SEVENMILE-GOOSEBERRY ROAD

UT PFH 39-1(4)

FINAL GEOTECHNICAL REPORT

Report # UT-FX-0039-10-01

Geotechnical Services Branch
July 2010

SIGNATURE SHEET

Report prepared by: _____

Justin T. Henwood P.E., Geotechnical Engineer

Report reviewed by: _____

Charlie Martinez, Geologist

Approved for distribution by: _____

Matthew DeMarco, Division Geotechnical Engineer

7-20-10

Date

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Project Management
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INTRODUCTION

Project Description

This report presents geotechnical findings and recommendations for the proposed Phase 4 improvements to the Sevenmile Gooseberry Road, also known as Utah Forest Highway (FH) 39. Utah FH 39 begins at the intersection of FH 42 (Fremont River Road) and FH 13 (Fish Lake Road) and proceeds northward for 29.5 miles along Sevenmile Creek and Gooseberry Creek to its junction with Interstate 70, approximately 7 miles east of Salina, Utah. The route is primarily on Federal lands within the Fishlake National Forest in Sevier County. The road is maintained by Sevier County. A project vicinity and site location map are provided in Appendix A.

Originally, this project was divided into three phases. Phase 1 included the northern 13.5 miles and was completed in 2005. Due to program funding and difficult subgrade conditions, only about 4.5 miles of Phase 1 has been paved, with the remaining 9 miles constructed to aggregate base. Phase 2, which is currently under construction, includes the central 5.1 miles. Phase 2 is scheduled for completion in 2009. Phase 3 has been revised to include the paving of approximately 5 miles of Phase 1. Phase 3 is schedule for completion in 2009. Phase 4 will complete the remaining southern portion of the route.

The proposed road reconstruction of Phase 4 will begin at the intersection of FH 42 (Fremont River Road) and FH 13 (Fish Lake Road) and proceed northerly for approximately 9.5 miles to the beginning of Phase 2. The road reconstruction will closely follow the existing road alignment with widening as appropriate to improve safety and minimize impacts. The southern-most section of the roadway alignment within Phase 4 will be realigned to avoid the Sevenmile Creek floodplain. The reconstruction will improve the alignment, grade, and width to the current standards. The project includes grading, surface and subsurface drainage structures, placing aggregate base, and the installation of safety related features necessary to meet current design practice.

Research

As part of this project, the following documents were reviewed to supplement information during our reconnaissance efforts:

- Preliminary (50%) design drawings titled *Plans for Proposed UT PFH 39-1(4), Sevenmile-Gooseberry Road, Fishlake National Forest, Sevier County*, as prepared by the Central Federal Lands Highway Division (May, 2009).
- Technical Memorandum titled *Preliminary Geotechnical Observations, Sevenmile-Gooseberry Road, Station 00+524.971 to 24+000, Utah PFH 39-1(2), Sevier County, Utah*, as prepared by Black Eagle Consulting (May, 2003).
- Geotechnical Report titled *Sevenmile-Gooseberry Road, Phase II, Station 10+010 to 23+654, Utah PFH 39-1(2), Sevier County, Utah*, as prepared by Black Eagle Consulting (May, 2005).

Much of the material contained in the Black Eagle Consulting reports supplements this preliminary geotechnical report. Applicable sections of those reports have been included in an effort to condense separate reports. Preliminary site observations by CFLHD personnel have also been captured in this report. The results and findings of CFLHD subsurface investigations are pending and will be included in a future report. **Station locations within this report that are noted with an asterisk (*) are considered approximate**, as they were converted from previous reports using a different system of units and a slightly different alignment.

Site Description

The subject alignment is located along the Sevenmile Valley within the Fish Lake Mountains. The existing Sevenmile-Gooseberry Road is a maintained gravel road with 4 to 6 inches of aggregate base and ranges in width between 15 feet and 23 feet. The road is maintained by Sevier County. Shallow v-ditches are located on the inboard side of the roadway, and numerous corrugated metal pipe (CMP) culverts are located under the roadway. The majority of the culverts exhibited only minor corrosion at joints and connections, and appeared to be functioning as designed. In a number of areas, the native surface cobbles and boulders are protruding through the existing road surface. Much of the existing alignment sits in minor cuts and fills at or near the original ground elevation. Cuts and fills of up to 12 feet in height or more exist in a few isolated areas. Cut and fill slopes generally exist at 1V:2H slope ratios. The average roadway grade along the centerline from the end of the alignment at Fremont River Road to the Notch-Lost Creek Divide at the top of the "Switchbacks" is approximately 0.3 percent, with a maximum elevation of 10,531 feet at the Divide and a minimum elevation of 8,661 feet at the intersection with Fremont River Road.

A number of potential springs are located within the proposed alignment, as indicated by lush grass and some surface seeps. Additional wet areas beyond those identified may also become apparent during normal or heavy precipitation years or during the early to late spring months during snowmelt and runoff.

Project Setting and Climate

The project site is located approximately 25 miles southeast of Richfield, UT. The area surrounding the subject route consists of mountains and lowlands with valley drainages. The vegetation consists primarily of sagebrush/grass on low relief foothills and flats with scattered pinyon pine and juniper. With increasing elevation, the vegetation shifts to dense stands of aspen, spruce, and fir trees. Dense riparian vegetation lines the banks of most streams and tributaries.

In the Fish Lake Mountains, summers are relatively cool and winters are cold and snowy. Temperatures are moderated by the relative elevation of the area, with high temperatures reaching above 80° F and low temperatures around 0° F.

Mean annual precipitation in the project area varies from 12 to 20 inches, most of which falls as snow between October and April. The surrounding mountains receive up to 30 inches of precipitation per year. About 75 percent of this precipitation is snowfall that provides year-round runoff to lower elevations. The existing roadway is closed to vehicular travel during the winter and spring months, when run-off saturates the roadway

base. The spring closures are intended to minimize rutting of the roadway under saturated conditions.

Regional and Site Geology

The project site is located in the High Plateaus section of the Colorado Plateau physiographic province. The alignment is located along Sevenmile Valley within the Fish Lake Mountains. This area within central Utah has been shaped by both tectonic activities and glaciation. The general geology of this area in the Fish Lake Mountains consists of Tertiary undifferentiated latite and basaltic andesite flows, shale, mudstone, colluvial deposits, and landslide deposits.

The published map, "Geology of the Salina Quadrangle, Utah (Williams and Hackman, 1971)," shows the roadway alignment mapped as Quaternary undifferentiated colluvial deposits, including talus, slope wash, and landslide deposits. Above 7,000 feet, the alignment subgrade consists of well-weathered and eroded till and landslide depostis of pre-Bull Lake age. The alignment also crosses or is adjacent to Tertiary undifferentiated latite and basaltic andesite flows.

Hardy and Muessig (1952) mapped much of the Fish Lake Plateau crossed by the alignment as a thick series of lava flows with sedimentary rocks of Tertiary age appearing beneath the flows along the northern edge of the plateau and along the eastern margin of Sevenmile Valley near Mt. Terrell. The alignment through Sevenmile Valley also passes along the edge of several large glacial moraines..

Generally, preliminary exploration and reconnaissance along the proposed alignment encountered similar materials as those described above. The proposed alignment generally crosses through two major soil types: 1) clayey sand with gravel to silty, clayey sand with gravel in Sevenmile Valley, and 2) lava flow rubble associated with lava flow in Sevenmile Valley. The Sevenmile Valley clayey sand with gravel was generally described as dry to moist, medium dense to dense and exhibited low to medium plasticity. The Sevenmile Valley silty, clayey sand was generally described as moist, loose to medium dense, and exhibited low plasticity to non-plastic characteristics. The lava flow rubble was generally described as dense, hard, volcanic cobbles and boulders to 3 feet in diameter that also contains a scattered clayey sand with gravel matrix.

Groundwater was present in a few drainages during the reconnaissance efforts. Groundwater in the area is mainly derived from spring snowmelt infiltration. Many of the springs are likely fed by snowmelt infiltration transported at shallow depths along the contact between overburden soils and bedrock or along the contact between landslide deposits and the underlying materials. These types of springs typically seep intermittently at the surface after the spring thaw or shortly after heavy precipitation, but can produce water year-round, depending on the amount of annual precipitation. Springs that produce water during dry months are often derived from long-term infiltration of precipitation that is captured in more permeable layers at depth. The springs become evident where the permeable layer is exposed at the ground surface. These types of springs are usually less affected by seasonal variations than by long-term variations in precipitation.

Regional and Local Seismic Setting

The local vicinity of the project site is not traversed by any faults, although there are

several faults located within 25 miles (northeast and southwest). These faults are shown crossing Quaternary deposits as concealed faults and probably do not have Quaternary movement. No evidence of faulting was observed during site reconnaissance. No additional fault hazard mitigation is considered necessary for the proposed alignment since no critical structures are planned for construction.

Geologic Hazards

Ground motions caused by an earthquake are influenced not only by the distance from the fault planes, but also by the geology found at the site. Amplified ground motions are not expected at the project site due to the relative distance from faults.

Based on the review of available geologic maps for the area and on geologic units observed during site reconnaissance, the roadway alignment is generally underlain by medium dense to dense clayey and granular soils, and very dense volcanic materials. As a result, the relative densities of these materials give an indication that the liquefaction potential of these materials is minimal.

One landslide area has been documented directly adjacent to the proposed alignment near Station 465+00. The landslide area is characterized as a translation slide, transforming into a debris flow near the lower extents. A translational slide is a slide in which the landslide mass moves along a planar surface with little rotation or tilting. A debris flow is a form of rapid mass movement in which a combination of loose soil, rock, air, and water combine to form a slurry that flows downslope. Debris flows are commonly caused by intense surface water flow, due to heavy precipitation or rapid snowmelt. No tension cracks or other evidence of recent movement were observed during the site reconnaissance; however, reactivation may occur during seismic events in years with normal to above average precipitation. This landslide is adjacent to the northern edge of a dense forest in Sevenmile Valley and is characterized by a hummocky appearance and the presence of scattered aspen trees along indistinct boundaries of the landslide. In addition, several young aspen trees are growing in the landslide surface. The landslide is approximately 230 feet wide near the alignment and extends upslope an undetermined distance.

A debris flow has been identified near Station 80+00, originating in the mountain range to the east of the proposed alignment. This debris flow occurred approximately 5 years ago as a result of a forest fire. The fire stripped much of the vegetation from the mountainside and a subsequent heavy precipitation event carried a significant amount of sediment toward the roadway, stopping short of the existing or proposed alignment. The debris flow channel has been stable in recent years due to the revegetation of the burn area. Due to the steep slopes and the relative thick mantle of soil present in this mountain range, additional debris flows may occur in the future and will most likely be triggered by above average precipitation events.

Significant rockfall hazards are associated with areas that exhibit lava flow rubble and cut slopes greater than 1V:1H. These slopes will exhibit continual raveling of both coarse and fine debris, as these slopes are unstable in terms of surficial stability. For these reasons, it is recommended that significant cut slopes be avoided in areas of lava flow rubble.

PROCEDURES AND RESULTS

Preliminary Subsurface Investigation

A preliminary subsurface investigation program was conducted in September, 2002, by Black Eagle Consulting. A series of 17 test pits were excavated in shoulder areas along the proposed roadway alignment. Surface examination was performed in inaccessible areas, in particular near the Sevenmile Creek realignment. Test pits were used for all roadway exploration. All test pits were excavated using a Case 580E rubber tire backhoe. The maximum depth of exploration was 10.5 feet below the existing ground surface, although practical refusal was often encountered at shallower depths due to the presence of boulders.

In addition, a subsurface investigation program was conducted within the materials source adjacent to Gates Lake Road in June, 2004. The material source is located approximately 0.9 miles west of Station 525+00. A total of five core holes, labeled BP-1 through BP-5, were advanced using an NQ-size core barrel and a track mounted CME 850 drill rig. The maximum depth of exploration was 20 feet below existing grade.

A subsequent subsurface investigation program was conducted in August, 2009 by CFLHD Geotechnical personnel, in an effort to supplement the information gathered during the initial investigation completed by Black Eagle Consulting. Eleven test pits were excavated at various locations along the proposed roadway alignment. The test pits were excavated using a Catepillar 416B rubber tire backhoe. The maximum depth of exploration was 6.0 feet below the existing ground surface, although practical refusal was often encountered at shallower depths due to the presence of boulders.

As part of the August, 2009 subsurface investigation program, five borings were also completed within the materials source adjacent to Gates Lake Road. The borings were completed in an effort to provide subsurface information for a possible expansion of the materials source. A total of five borings, labeled B-101 through B-105, were advanced using an HQ-size core barrel and a track mounted CME 850 drill rig provided by HazTech Drilling. The maximum depth of exploration was 40 feet below existing grade.

In addition, two borings, B-1 and B-2, were completed using hollow stem augers and a track mounted CME 850 drill rig provided by HazTech Drilling. These borings were completed at the proposed location of a large cut slope, between Station 437+00 and Station 445+00. The maximum depth of exploration was 15.5 feet below existing grade.

Locations of the test pits and borings are shown on the Geologic Map and Boring Location Plans in Appendix B. The test pit and boring logs have been included in Appendix C. Test pit and boring locations in Appendix B are considered approximate, as they were converted from the 30% alignment which utilized metric stationing. The location noted on the test pit and boring logs in Appendix C are metric stationing from the 30% alignment.

An engineering technician examined and classified all soils the field in general accordance with ASTM D 2488. Ground water levels and seeps were recorded where encountered. Bulk samples for index testing were collected from test pit sidewalls at specific depths in each soil horizon and returned to the laboratory for testing. Additional soil classification was subsequently performed in accordance with ASTM D 2487 upon completion of laboratory testing.

Upon completion of exploration, each test pit and boring was backfilled and compacted to the extent possible with the equipment used. The disturbed ground surface was reclaimed by grading the immediate area relatively flat and placing certified weed-free straw mulch.

In addition to the test pit exploration, three bulk surface material samples were obtained from a bedrock outcrop in the Gates Lake pit, which is located approximately 0.9 miles west of Station 525+00. The bedrock consists of a latite to basaltic andesite.

Water and soil samples were also collected at various locations along the proposed alignment for use in chemical testing to evaluate the potential to corrode buried steel or concrete structures.

Geologic mapping along the alignment was performed to identify surficial geologic units, anticipated subgrade materials, landslides, and other geologic hazards which could impact the design and construction of the roadway. Geologic mapping consisted of identifying major surficial geologic units and their spatial distribution within the mapped alignment area. During geologic mapping, landslide areas and obvious springs and seeps were also mapped, in addition to zones of scattered boulders and cobbles.

Laboratory Testing

At the conclusion of the fieldwork, index tests were conducted on 13 soil samples recovered from completed test pits. Laboratory tests on the samples included gradation (AASHTO T-88) and Atterberg limits (AASHTO T-89, T-90). Results of these tests were used to classify the soils according to ASTM D 2487 and to verify field logs, which were then updated as required. Classification in this manner provides an indication of the soil's mechanical properties. A summary of the test results is contained in Table 1. Index test results are represented in Appendix D.

Table 1. Index Test Summary.

Test Pit No.	Station	Sample Depth (ft)	%<200	LL	PI	Moisture Content (%)	Classification
TP-28	77+24*	3.9	20.3	19	1	4.3	SM
TP-27	101+84*	3.9	27.3	26	9	8.1	SC
TP-26	127+75*	3.0	18.1	NV	NP	5.7	SM
TP-26	127+75*	4.9	31.6	21	4	9.7	SC-SM
TP-25	154+32*	3.9	28.5	23	9	7.0	SC
TP-23	206+80	3.6	30.0	23	10	6.3	SC
TP-22	232+05*	5.6	32.9	34	15	13.1	GC
TP-21	259+28*	4.9	43.0	42	26	16.6	SC

Table 1 Cont. Index Test Summary.

Test Pit No.	Station	Sample Depth (ft)	%<200	LL	PI	Moisture Content (%)	Classification
TP-19	308+50*	2.0	53.4	47	30	13.9	CL
TP-17	364+24*	2.0	15.5	24	9	4.7	GC
TP-15	412+78*	3.0	45.0	49	32	12.4	SC
TP-14	441+32*	2.6	26.2	24	10	8.5	SC
TP-13	471+50	3.6	45.6	39	24	11.5	SC

Notes: NP – Non-plastic
NV – No Value

Six unconfined compression tests (ASTM D 2938) were performed on representative core samples obtained during exploration drilling of the Gates Lake Road materials source. The tests were performed to determine the unconfined compressive strength of bedrock materials. During the test, an axial load is continuously applied and increased on the sample until a peak load and failure is observed. A summary of the test results are provided in Table 2. Results of the unconfined compression testing are contained in Appendix D.

Table 2. Unconfined Compression Test Summary.

Sample Location	Boring	Sample Depth (ft)	Material Description	Compressive Strength (psi)
Gates Lake Pit	BP-3	7.4	Basalt	12,650
Gates Lake Pit	BP-4	1.3	Basalt	23,100
Gates Lake Pit	B-102	15.0-20.0	Basalt	7,080
Gates Lake Pit	B-102	20.0-25.0	Basalt	13,900
Gates Lake Pit	B-104	5.0-10.0	Basalt	20,070
Gates Lake Pit	B-105	5.0-10.0	Basalt	17,890

Nine point load tests (ASTM D 5731) were performed on representative samples of native materials obtained during exploration drilling of the Gates Lake Road materials source. The tests were performed by subjecting the sample to an increasingly concentrated load until failure occurred. The measured load at failure is used to calculate the point load strength index and to estimate the uniaxial compressive strength of the sample. A summary of the test results are provided in Table 3. Results of the point load testing are contained in Appendix D.

Table 3. Point Load Test Summary.

Sample Location	Boring	Sample Depth (ft)	Material Description	Gauge Failure Load (psi)	Compressive Strength (psi)
Gates Lake Pit	BP-1	9.8	Basalt	3,030	29,630
Gates Lake Pit	BP-2	9.2	Basalt	2,340	22,960
Gates Lake Pit	BP-2	14.1	Basalt	3,225	31,450
Gates Lake Pit	BP-3	8.9	Basalt	3,000	29,360
Gates Lake Pit	BP-3	15.8	Basalt	2,585	25,360
Gates Lake Pit	BP-4	2.3	Basalt	3,290	32,070
Gates Lake Pit	BP-4	11.8	Basalt	3,050	29,840
Gates Lake Pit	BP-5	9.2	Basalt	1,150	11,220
Gates Lake Pit	BP-5	2.0	Volcanic Breccia	195	2,620

Samples of the latite to basaltic andesite bedrock material proposed for use as an aggregate material source were initially crushed and processed to generate a Class D aggregate base material. The resulting material was then subjected to durability index tests (AASHTO T-210) on both the fine and the course fractions, Los Angeles abrasion tests (AASHTO T 96), sodium sulfate soundness loss tests (AASHTO T 104), and fractured faces determinations to determine if the proposed material would satisfy the specifications for aggregate base. A summary of the test results is contained in Table 4. Aggregate test results are contained in Appendix D.

Table 4. Aggregate Test Summary.

Sample Location	Sample Depth (ft)	Material Description	LA Abrasion (%)	Fractured Faces	Durability		Sodium Sulfate Soundness Loss (%)
					Fine	Coarse	
Gates Lake Pit	Surface	Volcanic	22	100	81	75	1.7
Gates Lake Pit	Varies	Volcanic	25	NT	NT	90	0.0

In addition, samples of the basaltic bedrock material recovered during the August, 2009 subsurface investigation program proposed for use as an aggregate material source were laboratory crushed to minus 1.5 inch material before testing. The resulting material was then subjected to specific gravity tests (AASHTO T 85), absorption tests (AASHTO T 85), Los Angeles abrasion tests (AASHTO T 96), durability index tests (AASHTO T-210), and sodium sulfate soundness loss tests (AASHTO T 104) to determine if the proposed material would satisfy the specifications for aggregate base. A summary of the test results is contained in Table 5. Aggregate test results are contained in Appendix D. Based on the

test results, the material within the Gates Lake material source meets the durability requirements for subbase, base, and surface course aggregate, as contained in Section 703 of the FP-03.

Table 5. Aggregate Test Summary.

Sample Location	Sample Depth (ft)	Material Description	LA Abrasion (%)	Fractured Faces	Durability		Sodium Sulfate Soundness Loss (%)
					Fine	Coarse	
Gates Lake Pit	Surface	Volcanic	22	100	81	75	1.7
Gates Lake Pit	Varies	Volcanic	25	NT	NT	90	0.0

One composite sample of bedrock core from the Gates Lake material source was tested to determine the suitability of this material for use as riprap. A summary of the test results are contained in Table 6. Riprap test results are provided in Appendix D. Based on the test results, the material within the Gates Lake material source meets the durability requirements for riprap, as contained in Section 705 of the FP-03.

Table 6. Riprap Test Summary.

Sample Location	Sample Depth (ft)	Material Description	Durability		Apparent Specific Gravity	Absorption, %
			Fine	Coarse		
Gates Lake Pit	Varies	Volcanic	N/A	90	2.66	2.80

A total of eleven Resistance value tests (R-value, AASHTO T 190) were performed on representative samples of subgrade soils. R-Value testing is a measure of subgrade strength and expansion potential and is used in the design of flexible pavements. A summary of the test results is contained in Appendix 7. R-Value test results are provided in Appendix D. The range of R-values along this route are indicative of soft to medium dense, low to moderate plasticity soils. These soils generally serve as fair to good subgrade soils.

Table 7. R-Value Test Summary.

Test Pit No.	Station	Sample Depth (ft)	Soil Classification (USCS)	R-Value
TP-28	77+24*	3.9	SM	36
TP-27	101+84*	3.9	SC	14
TP-26	127+75*	3.0	SM-SC	13
TP-25	154+32*	3.9	SC	24

Table 7 Cont. R-Value Test Summary

Test Pit No.	Station	Sample Depth (ft)	Soil Classification (USCS)	R-Value
TP-23	206+80*	3.6	SC	14
TP-22	232+05*	5.6	GC	16
TP-21	259+28*	4.9	SC	<5
TP-19	308+50*	2.0	CL	<5
TP-17	364+24*	2.0	GC	27
TP-15	412+78*	2.6	SC	<5
TP-14	441+32*	2.6	SC	12

One expansion test (AASHTO T 258) was performed on a sample of native clay soil remolded to 90 percent relative compaction at optimum moisture content to determine the materials' expansion potential and corresponding amount of swell. A summary of the test result is contained in Table 8. Expansion test results are provided in Appendix D.

Table 8. Expansion Test Summary.

Test Pit No.	Station	Sample Depth (ft)	Soil Classification (USCS)	Expansion (%)
TP-13	471+50*	3.9	SC	8.5

Twelve geochemical tests were performed on representative material samples to evaluate their potential to corrode buried steel structures and concrete. Testing for resistivity and pH were performed in general accordance with AASHTO T 288 and T 289, respectively. A summary of the test results is provided in Table 9. Geochemical test results are contained in Appendix D. In general, the tested soils from the project sites exhibited low potential to corrode buried steel or degrade concrete structures.

Table 9. Geochemical Test Summary.

Sample Designation	Station	pH	Conductivity (micromhos/cm)	Resistivity (ohm-cm)	Sample State	Corrosion Potential to Steel
TP-28	77+24*	6.67	132	7,900	Soil	Moderate
Water	167+00*	7.01	110	9,090	Aqueous	Moderate
Water	226+00	7.63	66	15,151	Aqueous	Mild
Water	244+00	7.95	200	5,000	Aqueous	Moderate
TP-21	259+28*	5.65	270	2,800	Soil	Moderate

Table 9 Cont. Geochemical Test Summary.

Sample Designation	Station	pH	Conductivity (micromhos/cm)	Resistivity (ohm-cm)	Sample State	Corrosion Potential to Steel
Water	269+50	7.93	170	5,882	Aqueous	Moderate
Surface	294+40	6.91	286	6,600	Soil	Moderate
Water	309+00	8.03	160	6,250	Aqueous	Moderate
Surface	309+00	6.91	192	6,100	Soil	Moderate
Water	373+00	8.08	180	5,556	Aqueous	Moderate
Water	413+00	7.68	200	5,000	Aqueous	Moderate
TP-14	441+32*	5.47	62	16,000	Soil	Mild

Notes: (1) – Tests for sulfates and chlorides are not required when the pH is between 6.0 and 8.0 and the resistivity is greater than 5000 ohm-cm per the FP-03.
(*) – Station locations are considered approximate.

Findings

Test pits conducted as part of each subsurface investigation program generally encountered dry to moist, medium dense to dense clayey sand with gravel exhibiting low to medium plasticity. Underlying the clayey sand at various depths was lava flow rubble. The lava flow rubble was generally described as dense, hard, volcanic cobbles and boulders to 3 feet in diameter within a clayey sand and gravel soil matrix. Bedrock was not encountered during test-pitting along the proposed alignment. Groundwater was not encountered during exploration of the test pits along the proposed alignment. Groundwater levels can vary significantly due to climatic or seasonal effects.

Borings conducted in the Gates Lake Road material source generally encountered grey basalt that was described as severely weathered and moderately hard. The basalt was generally encountered near the ground surface and extended to the borehole termination, which ranged from a depth of 20 to 40 feet below the ground surface.

Site Inspection

In an effort to supplement the subsurface investigation program, site reconnaissance was performed by Central Federal Lands Geotechnical personnel on June 23 and 24, 2009, and again on July 8 and 9, 2009. The site inspection was conducted to familiarize CFLHD personnel with the project site and prepare a preliminary site investigation plan for additional subsurface investigations. Many of the recommendations that follow stem from the recent site reconnaissance efforts, as well as recommendations made in preliminary geotechnical reports, as prepared by Black Eagle Consulting.

RECOMMENDATIONS AND SUMMARY

General Information

The proposed roadway improvements for this project are feasible if the geotechnical constraints are mitigated as summarized by the information contained in this report. The proposed alignment is underlain by variable fine-grain to granular materials that are considered poor to average roadway support materials, respectively. Areas of subexcavation will be necessary as outlined in the **Site Preparation** section. Depending on precipitation levels prior to construction, roadway subgrade soils may be well above optimum moisture levels and require stabilization as described in the **Site Preparation** section. Cut materials may also require significant moisture conditioning prior to subsequent placement as roadway embankment material. Permanent cut slopes should be constructed in accordance with the preliminary recommendations contained in the **Slope Stability** section. Adequate surface and subsurface drainage features should be installed as described in the **Site Drainage** section. Mass grading operations are discussed in the **Grading Requirements** section.

Site Preparation

Clearing and grubbing should be performed in accordance with Section 201 of the FP-03. Based on conditions encountered during the preliminary subsurface investigation average topsoil stripping depths should be anticipated as indicated in Table 10.

Table 10. Anticipated Topsoil Depths.

Station	Anticipated Depth (in)
10+00 to 200+00	8
200+00 to 250+00	10
250+00 to 300+00	12
300+00 to 520+00	8

In general, it is not anticipated that any areas of difficulty will be encountered during the clearing and grubbing operation, although cobbles and boulders are intermittently present near the ground surface along the entire length of the proposed alignment.

As noted previously, clay soils underlie minor portions of the alignment. The clay soils were classified as moist to wet, stiff to very hard, and exhibited medium to high plasticity characteristics. These materials were classified as CL and CH according to the USCS, and A-6 and A-7 according to AASHTO classification. Laboratory testing performed on these materials indicates the clays soils exhibit plasticity indices which are indicative of moderately to highly expansive soils. These soils are also considered poor roadway support materials. Granular soils will also be encountered throughout the alignment and are considered average roadway support materials.

Based on preliminary roadway design elevations and laboratory test results, subexcavation

and/or stailization of very poor subgrade soils may be necessary in the areas identified in Table 11. Subexcavation at these locations is required to place the desired thickness of blanket drain without affecting the vertical profile of the alignment. Subexcavation should be performed to the depth required to ensure that a minimum of 24 inches of suitable backfill (blanket drain) will exist below the structural pavement section, excluding the aggregate base layer. Placement of cut material from these areas, as well as sources of suitable backfill, should be placed as outlined in the **Grading Requirements** section. In addition, a contingent quantity of subexcavation (approximately 20% of planned subexcavation) should be added to the project in the event that additional areas requiring subexcavation are encountered during construction.

Table 11. Anticipated Subexcavation Areas.

Station (Approximate)
161+00 to 166+00
185+00 to 190+00
185+00 to 195+00
222+00 to 223+50
248+00 to 252+50
270+00 to 274+00
290+00 to 300+00

When clay soils are present at subgrade elevations that will be covered by embankment fill, the clay soils should be scarified to a depth of 6 inches, moisture conditioned to 2 percent under to 2 percent over optimum moisture content, and compacted to 95 percent relative compaction. The moisture level will decrease the magnitude of shrink-swell movements in the upper 6 inches of the clay. The high moisture content must be maintained by periodic surface wetting, or other methods, until the surface is covered by, at least, one lift of fill. Where existing aggregate base will be covered by embankment fill, the aggregate base should be compacted to 95 percent relative compaction. In all cases, the final surface should be smooth, firm, and exhibit no signs of deflection.

Surface soils may be well above optimum moisture content and impossible to compact in proximity to springs and/or seeps in the locations identified above. Other areas could also exhibit high moisture contents if wet weather or spring/early summer construction is anticipated. The extent of these areas may be considerably more extensive following a wet winter. In some situations, moisture conditioning may be possible by scarifying the top 12 inches of subgrade and allowing it to air dry to near-optimum moisture, prior to compaction. Where this procedure is ineffective or where construction schedules preclude delays, mechanical stabilization will be necessary. Mechanical stabilization may be achieved by subexcavation and/or placement of an initial 12 to 24 inch lift of 12 inch minus, well graded, angular rock. Additional lifts of rock may be necessary to achieve adequate stability, depending on the conditions present and the type of equipment used to place the stabilizing fill.

In several locations along the route, the proposed alignment crosses boulder fields

comprised of lava flow rubble. Individual boulders within the fields vary significantly in size, from approximately 1 to 6 feet in diameter. Prior to embankment construction across the boulder fields, the void spaces present, which have been estimated at approximately 30 to 40 percent by volume, should be filled by spreading a three-inch minus, ¾-inch-plus crushed aggregate across the surface of the boulder field and vibrating the aggregate into the voids using large vibratory equipment until a minimum thickness of 2 feet of crushed aggregate is present atop the boulder field. The standard 12 inches of select borrow can be included in the 2-foot minimum thickness, where the crushed aggregate lies directly beneath the select borrow. A Type I-B geotextile should be placed between the crushed aggregate and select borrow or roadway embankment to prevent material loss. Specific locations of the crushed aggregate embankment are detailed in Table 15 of the **Site Drainage** section. Mechanical picking of boulders will likely be necessary to construct the embankment through the boulder fields. Significant cuts are not recommended in the boulder fields due potential rockfall hazards.

Grading Requirements

Due to the limited amount of local borrow sources or waste areas, and to maximize cut to fill balance on this project, it is anticipated that the majority of roadway excavation will be used in the construction of roadway embankments. Isolated areas of subexcavation of clay soils, as outlined in the Site Preparation section, will be necessary. Clay soils excavated in these areas should be placed as backfill in the base of deep fills to be constructed on relatively level ground. No clay soils should be placed within 24 inches of the finished grade. Saturated granular materials can be placed as embankment material in thin lifts after allowing it to air dry prior to compaction.

An aggregate material source is located approximately 0.9 mile west of Station 525+00, and adjacent to Gates Lake Road. The material source was used to produce aggregate base and select borrow for the Phase 2 project. Laboratory testing performed on representative samples of material from this latite to basaltic andesite bedrock source indicates the material present would satisfy base aggregate specifications and most likely hot asphalt concrete pavement aggregate specifications for both fine and coarse aggregate. The material source should satisfy the majority of aggregate base and select borrow requirements, and possibly the hot mix asphalt concrete aggregate requirements.

Since native surficial materials include clay soils that are prone to failure when saturated and overlain by embankment fill, all fill placed on slopes should be keyed into existing materials. The benches should be of sufficient width to accommodate placement and compaction operations and equipment. The bench should be sloped in conjunction with embankment layer construction. Each horizontal cut should begin at the intersection of original ground and the vertical cut of the previous bench.

Rockfall and raveling hazards are present along the proposed alignment due to oversteepened cut/fill slopes. Rockfall hazards present in areas containing lava flow rubble are substantial on oversteepened cutslopes. Therefore, significant cut slopes are not recommended through portions of the route crossing lava flow rubble. Raveling hazards present along the balance of the alignment can most likely be addressed during final design and construction by adjusting slope ratios.

Care should be taken to ensure the proposed roadway improvements provide adequate vertical clearance between the base of the proposed improvements and any existing

culverts to remain in the area. Any fill placed on top of existing culverts should be done so as not to damage the existing culvert. In all cases, the finished surface should be smooth, firm, and show no signs of deflection. Grading should not be performed with or on frozen soils.

Subsidence, Shrinkage, and Expansion

Subsidence of granular soils and stiff to hard clay soils exposed in cuts should be negligible. Table 13 provides an estimate of anticipated levels of shrinkage of native materials when excavated and recompacted as embankment fill.

Table 13. Shrink-Swell Summary.

Station	Shrink-Swell Factor
10+00 to 27+00*	0.9
27+00* to 46+00*	0.85
46+00* to 168+00*	0.9
168+00* to 184+00*	0.85
184+00* to 262+00*	0.9
262+00* to 266+00*	0.85
266+00* to 520+00*	0.9

Portions of the roadway alignment are underlain by materials that exhibit a high fines content. Such materials are susceptible to frost heave. The frost penetration depth for this area is approximately 30 inches. As a result, the roadway subgrade could experience some amount of frost heave during the winter months; however, the amount would be dependent on numerous factors that include, but are not limited to, depth of snow pack, the amount of moisture in the subgrade, and the amount of fines in the soils. Although some amount of frost heave will most likely be experienced on this project, the costs associated with complete mitigation are prohibitive in relation to the type of roadway to be constructed and potential costs associated with isolated areas of remediation.

Slope Stability

A landslide feature was observed during site reconnaissance at approximate Station 465+00. No tension cracks or other signs of recent movement were noted during inspection of the feature. The proposed alignment crosses the lower extents of the ancient landslide feature. Construction of the proposed alignment is not expected to negatively impact the landslide feature and reactivate slope movement. It is recommended that the proposed alignment stay within the limits of the existing roadway or move slightly downslope through this area.

Significant cut and fill slopes could be constructed as part of this project. Slope ratio configurations of 1V:2H generally provide adequate stability in the types of materials

encountered during the preliminary site exploration. Allowable slope ratios for the materials encountered along the proposed alignment are contained in Table 14.

Table 14. Allowable Slope Ratios.

Station	Allowable Cut/Fill Slope Ratio (V:H)
10+00 to 27+00*	1:2
27+00* to 46+00*	1:1.5
46+00* to 168+00*	1:2
168+00* to 520+00*	1:1.5

Site Drainage

The proposed alignment is located in an area and at an elevation receiving significant precipitation amounts, the majority of which is stored as snowpack which melts and runs off in the spring. As a result, significant amounts of moisture are introduced into this area during a relatively short amount of time. Therefore, adequate surface and subsurface drainage improvements should be installed as a part of this project to maximize roadway performance.

Adequate surface drainage should be provided away from all structural improvements. Ponding of water on finish grade or at the edge of pavements should be prevented by proper grading. Drainage ditches should be constructed at the edge of the roadway along all uphill cut slopes and should drain to culverts to be installed as a part of this project. Where the existing roadway will remain above any realigned portions, the existing roadway could preclude proper drainage. As a result, proper drainage, including rounding of slope crests, should be provided in such areas.

Depending on the season of construction, local spring/seep areas may require both drainage and/or stabilization for placement of roadway fills and proper performance of overlying pavement sections. Subsurface drainage features should be installed in such areas to minimize saturation of cut/fill slopes and maximize slope stability. Table 15 outlines areas requiring subsurface drainage controls that could be determined in the field, to the extent possible, based on the gross test pit interval and recognizable surface seeps.

Table 15. Anticipated Subsurface Drainage Requirements.

Station (Approximate)	Drain Feature Type
25+50 to 27+10	Crushed aggregate embankment (Boulder Field)
28+10 to 29+90	Crushed aggregate embankment (Boulder Field)

Table 15 Cont. Anticipated Subsurface Drainage Requirements.

Station (Approximate)	Drain Feature Type
30+75 to 30+85	Crushed aggregate embankment (Boulder Field)
31+60 to 35+70	Crushed aggregate embankment (Boulder Field)
37+40 to 37+70	Crushed aggregate embankment (Boulder Field)
43+40 to 44+00	Crushed aggregate embankment (Boulder Field)
161+00 to 166+00	Blanket Drain
166+00 to 172+00	Crushed aggregate embankment (Boulder Field)
178+00 to 181+00	Crushed aggregate embankment (Boulder Field)
185+00 to 190+00	Blanket Drain
215+50 to 221+50	Underdrain
222+00 to 226+00	Blanket Drain
248+00 to 252+50	Blanket Drain
252+50 to 263+00	Underdrain
264+30 to 267+00	Underdrain
267+00 to 274+00	Blanket Drain
290+00 to 300+00	Blanket Drain
300+30 to 303+00	Underdrain
308+75 to 310+50	Blanket Drain
348+20 to 350+50	Blanket Drain
393+00 to 399+00	Underdrain
409+00 to 413+00	Underdrain
494+00 to 501+00	Underdrain

Geocomposite underdrains can be considered for use in underdrain applications, as appropriate. Each area should be evaluated with respect to its particular site constraints to determine the most appropriate underdrain alternate. A minimum 8-inch-diameter corrugated polyethylene (CPE) pipe should be used for underdrains. Underdrain backfill should consist of granular backfill; while blanket drain backfill should consist of permeable material.

A well-graded rock fill is recommended in areas in which the proposed alignment crosses boulder fields containing lava flow rubble. This fill is discussed in more detail in the **Site Preparation** section. The well graded rock fill will function much like a blanket drain and allow drainage to flow beneath the roadway embankment, such that it will not impound water.

Areas of seepage, in addition to those noted in Table 15, may be encountered during construction depending on the precipitation levels preceding construction. The identified areas are anticipated to be saturated during normal years. Additional wet areas to those identified may become apparent during normal or heavy precipitation years. Table 15 provides an estimation of approximate locations of springs/seeps that may affect performance of the road. The type of drainage system and the linear extent of drains to be installed should be determined during construction when precise locations of springs/seeps are known.

Buried Steel Structures

Resistivity tests have been performed on representative samples of native soils and groundwater, and the results indicate the site soils and groundwater are moderately corrosive to buried steel structures, as noted in the Laboratory Testing section. As a result, buried steel structures should be designed to resist impacts due to this moderately corrosive environment.

Construction Considerations

The delineation and segregation of clay soils that will require subexcavation could be difficult. The presence of large boulders in volcanic rubble deposits have the potential to make excavation difficult in areas underlain by these materials. Significant seepage in noted areas should be anticipated and will make subgrade preparation more difficult. Dewatering in these areas will most likely be necessary.

