CITY OF Grand Junction COLORADO

Purchasing Division

ADDENDUM NO. 2

DATE: **July 12, 2019**
FROM: **City of Grand Junction Purchasing Division**
TO: **All Offerors**
RE: **Professional Architectural Services for Fire Station #6 RFP-4666-19-DH**

Offerors responding to the above referenced solicitation are hereby instructed that the requirements have been clarified, modified, superseded and supplemented as to this date as hereinafter described.

Please make note of the following clarifications:

1. See attached Geotechnical report for the Fire Station #6 site.

The original solicitation for the project noted above is amended as noted.

All other conditions of subject remain the same.

Respectfully,

Duane Hoff Jr., Senior Buyer
City of Grand Junction, Colorado

Huddleston-Berry
Engineering & Testing, LLC

GEOTECHNICAL AND GEOLOGIC HAZARDS INVESTIGATION
FIRE STATION #6
731 27 ROAD
GRAND JUNCTION, COLORADO
PROJECT#00208-0099

CITY OF GRAND JUNCTION
333 WEST AVENUE, BUILDING C
GRAND JUNCTION, COLORADO 81501

JULY 12, 2019

Huddleston-Berry Engineering and Testing, LLC
2789 Riverside Parkway
Grand Junction, Colorado 81501

SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS

A geologic hazards and geotechnical investigation was conducted for the proposed new Fire Station #6 in Grand Junction, Colorado. The project location is shown on Figure 1 – Site Location Map. The purpose of the investigation was to evaluate the surface and subsurface conditions at the site with respect to geologic hazards, foundation design, pavement design, and earthwork for the proposed construction. This summary has been prepared to include the information required by civil engineers, structural engineers, and contractors involved in the project.

Subsurface Conditions (p. 2)

The subsurface investigation consisted of five borings, drilled on May 30th and June 12th, 2019. The locations of the borings are shown on Figure 2 – Site Plan. The borings generally encountered topsoil, fill, and/or pavement section materials above shale bedrock. Groundwater was not encountered in the subsurface at the time of the investigation. The native shale bedrock is moderately plastic and is anticipated to be slightly to moderately expansive.

Geologic Hazards (p. 3)

No geologic hazards were identified which would preclude development of this property. However, moisture sensitive soils and bedrock were encountered during the subsurface investigation and these will impact site development.

Summary of Foundation Recommendations

Spread Footings, Voided Spread Footings, or Isolated Pads and Grade Beams

- *Structural Fill* – A minimum of 48-inches below foundations. The native bedrock materials are not suitable for reuse as structural fill. Imported structural fill should consist of crusher fines, CDOT Class 6 base course, or other granular material approved by the engineer. (p. 4)
- *Maximum Allowable Bearing Capacity* – 3,000 psf. (p. 5)
- Minimum Dead-Load Pressure – 1,000 psf. (p. 5)

Drilled Piers

- *Minimum Length* – 25 feet. (p. 5)
- *Minimum Embedment* – 15 feet. (p. 5)
- *Allowable Skin Friction* – 1,500 psf for bonded length. (p. 5)
- *Allowable End-Bearing Capacity* – 15,000 psf (p. 5)
- *Minimum Dead-Load* – 5,000 psf (p. 5)

Micro Piles

- *Minimum Length* – 30 feet. (p. 6)
- *Unbonded Length* – 20 feet. (p. 6)
- *Allowable Skin Friction* – 1,500 psf for bonded length. (p. 6)

Other Foundation Criteria

- *Seismic Design* – Site Class C. (p. 6)
- *Lateral Earth Pressure* – 55 pcf active. 75 pcf at-rest. (p. 7)

Summary of Pavement Recommendations (p. 8)

Automobile Parking Areas

ESAL's = 50,000; Structural Number = 2.75

ALTERNATIVE	PAVEMENT SECTION (Inches)				
	Hot-Mix Asphalt Pavement	CDOT Class 6 Base Course	CDOT Class 3 Subbase Course	Concrete Pavement	TOTAL
A	3.0	9.0			12.0
B	4.0	7.0			11.0
C	3.0	6.0	6.0		15.0
Rigid Pavement		6.0		6.0	12.0

Fire Truck Traffic Areas

ESAL's = 350,000; Structural Number = 3.70

ALTERNATIVE	PAVEMENT SECTION (Inches)				
	Hot-Mix Asphalt Pavement	CDOT Class 6 Base Course	CDOT Class 3 Subbase Course	Rigid Pavement	TOTAL
A	3.0	17.0			20.0
B	4.0	14.0			18.0
C	3.0	6.0	16.0		25.0
Full Depth RP		6.0		8.0	14.0

27 Road Improvements

ESAL's = 875,000, Structural Number = 4.24

ALTERNATIVE	PAVEMENT SECTION (Inches)				
	Hot-Mix Asphalt Pavement	CDOT Class 6 Base Course	CDOT Class 3 Subbase Course	Concrete Pavement	TOTAL
A	4.0	18.0			22.0
B	5.0	15.0			20.0
C	4.0	6.0	17.0		27.0
Rigid Pavement		6.0		8.0	14.0

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APPENDICES

1.0 INTRODUCTION

As part of extensive development in Western Colorado, the City of Grand Junction proposes to construct a new fire station. As part of the design development process, Huddleston-Berry Engineering and Testing, LLC (HBET) was retained by the City of Grand Junction to conduct a geologic hazards and geotechnical investigation at the site.

1.1 Scope

As discussed above, a geologic hazards and geotechnical investigation was conducted for Fire Station #6 in Grand Junction, Colorado. The scope of the investigation included the following components:

- Conducting a subsurface investigation to evaluate the subsurface conditions at the site.
- Collecting soil and bedrock samples and conducting laboratory testing to determine the engineering properties of the soils and bedrock at the site.
- Providing recommendations for foundation type and subgrade preparation.
- Providing recommendations for bearing capacity.
- Providing recommendations for lateral earth pressure.
- Providing recommendations for pavements.
- Providing recommendations for drainage, grading, and general earthwork.
- Evaluating potential geologic hazards at the site.

The investigation and report were completed by a Colorado registered professional engineer in accordance with generally accepted geotechnical and geological engineering practices. This report has been prepared for the exclusive use of the City of Grand Junction.

1.2 Site Location and Description

The site is located at 731 27 Road in Grand Junction, Colorado. The project location is shown on Figure 1 – Site Location Map. Fire Station #6 will occupy the southeastern corner of the property.

At the time of the investigation, most of the building site was open. However, a large pile of fill was present in the northeastern portion of the site. The building site generally sloped gently down to the southeast. Vegetation consisted primarily of weeds and grasses. The building site was bordered to the north by undeveloped ground, to the west and south by existing residences, and to the east by 27 Road.

1.3 Proposed Construction

The proposed construction is anticipated to include a new fire station building, concrete aprons, asphalt parking areas, and improvements to 27 Road. The proposed structure will likely be masonry construction.

2.0 GEOLOGIC SETTING

2.1 Soils

Soils data was obtained from the USDA Natural Resource Conservation Service Web Soil Survey. The data indicates that the soils at the site consist of Persayo silty clay loam, 5 to 12 percent slopes and Persayo silty clay loam, 2 to 5 percent slopes. Soil survey data is included in Appendix A.

