Add PCD File No. MS232

UNRESOLVED V1:
Please see Code and include ALL components;In addition to these requirements set forth in this Code, the ECM requires geologic hazards and geotechnical reports addressing site constraints and mitigation for projects involving construction of public improvements. The DCM Volume 1 addresses the need for geotechnical analyses for embankment structures and DCM Volume 2 addresses geotechnical construction requirements for water quality best management practices (BMPs).

See Land Development Code 8.4.9 and the ECM for requirements

PARR ENGINEER
& CONSULTING
Christopher L. Parr, P.E. Principal
11590 Black Forest Road, Suite 10, Colorad
Office: 719-494-0404 Cell: 719-659-1313

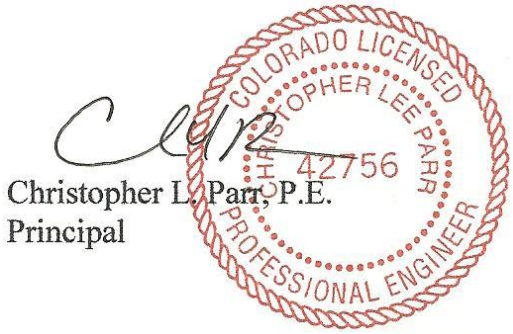
November 20, 2013

Project: **Subsurface Soil Investigation**
7630 Bent Grass Meadow Drive, 80831

Attached is a formal soils report for the project referenced above. Included in this report is a review of the soils investigation and analysis for this location. The purpose of our investigation was to evaluate the conditions of the subsurface soil in order to establish design and construction criteria for the proposed structure(s). A discussion of the results of our investigation with construction recommendations is also included. If revisions to the design of the proposed structure take place, it is advised that our firm be contacted immediately to review the changes and to determine if the revised plans are acceptable.

If you have any questions concerning this report please feel free to contact our office at 719-494-0404.

Sincerely,



Christopher L. Parr, P.E.
Principal

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Purpose and Scope of Study

This report presents the results of a subsurface exploration program to provide foundation recommendations for the proposed structure to be located on the parcel of land referenced above.

A field exploration program was conducted in order to obtain information regarding the subsurface conditions. Soil samples were retrieved from an exploratory soils boring and analyzed to provide data on the classification and engineering characteristics of the on-site soils. The results of the field and laboratory investigation are presented herein.

This report has been prepared to summarize the data obtained and to present our conclusion and recommendations based on the proposed construction and the subsurface conditions encountered. Design criteria and a discussion of the geotechnical engineering considerations related to the construction of the proposed structure are included.

Proposed Construction

Based on the information provided, the proposed construction will consist of a 1-story, block & metal storage building supported on a reinforced concrete, shallow foundation system. We anticipate maximum structural loadings of 3000 pounds per lineal foot for distributive wall loads and 15 kips for concentrated loads.

If the project features or loadings differ significantly from those above, our firm should be contacted to reevaluate the recommendations contained herein.

Field Investigation

The field investigation for this project was conducted on November 18, 2013.

A 4" diameter exploratory boring was drilled to approximately 20 feet in the area of the proposed construction. Standard penetration testing (SPT) was conducted during the drilling process. *The SPT measures resistance to penetration of a standard split-spoon sampler that is driven by a 140 lbm hammer dropped from a height of 30 in. The number of blows required to drive the sampler a distance of 12 in. after an initial penetration of 6 in. is referred to as the N-value or standard penetration resistance in blows per foot.*

The soil encountered during the drilling process was collected for subsequent laboratory evaluation and testing.

Laboratory Investigation

The field samples obtained were analyzed and classified in the laboratory. Laboratory testing included standard property tests, natural water content, Atterberg limits and Expansion Index tests.

The laboratory testing was conducted in general accordance with ASTM specifications.

Subsurface Conditions

The soil lithology of the subsurface conditions includes SAND from the surface to approx. 19 feet below grade overlain on CLAY/SILT from 19 feet to the total explored depth of the boring. The bearing depth based on the proposed construction was determined to be approx. 3-5 feet below ground surface. Laboratory results of the sample obtained at the proposed bearing depth are documented below.

Soil Classification	Fines	Sand	Gravel	LL[1]	PI[2]	EI[3]	Expansive Potential
Well Graded Sand with Silt (SW-SM)	8.1%	83.8%	8.0%	NP[4]	NP	**N/A**	**Very Low**

LL – Liquid Limit [1]
PI – Plasticity Index [2]
EI – Expansion Index [3]
NP – Nonplastic[4]

Groundwater was encountered at approximately 7 feet below grade during the time of our investigation and remained constant when measured 24 hours later. The elevation of the water table can be expected to fluctuate due to seasonal changes, degree of irrigation and/or other factors.

Foundation Recommendations

Considering the subsurface conditions encountered on-site and the nature of the proposed construction, we recommend that the proposed structure be founded on a thickened-edge, monolithic slab foundation system placed on native undisturbed soil. **Foundation elements shall be designed for a maximum allowable bearing pressure of 1500 lb/ft^2.**

Existing topsoil, silt or deleterious materials if encountered below the foundation must be removed.

Foundation Walls

Foundation walls which are laterally supported and can be expected to undergo a minimal amount of deflection ("at-rest condition") may be designed for a lateral earth pressure computed on the basis of an **equivalent fluid unit weight of 45 pcf for onsite material**.

All foundation walls should be designed for appropriate hydrostatic and surcharge pressures such as adjacent buildings, traffic and construction materials and equipment. The pressures recommended above assume a relatively horizontal backfill surface.

The onsite excavated materials may be used as foundation wall backfill. Backfill shall be carefully placed in uniform lifts and properly compacted near optimum moisture content. Care should be taken not to overcompact the backfill since this could cause excessive lateral pressure on the walls. Some settlement of deep foundation wall backfill will occur even if the material is placed correctly.

Open Excavation Observation

It is assumed that the results in this report are representative of the subsurface conditions throughout the site. However, variations across the site are a possibility and will not become evident until the foundation excavation is complete.

A representative of Parr Engineering & Consulting shall be contacted to inspect the completed foundation excavation prior to the placement of any formwork. Please contact our office a minimum of 24 hours prior to the requested site visit. This report may be rendered null and void if the open excavation observation is not completed.

Floor System Recommendations

Floor Slabs should be provided with control joints to reduce damage that may occur as a result of shrinkage cracking. We suggest the spacing of the joints to be no more than 20 feet centers. The actual joint spacing should be based on the slab reinforcing design.

Surface Drainage

The following drainage precautions should be observed during the construction and maintained at all times after the residence has been completed.

1) Excessive wetting and drying of the foundation excavations and underslab areas should be avoided during construction.
2) The ground surface surrounding the exterior of the building should be sloped to drain away from the foundation in all directions. We recommend a minimum slope of 12 inches in the first 10 feet.
3) Roof downspouts and drains should discharge well beyond the limits of the backfill.
4) Landscaping which requires excessive watering should be located at least 10 feet from the house.
5) Plastic membranes should not be used to cover the ground surface adjacent to the foundation walls.

Subsurface Drainage

A subsurface foundation drain or equivalent protection measure is recommended to direct subsurface water away from the foundation system.

Limitations

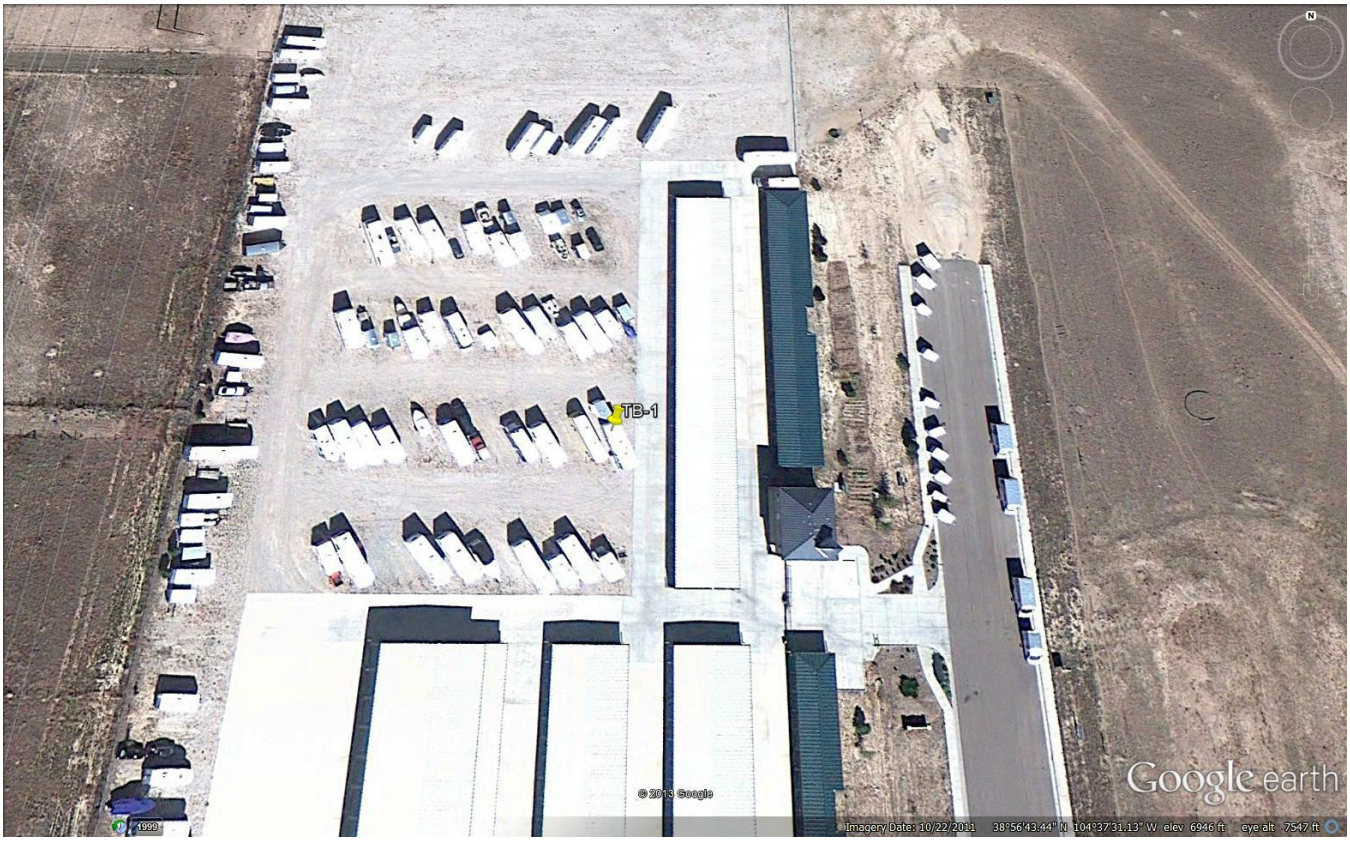
This report has been prepared with generally accepted soil and foundation engineering practices in this area for use by the client for design purposes. The conclusions and recommendations presented are based on data obtained from the exploratory boring. The nature and extent of variation from the boring may not become evident until excavation is performed. If during construction, soil, rock and groundwater conditions appear to be different from those described herein, our office should be advised immediately so that reevaluation of the recommendations may be made.

Although all laboratory procedures were performed under optimal conditions, it should be noted that precautions should be taken to accommodate for certain sources of failure such as inconsistencies in the properties/characteristics of the on-site soil, variations in groundwater levels due to seasonal changes, etc.

This report DOES NOT address the potential for geologic hazards or constraints (i.e., slope stability, landslides). It must be emphasized that such hazards and constraints are outside the scope of this investigation and must be investigated independently.

