Unknown	Unknown	>5%	<27								
1/2/15 rev	**4B**	FBP	4A refined/new	AASHTO	12-14 MPH	5% or <	27'	2,966	3,106	2,869	5,003	1,654	1,561	17,159	3.25
					12,14,16 MPH		27', 36', 47'								
1/9/2015	**5**	FBP	4B modified per 1/6/15 meeting	AASHTO	most 18 MPH some 12-14 MPH	80%<5%, 20% 5-8.3%	27'	1,265	2,824	3,343	2,755	2,058	1,878	14,123	2.67
3/17/2015	**6**	FBP	5 modified per 2/19/15 meeting	AASHTO	most 18 MPH some 12-14 MPH	80%<5%, 20% 5-8.3%	27'	1,113	2,801	3,029	2,851	2,074	1,995	14,124	2.68
5/1/2015	**7**	FBP	6 modified per 4/16/15 meeting	AASHTO	most 18 MPH some 12-14 MPH	80%<5%, 20% 5-8.3%	27'	1,176	2,934	3,037	2,851	2,074	1,995	14,067	2.66
MAY 2015	**FINAL**	FBP	7 modified per Site Ops modifications	AASHTO	most 18 MPH some 12-14 MPH	80%<5%, 20% 5-8.3%	27'	1,177	2,934	3,038	2,854	2,075	1,927	14,005	2.65

Note: Early in the planning process, each alignment alternative was designated with a letter (A,B) after the alignment number (1,2,3) to differentiate between the field alignment (A) as suggested by NKTA and the refinement of that alignment by desktop engineering.

Figure 3M: Alignment Comparison Table

Alignment 2

Similar to the process for Alignment 1 and for the alignment studies to follow, trail design standards were identified and the analysis began with a desktop engineering exercise to lay out the trail using existing maps and information. AASHTO shared-use path standards were applied to the NKTA alignment, the main difference being that turning radii were reduced from a minimum of 78 feet for a 30 mile per hour (mph) design speed under FHWA to a 60 foot radius for a 18 mph design speed. Additionally, a technical deviation allows for a minimum 27 foot radius with a 12 mph design speed, with mitigation such as wider path width and signage.

The result was an alignment that met all vertical standards for longitudinal slope under 5%. However, the consultant team, County and core stakeholders still felt there was too much disturbance of the steep forested slopes, particularly in the West Slope segment (refer to Figure 3N).

At this point, we had the opportunity to meet with Rich James, Transportation Program Manager for Clallam County and Paula Reeves (Assistant Director of Engineering Policy and Innovation) and Neal Campbell (WSDOT Local Programs) for Washington State Department of Transportation. See Appendix C for Meeting Notes from December 17, 2014 for detailed discussion. In summary, shared-use path design according to AASHTO standards is allowable in Washington State and technical deviations of these standards or the FHWA standards is allowed but requires documentation that the trail was designed per standards to the maximum extent possible. 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.

N

Port Gamble Road

NE CRAWFORD DRIVE

TAKA LANE NE

Miller Bay Road

(HANSVILLE ROAD NE) (COUNTY ROAD 307)

NE CROSBY ROAD

MILLER BAY ROAD NE

NOTE: All Curve Radii More Than 70' Per AASHTO

No Changes From Preliminary Alignment Grade

LEGEND

- Trail Grade 0% - 4%
- Trail Grade 4% - 5%
- 25' Contour Lines

Figure 3M: Alignment 2

Alignments 3 & 4

Due to steep grades and ravines with steep side slopes in the West Slope segment, NKTA continued to provide field reconnaissance and identified two new alignments in the West Slope and Gratitude segments that could potentially work. Specific trail design standards (AASHTO) were confirmed and the analysis of these alignments began with a desktop engineering exercise to lay out the trail using existing maps and information.

Additional information was provided at this point in time by ELS as they completed a high-level wetland analysis of the Alignments 3 and 4 to determine their feasibility with regards to impacts on critical areas. Refer to Appendix A for ELS's full feasibility report related to environmental impacts and recommended mitigation. Also, existing logging haul road maps were provided by the County and GPC and these were analyzed to assess feasibility for their ability to provide a corridor for the new trail. The three main issues with using haul roads as identified were: 1) many are well above 5% grade, 2)the haul road locations do not provide good connectivity between starting and end points- they run predominantly north/south instead of east/west, and 3) several of these roads would likely be used to access parcels if developed. It is possible that some of these haul roads could be used as an alternative equestrian trail in the future.

A meeting with the team reviewed these alignments (Figure 3O), the reconnaissance notes from in-field review of these alignments, and the wetland analysis that had been completed. The team determined a preferred alignment based on this discussion and a synthesis of the best sections of each of the previous alignments. Specific decisions are documented in the meeting minutes as found in Appendix C.

SPEED SEGMENT | WEST SLOPE SEGMENT | GRATITUDE SEGMENT | EAST SLOPE SEGMENT | WETLAND SEGMENT | MBR SEGMENT

0

PORT GAMBLE ROAD NE

MINDER ROAD NE

PORT GAMBLE ROAD NE

PORT GAMBLE ROAD NE

GRATITUDE WAY NE

GRATITUDE WAY NE

CRAWFORD DRIVE

TAKA LANE NE

(MANSVILLE ROAD NE) (COUNTY ROAD 65)

NORTH KITSAP HERITAGE PARK

GROVERS CREEK

MILLER BAY ROAD

MILLER BAY ROAD NE

POTENTIAL ALIGNMENTS

- ALIGNMENT 1A (NKTA GRANT)
- ALIGNMENT 4
- ALIGNMENT 3

EXISTING FEATURES

- OPG DIVIDE BOUNDARY
- WWRP RIPARIAN GRANT BOUNDARY
- LOT LINES
- GRATITUDE AND HAUL ROAD (SURVEYED 2015)
- HAUL ROADS 5% OR LESS
- HAUL ROADS GREATER THAN 5%
- CLASS 2 STREAM (WFC)
- CLASS 3 STREAM (WFC)
- CLASS 4 STREAM (WFC)
- CLASS 5 STREAM (WFC)
- CLASS 9 STREAM (WFC)
- UNCLASSIFIED STREAM (DNR)
- CLASSIFIED FORESTED BOG (SMAYDA)
- DELINEATED WETLANDS (BGE)
- DELINEATED WETLANDS (ELS)
- DELINEATED WETLANDS (PSS/FOC, PEMC AND PEMA)

0 200' 400'

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

Figure 3N: Alignments 3 & 4

Alignment 5

The preferred alignment was desktop engineered- preferred sections of trail were designed and combined by hand and in CAD based on the results of the previous studies and meetings. This alignment was then studied by MAP (Civil Engineers) in SiteOps, a 3D site optimization software described in more detail in Section 3.6. This software allowed the team to see the impact (both cost and habitat disturbance) of constraining the trail corridor between 20 feet and 30 feet per the trail sections as defined in Figure 4H on page 45. Minor adjustments were made to the alignment based on the results of the SiteOps modeling (Figure 3P). For example, retaining wall heights that were excessive were minimized by shifting the trail slightly uphill or downhill in various locations. ELS provided field investigation of this alignment to determine the potential for impacts to wetlands. Once again, a meeting was held to review this alignment and discuss the wetland analysis that had been completed. The team then decided on adjustments to the preferred alignment based on these findings. Specific decisions are documented in the meeting minutes as found in Appendix C.

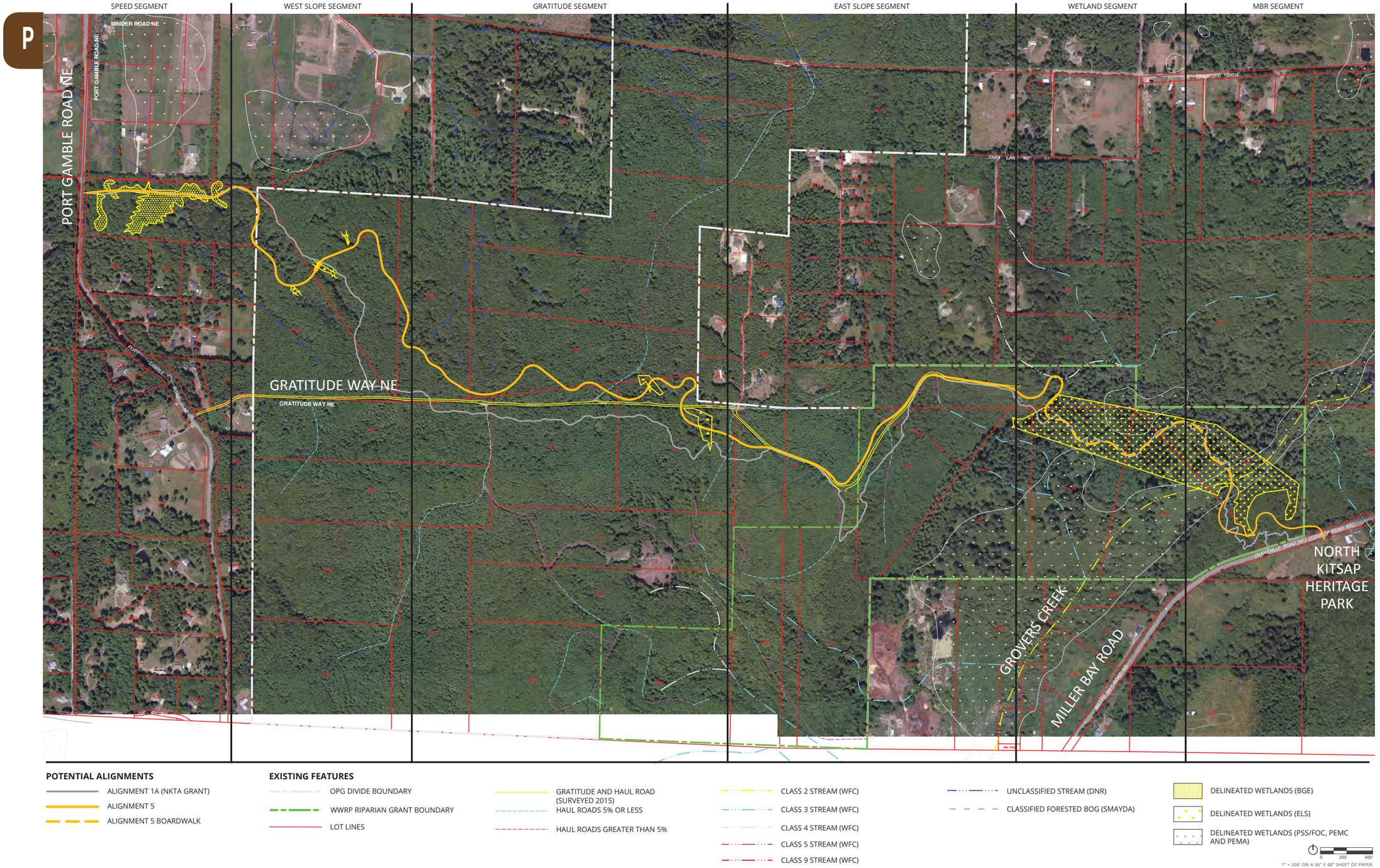

Figure 3O: Alignment 5

Alignment 6

Refinements to the preferred alignment were made, this time in SiteOps only, and both the planning process and the current alignment (Figure 3Q) were separately presented to a representative of the Suquamish Tribe and the Olympic Property Group, the owner of a majority of the continuous parcels within the Divide Block study area. Based on their input and feedback, which was primarily positive, minor changes were made to the alignment. Additionally, NKTA coordinated with the owner of the parcel in the Speed Segment to find an alignment solution. The challenge was finding an alignment that was not too steep or on steep side slopes, was confined to the eastern and northern most areas of the parcel to preserve development potential, and that could connect into the existing gravel road- all while minimizing the cut and fill required to make it a reality.

Q

SPEED SEGMENT | WEST SLOPE SEGMENT | GRATITUDE SEGMENT | EAST SLOPE SEGMENT | WETLAND SEGMENT | MBR SEGMENT

PORT GAMBLE ROAD NE

GRATITUDE WAY NE

NORTH KITSAP HERITAGE PARK

GROVERS CREEK

MILLER BAY ROAD

POTENTIAL ALIGNMENTS

- ALIGNMENT 1A (NKTA GRANT)
- ALIGNMENT 6
- ALIGNMENT 6 BOARDWALK

EXISTING FEATURES

- OPG DIVIDE BOUNDARY
- WWRP RIPARIAN GRANT BOUNDARY
- LOT LINES
- GRATITUDE AND HAUL ROAD (SURVEYED 2015)
- HAUL ROADS 5% OR LESS
- HAUL ROADS GREATER THAN 5%
- CLASS 2 STREAM (WFC)
- CLASS 3 STREAM (WFC)
- CLASS 4 STREAM (WFC)
- CLASS 5 STREAM (WFC)
- CLASS 9 STREAM (WFC)
- UNCLASSIFIED STREAM (DNR)
- CLASSIFIED FORESTED BOG (SMAYDA)
- DELINEATED WETLANDS (BGE)
- DELINEATED WETLANDS (ELS)
- DELINEATED WETLANDS (PSS/FOC, PEMC AND PEMA)

0 200' 400'

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Figure 3P: Alignment 6

Alignment 7

Alignment 7 (Figure 3R) was generated after making revisions to Alignment 6 as described. Alignment 7 was then presented at a public meeting in Kingston on May 28, 2015 in which approximately 25 people attended. In general, the planning process to date and the current alignment were met with approval. Only minor changes were made to Alignment 7 to better balance cut and fill and minimize wall heights, resulting in a preferred alignment that is the basis for this report and cost analysis. Section 4, following, describes in more detail the preferred trail alignment and its design parameters.

