GeoProfessional Innovation®

August 31, 2026
Files: MO23120W

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RE: **Transmittal**
Geotechnical Deliverable
LHTAC LILB Program
Charlie Creek Road Bridge, Key #30091
Benewah County, Idaho

Greetings Ken and Scott:

GeoProfessional Innovation Corporation (GPI) appreciates the ongoing opportunities to assist the Local Highway Technical Assistance Council (LHTAC) with the innovative Leading Idaho Local Bridge (LILB) program to repair/replace several bridges across Idaho. Appended to this letter are the final geotechnical plans and specifications for the Charlie Creek Road Bridge over Santa Creek in Benewah County, Idaho. We worked with HMH, Inc. (HMH) to update the plans with recent team comments. GPI looks forward to assisting you through construction and providing the necessary design continuity with responses to requests for clarifications and to verify design is implemented as intended during construction. The remainder of this transmittal letter provides you and the project team information on how to interpret and apply our deliverable.

YOUR DESIGN DELIVERABLE

These appended documents include geotechnical design delineating the construction requirements for the planned bridge. Our deliverable includes embankment and foundation material specifications as well as construction criteria prepared for LHTAC and HMH for the project, configuration, description, and location described in the deliverable. Please read, understand, and implement the criteria in their entirety. Do not read or rely on select elements only. Design continuity is enhanced through regular consultation and incrementally evaluating construction timing, bids, and changes that may be realized at the time the work is implemented. GPI remains available to verify that design is understood and properly incorporated into construction.

Project-Specific Design Factors

GPI considers a number of unique, project-specific factors when establishing our scope of services and finalizing our deliverables. Typical factors include the project goals, objectives, and risk management preferences; the general nature of the structure involved, size and configuration, and the project location. Typical changes that can reduce the reliability of the deliverable include those that affect:

- The anticipated traffic and load carrying capacity of the proposed bridge
- Elevation, configuration, location, orientation, and loading
- Streambank conditions
- Variable bedrock elevations and competency
- Project funding
- Roadway/bridge grades and drainage requirements

As a general rule, *always* inform GPI of project changes (even minor ones) and request an assessment of their impact to design. If our *Project Understanding*, as delineated in the project plans, is not correct, please notify us immediately. *We cannot accept responsibility or liability for problems that occur because our documents do not consider developments of which we were not informed.*

Subsurface and Surface Conditions Can Change

Unknown or unanticipated subsurface conditions are a principal cause of construction delays, cost overruns, and disputes. Site exploration identifies only a small portion of the site's subsurface conditions, which can change significantly between exploration locations. GPI performed 2 exploratory borings to help define the subsurface conditions. We relied on the field and laboratory data to apply our professional judgment rendering an opinion about the subsurface conditions along the alignment. Actual subsurface conditions may differ, sometimes significantly, from those identified in the borings and in our deliverable. GPI is happy to work with the selected contractor to review the pile substrate conditions and evaluate construction applications to accommodate variations.

Design Alternatives Analyzed

GPI considered the site subsurface conditions, desired bridge configuration communicated by Benewah County, LHTAC, and HMH, and the bridge loading to evaluate various foundation configurations and approaches. Deep and shallow conventional foundations were considered for abutment support. Loose and saturated fine grained sediment exists at the planned abutment evaluations. Based on the design bridge loads, settlement criteria could not be met without significant over-excavation and soil replacement. This would require considerable in-water work and therefore, considered less desirable than deep foundations.

Working with HMH, drilled and driven H-pile foundation alternatives were analyzed and compared. Various pile sections and configurations were evaluated to refine the foundation design and optimize pile capacity. Based on the lateral load requirements, shallow bedrock at each abutment, and soft sediments along the streambed, drilled-in and rock-socketed steel HP14X89 H-piles installed in 2-foot-diameter, concrete-filled holes were selected for the bridge foundation system. The pile caps and abutment foundations will be protected from scour by leaving the existing abutments in place and providing additional riprap, designed by HMH for the design flood event. Specialized abutments are not required for the bridge. The roadway will maintain its existing elevations, with imported crushed aggregate and geosynthetic reinforced abutment backfill (GRAB) used for the abutment backfill and new bridge approaches. The bridge deck and approaches will remain straight and will be paved.

Design Continuity

The design and resulting construction requirements are not final, because geotechnical engineers develop them principally from judgment and opinion. Construction continuity is the industry standard and a critical element of the geotechnical and civil design process. GPI maintains the necessary personnel, project familiarity, and expertise to provide geotechnical consultation to complement and validate our design as well as support the team. This includes aiding LHTAC or HMH efforts by responding to requests for information, reviewing bids, and construction sequencing.

EVALUATION LIMITATIONS

The attached deliverables are prepared to assist the planning, final design, and construction of the Charlie Creek Road Bridge #30091 in Benewah County, Idaho. Our services comprise professional opinions and recommendations made in accordance with generally accepted geotechnical engineering principles and practices, as they exist at the time and in the area of this deliverable. GPI's scope does not include a structural bridge evaluation, surveying, excavation safety or dewatering plan development, off-site improvements,

shoring, hazardous substance evaluation, permitting, or environmental site assessment. This acknowledgment is in lieu of all express or implied warranties.

CLOSING

We are pleased to provide LHTAC with this geotechnical deliverable, and we look forward to seeing this project advance through construction. If you have any questions regarding this deliverable or need more information, please contact us.

Sincerely,
GPI

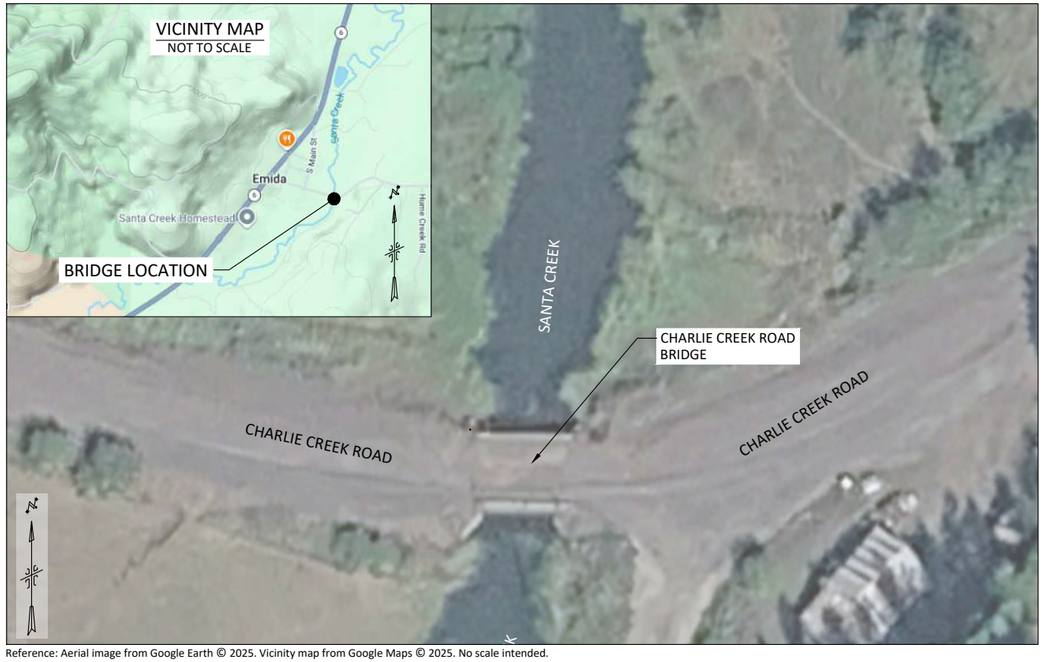
Sierra Larson, E.I.T
Project Engineer

Travis J. Wambeke, P.E.
Principal Engineer (GPI)

TJW/mg

Attachments: MO23120W Charlie Creek Road #30091, Geotechnical Plan Sheets GT1 to GT7

CHARLIE CREEK ROAD OVER SANTA CREEK - BRIDGE #30091



Reference: Aerial image from Google Earth © 2025. Vicinity map from Google Maps © 2025. No scale intended.

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230.01 INTRODUCTION

As part of the Leading Idaho Local Bridge (LILB) program, the Charlie Creek Road over Santa Creek Bridge #30091 in Benewah County will be replaced with a new, 50-foot span, pre-fabricated steel bridge. The new bridge will mostly match existing grades, be straight without skew, and will be lengthened and widened for improved travel. The bridge and roadway approaches will receive asphalt pavement for the finished travel surface. The new bridge will be supported on H-piles drilled and socketed into basalt bedrock with concrete pile caps. Strength structural loads reported by HMH Engineering (HMH) are estimated at 523.2 kips per abutment or 130.8 kips per pile. Service structural loads are estimated at 330.4 kips per abutment or 82.6 kips per pile. Concrete pile cap bearing elevations are reported at 2826.0 feet above mean sea level (AMSL). Bridge abutments will be backfilled with geosynthetic reinforced abutment backfill (GRAB) to construct the approach embankment prism. The existing abutments will be left in place and riprap will be placed behind the existing abutments to preclude scour per HMH's design.

