



ENTECH
ENGINEERING, INC.

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

November 26, 2019

KCH Engineering Solutions
5228 Cracker Barrel Circle
Colorado Springs, Colorado 80917

Attn: Ken Harrison

Re: Base Course Thickness Measurement, Grain Size Analysis, Moisture Density
Relation Curve Testing Results, and Density Testing Test Results
Prairie Ridge – Brown Road
El Paso County, Colorado

Dear Mr. Harrison:

As requested, personnel of Entech Engineering, Inc. have taken depth measurements of the road base and have performed laboratory testing on the soils obtained from the above referenced site. The observations and soils testing on the site were performed on November 6, 2019.

The project consisted of the evaluation of an existing gravel road to determine the thickness of the basecourse layer and to obtain samples for laboratory testing consisting of Grain size Analysis and moisture density relation testing. The following table shows the results of the laboratory testing and the thickness of the basecourse samples. Laboratory test results are enclosed with this letter.

In addition, density testing was performed on the roadway subgrade. Results of the density tests are attached to this report.

We trust that this has provided you with the information you require. Should you have any questions or need further information, please do not hesitate to contact us.

Respectfully Submitted,

ENTECH ENGINEERING, INC.

Daniel P. Stegman
Project Engineer

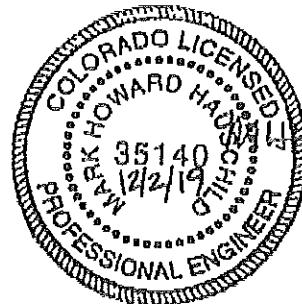
DPS/am

Enclosure

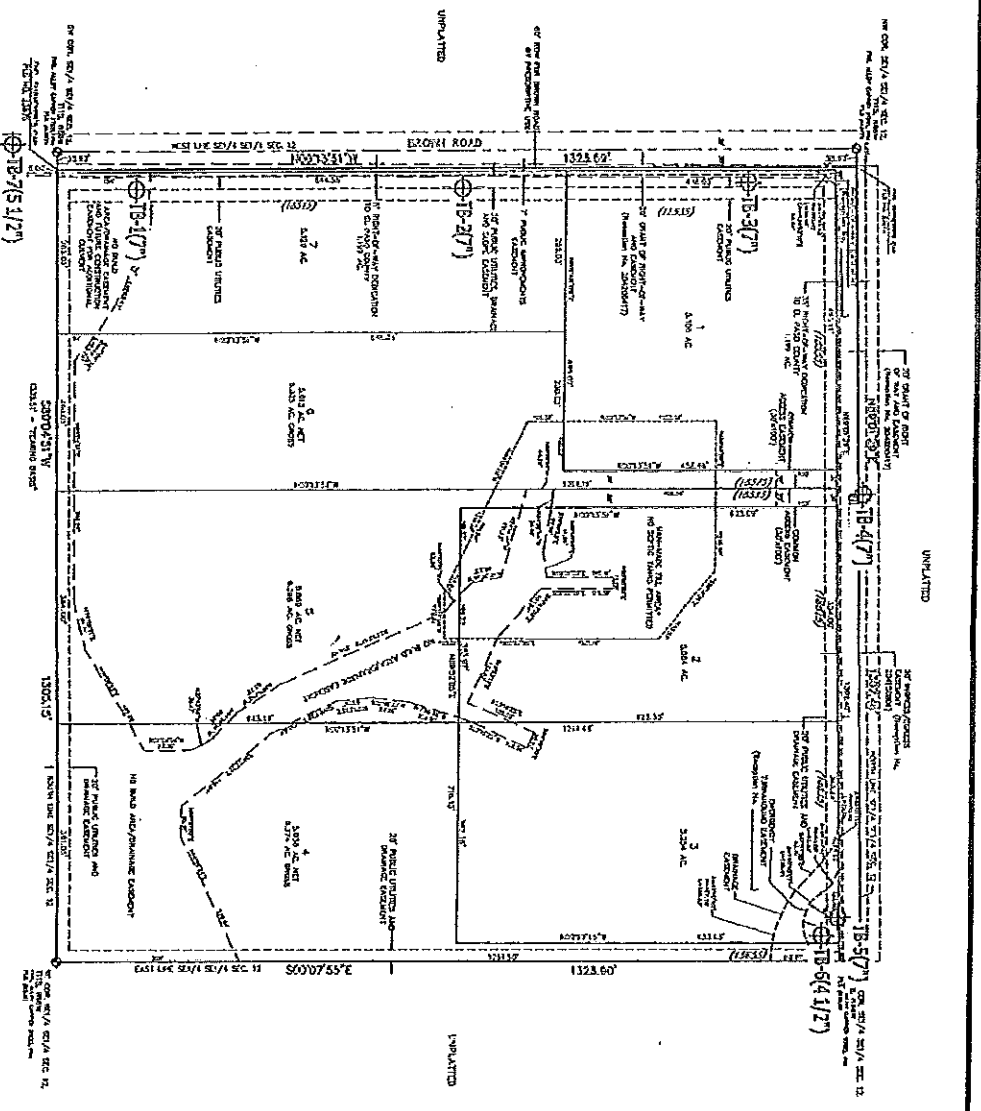
Entech Job No. 191877

F:\AA projects\2019\191877-LDC, Inc.-Prairie Ridge-191877\grain&md\rc.doc

CC: LDC Inc - Dan Kupferer



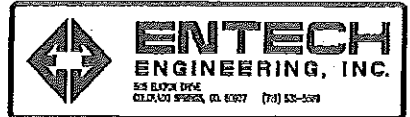
Mark H. Hauschild, P.E.
Senior Engineer



LEGEND:
 ⊕-TB-(X) = Test Bore No.(Depth of Road Base)

DATE	1/29/18
BY	AS
NO.	10077
REV.	1

SITE/SAMPLE LOCATION MAP
 PRAIRIE RIDGE
 EL PASO COUNTY, COLORADO
 FOR: LDS, INC.



REVISIONS	BY

TABLE 1

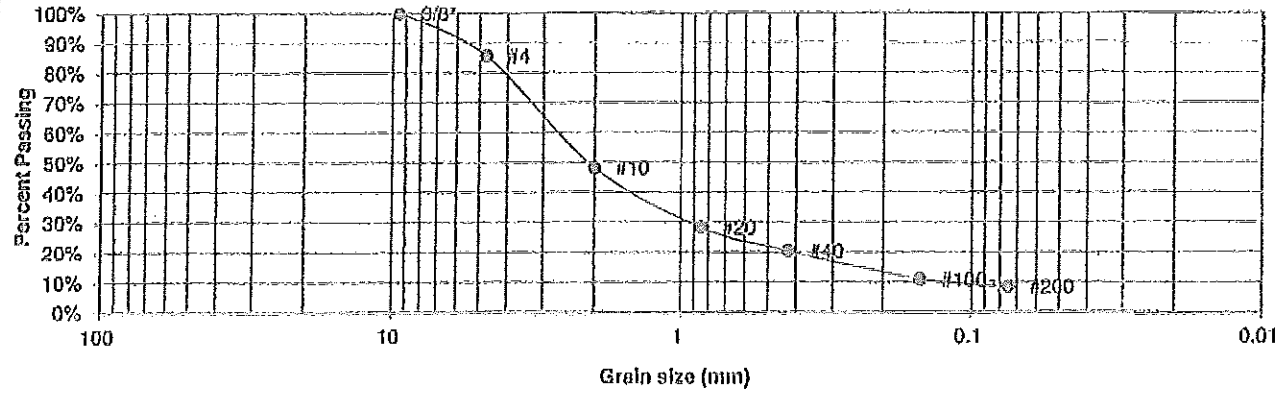
SUMMARY OF LABORATORY TEST RESULTS

CLIENT LDC, INC.
 PROJECT PRAIRIE RIDGE
 JOB NO. 191877

SAMPLE NO.	BASE COURSE THICKNESS	PASSING NO. 200 SIEVE (%)	UNIFIED CLASSIFICATION	SOIL DESCRIPTION
1	7"	8.4	SM-SW	SAND, SLIGHTLY SILTY
2	7"	10.8	SM-SW	SAND, SLIGHTLY SILTY
3	7"	12.9	SM	SAND, SILTY
4	7"	9.4	SM-SW	SAND, SLIGHTLY SILTY
5	7"	9.4	SM	SAND, SLIGHTLY SILTY
6	4.5"			
7	5.5"			
8	6"			
9	6"			