R

SPEED SEGMENT | WEST SLOPE SEGMENT | GRATITUDE SEGMENT | EAST SLOPE SEGMENT | WETLAND SEGMENT | MBR SEGMENT

MINDER ROAD NE

PORT GAMBLE ROAD NE

PORT GAMBLE ROAD NE

GRATITUDE WAY NE

GRATITUDE WAY NE

TAKA LANE NE

NE CRAWFORD DRIVE

MANSVILLE ROAD NE (COUNTY ROAD 65)

GROVERS CREEK

MILLER BAY ROAD

MILLER BAY ROAD NE

NORTH KITSAP HERITAGE PARK

POTENTIAL ALIGNMENTS

- ALIGNMENT 1A (NKTA GRANT)
- ALIGNMENT 7
- ALIGNMENT 7 BOARDWALK

EXISTING FEATURES

- OPG DIVIDE BOUNDARY
- WWRP RIPARIAN GRANT BOUNDARY
- LOT LINES
- GRATITUDE AND HAUL ROAD (SURVEYED 2015)
- HAUL ROADS 5% OR LESS
- HAUL ROADS GREATER THAN 5%
- CLASS 2 STREAM (WFC)
- CLASS 3 STREAM (WFC)
- CLASS 4 STREAM (WFC)
- CLASS 5 STREAM (WFC)
- CLASS 9 STREAM (WFC)
- UNCLASSIFIED STREAM (DNR)
- CLASSIFIED FORESTED BOG (SMAYDA)
- DELINEATED WETLANDS (BGE)
- DELINEATED WETLANDS (ELS)
- DELINEATED WETLANDS (PSS/FOC, PEMC AND PEMA)

0 200' 400'

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

Figure 3Q: Alignment 7

3.6 Preliminary Engineering/Site Optimization Software

The feasibility of routing approximately three miles of trail through hilly terrain, while analyzing three different trail alignments, was made very efficient through the use of a unique software. Alignments were draped over a terrain model (Figure 3S), and minimum/maximum longitudinal centerline profile slopes were inputted, together with the proposed cross-section template and pavement section depths. With the push of a button, 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 figure 3I and shown graphically with trail cross sections in Section 4 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 3T.

S

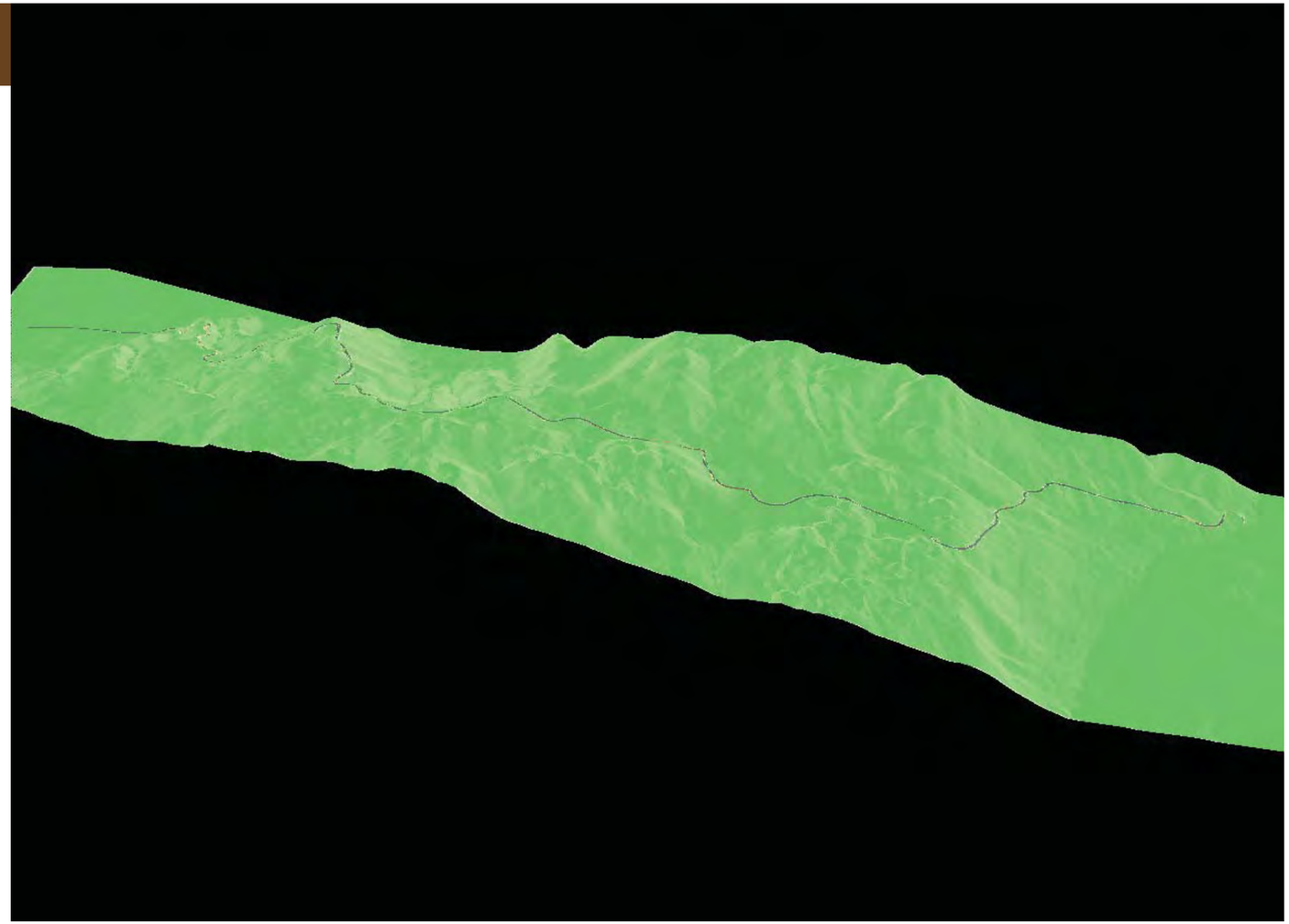
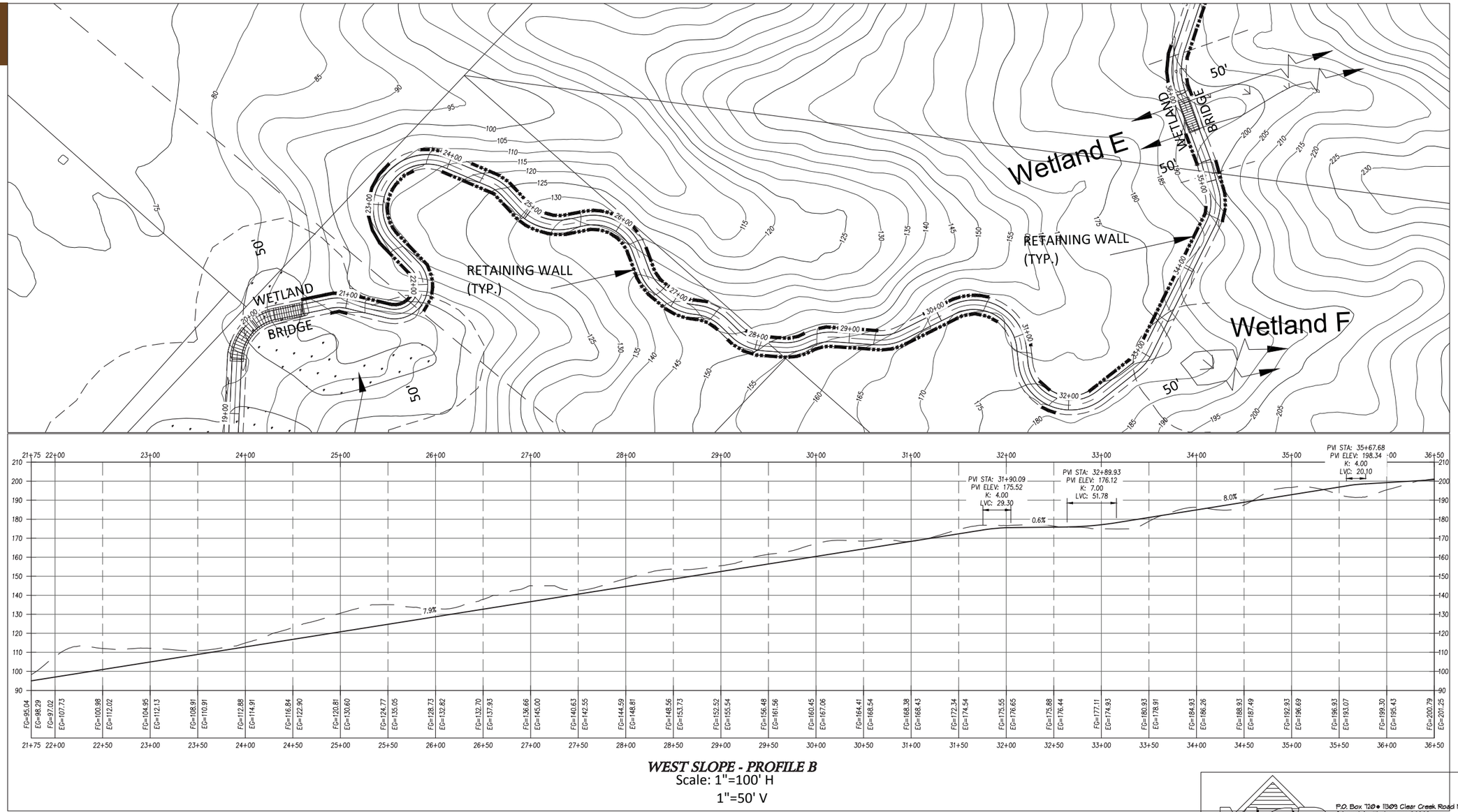


Figure 3R: West Elevation of Proposed Alignment With Vertical Exaggeration (Image Courtesy of MAP)



WEST SLOPE - PROFILE B
Scale: 1"=100' H
1"=50' V

PRELIMINARY 6-30-15

P.O. Box 720 • 13109 Clear Creek Road NW
Silverdale, Washington 98383
Silverdale 692-5525 • Seattle (206) 682-5514
Fax (360) 698-0546
ENGINEERING • SURVEYING
PLANNING

SHEET 3 OF 13

Figure 3S: Engineering Plan and Profile Example

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FINDINGS & RECOMMENDATIONS

A

Figure 4A: Forest Floor Along Proposed Trail Route (Photo Courtesy of Don Willott)

CHAPTER 4: FINDINGS AND RECOMMENDATIONS

Chapter 4 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 section in addition to trail cross sections on steep cross slopes (both with and without retaining walls) and a boardwalk section. 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.

4.1 Preferred Alignment

The following section summarizes the preferred alignment and highlights some of the opportunities and constraints of the alignment by planning segment. Refer to Figure 4B for a graphic of the alignment from west (Port Gamble Road) to east (Miller Bay Road).

The Numbers

On-grade Asphalt Trail:	11,689 LF	2.21 Miles
Boardwalk (Grovers Wetland):	2,088 LF	0.41 Miles
Boardwalk (Other Wetlands):	178 LF	0.03 Miles
Bridge over Grovers Creek:	50 Span	
Total Trail Length:	**14,005 LF**	**2.65 Miles**

Speed Segment

- To access Port Gamble Road from the Divide Block, NKTA has been coordinating with a private land owner for an easement across a portion of their property.
- There is a large wetland but a gravel road currently bisects it and the trail would utilize the road base with a shared-use agreement.
- The trail would leave the existing gravel road, cross a small wetland by boardwalk, make two switchback, and then climb up to the top of the ridge on the east side of the private parcel, much of which would be between 5% and 8.3% grade.

West Slope Segment

- This segment is the most challenging due to a significant change in grade (over 200 vertical feet), several ravines with steep side slopes, and wetlands or seeps within these ravines. Much of the trail in this segment would be between 5% and 8.3% grade.
- There would be several switchbacks in this section which require a technical deviation for smaller turning radii.
- A small boardwalk section would need to be installed as one portion of the trail crosses over a narrow finger of wetland as identified by ELS.

Gratitude Segment

- The trail was routed on the north side of Gratitude Road as it was determined to be optimal compared to the south side of Gratitude Road as previously recommended by NKTA. This is due to less steep slopes and thus less steep trail grades and less disturbance on the north side. In addition, the trail preserves more continuous areas of existing developable parcels to the south of Gratitude Road.
- By running near Gratitude Road and not down further on the north face of the ridge, the trail avoids drainages that develop into streams in some of these ravines as well as the steep side slopes of this area.
- Opportunities for overlooks and territorial views to the north are present along this segment.
- The trail runs parallel to the road for a short distance then crosses Gratitude Road at a 90 degree angle. A sign indicating a crossing should be installed on this private gravel road in addition to stop signs on the trail on either side of the crossing.