230.02 FIELD EXPLORATION AND LABORATORY TESTING

230.02.01 Borings

Exploration was accomplished on October 28, 2025 via 2 exploratory soil borings. Boring B-23120W-1 was advanced in the paved Charlie Creek Road shoulder while boring B-23120W-2 was advanced into the gravel surfaced road shoulder adjacent to Charlie Creek Road to avoid impeding traffic over the single lane bridge. Borings extended 30.2 to 35.5 feet below the roadway surface via a CME 75 exploratory drill. Exploratory boring logs are provided on Sheet GT5.

230.02.02 Field Tests

Soil samples were collected via Standard Penetration Test (SPT) and auger sampling methods. Bedrock was sampled via diamond core bit drilling. A soil sample was collected in the streambed for gradation analysis.

230.02.03 Geophysical Exploration

A geophysical survey or geophysical exploration was not performed for the bridge site.

230.02.04 Laboratory Tests

The summary table below shows the laboratory test results from select soil samples collected during exploration. Laboratory results are presented on the exploration logs on Sheet GT5 and on Sheet GT6.

Table G6.1: Laboratory Test Results Summary

Boring	Depth (feet)	Lab Number	Description (U.S.C.S. Classification)	In situ Moisture, %	In situ Dry Density, pcf	Unit Weight, pcf	Unconfined Compression, ksi	Atterberg Limits Liquid Limit	Atterberg Limits Plasticity Index	#200 Sieve Passing, %	pH	Resistivity Ω-cm	Sulfates ppm
Streambed 1	Bridge	21241	Silty Gravel with Sand (GM)	-	-	-	-	-	-	28	-	-	-
Streambed 2	Downstream	21242	Silt with Sand (ML)	-	-	-	-	-	-	57	-	-	-
B-23120W-1	2.5-4.0	21234	Poorly-Graded Sand with Silt and Gravel (SP-SM)	4.3	-	-	-	-	-	6.6	-	-	-
B-23120W-1	12.0-15.0	21237	Silty Sand (SM)	-	-	-	-	Non-Plastic		40	6.5	2,080	42
B-23120W-1	26.0-26.3	21240	Weathered Bedrock (RX)	-	-	153.1	1.8	-	-	-	-	-	-
B-23120W-1	33.0-33.3	21468	Bedrock (RX)	-	-	163.1	3.7	-	-	-	-	-	-
B-23120W-2	0.0-1.0	21235	Poorly-Graded Gravel with Silt and Sand (GP-GM)	4.2	-	-	-	-	-	7.6	-	-	-
B-23120W-2	6.5-7.0	21238	Silt with Sand (ML)	31.6	-	-	-	28	3	77	6.0	4,760	39
B-23120W-2	7.5-9.0	21243	Silt with Sand (ML)	35.7	85.4	-	-	-	-	-	-	-	-
B-23120W-2	14.0-15.0	21239	Silt with Sand (ML)	33.4	-	-	-	Non-Plastic		-	-	-	-

230.03 SURFACE CONDITIONS

Surface Conditions

The existing bridge is owned by Benewah County and is located approximately 1,000 feet east of Emida, Idaho. The bridge consists of a wood plank travel lane with wood girders supported by concrete abutments with wing walls. Bridge approaches are asphalt surfaced. The bridge structure is 25-feet-long by 21-feet-wide. Steel guardrails exist on both sides of the bridge as well as delineators on each corner. A communication utility alignment traverses along the south side of the bridge. Bridge abutments are elevated above the surrounding creek banks 7 to 10 feet. Santa Creek appears constrained by the abutments. The east approach slopes up 4 to 6% from the bridge, and the west approach slopes down 1 to 2% from the bridge. Scour, erosion, or soil creep was evident at each abutment corner. Concrete degradation was observed on the east abutment face. Riprap is not evident near the toe of the bridge abutments. Reference photographs are located on Sheet GT4.

230.04 SUBSURFACE CONDITIONS

Subsurface Conditions

Sediment encountered in the streambed is classified as silty gravel with sand (GM) and silt with sand (ML). The asphalt-paved roadway maintains 3.5 inches of asphalt pavement that appears to comprise multiple layers of bituminous surface treatment (BST). The BST is underlain by an 8.0 to 11.5-inch-thick gravel base course comprising poorly-graded gravel with silt and sand described as brown, medium dense, and moist. Beneath base course, the following subsurface units were encountered:

Embankment Fill

- Poorly-graded sand with silt, gravel, and cobbles (SP-SM): brown and orange to gray, loose, and moist. Embankment fill was encountered in each boring extending 5.0 to 7.5 feet below the road surface.

Alluvium

- Silty Sand (SM): dark brown to gray, loose to very loose, and saturated. Alluvial silty sand was encountered below embankment fill in boring B-23120W-1 extending to 15.5 feet beneath the road surface.
- Silt with Sand (ML): dark brown to gray, soft to very soft, wet to saturated. Alluvial silt with sand was encountered in boring B-23120W-2 below embankment fill extending to 16.0 feet beneath the road surface.

Bedrock

- Weathered Basalt (RX): gray, highly fractured (Rock Quality Designation (RQD) = 0), moderately hard, rubbly, slightly vesicular. Weathered bedrock was encountered in boring B-23120W-1 extending to 27.0 feet and B-23120W-2 extending to termination depth at 30.2 feet below the road surface.
- Fresh Basalt (RX): black and green, fresh, highly to moderately fractured (RQD = 12 to 73%), and hard. Fresh bedrock was encountered in boring B-23120W-1 extending to termination depth 35.5 feet below the road surface.

Groundwater was encountered at depths ranging between 7.8 feet and 8.2 feet below the road surface, consistent with the measured water surface level of Santa Creek below the bridge deck.

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REV	DATE	DESCRIPTION
3	8/27/26	FINAL
2	7/20/26	95% DRAFT
1	11/20/25	30% DRAFT

CHECK: TJW
FILE: MO2312OW

PROJECT:
CHARLIE CREEK ROAD OVER SANTA CREEK
BRIDGE KEY #30091
47.115297, -116.594840°
BENEWAH COUNTY, IDAHO

GEOTECHNICAL ENGINEERING EVALUATION

PREPARED FOR:
SCOTT WOOD, P.E.
LHTAC
3330 W. GRACE STREET
BOISE, IDAHO 83703

DESIGN: SSL
DRAWN: SSL

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230.05 CONCLUSIONS AND RECOMMENDATIONS

230.05.01 General

The following foundation design parameters are based on bearing the new bridge on steel H-piles drilled and socketed into basalt bedrock at depth below the roadway surface. These design parameters are derived from geotechnical field and laboratory testing, as well as engineering analyses.

230.05.02 Foundations

1. The latest *American Association of State Highway and Transportation Officials Load Resistance Factor Design Bridge Design Specifications* (AASHTO LRFD Specifications).
2. Abutment footing length is equal to 24.5 feet.
3. The *Idaho Department of Transportation* (ITD) does not require pile caps to be embedded below frost depth for bridge foundations supported on deep foundations.
4. HMH reports abutments will bear at 2826.0 feet AMSL and piles will be embedded 1-foot into the abutment at cutoff elevation 2827.0 feet AMSL.
5. Provide adequate riprap and leave existing abutments in place as established by HMH's scour analysis to prevent scour.

Soil Corrosivity

1. pH = 6.0 to 6.5 - slightly acidic
2. Sulfates = 39 to 42 ppm - low
3. Resistivity = 2,080 to 4,760 ohm-cm - moderately to highly corrosive
4. Based on these corrosion parameters, special cathodic protection or the use of galvanized products for piles and other buried structures will slightly extend their practical useful lives.
5. Site soil is applicable for Types I/II and IL cement.

230.05.02.01 Spread Footings

Shallow spread footings have not been selected for this project.

230.05.02.02 Deep Foundations

1. The project team evaluated drilled versus driven piles and ultimately selected drilled-in steel H-piles for bridge abutment support on this project.
2. Soil engineering parameters and construction recommendations herein are based on H-piles drilled-in and embedded (i.e. "rock-socketed") at least 15 feet into weathered or fresh bedrock to achieve the minimum vertical capacity and lateral fixity requirements.
3. Estimated pile elevations are summarized in Table G2.1.

Table G2.1: Pile Summary

Location	Estimated Elevation (feet AMSL)				Estimated Pile Length (feet)
	Pile Cap Bearing	Pile Cutoff	Bedrock	Highest Allowable Pile Tip	
West Abutment #1	2826.0	2827.0	2817.0	2802.0	25
East Abutment #2	2826.0	2827.0	2815.0	2800.0	27

4. Pile spacing and configuration shall be established by HMH based on loads and performance criteria determined through final design.
5. Minimum HP14X89, Grade 50 steel H-piles are recommended to achieve the minimum required vertical capacity, and the required fixity under lateral loading.
6. Pre-drilled holes shall have a minimum diameter of 2-feet to accommodate the 14.8-inch-wide H-pile section.
7. Pre-drilled holes shall meet specifications in accordance with Section 230.08 - *Drilled Pile Excavation*.
8. Contractors shall expect large woody debris (buried logs) in alluvial soil.
9. Remove loose soil and debris from the drill hole base and sidewalls.
10. Temporary casing is expected to be used to facilitate drilled hole construction and prevent sloughing and caving of the drilled hole sidewalls. Temporary casing shall meet the requirements in Section 230.08 - *Drilled Pile Temporary Casing*.
11. Maintain the H-pile in its proper alignment, location, and position as shown on the plans, backfill the rock socket portion of each pile with Class 40A concrete per ITD Standards, *Section 519 - Drilled-In Concreted Piles, Section 502.01.A - Concrete Classification,* and Section 230.08 - *Drilled Pile Construction* herein.
12. Place concrete to the top of bedrock as summarized in Table G2.1.
13. Support the pile in its proper alignment until the concrete has cured sufficiently to hold the pile in place.
14. Backfill the remainder of each hole with *Coarse Aggregate for Concrete No. 1* (CAC) specified in ITD Standards, *Section 703.02.C - Coarse Aggregate for Concrete* to the base of pile cap elevation.
15. Dynamic load testing or CAPWAP analysis are not required for drilled piles.

