April 6, 2018

ENTECH
ENGINEERING, INC.

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

Alliance Builders
P.O. Box 25217
Colorado Springs, CO 80936

Attn: Steve Hood

Re: Plot Plan Review
14625 Millhaven Place
Lot 51, Cathedral Pines Filing No. 2
El Paso County, Colorado

Ref: Entech Engineering, Inc. January 18, 2001, *Soil Geology and Wastewater Study, 700 Acre Black Forest Parcel, Holmes Road and Piedra Vista, El Paso County, Colorado.* Entech Job No. 97560.

Entech Engineering, Inc. November 6, 2014, *Subsurface Soil Investigation, 14625 Millhaven Place, Lot 51, Cathedral Pines Filing No. 2, El Paso County, Colorado.* Entech Job No. 141476.

Dear Mr. Hood:

As requested, personnel of Entech Engineering, Inc. have reviewed the plot plan dated March 23, 2018 for the above referenced site. The site lies in the Cathedral Pines Subdivision that was previously investigated by Entech Engineering, Inc. as a part of the above referenced Soil, Geology and Wastewater Study.

The site was observed on April 2, 2018 by personnel of Entech Engineering, Inc. The house corners were staked at the time of this investigation. The Geology/Engineering Geology Map is presented in Figure 1. The above referenced Subsurface Soil Investigation by Entech Engineering, Inc. is presented in Appendix A.

According to the Soil, Geology and Wastewater Study, portions of the site are mapped as downslope creep areas. The areas with the potential for downslope creep have been delineated more accurately since the house corners have been staked and are indicated on Figure 1. These areas are acceptable as building sites; however, we would anticipate accelerated lateral and vertical movement of the near surface soils in the downslope creep areas. Portions of the proposed house encroach on downslope creep areas. The foundation should be stepped into the slope with downslope creep areas to a depth that achieves a 3 to 1 projection from the toe of the slope. Additional foundation reinforcement, such as tie-beams, buttresses or counterforts are recommended. The need for additional reinforcement at the extent of foundation benching should be determined at the time of the time of the open excavation observation.

A no-build area was placed in the original plot to avoid the downslope creep area. The downslope creep area particularly in the area of the proposed house, will not prohibit development. It is our opinion the proposed house location is acceptable for the site conditions and the no-build area should be modified to accommodate the proposed plan. Foundation design parameters have been provided in the Subsurface Soil Investigation.

We trust this has provided you with the information you required. If you have any questions or need additional information, please do not hesitate to contact us.

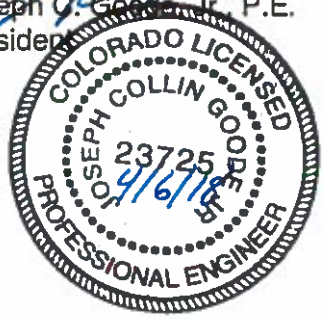
Respectfully Submitted,

ENTECH ENGINEERING, INC.

Logan L. Langford
Geologist

Reviewed by:

Joseph C. Goodell, Jr., P.E.
President

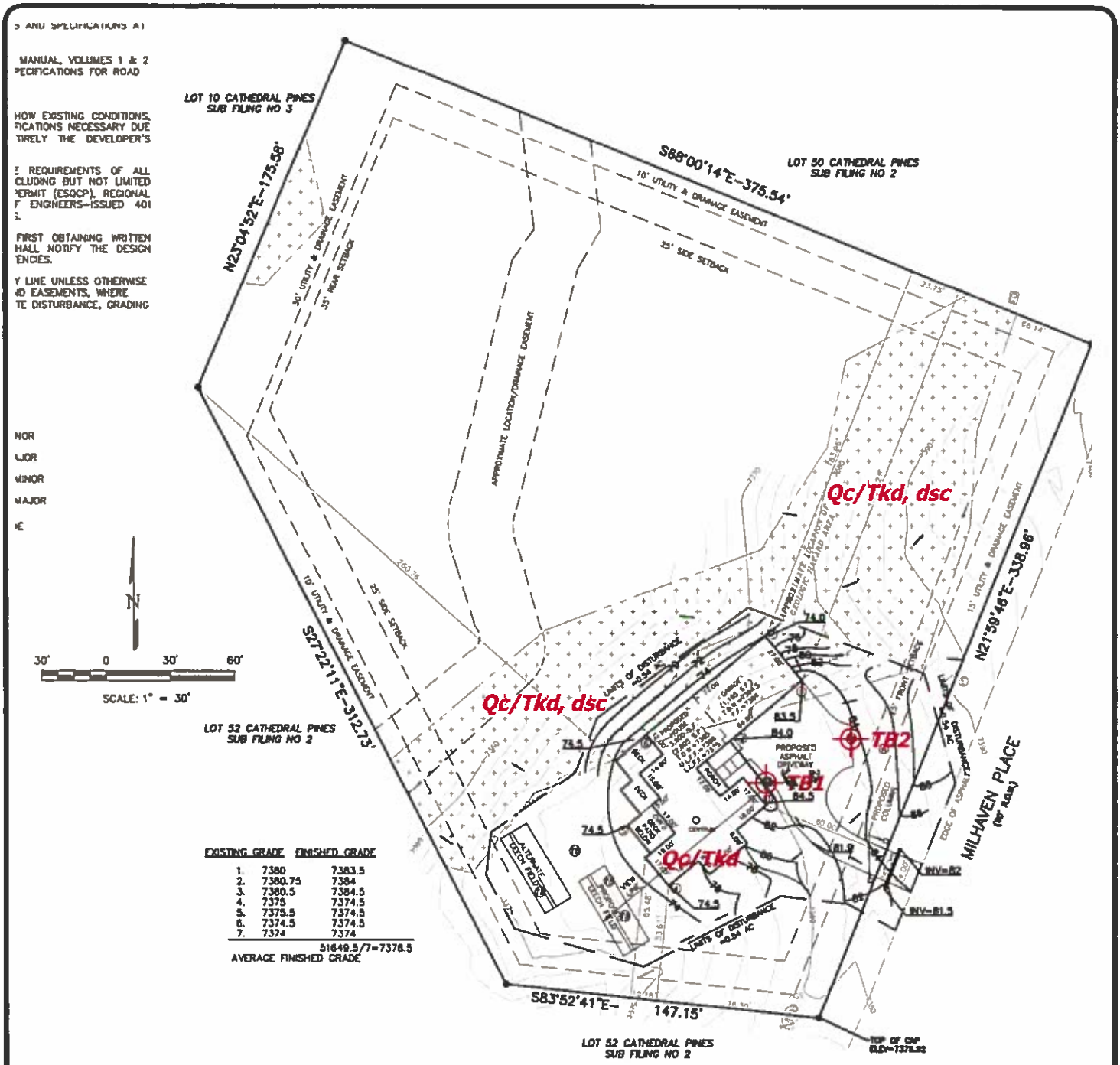


LLL/lll

Encl.

Entech Job No. 180542
AAprojects/2018/180542 ppr

FIGURES



EXISTING GRADE	FINISHED GRADE
1. 7380	7383.5
2. 7380.75	7384
3. 7380.5	7384.5
4. 7378	7374.5
5. 7375.5	7374.5
6. 7374.5	7374.5
7. 7374	7374

51649.5/7=7378.5
AVERAGE FINISHED GRADE

LEGEND:

Qc/TKd- Colluvium of Quaternary Age Overlying the Dawson Formation of Tertiary to Cretaceous Age: sheetwash and residual soil deposits overlying arkosic sandstone with siltstone and claystone lenses

dsc - downslope creep

- Test Boring Location

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

GEOLOGY/ENGINEERING GEOLOGY MAP
14625 MILLHAVEN PLACE
LOT 51, CATHEDRAL PINES FILING NO. 2
EL PASO COUNTY, CO.
FOR: ALLIANCE BUILDERS

DRAWN:	DATE:	CHECKED:	DATE:
LLL	4/6/18		

JOB NO.: 180542

FIG NO.: 1

APPENDIX A: Entech Engineering, Inc. Subsurface Soil Investigation, November 6, 2014, Entech Job No. 141476

November 6, 2014

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PHONE (719) 531-5599
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Alliance Builders
PO Box 25217
Colorado Springs, CO 80936

Attn: Steve Hood

Re: Subsurface Soil Investigation
14625 Millhaven Place
Lot 51, Cathedral Pines Filing No. 2
El Paso County, Colorado

Dear Mr. Hood:

Personnel of Entech Engineering, Inc. have drilled two shallow test borings at the site referenced above. Specific findings for the site are presented in this letter.

Soil Classification:

Soil types observed in the test borings drilled on this site were found to consist of silt-sand and very silty to slightly silty sand overlying slightly silty sandstone.

Allowable Bearing Capacity:

An allowable bearing capacity of 2400 psf is anticipated for the reconditioned site sand-silt and very silty sand and is recommended for the native silty sand. An allowable bearing pressure of 3500 psf is recommended for the undisturbed sandstone and 2800 psf is anticipated for structural fill, if overexcavation is required. An equivalent hydrostatic fluid pressure (in the active state) of 45 pcf is recommended for this site

Soil Moisture Conditions:

Moist.

Expansion Potential:

An expansion pressure of 270 psf with 0.09% volume change and 5.0% moisture increase was determined by laboratory tests on a sample of sand-silt from Test Boring No. 1 at a depth of 5 feet. This magnitude of expansion is in the low expansion range.

Swell/Consoildation testing resulted in a consolidation of 0.9%, which is in the moderate consolidation range for a sample of very silty sand from Test Boring No. 2 at a depth of 10 feet.

Fill:

None.