<u>UNIFIED CLASSIFICATION</u>	SM-SW	<u>CLIENT</u>	LDC, INC.
<u>SOIL TYPE #</u>	1	<u>PROJECT</u>	PRAIRIE RIDGE
<u>TEST BORING #</u>	1	<u>JOB NO.</u>	191877
<u>DEPTH (FT)</u>	7"	<u>TEST BY</u>	BL

**Sieve Analysis
Grain Size Distribution**



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	85.7%
10	48.2%
20	28.3%
40	20.3%
100	10.9%
200	8.4%

Atterberg Limits
 Plastic Limit
 Liquid Limit
 Plastic Index

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



**LABORATORY TEST
RESULTS**

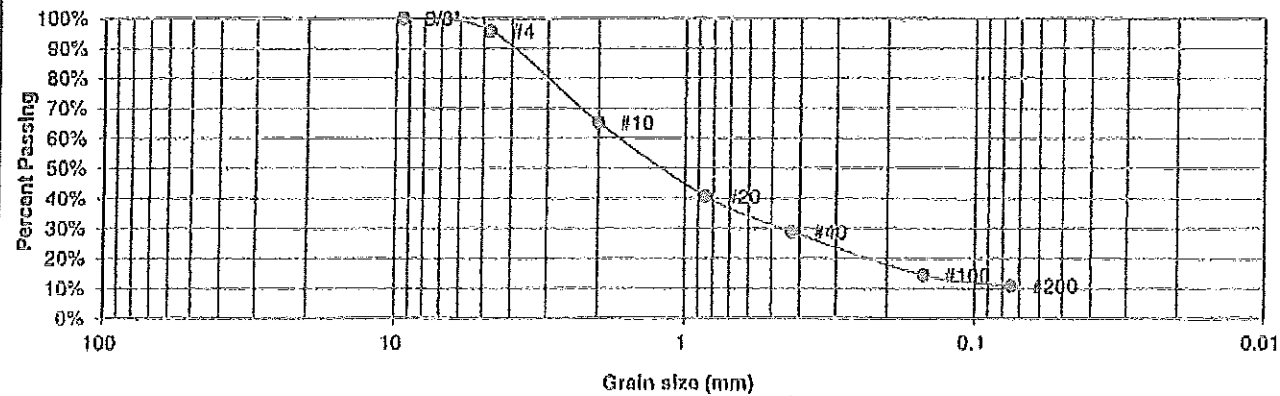
DRAWN:	DATE:	CHECKED: DS	DATE: 11/26/19
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JOB NO.
191877

FIG NO.
1

<u>UNIFIED CLASSIFICATION</u>	SM-SW	<u>CLIENT</u>	LDC, INC.
<u>SOIL TYPE #</u>	1	<u>PROJECT</u>	PRAIRIE RIDGE
<u>TEST BORING #</u>	2	<u>JOB NO.</u>	191877
<u>DEPTH (FT)</u>	7"	<u>TEST BY</u>	BL

**Sieve Analysis
Grain Size Distribution**



<u>U.S. Sieve #</u>	<u>Percent Finer</u>
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	95.8%
10	65.2%
20	40.7%
40	28.8%
100	14.4%
200	10.8%