230.05.02.02.01 Soil and Rock Parameters

Laboratory data from site soil and rock samples, as well as published correlations to field-testing data (SPT and RQD), were used to establish the soil and rock parameters for design analysis. The engineering parameters are summarized in Table G2.2.

Table G2.2: Soil and Rock Parameters

Soil or Rock Unit	Unit Weight γ, (pcf)		Friction Angle Φ, degrees	Soil Modulus k, (pci)	Young's Modulus E, (psf)
	Total	Buoyant			
Embankment Fill Sand with Silt & Gravel	125	63	30	20	$1x10^5$
Alluvial Silt with Sand	115	54	28	20	$1x10^5$
Weathered Basalt Bedrock	153	-	Unc. Comp. Strength 1.8 ksi		$4.7x10^5$
Basalt Bedrock	164	-	Unc. Comp. Strength 3.7 ksi		$2.0x10^6$

230.05.02.02.02 Nominal (Ultimate) Axial Resistance

1. Referencing AASHTO LRFD Specifications, *Section 10.8.3.5.2*, the nominal (ultimate) axial resistance of drilled-in steel H-piles socketed into basalt bedrock, is developed via a combination of shaft side resistance and tip resistance.
2. HMH reports the maximum vertical load applied to each pile is 130.8 kips under Strength 1 loading conditions.
3. Figure G2.1 illustrates the estimated nominal (ultimate) and factored (allowable) geotechnical resistance as a function of pile depth.
4. GPI estimates the nominal compressive resistance (ultimate structural capacity) of a HP14X89, Grade 50, steel H-pile is 1,305 kips per pile. Utilizing a factor of 0.6 referencing AASHTO LRFD Specifications, *Section 6.9.2*, the factored compressive resistance (allowable structural capacity) is estimated at 783 kips. This structural capacity shall be verified by HMH.
5. The factored geotechnical resistance exceeds the factored structural compressive resistance when HP14X89 H-piles are drilled at least 15-feet into basalt bedrock. Thus, the pile capacity is governed by the structural compressive resistance.
6. Per AASHTO LRFD Specifications, *Section 10.5.5.3*, design must incorporate a resistance factor of 1.0 for the extreme limit state.
7. Table G2.3 summarizes the pile size and properties representing the minimum recommended pile capacity to be verified by HMH.

Table G2.3: Pile Configuration

Pile Shape	Section	Modulus of Elasticity (ksi)	Steel Yield Strength f_y (ksi)	Estimated Factored Compressive Resistance (kips)
H-Pile	HP14X89	29,000	50	783

8. The minimum recommended center-to-center spacing for the piles socketed into rock is at least 2.0 times the maximum pile width (4-foot center-to-center spacing).
9. Based on AASHTO LRFD Specifications, *Section 10.8.3.6*, a group efficiency factor of 1.0 (i.e. no reduction) may be used for vertical axial capacity of piles where the pile cap is in firm contact with the ground at the time of construction and center-to-center spacing exceeds 2.0 times the maximum pile width.
10. The pile group capacity for ultimate vertical axial loading may be taken as the sum of the individual pile capacities.
11. Smaller pile spacing can result in disturbance during installation or other impacts that can reduce pile performance.
12. Pile down drag is not expected to be a significant concern at the site as grade changes are not anticipated to cause significant settlement in the soil adjacent to the drilled piles or beneath abutment foundations.
13. No uplift forces are anticipated for this project.

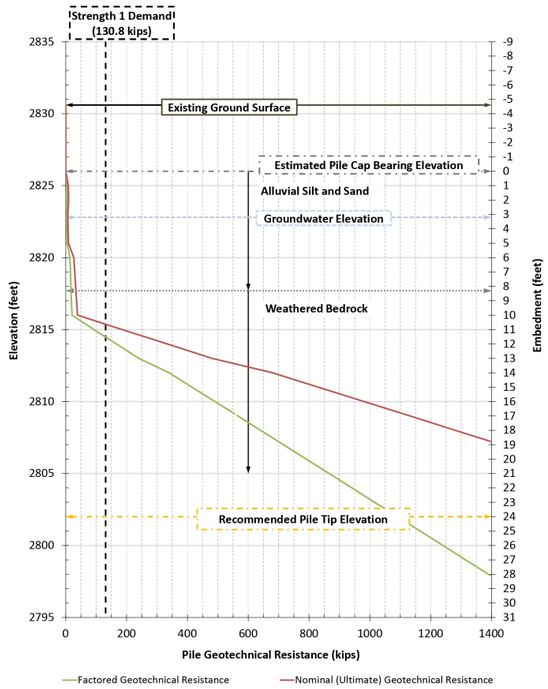


Figure G2.1: Drilled Single H-Pile Geotechnical Resistance in Rock

230.05.02.02.03 Estimated Settlement at Service Limit Loads

1. The bridge abutment foundations are currently planned to be supported on steel H-piles.
2. Given the planned service loads reported by HMH, vertical settlement at service limit is estimated at less than 0.5 inches, including elastic compression in the foundation elements and basalt bedrock.

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CHECK: TJW
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PROJECT: CHARLIE CREEK ROAD OVER SANTA CREEK BRIDGE KEY #30091 47.115297, -116.594840° BENEWAH COUNTY, IDAHO
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PREPARED FOR: SCOTT WOOD, P.E. LHTAC 3330 W. GRACE STREET BOISE, IDAHO 83703
DESIGN: SSL
DRAWN: SSL

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230.05.02.02.04 Lateral Loading

1. Per AASHTO LRFD Specifications, *Section 10.5.5.2.3*, design must incorporate a resistance factor of 1.0 for lateral loading.
2. The following conditions were incorporated into the lateral analysis:
   A. Tables G2.2 and G2.3.
   B. HMH reports the top of the pile will be pinned (i.e. zero pile moment at pile cap) and the pre-manufactured bridge girders will not be integrally poured into abutments.
   C. Scour does not reduce ground elevations adjacent to the piles, per HMH's design with riprap and existing abutments left in place .
3. Table G3.1 summarizes the estimated lateral load resistance of a single pile at various deflection limits.

Table G3.1: Lateral Pile Load-Deflection Estimates - Single Pile

Load Condition	Pile Section	Deflection at Pile Cap Base (inches)					
		0.25	0.50	0.75	1.00	1.50	2.00
		Lateral Resistance (kips)					
No Scour	HP14X89	13.7	23.8	32.5	40.2	53.4	59.6

4. Group reductions to pile lateral capacity may be required depending on final pile layout established by HMH.
5. Referencing AASHTO LRFD Specifications, *Section 10.8.2.3* and *Section 10.7.2.4,* apply a reduction factor to pile lateral capacity based on the pile group configuration and pile spacing as outlined in AASHTO LRFD Specifications, *Table 10.7.2.4-1* and Table G3.2 below.

Table G3.2: Pile Lateral Load Group Reduction Factors

Pile Center to Center Spacing (in the direction of loading)	Reduction Factor, η
	Single Row
3D[A]	0.8
5D[A]	1.0

Table G3.2 Notes:
A. D = drilled pile diameter (2 feet)

6. HMH's final design shall incorporate group reductions to pile lateral capacity based on the data in Table G3.2 where applicable due to pile spacing.
7. Based on GPI's exploration and lateral loading analysis, piles socketed at least 15 feet into basalt bedrock will achieve lateral fixity. Table G2.1 outlines the estimated pile elevations.

230.05.03 Lateral Pressures and Backfill

1. Design bridge abutments to resist lateral earth pressures from the retained soil and surface surcharges. Structurally design abutments to resist the lateral earth pressures in Table G3.3.
2. Apply lateral earth pressures for wall design using the following unfactored equivalent fluid weights (EFW) from Table G3.3. EFW are given for both above and below groundwater table (GWT).

Table G3.3: Equivalent Fluid Weights (EFW)[A]

Untreated Base ($\Phi = 38^o$, $\gamma = 135$ pcf)	Above GWT	Below GWT
Lateral Earth Pressure Case		
At-rest (no wall movement)	52 pcf	90 pcf
Active (wall movement away from soil mass)	32 pcf	80 pcf
Passive (wall movement toward soil mass)[B,C]	565 pcf	305 pcf

Table G3.3 Notes:
A. Calculated EFW's assume flat backslope behind abutment wall.
B. Passive case assumes 3/4 inch lateral movement to fully mobilize passive resistance.
C. Neglect passive resistance within the upper 3.0 feet below ground surface due to potential for erosion, frost action, and other disturbance in front of abutments .

