June 4, 2021
PSI Project No. 05322095

APPROVED
Engineering Department
06/16/2021 11:57:20 AM
dsdnijkamp
EPC Planning & Community
Development Department

Professional Service Industries, Inc.
1070 West 124th Avenue, Suite 800
Westminster, Colorado 80234
Phone: (303) 424-5578
Fax: (303) 423-5625

PCD File No. SF-191

Evergreen Devco, Inc.
1873 South Bellaire Street, Suite 1106
Denver, Colorado 80222

Attention: Ms. Dana Dragon

Re: Report Addendum – Meridian Road & Eastonville Road Turn Lane Improvements
Falcon Marketplace Roadways
Near East Woodmen Road & Meridian Road
Falcon, Colorado

Dear Ms. Dragon:

Professional Service Industries, Inc (PSI), an Intertek Company, is pleased to transmit our Report Addendum for the new road improvements associated with the Proposed Falcon Marketplace which includes the field exploration and laboratory testing results, as well as site preparation and recommended minimum pavement sections for the proposed widening of Meridian Road and Eastonville Road to accommodate turn/acceleration/deceleration lanes for the proposed development. Our services on this project were performed in general accordance with PSI's Change Order No. 1, dated April 27, 2017 and authorized with Addendum #1 to Contract Services dated April 28, 2021.

PSI is has previously performed geotechnical exploration for the roadways within the Falcon Marketplace development. We have issued a geotechnical report dated January 8, 2021.

PROJECT INFORMATION

As instructed by El Paso County, PSI understands that a boring was needed for the proposed improvements, which include multiple new pavement areas for turn/acceleration/deceleration lanes along Meridian Road and Eastonville Road. The traffic loading has been provided by the traffic engineer based on the Traffic Impact Study performed in 2018, however the El Paso County Engineering Criteria Manual (ECM) are greater and will therefore govern the project.

Lane	Classification	ESALs Based on Traffic Study	ESALs From ECM
Southbound Right-turn Decel Lane on Meridian Road approaching Eastonville Road	Urban Principal Arterial, 4-Lane	1,200,000	5,256,000
Southbound Right-turn Accel/Decel Lane on Meridian Road between Eastonville Road and the Right-in/Right-out Access	Urban Principal Arterial, 4-Lane	1,200,000	5,256,000
New tapered section of the southbound Right-turn Accel/Decel Lane on Meridian Road between the Right-in/Right-out Access and Woodmen Road	Urban Principal Arterial, 4-Lane	1,200,000	5,256,000
Westbound Right-turn Decel on Eastonville road approaching Meridian Road	Urban Minor Arterial	821,000	1,971,000
New Section of Left-turn Lane on Northbound Meridian Road approaching Woodmen Road	Not provided; based on Urban Principal Arterial, 4-Lane	Not provided	5,256,000

The current thickness of Meridian Road is 10 ¾ inches of asphalt, however, we understand full-depth asphalt is no longer allowed by the County. Therefore, a composite section has been requested.

SUBSURFACE EXPLORATION & INFORMATION

As part of PSI's evaluation, one exploratory boring was drilled to a depth of approximately 10 feet below existing grade along the proposed turn lane south of Eastonville Road. A Boring Location Map is provided as Figure 2.

The boring was advanced using a CME-55 truck-mounted drill rig equipped with 4-inch outside-diameter, solid-stem, continuous-flight augers. Soil samples were recovered at selected depths during drilling with the truck-mounted drill rig using a Modified California Barrel Sampler (with an inside diameter of 2 inches and an outside diameter of 2.4 inches) driven by a 140-pound hammer free-falling 30 inches. The total number of blows required to drive the sampler for 12 inches of penetration is designated as the penetration resistance (N-value, blows per foot) which provides an indication of the consistency of cohesive soils and the relative density of granular materials. While the procedure is similar to that employed in the Standard Penetration Test (ASTM D1586), the penetration resistance

obtained using the California barrel sampler is generally higher than that obtained using the standard split-spoon sampler.

A representative from our office observed the drilling of our boring and a boring log was prepared of the encountered conditions. The boring log is presented as Figure 3. It should be noted that the subsurface conditions presented on the boring log are representative of the conditions at the specific locations drilled. Variations may occur and should be expected across the site. The stratification represents the approximate boundary between subsurface materials and the transitions may be gradual and indistinct. Water level information obtained during our field operations is also shown on the attached boring log.