East Slope Segment

- Near the top of the logging road, the trail veers off to the west so that it does not merge with Gratitude. Keeping the trail off Gratitude Road will reduce potential vehicle and pedestrian conflicts and provide for a better user experience.
- A large portion of the trail on the east slope will require a technical deviations for longitudinal slopes over 5%. The trail gradient will be kept under the maximum 1:12 (8.3%). This will require landings every 200 linear feet along the trail.
- The logging road varies in gradient with maximum slopes of 10%, therefore some modification will be required to use this corridor for the trail. However, this strategy creates less disturbance to this slope than creating a completely new trail corridor up the slope.
- The trail descend down an existing logging road to the toe of the slope where the large Grovers Creek wetland complex begins. The logging road was surveyed during the planning process by a surveyor contracted by GPC. The importance of this is that this section is more accurate with regard to haul road location and the grades of this roadway.

B

SPEED SEGMENT | WEST SLOPE SEGMENT | GRATITUDE SEGMENT | EAST SLOPE SEGMENT | WETLAND SEGMENT | MBR SEGMENT

PORT GAMBLE ROAD NE

MINDER ROAD NE

PORT GAMBLE ROAD NE

GRATITUDE WAY NE

GRATITUDE WAY NE

PORT GAMBLE ROAD NE

TAKA LANE NE

NE GRAMFORD DRIVE

(MANSVILLE ROAD NE) (COUNTY ROAD 65)

GROVERS CREEK

MILLER BAY ROAD

NORTH KITSAP HERITAGE PARK

POTENTIAL ALIGNMENTS

- ALIGNMENT 1A (NKTA GRANT)
- PREFERRED ALIGNMENT
- PREFERRED ALIGNMENT BOARDWALK

EXISTING FEATURES

- OPG DIVIDE BOUNDARY
- WWRP RIPARIAN GRANT BOUNDARY
- LOT LINES
- GRATITUDE AND HAUL ROAD (SURVEYED 2015)
- HAUL ROADS 5% OR LESS
- HAUL ROADS GREATER THAN 5%
- CLASS 2 STREAM (WFC)
- CLASS 3 STREAM (WFC)
- CLASS 4 STREAM (WFC)
- CLASS 5 STREAM (WFC)
- CLASS 9 STREAM (WFC)
- UNCLASSIFIED STREAM (DNR)
- CLASSIFIED FORESTED BOG (SMAYDA)
- DELINEATED WETLANDS (BGE)
- DELINEATED WETLANDS (ELS)
- DELINEATED WETLANDS (PSS/FOC, PEMC AND PEMA)

0 200' 400'

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

Figure 4B: Preferred Alignment

Wetland Segment

- Based on field investigation by ELS, the forested wetland complex in the proposed trail area is continuous and made up of hydric and bog-type soil requiring the use of a boardwalk instead of an on-grade paved trail.

- The boardwalk is approximately 2,088 linear feet in length.

- The location for the boardwalk was selected by NKTA. After hours of field reconnaissance they determined that this is the most sensitive route to cross the wetland complex. ELS confirmed this conclusion during their field study. As such, the alignment in the preferred alignment closely follows the GPS route defined by NKTA for the Birkenfeld Grant.

- Actual boardwalk alignment and placement may vary during more detailed engineering and design when a survey can be executed to determine the location of large, significant trees that should be retained along this general route.

MBR Segment

- The trail crosses Grovers Creek where the channel has well defined banks. This location was originally identified by NKTA in coordination with the Suquamish Tribal Biologist and WDFW personnel. It is likely that a 50 foot span bridge will be required at this stream crossing.

- There is a short trail segment on dry ground from the Grovers Creek bridge to the west side of Miller Bay Road. It follows the terrain and crosses a small finger of wetland as identified by ELS. A small boardwalk section will cross this wetland.

- A crossing study will be completed by Kitsap County Public Works to determine the exact location based on site distances from the curves in the road and relative to the turning lanes into the parking area. After crossing the road, the trail would parallel Miller Bay Road on its east side terminating at the parking lot at North Kitsap Heritage Park.

C

Figure 4C: Gratitude Road (Photo Courtesy of Don Willott)

D

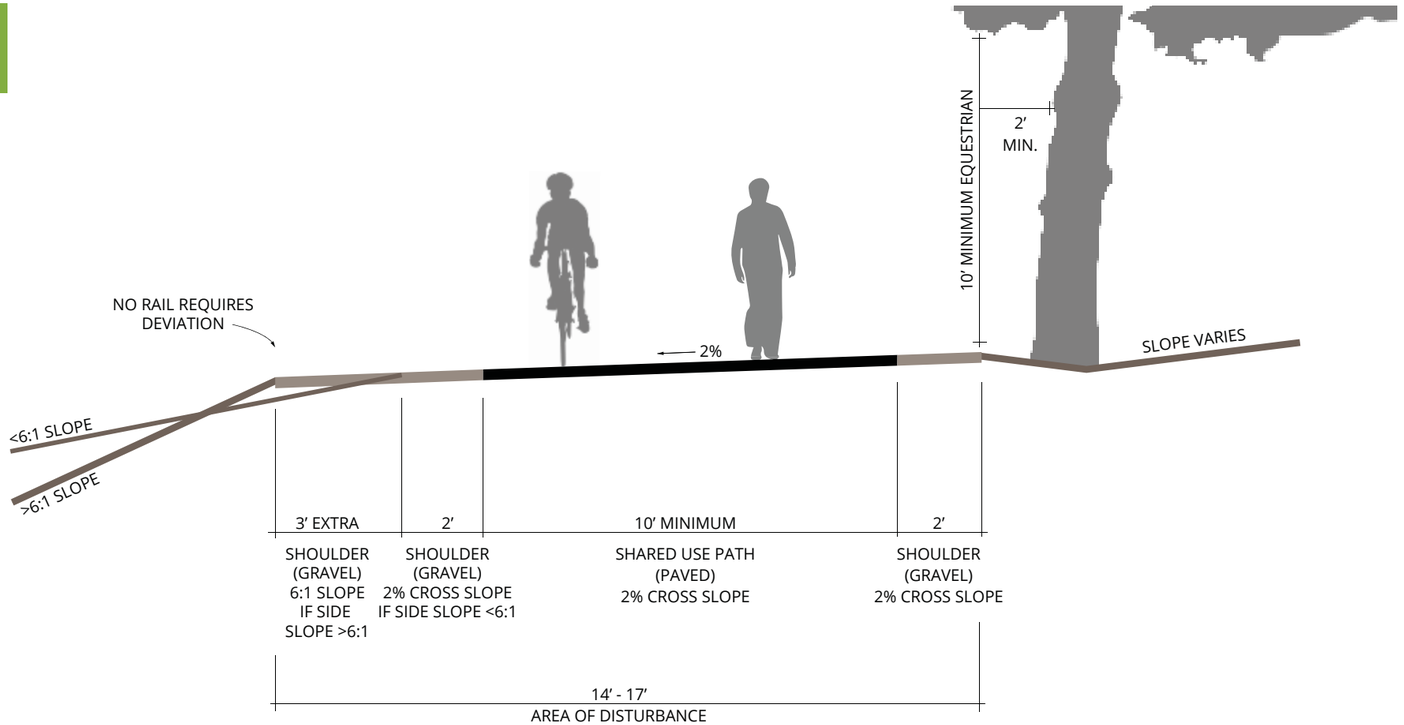

Figure 4D: Typical Cross-Section on Minimal Cross-Slope

E

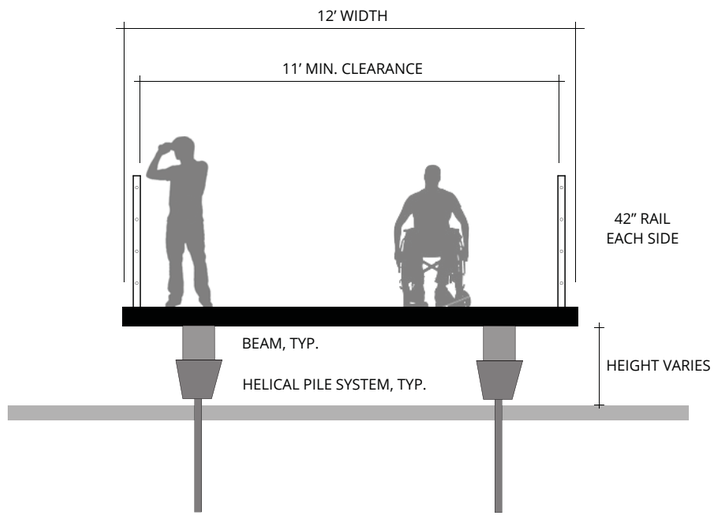

Figure 4E: Boardwalk

4.2 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. For each of the sections, a summary is provided for the method or material assumed to be best suited for the context of this particular project, which will also be 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 4D 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 3.4 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.

Boardwalk Cross Section

Figure 4E shows the shared-use path where it exists on boardwalk. The dimensions are based on AASHTO standards and decisions by the County and consultant team during the design process. In addition, GPC, the landowner of the segment of land that the boardwalk will be constructed on

F

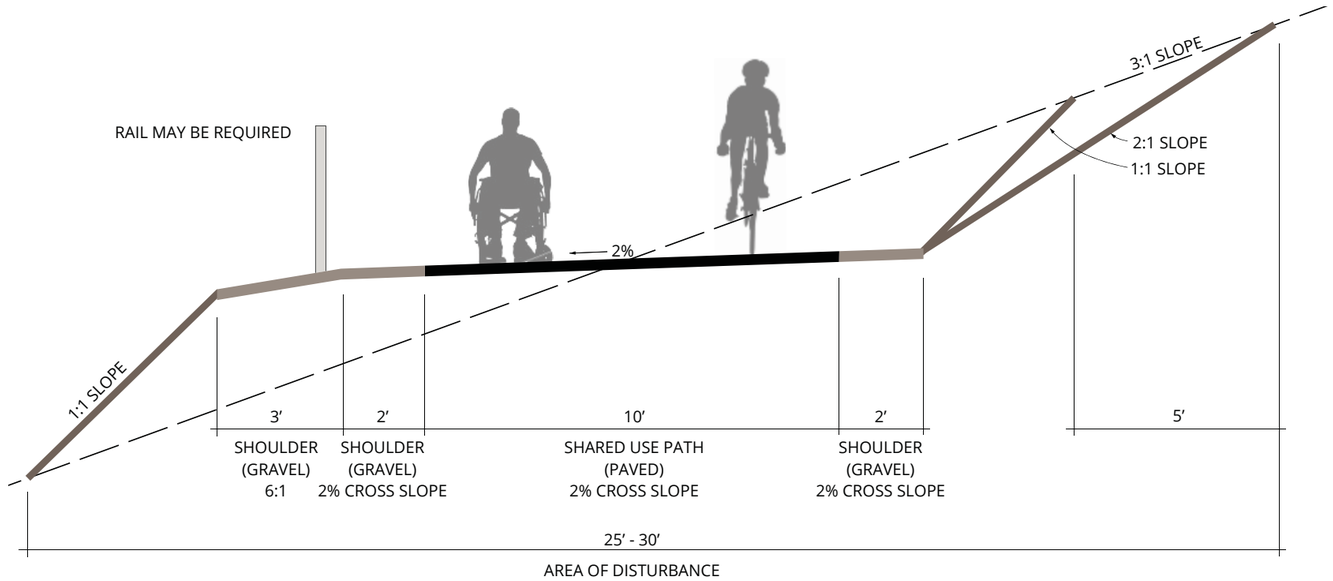

Figure 4F: Cross-Section on 3:1 Slope - Without Walls

G

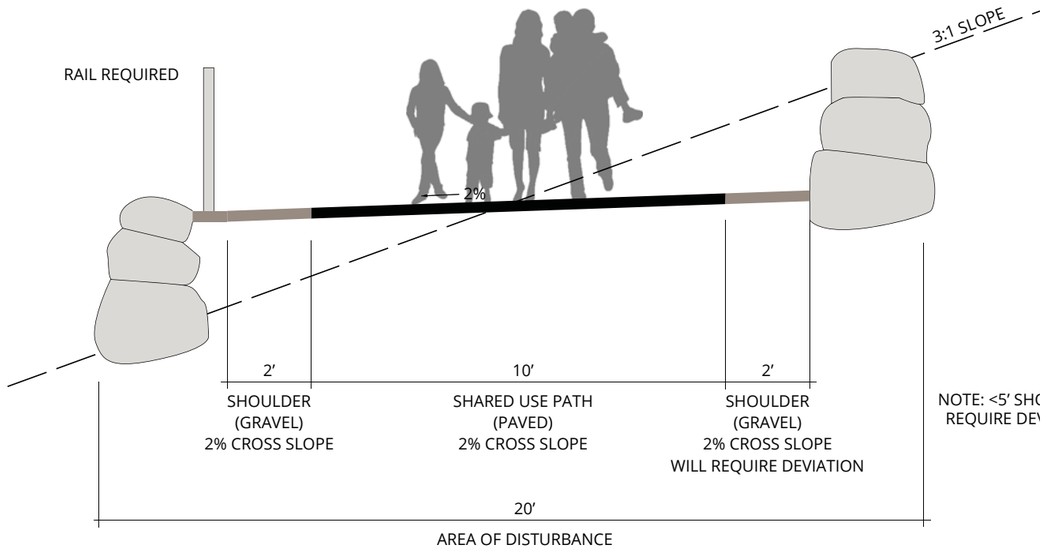

Figure 4G: Cross-Section on 3:1 Slope With Walls

has indicated their desire for boardwalk no wider than 12 feet which would allow for 11 feet of clearance once railings are included on each side. Per AASHTO Section 5.2.1 (2012) "eleven foot wide pathways are needed to enable a bicyclist to pass another path user going the same direction, at the same time a path user is approaching from the opposite direction." Railings (42 inch height) should be included on both sides of the boardwalk- per code and for safety in the case where the boardwalk is more than 30 inches above grade, and to keep pedestrians on the boardwalk to protect adjacent sensitive habitat in other instances. The boardwalk should be designed to meet both pedestrian and vehicle loads per AASHTO standards. Options for construction, such as footing types which will impact sensitive areas and materials which will impact cost, function and long-term maintenance, are summarized in a section to follow.

