GOLDER

June 26, 2018 Project No. 1895029

Callie Ewald, P.E.
Geotechnical Engineering Manager
Vermont Agency of Transportation
Geotechnical Engineering Section
2178 Airport Road, Unit B
Berlin, VT 05641-8628

RE: VT ROUTE 12 SLOPE STABILITY – STABILIZATION ALTERNATIVES AND FINAL DESIGN BETHEL, VERMONT

Dear Ms. Ewald:

Golder is pleased to provide this letter report to the Vermont Agency of Transportation (VTrans) in support of slope mitigation efforts for embankment slides at mile markers 2.9, 6.0, 6.28, and 6.35 on VT Route 12 in Bethel, Vermont. This report includes a brief summary of our field visit, an overview of the slope stability analyses, alternatives evaluation, and cost estimates previously discussed at Golder's April 6, 2018 presentation to VTrans, as well as final design recommendations. Our services were conducted in accordance with the scope, schedule, and budget described in our proposal dated February 12, 2018. The terms and conditions governing the services are stated in our On-Call Geotechnical Services Contract #PS0475, dated January 18, 2016.

Project Understanding

We understand that this area of Vermont experienced around 3-inches of rainfall over a 24-hour period on July 1, 2017 that caused several slope instabilities throughout the state. Four slope instabilities around MM 2.9, 6.0, 6.28, and 6.35 along VT Route 12 in Bethel, VT were observed.

Between August 2015 and August 2016, the Bethel-Randolph STP 2921(1) paving project rehabilitated 6.125 miles of roadway in Bethel and Randolph and encompassed the four slope instability areas. The project included cold planing, reclaiming, correcting superelevation deficiencies, and resurfacing the roadway. As part of the superelevation correction and roadway widening activities, additional material was typically added to the slopes and edge of pavement structure including Type I stone fill on a 1H:1V slope. Record plans for the project indicate that approximately 12 inches of stone fill and 6 inches of grubbing material were placed on the slopes at all four embankment slide areas. The embankment heights at the four slide areas range from about 20 to 40 feet.

VTrans performed a subsurface investigation from November 2 to 30, 2017 and drilled five borings across the four slide sites, took photos, performed a site survey and generated embankment cross sections from the survey data. VTrans provided this information to Golder on January 24, 2018. Preliminary assessments by VTrans suggest that the combined effects of heavy rain, added weight of the slope fill and steep slope angles likely caused the slides. VTrans requested Golder to review the available geotechnical, survey and construction data, and develop mitigation alternatives and stabilization design details for the slides to allow for stabilization construction in the summer of 2018.

Analysis of Existing Conditions

In support of our existing conditions assessment, Golder completed the following tasks:

Site Visit

On February 28, 2018, Golder performed an initial site visit accompanied by VTrans personnel to observe conditions in the field including identifying the extent of any rockfill placed as part of the 2015-2016 pavement project, making note of the conditions at the crest and toe of the embankments, identifying cracks, surface instabilities and seeps, locating drainage structures, identifying additional survey needs, and locating the lateral limits of the slope instabilities.

At MM 2.9, information from the site visit indicated the stone fill extended approximately 1/3 of the slope height (approximately 10-feet down the slope). The grade of the slope was measured to be approximately 1.2H:1V. A tension crack was noted along the guardrail posts and a surficial failure was observed along the upper portion of the slope. Grassy vegetation was noted past the stone fill, but no mature trees were seen in this section of the slope, as seen in Figure 1. The toe of this slope generally transitions to a level meadow. The lateral limits of the slope instability were measured to be approximately 75 feet and span from Sta. 1+40 to Sta. 2+15.

At MM 6.0, information from the site visit indicated the stone fill extended approximately 6-feet down the slope from the crest. The grade of the slope was measured to be approximately 1.15H:1V with portions as steep as a 1H:1V. A tension crack was noted just outside the guardrail posts in the shoulder material and a surficial failure was noted along the upper portion of the slope, as seen in Figure 2. Grassy vegetation was noted past the stone fill to the approximate bottom of the failure surface. A 3-foot by 3-foot box culvert was noted at the toe of the slope, as seen in Figure 3, with a stream flowing parallel to the roadway. Two delineator posts were found on either side of the roadway at this embankment, and it was later confirmed by Jack Holding of VTrans on April 4, 2018 that these posts marked the approximate limits of a 15-inch reinforced concrete pipe (RCP). The lateral limits of the slope instability were measured to be approximately 150 feet and span from Sta. 0+60 to Sta. 2+10.

At MM 6.28, the ground was generally snow covered during our February 2018 site visit. Information from the survey indicated the lateral limits of the slope instability are approximately 140 feet which was used in the alternatives analysis. During a subsequent site visit performed on April 12, 2018, Golder noted a small surficial failure near the toe of the slope, as seen in Figure 4, but no cracking was evident adjacent to the guardrail posts. The slope was measured to be graded to approximately a 1.3H:1V and was heavily vegetated except for the small surficial failure near the toe of the slope. The lateral limits of the surficial failure were measured to be approximately 50 feet and span from Sta. 116+00 to Sta. 116+50 (using the datum from the survey provided on April 18, 2018). The April 18, 2018 survey datum was used as that survey picked up more detail along the toe of the slope; however, this corresponds to Sta. 5+29 to Sta. 5+79 using the original survey stationing.

At MM 6.35, information from the site visit indicated the stone fill extended approximately ¼ of the slope height (approximately 12-feet down the slope) and the slope has a current grade of around 1.15H:1V at its steepest section. A crescent shaped tension crack was noted parallel to the guardrail posts, approximately 60 feet long, and a surficial failure was noted around the upper portion of the slope, as seen in Figure 5. Grassy vegetation and small underbrush was noted past the stone fill to the bottom of the slope. Remnants of an 18-inch RCP were noted at the toe of the slope with water still flowing around the exposed rebar. It was later confirmed by Michelle Redmond on May 3, 2018 that at 73 feet in from the inlet, the culvert invert is fully deteriorated and water is flowing on the embankment soil. The lateral limits of the slope instability were measured to be approximately 150 feet and span from Sta. 0+90 to Sta. 2+40.

Slope Stability Analyses

Following the site visit, soil profiles and soil parameters were developed and used in the slope stability analyses. In combination with the information gathered during our site visits, we utilized the as-built plans from the Bethel-Randolph STP 2921(1) paving project to verify the limits of the stone fill added to the four sites. We selected one critical cross section at each site using survey data provided by VTrans to evaluate four different stabilization alternatives. The cross section and boring locations used in the analysis are shown on Figure 30 through 33. Interpreted existing conditions at the time of the slope failure were modelled using *Slide* (Rocscience, 2018) to assess the soil and groundwater input parameters and provide a base model for the assessment of the four alternatives.

For the existing condition models, the global factor of safety (FS) of close to 1.0 was targeted in order to model imminent failure conditions and refine the soil and groundwater properties used in the analyses (see Figures 6, 11, 16, and 21). A water filled tension crack was modelled at the observed head scarps at MM 2.9, 6.0, and 6.35 to account for the influx of rainwater from the July 2017 storm event and the field conditions observed. Results for the existing conditions models are summarized in Table 1 below.

Evaluation of Stabilization Alternatives

Using the four initial condition models, Golder performed slope stability analyses using the two-dimensional limit equilibrium software program *Slide*, and generally accepted modified Bishop, Spencer, and Morgenstern-Price methods were utilized to model both rotational and translational global failures. Four stabilization alternatives were analyzed to increase the existing FS to a minimum of 1.3, in accordance with VTrans' *Geotechnical Engineering Instruction on Soil Slope Stability Investigation & Evaluation* dated October 2014, for a slope that does not contain or support a structural element, at each of the four sites. Alternative A included regrading the slope to a 1.5H:1V utilizing stone fill. Alternative B included regrading the slope to a 2H:1V utilizing granular borrow. Alternative C utilized an enhanced soil area to mimic a reinforced soil slope and alternative D consisted of a soil nail and mesh facing. Various configurations of each alternative were modelled to try and keep the repair limits within the existing ROW; however, the results from the stability modelling indicated additional ROW easements would be required at all four sites. Results of the stability analyses are summarized in Table 1 below and are included in Figures 6-25. Preliminary grading plans have been provided in Figures 30 through 33. These drawings depict how Golder anticipates the typical section grades will transition back into old ground at each site and show the lateral limit of the repairs.

Table 1: Summary of Slide Model Results

Location	Calculated Factor of Safety				
	Existing Conditions	*1.5H:1V Stone Fill Regrade*	*2H:1V Granular Borrow Regrade*	*RSS Alternative*	*Soil Nail Alternative*
MM 2.9	0.99	1.31	1.36	1.35	1.3[1]
MM 6.0	0.81[2]	1.29	1.33	1.28	1.3[1]
MM 6.28	0.97	1.30	1.34	1.31	1.3[1]
MM 6.35	0.99	1.29	1.29	1.34	1.3[1]

1. Shallow surficial failures among the upper portion of the slope were found with a FS < 1.3; however, those will be addressed with a facing support in the event this alternative becomes the preferred solution.
2. The Slide analysis run using the initial survey data provided by VTrans on December 26, 2017, resulted in a FS = 0.99. Golder re-analyzed the existing condition model using an updated more detailed survey provided on April 4, 2018 which indicated a steeper portion along the upper part of the slope. As a result, the critical failure surface migrated to this steeper portion resulting in a lower factor of safety. The latest survey was then used to verify the mitigation alternatives and was found to have minimal effect. All calculated FS results provided used the April 4, 2018 survey data.

Estimated Costs for Stabilization Alternatives

As presented during our April 6, 2018 meeting with VTrans, estimated costs for each of the alternatives were developed to assist VTrans in selecting their preferred alternatives. Based on data from the Bethel-Randolph STP 2921(1) paving project, a uniform ROW distance of 25-feet from centerline was assumed for additional ROW acquisition purposes. Estimated costs do not include additional ROW easements, temporary lane closures, lane shifts, night/weekend construction, management of traffic, access roads, and erosion prevention and sediment control measures. Table 2 provides the estimated costs and the approximate amount of additional ROW required beyond the assumed 25-foot offset to construct each alternative.

Table 2: Summary of Estimated Costs and ROW Needs

MM	Option #	Preliminary Opinion of Cost	Description of Alternantive Concept	Additional ROW Required
2.9	A	$27,450	Regrade 1.5H:1V w/ Stone Fill	17'
2.9	B	$18,699	Regrade 2H:1V w/ Granular Borrow	27'
2.9	C	$40,950	RSS	7'
2.9	D	$180,240	Soil Nails	15'
6.0	A	$149,442	Regrade 1.5H:1V w/ Stone Fill	50'
6.0	B	$84,450	Regrade 2H:1V w/ Granular Borrow	63'
6.0	C	$212,486	RSS	10'
6.0	D	$642,840	Soil Nails	22'
6.28	A	$352,572	Regrade 1.5H:1V w/ Stone Fill	45'
6.28	B	$97,650	Regrade 2H:1V w/ Granular Borrow	60'
6.28	C	$176,760	RSS	15'
6.28	D	$344,040	Soil Nails	18'
6.35	A	$146,661	Regrade 1.5H:1V w/ Stone Fill	45'
6.35	B	$93,300	Regrade 2H:1V w/ Granular Borrow	60'
6.35	C	$257,915	RSS	18'
6.35	D	$619,225	Soil Nails	25'

Following the April 6, 2018 meeting, VTrans determined that a regrade alternative (either Alternative A or B) would be the preferred mitigation alternative at these sites. Alternative A would be utilized in areas where culverts/streams are present along the toe of the slope (e.g., at MM 6.0) and Alternative B would be implemented at the other three sites.

Final Design Analyses

Prior to the April 6, 2018 meeting, Golder requested additional survey information from VTrans to facilitate the final design process. Golder received additional survey for MM 6.0 on April 4, 2018. Golder received additional survey information from VTrans for MM 6.28 and 6.35 on April 18, 2018. This survey data was used to confirm the project limits and optimize the stability analyses for the preferred alternatives. Additional hydraulic information was also provided for the culverts located at MM 6.0 and 6.35. On April 18, 2018, VTrans confirmed the 3'x3' box culvert at MM 6.0 is hydraulically adequate and may be extended. On May 22, 2018, VTrans confirmed that the 15-inch RCP culvert at MM 6.0 is plugged with sediment approximately 18 feet in from the inlet. Otherwise, the culvert itself is in good condition and is hydraulically adequate to be extended. On May 3, 2018, VTrans confirmed that at 73 feet from the inlet the culvert bottom at MM 6.35 is completely deteriorated for the remainder of its length. As a result, a new 24-inch culvert will be installed at this location.

MM 2.9 Recommended Alternative

A 2H:1V regrade with granular borrow is recommended at this site, as seen in Figure 27. This typical should begin around Station 1+40 and extend to approximately Station 2+15, using VTrans' initial survey stationing. The upper portion of this regrade should begin at an offset of 17 feet from centerline and transition down slope on a 2H:1V grade. The slope should be re-graded using Granular Borrow (Item 203.32). We recommend the existing slope surface be benched, according to VTrans Standard Drawing B-5 to facilitate compaction and provide a stronger interface layer. A 6 inch layer of topsoil and seed should be added to the slope to re-establish vegetation. A 6-inch underdrain should be installed along the toe of the slope, as detailed in Figure 26.

MM 6.0 Recommended Alternative

A 1.5H:1V regrade with Type II stone fill is recommended at this site, as seen in Figure 28. This typical should begin around Station 0+60 and extend to approximately Station 2+10, using VTrans' initial survey stationing. The upper portion of this regrade should begin at an offset of 19 feet from centerline and transition down slope on a 1.5H:1V grade. Three (3) feet of Type II stone fill should be placed along the upper 13 feet (measured vertically from the top of the slope), followed by a 5 foot layer of Type II stone fill to the toe of slope. An additional 4-foot berm (measured horizontally) of Type II stone fill should be added along the bottom 9 feet of the slope to increase the counterweight along the toe of the slope. There is a 3' x 3' box culvert that currently outlets onto the existing slope as well as a 15-inch reinforced concrete pipe (RCP) culvert that outlets near the toe of slope. VTrans found the 15-inch RCP culvert is plugged with sediment about 18 feet in from the inlet. We recommend this pipe be flushed prior to construction of the regrade at this site. VTrans has performed a hydraulic analysis of both culverts and found they are both suitable candidates for extensions. We have shown these extensions on the typical sections. Golder understands that VTrans will perform the final design and detailing of these culvert extensions.

MM 6.28 Recommended Alternative

After a review of the existing slope conditions and a discussion with VTrans, we recommend only a spot treatment of stone fill at this site to address some minor soil sloughing along a lower section of a portion of this slope. A 2-foot thick layer of Type II stone fill is recommended along the bottom portion of the slope (from El. 492 to the ditch line) between Sta. 116+00 and Sta. 116+50, using the latest VTrans survey data, to reinforce the slope against further surficial failures. This corresponds to Sta. 5+29 to Sta. 5+79 using the original survey stationing; however, that stationing does not provide as much detail at the toe of the slope. The slope should be cleared of any debris and brush and excavated to the limits shown on Figure 28, lined with a geotextile, and then armored with Type II stone fill to match the existing slope grade. Golder understands that VTrans recognizes that the global factor of safety of this slope will be less than 1.3 after the repair has been completed but has accepted the nominal risk associated with this condition. Golder recommends that the area foreman continue to monitor this section of roadway for pavement distress including longitudinal cracking and deformations (settlement).

MM 6.35 Recommended Alternative

A 2H:1V regrade with granular borrow is recommended at this site, as seen in Figure 29. This typical should begin around Station 0+90 and extend to approximately Station 2+40, using VTrans' initial survey stationing. The upper portion of this regrade should begin at an offset of 17 feet from centerline and transition down slope on a 2H:1V grade. The slope should be re-graded using Granular Borrow (Item 203.32). We recommend the slope be benched, according to VTrans Standard Drawing B-5, to facilitate compaction and provide a stronger interface layer. A 6 inch layer of topsoil and seed should be added to the slope to re-establish vegetation. A 6-inch underdrain should be installed along the toe of the slope, as detailed in Figure 29.

At the location of the failed 18-inch RCP around Sta. 1+60, we recommend a new 24-inch pipe be installed using trenchless methods to limit impacts to the pavement structure and the traveling public. The invert of the new pipe should be installed at elevation 502.6 (at the inlet) to be below the existing laterals (6-inch underdrain with an invert elevation (at the inlet) of 507.3 and 15-inch HDPE with an invert elevation (at the inlet) of 503.6). The new pipe should be sloped at ¼" per foot. Pipe material should consist of either centrifugally cast fiberglass reinforced polymer mortar pipe (CCFRPM), reinforced concrete pipe (RCP), corrugated polyethylene pipe (CPEP), or steel pipe. A stone drainage swale at the outlet, lined with a geotextile, is recommended as detailed in Figure 29A. We recommend the failed 18-inch RCP be filled with Controlled Density (Flowable) Fill (Item 541.45) prior to construction of the regrade at this site. As requested by VTrans, Golder will provide special provisions for the trenchless excavation and culvert installation as a separate document to this report.

Construction and Cost Considerations

The stabilization alternatives for the four sites present several construction issues that will require further consideration:

- All slopes should be cleared and grubbed of debris, vegetation and topsoil prior to placement of granular borrow/stone fill.
- Prepping the slope at MM 6.0 for the stone fill regrade will require excavation of approximately 6 feet of material at the toe, reducing the passive force along this slope. As a result, we recommend excavation and construction be performed in segments (maximum 25 feet) along this slope.

- Embankment material, including the bench areas and the granular borrow used for the regrades, should be compacted to 95 percent of the material's maximum dry density as determined by AASHTO T99, Method C.
- A culvert extension and replacement will be required at MM 6.0 and MM 6.35, respectively. These locations have been detailed on the typical sections; however, Golder has not performed any engineering analysis of these culverts. An estimated cost for the box culvert extension at MM 6.0 has been included in the preliminary cost estimate in this report. No cost estimate has been prepared for the new 24-inch pipe to be installed at MM 6.35.
- Golder's typical sections (Figures 26 through 29) should be used by VTrans in the development of contract drawings, as discussed at the April 6, 2018 meeting. We anticipate working with VTrans during the development of these drawings, as well as incorporating any updates to special provisions as needed. Preliminary grading plans have been provided in Figures 30 through 33. These drawings depict how Golder anticipates the typical section grades will transition back into old ground at each site. Final grading at the end of the 3' by 3' box culvert extension at MM 6.0 will need to be adjusted by VTrans depending upon the chosen configuration of the outlet headwall and wingwalls.
- Details of the proposed underdrain locations at MM 2.9 and MM 6.35 should be shown on the cross sections and the plan sheets for these sites. These underdrain pipes should be sloped to drain into existing drainage features.
- We anticipate the need for access roads to construct the regrades at MM 6.0 and 6.35. VTrans should consider this impact when acquiring ROW easements for construction. Possible access road locations should be detailed on the contract drawings.

Limitations

This report was prepared for VTrans for the assessment of slope mitigation alternatives and final design recommendations for the repair of four embankment slides at mile markers 2.9, 6.0, 6.28 and 6.35 on VT Route 12 in Bethel, Vermont. This report was prepared in accordance with generally accepted soil and foundation engineering principles and practices practiced in this geographical area and under similar time and financial constraints. Golder makes no other warranty, either expressed or implied. In the event that any changes in the nature, design or location of the proposed project are planned, Golder should be notified to review the appropriateness of our conclusions and recommendations, and to modify the recommendations as appropriate to reflect the changes in design.

The analyses and recommendations presented herein are based, in part, on information obtained from the referenced subsurface explorations completed by VTrans at the discrete locations described in the report. If variations from the conditions encountered in the subsurface explorations are encountered during construction Golder should be notified so that we may re-evaluate the recommendations made in this report.

We recommend we be provided the opportunity for a review of the final design drawings and related specifications to confirm that our design and earthwork recommendations are properly interpreted and implemented in the design.

We appreciate the opportunity to assist VTrans with this project. If you have any questions concerning the information in this report, or require additional information, please contact us.

Sincerely,

Golder Associates Inc.

