

MEMORANDUM

State of Alaska
Department of Transportation & Public Facilities
Northern Region
Design, Engineering, & Construction

TO: Sarah E. Schacher, P.E.
Preconstruction Engineer
Northern Region

THRU: Jason Hill, P.E.
Project Delivery Team Lead
Northern Region

DATE: February 28, 2023

FILE NO: H:\Projects\Fbks_NP\90139 Yankovich\6
Design\2 DSR\DSR Revision 2022

TELEPHONE NO: 907-451-5386

SUBJECT Yankovich-Miller Hill Road

Reconstruction and Multi-Use Path

FROM: Ivet Hall, P.E. *IHall*
Engineering Manager
Northern Region

Design Study Report Revisions

Submitted for your approval are the following revisions to the Abbreviated Design Study Report:

PROJECT DESCRIPTION

1. **Upgrade/widen Yankovich Road.** Replace the second sentence with the following:
The project will widen the full length of Yankovich Road from Ballaine Road to Miller Hill Road from 20-22 feet wide (10-foot lanes with 0- to 1- foot shoulders) to 30 feet (10-foot lanes and 5-foot shoulders).
2. **Reconstruct Miller Hill Road.** Change the dimension of roadway centerline offset in the third sentence to read: "...by shifting the roadway centerline 2 feet toward the separated path."
4. **Improve sight distance and road geometry.** Replace the second sentence with:
This project will lessen or remove deficiencies in vertical curves by modifying the roadway profile.

DESIGN STANDARDS.

Replace the first bullet with the following:

- American Association of State Highway and Transportation Officials (AASHTO), *A Policy on Geometric Design of Highways and Streets*, 2018

Add the following:

- AASHTO, *Guidelines for Geometric Design of Low-Volume Roads*, 2019
- AASHTO, *A Guide for Achieving Flexibility in Highway Design*, 2004

DESIGN EXCEPTIONS AND DESIGN WAIVERS. Replace this section with the following: This project has design waivers for profile grade, vertical curves, and clear zone distance. Design Waivers are located in Appendix F.

HORIZONTAL/VERTICAL ALIGNMENT. Replace the second, third, and fourth sentences with the following: Yankovich Road has two horizontal curves near the Yankovich/Ballaine intersection that will meet current design standards. Miller Hill Road

will follow a generally straight alignment with minor adjustments afforded by points of intersection. The centerline of Yankovich Road will be shifted 4 feet to the north and Miller Hill Road will be shifted 2 feet toward the east. This was done in both instances to move traffic further away from utility poles and minimize drainage changes to the opposite side of the roadway.

Replace the sixth and seventh sentences with the following: Vertical curves will meet the current design standards except for those included in the design waiver. Superelevation is needed for two curves located near the Yankovich/Ballaine intersection. Yankovich road will be constructed with a uniform cross slope of 2% draining to the south. Miller Hill Road will follow a normal crown section for the length of the project with a 2% cross slope.

TYPICAL SECTION(S). Replace the second and third sentences with the following: Shoulders of 5 feet width will promote safety for motorized and non-motorized travel. In areas of constricted ROW, the fore slopes may be as steep as 2H:1V in fill sections and back slopes as steep as 1H:1V in cut sections.

Replace Figure 3: Typical section – Yankovich Road and Figure 4: Typical Section –Miller Hill Road with attached new typical sections

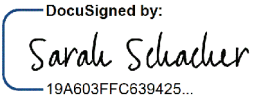
COST ESTIMATE. Replace this section with the following: The estimated cost for this project are as follows:

Design	\$ 1,247,809
Utilities	\$ 200,000
Right of Way	\$ 273,435
Construction (Includes 18% Engineering)	\$ 5,400,000
Total Cost of Project	\$7,121,244

Appendix A: DESIGN CRITERIA AND DESIGN DESIGNATION Replace the first PROJECT DESIGN CRITERIA sheet (Yankovich) with the attached Yankovich Design Criteria sheet

Add Appendix F: Design Waiver to the Design Study Report

Add Appendix G: Context Sensitive Solutions to the Design Study Report.