Structure construction in the site soils is described as being somewhat limited to very limited due to depth to soft bedrock and/or slope. Pavement construction in the native soils is indicated to be very limited due to depth to soft bedrock, low strength, frost action, and/or slope. Excavation in the site soils is described as being very limited due to depth to soft bedrock, dust, slope, and/or unstable excavation walls. The Persayo soils are indicated to have a moderate potential for frost action, high risk of corrosion of uncoated steel, and high risk of corrosion of concrete.

2.2 Geology

According to the *Geologic Map of the Grand Junction Quadrangle, Mesa County, Colorado* (2002), the site is underlain by undivided alluvium and colluvium. The alluvium and colluvium are underlain by Mancos Shale bedrock. The Mancos Shale unit is thick in the Grand Valley and has a low to moderate potential for swelling.

2.3 Groundwater

Groundwater was not encountered in the subsurface at the time of the investigation.

3.0 FIELD INVESTIGATION

3.1 Subsurface Investigation

The subsurface investigation was conducted on May 30th and June 12th, 2019 and consisted of five borings drilled to depths of between approximately 7.6 and 12.8 feet below the existing ground surface. The locations of the borings are shown on Figure 2 – Site Plan. The borings were located in the field relative to existing site features. Typed boring logs are included in Appendix B. Samples of the subsurface soils were collected during Standard Penetration Testing (SPT) and using bulk sampling methods at the locations shown on the logs.

As indicated on the logs, the subsurface conditions at the site were slightly variable. Borings B-1 through B-4, conducted on the building site, encountered 0.5 to 1.0 foot of topsoil or fill materials at the ground surface. Boring B-5, conducted along 27 Road, encountered 5.0-inches of asphalt pavement above granular base course to a depth of 2.0 feet. Below the topsoil, fill, and/or pavement materials, gray, soft to medium hard, highly to moderately weathered shale bedrock extended to the bottoms of all of the borings. As discussed previously, groundwater was not encountered in the subsurface at the time of the investigation.

3.2 Field Reconnaissance

The field reconnaissance included walking the site during the subsurface investigation. As discussed previously, the site was gently sloping. No evidence of recent landslides, debris flows, rockfalls, or other slope instability was observed.

4.0 LABORATORY TESTING

Selected bedrock samples collected from the borings were tested in the Huddleston-Berry Engineering and Testing LLC geotechnical laboratory for Atterberg limits determination. The laboratory testing results are included in Appendix C.

The laboratory testing results indicate that the shale bedrock is moderately plastic. Due to the degree of weathering/fracturing of the material, undisturbed samples of the shale were unable to be collected for swell/consolidation testing. However, based upon the Atterberg limits of the material and upon our experience with the Mancos shale in the Grand Valley, the shale is anticipated to be slightly to moderately expansive.

5.0 GEOLOGIC INTERPRETATION

5.1 Geologic Hazards

The primary geologic hazard identified on the site is the presence of moisture sensitive bedrock.

5.2 Geologic Constraints

In general, the primary geologic constraint to construction at the site is the presence of moisture sensitive bedrock.

5.3 Water Resources

No water supply wells were observed on the property. In addition, groundwater was not encountered to the depth explored. In general, with proper design and construction of stormwater management controls, the proposed construction is not anticipated to adversely impact surface water or groundwater.

5.4 Mineral Resources

Potential mineral resources in the Grand Valley generally include gravel, uranium ore, and commercial rock products such as flagstone. As discussed previously, the site is mapped as being underlain by alluvium and colluvium. However, no gravels were encountered during the subsurface investigation. In general, HBET does not believe that economically recoverable resources exist at this site.

6.0 CONCLUSIONS

Based upon the available data sources, field investigation, and nature of the proposed construction, HBET does not believe that there are any geologic conditions which should preclude subdivision of the site. However, the proposed construction should consider the presence of moisture sensitive bedrock.

7.0 RECOMMENDATIONS

7.1 Foundations

Based upon the subsurface conditions and nature of the proposed construction, both shallow and deep foundations may be considered. Deep foundations will provide the most protection against heave related movements; however, deep foundations can be considerably more expensive.

The recommended shallow foundation alternatives include spread footings, voided spread footings, and isolated pads and grade beams. The recommended deep foundation alternatives include drilled piers and micro piles. The foundation alternatives are discussed below.

Spread Footings, Voided Spread Footings, or Isolated Pads and Grade Beams

As discussed previously, expansive shale bedrock is present in the subsurface. Therefore, to limit the potential for excessive differential movements, it is recommended that shallow foundations be constructed above a minimum of 48-inches of structural fill resting on competent shale bedrock.

The native shale bedrock materials are not suitable for reuse as structural fill. Imported structural fill should consist of a granular, non-expansive, ***non-free draining*** material such as ¼-inch minus crusher fines or CDOT Class 6 base course. However, HBET should be provided the opportunity to evaluate proposed structural fill materials to ensure that they are not free-draining.

Prior to placement of structural fill, it is recommended that the bottoms of the foundation excavations be proofrolled to the Engineer's satisfaction. Soft or weak materials should be replaced with structural fill. Due to the expansion potential of the shale, no moisture should be added to the subgrade.

Structural fill should extend laterally beyond the edges of the foundation a distance equal to the thickness of structural fill. Structural fill should be moisture conditioned, placed in maximum 8-inch loose lifts, and compacted to a minimum of 95% of the standard Proctor maximum dry density for fine grained soils or modified Proctor maximum dry density for coarse grained soils, within ±2% of the optimum moisture content as determined in accordance with ASTM D698 or D1557, respectively.

For foundation building pads prepared as recommended with structural fill consisting of imported granular materials, a maximum allowable bearing capacity of 3,000 psf may be used. However, a minimum dead-load of 1,000 psf is recommended. Where the minimum dead-load is not achievable, such as for interior foundations, the dead-load should be maximized to the extent practical. It is recommended that the bottoms of exterior foundations be at least twenty-four inches below the final grade for frost protection.

Drilled Piers

In general, a minimum total drilled pier length of 25 feet is recommended. In addition, drilled piers should penetrate shale bedrock a minimum of 15 feet.

Skin friction should be ignored along the upper 5 feet of drilled piers embedded in the shale bedrock. An allowable skin friction of 1,500 psf may be used for the portion of the pier in weathered shale bedrock below 5 feet of embedment. In addition, an allowable end-bearing capacity of 15,000 psf may be used for the shale bedrock. However, the piers should be designed for a minimum dead-load pressure of 5,000 psf based upon the pier bottom end area. The skin friction given above can be assumed to act in the direction to resist uplift for the portion of the pier in the bedrock.

Drilled piers should be reinforced their full length using a reinforcement ratio of at least 1.0 percent; however, the piers should be adequately reinforced to resist possible tensile forces due to swelling of the shallow subgrade materials. Concrete used in the piers should be a fluid mix with a minimum slump of 4-inches and a minimum 28-day compressive strength of 3,000 psi.