Special Considerations:

Collapsible silt-sand and very silty sand were encountered in the test borings at the anticipated footing depth. It is recommended that a 3 foot layer of the soils below foundation members be moisture-conditioned and recompacted in place. This will require an overexcavation of 2 feet, scarification and moisture-conditioning and compacting the subgrade and then replacing the excavated soil. The backfill soils should be compacted in lifts not to exceed 6 inches after compaction, while maintaining a minimum of 95% of its maximum Modified Proctor Dry Density, ASTM-1557. The soils should be placed at a moisture content conducive to adequate compaction, and frequent density tests should be taken. The overexcavated site should be inspected by a representative of Entech Engineering, Inc. prior to fill placement and the first density test should be conducted when 18 inches of fill have been placed.

Claystone, which can exhibit a moderate to high expansion potential, is common in this area. If highly expansive materials are encountered at or within 4 feet of foundation grade, removal and replacement with a granular non-expansive structural fill may be required. The need for overexcavation will be determined at the time of the open excavation observation.

The potential for a combination of high bearing sandstone and moderate bearing on-site sand or reconditioned site materials exists on this site, depending on the conditions. The foundation should rest on soils with similar bearing capacities. If a majority of the soils encountered at foundation levels is sandstone, the remainder of the foundation components should rest on compacted on-site fill placed at 95% of its maximum Modified Proctor Dry Density, ASTM D-1557. If the majority of soil is to be on-site sand fill, the sandstone should be overexcavated 2 feet and replaced with on-site or structural fill placed at 95% of its maximum Modified Proctor Dry Density, ASTM D-1557.

Several natural drainages are located in the vicinity of the proposed house. The structure should be located a minimum of 25 feet away from any of the drainages. Smaller drainages and/or sheet and surface flows that are directed towards the house location must be backfilled and the flows diverted away from the house by regrading and the installation of culverts and swales as required.

Due to the sloping conditions in the drainages on this lot, additional reinforcing and foundation stiffeners such as tie-beams or counterforts may be required if the foundation encroaches on the drainages or steeply sloping areas. The need for additional reinforcing or stiffeners should be evaluated once the final building location has been staked.

Excavation of the site sandy soils should be moderate with rubber-tired equipment. Track-mounted equipment may be required due to the dense sandstone. Site materials may be acceptable for use as structural fill, pending approval by Entech Engineering, Inc.

Foundation Type:

A spread footing (16")/stemwall foundation system in conjunction with possible removal and recompaction is anticipated for this site. Point load bearing pads should be sized for the allowable bearing capacity given. **This does not constitute a foundation design.** Qualified personnel should verify that building loads do not exceed the bearing value given in this letter. The bottoms of exterior foundations should be located at least 30 inches below finished grade for frost protection.

Foundation Configuration Remarks:

The configuration of the foundation system is critical to its performance. The position of foundation windows, jogs, steps and the relative elevation of adjacent and opposite walls determine foundation performance. Improper placement of the above can result in differential and lateral foundation movement. In addition, foundation walls over 4 feet in height should not span over 30 feet in length without specific design.

Reinforcing:

Reinforcing should be designed to permit foundation walls to span a minimum of 10 feet under the design load. Foundation walls retaining over 4 feet of soil should be designed to resist an equivalent fluid pressure (in the active state) of 45 pcf. Highly expansive soils should not be used as backfill.

Floor Slabs:

Floor slabs-on-grade, if any, should be separated from structural portions of the building and allowed to float freely. Interior partitions must be constructed in such a manner that they do not transmit floor slab movement to the roof or overlying floor. Backfill placed below floor slabs should be compacted to a minimum of 95% of its maximum Modified Proctor Dry Density, ASTM D-1557.

Drainage and Grading:

The ground surface must be sloped away from the building to provide positive drainage away from the foundation. We recommend an equivalent slope of 6 inches in the first 10 feet (5%) surrounding the structure, where possible, or as required to quickly remove surface water. Where a 5% slope cannot be achieved practically, such as around patios, at inside foundation corners, and between a house and nearby sidewalk, we believe it is desirable to establish as much slope as possible and to avoid irrigation in the area. Roof downspouts should discharge beyond the limits of backfill. We recommend providing splash blocks and downspout extensions to discharge runoff beyond the limits of backfill.

Homebuyers should maintain the surface grading and drainage installed by the builder to assure water is not directed toward the foundations and does not pond near the house. Landscaping should be carefully designed to minimize irrigation adjacent to the foundation. We do not recommend use of impervious plastic membranes below landscaped areas near foundations; geotextile fabrics can control weed growth while allowing evaporation. Plants used close to foundation walls should be limited to those with low moisture requirements; irrigated grass should not be located within 5 feet of the foundation. Sprinklers should not discharge water within 5 feet of foundations. Irrigation should be limited to the minimum amount sufficient to maintain vegetation. Application of more water will increase the potential for slab and foundation movements.

Subdrain:

A subsurface perimeter drain should be placed around useable space below grade and is recommended around the entire structure if expansive soils are encountered in the foundation excavation. A typical drain detail is attached.

Backfill:

Backfill should be compacted to 95% of its maximum Modified Proctor Dry Density, ASTM D-1557. Backfill must be compacted by mechanical means. No water flooding techniques of any type should be used in the compaction of backfill on this site. Expansive soils are not to be used as foundation backfill.