Approved:  _____ Date 3/1/2023

DocuSigned by:
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Sarah E. Schacher, P.E.
Preconstruction Engineer

Attachments:

Figure 3: Typical section – Yankovich Road and Figure 4: Typical Section –Miller Hill Road

Yankovich Design Criteria

Appendix F: Design Waivers

Appendix G: Context Sensitive Solutions

jak/ih

Copy to: Preconstruction/Project File

Daniel E. Schacher, M&O District Superintendent

Original: Barbara L. Tanner, P.E., Chief of Contracts

cc: NR Design Directive 20-01 Distribution

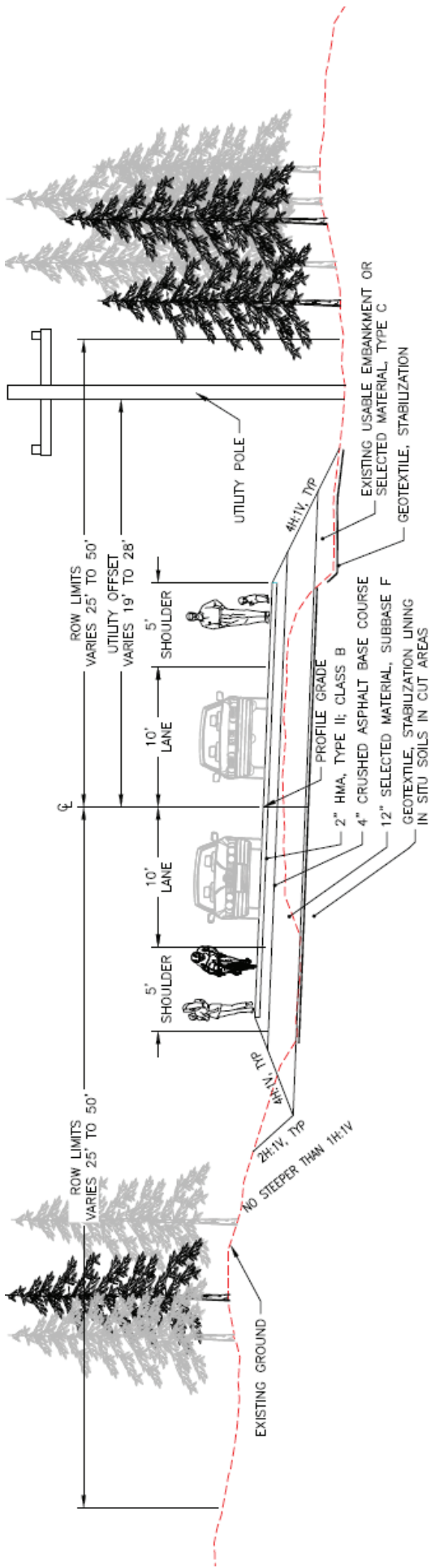


Figure 3: Typical Section – Yankovich Road

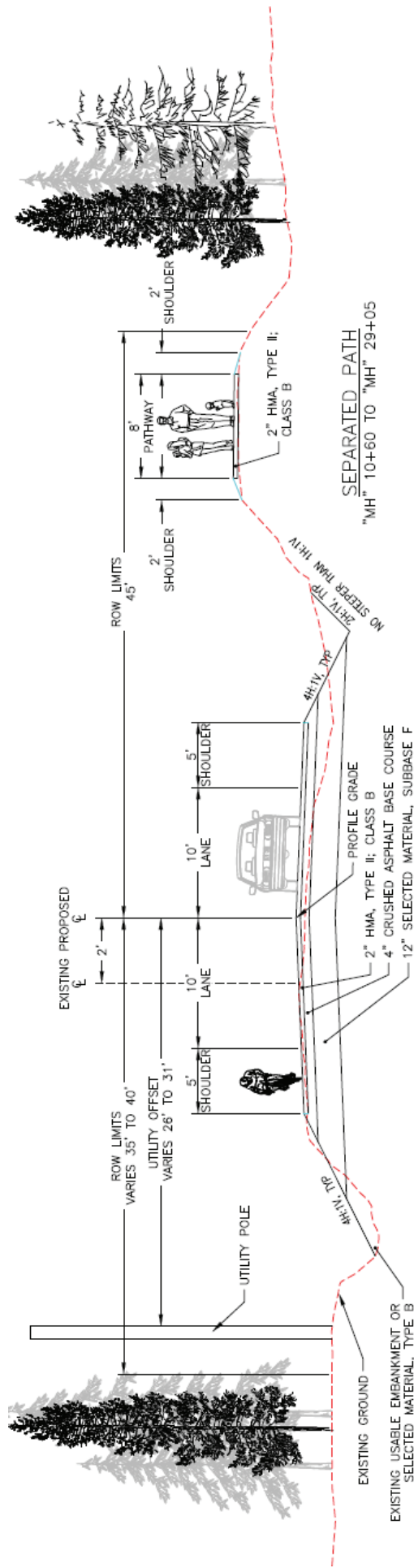


Figure 4: Typical Section – Miller Hill Road

ALASKA DOT&PF PRECONSTRUCTION MANUAL
Chapter 11 - Design
PROJECT DESIGN CRITERIA

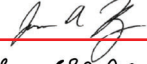
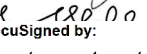
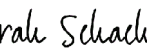
Project Name: Yankovich-Miller Hill Road Reconstruction and Multi-Use Path (Yankovich Road)	
<input checked="" type="checkbox"/> New Construction/Reconstruction <input type="checkbox"/> 3R <input type="checkbox"/> PM <input type="checkbox"/> Other:	
Project Number:	0002(378)/NFHWY00139 <input type="checkbox"/> NHS <input checked="" type="checkbox"/> Non NHS
Functional Classification:	Urban Minor Collector
Design Year:	2040 Present ADT: 1250 (2017)
Design Year ADT:	1660 Mid Design Period ADT: 1470 (2030)
DHV:	160 (2030) 180 (2040) Directional Split: 40/60
Percent Trucks:	6.15% Equivalent Axle Loading: 207,117
Pavement Design Year:	2037 Design Vehicle: SU-40
Terrain:	Rolling Number of Roadways: 1
Design Speed:	40 mph
Lane Width:	10 ft
Shoulder Width:	Outside: 6 ft 5 ft Inside: N/A
Cross Slope:	2%
Superelevation:	6% max
Min. Radius of Horizontal Curvature:	510 ft
Maximum Allowable Grade:	10%
Stopping Sight Distance:	305 ft
Vertical Clearance:	20 ft 6 in
Design Loading Structural Capacity:	N/A
Bridge Width:	N/A
Min. Allowable Grade:	0.3%
Min. K-Value for Vert. Curves:	Sag: 64 Crest: 44
Passing Sight Distance:	1470 ft
Surface Treatment:	T/W: Asphalt Shoulders: Asphalt