Marcy L. Montague, PE
Project Engineer

Christopher C. Benda, PE
Practice Leader

Mark S. Peterson, PE
Principal

CC: Jeff Lloyd, Golder

Attachments:

Figure 1	MM 2.9 Existing Conditions
Figure 2	MM 6.0 Existing Conditions
Figure 3	3' x 3' Box Culvert at MM 6.0
Figure 4	MM 6.28 Surficial Failure at Toe of Slope
Figure 5	MM 6.35 Existing Conditions
Figure 6	MM 2.9 Initial Conditions
Figure 7	MM 2.9 Alternative A Stability: Regrade to 1.5H:1V Using Stone Fill
Figure 8	MM 2.9 Alternative B Stability: Regrade to a 2H:1V Using Granular Borrow
Figure 9	MM 2.9 Alternative C Stability: Reinforced Soil Slope
Figure 10	MM 2.9 Alternative D Stability: Soil Nails
Figure 11	MM 6.0 Initial Conditions
Figure 12	MM 6.0 Alternative A Stability: Regrade to 1.5H:1V Using Stone Fill
Figure 13	MM 6.0 Alternative B Stability: Regrade to a 2H:1V Using Granular Borrow
Figure 14	MM 6.0 Alternative C Stability: Reinforced Soil Slope
Figure 15	MM 6.0 Alternative D Stability: Soil Nails
Figure 16	MM 6.28 Initial Conditions
Figure 17	MM 6.28 Alternative A Stability: Regrade to 1.5H:1V Using Stone Fill
Figure 18	MM 6.28 Alternative B Stability: Regrade to a 2H:1V Using Granular Borrow
Figure 19	MM 6.28 Alternative C Stability: Reinforced Soil Slope
Figure 20	MM 6.28 Alternative D Stability: Soil Nails
Figure 21	MM 6.35 Initial Conditions
Figure 22	MM 6.35 Alternative A Stability: Regrade to 1.5H:1V Using Stone Fill
Figure 23	MM 6.35 Alternative B Stability: Regrade to a 2H:1V Using Granular Borrow
Figure 24	MM 6.35 Alternative C Stability: Reinforced Soil Slope
Figure 25	MM 6.35 Alternative D Stability: Soil Nails
Figure 26	MM 2.9 Typical Section
Figure 27	MM 6.0 Typical Section
Figure 27A	MM 6.0 Typical Section at Box Culvert Crossing
Figure 27B	MM 6.0 Typical Section at RCP Culvert Crossing
Figure 28	MM 6.28 Typical Section
Figure 29	MM 6.35 Typical Section
Figure 29A	MM 6.35 Typical Section at Culvert Crossing
Figure 30	MM 2.9 Grading Plan View
Figure 31	MM 6.28 Grading Plan View
Figure 32	MM 6.35 Grading Plan View
Figure 33	MM 6.35 Grading Plan View

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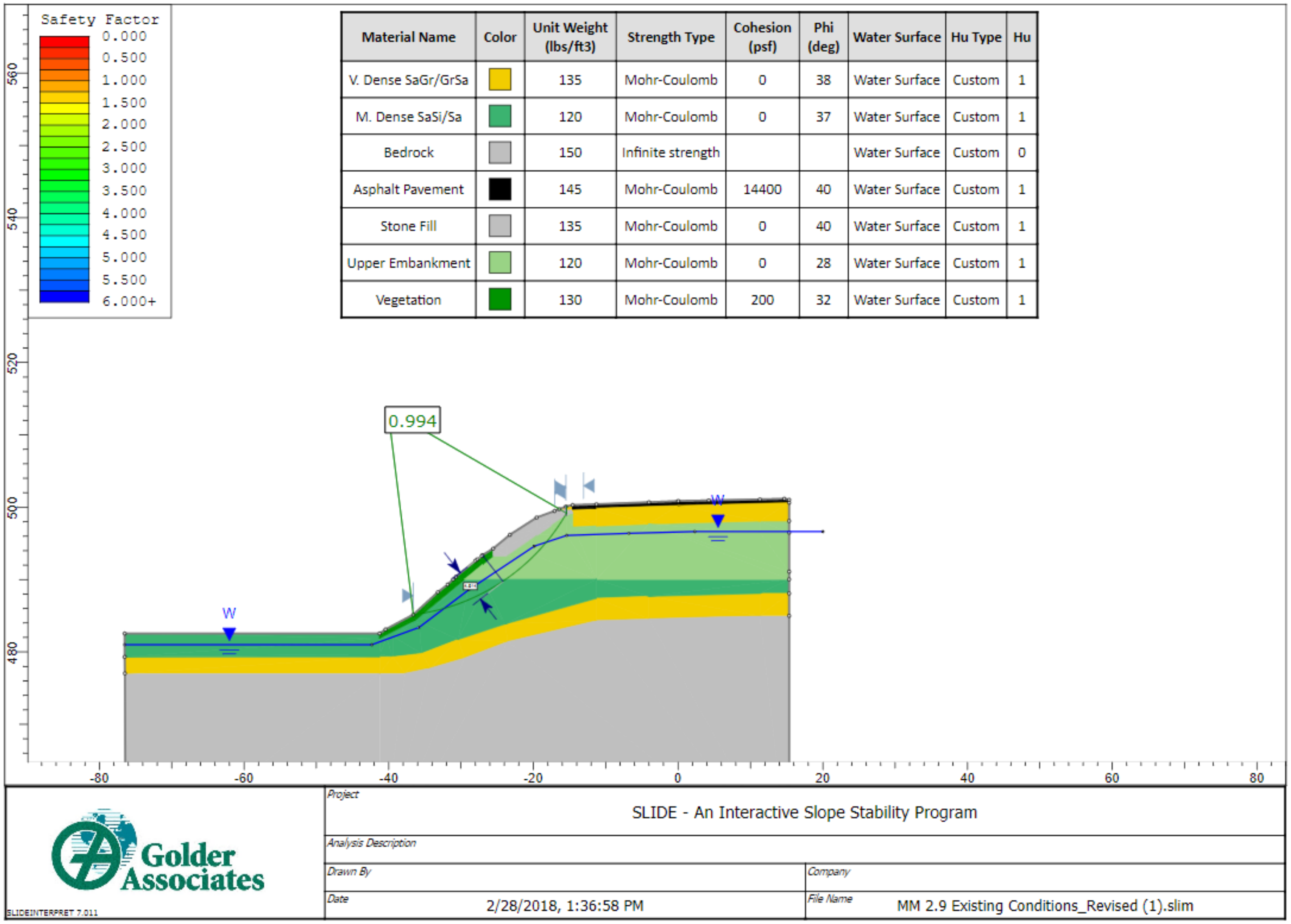
Figure 1: MM 2.9 Existing Conditions

Figure 2: MM 6.0 Existing Conditions

Figure 3: 3' x 3' Box Culvert at MM 6.0

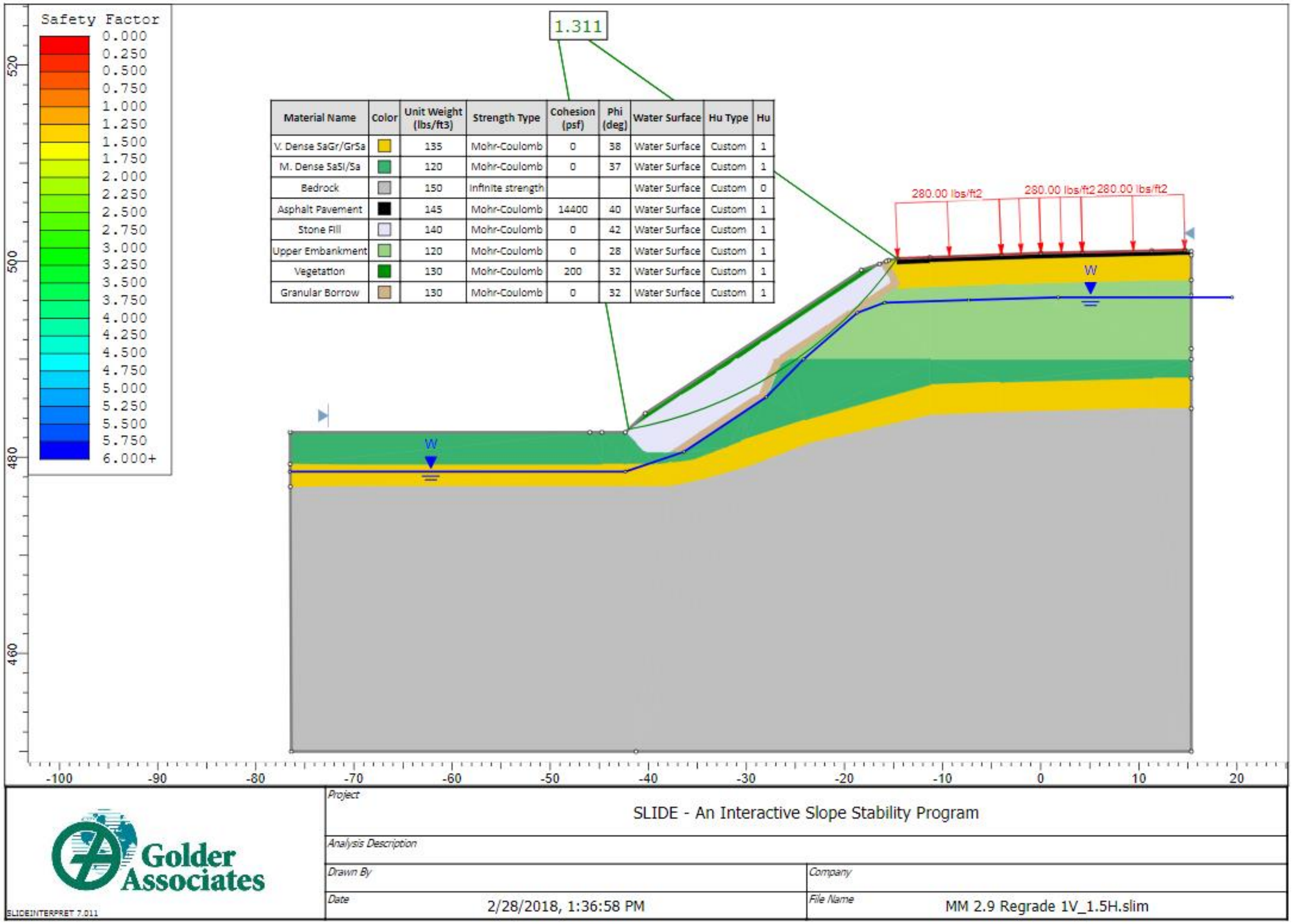
Figure 4: MM 6.28 Surficial Failure at Toe of Slope

Figure 5: MM 6.35 Existing Conditions



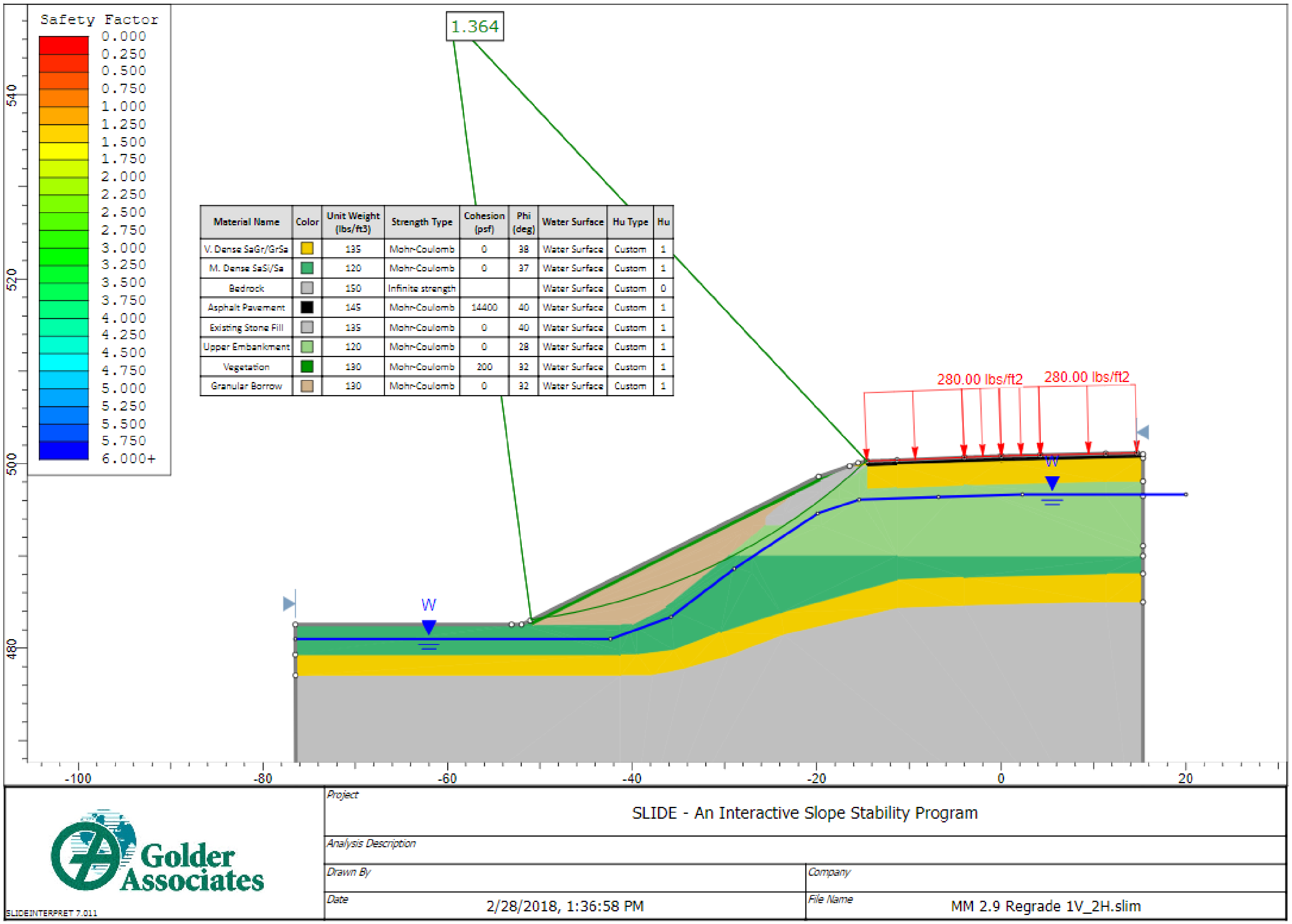
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type	Hu
V. Dense SaGr/GrSa		135	Mohr-Coulomb	0	38	Water Surface	Custom	1
M. Dense SaSi/Sa		120	Mohr-Coulomb	0	37	Water Surface	Custom	1
Bedrock		150	Infinite strength			Water Surface	Custom	0
Asphalt Pavement		145	Mohr-Coulomb	14400	40	Water Surface	Custom	1
Stone Fill		135	Mohr-Coulomb	0	40	Water Surface	Custom	1
Upper Embankment		120	Mohr-Coulomb	0	28	Water Surface	Custom	1
Vegetation		130	Mohr-Coulomb	200	32	Water Surface	Custom	1

Figure 6: MM 2.9 Initial Conditions



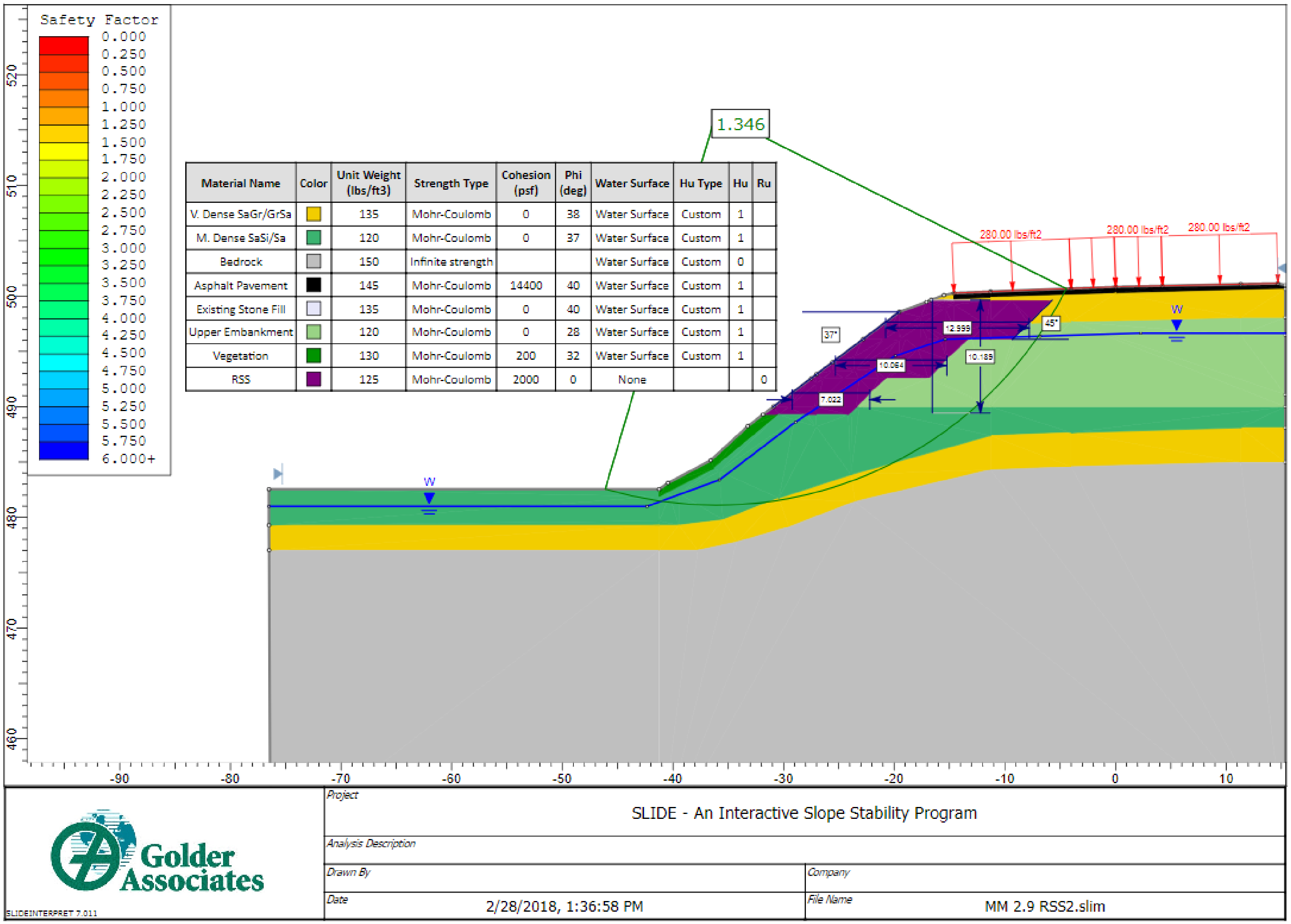
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type	Hu
V. Dense SaGr/GrSa		135	Mohr-Coulomb	0	38	Water Surface	Custom	1
M. Dense SaSi/Sa		120	Mohr-Coulomb	0	37	Water Surface	Custom	1
Bedrock		150	Infinite strength			Water Surface	Custom	0
Asphalt Pavement		145	Mohr-Coulomb	14400	40	Water Surface	Custom	1
Stone Fill		140	Mohr-Coulomb	0	42	Water Surface	Custom	1
Upper Embankment		120	Mohr-Coulomb	0	28	Water Surface	Custom	1
Vegetation		130	Mohr-Coulomb	200	32	Water Surface	Custom	1
Granular Borrow		130	Mohr-Coulomb	0	32	Water Surface	Custom	1

Figure 7: MM 2.9 Alternative A Stability: Regrade to a 1.5H:1V Using Stone Fill



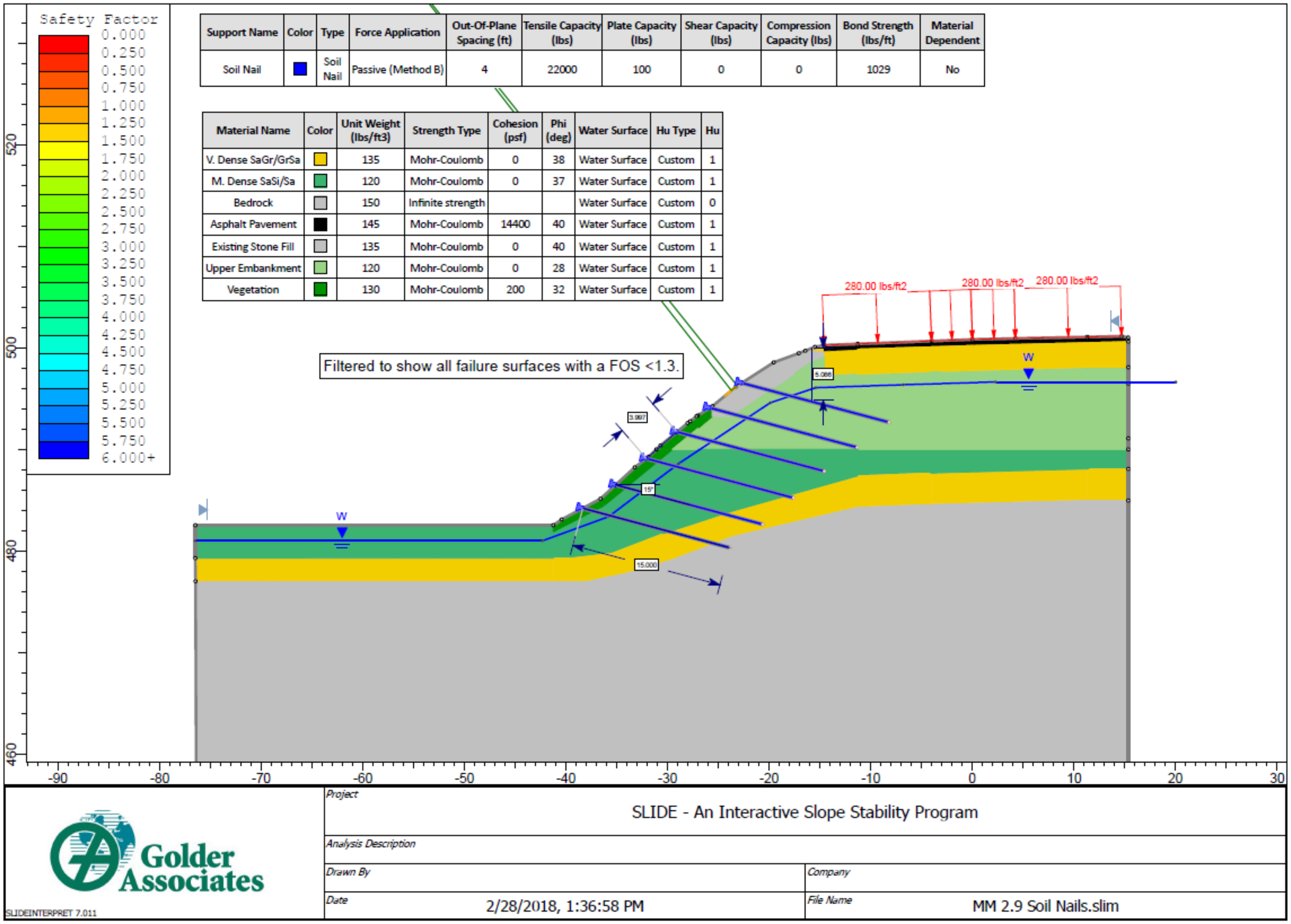
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type	Hu
V. Dense SaGr/GrSa		135	Mohr-Coulomb	0	38	Water Surface	Custom	1
M. Dense SaSi/Sa		120	Mohr-Coulomb	0	37	Water Surface	Custom	1
Bedrock		150	Infinite strength			Water Surface	Custom	0
Asphalt Pavement		145	Mohr-Coulomb	14400	40	Water Surface	Custom	1
Existing Stone Fill		135	Mohr-Coulomb	0	40	Water Surface	Custom	1
Upper Embankment		120	Mohr-Coulomb	0	28	Water Surface	Custom	1
Vegetation		130	Mohr-Coulomb	200	32	Water Surface	Custom	1
Granular Borrow		130	Mohr-Coulomb	0	32	Water Surface	Custom	1

Figure 8: MM 2.9 Alternative B Stability: Regrade to a 2H:1V Using Granular Borrow



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type	Hu	Ru
V. Dense SaGr/GrSa		135	Mohr-Coulomb	0	38	Water Surface	Custom	1	
M. Dense SaSi/Sa		120	Mohr-Coulomb	0	37	Water Surface	Custom	1	
Bedrock		150	Infinite strength			Water Surface	Custom	0	
Asphalt Pavement		145	Mohr-Coulomb	14400	40	Water Surface	Custom	1	
Existing Stone Fill		135	Mohr-Coulomb	0	40	Water Surface	Custom	1	
Upper Embankment		120	Mohr-Coulomb	0	28	Water Surface	Custom	1	
Vegetation		130	Mohr-Coulomb	200	32	Water Surface	Custom	1	
RSS		125	Mohr-Coulomb	2000	0	None			0

Figure 9: MM 2.9 Alternative C Stability: Reinforced Soil Slope



Support Name	Color	Type	Force Application	Out-Of-Plane Spacing (ft)	Tensile Capacity (lbs)	Plate Capacity (lbs)	Shear Capacity (lbs)	Compression Capacity (lbs)	Bond Strength (lbs/ft)	Material Dependent
Soil Nail		Soil Nail	Passive (Method B)	4	22000	100	0	0	1029	No

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type	Hu
V. Dense SaGr/GrSa		135	Mohr-Coulomb	0	38	Water Surface	Custom	1
M. Dense SaSi/Sa		120	Mohr-Coulomb	0	37	Water Surface	Custom	1
Bedrock		150	Infinite strength			Water Surface	Custom	0
Asphalt Pavement		145	Mohr-Coulomb	14400	40	Water Surface	Custom	1
Existing Stone Fill		135	Mohr-Coulomb	0	40	Water Surface	Custom	1
Upper Embankment		120	Mohr-Coulomb	0	28	Water Surface	Custom	1
Vegetation		130	Mohr-Coulomb	200	32	Water Surface	Custom	1

Figure 10: MM 2.9 Alternative D Stability: Soil Nails

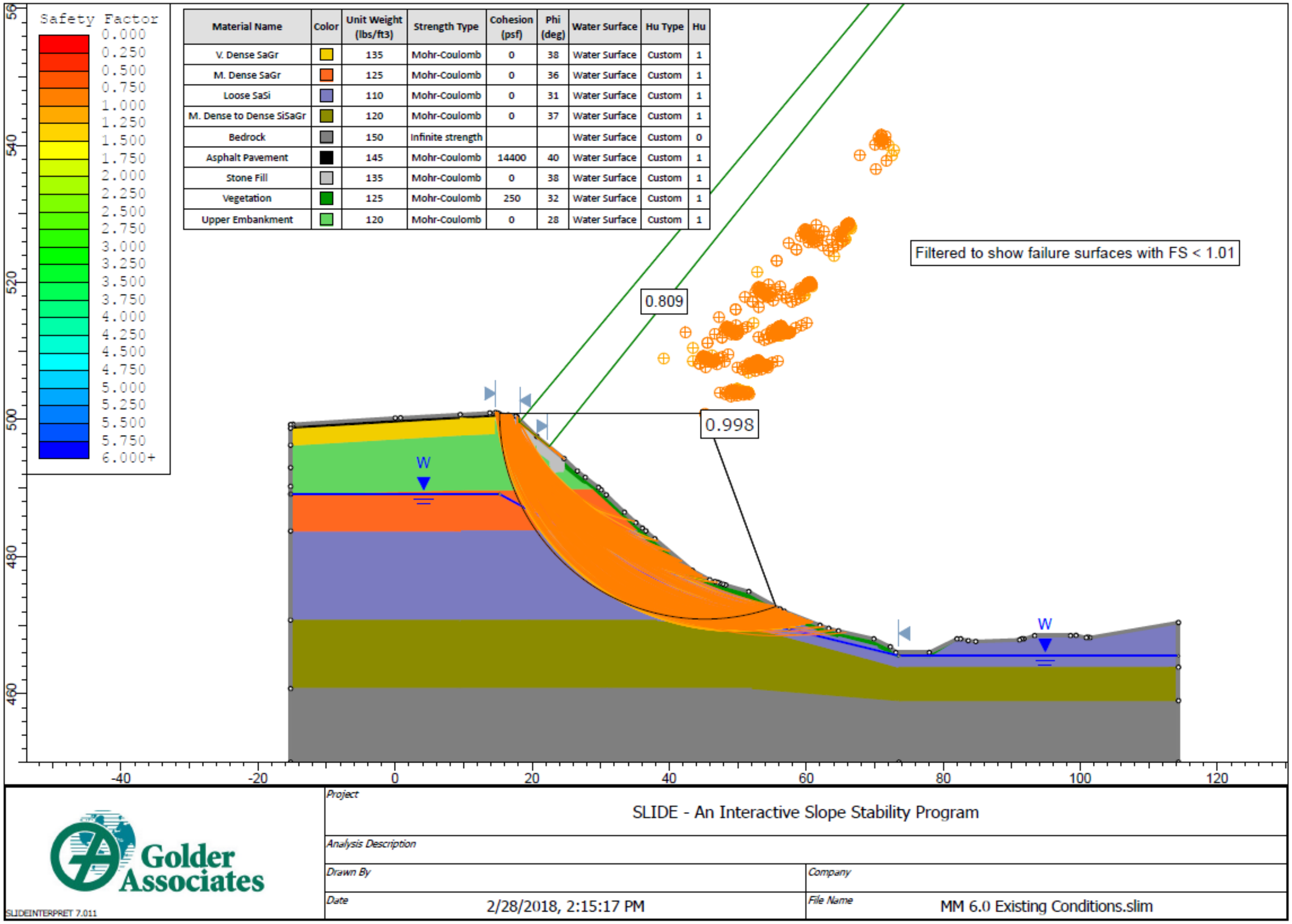
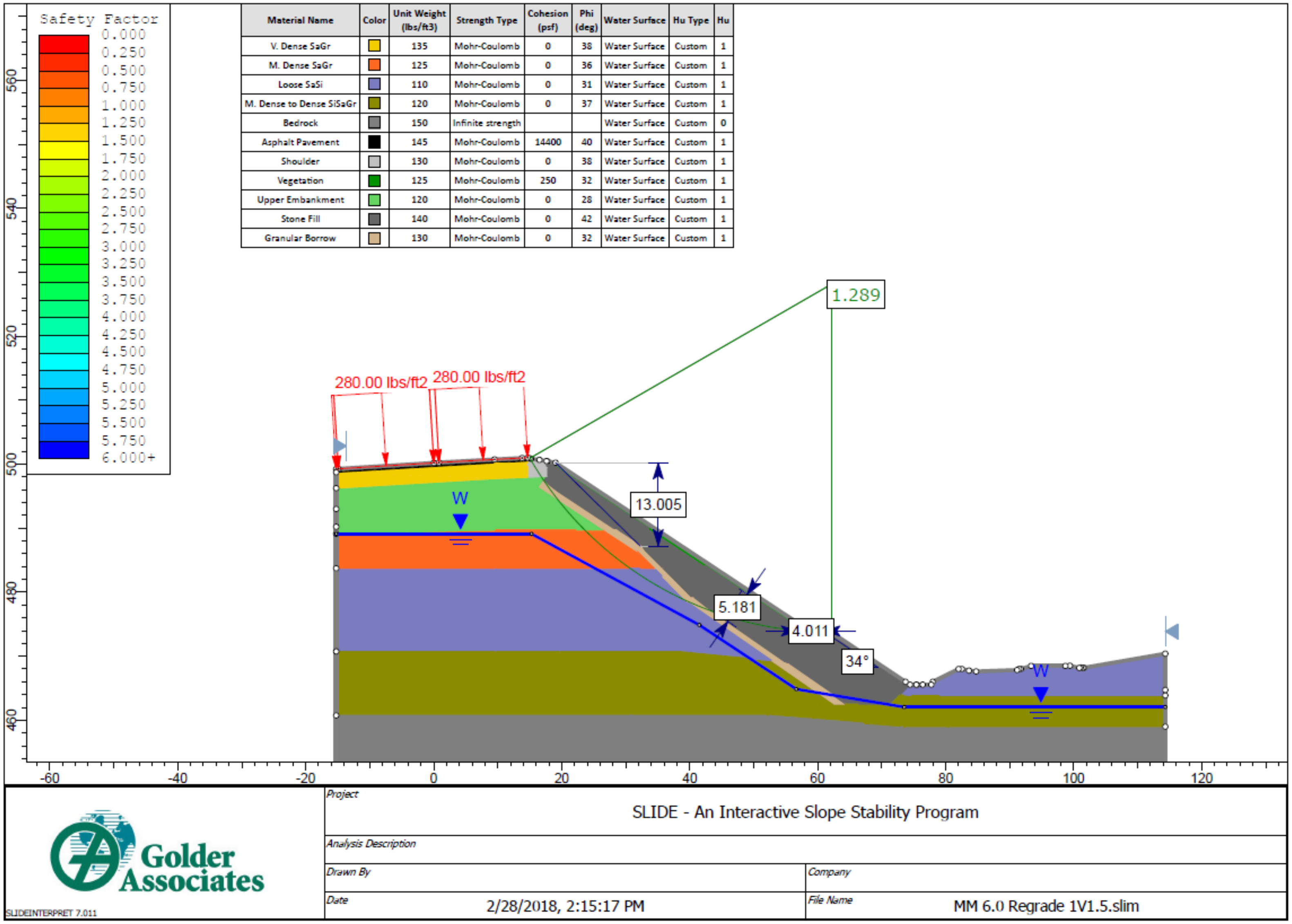
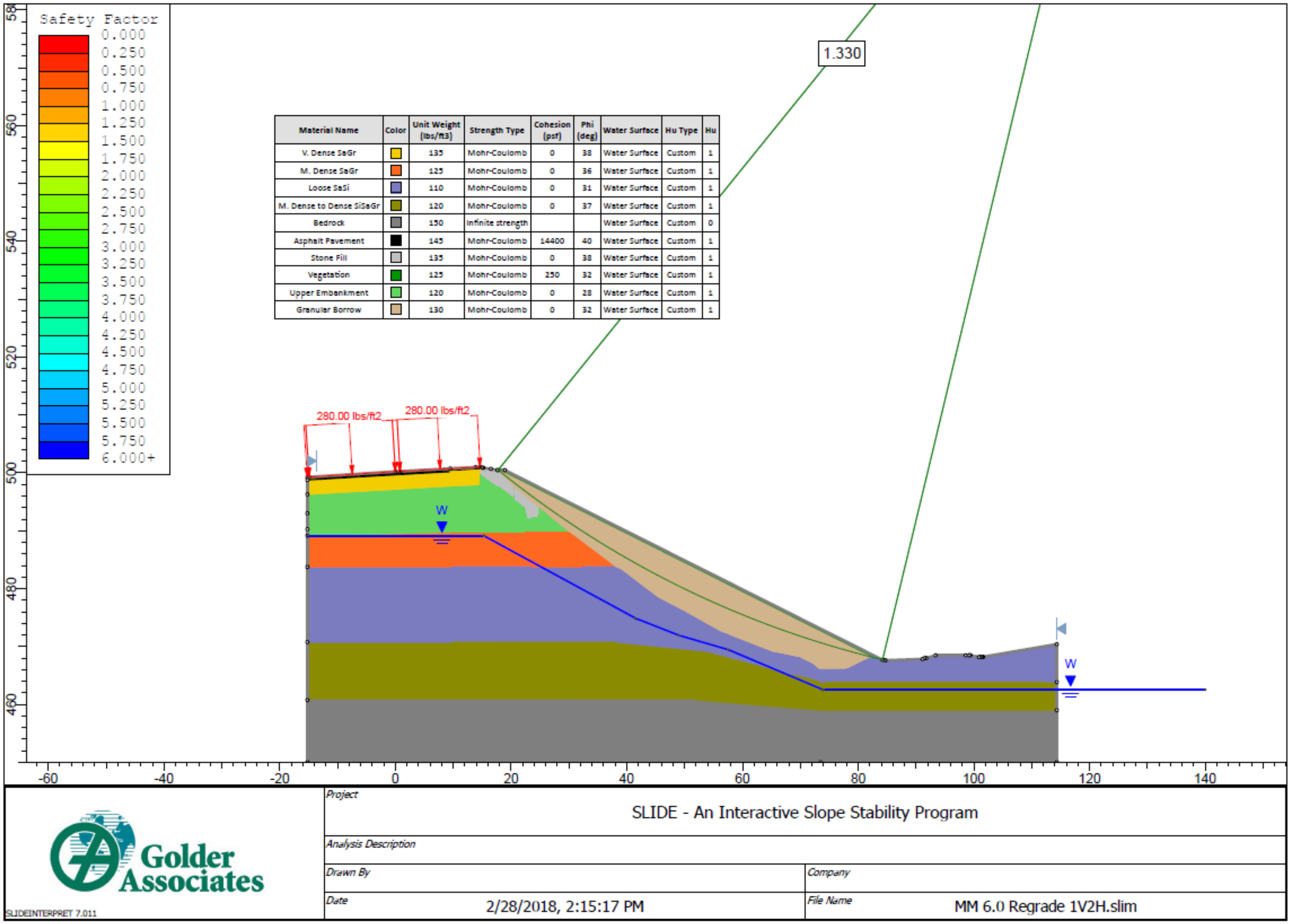


Figure 11: MM 6.0 Initial Conditions



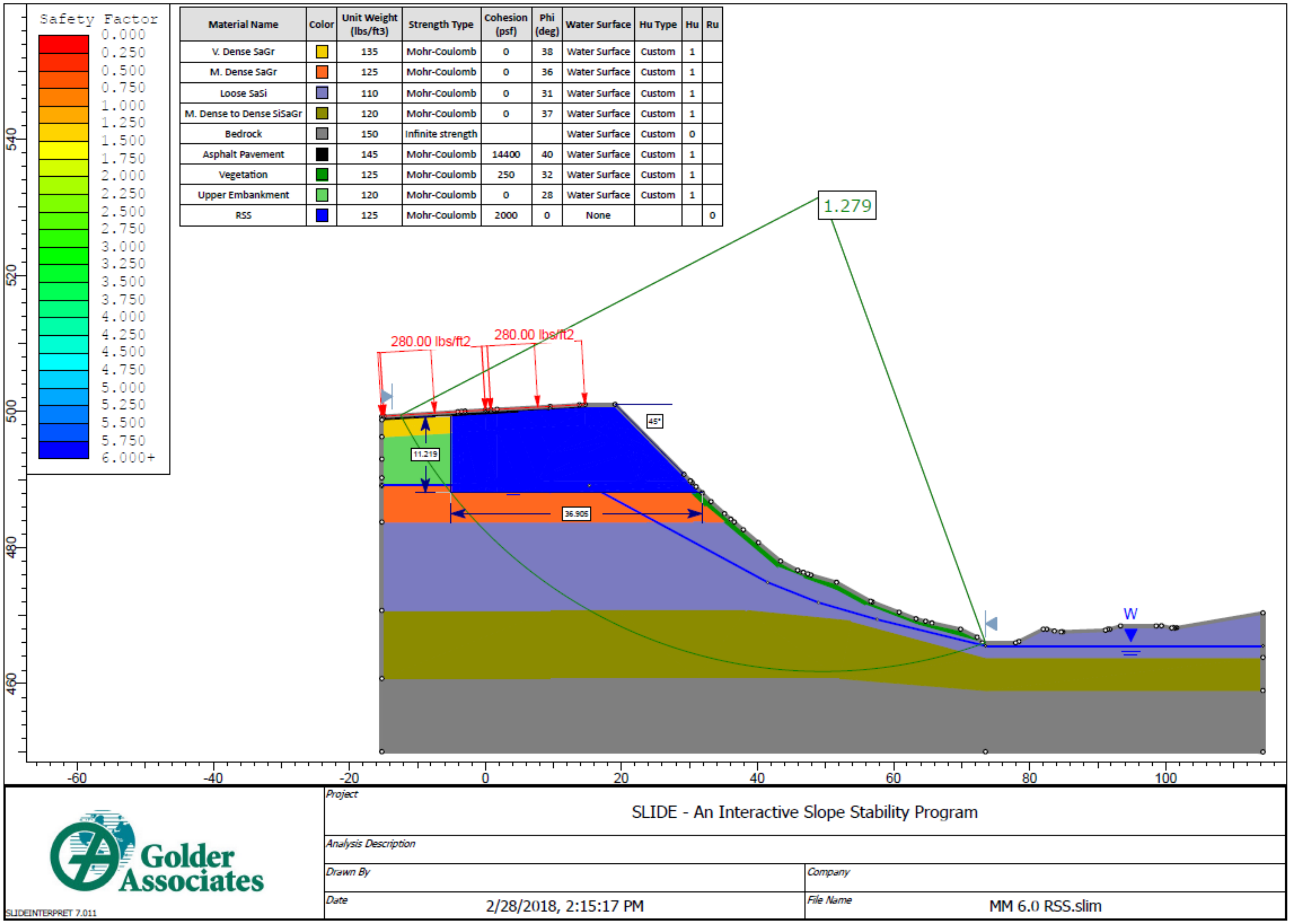
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type	Hu
V. Dense SaGr		135	Mohr-Coulomb	0	38	Water Surface	Custom	1
M. Dense SaGr		125	Mohr-Coulomb	0	36	Water Surface	Custom	1
Loose SaSi		110	Mohr-Coulomb	0	31	Water Surface	Custom	1
M. Dense to Dense SiSaGr		120	Mohr-Coulomb	0	37	Water Surface	Custom	1
Bedrock		150	Infinite strength			Water Surface	Custom	0
Asphalt Pavement		145	Mohr-Coulomb	14400	40	Water Surface	Custom	1
Shoulder		130	Mohr-Coulomb	0	38	Water Surface	Custom	1
Vegetation		125	Mohr-Coulomb	250	32	Water Surface	Custom	1
Upper Embankment		120	Mohr-Coulomb	0	28	Water Surface	Custom	1
Stone Fill		140	Mohr-Coulomb	0	42	Water Surface	Custom	1
Granular Borrow		130	Mohr-Coulomb	0	32	Water Surface	Custom	1

Figure 12: MM 6.0 Alternative A Stability: Regrade to a 1.5H:1V Using Stone fill



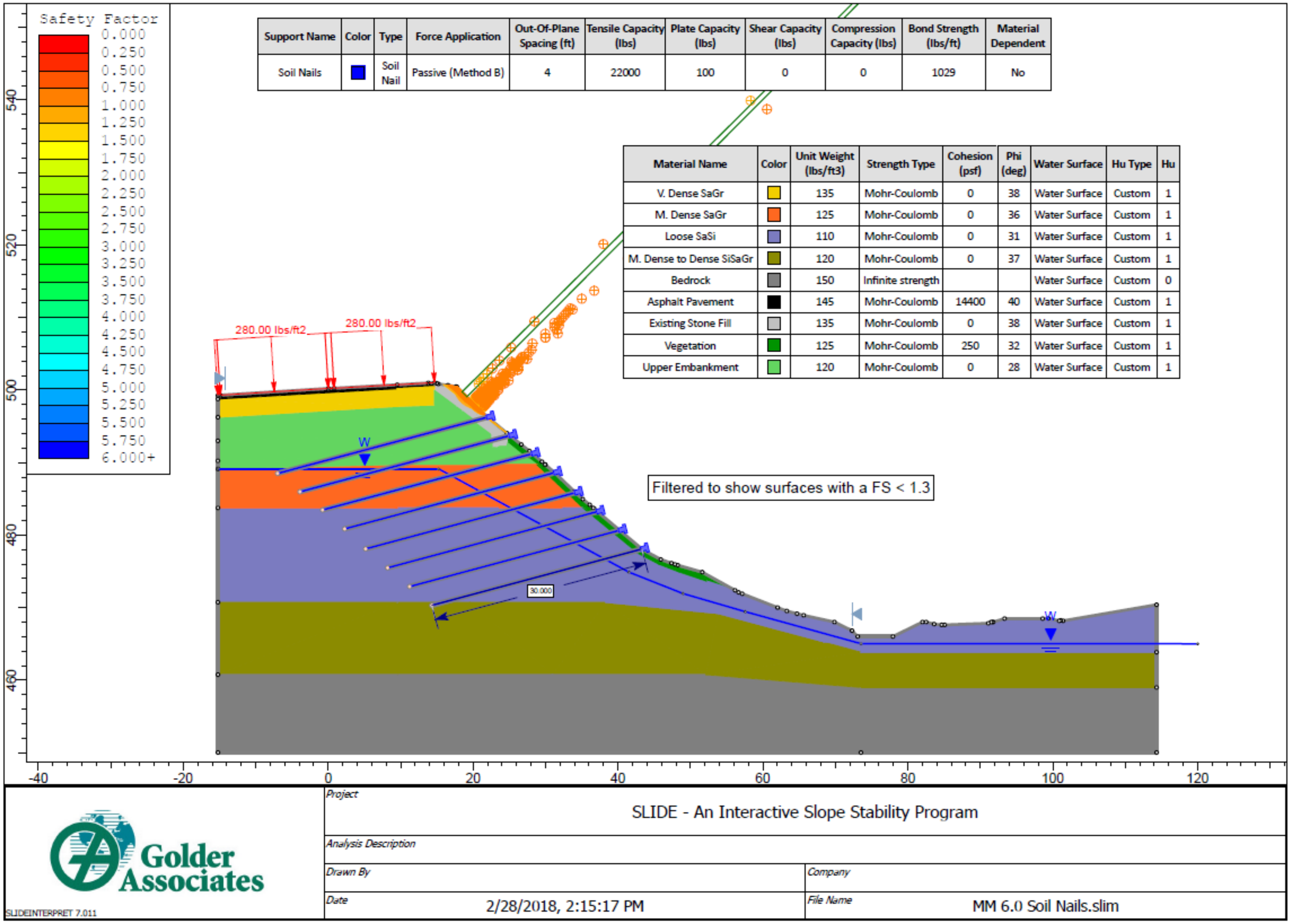
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type	Hu
V. Dense SaGr		135	Mohr-Coulomb	0	38	Water Surface	Custom	1
M. Dense SaGr		125	Mohr-Coulomb	0	36	Water Surface	Custom	1
Loose SaSi		110	Mohr-Coulomb	0	31	Water Surface	Custom	1
M. Dense to Dense SiSaGr		120	Mohr-Coulomb	0	37	Water Surface	Custom	1
Bedrock		150	Infinite strength			Water Surface	Custom	0
Asphalt Pavement		145	Mohr-Coulomb	14400	40	Water Surface	Custom	1
Stone Fill		135	Mohr-Coulomb	0	38	Water Surface	Custom	1
Vegetation		125	Mohr-Coulomb	250	32	Water Surface	Custom	1
Upper Embankment		120	Mohr-Coulomb	0	28	Water Surface	Custom	1
Granular Borrow		130	Mohr-Coulomb	0	32	Water Surface	Custom	1

Figure 13: MM 6.0 Alternative B Stability: Regrade to a 2H:1V Using Granular Borrow



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type	Hu	Ru
V. Dense SaGr		135	Mohr-Coulomb	0	38	Water Surface	Custom	1	
M. Dense SaGr		125	Mohr-Coulomb	0	36	Water Surface	Custom	1	
Loose SaSi		110	Mohr-Coulomb	0	31	Water Surface	Custom	1	
M. Dense to Dense SiSaGr		120	Mohr-Coulomb	0	37	Water Surface	Custom	1	
Bedrock		150	Infinite strength			Water Surface	Custom	0	
Asphalt Pavement		145	Mohr-Coulomb	14400	40	Water Surface	Custom	1	
Vegetation		125	Mohr-Coulomb	250	32	Water Surface	Custom	1	
Upper Embankment		120	Mohr-Coulomb	0	28	Water Surface	Custom	1	
RSS		125	Mohr-Coulomb	2000	0	None			0

Figure 14: MM 6.0 Alternative C Stability: Reinforced Soil Slope



Support Name	Color	Type	Force Application	Out-Of-Plane Spacing (ft)	Tensile Capacity (lbs)	Plate Capacity (lbs)	Shear Capacity (lbs)	Compression Capacity (lbs)	Bond Strength (lbs/ft)	Material Dependent
Soil Nails		Soil Nail	Passive (Method B)	4	22000	100	0	0	1029	No

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type	Hu
V. Dense SaGr		135	Mohr-Coulomb	0	38	Water Surface	Custom	1
M. Dense SaGr		125	Mohr-Coulomb	0	36	Water Surface	Custom	1
Loose SaSi		110	Mohr-Coulomb	0	31	Water Surface	Custom	1
M. Dense to Dense SiSaGr		120	Mohr-Coulomb	0	37	Water Surface	Custom	1
Bedrock		150	Infinite strength			Water Surface	Custom	0
Asphalt Pavement		145	Mohr-Coulomb	14400	40	Water Surface	Custom	1
Existing Stone Fill		135	Mohr-Coulomb	0	38	Water Surface	Custom	1
Vegetation		125	Mohr-Coulomb	250	32	Water Surface	Custom	1
Upper Embankment		120	Mohr-Coulomb	0	28	Water Surface	Custom	1

Figure 15: MM 6.0 Alternative D Stability: Soil Nails

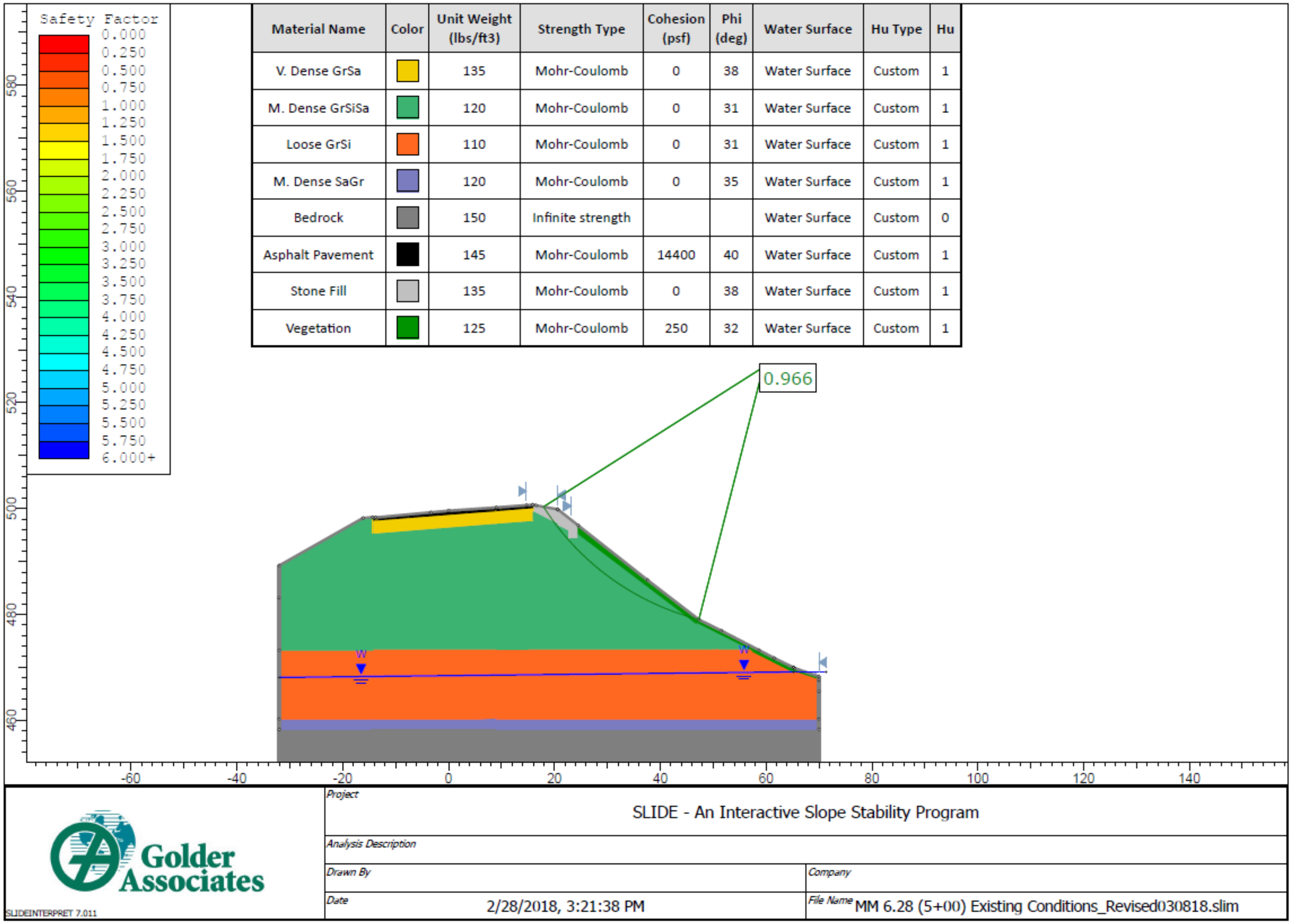
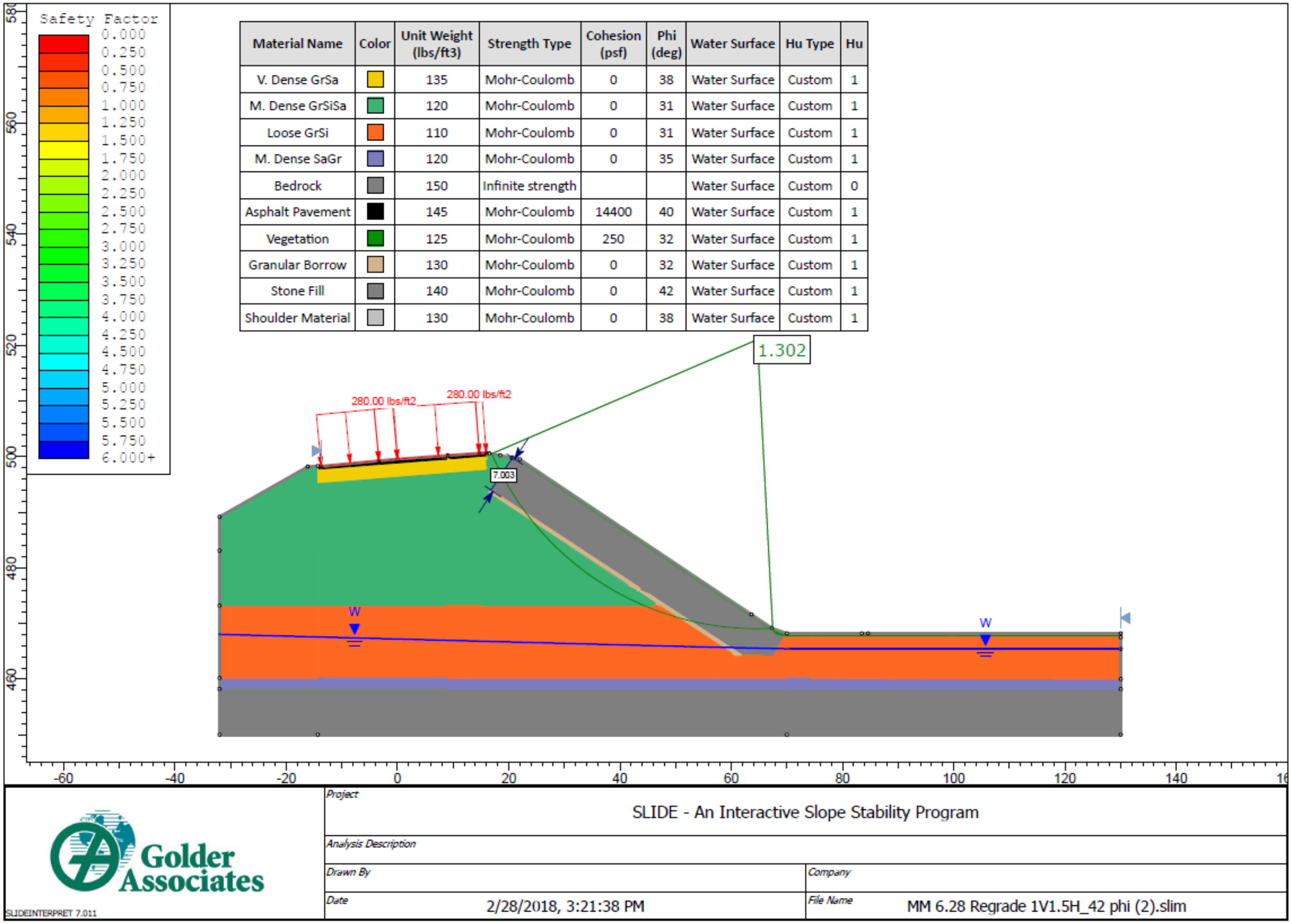


Figure 16: MM 6.28 Initial Conditions



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type	Hu
V. Dense GrSa		135	Mohr-Coulomb	0	38	Water Surface	Custom	1
M. Dense GrSiSa		120	Mohr-Coulomb	0	31	Water Surface	Custom	1
Loose GrSi		110	Mohr-Coulomb	0	31	Water Surface	Custom	1
M. Dense SaGr		120	Mohr-Coulomb	0	35	Water Surface	Custom	1
Bedrock		150	Infinite strength			Water Surface	Custom	0
Asphalt Pavement		145	Mohr-Coulomb	14400	40	Water Surface	Custom	1
Vegetation		125	Mohr-Coulomb	250	32	Water Surface	Custom	1
Granular Borrow		130	Mohr-Coulomb	0	32	Water Surface	Custom	1
Stone Fill		140	Mohr-Coulomb	0	42	Water Surface	Custom	1
Shoulder Material		130	Mohr-Coulomb	0	38	Water Surface	Custom	1

Figure 17: MM 6.28 Alternative A Stability: Regrade to 1.5H:1V Using Stone Fill

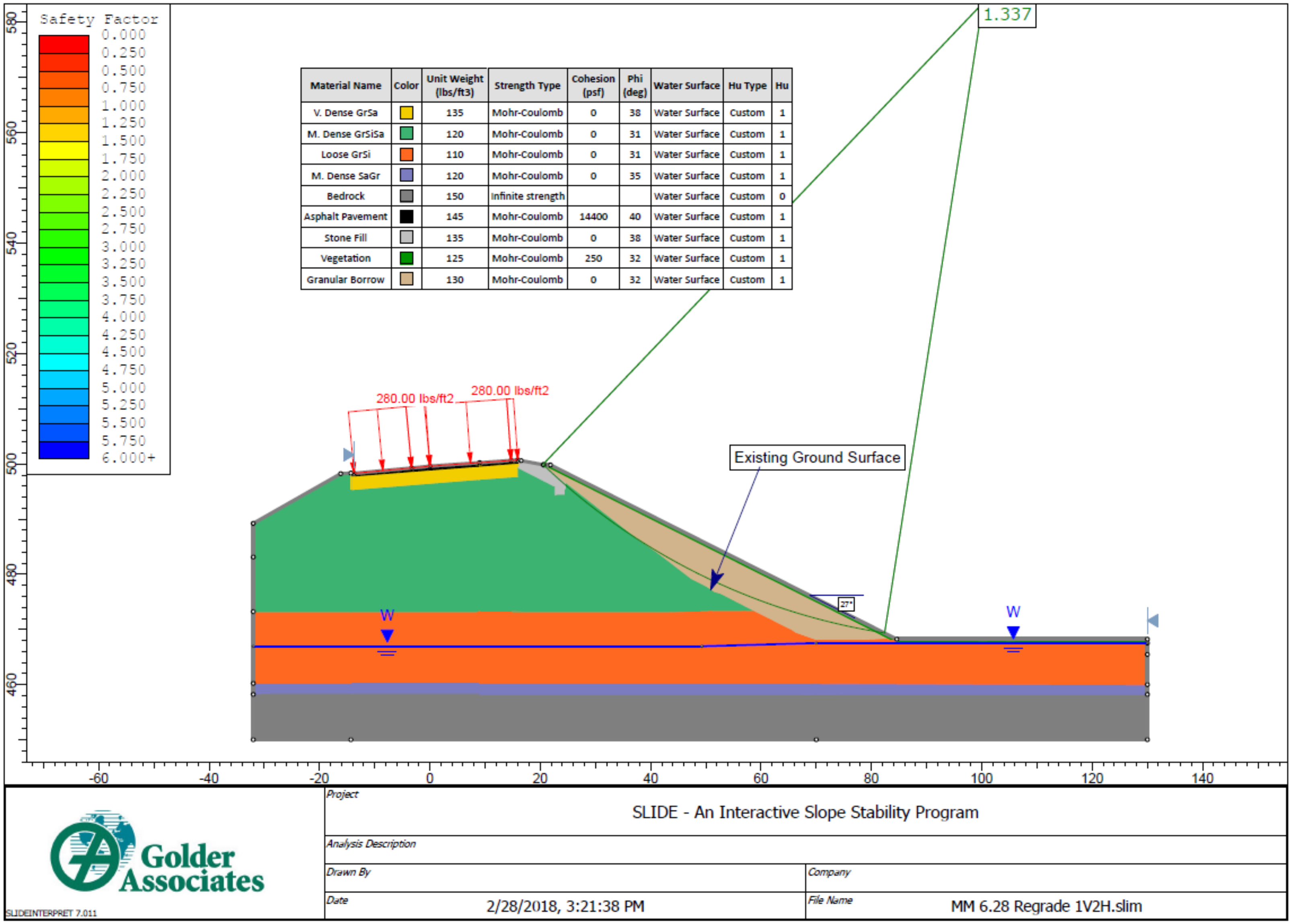
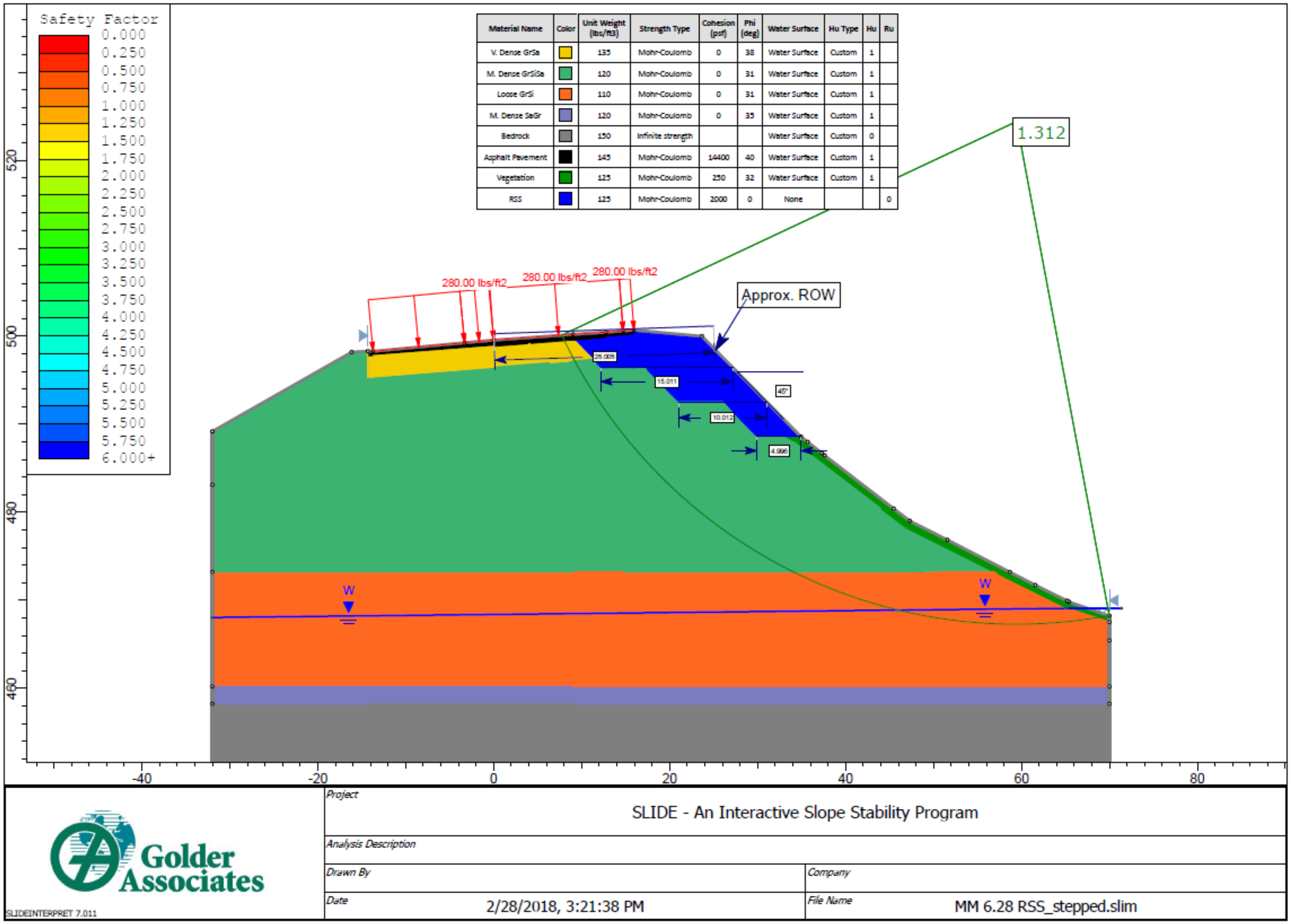
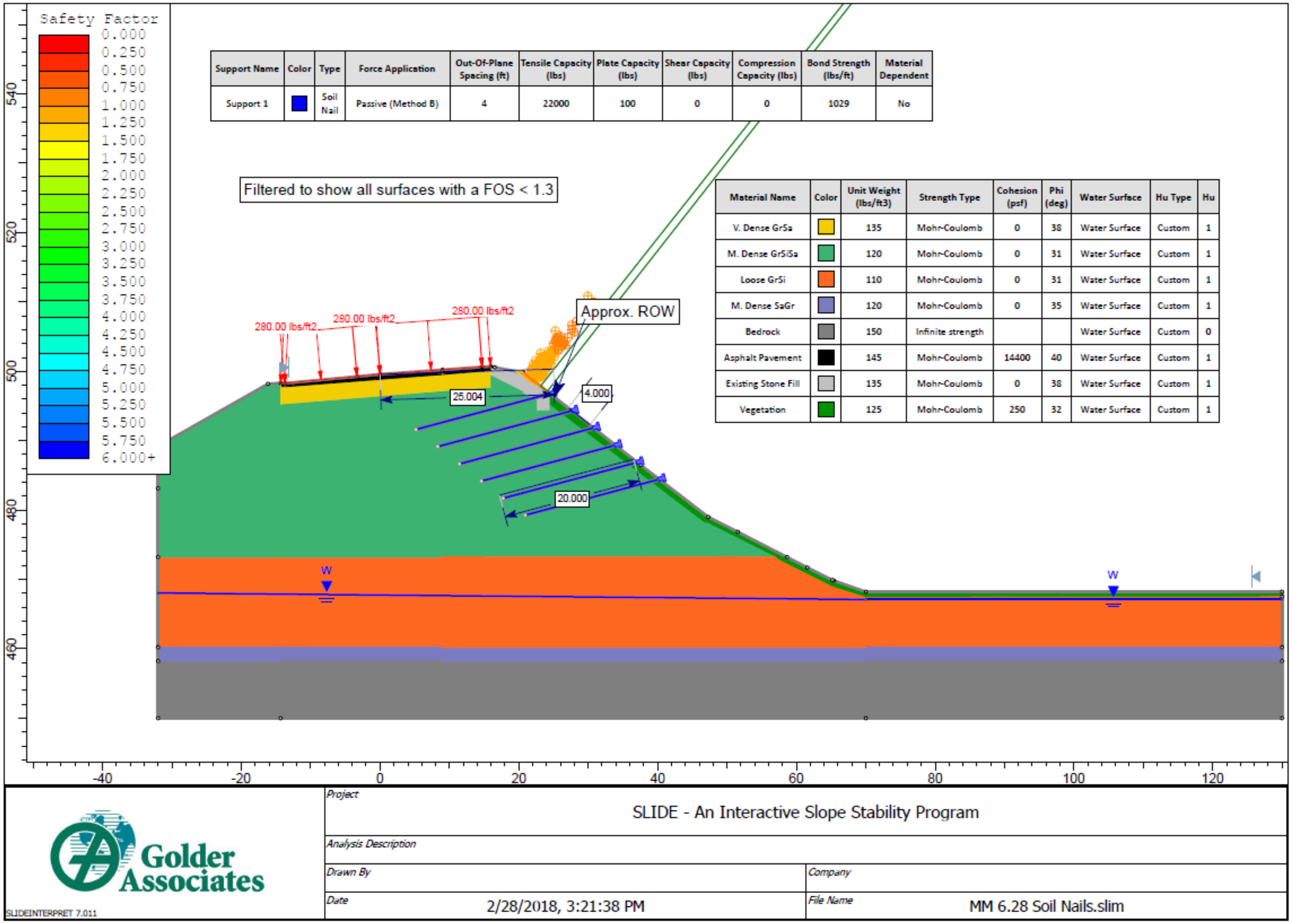


Figure 18: MM 6.28 Alternative B Stability: Regrade to a 2H:1V Using Granular Borrow



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type	Hu	Ru
V. Dense GrSa		135	Mohr-Coulomb	0	38	Water Surface	Custom	1	
M. Dense GrSiSa		120	Mohr-Coulomb	0	31	Water Surface	Custom	1	
Loose GrSi		110	Mohr-Coulomb	0	31	Water Surface	Custom	1	
M. Dense SaGr		120	Mohr-Coulomb	0	35	Water Surface	Custom	1	
Bedrock		150	Infinite strength			Water Surface	Custom	0	
Asphalt Pavement		145	Mohr-Coulomb	14400	40	Water Surface	Custom	1	
Vegetation		125	Mohr-Coulomb	250	32	Water Surface	Custom	1	
RSS		125	Mohr-Coulomb	2000	0	None			0

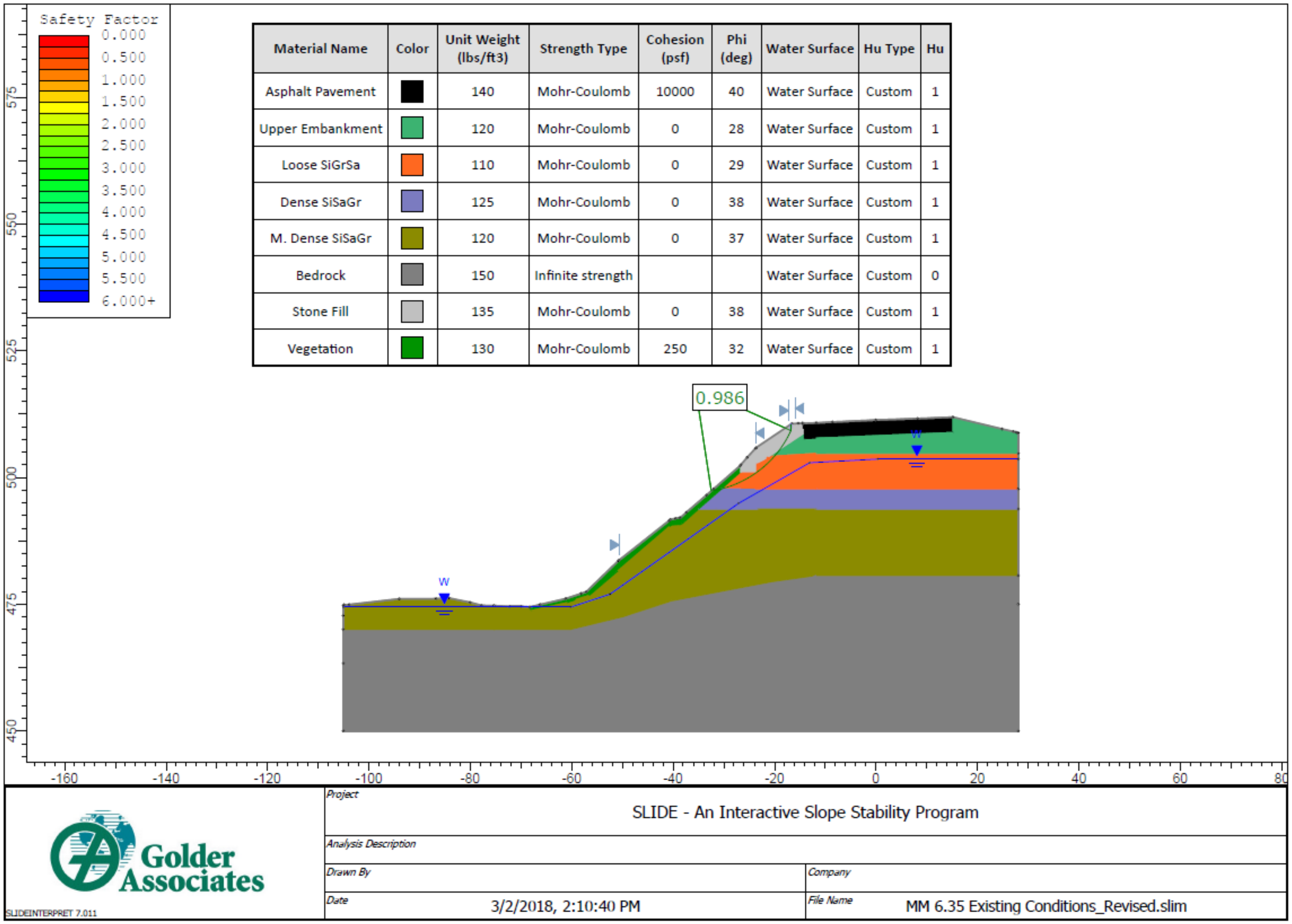
Figure 19: MM 6.28 Alternative C Stability: Reinforced Soil Slope



Support Name	Color	Type	Force Application	Out-Of-Plane Spacing (ft)	Tensile Capacity (lbs)	Plate Capacity (lbs)	Shear Capacity (lbs)	Compression Capacity (lbs)	Bond Strength (lbs/ft)	Material Dependent
Support 1		Soil Nail	Passive (Method B)	4	22000	100	0	0	1029	No

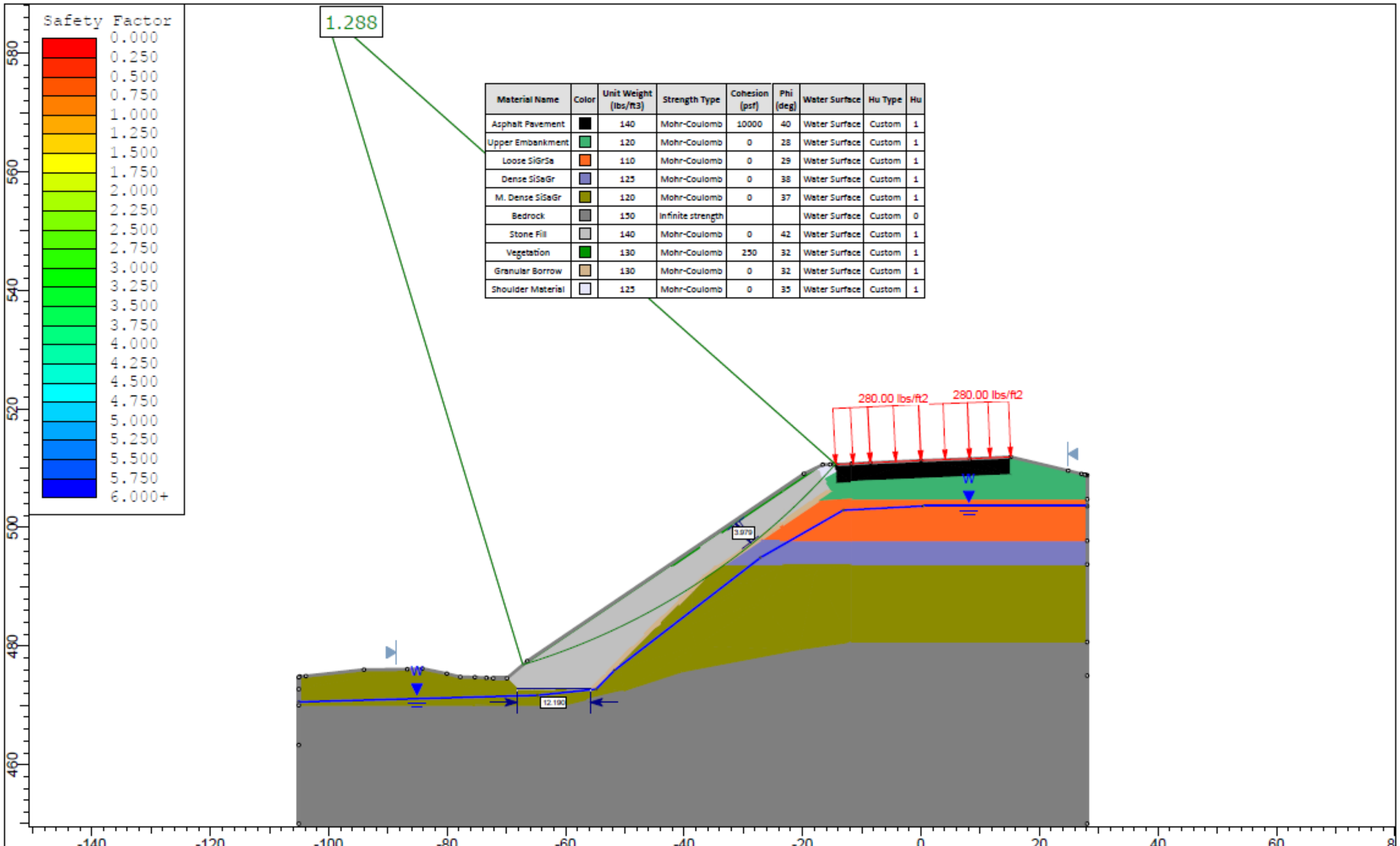
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type	Hu
V. Dense GrSa		135	Mohr-Coulomb	0	38	Water Surface	Custom	1
M. Dense GrSiSa		120	Mohr-Coulomb	0	31	Water Surface	Custom	1
Loose GrSi		110	Mohr-Coulomb	0	31	Water Surface	Custom	1
M. Dense SaGr		120	Mohr-Coulomb	0	35	Water Surface	Custom	1
Bedrock		150	Infinite strength			Water Surface	Custom	0
Asphalt Pavement		145	Mohr-Coulomb	14400	40	Water Surface	Custom	1
Existing Stone Fill		135	Mohr-Coulomb	0	38	Water Surface	Custom	1
Vegetation		125	Mohr-Coulomb	250	32	Water Surface	Custom	1

Figure 20: MM 6.28 Alternative D Stability: Soil Nails



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type	Hu
Asphalt Pavement		140	Mohr-Coulomb	10000	40	Water Surface	Custom	1
Upper Embankment		120	Mohr-Coulomb	0	28	Water Surface	Custom	1
Loose SiGrSa		110	Mohr-Coulomb	0	29	Water Surface	Custom	1
Dense SiSaGr		125	Mohr-Coulomb	0	38	Water Surface	Custom	1
M. Dense SiSaGr		120	Mohr-Coulomb	0	37	Water Surface	Custom	1
Bedrock		150	Infinite strength			Water Surface	Custom	0
Stone Fill		135	Mohr-Coulomb	0	38	Water Surface	Custom	1
Vegetation		130	Mohr-Coulomb	250	32	Water Surface	Custom	1

Figure 21: MM 6.35 Initial Conditions



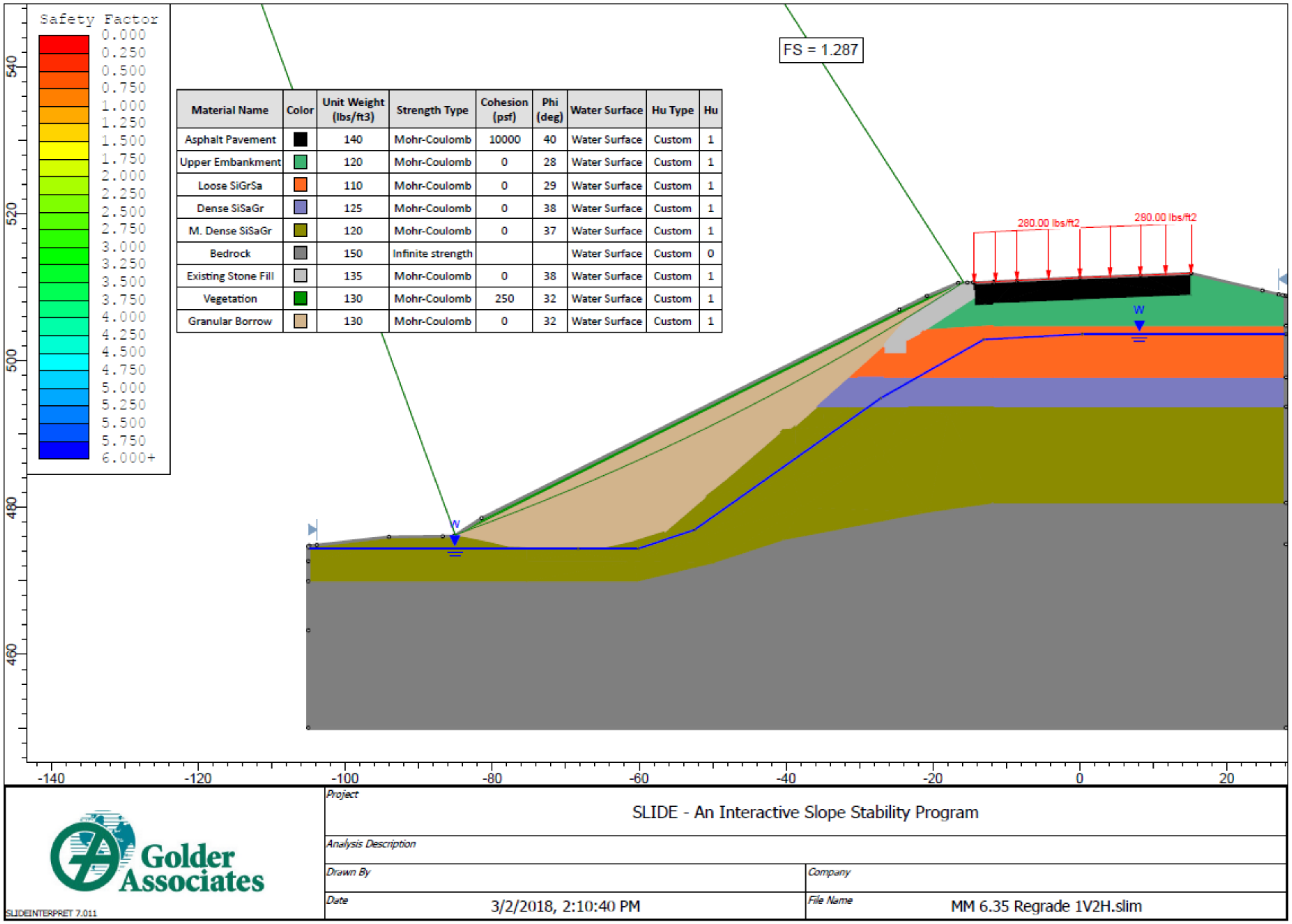
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type	Hu
Asphalt Pavement		140	Mohr-Coulomb	10000	40	Water Surface	Custom	1
Upper Embankment		120	Mohr-Coulomb	0	28	Water Surface	Custom	1
Loose SiGrSa		110	Mohr-Coulomb	0	29	Water Surface	Custom	1
Dense SiSaGr		125	Mohr-Coulomb	0	38	Water Surface	Custom	1
M. Dense SiSaGr		120	Mohr-Coulomb	0	37	Water Surface	Custom	1
Bedrock		150	Infinite strength			Water Surface	Custom	0
Stone Fill		140	Mohr-Coulomb	0	42	Water Surface	Custom	1
Vegetation		130	Mohr-Coulomb	250	32	Water Surface	Custom	1
Granular Borrow		130	Mohr-Coulomb	0	32	Water Surface	Custom	1
Shoulder Material		125	Mohr-Coulomb	0	35	Water Surface	Custom	1

Golder Associates

SLIDEINTERPRET 7.011

Project	SLIDE - An Interactive Slope Stability Program		
Analysis Description			
Drawn By		*Company*	
Date	3/2/2018, 2:10:40 PM	*File Name*	MM 6.35 1V_1.5H_mlm jdl (1).slim

Figure 22: MM 6.35 Alternative A Stability: Regrade to a 1.5H:1V Using Stone Fill



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type	Hu
Asphalt Pavement		140	Mohr-Coulomb	10000	40	Water Surface	Custom	1
Upper Embankment		120	Mohr-Coulomb	0	28	Water Surface	Custom	1
Loose SiGrSa		110	Mohr-Coulomb	0	29	Water Surface	Custom	1
Dense SiSaGr		125	Mohr-Coulomb	0	38	Water Surface	Custom	1
M. Dense SiSaGr		120	Mohr-Coulomb	0	37	Water Surface	Custom	1
Bedrock		150	Infinite strength			Water Surface	Custom	0
Existing Stone Fill		135	Mohr-Coulomb	0	38	Water Surface	Custom	1
Vegetation		130	Mohr-Coulomb	250	32	Water Surface	Custom	1
Granular Borrow		130	Mohr-Coulomb	0	32	Water Surface	Custom	1

Figure 23: MM 6.35 Alternative B Stability: Regrade to a 2H:1V Using Granular Borrow

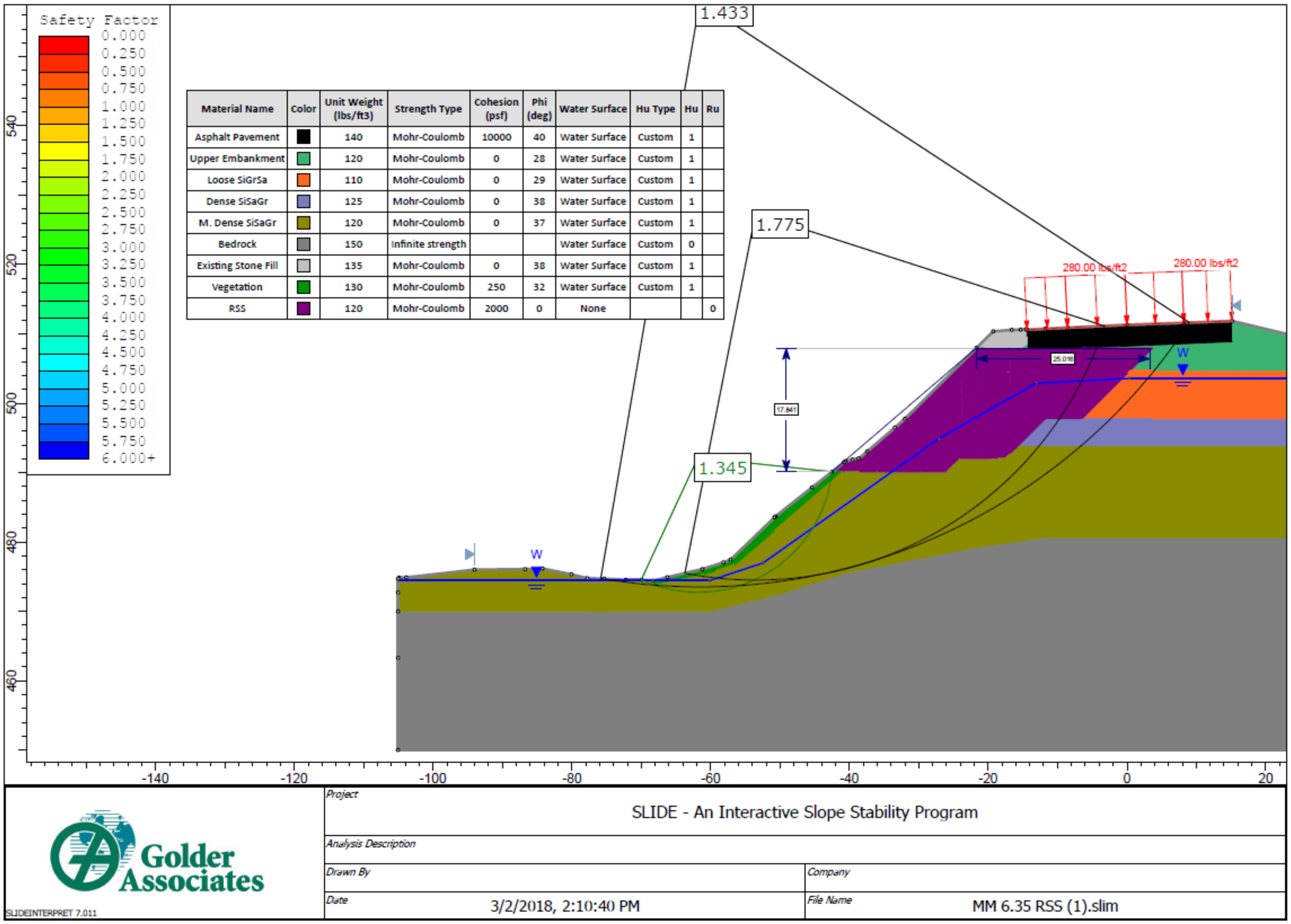


Figure 24: MM 6.35 Alternative C Stability: Reinforced Soil Slope

Support Name	Color	Type	Force Application	Out-Of-Plane Spacing (ft)	Tensile Capacity (lbs)	Plate Capacity (lbs)	Shear Capacity (lbs)	Compression Capacity (lbs)	Bond Strength (lbs/ft)	Material Dependent
Support 1		Soil Nail	Passive (Method B)	4	22000	100	0	0	1029	No

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type	Hu
Asphalt Pavement		140	Mohr-Coulomb	10000	40	Water Surface	Custom	1
Upper Embankment		120	Mohr-Coulomb	0	28	Water Surface	Custom	1
Loose SiGrSa		110	Mohr-Coulomb	0	29	Water Surface	Custom	1
Dense SiSaGr		125	Mohr-Coulomb	0	38	Water Surface	Custom	1
M. Dense SiSaGr		120	Mohr-Coulomb	0	37	Water Surface	Custom	1
Bedrock		150	Infinite strength			Water Surface	Custom	0
Existing Stone Fill		135	Mohr-Coulomb	0	38	Water Surface	Custom	1
Vegetation		130	Mohr-Coulomb	250	32	Water Surface	Custom	1

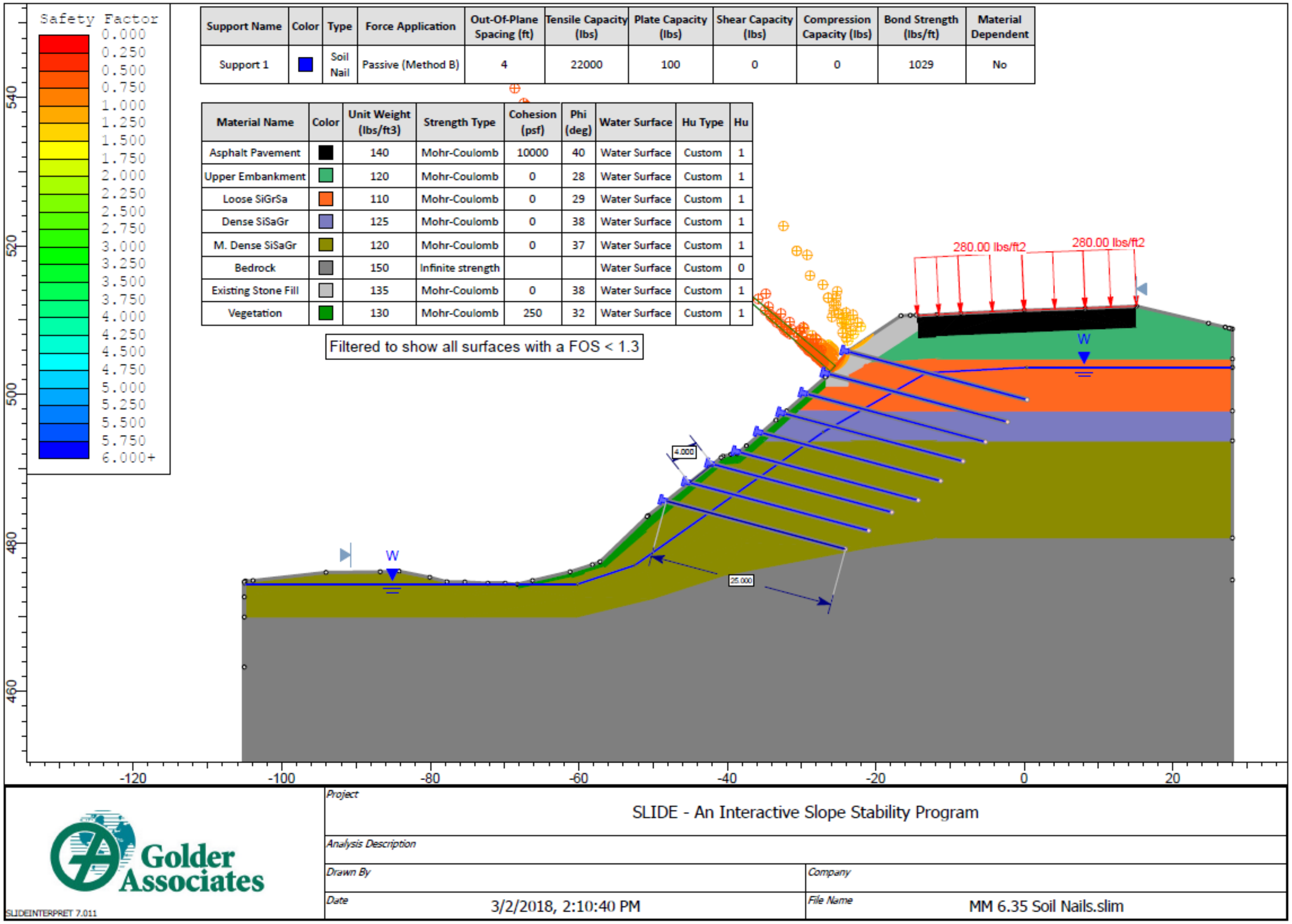
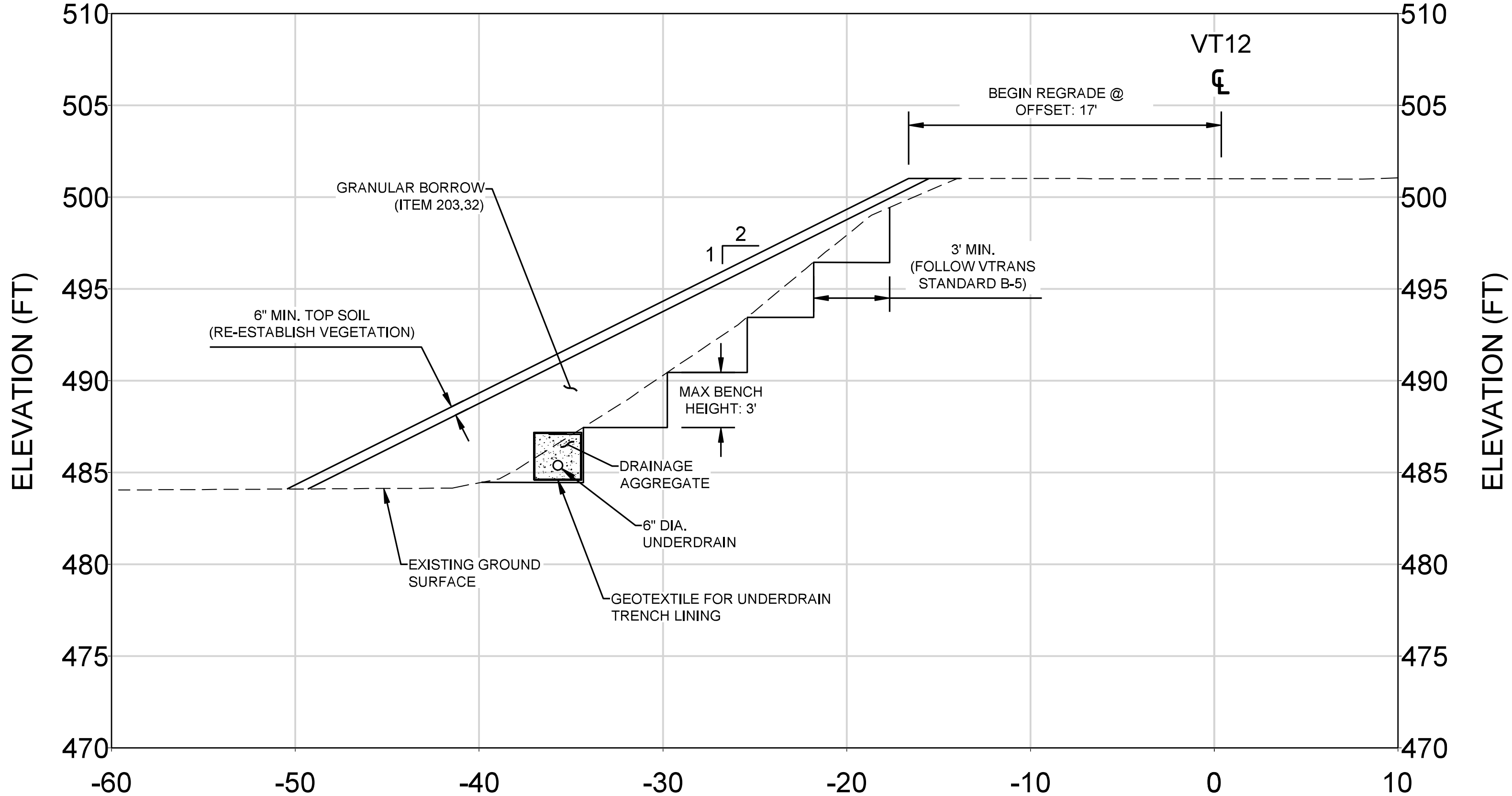
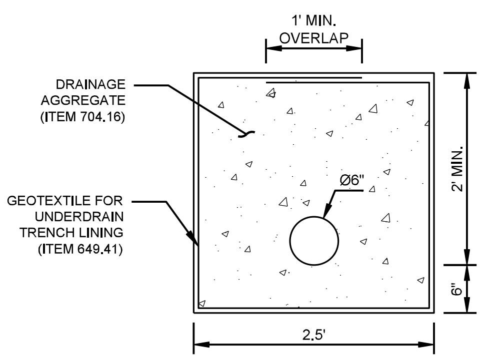


Figure 25: MM 6.35 Alternative D Stability: Soil Nails



Typical 2H:1V Slope Protection Section -MM 2.9 Slide
Sta. 1+40 - Sta. 2+15



UNDERDRAIN DETAIL
Scale: 1" = 2'

0 5 10
1" = 10' FEET

CLIENT
VERMONT AGENCY OF TRANSPORTATION (VTRANS)
BERLIN, VERMONT

PROJECT
BETHEL ROUTE 12
SLOPE STABILITY
VERMONT ROUTE 12, BETHEL, VERMONT

CONSULTANT

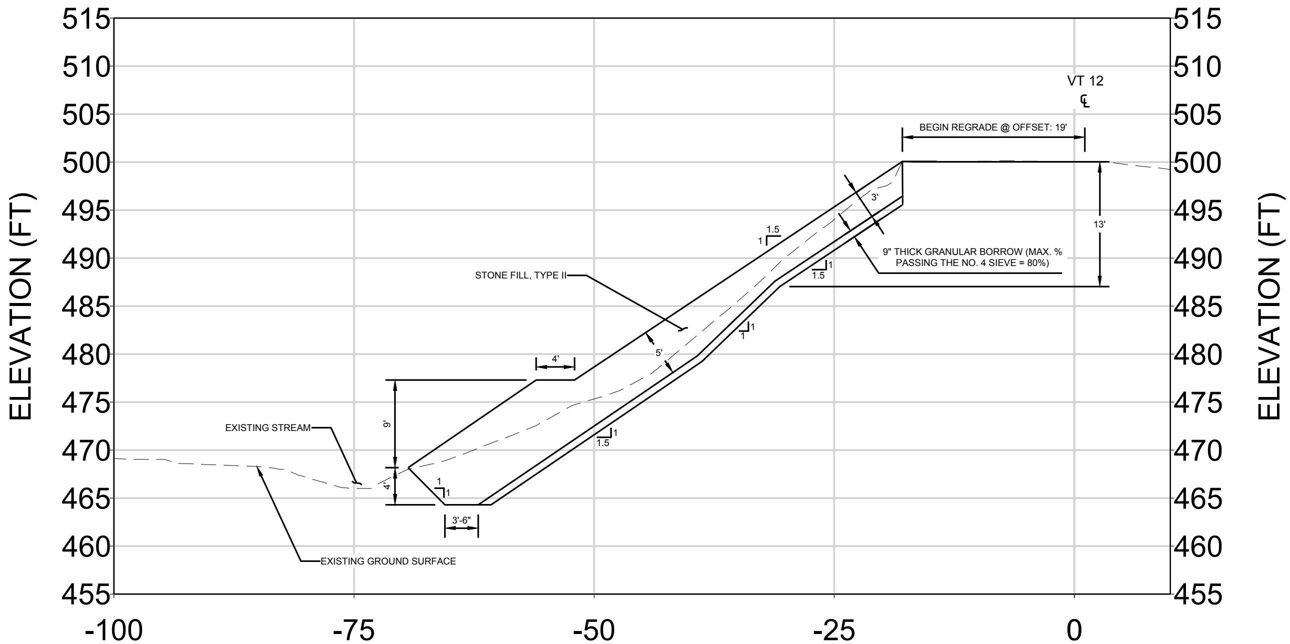
GOLDER

YYYY-MM-DD	2018-05-23
DESIGNED	MLM
PREPARED	RWC
REVIEWED	JDL
APPROVED	CCB

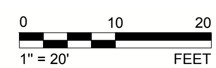
TITLE
TYPICAL SECTION - MM 2.90

PROJECT NO.	CONTROL	REV.	FIGURE
1895029	A	0	26

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A
0 1 in



Typical 1.5H:1V Slope Protection Section - MM 6.0
Sta. 0+60 - Sta. 2+10

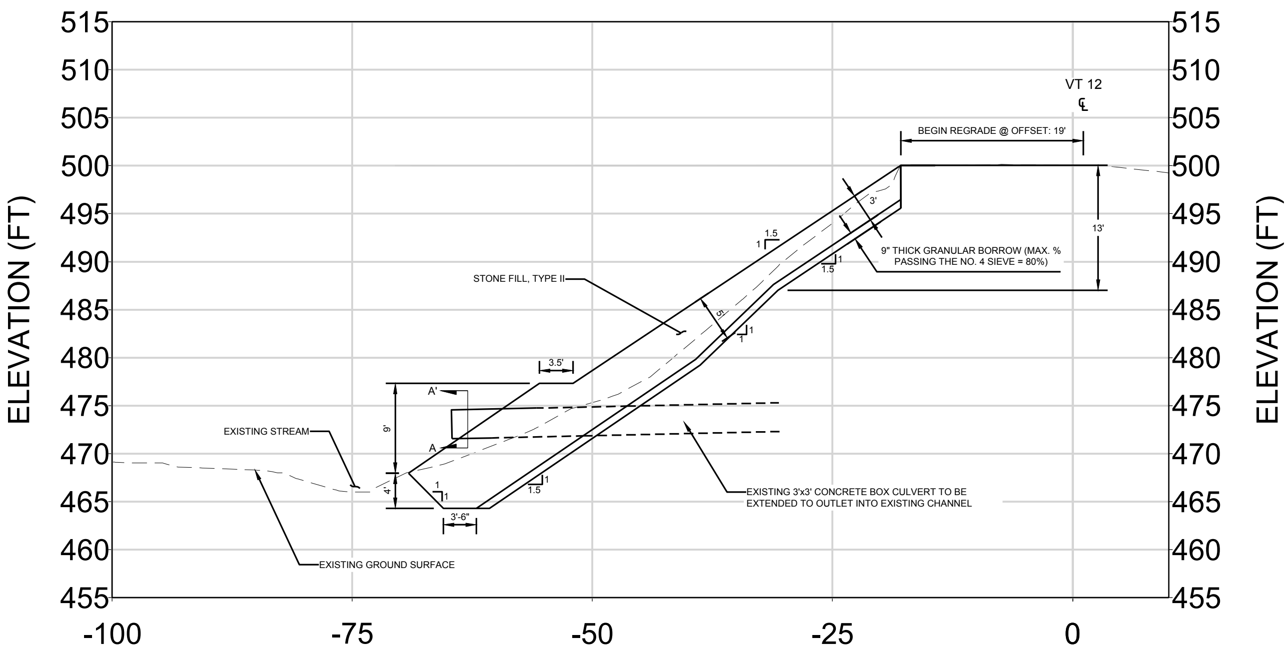


NOTES

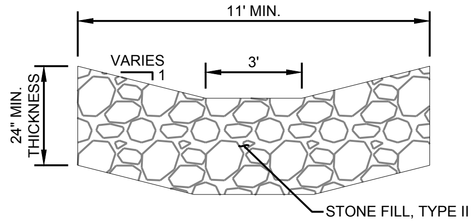
1. Slope excavation and construction shall be performed in segments (maximum 25 feet) along this slope. No excavations shall be left open overnight or on weekends.

CLIENT	VERMONT AGENCY OF TRANSPORTATION (VTRANS) BERLIN, VERMONT
CONSULTANT	GOLDER
YYYY-MM-DD	2018-05-23
DESIGNED	MLM
PREPARED	RWC
REVIEWED	JDL
APPROVED	CCB
PROJECT	BETHEL ROUTE 12 SLOPE STABILITY VERMONT ROUTE 12, BETHEL, VERMONT
TITLE	**TYPICAL SECTION - MM 6.0**
PROJECT NO.	189-5029
CONTROL	A
REV.	0
FIGURE	27

Last Edited By: rclark Date: 2018-06-21 Time:9:47:56 AM | Printed By: rclark Date: 2018-06-22 Time:3:00:10 PM
Path: \\manchester\cadd\VTRANS\VT_12_Bethel_MM_6.00\99_PROJECTS\1895029_VT_12_Bethel_MM_6.00\002_VT_12_Bethel_MM_6.00\02_PRODUCTION\DWG\ | File Name: 1895029_200_002.dwg



Typical 1.5H:1V Slope Protection Section - MM 6.0
Sta. At Box Culvert Crossing



SECTION A-A'
SCALE: 1" = 6'

0 10 20
1" = 20' FEET

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

NOTES

1. Slope excavation and construction shall be performed in segments (maximum 25 feet) along this slope. No excavations shall be left open overnight or on weekends.

CLIENT
VERMONT AGENCY OF TRANSPORTATION (VTRANS)
BERLIN, VERMONT

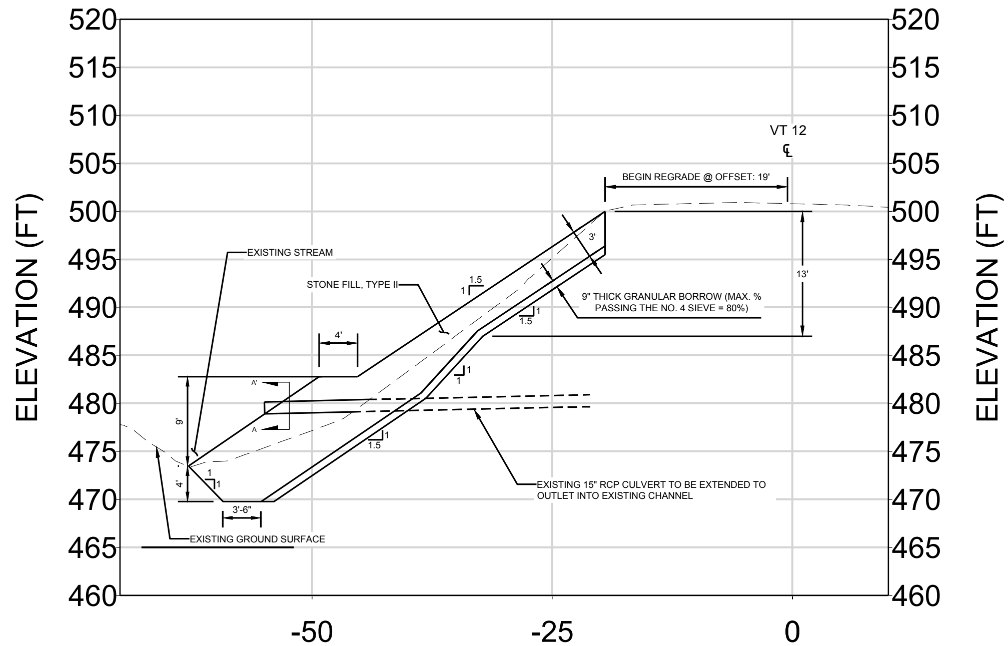
CONSULTANT
GOLDER

YYYY-MM-DD	2018-05-23
DESIGNED	MLM
PREPARED	RWC
REVIEWED	JDL
APPROVED	CCB

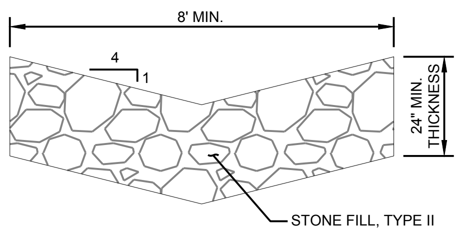
PROJECT
BETHEL ROUTE 12
SLOPE STABILITY
VERMONT ROUTE 12, BETHEL, VERMONT

TITLE
TYPICAL SECTION - MM 6.0 AT CULVERT CROSSING

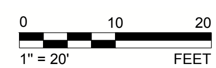
PROJECT NO.	CONTROL	REV.	FIGURE
189-5029	A	0	27A



Typical 1.5H:1V Slope Protection Section - MM 6.0
Sta. At RCP Culvert Crossing



SECTION A-A'
SCALE: 1" = 4'



NOTES

1. Existing 15" RCP is plugged with sediment approximately 18 feet in from the inlet and should be flushed prior to the regrade construction at this location.
2. Slope excavation and construction shall be performed in segments (maximum 25 feet) along this slope. No excavations shall be left open overnight or on weekends.

CLIENT
VERMONT AGENCY OF TRANSPORTATION (VTRANS)
BERLIN, VERMONT

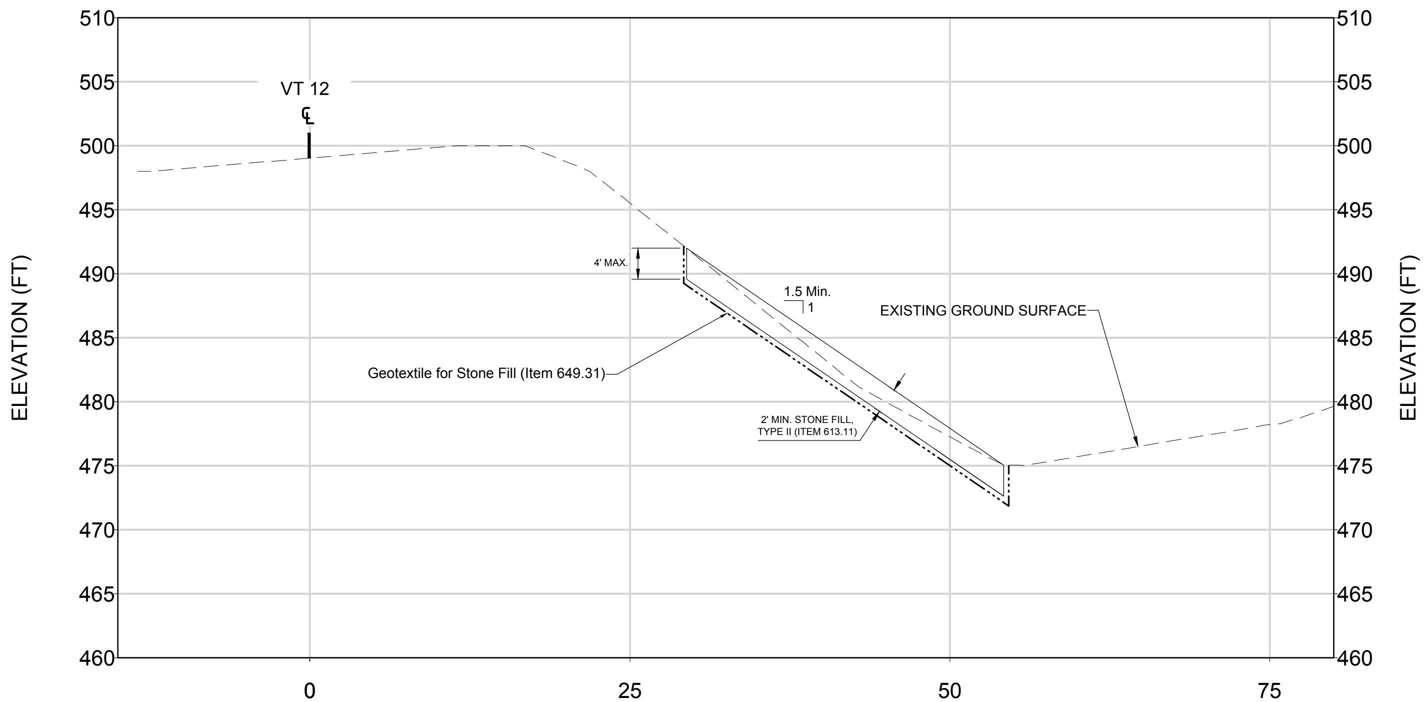
CONSULTANT
GOLDER

YYYY-MM-DD	2018-05-23
DESIGNED	MLM
PREPARED	RWC
REVIEWED	JDL
APPROVED	CCB

PROJECT
BETHEL ROUTE 12
SLOPE STABILITY
VERMONT ROUTE 12, BETHEL, VERMONT

TITLE
TYPICAL SECTION - MM 6.0 AT RCP CULVERT CROSSING

PROJECT NO.	CONTROL	REV.	FIGURE
189-5029	A	0	27B



Typical Stone Fill Repair Section - MM 6.28
Sta. 116+00 - Sta. 116+50
(Corresponding to Original Sta. 5+29 - Sta. 5+79)

0 7.5 15
1" = 15' FEET

NOTES

1. Sta. 116+00 - Sta. 116+50 corresponds to the stationing used in the survey provided by VTrans on April 18, 2018. This survey includes more detail along the toe of the slope and was used to generate the typical section. For construction plan development, this typical should be applied to Sta. 5+29 - Sta. 5+79 using the original datum.
2. Match stone fill into existing slope grade at elevation 492.0 and at the toe.

CLIENT
VERMONT AGENCY OF TRANSPORTATION (VTRANS)
BERLIN, VERMONT

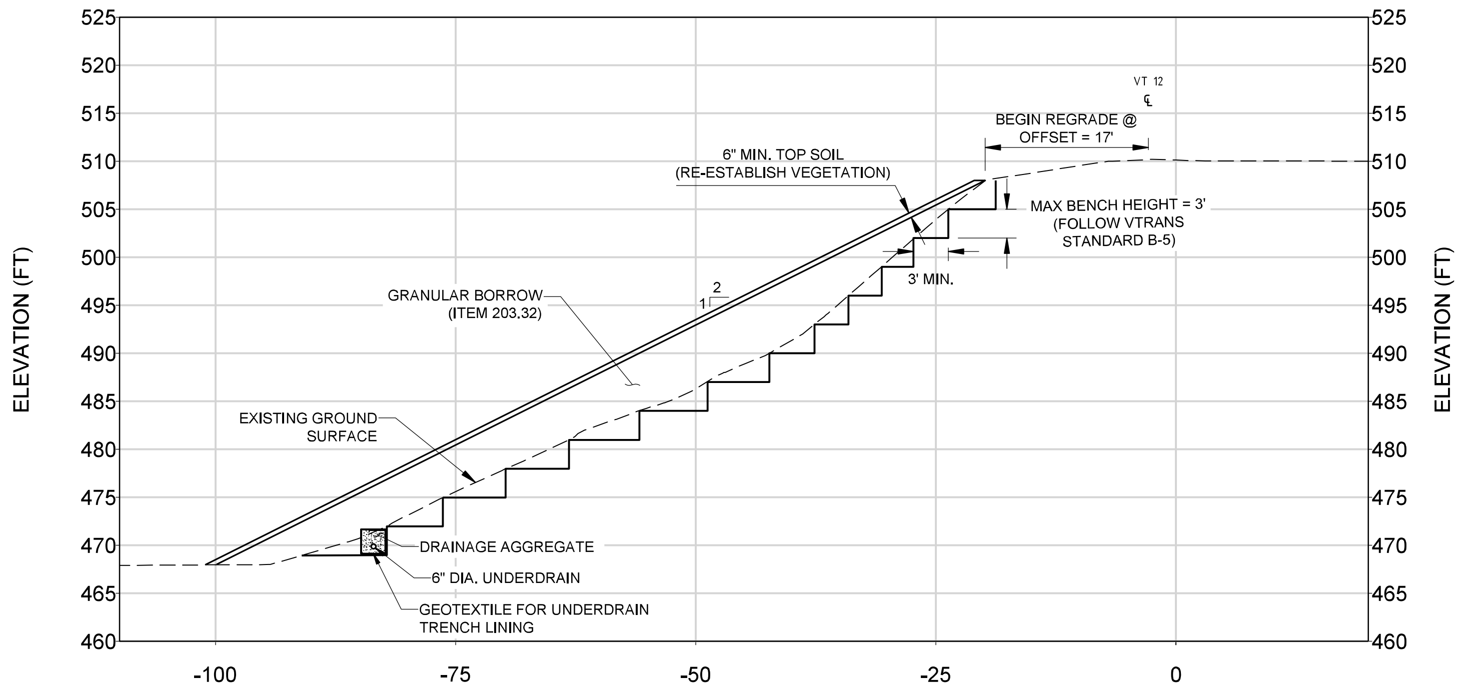
CONSULTANT
GOLDER

YYYY-MM-DD	2018-05-23
DESIGNED	MLM
PREPARED	RWC
REVIEWED	JDL
APPROVED	CCB

PROJECT
BETHEL 12
SLOPE STABILITY
VERMONT ROUTE 12, BETHEL, VERMONT

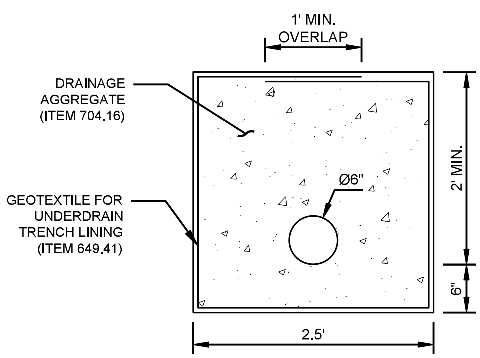
TITLE
TYPICAL SECTION - MM 6.28

PROJECT NO.	CONTROL	REV.	FIGURE
189-5029	A	0	28



Typical 2H:1V Slope Protection Section - MM 6.35

Sta. 0+90 - Sta. 2+40



UNDERDRAIN DETAIL

Scale: 1" = 2'

0 10 20
1" = 20' FEET

CLIENT
VERMONT AGENCY OF TRANSPORTATION (VTRANS)
BERLIN, VERMONT

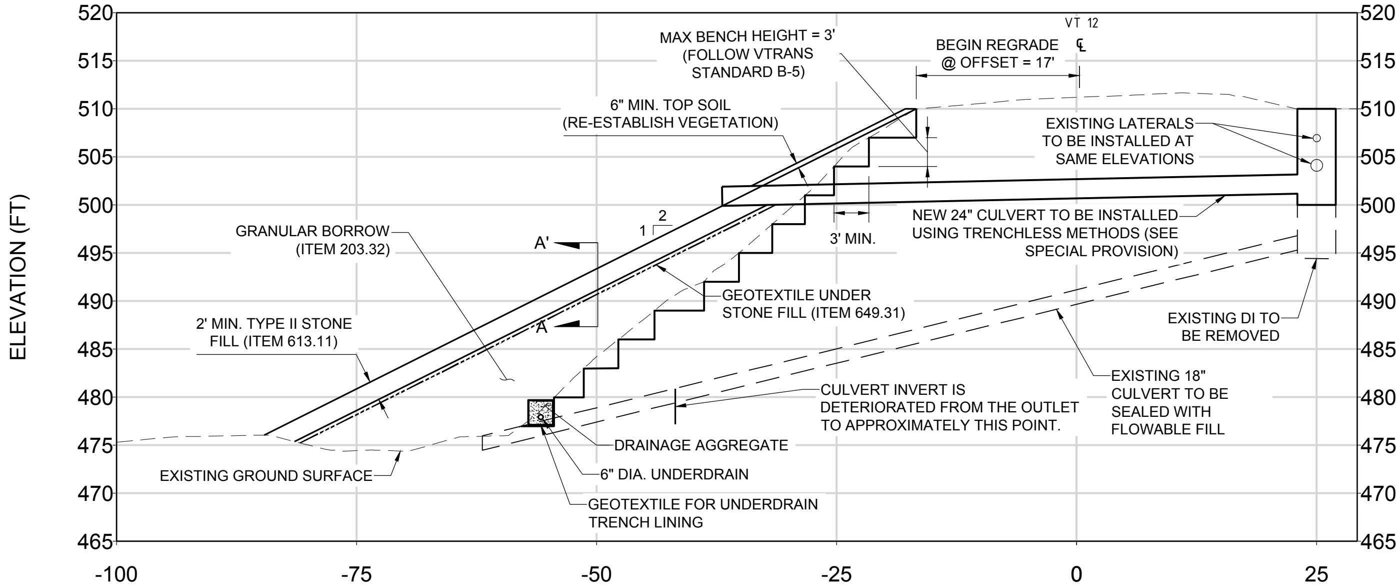
PROJECT
BETHEL 12
SLOPE STABILITY
VERMONT ROUTE 12, BETHEL, VERMONT

CONSULTANT
GOLDER

YYYY-MM-DD	2018-05-23
DESIGNED	MLM
PREPARED	RWC
REVIEWED	JDL
APPROVED	CCB

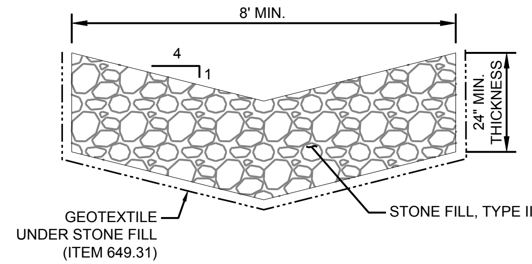
TITLE
TYPICAL SECTION - MM 6.35

PROJECT NO.	CONTROL	REV.	FIGURE
189-5029	A	0	29



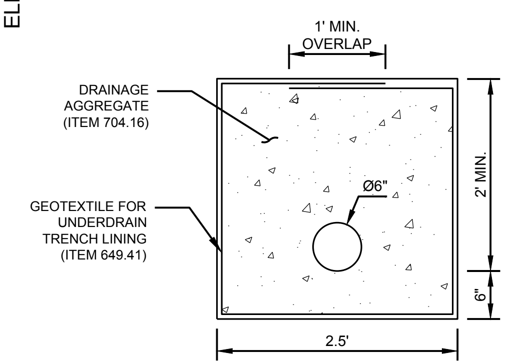
Typical 2H:1V Slope Protection Section - MM 6.35

Sta. At Culvert Crossing



SECTION A-A'

SCALE: 1" = 4'



UNDERDRAIN DETAIL

Scale: 1" = 2'

0 10 20
1" = 20' FEET

CLIENT
VERMONT AGENCY OF TRANSPORTATION (VTRANS)
BERLIN, VERMONT

PROJECT
BETHEL 12
SLOPE STABILITY
VERMONT ROUTE 12, BETHEL, VERMONT

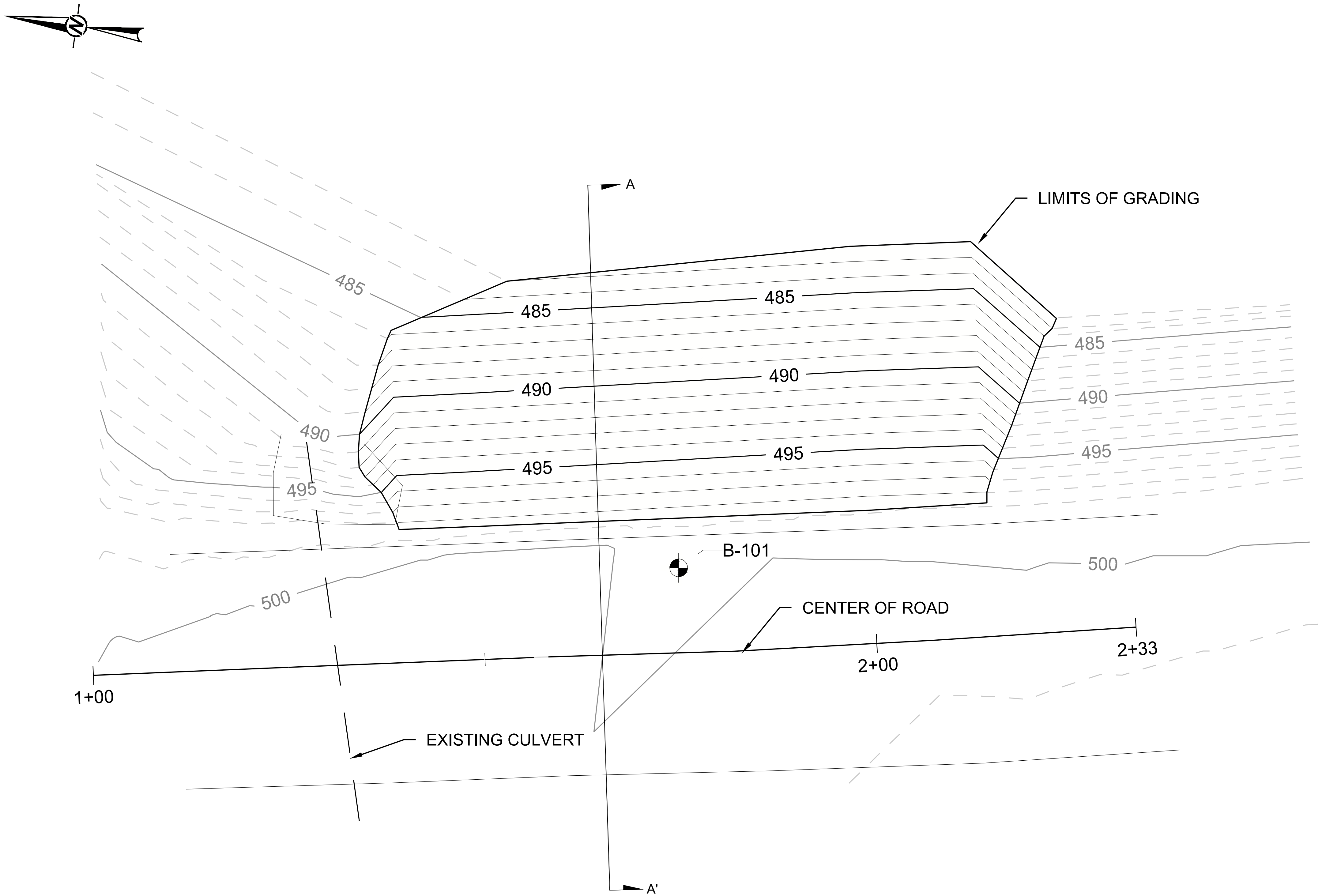
CONSULTANT

GOLDER

YYYY-MM-DD	2018-05-23
DESIGNED	MLM
PREPARED	RWC
REVIEWED	JDL
APPROVED	CCB

TITLE
TYPICAL SECTION - MM 6.35 AT CULVERT CROSSING

PROJECT NO.	CONTROL	REV.	FIGURE
189-5029	A	0	29A



LEGEND

EXISTING MAJOR CONTOUR (5 ft)

EXISTING MINOR CONTOUR (1 ft)

PROPOSED MAJOR CONTOUR (5 ft)

PROPOSED MINOR CONTOUR (1 ft)

A — LOCATION OF SECTION ANALYZED IN STABILITY ANALYSIS

BORING LOCATION

0 7.5 15
1" = 15' FEET

CLIENT VERMONT AGENCY OF TRANSPORTATION (VTRANS) BERLIN, VERMONT	PROJECT BETHEL ROUTE 12 SLOPE STABILITY VERMONT ROUTE 12, BETHEL, VERMONT

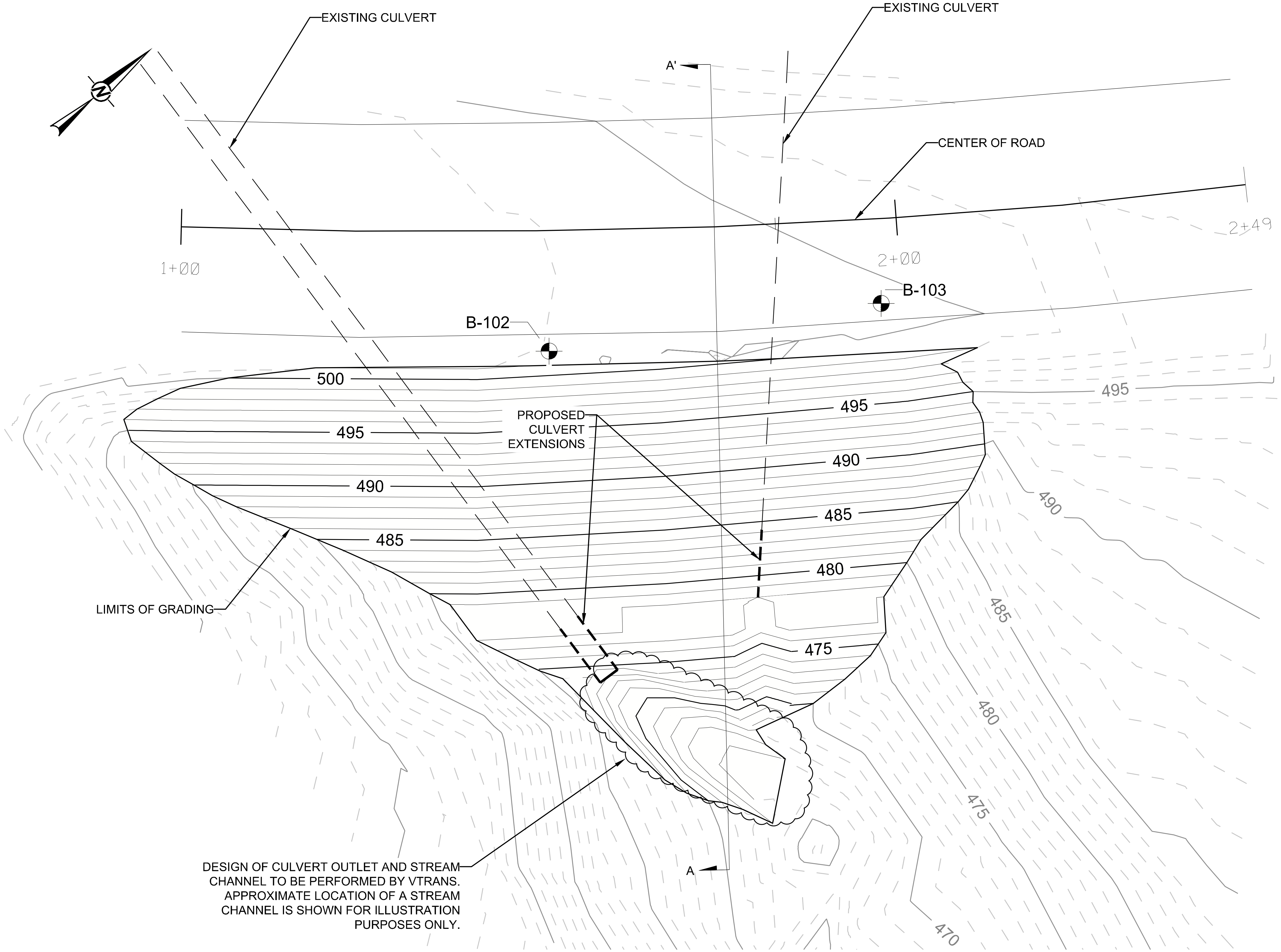
CONSULTANT: GOLDER

YYYY-MM-DD	2018-06-18
DESIGNED	MLM
PREPARED	RWC
REVIEWED	JDL
APPROVED	CCB

TITLE
PLAN VIEW - 2.90

PROJECT NO.	CONTROL	REV.	FIGURE
1895029	A	----	30

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B



LEGEND

- EXISTING MAJOR CONTOUR (5 ft)
- EXISTING MINOR CONTOUR (1 ft)
- PROPOSED MAJOR CONTOUR (5 ft)
- PROPOSED MINOR CONTOUR (1 ft)
- A — LOCATION OF SECTION ANALYZED IN STABILITY ANALYSIS
- BORING LOCATION

0 10 20
1" = 20' FEET

CLIENT
VERMONT AGENCY OF TRANSPORTATION (VTRANS)
BERLIN, VERMONT

CONSULTANT
GOLDER

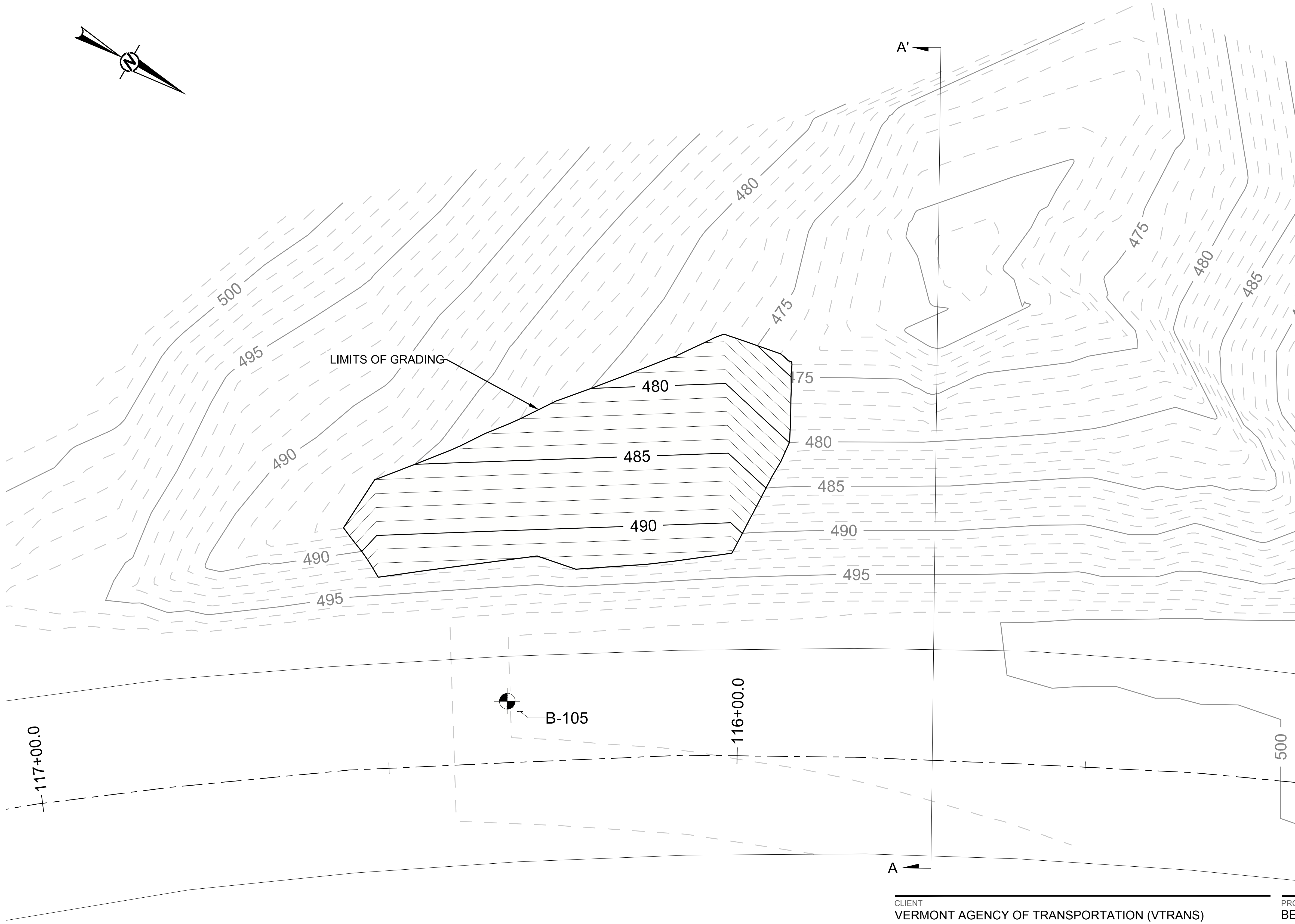
YYYY-MM-DD	2018-06-19
DESIGNED	JDL
PREPARED	RWC
REVIEWED	JDL
APPROVED	CCB

PROJECT
BETHEL ROUTE 12
SLOPE STABILITY
VERMONT ROUTE 12, BETHEL, VERMONT

TITLE
PLAN VIEW - 6.00

PROJECT NO.	CONTROL	REV.	FIGURE
189-5029	A	0	31

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B



LEGEND

- EXISTING MAJOR CONTOUR (5 ft)
- EXISTING MINOR CONTOUR (1 ft)
- PROPOSED MAJOR CONTOUR (5 ft)
- PROPOSED MINOR CONTOUR (1 ft)
- A — LOCATION OF SECTION ANALYZED IN STABILITY ANALYSIS
- BORING LOCATION

0 7.5 15
1" = 15' FEET

CLIENT
VERMONT AGENCY OF TRANSPORTATION (VTRANS)
BERLIN, VERMONT

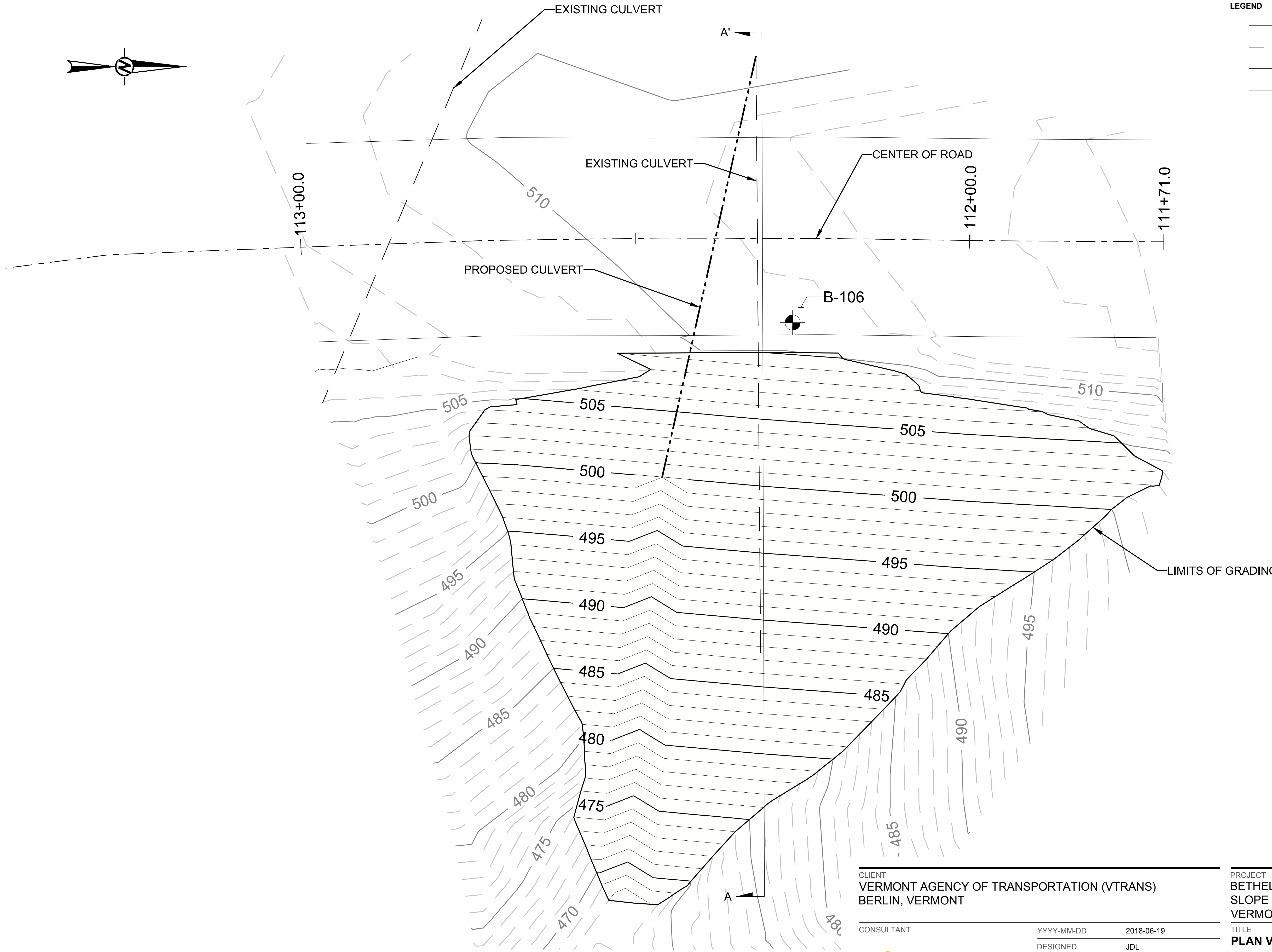
PROJECT
BETHEL 12
SLOPE STABILITY
VERMONT ROUTE 12, BETHEL, VERMONT

CONSULTANT
GOLDER

YYYY-MM-DD	2018-06-19
DESIGNED	JDL
PREPARED	RWC
REVIEWED	JDL
APPROVED	CCB

TITLE
PLAN VIEW - 6.28

PROJECT NO.	CONTROL	REV.	FIGURE
189-5029	A	0	32



LEGEND

- EXISTING MAJOR CONTOUR (5 ft)
- EXISTING MINOR CONTOUR (1 ft)
- PROPOSED MAJOR CONTOUR (5 ft)
- PROPOSED MINOR CONTOUR (1 ft)
- A — LOCATION OF SECTION ANALYZED IN STABILITY ANALYSIS
- BORING LOCATION

0 7.5 15
1" = 15' FEET

CLIENT	VERMONT AGENCY OF TRANSPORTATION (VTRANS) BERLIN, VERMONT	PROJECT	BETHEL 12 SLOPE STABILITY VERMONT ROUTE 12, BETHEL, VERMONT
CONSULTANT	GOLDER	TITLE	**PLAN VIEW - 6.35**
YYYY-MM-DD	2018-06-19	PROJECT NO.	189-5029
DESIGNED	JDL	CONTROL	A
PREPARED	RWC	REV.	0
REVIEWED	JDL	FIGURE	33
APPROVED	CCB		