Subsurface Profile

Subsurface soils encountered were silty sand overlying clayey sand. The silty sands were encountered to a depth of approximately 3-feet below existing grade and can be described as fine to medium grained sand, moist, brown, and generally loose. The clayey sands were encountered below the silty sand layer to the termination depth of the borings and can be described as fine to medium grained sand, moist, dark brown with white, and generally medium dense to dense.

Groundwater Conditions

Groundwater was not observed within the depths explored during drilling operations. It should be noted that it is possible for the groundwater table to fluctuate during the year depending upon climatic and rainfall conditions and changes to surface topography and drainage patterns. Discontinuous zones of perched water may also exist, or develop, within the overburden materials. The groundwater levels presented in this report are the levels that were measured at the time of our field activities.

GEOTECHNICAL EVALUATION

This report is for the proposed turn lane road improvements on Meridian Road and Eastonville Road as previously described. At the time of this report, we understand the roadway is at or near final elevation. The proposed pavement should conform to all applicable city, county or state requirements.

PSI recommends that the new pavement section be placed on no less than 12-inches of moisture conditioned and recompacted on-site soil.

The shallow in-situ soils were granular and nature and therefore believed to have a “low” swell potential. The in-situ soil swell potential could increase if excessive drying of the soils is allowed, therefore, care should be taken to evaluate and maintain desired moisture contents during construction. Drainage and sloping so water does not pond under pavements is recommended to help minimize the risk due to heaving soils. Pavement maintenance including crack-scaling over the life of the pavement will be critical for its performance.

The following geotechnical recommendations have been developed on the basis of the described project characteristics and subsurface conditions encountered. Should changes in the project criteria

occur, or if additional information becomes available, a review must be made by PSI to determine if modifications to our recommendations will be required.

SITE GRADING RECOMMENDATIONS

The proposed lanes should be excavated to no less than 12-inches below the bottom of the proposed pavement section and replaced with moisture conditioned and recompacted on-site soil. Prior to placement of base and pavement materials, the proposed new roadway area should be proof-rolled to identify areas of loose or soft soils. The proof-roll should be conducted with a loaded tandem-axle dump truck or similar pneumatic-tired equipment with a minimum weight of 15 tons. Movement and rutting of the subgrade soils should be limited to less than 1 inch.

Structural Fill

Based on PSI's field and laboratory data, it is our opinion that the majority of the on-site overburden soils will be suitable for re-use as backfill soils and for use as structural fill, provided the material is properly mixed, moisture conditioned and compacted. Bedrock materials, if encountered, should NOT be reused as structural fill. If material such as construction debris, trash, or other undesirable material is encountered during construction, they should be removed off site.

Imported structural fill, if required, should be free of organic or other deleterious materials, have a liquid limit less than 30, a plasticity index less than 10, and meet the following gradation outlined below. These criteria are intended as a general guideline. Imported structural fill materials should have a swell potential of less than 1 percent when compacted to 95 percent of maximum dry unit weight (MDUW) and at 2 percent below optimum moisture content (OMC) and tested under a swell test surcharge of 500 psf. The MDUW and OMC should be determined by ASTM D698 (Standard Proctor).

Screen Size	Percent Passing
2-inch	100
#4	50 – 100
#200	10 - 30

Imported fill material proposed for use on this site that does not meet these criteria should be submitted to the project geotechnical engineer for evaluation and approval. The geotechnical engineer should evaluate the proposed import fill prior to purchase and delivery. Fine-grained soils used for fill require close moisture content control and careful placement by the contractor to achieve the recommended degree of compaction and to control swell potential and settlement.

General Fill Placement and Testing

Unless otherwise specified, fill material should be compacted to at least 95 percent of the maximum dry unit weight as determined by the Standard Proctor Test (ASTM D 698). Each lift of compacted fill should be tested for density by a representative of the geotechnical engineer prior to placement of subsequent lifts. Sand fill soils should be moisture conditioned to between two percent below and two percent above optimum moisture content and clay fill soils should be moisture conditioned to a range

from optimum moisture content to four percent above optimum moisture content. Fill material should be placed in maximum eight-inch loose lifts.

A sample(s) of the proposed backfill soil(s) should be obtained for moisture density relationship (proctor test) three to four days prior to backfilling operations to expedite compaction and moisture content testing by the materials testing service provider.

Weather conditions in the site area are typically dry in the summer and early fall. While grading can be inhibited for short periods during and following times of precipitation, grading can generally be conducted year round. The major factor that must be considered during the winter months is ground freezing. During extended periods of sub-freezing weather, it can be difficult to properly moisture condition and compact soils. Grading must be conducted during the warmer parts of the day in freezing weather.