Swelling soils and bedrock exaggerate group effects on drilled piers. Therefore, the minimum center-to-center spacing of drilled piers should be eight diameters, or twelve feet, whichever is less. Drilled piers grouped less than eight diameters, or twelve feet, center-to-center should be individually evaluated to determine the appropriate reduction in end bearing capacity. A minimum 6-inch void should be provided beneath the grade beams to concentrate pier loadings and prevent expansive materials from exerting uplift forces on the grade beams.

In general, proper construction of drilled piers is critical. Therefore, it is strongly recommended that the piers be installed by a highly experienced contractor. If pier holes are clean and dry, concrete should be placed within 24-hours of drilling. However, if water is present in the pier holes, concrete should be placed the day of drilling. Tremie grouting of piers is recommended. In addition, care should be taken to prevent over-sizing of the tops of the piers. Mushroomed pier heads can reduce the effective dead-load pressure on the piers. Piers should also be within 2% of vertical and constant diameter

Micro Piles

For a micro pile foundation, it is recommended that micro piles have a minimum length of 30 feet. It is However, in order to reduce or eliminate uplift friction in the shallow subsurface, the upper 20 feet of the piles should be sleeved or cased. If subsurface moisture conditions differ than those encountered during the subsurface investigation, the sleeved or cased zone may be need to be increased as directed by the engineer.

Skin friction should be ignored for the sleeved or cased zone. An allowable skin friction value of 1,500 psf may be used for the bedrock below this zone. To ensure friction capacity, pile load testing is strongly recommended. Grout used in the bond zone of the micro piles should have a minimum 28 day compressive strength of 3,000 psi.

In general, micro piles should be installed with a center-to-center spacing of greater than 3 feet. However, to the extent practical, smaller numbers of longer micro piles should be used in lieu of larger numbers of shorter piles. The longer the piles and larger the loads on the piles, the lower the risk of movement. A minimum 6-inch void should be provided below the grade beams to concentrate loadings on the piles. The void forms should also extend above the micro piles such that only the reinforcement bar contacts the grade beam.

7.2 Seismic Design Criteria

In general, based upon the results of the subsurface investigation, the site generally classifies as Site Class C for soft rock.

7.3 Lateral Resistance for Seismic and Wind Loads

Based upon the results of the subsurface investigation, the following parameters are recommended for use in lateral pile capacity analyses:

Soil Type	Stiff Clay
Density (pci)	0.0667
Cohesion (psi)	8
Friction Angle (ϕ)	0
ε_{50} (in/in)	0.007
K (pci)	500

In addition to lateral resistance of the piles, lateral resistance can be developed from sliding friction between the floor slab and the ground. In general, for the native shale bedrock, a sliding friction angle of 18° is recommended. This corresponds to a friction factor of 0.32.

7.4 Corrosion of Concrete and Steel

As indicated previously, the USDA Soil Survey Data indicates that the site soils are highly corrosive to concrete. Therefore, at a minimum, Type I-II sulfate resistant cement is recommended for construction at this site.

The USDA Soil Survey Data also indicates that the site soils have a high potential for corrosion of uncoated steel. Therefore, buried steel utilities or other buried steel structures should consider corrosion in their design.

7.5 Non-Structural Floor Slabs and Exterior Flatwork

As discussed previously, expansive bedrock are present in the subsurface at the site. ***Due to the fact that slabs-on-grade do not generate sufficient loads to resist movement, differential movement of slabs-on-grade is likely***.

In general, the only way to eliminate, or nearly so, the risk of movement of floor slabs would be to support them on the foundations. However, if the City of Grand Junction is willing to accept the risk of using slab-on-grade floor systems, the risk of movement can be reduced by constructing floor slabs above a minimum of 48-inches of structural fill. Subgrade preparation, structural fill materials, and structural fill placement should be in accordance with the *Shallow Foundations* section of this report. It is recommended that exterior flatwork be constructed above a minimum of 18-inches of structural fill.

Slabs-on-grade should not be tied into or otherwise connected to the foundations in any manner. In addition, where a garage floor slab is used, interior, non-bearing partition walls should include a framing void or slip joint which permits a minimum of 2-inches of vertical movement. Also, framing, drywall, trim, brick facing, etc. should not rest on slabs-on-grade.

7.6 Lateral Earth Pressures

Stemwalls or retaining walls should be designed to resist lateral earth pressures. For backfill consisting of imported granular, non-free draining, non-expansive material, we recommend that the walls be designed for an active equivalent fluid unit weight of 55 pcf in areas where no surcharge loads are present. An at-rest equivalent fluid unit weight of 75 pcf is recommended for braced walls. Lateral earth pressures should be increased as necessary to reflect any surcharge loading behind the walls. Native shale materials should not be used as backfill.

7.7 Drainage

Drainage and grading are critical to the performance of the foundations and any slabs-on-grade. In order to improve the long-term performance of the foundations and slabs-on-grade, grading around the structure should be designed to carry precipitation and runoff away from the structure. It is recommended that the finished ground surface drop at least twelve inches within the first ten feet away from the structure. However, where sidewalks, pavements, etc. are adjacent to the structure, the grade can be reduced to ADA compliant grade (~2.5-inches in ten feet).

It is also recommended that landscaping within ten feet of the structure include primarily desert plants with low water requirements. In addition, it is recommended that automatic irrigation, including drip lines, within ten feet of foundations be minimized.

It is recommended that conventional downspouts be utilized with extensions that terminate a minimum of 10 feet from the structure or beyond the backfill zone, whichever is greater. However, if subsurface downspout drains are utilized, they should be carefully constructed of solid wall PVC pipe and daylight at least 15 feet from the structure. An impermeable membrane is recommended below subsurface downspout drains to reduce the potential for leaks in the drains to impact the structure. Dry wells should not be used.

In order to reduce the potential for surface moisture to impact the structure, a perimeter foundation drain is also recommended. In general, the perimeter foundation drain should consist of prefabricated drain materials or a perforated pipe and gravel system with the flowline of the drain at the bottom of the foundation (at the highest point). The perimeter drain should slope at a minimum of 1.0% to daylight or to a sump with pump. The drain should also include an impermeable membrane at the base to limit the potential for moisture to infiltrate vertically down below the foundations.

7.8 Excavations

Excavations in the soils and bedrock at the site may stand for short periods of time but should not be considered to be stable. Therefore, trenching and excavations should be sloped back, shored, or shielded for worker protection in accordance with applicable OSHA standards. The native soils and bedrock at the site generally classify as Type C soil with regard to OSHA's *Construction Standards for Excavations*. For Type C soils, the maximum allowable slope in temporary cuts is 1.5H:1V. However, the soil classification is based solely on the boring data and a Type B or Type A rating may be possible. HBET should be contacted to further evaluate the soils and bedrock during construction.

7.9 Pavements

The proposed construction is anticipated to include paved aprons, paved parking areas, and improvements to 27 Road. From the subsurface investigation, the pavement subgrade materials at the site consist primarily of shale bedrock. As discussed previously, the shale is expansive. Therefore, the minimum recommended Resilient Modulus of 3,000 psi was utilized for the pavement design.

Based upon the subgrade conditions and anticipated traffic loading, asphalt and concrete pavement section alternatives were developed in accordance with AASHTO design methodologies. The following minimum pavement section alternatives are recommended:

Automobile Parking Areas
ESAL's = 50,000; Structural Number = 2.75

ALTERNATIVE	PAVEMENT SECTION (Inches)				
	Hot-Mix Asphalt Pavement	CDOT Class 6 Base Course	CDOT Class 3 Subbase Course	Concrete Pavement	TOTAL
A	3.0	9.0			12.0
B	4.0	7.0			11.0
C	3.0	6.0	6.0		15.0
Rigid Pavement		6.0		6.0	12.0

Fire Truck Traffic Areas
ESAL's = 350,000; Structural Number = 3.70

ALTERNATIVE	PAVEMENT SECTION (Inches)				
	Hot-Mix Asphalt Pavement	CDOT Class 6 Base Course	CDOT Class 3 Subbase Course	Rigid Pavement	TOTAL
A	3.0	17.0			20.0
B	4.0	14.0			18.0
C	3.0	6.0	16.0		25.0
Full Depth RP		6.0		8.0	14.0

27 Road Improvements
ESAL's = 875,000, Structural Number = 4.24

ALTERNATIVE	PAVEMENT SECTION (Inches)				
	Hot-Mix Asphalt Pavement	CDOT Class 6 Base Course	CDOT Class 3 Subbase Course	Concrete Pavement	TOTAL
A	4.0	18.0			22.0
B	5.0	15.0			20.0
C	4.0	6.0	17.0		27.0
Rigid Pavement		6.0		8.0	14.0

Prior to pavement placement, the roadway prism should be stripped of all topsoil, fill, or other unsuitable materials. It is recommended that the subgrade be proofrolled to the Engineer's satisfaction. Due to the expansion potential of the shale, minimal moisture should be added to the subgrade.

Aggregate base course and subbase course should be placed in maximum 9-inch loose lifts, moisture conditioned, and compacted to a minimum of 95% and 93% of the maximum dry density, respectively, at -2% to +3% of optimum moisture content as determined by AASHTO T-180. In addition to density testing, base course should be proofrolled to verify subgrade stability.

It is recommended that Hot-Mix Asphaltic (HMA) pavement conform to CDOT grading SX or S specifications and consist of an approved 75 gyration Superpave method mix design. HMA pavement should be compacted to between 92% and 96% of the maximum theoretical density. An end point stress of 50 psi should be used. It is recommended that rigid pavements consist of CDOT Class P concrete or alternative approved by the Engineer. In addition, pavements should conform to local specifications.

The long-term performance of the pavements is dependent on positive drainage away from the pavements. Ditches, culverts, and inlet structures in the vicinity of paved areas must be maintained to prevent ponding of water on the pavement.

8.0 GENERAL

The recommendations included above are based upon the results of the subsurface investigation and on our local experience. These conclusions and recommendations are valid only for the proposed construction.

As discussed previously, the subsurface conditions encountered in the borings were slightly variable. However, the precise nature and extent of subsurface variability may not become evident until construction. The recommendations contained herein are designed to reduce the risk and magnitude of movements and it is extremely critical that ***ALL*** of the recommendations herein be applied to the design and construction. However, HBET cannot predict long-term changes in subsurface moisture conditions and/or the precise magnitude or extent of any volume change in the native soils and/or bedrock. ***Where significant increases in subsurface moisture occur due to poor grading, improper stormwater management, utility line failure, excess irrigation, or other cause, during or after construction, significant movements are possible***.

In addition, the success of the structure foundations, slabs, etc. is critically dependent upon proper construction. Therefore, HBET should be retained to provide materials testing, special inspections, and engineering oversight during ***ALL*** phases of the construction to ensure conformance with the recommendations herein.

Huddleston-Berry Engineering and Testing, LLC is pleased to be of service to your project. Please contact us if you have any questions or comments regarding the contents of this report.

Respectfully Submitted:
Huddleston-Berry Engineering and Testing, LLC

Michael A. Berry, P.E.
Vice President of Engineering

FIGURES

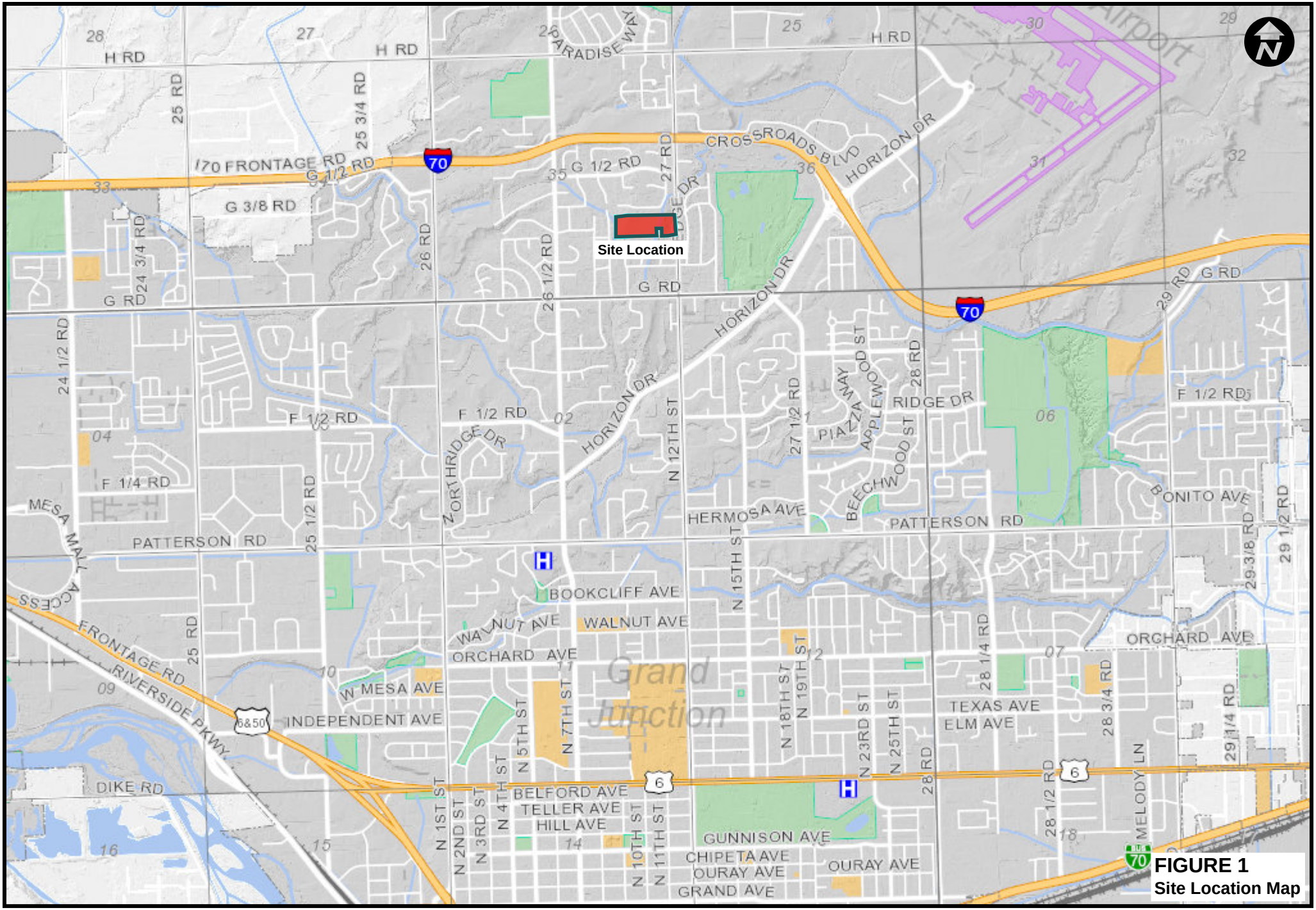


FIGURE 1
Site Location Map

Mesa County Map

0 0.25 0.5 1 mi
0 0.3 0.6 1.2 km

Print Date: June 20, 2019

Mesa County, Colorado
GIS/IT Department
gis.mesacounty.us

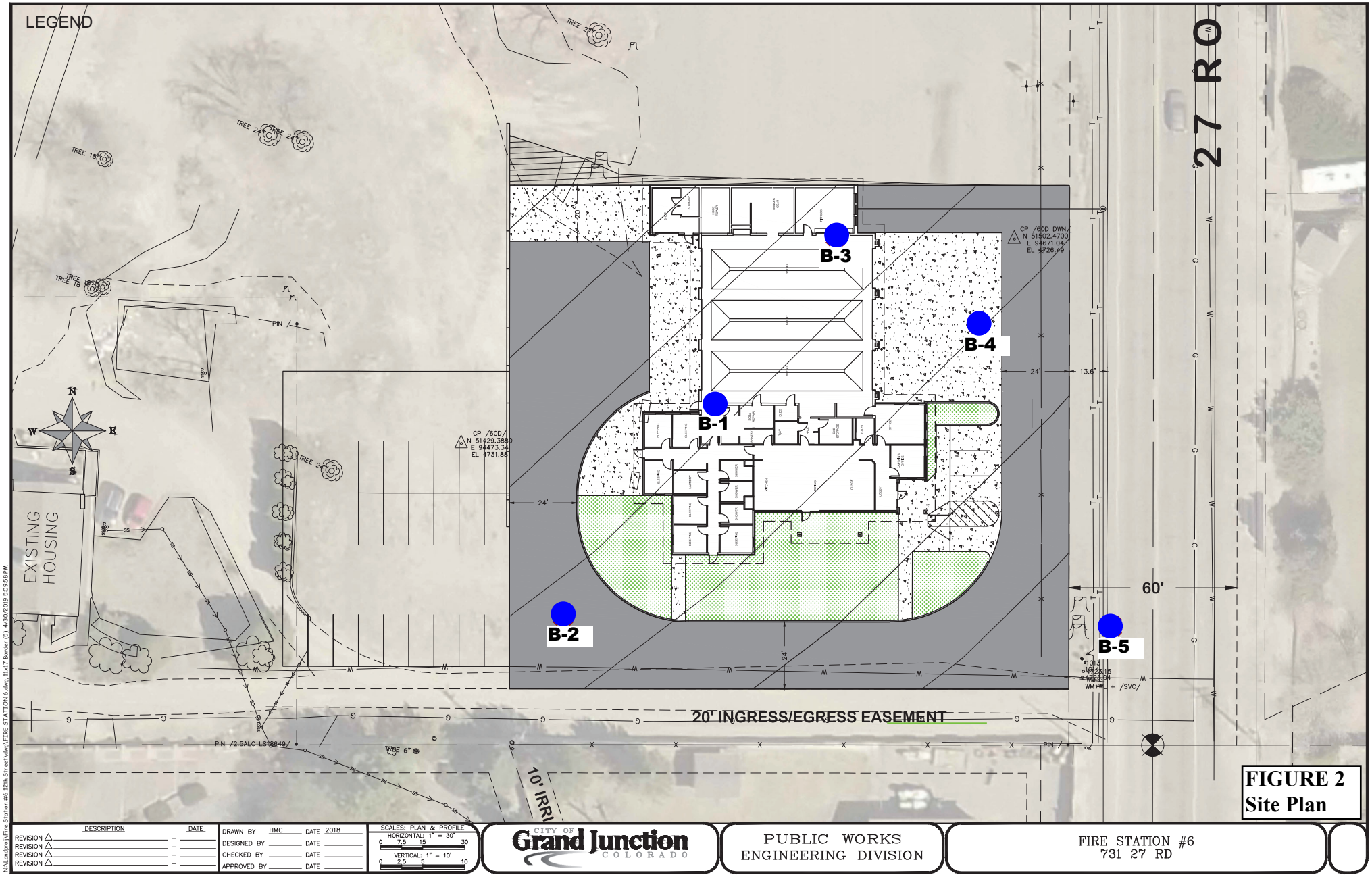


FIGURE 2
Site Plan

DESCRIPTION	DATE
REVISION △	–
REVISION △	–
REVISION △	–
REVISION △	–

DRAWN BY HMC DATE 2018
DESIGNED BY DATE
CHECKED BY DATE
APPROVED BY DATE

SCALES: PLAN & PROFILE
HORIZONTAL: 1" = 30'
0 7.5 15 30
VERTICAL: 1" = 10'
0 2.5 5 10

CITY OF Grand Junction COLORADO

PUBLIC WORKS
ENGINEERING DIVISION

FIRE STATION #6
731 27 RD

N:\Landpro\Fire Station #6 12th Street\dwg\FIRE STATTION 6.dwg, 11x17 Border(5), 4/30/2019 5:09:58 PM

APPENDIX A
Soil Survey Data

Soil Map—Mesa County Area, Colorado

Map Scale: 1:446 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 5 10 20 30

Feet: 0 20 40 80 120

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 12N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features

- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Mesa County Area, Colorado
Survey Area Data: Version 9, Sep 10, 2018

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Sep 13, 2010—Aug 8, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
Cc	Persayo silty clay loam, 5 to 12 percent slopes	0.0	2.2%
Ce	Persayo silty clay loam, 2 to 5 percent slopes	1.0	97.8%
Totals for Area of Interest		**1.0**	**100.0%**

Map Unit Description

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions in this report, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named, soils that are similar to the named components, and some minor components that differ in use and management from the major soils.

Most of the soils similar to the major components have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Some minor components, however, have properties and behavior characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. All the soils of a series have major horizons that are similar in composition, thickness, and arrangement. Soils of a given series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Additional information about the map units described in this report is available in other soil reports, which give properties of the soils and the limitations, capabilities, and potentials for many uses. Also, the narratives that accompany the soil reports define some of the properties included in the map unit descriptions.

Report—Map Unit Description

Mesa County Area, Colorado

Cc—Persayo silty clay loam, 5 to 12 percent slopes

Map Unit Setting

National map unit symbol: k0c0
Elevation: 4,490 to 5,220 feet

Mean annual precipitation: 6 to 9 inches
Mean annual air temperature: 50 to 55 degrees F
Frost-free period: 140 to 180 days
Farmland classification: Not prime farmland

Map Unit Composition

Persayo and similar soils: 90 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Persayo

Setting

Landform: Pediments
Landform position (two-dimensional): Backslope
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Cretaceous source residuum weathered from calcareous shale

Typical profile

Ap - 0 to 4 inches: silty clay loam
C - 4 to 15 inches: silty clay loam
Cr - 15 to 60 inches: bedrock

Properties and qualities

Slope: 5 to 12 percent
Depth to restrictive feature: 10 to 20 inches to paralithic bedrock
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately high (0.00 to 0.28 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 40 percent
Gypsum, maximum in profile: 10 percent
Salinity, maximum in profile: Very slightly saline to moderately saline (2.0 to 8.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 5.0
Available water storage in profile: Very low (about 2.5 inches)

Interpretive groups

Land capability classification (irrigated): 6s
Land capability classification (nonirrigated): 7c
Hydrologic Soil Group: D
Ecological site: Desert Loamy Clay (Shadscale) (R034BY109UT)
Hydric soil rating: No

Ce—Persayo silty clay loam, 2 to 5 percent slopes

Map Unit Setting

National map unit symbol: k0c2
Elevation: 4,490 to 5,220 feet

Mean annual precipitation: 6 to 9 inches
Mean annual air temperature: 50 to 55 degrees F
Frost-free period: 140 to 180 days
Farmland classification: Not prime farmland

Map Unit Composition

Persayo and similar soils: 90 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Persayo

Setting

Landform: Pediments
Landform position (two-dimensional): Backslope
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Cretaceous source residuum weathered from calcareous shale

Typical profile

Ap - 0 to 4 inches: silty clay loam
C - 4 to 15 inches: silty clay loam
Cr - 15 to 60 inches: bedrock

Properties and qualities

Slope: 2 to 5 percent
Depth to restrictive feature: 10 to 20 inches to paralithic bedrock
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately high (0.00 to 0.28 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 40 percent
Gypsum, maximum in profile: 10 percent
Salinity, maximum in profile: Very slightly saline to moderately saline (2.0 to 8.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 5.0
Available water storage in profile: Very low (about 2.5 inches)

Interpretive groups

Land capability classification (irrigated): 6s
Land capability classification (nonirrigated): 7c
Hydrologic Soil Group: D
Ecological site: Desert Loamy Clay (Shadscale) (R034BY109UT)
Hydric soil rating: No

Data Source Information

Soil Survey Area: Mesa County Area, Colorado
Survey Area Data: Version 9, Sep 10, 2018

Dwellings and Small Commercial Buildings

Soil properties influence the development of building sites, including the selection of the site, the design of the structure, construction, performance after construction, and maintenance. This table shows the degree and kind of soil limitations that affect dwellings and small commercial buildings.

The ratings in the table are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect building site development. *Not limited* indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. *Somewhat limited* indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. *Very limited* indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Numerical ratings in the table indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

Dwellings are single-family houses of three stories or less. For dwellings without basements, the foundation is assumed to consist of spread footings of reinforced concrete built on undisturbed soil at a depth of 2 feet or at the depth of maximum frost penetration, whichever is deeper. For dwellings with basements, the foundation is assumed to consist of spread footings of reinforced concrete built on undisturbed soil at a depth of about 7 feet. The ratings for dwellings are based on the soil properties that affect the capacity of the soil to support a load without movement and on the properties that affect excavation and construction costs. The properties that affect the load-supporting capacity include depth to a water table, ponding, flooding, subsidence, linear extensibility (shrink-swell potential), and compressibility. Compressibility is inferred from the Unified classification. The properties that affect the ease and amount of excavation include depth to a water table, ponding, flooding, slope, depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, and the amount and size of rock fragments.

Small commercial buildings are structures that are less than three stories high and do not have basements. The foundation is assumed to consist of spread footings of reinforced concrete built on undisturbed soil at a depth of 2 feet or at the depth of maximum frost penetration, whichever is deeper. The ratings are based on the soil properties that affect the capacity of the soil to support a load without movement and on the properties that affect excavation and construction costs. The properties that affect the load-supporting capacity include depth to a water table, ponding, flooding, subsidence, linear extensibility (shrink-swell potential), and compressibility (which is inferred from the Unified classification). The properties that affect the ease and amount of excavation include flooding, depth to a water table, ponding, slope, depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, and the amount and size of rock fragments.

Information in this table is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil between the surface and a depth of 5 to 7 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this table. Local ordinances and regulations should be considered in planning, in site selection, and in design.

Report—Dwellings and Small Commercial Buildings

[Onsite investigation may be needed to validate the interpretations in this table and to confirm the identity of the soil on a given site. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the potential limitation. The table shows only the top five limitations for any given soil. The soil may have additional limitations]

Dwellings and Small Commercial Buildings–Mesa County Area, Colorado							
Map symbol and soil name	Pct. of map unit	Dwellings without basements		Dwellings with basements		Small commercial buildings	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
Cc—Persayo silty clay loam, 5 to 12 percent slopes							
Persayo	90	Somewhat limited		Very limited		Very limited	
		Depth to soft bedrock	0.50	Depth to soft bedrock	1.00	Depth to soft bedrock	1.00
		Slope	0.04	Slope	0.04	Slope	1.00

Dwellings and Small Commercial Buildings–Mesa County Area, Colorado							
Map symbol and soil name	Pct. of map unit	Dwellings without basements		Dwellings with basements		Small commercial buildings	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
Ce—Persayo silty clay loam, 2 to 5 percent slopes							
Persayo	90	Somewhat limited		Very limited		Somewhat limited	
		Depth to soft bedrock	0.50	Depth to soft bedrock	1.00	Depth to soft bedrock	1.00
						Slope	0.01

Data Source Information

Soil Survey Area: Mesa County Area, Colorado
Survey Area Data: Version 9, Sep 10, 2018

Roads and Streets, Shallow Excavations, and Lawns and Landscaping

Soil properties influence the development of building sites, including the selection of the site, the design of the structure, construction, performance after construction, and maintenance. This table shows the degree and kind of soil limitations that affect local roads and streets, shallow excavations, and lawns and landscaping.

The ratings in the table are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect building site development. *Not limited* indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. *Somewhat limited* indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. *Very limited* indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Numerical ratings in the table indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material; a base of gravel, crushed rock, or soil material stabilized by lime or cement; and a surface of flexible material (asphalt), rigid material (concrete), or gravel with a binder. The ratings are based on the soil properties that affect the ease of excavation and grading and the traffic-supporting capacity. The properties that affect the ease of excavation and grading are depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, depth to a water table, ponding, flooding, the amount of large stones, and slope. The properties that affect the traffic-supporting capacity are soil strength (as inferred from the AASHTO group index number), subsidence, linear extensibility (shrink-swell potential), the potential for frost action, depth to a water table, and ponding.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for graves, utility lines, open ditches, or other purposes. The ratings are based on the soil properties that influence the ease of digging and the resistance to sloughing. Depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, the amount of large stones, and dense layers influence the ease of digging, filling, and compacting. Depth to the seasonal high water table, flooding, and ponding may restrict the period when excavations can be made. Slope influences the ease of using machinery. Soil texture, depth to the water table, and linear extensibility (shrink-swell potential) influence the resistance to sloughing.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. Irrigation is not considered in the ratings. The ratings are based on the soil properties that affect plant growth and trafficability after vegetation is established. The properties that affect plant growth are reaction; depth to a water table; ponding; depth to bedrock or a cemented pan; the available water capacity in the upper 40 inches; the content of salts, sodium, or calcium carbonate; and sulfidic materials. The properties that affect trafficability are flooding, depth to a water table, ponding, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer.

Information in this table is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil between the surface and a depth of 5 to 7 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this table. Local ordinances and regulations should be considered in planning, in site selection, and in design.

Report—Roads and Streets, Shallow Excavations, and Lawns and Landscaping

[Onsite investigation may be needed to validate the interpretations in this table and to confirm the identity of the soil on a given site. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the potential limitation. The table shows only the top five limitations for any given soil. The soil may have additional limitations]

Roads and Streets, Shallow Excavations, and Lawns and Landscaping–Mesa County Area, Colorado							
Map symbol and soil name	Pct. of map unit	Lawns and landscaping		Local roads and streets		Shallow excavations	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
Cc—Persayo silty clay loam, 5 to 12 percent slopes							
Persayo	90	Very limited		Very limited		Very limited	
		Depth to bedrock	1.00	Depth to soft bedrock	1.00	Depth to soft bedrock	1.00
		Droughty	0.87	Low strength	1.00	Dusty	0.50
		Dusty	0.50	Frost action	0.50	Slope	0.04
		Low exchange capacity	0.50	Slope	0.04	Unstable excavation walls	0.01
		Slope	0.04				

Roads and Streets, Shallow Excavations, and Lawns and Landscaping–Mesa County Area, Colorado							
Map symbol and soil name	Pct. of map unit	Lawns and landscaping		Local roads and streets		Shallow excavations	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
Ce—Persayo silty clay loam, 2 to 5 percent slopes							
Persayo	90	Very limited		Very limited		Very limited	
		Depth to bedrock	1.00	Depth to soft bedrock	1.00	Depth to soft bedrock	1.00
		Droughty	0.87	Low strength	1.00	Dusty	0.50
		Dusty	0.50	Frost action	0.50	Unstable excavation walls	0.01
		Low exchange capacity	0.50				

Data Source Information

Soil Survey Area: Mesa County Area, Colorado
Survey Area Data: Version 9, Sep 10, 2018

Soil Features

This table gives estimates of various soil features. The estimates are used in land use planning that involves engineering considerations.

A *restrictive layer* is a nearly continuous layer that has one or more physical, chemical, or thermal properties that significantly impede the movement of water and air through the soil or that restrict roots or otherwise provide an unfavorable root environment. Examples are bedrock, cemented layers, dense layers, and frozen layers. The table indicates the hardness and thickness of the restrictive layer, both of which significantly affect the ease of excavation. *Depth to top* is the vertical distance from the soil surface to the upper boundary of the restrictive layer.

Subsidence is the settlement of organic soils or of saturated mineral soils of very low density. Subsidence generally results from either desiccation and shrinkage, or oxidation of organic material, or both, following drainage. Subsidence takes place gradually, usually over a period of several years. The table shows the expected initial subsidence, which usually is a result of drainage, and total subsidence, which results from a combination of factors.

Potential for frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, saturated hydraulic conductivity (Ksat), content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured, clayey soils that have a high water table in winter are the most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage to pavements and other rigid structures.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that corrodes or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors results in a severe hazard of corrosion. The steel or concrete in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than the steel or concrete in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low*, *moderate*, or *high*, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion also is expressed as *low*, *moderate*, or *high.* It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

Report—Soil Features

Soil Features–Mesa County Area, Colorado									
Map symbol and soil name	Restrictive Layer				Subsidence		Potential for frost action	Risk of corrosion	
	Kind	Depth to top	Thickness	Hardness	Initial	Total		Uncoated steel	Concrete
		Low-RV-High	*Range*		*Low-High*	*Low-High*			
		In	*In*		*In*	*In*			
Cc—Persayo silty clay loam, 5 to 12 percent slopes									
Persayo	Paralithic bedrock	10-15-20	—	Weakly cemented	0	0	Moderate	High	High
Ce—Persayo silty clay loam, 2 to 5 percent slopes									
Persayo	Paralithic bedrock	10-15-20	—	Weakly cemented	0	0	Moderate	High	High

Data Source Information

Soil Survey Area: Mesa County Area, Colorado
Survey Area Data: Version 9, Sep 10, 2018

APPENDIX B
Typed Boring Logs

Huddleston-Berry Engineering & Testing, LLC
640 White Avenue, Unit B
Grand Junction, CO 81501
970-255-8005
970-255-6818

BORING NUMBER B-1

CLIENT City of Grand Junction
PROJECT NAME Fire Station #6
PROJECT NUMBER 00208-0099
PROJECT LOCATION Grand Junction, CO
DATE STARTED 5/30/19 **COMPLETED** 5/30/19
GROUND ELEVATION ---- **HOLE SIZE** 4-inches
DRILLING CONTRACTOR S. McKracken
GROUND WATER LEVELS:
DRILLING METHOD Simco 2000 Track Rig
AT TIME OF DRILLING dry
LOGGED BY SD **CHECKED BY** MAB
AT END OF DRILLING dry
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0.0		Sandy GRAVEL (FILL)										
		SHALE, grey, soft to medium hard, highly weathered to moderately weathered										
2.5			SS 1	72	11-16-19 (35)							
5.0												
7.5			SS 2	92	22-28				35	23	12	
10.0												
12.5			SS 3	100	25-25/4"							
		Bottom of hole at 12.8 feet.										

Huddleston-Berry Engineering & Testing, LLC
640 White Avenue, Unit B
Grand Junction, CO 81501
970-255-8005
970-255-6818

BORING NUMBER B-2

CLIENT City of Grand Junction
PROJECT NAME Fire Station #6
PROJECT NUMBER 00208-0099
PROJECT LOCATION Grand Junction, CO
DATE STARTED 5/30/19 **COMPLETED** 5/30/19
GROUND ELEVATION _____ **HOLE SIZE** 4-inches
DRILLING CONTRACTOR S. McKracken
GROUND WATER LEVELS:
DRILLING METHOD Simco 2000 Track Rig
AT TIME OF DRILLING dry
LOGGED BY SD **CHECKED BY** MAB
AT END OF DRILLING dry
NOTES _____
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0.0		Lean CLAY with Organics (TOPSOIL)										
		SHALE, grey, soft to medium hard, highly weathered										
2.5			SS 1	56	4-8-13 (21)							
5.0												
7.5												
10.0			SS 2	100	38-12/2"							
		Bottom of hole at 10.6 feet.										

Huddleston-Berry Engineering & Testing, LLC
640 White Avenue, Unit B
Grand Junction, CO 81501
970-255-8005
970-255-6818

BORING NUMBER B-3

CLIENT City of Grand Junction
PROJECT NAME Fire Station #6
PROJECT NUMBER 00208-0099
PROJECT LOCATION Grand Junction, CO
DATE STARTED 5/30/19 **COMPLETED** 5/30/19
GROUND ELEVATION _____ **HOLE SIZE** 4-inches
DRILLING CONTRACTOR S. McKracken
GROUND WATER LEVELS:
DRILLING METHOD Simco 2000 Track Rig
AT TIME OF DRILLING dry
LOGGED BY SD **CHECKED BY** MAB
AT END OF DRILLING dry
NOTES _____
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0.0		Sandy GRAVEL (FILL)										
		SHALE, grey, soft to medium hard, highly weathered										
2.5			SS 1	83	16-21-27 (48)							
5.0												
7.5			SS 2	100	40-10/1"							
		Bottom of hole at 7.6 feet.										

Huddleston-Berry Engineering & Testing, LLC
640 White Avenue, Unit B
Grand Junction, CO 81501
970-255-8005
970-255-6818

BORING NUMBER B-4

CLIENT City of Grand Junction
PROJECT NAME Fire Station #6
PROJECT NUMBER 00208-0099
PROJECT LOCATION Grand Junction, CO
DATE STARTED 5/30/19 **COMPLETED** 5/30/19
GROUND ELEVATION _____ **HOLE SIZE** 4-inches
DRILLING CONTRACTOR S. McKracken
GROUND WATER LEVELS:
DRILLING METHOD Simco 2000 Track Rig
AT TIME OF DRILLING dry
LOGGED BY SD **CHECKED BY** MAB
AT END OF DRILLING dry
NOTES _____
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0.0		Sandy GRAVEL (FILL)										
		SHALE, grey, soft to medium hard, highly weathered										
2.5			SS 1	89	10-19-19 (38)							
5.0												
7.5												
10.0			SS 2	100	29-21/3"				32	23	9	
		Bottom of hole at 10.8 feet.										

Huddleston-Berry Engineering & Testing, LLC
640 White Avenue, Unit B
Grand Junction, CO 81501
970-255-8005
970-255-6818

BORING NUMBER B-5

CLIENT City of Grand Junction
PROJECT NAME Fire Station #6
PROJECT NUMBER 00208-0099
PROJECT LOCATION Grand Junction, CO
DATE STARTED 6/12/19 **COMPLETED** 6/12/19
GROUND ELEVATION ---- **HOLE SIZE** 4-inches
DRILLING CONTRACTOR S. McKracken
GROUND WATER LEVELS:
DRILLING METHOD Simco 2000 Track Rig
AT TIME OF DRILLING dry
LOGGED BY SD **CHECKED BY** MAB
AT END OF DRILLING dry
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0.0		ASPHALT										
		Granular Base Course										
2.5		SHALE, grey, soft to medium hard, highly weathered	SS 1	33	4-4-4 (8)							
5.0												
7.5			SS 2	100	20-30							
10.0			SS 3	100	24-26							
		Bottom of hole at 11.0 feet.										

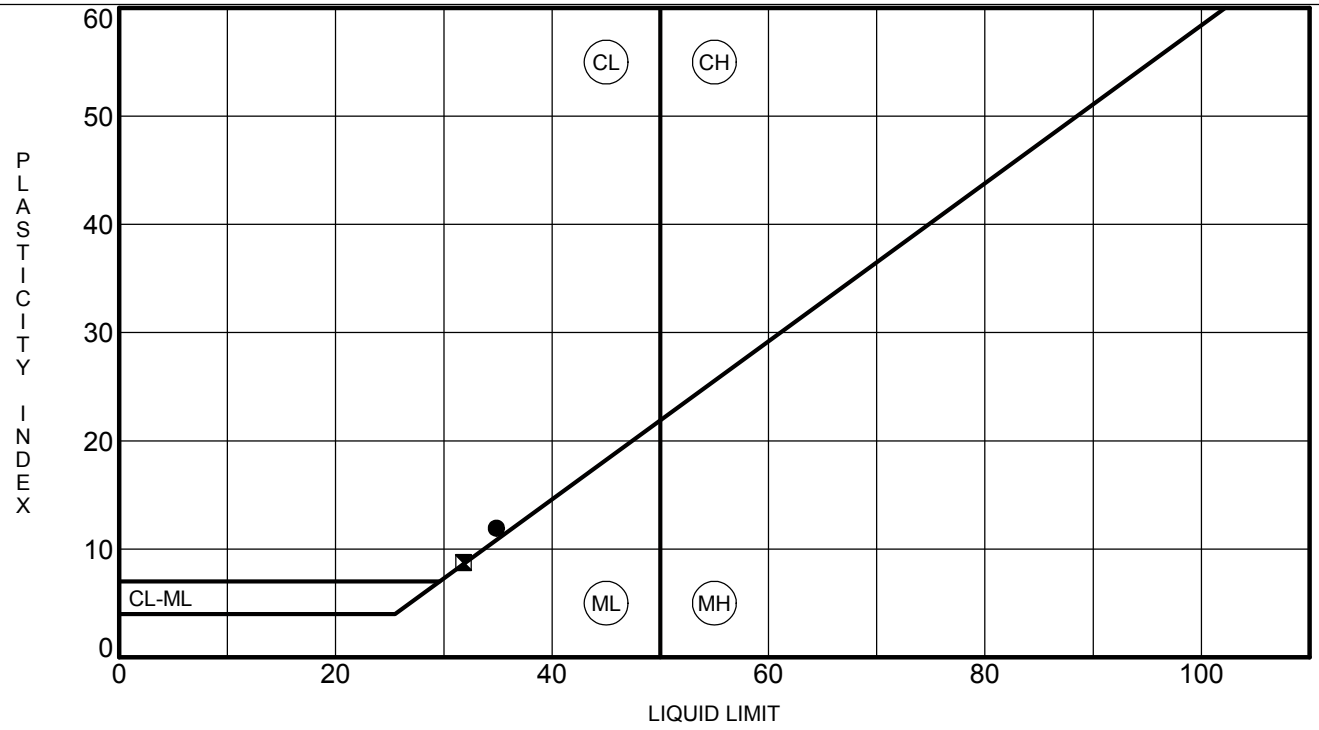
APPENDIX C
Laboratory Testing Results

Huddleston-Berry Engineering & Testing, LLC
640 White Avenue, Unit B
Grand Junction, CO 81501
970-255-8005
970-255-6818

ATTERBERG LIMITS' RESULTS

CLIENT City of Grand Junction **PROJECT NAME** Fire Station #6

PROJECT NUMBER 00208-0099 **PROJECT LOCATION** Grand Junction, CO



	Specimen Identification		LL	PL	PI	#200	Classification
●	**B-1, SS2**	**5/2019**	**35**	**23**	**12**		
⧓	**B-4, SS2**	**5/2019**	**32**	**23**	**9**		