Atterberg Limits
 Plastic Limit
 Liquid Limit
 Plastic Index

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



**ENTECH
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 505 ELKTON DRIVE
 COLORADO SPRINGS, COLORADO 80907

**LABORATORY TEST
RESULTS**

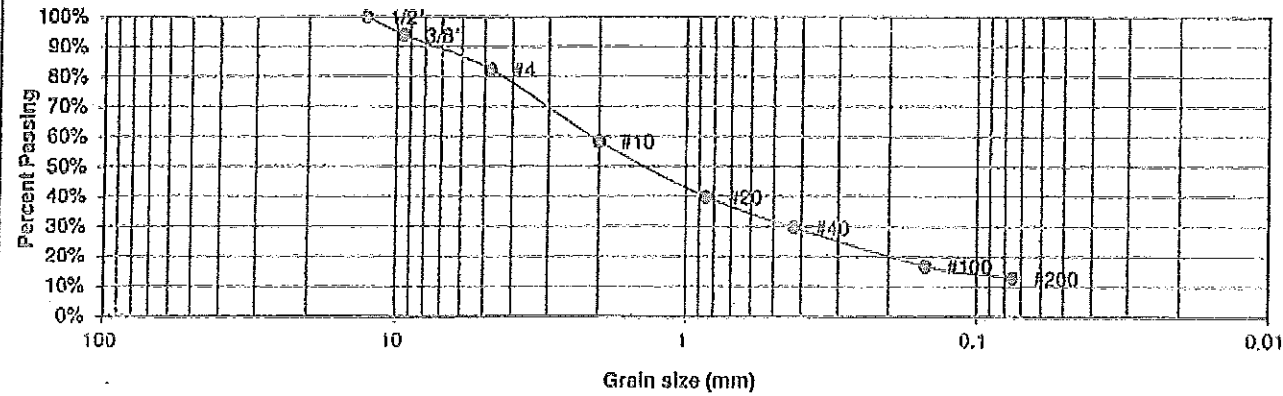
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JOB NO:
191877

FIG NO:
2

<u>UNIFIED CLASSIFICATION</u>	SM	<u>CLIENT</u>	LDC, INC.
<u>SOIL TYPE #</u>	1	<u>PROJECT</u>	PRAIRIE RIDGE
<u>TEST BORING #</u>	3	<u>JOB NO.</u>	191877
<u>DEPTH (FT)</u>	7"	<u>TEST BY</u>	BL

**Sieve Analysis
Grain Size Distribution**



U.S. Sieve #	Percent Finer	Atterberg Limits
3"		Plastic Limit
1 1/2"		Liquid Limit
3/4"		Plastic Index
1/2"	100.0%	
3/8"	93.8%	
4	82.3%	
10	58.3%	
20	39.8%	
40	29.6%	
100	16.9%	
200	12.9%	

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



**LABORATORY TEST
RESULTS**

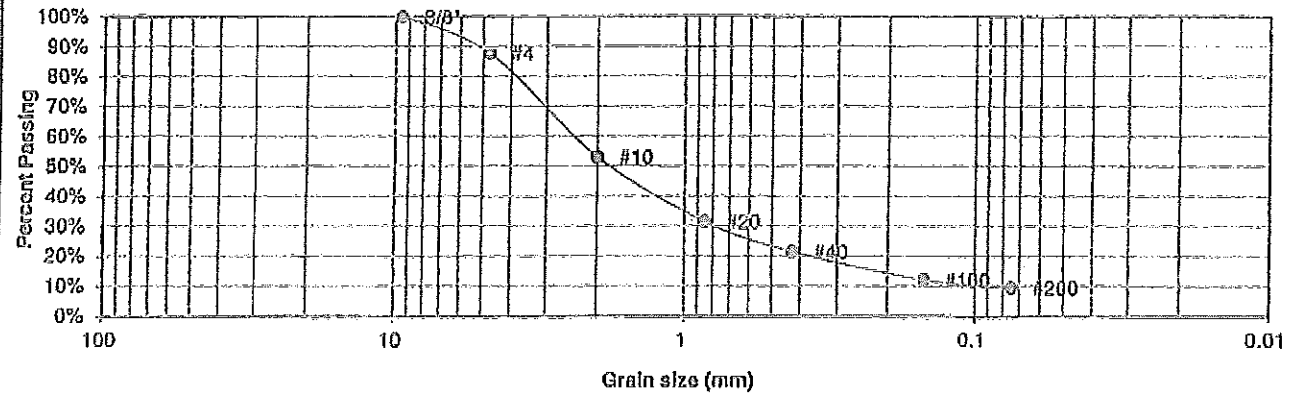
DRAWN:	DATE:	CHECKED DS	DATE 11/26/19
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JOB NO:
191877