3. The above equivalent fluid weights include both fully drained conditions (above GWT) and saturated conditions (below GWT) for the proposed abutments.
4. Abutment walls shall be constructed with adequate drainage specified by design to reduce the potential for instability or seepage.
5. Lateral surcharge pressures due to traffic equipment, storage loads, etc., are not included in the above lateral earth pressure recommendations. Use a lateral earth pressure coefficient of 0.5, acting over the abutment height to estimate the lateral surcharge loads (q_w) from traffic and other surcharges behind and above abutments. Figure G3.1 illustrates the lateral earth pressure configurations.
6. The equivalent fluid weights and lateral earth pressures presented in Table G3.3 are nominal (unfactored) values. Apply the applicable AASHTO LRFD load factors and load combinations for the design limit state, including Strength I, Service I, and Extreme Event I, as applicable.

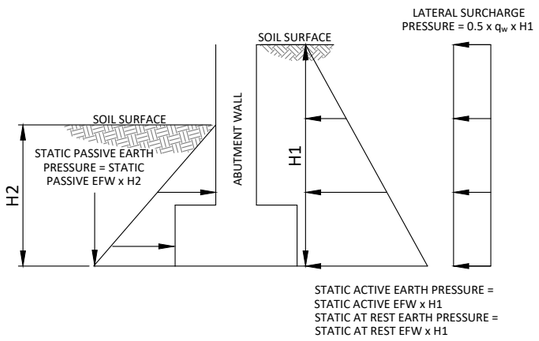


Figure G3.1: Static Lateral Earth Pressure Diagram

230.05.04 Anchors

1. Anchors are not required for this project.

230.05.05 Drainage

1. This project spans Santa Creek, which is considered occupied by federally protected bull trout. Contractor shall obtain permits, plan for, and schedule in-stream construction (if required) in compliance with environmental standards and federal guidelines for bull trout protection prior to in-stream construction.
2. If in-water work is required, the contractor shall establish stream diversion alternatives and dewatering plans to accomplish new bridge construction. Construction during low flow months is highly recommended.
3. Groundwater was encountered in the exploration near the creek surface elevation, approximately 8.0 feet below the roadway surface. Water was flowing in Santa Creek during field exploration. Groundwater elevations are expected to fluctuate with irrigation, precipitation, and runoff that create seasonal flow changes in Santa Creek.
4. The site soil surface is susceptible to pumping from equipment loads at any time of the year.
5. The contractor shall prepare subgrades and stage earthwork noting wet weather and wet soil will exist. Earthwork may require temporary additional grading and over-excavation to accomplish work during wet weather/wet soil conditions.
6. Significant new impervious areas will not occur as part of this project. Site grading shall return ground surfaces to existing drainage patterns with positive drainage of surface runoff water away from the bridge foundations.
7. Stream flow towards foundation construction areas can occur during storm events. Contractors shall expect these conditions and be prepared to install runoff management facilities and to replace wet or disturbed soil with *Untreated Base* (UTB) or *Granular Subbase* (GSB) referencing *Section 230.05.09, Over-excavation*.
8. Plan excavations carefully, allowing water collection points and utilizing conventional sumps and pumps to remove nuisance water from runoff, seeps, springs, or precipitation.
9. Discharge collected construction water into temporary stormwater and sediment facilities by Civil Design and contractor's Stormwater Pollution Prevention Plan (SWPPP) or Pollution Prevention Plan (PPP).

230.05.06 Embankments, MSE Walls and Reinforced Soil Slopes

1. Embankments will be reconstructed as bridge approaches for the project. Mechanically stabilized earth (MSE) walls and reinforced soil slopes (RSS) are not required. However, GRAB shall be used to backfill pile cap and abutment excavations.
2. Temporary slopes used in new bridge embankment construction shall be constructed per the requirements in Section 230.05.09, *Excavation Characteristics* herein, and the ITD Standards.
3. GRAB shall extend a minimum 6 feet from the back of abutment pile cap and slope back at 2H:1V referencing ITD Bridge Design Detail, *B11.1*.
4. GRAB shall meet the specifications detailed in ITD Standards, *Section 215 - Geosynthetic Reinforced Abutment Backfill*, shall have maximum 0.67 feet compacted lift thickness of UTB and a geotextile layer every 1.33 feet.
5. GRAB backfill materials must adhere to the specifications in these plans and the ITD Standards, including ITD Standards, *Section 703.04* and Table G7.1, herein, for UTB and ITD Standards, *Section 718.07* and Table G4.3, herein, for geotextile.
6. Place at least 0.70 feet of UTB as base course meeting ITD Standards, Section 703.04 requirements for the paved sections of roadway and compact to requirements in Section 230.08, *Current Specifications and Minimum Testing Requirements*.
7. Place hot mix asphalt (HMA) 0.35-feet-thick for the final travel surface meeting ITD Standards, *Section 405* requirements.
8. Adequate vertical separation and coordination between the last reinforcement layer and guardrail posts or "cans" shall be considered. Coordinate to avoid interference with GRAB reinforcing layers.
9. Slopes shall incline 1.5H:1V or flatter for slopes constructed with granular soil and protected with riprap as referenced in ITD Bridge Design Detail, *B.11.1*. HMH reports slopes protected with riprap at 2H:1V.
10. Figure G3.2 illustrates a typical GRAB construction schematic with the planned pile cap. Figure G3.2 is not a structural detail.

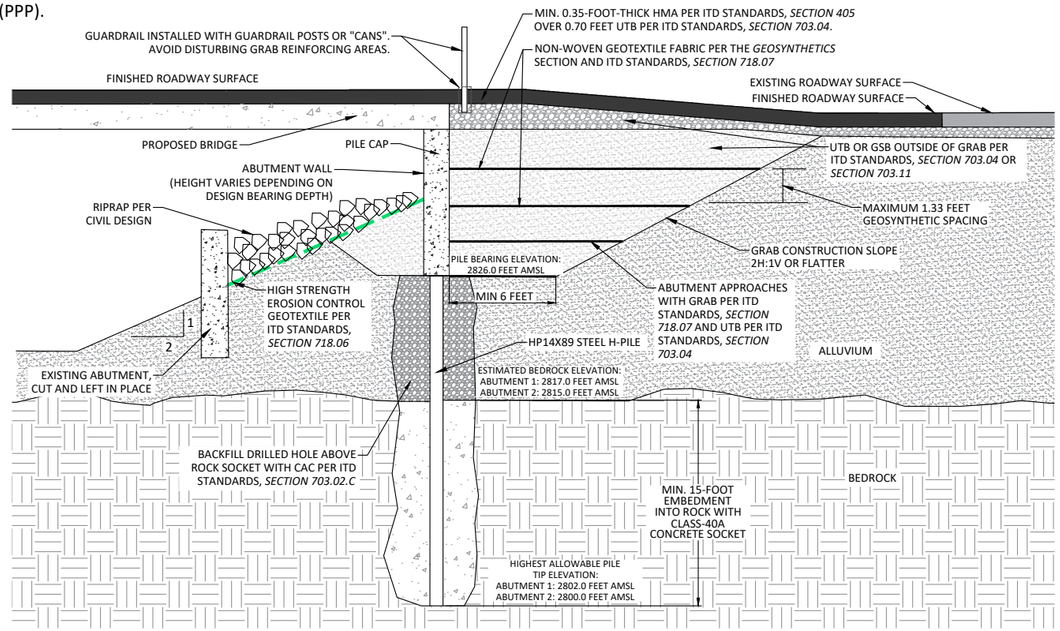


Figure G3.2: Embankment Construction Schematic (Not to Scale)

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REV	DATE	DESCRIPTION
3	8/27/26	FINAL
2	7/20/26	95% DRAFT
1	11/20/25	30% DRAFT

CHECK: TJW
FILE: IMO2312OW
PROJECT: CHARLIE CREEK ROAD OVER SANTA CREEK
BRIDGE KEY #30091
47.115297, -116.594840°
BENEWAH COUNTY, IDAHO
GEOTECHNICAL ENGINEERING EVALUATION
PREPARED FOR: SCOTT WOOD, P.E. LHTAC 3330 W. GRACE STREET BOISE, IDAHO 83703
DESIGN: SSL
DRAWN: SSL

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230.05 CONCLUSIONS AND RECOMMENDATIONS - CONTINUED

230.05.07 Erosion Control

1. Install silt fence per ITD Standards, *Table 718.09-1* requirements around the perimeter of the disturbed area to prevent siltation, see Figure G4.1. Contractor shall prepare the SWPPP or PPP.
2. Place at least 0.5 feet of topsoil on embankment slopes to facilitate vegetative growth and track-walk the topsoil into the slope face.
3. Erosion was observed at both existing abutments. Establish necessary erosion control measures to reduce erosion by installing riprap per ITD Standards, *Section 711.04 - Minimum Class III* or per HMH's civil design. Place riprap at slopes no steeper than 1.5H:1V.
4. Existing abutment cutoff, riprap materials, and riprap thickness shall align with scour analysis by HMH.

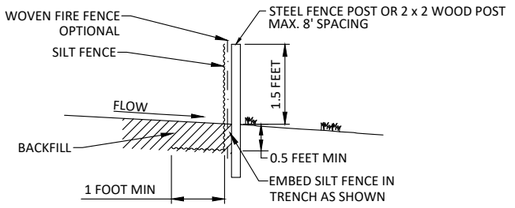


Figure G4.1: Silt Fence Cross-Section Schematic (Not to Scale)

230.05.08 Seismic Design

1. Site geology with relatively shallow bedrock correlates to a seismic site soil Class B - *Rock*.
2. Seismic design shall reference the parameters provided in Table G4.1. Referencing AASHTO LRFD Specifications, *Section 3.10.6*, these site parameters correlate to Seismic Performance Zone 1.

Table G4.1: Seismic Response Criteria[A]

Period (seconds)	Standard Acceleration Coefficients (g)	MCE_R Spectral Acceleration Parameters for Site Class B (g)	Design Spectral Acceleration Parameters for Site Class B (g)[B]
0.0 (Peak)	PGA = 0.09	F_{PGA} = 1.6	A_S = 0.14
0.2 (Short)	S_S = 0.19	F_a = 1.6	S_{DS} = 0.30
1.0	S_1 = 0.06	F_v = 2.4	S_{D1} = 0.15

Table G4.1 Notes:

A. Seismic data coordinates Latitude: 47.115297°N, Longitude: 116.594840°W.

B. Acceleration coefficients based on *Figures 630.04.01.1*, *630.04.01.2*, and *630.04.01.3* in the ITD Materials Manual. Site factors based on *Tables 630.04.02.1* and *630.04.02.2* in the ITD Materials Manual.

3. Deep foundations extend through potentially liquefiable soil and bear in bedrock; thus, the risk of liquefaction-related foundation distress to the bridge is low.
4. Liquefaction analysis beneath approach embankments was performed on the saturated silty sand layer between 4 and 15 feet below the ground surface. Based on the parameters outlined in Table G4.2, the calculated factor of safety (FOS) is 2.0 in this soil layer. Thus, liquefaction risk is low at the site.

Table G4.2: Liquefaction Analysis[A]

Soil Type	Peak Ground Acceleration (PGA)	Earthquake Magnitude	Cyclic Resistance Ratio (CRR)	Factor of Safety
Silty Sand	0.09 g	5.1	0.138-0.339	2.0

Table G4.2 Notes:

A. Seismic data coordinates Latitude: 47.115297°N, Longitude: 116.594840°W.

B. Earthquake magnitude from the *USGS Unified Hazard Tool-100-year return period.*

5. The seismic parameters provided in Table G4.1 and Table G4.2 are recommended for design referencing the ITD Materials Manual, *Section 630*.

230.05.09 Construction

Bridge approach embankments and drilled and socketed H-pile foundations will be constructed for the new bridge. The sections that follow include recommendations for construction.

Clearing and Grubbing

1. Clear and grub vegetation, topsoil, and crushed aggregate along the planned bridge approaches per ITD Standards, *Section 201*.
2. Budget for 1.0 foot of clearing and grubbing outside of the existing roadway.
3. Fill was encountered 7.0 feet below the ground surface.
4. Remove fill from bridge foundation area to the planned pile cap elevation. Do not reuse existing embankment fill for abutment backfill and embankment construction.

Subgrading

1. Plan subgrade preparation during periods of low stream flow. Contractor shall divert Santa Creek as necessary to facilitate construction.
2. Excavate existing abutment backfill to expose alluvium at the base of the abutment pile caps.
3. Prepare pile cap subgrades by exposing native soil with smooth blade equipment to a neat, level, and undisturbed condition.
4. Exposed subgrades shall be free of rutting, standing water, loose soil and rock, frozen soil, and debris.
5. If required, backfill below pile caps with UTB to the pile cap bearing elevation.
6. Install H-piles referencing Section 230.05.02.02 - *Deep Foundations* to the minimum depths on the bridge plans, in Table G2.1, Figure G3.2 and Section 230.06, *Exploration Map*.
7. Place concrete pile cap once piles have been verified to extend to the minimum required depths and meet pile installation requirements.
8. For each foundation subgrade, coordinate construction activities and backfilling as rapidly as possible following excavation to reduce the potential for subgrades to degrade under construction traffic and wet/soft soil conditions due to the site's proximity to Santa Creek. Where soft spots are realized during subgrading, over excavate as delineated in Subsection, *Over-Excavation*.
9. After abutment backfilling per Section 230.05.06, *Embankments, MSE Walls and Reinforced Soil Slopes*, prepare road subgrades by grading and compacting to Section 230.08 specifications, herein.

Excavation Characteristics

1. Site soil is expected to be excavatable using large, conventional excavation techniques and equipment with mechanical thumbs to manipulate boulders and existing bridge debris.
2. Temporarily excavate, slope, shore or brace excavations in accordance with *Occupational Safety and Health Administration* (OSHA) regulations and local codes. Regulations outlined in OSHA, *Part 1926* provide temporary construction slope requirements for various soil types, slopes, and configurations.
3. Site soil, when dry, is classified as Type C soil referencing OSHA and must be temporarily sloped back 1.5H:1V (horizontal:vertical). When site soil is wet, saturated, or water is intruding into the excavation, side slopes shall be substantially flattened or shored.
4. Excavations may occur near the groundwater table and could require dewatering, cofferdams, or temporary stream diversion.
5. Construction vibrations, seepage, or surface loading can cause excavations to slough or cave and should be avoided or construction slopes flattened.
6. The contractor is solely responsible for site safety, excavation configurations, and maintaining OSHA-approved personnel for excavation monitoring.

Over-Excavation

1. Soft, loose, wet, pumping, or rutting areas that cannot achieve neat subgrade surfaces shall be removed to firm subgrade soil.
2. Replace over-excavations with GSB or UTB as described in Section 230.05.06 - *Embankments, MSE Walls, and Soil Slopes* and Figure G4.2.
3. Over-excavation backfill materials must adhere to the latest ITD Standards, including *Section 703.04* for UTB and *Section 703.11* for GSB.

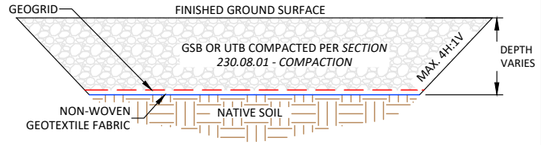


Figure G4.2: Over-Excavation Schematic

Geosynthetics

1. Geosynthetics are required for GRAB and riprap applications for this project. Geosynthetic potential uses and material requirements including ITD Standards are provided in Table G4.3.

Table G4.3: Geosynthetic Specifications

Geosynthetic Type	Use	Material Specifications
Non-Woven Geotextile Separation Fabric	– GRAB – Over-excavation	– Reference Figure G3.2 for placement – Meeting drainage geotextile ITD Standards, *Table 718.07-1, Type III* requirements – Min. grab tensile strength: 270 pound – Min. puncture strength: 600 pound
High Strength Riprap / Erosion Control Geotextile	– Below riprap	– Reference Figure G3.2 and HMH *Design Drawings* for placement. – Meeting *Riprap/Erosion Control Geotextile Criteria* requirements in ITD Standards, *Table 718.06-1*
Biaxial Geogrid	– Extremely soft subgrade conditions	– Reference Figure G4.2 for placement – Meeting biaxial geogrid requirements in ITD Standards, *Section 641 - Biaxial Geogrid and* ITD Standards, *Table 641.02-1, Type III* requirements – Punched and drawn polypropylene

2. Geosynthetics that do not meet the requirements in Table G4.3 may be used only if approved by the Engineer.
3. Geosynthetics are applicable for GRAB construction, below riprap, and when constructing on extremely soft or wet soil for subgrade stabilization.
4. Apply geosynthetics directly on approved subgrades, taut, free of wrinkles, and overlapping at least 1 foot.
5. Install geosynthetics per ITD Standards, *Section 215* and manufacturer recommendations.

230.06 SITE PHOTOGRAPHS



Photograph G4.1: West abutment



Photograph G4.2: East abutment



Photograph G4.3: West abutment erosion



Photograph G4.4: East abutment erosion

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3	8/27/26	FINAL
2	7/20/26	95% DRAFT
1	11/20/25	30% DRAFT

CHECK: TJW
FILE: IMO23120W

PROJECT:
CHARLIE CREEK ROAD OVER SANTA CREEK
BRIDGE KEY #30091
47.115297°, -116.594840°
BENEWAH COUNTY, IDAHO

GEOTECHNICAL ENGINEERING EVALUATION

PREPARED FOR:
SCOTT WOOD, P.E.
LHTAC
3330 W. GRACE STREET
BOISE, IDAHO 83703

DESIGN: SSL
DRAWN: SSL

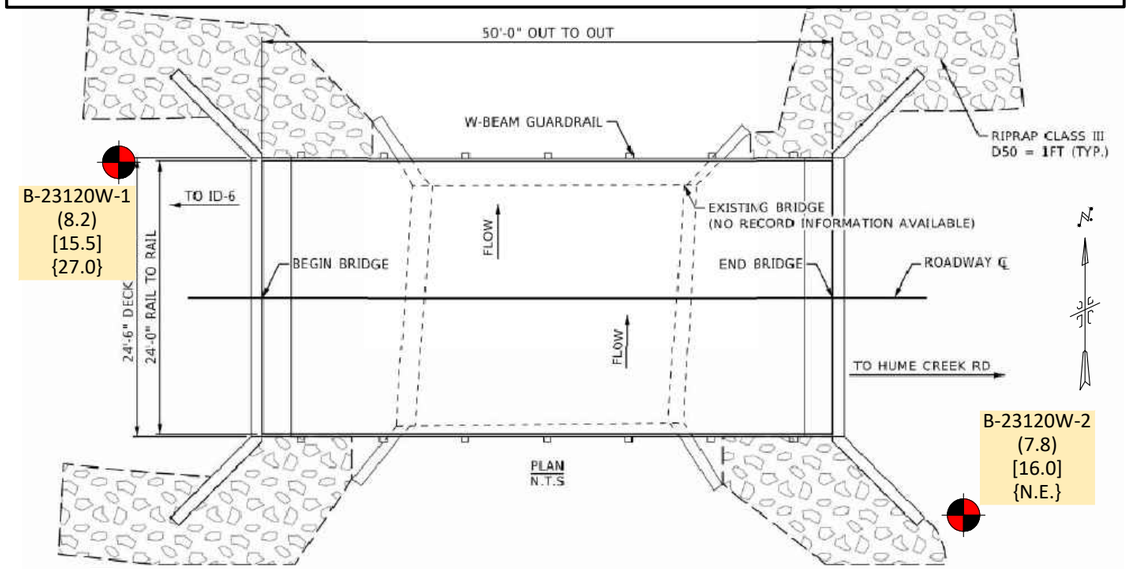
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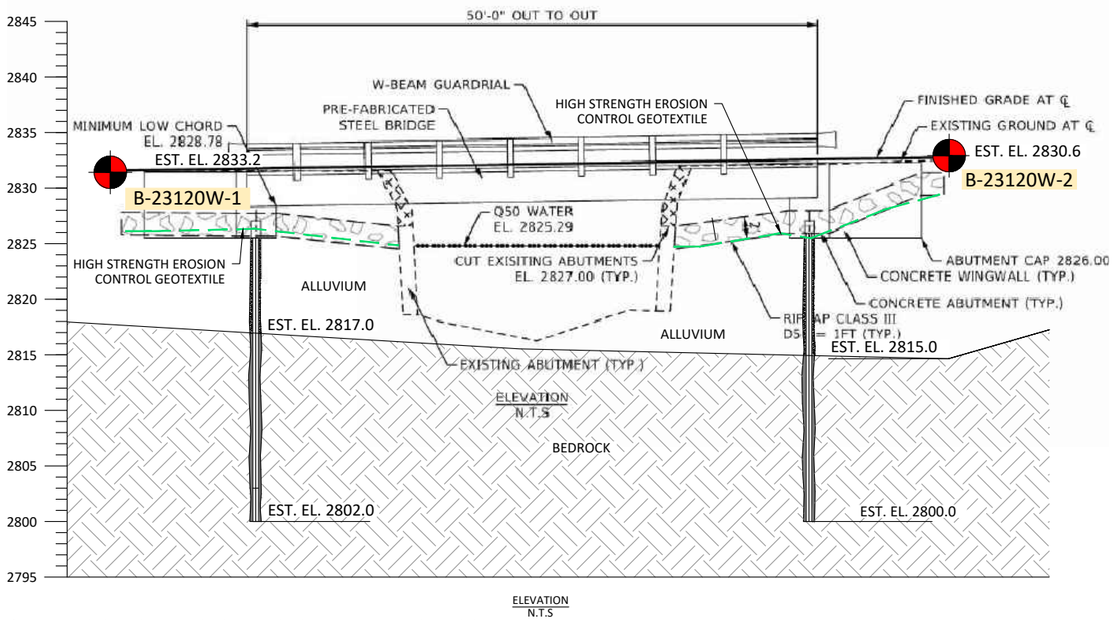
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230.06 EXPLORATION MAP

LEGEND

⊕	Approximate boring locations observed by GPI on October 28, 2025	{27.0}	Approximate depth to bedrock measured in feet below ground surface.
(7.8)	Approximate depth to groundwater measured in feet below the surface.	N.E.	Not encountered.
[16.0]	Approximate depth to weathered bedrock measured in feet below ground surface.		





Reference: HMH Charlie Creek Conceptual Bridge Layout dated March 23, 2026. No scale intended.

EXPLORATION LOGS

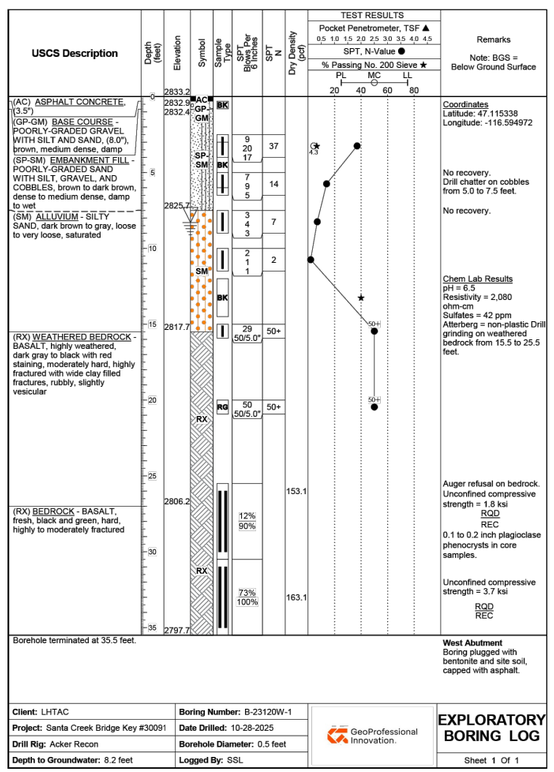
UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS			GRAPHIC SYMBOL	GROUP SYMBOL	TYPICAL NAMES
COARSE GRAINED SOIL	GRAVEL	CLEAN GRAVEL		GW	WELL-GRADED GRAVEL, GRAVEL-SAND MIXTURES.
				GP	POORLY-GRADED GRAVEL, GRAVEL-SAND MIXTURES.
		GRAVEL WITH FINES		GM	SILTY GRAVEL, GRAVEL- SAND-SILT MIXTURES.
				GC	CLAYEY GRAVEL, GRAVEL-SAND-CLAY MIXTURES.
	SAND	CLEAN SAND		SW	WELL-GRADED SAND, GRAVELLY SAND.
				SP	POORLY-GRADED SAND, GRAVELLY SAND.
		SAND WITH FINES		SM	SILTY SAND, SAND-SILT MIXTURES.
				SC	CLAYEY SAND, SAND-CLAY MIXTURES.
FINE GRAINED SOIL	SILT AND CLAY LIQUID LIMIT LESS THAN 50%			ML	INORGANIC SILT, SANDY OR CLAYEY SILT.
				CL	INORGANIC CLAY OF LOW TO MEDIUM PLASTICITY, SANDY OR SILTY CLAY.
				CL-ML	INORGANIC MIXED CLAY AND SILT.
				OL	ORGANIC SILT AND CLAY OF LOW PLASTICITY.
	SILT AND CLAY LIQUID LIMIT GREATER THAN 50%			MH	INORGANIC SILT, MICA- CEOUS SILT, PLASTIC SILT.
				CH	INORGANIC CLAY OF HIGH PLASTICITY, FAT CLAY.
				OH	ORGANIC CLAY OF MEDIUM TO HIGH PLASTICITY.
				PT	PEAT, MUCK AND OTHER HIGHLY ORGANIC SOILS.

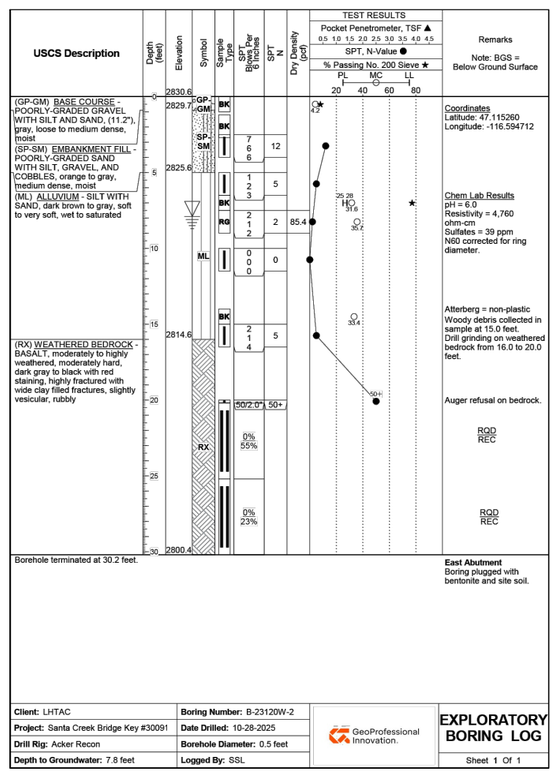
BORING LOG SYMBOLS
- STANDARD 2 INCH OD SPLIT SPOON SAMPLE
- CALIFORNIA MODIFIED 3 INCH OD SPLIT SPOON SAMPLE
- ROCK CORE XX% = %RQD / XX% = %RECOVERY
- SHELBY TUBE 3 INCH OD UNDISTURBED SAMPLE