GEOTECHNICAL RECOMMENDATIONS

Based upon the soils encountered, PSI has used a Resilient Modulus (M_R) of 5,850 psi, for design of the proposed pavement sections, which correlates to an approximate R-value of 29. The value should be confirmed prior to construction. Pavements will be designed to the minimum asphalt depth for this soil type.

Based on the ECM, the new lanes will be designed for ESALs of 1,971,000 and 5,256,000 as described in the project information section. Our design is in general accordance with the ECM. We have also used the following design criteria; a 20-year design life, a Pavement Serviceability Index (PSI) of 2.5 and a Reliability of 85 percent for Urban Minor Arterial and 90 percent for Urban Principal Arterial, 4-Lane.

Minimum pavement section options are provided for asphalt over aggregate base course (composite) pavement. Based on the provided information, the following minimum pavement sections were determined, as presented in the following table.

Pavement Area	Composite Section
Urban Minor Arterial ESALs = 1,971,000	6 inches Asphalt over 10½ inches Aggregate Base Course
Urban Principal Arterial, 4-Lane ESALs = 5,256,000	7 inches Asphalt over 12½ inches Aggregate Base Course

Flexible Pavement

Allowances for proper drainage and proper material selection of base materials are important factors for performance of asphaltic pavements. Ruts and birdbaths in asphalt pavement allow for quick deterioration of the pavement primarily due to saturation of the underlying base and subgrade.

Hot bituminous pavement should meet the requirements as detailed for SuperPave Mixtures in Colorado Department of Transportation Standard Specifications for Road and Bridge Construction. Material meeting the Colorado Department of Transportation requirements for Grading SX (½ inch nominal) for top lift, and Grading S (¾ inch nominal) for the lower layers is recommended. In addition, the following are presented as general guidelines for properties of asphaltic concrete.

Falcon Marketplace Roadways	
Asphalt Cement	PG 58-28 or PG 64-22
Asphalt Content	As per mix design
Percent Air Voids	3½

The minimal layer thickness shall be 2 inches and each layer should be a minimum of 2 times the aggregate size. Asphalt material should be obtained from an approved mix design stating the SuperPave Mixture properties, including optimum asphalt content, job mix formula, and recommended mixing and placing temperatures. Materials and construction methods should be in accordance with the latest edition of the Pikes Peak Region Asphalt Specification, the El Paso County ECM, and CDOT Standard Specifications for Road and Bridge Construction Section 403.

Aggregate Base Course

Aggregate base course materials should conform to CDOT requirements for Class 6 aggregate base course per Table 703-2 and construction methods should conform to Section 304 of the Colorado Department of Transportation Standard Specifications for Road and Bridge Construction and the El Paso County ECM.

Pavement Drainage and Maintenance

Pavement subgrades should be sloped to provide rapid surface drainage during and after construction. Water allowed to pond on or adjacent to pavement areas could saturate the subgrade or pavement section and cause premature deterioration of pavements, and removal and replacement may be required. Periodic maintenance of the pavement should be anticipated. This should include sealing of cracks and joints and by maintaining proper surface drainage to avoid ponding of water on or near the pavement area.

If you have questions pertaining to this addendum, or if we may be of further service, please contact us at your convenience.

PSI thanks you for your business and we look forward to finding ways to grow our partnership, expand our services, and continue Building Better Together.

Professional Service Industries, Inc.

Hannah C. Tawfik

COLORADO LICENSED
KYLE RYAN DUITSMAN
42136
PROFESSIONAL ENGINEER
Kyle Duitsman
Digitally signed by Kyle Duitsman
Date: 2021.06.07 08:53:39 -06'00'

Hannah C. Tawfik, P.E.
Project Engineer

Kyle R. Duitsman, P.E.
Site Manager

Reviewed by: Lloyd Lasher, P.E.
Principal Consultant

Attachments:
Boring location Maps
Boring Log
Key to Symbols
Appendix A: Laboratory Testing
Appendix B: Pavement Design Data