Side Slope Ratios:	Foreslopes: 4H:1V Backslopes: 2H:1V, up to 1H:1V
Degree of Access Control:	Partial access control (at-grade intersections and driveways by permit)
Median Treatment:	N/A
Illumination:	N/A
Lateral Offset to Obstruction:	12 ft outside horizontal curves & 8 ft tangents, if clear zone width cannot be achieved
Curb Usage and Type:	N/A
Bicycle Provisions:	Shared roadway Shoulder
Pedestrian Provisions:	Shared roadway Shoulder
Misc. Criteria:	

Proposed - Designer/Consultant: 
 Endorsed - Engineering Manager: 
 Approved - Preconstruction Engineer: 

Date: 11-7-19
 Date: 11-08-2019
 Date: 11/10/2019

Shaded criteria are commonly referred to as FHWA controlling criteria for NHS high-speed roadways (design speed >= to 50 mph). For NHS low-speed roadways (design speed < 50 mph), the only two FHWA controlling criteria which apply are design speed and design loading structural capacity. For NHS routes only, controlling criteria must meet the minimums established in the Green Book, unless a design exception is approved. For all other routes, all criteria must meet the minimums established in the Alaska Highway Preconstruction Manual, unless a Design Waiver is approved.

Design Criteria marked with a " # " do not meet minimums and must have a Design Exception(s) and/or Design Waiver(s) approved. See the Design Study Report for Design Exception/Design Waiver approval(s) and approved design criteria values.

DSR Revision Update: Proposed - Designer:  Josh Kunz 2.28.2023
 Endorsed - Engineering Manager:  et Hall, P.E. 2/28/2023
 Approved: Preconstruction Engineer:  3/1/2023
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APPENDIX F

DESIGN WAIVER

ALASKA DOT&PF PRECONSTRUCTION DESIGN EXCEPTION/DESIGN WAIVER FORM

Type of Request: (select one or both)

- Design Exception (FHWA controlling design criteria on NHS routes only)
- Design Waiver (Non NHS Routes and all other design criteria)

Note: A project on the NHS may have both Design Exceptions and Design Waivers. A project on a Non NHS route will only have Design Waivers.

