



Please provide a permit number that is associated the the system at the property



① 01- Site Plan
1" = 80'-0"

JDM CONSULTING, LLC

P.O. Box 26137, Colorado Springs, CO 80936
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515 S Yoder Rd,
80864

OWTS Design

Site Map

Project number	23-180
Date	10/10/2023
Drawn by	D.MIZICKO
Checked by	J.DUMKE

C1 of 4

Scale 1" = 80'-0"

4" SCH 40 PVC PIPE FROM
SEPTIC TANK TO PUMP TANK

4" SCH 40 PVC PIPE SEWER LINE FROM
STRUCTURE, GRAVITY FLOW TO TANK
IF POSSIBLE. PROVIDE CLEANOUTS PER
COUNTY REGULATIONS (NO FURTHER
THAN 5' FROM STRUCTURE).

SEPTIC TANK
1000 GAL SEPTIC TANK
W/EFFLUENT FILTER

PUMP TANK - 500 GAL MINIMUM.
SJE RHOMBUS MODEL 112 CONTROL PANEL OR EQUAL.
ZOELLER MODEL 137 PUMP OR EQUAL
DESIGN FLOW RATE: **16.1 GPM**
TOTAL DYNAMIC HEAD: **17.4 FT.**
DOSE VOLUME: **50 GALLONS**

AUTOMATIC DISTRIBUTION VALVE
CLARUS MODEL 6404 (4 ZONE ONLY) OR EQUAL, MUST BE
LOCATED AT SYSTEM HIGH POINT TO ALLOW DRAINAGE AND
PREVENT FREEZING. INSIDE RISER TO GRADE W/ INSULATED LID.



1-1/2" SCHEDULE
40 PVC PIPE TO STA

AIR VAC/RELEASE VALVE
MUST BE LOCATED AT SYSTEM HIGH
POINT. MAY BE OMITTED IF A.D.V. IS
LOCATED AT THE SYSTEM HIGH POINT

PRESSURE DISTRIBUTION LINES
1-1/2" SCH 40 PVC PIPE. (1) 3/16 ORIFICE DRILLED @ 48"
O.C. ALONG ENTIRE LENGTH OF LATERAL. ROTATE ORIFICES
FROM THE 10-O'CLOCK, 2-O'CLOCK, AND 6-O'CLOCK
POSITIONS ALONG THE PIPE TO ALLOW EVEN DISTRIBUTION
AND PROPER DRAINAGE. PROVIDE AN ADDITIONAL ORIFICE
AT 6-O'CLOCK AT BEGINNING AND END OF EACH LATERAL
TO ASSIST IN DRAINAGE OF THE LATERAL.

SOIL TREATMENT AREA (BED #1)
4 LATERALS, 2 ZONES, 2 LATERALS PER ZONE,
28 ARC36 CHAMBERS (OR EQUAL) TOTAL PER
BED, 7 CHAMBERS PER LATERAL

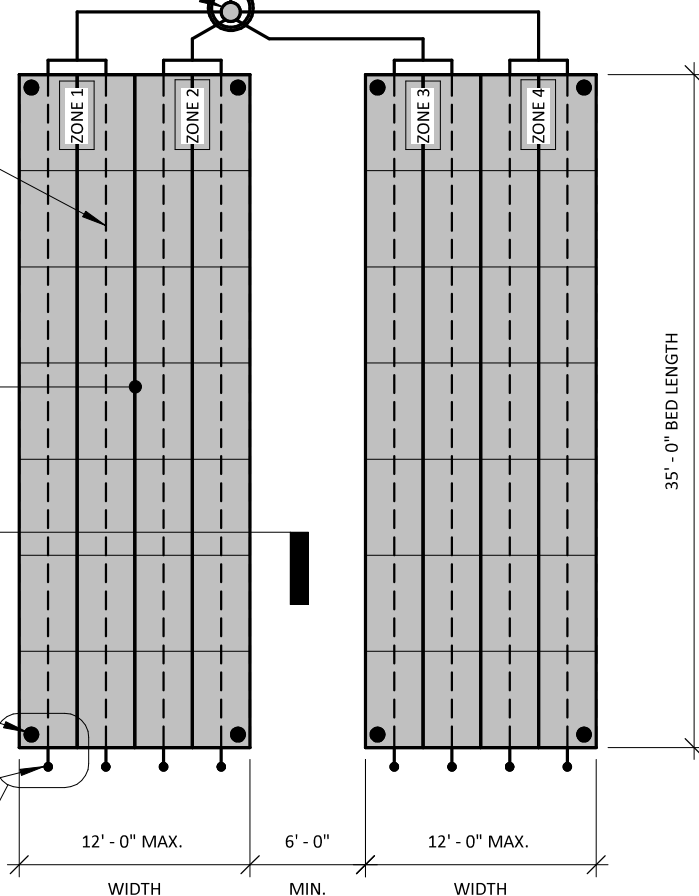
SOIL TREATMENT AREA (BED #2)
4 LATERALS, 2 ZONES, 2 LATERALS PER ZONE,
28 ARC36 CHAMBERS (OR EQUAL) TOTAL PER
BED, 7 CHAMBERS PER LATERAL

4" INSPECTION PORTS TO GRADE, LOCATE AT ALL
FOUR CORNERS OF EACH BED. INSPECTION PORTS
MUST EXTEND TO INFILTRATIVE SURFACE.

