

MaineDOT - HIGHWAY PRELIMINARY DESIGN REPORT

Project Name: Caribou, Prestile Hill Bridge
WIN: 22845.00

Draft Distribution Date: 10/1/2019
Final Distribution Date: 1/9/2020

Town(s): Caribou	Route(s): ME 164		
WIN: 22845.00	Federal Project No: 2284500		
Project Type: Large Culvert Replacement			
Project Location: Rt. 164, Prestile Brook crossing			
Length: 0.16 mi.	BRLM: 22.45	ERLM: 22.60	RLM Date:
Program: Highway		Program Manager: Brad Foley	
Project Manager: Roger Soucy		Designer: VHB	
FHWA Oversight:		Engineer of Record: Tony Grande	

LOCATION MAP

CARIBOU 22845.00



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2.5 Miles
1 inch = 1.77 miles

Date: 1/22/2018
Time: 9:08:36 AM

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PLANNING

Project History:

In 1999 the project area was improved with the installation of gabion walls into the inslopes on either side of the roadway, new pavement, drainage improvements and a CMP extension placed on the east/outlet end of the concrete box culvert.

Purpose & Need:

The project is at the bottom of two significant downslopes, and there are reported issues with water on the roadway. During one significant event in 1983 the entire road flooded. There have been significant numbers of collisions with wildlife. The existing box culvert has some structural deficiencies, such as failing wingwalls. Inslopes that have been reinforced with gabion walls are failing.

Brief Summary of Proposed Scope of Work:

The project will consist of replacement of the box culvert that carries Prestile Brook under Route 164 (Main Street) in Caribou. Culvert is to be replaced with a pre-cast concrete arch culvert, approximately 30' W x 17'-4" Rise x 96' L. The new culvert will address Habitat Connectivity and be realigned to improve stream flow within the project limits. Alignment and vertical profile of Rt. 164 will remain unchanged. Outside the reconstruction area necessary for the installation of the new culvert and potential temporary access road, approximately 200' of the north end of the project limits will consist of pavement rehabilitation and shoulder reconstruction.

Scope Changes:

TRAFFIC

Intersections – No intersections were evaluated. The intersection with Kittinger Road, which is a private road, is at the north end of the project, however no changes to this intersection will be made.

Design Vehicle (without encroachment):

Design Vehicle (with encroachment):

Auxiliary Lanes:

Crash Data

Analysis Period: 2016 – 2018

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High Crash Locations (including Critical Rate Factor and number of crashes): High crash location for deer. The proposed structure will provide passage for wildlife and funnel fencing will be installed.

DESIGN CRITERIA

Basic Design Controls

	Section 1	Section 2	Section 3
		(not used)	(not used)
Corridor Priority	3		
Functional Class	Rural, Major/urban collector		
NHS/Non-NHS	Non-NHS		
Posted Speed	50 mph		
2018 AADT (Current)	2240		
2030 AADT (Design)	2510		
DHV	10%		
Scope (choices below)	Reconstruction		
(New Construction, Reconstruction, Rehabilitation, Restoration/Resurfacing, Spot Improvement)			

Controlling Criteria

Element	Required Standard	Required Standard	Required Standard
	Section 1	Section 2	Section 3
Design Speed	50 mph		
Lane Width	10-12'		
Shoulder Width	2-6'		
Horizontal Curve Radius	833 ft		
Superelevation Rate	N/A		
Stopping Sight Distance	425'		
Maximum Grade	8%		
Cross Slope (Travelway)	2.0%		
Vertical Clearance	N/A		
Clear Zone	10'		

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Typical Section

Element	Proposed Value	Proposed Value	Proposed Value
	Section 1	Section 2	Section 3
Lane Width	12'		
Shoulder Width	5'		
Cross Slope (Travelway)	2.0%		
Side Slopes	2:1, 3:1		

DESIGN EXCEPTION SUMMARY

Controlling Criteria

Element	Required Standard	Proposed Value	Date Approved

Drives and Entrances

Station	Maximum Grade	Grade Change	Date Approved

PAVEMENT STRUCTURE

Pavement Assessment Report (Title and Location): NA

Design Review Date: 2/05/2020

Design Guidance Subgrade Soil Type (1-3): Type 2 (fill)

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Pavement Structure Design

Design Method	Design Guidance		DARWin 3.1	
	Layer	Thickness	Type	Thickness
Hot Mix Asphalt Pavement	4"	As per SP 403	NA	NA
Recycled Layer	NA	NA	NA	NA
Base Course Gravel	20"	Type C	NA	NA
Subbase Course Gravel	NA	NA	NA	NA
Shoulder Pavement	4"	As per SP 403	NA	NA

Pavement Design Coachpoint Date: 02/05/2020

Final Pavement Structure Design

Design Method	Design Guidance	
	Layer	Thickness
Hot Mix Asphalt Pavement	4"	As per SP 403
Recycled Layer	NA	NA
Base Course Gravel	26"	Type C
Subbase Course Gravel	NA	NA
Shoulder Pavement	4"	As per SP 403

Comments:

12-yr ESALs = 341,640. Table 1 in the Structural Pavement Design Guidance was used for design. The design guidance requires a minimum of 20" of aggregate, but 26" is being used for an overall pavement structure section of 30". Aggregate Base Course – Type C the type of aggregate used in this area of Aroostook County.