Concrete:

Type II cement is recommended for all concrete on this site. Concrete should not be placed on frozen or wet ground. Care should be taken to prevent the accumulation and ponding of water in the footing excavation prior to the placement of concrete. If standing water is present in the excavation, it should be removed by installing sumps and pumping the water away from the building area. If concrete is placed during periods of cold temperatures, the concrete must be kept from freezing. This may require covering the concrete with insulated blankets and heating to prohibit freezing.

Open Foundation Excavation Observation:

The open foundation excavation should be observed prior to construction of the foundation in order to verify that no anomalies are present, that materials at the proper design bearing capacity have been encountered, and that no soft spots or debris are present in the foundation area.

Remarks:

The recommendations provided in this letter are based upon the observed soil parameters, anticipated foundation loads, and accepted engineering procedures. The recommendations are intended to minimize differential movement resulting from the heaving of expansive soils or resulting from settlement induced by the application of building loads. It must be recognized that the foundation may undergo movement. In addition, concrete floor slabs may experience movement; therefore, adherence to those recommendations which would isolate floor slabs from columns, walls, partitions or other structural components is extremely important, if damage to the superstructure is to be minimized. Any subsequent owners should be apprised of the soil conditions and advised to maintain good practice in the future with regard to surface and subsurface drainage, framing of partitions above floor slabs, drywall and finish work above floor slabs, etc.

We trust this has provided you with the information you required. If you have any questions or need additional information, please do not hesitate to contact us.

Respectfully Submitted,

ENTECH ENGINEERING, INC.

Daniel P. Stegman

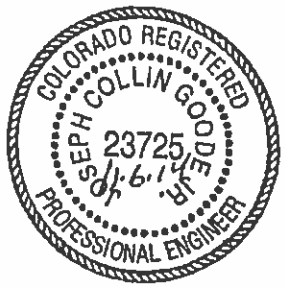
DPS/crf

Encl.

Entech Job No. 141476
2MSW/lel/2014/141476 ssl

Reviewed by:

Joseph C. Goode, Jr., P.E.
President



TEST BORING NO 1
DATE DRILLED 10/21/2014
Job # 141476

REMARKS

DRY TO 20', 10/22/14

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
			13	7.1	
5			19	5.8	
10			21	6.6	
15			24	6.4	
20			50 7"	5.0	

SILT-SAND, FINE GRAINED, FIRM TO STIFF, BROWN, MOIST

SAND, SILTY, FINE TO COARSE GRAINED, BROWN, MEDIUM DENSE, MOIST

SANDSTONE, SLIGHTLY SILTY, FINE TO COARSE GRAINED, TAN, VERY DENSE, MOIST

TEST BORING NO. 2
DATE DRILLED 10/21/2014
CLIENT ALLIANCE BUILDERS
LOCATION 14625 MILLHAVEN PLACE

REMARKS

DRY TO 20', 10/22/14

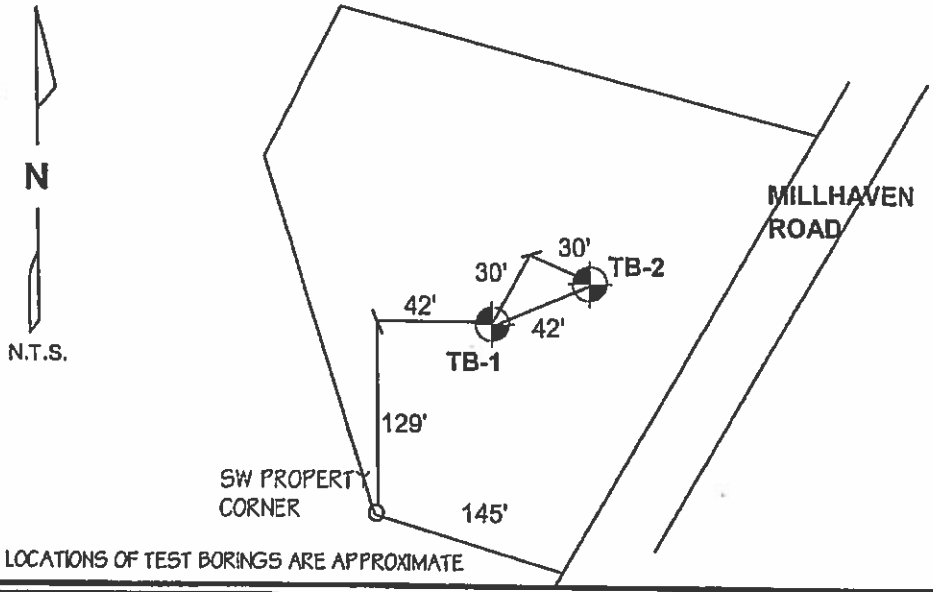
Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
			22	4.1	
5			11	7.8	
10			24	6.6	
15			17	8.0	
20			50 7"	6.8	