DISCLAIMER/LIMITATIONS CLAUSE

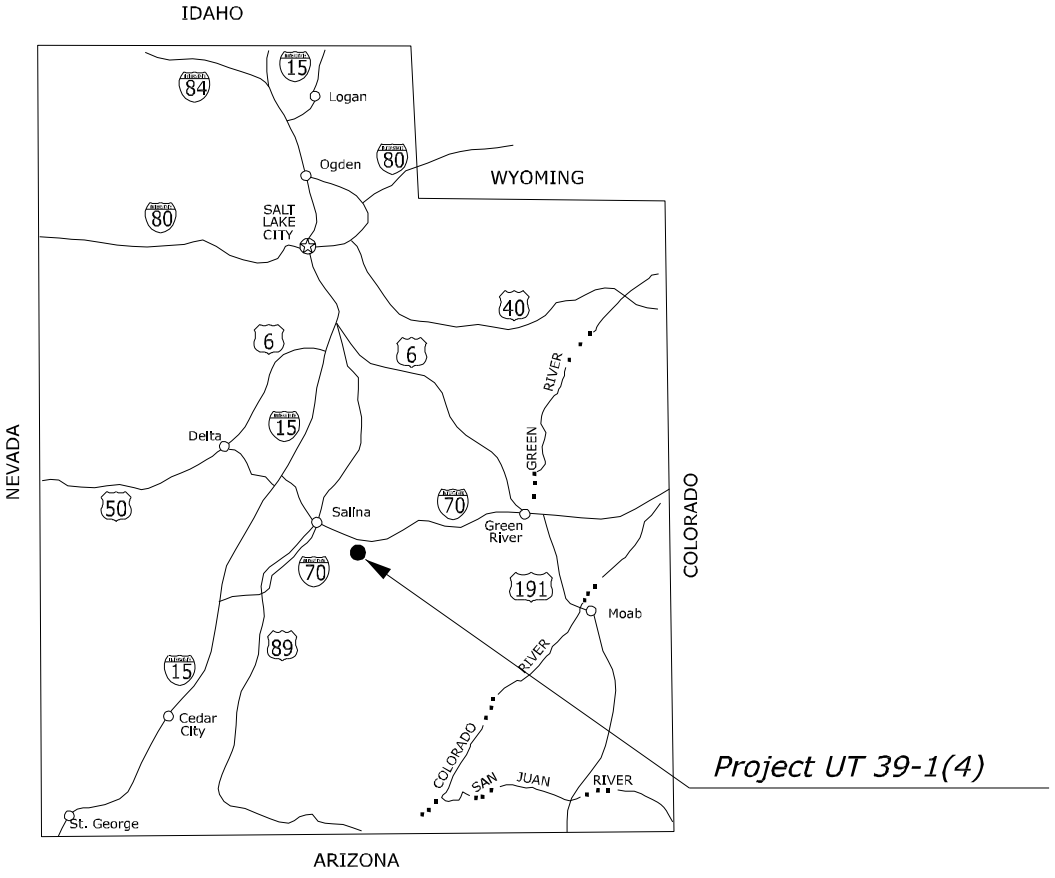
The subsurface explorations and tests described in the section on Procedures and Results have been conducted in accordance with standard practices and procedures (except as specifically noted). The results of these explorations and tests represent conditions at the specific locations indicated. Subsurface conditions between these locations may vary. The Recommendations section in this report includes interpretations and recommendations developed by the Government in the process of preparing the design. These interpretations are not intended as a substitute for the personal investigation, independent interpretation, and judgment of the Contractor.

REFERENCES

Hardy, C.T. and Muessig, S., 1952, *Glaciation and Drainage Changes in the Fish Lake Plateau, Utah,* Bulletin of the Geological Society of America, v. 63, p 1,109-1,116.

Williams, P.L. and Hackman, R.J., 1971, *Geology of the Salina Quadrangle, Utah,* U.S. Geological Survey Miscellaneous Geologic Investigations Map I-591-A.

APPENDIX A – Figures



KEY MAP OF UTAH

$$$$DATE$$$$ $TIME$ $$$$DGN$$$$

U.S. DEPARTMENT OF TRANSPORTATION FEDERAL HIGHWAY ADMINISTRATION CENTRAL FEDERAL LANDS HIGHWAY DIVISION LAKEWOOD, COLORADO	FIGURE 1 PROJECT VICINITY MAP	REG	STATE	PROJECT	SHEET NO.	TOTAL SHEETS
		8	UT	PFH 39-1(4)	1	1

REG	STATE	PROJECT	SHEET NO.	TOTAL SHEETS
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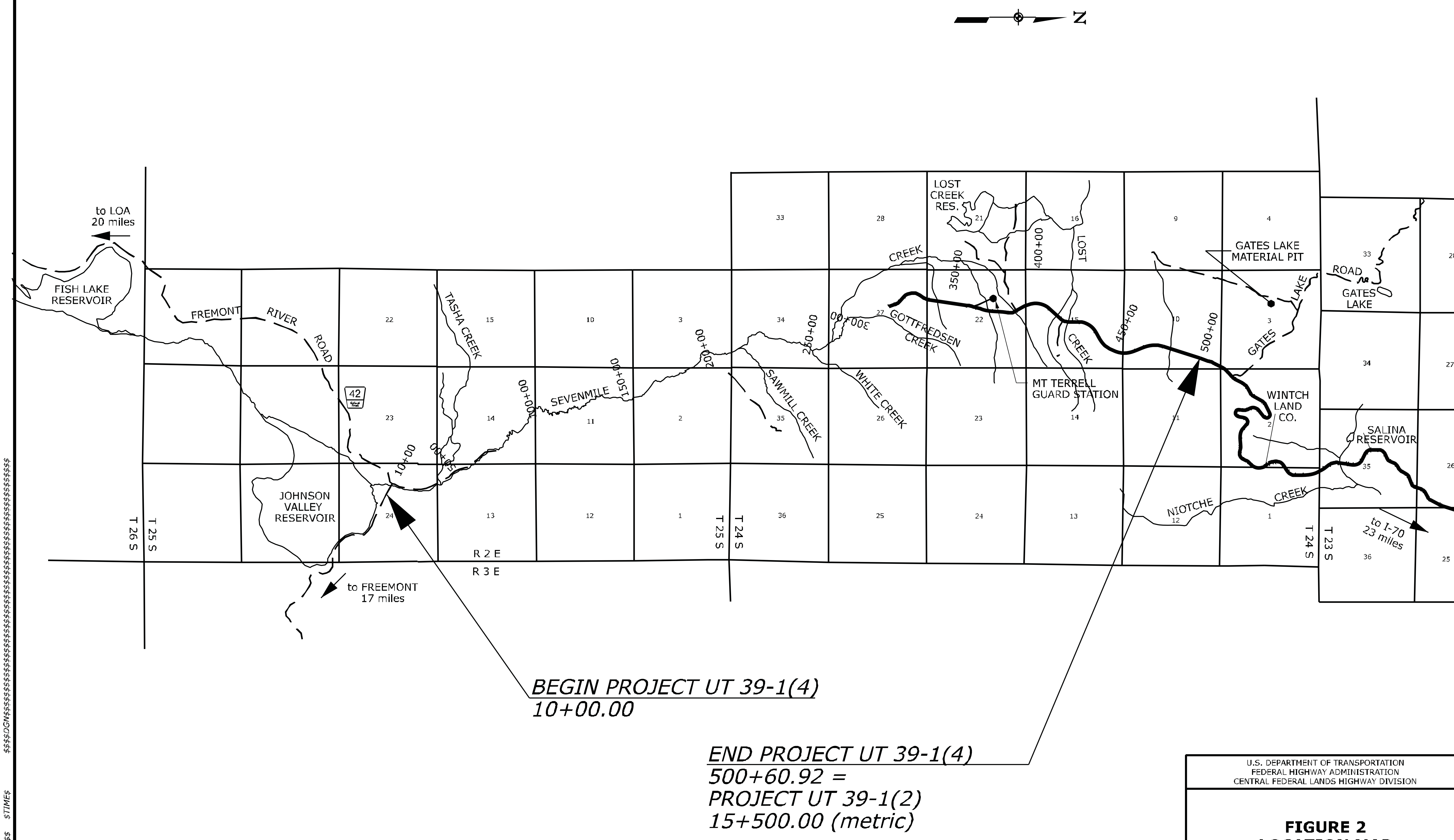

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FIGURE 2
LOCATION MAP

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APPENDIX B – Geologic Map

REG	STATE	PROJECT	SHEET NO.	TOTAL SHEETS
8	UT	UT PFH 39-1(4) SEVENMILE GOOSEBERRY	1	19

Geologic Map Unit Descriptions

Lava flow rubble - Typically hard to very hard, grey to black, and composed of sub-angular to sub-rounded cobble to boulder sized blocks in excess of 4 ft. in diameter. Lava flow does not contain a soil matrix.

Clayey Sand with Gravel (Vicinity of Sevenmile) - Typically loose to medium dense, brown to dark brown, low to medium plasticity, has variable percentages of fines, sand, and gravel. Grades into and contains zones of silty, clayey sand with gravel. Unit also contains scattered surface volcanic cobbles and boulders.
(Station 10+00 to 25+00)
(Station 65+00 to 503+00)

Volcanic Rubble and Clayey Sand with Gravel (Vicinity of Sevenmile Creek Realignment) - Typically highly variable unit composed of lava flow rubble and clayey sand with gravel, both as a matric and as distinct, but variable zones.
(Station 25+00 to 65+00)

Legend

Subexcavation Areas- Wet or Saturated Zones

Landslide Area

Soil/Water geochemical sample

Spring

Test pit, approximate location

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CENTRAL FEDERAL LANDS HIGHWAY DIVISION

SEVENMILE-GOOSEBERRY ROAD
UTAH PFH 39-1(4)

GEOLOGIC MAP

REG	STATE	PROJECT	SHEET NO.	TOTAL SHEETS
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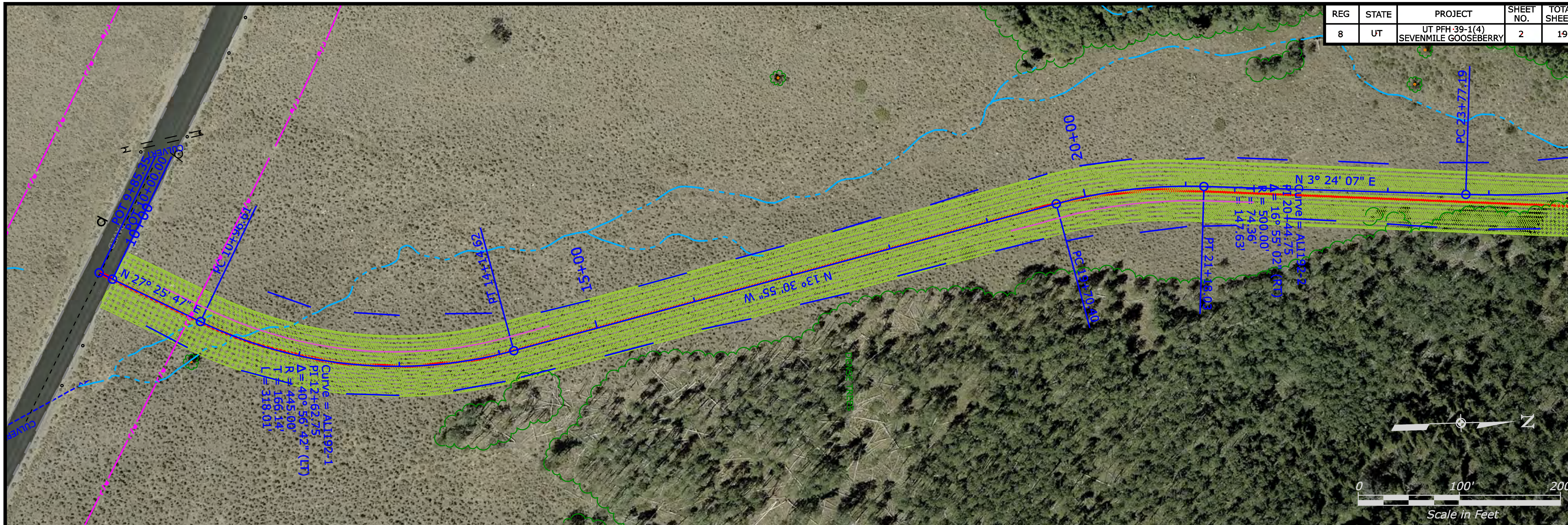

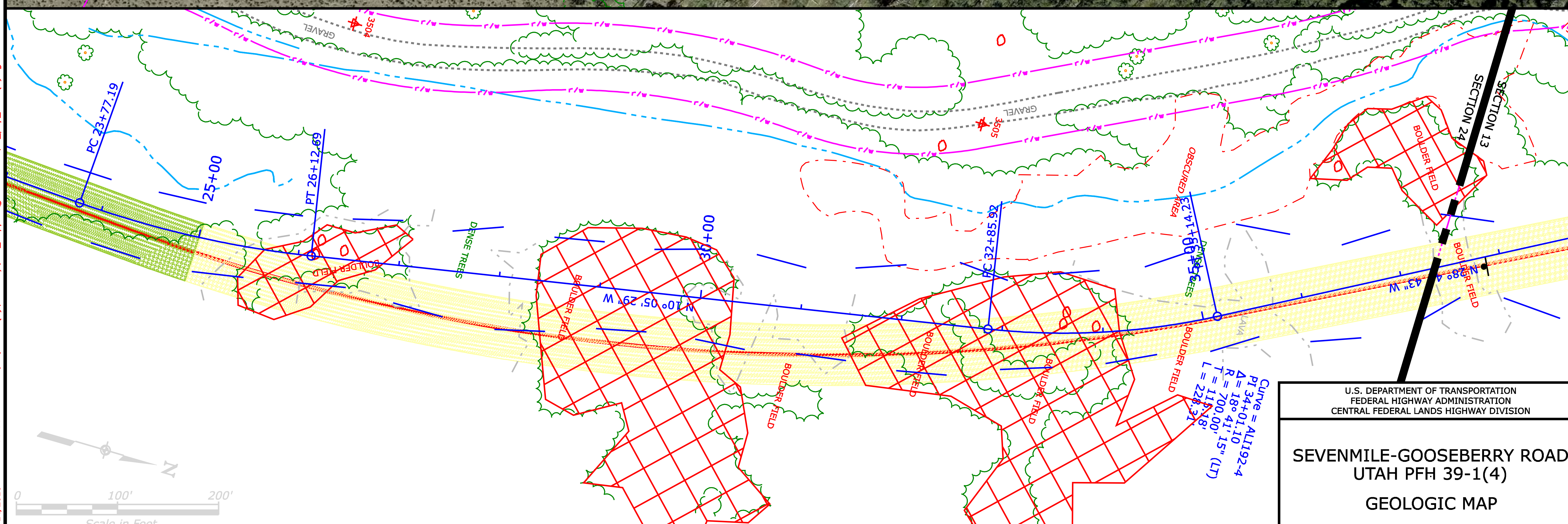

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SEVENMILE-GOOSEBERRY ROAD
UTAH PFH 39-1(4)

GEOLOGIC MAP

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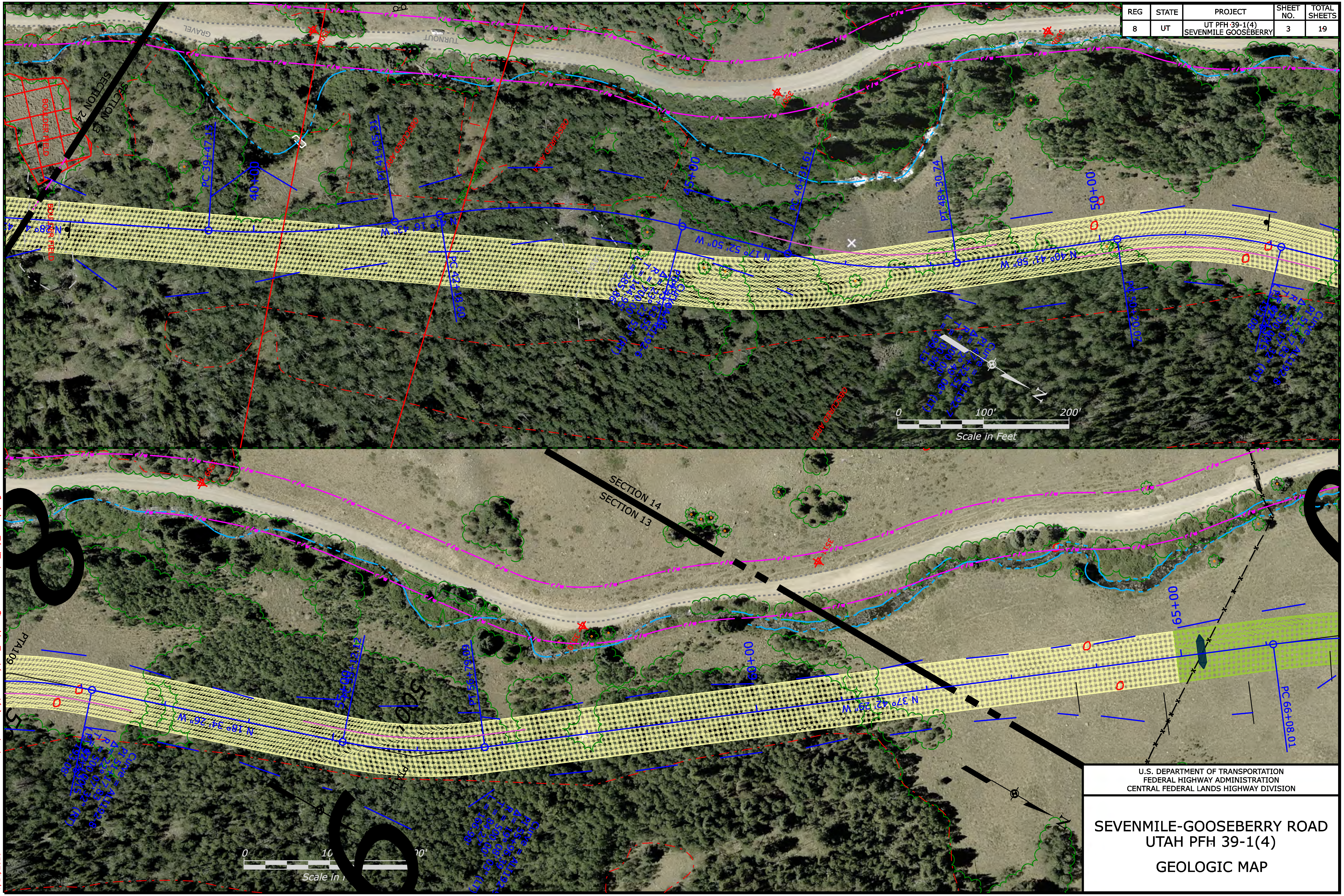

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SEVENMILE-GOOSEBERRY ROAD
UTAH PFH 39-1(4)
GEOLOGIC MAP

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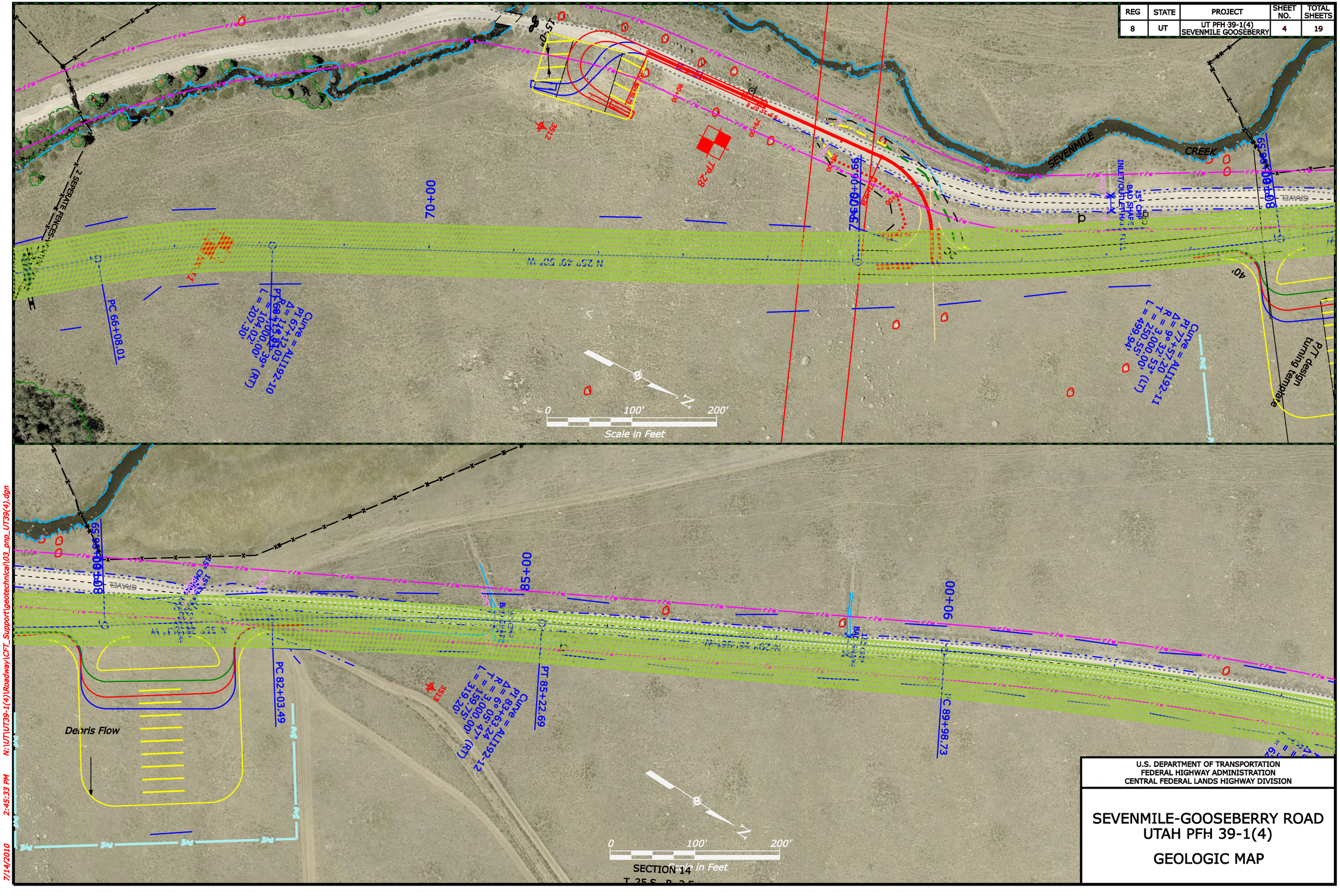

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SEVENMILE-GOOSEBERRY ROAD
UTAH PFH 39-1(4)

GEOLOGIC MAP

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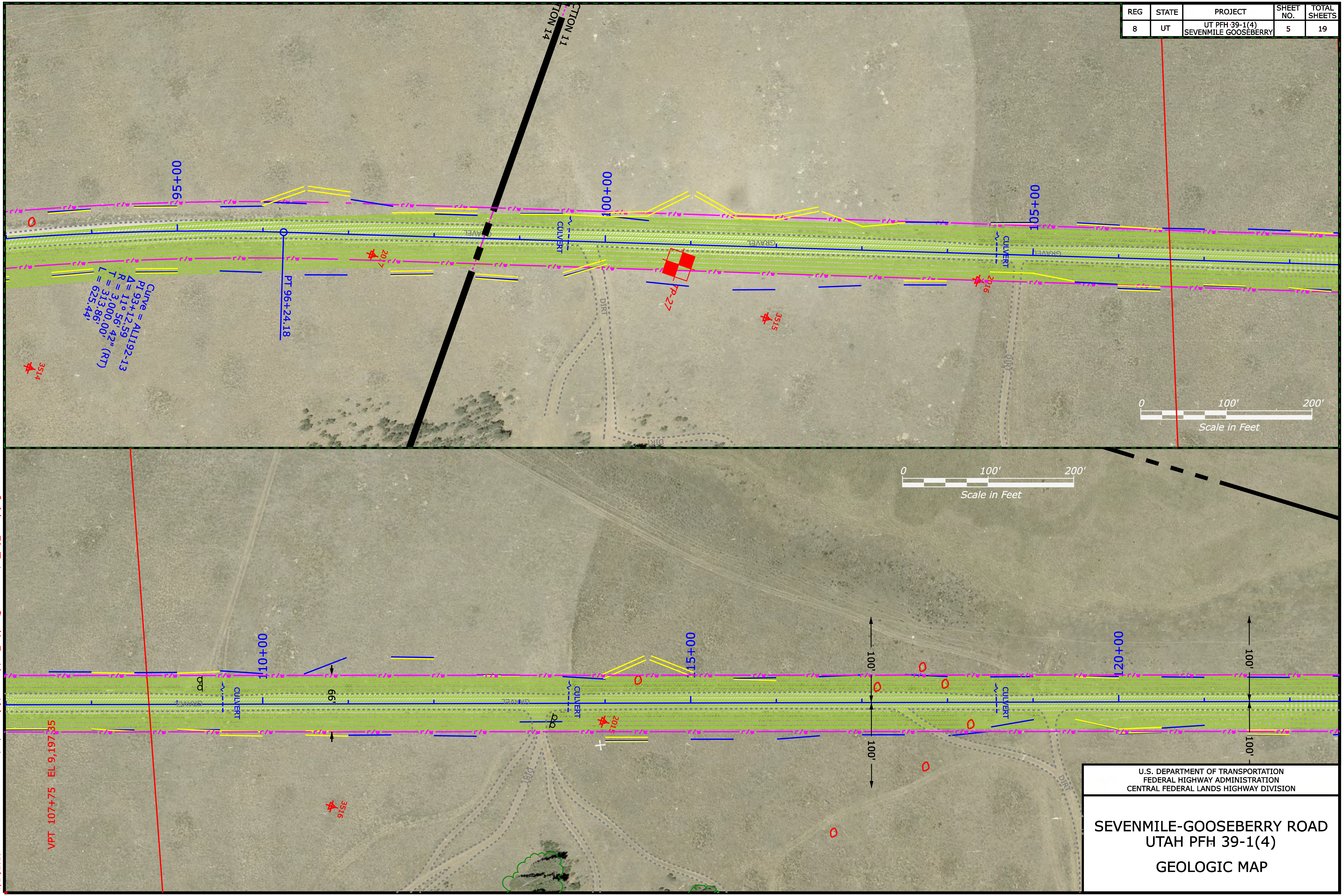

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SEVENMILE-GOOSEBERRY ROAD
UTAH PFH 39-1(4)
GEOLOGIC MAP

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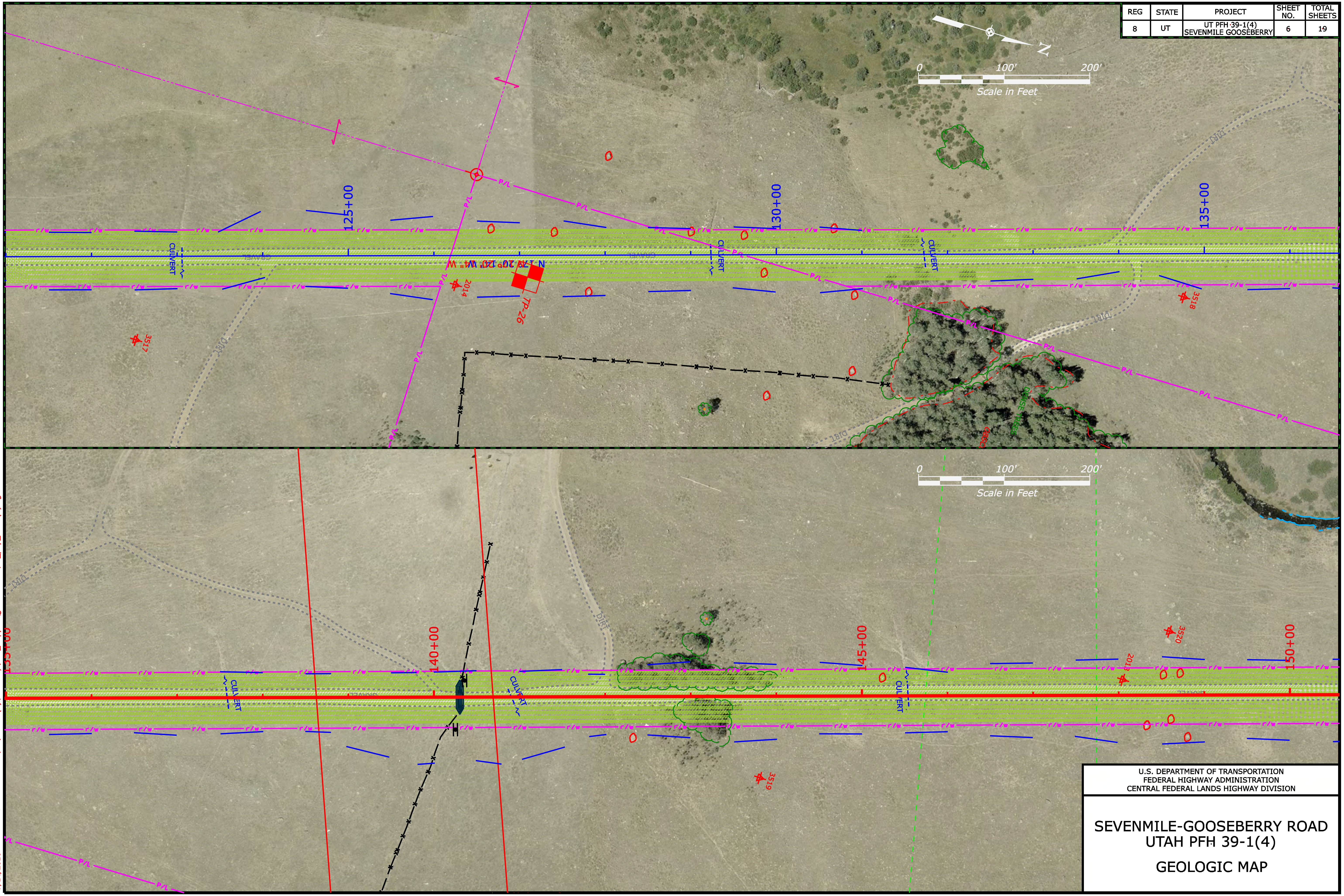

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SEVENMILE-GOOSEBERRY ROAD
UTAH PFH 39-1(4)
GEOLOGIC MAP

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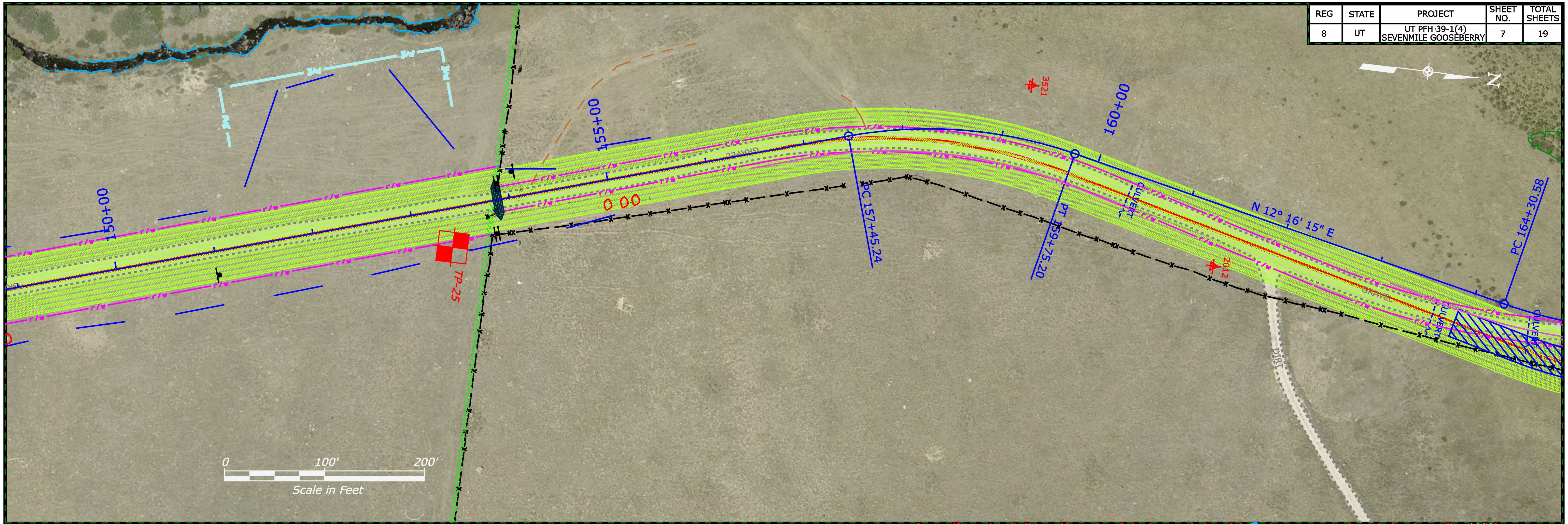

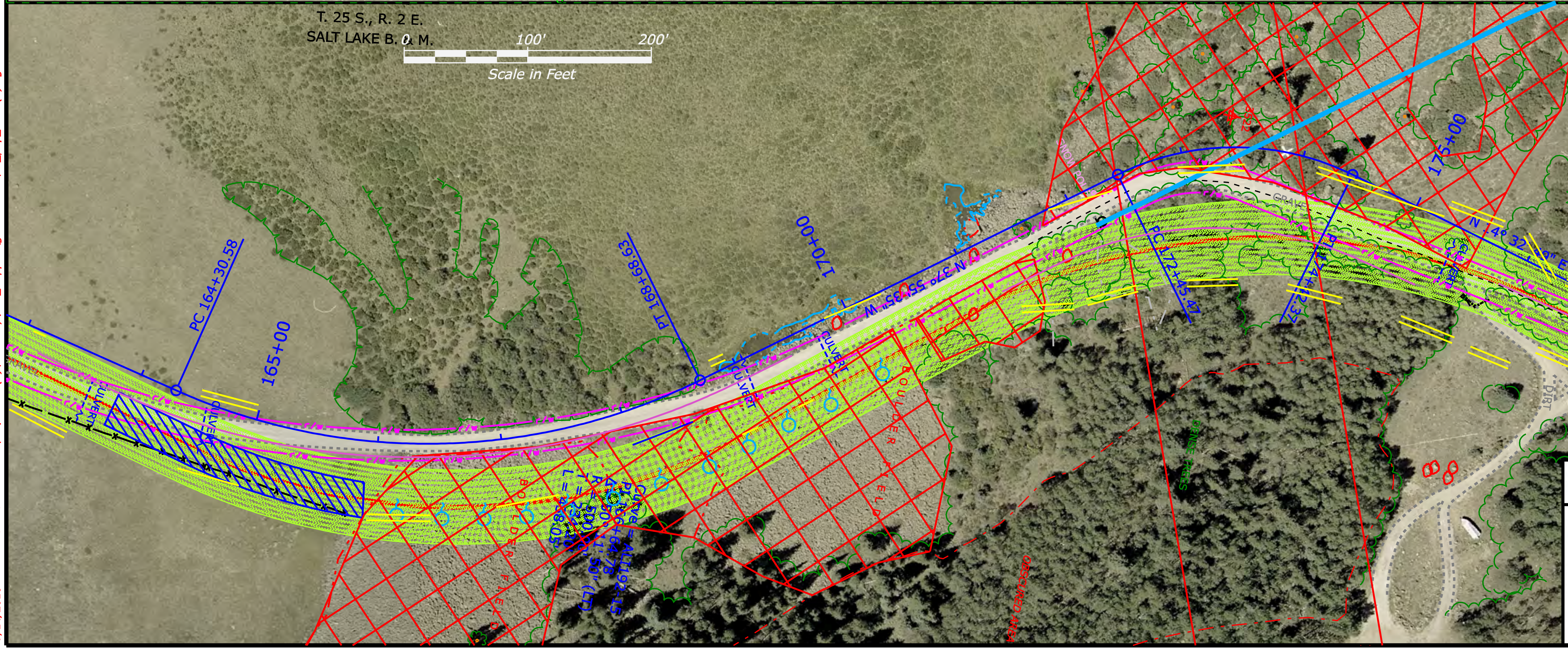

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SEVENMILE-GOOSEBERRY ROAD
UTAH PFH 39-1(4)

GEOLOGIC MAP

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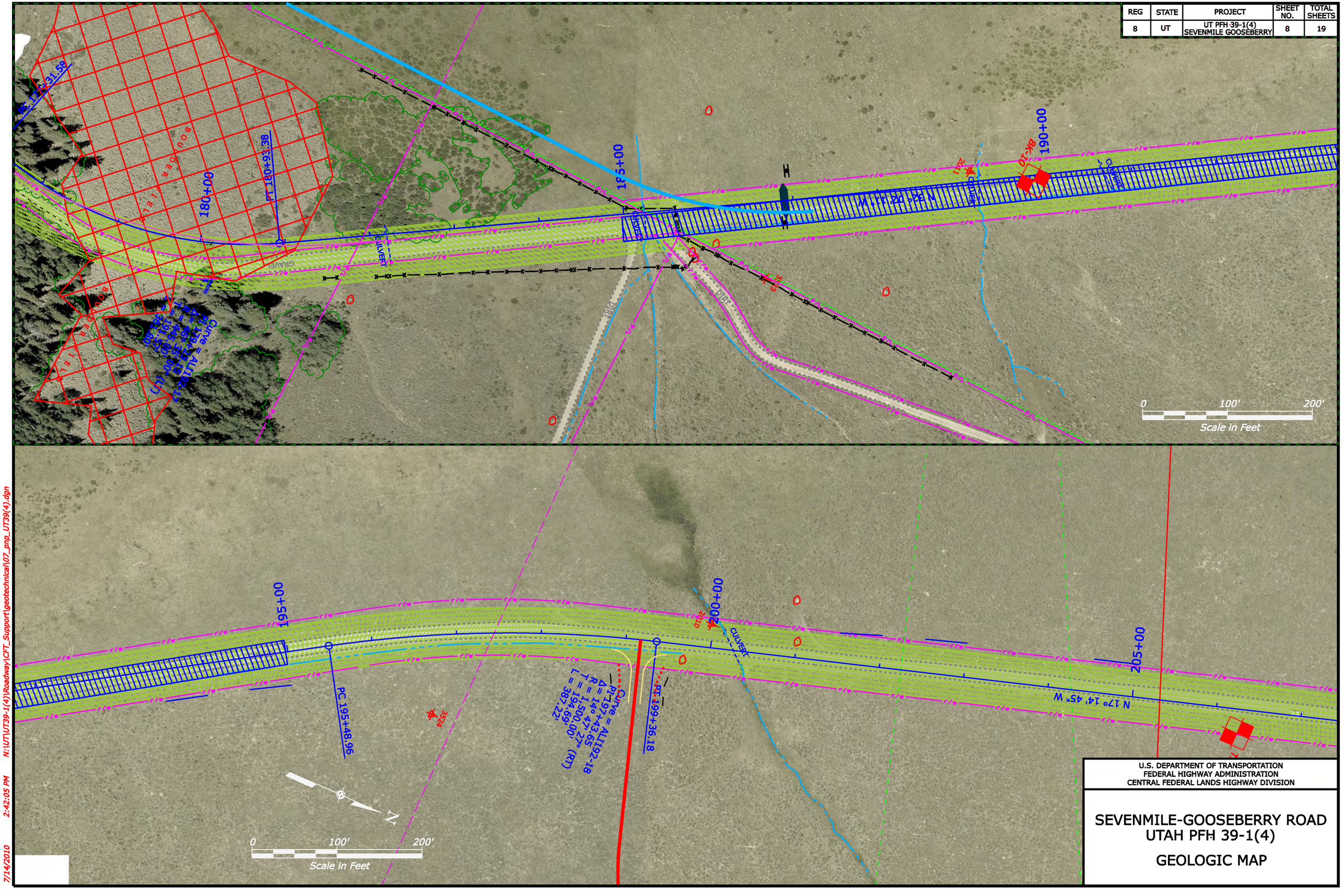