COMPLETE STREETS COMPLIANCE

Select and summarize the Complete Streets elements that have been incorporated into the project:

- Sidewalks
- Crosswalks
- Lighting (street or pedestrian scale)

Street lights are currently in place through the project area. It is anticipated these will remain at the conclusion of the project.

- Pedestrian Signals

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- Streetscaping (benches, landscaping, etc.)
- Shoulder Improvements
- Bike Lanes/Shared Use Paths
- Public Transit (bus stops, etc.)
- Other (explain)

Summarize the reasons any elements were not incorporated:

The elements above that are not incorporated do not presently exist in the project area and were not added as they are beyond the declared scope of the project, and their use is unforeseen. The replacement of the large culvert will require the closure of the road in order to facilitate the construction. Following construction, the roadway lane and shoulder widths will be restored to their present conditions.

ADA COMPLIANCE

Minimum Improvements based on the Policy: None

Summarize the proposed improvements: None

Existing Pedestrian Facilities

Element	Compliant? (Y/N)	Upgrades Proposed? (Y/N)	ADA Design Exception? (Y/N)
Curb Ramps	(None)		
Running Slope	N/A		
Cross Slope	N/A		
Width	N/A		
Counter Slope	N/A		
Flared Sides	N/A		
Landings	N/A		
Diagonal Ramps	N/A		
Detectable Warnings	N/A		
Sidewalks	(None)		
Width	N/A		
Cross Slope	N/A		

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Are pedestrian signals proposed to be installed or upgraded if required? No pedestrian signals proposed.

ENVIRONMENTAL PERMITS / ISSUES

Team Member: Audie Arbo

NEPA	Programmatic Categorical Exclusion expected 4/26/2020 STIP PE: 8/28/2018 STIP ROW: 8/28/2018 ADV/Construct: not listed
Section 106	No Effect: MHPC Concurrence 10/9/2019 Tribal notifications sent 4/14/2017
Section 4(f)	No 4f properties
Endangered Species	Canada lynx DPS only, no effect Northern long-eared bat, not likely to adversely affect (meets 4(d) rule)
Essential Fish Habitat	project is within EFH for Atlantic salmon, adverse effect not substantial
Fish Passage	Required
In-Stream Window	In-stream work window- will request a June 1 start to work window
Hazardous Material	Review suggests no issues.
Dredge Material	Stream is Class B, amount of dredge needed for Spec to be drafted
Stormwater/MS4	does not trigger Chapter 500, not in a MS4
DEP/LUPC	exempt per MRS 480-Q 2-D. Existing crossings
ACOE	Category II permit required
Mitigation	Will not be required
Other	IF&W has requested 1.2x BFW culvert with full fish passage Skewed pipe alignment preferred. Prestile Brook- high quality brook trout habitat

Avoidance & Minimization:

Additional Comments:

Some wildlife control measures will be installed to direct animals to cross under the road via the new structure, and not by going across the road. Chain-link fencing, 8' high, will be installed on both sides of the road beginning from the structure and running along the toe of slope in each direction. This fencing will have a one-way wildlife escape gate, one on each side of the road, to allow animals that wander into the roadway in this area a means to pass through the fence and out of the road. In addition, at the north end of the project area and end of the proposed fencing, a dog-hair loam mix will be roto-tilled into the soil and/or placed loam to further deter deer from rounding the fence into the road.

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RIGHT-OF-WAY COORDINATION

Team Member:

	Section 1	Section 2	Section 3	Section 4
Total Existing Width:	90'			
Total Proposed Width:	90'			
# of Abutters: 4				
# of Acquisitions: 4-Temp Rights & Perm. Easements				
# of Relocations: 0				
Building Availability: n/a				
Reserved Limits: n/a				

UTILITY IMPACTS/ISSUES

Team Member: Mark S. LaGross

Above Ground Utilities:

1. FairPoint Northern New England Telephone Operations dba Consolidated Communications
 - Temporary transfers during construction phase
2. Emera Maine
 - Temporary pole sets and transfers
3. Spectrum
 - Temporary transfers
4. Maine Fiber Company
 - Temporary transfers
5. MaineDOT street lighting
 - Remove light fixtures prior construction
 - Install existing or new light fixtures post construction

Below Ground Utilities: Not applicable.