Taken From Google Earth

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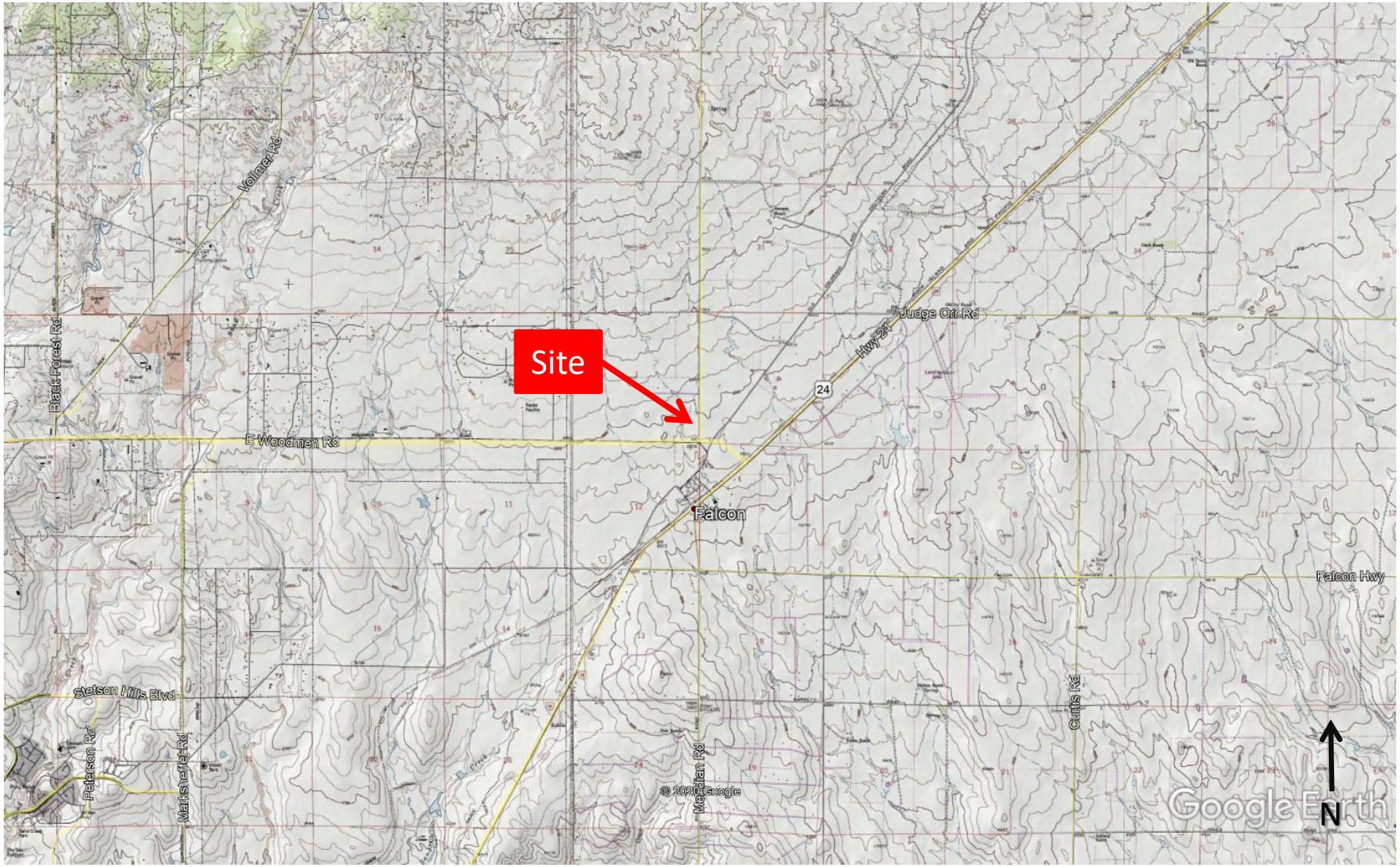
Falcon Marketplace		JOB NO.	5322095
Site Vicinity Map		FIGURE NO.	1a



