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SUBSURFACE SOIL INVESTIGATION AND PAVEMENT THICKNESS DESIGN

PARKING LOT & ALLEY DESIGN
FOUNTAIN, COLORADO

NOLTE ASSOCIATES, INC.
1975 RESEARCH PARKWAY, #165
COLORADO SPRINGS, COLORADO
80920

SUBSURFACE SOIL INVESTIGATION AND PAVEMENT THICKNESS DESIGN

Parking Lot and Alley Design
Fountain, Colorado

PREPARED FOR:

Nolte Associates, Inc.
1975 Research Pkwy # 165
Colorado Springs, CO 80920

JOB NO. 124917
May 24, 2010

Respectfully Submitted,
RMG ENGINEERS GROUP

COLORADO REGISTERED
RICHARD E. WEBB
31527
5/25/10
PROFESSIONAL ENGINEER

Richard E. Webb, P.E.
Senior Geotechnical Engineer

Reviewed By:

Nathan A. Dowden, P.E.
Principal Geotechnical Engineer

TABLE OF CONTENTS

SUMMARY

Location: The parking lot and alley considered in this investigation is located in Fountain, Colorado. The approximate locations of the parking lot and alley are shown on the Site Vicinity Map, Figure 1.

Project Description: The City of Fountain Utilities will be remodeling the existing building located at 102 North Main Street. As part of the remodel, the parking lot (approximately 90 feet long and 60 feet wide) and alley (approximately 370 lineal feet, 16 feet wide) will be paved. To assist in attaining LEED™ certification, implementation of a porous pavement system is desired for the parking lot and alley. This subsurface soil investigation and pavement thickness design was performed to evaluate the subsurface conditions at the site of the parking lots and to develop recommendations for the design and construction of the proposed pavement systems.

Site Conditions: At the time of our field exploration, the existing alley was unpaved. Overhead and underground utilities were located within and along the sides of the alley. Vegetation within and along the alley generally consisted of sparse grass and weeds with several large, mature deciduous trees. The surface of the parking lot consisted of deteriorated asphalt concrete which exhibited alligator cracking and potholes. There was grass and weeds growing through the cracks in the pavement. General topography of the area slopes gently to the south and west.

Subsurface Materials: The soils encountered consisted of sandy clay and clayey sand. Field percolation tests indicated these soils possess very poor infiltration characteristics.

Groundwater: Groundwater was not encountered in the test borings during drilling. Groundwater is not expected to affect the construction of the pavements.

Pavement Thickness Recommendations: Flexible and rigid pavement thickness and concrete paver alternatives are presented in this report for the parking lot and alley. In addition, recommendations for porous asphalt concrete, porous Portland cement concrete and porous concrete paver pavement alternatives have also been provided. Pavement materials should be selected, prepared, and placed in accordance with the *Pikes Peak Region Asphalt Paving Specifications* and recommendations presented in this report.

Drainage: Surface drainage should provide for efficient removal of storm-water runoff. The drainage plan should be designed so that water does not pond along the edges of pavements.

Additional discussion is presented in the body of this report.
All recommendations are subject to limitations stated in this report.

GENERAL SITE AND PROJECT DESCRIPTION

Location

The parking lot and alley considered in this investigation are located in Fountain, Colorado. The parking lot is located north of the building located at 102 North Main Street. The alley is located between West Iowa and West Ohio Avenues and extends from North Main to North Race Streets. The approximate locations of the parking lot and alley are shown on the Site Vicinity Map, Figure 1.

Existing Conditions

At the time of our field exploration, the existing alley was unpaved. Overhead and underground utilities serving the adjacent structures were located within and along the sides of the alley. Vegetation generally consisted of sparse grass and weeds with several large, mature deciduous trees.

The surface of the parking lot consisted of deteriorated asphalt concrete which exhibited alligator cracking and potholes. There was grass and weeds growing through the cracks in the pavement.

General topography of the area slopes gently to the south and west.

Project Description

Based upon the information provided by Nolte Associates, Inc., the City of Fountain Utilities will be remodeling the existing building located at 102 North Main Street. As part of the remodel, the parking lot (approximately 90 feet long and 60 feet wide) and alley (approximately 370 lineal feet, 16 feet wide) will be paved.

The building remodel project is anticipated to qualify for LEED™ certification. To assist in attaining the certification, implementation of a porous pavement system is desired for the parking lot and alley.

This subsurface soil investigation and pavement thickness design was performed to evaluate the subsurface conditions at the site of the parking lots and to develop recommendations for the design and construction of the proposed pavement systems.

FIELD INVESTIGATION AND LABORATORY TESTING

Drilling

The subsurface conditions were investigated by drilling four exploratory test borings. Two test borings were drilled within the parking lot and two were drilled along the alignment of the alley. The test borings were located in the field by RMG. Approximate location of the test borings are presented in the Test Boring Location Plan, Figure 2.

The test borings were advanced with a power-driven, continuous-flight auger drill rig and extended to depths of 5 feet below the existing ground surface. Bulk samples of the soils were obtained for engineering classification. An Explanation of Test Boring Logs and the Test Boring Logs are presented in Figures 3 through 5.

Percolation Test Results

To evaluate the subgrade soil infiltration rate for design of porous pavements, percolation tests were conducted in the test borings. The tests were conducted by filling the test holes with water and monitoring the rate at which the water level in the test holes drops. Our tests indicated a maximum infiltration rate of 0.0625 inch (1/16 inch) per hour.

Laboratory Testing

The moisture content of the recovered samples was obtained in the laboratory. Grain-size analysis and Atterberg Limits tests were performed on selected samples for purposes of classification and obtaining pertinent engineering parameters. Summaries of Laboratory Test Results are presented in Figure 6. Soil Classification Data are presented in Figure 7.

SUBSURFACE CONDITIONS

Subsurface Materials

In general, the soils encountered on this site consisted of silty sand and clayey sand. The soils were classified utilizing the AASHTO classification system. The soils were grouped into two general categories and are discussed in the following paragraphs.

Soil Type 1 consists of sandy clay with general AASHTO classifications of A-7-6(12) and A-6(9). This soil was encountered at the ground surface in three of the test borings and extended to the 5 foot termination depths of the borings. The clay was moist. Atterberg Limits tests indicated Liquid

Limits of 39 and 41 and Plasticity Indices of 17 and 20. Grain-size analyses indicated 63.3 to 75.2 percent passing the No. 200 sieve (Percent Fines).