Any subdivision requires a soils and GEOLOGY report. Please provide documentation to address geologic hazards/constraints

Site Map


TB-1
© 2013 Google
Google earth
Imagery Date: 10/22/2011 38°56'43.44" N 104°37'31.13" W elev 6946 ft eye alt 7547 ft

Laboratory Analysis – Sieve Analysis

SOIL CLASSIFICATION

Location of Site	7630 Bent Grass Meadow Drive, 80831	Tested By:	C. Shaw
		Date Tested	11/19/13
Legal Description	N/A		
		Collected By	D. Mizicko
Job Number	CS.13.289	Date Collected	11/18/13

SITE INVESTIGATION

Total Depth Boring	20'	Groundwater Table	N/A
Surface Layer Thickness	6"	Volume of Soil Sample	1 cu.ft.
Soil System	Multiple Layer	Visual Moisture Observation	Moist

Layer	Soil Type/Depth		
Surface	(SW-SM)/0-6"	Critical Layer	1
No. 1	(SW)/6"-19'	Coloration	L. Brown
No. 2	(CL-ML)/19'-20'	Odor	Little-None
No. 3		Organic Content	Little-None
		Gravel	N/A

SIEVE ANALYSIS

Layer	1	Wet Weight of Soil (g)	870.8
		Dry Weight of Soil (g)	834.1
Depth of Sample	5'	Natural Moisture Content	4.4%

Sieve #	Thickness (mm)	Mass Ret. (g)	% Ret.	%Pass			
						Coarse	767.7
4	4.750	66.8	8.0%	92.0%	Gravel		
10	2.000	199.8	24.1%	67.9%	Sand		
40	0.425	339.9	40.9%	27.0%			
60	0.250	81.8	9.8%	17.2%			
100	0.150	44.6	5.4%	11.8%			
200	0.075	30.3	3.6%	8.1%			
Pan	0.000	67.6	8.1%	0.0%	Fines		
Pan	0.000	0.0	0.0%	0.0%	Organic		
Totals		830.8	100.0%				

% Gravel	8.0%	$C_u = D_{60}/D_{10}$ =	14.55
% Sand	83.8%		
% Fines	8.1%	$C_c = D_{30}^2/(D_{10})(D_{60})$ =	1.26
% Organic	0.0%		
Check	100.0%		

Laboratory Analysis – Atterberg Limits

ATTERBERG LIMITS

LIQUID LIMIT - LL

Cup #	# Drops	Tin Mass(g) Empty	Wet Soil	Dry Soil	Water Mass (g)	Solids Mass (g)	Water Content
1	NONPLASTIC						
2							
3							

Liquid Limit (from plot)	**NP**

PLASTIC LIMIT - PL

Cup #	Tin Mass(g) Empty	Wet Soil	Dry Soil	Water Mass (g)	Solids Mass (g)	Plastic Limit (PL)
1	NONPLASTIC					
2						
					Average	

Plastic Limit	**NP**

Note: Liquid Limit, Plastic Limit and Plasticity Index values have been rounded to nearest whole number when expressing as a percentage.