SAND, SLIGHTLY SILTY, FINE TO COARSE GRAINED, TAN, MEDIUM DENSE, MOIST

SAND, VERY SILTY, FINE GRAINED, BROWN, MEDIUM DENSE, MOIST

SAND, SILTY, FINE TO COARSE GRAINED, TAN, MEDIUM DENSE, MOIST

SAND, SLIGHTLY SILTY, FINE TO COARSE GRAINED, TAN, VERY DENSE, MOIST



LOCATIONS OF TEST BORINGS ARE APPROXIMATE

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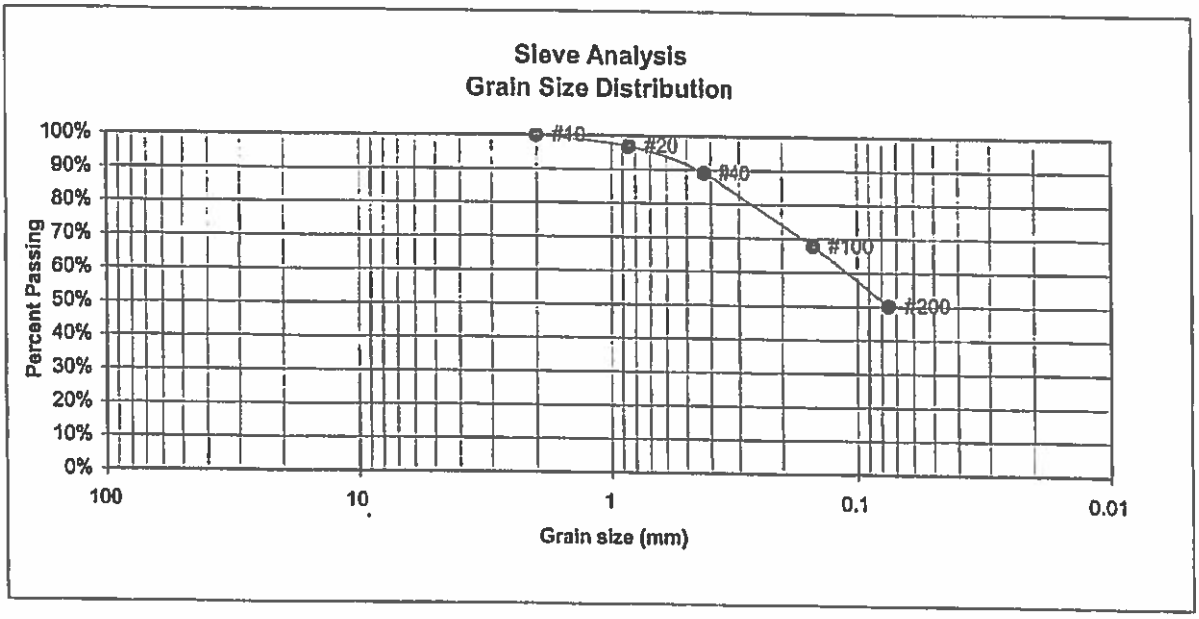
COLORADO SPRINGS, COLORADO 80907

TEST BORING LOG

DRAWN:	DATE:	CHECKED:	DATE:
		DS	11/5/14

JOB NO.: 141476
FIG NO.: 1

BORING NO. 1		UNIFIED CLASSIFICATION ML-SM	TEST BY BL
DEPTH(ft) 5		AASHTO CLASSIFICATION	JOB NO. 141476
CLIENT	ALLIANCE BUILDERS		
PROJECT	14625 MILLHAVEN PLACE		



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	
10	100.0%
20	96.9%
40	89.1%
100	67.7%
200	50.1%

Atterberg Limits

Plastic Limit	
Liquid Limit	
Plastic Index	

Swell

Moisture at start	12.4%
Moisture at finish	17.4%
Moisture increase	5.0%
Initial dry density (pcf)	107
Swell (psf)	270

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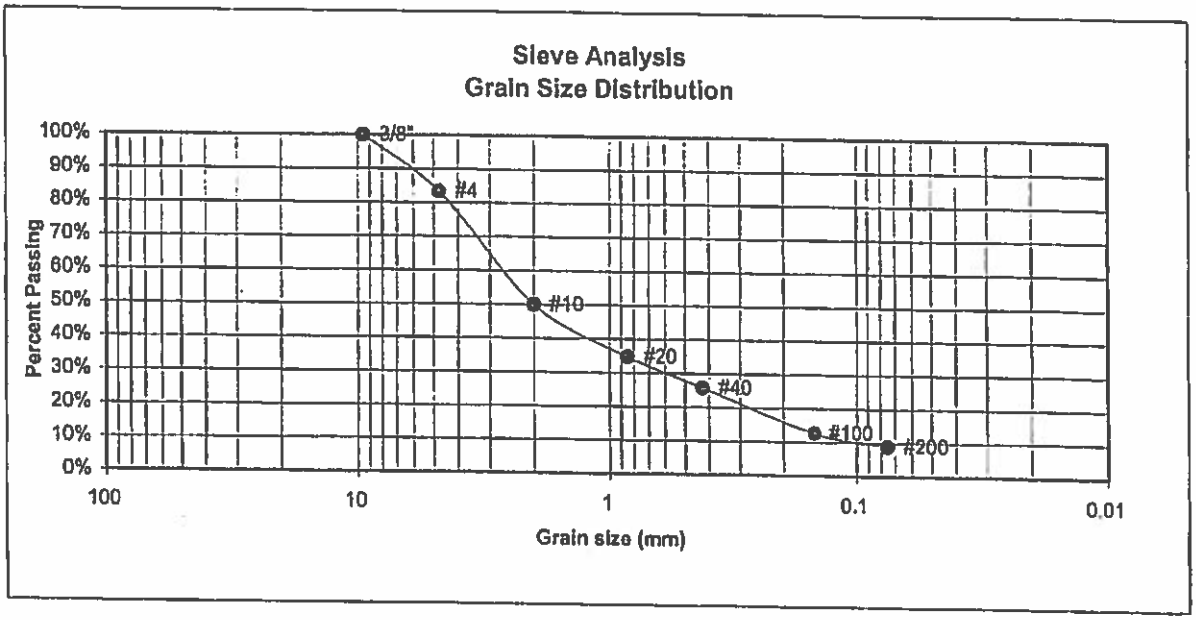
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		DS	11/3/14