Soil Type 2 consists of clayey sand with a general AASHTO classification of A-6(1). The clayey sand was encountered at the ground surface in Test Boring PB-4 near the west end of the alley and extended to the 5-foot termination depth of the boring. The sand was moist. An Atterberg Limits test indicated a Liquid Limit of 38 and a Plasticity Index of 11. A grain-size analysis indicated 40.9 percent passing the No. 200 sieve (Percent Fines).

Additional descriptions of the materials are included on the Test Boring Logs. The classification of the materials shown on the logs is based on the engineer's classification of the samples and at the depths indicated. The stratification lines shown on the logs represent the approximate boundaries between material types and the actual transitions may be gradual and vary with location.

Groundwater

Groundwater was not observed in the test borings during drilling. Groundwater is not expected to affect the construction of the pavements. Fluctuations in groundwater and subsurface moisture conditions may occur due to variations in precipitation and other factors not readily apparent at this time.

CONCLUSIONS AND RECOMMENDATIONS

The discussion presented here is based on the subsurface conditions encountered in the test borings and on the project characteristics previously described. If the subsurface conditions are different from those described in this report or the project characteristics change, RMG should be retained to review our recommendations and adjust them, if necessary. The conclusions and recommendations presented in this report should be verified by RMG during construction.

Subgrade Soil Strength Properties

Based upon our exploratory borings and the results of our laboratory testing, the subgrade soils will consist of sandy clay and clayey sand with AASHTO classifications of A-6(9), A-7-6(12) and A-6(1). Empirical correlations with the laboratory test results indicate Hveem Stabilometer values (R-values) ranging from 7 to 14. We have used an R-value of 10 and a modulus of subgrade reaction of 75 pci for flexible and rigid pavement thickness design calculations, respectively.

Conventional Flexible Pavement

Based upon our experience with similar subsurface materials, alleys and parking lots and the City of Colorado Springs *Pavement Design Manual* (PDM), we utilized the design parameters presented in the following table for flexible pavement design.

Design Parameter	Value
Traffic, 18-kip Equivalent Single Axle Load	36,500
Reliability	80%
Standard Deviation	0.44
Initial Serviceability	4.5
Terminal Serviceability	2.5

Calculations to determine the structural number (SN) were made using the procedures for flexible pavement design presented in the PDM. The strength coefficients for pavement thickness design were obtained from PDM and are summarized in the following table.

Pavement Structure Component	Strength Coefficient
Hot-mix Asphalt (HMA)	**0.44**
Aggregate Base Course (ABC, R-value 69 minimum)	**0.12**

The results of our calculations for new full depth asphalt and composite pavement sections constructed over existing subgrade soils are presented in the following table.

LOCATION	REQUIRED SN	HMA IN.	ABC IN.	CALCULATED SN
Parking Lot and Alley	2.13	5.00	---	2.20
		4.00	3.5	2.18

Pavement materials should be selected, prepared, and placed in accordance with the *Pikes Peak Region Asphalt Paving Specifications*, Version 2, Effective April 1, 2008. Tests should be performed in accordance with applicable procedure presented in the Specifications.

Conventional Rigid Pavement

Similar to flexible pavement design, we utilized the design parameters presented in the following table for rigid pavement design.

Design Parameter	Value
Reliability	80%
Standard Deviation	0.34
Concrete Elastic Modulus	3,500,000 psi
Concrete Modulus of Rupture	650 psi
Load Transfer Coefficient	4.2
Initial Serviceability	4.5
Terminal Serviceability	2.5

Calculations to determine the thickness were made using the procedures for rigid pavement design presented in the PDM. Based upon the results of our analyses, a minimum pavement thickness of 5 inches is recommended.

Pavement materials should be selected, prepared, and placed in accordance with the City of Fountain requirements. Tests should be performed in accordance with applicable procedure presented in the Specifications.

Concrete Pavers

If a pavement comprised of concrete pavers is desired, we recommend the pavers be a minimum of 3-1/8 inches thick and be installed over a minimum of 4 inches of compacted aggregate base materials. The aggregate base materials should be selected, moisture conditioned, placed and compacted in accordance with the City of Fountain requirements. The pavers should be installed in accordance with the manufacturer's recommended procedures.

Subgrade Preparation for Non-Porous Pavements

The existing subgrade soils should be proof-rolled to detect soft areas. Proof-rolling should be performed using a double pass of a loaded dump truck or similar piece of heavy construction equipment. Areas where the subgrade soils deflect or "pump" more than ½ inch should be removed to firm materials and replaced with moisture-conditioned, recompacted native soils. The soils should be placed in lifts not exceeding 6 inches after compaction at a minimum dry density of 95% of the maximum dry density as determined by AASHTO T-99. The moisture content of the soils should be within 2 percent of the optimum moisture content as determined by AASHTO T-99.

RMG should be present at the site during subgrade preparation, placement of fill, and construction of pavements to perform site observations and testing.

The subgrade soils generally consist of sandy clay and clayey sand. These soils should be considered sensitive to moisture and susceptible to pumping and rutting if allowed to become wet (soil moisture content in excess of the optimum moisture content). In addition, construction equipment operating on wet subgrade soils will likely result in creating conditions where an otherwise acceptable subgrade becomes unacceptable. The use of light pressure construction equipment may be required.

Surface water should not be allowed to collect and pond on the subgrade surface. We recommend the contractor establish good site drainage to facilitate surface water drainage. This will likely include temporary grading, shallow trenches, and sealing of the subgrade surface. Consideration of the weather conditions and anticipated precipitation should also be considered prior to commencing subgrade preparation activities.

Subgrade soils which become wet should be disked and allowed to dry. If available, drier soils may also be mixed with wet subgrade soils to help dry the soils. The disking and mixing operations should be repeated until the subgrade soils dry to a moisture content to allow proper compaction.