FIG NO:
3

UNIFIED CLASSIFICATION	SM-SW	CLIENT	LDC, INC.
SOIL TYPE #	1	PROJECT	PRAIRIE RIDGE
TEST BORING #	4	JOB NO.	191877
DEPTH (FT)	7"	TEST BY	BL

**Sieve Analysis
Grain Size Distribution**



U.S. Sieve #	Percent Finer	Atterberg Limits
3"		Plastic Limit
1 1/2"		Liquid Limit
3/4"		Plastic Index
1/2"		
3/8"	100.0%	
4	87.7%	<u>Swell</u>
10	53.0%	Moisture at start
20	31.4%	Moisture at finish
40	21.4%	Moisture increase
100	12.0%	Initial dry density (pcf)
200	9.4%	Swell (psf)



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COLORADO SPRINGS, COLORADO 80907

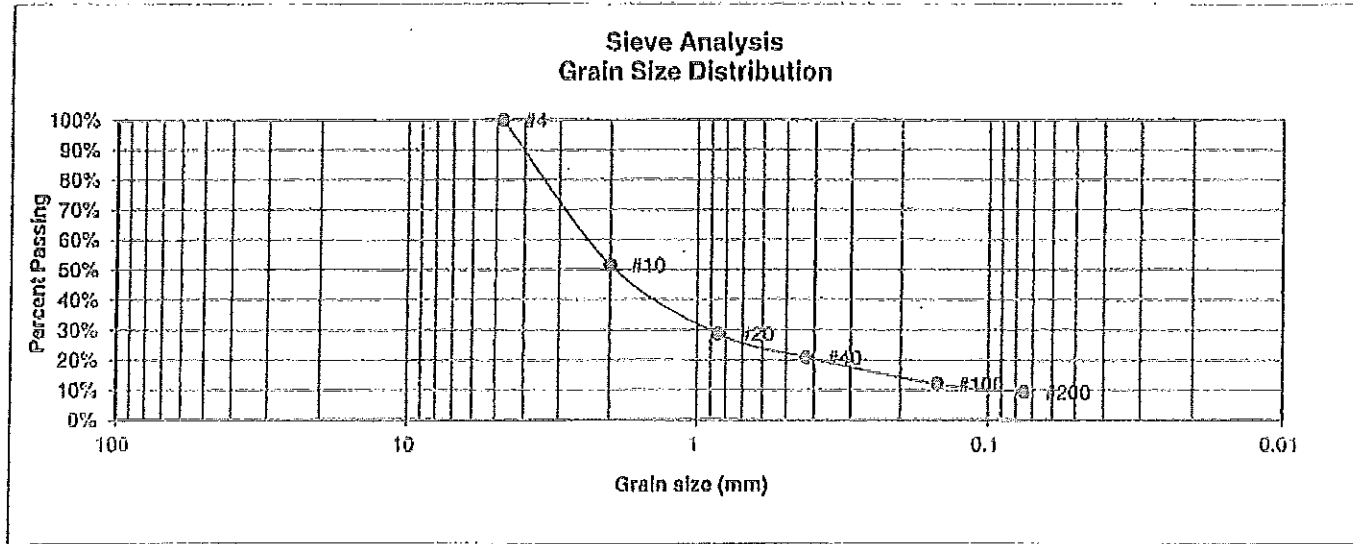
**LABORATORY TEST
RESULTS**

DRAWN:	DATE:	CHECKED:	DATE:
		<i>PS</i>	11/26/17

JOB NO.
191877

FIG NO.
4

<u>UNIFIED CLASSIFICATION</u>	SM	<u>CLIENT</u>	LDC, INC.
<u>SOIL TYPE #</u>	1	<u>PROJECT</u>	PRAIRIE RIDGE
<u>TEST BORING #</u>	5	<u>JOB NO.</u>	191877
<u>DEPTH (FT)</u>	7"	<u>TEST BY</u>	BL



U.S. Sieve #	Percent Finer	Atterberg Limits
3"		Plastic Limit
1 1/2"		Liquid Limit
3/4"		Plastic Index
1/2"		
3/8"		
4	100.0%	<u>Swell</u>
10	51.6%	Moisture at start
20	28.7%	Moisture at finish
40	20.8%	Moisture increase
100	12.0%	Initial dry density (pcf)
200	9.4%	Swell (psf)