JOB NO.: 141476
FIG NO.: 2

BORING NO. 1		UNIFIED CLASSIFICATION SM-SW	TEST BY BL
DEPTH(ft) 20		AASHTO CLASSIFICATION	JOB NO. 141476
CLIENT	ALLIANCE BUILDERS		
PROJECT	14625 MILLHAVEN PLACE		



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	83.3%
10	49.9%
20	34.8%
40	25.7%
100	12.7%
200	9.0%

Atterberg Limits
Plastic Limit
Liquid Limit
Plastic Index

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

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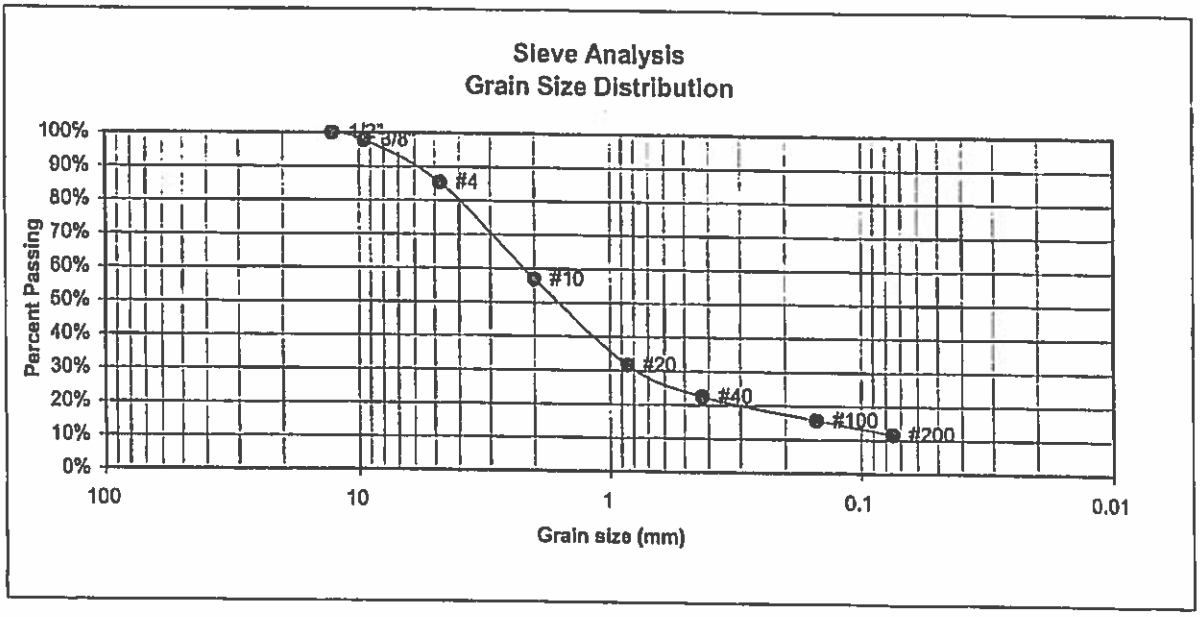
505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		DS	11/3/14

JOB NO.: 141476
FIG NO.: 3

BORING NO. 2		UNIFIED CLASSIFICATION SM-SW	TEST BY BL
DEPTH(ft) 2-3		AASHTO CLASSIFICATION	JOB NO. 141476
CLIENT	ALLIANCE BUILDERS		
PROJECT	14625 MILLHAVEN PLACE		



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	100.0%
3/8"	97.9%
4	85.4%
10	56.9%
20	31.6%
40	22.6%
100	15.7%
200	11.7%