If the construction schedule does not allow the soils to be dried by disking and/or mixing, chemical stabilization using lime, cement, or fly ash may be an alternative. The use of cement-stabilized subgrade has been utilized successfully in the Fountain area for roadway construction. Generally the concept incorporates the blending of Portland Cement with the existing subgrade soils and compacting the blended materials to construct a stable subgrade. The amount of Portland Cement required is based upon laboratory mix designs, however, addition of approximately 4 to 7 percent, by weight, of Portland Cement to depths ranging from 7 to 12 inches has been found to be sufficient.

The use of geosynthetics, such as geogrid and geotextiles, may also be considered. In general, woven geosynthetic fabrics or geogrid materials are placed at the subgrade soil-aggregate base course interface to serve as a stabilization layer. The geosynthetic fabric and geogrid material function in a manner similar to reinforcing steel within Portland Cement Concrete, increasing the soil modulus, or "stiffening" the subgrade materials. RMG should be contacted for recommendations regarding the use of chemical stabilization or geosynthetics.

The existing soils are suitable for use as backfill. Backfill should be compacted in such a manner as to avoid future settling of the subgrade and to maintain the minimum slopes required for drainage and roadway construction. Backfill soils should be moisture conditioned to within 2 percent of the optimum moisture content and compacted to at least 95 percent of the maximum dry density as determined by AASHTO T-99.

City of Fountain specifications should be used for fill placed in utility trenches. If material is imported for backfill, the material should be approved by the RMG. Backfill should be compacted by mechanical means. Care must be taken to maintain positive grading along the shoulders and the drainage plan is designed such that water does not pond along the edges of the pavement.

Porous Pavements – General Comments

The intent of a porous pavement is to reduce stormwater runoff by allowing stormwater to penetrate the pavement section and infiltrate into the subgrade soil. The pavement section is designed using an open-graded asphalt concrete or Portland cement concrete wearing surface underlain by a granular reservoir. The granular reservoir provides support for the wearing surface and a storage reservoir for stormwater until it can infiltrate into the subgrade soils (usually 1 to 5 days).

The design of the granular reservoir is typically based on soil and groundwater conditions, slope, frost and amount of stormwater runoff. In general, a thicker reservoir is required to accommodate poor soil and groundwater conditions, sloping terrain, deeper frost penetration and higher stormwater runoff flows.

As indicated previously, a maximum infiltration rate of 0.0625 inch (1/16 inch) per hour was obtained from percolations tests. Design guidance from the National Asphalt Pavement Association (NAPA), the Portland Cement Association (PCA) and the National Ready Mixed Concrete Association (NRMCA) recommends an infiltration rate of 0.5 inch per hour and faster.

The sandy clay and clayey sand subgrade soil encountered in the parking lot and alley are not considered suitable for porous pavements where infiltration into the surrounding soil is the only method of discharging the water collected. If porous pavements are considered for the parking lot and alley, they should be designed with an underdrain to facilitate transporting and discharging collected water from the granular reservoir to an approved outlet (e.g. storm sewer).

Design Stormwater Runoff Rates

The run-off flow rates for the parking lot and alley were provided by Nolte Associates, Inc. and are presented in the table below.

Location	10-Year Storm	100-Year Storm
Parking Lot (without roof drains)	0.7 cfs	1.3 cfs
Parking Lot (with roof drains)	0.8 cfs	1.5 cfs
Alley	0.4 cfs	0.7 cfs

These values were used to help develop the granular reservoir thicknesses presented in the following sections.

Porous Pavement Subgrade Preparation

The subgrade soils underlying the pavement section should not be compacted prior to placing the geotextile. Excavation activities should be accomplished using low ground pressure equipment (e.g. equipment with tracks or over-sized tires). Compaction of the subgrade soils will lower the infiltration rate of the soils and reduce the efficiency of the porous pavement system.

Porous Pavement Underdrain

An underdrain installed beneath the granular reservoir is recommended to facilitate the transport and discharge of the collected water to an approved outlet (e.g. storm sewer). We recommend the underdrain consist of a rigid, perforated pipe with a minimum diameter of 4 inches. The pipe should be encased in an AASHTO No. 2 aggregate. The bottom of the reservoir should be sloped a minimum of 2 percent toward the pipe. The drain pipe should be sloped a minimum of 1 percent to the outlet. A typical detail is presented in Figure 8. "Clean-outs" for the underdrain pipe should be provided at maximum 100 foot spacings. Caps for the "clean-outs" should be rated for H-20 vehicle traffic loads.

Porous pavement systems reportedly improve the quality of stormwater by filtering the water through the porous wearing surface and the choker and reservoir courses. The amount of improvement is not well defined and continues to be a topic of research. If desired, the total suspended solids of the collected water can be reduced by either placing a non-woven geotextile (e.g. Mirafi 140N with an Apparent Opening Size equivalent to U.S. Sieve No. 70) over the top of the collection pipe or by encasing the pipe in concrete sand with a gradation conforming to ASTM C33.

Porous Asphalt Pavement

The design of the porous asphalt pavement was based upon information presented in the publication entitled *Porous Asphalt Pavements*, National Asphalt Producers Association, Information Series 131, copyright 2007. The recommended porous asphalt pavement section is presented in Figure 9.

The reservoir course should be constructed in lifts using a washed, crushed aggregate with a gradation conforming to AASHTO No. 2 aggregate. The aggregate should be lightly compacted with plate compactors or lightweight rollers.

A minimum 2-inch thick choker course should be placed over the reservoir course to provide a suitable surface on which to place the asphalt. The choker course should be a washed, crushed aggregate with a gradation conforming to AASHTO No. 57 aggregate.

The porous asphalt course should be placed over the choker course. The placed asphalt should be rolled with two or three passes using a 10-ton roller. Over-rolling the asphalt reduces the infiltration characteristics of the asphalt.

The recommended gradation of the aggregate used in the asphalt is presented below:

Sieve	Percent Passing
0.75 inch (19 mm)	100
0.50 inch (12.5 mm)	85-100
0.375 inch (9.5 mm)	55-75
No. 4 (4.75 mm)	10-25
No. 8 (2.36 mm)	5-10
No. 200 (0.075 mm)	2-4

If available, the asphalt binder should be one to two grades (high temperature designation) than that specified in the current version of the *Pikes Peak Region Asphalt Paving Specifications*. Typical asphalt content generally ranges from approximately 6.0 to 6.5 percent of the total weight of the mix. We recommend that the asphalt mix design be determined using the aggregates and asphalt binder which will be used during construction.