PROJECT INFORMATION:

Project Name: Yankovich-Miller Hill Reconstruction and Multi-Use Path

Project Number (IRIS/Federal): (NFHWY00139/0002378)

NHS High Speed (≥ 50 mph) NHS Low Speed (< 50 mph) Non NHS

Design Functional Classification: Urban Minor Collector

Design Year: 2040

Present ADT: 1250

Design Year ADT: 1660

Mid Design Period ADT: 1470 (2030)

DHV: 160 (2030) 180 (2040)

Directional Split: 40/60

Percent Trucks: 6.15%

Equivalent Axle Loading: 207,117

Pavement Design Year: 2037

Design Vehicle: SU-40

Terrain: Rolling

Number of Roadways: 1

*Design Speed: 40 mph

Posted Speed: 40 mph

Operational Speed:

** If requesting a design exception for design speed, use the recommended not reduced design speed here. Further, any design which uses a design speed below the posted or regulatory speed limit should not be approved (Source: FHWA Supplement, Section 8.,b. Application of Design Standards, Uniform Federal Accessibility Standards, and Bridges located here: <http://www.fhwa.dot.gov/design/0625sup.cfm>). FHWA also recommends evaluating specific geometric element(s) and treating those as design exceptions instead of lowering the design speed.*

PROJECT INFORMATION:

It is required that a location map, as a minimum, be provided with your package. It is highly recommended that other exhibits be provided to support your request. Exhibits may include typical sections, geometric details, correspondence from other sections, agency correspondence, etc.

1. **Design Exception requested for the following design criteria. Mark all the criteria to be discussed:**

NHS High Speed (≥ 50 mph)	NHS Low Speed (< 50 mph)
<input type="checkbox"/> Design Speed	<input type="checkbox"/> Design Speed
<input type="checkbox"/> Lane Width	<input type="checkbox"/> Design Loading Structural Capacity
<input type="checkbox"/> Shoulder Width	
<input type="checkbox"/> Horizontal Curve Radius	
<input type="checkbox"/> Superelevation	
<input type="checkbox"/> Maximum Grade	
<input type="checkbox"/> Stopping Sight Distance	
<input type="checkbox"/> Cross Slope	
<input type="checkbox"/> Vertical Clearance	
<input type="checkbox"/> Design Loading Structural Capacity	

The above design criteria are commonly referred to as *FHWA controlling criteria*. For NHS routes only, these criteria must meet the minimums established in the Green Book (*AASHTO A Policy on Geometric Design of Highways and Streets*). Otherwise a Design Exception must be approved. For all other routes, these criteria must meet the minimums established in the *Alaska Highway Preconstruction Manual*.

Design Waiver requested for the following design criteria. Mark all the criteria to be discussed.

Non NHS
<input type="checkbox"/> Design Speed
<input type="checkbox"/> Lane Width
<input type="checkbox"/> Shoulder Width
<input type="checkbox"/> Horizontal Curve Radius
<input type="checkbox"/> Superelevation
<input type="checkbox"/> Maximum Grade
<input type="checkbox"/> Stopping Sight Distance
<input type="checkbox"/> Cross Slope
<input type="checkbox"/> Vertical Clearance
<input type="checkbox"/> Design Loading Structural Capacity
<input checked="" type="checkbox"/> Min. K-Value for Vertical Curve
<input checked="" type="checkbox"/> Clear Zone
<input type="checkbox"/> _____
<input type="checkbox"/> _____

Design Waivers are required for any design criteria which do not meet the minimums established in the *Alaska Highway Preconstruction Manual*.

Note: A project on the NHS may have both Design Exceptions and Design Waivers. A project on a Non NHS route will only have Design Waivers.

2. Provide a synopsis of the project scope (including purpose and need), the situation you are encountering, and the problem you are attempting to mitigate.

This project will improve:

- The portion of Miller Hill Road from the intersection with Yankovich Road to where it terminates at a stop controlled, T-shaped intersection with Sheep Creek Road.
- The portion of Yankovich Road from the intersection with Miller Hill Road to where it terminates at a stop controlled, T-shaped intersection with Ballaine Road.

The project will widen the roadway width, improve the roadway geometry, and upgrade the safety of the intersection of Yankovich Road and Ballaine Road.