Atterberg Limits
Plastic Limit
Liquid Limit
Plastic Index

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

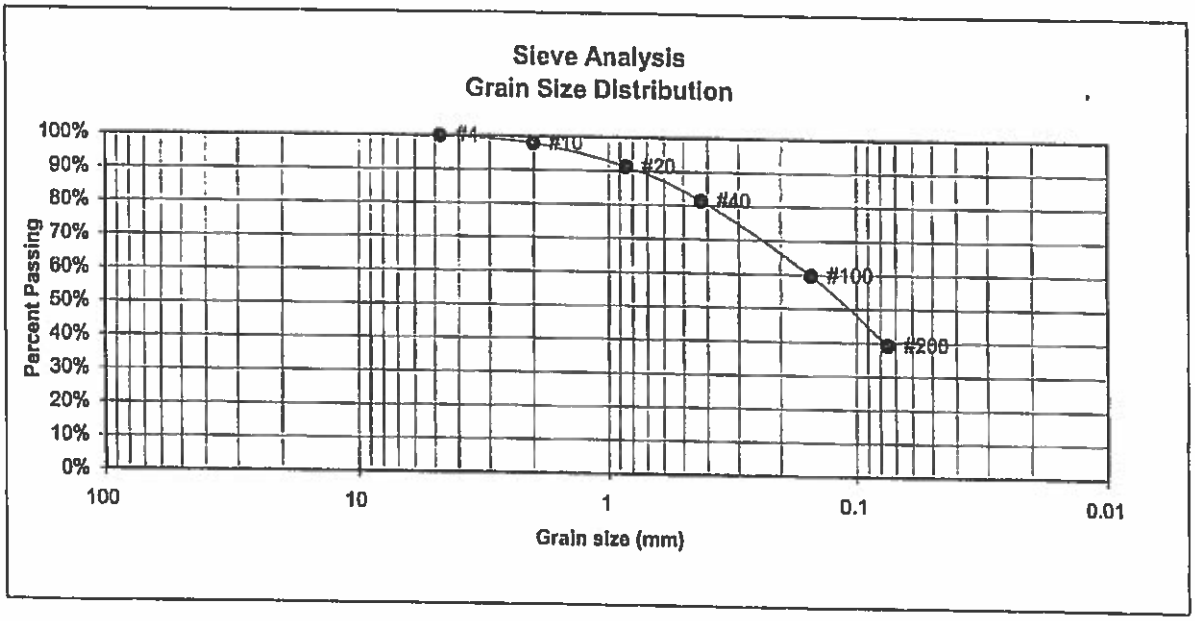
ENTECH ENGINEERING, INC.
506 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		TB	11/3/04

JOB NO.: 141476
FIG NO.: 4

BORING NO. 2		UNIFIED CLASSIFICATION SM	TEST BY BL
DEPTH(ft) 10		AASHTO CLASSIFICATION	JOB NO. 141476
CLIENT	ALLIANCE BUILDERS		
PROJECT	14625 MILLHAVEN PLACE		



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	97.9%
20	91.3%
40	81.4%
100	59.7%
200	39.2%

Atterberg Limits
Plastic Limit
Liquid Limit
Plastic Index

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

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505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

LABORATORY TEST RESULTS

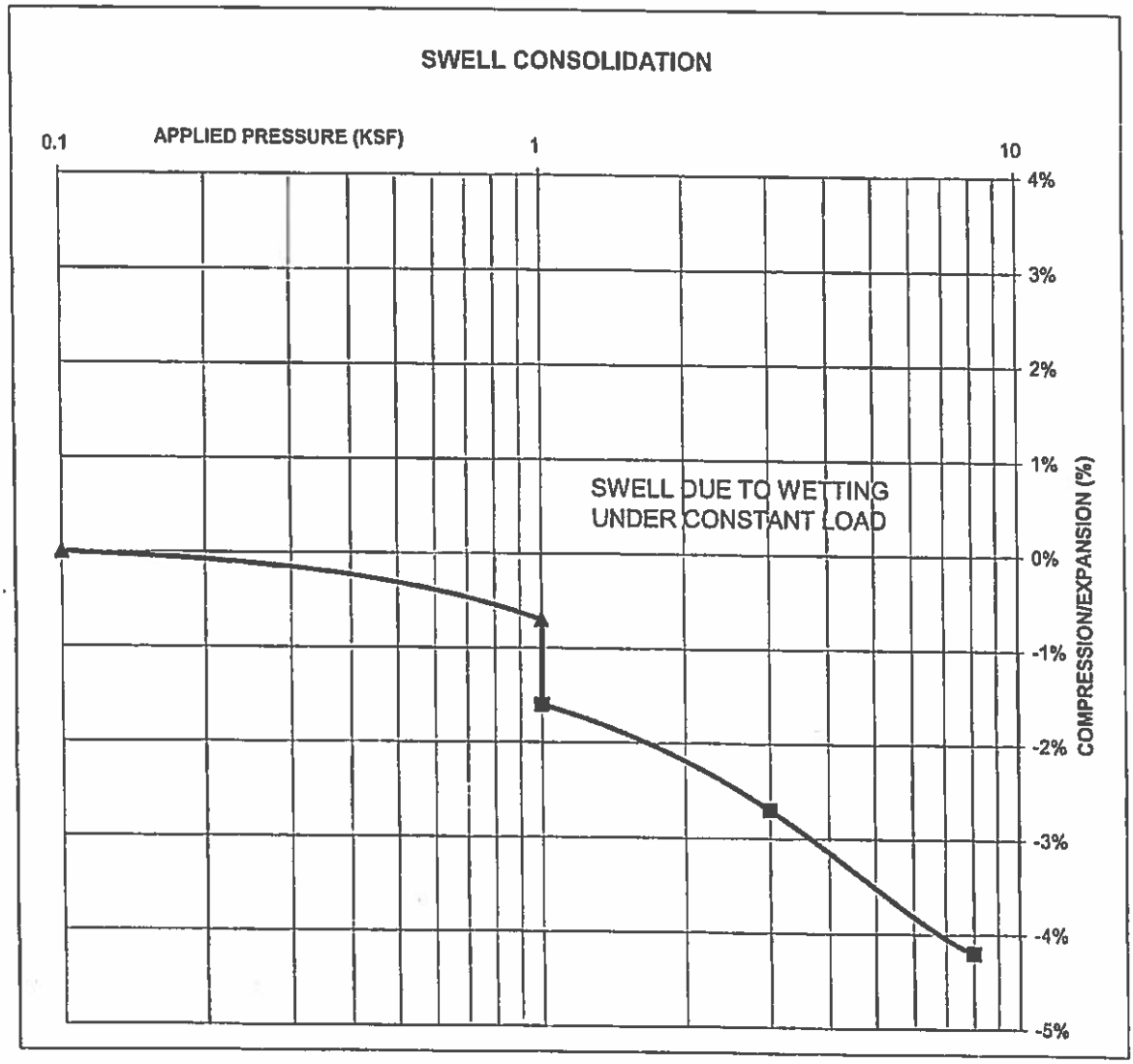
DRAWN:	DATE:	CHECKED:	DATE:
		DS	11/3/14