Cross Section on Steep Slope Without Retaining Walls

Figure 4F 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 3.4 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 4G shows a shared-use path cross section where there 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 3.4 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.

Criteria for Engineering Modeling Using Retaining Walls

There is a trade-off between cost and impact to habitat that was considered when determining where to use each one of these two sections. The engineering modeling software that was discussed previously in Section 3 had to be told which areas to constrain with retaining walls and which areas did not need to be constrained. Those areas determined to be constrained were 1) mature forest that was either identified in-field and on aerial photos or 2) GPC land that was acquired for habitat protection. Those areas determined not to be constrained were 1) young forest (including predominantly alder forest) and 2) OPG ownership of land that will likely retain forest harvesting rights. This determination did not apply to the section of boardwalk where cross slopes are minimal and the trail will be above grade anyhow. Approximately 65% of the alignment was constrained to 20 feet of disturbed width and 35% was constrained to 30 feet of disturbed width.

H

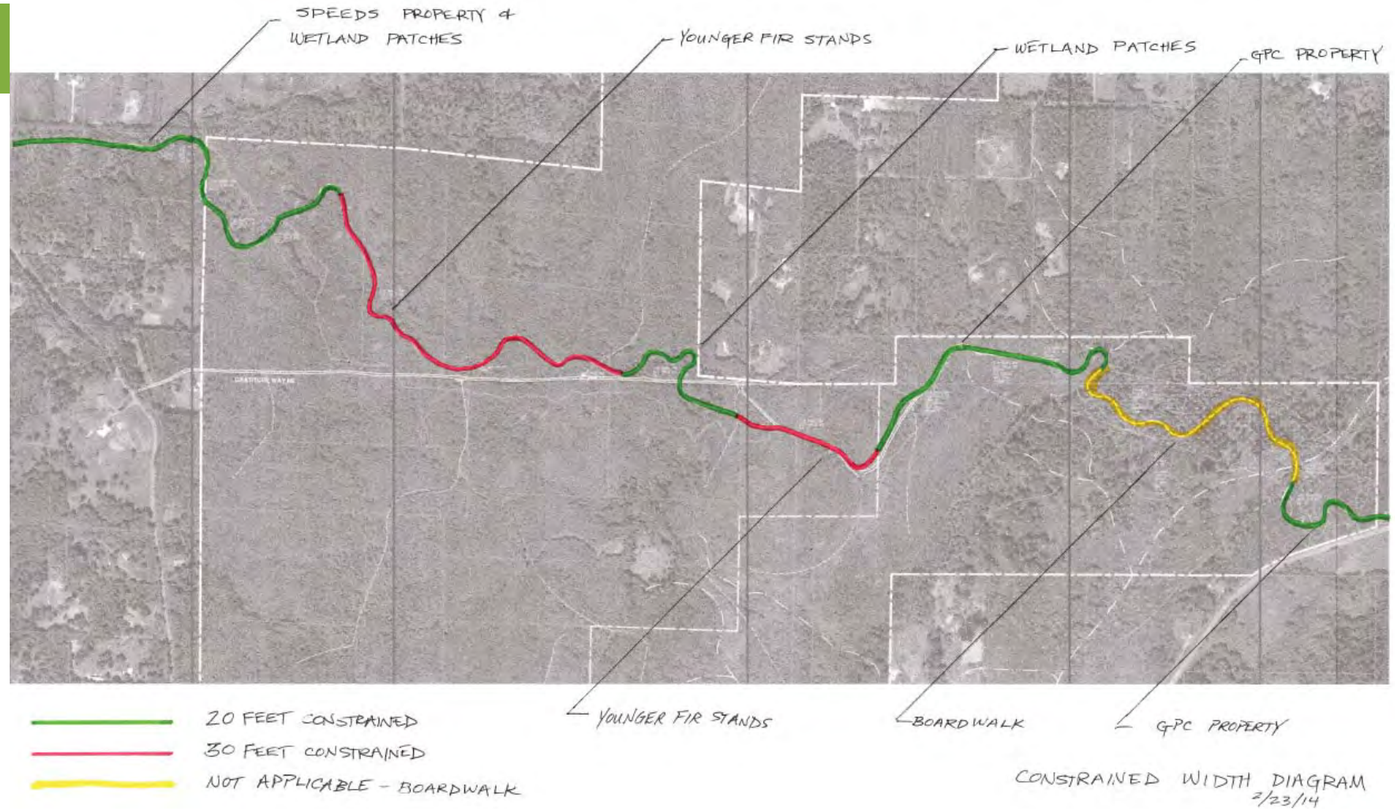

Figure 4H: Designation of Constrained Widths

Boardwalk

The boardwalk section with dimensions has been described previous in the chapter. With regard to construction methods and materials several factors should be considered including implementation cost, maintenance ease and cost, safety, function, aesthetics, sustainability and impact to the surrounding sensitive habitats. There would be 2,266 linear feet of boardwalk- 2,088 linear feet through the Grovers Creek wetland area and a cumulative 178 linear feet through three other small wetland areas. The boardwalk would be 12 feet wide with railings for a clear distance in between of 11 feet.

The live load should be designed to accommodate weights up to a small maintenance vehicle such as a Gator, as well as for wind, seismic, snow and equestrian use. The governing code for design of the boardwalk will be AASHTO LRFD Guide Specifications for Design of Pedestrian Bridges. The current boardwalk alignment is conceptual only is based on NKTA's extensive field work and confirmation by the consultant team wetland scientist. Detailed design and engineering will need to be completed based on a field survey of existing mature trees along the proposed alignment to minimize impact to this environment.

For the purpose of the feasibility study and cost estimate, a concrete PermaTrak (http://www.permatrak.com/) boardwalk was estimated for cost. PermaTrak is an environmentally friendly precast concrete boardwalk system engineered for ease of flexibility. It requires little maintenance compared to timber. Timber can become slick in a wet environment such as the Pacific Northwest. Structural members of the PermaTrak system are also reinforced concrete. Timber may be considered as a lower cost alternative (approximately 25%-30% less) in he short-term but will incur higher maintenance and replacement costs over time.

I

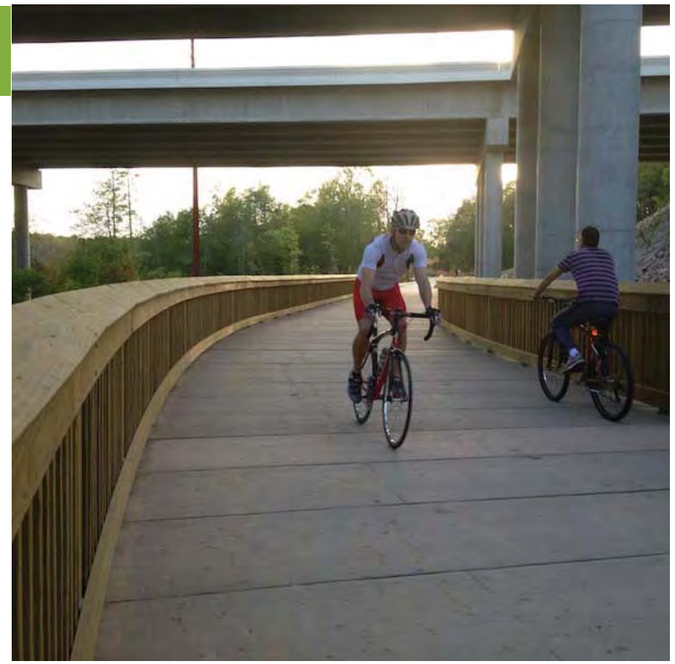

Figure 4I: Concrete Boardwalk (Image Courtesy of PermaTrak)

For the footing system, whether a PermaTrak boardwalk system or timber, a helical pile system is recommended due to the deep layer of bog soil that exists and the less impact this system has on critical areas. PermaTrak claims that its system can be constructed "top-down" which refers to the ability to install the boardwalk treads and beams from equipment operating on top of previously installed treads and beams. As such, sensitive areas can be protected during the construction phase.

Table 4K on the following page provides a summary of the various materials that can be used for boardwalk surfacing. Appendix D contains a conceptual plan and section of the PermaTrak boardwalk system.

J

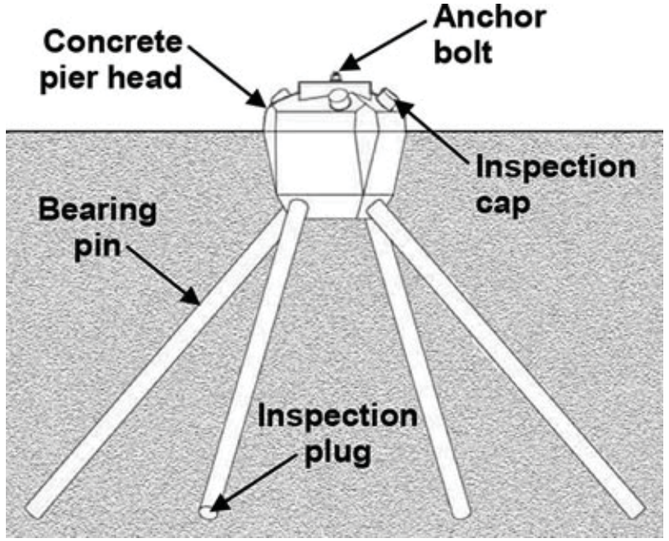

Figure 4J: Pin Pile Footings (Image Courtesy of Diamond Pier)

K

MATERIAL	PROS	CONS	RELATIVE COST
WOOD			
Cedar	Local Natural look and feel Blends with surroundings Standard construction	Short 15 year lifespan Maintenance needs Can get slippery	$$
Pressure Treated	Somewhat natural looking Standard construction Widespread availability	Slight leaching into localized water/soil column Can get slippery	$
Tropical Hardwoods	Longevity Natural look and feel	Finding sustainable sources Can get slippery	$$$
Kiln Dried Ash	Long lasting hardwood No chemicals Sustainable	Slippery Expensive	$$$
COMPOSITE	Longevity Wide variety of color options Can be cut/modified in field	Questionable look and feel Can get slippery Less standard construction Non-biodegradable/renewable Surface can become hot	$$
PRE-CAST CONCRETE	50-75 year lifespan Top-down construction Textured surface available Less slip resistant Greater weight bearing capacity Cooler surface in sun No chemicals/sealants	Heavy to transport Less standard construction	$$
METAL	Low maintenance Slip protection Allows detritus to fall through and accumulate underneath	Workability Less standard construction	$$$$

Table 4K: Potential Boardwalk Surfacing Materials

L

Figure 4L: Typical Asphalt Pavement Surfacing

Trail Surfacing

Hard, all-weather pavement surfaces are preferred. 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. A softer surface is preferred by joggers and walkers. 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.

M

Figure 4M: Typical Interpretive Sign Along Trail

N

Figure 4N: Typical Regulatory Sign Along Trail

O

Figure 4O: 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.

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

P

Figure 4P: Example of Wayfinding Sign Along Trail

Development of a wayfinding sign plan for the STO Trail within Kitsap County is recommended to provide a consistent messaging and similar environmental graphics such as materials, colors, fonts, and icons among all wayfinding and interpretive signs. This latter recommendation is not reflected in the cost estimate, although the design, fabrication and installation of wayfinding signs for this segment of trail is included.

Q

Figure 4Q: Example of Interpretive Sign

Interpretation & Education (I & E) Signage

Interpretation provides and 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 Divide Block 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, particularly within the Grovers Creek boardwalk segment. An interpretation and education plan for the STO trail 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.

R

Figure 4R: Example of Trailhead Kiosk

Trailheads

Trailheads for the Divide Block shared-use path segment would be located at both the east and west ends of the trail. A trailhead on the east end of the trail would not be associated with the existing parking at North Kitsap Heritage Park as previously described. Instead, a small kiosk with trail map and other information could be located adjacent to Miller Bay Road where the trail crosses the road. The trailhead on the west end of the trail would be associated with the new parking area off of Port Gamble Road as described previously. For purposes of cost estimating, trailhead elements will each include a small kiosk and trash receptacle.