TEST PIT LOG SYMBOLS
- BG GRAB BAG SAMPLE
- BK BULK SAMPLE
- RG RING SAMPLE

GROUNDWATER SYMBOLS
- GROUNDWATER AFTER 24 HOURS
- GROUNDWATER AT TIME OF DRILLING
- GROUNDWATER AT THE END OF DRILLING



Client: LHTAC	**Boring Number:** B-23120W-1	GeoProfessional Innovation.	**EXPLORATORY BORING LOG**
Project: Santa Creek Bridge Key #30091	**Date Drilled:** 10-28-2025		Sheet 1 Of 1
Drill Rig: Acker Recon	**Borehole Diameter:** 0.5 feet		
Depth to Groundwater: 8.2 feet	**Logged By:** SSL		



Client: LHTAC	**Boring Number:** B-23120W-2	GeoProfessional Innovation.	**EXPLORATORY BORING LOG**
Project: Santa Creek Bridge Key #30091	**Date Drilled:** 10-28-2025		Sheet 1 Of 1
Drill Rig: Acker Recon	**Borehole Diameter:** 0.5 feet		
Depth to Groundwater: 7.8 feet	**Logged By:** SSL		

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3	8/27/26	FINAL
2	7/20/26	95% DRAFT
1	11/20/25	30% DRAFT

FILE: MO23120W CHECK: TJW

PROJECT: CHARLIE CREEK ROAD OVER SANTA CREEK
BRIDGE KEY #30091
47.115297, -116.594840°
BENEWAH COUNTY, IDAHO

GEOTECHNICAL ENGINEERING EVALUATION

PREPARED FOR: SCOTT WOOD, P.E.
LHTAC
3330 W. GRACE STREET
BOISE, IDAHO 83703

DESIGN: SSL DRAWN: SSL

lhtac2

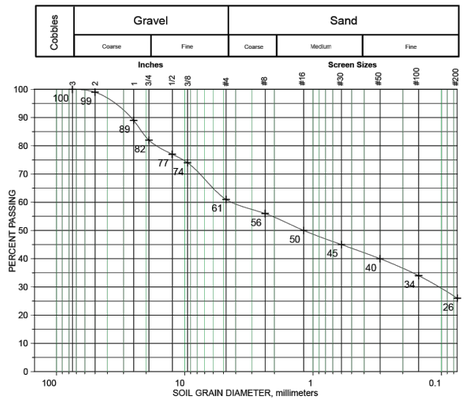
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230.06 LABORATORY TESTS

GRADATION ANALYSIS

ASTM D6913

Project Name: Charlie Creek Road over Santa Creek #30091
Project Number: MO23120W
Client: LHTAC
Lab Number: 21241
Sample Location: Streambed 1, Bridge
Sample Classification: Silty Gravel with Sand (GM)
Date Tested: 11/17/2025 By: MJK

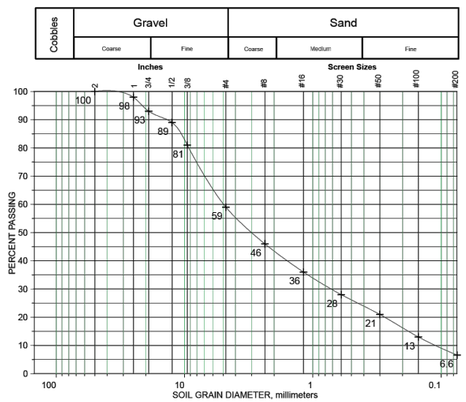


Reviewed by: _____ GeoProfessional Innovation.

GRADATION ANALYSIS

ASTM D6913

Project Name: Charlie Creek Road over Santa Creek #30091
Project Number: MO23120W
Client: LHTAC
Lab Number: 21234
Sample Location: Embankment Fill, B-23120W-1 @ 2.5-4.0 feet BGS
Sample Classification: Poorly-Graded Sand with Silt and Gravel (SP-SM)
Date Tested: 11/20/2025 By: MJK

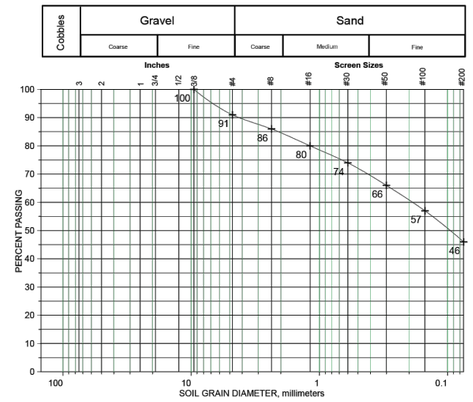


Reviewed by: _____ GeoProfessional Innovation.

GRADATION ANALYSIS

ASTM D6913

Project Name: Charlie Creek Road over Santa Creek #30091
Project Number: MO23120W
Client: LHTAC
Lab Number: 21237
Sample Location: Alluvium, B-23120W-1 @ 12.0-15.0 feet BGS
Sample Classification: Silty Sand (SM)
Date Tested: 11/18/2025 By: MJK

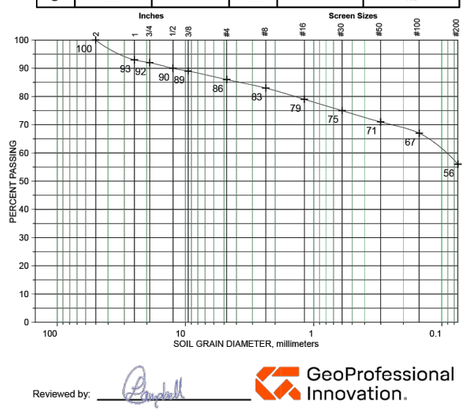


Reviewed by: _____ GeoProfessional Innovation.

GRADATION ANALYSIS

ASTM D6913

Project Name: Charlie Creek Road over Santa Creek #30091
Project Number: MO23120W
Client: LHTAC
Lab Number: 21242
Sample Location: Streambed 2, Downstream
Sample Classification: Silt with Sand (ML)
Date Tested: 11/19/2025 By: MJK

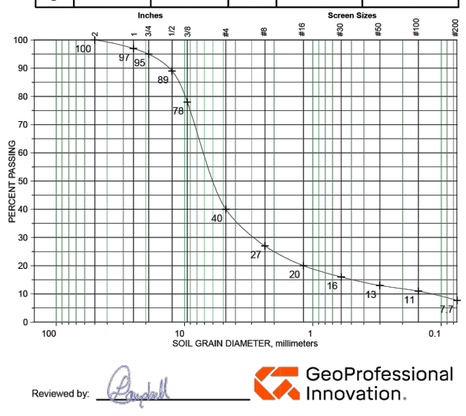


Reviewed by: _____ GeoProfessional Innovation.

GRADATION ANALYSIS

ASTM D6913

Project Name: Charlie Creek Road over Santa Creek #30091
Project Number: MO23120W
Client: LHTAC
Lab Number: 21235
Sample Location: Base Course, B-23120W-2 @ 0.0-1.0 feet BGS
Sample Classification: Poorly-Graded Gravel with Silt and Sand (GP-GM)
Date Tested: 11/19/2025 By: MJK



Reviewed by: _____ GeoProfessional Innovation.

230.07 FOUNDATION INVESTIGATION PLAT

A foundation investigation plat was not prepared for this project.

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REV	DATE	DESCRIPTION
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CHECK: TJW
FILE: MO23120W
DRAWN: SSL
DESIGN: SSL

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PREPARED FOR:
SCOTT WOOD, P.E.
LHTAC
3330 W. GRACE STREET
BOISE, IDAHO 83703

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230.08 CURRENT SPECIFICATIONS AND MINIMUM TESTING REQUIREMENTS

Earthwork Monitoring

The firm retained to verify subgrade conditions and compaction shall become the geotechnical engineer-of-record for construction. At a minimum, the following earthwork observations shall be implemented.

1. *Bridge Pile Foundation Installation* - Documented by the geotechnical engineer-of-record retained for construction to verify rock socket meets design intent for capacity.
2. *Pile Cap Abutment Backfill/Approach Embankment Construction* - Full time compaction testing and observation of geotextile placement for GRAB. One compaction test each side of abutment, per fill lift, minimum 3 tests per testing event or full-time compaction monitoring for coarse fill products.
3. *Roadway Aggregate* - One compaction test every 50 feet, per lane, per fill lift. One laboratory test suite including gradation and theoretical maximum density (Proctor).
4. *Hot Mix Asphalt* - One acceptance compaction test every 50 feet, per lane, per lift. One laboratory test suite including extraction/gradation and theoretical maximum density (Rice), per each day's paving.

Drilled Pile Excavation

1. Use excavation methods that provide contact with firm, undisturbed soil or rock with the sides and bottom of the drilled pile referencing ITD Standards, *Section 519 - Drilled in Piles*.
2. Drill all pile excavations to the bottom elevations referencing the bridge plans and Table G2.1.
3. Construct the excavations so that the vertical centerline axis of the finished shaft is within 3 inches of the plan location at the top of the pile. Drill all piles to within 2% of vertical the entire depth of the excavation.
4. Use an air lift to demonstrate that the shaft is clean. The air lift will meet the following criteria:
   A. Sufficient length to discharge outside of the shaft
   B. Minimum 4-inch diameter
   C. Compressed air input line located within 1 foot off the bottom of the lift pipe.
   D. Air compressor capable of producing 185 cubic feet per minute (cfm) at 100 psi; and
   E. Meets all applicable environmental requirements relating to discharge.
5. Use tools and withdrawal rates that will not cause suction effects that result in soil intrusion or instability of excavation. In addition, use construction methods that ensure no sloughing or caving within the shaft side walls.
6. If sloughing or caving occurs, remove all sloughed material and ensure concrete completely fills the shaft. If caving occurs during placement of drilled shaft concrete, immediately stop concrete flow and undertake corrective measures.
7. If necessary to facilitate material removal, remove the concrete and reinforcing steel already placed in the shaft at no additional cost.
8. During final clean out and until concrete placement is complete, maintain the fluid level within the shaft at a level of 5 feet or more over the water level present outside of the shaft.