FLUSHING VALVE ASSEMBLY (TYP.
AT THE END OF EACH LATERAL)

2
C3 of 4

1
C4 of 4



① STA - 4 Row, Pressure Dosed, 2-Beds
1" = 10'-0"

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OWTS Design

System Layout

Project number 23-180

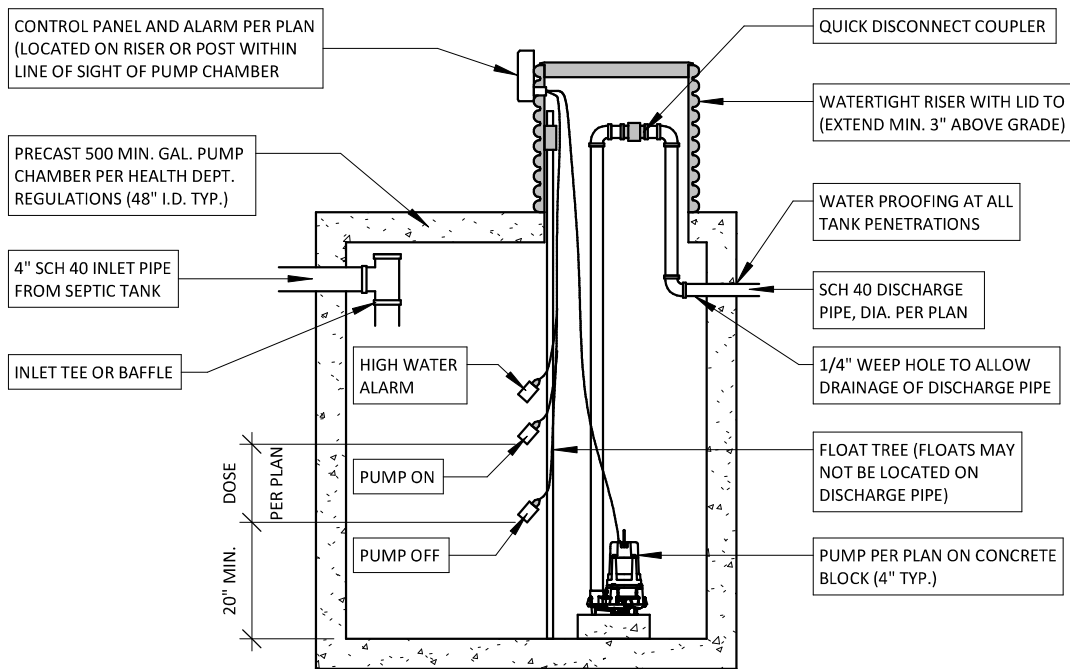
Date 10/10/2023

Drawn by D.MIZICKO

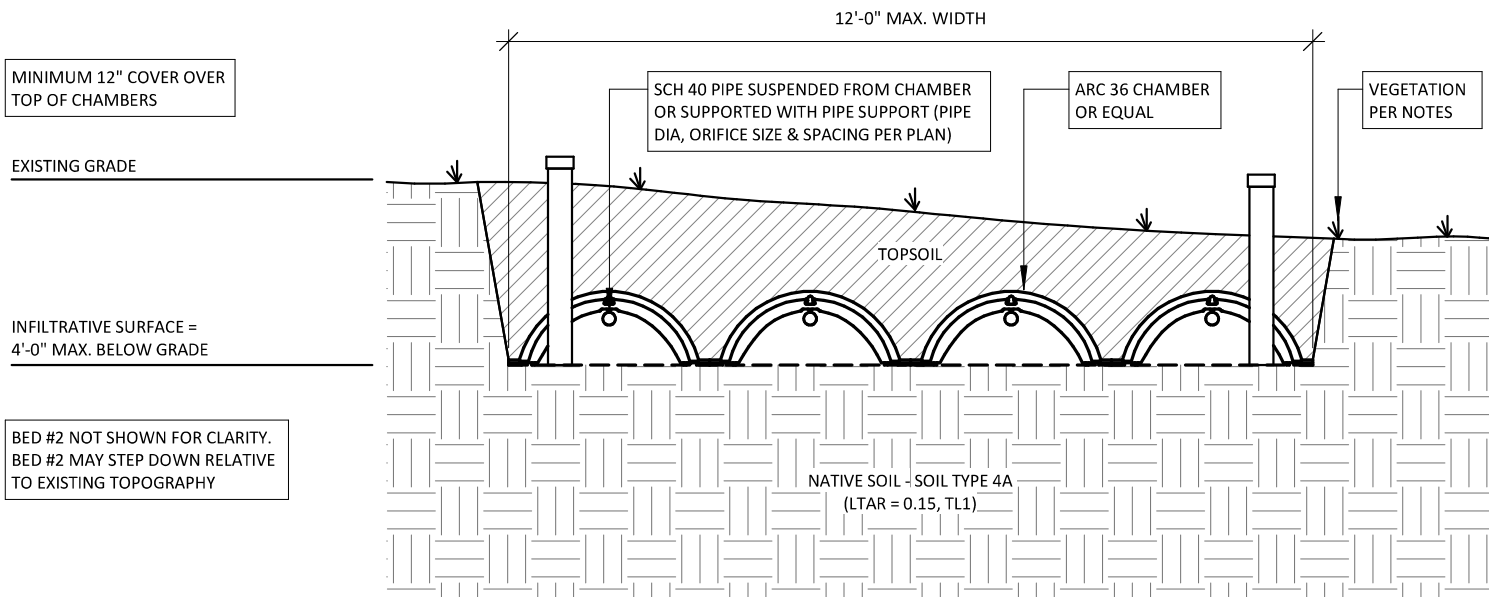
Checked by J.DUMKE

C2 of 4

Scale 1" = 10'-0"



① Pump Chamber
3/8" = 1'-0"



② STA Section - 4-Row Pressure Dosed Bed, 2-Beds Req.
3/8" = 1'-0"

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OWTS Design

Sections

Project number 23-180

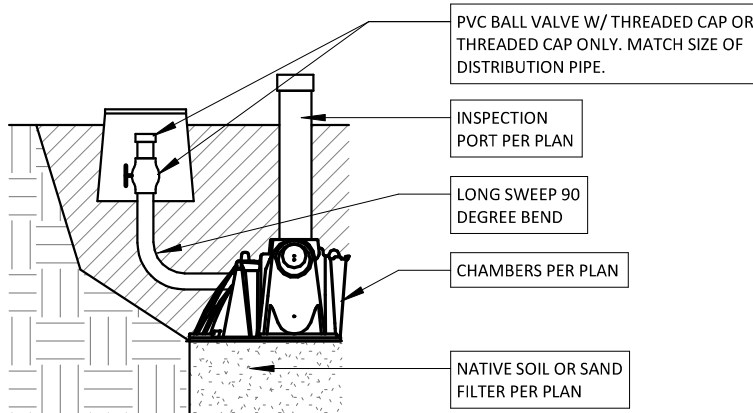
Date 10/10/2023

Drawn by D.MIZICKO

Checked by J.DUMKE

C3 of 4

Scale 3/8" = 1'-0"