S

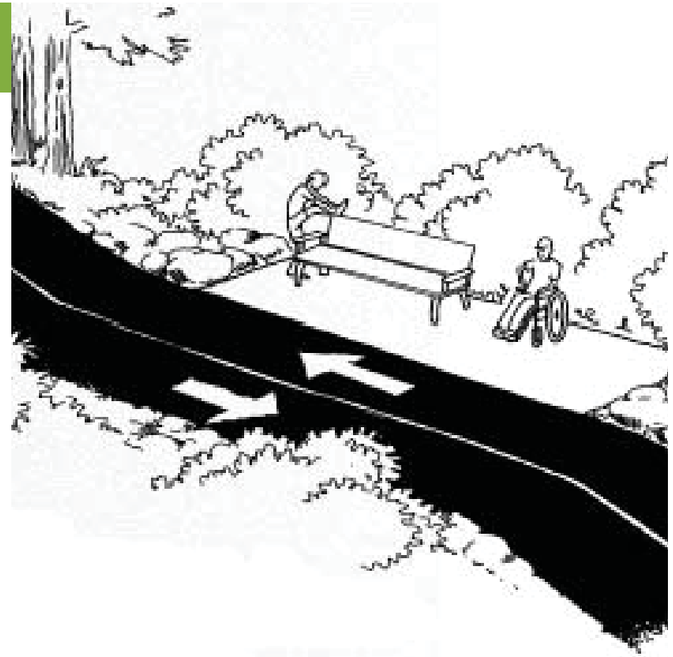

Figure 4S: Sketch of Trail Pullout

T

Figure 4T: Existing Gravel Parking on Miller Bay Road

ADA Pullouts/Landings

Several segments of the trail will have a grade over 5% but under the maximum 8.3% (1:12). Specifically, 38% of the trail from Port Gamble Road to the large boardwalk will be over 5% in grade. Overall, 30% of the 2.65 mile trail will be between 5% and 8.3% in grade. 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 the length and width of the trail which will result in a grass-separated situation requiring a small retaining wall in each case. The landings will be required to be paved similar to the adjacent trail. The above sketch is an example, although not entirely accurate since the trail will not have the same gentle slope adjacent to the flat pull-out area. Since the trail will be sloping and the pull-out flat, there will need to be a short retaining wall between the two to accommodate the grade change and only a minimum width entry into the landing.

There are approximately 20 pull outs. They are not currently located on the preliminary engineering drawings located in Appendix A. These will be designed in more detail during the engineering phase of the project. The pullouts should be strategically located to take advantage of views, whether territorial or nearby significant natural features. Some of these pullouts would provide a good location for interpretation and education signs as described in a later section. For the purpose of the cost estimate, a lump sum amount was assumed for each of these pullouts.

Parking

On the east end of the trail, parking already exists at North Kitsap Heritage Park. Approximately 18 stalls in a gravel parking area 90 feet by 90 feet are located on the east side of Miller Bay Road. Turn lanes were recently added by the County to Miller Bay Road to improve access to and from the parking lot. An additional parking area was studied on the west side of Miller Bay Road. However, when GPC purchased the eastern portion of the Divide Block, they indicated that constructing, managing and maintaining a parking lot on this land was not consistent with the organization's goal of providing land for habitat preservation and that they would like to see the parking lot at North Kitsap Heritage Park used to accommodate trail users. For this feasibility study, no costs have been included for improvements or expansion of the existing parking area to accommodate additional users.

On the west end of the trail, parking is proposed off of Port Gamble Road on an easement to the Speed property currently being negotiated by NKTA. This parking area would be in the northwest corner of the parcel. It will be built with a gravel surface, will be 100 feet by 65 feet in size, and will accommodate approximately 12 vehicles. For the purpose of this feasibility study, costs have been included for the development of this parking area.

U

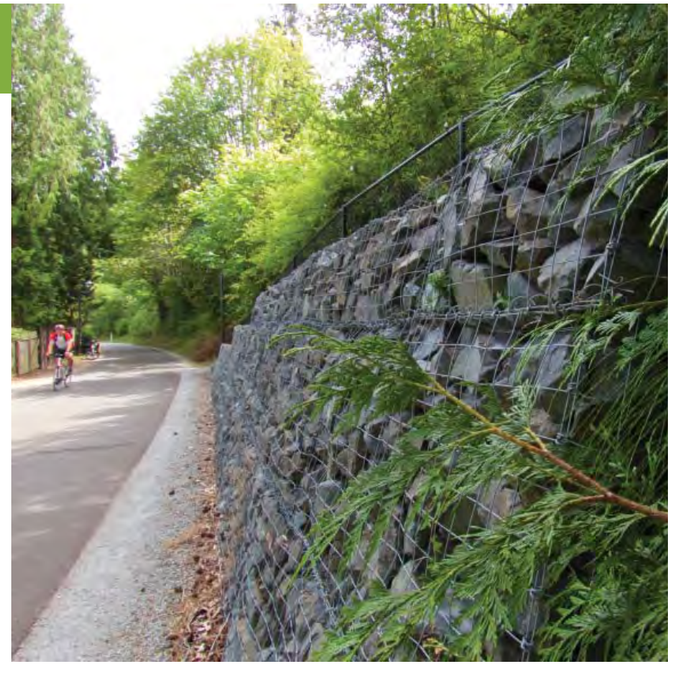

Figure 4U: Example of Gabion Retaining Wall

Retaining Walls

Retaining walls along the trail were assumed, for the purposes of planning and costing, to be either basalt rockery (generally those three feet or less in height) or mechanically stabilized earth (MSE) where taller than three feet. MSE wall systems are generally used for slope stabilization and to minimize right-of-way embankment requirements. MSE wall systems are cost-effective earth-retaining structures that can tolerate larger settlements than conventional retaining wall systems. There are several wall facing systems for MSE walls that can be selected depending on cost, ease of construction and aesthetics. These include modular blocks, gabion facing as shown above, geosynthetic facing and precast concrete panels. For the purposes of this study, a modular block system was used for costing.

V

Figure 4V: Example of Trail Crossing

Road Crossings

The County will be completing a preliminary study of crossing options for Miller Bay Road near North Kitsap Heritage Park. Possible constraints for a crossing include limited site distances due to curves in the road coming from each direction, as well as vertical changes in the road. Also, two turn lanes were recently added to 2-lane Miller Bay Road which makes a crossing at this central location (where site distances are the best) less advantageous. 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 due to high traffic volumes on Miller Bay Road. It may also be appropriate to provide flashing traffic signals on Miller Bay Road that are either manually or automatically activated by trail users. Guidance on the need for a signal and other traffic control devices is provided in the MUTCD and FHWA sources. The safest approach to crossing Miller Bay Road would be to design and install an underpass,

W

Figure 4W: Example of Trail Underpass

using a concrete box culvert, for example so there is no opportunity for conflict between pedestrians and vehicles. Project costs for an underpass of the size needed for this application could easily approach $500,000.

Lighting

Due to the rural nature of the location of the trail, lighting is not proposed on this shared-use path. Lighting may be considered in the future during engineering if the County determines that lighting would be an amenity at the trailhead kiosks. If an underpass were to be installed, lighting would be included within the box culvert for safety. Lighting of the road crossing at Miller Bay Road is discussed in a previous section. As such, no costs for lighting will be included in the costs estimate.

X

Figure 4X: Example of a Trail Overlook

Overlook or Viewpoint

Overlooks are differentiated from the trail pullouts or ADA landings described previously in that these elements become a destination for trail users. An overlook or viewpoint could enhance the user experience, draw users to this recreation resource, and provide a place for respite that is safely off the main trail. An example would be the Grovers Creek wetland complex. A small spur boardwalk could extend a short distance off of the main trail to a location with a significant view of large trees framing a more open wetland area. An interpretive sign would describe the significance of the location. A second example would be an on-grade overlook, located near the west side of the Gratitude segment or east side of the West Slope segment. There are territorial views of the valley to the north through the trees. A large gravel pull-off, defined by split-rail fence and containing an interpretive sign should be field located during more detailed design.

Y

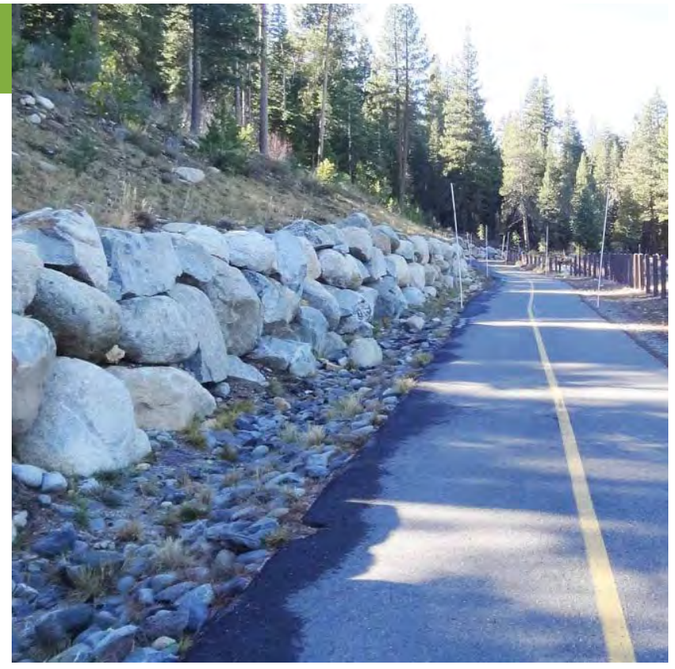

Figure 4Y: Example of Trail Drainage

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.

Z

Figure 4Z: Typical Steel Bridge

Bridges

One 50 foot minimum span bridge over Grovers Creek will be required. Smaller wetlands sections can be crossed using boardwalk. Prefabricated steel truss bridges, such as those provided by the vendor Contech, would be favorable to wood beam structures due to their longevity. Decking on the bridge would be concrete. Spans of 50 feet have been pre-engineered for various widths. A prefabricated bridge would be built off-site and delivered for installation by a contractor who would also need to construct the bridge abutments, which will require design and engineering.

AA

Figure 4AA: Lichen Along Proposed Trail Route (Photo Courtesy of Don Willott)

4.3 Summary of Estimates of Probable Costs

Project costs are estimated in 2015 dollars and consist of both soft costs, such as design, engineering and construction management and hard costs, which are the construction costs. The overall project cost for a 2.65 mile shared-use path meeting federal and state standards through the Divide Block is estimated at $6,001,000. This includes $4,846,000 in construction costs and $1,155,000 in soft costs (24% of construction cost). The soft cost percentage (relative to construction costs) appear lower than typical for a public transportation project because the design and engineering of the boardwalk and bridge, which are large cost items, are built into the materials and installation fees quoted by the boardwalk and bridge vendors.

The costs above equates to approximately $428 per linear foot for the length of 14,005 foot long trail. The cost of the boardwalk (2,266 linear feet or 16% of the trail length) is approximately $890 per linear foot (for design, delivery and install) and is having a significant impact on the cost of the trail per linear foot. The portion of the trail that is not boardwalk but on-grade is approximately $271 per linear foot. Not included are any costs associated with land acquisition. It is assumed that necessary land acquisitions would be completed prior to moving into final design of the trail. 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 or through research costs quoted from manufacturers such as PermaTrak (boardwalk) or Continental Bridge.

Soft Costs

Soft costs are non-construction related costs and for this estimate are 24% of the construction cost and are 20% of the total project cost. They include:

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

Hard Costs

Hard costs are construction costs. Construction costs account for 80% 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
- Boardwalk
- Bridges
- Crosswalk
- Drainage
- Signs
- Parking

AA

ESTIMATE OF PROBABLE PROJECT COSTS FOR NORTH KITSAP TRAIL FEASIBILITY STUDY
2015 Dollars

CONSTRUCTION COSTS (Hard Costs)

ON-SITE PREPARATION

Work Activity	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL	NOTES
Site Clearing						
Clearing	7	AC	$10,000.00	$69,000		
Topsoil Strip/Cut	4,000	CY	$3.00	$12,000		
Topsoil Fill	2,350	CY	$5.00	$11,750		
Topsoil Export	1,650	CY	$25.00	$41,250		
Total Site Clearing				$134,000	$134,000	Quantities generated in Site Ops and costs per MAP
Grading Cut						
Earth Cut	12,650	CY	$15.00	$189,750		
Total Grading Cut				$189,750	$189,750	Quantities generated in Site Ops and costs per MAP
Grading Fill						
Earth Fill	4,550	CY	$25.00	$113,750		
Total Grading Fill				$113,750	$113,750	Quantities generated in Site Ops and costs per MAP
Grading Export						
Earth Export	8,100	CY	$25.00	$202,500		
Total Grading Export				$202,500	$202,500	Quantities generated in Site Ops and costs per MAP
Retaining Wall	19,950	SF	$37.50		$748,125	Quantities generated in Site Ops and costs per MAP
Other Preparation						
Fine Grading Sub-Grade Prep	9,900	SY	$4.00	$39,600		
Erosion Control	7	AC	$4,000.00	$27,600		
Seeding/Slope Stabilization	3	AC	$20,000.00	$60,000		
Total Other Preparation				$127,200	$127,200	Quantities generated in Site Ops and costs per MAP
TOTAL ON-SITE PREPARATION					**$1,515,325**	