Taken From USGS Map -

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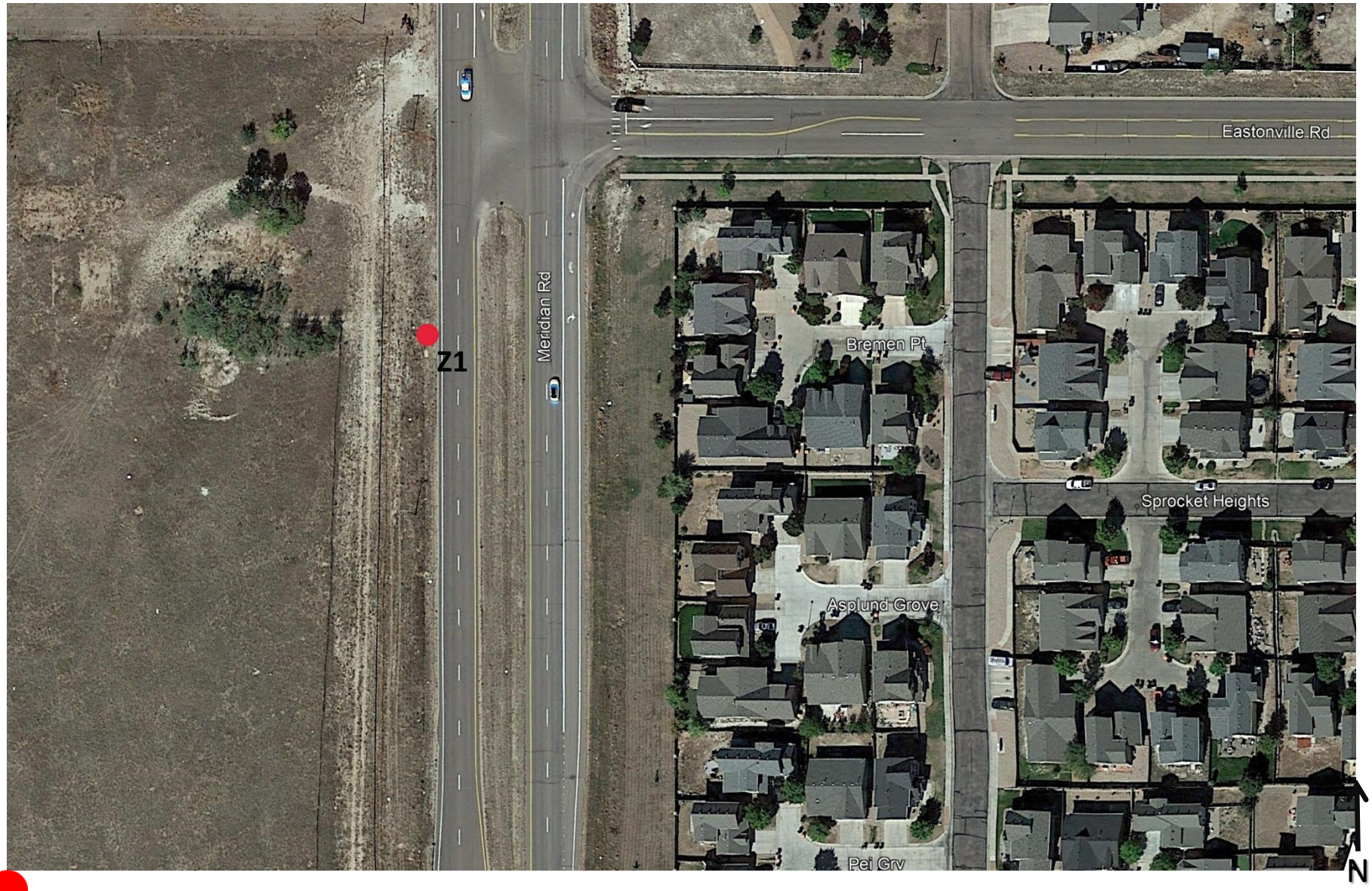
Falcon Marketplace	JOB NO.	5322095
Site Vicinity Map	FIGURE NO.	1b