① Flushing Assembly
1/2" = 1'-0"

OPERATION AND SYSTEM MAINTENANCE:

HOMEOWNERS ARE RESPONSIBLE FOR EDUCATING THEMSELVES ABOUT THE COMPONENTS AND OPERATION OF THEIR ONSITE WASTEWATER TREATMENT SYSTEM (OWTS) TO ENSURE THAT THE SYSTEM FUNCTIONS PROPERLY. HOMEOWNERS SHOULD BE ADVISED OF RECOMMENDED MAINTENANCE AND/OR SPECIAL CONSIDERATIONS (EFFLUENT FILTER, DIVERTER VALVES, PUMP CONTROL, INSPECTION PORTS, ETC) FOR THEIR SEPTIC SYSTEM. REFER TO THE EL PASO COUNTY PUBLIC HEALTH DEPARTMENT OR YOUR LOCAL HEALTH DEPARTMENT AUTHORITY FOR MORE INFORMATION REGARDING SEPTIC SYSTEM CARE.

IT IS THE HOMEOWNERS RESPONSIBILITY TO PRACTICE WATER CONSERVATION AS MUCH AS PRACTICAL. REPAIR LEAKING FAUCETS AND TOILETS IMMEDIATELY. LEAKING PLUMBING FIXTURES CAN SATURATE AND ULTIMATELY FAIL A ONSITE WASTEWATER TREATMENT SYSTEM IN A VERY SHORT PERIOD OF TIME.

NOTES & LIMITATIONS:

ALL OWTS ELEMENTS MUST MAINTAIN A MINIMUM 10' FROM PROPERTY LINE.

ALL STA ELEMENTS MUST MAINTAIN A MINIMUM 100' SETBACK FROM THE WELL ONSITE (IF APPLICABLE) IN ADDITION TO ANY NEIGHBORING WELLS

THE DESIGN OF THIS SYSTEM HAS BEEN PREPARED IN ACCORDANCE WITH THE STANDARDS AND REGULATIONS OUTLINED BY THE EL PASO COUNTY HEALTH DEPARTMENT. ALL REGULATIONS APPLY TO THIS DESIGN INCLUDING BUT NOT LIMITED TO: PROPERTY LINE SETBACKS, PIPE CLEANOUTS, WELL SETBACKS, ETC. THIS DESIGN MUST BE COORDINATED WITH FINAL AS-CONSTRUCTED CONDITIONS ONSITE (FINAL ELEVATIONS, STRUCTURE LAYOUT, SITE GRADING, DRAINAGE, ETC.) PRIOR TO CONSTRUCTION. IF DURING CONSTRUCTION, UNFORESEEN CIRCUMSTANCES REQUIRE MODIFICATIONS TO THE DESIGN, JDM CONSULTING LLC. MUST BE NOTIFIED IMMEDIATELY TO RE-EVALUATE THE DESIGN. JDM CONSULTING LLC. SHALL NOT BE HELD LIABLE FOR DESIGN CHANGES AND/OR ADDITIONS TO THE DESIGN DUE TO UNFORESEEN CIRCUMSTANCES. THIS DESIGN IS INTENDED FOR RESIDENTIAL WASTEWATER FLOWS ONLY, AND SHALL NOT BE USED FOR ANY COMMERCIAL PURPOSES. ANY COMMERCIAL USE OF THIS SYSTEM WILL RENDER THE DESIGN NULL AND VOID.

THIS DESIGN IS BASED OFF INFORMATION AVAILABLE AT THE TIME OF DESIGN AND CRITERIA DETERMINED BY THE PROFILE EVALUATION. SOIL CONDITIONS CAN VARY ACROSS AN STA, JDM CONSULTING, LLC. IS NOT RESPONSIBLE FOR VARYING SOIL CONDITIONS ONSITE. PERFORMANCE OF A SYSTEM IS HIGHLY VARIABLE DEPENDING ON HOMEOWNER WATER USE, DRAINAGE, HEAVY RAINFALL OR SNOWFALL, DEEP FREEZE, ETC. DUE TO THE AFOREMENTIONED VARIABLES, NO WARRANTY AGAINST FAILURE IS GIVEN OR IMPLIED BY JDM CONSULTING, LLC.

(HOMEOWNER) RE-ESTABLISH VEGETATION OVER SOIL TREATMENT AREA AS SOON AS POSSIBLE AFTER INSTALLATION. HOWEVER, NO IRRIGATION IS ALLOWED ON SOIL TREATMENT AREA. NATIVE GRASSES AND PLANTS WITH SHALLOW ROOT SYSTEMS ARE RECOMMENDED. CONTACT SOIL CONSERVATION SERVICE OR COUNTY EXTENSION AGENT FOR INFORMATION REGARDING NATIVE VEGETATION.

NO VEHICULAR TRAFFIC OR LIVESTOCK SHOULD BE PERMITTED ON THE SOIL TREATMENT AREA. WITH LAWN CARE EQUIPMENT, SUCH AS A RIDING LAWN MOWER OR TRACTOR, IT IS IMPORTANT NOT TO TRAVEL ON THE SOIL TREATMENT AREA WHEN THE SOIL IS SATURATED. WINTER TRAFFIC ON THE SOIL TREATMENT AREA SHOULD ALSO BE AVOIDED TO MINIMIZE FROST PENETRATION IN COLDER CLIMATE AREAS AND TO MINIMIZE COMPACTION IN OTHER AREAS.

ALL ONSITE DRAINAGE (INCLUDING GUTTERS, DOWNSPOUTS, ETC.) MUST BE DIVERTED TO AVOID THE SOIL TREATMENT AREA.