Table 4AA: Summary of Cost Estimate

ON-SITE IMPROVEMENTS						
Work Activity	**QUANTITY**	**UNIT**	**UNIT COST**	**SUBTOTAL**	**TOTAL**	**NOTES**
Paving - Trail Section						
Asphalt Paving - Trail	12,900	SY	$22.64	$292,056		
CSTC Gravel Shoulders	2,100	Ton	$40.00	$84,000		
Total Paving - Asphalt				$292,056	$292,056	Quantities generated in Site Ops and costs per MAP
Boardwalks						
Boardwalk through Grovers Creek Complex	2,088	LF	$840.00	$1,753,920		$70/SF for 12' width, assumes PermaTrak concrete system, including pile foundations, design
Boardwalks through (3) other Wetland Areas	178	LF	$840.00	$149,520		$70/SF for 12' width, assumes PermaTrak concrete system, including pile foundations, design
Railings	4,532	LF	$50.00	$226,600		Assumes timber rail. Steel rail would be closer to $75-$100/LF
Total Boardwalk				$2,130,040	$2,130,040	
Bridges						
Bridge- Grovers Creek- Steel Truss Delivered	1	LS	$50,000.00	$50,000		$1,000/LF for 12' width based on costs from Continental Bridge (CB), includes design fee
Abutments	2	LS	$7,500.00	$15,000		
Install + Crane	1	LS	$150,000.00	$150,000		Install cost is 2.5 times bridge + abutment cost per CB
Total Bridges				$215,000	$215,000	
Other On-Site Improvements						
65'x100' Gravel Parking Area West End	1	LS	$17,500.00	$17,500		
Trail Signage						
Regulatory Allowance	1	LS	$7,250.00	$7,250		Allowance
Wayfinding Allowance	1	LS	$7,250.00	$7,250		Allowance
Interpretive Allowance	1	LS	$15,000.00	$15,000		Allowance
Trailhead Kiosks	2	EA	$5,000.00	$10,000		Allowance
Rest Area Pull-outs	20	EA	$3,000.00	$60,000		Includes paving (12' x 12' min), walls, clearing, grading, bench
Viewpoint or Overlook	2	EA	$5,000.00	$10,000		Includes paving (12' x 12' min), walls, clearing, grading, bench, fence
Crosswalk- Miller Bay Road	1	LS	$65,000.00	$65,000		Budget per Kitsap County
Storm Drainage	11,650	LF	$12.00	$139,800		Concentrated and Sheetflow Dispersion Through Native Vegetation per BMP's T5.11 and T5.12
Lighting	-	-	-	-		No lighting allowance included
Wetland Mitigation- per ELS report	1	LS	$130,691.00	$130,691		Cost per wetland mitigation report by ELS
Total - Other On-Site Improvements				$462,491	$462,491	
TOTAL ON-SITE IMPROVEMENTS				**TOTAL**	**$3,099,587**	
Contractor Mobilization @ 5%	1	LS	$230,745.60	$230,746		Industry standard percentage
TOTAL CONSTRUCTION				**TOTAL**	**$4,845,658**	
Design and Construction Management (Soft Costs)						
Engineering/Design Consultants 20%	1	LS	$548,443.52	$548,444		Excludes 20% of Boardwalk, Bridge + Install Estimate- Design & Enginnering are included in cost
Construction Management 12%	1	LS	$581,478.91	$581,479		
Conditional Use, SEPA, SDAP Permitting Fees	1	LS	$25,000.00	$25,000		
TOTAL Design Soft Costs and Construction Management				**TOTAL**	$1,154,922	
Total Project Costs (Construction and Soft Cost Estimate)					**$6,000,580**	

IMPLEMENTATION AND NEXT STEPS

A

Figure 5A: Existing Vegetation Along Proposed Trail Route (Photo Courtesy of Don Willott)

CHAPTER 5: IMPLEMENTATION & NEXT STEPS

Adoption of this feasibility study by the County Commissioners will allow additional planning and implementation to commence. 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 to fit the trail into the landscape. Land use and required environmental and construction permits, which are listed below, will need to be acquired during detailed engineering design prior to 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 such as Birkenfeld
- 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. Most of the trail lies within the Rural Wooded Zone and the western-most privately owned Speed Parcel lies within the Rural Residential 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.

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), and Kitsap County, when proposing direct impacts to wetlands (filling, ditching, dredging, etc.). 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.

Kitsap County- Impacts to wetlands and buffers are regulated by Kitsap County and require submittal of Site Development Activity Permit (SDAP). A State Environmental Policy Act (SEPA) checklist must be submitted along with the SDAP permit package. Wetland delineation and wetland/buffer mitigation plan reports are required as part of the SDAP permit. No individual critical area or wetland permits are required by Kitsap County. Mitigation for wetland impacts are varied and depend 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. Kitsap County will usually 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 applies 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 wetland, the installation of pin piles in the Wetland Segment may require a permit from the

B

Figure 5B: NKTA Volunteers Scouting Probable Trail Routes (Photo Courtesy of Don Willott)

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.

C

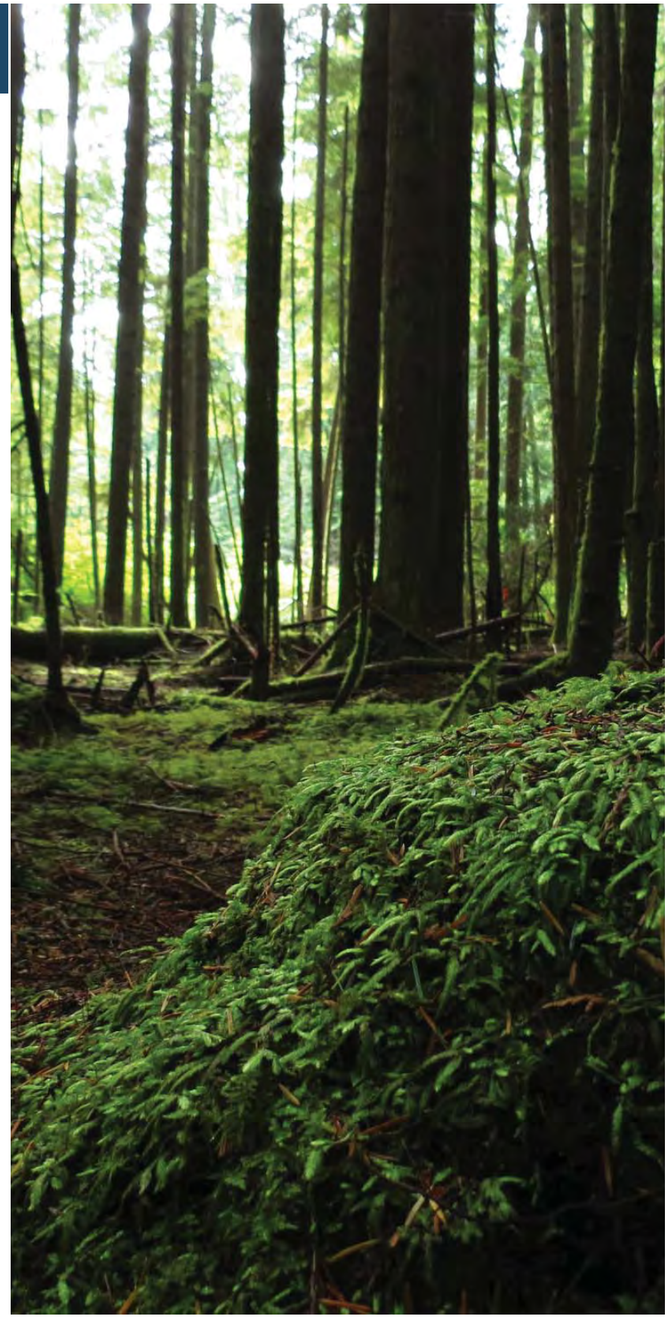

Figure 5C: Existing Forest Stand and Understory Along Proposed Trail Route (Photo Courtesy of Don Willott)

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 will be required for the bridge and boardwalk crossings of state regulated streams to ensure that the crossings will not have adverse impacts on the stream and habitat areas.

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. 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 Right-of-Way (Public Works Permit)
- Permit to Use, Alter, and/or Improve Unopened County 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 adoption of Plan by Kitsap County Commissioners
- Integrate Plan into County Comprehensive Plan- 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 Departments
- Land Acquisition- Continue negotiations with Olympic Property Group and smaller property owners to acquire the land or easements in manner that conforms to federal regulations
- Develop Funding Plan- Continue partnerships, submit grant applications and explore other funding sources
- Design Development, final engineering and environmental documentation
- Work with NKTA to develop a comprehensive wayfinding, signage, interpretive and educational plan for the entire Sound to Olympics Trail
- Permits- Develop a comprehensive strategy and complete the required documentation

Conclusion

Implementation of this 2.65 mile segment of trail through the Divide Block would come at considerable cost due to the steep terrain and a large wetland complex. However, this study demonstrates that a trail within the Divide Block 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.

APPENDICES

Appendix A: PRELIMINARY ENGINEERING ALIGNMENTS

Appendix B: WETLAND FEASIBILITY REPORT

APPENDIX C: MEETING MINUTES

FISCHER · BOUMA PARTNERSHIP

North Kitsap Trail Feasibility Study – DRAFT Meeting Minutes
Kitsap County Public Works
November 12, 2014
10:00 a.m. – 12:30 p.m.

Attendees:
Jeff Bouma, FBP
Sandy Fischer, FBP
Stephen Padua, Kitsap County Public Works
Jon Brand, Kitsap County Public Works
Scott Pascoe, GPC
Joanne Bartlett, ELS
Pat Fuhrer, MAP
Linda Berry-Maraist

Note: Persons/entities responsible for action items are in bold **red** text.

1. **Summary of Work to Date including Field Visit**
   We briefly discussed the site visit.

2. **Analysis and Design Standards**
   Questions: Are these federal/state standards appropriate for use in the initial alignment assessments?
   - After discussion of the standards and cross section presented, Jon felt that the appropriate standards to use as a starting point for running the model are the following:
     - 10' paved path width
     - 2' shoulder width on the uphill side (in both flat and steep terrain)
     - 2' shoulder width on the downhill side in flat terrain and up to 5' shoulder width in steep terrain
     - Additional as needed for drainage (TBD by MAP during modeling)
     - No accommodation for equestrian on the trail. **Linda** needs to confer with the NKTA to see if this will be acceptable based on the vision and goals of the group. This would not preclude equestrians from using the shoulder in wide areas and to develop additional trails off the paved shared use trail.
     - Boardwalk section to be 12' width and be able to accommodate (width and structural design) a county service vehicle.

3. **Potential Implications of Standards on NKTA Proposed Alignment**
   Questions: How do we define the NKTA proposed alignment so that is can be assessed? Does it make sense to modify the alignment as minimally as possible per 1) horizontal alignment and/or 2) vertical so that it can be assessed (as currently provided, little of the GPS'd centerline meets federal standards just based on the nature of the process used to generate the line)?
   - Per the discussion Jon confirmed that the scope of this project is to assess the feasibility of a shared use trail that will meet federal design standards. As such, the starting point will be the Preliminary

alignment that was developed. Before running the Site Ops model, however, additional modifications to this alignment will be made according to:
   - Investigation of old logging haul roads based on old aerial photography.
   - In-field environmental assessment by Joanne and further investigation by volunteers (coordinated by Linda) in the parcels that would require switchbacks.
   - Discussion with Rich James to see what strategies have worked in Clallam County for shared use trails in similar terrain.

4. **Assessment Criteria for Analysis**
   Question: Is there additional assessment criteria and how do we weight these criteria?
   - Per the discussion **FBP** will update the criteria list and take input from stakeholders during the process to refine.
   - It has yet to be determined as to how the various criteria should be weighted. They will be used to compare various alignment or segment alignments if necessary. They may simply be used to describe the only alternative that works. This will be determined as we move deeper into the process of identifying alignments and modeling them.
   - Phasing and staging should be considerations under Section 5 Construction Costs.
   - Joanne suggested adding size of wetland buffers as criteria.

5. **Design Details**
   - **FBP** to research alternative boardwalk materials- timber, concrete, asphalt, metal grate, synthetic, etc. Scott felt that pin piles would be permittable vs. any type if geosynthetic underlay to float an earthen trail due to sensitive hydrology of the site. Permeability is important in wetland areas. Geotextiles will be too disruptive.
   - Drainage will need to be addressed.
   - Bridge should be designed with 3' freeboard above 100 high water elevation and will need to be clear span.
   - No creosote or treated wood will be accepted by tribe.
   - The goal is a self-mitigating plan, however if mitigation is required there may be an opportunity to do it off sites on GPC property; family forest fish passage near Orseth Road.

6. **Schedule - Next Steps + Action Items**
   - Meeting with Rich James, Clallam County- Jon has set up tentative time for 12/17/2014 from 1-3 pm. **Jon** to determine who at WSDOT might be appropriate to invite as well.
   - Direction to Mr. Speed- **Linda** should let him know that he should proceed with the Short Plat. Jon has checked with the County's ROW agent and there could be challenges with a federally funded trail sharing access with a private drive. If this is the case, the County may need to own fee simple the trail. As such, Jon to investigate whether there is an issue with granting a private access over a public trail. **Jon** will also write a letter for Mr. Speed that Public Works is amenable to a shared use road and encouraging him to begin the short plat process as that will be the venue for many of the questions to be answered.
   - Environmental field work schedule- Joanne scheduled to start next week based on the Preliminary alignment and complete in Nov.