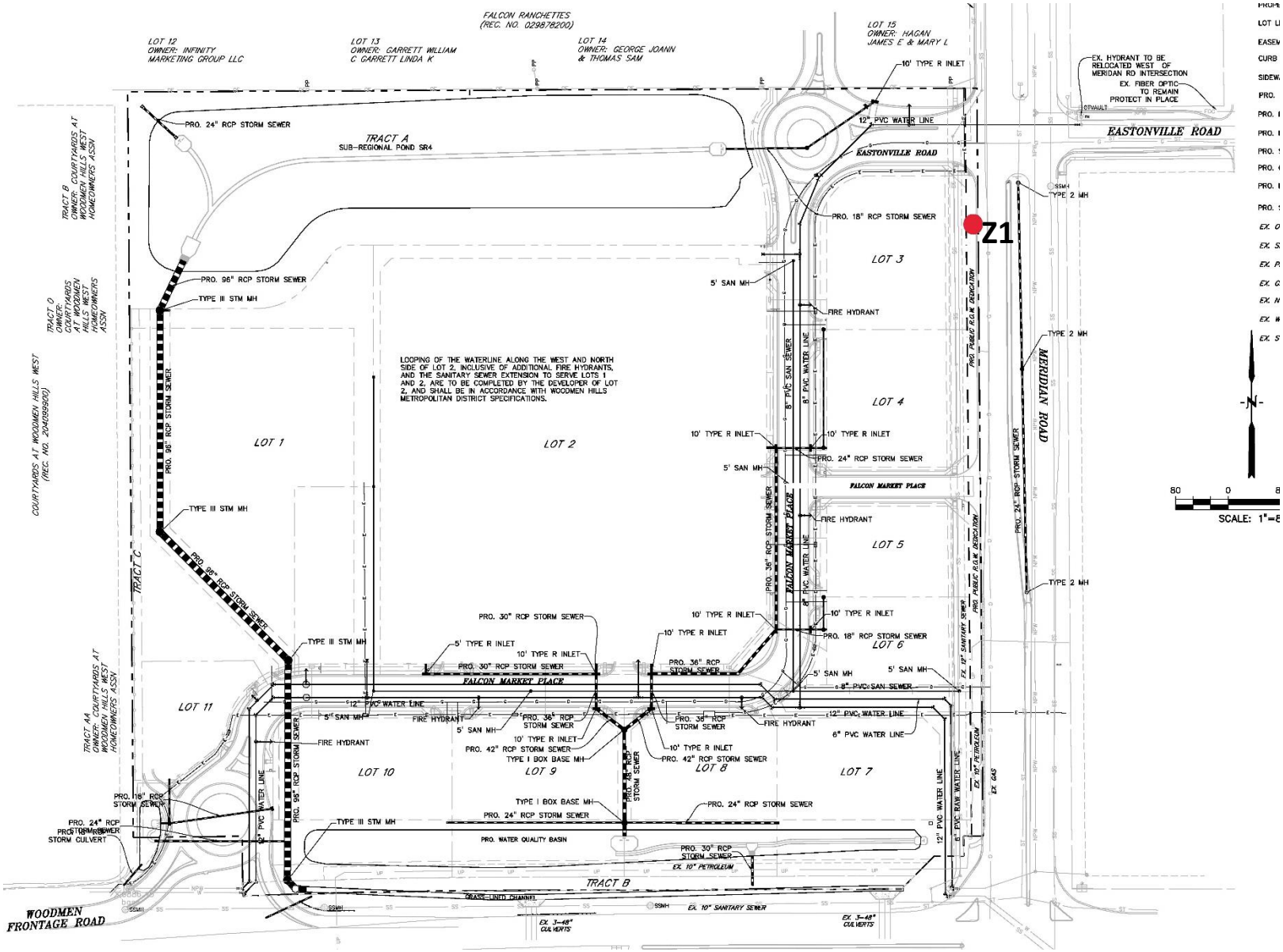


Indicates Approximate location of Boring

Taken from Google Earth

intertek psi

Falcon Marketplace	JOB NO.	5322095
Boring Location Map	FIGURE NO.	2a



Indicates Approximate location of Boring

Taken from Proposal Documentation

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Falcon Marketplace	JOB NO.	5322095
Boring Location Map	FIGURE NO.	2b

BORING Z1

DATE STARTED:	5/5/21	**DRILL COMPANY:**	Dakota Drilling
DATE COMPLETED:	5/5/21	**DRILLER:** JC	**LOGGED BY:** BP
COMPLETION DEPTH	10.0 ft	**DRILL RIG:**	CME-55
BENCHMARK:	N/A	**DRILLING METHOD:**	Solid Stem Auger
ELEVATION:	N/A	**SAMPLING METHOD:**	Modified California
LATITUDE:	38.9418°	**HAMMER TYPE:**	Manual
LONGITUDE:	-104.6093°	**EFFICIENCY**	N/A
STATION: N/A	**OFFSET:** N/A	**REVIEWED BY:**	KD

REMARKS:

Water		
	While Drilling	Not Observed
	Upon Completion	Not Observed
	Delay	N/A

BORING LOCATION:
See Figure 2

Meridian Rd Turn Lane

Elevation (feet)	Depth, (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification		Moisture, %	STANDARD PENETRATION TEST DATA N in blows/ft ◎ × Moisture ◪ PL ✚ LL (0, 25, 50) STRENGTH, tsf ▲ Qu ✳ Qp (0, 2.0, 4.0)	Additional Remarks
	0					**SILTY SAND** - Fine to medium grained sand, moist, brown, loose					
				1	12		SM	5-6 N=11	3		DD = 101 pcf Non-Plastic
						CLAYEY SAND - Fine to medium grained sand, moist, dark brown w/white, medium dense to dense					
									7		DD = 124 pcf GRAD: -200 = 27.6% SC
	5			2	12			14-23 N=37			
									8		DD = 123 pcf LL = 25 PL = 13
				3	12		SC	20-30 N=50			
				4	12			50/9"		>>◎	
	10										

