Jericho Bolger Hill Road

Supplemental Study
Alternative 4 Advancement
Conceptual Design Phase

Prepared for:
Town of Jericho, Vermont
and
Chittendon County Regional Planning Commission

Hoyle, Tanner & Associates, Inc.
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May 2021

Technical Memo

Bolger Hill Road
Jericho, VT

Prepared for

Chittenden County Regional Planning Commission

May 2021

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Design Narrative

Project:	Bolger Hill Drainage Improvements Project
Project No.:	924703.01
To:	Chittenden County Regional Planning Commission
	Attn. Dan Albrecht
From:	Audrey G. Beaulac, PE
Date:	May 21, 2021

Included as part of this narrative are the Conceptual Plans titled *Plans of Proposed Bolger Hill Drainage Improvements,* consisting of 11 sheets, prepared by Hoyle, Tanner & Associates, Inc. and dated May 2021. The conceptual plans include applicable BMP design details and layout for the Town Green and Browns Trace BMPs. Also included as part of this narrative is the *Conceptual (25%) Opinion of Cost to Date for Bolger Hill Road Drainage Improvement Project, Jericho VT,* prepared for CCRPC, prepared by Hoyle, Tanner & Associates, Inc. and dated 5-21-2021.

Hoyle, Tanner & Associates, Inc. did not calculate cost for Preliminary and Final Designs.

Overview:

In October 2019, Hoyle, Tanner & Associates, Inc. (Hoyle, Tanner) was contracted by Chittenden County Regional Planning Commission (CCRPC) to provide engineering services for the Bolger Hill Road Drainage Alternatives Study (Study #1) from Jericho Center Circle to the top of the hill, approximately 850 linear feet. The Class 3 gravel road is narrow with fairly steep grades that rise to a knoll. The lack of ditches and drainage structures along this section of roadway results in significant erosion of the road surface during rain events leading to washed out gravel accumulation in Jericho Center Circle and the Town Green. Hoyle, Tanner submitted Study #1 in January 2020, recommending Alternative #4. Alternative #4 included the following features:

Roadway features:

- Approximately 650 linear feet of new pavement
- Approximately 80 linear feet of bituminous curb
- Reconstructed drive for House #4
- New closed drainage systems
- Stormwater treatment facilities
- Approximately 340 linear feet of new stone-lined ditch

Stormwater features:

- Underground Infiltration System or Above Ground Bioretention System
- Groundwater Recharge
- Overflow outlet to eliminate ponding at the intersection of Bolger Hill with Jericho Center Circle
- Underground storage for larger storm events
- Stormwater pretreatment

The above project was divided into two projects and in August 2020, Hoyle, Tanner was contracted by CCRPC to provide engineering services for the Final Design (100%) of the Stormwater Best Management Practices (BMPs) in the Town Green area within Jericho Center Circle (**Jericho Center Circle SW BMP Design project**) to support the larger Bolger Hill Road Drainage Improvement project (**Bolger Hill Drainage Scoping project**). The scope of the Bolger Hill Drainage Scoping project was to provide engineering services for the advancement to conceptual design (25%) of the Alternative #4 Design presented in Study #1 (noted above). This project builds on the previous study that investigated drainage issues and evaluated improvement options for Bolger Hill Road in Jericho. A survey was conducted, and conceptual plans were drafted to more accurately develop a cost estimate for improvements to Bolger Hill Road. Further design aspects of the Bolger Hill Drainage Scoping project conceptual design are noted below. The **Jericho Center Circle SW BMP Design project** is not discussed further in this Design Narrative.

The purpose of the project is to provide a roadway and drainage alternative that reduces the erosion that is currently occurring along Bolger Hill Road and to reduce the sediment accumulation at its intersection with Jericho Center Circle. The need for the project is to reduce the gravel, which comes from Bolger Hill Road, that gets washed into the Town Green and abutters properties after large storm events. The Town would also like to improve the water quality in this area.