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SEVENMILE-GOOSEBERRY ROAD
UTAH PFH 39-1(4)

GEOLOGIC MAP

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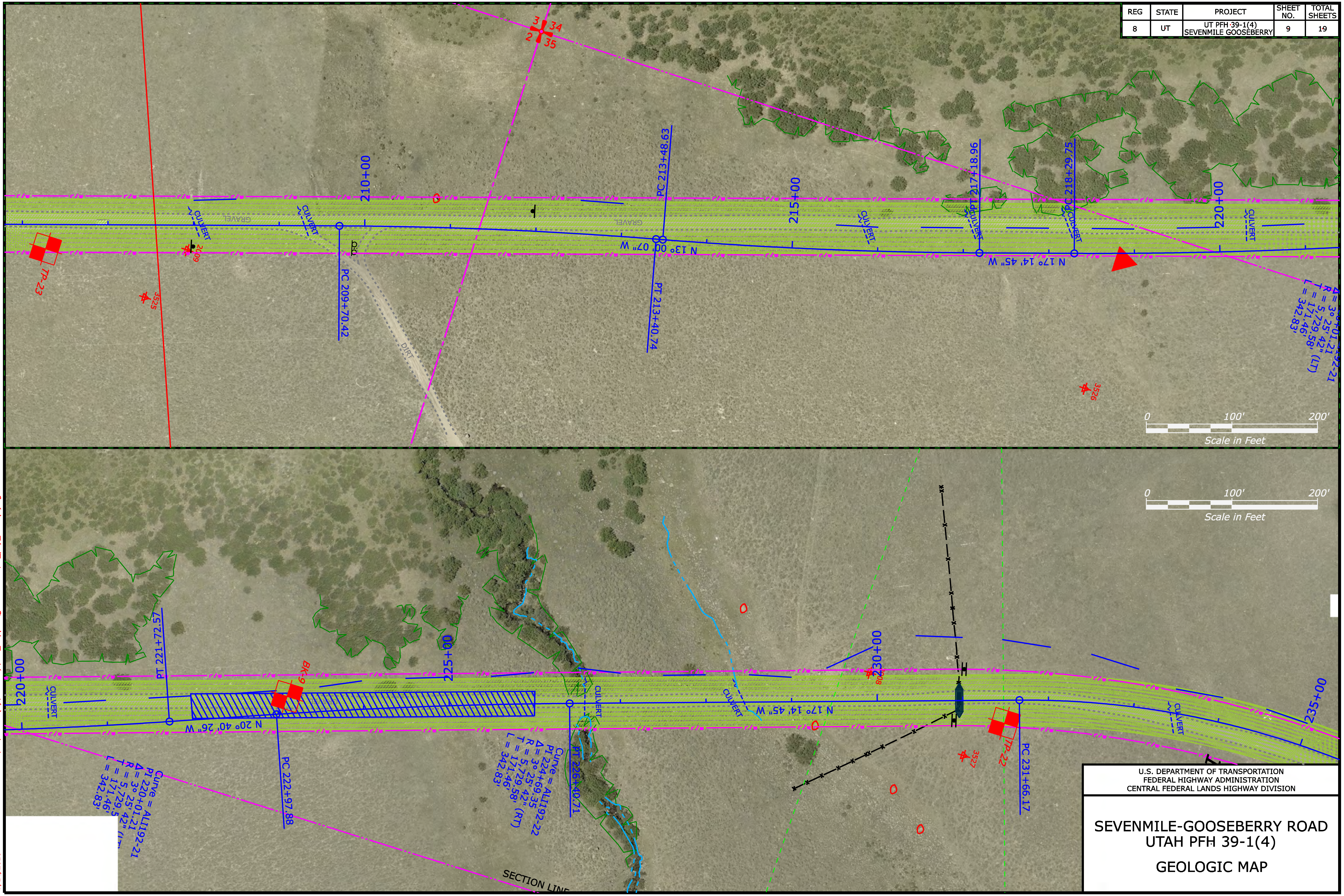

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SEVENMILE-GOOSEBERRY ROAD
UTAH PFH 39-1(4)
GEOLOGIC MAP

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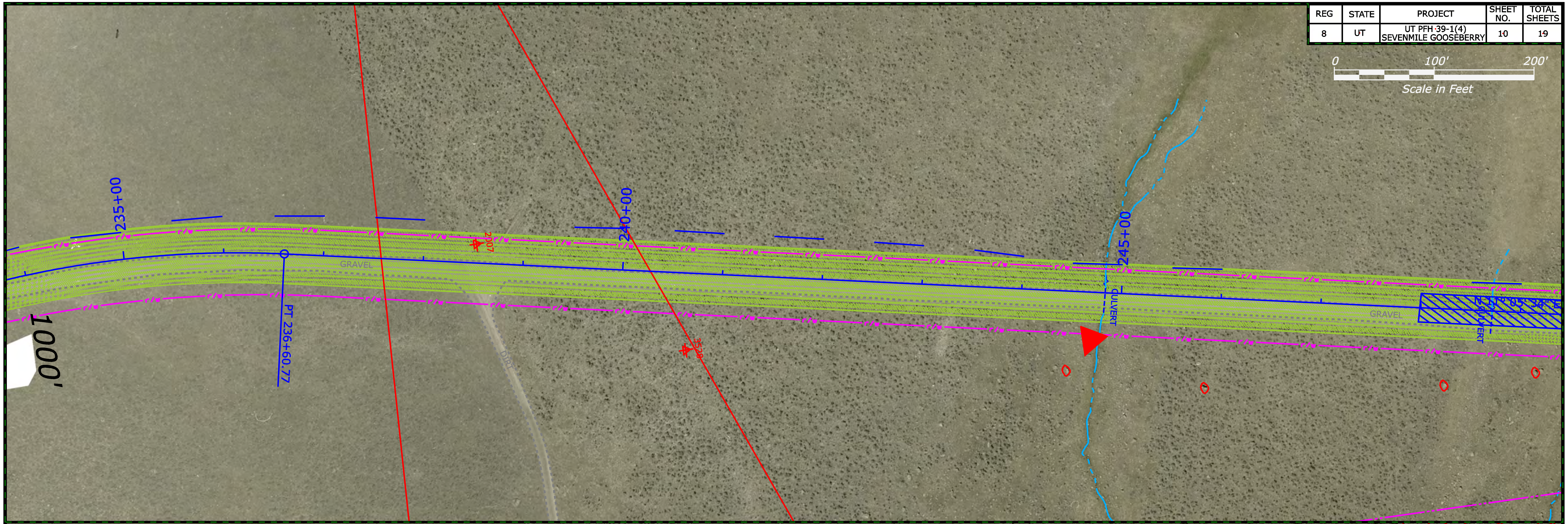

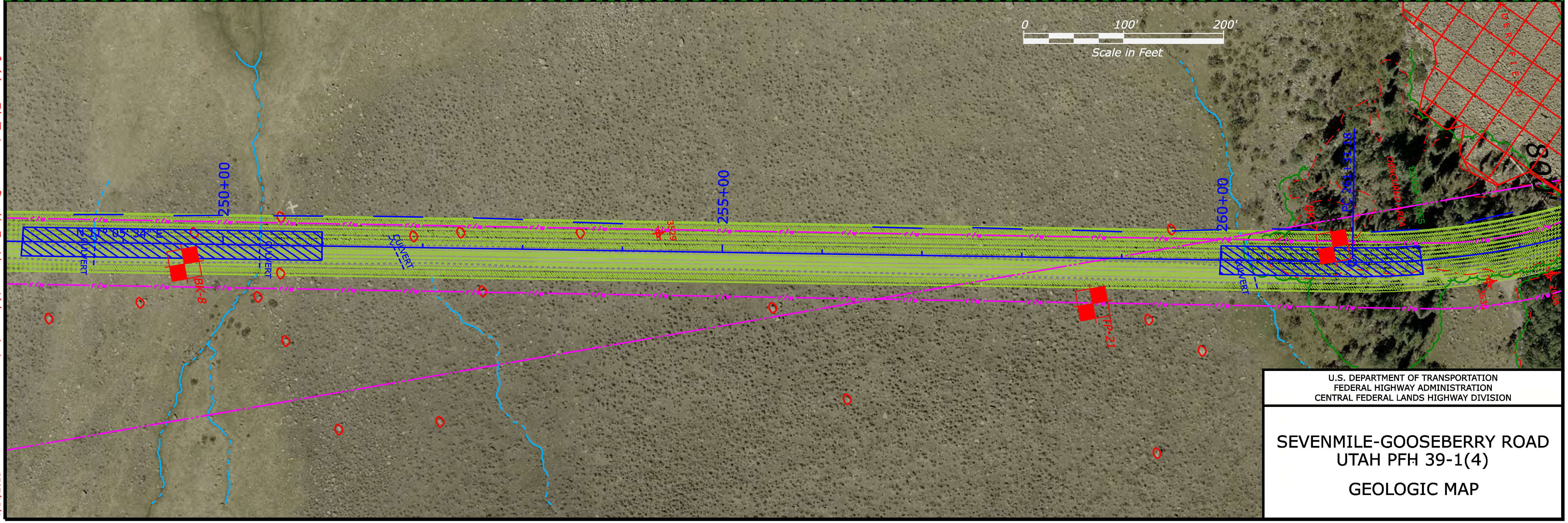

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SEVENMILE-GOOSEBERRY ROAD
UTAH PFH 39-1(4)

GEOLOGIC MAP

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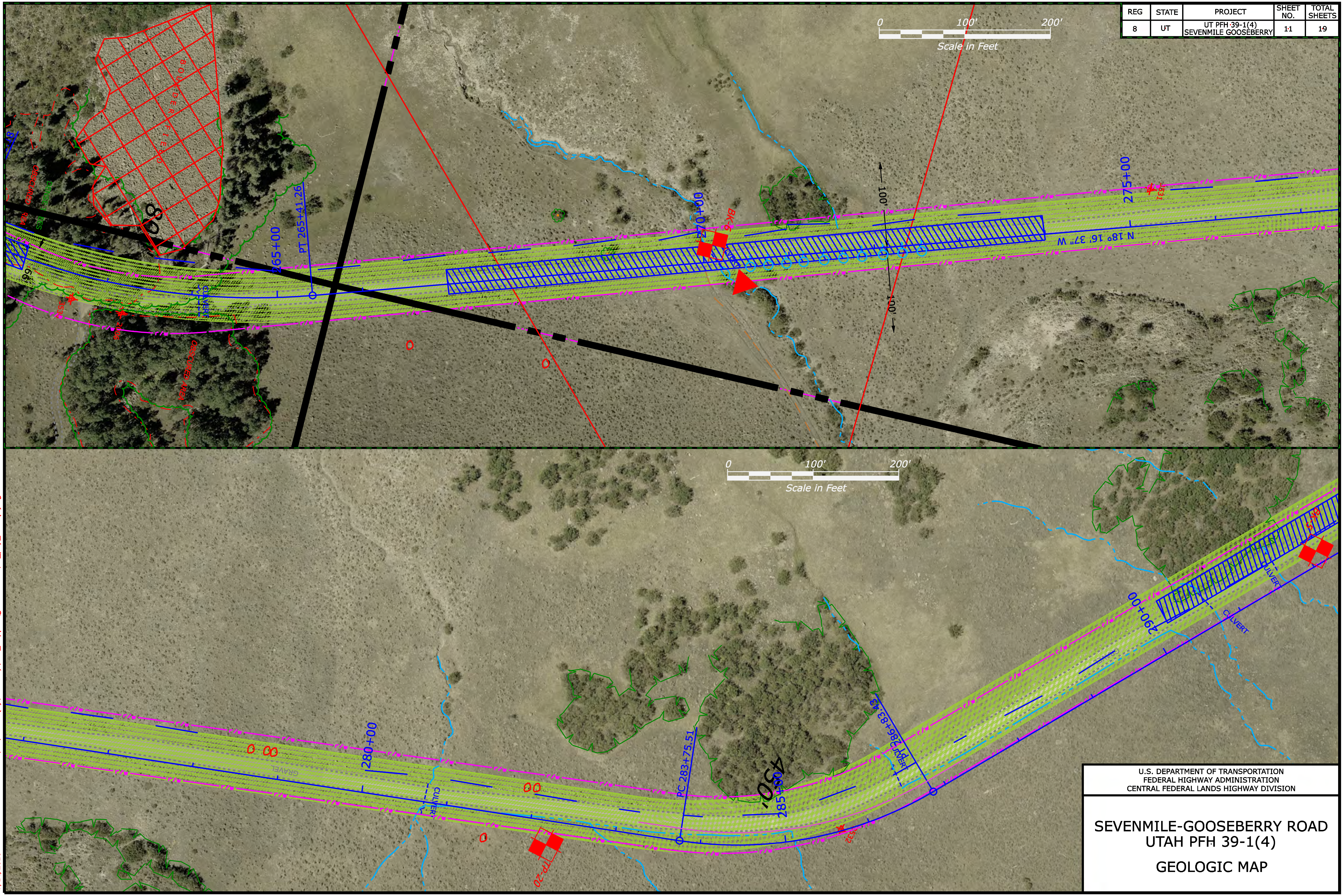

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SEVENMILE-GOOSEBERRY ROAD
UTAH PFH 39-1(4)

GEOLOGIC MAP

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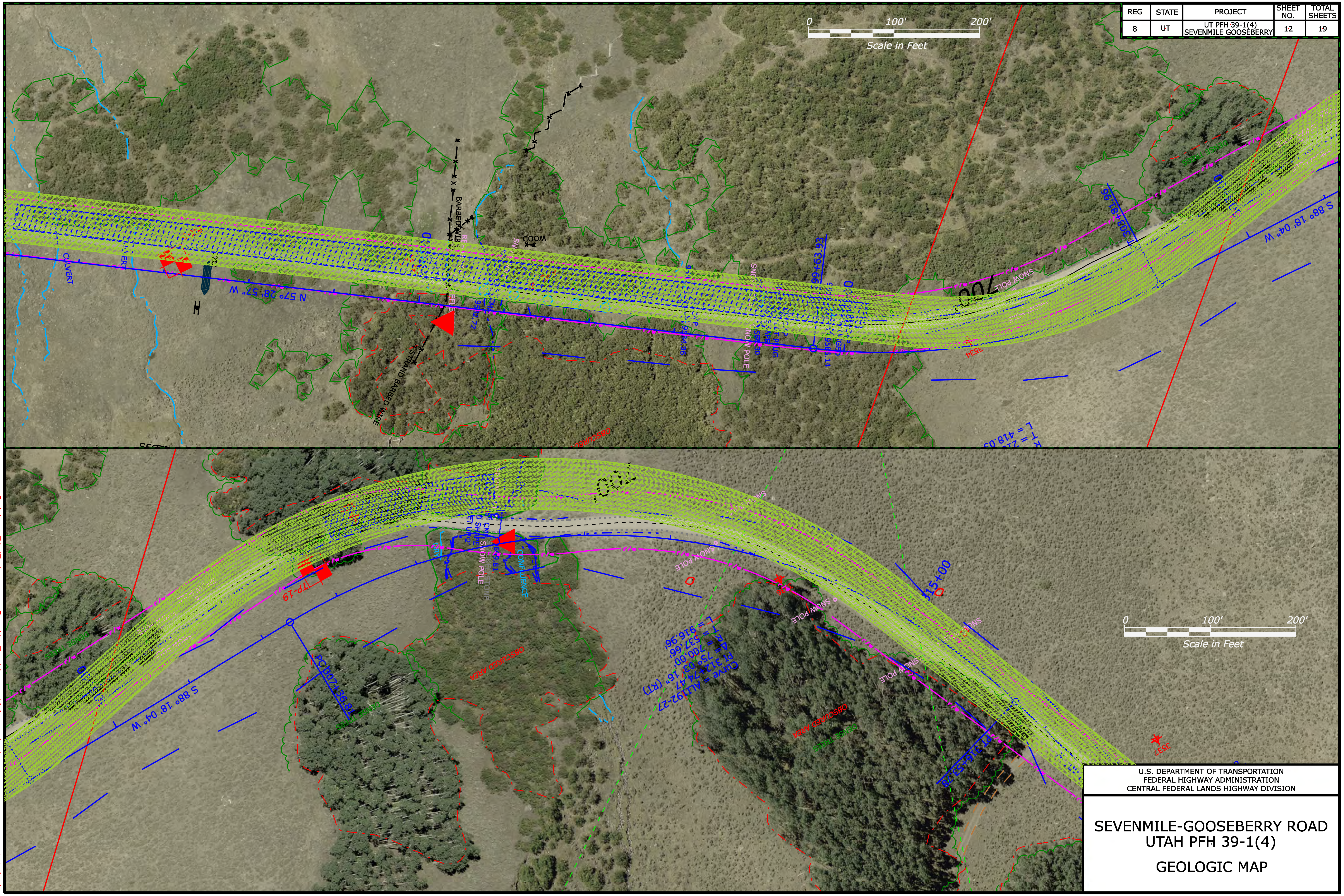

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SEVENMILE-GOOSEBERRY ROAD
UTAH PFH 39-1(4)

GEOLOGIC MAP

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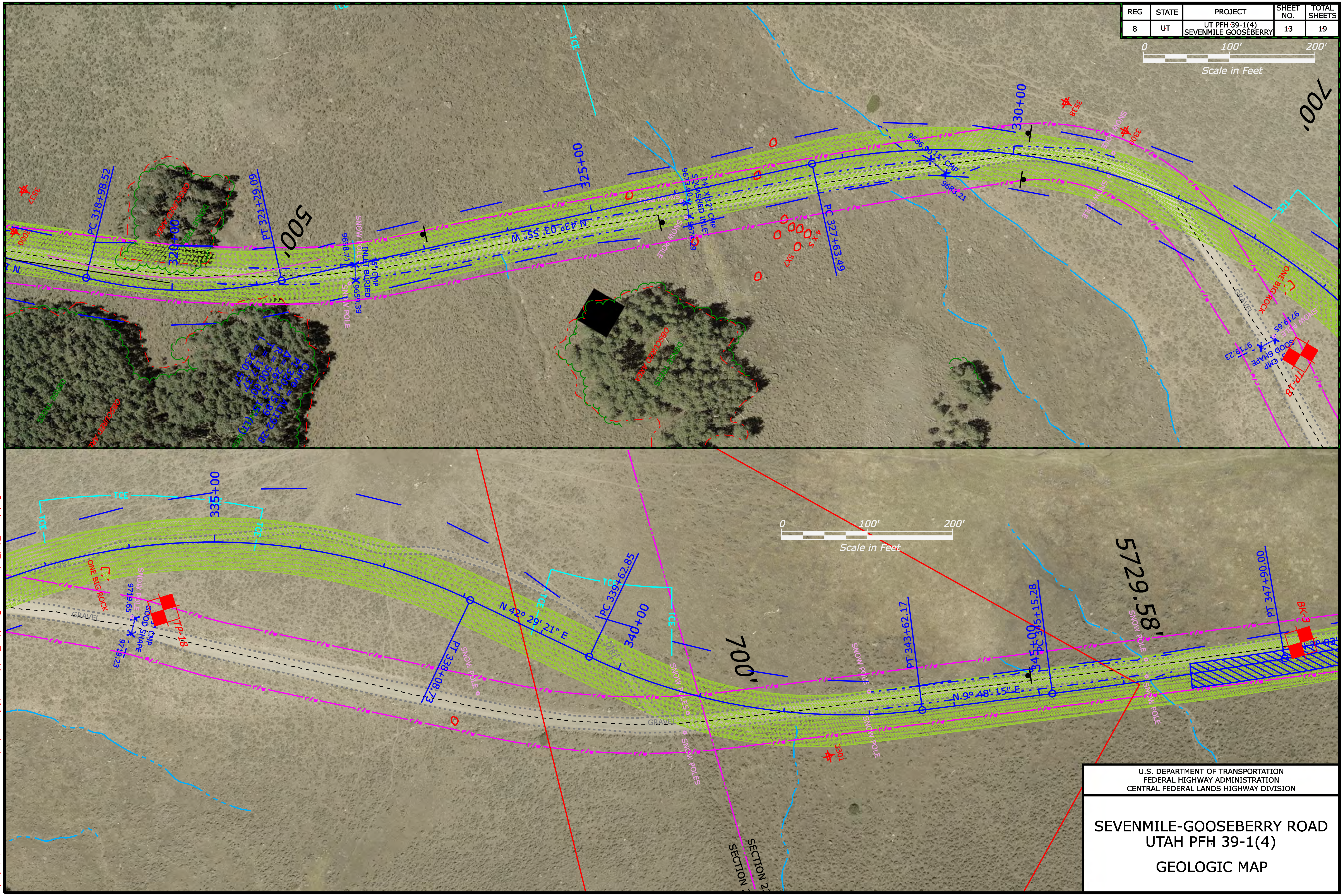

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SEVENMILE-GOOSEBERRY ROAD
UTAH PFH 39-1(4)

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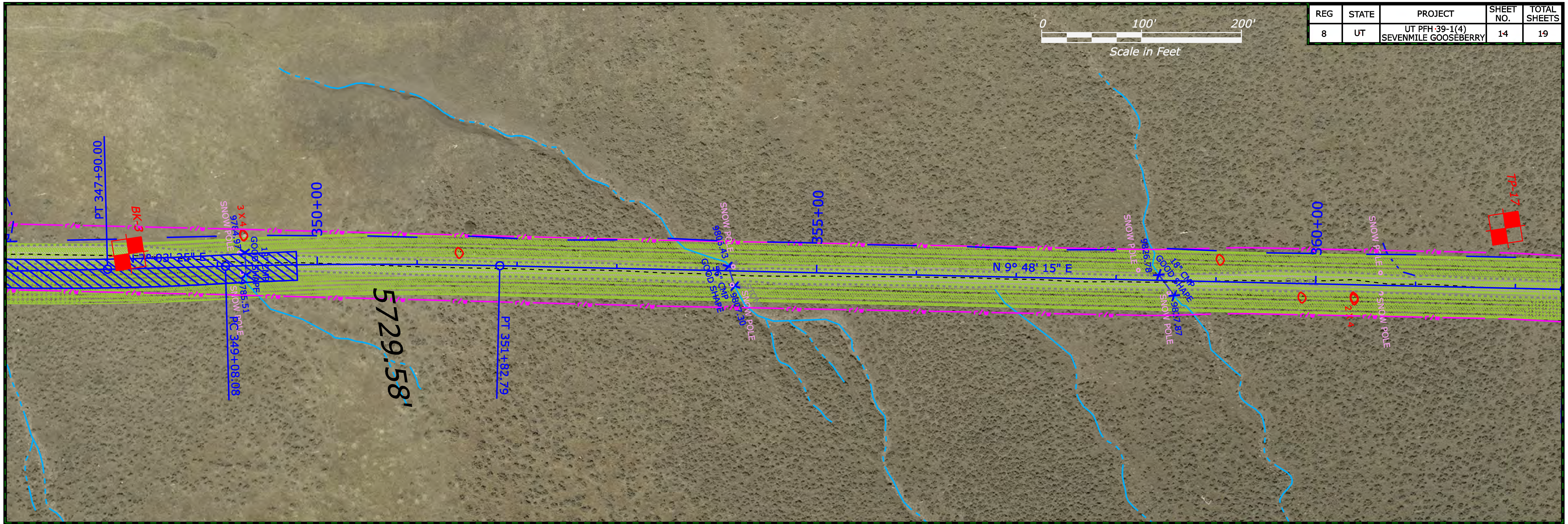

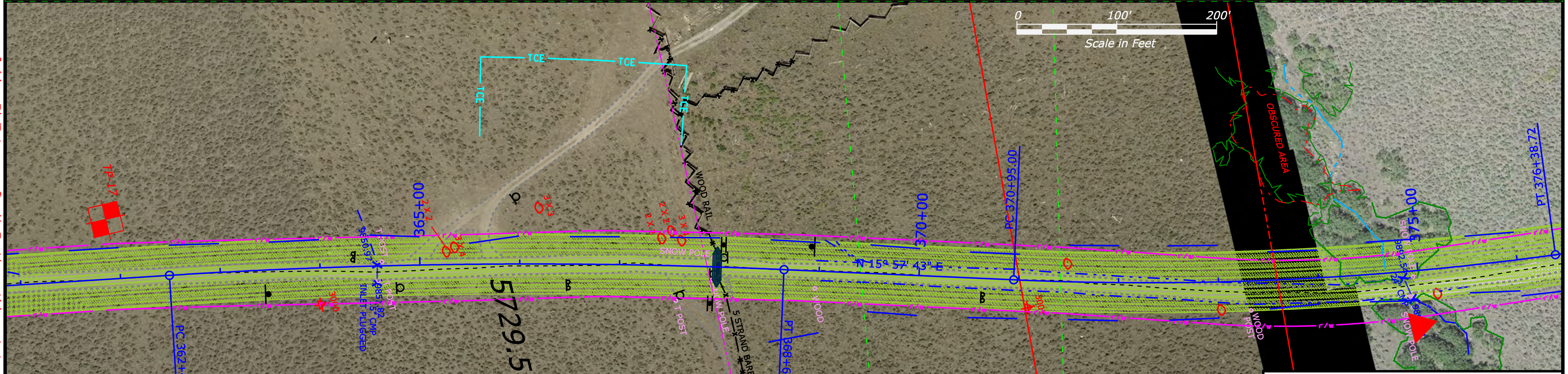

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SEVENMILE-GOOSEBERRY ROAD
UTAH PFH 39-1(4)

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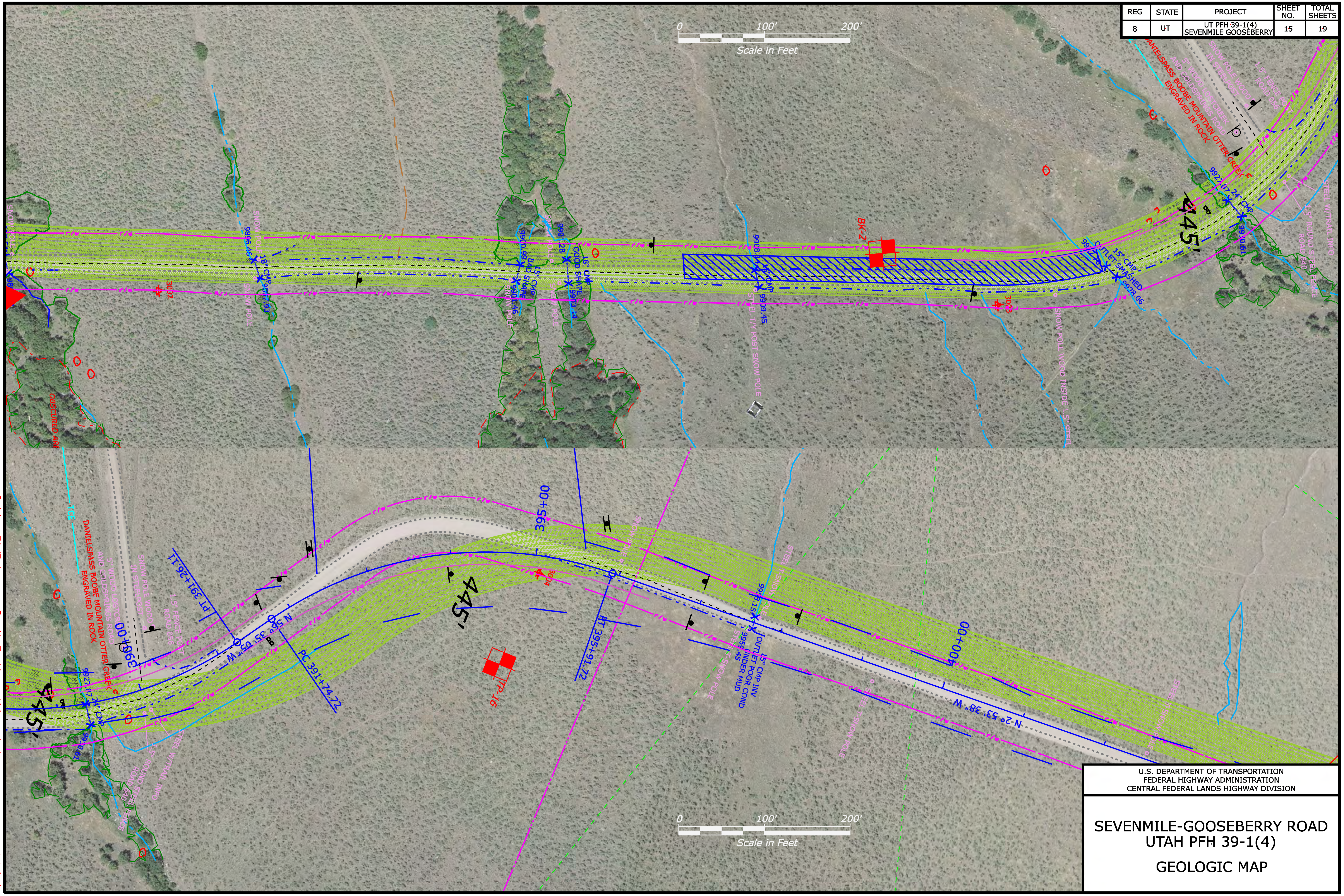
REG	STATE	PROJECT	SHEET NO.	TOTAL SHEETS
8	UT	UT PFH 39-1(4) SEVENMILE GOOSEBERRY	15	19



N:\UT\UT39-1(4)\Roadway\CFT_Support\geotechnical\14_pnp_UT39(4).dgn
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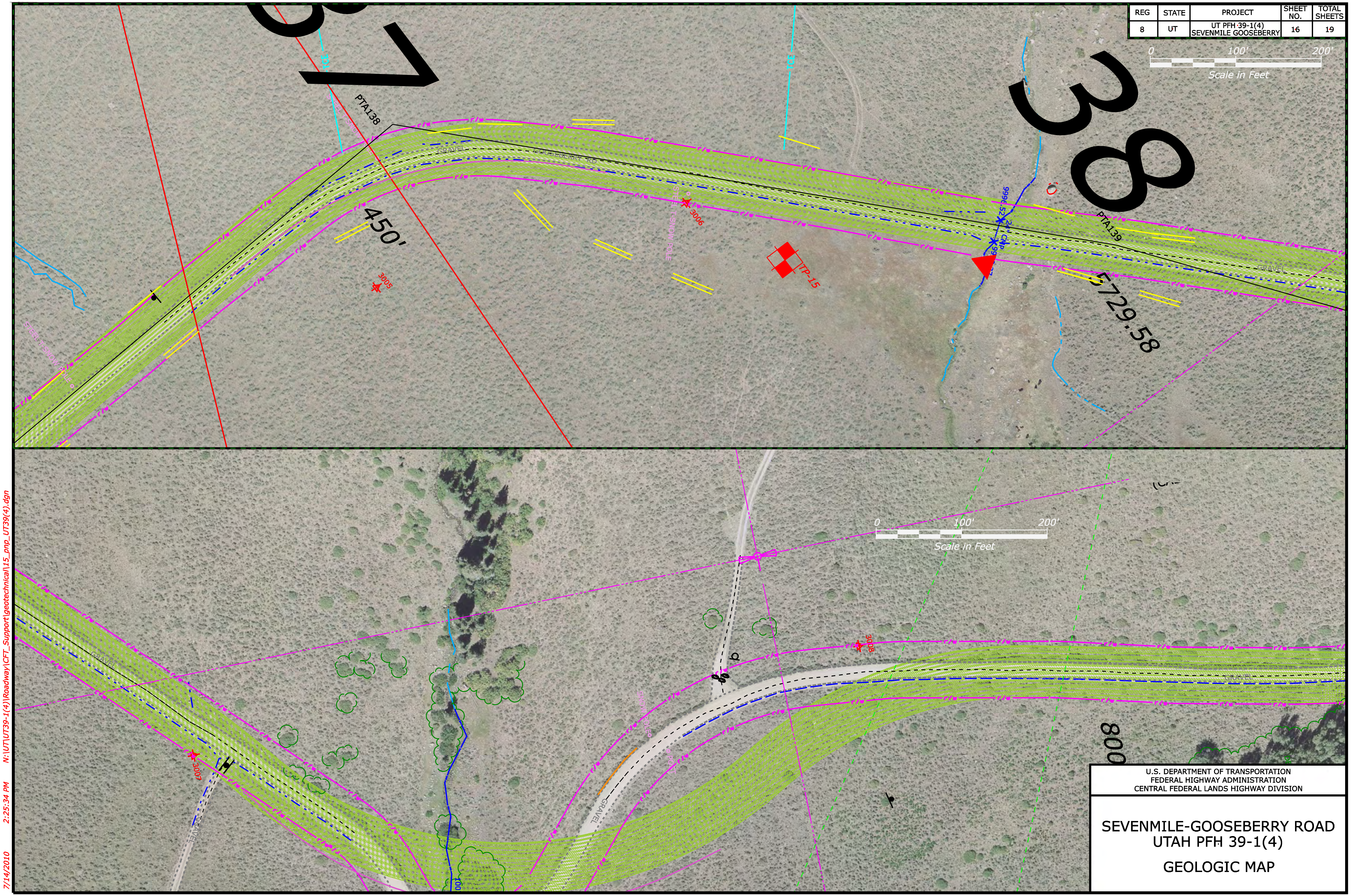
7/14/2010

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
CENTRAL FEDERAL LANDS HIGHWAY DIVISION

SEVENMILE-GOOSEBERRY ROAD
UTAH PFH 39-1(4)

GEOLOGIC MAP

REG	STATE	PROJECT	SHEET NO.	TOTAL SHEETS
8	UT	UT PFH 39-1(4) SEVENMILE GOOSEBERRY	16	19



U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
CENTRAL FEDERAL LANDS HIGHWAY DIVISION

SEVENMILE-GOOSEBERRY ROAD
UTAH PFH 39-1(4)

GEOLOGIC MAP

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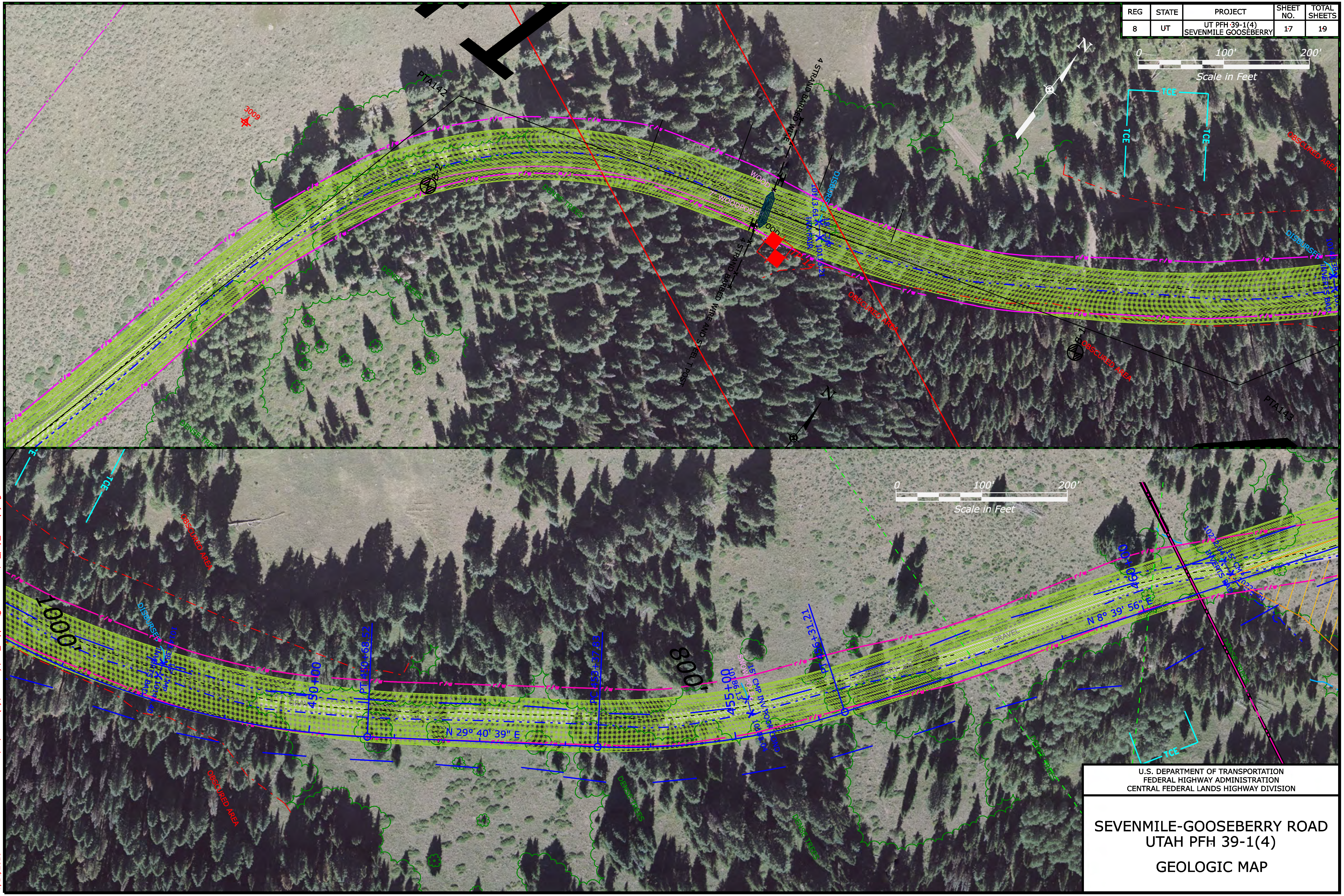
7/14/2010

REG	STATE	PROJECT	SHEET NO.	TOTAL SHEETS
8	UT	UT PFH 39-1(4) SEVENMILE GOOSEBERRY	17	19



U.S. DEPARTMENT OF TRANSPORTATION
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CENTRAL FEDERAL LANDS HIGHWAY DIVISION

SEVENMILE-GOOSEBERRY ROAD
UTAH PFH 39-1(4)