JOB NO.: 141476
FIG NO.: 5

CONSOLIDATION TEST RESULTS

SAMPLE FROM:	2	DEPTH(ft)	10
DESCRIPTION	SAND, SILTY		
NATURAL UNIT DRY WEIGHT (PCF)			105
NATURAL MOISTURE CONTENT			7.6%
SWELL/CONSOLIDATION (%)			-0.9%

JOB NO. 141476
CLIENT ALLIANCE BUILDERS
PROJECT 14625 MILLHAVEN PLACE



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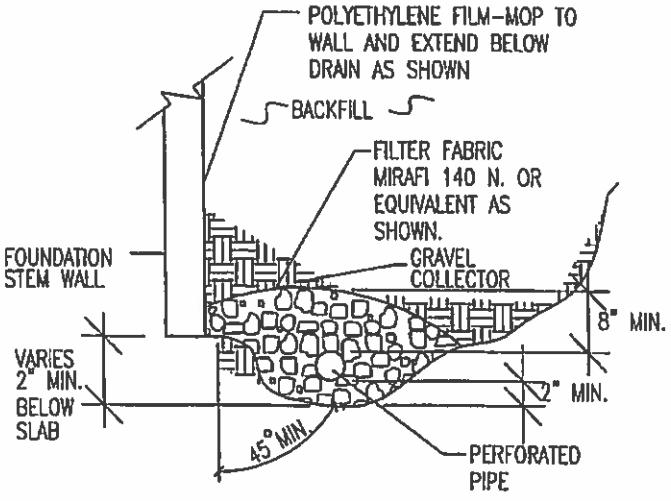
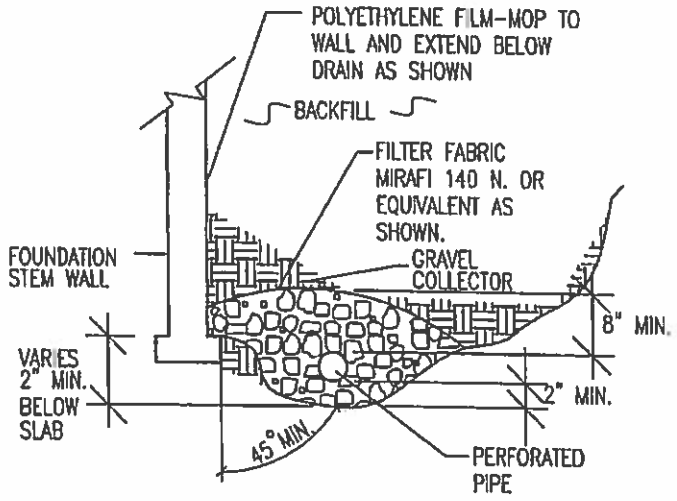
ENGINEERING, INC.
505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

SWELL CONSOLIDATION
TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		DJ	11/3/14

JOB NO.: 141476
FIG NO.: 6





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.

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

PERIMETER DRAIN DETAIL

DRAWN:	DATE:	DESIGNED:	CHECKED:
			PJ

JOB NO.: 14147

FIG NO.: 7