PLASTICITY INDEX - PI

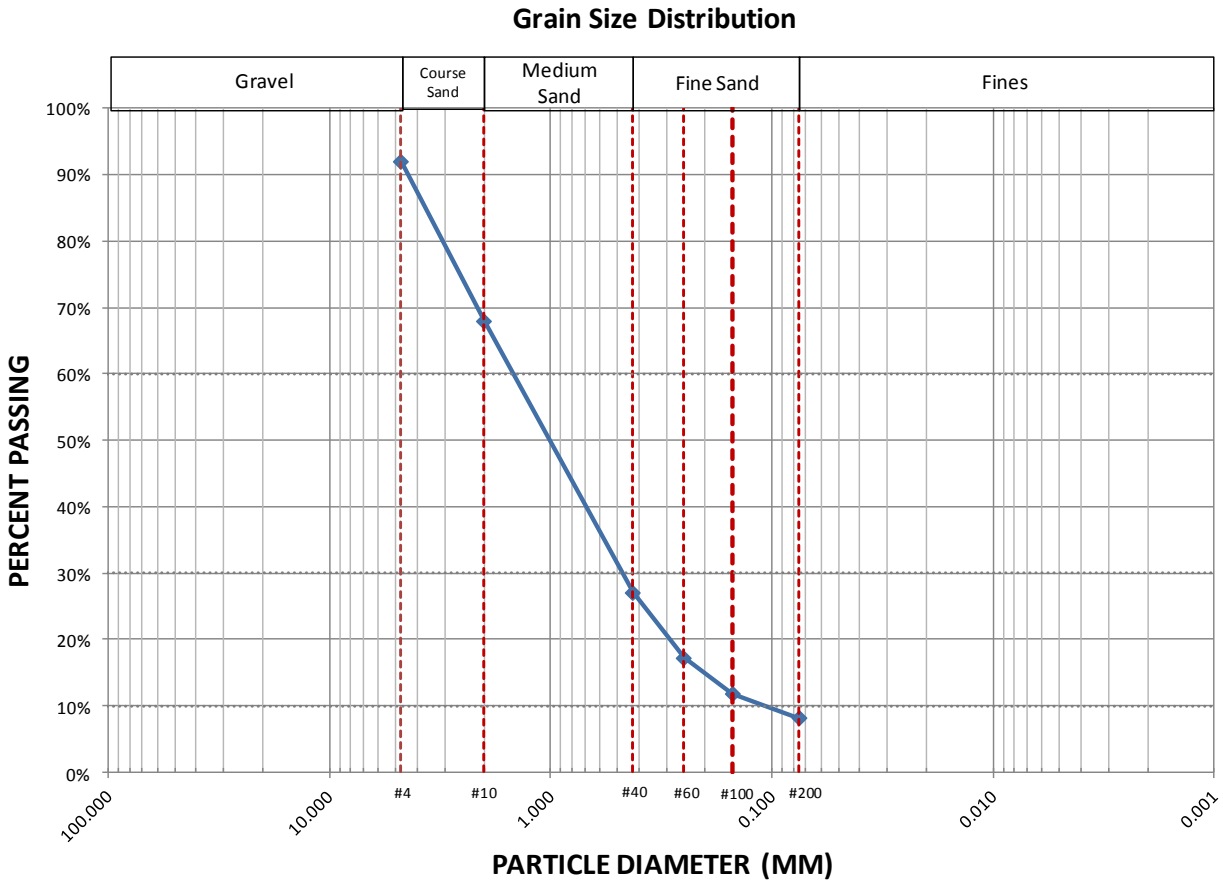
Plasticity Index = Liquid Limit - Plastic Limit

Plasticity Index	**NP**

CLASSIFICATION

Group Symbol	**(SW-SM)**
Group Name	**Well Graded Sand with Silt**

Laboratory Analysis – Grain Size Distribution



Drill Log/Profile

Parr Engineering & Consulting, Inc.
11590 Black Forest Road, Suite 10
Colorado Springs, Colorado 80908
Phone: 719-494-0404

BORING LOG

Job Number:	CS.13.289
Date Drilled:	11/18/2013
Boring #:	Test Boring #1

Driller:	D.Mizicko	Total Depth:	20'
Logged By:	D.Mizicko	Groundwater Elevation Below Grade:	7'-5"
Auger:	Drill Rig	Latitude:	38° 56' 43.37"
Auger Size:	4"	Longitude:	104° 37' 31.61"

Depth (ft.)	Sample Interval	SPT Blows 6"/12"/18"	Description	Comments
			Sand, Fine-Medium Grained, Trace Gravel, Some Silt, Tan , Moist, Loose (SW-SM)	
5				
		8/20/35	Sand, Coarse Grained, Some Garvel, Tan, Saturated, Medium Density (SW)	
10			**Groundwater @ Approx. 7 feet below grade**	
15				
		26/50+@7"		
20			Clay, Silty, Some Sand, Medium Plasticity, Wet, Firm-Hard (CL-ML)	
			Total Depth = 20'	
25				
30				