	Necessary for this Project? (Yes or No)	Coordination Still Needed? (Yes or No)
Pole List:	Yes	Yes
Utility Agreements:	No	No
RR PRTS:	No	No
Railroad Agreement:	No	No

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ROW issues related to utilities:

TBD. The present intent shall be for all temporary pole sets/line transfers to occur outside the present existing right-of-way limits w/ final new pole sets/line transfers to occur back along the original alignment.

GEOTECHNICAL COORDINATION

Team Member: Kate Maguire

Available Soils Information:

One (1) boring and one (1) probe were drilled at opposite, diagonal corners of the existing structure. The subgrade soils encountered in the boring consisted of loose to medium dense fill sand and silty sand underlain by medium dense to very dense sand and gravelly sand till and very stiff to hard silt and sandy silt till. Boring HB-CARI-101 was drilled to a depth of approximately 47.0 feet below ground surface (bgs) and did not encounter a refusal surface. Probe HB-CARI-102 was drilled to a depth of approximately 45.0 feet bgs and did not encounter a refusal surface.

Additional Borings Required? (Y/N) No

Additional Geotechnical Analysis Required? (Y/N) Yes

Comments by Geotechnical Engineer:

The proposed structure can be bedded on a 1 foot thick layer of Granular Borrow, Material for Underwater Backfill (MaineDOT item 203.25, Granular Borrow).

The Geotechnical section will work with VHB's structural engineer to finalize the foundation design.

Are Foundations for Overhead Sign Structures, Traffic Signals or Lighting Required? (Y/N) No
(If yes, one boring per foundation required.)

PUBLIC PROCESS

Proposed Public Contact Method and Date(s): No meetings have been held to date. Waiting until project is funded for construction.

Concerns Identified at Preliminary Public Meeting:

Municipal Agreement:

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M&O ISSUES / CONCERNS

Existing inslopes and the gabion walls in them are failing. Debris is accumulating at the inlet end of the culvert. Significant number of deer hits in this area. One major event in 1983 flooded the roadway.

CONSTRUCTION SCHEDULE

PS&E Date	1/23/2023
Advertise Date	2/13/2023
Construction Begin Date	4/15/2023
Construction Complete	10/1/2023

TAME RESULTS (Transfer results from returned Tame Request Form)

Morning Restrictions	
Evening Restrictions	
Maximum Closure Length	
Minimum Lane Width	

Additional Comments: Project has not yet gone through the TAMEing process and will do that once funding has been secured. Route 164 is intended to be shut down for construction duration with intent to utilize a local detour route.

BUDGET

	Programmed	Available	PDR Estimate
Date	8/8/2018	9/3/2019	10/1/2019
Preliminary Engineering	\$145,000	\$145,000	\$145,000
Right of Way	0	\$10,000	\$30,000
Construction	0	0	\$4,600,000
Construction Engineering	0	0	\$100,000
Other	0	0	
TOTAL	\$145,000		\$4,875,000
Total Cost per Mile:			
Funding Strategy (Sources):	9095 - Federal 80% - State 20%		

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SUMMARY OF PRELIMINARY ENGINEERING

Alternatives Analysis

Several alternatives were explored for replacement of the existing box culvert. One set of alternatives proposed a precast concrete arch culvert, with sufficient room to allow wildlife passage on a shelf to be set on one side of the archway. Additionally, the analysis determined impacts to setting the proposed new culvert either at the same alignment as the current structure (approximately perpendicular to the roadway), or skewing the new structure at an angle more suitable for improved stream flow. The skewed alignment was preferred for its improvements to channel alignment and hydraulic design considerations.

Another set of alternatives explored constructing a bridge rather than a culvert, however this was dismissed early in the design process for cost and maintenance reasons. Finally, due to the sharp grade of the roadway coming down to the culvert from each direction, the option to raise the road profile was analyzed to potentially improve safety and HLSD. However, once the decision to proceed with a culvert instead of a bridge was made, due to the significant amount of fill that would be required to raise the profile, it was determined the profile would remain essentially as is to avoid excessive costs. For additional information see the Culvert Replacement Options Memorandum, submitted to the Department on April 5, 2018.

Design Variances

Side slopes throughout the majority of the project will be 2:1, to reduce the amount of fill and RW impacts as much as possible. The proposed sag vertical curve in the center of the project has a HLSD of 138', which is less than half of the required SSD of 425'. This is unchanged from the existing condition since the existing profile will be kept as discussed above.

Proposed Design Elements

Horizontal Alignment:

The proposed alignment is following the same horizontal alignment from the 1999 project, and has one angle point with a deflection angle of 43'41.4" near the start of the project. No changes to the existing alignment were considered.