GEOLOGIC MAP

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7/14/2010

REG	STATE	PROJECT	SHEET NO.	TOTAL SHEETS
8	UT	UT PFH 39-1(4) SEVENMILE GOOSEBERRY	18	19

460+00
465+00
470+00
475+00
480+00
485+00
PC 463+14.98
PT 467+78.94
PC 473+94.53
PC 473+82.97
PC 485+55.64
PT 488+84.67
N 24° 33' 48" W
N 23° 50' 57" E
GOOSEBERRY RD
GRAVEL
LOST CREEK OVERLOOK
SE ¼
SECTION 10
DENSE TREES
0 100' 200'
Scale in Feet
N

U.S. DEPARTMENT OF TRANSPORTATION
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CENTRAL FEDERAL LANDS HIGHWAY DIVISION

SEVENMILE-GOOSEBERRY ROAD
UTAH PFH 39-1(4)

GEOLOGIC MAP

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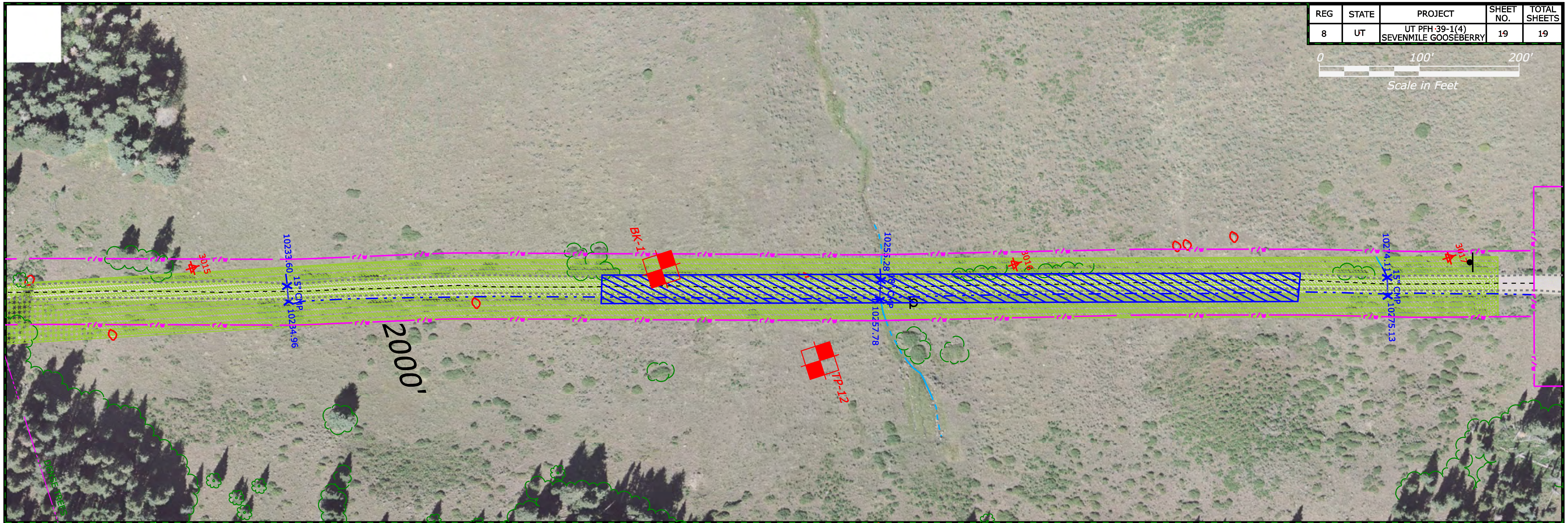
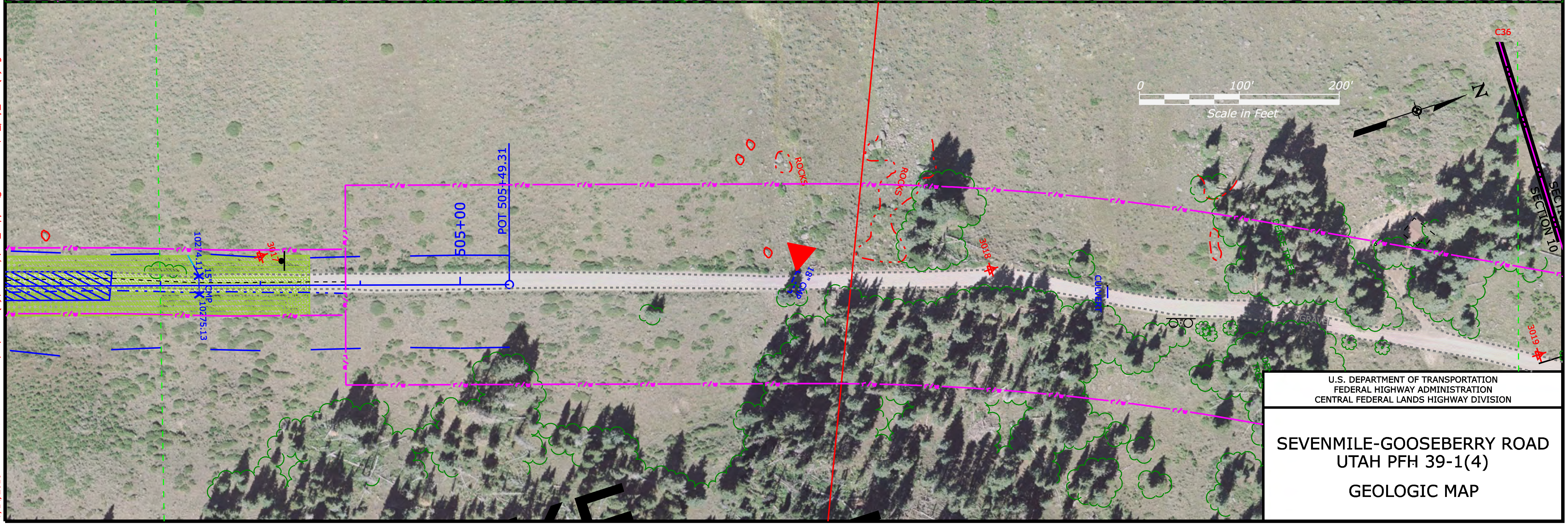
7/14/2010

REG	STATE	PROJECT	SHEET NO.	TOTAL SHEETS
8	UT	UT PFH 39-1(4) SEVENMILE GOOSEBERRY	19	19





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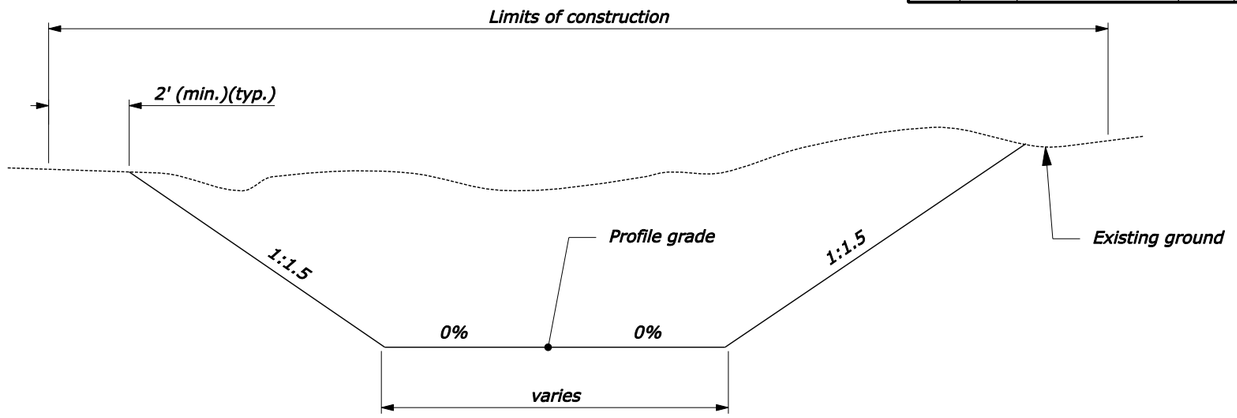
CENTRAL FEDERAL LANDS HIGHWAY DIVISION

SEVENMILE-GOOSEBERRY ROAD
UTAH PFH 39-1(4)

GEOLOGIC MAP

REG	STATE	PROJECT	SHEET NO.	TOTAL SHEETS
8	UT	UT PFH 39-1(4) SEVENMILE GOOSEBERRY		G3



TYPICAL SECTION

BEGIN RECLAMATION
STA. 10.00+00
N 6,714,664.76
E 1,589,046.71

END RECLAMATION
STA. 17+53.09
N 6,714,258.22
E 1,589,734.60

CRUSHED GRAVEL
CRUSHED GRAVEL
GRADE BREAKS
FS ROAD 040C
TRASH PILE
ROCK PILE
STEEL 'T' FENCE POSTS -NO WIRE
ROCKS TO THE EAST DIRT TO THE WEST
POT 10+00.00
10+00
15+00
POT 15+97.52
POT 18+35.66
S 65° 58' 51" E
S 65° 58' 51" E
S 65° 58' 51" E
2902
Baseline
Slope limits
Limits of construction
Boring BP-1
Boring BP-2
Boring BP-3
Boring BP-4
Boring BP-5
Boring B-101
Boring B-102
Boring B-103
Boring B-104
Boring B-105
10294.43
10277.91
10272.91
10283.91
10271.54
10278.17
10272.82
10278.95
10278.06
10277.72
10268.39
10317.18
10355.29
10346.88
10306.86
10353.05
10282.89
0
100'
200'
Scale in Feet

U.S. DEPARTMENT OF TRANSPORTATION
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CENTRAL FEDERAL LANDS HIGHWAY DIVISION

BORING LOCATION PLAN
GATES LAKE PIT

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APPENDIX C – Test Pit and Boring Logs

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS GRAPH	SYMBOLS LETTER	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS (MORE THAN 50% OF MATERIAL IS LARGER THAN NO 200 SIEVE SIZE)	GRAVEL AND GRAVELLY SOILS (MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE)	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
				GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
	SAND AND SANDY SOILS (MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE)	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND - SILT MIXTURES
				SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS (MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE)	SILTS AND CLAYS (LIQUID LIMIT LESS THAN 50)			ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS (LIQUID LIMIT GREATER THAN 50)			MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS
FILL MATERIAL				- -	FILL MATERIAL, NON-NATIVE

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS.

EXPLORATION SAMPLE TERMINOLOGY

Sample Type	Sample Symbol	Sample Code
Auger Cuttings		Auger
Bulk (Grab) Sample		Grab
Modified California Sampler		MC
Shelby Tube		SH or ST
Standard Penetration Test		SPT
Split Spoon		SS
No Sample		

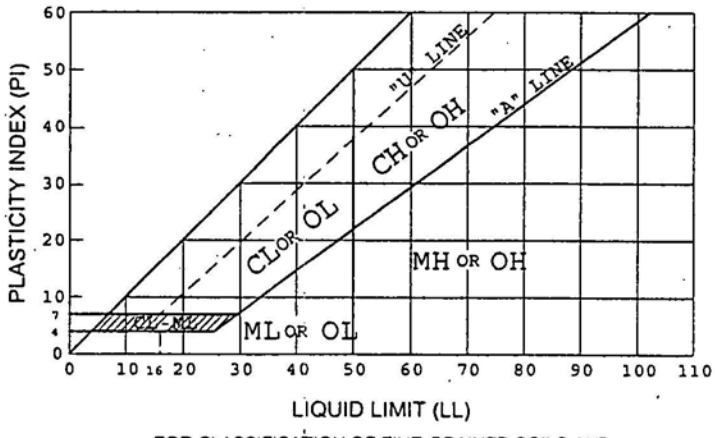
GRAIN SIZE TERMINOLOGY

Component of Sample	Size Range
Boulders	Over 12 in. (300mm)
Cobbles	12 in. to 3 in. (300mm to 75mm)
Gravel	3 in. to #4 sieve (75mm to 2mm)
Sand	# 4 to #200 sieve (2mm to 0.074mm)
Silt or Clay	Passing #200 sieve (0.074mm)

RELATIVE DENSITY OF GRANULAR SOILS

N - Blows/ft	Relative Density
0 - 4	Very Loose
5 - 10	Loose
11 - 30	Medium Dense
31 - 50	Dense
greater than 50	Very Dense

PLASTICITY CHART



FOR CLASSIFICATION OF FINE-GRAINED SOILS AND FINE-GRAINED FRACTION OF COARSE-GRAINED SOILS

CONSISTENCY OF COHESIVE SOILS

Unconfined Compressive Strength, psf	N - Blows/ft	Consistency
less than 500	0 - 1	Very Soft
500 - 1,000	2 - 4	Soft
1,000 - 2,000	5 - 8	Firm
2,000 - 4,000	9 - 15	Stiff
4,000 - 8,000	16 - 30	Very Stiff
8,000 - 16,000	31 - 60	Hard
greater than 16,000	greater than 60	Very Hard

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1345 Capital Blvd., Suite A
Reno, Nevada 89502-7140
Telephone: (775) 359-6600
Fax: (775) 359-7766

USCS Soil Classification Chart

Project: Sevenmile-Gooseberry Phase II & III

Location: Sevier County, Utah

Project Number: 0079-06-2 Plate Number: A.2.

TEST PIT LOG

TEST PIT NO.: 02+550 (TP-28)

DATE: 9/21/2002

TYPE OF HOE: Case 580E

DEPTH TO GROUND WATER (m): NE

LOGGED BY: SDB

GROUND ELEVATION (m): 2788

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (m)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
					0	SC		0.0 m - 0.3 m: **CLAYEY SAND**, dark brown, moist, loose, with estimated 35% low plasticity fines, 60% fine to coarse sand, and trace subangular to subrounded fine to coarse gravel. Unit contains scattered volcanic cobbles and boulders to 0.6 m in diameter. Topsoil.
28A	GRAB					SC-SM		0.3 m - 1.5 m: **SILTY, CLAYEY SAND with GRAVEL**, brown, dry to moist, medium dense to dense, with estimated 25% non-plastic to low plasticity fines, 55% fine to coarse sand, and 20% subangular to subrounded fine to coarse volcanic gravel. Unit contains approximately 25-30% subangular volcanic cobbles and boulders to 0.6 m in diameter. Variable unit.
					1			
					2			Almost reached refusal, backhoe not operating properly. Difficult excavation due to cobbles and boulders. Bulk sample (1.2 m - 1.5 m).
					3			

UTM (4276645N, 443078E)

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(775) 359-6600

CH2M Hill

Sevenmile-Gooseberry Phase II & III

Sevier County, Utah

PROJECT NO.: 0079-06-2

PLATE: A.2.2

SHEET 1 OF 1

TEST PIT LOG

TEST PIT NO.: 03+300 (TP-27)

DATE: 9/21/2002

TYPE OF HOE: Case 580E

DEPTH TO GROUND WATER (m): NE

LOGGED BY: SDB

GROUND ELEVATION (m): 2800

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (m)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
					0	SC		0.0 m - 0.3 m: **CLAYEY SAND**, dark brown, moist, loose, with estimated 35% low plasticity fines, 60% fine to coarse sand, and trace subangular to subrounded fine to coarse gravel. Unit contains scattered volcanic cobbles and boulders to 0.6 m in diameter. Topsoil.
								0.3 m - 2.4 m: **CLAYEY SAND with GRAVEL**, brown, dry to moist, medium dense, with 27% low plasticity fines, 37% fine to coarse sand, and 36% subangular to subrounded fine to coarse gravel. Unit contains approximately 30-40% subrounded to subangular volcanic, with few siltstone and claystone cobbles and boulders.
27A	GRAB				1			
						SC		
					2			
								Easy to moderate difficulty excavation. Bulk sample (1.2 m - 1.5 m).
					3			

UTM (4277346N, 442764E)

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CH2M Hill

Sevenmile-Gooseberry Phase II & III

Sevier County, Utah

PROJECT NO.: 0079-06-2

PLATE: A.2.3

SHEET 1 OF 1

TEST PIT LOG

TEST PIT NO.: 04+090 (TP-26)

DATE: 9/21/2002

TYPE OF HOE: Case 580E

DEPTH TO GROUND WATER (m): NE

LOGGED BY: SDB

GROUND ELEVATION (m): 2798

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (m)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
26A	GRAB					SC		0.0 m - 0.2 m: **CLAYEY SAND**, dark brown, moist, loose, with estimated 35% low plasticity fines, 60% fine to coarse sand, and trace subangular to subrounded fine to coarse gravel. Unit contains scattered volcanic cobbles and boulders to 0.6 m in diameter. Topsoil.
								0.2 m - 2.0 m: **SILTY, CLAYEY SAND with GRAVEL**, brown, dry to moist, medium dense to dense, with 32% non-plastic to low plasticity fines, 50% fine to coarse sand, and 18% subangular to subrounded fine to coarse gravel. Unit contains approximately 10-15% subrounded to subangular volcanic cobbles and boulders to 355 mm with a gradational contact with the underlying unit.
26B	GRAB		5.7	NP	1	SC-SM		
					2	SC		2.0 m - 2.4 m: **CLAYEY SAND with GRAVEL**, brown, moist, medium dense, with estimated 35% low plasticity fines, 50% fine to coarse sand,a and 15% subrounded to subangular fine to coarse gravel. Unit contains approximately 10-20% subrounded to subangular volcanic cobbles and boulders to 0.4 m in diameter. Easy difficulty excavation. Bulk sample (1.5 m - 1.8 m).
					3			

UTM (4278068N, 442544E)

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CH2M Hill

Sevenmile-Gooseberry Phase II & III

Sevier County, Utah

PROJECT NO.: 0079-06-2

PLATE: A.2.4

SHEET 1 OF 1

TEST PIT LOG

TEST PIT NO.: 04+900 (TP-25)

DATE: 9/21/2002

TYPE OF HOE: Case 580E

DEPTH TO GROUND WATER (m): NE

LOGGED BY: SDB

GROUND ELEVATION (m): 2827

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (m)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
25A	GRAB				0	SC		0.0 m - 0.2 m: **CLAYEY SAND**, dark brown, moist, loose, with estimated 30-35% low to medium plasticity fines, 65-70% fine to coarse sand, and trace subangular to subrounded fine to coarse gravel. Topsoil.
25B	GRAB				1	SC		0.2 m - 2.0 m: **CLAYEY SAND with GRAVEL**, brown, dry to moist, medium dense to dense, with 29% low plasticity fines, 44% fine to coarse sand, and 27% subrounded to subangular fine to coarse volcanic gravel. Unit contains approximately 30% scattered subangular to subrounded siltstone and sandstone cobbles and boulders to 0.6 m in diameter.
					2			Refusal on large volcanic boulder. Moderate to difficult excavation. Bulk sample (1.2 m - 1.5 m).
					3			

UTM (4278835N, 442310E)

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CH2M Hill

Sevenmile-Gooseberry Phase II & III

Sevier County, Utah

PROJECT NO.: 0079-06-2

PLATE: A.2.5

SHEET 1 OF 1

TEST PIT LOG

TEST PIT NO.: 05+610 (TP-24)

DATE: 9/21/2002

TYPE OF HOE: Case 580E

DEPTH TO GROUND WATER (m): NE

LOGGED BY: SDB

GROUND ELEVATION (m): 2830

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (m)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
24A	GRAB					SC		0.0 m - 0.3 m: **CLAYEY SAND with GRAVEL**, dark brown, moist, loose, with estimated 30% low to medium plasticity fines, 50-55% fine to coarse sand, and 15-20% subangular to subrounded fine to coarse volcanic gravel. Topsoil.
24B	GRAB				1	SC		0.3 m - 1.2 m: **CLAYEY SAND with GRAVEL**, brown, moist, medium dense to dense, with estimated 20-25% low to medium plasticity fines, 35-50% fine to coarse sand, and 30-40% subangular to subrounded fine to coarse volcanic gravel. Unit contains approximately 40-50% subangular to subrounded volcanic cobbles and boulders to 0.6 m in diameter.
					2			Refusal on subangular to subrounded volcanic cobbles and boulders within a lava flow rubble. Difficult excavation due to boulders to 0.6 m diameter. Bulk sample (0.6 m - 1.2 m).
					3			

UTM (4279514N, 442183E)

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CH2M Hill

Sevenmile-Gooseberry Phase II & III

Sevier County, Utah

PROJECT NO.: 0079-06-2

PLATE: A.2.6

SHEET 1 OF 1

TEST PIT LOG

TEST PIT NO.: 06+500 (TP-23)

DATE: 9/21/2002

TYPE OF HOE: Case 580E

DEPTH TO GROUND WATER (m): NE

LOGGED BY: SDB

GROUND ELEVATION (m): 2858

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (m)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
						SC-SM		0.0 m - 0.4 m: **SILTY, CLAYEY SAND**, dark brown, moist, loose, with estimated 35% non-plastic to low plasticity fines, 55-60% fine to coarse sand, and 5-10% subangular fine to coarse volcanic gravel. Unit contains trace, scattered subangular volcanic cobbles to 200 mm in diameter. Topsoil.
23A	GRAB					SC		0.4 m - 0.9 m: **CLAYEY SAND with GRAVEL**, dark brown, dry to moist, medium dense, with estimated 30-35% low to medium plasticity fines, 50-55% fine to coarse sand, and 15% subrounded fine to coarse gravel. Unit contains approximately 25-35% moderately to highly weathered subrounded with few subangular volcanic, sandstone, siltstone, and claystone cobbles and boulders to 0.4 m in diameter. Slight to moderate effervescent of non-volcanic clasts.
23B	GRAB		6.3	10	1			0.9 m - 2.6 m: **CLAYEY SAND with GRAVEL**, variable white to grey to brown, dry to moist, dense to very dense, with 30% low to medium plasticity fines, 42% fine to coarse sand, and 28% subangular fine to coarse gravel. Unit contains approximately 35-45% subangular sandstone and claystone cobbles and boulders with slight to moderate efferece. Variable unit.
					2	SC		
					3			Moderate to difficult excavation due to cobbles and boulders. Bulk sample (1.1 m - 1.4 m).

UTM (4280321N, 441852E)

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CH2M Hill

Sevenmile-Gooseberry Phase II & III

Sevier County, Utah

PROJECT NO.: 0079-06-2

PLATE: A.2.7

SHEET 1 OF 1

TEST PIT LOG

TEST PIT NO.: 07+270 (TP-22)

DATE: 9/21/2002

TYPE OF HOE: Case 580E

DEPTH TO GROUND WATER (m): NE

LOGGED BY: SDB

GROUND ELEVATION (m): 2876

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (m)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
22A	GRAB					SC-SM		0.0 m - 0.5 m: **SILTY, CLAYEY SAND**, dark brown, moist, loose, with estimated 35% non-plastic to low plasticity fines, 55-60% fine to coarse sand, and 5-10% subangular fine to coarse volcanic gravel. Unit contains trace, scattered subangular volcanic cobbles to 200 mm in diameter. Topsoil.
22B	GRAB				1	GC		0.5 m - 2.6 m: **CLAYEY GRAVEL with SAND**, brown to dark brown, moist, dense to very dense, with 33% medium plasticity fines, 33% fine to coarse sand, and 34% subangular fine to coarse volcanic gravel. Unit contains 30-40% slightly to highly weathered, subangular, vesicular volcanic cobbles. Increases to boulders with depth below approximately 1.8 m with diameter up to 0.6 m.
					2			
					3			Difficult excavation due to cobbles and boulders. Bulk sample (1.7 m - 2.0 m).

UTM (4281041N, 441632E)

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CH2M Hill

Sevenmile-Gooseberry Phase II & III

Sevier County, Utah

PROJECT NO.: 0079-06-2

PLATE: A.2.8

SHEET 1 OF 1

TEST PIT LOG

TEST PIT NO.: 08+100 (TP-21)

DATE: 9/21/2002

TYPE OF HOE: Case 580E

DEPTH TO GROUND WATER (m): NE

LOGGED BY: SDB

GROUND ELEVATION (m): 2885

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (m)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
21A	GRAB					SC-SM		0.0 m - 0.5 m: **SILTY, CLAYEY SAND**, dark brown, moist, loose, with estimated 35% non-plastic to low plasticity fines, 55% fine to coarse sand, and 10% subrounded fine to coarse gravel. Topsoil.
21B	GRAB					SC		0.5 m - 0.9 m: **CLAYEY SAND with GRAVEL**, brown, dry to moist, medium dense, with estimated 30% low to medium plasticity fines, 50-55% fine to coarse sand, and 15-20% subrounded to subangular fine to coarse volcanic gravel. Unit contains approximately 10-15% moderately to highly weathered, subangular to subrounded volcanic cobbles to 250 mm in diameter.
21C	GRAB				1	SC		0.9 m - 2.5 m: **CLAYEY SAND with GRAVEL**, dark brown, moist, medium dense to dense, with 43% medium plasticity fines, 31% fine to coarse sand, and 26% subangular fine to coarse volcanic gravel. Unit contains few scattered subangular volcanic cobbles.
					2			
					3			Easy to moderate difficulty excavation. Bulk sample (1.5 m - 2.0 m).

UTM (4281863N, 441737E)

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CH2M Hill

Sevenmile-Gooseberry Phase II & III

Sevier County, Utah

PROJECT NO.: 0079-06-2

PLATE: A.2.9

SHEET 1 OF 1

TEST PIT LOG

TEST PIT NO.: 08+840 (TP-20)

DATE: 9/20/2002

TYPE OF HOE: Case 580E

DEPTH TO GROUND WATER (m): NE

LOGGED BY: SDB

GROUND ELEVATION (m): 2907

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (m)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
20A	GRAB				0	SC-SM		0.0 m - 0.3 m: **SILTY, CLAYEY SAND**, dark brown, moist, loose, with estimated 35% non-plastic to low plasticity fines, 50% fine to coarse sand, and 15% subangular to subrounded fine to coarse gravel. Unit contains scattered subangular to subrounded volcanic cobbles and boulders to 0.9 m in diameter. Topsoil.
20B	GRAB				1	SC		0.3 m - 1.4 m: **CLAYEY SAND with GRAVEL**, brown to red-brown, moist, medium dense to dense, with estimated 35% low to medium plasticity fines, 40% fine to coarse sand, and 25% subrounded to subangular fine to coarse volcanic gravel. Unit contains scattered subangular to subrounded volcanic cobbles and boulders to 0.9 m in diameter with density increasing to very dense below 0.9 m.
20C	GRAB				2	SC		1.4 m - 2.7 m: **CLAYEY SAND with GRAVEL**, dark brown, moist, dense to very dense, with estimated 30% low to medium plasticity fines, 40-45% fine to coarse sand, and 25-30% subrounded to subangular fine to coarse volcanic gravel. Unit contains increasing subrounded volcanic gravel with depth and scattered volcanic cobbles to 200 mm in diameter.
					3			Refusal on very tight volcanic cobbles.

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Sevenmile-Gooseberry Phase II & III

Sevier County, Utah

PROJECT NO.: 0079-06-2

PLATE: A.2.10

SHEET 1 OF 1

TEST PIT LOG

TEST PIT NO.: 09+600 (TP-19)

DATE: 9/20/2002

TYPE OF HOE: Case 580E

DEPTH TO GROUND WATER (m): NE

LOGGED BY: SDB

GROUND ELEVATION (m): 2929

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (m)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
					0	SC-SM		0.0 m - 0.2 m: **SILTY, CLAYEY SAND**, dark brown, moist, loose, with estimated 30% non-plastic to low plasticity fines, 60% fine to coarse sand, and 10% subrounded to subangular fine gravel.
19A	GRAB		13.9	30	1	CL		0.2 m - 1.4 m: **SANDY LEAN CLAY with GRAVEL**, dark red-brown, moist, very stiff, with 53% high plasticity fines, 27% fine to coarse sand, and 20% subangular to subrounded fine to coarse volcanic gravel. Unit contains approximately 30-40% subangular to subrounded volcanic cobbles and boulders to 0.8 m in diameter.
					2			Refusal on subangular to subrounded volcanic cobbles and boulders to 0.8 m diameter. Bulk sample (0.6 m - 1.2 m).
					3			

UTM (4282928N, 440959E)

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Sevenmile-Gooseberry Phase II & III

Sevier County, Utah

PROJECT NO.: 0079-06-2

PLATE: A.2.11

SHEET 1 OF 1

TEST PIT LOG

TEST PIT NO.: 10+400 (TP-18)

DATE: 9/20/2002

TYPE OF HOE: Case 580E

DEPTH TO GROUND WATER (m): NE

LOGGED BY: SDB

GROUND ELEVATION (m): 2962

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (m)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
					0	SC-SM		0.0 m - 0.6 m: **SILTY, CLAYEY SAND**, dark brown, moist, loose, with estimated 30% non-plastic to low plasticity fines, 60% fine to coarse sand, and 10% subrounded to subangular fine gravel.
18A	GRAB							
18B	GRAB					SC		0.6 m - 1.1 m: **CLAYEY SAND with GRAVEL**, brown to grey-brown, dry to moist, medium dense, with estimated 30-35% low to medium plasticity fines, 45-50% fine to coarse sand, and 20% subrounded to subangular fine to coarse volcanic gravel. Unit contains approximately 10-20% subangular to subrounded volcanic cobbles and boulders to 0.4 m in diameter.
18C	GRAB				1			1.1 m - 2.6 m: **CLAYEY SAND with GRAVEL**, dark brown, moist, dense to very dense, with estimated 35% low to high plasticity fines, 45% fine to coarse sand, and 20% subrounded to subangular fine to coarse volcanic gravel. Unit contains 30-35% subangular to subrounded volcanic cobbles and boulders. Variable unit.
						SC		
					2			
					3			Refusal on very tight volcanic cobbles and boulders. Moderate difficulty excavation above 2.6 m.

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Sevier County, Utah

PROJECT NO.: 0079-06-2

PLATE: A.2.12

SHEET 1 OF 1

TEST PIT LOG

TEST PIT NO.: 11+300 (TP-17)

DATE: 9/20/2002

TYPE OF HOE: Case 580E

DEPTH TO GROUND WATER (m): NE

LOGGED BY: SDB

GROUND ELEVATION (m): 2999

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (m)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
17A	GRAB					SC		0.0 m - 0.4 m: **CLAYEY SAND**, dark brown, moist, loose, with estimated 30-40% low to medium plasticity fines, 60-70% fine to coarse sand, and 10% subrounded to subangular fine to coarse gravel. Topsoil.
17B	GRAB		4.7	9	1	GC		0.4 m - 1.2 m: **CLAYEY GRAVEL with SAND**, tan to brown, dry, medium dense to dense, with 15% low plasticity fines, 30% fine to coarse sand, and 55% subangular to subrounded fine to coarse volcanic and sandstone gravel. Unit contains 35-40% subangular to subrounded volcanic and scattered sandstone cobbles and boulders to 0.8 m in diameter.
					2			Refusal on volcanic cobbles and boulders to 0.8 m diameter. Bulk sample (0.6 m - 0.9 m).
					3			

UTM (4264383N, 440738E)

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Sevenmile-Gooseberry Phase II & III

Sevier County, Utah

PROJECT NO.: 0079-06-2

PLATE: A.2.13

SHEET 1 OF 1

TEST PIT LOG

TEST PIT NO.: 12+250 (TP-16)

DATE: 9/20/2002

TYPE OF HOE: Case 580E

DEPTH TO GROUND WATER (m): NE

LOGGED BY: SDB

GROUND ELEVATION (m): 3033

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (m)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
						SM		0.0 m - 0.6 m: **SILTY SAND**, dark brown, moist, loose, with estimated 40% non-plastic to low plasticity fines and 60% fine to coarse sand. Topsoil.
16A	GRAB							
16B	GRAB					SC		0.6 m - 0.8 m: **CLAYEY SAND with GRAVEL**, white to grey, dry, medium dense, with estimated 35% low to medium plasticity fines, 50% fine to coarse sand, and 15% subrounded to subangular fine volcanic gravel.
16C	GRAB				1	SC		0.8 m - 2.0 m: **CLAYEY SAND with GRAVEL**, red-brown, moist, dense to very dense, with estimated 30-35% low to medium plasticity fines, 45-50% fine to coarse sand, and 20% subrounded to subangular fine to coarse volcanic gravel. Unit contains approximately 25-35% subangular to subrounded volcanic cobbles and boulders.
					2			Refusal on volcanic boulders to approximately 0.6 m in diameter. Moderate difficulty excavation above 2.0 m.
					3			

UTM (4285771N, 440825E)

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Sevenmile-Gooseberry Phase II & III

Sevier County, Utah

PROJECT NO.: 0079-06-2

PLATE: A.2.14

SHEET 1 OF 1

BORING_LOG_0079062.GPJ BLKEAGLE.GDT 12/2/2002

TEST PIT LOG

TEST PIT NO.: 12+780 (TP-15)

DATE: 9/20/2002

TYPE OF HOE: Case 580E

DEPTH TO GROUND WATER (m): NE

LOGGED BY: SDB

GROUND ELEVATION (m): 3050

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (m)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
15A	GRAB					SC-SM		0.0 m - 0.3 m: **SILTY, CLAYEY SAND**, dark brown, moist, loose, with estimated 40% non-plastic to low plasticity fines and 60% fine to coarse sand. Topsoil.
15B	GRAB					SC		0.3 m - 0.5 m: **CLAYEY SAND with GRAVEL**, grey brown to greenish brown, dry to moist, medium dense, with estimated 35-40% low to medium plasticity fines, 50-55% fine to coarse sand, and 15% subrounded to subangular fine to coarse volcanic gravel.
15C	GRAB				1	SC		0.5 m - 1.8 m: **CLAYEY SAND with GRAVEL**, dark brown, moist, medium dense to dense, with 45% high plasticity fines, 25% fine to coarse sand, and 30% subrounded to subangular fine to coarse volcanic gravel. Unit contains approximately 25% subrounded to subangular volcanic cobbles and boulders to 0.4 m in diameter. Variable unit with interbedded sandy lean clay with gravel.
15D	GRAB				2	CL		1.8 m - 2.4 m: **SANDY LEAN CLAY with GRAVEL**, dark red-brown, moist, stiff, with estimated 50-60% low to medium plasticity fines, 25-30% fine to coarse sand, and 15-20% subrounded to subangular fine gravel. Unit contains approximately 15% subangular to subrounded volcanic cobbles to 0.3 m diameter.
					3			Moderate difficulty excavation. Bulk sample (0.9 m - 1.4 m).

BORING_LOG_0079062.GPJ BLKEAGLE.GDT 12/2/2002

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Sevenmile-Gooseberry Phase II & III

Sevier County, Utah

PROJECT NO.: 0079-06-2

PLATE: A.2.15

TEST PIT LOG

TEST PIT NO.: 13+650 (TP-14)

DATE: 9/20/2002

TYPE OF HOE: Case 580E

DEPTH TO GROUND WATER (m): NE

LOGGED BY: SDB

GROUND ELEVATION (m): 3084

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (m)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
14A	GRAB					SC		0.0 m - 0.6 m: **CLAYEY SAND**, dark brown, moist, loose, with estimated 30% low plasticity fines, 70% fine to coarse sand, and trace subangular to subrounded fine to coarse gravel. Topsoil.
14B	GRAB				1	SC		0.6 m - 2.1 m: **CLAYEY SAND with GRAVEL**, brown to dark brown, moist, medium dense, with 26% medium plasticity fines, 44% fine to coarse sand, and 30% subangular fine to coarse gravel. Unit contains approximately 20% subangular volcanic cobbles and boulders to 0.5 m.
14C	GRAB				2	SC		2.1 m - 2.7 m: **CLAYEY SAND with GRAVEL**, dark brown to dark red-brown, moist, medium dense, with estimated 30-35% medium to high plasticity fines, 45-55% fine to coarse sand, and 15-20% subangular to subrounded fine to coarse gravel. Unit contains approximately 15-25% subangular to subrounded volcanic cobbles.
					3			Easy difficulty excavation. Bulk sample (0.8 m - 1.1 m).

UTM (4286483N, 441208E)

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Sevenmile-Gooseberry Phase II & III

Sevier County, Utah

PROJECT NO.: 0079-06-2

PLATE: A.2.16

SHEET 1 OF 1

TEST PIT LOG

TEST PIT NO.: 14+590 (TP-13)

DATE: 9/20/2002

TYPE OF HOE: Case 580E

DEPTH TO GROUND WATER (m): NE

LOGGED BY: SDB

GROUND ELEVATION (m): 3134

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (m)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
						SM		0.0 m - 0.3 m: **SILTY SAND**, dark brown, moist, loose, with estimated 40% non-plastic to low plasticity fines and 60% fine to coarse sand. Topsoil.
13A	GRAB					SC		0.3 m - 0.6 m: **CLAYEY SAND with GRAVEL**, dark brown, moist, medium dense, with estimated 30-35% low to medium plasticity fines, 55-65% fine to coarse sand, and 15-20% subrounded to subangular fine to coarse volcanic gravel.
13B	GRAB				1	SC		0.6 m - 1.1 m: **CLAYEY SAND with GRAVEL**, grey-brown, dry to moist, medium dense, with estimated 35-40% low to medium plasticity fines, 50-60% fine to coarse sand, and 15-20% subangular fine to coarse volcanic gravel. Unit possible contains volcanic ash.
13C	GRAB		11.5	24		SC		1.1 m - 1.7 m: **CLAYEY SAND with GRAVEL**, dark red-brown, moist, medium dense, with 46% medium plasticity fines, 30% fine to coarse sand, and 24% subangular to subrounded fine to coarse gravel. Unit also contains sandy fat clay lenses and small nodules.
13D	GRAB				2	SC		1.7 m - 2.1 m: **CLAYEY SAND**, red-brown, moist, medium dense, with estimated 30-40% medium plasticity fines, 60-70% fine to coarse sand, and trace subangular to subrounded fine to coarse gravel. Variable unit.
13E	GRAB					SC-CL		2.1 m - 3.0 m: **CLAYEY SAND / SANDY LEAN CLAY**, grey to grey-brown, moist, medium dense, with estimated 45-55% low to medium plasticity fines and 45-55% fine to medium sand. Unit may also contain volcanic ash.
					3			

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Sevenmile-Gooseberry Phase II & III

Sevier County, Utah

PROJECT NO.: 0079-06-2

PLATE: A.2.17

SHEET 1 OF 1

BORING LOG

BORING NO.: BP-1

TYPE OF BORING: CME 850

LOGGED BY: SMM

DATE: 6/27/2004

DEPTH TO GROUND WATER (m): NE

GROUND ELEVATION (m): .

SAMPLE NO.	SAMPLE TYPE	BLOWS/300mm	MOISTURE (%)	PLASTICITY INDEX	DEPTH (m)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
	CORE				1			**BASALT** Grey, heavily fractured, severely weathered, moderately hard. Abundant reddish-brown low to medium plasticity fines in fractures.
								BASALT Grey, violet, poorly fractured, slightly weathered, hard, some oxide stain on fractures.
					2			**BASALT** Grey, heavily fractured, severely weathered, moderately hard.
A	RC				3			**BASALT** Grey, violet, poorly fractured, slightly weathered, hard, some oxide stain on fractures.
	CORE				4			**BASALT** Grey, heavily fractured, severely weathered, moderately hard.
					5			**BASALT** Grey, heavily fractured, slightly weathered, hard.

Proposed Gates Lake Borrow Pit area. Formation dips 50°-65° NNE, strikes N70°-85° W.

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Sevenmile - Gooseberry Phase II

Sevier County, Utah

PROJECT NO.: 0079-06-3

PLATE: A.3

SHEET 1 OF 1

BORING_LOG_METRIC_GOOSBERRY PHASE II REPORT.GPJ_BLKEAGLE.GDT 2/18/2005

BORING LOG

BORING NO.: BP-2

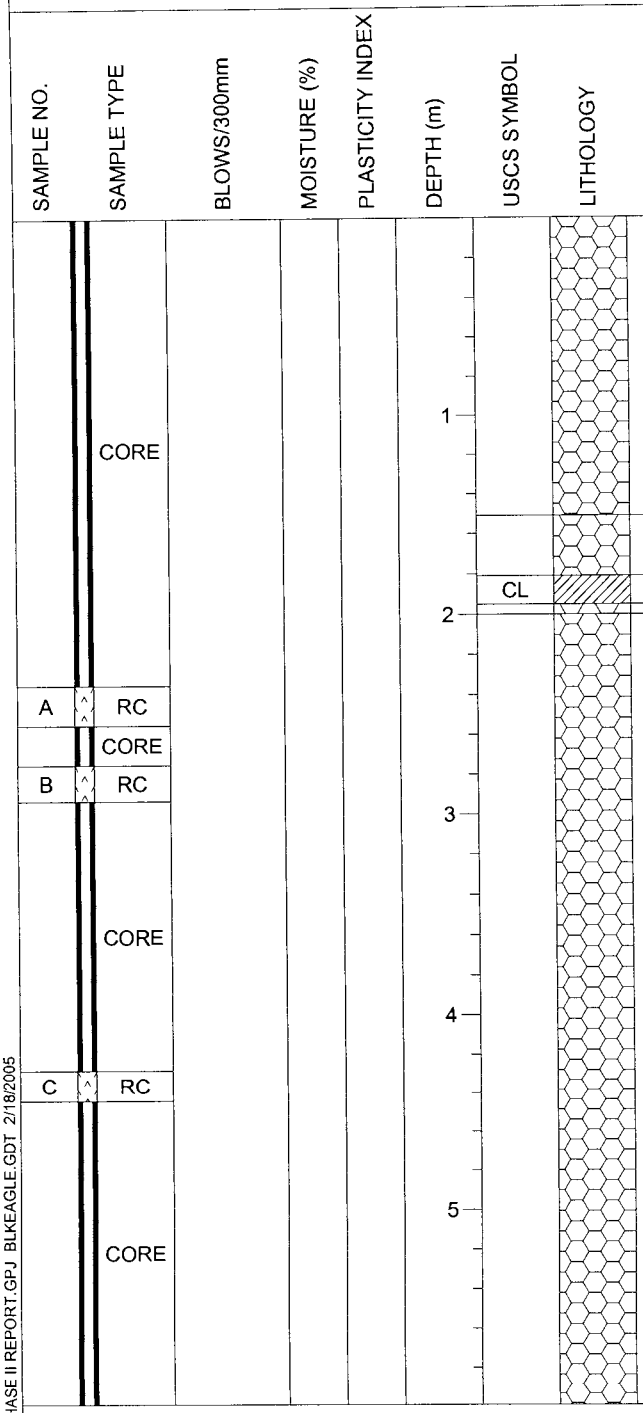
TYPE OF BORING: CME 850

LOGGED BY: SMM

DATE: 6/27/2004

DEPTH TO GROUND WATER (m): NE

GROUND ELEVATION (m): .



DESCRIPTION

BASALT Grey, violet, heavily fractured, severely weathered moderately hard vesicular basalt clasts up to 0.2 mts size. Fines washed out by core drilling.

BASALT Grey, poorly fractured, moderately weathered, hard. Common reddish-brown plastic alteration material on fracture surfaces.

Clay Reddish-brown, slightly moist, very stiff, with an estimated 80-85% medium to high plasticity fines, 15-20% angular to subangular gravel. Fracture alteration/fill.

BASALT Grey, poorly fractured, moderately weathered, hard. Common reddish-brown plastic alteration material on fracture surfaces.

BASALT Grey, poorly fractured, fresh, hard. Average fracture spacing approximately 0.75 m. Common reddish-brown plastic alteration material on fracture surfaces.

Proposed Gates Lake Borrow Pit area. Formation dips 50°-65° NNE, strikes N70°-85° W.

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CH2M Hill

Sevenmile - Gooseberry Phase II

Sevier County, Utah

PROJECT NO.: 0079-06-3

PLATE: A.3

SHEET 1 OF 1

BORING_LOG_METRIC GOOSEBERRY PHASE II REPORT.GPJ BLKEAGLE.GDT 2/18/2005

BORING LOG

BORING NO.: BP-3

DATE: 6/28/2004

TYPE OF BORING: CME 850

DEPTH TO GROUND WATER (m): NE

LOGGED BY: SMM

GROUND ELEVATION (m): .

SAMPLE NO.	SAMPLE TYPE	BLOWS/300mm	MOISTURE (%)	PLASTICITY INDEX	DEPTH (m)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
	CORE				1			**BASALT** Grey, heavily fractured, severely weathered, moderately hard, gravel sized clasts. Fines washed away by core drilling.
A	RC				2			**BASALT** Violet, heavily fractured, some reddish-brown plastic fines as alteration on fractures.
	CORE							
B	RC				3			**BASALT** Grey, violet, poorly - moderately fractured, slightly weathered, hard, common reddish-brown plastic alteration on fracture surfaces spaced 0.2 to 0.3 mts. intervals.
	CORE				4			
C	RC				5			
	CORE							

Proposed Gates Lake Borrow Pit area. Formation dips 50°-65° NNE, strikes N70°-85° W.

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Sevenmile - Gooseberry Phase II

Sevier County, Utah

PROJECT NO.: 0079-06-3

PLATE: A.3

SHEET 1 OF 1

BORING_LOG_METRIC GOOSBERRY PHASE II REPORT.GPJ BLKEAGLE.GDT 2/18/2005

BORING LOG

BORING NO.: BP-4

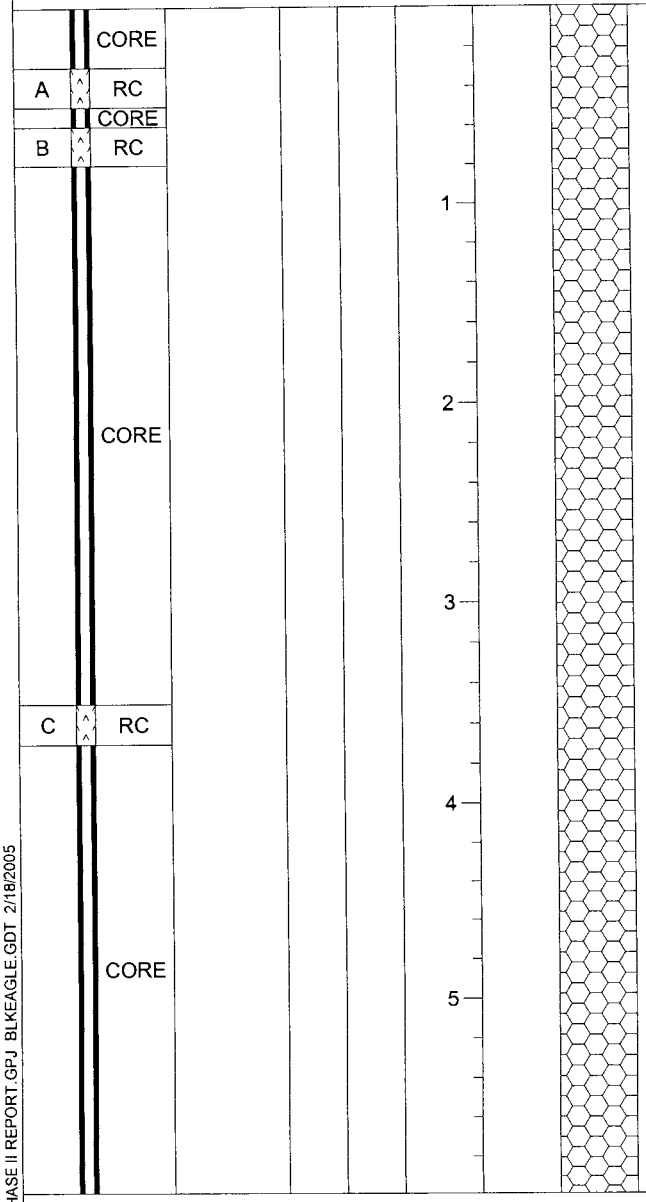
TYPE OF BORING: CME 850

LOGGED BY: SMM

DATE: 6/28/2004

DEPTH TO GROUND WATER (m): NE

GROUND ELEVATION (m): .



DESCRIPTION

BASALT Grey, violet, moderately fractured, slightly weathered, hard. Common reddish-brown alteration on fractures spaced 0.2 to 0.4 meter intervals.

Proposed Gates Lake Borrow Pit area. Formation dips 50°-65° NNE, strikes N70°-85° W.

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Sevenmile - Gooseberry Phase II

Sevier County, Utah

PROJECT NO.: 0079-06-3

PLATE: A.3

SHEET 1 OF 1

BORING_LOG_METRIC GOOSBERRY PHASE II REPORT.GPJ BLKEAGLE.GDT 2/18/2005

BORING LOG

BORING NO.: BP-5

TYPE OF BORING: CME 850

LOGGED BY: SMM

DATE: 6/28/2004

DEPTH TO GROUND WATER (m): NE

GROUND ELEVATION (m): .

SAMPLE NO.	SAMPLE TYPE	BLOWS/300mm	MOISTURE (%)	PLASTICITY INDEX	DEPTH (m)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
	CORE				0			**BASALT** Grey, heavily fractured, Moderately severely weathered, hard. Common reddish-brown plastic fines on fracture surfaces.
A	RC				1			
	CORE				2			**DIORITE** mafic, crystalline, vuggy, fresh, hard. Common lavender to violet crystalline fill, including abundant pyrite, in vugs.
B	RC				3			**VOLCANIC BRECCIA** brown, reddish-brown, moderately hard, heavily fractured, moderately severely weathered, fine-grained matrix with abundant angular, vesicular cinder and rhyolite clasts. **BASALT** Grey, violet, heavily fractured, slightly weathered, hard. Common reddish-brown plastic fines on fracture surfaces.
	CORE				4			
					5			

Proposed Gates Lake Borrow Pit area. Formation dips 50°-65° NNE, strikes N70°-85° W.

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Sevenmile - Gooseberry Phase II

Sevier County, Utah

PROJECT NO.: 0079-06-3

PLATE: A.3

SHEET 1 OF 1

BORING_LOG_METRIC_GOOSBERRY PHASE II REPORT.GPJ_BLKEAGLE.GDT 2/18/2005

BACKH0E LOG

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
CENTRAL FEDERAL LANDS HIGHWAY DIVISION

Project Name: UT PFH 39-1(4), Sevenmile Gooseberry Road	Backhoe No. BK-1	Date: August 2009	Sheet 1 of 1
Location: STA 495+00, 20 ft. LT	Type of Boring: N.A.		
Coordinates:	Casing Used: N.A.	Size: N.A.	
Drill: N.A. / Driller: N.A.	Began: 8/17/09	Completed: 8/17/09	
Field Logged By: C. Martinez	Ground Elev: ft.	Weather: Sunny	
Revisions/Final By: C. Martinez	Water Depth:		
	Date:		
	Time:		

Run/Samp No.	Depth (feet)	Graphic Log	U.S.C.S.	Length Recov. feet ----- % Rec.	RQD	SPT Blows per 6 in	Description: (Density, Color, Type, Moisture, Other)
							0.0 - 1.3 ft. TOPSOIL
	1.3						1.3 - 4.0 ft. Brown silty SAND and ROCK FRAGMENTS, dry to slightly moist
	4						BHT at 4.0 ft.
	5						
	10						
	15						
	20						

BORING LOG SEVENMILE.GPJ FHWA_CO.GDT 7/9/10

BACKHOE LOG

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
CENTRAL FEDERAL LANDS HIGHWAY DIVISION

Project Name: UT PFH 39-1(4), Sevenmile Gooseberry Road	Backhoe No. BK-2	Date: August 2009	Sheet 1 of 1
Location: STA 385+10, 20 ft. LT	Type of Boring: N.A.		
Coordinates:	Casing Used: N.A.		Size: N.A.
Drill: N.A. / Driller: N.A.	Began: 8/17/09		Completed: 8/17/09
Field Logged By: C. Martinez	Ground Elev: ft.		Weather: Sunny
Revisions/Final By: C. Martinez	Water Depth:		
	Date:		
	Time:		

Run/Samp No.	Depth (feet)	Graphic Log	U.S.C.S.	Length Recov. feet ----- % Rec.	RQD	SPT Blows per 6 in	Description: (Density, Color, Type, Moisture, Other)
	1.5						0.0 - 1.5 ft. TOPSOIL
	5						1.5 - 5.0 ft. Red brown gravelly CLAY with boulder size ROCK FRAGMENTS, moist to wet
	5						BHT at 5.0 ft.
	10						
	15						
	20						

BORING LOG SEVENMILE.GPJ FHWA_CO.GDT 7/9/10

BACKHOE LOG

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
CENTRAL FEDERAL LANDS HIGHWAY DIVISION

Project Name: UT PFH 39-1(4), Sevenmile Gooseberry Road	Backhoe No. BK-3	Date: August 2009	Sheet 1 of 1
Location: STA 348+00, 15 ft. LT	Type of Boring: N.A.		
Coordinates:	Casing Used: N.A.		Size: N.A.
Drill: N.A. / Driller: N.A.	Began: 8/17/09		Completed: 8/17/09
Field Logged By: C. Martinez	Ground Elev: ft.		Weather: Sunny
Revisions/Final By: C. Martinez	Water Depth:	2.5ft.	
	Date:	8/17/2010	
	Time:		

Run/Samp No.	Depth (feet)	Graphic Log	U.S.C.S.	Length Recov. feet ----- % Rec.	RQD	SPT Blows per 6 in	Description: (Density, Color, Type, Moisture, Other)
	1.8 ▽						0.0 - 1.8 ft. TOPSOIL
	3.5						1.8 - 3.5 ft. Red brown gravelly sandy CLAY with boulder size ROCK FRAGMENTS, moist to wet
							BHT at 3.5 ft.
	5						
	10						
	15						
	20						

BORING LOG SEVENMILE.GPJ FHWA_CO.GDT 7/9/10

BACKHOE LOG

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
CENTRAL FEDERAL LANDS HIGHWAY DIVISION

Project Name: UT PFH 39-1(4), Sevenmile Gooseberry Road	Backhoe No. BK-5	Date: August 2009	Sheet 1 of 1
Location: STA 292+00, 15 ft. LT	Type of Boring: N.A.		
Coordinates:	Casing Used: N.A.		Size: N.A.
Drill: N.A. / Driller: N.A.	Began: 8/17/09		Completed: 8/17/09
Field Logged By: C. Martinez	Ground Elev: ft.		Weather: Sunny
Revisions/Final By: C. Martinez	Water Depth:		
	Date:		
	Time:		

Run/Samp No.	Depth (feet)	Graphic Log	U.S.C.S.	Length Recov. feet ----- % Rec.	RQD	SPT Blows per 6 in	Description: (Density, Color, Type, Moisture, Other)
	1.2						0.0 - 1.2 ft. TOPSOIL
	3						1.2 - 3.0 ft. Brown gravelly CLAY with ROCK FRAGMENTS, dry to moist
							BHT at 3.0 ft.
	5						
	10						
	15						
	20						

BORING LOG SEVENMILE.GPJ FHWA_CO.GDT 7/9/10

BACKHOE LOG

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
CENTRAL FEDERAL LANDS HIGHWAY DIVISION

Project Name: UT PFH 39-1(4), Sevenmile Gooseberry Road	Backoe No. BK-6	Date: August 2009	Sheet 1 of 1
Location: STA 270+00, 20 ft. LT	Type of Boring: N.A.		
Coordinates:	Casing Used: N.A.		Size: N.A.
Drill: N.A. / Driller: N.A.	Began: 8/17/09		Completed: 8/17/09
Field Logged By: C. Martinez	Ground Elev: ft.		Weather: Sunny
Revisions/Final By: C. Martinez	Water Depth:		
	Date:		
	Time:		

Run/Samp No.	Depth (feet)	Graphic Log	U.S.C.S.	Length Recov. feet ----- % Rec.	RQD	SPT Blows per 6 in	Description: (Density, Color, Type, Moisture, Other)
	1.1						0.0 - 1.1 ft. TOPSOIL
	2.3						1.1 - 2.3 ft. Light gray SILT/CLAY, wet
	4						2.3 - 4.0 ft. Brown gravelly CLAY, moist to wet
	5						4.0 - 5.0 ft. Red brown gravelly sandy CLAY and rock fragments, moist
	5						BHT at 5.0 ft.
	10						
	15						
	20						

BORING LOG SEVENMILE.GPJ FHWA_CO.GDT 7/9/10

BACKHOE LOG

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
CENTRAL FEDERAL LANDS HIGHWAY DIVISION

Project Name: UT PFH 39-1(4), Sevenmile Gooseberry Road		Backhoe No. BK-7	Date: August 2009	Sheet 1 of 1
Location: STA 261+00, 15 ft. LT		Type of Boring: N.A.		
Coordinates:		Casing Used: N.A.	Size: N.A.	
Drill: N.A.	Driller: N.A.	Began: 8/17/09	Completed: 8/17/09	
Field Logged By: C. Martinez		Ground Elev: ft.	Weather: Sunny	
Revisions/Final By: C. Martinez		Water Depth:		
		Date:		
		Time:		

Run/Samp No.	Depth (feet)	Graphic Log	U.S.C.S.	Length Recov. feet ----- % Rec.	RQD	SPT Blows per 6 in	Description: (Density, Color, Type, Moisture, Other)
	1						0.0 - 1.0 ft. TOPSOIL and BOULDERS BHT at 1.0 ft.
	5						
	10						
	15						
	20						

BORING LOG SEVENMILE.GPJ FHWA_CO.GDT 7/9/10

BACKHOE LOG

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
CENTRAL FEDERAL LANDS HIGHWAY DIVISION

Project Name: UT PFH 39-1(4), Sevenmile Gooseberry Road		Backhoe No. BK-8	Date: August 2009	Sheet 1 of 1
Location: STA 249+50, 20 ft. RT		Type of Boring: N.A.		
Coordinates:		Casing Used: N.A.	Size: N.A.	
Drill: N.A.	Driller: N.A.	Began: 8/17/09	Completed: 8/17/09	
Field Logged By: C. Martinez		Ground Elev: ft.	Weather: Sunny	
Revisions/Final By: C. Martinez		Water Depth:		
		Date:		
		Time:		

Run/Samp No.	Depth (feet)	Graphic Log	U.S.C.S.	Length Recov. feet ----- % Rec.	RQD	SPT Blows per 6 in	Description: (Density, Color, Type, Moisture, Other)
	2						0.0 - 2.0 ft. TOPSOIL and large BOULDERS
	3.5						2.0 - 3.5 ft. Brown gravelly CLAY and ROCK FRAGMENTS, dry to moist
	4						3.5 - 4.0 ft. Red brown gravelly CLAY, moist to wet BHT at 4.0 ft.
	5						
	10						
	15						
	20						

BORING LOG SEVENMILE.GPJ FHWA_CO.GDT 7/9/10

BACKHOE LOG

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
CENTRAL FEDERAL LANDS HIGHWAY DIVISION

Project Name: UT PFH 39-1(4), Sevenmile Gooseberry Road	Backhoe No. BK-9	Date: August 2009	Sheet 1 of 1
Location: STA 223+00, 20 ft. LT	Type of Boring: N.A.		
Coordinates:	Casing Used: N.A.		Size: N.A.
Drill: N.A. / Driller: N.A.	Began: 8/17/09		Completed: 8/17/09
Field Logged By: C. Martinez	Ground Elev: ft.		Weather: Sunny
Revisions/Final By: C. Martinez	Water Depth:	3ft.	
	Date:	8/17/2010	
	Time:		

Run/Samp No.	Depth (feet)	Graphic Log	U.S.C.S.	Length Recov. feet ----- % Rec.	RQD	SPT Blows per 6 in	Description: (Density, Color, Type, Moisture, Other)
	0.8						0.0 - 0.8 ft. TOPSOIL
							0.8 - 4.5 ft. Brown red silty SAND, moist to wet
	4.5						BHT at 4.5 ft.
	5						
	10						
	15						
	20						

BORING LOG SEVENMILE.GPJ FHWA_CO.GDT 7/9/10

BACKHOE LOG

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
CENTRAL FEDERAL LANDS HIGHWAY DIVISION

Project Name: UT PFH 39-1(4), Sevenmile Gooseberry Road	Backhoe No. BK-10	Date: August 2009	Sheet 1 of 1
Location: STA 189+75, 20 ft. LT	Type of Boring: N.A.		
Coordinates:	Casing Used: N.A.		Size: N.A.
Drill: N.A. / Driller: N.A.	Began: 8/17/09		Completed: 8/17/09
Field Logged By: C. Martinez	Ground Elev: ft.		Weather: Sunny
Revisions/Final By: C. Martinez	Water Depth:	4ft.	
	Date:	8/17/2010	
	Time:		

Run/Samp No.	Depth (feet)	Graphic Log	U.S.C.S.	Length Recov. feet ----- % Rec.	RQD	SPT Blows per 6 in	Description: (Density, Color, Type, Moisture, Other)
	2.2						0.0 - 2.3 ft. TOPSOIL, moist to wet
							2.3 - 6.0 ft. Brown red clayey SAND, some gravels, moist to wet
	5						
	6						BHT at 6.0 ft.
	10						
	15						
	20						

BORING LOG SEVENMILE.GPJ FHWA_CO.GDT 7/9/10

BACKHOE LOG

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
CENTRAL FEDERAL LANDS HIGHWAY DIVISION

Project Name: UT PFH 39-1(4), Sevenmile Gooseberry Road	Backhoe No. BK-11	Date: August 2009	Sheet 1 of 1
Location: STA 67+50, CL	Type of Boring: N.A.		
Coordinates:	Casing Used: N.A.	Size: N.A.	
Drill: N.A. / Driller: N.A.	Began: 8/17/09	Completed: 8/17/09	
Field Logged By: C. Martinez	Ground Elev: ft.	Weather: Sunny	
Revisions/Final By: C. Martinez	Water Depth:		
	Date:		
	Time:		

Run/Samp No.	Depth (feet)	Graphic Log	U.S.C.S.	Length Recov. feet ----- % Rec.	RQD	SPT Blows per 6 in	Description: (Density, Color, Type, Moisture, Other)
	0.5						0.0 - 0.5 ft. TOPSOIL, moist to wet
							0.5 - 3.0 ft. Light brown red silty SAND, some boulder size rock fragments, dry
	3						BHT at 3.0 ft.
	5						
	10						
	15						
	20						

BORING LOG SEVENMILE.GPJ FHWA_CO.GDT 7/9/10

BACKHOE LOG

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
CENTRAL FEDERAL LANDS HIGHWAY DIVISION

Project Name: UT PFH 39-1(4), Sevenmile Gooseberry Road	Backhoe No. BK-12	Date: August 2009	Sheet 1 of 1
Location: STA 10+50, CL	Type of Boring: N.A.		
Coordinates:	Casing Used: N.A.		Size: N.A.
Drill: N.A. / Driller: N.A.	Began: 8/17/09		Completed: 8/17/09
Field Logged By: C. Martinez	Ground Elev: ft.		Weather: Sunny
Revisions/Final By: C. Martinez	Water Depth:		
	Date:		
	Time:		

Run/Samp No.	Depth (feet)	Graphic Log	U.S.C.S.	Length Recov. feet ----- % Rec.	RQD	SPT Blows per 6 in	Description: (Density, Color, Type, Moisture, Other)
	0.7						0.0 - 0.7 ft. TOPSOIL and BOULDERS, dry
	1.5						0.7 - 1.5 ft. Dark brown silty SAND and BOULDERS, dry
							BHT at 1.5 ft.
	5						
	10						
	15						
	20						

BORING LOG SEVENMILE.GPJ FHWA_CO.GDT 7/9/10

BORING LOG

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
CENTRAL FEDERAL LANDS HIGHWAY DIVISION

Project Name: UT PFH 39-1(4), Sevenmile Gooseberry Road	Boring No. B-101	Date: August 2009	Sheet 1 of 1
Boring Location: Gates Lake Pit	Type of Boring: Wireline core		
Coordinates:	Casing Used: HQ3	Size: 3.5"	
Drill: CME 850 / Driller: HazTech Drilling	Boring Began: 8/18/09	Completed: 8/18/09	
Field Logged By: C. Martinez	Ground Elev: 10355.8 ft.	Weather: PC	
Revisions/Final By: C. Martinez	Water Depth:		
	Date:		
	Time:		

Run/Samp No.	Depth *Elevation* (feet)	Graphic Log	U.S.C.S.	Length Recov. feet ----- % Rec.	RQD	SPT Blows per 6 in	Description: (Density, Color, Type, Moisture, Other)
RCH 1				1.80 36%			0.0 - 28.0 ft. Sands, gravels, cobble to boulder size rock fragments RCH 1 Rec. 1.8 ft. of sand and gravels and cobble to boulder size rock fragments. 5 minute run.
RCH 2	5			2.25 45%			RCH 2 Rec. 2.25 ft. of boulder-size basalt fragment. 5 minute run.
RCH 3	10			0.70 14%			RCH 3 Rec. 0.7 ft. of gravels. 4 minute run.
RCH 4	15			1.40 28%			RCH 4 Rec. 1.4 ft. of gravels and and small cobbles, easy drilling from 17' to 19'. 3 1/2 minute run.
RCH 5	20			1.40 28%			RCH 5 Rec. 1.4 ft. of gravels. 6 1/2 minute run.
RCH 6	25 *10327.8* *10325.8* 30			3.00 60%	0		RCH 6 Rec. 3 ft. of gravels and cobbles (1.0') and red brown volcanic breccia. 7 1/2 minute run. 28.0 - 30.0 ft. Red brown breccia
	35						BHT at 30.0 ft.
	40						

BORING LOG SEVENMILE.GPJ FHWA_CO.GDT 7/9/10

BORING LOG

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
CENTRAL FEDERAL LANDS HIGHWAY DIVISION

Project Name: UT PFH 39-1(4), Sevenmile Gooseberry Road	Boring No. B-102	Date: August 2009	Sheet 1 of 1
Boring Location: Gates Lake Pit	Type of Boring: Wireline core		
Coordinates:	Casing Used: HQ3	Size: 3.5"	
Drill: CME 850 / Driller: HazTech Drilling	Boring Began: 8/19/09	Completed: 8/19/09	
Field Logged By: C. Martinez	Ground Elev: 10353.6 ft.	Weather: Sunny	
Revisions/Final By: C. Martinez	Water Depth:		
	Date:		
	Time:		

Run/Samp No.	Depth *Elevation* (feet)	Graphic Log	U.S.C.S.	Length Recov. feet ----- % Rec.	RQD	SPT Blows per 6 in	Description: (Density, Color, Type, Moisture, Other)
RCH 1				2.70 54%			0.0 - 17.0 ft. gravels, cobble to boulder size rock fragments and clay RCH 1 Rec. 2.7 ft. of gravels (0.7') and clay with some gravels (2.0').
RCH 2	5			3.00 60%			RCH 2 Rec. 3 ft. of gray vesicular basalt cobble to boulder size rock fragments some clay seams. 8 minute run.
RCH 3	10			4.00 80%	44		RCH 3 Rec. 4 ft. of gray vesicular basalt boulders with some clay seams. 8 minute run.
RCH 4	15 *10336.6*			4.30 86%	42		RCH 4 Rec. 4.3 ft. of gray vesicular basalt boulder (1.5') and red brown to gray fractured basalt (2.8'). 9 minute run. 17.0 - 30.0 ft. red brown to gray fractured basalt. 12 minute run.
RCH 5	20			4.20 84%	58		RCH 5 Rec. 4.2 ft. of red brown to gray fractured basalt. 12 minute run.
RCH 6	25			3.50 70%	32		RCH 6 Rec. 3.5 ft. of red brown to gray fractured basalt. 12 minute run.
	10323.6 30						BHT at 30.0 ft.
	35						
	40						

BORING LOG SEVENMILE.GPJ FHWA_CO.GDT 7/9/10

BORING LOG

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
CENTRAL FEDERAL LANDS HIGHWAY DIVISION

Project Name: UT PFH 39-1(4), Sevenmile Gooseberry Road	Boring No. B-103	Date: August 2009	Sheet 1 of 1
Boring Location: Gates Lake Pit	Type of Boring: Wireline core		
Coordinates:	Casing Used: HQ3	Size: 3.5"	
Drill: CME 850 / Driller: HazTech Drilling	Boring Began: 8/19/09	Completed: 8/20/09	
Field Logged By: C. Martinez	Ground Elev: 10356.6 ft.	Weather: Sunny	
Revisions/Final By: C. Martinez	Water Depth:		
	Date:		
	Time:		

Run/Samp No.	Depth *Elevation* (feet)	Graphic Log	U.S.C.S.	Length Recov. feet ----- % Rec.	RQD	SPT Blows per 6 in	Description: (Density, Color, Type, Moisture, Other)
RCH 1				3.30 66%			0.0 - 5.0 ft. cobble-size basalt fragments and clay. RCH 1 Rec. 3.3 ft. of cobble-size basalt fragments and clay.
	10351.6 5						
RCH 2				2.90 58%	0		5.0 - 10.0 ft. gray basalt and clay. RCH 2 Rec. 2.9 ft. of gray basalt and clay.
	10346.6 10						
RCH 3				3.50 70%	16		10.0 - 40.0 ft. gray basalt RCH 3 Rec. 3.5 ft. of gray basalt. 8 minute run.
	15						
RCH 4				3.20 64%	18		RCH 4 Rec. 3.2 ft. of gray basalt. 9 minute run.
	20						
RCH 5				3.75 75%	20		RCH 5 Rec. 3.75 ft. of gray basalt. 12 minute run.
	25						
RCH 6				4.25 85%	60		RCH 6 Rec. 4.25 ft. of gray basalt. 12 minute run.
	30						
RCH 7				4.50 90%	66		RCH 7 Rec. 4.5 ft. of gray basalt. 11 1/2 minute run.
	35						
RCH 8				3.50 70%	18		RCH 8 Rec. 3.5 ft. of gray basalt. 10 minute run.
	10316.6 40						BHT at 40.0 ft.

BORING LOG SEVENMILE.GPJ FHWA_CO.GDT 7/9/10

BORING LOG

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
CENTRAL FEDERAL LANDS HIGHWAY DIVISION

Project Name: UT PFH 39-1(4), Sevenmile Gooseberry Road	Boring No. B-104	Date: August 2009	Sheet 1 of 1
Boring Location: Gates Lake Pit	Type of Boring: Wireline core		
Coordinates:	Casing Used: HQ3	Size: 3.5"	
Drill: CME 850 / Driller: HazTech Drilling	Boring Began: 8/20/09	Completed: 8/20/09	
Field Logged By: C. Martinez	Ground Elev: 10348.8 ft.	Weather: Sunny	
Revisions/Final By: C. Martinez	Water Depth:		
	Date:		
	Time:		

Run/Samp No.	Depth *Elevation* (feet)	Graphic Log	U.S.C.S.	Length Recov. feet ----- % Rec.	RQD	SPT Blows per 6 in	Description: (Density, Color, Type, Moisture, Other)
RCH 1	*10343.8* 5			1.00 20%			0.0 - 5.0 ft. basalt rock fragments and brown sandy clay RCH 1 Rec. 1 ft. of basalt rock fragments and brown sandy clay, sl. moist.
RCH 2				4.70 94%	54		5.0 - 38.5 ft. gray basalt RCH 2 Rec. 4.7 ft. of gray basalt. 9 minute run.
RCH 3	10			3.30 66%	42		RCH 3 Rec. 3.3 ft. of gray fractured basalt. 8 minute run.
RCH 4	15			4.70 94%	60		RCH 4 Rec. 4.7 ft. of gray basalt. 8 minute run.
RCH 5	20			4.90 98%	60		RCH 5 Rec. 4.9 ft. of gray basalt. 9 minute run.
RCH 6	25			5.00 100%	70		RCH 6 Rec. 5 ft. of gray basalt. 9 1/2 minute run.
RCH 7	30			4.30 86%	54		RCH 7 Rec. 4.3 ft. of gray basalt. 12 1/2 minute run.
RCH 8	35			3.10 89%	60		RCH 8 Rec. 3.1 ft. of gray basalt. 9 1/2 minute run.
	10310.3 40						BHT at 38.5 ft.

BORING LOG SEVENMILE.GPJ FHWA_CO.GDT 7/9/10

BORING LOG

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
CENTRAL FEDERAL LANDS HIGHWAY DIVISION

Project Name: UT PFH 39-1(4), Sevenmile Gooseberry Road	Boring No. B-105	Date: August 2009	Sheet 1 of 1
Boring Location: Gates Lake Pit	Type of Boring: Wireline core		
Coordinates:	Casing Used: HQ3	Size: 3.5"	
Drill: CME 850 / Driller: HazTech Drilling	Boring Began: 8/20/09	Completed: 8/21/09	
Field Logged By: C. Martinez	Ground Elev: 10334.5 ft.	Weather: Sunny	
Revisions/Final By: C. Martinez	Water Depth:		
	Date:		
	Time:		

Run/Samp No.	Depth *Elevation* (feet)	Graphic Log	U.S.C.S.	Length Recov. feet ----- % Rec.	RQD	SPT Blows per 6 in	Description: (Density, Color, Type, Moisture, Other)
RCH 1	*10332.5*			2.70 54%	63		0.0 - 2.0 ft. Brown **CLAY** RCH 1 Rec. 2.7 ft. of gray basalt. 7 minute run. 2.0 - 40.0 ft. Gray **BASALT**
RCH 2	5			4.80 96%	80		RCH 2 Rec. 4.8 ft. of gray basalt. 11 minute run.
RCH 3	10			4.80 96%	60		RCH 3 Rec. 4.8 ft. of gray basalt. 9.5 minute run.
RCH 4	15			5.00 100%	78		RCH 4 Rec. 5 ft. of gray basalt. 10.5 minute run.
RCH 5	20			4.90 98%	66		RCH 5 Rec. 4.9 ft. of gray basalt. 16 minute run.
RCH 6	25			5.00 100%	76		RCH 6 Rec. 5 ft. of gray basalt. 10 minute run.
RCH 7	30			5.00 100%	58		RCH 7 Rec. 5 ft. of gray basalt. 11 minute run.
RCH 8	35			5.00 100%	100		RCH 8 Rec. 5 ft. of gray basalt. 12 minute run.
	10294.5 40						BHT at 40.0 ft.