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OWTS Design

Details & Notes

Project number	23-180	C4 of 4
Date	10/10/2023	
Drawn by	D.MIZICKO	
Checked by	J.DUMKE	Scale As indicated

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Job #: 23-180

Project Address:

515 S Yoder Rd, 80864



Tank Size & Design Flow

1000 Gallon Tank(s) (1 - 1000 Gallon Septic Tank; 48 Hour Usage Retention Min.)

180 Wastewater Design Flow in GPD from maximum proposed occupancy (See Below)

Water Usage Disclaimer (Design void if not signed):

I _____ (property manager) certify that the proposed occupancy is accurate to the best of my knowledge. I understand that water usage may change over time and can have an effect on the functionality of the septic system designed by JDM Consulting, LLC. JDM Consulting, LLC is not responsible for issues caused within the soil treatment area due to fluctuating water usage.

Signed: _____ Date: _____

Profile Evaluation

Reference Documents: Profile Evaluation by JDM Consulting, LLC Dated: September 14, 2023, Job # 23-180

Receiving Soil Type:

Type 4A

LTAR of Soil:

0.15

Gal/day/sq.ft.

Soil Treatment Area

Design Flow / LTAR = SF Required

1200 Sq.ft. (Unadjusted)

840 Sq.Ft. (Adjusted)

Adjustment Factors (Table 10-2, 10-3)*

1.0	Application -	Bed - Pressure Dosed
0.7	Distribution Media -	Chambers
1.0	Diverter Valve Used -	No

*No Adjustments Allowed for Type R Soils

of Chambers - Arc 36 (15 sq.ft. per Chamber)

56 Minimum

of Chambers - Quick 4 (12 sq.ft. per Chamber)

70 Minimum

Building use and Occupancy

The structure onsite is a manufacturing facility for pre-manufactured barns and sheds. The facility is open 5 days a week, for 8 hours a day. The facility is in use by employees only. The facility has a maximum of 6 employees onsite.

Design Flow rate (Anticipated)

COMMERCIAL WASTEWATER: Factories and plants exclusive of industrial wastewater per employee per eight-hour shift – no showers.

Gallons/Day per Kennel =	20	<i>Gallons Per Day per Employee per eight-hour shift.</i>
Max. Proposed Occupancy =	6	<i>Employees</i>
Factor of Safety	1.5	
Estimated Daily flow rate =	180	<i>Gallons Per Day</i>

Wastewater Strength (Anticipated)

Biochemical Oxygen Demand	0.05	<i>lbs/day/employee</i>
Daily Flow Rate	180	<i>Gallons Per Day</i>
BOD ₅	300	<i>mg/l</i>

Dose Volume			
Pipe Dia. (in.)	1.5	Pipe Area (in ²)	1.76625
Dist. Pipe Length (ft.)	50	Dist. Pipe Length (in.)	600
Lateral Length (ft.)	35	Lateral Length (in.)	420
Number of Laterals	2		
Dose Volume (Gal)	30.27857		

Total Number of Orifices

Lateral Length (ft.)	35		
Orifice Spacing (ft)	4		
Number of Laterals	2		
Total Orifices	21.5	Use	22

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Property Address:	515 S Yoder Rd	Date:	September 14, 2023
	Yoder, CO 80864	Job #:	23-180
Endorsement:	Jared R. Dumke, P.E.		



Purpose of Investigation: To determine the subsurface suitability for an Onsite Wastewater Treatment System (OWTS) as well as outline design criteria for a future Soil Treatment Area (STA) through both visual and tactile evaluations of the onsite subsurface soil. The onsite evaluation and associated soil testing were conducted in compliance with the El Paso County Board of Health OWTS Regulations

Profile Pit Summary	
Profile Pit #1	
Lat:	38°49'24.24"N
Long:	104°13'14.16"W
0 - 0'-6"	Topsoil
0'-6" - 3'-0"	Soil Type 4
3'-0" - 4'-6"	Soil Type 3
4'-6" - 6'-0"	Soil Type 3A
6'-0" - 8'-0"	Soil Type 4A
Profile Pit #2	
Lat:	38°49'24.33"N
Long:	104°13'15.31"W
0 - 0'-6"	Topsoil
0'-6" - 2'-6"	Soil Type 4
2'-6" - 3'-6"	Soil Type 3
3'-6" - 6'-0"	Soil Type 4A
6'-0" - 8'-0"	Soil Type 4
Existing Well (If applicable)	
Lat:	38°49'25.00"N
Long:	104°13'12.18"W

Profile Pit #1		Profile Pit #2	
	Topsoil		Topsoil
1'-0"		1'-0"	
2'-0"	Soil Type 4	2'-0"	Soil Type 4
3'-0"		3'-0"	Soil Type 3
4'-0"	Soil Type 3	4'-0"	
5'-0"	Soil Type 3A	5'-0"	Soil Type 4A
6'-0"		6'-0"	
7'-0"	Soil Type 4A	7'-0"	Soil Type 4
8'-0"		8'-0"	
9'-0"		9'-0"	

Recommendations:

An Engineered On-Site Wastewater Treatment System (OWTS) will be required for this site due to: (a) Soil Type 3A identified in the treatment zone of Profile Pit #1. (b) Soil Type 4 identified in the treatment zone of Profile Pit #1 & Profile Pit #2. (c) Soil Type 4A identified in the treatment zone of Profile Pit #1 & Profile Pit #2. (d) The proposed OWTS will serve a commercial facility. Soil Type 4A (LTAR = 0.15, Treatment Level 1) will be the most restrictive soil in the treatment zone of the soil treatment area.