- Site Ops software modeling- To save resources, we will wait until the Preliminary alignment is modified based on 1) investigation of old haul roads, 2) in-field environmental assessment, and 3) discussion with Rich James. It does not make sense to run the model on the NKTA proposed alignment as so much of it does not meet federal standards for horizontal or vertical alignment.
- Set up first stakeholder meeting for 2nd week in December- Jon decided we should wait until we have refined the Preliminary alignment. First stakeholder meeting will be pushed to January.
- Further volunteer assistance on alignment alternatives- **FBP** to provide Linda with pdfs of preliminary alignment for use by volunteers in field to look at opportunities and constraints where alignment deviates from the original NKTA alignment.
- **Jon** to check with County and provide old aerial photos of site to determine logging haul roads. Scott provided similar info as well as the Wild Fish Conservancy (WFC) maps.
- **Scott** will provide map of GPLC lands and possible acquisitions as well as studies that have been completed that are relevant to our work
- **FBP** will use old aerial and WFC info to build a more detailed site opportunities/constraints map for future meetings. Will also include, per Scott's suggestion the OPG property boundary, critical areas, Gratitude Way, 180 acres associated with GPC grant, and OPG lot numbers from the segregation plan.
- **FBP** to confirm site distances and turning radii and if there are exemptions allowed with additional safety measures (signage, etc.).
- **Joanne** to research mitigation requirements for placement of boardwalk in wetland per USACE. Removal of invasives was discussed and Scott mentioned GPC may have a nearby off-site location if needed.
- GPC has purchased 21 acres adjacent to the study site and across Miller Bay Road from the North Kitsap Heritage Park parking area. The trail could be placed in this area and allow it to go directly across the road (instead of along the road for a short distance per NKTA's alignment). **Pat** to investigate site distances on the road for a crossing in this area and make a recommendation. **Scott** to look into whether parking is programmatically feasible on GPC land assuming the County (Parks) would maintain).
- **Linda** to keep Jon Rose of OPG apprised of the planning process and that federal standards may require the trail to switchback in a couple parcels to the extent that they may not be sellable/buildable.

North Kitsap Trail Feasibility Study – DRAFT Meeting Minutes
Kitsap County Public Works
December 17, 2014
1:00 – 3:00 p.m.

Attendees:
See attached scanned sign-in sheet.

1. **Goal**
   - The goal of the meeting was to determine appropriate technical standards for trails with significant environmental and topographic constraints that will not compromise the County's ability to secure the necessary funding to implement.
   - Does WA HB 1700, which allows less stringent design standards for trails, still maintain eligibility for federal funding? The conclusion drawn based on case studies in the presentations was, yes- the AASHTO standards and WSDOT technical guidance provide less stringent standards than the FHWA and projects are still eligible for federal funding. If deviations from the AASHTO standards are pursued, maximum extent feasible documentation needs to be provided and could impact funding depending on the source.

2. **Project Overview**
   - Sandy provided a brief description of current project to provide context for the meeting.
   - Linda provided a brief description on NKTA's role to date and the Birkenfeld grant application.

3. **Rich James**, Transportation Program Manager, Clallam County
   - Rich gave a presentation (PowerPoint file was given to the County) on lessons learned during design and funding of portions of the Olympic Discovery Trail which included the following:
     - Shared use design standards and technical deviations
       - Technical deviations for trail width require 3-4 criteria are met including expected volume of users.
       - 2' gravel shoulders, 10' min paved width, 5% grade or less typical.
       - Deviations include 8' width.
       - Deviations include tighter turn radii with lower speed volumes which as mitigated with signs.
       - Deviations include >5% slope with landings as long as 8.33% ADA max is not exceeded and for lengths as specified in AASHTO.
       - 2% cross slope maximum.
       - 2-4" asphalt depth depending on use.
     - Drainage- use as few ditches as possible, carry water as little as possible
     - Funding- Rich reviewed RCW 47.30.005, .030, 050 and RCW 47.68.060 and 090 which allow for trails to be treated as roads for spending purposes.
     - Water crossings- should be as wide as paved trail abutting them. Width typically is 14' to accommodate equestrians.
     - Equestrian use- many multiuse trails share this use- either on paved trail or gravel shoulder if separated trail is not available. These are actually called equestrian trails.

4. **Paula Reeves**, Asst. Director of Engineering Policy and Innovation
   - Paula gave a short presentation on WSDOT shared use design standards based on the AASHTO standards and technical deviations.
   - Neal Campbell, WSDOT Local Programs also attended and provided technical expertise related to case studies in support of Paula's presentation.
   - HB 1700 (2011/2012) is a flexible design bill allowing WSDOT flexibility in allowing for design as outlined in AASHTO.
   - Maximum extent feasible documentation is required for any deviations from the AASHTO standards.
   - No deviation is necessary to reduce trail width from 12' (typical) to 10' per Paula.
   - Speed of 20 mph or more does not require signs. Under 20 mph requires signs.
   - Smaller radii turns require lower speeds and greater widths- refer to AASHTO.
   - Funding- funding sources will impact liability. Funding includes STP funds, TAP funds, RCO, and RCO WWRP funds.
   - Federal funding requires a clear designation of trail 'termini' which are access points or destinations.
   - If federal funds are used, County needs to control the land- preferable through fee simple ownership or long-term easement. If not, there could be financial implications if the County ever loses control of the land.

4. **Next Steps**
   - FBP and the County will coordinate to set up a working meeting in early January 2015 to confirm standards and discuss alignments considered to date for more detailed feasibility analysis.

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North Kitsap Trail Feasibility Study – DRAFT Meeting Minutes
Kitsap County Public Works
January 6, 2015
1:30 – 3:30 p.m.

Attendees:
Jon Brand, Dick Dadisman, Stephen Padua (Kitsap County Public Works), Jeff Bouma & Sandy Fischer (FBP), Pat Fuhrer (MAP), Joanne Bartlett (ELS), Linda Berry-Maraist & Don Willot (NKTA), Scott Pascoe (GPC).

Minutes by:
Jeff Bouma (FBP)

1. **Goal of Meeting**
   - Confirm parameters (standards and deviations, if any at this stage) for modeling based on current research/understanding and determine which alignment(s) to model in Site Ops software.

2. **Summary of Heritage Park Trail**
   - Dick Dadisman provided an overview of the grade issues faced in engineering of the Mosquito fleet trail. He is running into the same issues of steep slopes. Several grades of up to 12% slopes, some as long as 2000LF exist on the current trail. Designing per 30 mph standards and <5% slopes along the alignment of the current trail, the result is significant cut and fill as well as up to 24' high retaining walls. Costs increase from $1.3M to $3.3M. Trail is being built with local County funds.

3. **Review of Previous Meeting**
   - Had a brief discussion about what we learned and how to apply it to this project:
     - FHWA allows a 8.3% max slope for a distance of 200' with landings less than 2% slope.
     - Linda to confirm with Rich James that trails using this standard were funded with federal funds even though AASHTO is not clear on slope segments greater than 5%.

4. **Confirm Standards for Horizontal/Vertical Alignments/Cross Sections**
   - We reviewed the WSDOT/AASTO standards/graphic cross sections to use for modeling the alignments. Changes to these sections include:
     - 1.5H : 1V side slopes
     - Drainage not currently shown but to be included in costs
     - Boardwalk of 14' width, design load for standard size pickup truck

5. **Alignments**
   - Determined which alignment to model as the preferred alternative (5B):
     - Speed Segment: Use modified 3B based on Linda's recent field work and sketch provided which will result in a few areas of steeper (up to 8.33%) slope needing an exception to the AASHTO Standards.
     - W Slope Segment: Use 4B
     - Gratitude Segment: Use 4B
     - E Slope Segment: Use combination of 4B and 1B using existing haul road which will result in a few areas of steeper (up to 8.33%) slope needing an exception to the AASHTO Standards. Trail will be modified slightly to stay out of parcel 015 per GPC.
     - Wetland Segment: Use 4B which most closely matches NKTA alignment and was confirmed by Joanne's field work to be generally the mostly dry through the wetland mosaic.
     - MBT Segment: 4B is within a wetland identified by Joanne so a new alignment based on 1B and AASHTO will be developed. Use of the new GPC parcel to the NE will be utilized to run the trail NE and cross Miller Bay Road directly across from the Heritage Park parking area.
   - Review of haul road analysis and options for possible alignments on such:
     - There are 3 main issues with utilizing existing haul roads:
       1) Many are above 5% and our first alignment attempts are focusing on keeping to this standard.
       2) Their locations do not provide very good connectivity between starting and end points
       3) Several of these roads would likely be used to access parcels if developed- as such we have not included in the alternatives shown to date. It is possible that some of these haul roads can be used as an alternative equestrian trail and will explore this at a high level.

6. **Next Steps**
   - This week- FBP to refine alignment of preferred alternative based on #5 notes above.
   - This week- Linda to meet with Jon Rose (OPG) to update him on the status of the project and share the preferred alignment.
   - Following 3 weeks in January- Pat to model preferred alignment in Site Ops.
   - Consider another meeting at this point with OPG to share the results of the modeling before presenting to the large stakeholder group.
   - First week of Feb.- meet with County and core team to discuss outcome of modeling.
   - Mid Feb- larger stakeholder meeting with tribe, OPG, WDFW to share work to date.

7. **Misc Items**
   - Possible materials to be discussed at next meeting. Bring matrix of pros/cons for each of the material options.
   - Where steeper haul roads exist near proposed alignments, we will explore using these already disturbed corridors where we can achieve a grade of less than 8.3%.
   - Rory Calhoun at RCO would be worth contacting per Don W.

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North Kitsap Trail Feasibility Study – DRAFT Meeting Minutes
Kitsap County Public Works
February 19, 2015
1:30 – 3:30 p.m.

Attendees:
Jon Brand & Stephen Padua (Kitsap County Public Works), Jeff Bouma & Sandy Fischer (FBP), Pat Fuhrer (MAP), Joanne Bartlett (ELS), Linda Berry-Maraist (phone) & Don Willot (NKTA), Scott Pascoe (GPC).

Minutes by:
Jeff Bouma (FBP)

1. **Goal of Meeting**
   - Reviewed goal of meeting: To refine the preferred trail alignment based on opportunities and constraints identified through 1) Site Ops software modeling and 2) in-field investigations performed by NKTA and ELS.

2. **Summary of Previous Meeting**
   - Confirmed parameters (standards and exceptions) for modeling and determined a preferred alignment to model in Site Ops software and verify in field.

4. **Site Ops Modeling Results & Discussion – Pat, MAP Ltd.**
   - 1st: Started with "Unconstrained" alignment in CAD showing cut/fill implications of preferred alignment using agreed- upon parameters (10' wide trail, 2% cross slope, 2' shoulder uphill side, 5' shoulder downhill side.
   - 2nd: Next looked at "30' Constrained" alignment using same parameters. Any disturbance outside of 30' width is mitigated with a wall. Ran example for 2 segments- one east of Grover's creek and the other west of the haul road to Speed's. Boardwalk segment of 2,000 LF was not modeled. A few walls of excessive height in the West Slope segment can be minimized by adjusting the horizontal alignment slightly.
   - 3rd: Next looked at "20' Constrained" alignment using same parameters.
   - Pat provided a summary cost spreadsheet for the two conditions (20' and 30' constrained). In general, costs increased 30% due to additional retaining walls in more constrained version.
   - Need to weigh cost of additional walls vs. disturbance to forest habitat/canopy. Strategy will be to use varying widths disturbance/constrained trail with walls. More mature forest will be identified in field and on aerial and those trail segments will be more constrained. Younger or alder forest will be less constrained. Linda pointed out that future OPG or County ownership of these lands will likely retain forest harvesting rights anyhow.

5. **In-field Findings and Discussion**
   - Linda indicated that Speed wants to use existing road and then, if possible, cross second small wetland and then keep trail on the back side of the ridge to keep it out of view from property.

   - Joanne provided a series of maps to the group showing wetlands identified along alignment 5B. Adjustments to trail were discussed and will be made with input from Joanne (see below).

6. **Determine a Refined Preferred Alignment (#6)**
   - FBP will synthesize results of this meeting for developing a refined alignment. Changes on alignment 5B will include:
     - Adjustment of horizontal alignment on Speed Segment to avoid property line to the north, stay off Speed's property line to the east, and stay on the far side of the first ridge so the trail is out of view from where he wants to locate a house.
     - Adjustment of horizontal alignment in West Slope Segment to avoid the tip of Wetland F per Joanne. Pat will also massage horizontal alignment in this area to minimize use of walls.
     - Significant change of alignment at east end of Gratitude to avoid wetlands discovered on the north side of the road. Trail to cut across road at 2 blue flags and as indicated on plans to be provided by Joanne to FBP. Use of old logging road south of Gratitude will minimize disturbance.
     - Adjustment of alignment to lay directly over haul road on GPC property due to recent surveyed location.

7. **Next Steps/Action Items**
   - Stephen to research best option for crossing at Heritage Park parking lot based on existing County drawings and regulations. Cross at parking (conflict with turn lanes) or cross to the south?
   - FBP to determine preliminary disturbance constraint widths for sections of trail. Assuming about 2/3 will be 30' width and 1/3 will be 20' width (excluding boardwalk). Pat to apply this to next model.
   - FBP to refine preferred alignment in CAD for use by Pat in running model.
   - Jon to set up meeting with OPG to go over process and preferred alignment.
   - Jon to set up stakeholder meeting with tribes, WDFW, GPC, others at Kingston fire station with walk-thru to follow. Joanne is able to lead in-field portion if Linda is not available.
   - FBP will prepare visual materials for meetings as needed, including preliminary alternatives and preferred alignment and cross section showing adopted parameters for study.
   - Public meeting to be scheduled after stakeholder meetings have occurred.