Design References:

- Town of Jericho Public Works Specs, 2009
- 2019 AASHTO Guidelines for Geometric Design of Low-Volume Roads
- AASHTO Greenbook, 7th Ed.
- AASHTO Roadside Design Guide, 2011
- VTrans Transportation Data Management System
- The Orange Book, A Handbook for Local Officials, 2017-2019
- VTrans Simplified Pavement Design for Small Projects, 2013

Project Design Criteria:

- Design Speed: 25 mph
- This roadway is assumed to have less than 2000 vehicles per day based on observed conditions and therefore is considered a low volume road per AASHTO criteria

Horizontal Alignment:

- Minimum Horizontal Radius: 150’ (Jericho Public Works Specs, p. 7)
- Minimum Horizontal Tangent Length: 100’ (Jericho Public Works Specs, p. 7)

Curve 1 (PI 100+79.00) has a radius of 95'. This is less then the 150' required by the Jericho Public Works Specs, however it matches existing, there is no identified crash history in the area, and is therefore acceptable per the AASHTO Low Volume Roads Guidelines. All other curve radii are at least 150'.

The second and third tangents (101+26.48 to 104+09.69 and 104+09.69 to 104+74.80) are less than the 100' required by the Jericho Public Works Specs, however they match existing, there is no identified crash history in the area, and therefore are acceptable per the AASHTO Low Volume Roads Guidelines. All other tangents are at least 100' in length.

The slip ramp alignment (10 series) does not meet the Jericho Public Works Specs for curve radii or tangent length noted above, however the ramp alignment matches existing conditions, there is no identified crash history in the area, and therefore is acceptable per the AASHOT Low Volume Roads Guidelines.

Vertical Alignment:

- Crest Curve Minimum K value: 12 (AASHTO Greenbook, AASHTO Low Volume Roads)
- Sag Curve Minimum K value: 26 (AASHTO Greenbook)
- Max grade within 100' of intersection is 3% (Jericho Public Works Specs, p. 6)
- Desired vertical grade is less than 8%, 10% Max (Jericho Public Works Specs, p. 6)

The first vertical curve (PVI 100+80.00) has a K value less than that suggested by AASHTO Greenbook, and AASHTO Low Volume Roads, however this curve is near the end of the road and traffic will be slowing and/or coming to a stop and will not likely be at the 25-mph design speed. The proposed curve also matches existing conditions and there is no history of crashes at this location due to the vertical curve.

The second vertical tangent (101+05.00 to 102+78.00) and the third vertical tangent (103+78.00 to 105+13.00) have grades greater than the 8% and 10% recommended grades by the Jericho Public Works Specs, respectively. There is no crash history along this roadway due to these grades and these grades mimic existing conditions.

Typical Section:

- 5" Pavement per VTrans Simplified Pavement Design for Small Projects
- 3" Pavement per Jericho Public Works Specs (Minor Roads)
- 4" Pavement per Jericho Public Works Specs (Major, Collector Roads and commercial roads)
- Major Roads have at least 800 vpd (Jericho Public Works Specs, p. 6)
- Minimum Bituminous Pavement Width (non-curbed) is 22' (Jericho Public Works Specs, p. 6)

State Standards recommend 5" of pavement, although there is no traffic data available for this roadway, this is assumed to be conservative. Town Standards recommend 3" of pavement for minor roads which Bolger Hill is assumed to be. However, due to the steep roadway grade and potential for pavement shoving during breaking downhill, a pavement thickness of 4" is proposed. This also aligns with the pavement thickness recommended for major roads in town.

In roadway profile fill sections, removal of 3" of existing gravel followed by shimming with crushed gravel to final base of pavement grade is proposed. In profile cut sections, a full box of 24" gravels and

4” pavement is proposed. A ditch line is proposed along the southern roadside from the crest of the hill (project limits) to the intersection.

A 16-foot-wide roadway is proposed with 2’ gravel shoulders. This is less than the 22’ roadway width outlined in the Jericho Public Works Specs, however it matches the existing roadway width, and width has not be outlined as an issue requiring review.

Cross Slope:

- Recommended cross slope is 1 to 2% (The Orange Book)

Normal Crown is proposed, mimicking existing conditions. As the proposed roadway will be paved, a 2% normal crown is proposed.

Drainage:

Westbound roadway drainage will continue to sheet flow off the roadway toward the north, mimicking the existing conditions from 102+00 to 107+25.

Eastbound roadway drainage will continue to sheet flow off the roadway toward the south and into roadside ditch lines. The ditch lines are proposed to be stone lined with check dams to dissipate the energy in the stormwater. The existing catch basins which convey stormwater beneath the roadway toward the western edge of roadway in the existing condition are proposed to be replaced with new catch basins and outlet pipes that are proposed to convey the stormwater into the roadside ditch lines along the eastern edge of roadway. At the base of the hill, near House #4, a ditch line is proposed adjacent to the roadway, where there is not an existing ditch line. A catch basin is proposed on either side of the drive to House #4 which will collect the stormwater and convey it to an underground treatment system within the Town Green, to be designed as part of the **Jericho Center Circle SW BMP Design project.** Additionally, bituminous curb is proposed from approximately 101+20 to 102+00, left and a catch basin near 101+20, left. This catch basin will convey stormwater into the previously mentioned closed drainage system and underground treatment system. Each catch basin will have a deep sump providing pretreatment. Underdrain is proposed along the southern roadway edge.