Due to the setting of the project, with many driveways and side streets intersecting, it is difficult to raise the profile. Due to discontinuous permafrost, lowering the profile of the roadway is undesirable. Due to many existing tight horizontal curves, bringing the profile to design standards would have negative impacts on adjacent property or on the stability of the roadway embankment.

3. Provide a concise written description of the proposed Design Exception(s)/Design Waiver(s). It is required to be specific in stating which design standard(s) is being requested to be excepted or waived and the location (either the entire project length or a station range). State the standard and proposed values of the design criteria exception/waiver citing AASHTO, Department, or other standards. Include the date of the design standard references cited. Whenever possible, reference AASHTO guidelines to support your design decisions.

Proposed Design Exceptions/Design Waivers Summary			
Criteria	Standard	Proposed	Location (<i>entire project or station range</i>)
GB Table 3-36 Sag Vert. Curve Minimum K-Value	64	49	527+00-530+50
GB Table 3-36 Sag Vert. Curves Minimum K-Value	64	49	569+50-577+00
GB Table 3-36 Crest Vert. Curves Minimum K-Value	44	29	566+00-580+00
1130-2 Table Clear Zone Distance	14-16'	Min 5'	510+00-587+50

4. Discuss the terrain in the area of the project and the proposed Design Exception(s)/Design Waiver(s).

The project is in rolling hills in an urban setting. Much of the area in the requested design waiver locations is classified with a Roadside Hazard Rating of 5-6. It is heavily wooded with some side slopes of 1:2 (H:V) and poles 6'-14' from edge of traveled way. The design waiver areas along Yankovich road will be an improvement of existing facilities with wider shoulders and improved K-Values of both Sag and Crest curves.

5. Discuss the traffic characteristics in the area of the project and the proposed Design Exception(s)/Design Waiver(s).

Traffic mostly consists of residential trips to and from Fairbanks for work and supplies. This area sees frequent use by non-motorized users as well. There is the Large Animal Research Station located on Yankovich road that attracts bus and other tourist traffic year-round. The design waiver areas along Yankovich road are being improved from the existing profile to meet design criteria for 35 MPH which is, however, lower than the design speed of 40 MPH.

6. Discuss the crash history of the project and the proposed Design Exception(s)/Design Waiver(s). State if any anomalies are present within the project limits. Also discuss the expected operational and safety performance of the highway if the Design Exception(s)/Design Waiver(s) are implemented.

The crashes for the past 5 years available along the corridor were reviewed and the only qualified crashes present were the three crashes near Dalton Trail caused by the vehicle traveling southbound on the Dalton Trail not being able to come to a stop before entering Yankovich Road. The crash history, and public comments received, do not identify areas of the roadway prone to run-off-the-road crashes. The design waiver areas along Yankovich road will be an improvement of existing facilities with wider shoulders and improved K-Values of both Sag and Crest curves.

7. Discuss the degree to which a standard is being reduced, whether the exception/waiver will affect other standards, and are there any additional features being introduced, e.g., signing or delineation that would mitigate the deviation and the proposed Design Exception(s)/Design Waiver(s). Discuss if multiple Design Exceptions/Waivers are being requested in the same segment and if they will influence each other. Also, discuss compatibility with the adjacent sections of highway.

A design waiver for 3 Sag vertical curves and 3 Crest vertical curves is being asked for along Yankovich road. This will lower the standard in these areas from 40 mph to 35 mph roadway. The combination of these vertical curves along with the limited clear zone should have a positive traffic calming effect in the area leading up to a STOP sign where Yankovich Road intersects with Ballaine Road. Per the AASHTO Guidelines for Geometric Design of Low Volume Roads, section 4.7.2 Existing Roads, "Roadside clear zones and traffic barriers are not generally cost effective and need not generally be provided, except in situations where a site-specific crash pattern is present or the engineering judgment of the designer identifies a need for the provision of a roadside clear zone or a guardrail."

8. Explain why the proposed Design Exception(s)/Design Waiver(s) is needed and the alternatives considered. (Provide supporting information as to why the minimum design criteria cannot be met. Substantiate reasons with facts, historical data, cost estimates, etc.)

To keep the project moving along towards completion without additional ROW acquisition and within available funding is the goal. Large changes to profile would require additional ROW and would be difficult to accomplish without significant impact on adjacent properties and intersecting roadways. To offset the existing utility poles would require significantly more funding than is available. To provide full clear zone on foreslopes would require significant ROW acquisition.