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Professional Service Industries, Inc.
1070 West 124th Avenue, Suite 800
Westminster, CO 80234
Telephone: (303) 424-5578

PROJECT NO.: 05322095
PROJECT: Falcon Marketplace Roads
LOCATION: Meridian & Woodmen
Falcon, CO

The stratification lines represent approximate boundaries. The transition may be gradual.

KEY TO SYMBOLS

USCS Silty Sand

USCS Clayey Sand

SSA = Solid Stem Auger

HSA = Hollow Stem Auger

CFA = Continuous Flight Auger

SPT = Standard Penetration Test

MC - Modified California Sampler

SS = Split-spoon Sampler

ST = Shelby Tube Sampler

RC = Rock Core

DD = Dry Density

MC = Moisture Content

LL = Liquid Limit

PL = Plastic Limit

-200 = Percent Passing the No. 200 Sieve (%)

S(250) = Swell under 250 psf surcharge pressure (%)

S(500) = Swell under 500 psf surcharge pressure (%)

S(1000) = Swell under 1000 psf surcharge pressure (%)

Qu = Unconfined Compressive Strength

RQD = Rock Quality Designation

REC'D = Rock Core Recovery Percentage

PID = Photo Ionic Detector (ppm)

The borings were advanced into the ground using 4-inch solid stem augers. At regular intervals throughout the boring depths, soil samples were obtained with either a 1.4-inch I.D., 2.0-inch O.D., split-spoon sampler or a 2.0-inch I.D., 2.4-inch O.D. Modified California sampler. The samplers were first seated 6-inches to penetrate any loose cuttings and then driven an additional foot where possible with blows of a 140-pound hammer falling 30-inches. The number of hammer blows required to drive the sampler each 6-inch increment is recorded in the field. The penetration resistance "N-value" is redesignated as the number of hammer blows required to drive the sampler the final foot and, when properly evaluated, is an index to cohesion for clays and relative density for sands. N-values recorded on the boring logs are uncorrected. The split-spoon sampling procedures used during this exploration are in general accordance with ASTM Designation D 1586.

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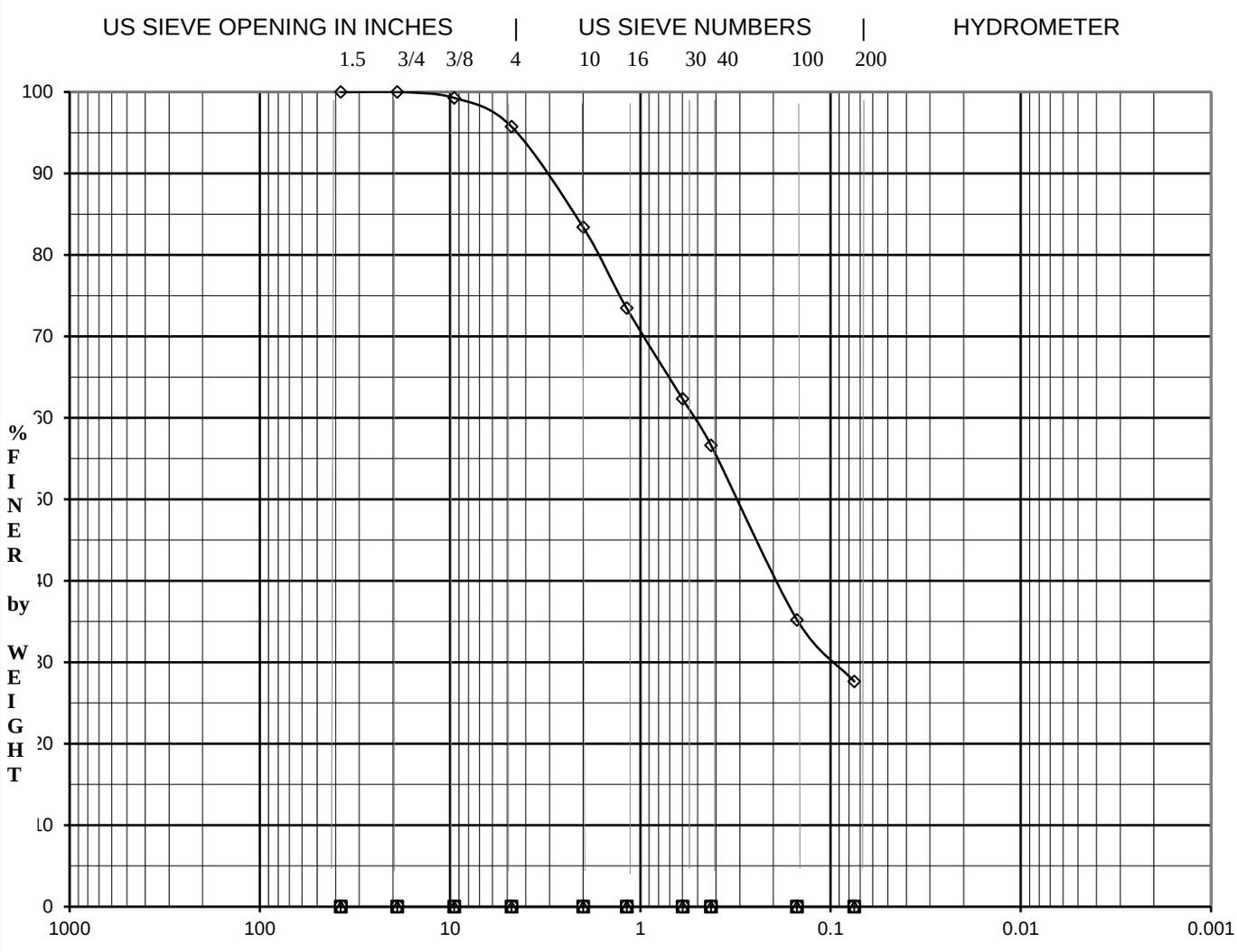
Appendix A