Drilled Pile Temporary Casing

1. To preclude caving and sloughing into the pile excavation, use temporary casing during pile drilling with an outside diameter no less than the specified diameter of the drilled pile hole.
2. Limit the excavation in advance of the casing tip to no more than 5 feet unless synthetic slurry is being used.
3. During casing extraction, maintain a sufficient level of fluid in the casing to counteract external hydrostatic pressures, but no less than 5 feet of positive head.
4. Maintain an adequate level of concrete within the casing to ensure that fluid trapped behind the casing is displaced upward and discharged at the ground surface without contaminating or displacing the concrete surrounding the pile.
5. Temporary casings that have become bound or fouled during pile construction and cannot be removed are considered a defect.
6. Correct defective piles at no cost to LHTAC or Benewah County.

Drilled Pile Construction

1. Place drilled pile concrete by tremie tube, pump, or other approved method to avoid concrete separation and segregation.
2. Separate the first concrete placed from the fluid in the excavation using a plug in the tube, or other approved device.
3. Maintain a minimum of 10 feet of tremie pipe embedment and continuously place concrete to ensure upward displacement of contaminated concrete.
4. If at any time during placement, it is necessary to temporarily stop or the tremie pipe orifice is removed from the concrete, stop, and restart concrete placement in a manner that ensures that air, water, or other undesirable material is not allowed to be mixed into the concrete or incorporated into the drilled pile.
5. Concrete that is discharged above the rising concrete level in the pile is considered undesirable material.

Asphalt Pavement Construction

1. Reconstruct asphalt pavement sections to a section thickness of 0.35 feet of asphalt meeting ITD Standards, *Section 405* atop 0.70 feet of UTB meeting ITD Standards, *Section 703.04*.
2. Pavement section materials must adhere to the latest ITD Standards, including *Section 405 - Hot Mix Asphalt* including accompanying supplemental specifications and special provisions, *Section 703.04 - Aggregate for Untreated Base, Treated Base and Road Mix*, and ITD Standards, *Section 702.04 - Anti-Stripping Additive*.
3. Plant mix design shall use a minimum of 1/2% of approved anti-strip additive by weight of asphalt meeting ITD Standards, *Section 702.04* and *Section 720.06*.
4. Utilize 1/2-inch, SP-3 PG 64-28 hot mix asphalt or approved equivalent with a unit weight of 146 pcf for density estimates.

Material Requirements

1. Material requirements for backfill reference the latest ITD Standards and are outlined in Table G7.1.
2. There is not a specified aggregate source for this project.
3. Contractor supplied sources are expected for use on this project.
4. Contractor shall coordinate with the Benewah County Highway District for excavation spoil and debris disposal area, if available.

Table G7.1: Backfill Specifications and Allowable Use

Granular Subbase (GSB)	- Over-excavations - Embankment construction outside of GRAB	- Meeting ITD Standards, *Section 703.11, Aggregate for Granular Subbase* - Wet density estimate at 130 pcf
Untreated Base (UTB)	- GRAB applications - GSB applications - Roadway support	- Meeting ITD Standards, *Section 703.04, Aggregate for Untreated Base, Treated Base, and Road Mix* - Wet density estimate at 140 pcf.
Coarse Aggregate for Concrete (CAC)	-Pile boring backfill	- Meeting ITD Standards, *Section 703.02.C - Coarse Aggregate for Concrete (No. 1)* - Wet density estimate at 125 pcf.

Required Compaction

1. Backfill shall not be placed on frozen subgrades or contain particles of frozen soil, mud, snow, or ice.
2. Backfill products must be moisture conditioned to near optimum moisture content prior to compaction.
3. Backfill products for GRAB construction are expected to contain UTB requiring compaction methods referencing ITD Standards, *Class A Compaction*.
4. Any material with greater than 10 percent retained on the 3-inch sieve and 30 percent retained above the ¾-inch sieve is too coarse for AASHTO T 180 density testing, but may be used as backfill. Coarse fill must be compacted using methods outlined in ITD Standards, *Subsection 205.03.G.1 - Class A Compaction* and geotechnical design requirements herein.
5. At a minimum, place all coarse fill in maximum 1.5-foot-thick lifts and compact with 5 complete passes of a minimum 10-ton, vibratory smooth drum or grid roller. Where smaller or lighter compaction equipment is provided, reduce the lift thickness to meet the compaction requirements presented herein.
6. Vibratory rollers shall have a dynamic force of at least 30,000 pounds per impact per vibration and at least 1,000 vibrations per minute. Compact coarse fill to a dense, interlocking, and unyielding surface.
7. Alternatively, a vibratory hoe pack excavator attachment can be used for compaction efforts. Hoe packs shall have minimum 8,000 pounds centrifugal force per impact, at least 2,000 vibrations per minute, and a minimum 6 square-foot-base plate.
8. Compact backfill for this project per Table G7.2 below.

Table G7.2: Required Product Compaction for Designated Project Areas

Project Area	Required Structural Fill Product	Compaction Requirement
- Embankment outside of GRAB, Over-excavations	GSB	95%[A,B]
- GRAB, roadway support course, roadway surfacing	UTB	95%[A]
- Pavement surface	Hot Mix Asphalt	92%[C,D]

Table G7.2 Notes:

A. Relative compaction requirement compared to the maximum dry density of the soil referencing Class A Compaction in ITD Standards and Idaho T-74.

B. Coarse material requires Class A Compaction method specified in ITD Standards *Section 205, Subsection G, Table 205.03-1*.

C. Relative compaction requirement compared to the maximum theoretical density in ITD Standards, *Section 405.03*, *Subsection O* and AASHTO T 209.

D. Asphalt compaction method specified in ITD Standards, *Section 405.03, Subsection O*.

230.09 SPECIAL PROVISION ITEMS

1. If magnesium chloride is applied to Charlie Creek Road as dust abatement, cease application within 300 feet on each side of the bridge.

230.10 REFERENCES

General

- GPI's field exploration, reference sheets GT1, GT4, and GT5
  - o Borings advanced on October 28, 2025
- GPI's laboratory testing, reference sheets GT1 and GT6
- 2020 Idaho Transportation Department (ITD) Materials Manual
- Idaho Transportation Department (ITD) Bridge Design Drawings
- Bridge foundation settlement tolerances
  - o Vertical settlement: 1.0 inch total
  - o Differential settlement: 0.75 inches across abutment footing
- Settlement estimates are unfactored
- Foundation frost depth: 3.0 feet

Field Exploration

- ASTM D420 - Guide to site characterization for engineering, design, and construction
- ASTM D2487 - Test method for classification of soils for engineering purposes (USCS)
- ASTM D2488 - Practice for description & identification of soil (Visual-manual procedure)

Laboratory Investigation

- ASTM D2216 - laboratory determination of moisture content of soil and rock by mass
- ASTM D4318 - Atterberg limits
- ASTM D6913 - particle-size distribution of soils using sieve analysis
- ASTM D7012 - laboratory test method for compressive strength and elastic moduli of intact rock core
- AASHTO T288 - laboratory test method for resistivity of soil
- AASHTO T289 - laboratory test method for pH of soil
- AASHTO T290 - laboratory test method for soluble sulfate content in soil

Bridge Configuration and Loading Criteria

- HMH's bridge loads provided June 6, 2026.
- HMH Charlie Creek Conceptual Bridge Layout dated March 23, 2026

Construction Standards

- 2023 Idaho Transportation Department (ITD) Standard Specifications for Highway Construction (Standards)

Foundation Design Criteria

- 2024 American Association of State Highway and Transportation Officials (AASHTO) Load Resistance Factor Design (LRFD) Bridge Design Specifications (Specifications), 10th Edition
- L-Pile software by Ensoft, Inc. (2022)

ISSUED FOR
☒ DESIGN USE
☐ PRELIMINARY REVIEW
☒ YOUR APPROVAL
☒ REFERENCE
☒ CONSTRUCTION
☒ DESTROY PREVIOUS PRINTS

REV	DATE	DESCRIPTION
3	8/27/26	FINAL
2	7/20/26	95% DRAFT
1	11/20/25	30% DRAFT

CHECK: TJW
FILE: MO23120W
PROJECT:
CHARLIE CREEK ROAD OVER SANTA CREEK
BRIDGE KEY #30091
47.115297° -116.594840°
BENEWAH COUNTY, IDAHO
GEOTECHNICAL ENGINEERING EVALUATION

DRAWN: SSL
DESIGN: SSL
PREPARED FOR:
SCOTT WOOD, P.E.
LHTAC
3330 W. GRACE STREET
BOISE, IDAHO 83703

Intact2

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