9. What additional right of way impacts will result due to the proposed Design Exception(s)/Design Waiver(s)? N/A

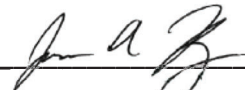
10. What impacts to the human and natural environment will result due to the proposed Design Exception(s)/Design Waiver(s)? Including impacts to the community and impacts on the needs of all users of the facility?


A reconstructed roadway with improved shoulders and sight distance will have a positive impact on the community and the users of the facility. The vehicles will have additional 5 feet of shoulder on each side to recover, compared to virtually existing shoulders of zero to up to 1 foot.

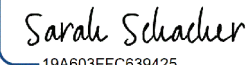
11. Discuss the cost of the project and the proposed Design Exception(s)/Design Waiver(s). Provide information that reflects the cost with and without the Design Exception(s)/Design Waiver(s). Attach detailed cost estimates.

Project Cost Summary	
To Standards	With approved Design Exceptions/ Design Waivers
3 or more years of delay for additional ROW acquisitions. Additional costs associated with ROW have the potential to increase project cost 2 to 3 times above planned design. Additionally, building the roadway embankment to clear zone per the Preconstruction Manual would oppose majority of the public comments received.	As presented in the Revised DSR

12. Is there a future project which could bring the section(s) into compliance with applicable standards? No.

Proposed Designer/Consultant: Josh Kunz  Date: 02.28.2023

Endorsed Engineering Manager: Ivet Hall D.E. DocuSigned by:  Date: 2/28/2023

Approved Preconstruction Engineer:  Date: 3/1/2023
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Concur – FHWA: N/A Date: _____

FHWA concurrence required for Projects of Division Importance (PoDIs) when included in the project agreements.

APPENDIX G

CONTEXT SENSITIVE SOLUTIONS

Introduction

Yankovich Road and Miller Hill Road are narrow, paved, two-way roadways with no shoulders. They are in rural setting with multiple trails and nearby single residences. This project will improve:

- The portion of Miller Hill Road from the intersection with Yankovich Road to where it terminates at a stop controlled, T-shaped intersection with Sheep Creek Road.
- The portion of Yankovich Road from the intersection with Miller Hill Road to where it terminates at a stop controlled, T-shaped intersection with Ballaine Road.

Large adjacent property belonging to the University of Alaska Fairbanks is adjacent to both roadways. This largely undeveloped land has multiple non-motorized trails throughout. To improve access, a separated multi-use pathway was built in 2017 along the roadways including in this project, specifically along the entire length of the Miller Hill Road, and along the portion of Yankovich Road between the Miller Hill intersection and the Large Animal Research Station. That project did not improve, nor did it widen, the narrow Miller Hill Road (22-ft pavement) or Yankovich Road (20-ft pavement). However, the construction of the separated multi-use pathway extended the connection of existing non-motorized transportation network from Sheep Creek Road. This project will finish connecting the non-motorized facilities all the way to the existing network on Ballaine Road where Yankovich Road terminates.

Miller Hill Road

Context description:

Miller Hill Road runs south to north with profile grade of almost 10%, which is steeper than most profiles in the Fairbanks area. Non-motorized trails in the surrounding woods are accessible off both sides of the roadway. Along Miller Hill Road, the separated path is on the east side where there are no driveways. The path provides access to the multiple trails within the wooded land of the University of Alaska Fairbanks.

The west side of Miller Hill Road has power poles and rural residential properties with driveways either directly accessible from Miller Hill Road or accessed from the few local roadways that feed into Miller Hill Road. Prior to the construction of the multi-use path in 2017, Miller Hill Road had a very rural setting with dense trees along both sides of the roadway – see before and after photos below.

Roadway description:

Miller Hill Road has a 22-ft wide paved surface with grades exceeding standards in the Alaska Preconstruction Manual. The south end of Miller Hill flattens out into a valley where it connects with Sheep Creek Road. This roadway has no horizontal curves. Miller Hill Road embankment near this intersection requires frequent maintenance due to foundation issues, area drainage, and deteriorating permafrost underlying the roadway.



Miller Hill Road before the 2017 construction, Photo from Google Earth



Miller Hill Road after the 2017 construction of the separated shared-use path, Photo from iVision 5

Yankovich Road

Context description:

The east end of Yankovich Road close to the intersection with Miller Hill Road has a separated shared use path. In this areas there is a cemetery, Large Animal Research Station, and access to UAF's College International Geophysical Observatory. The remaining portion of Yankovich Road, which is the majority of it, serves as a collector with access to multiple roadways and subdivisions, with the occasional direct driveway access to nearby residences.