8. **Misc Items**
   - Scott indicated that GPC is not interested in having a parking area on their parcel across Miller Bay Road from the Heritage Park parking area as it is not consistent with the mission of GPC.
   - A 65' x 100' gravel parking area should be shown on Speed property north of the trail in the northwest corner of the property and will be included in whatever easement/purchase is negotiated with Speed.
   - Discussed concrete boardwalk system called Permatrack. FBP to send info to group on this product.
   - For costing purposes, assume railing vs curb on both sides of boardwalk regardless of boardwalk height to keep people on the boardwalk. Pat may have detail of simple cable rail.
   - Assume drainage along trail will use dispersal strategy. Costs should reflect this strategy.

North Kitsap Trail Study Meeting Agenda – DRAFT Meeting Minutes
Kitsap County Public Works
April 16, 2015
1:00 – 4:00 p.m.

Attendees:
Jon Brand, Stephen Padua (Kitsap County Public Works), Jeff Bouma (FBP), Pat Fuhrer (MAP), Joanne Bartlett (ELS), Linda Berry-Maraist & Don Willot (NKTA), Alison O'Sullivan (Suquamish Tribe).

Minutes by:
Jeff Bouma (FBP)

1. **Goals of Meeting**
   - Introduce and update stakeholders to the feasibility study process to date and the current preferred alignment.
   - Review current alignment and determine next steps.

2. **Overview of Project, Context and Summary of Alignment #6**
   - Provided project overview and context.
   - Provided Alignment #6 description per map.

3. **Review of Planning Process**
   - Reviewed alignments and trail design standards used to date (referred to process diagram).

4. **Review of AASHTO Standards Applied**
   - Reviewed adopted trail standards and exceptions for this alignment (referred to trail cross sections).

5. **Review of Environmental Field Work – Joanne Bartlett**
   - ELS provided an overview of wetland determination along preferred alignment- wetland complex, small wetlands in central area and wetlands at Speed's.

6. **Site Ops Modeling Results & Discussion – Pat Fuhrer**
   - MAP provided a summary of Site Ops engineering model used to analyze alignments and modify the alignment to minimize disturbance and reduce costs.
   - Reviewed refinements made in the Speed property and discussed implications:
     - Pat and Linda have been working together to tweak the alignment at Speed's to get the trail across the small east wetland, stay on the far east ridge (not side slopes) and out of sight lines of Speed's developable area while maintaining slopes of 8.3% or less.

7. **Discussion**
   - Changes to Alignment #6 (now Alignment #7) include:
     - Alignment to Speed's east segment as discussed above.
     - Pull tight radius on West Slope segment uphill a bit and increase trail slope if necessary to minimize 6-8' walls that are currently being generated per the SiteOps analysis.
     - Adjust crossing of wetland on east side of Gratitude closer to the original crossing as shown as the NKTA original route.
   - Alison did not have any major concerns about the process or alignment being proposed at this point.
   - Alison requested a pdf version of the alignment once updated with tweaks as listed above, minus the property line and WWRP layers but adding in the haul road layer.
   - Confirm streams on map as Wild Fish Conservancy or DNR and correctly label on legend.
   - Discussion about strategy at Speed's property to secure the land/easement. Pat is close to making a conservative estimate of land needed based on alignment and offset from north and east property lines that may be needed.

8. **Next Steps**
   - Meet with OPG 4/18/2015 to update them on alignment and process to date.
   - Pat to make tweaks as discussed above in SiteOps and provide CAD to FBP for maps/diagrams.
   - Begin the report documentation process.
   - FBP team to start developing the cost estimate in more detail.
   - Jon/County to set up public meeting at the firehouse in Kingston for late May on a weekday evening.
   - FBP to develop the agenda and materials for the meeting.
   - Coordinate with team to develop an email invite to stakeholders and interested parties.

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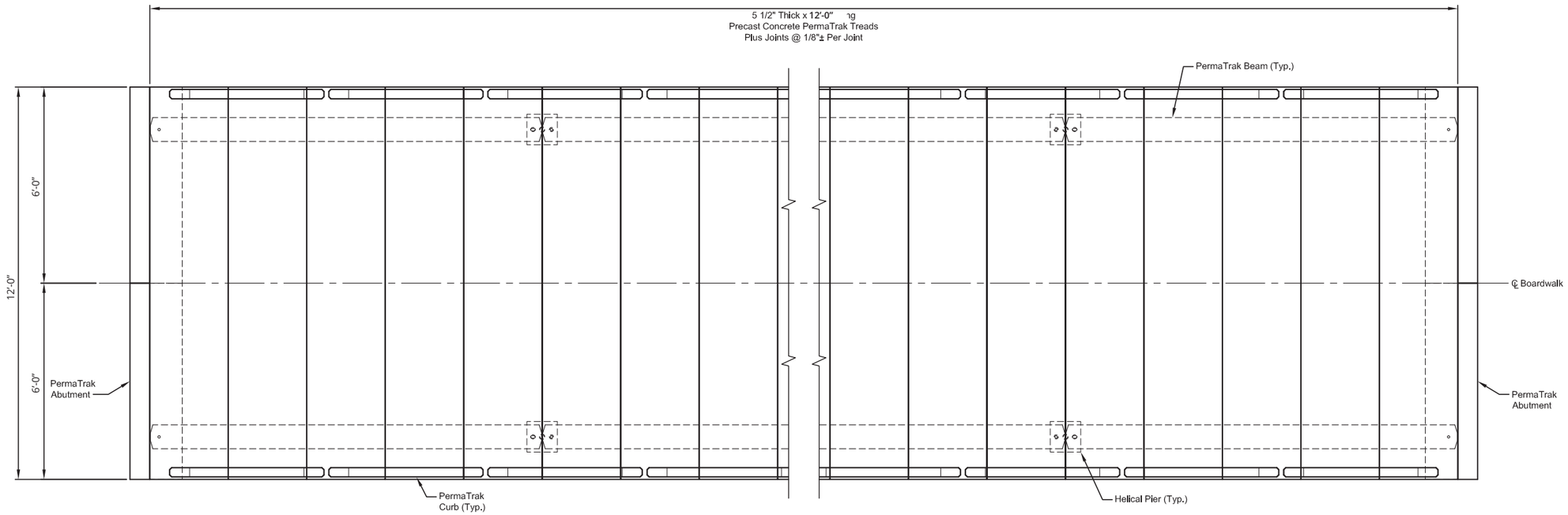
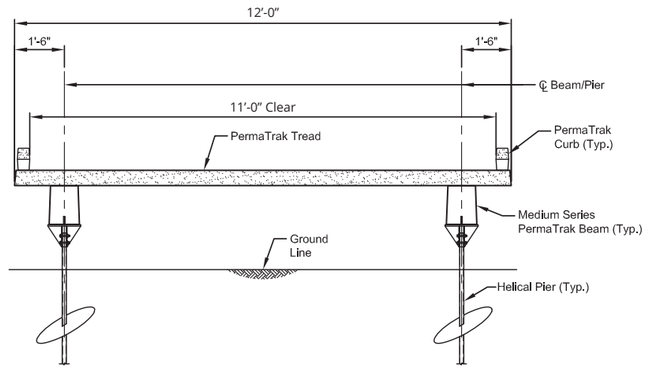
APPENDIX D: CONCEPTUAL BOARDWALK PLAN AND SECTION



BOARDWALK PLAN

Scale: 1/2" = 1'-0"



TYPICAL SECTION - PERMATRAK ON HELICAL PIERS

Scale: 1/2" = 1'-0"

NO.	DATE	DESCRIPTION	BY:
6			
5			
4			
3			
2			
1			

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PROJECT TITLE:

PERMATRAK SAMPLE CURBS AND HELICAL PIERS

JOB NUMBER:	NA
DATE:	02/20/2015
DESIGNED BY:	JVP
DRAWN BY:	RPU
CHECKED BY:	JVP
SHEET NO.	SK01

FINAL - November 2015

APPENDIX E: ALIGNMENT COMPARISON INDEX

NORTH KITSAP TRAIL FEASIBILITY STUDY

TRAIL ALIGNMENT ALTERNATIVES PRELIMINARY EVALUATION

ALIGNMENT 1	
Speed Property	**1B-30 MPH, 78' min R**
Pros	**Cons**
5% grade	Large amount of disturbance
Complies w/ FHWA & ADA	Large cuts and fills
	Large fill with culvert or bridge
West Slope	**1B-30 MPH, 78' min R**
5% grade	Large amount of disturbance
Complies w/ FHWA & ADA	Large cuts and fills
Mod impact to slopes 3:1>	Longest
	Impacts 2 bldg. parcels
	Ravine crossings
	More Bridges over ravines
Gratitude	**1B-30 MPH, 78' min R**
5% grade	More cut & fill
Complies w/ FHWA & ADA	S. of Gratitude=steeper grades
	Cross Gratitude on west side
East Slope	**1B-30 MPH, 78' min R**
5% grade	A lot of cut and fill
Complies w/ FHWA & ADA	
Wetland	**TBD**
5% grade	
Complies w/ FHWA & ADA	Long boardwalk
Miller Bay	**1B-30 MPH, 78' min R**
5% grade	
Complies w/ FHWA & ADA	On St. or adjacent to street-400'
	Less safe than options 2-4
	More cut and fill
	Longer trail

ALIGNMENT 2	
Speed Property	**2B-18 MPH 60' min R**
Pros	**Cons**
5% grade	Large cut, more cut and fill
Complies w/ AASHTO & ADA	
West Slope	**18 MPH 60' min R**
5% grade	Longest of 4 alt
Complies w/ AASHTO & ADA	Many switchbacks
	disturbance will be more visible
	Impacts 2 bldg. parcels (<alt1)
Gratitude	**18 MPH or > 60' R**
5% grade	Similar to 4
Complies w/ AASHTO & ADA	Less on 4:1 slope
Cross Gratitude on east side	
Preserve high spots of parcel	
East Slope	**12 MPH Min 27' R**
5% grade	2,3,4 are same
Complies w/ AASHTO & ADA	4-5 deviations 12 MPH
More sensitive to terrain than 1	to avoid extensive earthwork
	fills and /or walls
Wetland	**TBD**
5% grade	2,3,4 are same
Complies w/ AASHTO & ADA	Long boardwalk
Closely follows NKTA alignment	
Miller Bay	**12 MPH Min 27' R- 2 curves**
5% grade	
Complies w/ AASHTO & ADA	
Uses GPC parcel to avoid on-street path	
Possible future underpass	
Shorter length	

ALIGNMENT 3	
Speed Property-	**18 MPH 60' min R (1-12mph curve)**
Pros	**Cons**
5% grade	
Complies w/ AASHTO & ADA	Med impacts to building sites
Fits terrain better , less fill	May require 12 MPH-1 curve
West Slope	**18 MPH or > 60' min R**
5% grade	Lowest alignment, wetter
Complies w/ AASHTO & ADA	Most Creek Crossing
Shortest (slightly)	disturbance will be more visible
Upper parcel buildable	Much on 3:1 slopes =
	on slope reqs walls or 30' ROW
Gratitude	**18 MPH or > 60' R**
5% grade	Lowest alignment, wetter
Complies w/ AASHTO & ADA	Most Creek Crossing
Cross Gratitude on east side	disturbance will be more visible
Preserve high spots of parcel	Much on 3:1 slopes =
	on slope reqs walls or 30' ROW
East Slope	**12 MPH Min 27' R**
5% grade	2,3,4 are same
Complies w/ AASHTO & ADA	4-5 deviations 12 MPH
More sensitive to terrain than 1	to avoid extensive earthwork
More interesting experience	fills and /or walls
Wetland	**TBD**
5% grade	2,3,4 are same
Complies w/ AASHTO & ADA	Long boardwalk
Closely follows NKTA alignment	
Miller Bay	**12 MPH Min 27' R- 2 curves**
5% grade	
Complies w/ AASHTO & ADA	
Uses GPC parcel to avoid on-street path	
Possible future underpass	
Shorter length	

ALIGNMENT 4	
Speed Property	**12 MPH min 27'R**
Pros	**Cons**
5% grade	Longest of 4 alts
Complies w/ AASHTO & ADA	Most visible disturbance
	Greatest impact to bldg. site
	Designed for 12 MPH -full length
	Requires deviations
	Requires larger land purchase
West Slope	**12 MPH min 27'R**
5% grade	Higher / drier
Complies w/ AASHTO & ADA	4-5- 12MPH curve-req Deviation
Least disruptive to parcels	disturbance will be more visible
Upper parcel buildable	Much on 4:1 slope
	on slope reqs walls or 30' ROW
Gratitude	**18 MPH or > 60' R**
5% grade	Small section on 4:1 slope
Complies w/ AASHTO & ADA	on slope reqs walls or 30' ROW
Cross Gratitude on east side	
Preserve high spots of parcel	
Higher / drier	
East Slope	**12 MPH Min 27' R**
5% grade	2,3,4 are same
Complies w/ AASHTO & ADA	4-5 deviations 12 MPH
More sensitive to terrain than 1	to avoid extensive earthwork
More interesting experience	fills and /or walls
Wetland	**TBD**
5% grade	2,3,4 are same
Complies w/ AASHTO & ADA	Long boardwalk
Closely follows NKTA alignment	
Miller Bay	**12 MPH Min 27' R- 2 curves**
5% grade	
Complies w/ AASHTO & ADA	
Uses GPC parcel to avoid on-street path	
Possible future underpass	
Shorter length	