Laboratory Test Results



Specimen I.D.	Description	USCS	AASHTO	Group Index	LL	PI	PL
◇ Z1 @ 4 FEET	Clayey Sand	SC	A-2-6	0	25	12	13
□							
△							
○							
+							

Specimen I.D.	D100	D60	D30	D10	Cc	Cu	%Gravel	%Sand	%Silt&Clay
◇ Z1 @ 4 FEET	19.00	0.53	0.098				4	68	28
□									
△									
○									
+									

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Falcon Marketplace Turn Lane

JOB NO. 5322095

GRADATION CURVES

FIGURE NO. A1

Appendix B

Pavement Design

WinPAS

Pavement Thickness Design According to

1993 AASHTO Guide for Design of Pavements Structures

American Concrete Pavement Association

Flexible Design Inputs

Project Name: Meridian & Eastonville Turn Lanes @ Falcon Marketplace
Route: 1,971,000 ESALs, Urban Minor Arterial
Location:
Owner/Agency:
Design Engineer:

Flexible Pavement Design/Evaluation

Structural Number	3.80		**Subgrade Resilient Modulus**	5,850.00	**psi**
Total Flexible ESALs	1,971,000		**Initial Serviceability**	4.50	
Reliability	85.00	**percent**	**Terminal Serviceability**	2.00	
Overall Standard Deviation	0.45				

Layer Pavement Design/Evaluation

Layer Material	Layer Coefficient	Drainage Coefficient	Layer Thickness	Layer SN
Asphalt Cement Concrete	0.44	1.00	6.00	2.64
Graded Stone Base	0.11	1.00	10.50	1.16
			Σ SN	3.80

WinPAS

Pavement Thickness Design According to

1993 AASHTO Guide for Design of Pavements Structures

American Concrete Pavement Association

Flexible Design Inputs

Project Name: Meridian & Eastonville Turn Lanes @ Falcon Marketplace
Route: 5,256,000 ESALs, Urban Principal Arterial, 4-Lane
Location:
Owner/Agency:
Design Engineer:

Flexible Pavement Design/Evaluation

Structural Number	4.46		**Subgrade Resilient Modulus**	5,850.00	**psi**
Total Flexible ESALs	5,256,000		**Initial Serviceability**	4.50	
Reliability	90.00	**percent**	**Terminal Serviceability**	2.00	
Overall Standard Deviation	0.45				

Layer Pavement Design/Evaluation

Layer Material	Layer Coefficient	Drainage Coefficient	Layer Thickness	Layer SN
Asphalt Cement Concrete	0.44	1.00	7.00	3.08
Graded Stone Base	0.11	1.00	12.50	1.38
			Σ SN	4.46

Engineer: _____