BORING LOG SEVENMILE.GPJ FHWA_CO.GDT 7/9/10

BORING LOG

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
CENTRAL FEDERAL LANDS HIGHWAY DIVISION

Project Name: UT PFH 39-1(4), Sevenmile Gooseberry Road		Boring No. B-1	Date: August 2009	Sheet 1 of 1
Boring Location: STA 445+00, 50 ft. RT		Type of Boring: Auger		
Coordinates:		Casing Used: HSA	Size: 4" I.D.	
Drill: CME 850	Driller: HazTech Drilling	Boring Began: 8/21/09	Completed: 8/21/09	
Field Logged By: C. Martinez		Ground Elev: ft.	Weather: Sunny	
Revisions/Final By: C. Martinez		Water Depth:		
		Date:		
		Time:		

Run/Samp No.	Depth (feet)	Graphic Log	U.S.C.S.	Length Recov. feet ----- % Rec.	RQD	SPT Blows per 6 in	Description: (Density, Color, Type, Moisture, Other)
AR 1							AR 1
SPT 1	5			1.08 72%		4/11/6	SPT 1 Rec. 1.08 ft. of
AR 2							AR 2
SPT 2	10			0.00 0%		10-0	SPT 2 No recovery.
AR 3							AR 3
							BHT at 11.0 ft.
	15						
	20						
	25						
	30						
	35						
	40						

BORING LOG SEVENMILE.GPJ FHWA_CO.GDT 7/9/10

BORING LOG

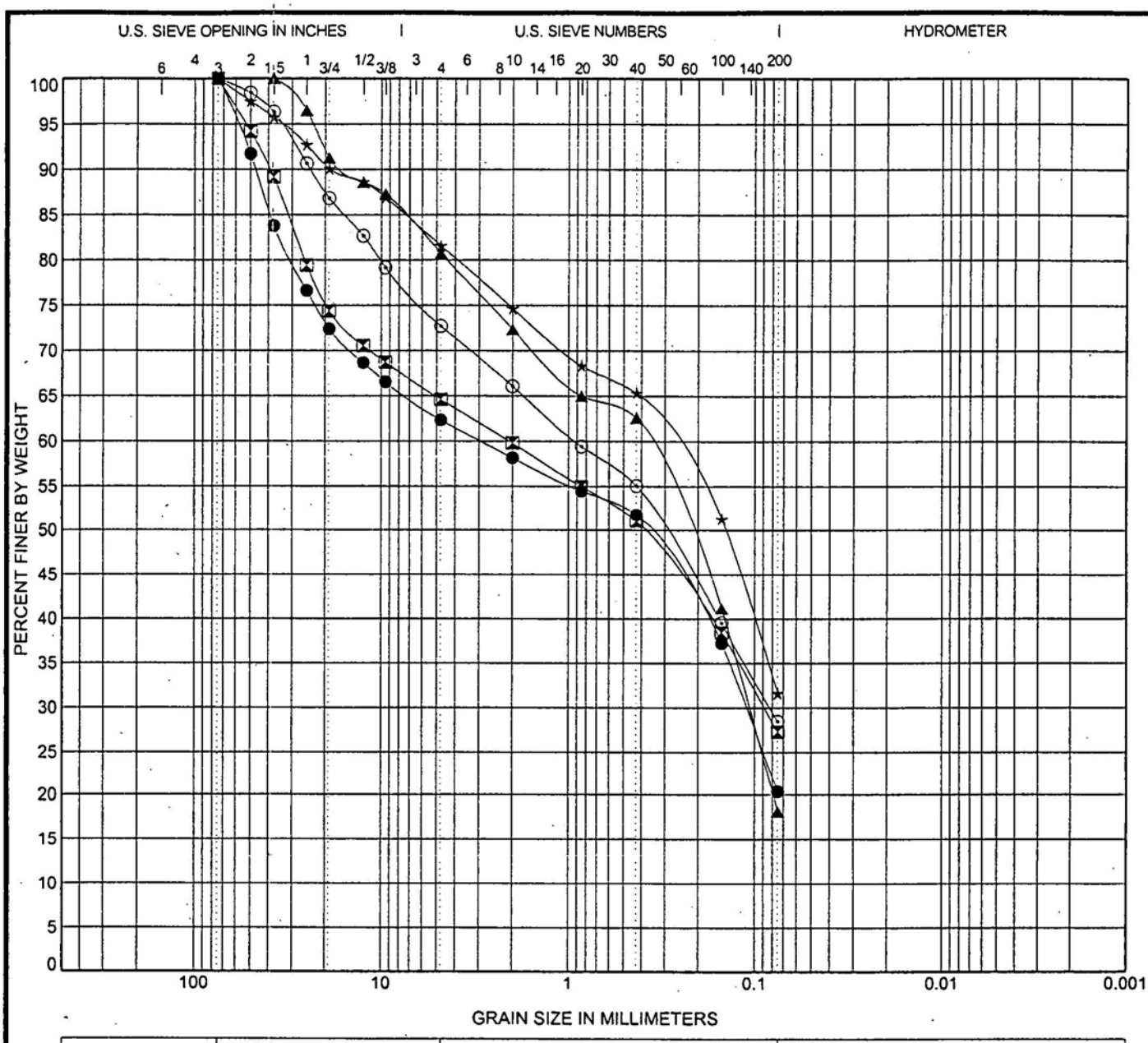
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
CENTRAL FEDERAL LANDS HIGHWAY DIVISION

Project Name: UT PFH 39-1(4), Sevenmile Gooseberry Road	Boring No. B-2	Date: August 2009	Sheet 1 of 1
Boring Location: STA 437+00, 20 ft. RT	Type of Boring: Auger		
Coordinates:	Casing Used: HSA	Size: 4" I.D.	
Drill: CME 850 / Driller: HazTech Drilling	Boring Began: 8/21/09	Completed: 8/21/09	
Field Logged By: C. Martinez	Ground Elev: ft.	Weather: Sunny	
Revisions/Final By: C. Martinez	Water Depth:		
	Date:		
	Time:		

Run/Samp No.	Depth (feet)	Graphic Log	U.S.C.S.	Length Recov. feet ----- % Rec.	RQD	SPT Blows per 6 in	Description: (Density, Color, Type, Moisture, Other)
AR 1							AR 1
SPT 1	5			0.83 55%		14/9/18	SPT 1 Rec. 0.83 ft. of
AR 2							AR 2
SPT 2	10			0.75 50%		4/6/8	SPT 2 Rec. 0.75 ft. of
AR 3							AR 3
SPT 3	15			0.00 0%		10-0	SPT 3 No recovery.
AR 4							AR 4
	20						BHT at 15.5 ft.
	25						
	30						
	35						
	40						

BORING LOG SEVENMILE.GPJ FHWA_CO.GDT 7/9/10

APPENDIX D – Laboratory Data



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		AASHTO Classification	LL	PL	PI	Cc	Cu
●	02+550 (TP-28)	1.2	A-2-4 (0)	19	18	1		
⊠	03+300 (TP-27)	1.2	A-2-4 (0)	26	17	9		
▲	04+090 (TP-26)	0.9	A-2-4 (0)	NP	NP	NP		
★	04+090 (TP-26)	1.5	A-2-4 (0)	21	17	4		
⊙	04+900 (TP-25)	1.2	A-2-4 (0)	23	14	9		

	Specimen Identification		D100	D60	D30	D10	MC %	% +76mm	%Gravel	%Sand	%Silt	%Clay
●	02+550 (TP-28)	1.2	75	2.926	0.111		4.3	0.0	37.7	42.0	20.3	
⊠	03+300 (TP-27)	1.2	75	2.073	0.089		8.1	0.0	35.4	37.3	27.3	
▲	04+090 (TP-26)	0.9	37.5	0.375	0.107		5.7	0.0	19.3	62.6	18.1	
★	04+090 (TP-26)	1.5	75	0.286			9.7	0.0	18.4	49.9	31.6	
⊙	04+900 (TP-25)	1.2	75	0.915	0.083		7.0	0.0	27.3	44.2	28.5	

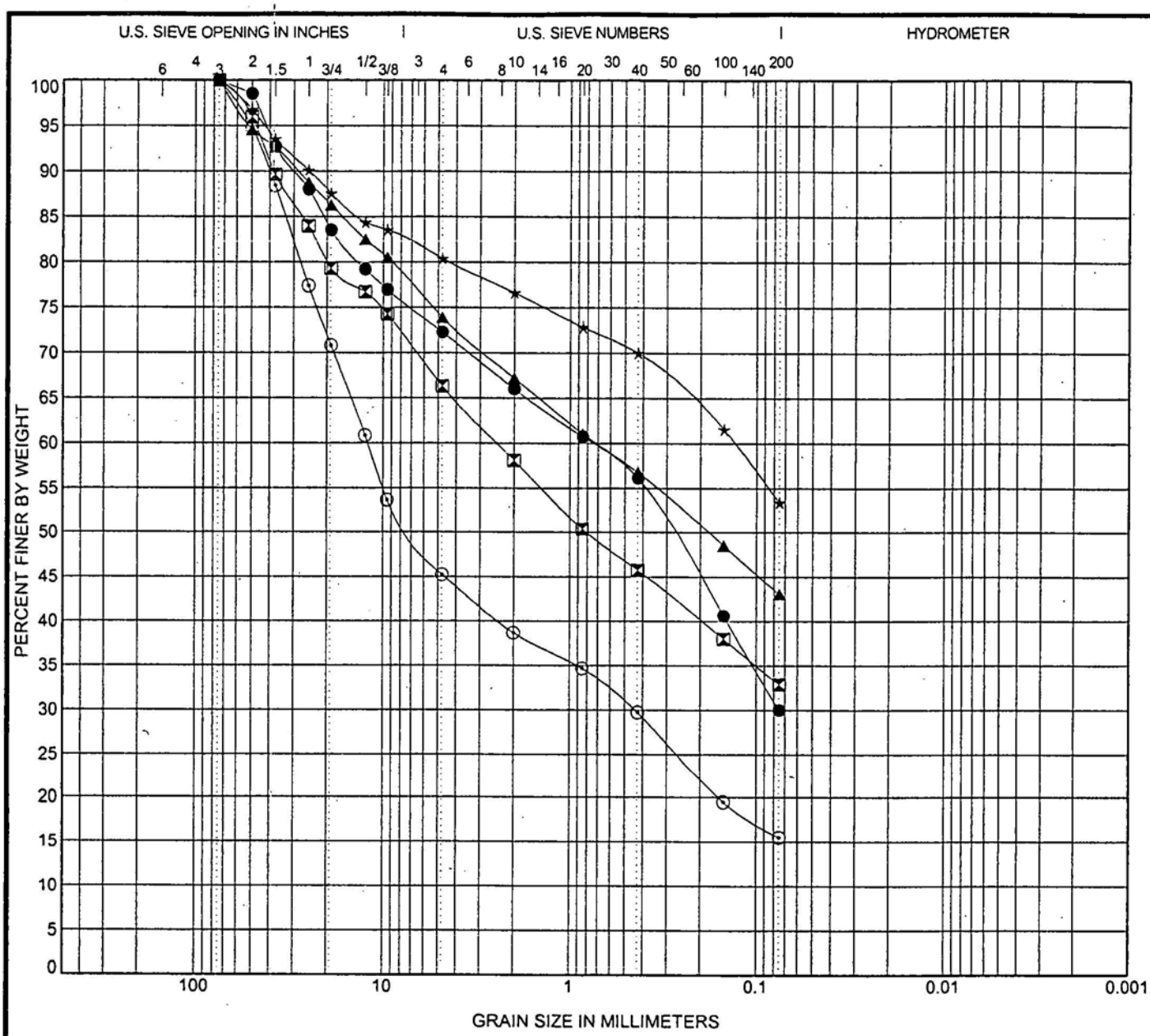
Black Eagle Consulting, Inc.
1345 Capital Blvd., Suite A
Reno, Nevada 89502-7140
Telephone: (775) 359-6600
Fax: (775) 359-7766

GRAIN SIZE DISTRIBUTION

Project: Sevenmile-Gooseberry Phase II & III

Location: Sevier County, Utah

Project Number: 0079-06-2 Plate Number: B.1.1



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		AASHTO Classification	LL	PL	PI	Cc	Cu
●	06+500 (TP-23)	1.1	A-2-4 (0)	23	13	10		
⊠	07+270 (TP-22)	1.7	A-2-6 (1)	34	19	15		
▲	08+100 (TP-21)	1.5	A-7-6 (6)	42	16	26		
★	09+600 (TP-19)	0.6	A-7-6 (12)	47	17	30		
⊙	11+300 (TP-17)	0.6	A-2-4 (0)	24	15	9		

	Specimen Identification		D100	D60	D30	D10	MC %	% +76mm	%Gravel	%Sand	%Silt	%Clay
●	06+500 (TP-23)	1.1	75	0.759	0.075		6.3	0.0	27.7	42.3	30.0	
⊠	07+270 (TP-22)	1.7	75	2.448			13.1	0.0	33.7	33.4	32.9	
▲	08+100 (TP-21)	1.5	75	0.716			16.6	0.0	26.1	30.8	43.0	
★	09+600 (TP-19)	0.6	75	0.131			13.9	0.0	19.6	27.0	53.4	
⊙	11+300 (TP-17)	0.6	75	12.107	0.442		4.7	0.0	54.8	29.7	15.5	

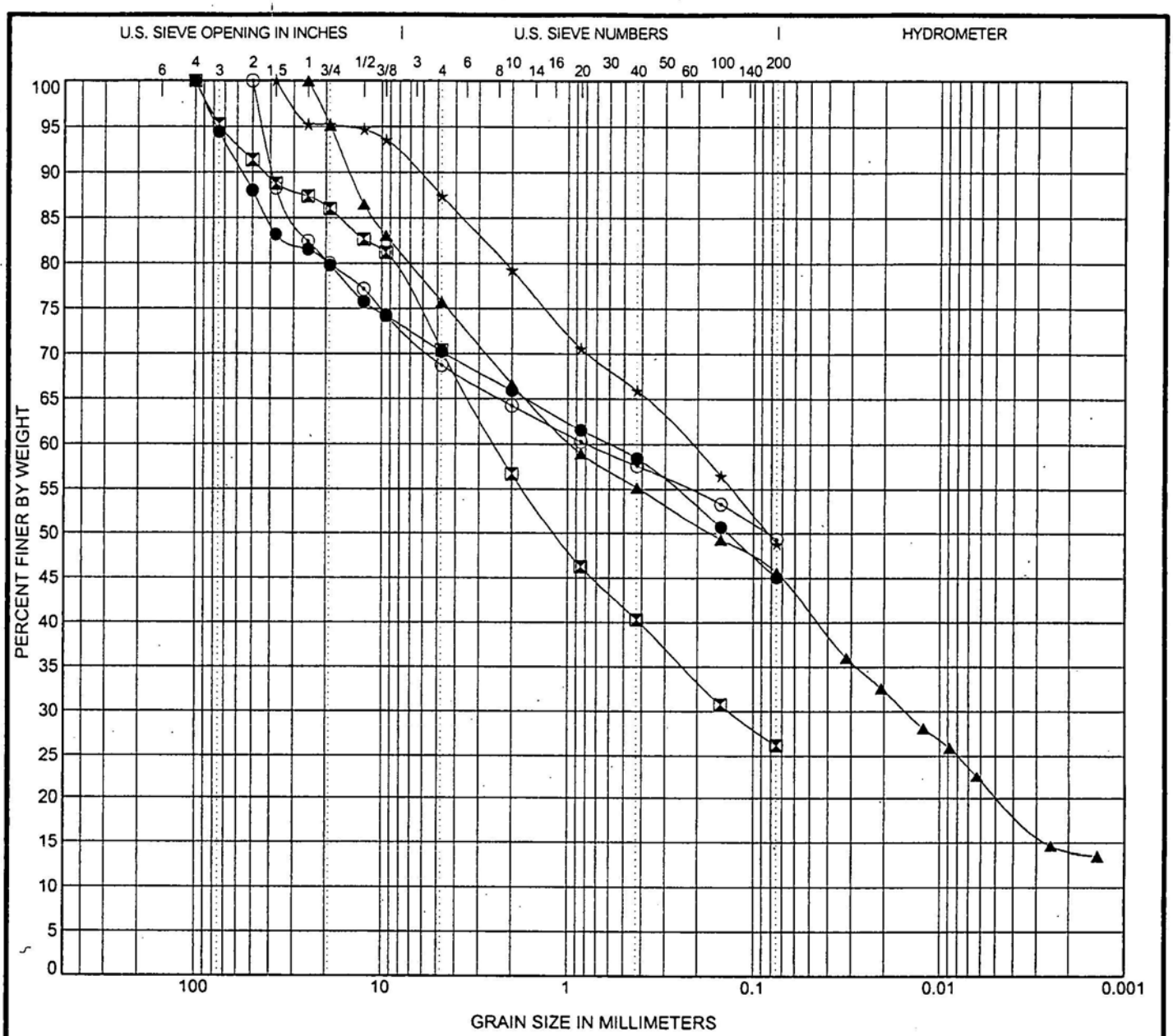
Black Eagle Consulting, Inc.
1345 Capital Blvd., Suite A
Reno, Nevada 89502-7140
Telephone: (775) 359-6600
Fax: (775) 359-7766

GRAIN SIZE DISTRIBUTION

Project: Sevenmile-Gooseberry Phase II & III

Location: Sevier County, Utah

Project Number: 0079-06-2 Plate Number: B.1.2



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification		AASHTO Classification	LL	PL	PI	Cc	Cu
● 12+780 (TP-15)	0.9	A-7-6 (9)	49	17	32		
⊠ 13+650 (TP-14)	0.8	A-2-4 (0)	24	14	10		
▲ 14+590 (TP-13)	1.1	A-6 (6)	39	15	24		
★ 16+180 (TP-11)	0.6	A-6 (7)	38	16	22		
⊙ 17+030 (TP-10)	0.5	A-4 (1)	26	17	9		

Specimen Identification		D100	D60	D30	D10	MC %	% +76mm	%Gravel	%Sand	%Silt	%Clay
● 12+780 (TP-15)	0.9	100	0.604			12.4	6.0	24.2	25.2	45.0	
⊠ 13+650 (TP-14)	0.8	100	2.466	0.134		8.5	5.0	24.8	44.2	26.2	
▲ 14+590 (TP-13)	1.1	25	0.954	0.015		11.5	0.0	24.2	30.1	25.1	20.5
★ 16+180 (TP-11)	0.6	37.5	0.221			14.4	0.0	12.6	38.6	48.8	
⊙ 17+030 (TP-10)	0.5	50	0.789			5.9	0.0	31.3	19.4	49.3	

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Reno, Nevada 89502-7140
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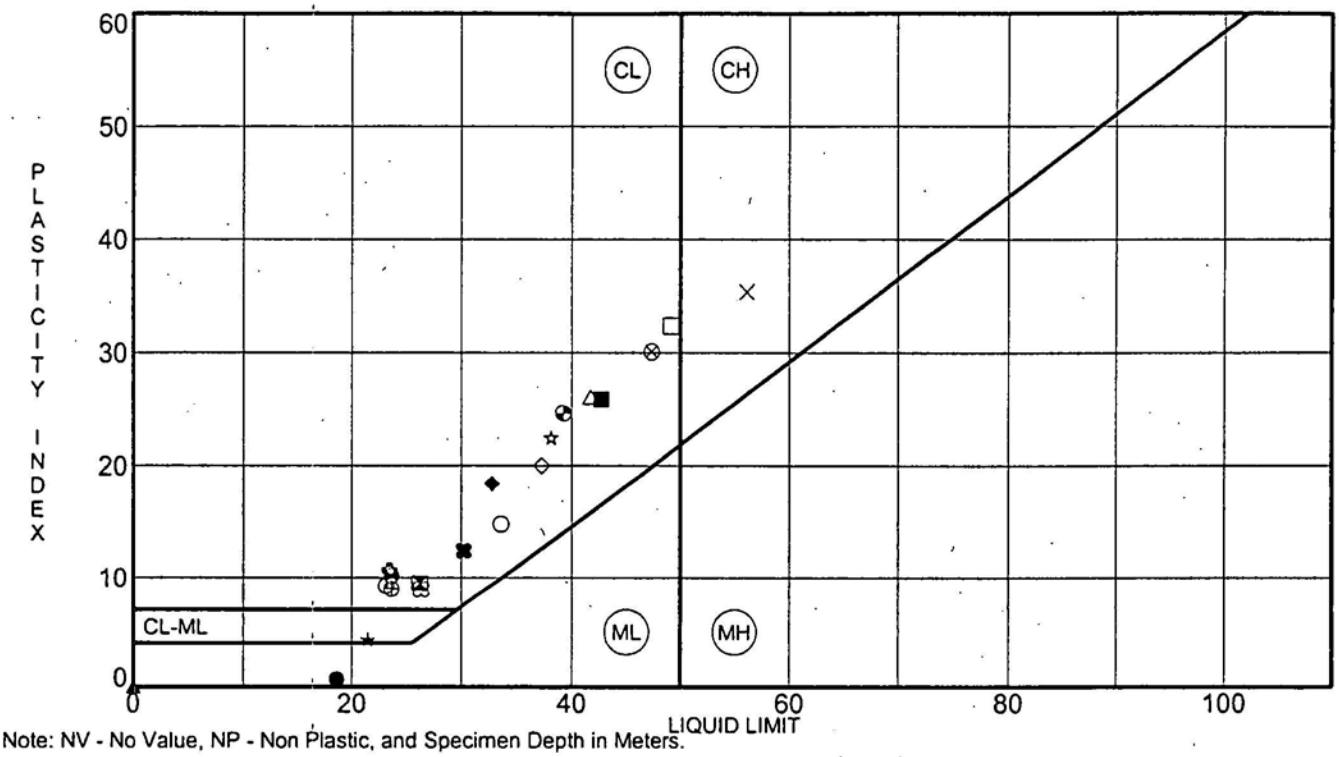
GRAIN SIZE DISTRIBUTION

Project: Sevenmile-Gooseberry Phase II & III

Location: Sevier County, Utah

Project Number: 0079-06-2 Plate Number: B.1.3

GRAIN_SIZE3M 0079062.GPJ US_LAB.GDT 10/17/2002



Note: NV - No Value, NP - Non Plastic, and Specimen Depth in Meters.

Specimen Identification			LL	PL	PI	Fines	AASHTO Classification
●	02+550 (TP-28)	1.2	19	18	1	20	A-2-4 (0)
⊠	03+300 (TP-27)	1.2	26	17	9	27	A-2-4 (0)
▲	04+090 (TP-26)	0.9	NV	NV	NP	18	A-2-4 (0)
★	04+090 (TP-26)	1.5	21	17	4	32	A-2-4 (0)
⊙	04+900 (TP-25)	1.2	23	14	9	28	A-2-4 (0)
✿	06+500 (TP-23)	1.1	23	13	10	30	A-2-4 (0)
○	07+270 (TP-22)	1.7	34	19	15	33	A-2-6 (1)
△	08+100 (TP-21)	1.5	42	16	26	43	A-7-6 (6)
⊗	09+600 (TP-19)	0.6	47	17	30	53	A-7-6 (12)
⊕	11+300 (TP-17)	0.6	24	15	9	15	A-2-4 (0)
□	12+780 (TP-15)	0.9	49	17	32	45	A-7-6 (9)
⊖	13+650 (TP-14)	0.8	24	14	10	26	A-2-4 (0)
◕	14+590 (TP-13)	1.1	39	15	24	46	A-6 (6)
☆	16+180 (TP-11)	0.6	38	16	22	49	A-6 (7)
⊠	17+030 (TP-10)	0.5	26	17	9	49	A-4 (1)
■	18+300 (TP-09)	1.2	43	17	26	88	A-7-6 (23)
◆	19+300 (TP-08)	1.1	33	14	19	79	A-6 (13)
◇	19+300 (TP-08)	1.1	37	17	20	67	A-6 (11)
×	20+700 (TP-07)	0.9	56	21	35	86	A-7-6 (32)
✖	21+700 (TP-05)	1.8	30	18	12	25	A-2-6 (0)

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Telephone: (775) 359-6600
Fax: (775) 359-7766

ATTERBERG LIMITS RESULTS

Project: Sevenmile-Gooseberry Phase II & III

Location: Sevier County, Utah

Project Number: 0079-06-2 Plate Number: B.1.6

US ATTERBERG LIMITS METRIC 0079062.GPJ US LAB.GDT 10/17/2002

UNCONFINED COMPRESSIVE STRENGTH
ASTM D 2938

CLIENT: Black Eagle Consulting

JOB NO.: 2616-01

LOCATION: Gooseberry Project # 0079-06-03 Site

DATE TEST8/26/04 HN

Specimen ID Boring, Depth (m)	Diameter (in.)	Length (in.)	Mass (gms)	Wet Density (pcf)	Failure Load (lb)	Failure Types **	Compressive Strength (psi)
17+710 10.3-10.5	2.394	4.347	684.10	133.2	721	S	*160
BP-3, 2.15-2.35	2.396	4.649	858.80	156.1	57,255	C	*12650
BP-4, 0.3-0.5	2.387	4.690	870.70	158.0	103,610	S	*23100

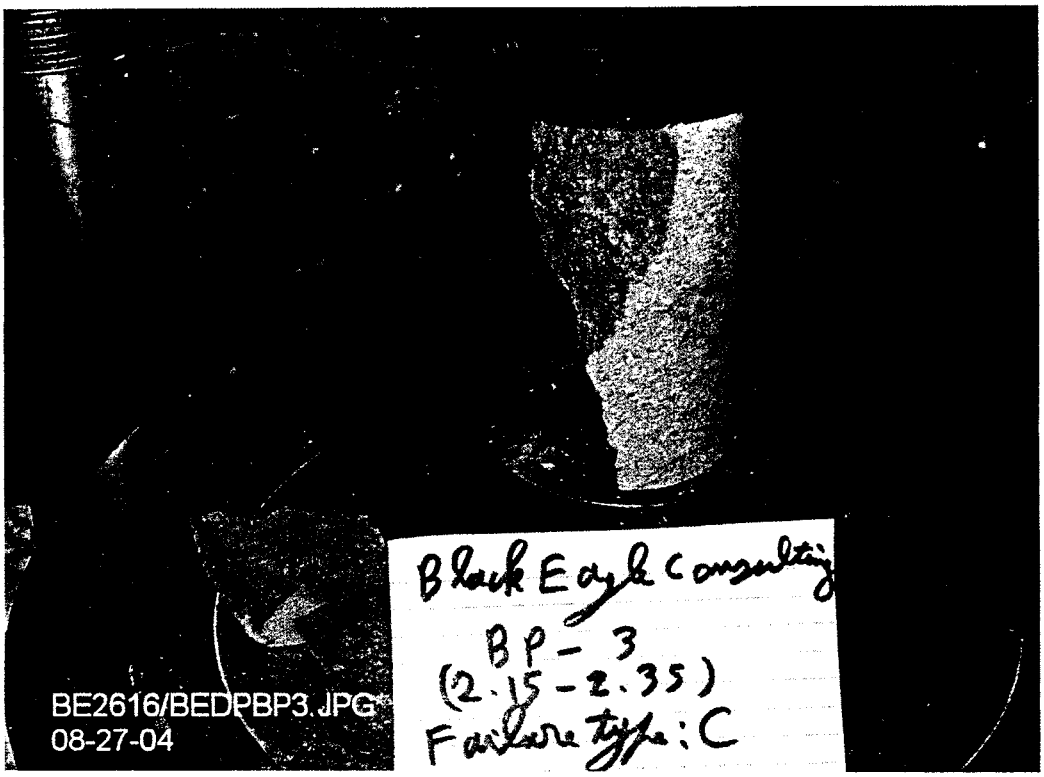
Notes and Comments:

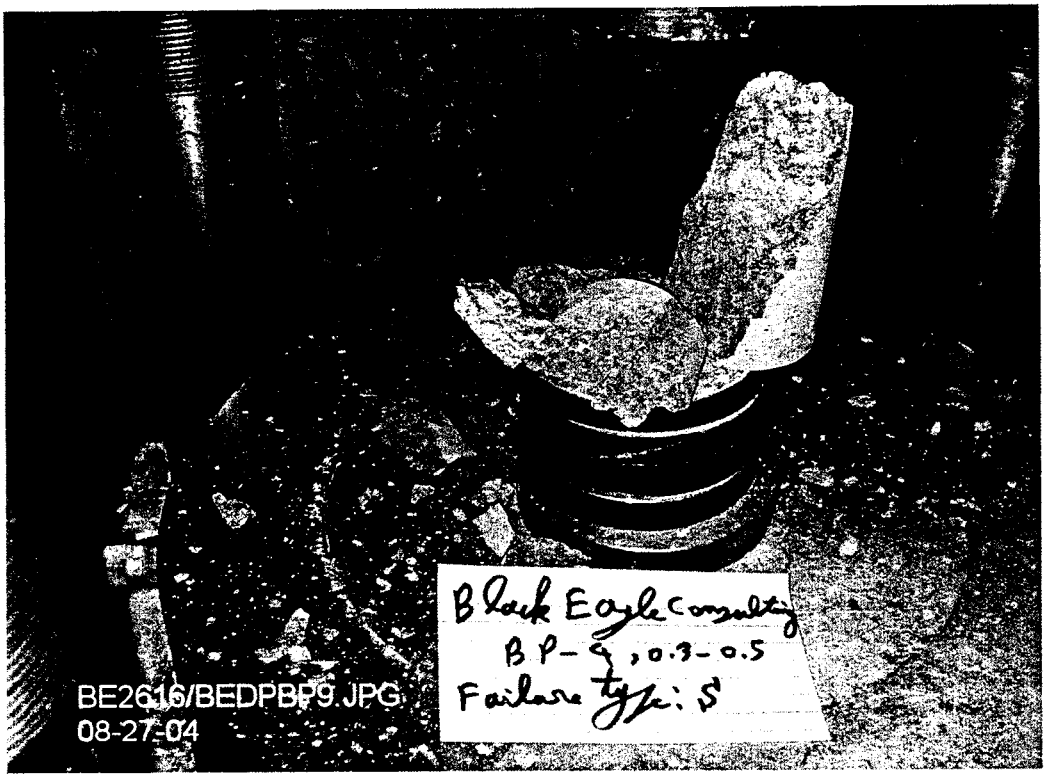
* Indicates L/D < 2.0. Correction Factor from ASTM D 2938 used.
C=Ca/[0.88+0.24b/h]
Ca = Failure Load / Surface Area
b = Sample Diameter
h = Sample Length

** Failure Types:
S: Shear Failure, M: Matrix Failure, F/V: Fracture, Bedding/Void Failure, C: Combination

Data Entered By: HN Date: 08/26/2004
Data Checked By: CW Date: 08/26/04
Filename: BEUCSRCK

ADVANCED TERRA TESTING, Inc.


Black Eagle Consulting
BP-3
(2.15-2.35)
Failure type: C
BE2616/BEDPBP3.JPG
08-27-04


Black Eagle Consulting
BP-9, 0.3-0.5
Failure type: S
BE2616/BEDPBP9.JPG
08-27-04

DIAMETRAL POINT LOAD TEST
ASTM D 5731

CLIENT: Black Eagle Consulting JOB NO.: 2616-01

LOCATION: Goosberry Project #0079-06-03 Site DATE TESTED: 8/25/04 HN

Specimen ID Boring, Depth(m)	Length (in.)	Diameter (in.)	De^2 (in^2)	Gauge Failure Load (psig)	P (lb)	Is	F	Is(50)	C	Compressive Strength (psi)	Loading with respect to Fracture/Bedding	Failure Mode
17+810, 9.3-9.5	2.470	2.376	5.645	35	72.5	12.8	1.1	13.9	24.8	340	N/A	S
22+510, 7.00-7.15	2.815	2.393	5.726	1055	2183.9	381.4	1.1	413.4	24.9	10,300	N/A	S
22+510, 7.68-7.88	3.694	2.392	5.722	2752	5696.6	995.6	1.1	1079.1	24.9	26,870	N/A	S
BP-1, 2.9-3.1	3.431	2.389	5.707	3030	6272.1	1099.0	1.1	1190.5	24.9	29,630	N/A	S
BP-2, 2.75-2.93	3.332	2.382	5.674	2340	4843.8	853.7	1.1	923.6	24.9	22,960	N/A	S
BP-2, 4.28-4.40	3.479	2.395	5.736	3225	6675.8	1163.8	1.1	1262.2	24.9	31,450	N/A	S
BP-3, 2.65-2.80	3.408	2.387	5.698	3000	6210.0	1089.9	1.1	1180.2	24.9	29,360	N/A	S
BP-3, 4.70-4.93	3.124	2.382	5.674	2585	5351.0	943.1	1.1	1020.3	24.9	25,360	N/A	S
BP-4, 0.6-0.8	3.385	2.396	5.741	3290	6810.3	1186.3	1.1	1286.8	24.9	32,070	N/A	S
BP-4, 3.5-3.7	3.392	2.388	5.703	3050	6313.5	1107.1	1.1	1199.1	24.9	29,840	N/A	S
BP-5, 2.75-2.90	3.979	2.394	5.731	1150	2380.5	415.4	1.1	450.4	24.9	11,220	N/A	S

Notes:
L: Sample Length
D: Sample Diameter
De^2: Exquivalent Diameter = D^2
Piston Area (in^2): 2.07
P: Gauge Failure Load * Piston area (in^2)
Is: Point Load Index Strength = P/De^2
F: Size Correction Factor to 2.0 in = (De/2.0)^0.45
Is(50): Size Corrected Index Strength = F* Is
C: Factor to Estimate Compressive Strength related to Core Diameter
Compressive Strength in psi = C * Is(50)

Failure Modes:
F: Fracture/Bedding Controlled
S: Substance Controlled
C: Combination Substance & Fracture

Data Entered By: HN Date: 08/26/2004
Data Checked By: [illegible] Date: 08/26/04
Filename: BEPTLOAD

ADVANCED TERRA TESTING, Inc.

AXIAL POINT LOAD TEST
ASTM D 5731

CLIENT: Black Eagle Consulting

JOB NO.: 2616-01

LOCATION: Goosberry Project #0079-06-03 Site

DATE TESTED: 8/25/04 HN

Specimen ID Boring, Depth(m)	Length (in.)	Diameter (in.)	De^2 (in^2)	Gauge Failure Load (psig)	P (lb)	Is	F	Is(50)	C	Compressive Strength (psi)	Loading with respect to Fracture/Bedding	Failure Mode
BP-5, 0.5-0.7	1.248	2.390	3 798	195	403.7	106.3	1.0	105.1	24.9	2,620	N/A	S
17+710, 12.9-13.3	2.050	2.385	6.225	29	60.0	9.6	1.1	10.7	24.9	260	N/A	S

Notes:
L: Sample Length
D: Sample Diameter
De^2: Exquivalent Diameter = 4*L*D/pi
Piston Area (in^2): 2.07
P: Gauge Failure Load * Piston area (2.07 in^2)
Is: Point Load Index Strength = P/De^2
F: Size Correction Factor to 2.0 in = (De/2.0)^0.45
Is(50): Size Corrected Index Strength = F* Is
C: Factor to Estimate Compressive Strength related to Core Diameter
Compressive Strength in psi = C * Is(50)

Failure Modes:
F: Fracture/Bedding Controlled
S: Substance Controlled
C: Combination Substance & Fracture

Data Entered By: HN Date: 08/25/2004
Data Checked By: CJ Date: 08/26/04
Filename: BEPTLOA1

ADVANCED TERRA TESTING, Inc.

October 8, 2002
AMEC Project No. 8-419-000309

RECEIVED
OCT 11 2002
BY:

Black Eagle Consulting Inc.
1345 Capital Boulevard, Suite A
Reno, Nevada 89502-7140

Attention: Mr. Ron Weber

Re: GOOSEBERRY ROAD, PHASE II
Durability Indexes

Dear Mr. Weber:

Per your request, AMEC Earth & Environmental, Inc., performed durability indexes (Cal Trans 229) on crushed coarse and fine aggregate. The results are as follows.

Sample	Sample Number	Durability Index
Coarse Aggregate	1	78
	2	74
	3	73
	Average	75
Fine Aggregate	1	82
	2	83
	3	79
	Average	81

We trust this information complies with your current need. If you have any questions, please do not hesitate to call me at (775) 331-2375.

Respectfully submitted,

AMEC Earth & Environmental, Inc.

Steve Vineis
Laboratory Supervisor

SV/mm

\\RENO_MAIN\VOL1\PROJECTS\Lab\8-309\8419000309_rweber_10-8-02_llr2.doc

Figure B.3.1

AMEC Earth & Environmental, Inc.
780 Vista Boulevard, Suite 100
Sparks, Nevada
USA 89434-6656
Tel + 1 (775) 331-2375
Fax + 1 (775) 331-4153
www.amec.com

U.S. Department of Transportation
Federal Highway Administration

Central Federal Lands Highway Division Laboratory

An AASHTO and ISO Accredited Laboratory

AASHTO R18 ISO/IEC 17025

Report of Miscellaneous Tests

Project: Utah PFH 39-1(2) Sevenmile-Gooseberry

Date Reported: 1/5/2005

Laboratory Number: 04-1855-C

Submitted By: Matt DeMarco

Material Type: Basalt Cores

Material Source: Gates Lake (within the intact rock portion)

Tested For: AASHTO T 85, T 96, TP 58, T 104, T210

Field Sample Number: CFL-Gates-MS

Test Results

AASHTO T 85 Specific Gravity and Absorption of Coarse Aggregate

Bulk Specific Gravity	2.47
Bulk Specific Gravity (SSD)	2.54
Apparent Specific Gravity	2.66
Absorption, %	2.8

AASHTO T 96 Resistance to Degradation of Small Size Coarse Aggregate by Abrasion and Impact in the Los Angles Machine

LA Abrasion, Grading A: 25% Loss

AASHTO TP 58 Resistance of Coarse Aggregate to Degradation by Abrasion in the Micro-Deval Apparatus

Micro Deval, Grading 7.2: 9.4% Loss

AASHTO T 104 Soundness of Aggregate by use of Sodium Sulfate

Soundness: 0% Loss

AASHTO T 210 Aggregate Durability Index

Coarse Durability Index, Procedure A: 90

Black Eagle sampled these cores, from a variety of locations to a depth of 20', in the fall of 2004. The samples were laboratory crushed to – 1 ½" before the testing was performed.

Plate B.7.2

Distribution:
Laboratory
Geotechnical
Pavements
Materials

Num. / Project File
Darrell Harding
Matt DeMarco
Steve Deppmeier
1 Copy

Reported By:

Darrell Harding

Form FHWA 1742 Rev. 12/01

Black Eagle Consulting, Inc.
SPECIFIC GRAVITY AND ABSORPTION

COARSE AGGREGATE

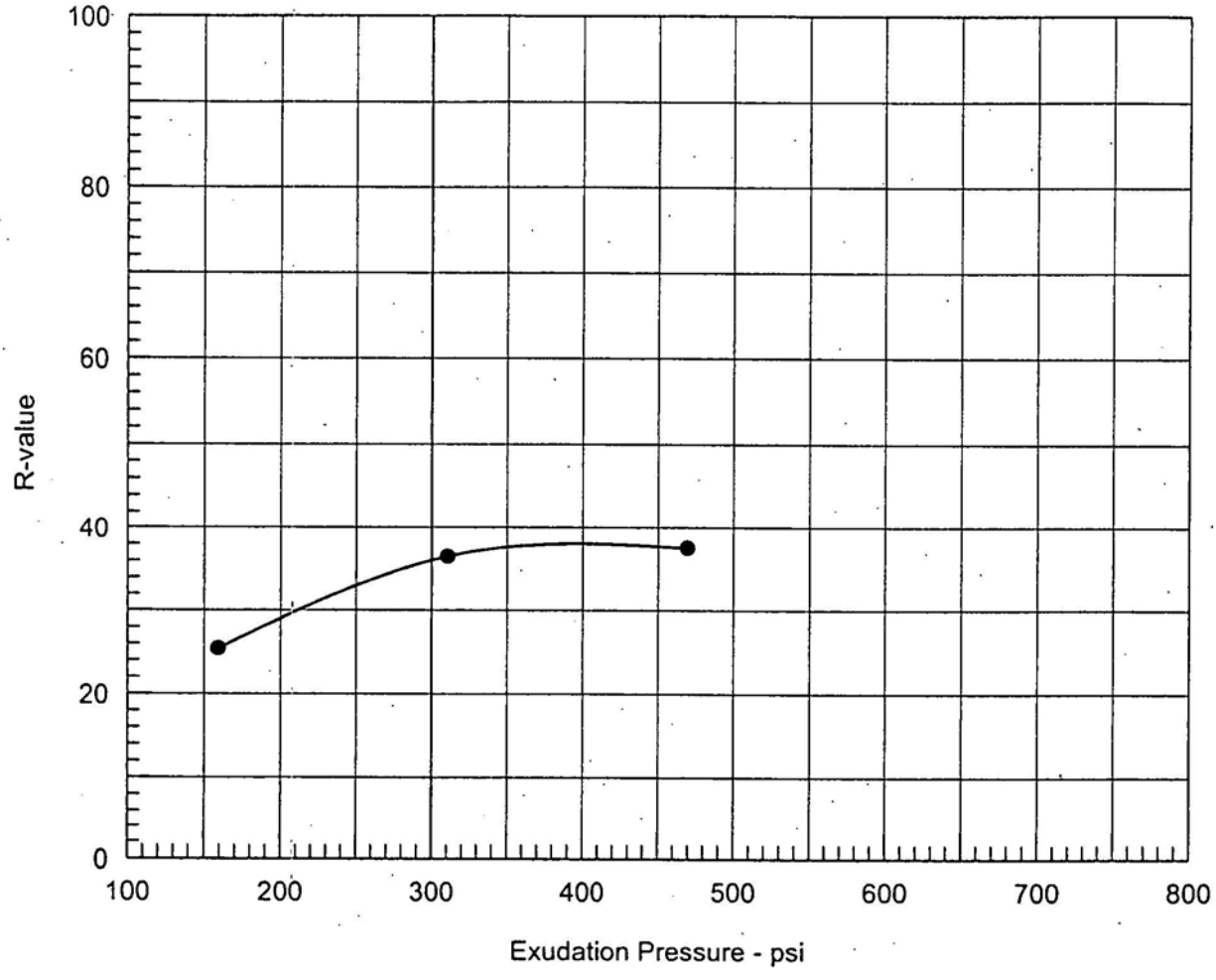
Location		Owner	Gooseberry		
Contractor		Job No.	0079-06-3	LL: 5670	
Sampled By		Tested by	GB	Date	11/10/04
Source of Aggregate	Rip Rap – Native Boulders		Sample No.	1	

Weight of in grams of saturated surface dry sample in air		B	2,891.5		
Weight in grams of saturated sample in water		C	1,614.0		
Weight in grams of oven-dry sample in air		A	2,823.2		
$Bulk = \frac{A}{B-C}$	$Bulk\ SSD\ \frac{B}{B-C}$	$Apparent\ \frac{A}{A-C}$	2.210	2.263	2.335
$Absorption, percent = \frac{B-A}{A} \times 100$			2.42		

UNIT WEIGHTS

Weight of Sample & Container			
Weight of Container			
Weight of Sample			
Volume of Container			
Unit Weight			

R-VALUE TEST REPORT



Resistance R-Value and Expansion Pressure - AASHTO T 190

No.	Compact. Pressure psi	Density pcf	Moist. %	Expansion Pressure psi	Horizontal Press. psi @ 160 psi	Sample Height in.	Exud. Pressure psi	R Value	R Value Corr.
1	280	117.2	13.1	0.00	80	2.47	310	36	36
2	200	115.1	14.5	0.00	95	2.42	159	27	25
3	300	122.0	12.1	0.00	75	2.51	470	38	38

Test Results	Material Description
R-value at 300 psi exudation pressure = 36	Silty Sand with Gravel

Project No.: 0079-06-2

Project: Sevenmile Gooseberry Road Phase II and III

Source of Sample: TP28 Bulk **Depth:** 4.0'

Date: 10/17/2002

Tested by: J.F.

