



ENTECH
ENGINEERING, INC.

505 ELKTON DRIVE
COLORADO SPRINGS, CO 80907
PHONE (719) 531-5599
FAX (719) 531-5238

**SOIL, GEOLOGY, GEOLOGIC HAZARD,
AND WASTEWATER STUDY
ARVIDSON SUBDIVISION
2310 WAKONDA WAY
MONUMENT, COLORADO**

Prepared for

Jenna and Matthew Arvidson
2310 Wakonda Way
Monument, Colorado 80132

Attn: Jenna and Matthew Arvidson

September 14, 2017

Respectfully Submitted,

ENTECH ENGINEERING, INC.

Logan L. Langford
Geologist

LLL/nc

Encl.

Entech Job No. 171248

AAprojects/2017/171248 countysoil/geo/ww

Reviewed by:

Joseph E. Goode, Jr.
President

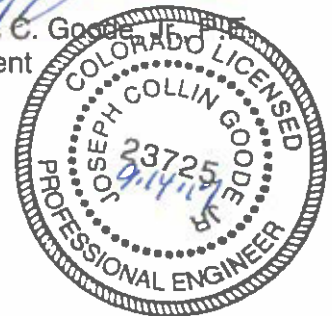


TABLE OF CONTENTS

1.0 SUMMARY 1
2.0 GENERAL SITE CONDITIONS AND PROJECT DESCRIPTION 2
3.0 SCOPE OF THE REPORT 3
4.0 FIELD INVESTIGATION 3
5.0 SOIL, GEOLOGY AND ENGINEERING GEOLOGY 4
 5.1 General Geology 4
 5.2 Soil Conservation Survey 4
 5.3 Site Stratigraphy 5
 5.4 Soil Conditions 6
 5.5 Groundwater 6
6.0 ENGINEERING GEOLOGY – IDENTIFICATION AND MITIGATION OF GEOLOGIC HAZARDS 6
 6.1 Relevance of Geologic Conditions to Land Use Planning 8
7.0 ON-SITE DISPOSAL OF WASTEWATER 10
8.0 ECONOMIC MINERAL RESOURCES 11
9.0 EROSION CONTROL 12
10.0 CLOSURE 13
BIBLIOGRAPHY 14

TABLES

- Table 1: Summary of Laboratory Test Results
- Table 2: Summary of Percolation Test Results and Tactile Test Pits

FIGURES

- Figure 1: Vicinity Map
- Figure 2: USGS Map
- Figure 3: Site Plan/Test Boring Location Map
- Figure 4: Soil Survey Map
- Figure 5: Monument Quadrangle Geology Map
- Figure 6: Geology Map/Engineering Geology
- Figure 7: Floodplain Map
- Figure 8: Typical Perimeter Drain Details
- Figure 9: Septic Suitability Map

- APPENDIX A: Site Photographs
- APPENDIX B: Profile Hole Logs and Test Pit Logs
- APPENDIX C: Laboratory Test Results
- APPENDIX D: Soil Survey Descriptions
- APPENDIX E: El Paso County Health Department Septic Records

1.0 SUMMARY

Project Location

The project lies in a portion of the SE¼ of the SE¼ of Section 3, Township 11 South, Range 67 West of the 6th Principal Meridian in El Paso County, Colorado. The site is located approximately 1¼ miles north of Monument, Colorado.

Project Description

Total acreage involved in the project is approximately 5 acres. The proposed site development consists of two single-family rural residential lots. The existing structure is to remain on Lot 1. The development will utilize an individual well and on-site wastewater treatment system.

Scope of Report

This report presents the results of our geologic evaluation, treatment of engineering geologic hazard study and wastewater study for individual on-site wastewater treatment systems.

Land Use and Engineering Geology

This site was found to be suitable for the proposed development. Areas were encountered where the geologic conditions will impose some constraints on development and land use. These include areas of potentially unstable slopes, shallow bedrock, and seasonal shallow groundwater areas. Based on the proposed development plan, it appears that these areas will have some impact on the development. These conditions will be discussed in greater detail in the report.

In general, it is our opinion that the development can be achieved if the observed geologic conditions on site are either avoided or properly mitigated. All recommendations are subject to the limitations discussed in the report.

Should this be no
build?

2.0 GENERAL SITE CONDITIONS AND PROJECT DESCRIPTION

The site is located in a portion of the SE $\frac{1}{4}$ of the SE $\frac{1}{4}$ of Section 3, Township 11 South, Range 67 West of the 6th Principal Meridian in El Paso County, Colorado. The site is located approximately 1 $\frac{1}{4}$ miles north of Monument, Colorado, northwest of Beacon Lite Road and Wakonda Way. The location of the site is as shown on the Vicinity Map, Figure 1.

The topography of the site varies of gradually to steeply sloping generally to the south and southwest, with moderate to steep slopes along the ridge that bisects the property. The steepest slopes are located along the road cut in the southwestern portion of the site on the north side of Wakonda Way. The drainages on-site flow in southerly and southwesterly directions through the western and southeastern portions of the site. Water was not observed in the drainages at the time of this investigation. The site boundaries are indicated on the USGS Map, Figure 2. Previous land uses have included grazing and pasture land. The site contains primarily field grasses, weeds, cacti, yucca, Ponderosa Pines and scrub oak. The existing house located on Lot 1 will remain. An existing septic system and water well are located at the house. The septic system was previously abandoned and the house is now tied into Monument Sanitation sewer. El Paso County Health Department records for the septic are included in Appendix E. Site photographs, taken August 16, 2017, are included in Appendix A.

Total acreage involved in the proposed development is approximately 5 acres. Two single-family rural residential lots are proposed. The proposed lots are approximately 2.1 and 2.3 acres each. The new lot will be serviced by an individual well and on-site wastewater treatment system. The proposed Development Plan is presented in Figure 3.

3.0 SCOPE OF THE REPORT

The scope of the report will include the following:

- A general geologic analysis utilizing published geologic data. Detailed site-specific mapping will be conducted to obtain general information in respect to major geographic and geologic features, geologic descriptions and their effects on the development of the property.
- The site will be evaluated for individual on-site wastewater treatment systems in accordance with El Paso Land Development Code.

4.0 FIELD INVESTIGATION

Our field investigation consisted of the preparation of a geologic map of any bedrock features and significant surficial deposits. The Natural Resource Conservation Service (NRCS), previously the Soil Conservation Service (SCS) survey was also reviewed to evaluate the site. The position of mappable units within the subject property are shown on the Geologic Map. Our mapping procedures involved both field reconnaissance and measurements and air photo reconnaissance and interpretation. The same mapping procedures have also been utilized to produce the Geology/Engineering Geology Map which identified pertinent geologic conditions affecting development. The field mapping was performed by personnel of Entech Engineering, Inc. on August 18, 2017.

Two (2) test pits were performed on Lot 2 to determine general suitability of the site for the use of an on-site wastewater treatment system and provide foundation recommendations. The locations of the test pits are indicated on the Development Plan/Test Boring Location Map, Figure 3. The Test Pit Logs are presented in Appendix B. Results of this testing will be discussed later in this report.

Laboratory testing was also performed on some of the soils to classify and determine the soils engineering characteristics. Laboratory tests included grain-size analysis, ASTM D-422. Results of the laboratory testing are included in Appendix C. A Summary of Laboratory Test Results is presented in Table 1.

5.0 SOIL, GEOLOGY AND ENGINEERING GEOLOGY

5.1 General Geology

Physiographically, the site lies in the western portion of the Great Plains Physiographic Province along the Palmer Divide. Approximately 3 miles to the west is a major structural feature known as the Rampart Range Fault. This fault marks the boundary between the Great Plains Physiographic Province and the Southern Rocky Mountain Province. The site exists within the southeastern edge of a large structural feature known as the Denver Basin. Bedrock in the area tends to be very gently dipping in a northeasterly direction (Reference 1). The rocks in the area of the site are sedimentary in nature and typically Tertiary to Upper Cretaceous in age. The bedrock underlying the site consists of the Dawson Arkose Formation. Overlying this formation are unconsolidated deposits of residual soils, and alluvial soils of the Quaternary Age. The residual soils are produced by the in-situ action of weathering of the bedrock on site. The alluvial soils were deposited by water in the drainages on site. The site's stratigraphy will be discussed in more detail in Section 5.3.

5.2 Soil Conservation Survey

The Natural Resource Conservation Service (Reference 2), previously the Soil Conservation Service (Reference 3) has mapped one soil type on the site (Figure 4). In general, it consists of gravelly loamy sands. The soils are described as follows:

<u>Type</u>	<u>Description</u>
41	Kettle Gravelly Loamy Sands, 8-40% slopes

Complete description of the soil type is presented in Appendix D. The soils have generally been described to have moderate to moderately rapid permeabilities. Roads may need to be designed to minimize frost-heave potential. Possible hazards with soil erosion are present on the site. The erosion potential can be controlled with vegetation. The majority of the soils have been described to have slight to moderate erosion hazards.

5.3 Site Stratigraphy

The Monument Quadrangle Geology Map showing the site is presented in (Figure 5, Reference 4). The Geology Map prepared for the site is presented in (Figure 6). Four mappable units were identified on this site which are described as follows:

- Qal** **Recent Alluvium of Holocene Age:** These are recent deposits that have been deposited along the drainage that exist on-site. These materials typically consist of silty to clayey sands and sandy clays. Some of these alluviums contain highly organic soils.
- Qaf** **Artificial Fill of Holocene Age:** These are man-made fill deposits associated with the erosion berm in the southeast portion of Lot 1.
- Qas₁** **Younger Piedmont-Slope Alluvium of Holocene Age:** These are sheetwash and stream-deposited alluvium associated with Monument Creek and its tributaries. These materials consist of gravelly to silty to clayey sands.
- Tkd** **Dawson Formation of Tertiary to Cretaceous Age:** The Dawson formation typically consists of arkosic sandstone with interbedded fine-grained sandstone, siltstone and claystone. Overlying this formation is a variable layer of residual soil. The residual soils were derived from the in-situ weathering of the bedrock materials on-site. These soils consisted of silty to clayey sands and sandy clays.

The soils listed above were mapped from site-specific mapping, the *Geologic Map of the Monument Quadrangle* distributed by the Colorado Geological Survey in 2003 (Reference 4), the *Geologic Map of the Colorado Springs-Castle Rock Area*, distributed by the US Geological Survey in 1979 (Reference 5), and the *Geologic Map of the Denver 1^o x 2^o Quadrangle*, distributed by the US Geological Survey in 1981 (Reference 6). The Test Pits and Profile Holes were also used in evaluating the site and are included in Appendix B. The Geology Map prepared for the site is presented in Figure 6.

5.4 Soil Conditions

The soils encountered in the Test Pits can be grouped into one general soil type. The test pit soils were classified using the USDA Textural Soil Classification and Unified Soil Classification System (USCS).

Soil Type 1 is a silty sandstone (SM). This material was encountered in both of the test pits. The sandstone was encountered at 1 foot and extended to the termination of the test pits (4 to 6 feet). A thin layer of residual soils and topsoil exists on top of the sandstone. The sandstone was encountered at dense to very dense states and moist conditions. Samples tested had 15 to 18 percent passing the No. 200 sieve. The sandstones are typically non-expansive, however; expansive clayey sandstone and claystone are common in the area.

The Test Pit Logs are presented in Appendix B. Laboratory Test Results are presented in Appendix C. A Summary of Laboratory Test Results is presented in Table 1.

5.5 Groundwater

Groundwater was not encountered in the test pits which were excavated to depths of 4 to 6 feet. Areas of seasonal shallow groundwater have been mapped in low-lying areas and in the small drainages on-site. These areas are discussed in the following section. Fluctuation in groundwater conditions may occur due to variations in rainfall and other factors not readily apparent at this time.

It should be noted that in the sandy materials on site, some groundwater conditions might be encountered due to the variability in the soil profile. Isolated sand and gravel layers within the soils, sometimes only a few feet in thickness and width, can carry water in the subsurface. Groundwater may also flow on top of the underlying bedrock. Builders and planners should be cognizant of the potential for the occurrence of such subsurface water features during construction on-site and deal with each individual problem as necessary at the time of construction.

6.0 ENGINEERING GEOLOGY – IDENTIFICATION AND MITIGATION OF GEOLOGIC HAZARDS

As mentioned previously, detailed mapping has been performed on this site to produce an Geology/Engineering Geology Map (Figure 6). This map shows the location of various geologic conditions of which the developers should be cognizant during the planning, design and construction stages of the project. These hazards and the recommended mitigation techniques are as follows:

Expansive Soils

Expansive soils were not encountered in the test pits excavated on-site, however; expansive very clayey sandstone and claystone are commonly encountered within the Dawson Formation. These occurrences are typically sporadic; therefore, none have been indicated on the maps. These expansive soils, if encountered beneath foundations, can cause differential movement in the structure foundation. These occurrences should be identified and dealt with on an individual basis.

Mitigation: Should expansive soils be encountered beneath the foundation, mitigation will be necessary. Mitigation of expansive soils will require special foundation design. Overexcavation and replacement with non-expansive soils at a minimum of 95% of its maximum Modified Proctor Dry Density, ASTM D-1557 is a suitable mitigation, which is common in the area. Another alternative in areas of highly expansive soils is the use of drilled pier foundation systems. Typical minimum pier depths are on the order of 20 feet or more and require penetration into the bedrock material a minimum of 4 to 6 feet, depending upon building loads. Floor slabs on expansive soils should be expected to experience movement. Overexcavation and replacement has been successful in minimizing slab movements. The use of structural floors should be considered for basement construction on highly expansive clays. Final recommendations should be determined after additional investigation of each building site.

Floodplain and Seasonal Shallow Groundwater Area

The site is not mapped within any floodplains according to the FEMA Map No. 08041CO276F, dated March 17, 1997 (Figure 7, Reference 7). Areas of seasonal shallow groundwater were observed across the site. In these areas, we would anticipate the potential for periodically high subsurface moisture conditions and frost heave potential. These areas lie within low-lying areas

along the southern portion of the site and in the smaller drainages in the western portion of the site. Water was not observed in any of the drainages at the time of our site investigation. These areas can likely be avoided or properly mitigated by development. The potential exists for high groundwater levels during high moisture periods and should structures encroach on these areas the following precautions should be followed:

Mitigation: Foundations must have a minimum 30-inch depth for frost protection. In areas where high subsurface moisture conditions are anticipated periodically, subsurface perimeter drains are recommended to help prevent the intrusion of water into areas below grade. Typical drain details are presented in Figure 8. Any grading in these areas should be done to direct surface flow around construction to avoid areas of ponded water. All organic material would be completely removed prior to any fill placement. Specific drainage studies are beyond the scope of this report.

Potentially Unstable Slopes

The slopes identified with this hazard exist along the road cut on the north side of Wakonda Way in the southern portion of the site. These slopes are stable in their present condition; however, considerable care must be exercised in these areas not to create a condition which would tend to activate instability.

Mitigation: These slopes lie along the southern property boundary, therefore, building from this project is not proposed on these slopes. The best mitigation for potentially unstable slopes is avoidance. The potential house location on Lot 2 is a sufficient distance away that potentially unstable slopes should not affect the proposed development.

6.1 Relevance of Geologic Conditions to Land Use Planning

As mentioned earlier in this report, we understand that the development will be rural residential. It is our opinion that the existing geologic and engineering geologic conditions will impose some minor constraints on the proposed development and construction. The most significant problems affecting development will be those associated with the potentially unstable slope on the southwest side of the site that can be avoided. Other hazards on site may be satisfactorily mitigated through proper engineering design and construction practices.

Should this be a no
build?

The upper materials are typically at medium dense states to very dense. The granular soils and sandstone bedrock encountered in the test pits should provide good support for foundations. Foundations anticipated for the site are standard spread footings bearing on medium dense sands or undisturbed sandstone. Areas containing arkosic sandstone will have high allowable bearing conditions. Difficult excavation should be anticipated in areas of shallow bedrock. Expansive layers may also be encountered in the soil and bedrock on this site. Areas of expansive soils encountered on site are sporadic; therefore, none have been indicated on the maps. Expansive clayey sandstone and claystone is common in the Dawson Formation, and may require mitigation if encountered at or within four feet of foundation grade. Expansive soils, if encountered, will require special foundation design and/or overexcavation. These soils will not prohibit development.

Areas of potentially seasonal shallow groundwater were encountered on site. These areas exist along a drainage swale located on the western side of Lot 2 and in the southeast side of Lot 1 along Wakonda Way. Water was not observed in the pond or drainages on-site. Due to the size of the lots and the proposed development, these areas can be avoided by construction. Structures should not block drainages. Leach fields should not be located in these areas due to the potential for periodic high groundwater conditions.

In summary, development of the site can be achieved if the items mentioned above are mitigated. These items can be mitigated through proper design and construction or through avoidance. Investigation on each lot is recommended prior to construction.

7.0 ON-SITE WASTEWATER TREATMENT

The site was evaluated for individual on-site wastewater treatment systems in accordance with El Paso Land Development Code. Two (2) test pits were performed on the property. Test pits were located in potential location of future a system on Lot 2. The approximate locations of the Test Pits are indicated on Figure 3, on the Geology/Engineering Geology Map, Figure 6, and on the Septic Suitability Map, Figure 9. A table showing the results of the test pits is presented in Table 2. The specific percolation test results are presented in Appendix E of this report.

The Natural Resource Conservation Service (Reference 2), previously the Soil Conservation Service (Reference 3) has been mapped with one soil description. The Soil Survey Map (Reference 2) is presented in Figure 4, and the Soil Survey Description is presented in Appendix D. The soils are described as having moderate to moderately rapid percolation rates.

Soils encountered in the test pits consisted of gravelly sandy loam overlying silty sandstone. The limiting layers encountered in the test pits is the silty sandstone, which corresponds to an LTAR values of 0.30 gallons per day per square foot. The bedrock was encountered at approximately 1 foot in both of the test pits. These conditions will require a designed system.

In summary, it is our opinion the site is suitable for individual on-site wastewater treatment systems (OWTS) and that contamination of surface and subsurface water resources should not occur provided the OWTS site is evaluated and installed according to El Paso County and State Guidelines and properly maintained. Based on the testing performed as part of this investigation a designed system will be required. A Septic Suitability Map is presented in Figure 9. Additional testing may be required if the new field is not located in the tested area. Absorption fields must be located a minimum of 100 feet from any well, including those on adjacent properties. Absorption fields must also be located a minimum of 50 feet from any drainages, floodplains or ponded areas and 25 feet from dry gulches.

8.0 ECONOMIC MINERAL RESOURCES

Some of the sandy materials on-site could be considered a low-grade sand resource. According to the *El Paso County Aggregate Resource Evaluation Map* (Reference 8), the area is not mapped with any aggregate deposits. According to the *Atlas of Sand, Gravel and Quarry Aggregate Resources, Colorado Front Range Counties* distributed by the Colorado Geological Survey (Reference 9), areas of the site are not mapped with any resources. According to the *Evaluation of Mineral and Mineral Fuel Potential* (Reference 10), the area of the site has been mapped as “Fair” for industrial minerals. However, considering the silty to clayey nature of much of these materials and abundance of similar materials through the region and the close proximity to developed land, they would be considered to have little significance as an economic resource.

According to the *Evaluation of Mineral and Mineral Fuel Potential of El Paso County State Mineral Lands* (Reference 10), the site is mapped within the Denver Basin Coal Region. However, the area of the site has been mapped as “Poor” for coal resources. No active or inactive mines have been mapped in the area of the site. No metallic mineral resources have been mapped on the site (Reference 10).

The site has been mapped as “Fair” for oil and gas resources (Reference 10). No oil or gas fields have been discovered in the area of the site. The sedimentary rocks in the area may lack the geologic structure for trapping oil or gas; therefore, it may not be considered a significant resource. Hydraulic fracturing is a new method that is being used to extract oil and gas from rocks. It utilizes pressurized fluid to extract oil and gas from rocks that would not normally be productive. The area of the site has not been explored to determine if the rocks underlying the site would be commercially viable utilizing hydraulic fracturing. The practice of hydraulic fracturing has come under review due to concerns about environmental impacts, health and safety.

9.0 EROSION CONTROL

The soil types observed on the site are mildly to highly susceptible to wind erosion, and moderately to highly susceptible to water erosion. A minor wind erosion and dust problem may be created for a short time during and immediately after construction. Should the problem be considered severe enough during this time, watering of the cut areas or the use of chemical palliative may be required to control dust. However, once construction has been completed and vegetation re-established, the potential for wind erosion should be considerably reduced.

With regard to water erosion, loosely compacted soils will be the most susceptible to water erosion, residually weathered soils and weathered bedrock materials become increasingly less susceptible to water erosion. For the typical soils observed on site, allowable velocities or unvegetated and unlined earth channels would be on the order of 3 to 4 feet/second, depending upon the sediment load carried by the water. Permissible velocities may be increased through the use of vegetation to something on the order of 4 to 7 feet/second, depending upon the type of vegetation established. Should the anticipated velocities exceed these values, some form of channel lining material may be required to reduce erosion potential. These might consist of some of the synthetic channel lining materials on the market or conventional riprap. In cases where ditch-lining materials are still insufficient to control erosion, small check dams or sediment traps may be required. The check dams will serve to reduce flow velocities, as well as provide small traps for containing sediment. The determination of the amount, location and placement of ditch linings, check dams and of the special erosion control features should be performed by or in conjunction with the drainage engineer who is more familiar with the flow quantities and velocities.

Cut and fill slope areas will be subjected primarily to sheetwash and rill erosion. Unchecked rill erosion can eventually lead to concentrated flows of water and gully erosion. The best means to combat this type of erosion is, where possible, the adequate re-vegetation of cut and fill slopes. Cut and fill slopes having gradients more than three (3) horizontal to one (1) vertical become increasingly more difficult to revegetate successfully. Therefore, recommendations pertaining to the vegetation of the cut and fill slopes may require input from a qualified landscape architect and/or the Soil Conservation Service.

10.0 CLOSURE

It is our opinion that the existing geologic engineering and geologic conditions will impose some minor constraints on development and construction of the site. The majority of these conditions can be avoided by construction. Others can be mitigated through proper engineering design and construction practices. The proposed development and use is consistent with anticipated geologic and engineering geologic conditions.

It should be pointed out that because of the nature of data obtained by random sampling of such variable and non-homogeneous materials as soil and rock, it is important that we be informed of any differences observed between surface and subsurface conditions encountered in construction and those assumed in the body of this report. Individual investigations for building sites and septic systems will be required prior to construction. Construction and design personnel should be made familiar with the contents of this report. Reporting such discrepancies to Entech Engineering, Inc. soon after they are discovered would be greatly appreciated and could possibly help avoid construction and development problems.

This report has been prepared for Jenna and Matthew Arvidson, for application to the proposed project in accordance with generally accepted geologic soil and engineering practices. No other warranty expressed or implied is made.

We trust that this report has provided you with all the information that you required. Should you require additional information, please do not hesitate to contact Entech Engineering, Inc.

BIBLIOGRAPHY

1. Bryant, Bruce; McGrew, Laura W, and Wabus, Reinhard A. 1981. *Geologic Structure Map of the Denver 1° x 2° Quadrangle, North-Central Colorado*. Sheet 2. U.S. Geologic Survey. Map I-1163.
2. Natural Resource Conservation Service, September 22, 2015. *Web Soil Survey*. United States Department Agriculture, <http://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm>.
3. United States Department of Agriculture Soil Conservation Service. June 1981. *Soil Survey of El Paso County Area, Colorado*.
4. Thorson, Jon P. and Madole, Richard F., 2003. *Geologic Map of the Monument Quadrangle, El Paso County, Colorado*. Colorado Geological Survey. Open-File Report 02-40.
5. Trimble, Donald E. and Machette, Michael N. 1979. *Geologic Map of the Colorado Springs-Castle Rock Area, Front Range Urban Corridor, Colorado*. USGS, Map I-857-F.
6. Bryant, Bruce; McGrew, Laura W. and Wobus, Reinhard A. 1981. *Geologic Map of the Denver 1° x 2° Quadrangle, North-Central Colorado*. U.S. Geologic Survey. Map 1-1163.
7. Federal Emergency Management Agency. March 17, 1997. *Flood Insurance Rate Maps for the City of Colorado Springs, Colorado*. Map Number 08041CO276F
8. El Paso County Planning Development. December 1995. *El Paso County Aggregate Resource Evaluation Maps*.
9. Schwochow, S.D.; Shroba, R.R. and Wicklein, P.C. 1974. *Atlas of Sand, Gravel, and Quarry Aggregate Resources, Colorado Front Range Counties*. Colorado Geological Survey. Special Publication 5-B.
10. Keller, John W.; TerBest, Harry and Garrison, Rachel E. 2003. *Evaluation of Mineral and Mineral Fuel Potential of El Paso County State Mineral Lands Administered by the Colorado State Land Board*. Colorado Geological Survey. Open-File Report 03-07.

TABLES

TABLE 1
SUMMARY OF LABORATORY TEST RESULTS

CLIENT JENNA & MATTHEW ARVIDSON
 PROJECT 2310 WAKANDA WAY
 JOB NO. 171248

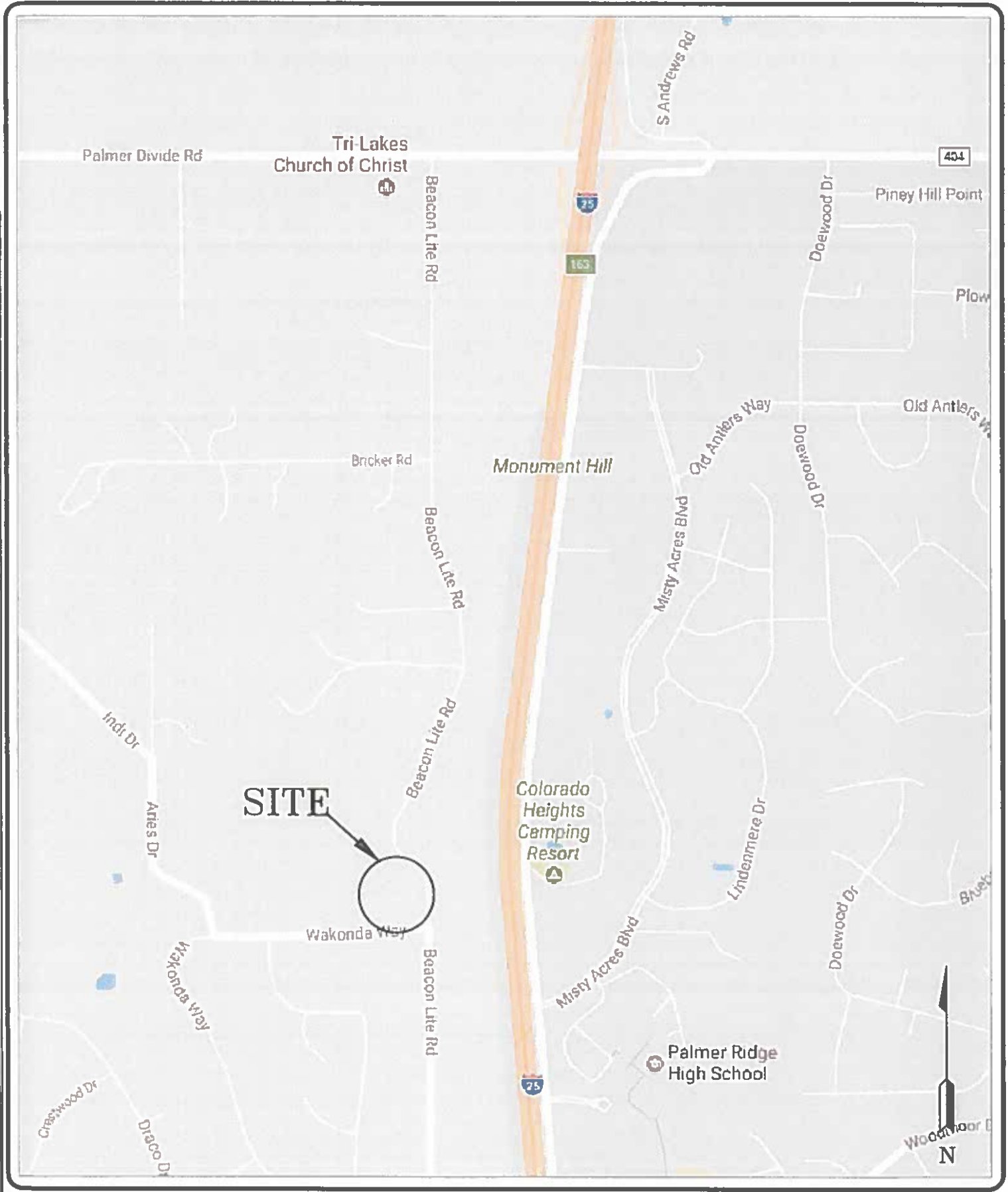
SOIL TYPE	TEST PIT NO.	DEPTH (FT)	WATER (%)	DRY DENSITY (PCF)	PASSING NO. 200 SIEVE (%)	LIQUID LIMIT (%)	PLASTIC INDEX (%)	SULFATE (WT %)	FHA SWELL (PSF)	SWELL/CONSOL (%)	UNIFIED CLASSIFICATION	SOIL DESCRIPTION
1	1	1-4			17.7						SM	SANDSTONE, SILTY
1	2	1-5			15.0						SM	SANDSTONE, SILTY

Table 2: Summary of Tactile Test Pit Results

Percolation Test No.	USDA Soil Classification	LTAR Value	Depth to Bedrock (ft.)	Depth to Groundwater (ft.)
1	3A*	0.30*	1	N/A
2	3A*	0.30*	1	N/A

*- Conditions that will require an engineered OWTS

FIGURES

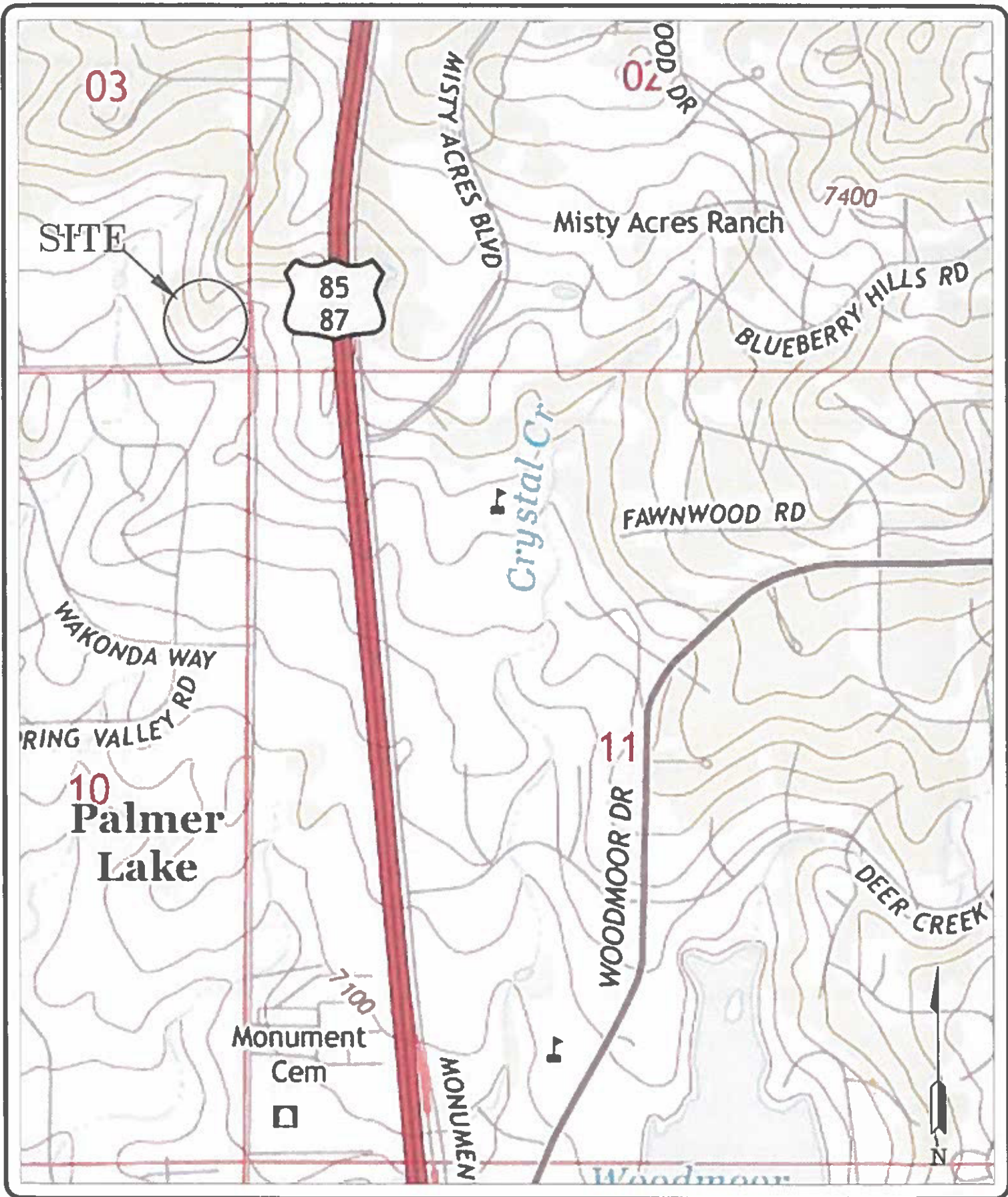


ENTECH
ENGINEERING, INC.
 1905 ELKTON DRIVE
 COLORADO SPRINGS, CO 80907 (719) 531-3399

VICINITY MAP
 ARVIDSON SUBDIVISION
 2310 WAKONDA WAY
 MONUMENT, CO.
 FOR: JENNA AND MATTHEW ARVIDSON

DRAWN: LLL	DATE: 9/12/17	CHECKED:	DATE:
---------------	------------------	----------	-------

JOB NO.:
 171248
 FIG NO.:
 1



ENTECH
ENGINEERING, INC.
 505 ELKTON DRIVE
 COLORADO SPRINGS, CO. 80907 (719) 531-5599

USGS MAP
 ARVIDSON SUBDIVISION
 2310 WAKONDA WAY
 MONUMENT, CO.

FOR: JENNA AND MATTHEW ARVIDSON

DRAWN:
 LLL

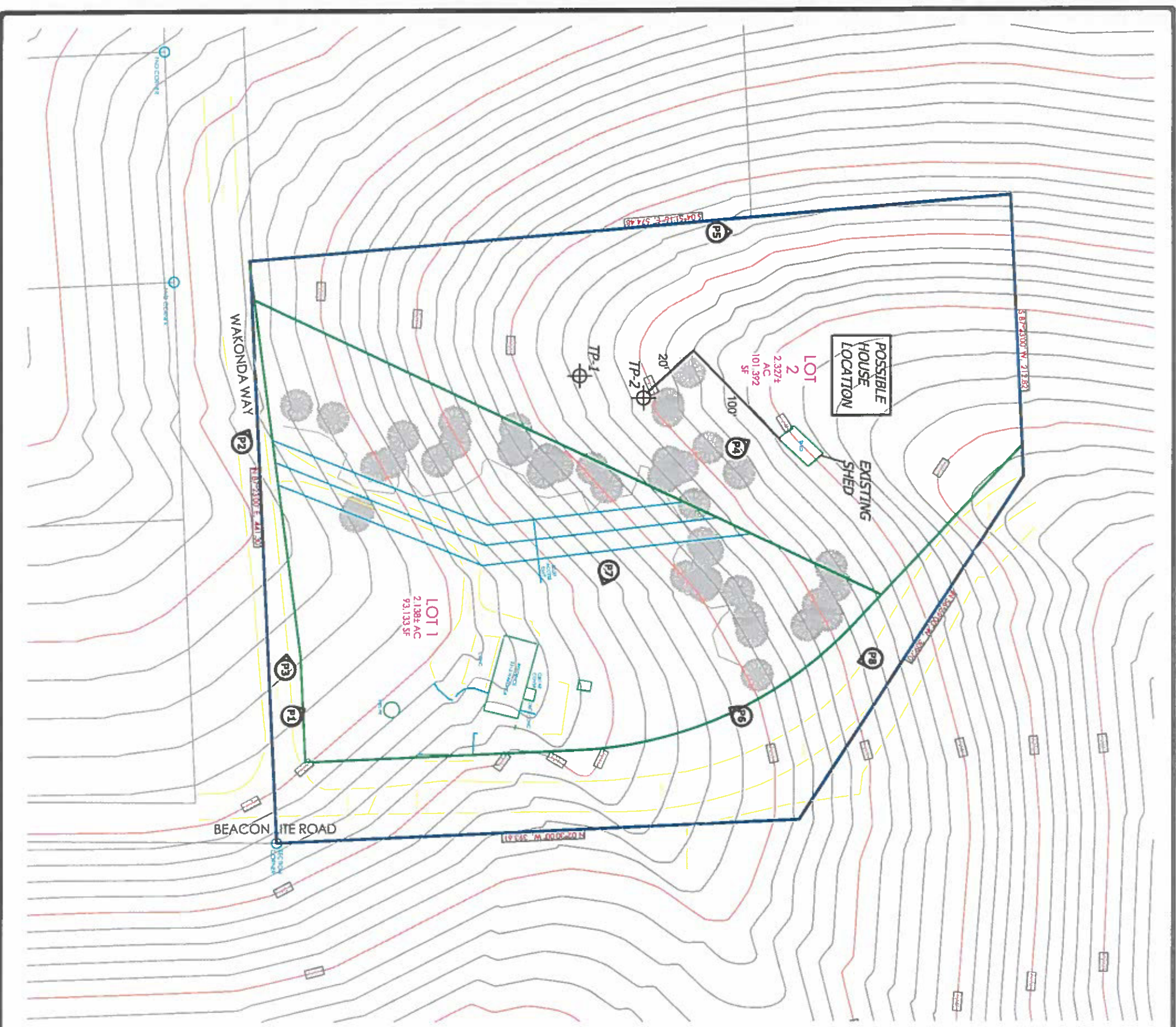
DATE:
 9/12/17

CHECKED:

DATE:

JOB NO.:
 171248

FIG NO.:
 2



- LEGEND:**
- ⊕ TP - APPROXIMATE TEST PIT LOCATION AND NUMBER
 - TP-1 (18' W X 48' S OF TP-2)
 - TP-2 (100' SW X 20' SE OF THE S CORNER OF THE EXISTING SHED)
 - Ⓟ - APPROXIMATE TEST PIT LOCATION AND NUMBER



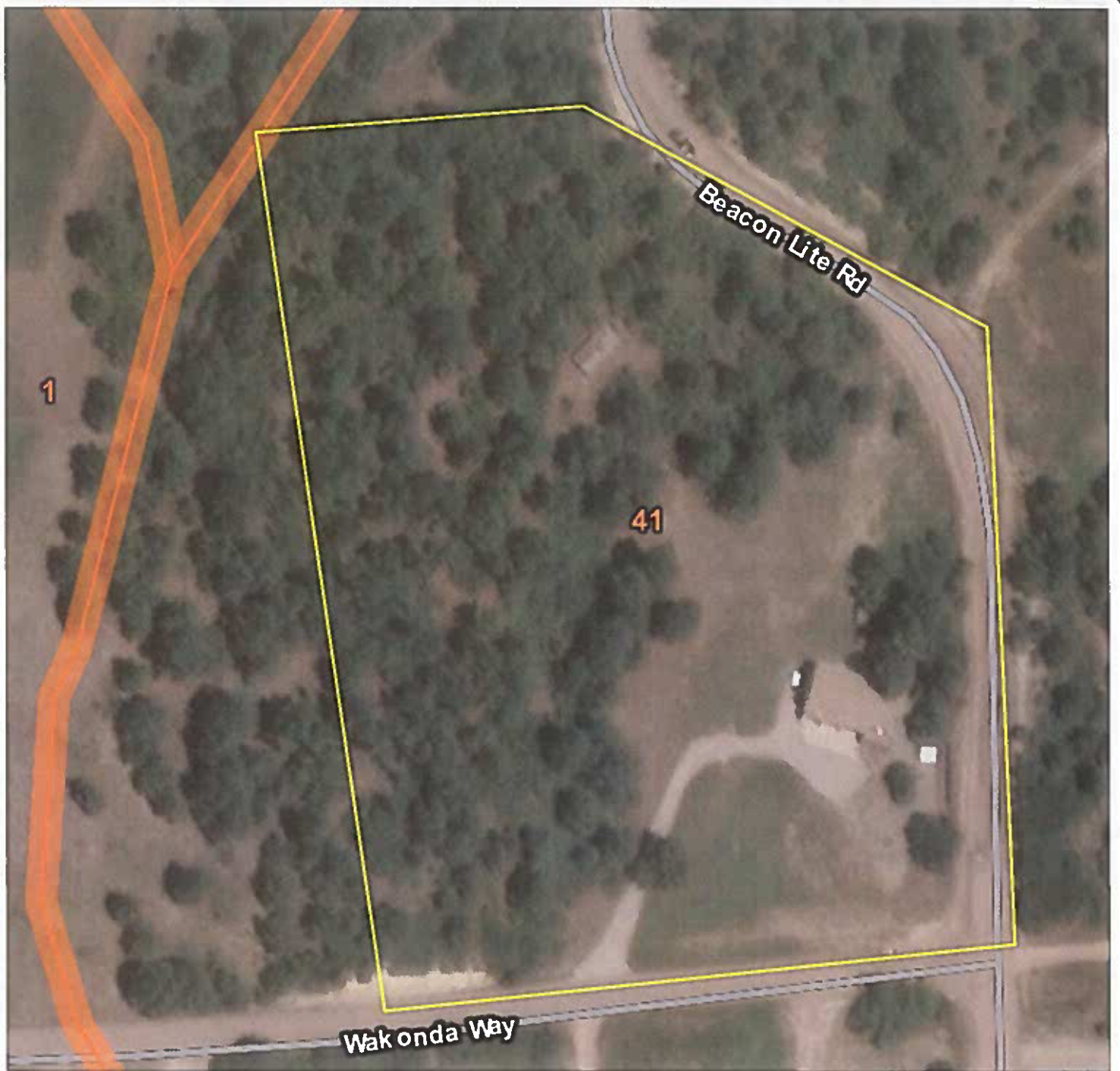
DATE	9/15/17
CHECKED	AS
BY	AS
SCALE	1" = 20'
FIGURE NO.	3

SITE PLAN/TEST PIT LOCATION MAP
ARVIDSON SUBDIVISION
2310 WAKONADA WAY
MONUMENT, CO.
FOR: JENNA AND MATTHEW ARVIDSON



ENTECH
ENGINEERING, INC.
505 ELKTON DRIVE
 COLORADO SPRINGS, CO. 80907 (719) 531-5599

REVISION BY	

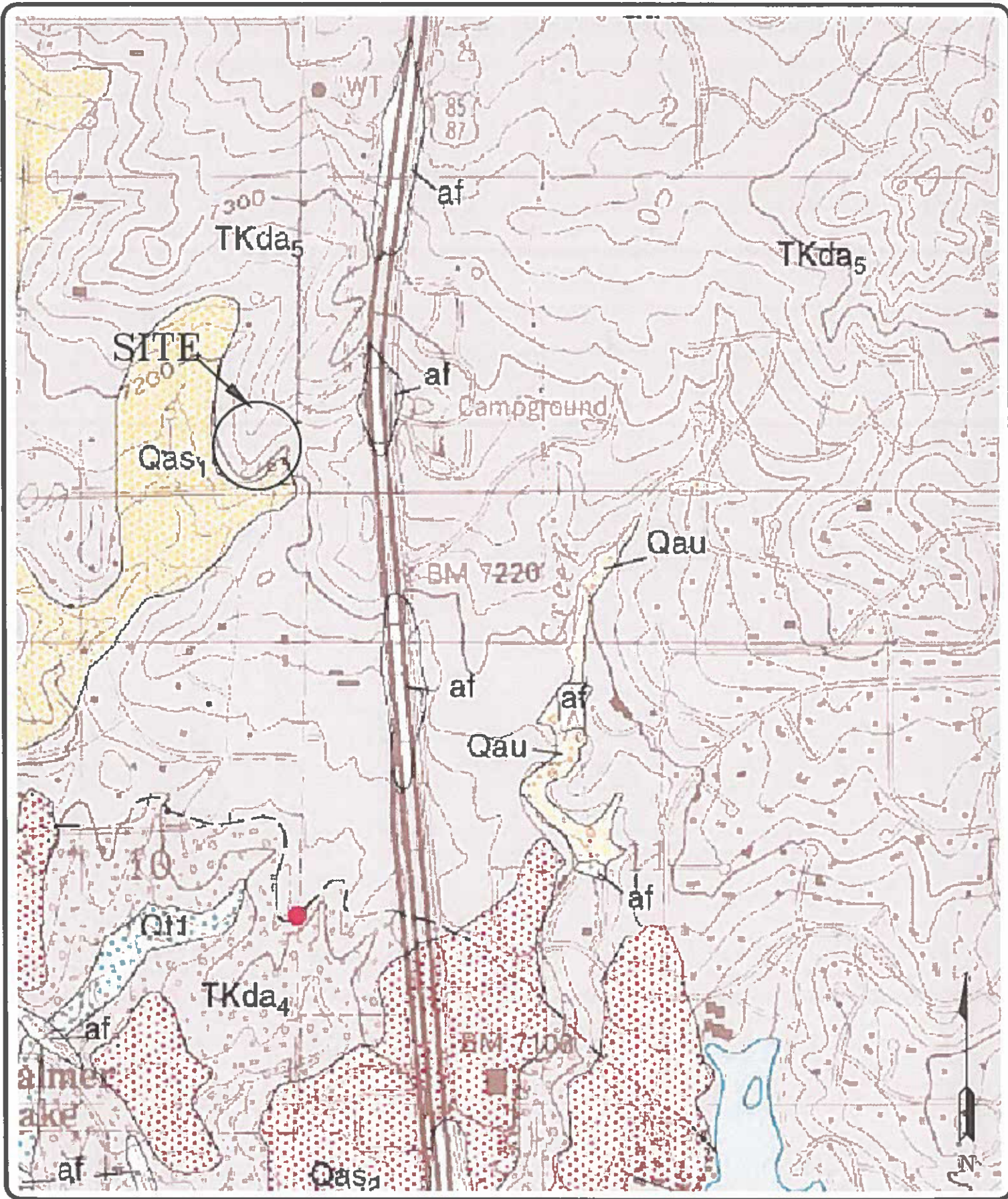



ENTECH
ENGINEERING, INC.
505 ELKTON DRIVE
 COLORADO SPRINGS, CO. 80907 (719) 531-9399

SCS MAP
 ARVIDSON SUBDIVISION
 2310 WAKONDA WAY
 MONUMENT, CO.
 FOR: JENNA AND MATTHEW ARVIDSON

DRAWN: LLL	DATE: 9/12/17	CHECKED:	DATE:
---------------	------------------	----------	-------

JOB NO.:
171248
 FIG NO.:
 4

ENTECH
ENGINEERING, INC.
325 ELKTON DRIVE
COLORADO SPRINGS, CO. 80907 (719) 531-3399

MONUMENT QUADRANGLE GEOLOGIC MAP
ARVIDSON SUBDIVISION
2310 WAKONDA WAY
MONUMENT, CO.
FOR: JENNA AND MATTHEW ARVIDSON

DRAWN: LLL	DATE: 9/12/17	CHECKED:	DATE:
---------------	------------------	----------	-------

JOB NO.:
171248

FIG NO.:
5



- LEGEND:**
- Qal - Alluvium of Holocene Age: water deposited materials associated with small drainages on the property
 - Qaf - Artificial Fill of Holocene Age: man-made fill deposit associated with erosion berm
 - Qas₁ - Younger Piedmont-Slope Alluvium of Holocene and Late Pleistocene Age: sheetwash and stream deposited alluvium associated with Monument Creek and its tributaries
 - TKda - Dawson Formation of Tertiary to Cretaceous Age: arkosic sandstone with interbedded fine-grained sandstone, siltstone and claystone
 - pu - potentially unstable slopes
 - psw - potentially seasonal shallow groundwater area
 - ⊕ - test pit location and number
 - tp-1 (18' w x 48' s of tp-2)
 - tp-2 (100' sw x 20' se of the s corner of the existing shed)



DATE	9/14/17
BY	AS
CHECKED	AS
SCALE	AS SHOWN
JOB NO.	171248
FRAME NO.	6

GEOLOGY/ENGINEERING GEOLOGY MAP
ARVIDSON SUBDIVISION
 2310 WAKONADA WAY
 MONUMENT, CO.
 FOR: JENNA AND MATTHEW ARVIDSON

ENTECH
ENGINEERING, INC.

505 ELKTON DRIVE
 COLORADO SPRINGS, CO. 80907 (719) 531-5599

REVISION BY	

LEGEND

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood) also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AV, V, and VE. The Mean Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A No Base Flood Elevation determined.

ZONE AE Base Flood Elevations determined.

ZONE AH Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.

ZONE AO Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.

ZONE AV Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AV indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.

ZONE AV9 Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.

ZONE V Coastal flood zone with velocity hazard (wave action); no Base Flood Elevation determined.

ZONE VE Coastal flood zone with velocity hazard (wave action); Base Flood Elevation determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream, plus any adjacent floodplain area that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X Areas determined to be outside the 0.2% annual chance floodplain.

ZONE D Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas

1% annual chance floodplain boundary

0.2% annual chance floodplain boundary

Floodway boundary

Zone D boundary

CBRS and OPA boundary

Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.

River Flood Elevation line and value; elevation in feet

Base Flood Elevation value where uniform within area; elevation in feet

Reference to the National Geodetic Vertical Datum of 1929

From section Baa

Traced line

Geographic coordinates referenced to the North American Datum of 1983 (NAD 83); Western Hemisphere

1000-meter Universal Transverse Mercator grid tick value, zone 4

5000-foot grid tick value; 11-foot State Plane coordinate system, zone 3 (FIPS ZONE 5103); Transverse Mercator projection

Benchmark (see explanation in Notes to Users section of this FIRM panel)

Coastal MILE marker

MAP REPOSITORY

Refer to listing of Map Repositories on Map slides

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP

November 20, 2000

EFFECTIVE DATES OF REVISIONS TO THIS PANEL

September 30, 2004 - to change Special Flood Hazard Areas, to update map format, to reflect revised shoreline and to incorporate previously issued Letters of Map Revision.

UNINCORP

NOTE: MAP AREA SHO TOWNSHIP 11 SOUTH, 1

3

ZONE X

SITE

SPRING

VALLEY

ROAD

ROAD

OLD

ANTLERS

WAY

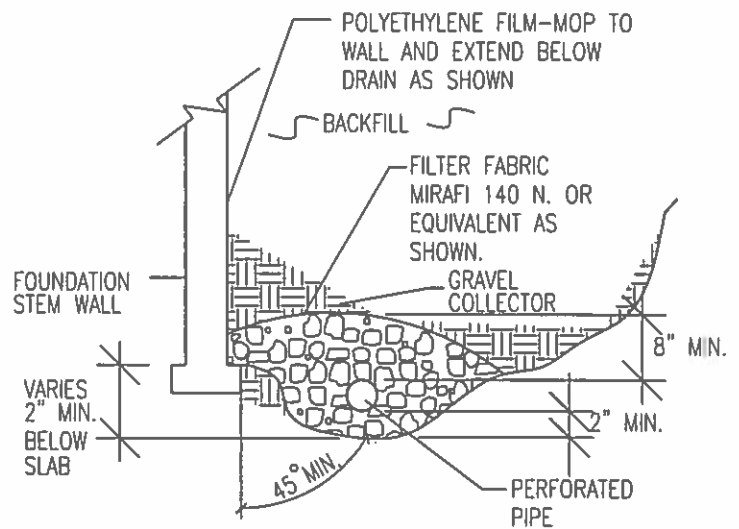
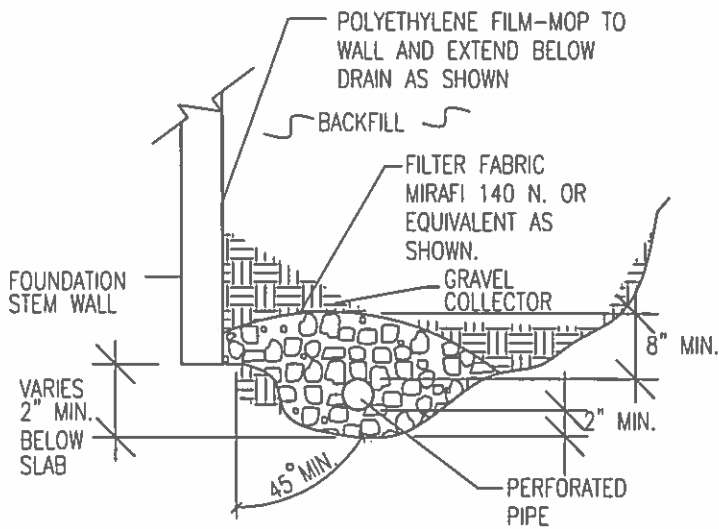


REVISION	BY

ENTECH ENGINEERING, INC.
 505 ELKTON DRIVE
 COLORADO SPRINGS, CO. 80907 (719) 531-5599

FLOODPLAIN MAP
ARVIDSON SUBDIVISION
 2310 WAKONDA WAY
 MONUMENT, CO.
FOR: JENNA AND MATTHEW ARVIDSON

DATE	BY	REVISION
9/12/17 <td>SCOTT AS SHOWN <td>7</td> </td>	SCOTT AS SHOWN <td>7</td>	7
171248 <td>TRULING, INC. <td> </td> </td>	TRULING, INC. <td> </td>	



NOTES:

-GRAVEL SIZE IS RELATED TO DIAMETER OF PIPE PERFORATIONS-85% GRAVEL GREATER THAN 2x PERFORATION DIAMETER.

-PIPE DIAMETER DEPENDS UPON EXPECTED SEEPAGE. 4-INCH DIAMETER IS MOST OFTEN USED.

-ALL PIPE SHALL BE PERFORATED PLASTIC. THE DISCHARGE PORTION OF THE PIPE SHOULD BE NON-PERFORATED PIPE.

-FLEXIBLE PIPE MAY BE USED UP TO 8 FEET IN DEPTH, IF SUCH PIPE IS DESIGNED TO WITHSTAND THE PRESSURES. RIGID PLASTIC PIPE WOULD OTHERWISE BE REQUIRED.

-MINIMUM GRADE FOR DRAIN PIPE TO BE 1% OR 3 INCHES OF FALL IN 25 FEET.

-DRAIN TO BE PROVIDED WITH A FREE GRAVITY OUTFALL, IF POSSIBLE. A SUMP AND PUMP MAY BE USED IF GRAVITY OUT FALL IS NOT AVAILABLE.



ENTECH
ENGINEERING, INC.
505 ELIXON DRIVE
COLORADO SPRINGS, CO. 80907 (719) 531-5399

PERIMETER DRAIN DETAIL

DRAWN:

DATE DRAWN:

DESIGNED BY:

CHECKED:

DS

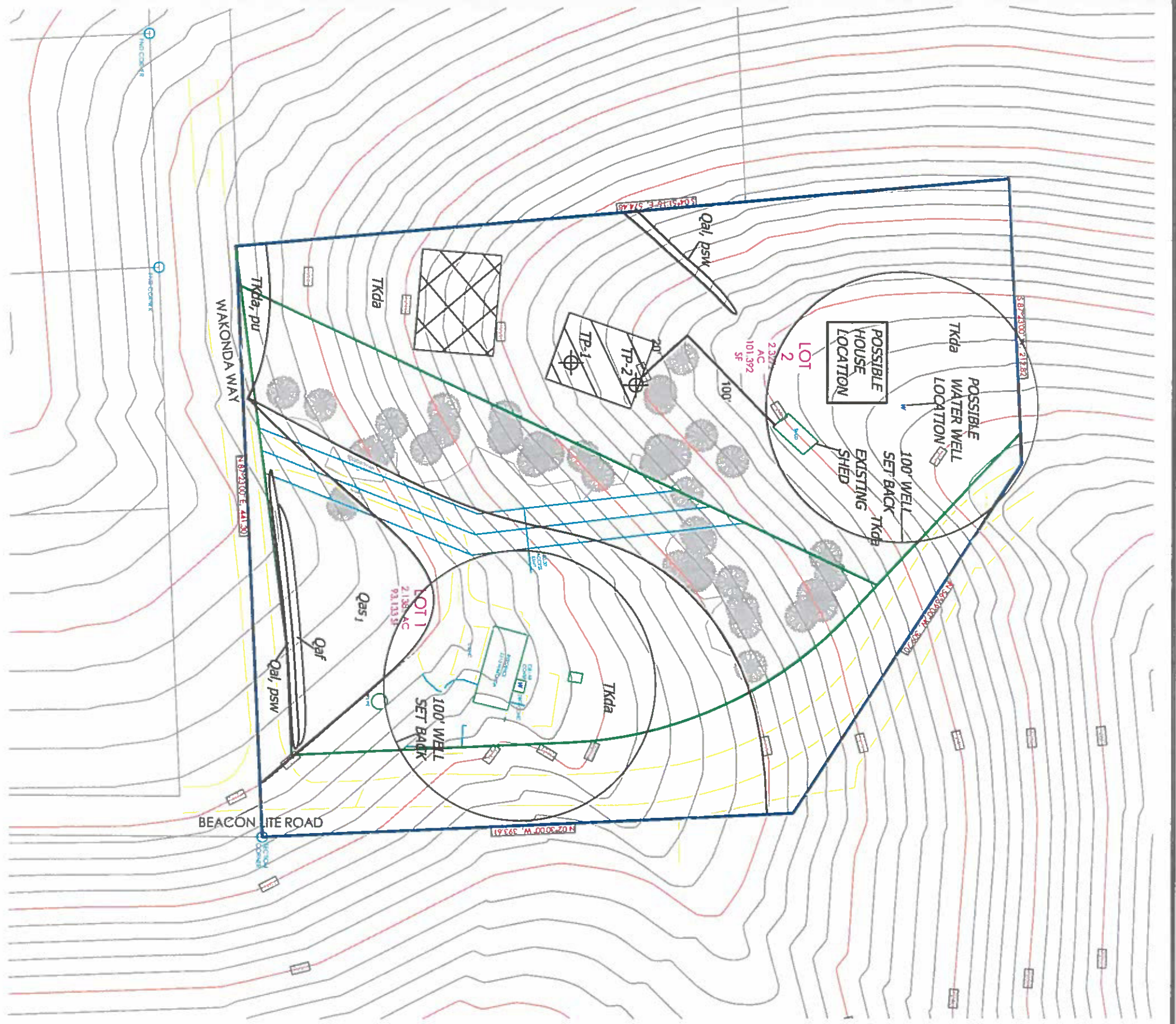
LLL

JOB NO.:

171248

FIG. NO.:

8



LEGEND:

 - POTENTIAL OWTs LOCATION

 - POTENTIAL ALTERNATE OWTs LOCATION

*WATER WELLS MUST BE A MINIMUM OF 100 FT FROM OWTs ABSORPTION FIELDS

-  -TP-1 (18' W X 48' S OF TP-2)
-  -TP-2 (100' SW X 20' SE OF THE S CORNER OF THE EXISTING SHED)



DATE	9/14/17
CHECKED	AS SHOWN
SCALE	1" = 20'
JOB NO.	171240
TRACER NO.	
9	

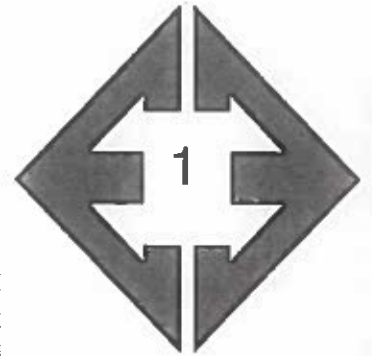
OWTS SUITABILITY MAP
ARVIDSON SUBDIVISION
 2310 WAKONADA WAY
 MONUMENT, CO.
 FOR: JENNA AND MATTHEW ARVIDSON



ENTECH
ENGINEERING, INC.
505 ELKTON DRIVE
 COLORADO SPRINGS, CO. 80907 (719) 531-5599

REVISION BY	

APPENDIX A: Site Photographs



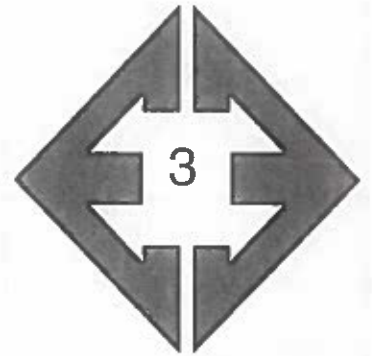
**Looking northwest
from the southeast
corner of the site.**

August 16, 2017



**Looking northwest at
road cut along
Wakonda Way.**

August 16, 2017



Looking west from the southeast portion of the sitep.

August 16, 2017



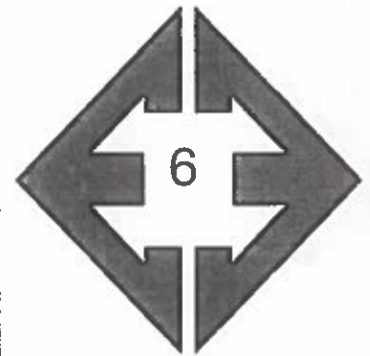
Looking north towards old shed that is located on Lot 2.

August 16, 2017



**Looking north along
the western property
boundary of the site.**

August 16, 2017



**Looking south from
the northern portion of
the site.**

August 16, 2017



**Looking northeast
from the central
portion of the site.**

August 16, 2017



**Looking east along
Beacon Lite Road on
the northern side of
the site.**

August 16, 2017

APPENDIX B: Test Pit Logs

TEST PIT NO. 1
 DATE EXCAVATED 8/17/2017
 Job # 171172

TEST PIT NO. 2
 DATE EXCAVATED 8/17/2017
 CLIENT JENNA AND MATTHEW ARVIDSON
 LOCATION 2310 WAKONAD WAY

REMARKS	Depth (ft)	Symbol	Samples	Soil Structure Shape	Soil Structure Grade	USDA Soil Type	REMARKS	Depth (ft)	Symbol	Samples	Soil Structure Shape	Soil Structure Grade	USDA Soil Type
topsoil, gravelly sandy loam, fine to coarse grained, brown	1	⌘					topsoil, gravelly sandy loam, fine to coarse grained, brown	1	⌘				
silty sandstone, fine to coarse grained, tan, moist	2	⌘		ma		3A	silty sandstone, fine to coarse grained, tan, moist	2	⌘		ma		3A
	3	⌘						3	⌘				
	4	⌘						4	⌘				
	5	⌘						5	⌘				
	6	⌘						6	⌘				
	7	⌘						7	⌘				
	8	⌘						8	⌘				
	9	⌘						9	⌘				
	10	⌘						10	⌘				

Soil Structure Shape

- granular - gr
- platy - pl
- blocky - bl
- prismatic - pr
- single grain - sg
- massive - ma

Soil Structure Grade

- weak - w
- moderate - m
- strong - s
- loose - l



ENTECH
ENGINEERING, INC.

505 ELKTON DRIVE
 COLORADO SPRINGS, COLORADO 80907

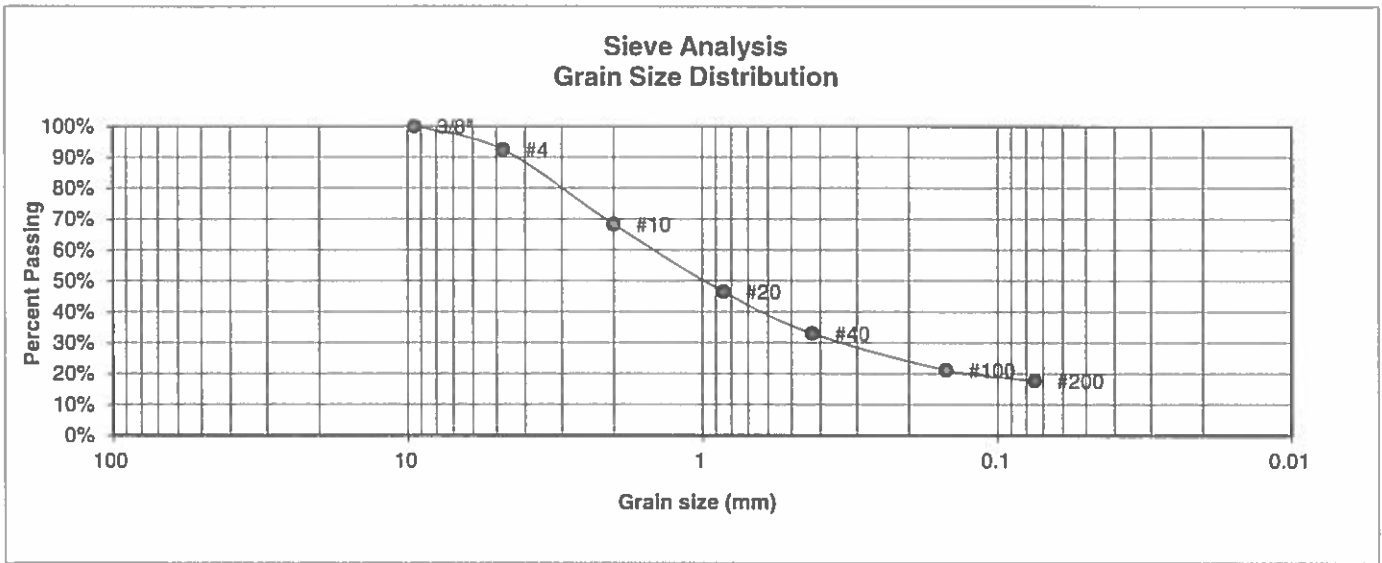
TEST PIT LOG

DRAWN:	DATE:	CHECKED:	DATE:
		LLL	9/12/17

JOB NO.:
 171248
 FIG NO.:
 B-1

APPENDIX C: Laboratory Test Results

BORING NO.	TP-1	<u>UNIFIED CLASSIFICATION</u>	SM	<u>TEST BY</u>	BL
DEPTH(ft)	1-4	<u>AASHTO CLASSIFICATION</u>		<u>JOB NO.</u>	171248
CLIENT	JENNA & MATTHEW ARVIDSON				
PROJECT	2310 WAKANDA WAY				



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	92.4%
10	68.3%
20	46.5%
40	33.0%
100	21.2%
200	17.7%

Atterberg Limits
 Plastic Limit
 Liquid Limit
 Plastic Index

Swell
 Moisture at start
 Moisture at finish
 Moisture increase
 Initial dry density (pcf)
 Swell (psf)



ENTECH ENGINEERING, INC.
 505 ELKTON DRIVE
 COLORADO SPRINGS, COLORADO 80907

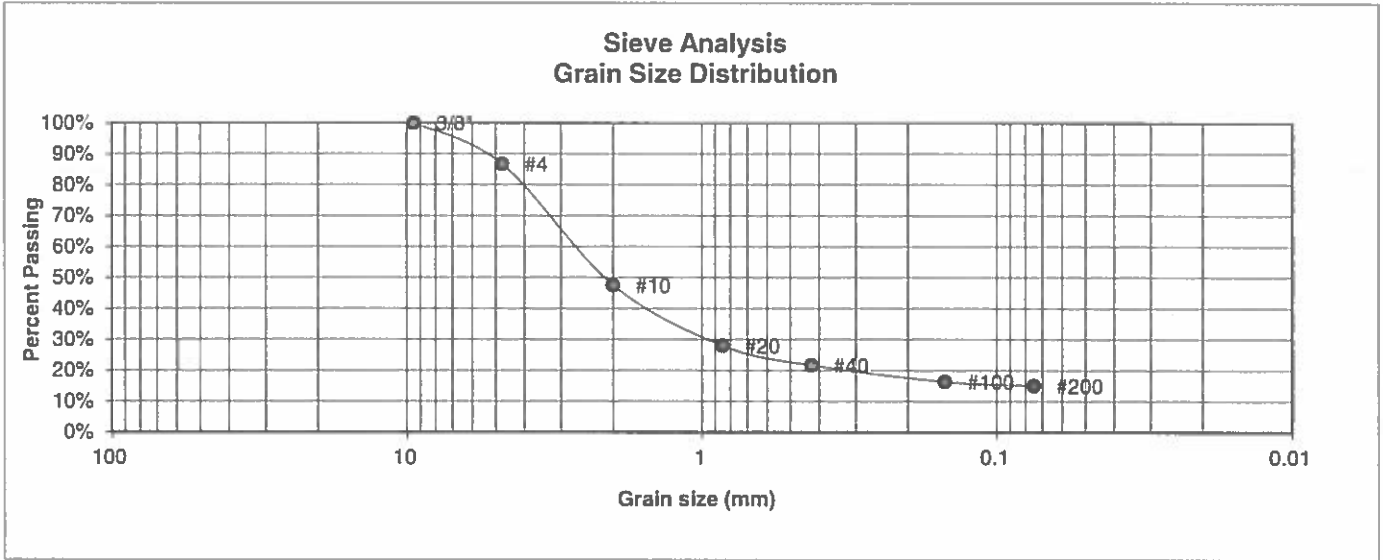
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED: LLL	DATE: 9/11/17
--------	-------	-----------------	------------------

JOB NO.:
171248

FIG NO.:
C-1

BORING NO.	TP-2	UNIFIED CLASSIFICATION	SM	TEST BY	BL
DEPTH(ft)	1-5	AASHTO CLASSIFICATION		JOB NO.	171248
CLIENT	JENNA & MATTHEW ARVIDSON				
PROJECT	2310 WAKANDA WAY				



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	86.7%
10	47.5%
20	28.0%
40	21.7%
100	16.4%
200	15.0%

Atterberg Limits
 Plastic Limit
 Liquid Limit
 Plastic Index

Swell
 Moisture at start
 Moisture at finish
 Moisture increase
 Initial dry density (pcf)
 Swell (psf)



ENTECH ENGINEERING, INC.
 505 ELKTON DRIVE
 COLORADO SPRINGS, COLORADO 80907

LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		LLL	9/11/17

JOB NO.
171248

FIG NO.
C-2

APPENDIX D: Soil Survey Descriptions

El Paso County Area, Colorado

41—Kettle gravelly loamy sand, 8 to 40 percent slopes

Map Unit Setting

National map unit symbol: 368h

Elevation: 7,000 to 7,700 feet

Farmland classification: Not prime farmland

Map Unit Composition

Kettle and similar soils: 85 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Kettle

Setting

Landform: Hills

Landform position (three-dimensional): Side slope

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Sandy alluvium derived from arkose

Typical profile

E - 0 to 16 inches: gravelly loamy sand

Bt - 16 to 40 inches: gravelly sandy loam

C - 40 to 60 inches: extremely gravelly loamy sand

Properties and qualities

Slope: 8 to 40 percent

Depth to restrictive feature: More than 80 inches

Natural drainage class: Somewhat excessively drained

Runoff class: Medium

Capacity of the most limiting layer to transmit water (Ksat): High
(2.00 to 6.00 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water storage in profile: Low (about 3.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7e

Hydrologic Soil Group: B

Hydric soil rating: No

Minor Components

Other soils

Percent of map unit:

Hydric soil rating: No

Pleasant

Percent of map unit:

Landform: Depressions

Hydric soil rating: Yes

Data Source Information

Soil Survey Area: El Paso County Area, Colorado

Survey Area Data: Version 14, Sep 23, 2016

**APPENDIX E: El Paso County Health Department
Septic Records**

ON#

7103001034

EL PASO COUNTY HEALTH DEPARTMENT
COLORADO SPRINGS, COLORADO

SEWAGE DISPOSAL INSPECTION FORM

Replacement of ~~an~~
existing failed
system

163.7

DATE 6/30/82 P

APPROVAL:
YES NO

ENVIRONMENTALIST Robin Strout

LOCATION (street number) 2310 Wakonda Way OCCUPANT Virginia Taber

LEGAL DESCRIPTION See attached

TYPE OF CONSTRUCTION Single Family NO. OF BEDROOMS 3

SYSTEM INSTALLED BY Russ Palmer

COMMERCIAL MFG. Yes SIZE 1250 gal

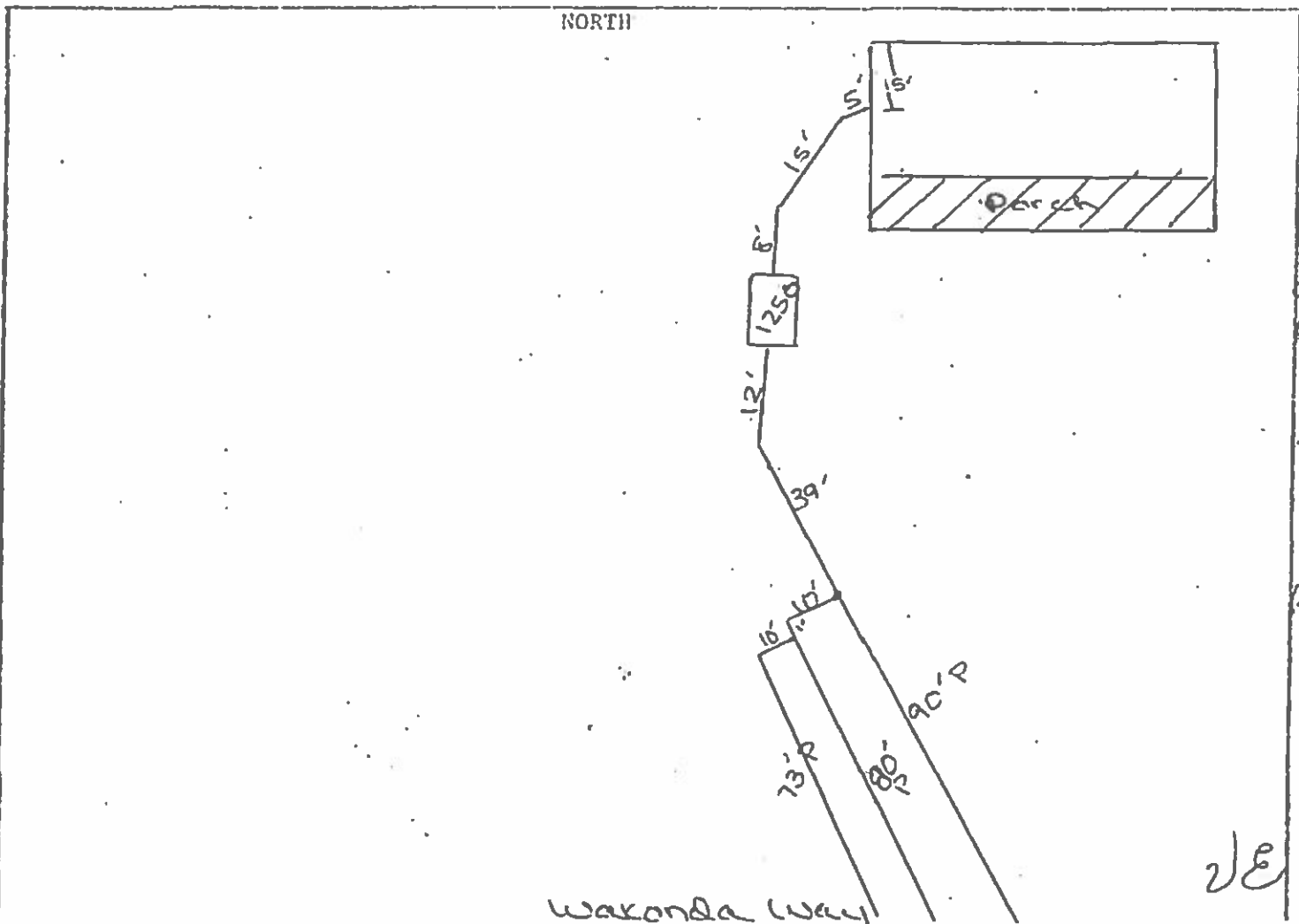
TYPE OF MATERIAL pre-cast concrete NO. COMPARTMENTS 2

WIDTH LENGTH DEPTH (total) LIQ. CAP. 1250 gal

DISPOSAL FIELD: BED OR TRENCH DEPTH 36" WIDTH 36" LENGTH 242' SQ. FT. 726

DISTANCE BETWEEN LINES 10' ROCK river DEPTH 12" UNDER 6" OVER 2"

LEACHING PITS (NO.) LINING MATERIAL CAPACITY SQ. FT.



1637

EL PASO COUNTY • COUNTY HEALTH DEPARTMENT
501 North Foote Avenue • Colorado Springs, Colorado • 475-8240

Receipt No. 4438

PERMIT

Water Supply Well

TO CONSTRUCT, ALTER, REPAIR OR MODIFY AN INDIVIDUAL SEWAGE DISPOSAL SYSTEM

Issued To Virginia C. Taber Date 6/23/82

Address of Property 2310 Wakonda Way, Monument, CO.

(Permit valid at this address only)

Note: Need additional two (2) compartment septic tank for total capacity of 1250 gallons. Watch minimum distances

Sewage-Disposal System work to be performed by Ray's Diggins Phone _____

This Permit is issued in accordance with 25-10-106 Colorado Revised Statutes 1973, as amended. PERMIT EXPIRES upon completion-installation of sewage-disposal system or at the end of six (6) months from date of issue - whichever occurs first - (unless work is in progress).

This Permit does not denote approval of zoning and acreage requirements.

\$ 130.00
~~450.00~~

Dr. John B. Muth, M.D.
Director, City-County Health Department

[Signature]

Permit Fee December 23, 1982

Date of Expiration

Environmentalist

NOTE: LEAVE ENTIRE SEWAGE-DISPOSAL SYSTEM UNCOVERED FOR FINAL INSPECTION. 728 Sq. Ft.

24-HOUR ADVANCE NOTICE REQUIRED

Septic tank	NA	gals.	Field	<u>242</u>	Feet of trench	<u>36</u>	inches wide
Seepage bed			OR. Field	<u>362</u>	Feet of trench	<u>24</u>	inches wide
			ft. long		ft. wide.	sq. ft.	diam. w/d

The Health Officer shall assume no responsibility in case of failure or inadequacy of a sewage-disposal system, beyond consulting in good faith with the property owner or representative. Free access to the property shall be authorized at reasonable times for the purpose of making such inspections as are necessary to determine compliance with requirements of this law.

Date 6-2-82

Carrie - to lead use

EL PASO COUNTY HEALTH DEPARTMENT
501 NORTH FOOTE AVENUE
COLORADO SPRINGS, COLORADO
636-0125

Tax Schedule # 7103001034

Dick Varner

Application for permit to construct, Remodel, or Install a Sewage Disposal System.

Name of Owner VIRGINIA C. TABER Phone 594-6129

Address of Property 2310 WAKONDA WAY, MONUMENT, CO.

Legal Description of Property SEE ATTACHED SHEET.

Owner's Address (if different) 3275 TORO DR. COLORADO SPRINGS, CO. Phone 594-6129

Systems Contractor Rays Digging Address _____ source and type _____

Type of Construction Single Family of water supply WELL

Size of Lot 5.01 ACRES

The construction of the Sewage Disposal System will comply with all applicable Laws, Ordinances, Standards or Resolutions.

HEALTH DEPARTMENT USE ONLY

Permit Number _____ Receipt Number _____

Number of Bedrooms 3 Tank Capacity existing 750 gallons Absorption area 726 sq. Ft.

Remarks need add a comp septic tank for total capacity of 1250 gal
need 24 2 ft or 3' trench or water minimum
362 ft of 2' trench distances

APPLICATION IS APPROVED () DENIED

ENVIRONMENTALIST Robin Shout DATE _____ 19__

PLOT PLAN WILL INCLUDE THE FOLLOWING .

Plot plan may be drawn on the back of this sheet or on a separate sheet.

- | | |
|--|---------------------------------------|
| 1. Streams, Lakes, Ponds, Irrigation Ditches and other Water Courses | 6. Location of Proposed Septic System |
| 2. North Direction | 7. Location of percolation test |
| 3. Location of Property Line | 8. Geographical features |
| 4. Buildings | 9. Other Information as required |
| 5. Wells | |

RECEIVED
By _____
3 1982
El Paso County
Planning Department

Markup Summary

dsdruiz (2)



Subject: Cloud+
Page Label: 3
Lock: Locked
Author: dsdruiz

Should this be no build?



Subject: Cloud+
Page Label: 10
Lock: Locked
Author: dsdruiz

Should this be a no build?