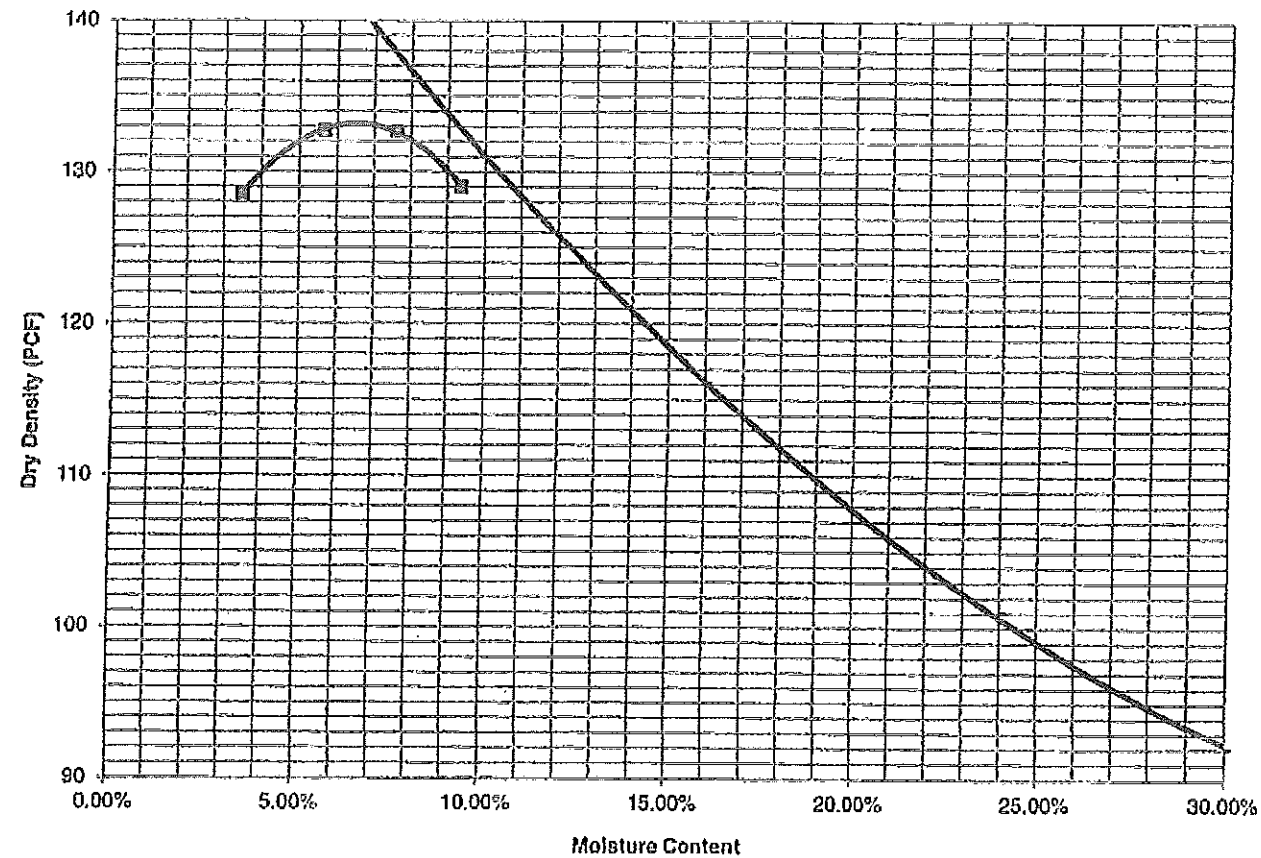
LABORATORY TEST RESULTS			
DRAWN:	DATE:	CHECKED:	DATE:
		DS	11/22/19

JOB NO. 191877
FIG NO. 5

PROJECT	PRAIRIE RIDGE	CLIENT	LDC, INC.
SAMPLE LOCATION	BROWN ROAD	JOB NO.	191877
SOIL DESCRIPTION	SAND, SILTY, RED BROWN	DATE	11/20/19

IDENTIFICATION	SM	PROCTOR TEST #	1
TEST DESIGNATION / METHOD	ASTM D-1557-B	TEST BY	BL
MAXIMUM DRY DENSITY (PCF)	133.2	OPTIMUM MOISTURE	6.4%

Compaction Curve



■ ACTUAL POINTS - - - PARABOLIC FIT ——— ZERO AIR VOIDS



ENTECH
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 505 ELKTON DRIVE
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MOISTURE DENSITY RELATION

DRAWN:	DATE:	CHECKED:	DATE:
		DS	11/22/19

JOB NO -
 191877
 FIG NO -
 6

Client: LDC, Inc.