Geotechnical:

Borings were not performed, however visual inspection has noted some ledge off the southern roadway edge, near the top of the hill (project limits). Some ledge will require removal to construct the proposed catch basins, underdrain and ditch lines.

Guardrail:

- Guardrail Warranted: >3:1 slopes, or 3:1 slopes greater than 10’ high (Jericho Public Works Specs, p. 8)

No guardrail is proposed for the following reasons:

- No existing guardrail within project limits
- No history of run off the road accidents within project limits
- No existing hazards within project limits
- Proposed slopes are generally 3:1 or flatter

- Only proposed potential hazard within project limits is the headwall near 105+00, right. The headwall was evaluated individually and is on a tangent section of roadway abutting a low speed, uphill traffic lane, and therefore does not warrant guardrail.

Sight Distance:

- Minimum Stopping Sight Distance (SSD): 150 feet (Jericho Public Works Specs, p. 7)
- "No Control" intersection sight distance (ISD) (turning right): 115 feet (AASHTO Greenbook)
- "Left Turn From Stop" intersection sight distance: 280 feet (AASHTO Greenbook)

Existing Conditions: Along the roadway, the minimum stopping sight distance of 150 feet is met along most of the roadway. Existing shrubs and vegetation encroach into the sight line and on the roadway along the inside of the curve just prior to the end of Bolger Hill Road at Jericho Center Circle. At the intersection (slip ramp) for right turning traffic, the "no control" intersection sight distance criteria of 115 feet is met. Also at the intersection, with the stop sign, the "left turn from stop" intersection sight distance criteria of 280 feet is met. The proposed condition mimics the existing condition, therefore the proposed SSD and ISD's are similar. Relocation or trimming of the existing vegetation near the inside of the curve just prior to the end of the roadway would improve the sight distance coming into the intersection.

Right-of-Way:

All proposed work, except that proposed for the reconstruction of the drive for House #4, is proposed to be within the roadway right-of-way. Approval from the abutter during final design at House #4 will be required for reconstruction of the driveway.

Utilities:

Existing overhead utility lines are present within the project area. A utility pole located within the small, grassed median at the base of Bolger Hill Road redirects the overhead lines from Jericho Center Circle and up the southern side of Bolger Hill Road. The lines cross over to the northern side at the project limits. A utility conflicts list has not been completed and it is assumed coordination will be initiated with any utility companies during preliminary design.

Environmental:

During future phases of this project, information from previous database searches of the Vermont Agency of Natural Resources (ANR) Natural Resources Atlas Tool will need to be updated for the presence of any known environmental resources and hazards. Additionally, an update will be required for the information from previous searches of rare species and exemplary natural communities and US Fish and Wildlife Services (USFWS) Information for Planning and Conservation (IPaC) for federally listed species in the vicinity of the project site. It was determined the underground fuel oil tank (Facility ID 8994593) noted in Study #1 is incorrectly shown in the online database and is not within the project limits.

Wetlands shall be delineated along Bolger Hill Road, the Town Green, the Browns Trace Triangle and along Varney Road.

Cultural Resources:

The southwestern portion of the project is located within the Jericho Center Historic District, National Register #83003207. Coordination with the Vermont Division for Historic Preservation (VDHP) that serves as the State Historic Preservation Officer (SHPO) should be initiated in the design phase of this project to identify any additional concerns regarding protected historic/cultural/archeological resources and, if required, to resolve concerns regarding potential effects on the Historic District as a result of the project. Because work will be mostly contained within the right-of-way, it is not expected that SHPO would have concerns.

Traffic Control:

It is anticipated Bolger Hill Road would remain open during construction to allow access to the residences up the hill from the project limits. With minimal profile raise near the intersection and the majority of the drainage work located off the edge of the roadway, single lane closures using flaggers can be utilized during construction. For roadway reconstruction, multiple lane shifts and staged reconstruction of the roadway materials will be required to maintain one lane of traffic. The roadway would be open to full width every evening.

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