Porous Portland Cement Concrete Pavement

If a rigid porous pavement system is desired, the porous asphalt pavement course should be replaced with porous Portland cement concrete. The recommended porous asphalt pavement section is presented in Figure 10.

The concrete should be a minimum of 4 inches thick and have a minimum of compressive strength of 2,500 psi. Little or no fine aggregate should be used in the concrete mix and an ASTM No. 89 gradation is recommended for the coarse aggregate gradation. Cement Type I/II is also recommended to provide resistance to water soluble sulfates. Water-to-cement ratios ranging from approximately 0.27 to 0.30 are anticipated. We recommend the concrete mix design be determined using the aggregates and cement which will be used during construction.

Porous Concrete Pavers

Porous concrete pavers may be used in place of either asphalt concrete or Portland cement concrete. If porous concrete pavers are used, we recommend the pavers be a minimum of 3-1/8 inches thick and be installed be installed in accordance with the manufacturer's recommended procedures.

Porous Pavement Maintenance

Sand, ash or salt should not be used for snow and ice because they may clog the pores within the pavement. If de-icing of the pavement is desired, a liquid de-icing compound should be used because it drains out with snow and ice melt and does not clog the pavement. Consideration may be given to posting signs to remind maintenance personnel that the pavement is porous so that sand, ash or salt is not used for de-icing.

Porous pavements should be periodically inspected to check for surface ponding that may indicate possible clogging of the pavement. Porous pavements can be flushed or jet washed to assist in the maintenance of the pavement porosity.

Damage to the porous pavement can be repaired using conventional, non-porous asphalt patching mixes as long as the cumulative area repaired does not exceed 10 percent of the total area of porous pavement.

CLOSING

This report has been prepared for the exclusive purpose of providing geotechnical engineering information and recommendations for development described in this report. RMG should be retained to review the final construction documents prior to construction to verify our findings, conclusions and recommendations have been appropriately implemented.

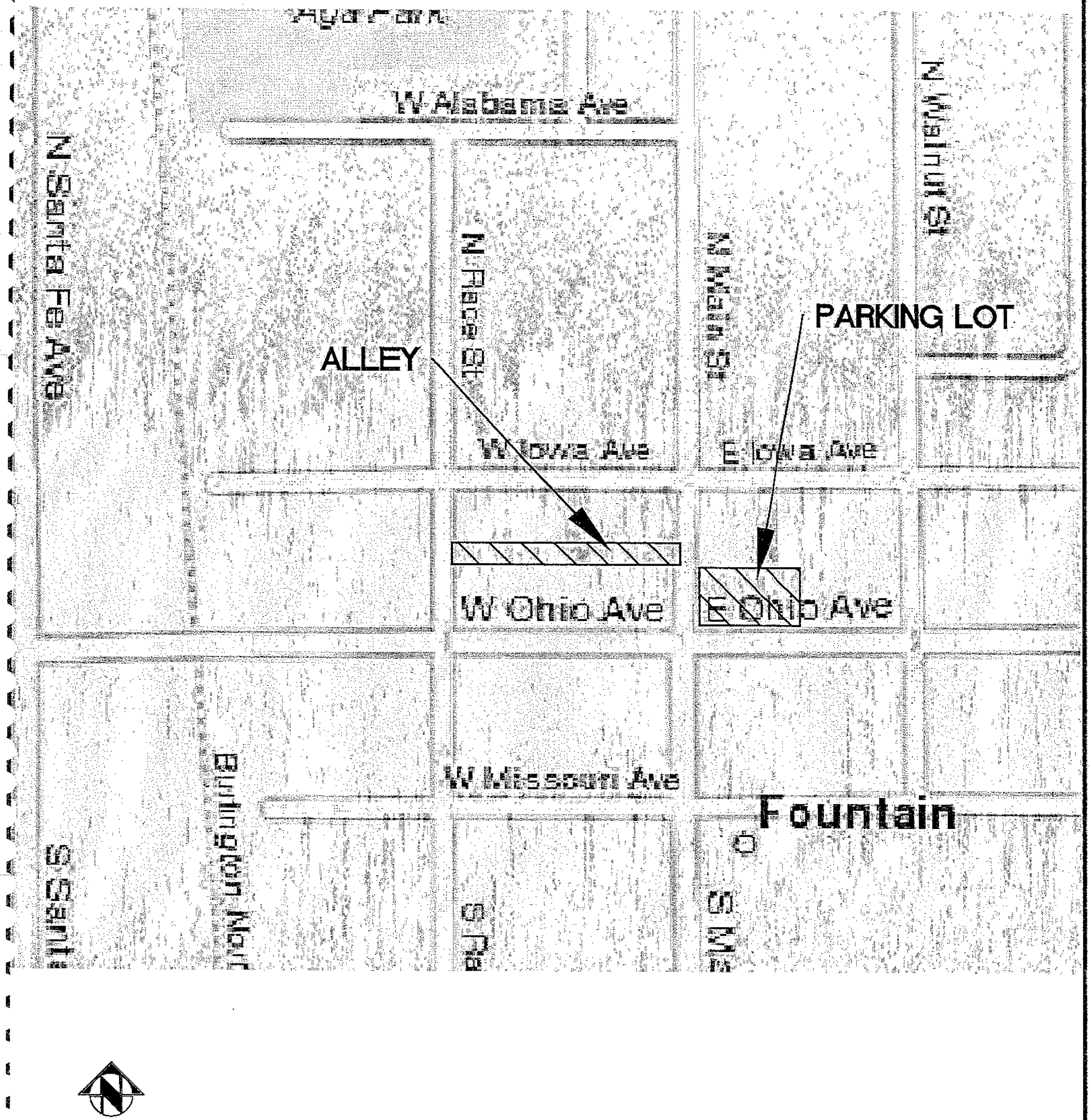
This report has been prepared for the exclusive use by Nolte Associates, Inc. for application as an aid in the design and construction of the proposed development in accordance with generally accepted geotechnical engineering practices. The analyses and recommendations in this report are based in part upon data obtained from test borings, site observations and the information presented in referenced reports. The nature and extent of variations may not become evident until construction. If variations then become evident, RMG should be retained to review the recommendations presented in this report considering the varied condition, and either verify or modify them in writing.