Vertical Alignment:

The proposed vertical alignment essentially follows the existing profile, beginning with a 7% downgrade toward the 320' sag curve, then an 8% grade toward the project end. Due to the large inslopes created by the depth of the culvert and stream, it was decided not to raise the vertical alignment and reduce these grades to avoid excessive fill. The project is located in a long tangent and has existing street lighting, which help to alleviate headlight sight distance concerns.

Typical Section:

Throughout the project, the typical section of the reconstruction area necessary to install the new culvert will consist of 12' travelways, 5' shoulders from edge of travelway to face of guardrail and 3' of

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additional paved section from face of guardrail to edge of shoulder. The pavement depth of the travelways will be 6", and 3" for the shoulders. Cross slope of the travelways will be 2.0%, and 4.0% for the shoulders. No superelevations will be used in the project area. The gravel base will be 24" deep under the travelways and 27" deep under the shoulders. Beyond the edge of shoulder, the inslopes will be 2:1 through the majority of the project, and 3:1 for approximately 250' at the southern end of the project.

In the pavement rehabilitation areas at the northern end of the project, the typical section will keep the same pavement depths, lane/shoulder widths and cross slopes as above. Underneath the 3" of pavement in the shoulders, there will be 3" of shoulder aggregate added to make up for the 6" of overall pavement milling. There will be no new gravel base material. The inslopes will vary as they match into existing ground at the project ends.

Culvert Details:

Culvert #913180 is an existing reinforced concrete culvert with a 7'-6" span and 8'-0" rise of unknown age. There is a corrugated metal pipe arch extension on the eastern (outlet) end. The culvert is in poor condition with multiple large full depth cracks, active leakage, spalls, exposed rebar and is currently undersized to meet minimum hydraulic requirements.

The proposed structure is a C-Series Bebo precast concrete arch culvert with a 30'-0" span and 17'-4" rise set atop 11'-0" tall concrete pedestal walls. The proposed structure provides enough vertical clearance for moose crossings. The two pedestal walls will be connected via a closure pour to create a slab footing for the culvert. This alternative was chosen based on an increase in cost to drive piles along a similar sized foundation.

Approximately 246'-0" of channel will be reconstructed allowing Prestile Brook to flow adjacent to the 13'-0" wide wildlife shelf within the culvert. The installation of this structure will create significant impacts to Route 164 and therefore require full depth reconstruction for a section of Route 164.

Pavement Structure:

The proposed pavement structure will be full construction, except for approximately 200' of rehabilitation at the north end of the project.

Drainage/Hydrology:

With the project lying in a deep sag curve, the existing drainage systems is open-ditch or simply allows for run-off down the inslopes to the stream below. A closed drainage system exists near the start of the project at the north end, with outlets on either side of the road. No changes to this closed system are proposed, other than any modifications to these outlets caused by changes to the inslopes. For further information, refer to the Habitat Connectivity Design Report dated November 23, 2018 and revised October 1, 2019.

Guardrail:

Mid-way splice guardrail will be installed for much of the project area, in keeping with the existing conditions and given the significant inslopes on each side of the road. Face of guardrail will be 5' from the edge of travelway on each side of the road as noted above.

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Intersection Geometry:

No intersections were evaluated. The intersection with Kittinger Road, which is a private road, is at the north end of the project, however no changes to this intersection will be made.

Right-of-Way:

According to current DOT right-of-way plans, there is 90' of fee right-of-way and beyond that, large prescriptive easements (wrought portion) for the large inslopes. These prescriptive easement limits have been updated based on the topo survey acquired for this project. There are existing drainage easements at three drainage outlets. All existing right-of-way lines have been recovered from field evidence. Additional slope and drainage easements will likely be necessary, as well as temporary rights for utility relocations and construction access.

Utilities:

Existing utilities are overhead power and communication lines. No underground utilities are known to exist. Utility relocation plans are in development.

Other Design Issues:

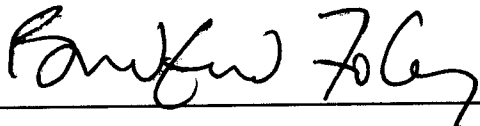
- Utility poles will need to be temporarily relocated during construction
- Coordination with construction access will be required.

DRAFT PDR DISTRIBUTION TEAM COMMENTS AND RESPONSE

Comments: Draft PDR was distributed to the Team on 10/1/2019. Comments were addressed and Final PDR was distributed on 1/9/2020. Final PDR was then revised following Team Meeting on 2/5/2020.

Comment Deadline	Date:
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APPROVALS

Preliminary Design Report Complete		Date: 3.5.2020
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For Large Culvert Projects, Preliminary Design Report Complete also signifies Plan Impacts Complete.