Checked by: R.W.

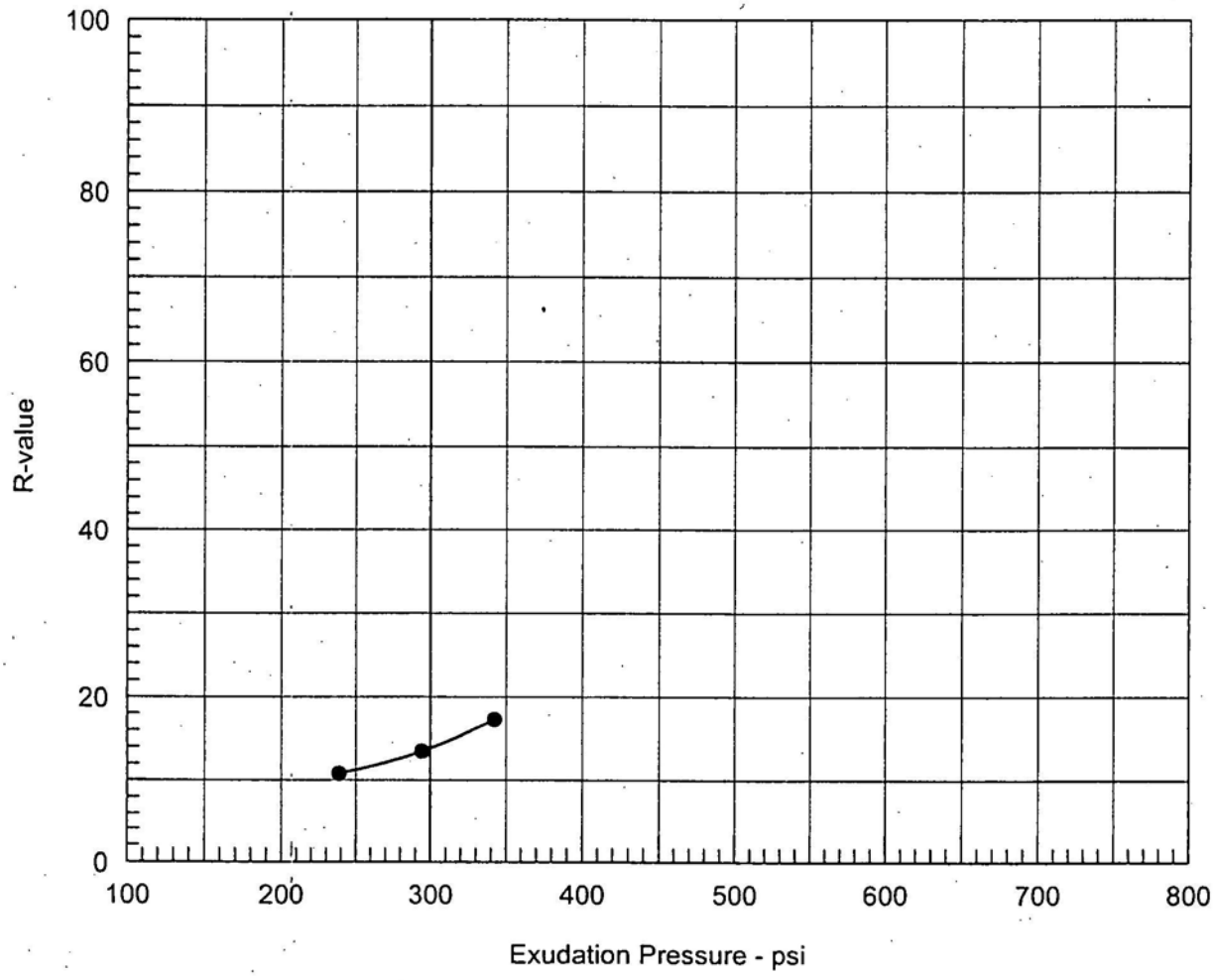
Remarks:
Laboratory Number 3223
September 24, 2002

R-VALUE TEST REPORT

BLACK EAGLE CONSULTING, INC.

Figure B.4.1

R-VALUE TEST REPORT



Resistance R-Value and Expansion Pressure - AASHTO T 190

No.	Compact. Pressure psi	Density pcf	Moist. %	Expansion Pressure psi	Horizontal Press. psi @ 160 psi	Sample Height in.	Exud. Pressure psi	R Value	R Value Corr.
1	120	116.8	15.2	0.00	133	2.51	239	11	11
2	140	118.7	14.4	0.00	127	2.44	294	14	13
3	160	120.8	14.0	0.00	118	2.41	342	18	17

Test Results	Material Description
R-value at 300 psi exudation pressure = 14	Clayey Sand with Gravel

Project No.: 0079-06-2

Project: Sevenmile Gooseberry Road Phase II and III

Source of Sample: TP27 Bulk **Depth:** 4.0'

Date: 10/17/2002

Tested by: J.F.

Checked by: R.W.

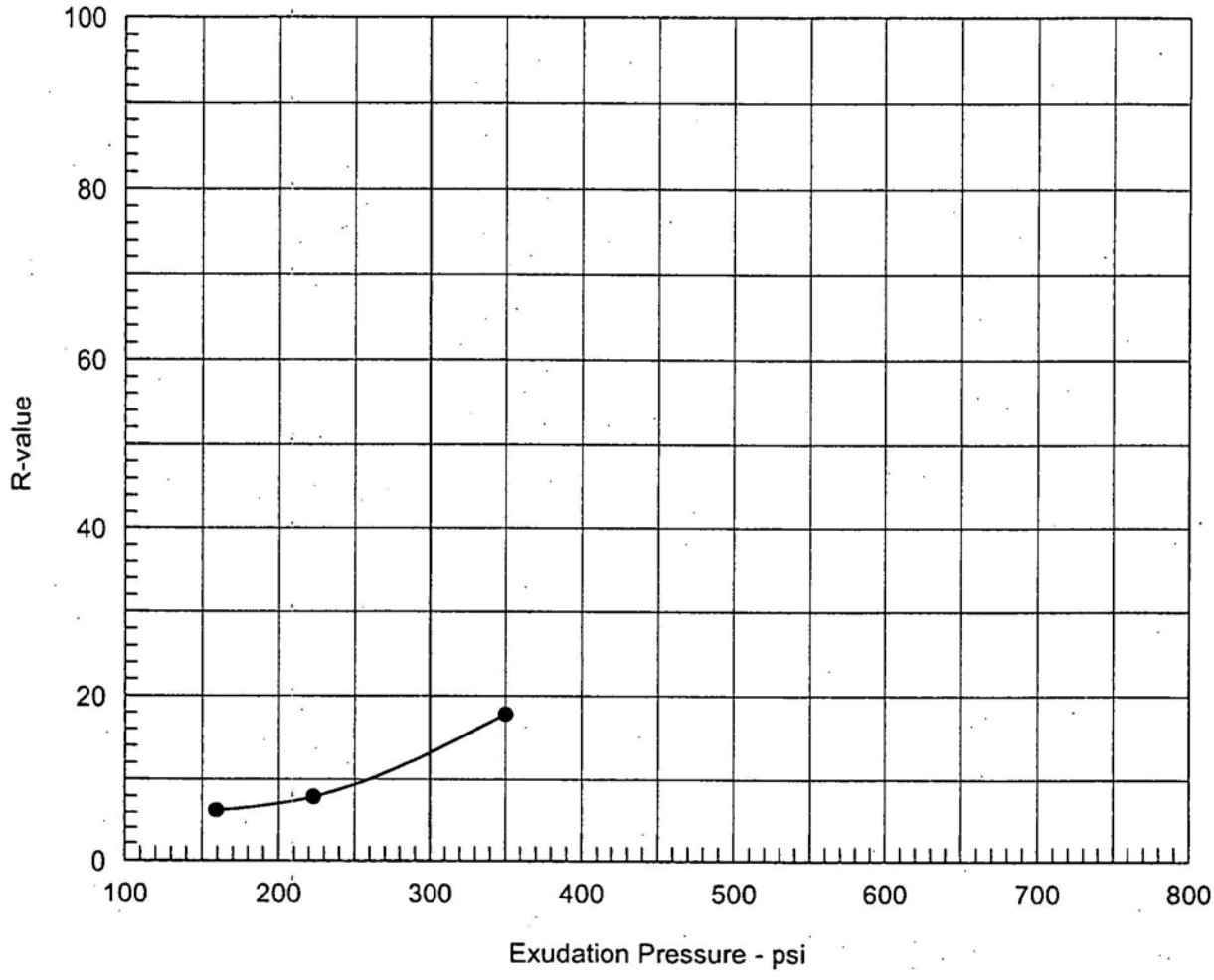
Remarks:
Laboratory Number 3223
September 24, 2002

R-VALUE TEST REPORT

BLACK EAGLE CONSULTING, INC.

Figure B.4.2

R-VALUE TEST REPORT



Resistance R-Value and Expansion Pressure - AASHTO T 190

No.	Compact. Pressure psi	Density pcf	Moist. %	Expansion Pressure psi	Horizontal Press. psi @ 160 psi	Sample Height in.	Exud. Pressure psi	R Value	R Value Corr.
1	50	117.0	14.8	0.00	142	2.42	159	7	6
2	100	120.8	13.6	0.00	139	2.43	223	8	8
3	210	124.7	12.6	0.00	119	2.46	350	18	18

Test Results	Material Description
R-value at 300 psi exudation pressure = 13	Silty, Clayey Sand with Gravel

Project No.: 0079-06-2

Project: Sevenmile Gooseberry Road Phase II and III

Source of Sample: TP26 Bulk **Depth:** 3.0'

Date: 10/17/2002

Tested by: J.F.

Checked by: R.W.

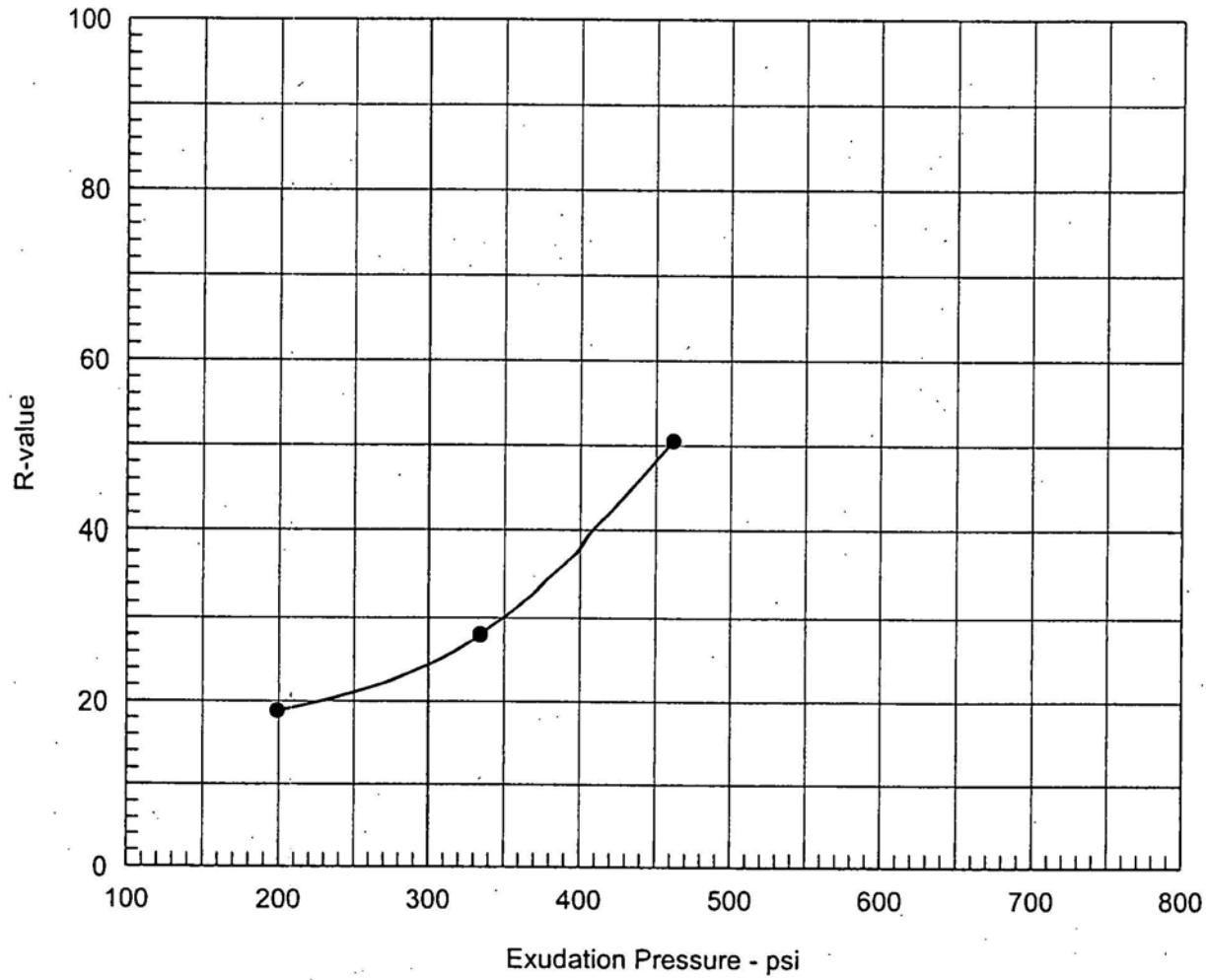
Remarks:
Laboratory Number 3223
September 24, 2002

R-VALUE TEST REPORT

BLACK EAGLE CONSULTING, INC.

Figure B.4.3

R-VALUE TEST REPORT



Resistance R-Value and Expansion Pressure - AASHTO T 190

No.	Compact. Pressure psi	Density pcf	Moist. %	Expansion Pressure psi	Horizontal Press. psi @ 160 psi	Sample Height in.	Exud. Pressure psi	R Value	R Value Corr.
1	100	122.9	12.3	0.00	114	2.39	199	20	19
2	120	124.1	11.9	0.00	100	2.51	334	28	28
3	160	125.1	11.5	0.00	65	2.49	462	51	51

Test Results	Material Description
R-value at 300 psi exudation pressure = 24	Clayey Sand with Gravel

Project No.: 0079-06-2

Project: Sevenmile Gooseberry Road Phase II and III

Source of Sample: TP25 Bulk **Depth:** 4.0'

Date: 10/17/2002

Tested by: J.F.

Checked by: R.W.

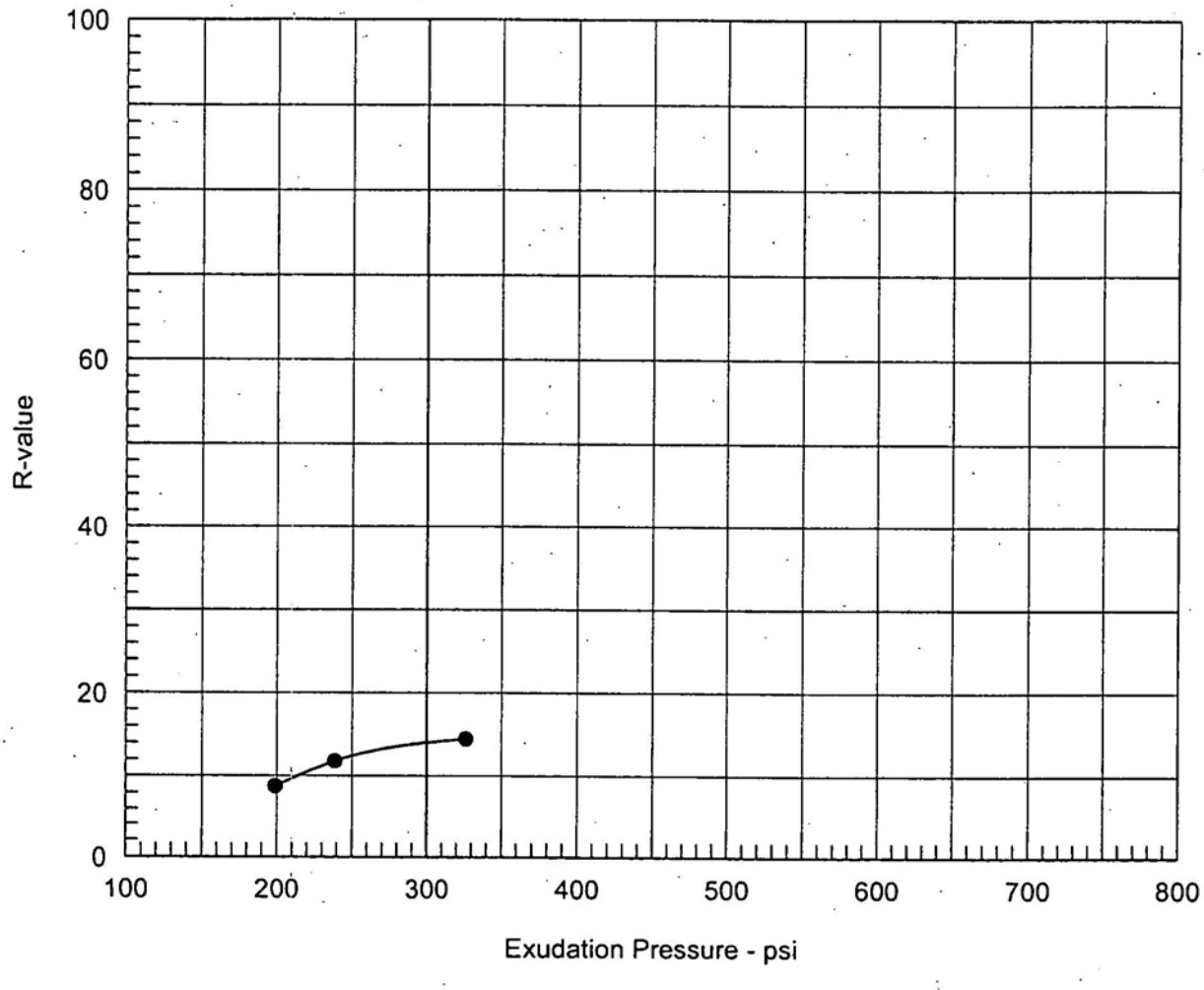
Remarks:
Laboratory Number 3223
September 24, 2002

R-VALUE TEST REPORT

BLACK EAGLE CONSULTING. INC.

Figure B.4.4

R-VALUE TEST REPORT



Resistance R-Value and Expansion Pressure - AASHTO T 190

No.	Compact. Pressure psi	Density pcf	Moist. %	Expansion Pressure psi	Horizontal Press. psi @ 160 psi	Sample Height in.	Exud. Pressure psi	R Value	R Value Corr.
1	50	118.1	14.0	0.00	135	2.37	199	10	9
2	80	118.9	13.7	0.00	130	2.49	239	12	12
3	150	120.6	12.9	0.00	123	2.43	326	15	14

Test Results	Material Description
R-value at 300 psi exudation pressure = 14	Clayey Sand with Gravel

Project No.: 0079-06-2

Project: Sevenmile Gooseberry Road Phase II and III

Source of Sample: TP23 Bulk **Depth:** 3.5'

Date: 10/17/2002

Tested by: J.F.

Checked by: R.W.

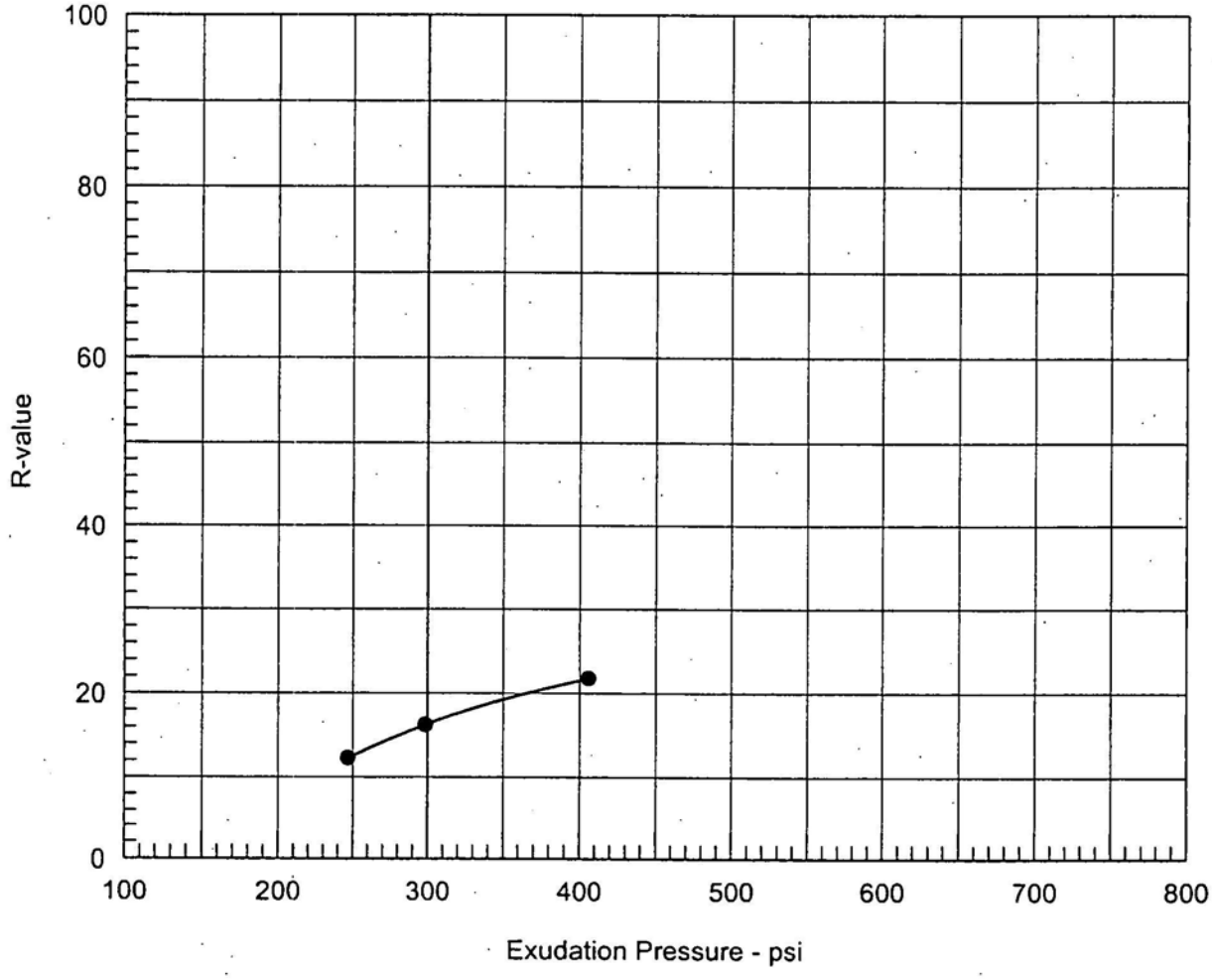
Remarks:
Laboratory Number 3223
September 24, 2002

R-VALUE TEST REPORT

BLACK EAGLE CONSULTING, INC.

Figure B.4.5

R-VALUE TEST REPORT



Resistance R-Value and Expansion Pressure - AASHTO T 190

No.	Compact. Pressure psi	Density pcf	Moist. %	Expansion Pressure psi	Horizontal Press. psi @ 160 psi	Sample Height in.	Exud. Pressure psi	R Value	R Value Corr.
1	110	106.8	19.8	0.00	122	2.51	298	16	16
2	150	107.3	19.4	0.00	110	2.50	406	22	22
3	100	104.8	20.2	0.00	130	2.57	247	12	12

Test Results	Material Description
R-value at 300 psi exudation pressure = 16	Clayey Gravel with Sand

Project No.: 0079-06-2

Project: Sevenmile Gooseberry Road Phase II and III

Source of Sample: TP22 Bulk **Depth:** 5.5'

Date: 10/17/2002

Tested by: J.F.

Checked by: R.W.

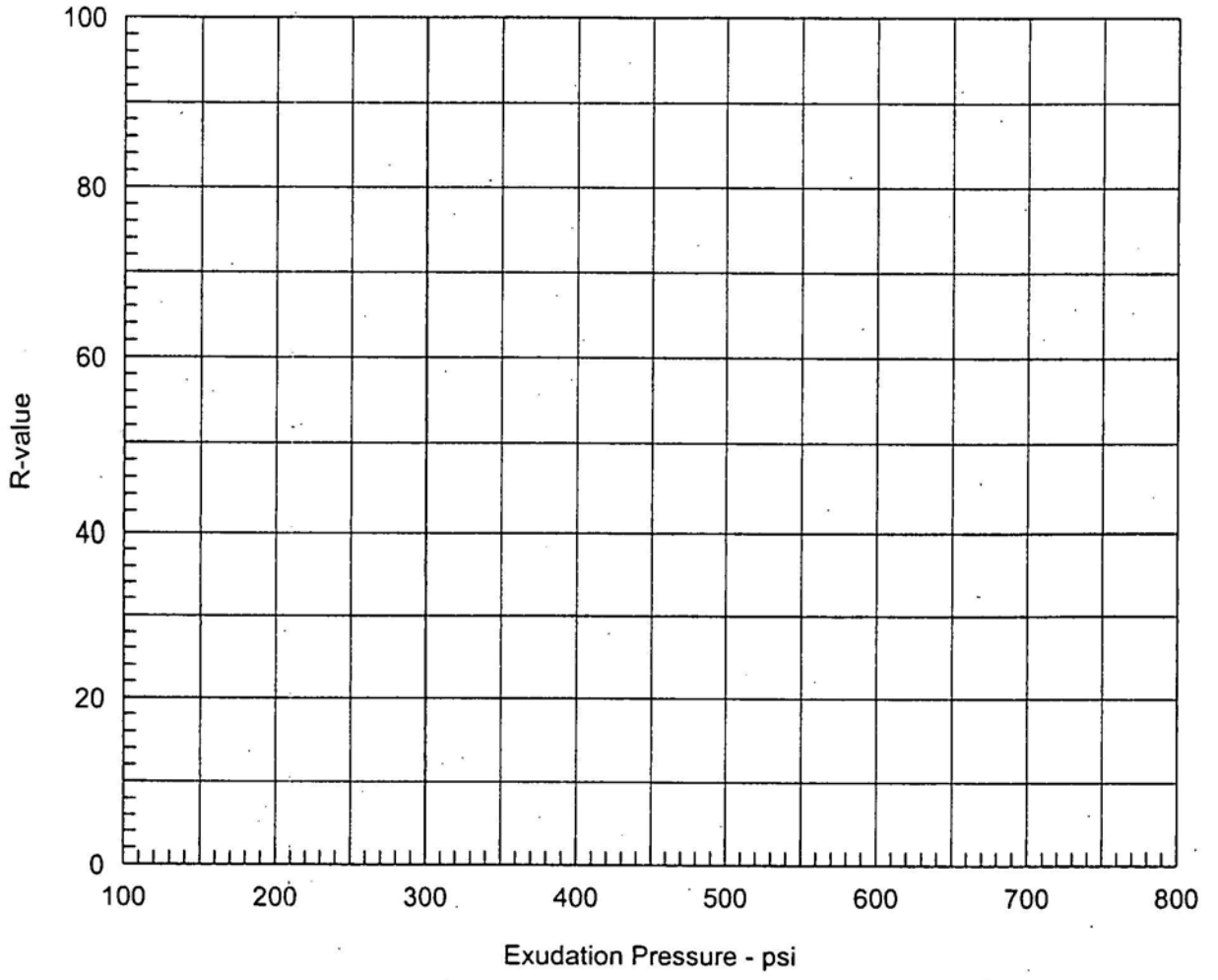
Remarks:
Laboratory Number 3223
September 24, 2002

R-VALUE TEST REPORT

BLACK EAGLE CONSULTING. INC.

Figure B.4.6

R-VALUE TEST REPORT



Resistance R-Value and Expansion Pressure - AASHTO T 190

No.	Compact. Pressure psi	Density pcf	Moist. %	Expansion Pressure psi	Horizontal Press. psi @ 160 psi	Sample Height in.	Exud. Pressure psi	R Value	R Value Corr.

Test Results	Material Description
R-value at 300 psi exudation pressure = Less Than 5	Clayey Sand with Gravel

Project No.: 0079-06-2

Project: Sevenmile Gooseberry Road Phase II and III

Source of Sample: TP21 Bulk

Date: 10/18/2002

Tested by: J.F.

Checked by: R.W.

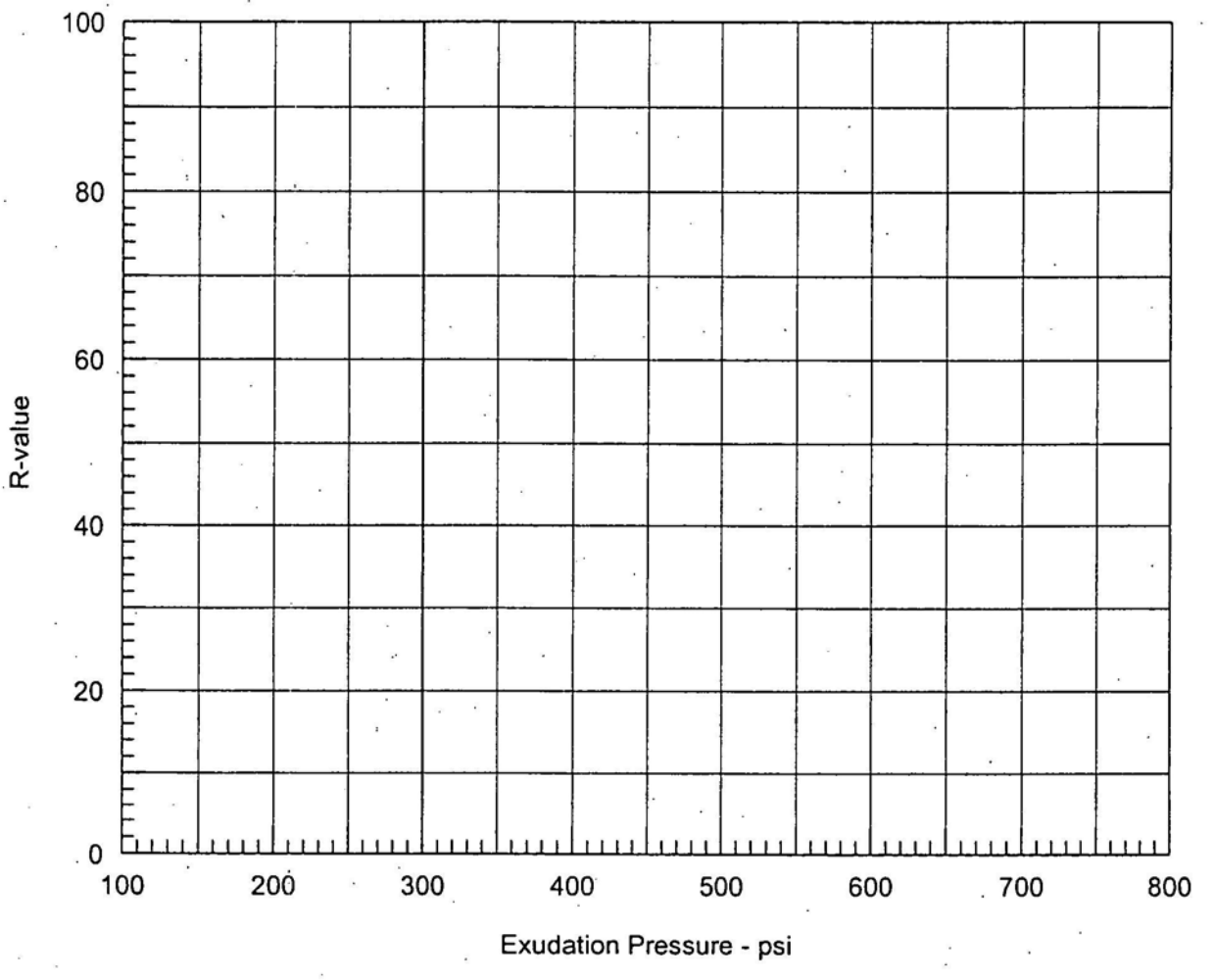
Remarks:
Laboratory Number 3223
September 24, 2002

R-VALUE TEST REPORT

BLACK EAGLE CONSULTING, INC.

Figure B.4.7

R-VALUE TEST REPORT



Resistance R-Value and Expansion Pressure - AASHTO T 190

No.	Compact. Pressure psi	Density pcf	Moist. %	Expansion Pressure psi	Horizontal Press. psi @ 160 psi	Sample Height in.	Exud. Pressure psi	R Value	R Value Corr.

Test Results	Material Description
R-value at 300 psi exudation pressure = Less Than 5	Sandy Lean Clay with Gravel

Project No.: 0079-06-2

Project: Sevenmile Gooseberry Road Phase II and III

Source of Sample: TP19 Bulk **Depth:** 2.0'

Date: 10/18/2002

Tested by: J.F.

Checked by: R.W.

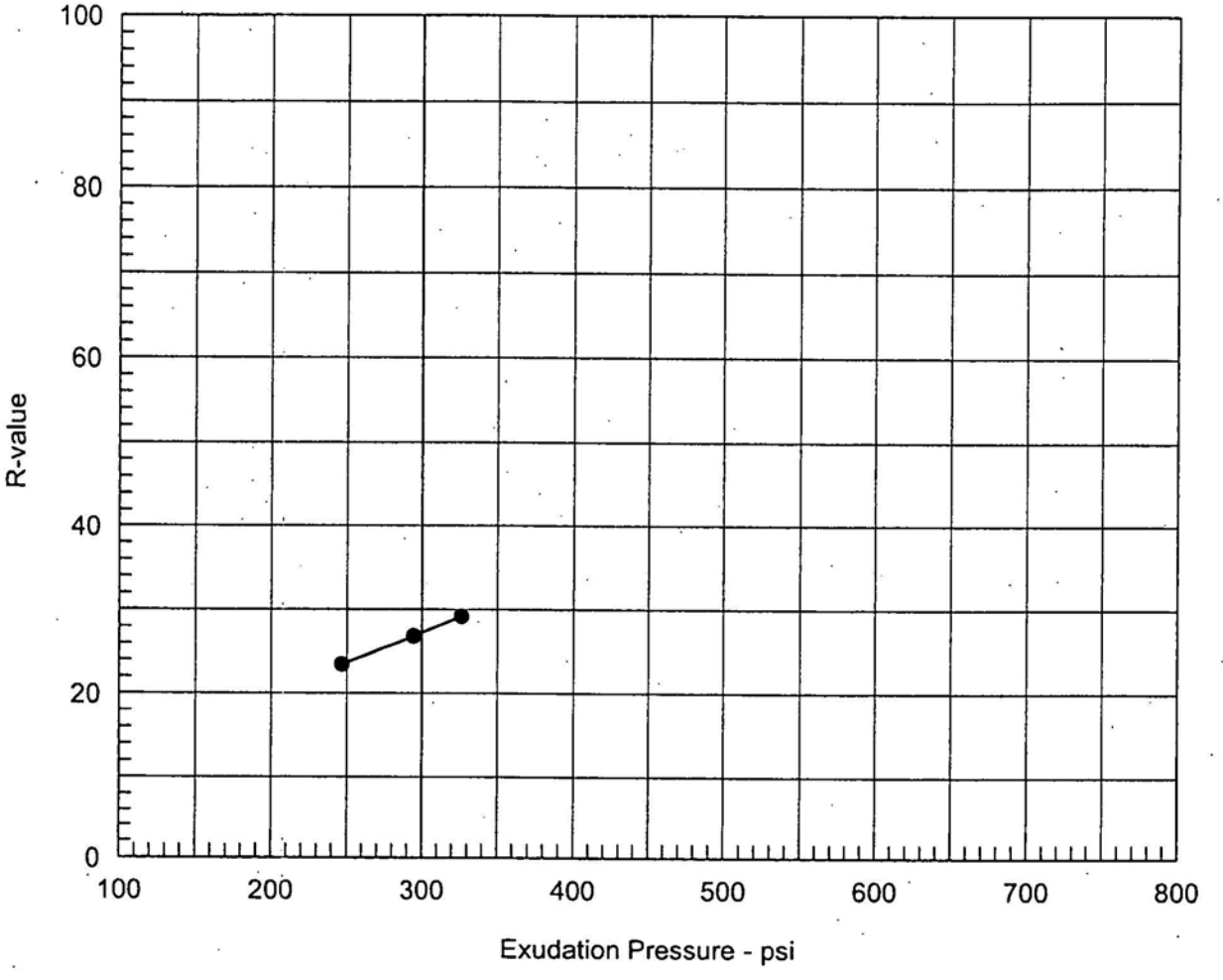
Remarks:
Laboratory Number 3223
September 24, 2002

R-VALUE TEST REPORT

BLACK EAGLE CONSULTING, INC.

Figure B.4.8

R-VALUE TEST REPORT



Resistance R-Value and Expansion Pressure - AASHTO T 190

No.	Compact. Pressure psi	Density pcf	Moist. %	Expansion Pressure psi	Horizontal Press. psi @ 160 psi	Sample Height in.	Exud. Pressure psi	R Value	R Value Corr.
1	110	119.8	12.7	0.00	109	2.49	247	23	23
2	130	122.3	12.1	0.12	100	2.47	294	27	27
3	150	125.4	11.8	0.00	93	2.43	326	31	29

Test Results	Material Description
R-value at 300 psi exudation pressure = 27	Clayey Gravel with Sand

Project No.: 0079-06-2

Project: Sevenmile Gooseberry Road Phase II and III

Source of Sample: TP17 Bulk **Depth:** 2.0'

Date: 10/17/2002

Tested by: J.F.

Checked by: R.W.

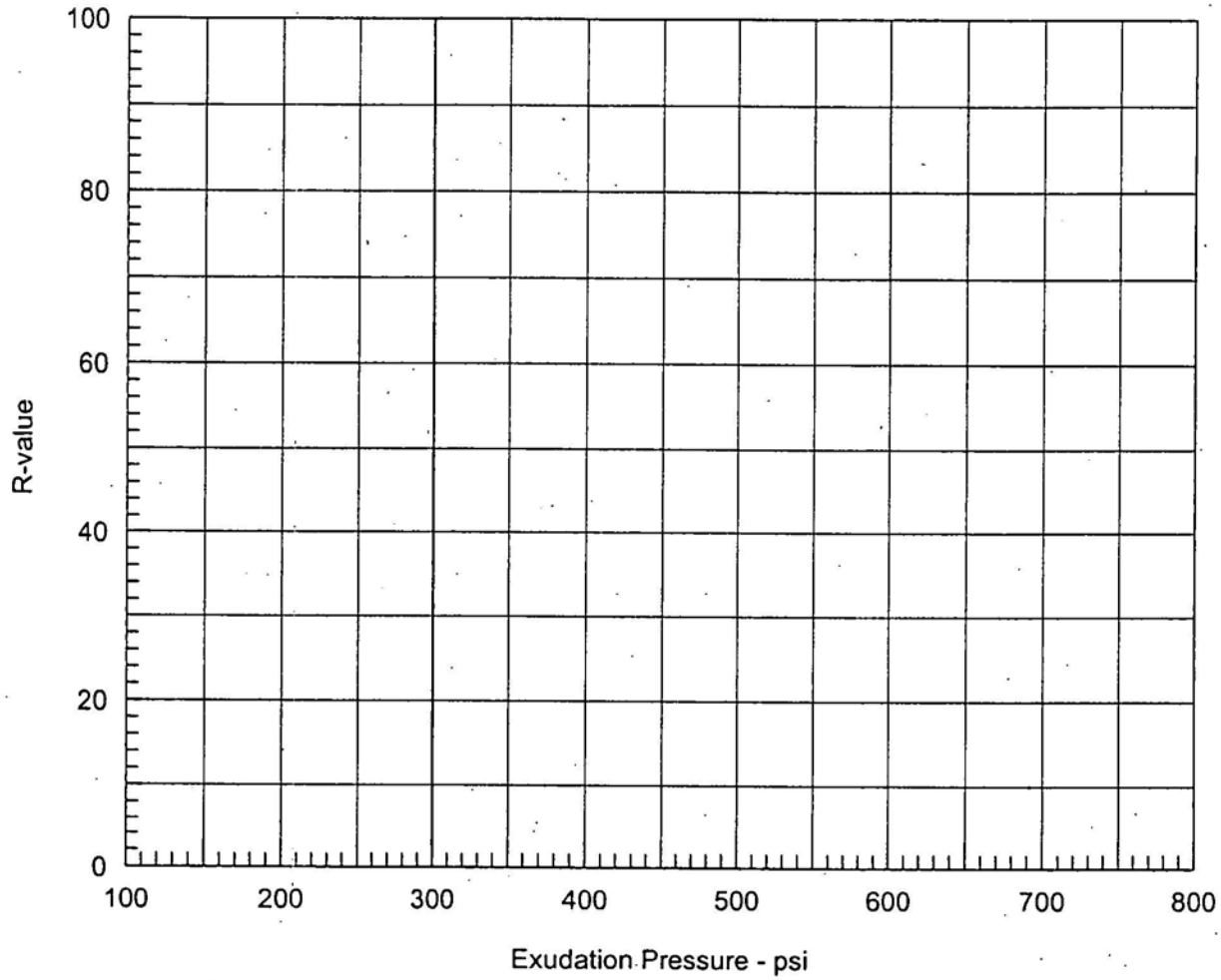
Remarks:
Laboratory Number 3223
September 24, 2002

R-VALUE TEST REPORT

BLACK EAGLE CONSULTING, INC.

Figure B.4.9

R-VALUE TEST REPORT



Resistance R-Value and Expansion Pressure - AASHTO T 190

No.	Compact. Pressure psi	Density pcf	Moist. %	Expansion Pressure psi	Horizontal Press. psi @ 160 psi	Sample Height in.	Exud. Pressure psi	R Value	R Value Corr.

Test Results	Material Description
R-value at 300 psi exudation pressure = Less Than 5	Clayey Sand with Gravel

Project No.: 0079-06-2

Project: Sevenmile Gooseberry Road Phase II and III

Source of Sample: TP15 Bulk

Date: 10/18/2002

Tested by: J.F.

Checked by: R.W.

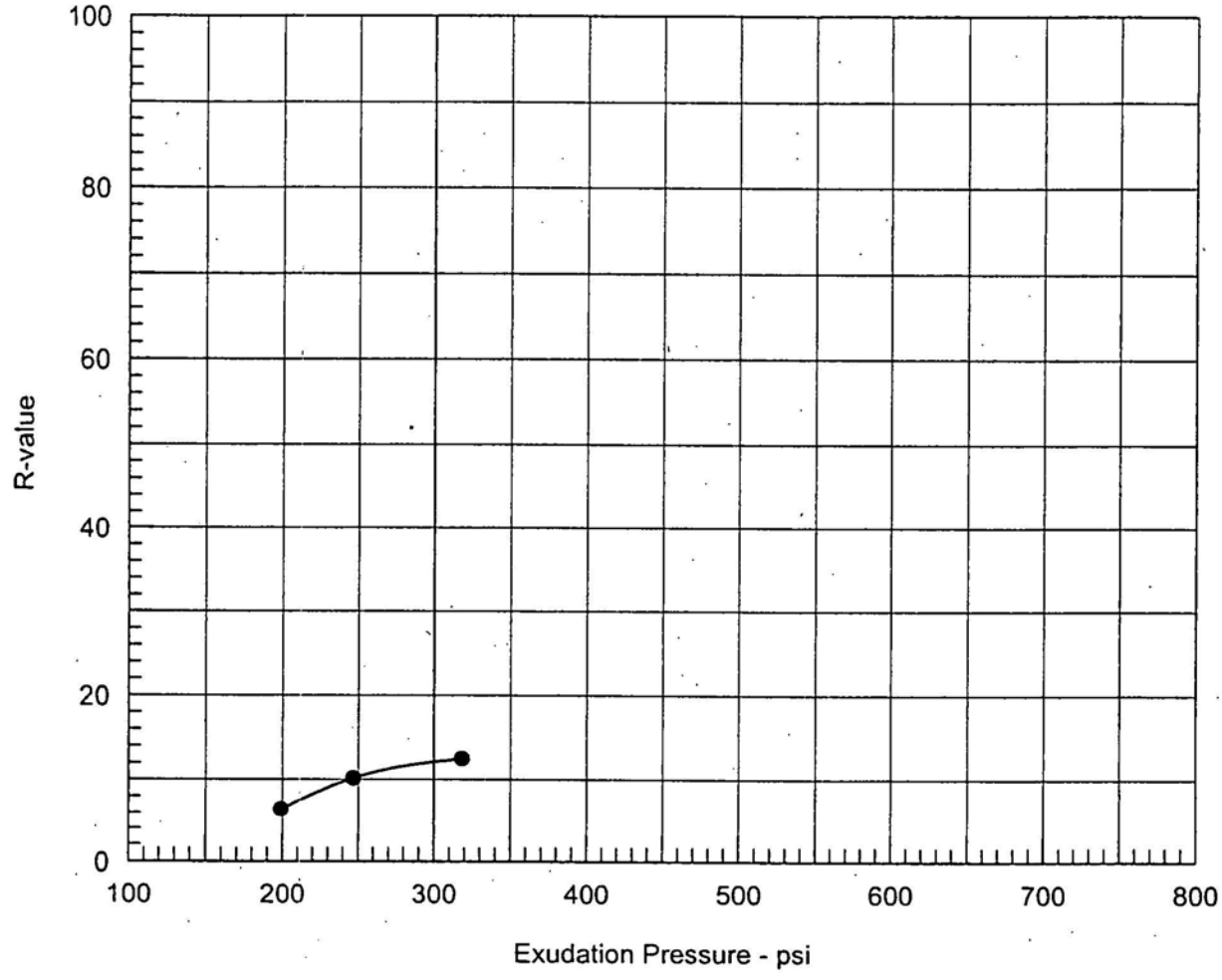
Remarks:
Laboratory Number 3223
September 24, 2002

R-VALUE TEST REPORT

BLACK EAGLE CONSULTING, INC.

Figure B.4.10

R-VALUE TEST REPORT



Resistance R-Value and Expansion Pressure - AASHTO T 190

No.	Compact. Pressure psi	Density pcf	Moist. %	Expansion Pressure psi	Horizontal Press. psi @ 160 psi	Sample Height in.	Exud. Pressure psi	R Value	R Value Corr.
1	50	117.6	14.1	0.00	140	2.40	199	7	6
2	70	119.3	12.9	0.00	133	2.50	247	10	10
3	120	122.2	12.6	0.00	128	2.45	318	12	12

Test Results	Material Description
R-value at 300 psi exudation pressure = 12	Clayey Sand with Gravel

Project No.: 0079-06-2

Project: Sevenmile Gooseberry Road Phase II and III

Source of Sample: TP14 Bulk **Depth:** 2.5'

Date: 10/17/2002

Tested by: J.F.

Checked by: R.W.

Remarks:
Laboratory Number 3223
September 24, 2002

R-VALUE TEST REPORT

BLACK EAGLE CONSULTING, INC.

Figure B.4.11

Expansion Test Results

Station	Initial MC (%)	Initial Dry Density γ_d (kg/m³)	Final MC (%)	Final Dry Density γ_d (kg/m³)	Measured Expansion (%)
14+590	11.2	1944.8	17.5	1791.0	8.49
19+300	16.3	1851.9	20.2	1768.6	4.77
22+980	13.2	1509.1	30.7	1433.8	5.26

Laboratory Analysis Report

Sierra Environmental Monitoring, Inc.

Black Eagle Consulting, Inc.
Attn: Steve Bowman
1345 Capital Blvd., Suite A
Reno, NV 89502-7140

Date: 10/1/2002
Client: BEC-100
Taken by: S. Bowman
Report: 49219
PO #: 0079-06-2

Sample ID:	Customer Sample ID	Date Sampled	Time Sampled	Date Received
S200209-1593	Gooseberry 3 5+280	9/18/2002	2:40 PM	9/27/2002

Parameter	Method	Result	Units Of Measure	Reporting Limit	Analyst	Date Analyzed
Conductivity	SM 2510 B	110	µmhos/cm	0	Kobza	9/30/2002
pH	SM 4500 H+B	7.01	pH Units	1	Kobza	9/27/2002
pH - Temperature	SM 4500 H+B	21.2	°C	0	Kobza	9/27/2002

Sample ID:	Customer Sample ID	Date Sampled	Time Sampled	Date Received
S200209-1594	Gooseberry 3 7+715	9/19/2002	3:25 PM	9/27/2002

Parameter	Method	Result	Units Of Measure	Reporting Limit	Analyst	Date Analyzed
Conductivity	SM 2510 B	200	µmhos/cm	0	Kobza	9/30/2002
pH	SM 4500 H+B	7.95	pH Units	1	Kobza	9/27/2002
pH - Temperature	SM 4500 H+B	21.3	°C	0	Kobza	9/27/2002

Sample ID:	Customer Sample ID	Date Sampled	Time Sampled	Date Received
S200209-1595	Gooseberry 3 6+915	9/18/2002	3:10 PM	9/27/2002

Parameter	Method	Result	Units Of Measure	Reporting Limit	Analyst	Date Analyzed
Conductivity	SM 2510 B	66	µmhos/cm	0	Kobza	9/30/2002
pH	SM 4500 H+B	7.63	pH Units	1	Kobza	9/27/2002
pH - Temperature	SM 4500 H+B	21.3	°C	0	Kobza	9/27/2002

Sample ID:	Customer Sample ID	Date Sampled	Time Sampled	Date Received
S200209-1596	Gooseberry 2 8+480	9/19/2002	4:30 PM	9/27/2002

Parameter	Method	Result	Units Of Measure	Reporting Limit	Analyst	Date Analyzed
Conductivity	SM 2510 B	170	µmhos/cm	0	Kobza	9/30/2002
pH	SM 4500 H+B	7.93	pH Units	1	Kobza	9/27/2002
pH - Temperature	SM 4500 H+B	21.2	°C	0	Kobza	9/27/2002

John Kobza, Ph.D.
Laboratory Director

1135 Financial Blvd.
Reno, NV 89502-2348
Phone (775) 857-2400
FAX (775) 857-2404
sem@sem-analytical.com

John C. Seher
Special Consultant
Quality Assurance Manager

Plate B.6.1

Laboratory Analysis Report

Sierra Environmental Monitoring, Inc.

Black Eagle Consulting, Inc.
Attn: Steve Bowman
1345 Capital Blvd., Suite A
Reno, NV 89502-7140

Date: 10/1/2002
Client: BEC-100
Taken by: S. Bowman
Report: 49219
PO #: 0079-06-2

Sample ID:	Customer Sample ID	Date Sampled	Time Sampled	Date Received
S200209-1597	Gooseberry 2 18+200	9/22/2002	3:30 PM	9/27/2002

Parameter	Method	Result	Units Of Measure	Reporting Limit	Analyst	Date Analyzed
Conductivity	SM 2510 B	150	µmhos/cm	0	Kobza	9/30/2002
pH	SM 4500 H+B	8.00	pH Units	1	Kobza	9/27/2002
pH - Temperature	SM 4500 H+B	21.2	°C	0	Kobza	9/27/2002

Sample ID:	Customer Sample ID	Date Sampled	Time Sampled	Date Received
S200209-1598	Gooseberry 2 20+740	9/22/2002	4:00 PM	9/27/2002

Parameter	Method	Result	Units Of Measure	Reporting Limit	Analyst	Date Analyzed
Conductivity	SM 2510 B	120	µmhos/cm	0	Kobza	9/30/2002
pH	SM 4500 H+B	6.80	pH Units	1	Kobza	9/27/2002
pH - Temperature	SM 4500 H+B	21.0	°C	0	Kobza	9/27/2002

Sample ID:	Customer Sample ID	Date Sampled	Time Sampled	Date Received
S200209-1599	Gooseberry 9+700	9/22/2002		9/27/2002

Parameter	Method	Result	Units Of Measure	Reporting Limit	Analyst	Date Analyzed
Conductivity	SM 2510 B	160	µmhos/cm	0	Kobza	9/30/2002
pH	SM 4500 H+B	8.03	pH Units	1	Kobza	9/27/2002
pH - Temperature	SM 4500 H+B	21.3	°C	0	Kobza	9/27/2002

Sample ID:	Customer Sample ID	Date Sampled	Time Sampled	Date Received
S200209-1600	Gooseberry 2 12+860	9/22/2002	11:50 AM	9/27/2002

Parameter	Method	Result	Units Of Measure	Reporting Limit	Analyst	Date Analyzed
Conductivity	SM 2510 B	200	µmhos/cm	0	Kobza	9/30/2002
pH	SM 4500 H+B	7.68	pH Units	1	Kobza	9/27/2002
pH - Temperature	SM 4500 H+B	21.3	°C	0	Kobza	9/27/2002

John Kobza, Ph.D.
Laboratory Director

1135 Financial Blvd.
Reno, NV 89502-2348
Phone (775) 857-2400
FAX (775) 857-2404
sem@sem-analytical.com

John C. Seher
Special Consultant
Quality Assurance Manager

Plate B.6.2

Sierra Environmental Monitoring, Inc.

Laboratory Analysis Report

Black Eagle Consulting, Inc.
Attn: Steve Bowman
1345 Capital Blvd., Suite A
Reno, NV 89502-7140

Date: 10/1/2002
Client: BEC-100
Taken by: S. Bowman
Report: 49219
PO #: 0079-06-2

Sample ID:	Customer Sample ID	Date Sampled	Time Sampled	Date Received
S200209-1601	Gooseberry 2 19+500	9/20/2002	11:50 AM	9/27/2002

Parameter	Method	Result	Units Of Measure	Reporting Limit	Analyst	Date Analyzed
Conductivity	SM 2510 B	210	µmhos/cm	0	Kobza	9/30/2002
pH	SM 4500 H+B	7.99	pH Units	1	Kobza	9/27/2002
pH - Temperature	SM 4500 H+B	21.4	°C	0	Kobza	9/27/2002

Sample ID:	Customer Sample ID	Date Sampled	Time Sampled	Date Received
S200209-1602	Gooseberry 2 11+675	9/22/2002	11:30 AM	9/27/2002

Parameter	Method	Result	Units Of Measure	Reporting Limit	Analyst	Date Analyzed
Conductivity	SM 2510 B	180	µmhos/cm	0	Kobza	9/30/2002
pH	SM 4500 H+B	8.08	pH Units	1	Kobza	9/27/2002
pH - Temperature	SM 4500 H+B	21.2	°C	0	Kobza	9/27/2002

Approved By: John Kobza
Sierra Environmental Monitoring, Inc

Date: 10/1/02

John Kobza, Ph.D.
Laboratory Director

1135 Financial Blvd.
Reno, NV 89502-2348
Phone (775) 857-2400
FAX (775) 857-2404
sem@sem-analytical.com

John C. Seher
Special Consultant
Quality Assurance Manager

Plate B.6.3

Western Environmental Testing Laboratory
Analytical Report

Black Eagle Consulting
Client Sample ID/Location: See Below
Date/Time Collected: Not Specified

Lab sample ID: 210-031 06/10
Reported: 10/09/02

Parameter	Method	Results	Units	Analyzed
TP-14				
pH	9045B	5.47	SU	10/09/02
Resistivity	2510B	16000	Ω.cm	10/09/02
TP-21				
pH	9045B	5.65	SU	10/09/02
Resistivity	2510B	3700	Ω.cm	10/09/02
TP-28				
pH	9045B	6.67	SU	10/09/02
Resistivity	2510B	7600	Ω.cm	10/09/02
9 + 250 Geochem				
pH	9045B	6.91	SU	10/09/02
Resistivity	2510B	3500	Ω.cm	10/09/02
9 + 700 Geochem				
pH	9045B	6.91	SU	10/09/02
Resistivity	2510B	5200	Ω.cm	10/09/02

Lance Bell, Lab Manager

WET LAB 992 Spice Islands Drive Sparks, NV 89431 775-355-0202

U.S. Department of Transportation
Federal Highway Administration

Central Federal Lands Highway Division Laboratory

An AASHTO and ISO Accredited Laboratory

AASHTO R18 ISO/IEC 17025

Report of Rock Core Tests

Project: Utah PFH 39-1 (4) Sevenmile-Gooseberry

Laboratory Numbers: See Below

Date Reported: 10/1/2009

Submitted By: Justin Henwood

Material Type: Rock Cores

Material Source: Bore Holes

Tested For: ASTM D 7012 Unconfined Compressive Strength, Method C

Field Sample Numbers: See Below

Test Results

Laboratory Number	09-1265-C	09-1266-C	09-1268-C
Boring Number	B-102	B-103	B-104
Sample Number	Run 4/5/6	Run 3/4/5	Run 1/2/3
Sample Depth (Feet)	15.0-30.0	10.0-25.0	0-15.0
AASHTO T 85 Apparent Specific Gravity of Coarse Aggregate	2.64	2.66	2.69
AASHTO T 85 Absorption of Coarse Aggregate, %	2.7	2.9	3.1
AASHTO T 96 Los Angeles Abrasion Grading A, % Loss	26	21	27
AASHTO T 210 Coarse Aggregate Durability Index	90	90	87
AASHTO T 104 Sodium Sulfate Soundness, % Loss	1	1	0

This material was laboratory crushed to – 1 ½" before testing.

Distribution:
Laboratory
Geotechnical
Materials

Num. / Project File
Darrell Harding
Justin Henwood
1 Copy

Reported By:

For
Darrell Harding

U.S. Department of Transportation
Federal Highway Administration

Central Federal Lands Highway Division Laboratory

An AASHTO and ISO Accredited Laboratory

AASHTO R18 ISO/IEC 17025

Report of Rock Core Tests

Project: Utah PFH 39-1 (4) Sevenmile-Gooseberry

Laboratory Numbers: See Below

Date Reported: 10/1/2009

Submitted By: Justin Henwood

Material Type: Rock Cores

Material Source: Bore Holes

Tested For: ASTM D 7012 Unconfined Compressive Strength, Method C

Field Sample Numbers: See Below

Test Results

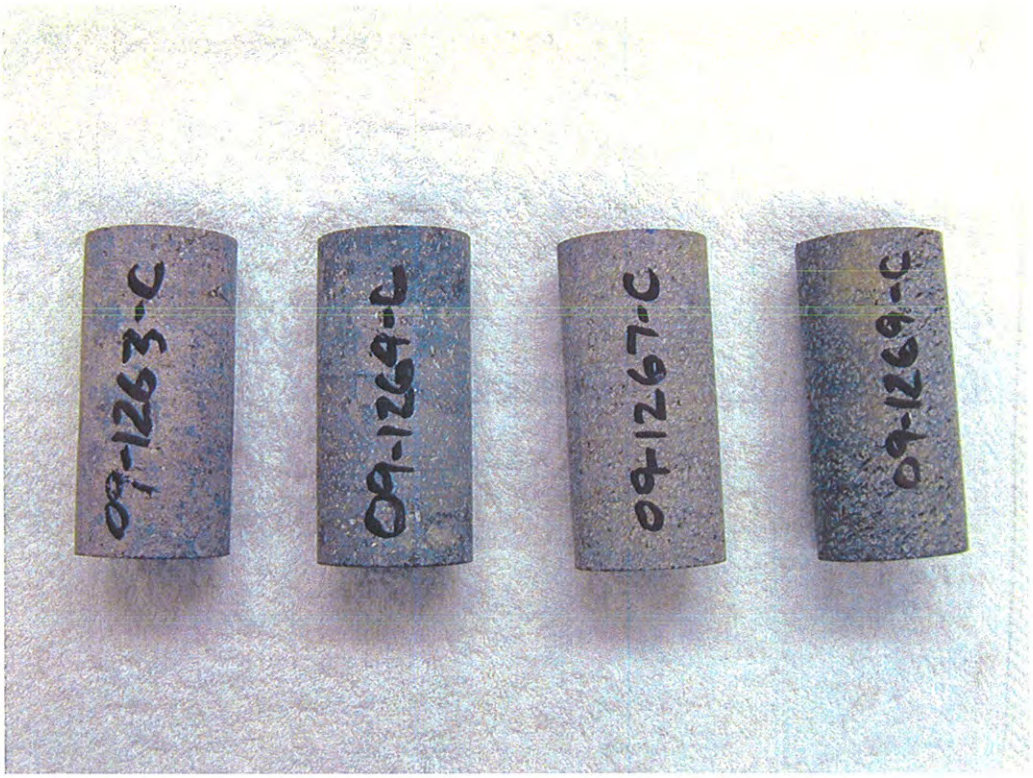
Laboratory Number	Boring Number	Sample Number	Sample Depth (Feet)	Specimen Length (inches)	Specimen Diameter (Inches)	L/D Ratio	Total Load (lbf)	Compressive Strength (psi)
09-1263-C	B-102	Run 4	15.0-20.0	5.07	2.40	2.11	32,021	7,080
09-1264-C	B-102	Run 5	20.0-25.0	5.09	2.41	2.11	63,407	13,900
09-1267-C	B-104	Run 2	5.0-10.0	5.03	2.39	2.10	90,051	20,070
09-1269-C	B-105	Run 2	5.0-10.0	4.92	2.39	2.06	80,242	17,890

Distribution:
Laboratory
Geotechnical
Materials

Num. / Project File
Darrell Harding
Justin Henwood
1 Copy

Reported By:

For
Darrell Harding



Trimmed Compressive Strength Specimens

Tested Compressive Strength Specimens

APPENDIX E – Photos

Station 26+00, Ahead On Line (AOL)

Station 26+00, Back On Line (BOL)

Station 30+00, Ahead On Line (AOL)

Station 30+00, Back On Line (BOL)

Station 34+00, Ahead On Line (AOL)

Station 34+00, Back On Line (BOL)

Station 79+00, Ahead On Line (AOL)

Station 79+00, Back On Line (BOL)

Station 100+00, AOL

Station 100+00, BOL

Station 129+00, AOL

Station 129+00, BOL

Station 162+00, AOL

Station 162+00, BOL

Station 170+00, AOL

Station 170+00, BOL

Station 175+00, AOL

Station 175+00, BOL

Station 189+00, AOL

Station 189+00, BOL

Station 217+00, AOL

Station 217+00, BOL

Station 271+00, AOL

Station 271+00, BOL

Station 295+00, AOL

Station 295+00, BOL

Station 309+00, AOL

Station 309+00, BOL

Station 433+00, AOL

Station 433+00, BOL

Station 434+00, AOL

Station 434+00, BOL

Station 442+00, AOL

Station 442+00, BOL

Station 447+00, AOL

Station 447+00, BOL

Station 452+00, AOL

Station 452+00, BOL

Station 456+00, AOL

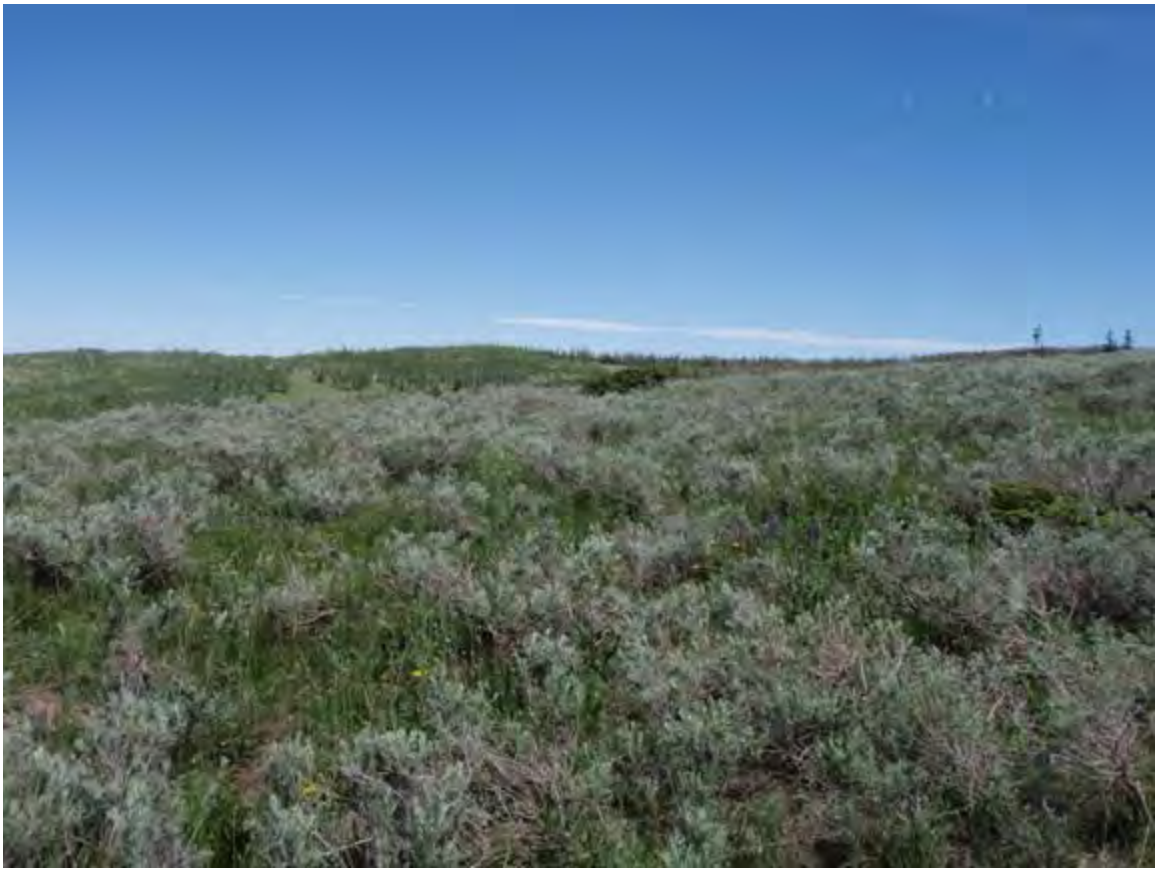
Station 456+00, BOL

Station 459+00, AOL

Station 459+00, BOL

Station 462+00, AOL

Station 462+00, BOL



Station 469+00, AOL

Station 469+00, BOL

Station 475+00, AOL

Station 475+00, BOL

Station 480+00, AOL

Station 480+00, BOL

Station 487+00, AOL

Station 487+00, BOL

Station 495+00, AOL

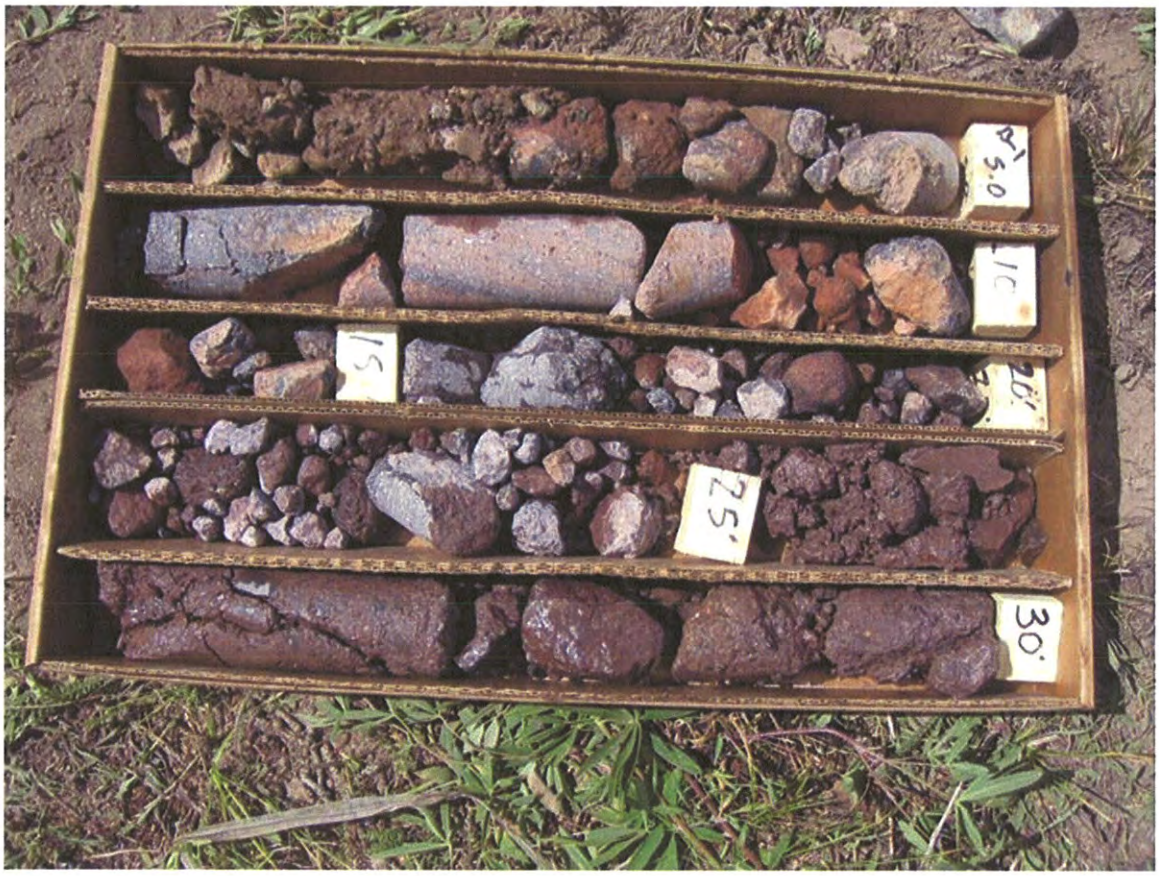
Station 495+00, BOL

Station 80+00, Debris Flow Slope

Gates Lake Road Material Source

Gates Lake Road Material Source

Boring B-101 Drill Rig Setup



Boring B-101 Core, 5.0'-30.0'

Boring B-102 Drill Rig Setup

Boring B-102 Core, 0.0-13.5'

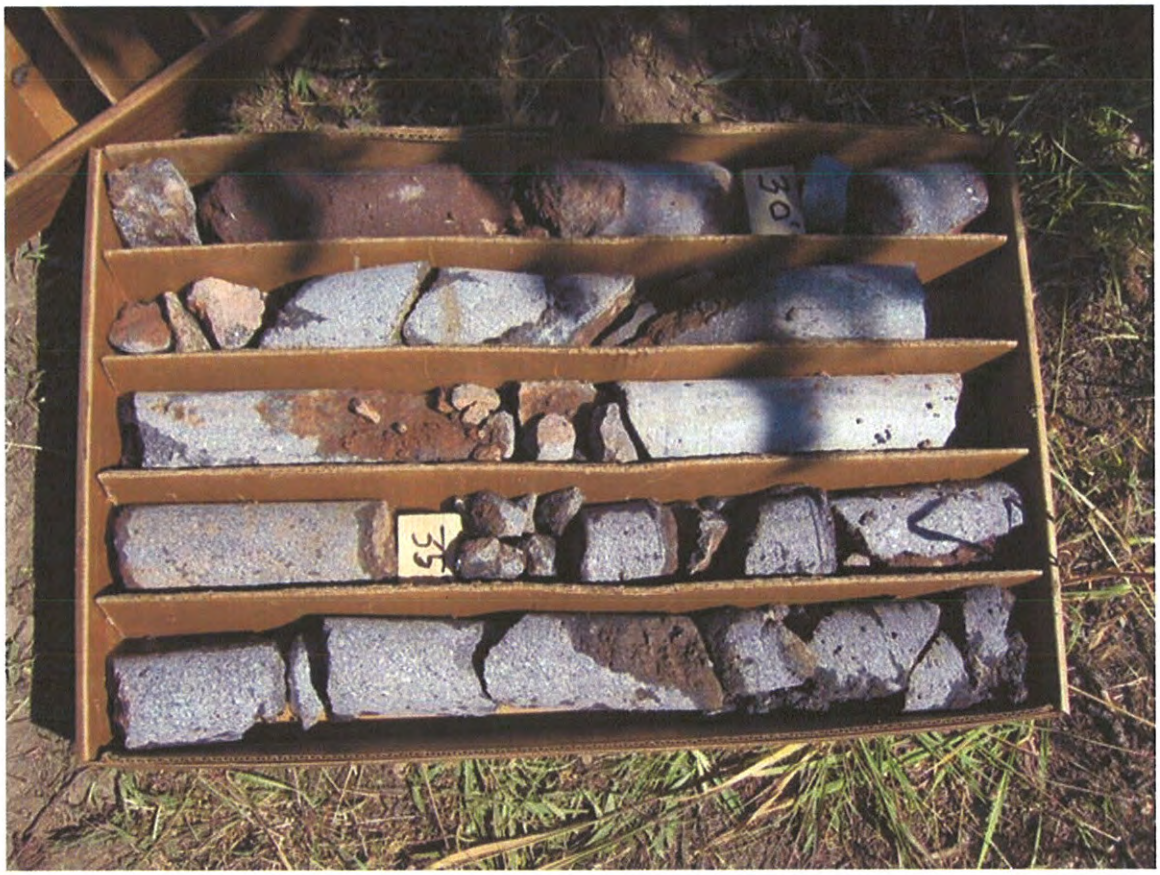
Boring B-102 Core, 13.5'-24.5'

Boring B-102 Core, 24.5'-30.0'

Boring B-103 Drill Rig Setup

Boring B-103 Core, 0.0-15.0'

Boring B-103 Core, 15.0'-28.5'



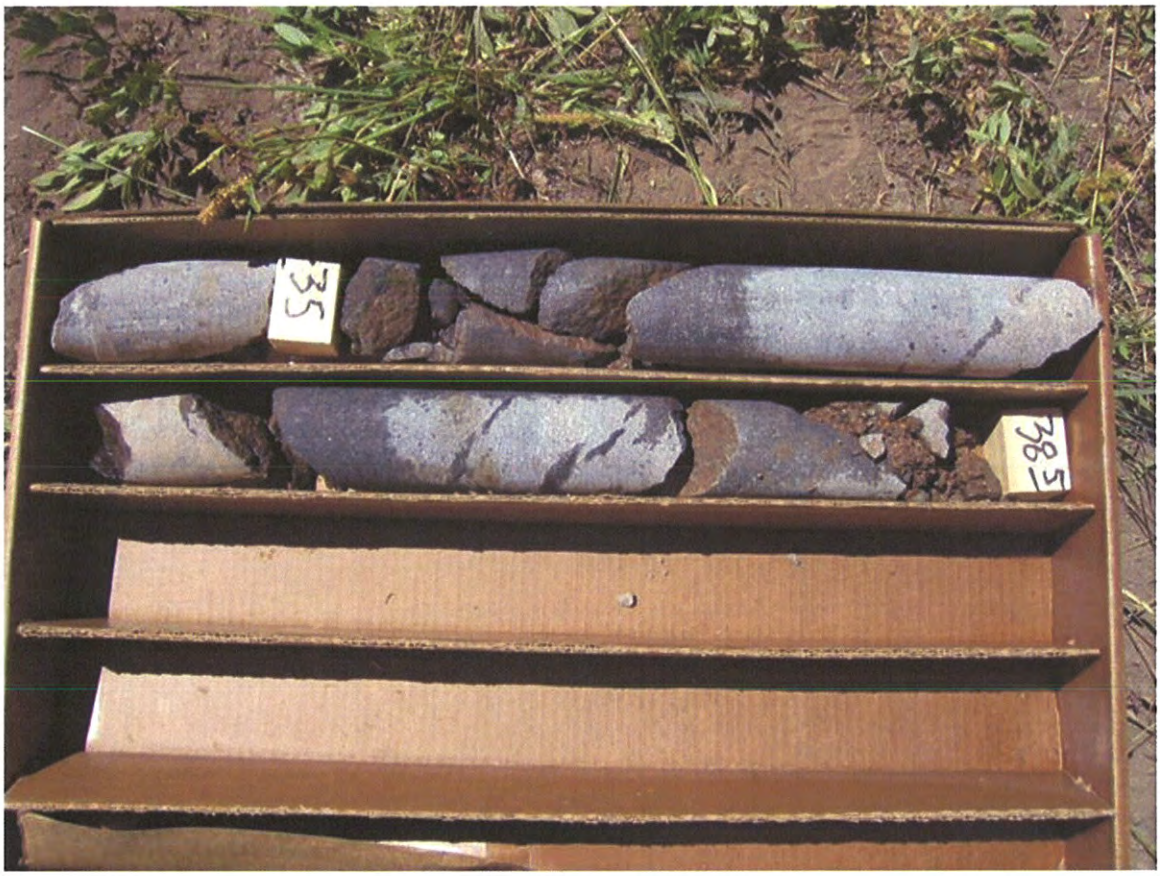
Boring B-103 Core, 28.5'-40.0'

Boring B-104 Drill Rig Setup

Boring B-104 Core, 0.0-15.0'

Boring B-104 Core, 15.0'-25.0'

Boring B-104 Core, 25.0'-34.5'



Boring B-104 Core, 24.5'-38.5'

Boring B-105 Drill Rig Setup

Boring B-105 Core, 0.0-11.7'

Boring B-105 Core, 11.7'-20.0'

Boring B-105 Core, 20.0'-30.0'

Boring B-105 Core, 30.0-40.0’