Our professional services were performed using that degree of care and skill ordinarily exercised, under similar circumstances, by geotechnical engineers practicing in this or similar localities. RMG does not warrant the work of regulatory agencies or other third parties supplying information which may have been used during the preparation of this report. No warranty, express or implied is made by the preparation of this report. Third parties reviewing this report should draw their own conclusions regarding site conditions and specific construction techniques to be used on this project.

The scope of services for this project does not include, either specifically or by implication, environmental assessment of the site or identification of contaminated or hazardous materials or conditions. Development of recommendations for the mitigation of environmentally related conditions, including but not limited to biological or toxicological issues, are beyond the scope of this report. If the Client desires investigation into the potential for such contamination or conditions, other studies should be undertaken.

If we can be of further assistance in discussing the contents of this report or analysis of the proposed development, from a geotechnical engineering point-of-view, please feel free to contact us.

FIGURES



NOT TO SCALE

Colorado Springs: (Main Office)
2910 Austin Bluffs Parkway
Colo. Spgs., CO 80918
Voice (719) 548-0600
Fax (719) 548-0223

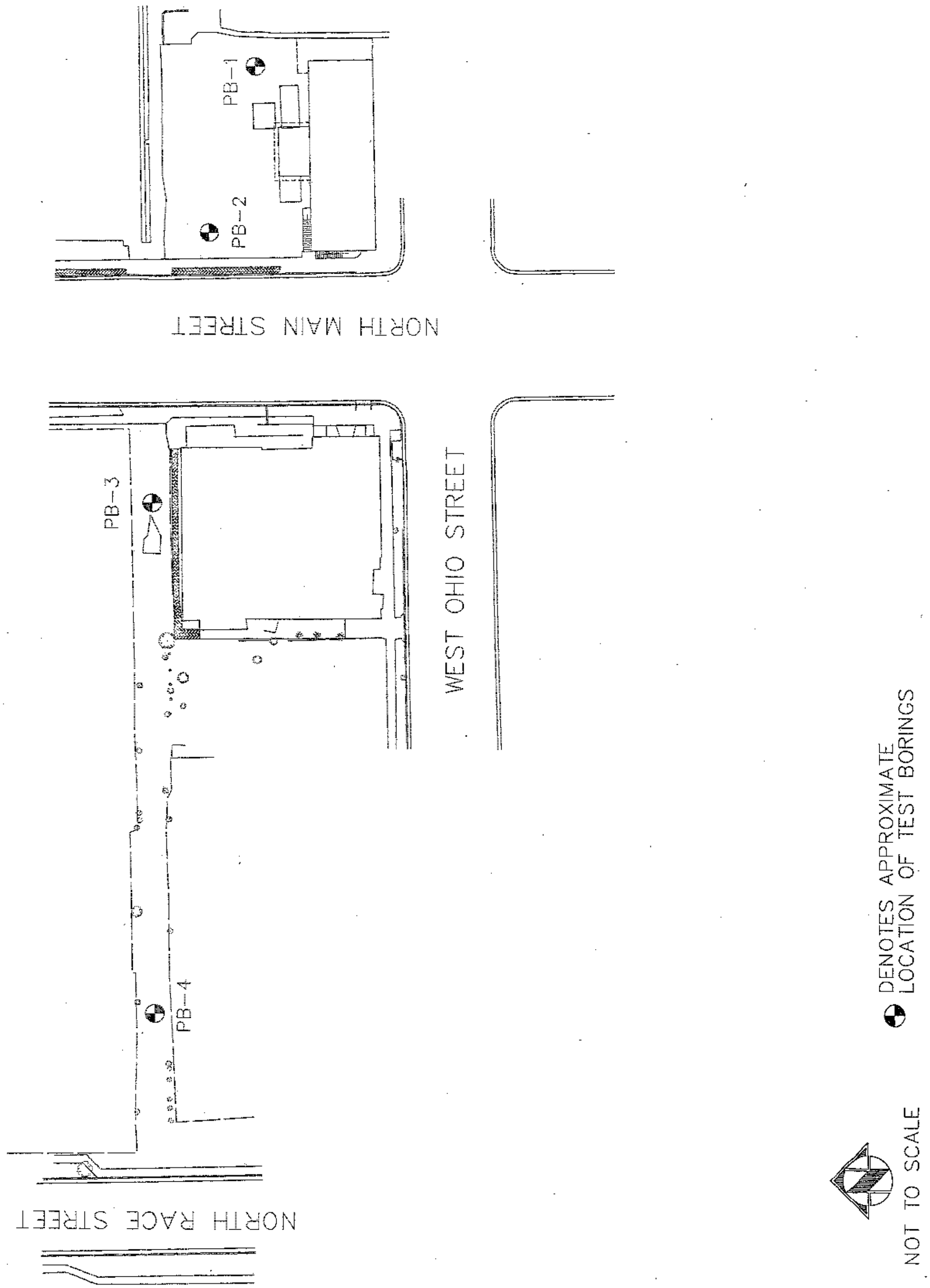
Structural • Geotechnical
RMG
ENGINEERS

Summit County:
202 Main Street #22
Post Office Box 4038
Frisco, Colorado 80443
(970) 668-4530 Fx (970) 668-4589

SITE VICINITY MAP

PARKING LOT AND ALLEY
FOUNTAIN, COLORADO

JOB. No.	124917
FIG. No.	1
DATE	5/25/10



Colorado Springs: (Main Office)
2910 Austin Bluffs Parkway
Colo. Spgs., CO 80918
Voice (719) 548-0600
Fax (719) 548-0223

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RMG
ENGINEERS

Summit County:
202 Main Street #22
Post Office Box 4038
Frisco, Colorado 80443
(970) 668-4530 Fx (970) 668-4589