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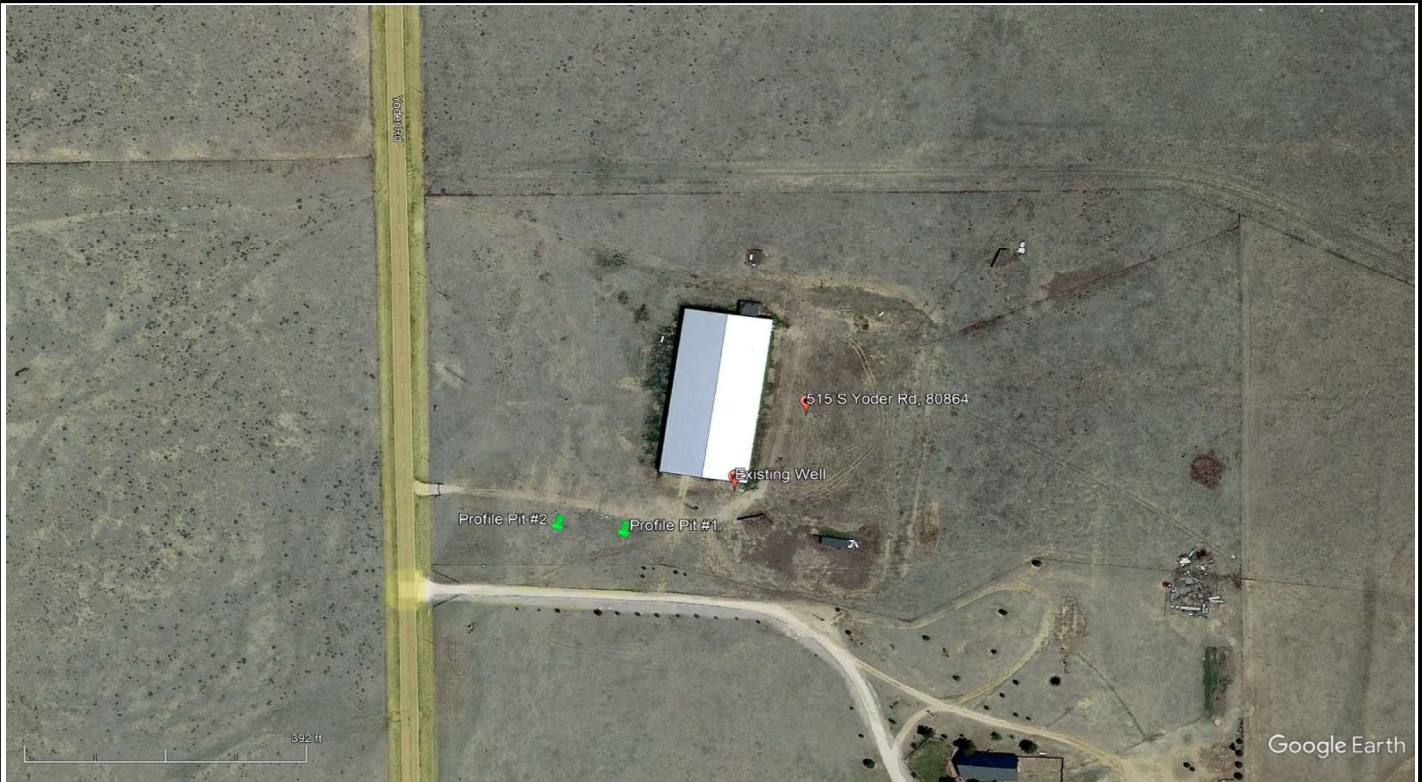
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Site Map:





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Job Number:	23-180	Test Pit#	Pit #1
Date of Evaluation:	September 12, 2023	Total Depth:	8'-0"
Evaluator:	D.Mizicko	STA Slope and Direction:	W @ ±4%
Excavator:	Contractor	Latitude:	38°49'24.24"N
Equipment:	Mini Excavator	Longitude:	104°13'14.16"W

515 S Yoder Rd, 80864

Depth Below Grade	Sample Depth	USDA Soil texture	USDA Soil Structure - Type	USDA Soil Structure Grade	Soil Type	Redoximorphic Features Present (Y/N)
0 - 0'-6"	Topsoil					
0'-6" - 3'-0"	2'-0"	Sandy Clay	Blocky	Strong	Soil Type 4	No
3'-0" - 4'-6"	4'-0"	Sandy Clay Loam	Granular	Moderate	Soil Type 3	No
4'-6" - 6'-0"	5'-0"	Sandy Clay Loam	Massive*	Structureless	Soil Type 3A	No
6'-0" - 8'-0"	7'-0"	Sandy Clay	Massive*	Structureless	Soil Type 4A	No

Total Depth =	8'-0"	Comments:
Groundwater Evidence?	No	-
Bedrock Encountered?	No	-
Is Dawson Arkose (DA) or Cemented Sands (CS) Present?	Yes	
Is the material fractured and/or Jointed	No	
If Yes, what is the cementation class?	*Weakly Cemented	
Is the Dawson Arkose or Cemented Sand a limiting layer?	No	
Type "R" Soils (High Rock Content) Encountered?	No	



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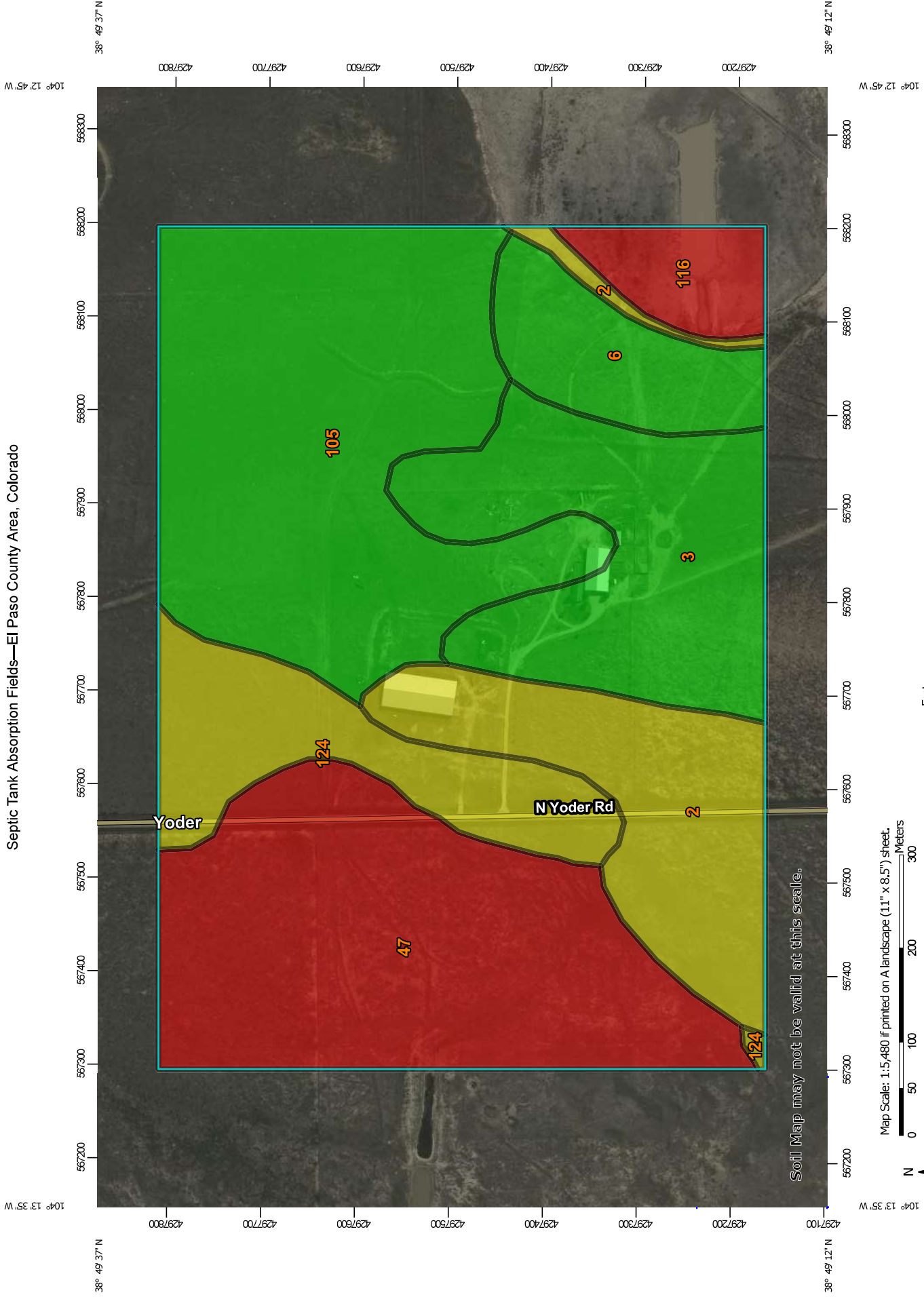
Job Number:	23-180	Test Pit#	Pit #2
Date of Evaluation:	September 12, 2023	Total Depth:	8'-0"
Evaluator:	D.Mizicko	STA Slope and Direction:	W @ ±4%
Excavator:	Contractor	Latitude:	38°49'24.33"N
Equipment:	Mini Excavator	Longitude:	104°13'15.31"W

515 S Yoder Rd, 80864

Depth Below Grade	Sample Depth	USDA Soil texture	USDA Soil Structure - Type	USDA Soil Structure Grade	Soil Type	Redoximorphic Features Present (Y/N)
0 - 0'-6"	Topsoil					
0'-6" - 2'-6"	-	Sandy Clay	Blocky	Strong	Soil Type 4	No
2'-6" - 3'-6"	-	Sandy Clay Loam	Granular	Moderate	Soil Type 3	No
3'-6" - 6'-0"	-	Sandy Clay	Massive*	Structureless	Soil Type 4A	No
6'-0" - 8'-0"	-	Sandy Clay	Granular	Moderate	Soil Type 4	No

Total Depth =	8'-0"	Comments:
Groundwater Evidence?	No	
Bedrock Encountered?	No	
Is Dawson Arkose (DA) or Cemented Sands (CS) Present?	Yes	
Is the material fractured and/or Jointed	No	
If Yes, what is the cementation class?	*Weakly Cemented	
Is the Dawson Arkose or Cemented Sand a limiting layer?	No	
Type "R" Soils (High Rock Content) Encountered?	No	

Septic Tank Absorption Fields—El Paso County Area, Colorado



Soil Map may not be valid at this scale.

Map Scale: 1:5,480 if printed on A landscape (11" x 8.5") sheet.

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 13N WGS84



Natural Resources
Conservation Service

Web Soil Survey
National Cooperative Soil Survey

9/13/2023
Page 1 of 6

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Background

Aerial Photography

Soils

Soil Rating Polygons

Very limited

Somewhat limited

Not limited

Not rated or not available

Soil Rating Lines

Very limited

Somewhat limited

Not limited

Not rated or not available

Soil Rating Points

Very limited

Somewhat limited

Not limited

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

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: El Paso County Area, Colorado
Survey Area Data: Version 20, Sep 2, 2022

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

Date(s) aerial images were photographed: Sep 11, 2018—Oct 20, 2018

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.

Septic Tank Absorption Fields

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
2	Ascalon sandy loam, 1 to 3 percent slopes	Somewhat limited	Ascalon (98%)	Slow water movement (0.50)	18.3	12.7%
3	Ascalon sandy loam, 3 to 9 percent slopes	Not limited	Ascalon (85%)		22.4	15.5%
			Vona (5%)			
6	Bijou sandy loam, 0 to 3 percent slopes	Not limited	Bijou (85%)		8.7	6.0%
			Olnest (5%)			
47	Limon clay, 0 to 3 percent slopes	Very limited	Limon, Occasionally flooded (95%)	Flooding (1.00)	36.0	24.9%
				Slow water movement (1.00)		
105	Vona sandy loam, warm, 3 to 6 percent slopes	Not limited	Vona, warm (85%)		40.5	28.1%
			Olnest, warm (5%)			
			Otero, warm (5%)			
116	Udic Haplusterts	Very limited	Udic Haplusterts, ponded (85%)	Ponding (1.00)	4.9	3.4%
				Slow water movement (1.00)		
			Feterita, ponded (9%)	Ponding (1.00)		
				Depth to saturated zone (1.00)		
				Slow water movement (0.47)		
			Pachic Haplustolls (6%)	Slow water movement (1.00)		
124	Olnest sandy loam, 0 to 3 percent slopes	Somewhat limited	Olnest (85%)	Slow water movement (0.47)	13.7	9.5%
Totals for Area of Interest					144.5	100.0%

Rating	Acres in AOI	Percent of AOI
Not limited	71.6	49.5%
Very limited	40.8	28.3%

Rating	Acres in AOI	Percent of AOI
Somewhat limited	32.1	22.2%
Totals for Area of Interest	144.5	100.0%

Description

ENG - Engineering

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 60 inches is evaluated. The ratings are based on the soil properties that affect absorption of the effluent, construction and maintenance of the system, and public health. Saturated hydraulic conductivity (Ksat), depth to a water table, ponding, depth to bedrock or a cemented pan, and flooding affect absorption of the effluent. Stones and boulders, ice, and bedrock or a cemented pan interfere with installation. Subsidence interferes with installation and maintenance. Excessive slope may cause lateral seepage and surfacing of the effluent in downslope areas.

Some soils are underlain by loose sand and gravel or fractured bedrock at a depth of less than 4 feet below the distribution lines. In these soils the absorption field may not adequately filter the effluent, particularly when the system is new. As a result, the ground water may become contaminated.

The ratings 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 the specified use. "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 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).

The map unit components listed for each map unit in the accompanying Summary by Map Unit table in Web Soil Survey or the Aggregation Report in Soil Data Viewer are determined by the aggregation method chosen. An aggregated rating class is shown for each map unit. The components listed for each map unit are only those that have the same rating class as listed for the map unit. The percent composition of each component in a particular map unit is presented to help the user better understand the percentage of each map unit that has the rating presented.

Other components with different ratings may be present in each map unit. The ratings for all components, regardless of the map unit aggregated rating, can be viewed by generating the equivalent report from the Soil Reports tab in Web Soil Survey or from the Soil Data Mart site. Onsite investigation may be needed to

validate these interpretations and to confirm the identity of the soil on a given site.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Engineering Properties

This table gives the engineering classifications and the range of engineering properties for the layers of each soil in the survey area.

Hydrologic soil group is a group of soils having similar runoff potential under similar storm and cover conditions. The criteria for determining Hydrologic soil group is found in the National Engineering Handbook, Chapter 7 issued May 2007(<http://directives.sc.egov.usda.gov/OpenNonWebContent.aspx?content=17757.wba>). Listing HSGs by soil map unit component and not by soil series is a new concept for the engineers. Past engineering references contained lists of HSGs by soil series. Soil series are continually being defined and redefined, and the list of soil series names changes so frequently as to make the task of maintaining a single national list virtually impossible. Therefore, the criteria is now used to calculate the HSG using the component soil properties and no such national series lists will be maintained. All such references are obsolete and their use should be discontinued. Soil properties that influence runoff potential are those that influence the minimum rate of infiltration for a bare soil after prolonged wetting and when not frozen. These properties are depth to a seasonal high water table, saturated hydraulic conductivity after prolonged wetting, and depth to a layer with a very slow water transmission rate. Changes in soil properties caused by land management or climate changes also cause the hydrologic soil group to change. The influence of ground cover is treated independently. There are four hydrologic soil groups, A, B, C, and D, and three dual groups, A/D, B/D, and C/D. In the dual groups, the first letter is for drained areas and the second letter is for undrained areas.

The four hydrologic soil groups are described in the following paragraphs:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Depth to the upper and lower boundaries of each layer is indicated.

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is 15 percent or more, an appropriate modifier is added, for example, "gravelly."

Classification of the soils is determined according to the Unified soil classification system (ASTM, 2005) and the system adopted by the American Association of State Highway and Transportation Officials (AASHTO, 2004).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to particle-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, CL-ML.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of particle-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

Percentage of rock fragments larger than 10 inches in diameter and 3 to 10 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage. Three values are provided to identify the expected Low (L), Representative Value (R), and High (H).

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an oven-dry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field. Three values are provided to identify the expected Low (L), Representative Value (R), and High (H).

Liquid limit and plasticity index (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination. Three values are provided to identify the expected Low (L), Representative Value (R), and High (H).

References:

American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.

American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.

Report---Engineering Properties

Absence of an entry indicates that the data were not estimated. The asterisk '*' denotes the representative texture; other possible textures follow the dash. The criteria for determining the hydrologic soil group for individual soil components is found in the National Engineering Handbook, Chapter 7 issued May 2007(<http://directives.sc.egov.usda.gov/OpenNonWebContent.aspx?content=17757.wba>). Three values are provided to identify the expected Low (L), Representative Value (R), and High (H).

Engineering Properties—El Paso County Area, Colorado														
Map unit symbol and soil name	Pct. of map unit	Hydrologic group	Depth	USDA texture	Classification		Pct Fragments		Percentage passing sieve number—				Liquid limit	Plasticity index
					Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
			In				L-R-H	L-R-H	L-R-H	L-R-H	L-R-H	L-R-H	L-R-H	L-R-H
2—Ascalon sandy loam, 1 to 3 percent slopes														
Ascalon	98	B	0-8	Sandy loam	SM	A-2, A-4	0-0-0	0-0-0	95-98-100	90-95-100	70-83-95	25-38-50	20-23-25	NP-3 -5
			8-21	Sandy clay loam, sandy loam	CL, SC- SM, SC	A-4, A-6	0-0-0	0-0-0	95-98-100	90-95-100	80-90-100	40-48-55	25-30-35	5-10-15
			21-27	Sandy loam, loam, sandy clay loam	SC-SM, CL-ML, SC	A-4, A-6	0-0-0	0-0-0	95-98-100	95-98-100	75-85-95	40-53-65	25-30-35	5-10-15
			27-48	Fine sandy loam, loamy sand, sandy loam	ML, SM	A-2-4, A-4	0-0-0	0-0-0	95-96-100	89-93-100	67-72-85	33-37-48	18-22-30	3-6 -12
			48-60	Fine sandy loam, loamy sand, sandy loam	ML, SM	A-2-4, A-4	0-0-0	0-0-0	95-96-100	89-93-100	68-73-80	24-26-31	0-16 -19	NP-1 -2

Engineering Properties—El Paso County Area, Colorado														
Map unit symbol and soil name	Pct. of map unit	Hydrologic group	Depth	USDA texture	Classification		Pct Fragments		Percentage passing sieve number—				Liquid limit	Plasticity index
					Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
			<i>In</i>				<i>L-R-H</i>	<i>L-R-H</i>	<i>L-R-H</i>	<i>L-R-H</i>	<i>L-R-H</i>	<i>L-R-H</i>	<i>L-R-H</i>	<i>L-R-H</i>
3—Ascalon sandy loam, 3 to 9 percent slopes														
Ascalon	85	B	0-6	Sandy loam	SC	A-4	0-0-0	0-0-0	100-100-100	100-100-100	74-77-80	37-39-44	21-26-30	4-8-10
			6-12	Sandy loam, sandy clay loam	CL	A-6	0-0-0	0-0-0	100-100-100	100-100-100	81-88-94	45-56-63	22-36-39	5-16-18
			12-19	Sandy clay loam, sandy loam	CL	A-6	0-0-0	0-0-0	100-100-100	92-100-100	68-88-90	37-56-58	21-36-38	4-16-18
			19-35	Sandy clay loam, fine sandy loam, sandy loam	SC-SM	A-4	0-0-0	0-0-0	100-100-100	100-100-100	89-93-100	37-41-48	19-23-31	2-5-12
			35-80	Sandy clay loam, fine sandy loam, sandy loam	SC-SM	A-4	0-0-0	0-0-0	100-100-100	100-100-100	89-93-100	37-41-48	19-23-31	2-5-12
6—Bijou sandy loam, 0 to 3 percent slopes														
Bijou	85	A	0-4	Sandy loam	SC-SM	A-4	0-0-0	0-0-0	100-100-100	100-100-100	75-77-80	36-40-44	20-23-32	4-6-12
			4-8	Sandy loam	SC	A-4	0-0-0	0-0-0	100-100-100	100-100-100	74-77-79	35-40-43	22-27-30	6-9-12
			8-21	Sandy loam	SC	A-4	0-0-0	0-0-0	100-100-100	100-100-100	74-77-79	35-40-43	22-27-30	6-9-12
			21-28	Sandy loam	SC-SM	A-4	0-0-0	0-0-0	100-100-100	100-100-100	74-76-79	34-38-42	22-24-30	6-7-12
			28-79	Loamy sand, sandy loamy coarse sand	SM	A-2-4	0-0-0	0-0-0	100-100-100	100-100-100	51-55-58	17-21-25	0-18-22	NP-3-6

Engineering Properties—El Paso County Area, Colorado														
Map unit symbol and soil name	Pct. of map unit	Hydrologic group	Depth	USDA texture	Classification		Pct Fragments		Percentage passing sieve number—				Liquid limit	Plasticity index
					Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
			In				L-R-H	L-R-H	L-R-H	L-R-H	L-R-H	L-R-H	L-R-H	L-R-H
47—Limon clay, 0 to 3 percent slopes														
Limon, occasionally flooded	95	C	0-4	Clay	CL, CH	A-7-6	0-0-0	0-0-0	100-100-100	100-100-100	90-95-100	75-85-95	40-53-65	20-30-40
			4-12	Silty clay	CL, CH	A-7-6	0-0-0	0-0-0	100-100-100	100-100-100	89-99-100	86-96-100	40-53-65	20-30-40
			12-60	Silty clay loam, clay, silty clay	MH, ML	A-7-5	0-0-0	0-0-0	100-100-100	100-100-100	90-95-100	85-90-95	45-58-70	15-25-35
105—Vona sandy loam, warm, 3 to 6 percent slopes														
Vona, warm	85	A	0-5	Sandy loam	SC-SM	A-4	0-0-0	0-0-0	100-100-100	100-100-100	74-78-82	35-40-46	20-23-30	4-6-9
			5-12	Sandy loam, fine sandy loam	SC	A-6	0-0-0	0-0-0	100-100-100	100-100-100	73-77-80	35-39-44	22-29-30	6-11-12
			12-17	Sandy loam, fine sandy loam	SC	A-4	0-0-0	0-0-0	100-100-100	100-100-100	72-77-81	34-39-45	22-27-30	6-9-12
			17-41	Sandy loam, fine sandy loam	SC-SM	A-4	0-0-0	0-0-0	100-100-100	100-100-100	75-78-82	34-39-45	20-23-29	5-7-12
			41-79	Sandy loam, fine sandy loam, loamy sand	SM	A-2-4	0-0-0	0-0-0	100-100-100	92-100-100	68-78-83	20-27-34	0-16-26	NP-1-9

Engineering Properties—El Paso County Area, Colorado														
Map unit symbol and soil name	Pct. of map unit	Hydrologic group	Depth	USDA texture	Classification		Pct Fragments		Percentage passing sieve number—				Liquid limit	Plasticity index
					Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
116—Udic Haplusterts			In				L-R-H	L-R-H	L-R-H	L-R-H	L-R-H	L-R-H	L-R-H	L-R-H
Udic haplusterts, ponded	85	D	0-5	Clay	CH	A-7-6	0-0-0	0-0-0	100-100-100	98-100-100	83-95-98	67-78-81	50-61-66	25-32-35
			5-17	Clay	CH	A-7-6	0-0-0	0-0-0	100-100-100	98-100-100	81-92-97	69-81-86	54-65-72	29-36-40
			17-28	Clay	CH	A-7-6	0-0-0	0-0-0	100-100-100	98-100-100	81-92-97	69-81-86	52-63-70	29-36-40
			28-36	Clay	CH	A-7-6	0-0-0	0-0-0	100-100-100	98-100-100	81-92-97	69-81-86	52-63-70	29-36-40
			36-68	Clay	CH	A-7-6	0-0-0	0-0-0	100-100-100	98-100-100	81-92-97	69-81-86	52-63-70	29-36-40
124—Olnest sandy loam, 0 to 3 percent slopes														
Olnest	85	B	0-4	Sandy loam	SC	A-4	0-0-0	0-0-0	100-100-100	100-100-100	73-77-81	34-39-44	25-27-35	7-8-13
			4-20	Sandy clay loam	SC	A-6	0-0-0	0-0-0	100-100-100	100-100-100	88-94-99	43-49-55	31-37-44	13-18-23
			20-48	Sandy clay loam, sandy loam	SC	A-4	0-0-0	0-0-0	100-100-100	100-100-100	73-78-85	34-41-52	22-26-41	6-9-21
			48-79	Very fine sandy loam, fine sandy loam, sandy loam	CL	A-6	0-0-0	0-0-0	100-100-100	100-100-100	87-100-100	49-69-75	22-28-29	6-11-12

Data Source Information

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 20, Sep 2, 2022