Entech Job #: 191877.6

Proctor Value Key: M = modified, ASTM D-1557

Project: Prairie Ridge - Brown Road

Tested By: T. Kinner

S = standard, ASTM D-698

Subject: Roadway Subgrade

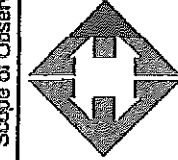
Report Date: 12-02-2019

T = AASHTO, T-180

Test #	Location	Testing Date	Percent Compaction	Percent Required	Percent Moisture	Soil Type	Proctor Type	Proctor Value	Pass/Fail
1	40' north and 4' west of northeast corner of intersection with Walker Road, Brown Road, northbound, roadway subgrade, at grade.	11/30/19	99	95	7.6	SM	M	133.2 @ 6.4	<input type="checkbox"/>
2	65' north and 6' east of northwest corner of intersection with Walker Road, Brown Road, southbound, roadway subgrade, at grade.	11/30/19	99	95	7.1	SM	M	133.2 @ 6.4	<input type="checkbox"/>
3	400' north and 8' west of northeast corner of intersection with Walker Road, Brown Road, northbound, roadway subgrade, at grade.	11/30/19	99	95	6.9	SM	M	133.2 @ 6.4	<input type="checkbox"/>
4	440' north and 4' east of northwest corner of intersection with Walker Road, Brown Road, southbound, roadway subgrade, at grade.	11/30/19	99	95	7.3	SM	M	133.2 @ 6.4	<input type="checkbox"/>
5	75' north and 6' west of northeast corner of driveway to 18275 Brown Road, northbound, roadway subgrade, at grade.	11/30/19	99	95	7.4	SM	M	133.2 @ 6.4	<input type="checkbox"/>
6	270' north and 13' west of northeast corner of driveway to 18275 Brown Road, southbound, roadway subgrade, at grade.	11/30/19	99	95	6.2	SM	M	133.2 @ 6.4	<input type="checkbox"/>
7	25' north and 16' east of northwest corner of driveway to 18845 Brown Road, northbound, roadway subgrade, at grade.	11/30/19	99	95	7.1	SM	M	133.2 @ 6.4	<input type="checkbox"/>
8	170' north and 7' east of northwest corner of driveway to 18845 Brown Road, southbound, roadway subgrade, at grade.	11/30/19	99	95	6.9	SM	M	133.2 @ 6.4	<input type="checkbox"/>
9	40' west and 4' south of northwest corner of driveway to 18865 Brown Road, westbound, roadway subgrade, at grade.	11/30/19	99	95	7.6	SM	M	133.2 @ 6.4	<input type="checkbox"/>
10	300' west and 11' south of northwest corner of driveway to 18885 Brown Road, eastbound, roadway subgrade, at grade.	11/30/19	99	95	7.1	SM	M	133.2 @ 6.4	<input type="checkbox"/>

Comments:

Scope of Observation: PERIODIC; CONTRACTOR'S OR CLIENT'S REPRESENTATIVE ADVISED

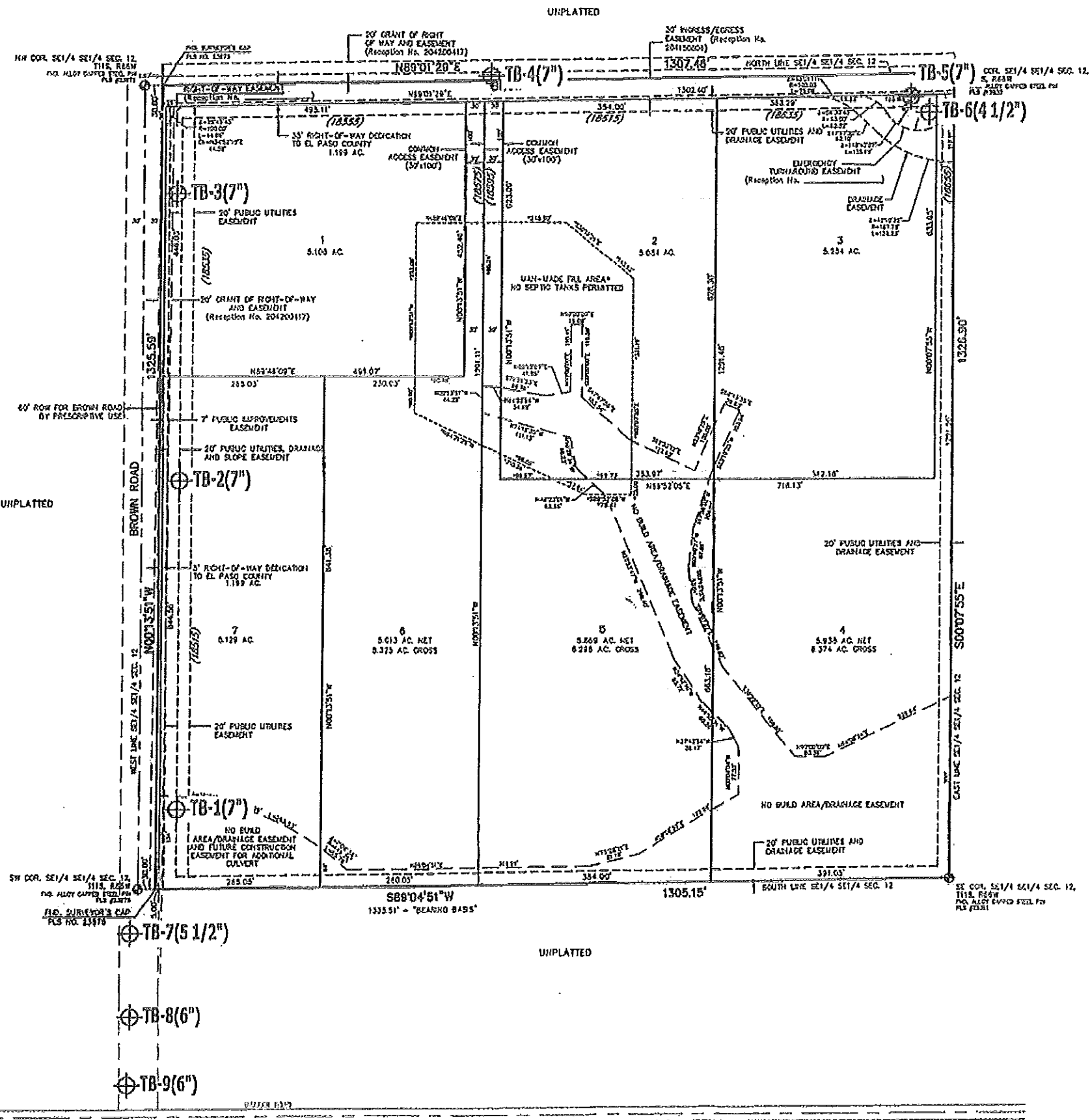


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505 Elkton Drive
Colorado Springs, CO 80937
(719) 531-5598 • (719) 531-5236 (fax)

FIELD DENSITY RESULTS

All dimensions are approximate. Cl. = Centerline

Mark H. Hauschild, P.E.



LEGEND:

⊕TB-1(X") = Test Bore No.(Depth of Road Base)

REVISIONS	BY:

ENTTECH
ENGINEERING, INC.

10000 S. RIVER RD.
DENVER, CO 80231
(719) 551-5000

SITE/SAMPLE LOCATION MAP
PRAIRIE RIDGE
EL PASO COUNTY, COLORADO
FOR: LDS, INC.

DATE: 11/29/10
SCALE: AS SHOWN
DWG NO: 101877
REVISION NO: 1
1