TEST BORING LOCATION PLAN

101 N. MAIN STREET
FOUNTAIN, COLORADO

JOB. No.	124917
FIG. No.	2
DATE	5/11/10

SOILS DESCRIPTION

SANDY CLAY

CLAYEY SAND

SYMBOLS AND NOTES

Symbol	Description
XX	STANDARD PENETRATION TEST - OBTAINED BY DRIVING A SPLIT-BARREL SAMPLER INTO THE SOIL BY DROPPING A 140 LB. HAMMER 30", IN GENERAL ACCORDANCE WITH ASTM D-1586. NUMBER INDICATES NUMBER OF HAMMER BLOWS PER FOOT (UNLESS OTHERWISE INDICATED).
	WATER LEVEL MEASURED IN TEST BORING
BULK	DISTURBED BULK SAMPLE
XX	CALIFORNIA SAMPLE - OBTAINED BY DRIVING A RING-LINED SAMPLER INTO THE SOIL BY DROPPING A 140 LB. HAMMER 30", IN GENERAL ACCORDANCE WITH ASTM D-3550. NUMBER INDICATES NUMBER OF HAMMER BLOWS PER FOOT (UNLESS OTHERWISE INDICATED).
1	RMG SOIL TYPE - SEE REPORT TEXT FOR DESCRIPTION
4.5	WATER CONTENT (%)

Colorado Springs: (Main Office)
2910 Austin Bluffs Parkway
Colorado Springs, CO 80918
Voice (719) 548-0600
Fax (719) 548-0223

Structural • Geotechnical
RMG ENGINEERS

Eagle County:
910 Nottingham Road, Suite N12
Post Office Box 7026
Avon, Colorado 81620
Voice (970) 949-1970
Fax (970) 949-1179

EXPLANATION OF TEST BORING LOGS

JOB No. 124917

FIGURE No. 3

DATE 5/11/10

TEST BORING NO.: **PB-1** DATE DRILLED: 4/14/10 REMARKS: NO GROUNDWATER ON 4/14/10	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %	SOIL TYPE
CLAY, SANDY, DARK BROWN, MOIST	2.5				15.3	1
	5.0					

TEST BORING NO.: **PB-2** DATE DRILLED: 4/14/10 REMARKS: NO GROUNDWATER ON 4/14/10	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %	SOIL TYPE
CLAY, SANDY, DARK BROWN, MOIST	2.5				19.0	1
	5.0					

Colorado Springs: (Main Office)
2910 Austin Bluffs Parkway
Colorado Springs, CO 80918
Voice (719) 548-0600
Fax (719) 548-0223

Eagle County:
910 Nottingham Road, Suite N12
Post Office Box 7026
Avon, Colorado 81620
Voice (970) 949-1970
Fax (970) 949-1179

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TEST BORING LOGS

JOB No. 124917

FIGURE No. 4

DATE 5/11/10

TEST BORING NO.: **PB-3** DATE DRILLED: 4/14/10 REMARKS: NO GROUNDWATER ON 4/14/10	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %	SOIL TYPE
CLAY, SANDY, DARK BROWN, MOIST	2.5				16.5	1
	5.0					

TEST BORING NO.: **PB-4** DATE DRILLED: 4/14/10 REMARKS: NO GROUNDWATER ON 4/14/10	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %	SOIL TYPE
SAND, CLAYEY, DARK BROWN, MOIST	2.5				5.5	2
	5.0					

Colorado Springs: (Main Office)
2910 Austin Bluffs Parkway
Colorado Springs, CO 80918
Voice (719) 548-0600
Fax (719) 548-0223

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RMG ENGINEERS™

Eagle County:
910 Nottingham Road, Suite N12
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Avon, Colorado 81620
Voice (970) 949-1970
Fax (970) 949-1179

TEST BORING LOGS

JOB No. 124917

FIGURE No. 5

DATE 5/11/10

Location	Depth	Water Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% Retained No.4 Sieve	% Passing No. 200 Sieve	CBR-Value	% Swell	AASHTO Classification
PB-1	0.0	15.3		41	20	0.0	68.5			A-7-6 (12)
PB-2	0.0	19.0		39	17	2.4	63.3			A-6 (9)
PB-3	0.0	16.5		41	17	2.1	75.2			A-7-6 (12)
PB-4	0.0	5.5		38	11	10.4	40.9			A-6 (1)

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910 Nottingham Road, Suite N
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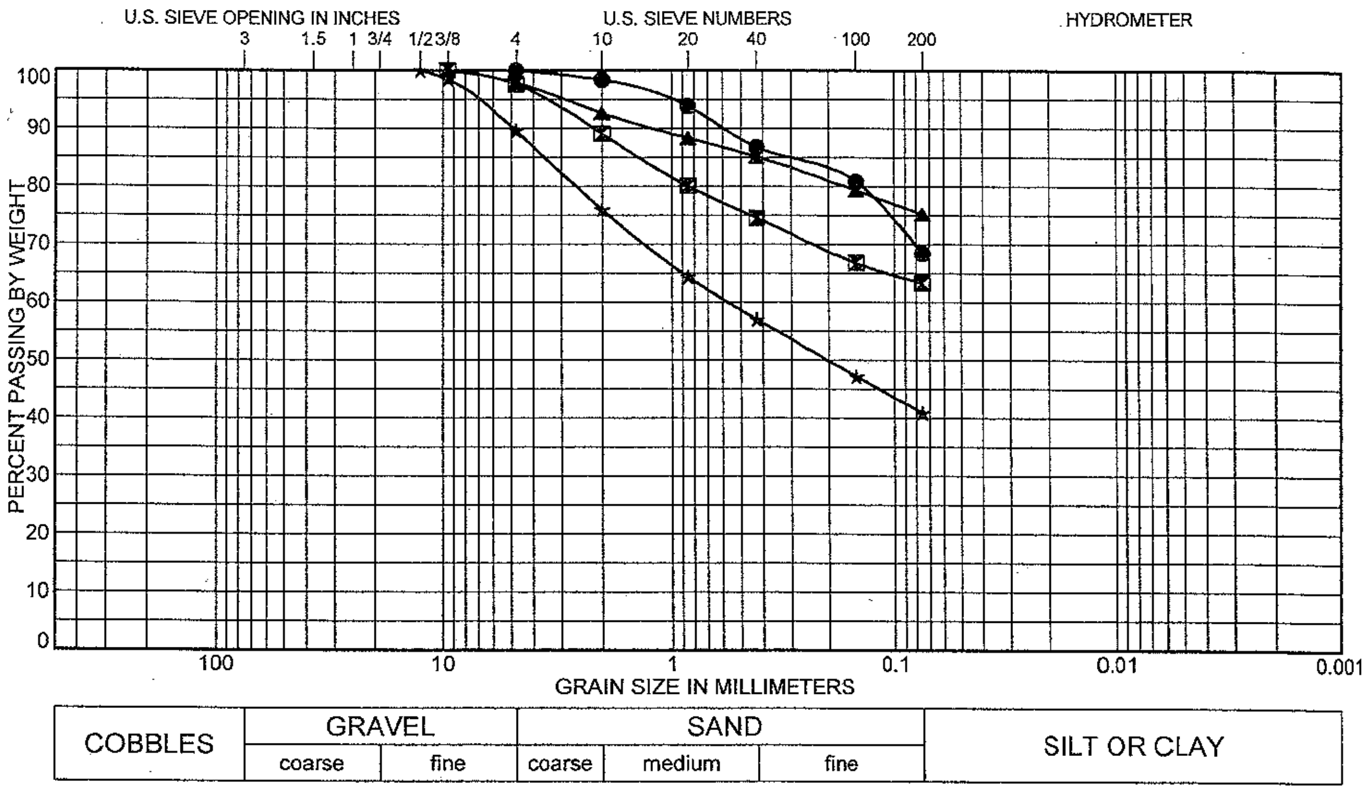
Avon, Colorado 81620
Voice (970) 949-1970
Fax (970) 949-1179