The northern side of Yankovich Road has relatively small V-shaped ditch that collects water from the topography to the north and conveys it across the roadway to continue flowing to the south. The ditch was cut into original terrain and the backslope is often at a higher elevation than the roadway embankment. This back slope of the ditch is the roadway side of a tree buffer consisting of mature trees that shelter most residencies from being readily visible from the roadway.

The south side of Yankovich Road has power poles located relatively close to the roadway (6-10 feet from the edge of the travel lane). The south side of Yankovich Road is either lined with trees or opens up into lawns fronting residencies relatively close to Yankovich Road. Extending the roadway beyond a few feet would either remove much of the tree buffer from the residencies or would bring public use facilities to the proximity of residencies which is expected in an urban setting.

Roadway description:

The geography of the roadway combined with the narrow pavement likely act as natural speed reduction measures for motorists. Yankovich Road is relatively straight except for few horizontal curves approaching the T intersection with Ballaine Road. Most of the existing vertical curves do not meet the sight distance requirements for the posted speed of 40 MPH.

Public comments:

Two meetings were held for this project in 2017. One was in August for the general public and another in November was for adjacent property owners only.

Of those attending the public meetings and subsequent adjacent landowner meetings, the reported non-motorized use of the corridor was higher than for many other rural roadways, especially considering that the existing roadway has two narrow 10-ft lanes and no shoulders [driving (29%), biking (31%), walking (21%), running (12%), roller skiing (4%), and all-terrain vehicle (ATV) or snow machine (3%)].

The majority of the northern side of Yankovich has a line of trees 14 to 22 feet from the existing edge of the traveled way. The comments from public meetings to date expressed concern that clearing the trees along the roadway will remove the visual and auditory buffer between residencies and the roadway. Furthermore, excavation underneath the currently mature trees will likely undermine the root system of trees located on private land, increasing the loss of vegetative buffer onto adjacent private properties.

Public comments also expressed concerns that wider roadways would increase the speeds of motorists and change the character and feel of the roadway.

Comments for the separated path proposed to be extended to Ballaine Road under this project: Some public comments advocated for a separated path, while others stated that it is more dangerous due to the speeds bikers and skiers may gain coming down the steeper portions of the pathway. Note about the frequency of the driveways and intersecting roadways, and concern for the safety of the non-motorized users at driveways and intersections, when the path is separated from the roadway, was also mentioned.

Those commenting felt sympathetic to the adjacent property owners, either using this as one of the reasons to not prefer a separated path or hoping that the project can somehow compensate them for the changes that would happen to their property as a result of constructing a separated pathway. Comments also mentioned that separated pathway is safer for children.

There were several comments asking that the project not make such a large impact to the corridor, especially referencing the clearing of trees that was done for the Miller Hill Multi-Use path in 2017.

Considerations for design:

The purpose and need of the project is to improve the roadway and drainage of Yankovich Road and Miller Hill Road, and to connect the separate pathway built in 2017 to the existing shared-use facility along Ballaine Road.

The users of these corridors include: vehicles (including tour busses), bicyclists, pedestrians (runners and walkers), roller skiers, and the drivers of ATVs and snow machines.

The majority of public comments supported an improvement in motorized and non-motorized transportation within the project limits. Many of the supporters and most of those not supporting the project expressed concern that the project may change the character of the roadway and therefore the character of the area. Several comments received advocated for a project that would have a lesser visual impact on the roadway than the previous project in the area that constructed the shared-use pathway along Miller Hill Road and the west end of Yankovich Road.

Proposed Design: Miller Hill Road

The proposed project will widen the paved surface by adding shoulders on each side. There will be 10 foot lanes and 5 foot shoulders. The 30 foot Total Roadway width is greater than the 23 required by [Guidelines for Geometric Design of low-Volume Roads](#). This publication is advised for use by the Greenbook since the design ADT is below 2000. Additionally, the project will offset the roadway centerline east by 2 feet. This centerline offset will address public comments by:

- Minimizing removal of trees on the west side of Miller Hill Road.
- Taking advantage of the tree clearing during the 2017 shared use path project by bringing the roadway embankment closer to the separated shared-use path, thus minimizing fill outside the 2017 project footprint.

The proposed design will improve safety and address public comments by:

- Providing 5-foot shoulders for non-motorized users who do not choose to, or who cannot, use the adjacent separated shared-use path.

- Five-foot shoulders are one foot wider than the minimum width for bicycle facilities, however the steep grade for the north-bound non-motorized users is much more likely to cause the non-motorized users to weave during the steep section of the roadway. Additionally, the 1-foot wider shoulders will not cause more tree clearing or greater visual impact compared to the minimum 4-foot shoulders, because this additional one-foot width will be compensated by the centerline offset toward the separated pathway. Therefore due to the steep grade and already cleared area, providing 5-foot shoulders along Miller Hill Road is preferred.
- Currently Miller Hill Road has around 11 feet of surfaced roadway from the centerline, providing vehicles no shoulder to recover to the travel lane before encountering a side slope. Providing 5 feet of paved shoulder on both sides of the roadway will provide 15 feet of paved surface (the striped lanes will be reduced to 10 feet) for vehicles to recover after departing the travel lane and before encountering foreslope and loose material.
- Narrowing the delineated travel lanes to 10 feet from the existing 11 to promote slower speed due to shy offset for side friction with the opposing traffic. Narrower lanes are recommended for desired lower speeds, especially along a roadway with no horizontal curves, because they have a visual calming effect on traffic by the lanes appearing narrower. These 10-foot lanes will be also consistent with the adjacent Yankovich Road lanes. Additionally, narrowing the lanes will provide additional 1-foot shoulder width as described above, while not sacrificing the safety of the vehicular users.
- Offsetting the centerline east will increase the distance of the existing power poles from driving lanes, therefore improving safety for vehicles departing the roadway.
- Similarly, offsetting the centerline east will move the existing treeline 2 feet further from the travel lane.
- Not providing seemingly an excessively wide roadway surface for motorized vehicles in the winter when pavement markings may be obscured by snow and/or ice.

The project will change the current profile only slightly. To aid in reducing frequent maintenance required due to poor subgrade, the proposed project will also reinforce the embankment in areas recommended for this action following a review of data gathered from geotechnical exploration.

Proposed Design: Yankovich Road

The proposed project will widen the paved surface by adding shoulders on each side. The 30 foot Total Roadway width is greater than the 23 required by Guidelines for Geometric Design of low-Volume Roads. This publication is advised for use by the Greenbook since the design ADT is below 2000. . Additionally, the project will offset the roadway centerline north by 3 feet for the majority of Yankovich road.

The proposed design will address public comments and improve safety by:

- Providing 5-foot shoulders to accommodate bicyclists, pedestrians, and runners.
- The 5-foot shoulders will provide additional 5 feet of the roadway for a vehicle to recover before encountering an embankment slope.
- Not separating the non-motorized facility by a curb or loose material will allow the pedestrians to utilize the adjacent driveway or the outer portion of the adjacent traveled lane when they need to pass other non-motorized users and the 5-foot shoulder is not wide enough. This is also how the project will meet the minimum 5-foot wide passing space per the Americans with Disabilities Act. The vehicular traffic on this road is sparse enough to accommodate this when needed.

- Maintaining the existing lane width of 10 feet will provide sufficient lane width for vehicles while also creating a visual calming effect due to perceived side friction with the oncoming lane. This should help keep the vehicular speeds close to the posted speed of 40 MPH.

This context-sensitive solution design does not provide for the desired 14-16 feet clear zone distance recommended by the Alaska Preconstruction Manual. Per standard practice, the crashes for the past 5 years available along the corridor were reviewed and the only crashes present were the three crashes near Dalton Trail caused by the vehicle traveling southbound on the Dalton Trail not being able to come to a stop before entering Yankovich Road. The crash history, and public comments received, do not identify areas of the roadway prone to run-off-the-road crashes. While the project will not meet the desired clear zone of 14-16 feet, it will increase the existing clear zone from a minimum of 0-3 feet to 5 feet by providing an additional 5 feet of shoulder to recover before the vehicle leaving the flat roadway surface encounters a foreslope. Along Yankovich road, widening the roadway surface within the narrow area between the trees may necessitate foreslopes as steep as 2:1 right off the pavement, however, the embankment height is generally not tall enough that a vehicle would actually roll over. A run-off-the-road vehicle may end up on its side.