SUMMARY OF LABORATORY TEST RESULTS

JOB No. 124917
FIGURE No. 6
PAGE 1 OF 1
DATE 5/11/10



Test Boring		Depth (ft)	RMG Soil Type	LL	PL	PI	Cc	Cu
●	PB-1	0.0	1	41	21	20		
☒	PB-2	0.0	1	39	22	17		
▲	PB-3	0.0	1	41	24	17		
★	PB-4	0.0	2	38	27	11		

Test Boring		Depth (ft)	%Gravel	%Sand	%Silt	%Clay
●	PB-1	0.0	0.0	31.5	68.5	
☒	PB-2	0.0	2.4	34.3	63.3	
▲	PB-3	0.0	2.1	22.6	75.2	
★	PB-4	0.0	10.4	48.7	40.9	

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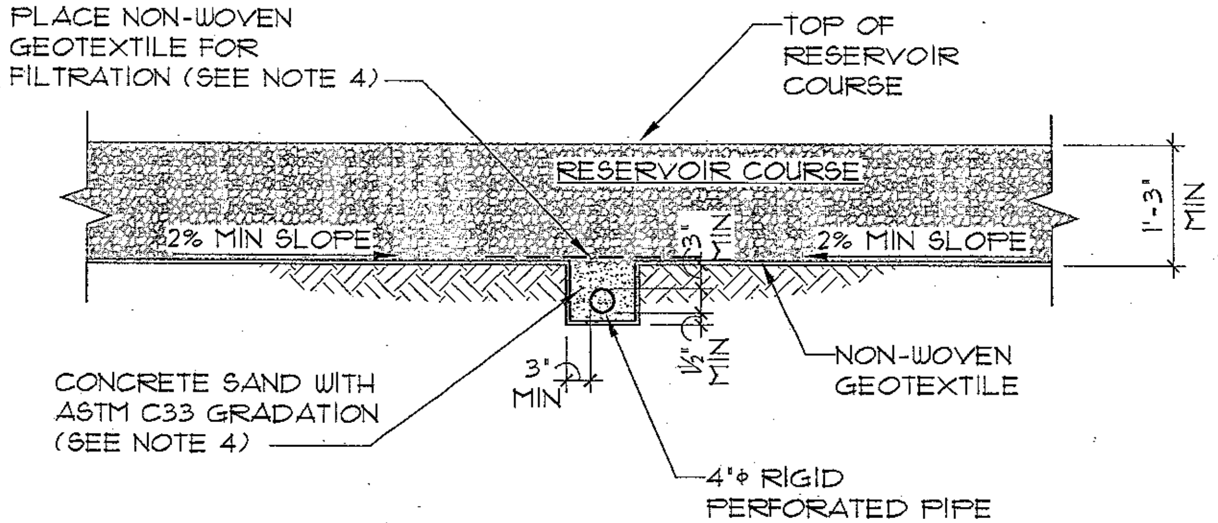
Eagle County:
910 Nottingham Road, Suite N12
Post Office Box 7026
Avon, Colorado 81620
Voice (970) 949-1970
Fax (970) 949-1179

SOIL CLASSIFICATION DATA

JOB No. 124917

FIGURE No. 7

DATE 5/11/10



NOTES:

1. NON-WOVEN GEOTEXTILE SHALL BE MIRAFI 140N OR APPROVED ALTERNATE.
2. RESERVOIR COURSE AND MATERIALS AROUND PIPE SHALL CONSIST OF WASHED, CRUSHED AGGREGATE WITH AASHTO No. 2 GRADATION.
3. PIPE SHALL SLOPE MINIMUM 1% TO APPROVED OUTLET.
4. TO PROVIDE FOR FILTERING WATER COLLECTED BY PIPE, PLACE NON-WOVEN GEOTEXTILE OVER TOP OF PIPE AS SHOWN. AS AN ALTERNATIVE, CONCRETE SAND WITH ASTM C33 GRADATION SHOULD BE PLACED AROUND PIPE AS SHOWN. PIPE PERFORATIONS SHOULD BE SMALLER THAN THE MINIMUM SAND SIZE OR THE PIPE ENCLOSED WITH A NON-WOVEN GEOTEXTILE FABRIC PRIOR TO SAND PLACEMENT.

TYPICAL UNDERDRAIN DETAIL

SCALE: 1/2" = 1'-0"

Colorado Springs: (Main Office)
2910 Austin Bluffs Parkway
Colo. Spgs., CO 80918
Voice (719) 548-0600
Fax (719) 548-0223

Eagle County:
910 Nottingham Rd #N12
Post Office Box 7026
Avon, Colorado 81620
Voice (970) 949-1970
Fax (970) 949-1179

Summit County:
202 Main Street #22
Post Office Box 4038
Frisco, Colorado 80443
(970) 668-4530 Fx (970) 668-4589

Structural • Geotechnical
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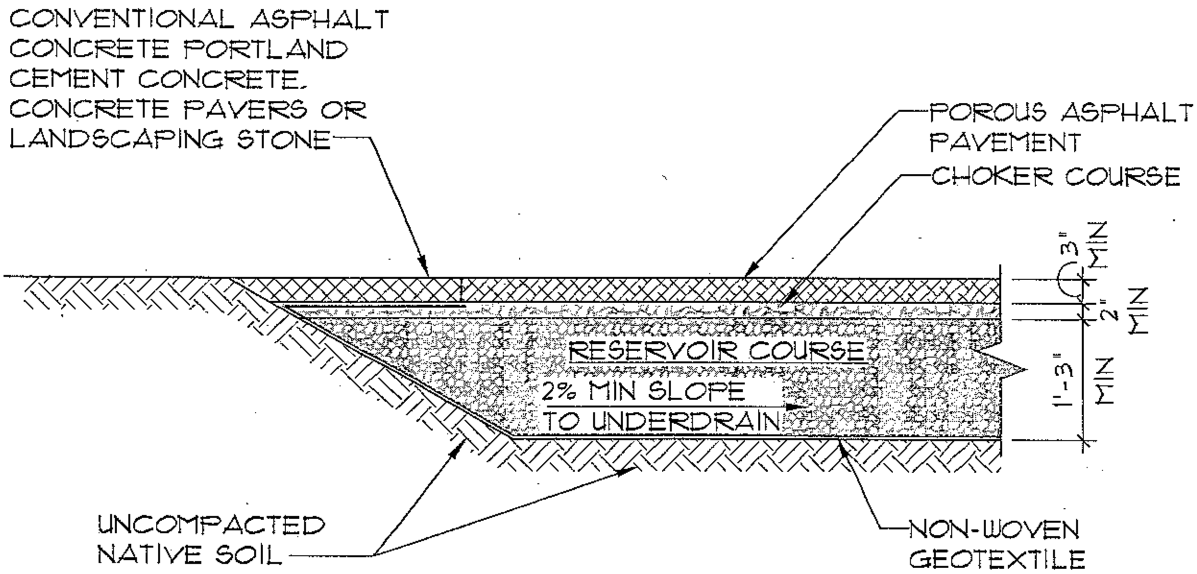
PARKING LOT
101 NORTH MAIN ST
FOUNTAIN, CO
NOLTE ASSOCIATES Inc

JOB. No. 124917

FIG. No. 8

DATE: 5-12-10

REVISION DATE:



NOTES:

1. NON-WOVEN GEOTEXTILE SHALL BE MIRAFI 140N OR APPROVED ALTERNATE.
2. RESERVOIR COURSE AND MATERIALS AROUND PIPE SHALL CONSIST OF WASHED, CRUSHED AGGREGATE WITH AASHTO No. 2 GRADATION.
3. CHOKER COURSE SHALL CONSIST OF WASHED CRUSHED AGGREGATE WITH AASHTO No. 57 GRADATION.
4. POROUS ASPHALT CONCRETE PER **POROUS ASPHALT PAVEMENT** SECTION OF THIS REPORT.

POROUS ASPHALT CONCRETE PAVEMENT SECTION

SCALE: 1/2" = 1'-0"

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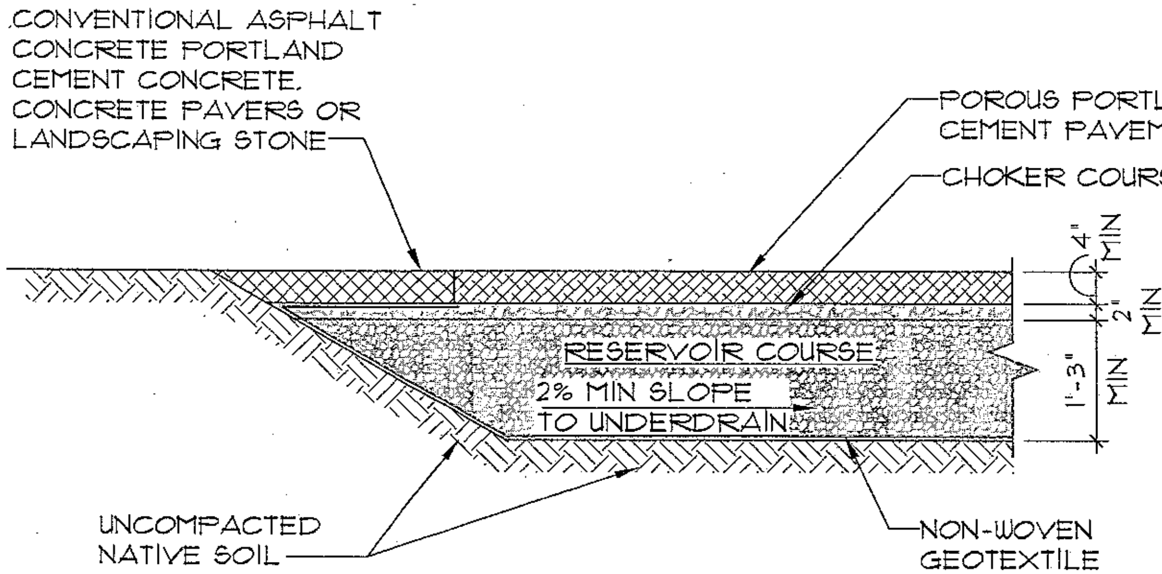
JOB. No. 124917
FIG. No. 9
DATE: 5-12-10
REVISION DATE:



NOTES:
1. NON-WOVEN GEOTEXTILE SHALL BE MIRAFI 140N OR APPROVED ALTERNATE.
2. RESERVOIR COURSE AND MATERIALS AROUND PIPE SHALL CONSIST OF WASHED, CRUSHED AGGREGATE WITH AASHTO No. 2 GRADATION.
3. CHOKER COURSE SHALL CONSIST OF WASHED CRUSHED AGGREGATE WITH AASHTO No. 57 GRADATION.
4. POROUS ASPHALT CONCRETE PER **POROUS PORTLAND CEMENT PAVEMENT** SECTION OF THIS REPORT.

POROUS PORTLAND CEMENT CONCRETE PAVEMENT SECTION

SCALE: 1/2" = 1'-0"

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Frisco, Colorado 80443
(970) 668-4530 Fx (970) 668-4589

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FIG. No. 10

DATE: 5-12-10

REVISION DATE: