ORDINANCE NO. 327

AN ORDINANCE OF THE TOWNSHIP OF ANTRIM, FRANKLIN COUNTY, PENNSYLVANIA, ESTABLISHING A WEIGHT LIMIT AND PERMIT REQUIREMENTS ON RABBIT ROAD (T-342) NORTH OF BUCHANAN TRAIL WEST (SR 0016)

WHEREAS, Section 1527 of the Second Class Township Code, as amended, (53 P.S. 66527) authorizes the Board of Supervisors of second Class Townships to adopt ordinances to secure the safety of persons or property within the Township; and

WHEREAS, the Pennsylvania Vehicle Code provides local authorities with the right to prohibit or restrict the use of highways at particular places or by particular class of vehicles whenever the highway or portions of the highway may be seriously damaged by the use or the movement of the vehicles would constitute a safety hazard (75 Pa. C.S.A. §6109 (a)(7)); and

WHEREAS, the Pennsylvania Vehicle Code further provides that local authorities with respect to highways under their jurisdiction may prohibit the operation of vehicles and may impose restrictions as to weight or size of vehicles operated upon a highway whenever they determine that the highway may be damaged or destroyed unless use by vehicles is prohibited or the permissible size of weight of vehicles is reduced (75 Pa. C.S.A. §4902(a)); and

WHEREAS, the Pennsylvania Vehicle Code also provides that local authorities with respect to highways under their jurisdiction may prohibit the operation of vehicles and may impose restrictions as to the weight or size of vehicles operated, upon a highway whenever they determine that hazardous traffic conditions or other safety factors require such prohibitions or restrictions (75 Pa. C.S.A. §4902 (b)); and

WHEREAS, the Pennsylvania Vehicle Code further provides that local authorities may exercise the powers granted in the Code only by duly enacted ordinances of their governing bodies (75 Pa. C.S.A. § 6109 (b)(1)); and

WHEREAS, the Engineers for the Township of Antrim have performed a traffic engineering vehicle weight restriction study concerning Rabbit Road North (T-342) (a copy of said study is labeled Exhibit "A" and attached hereto); and

WHEREAS, said study has determined that hazardous traffic conditions or other safety factors require a weight limit restriction; and

WHEREAS, said study has also determined that the road may be damaged or destroyed unless weight limit restrictions are imposed on vehicles operating on said roadway; and

WHEREAS, the Antrim Township Board of Supervisors believes that it is in the best interest of the public health, welfare, and safety of the residents of the Township to establish a ten (10) ton vehicle weight limit anywhere on Rabbit Road North (T-342) of Buchanan Trail West (S.R. 0016) within Antrim Township.

NOW, THEREFORE, BE IT ENACTED AND ORDAINED, by the Board of Supervisors of the Township of Antrim, Franklin County, Pennsylvania, pursuant to the authority as described above as follows:

SECTION 1: Chapter 139 -23 A of the Code of the Township of Antrim, Pennsylvania is amended by the addition of the following:

Street or Bridge	Between	Maximum Gross Weight
Rabbit Road North	Entire length within Antrim Township North of Buchanan Trail West (SR 0016)	Ten (10) Tons (except for emergency vehicles, School buses, vehicles used by public utilities, and agriculture vehicles)

SECTION 2: Chapter 139-23 B of the Code of the Township of Antrim, Pennsylvania shall be renumbered to D. The new subsection B and C shall read as follows:

B. Permits and Security. The Board of Supervisors of the Township of Antrim or their authorized representatives may issue permits for the movement of motor vehicles or combinations with weights in excess of the restrictions imposed for Rabbit Road North (T-342). Prior to the Township issuing such permit, security in the form acceptable to the Township shall be provided to the Township in an amount to cover the costs of anticipated or probable repairs and restoration necessitated by the permitted movement of vehicles.

C. Erection of Signs - The Township shall erect or cause to be erected and maintained restriction signs designating the restrictions at the end of the portion of road restricted as provided in this Article. In the case of a restriction on a road which has not begun or ended at an intersection with an unrestricted highway, the Township shall also place an advance informational sign at the intersection nearest each end of the restricted portion of the road which would allow drivers to avoid the restricted portion of road.

SECTION 3: SEVERABILITY - The provision of this Ordinance are severable. If any sentence, clause, or section of this Ordinance is for any reason found to be unconstitutional, illegal, or invalid, such unconstitutionality, illegality, or invalidity shall not affect or impair any of the remaining provisions, sentences, clauses, or sections of this Ordinance. It is hereby declared to be the intent of the Board of Supervisors of the Township of Antrim that this Ordinance would have been adopted had such unconstitutional, illegal, or invalid sentence, clause, or section not been included herein.

SECTION 5: EFFECTIVE DATE - This ordinance shall take effect in accordance with law.

ENACTED AND ORDAINED this 13th day of August, 2013 by the Board of Supervisors of the Township of Antrim, Franklin County, Pennsylvania in lawful session, duly assembled.

Attest:

Jennifer Becknell

Jennifer Becknell, Secretary

(seal)

SUPERVISORS OF ANTRIM TOWNSHIP

Fred Young III, Chairman

ANTRIM TOWNSHIP, FRANKLIN COUNTY, PENNSYLVANIA
SUMMARY SHEET

WEIGHT AND SIZE RESTRICTIONS
BASED ON CONDITION OF HIGHWAY OR BRIDGE
(§201.81 of Title 67 -- §4902(a) of PVC)

Road Name Rabbit Road North Twp. Rd No. 343

If State Highway/Bridge: From Sta. NA To Sta. NA

If Local Road Bridge: From Rt. 16 To Kuhn Road

Posted Speed Limit 35 ADT NA Average Speed NA

Road Length ~1.1 miles Road Width _____ Road R.O.W. 33 ft.

HIGHWAY RESTRICTIONS

THIS RESTRICTION IS BEING PLACED FOR THE REASON OR REASONS INDICATED:
(Non-applicable criteria shall be indicated by N.A. in the space provided.)

(NA) Geometric Review -- The highway has inadequate turning radii, horizontal width or underclearance at one or more locations.

(NA) Past Experience -- An analysis of previous climatic conditions indicates that certain weight vehicles should have been prohibited from the highway.

(NA) Pavement Analysis -- A pavement analysis and/or engineering judgment indicates existing physical deterioration due to heavy vehicle use requires that certain weight vehicles be prohibited.

Pavement type _____ Thickness _____ General Condition _____

Adequacy of drainage _____ Base pushing _____ Cross section deterioration _____

Surface alligatored _____ Shoulder damage _____ Other _____

(✓) Traffic Generators -- One or more of the following traffic generators is in the planning and/or development stage and can only be reached by this road:

( ) Shopping Center (✓) Quarry Operation ( ) Manufacturing or Assembly Plant

( ) Warehouse ( ) Trucking Terminal ( ) Other _____

and since pavement analysis, engineering judgment, and past experience of like or similar roadways have indicated that certain weight vehicles have seriously damaged the roadway and/or shoulders, it is likely that one or more of the following types of damage may be incurred.

Base pushing ✓ Cross Section deterioration ✓

Surface alligatored ✓ Shoulder damage ✓

Other _____

EXHIBIT A

BRIDGE RESTRICTIONS

(NA) General – The bridge has poor alignment, inferior bridge or guide rails, substandard horizontal or vertical clearance, substandard underclearance, or requires protection against accidents or damage.

(NA) Structural Analysis –

( ) The bridge is not designed for AASHTO HS20 loading.

( ) The bridge has been damaged by fire, accident or environmental deterioration.

( ) Engineering calculations indicate overstressing of members when subject to maximum legal loads.

( ) Engineering judgment indicates that the further use by heavy vehicles could damage the structure.

The above is a compilation of the results of an engineering and traffic study conducted in accordance with the provisions of Title 67 Pa. Code, Ch. 201, §201.61. As a result of the study, it has been determined that a weight restriction of 10 tons be posted. The restriction should be accompanied by "Except for Local Deliveries."

Field Inspection Conducted on May 10 2013

By: Triad Engineering
(Print Name)

Signature:

Recommended by: Stephen J. Gyurisin, P.E.

Title: Project Engineer

Date: 6/10/13

Report of
Geotechnical Exploration

Rabbit Road North Pavement Exploration
Antrim Township, Pennsylvania

Triad Project No. 03-13-0190

Prepared For:

Mr. Mike Condo
Antrim Township
10655 Antrim Church Road
Greencastle, Pennsylvania 17225

Prepared by:

TRIAD ENGINEERING, INC.

1075-D Sherman Avenue
Hagerstown, Maryland 21740
www.triadeng.com

May 29, 2013

TRIAD Listens, Designs & Delivers

May 29, 2013

Mr. Mike Condo
Antrim Township
10655 Antrim Church Road
Greencastle, Pennsylvania 17225

RE: Report of Geotechnical Exploration
Rabbit Road North
Antrim Township, Pennsylvania
Triad Project No. 03-13-0190

Dear Mr. Condo:

Triad Engineering, Inc. (Triad) has completed a geotechnical exploration at Rabbit Road North located in Antrim Township, Pennsylvania. The purpose of this study was to explore and evaluate the subsurface conditions at the subject site. This report outlines the results of our field exploration and presents our recommendations.

We appreciate the opportunity to provide our services on this project. If you have any questions regarding this report, or you require any additional information, please do not hesitate to contact us.

Sincerely,

TRIAD ENGINEERING, INC.

James R. Wheeler
Geotechnical Scientist

Stephen J. Gyurisin, P.E.
Project Engineer

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
STEPHEN J. GYURISIN
ENGINEER
No. PE070662

TABLE OF CONTENTS

Report of Pavement Exploration
Rabbit Road North
Antrim Township, Pennsylvania
Triad Project No. 03-13-0190

SITE AND PROJECT DESCRIPTION

The project site is Rabbit Road North from the intersection with Route 16 to the entrance road to a shale pit located approximately ½ mile north of the intersection. The entrance to the shale pit is located at the address 8722 Rabbit Road North. The approximate site location is shown on Figure A-1 in Appendix A.

We understand that an asphalt overlay was placed on this section of the road in 2009. No major signs of pavement distress were observed during our exploration. Due to the heavy truck traffic generated from the shale pit operations within this portion of the roadway, we understand that a determination of the roadway traffic capacity was requested. In addition, an evaluation of the existing pavement section and recommendations for modifications to the existing pavement section with respect to the traffic loading was requested.

GEOLOGIC SETTING

According to the Geologic Map of Pennsylvania (1980), the site is underlain by the Martinsburg Formation. The Martinsburg Formation is described as "Gray to dark-gray, buff-weathering shale".

FIELD EXPLORATION

The field exploration included six test locations. Each test location included coring of the asphalt, Wildcat dynamic cone penetrometer (DCP) testing and hand augers. The Test Location Plan, Figure A-2, included in Appendix A, illustrates the approximate test locations.

The exploration locations were selected and staked by Triad by taping distances along the roadway from the Rabbit Road North and Route 16 intersection. Ground surface elevations were not determined.

Geotechnical personnel from our office were present full time during the field exploration to perform the testing, log all recovered samples, and observe groundwater conditions. The recovered soil samples were transported to our laboratory for further testing. Detailed descriptions of materials encountered in the test locations are contained on the logs in Appendix B. The results of the Wildcat DCP tests are contained on the Wildcat DCP logs in Appendix B. Figure 1 in Appendix B contains a description of the classification system and terminology utilized.

SUBSURFACE CONDITIONS

Subsurface Strata

The materials encountered at the test locations are generally described below. Stratification lines indicated on the logs represent the approximate boundaries between material types.

Asphalt Pavement: The asphalt pavement ranged in thickness from 5.25 to 14 inches. The specific types of asphalt pavement materials can not be determined from coring alone. However, in general, the upper asphalt pavement appeared to be a conventional asphalt paving mixture which was underlain by a tar and chip type pavement at locations C-3, C-4 and C-5.

Dirty Crusher Run and Crushed Stone: Below the asphalt, dirty crusher run and crushed stone was encountered at several of the test locations. The dirty crusher run and crushed stone ranged in thickness from 0.5 to 8.75 inches. Based on the Wildcat DCP tests, the materials exhibited a medium dense to dense relative density.

Old Fill: Old fill was encountered in two of the test locations, and it generally consisted of brown shale. Based on the Wildcat DCP test results, the materials exhibited a medium dense to dense relative density.

Residual Soils and Decomposed Shale: Residual soils and decomposed shale were encountered in the majority of the test locations. These materials generally consisted of tan brown silty gravel, clayey sand and silty shale. Based on the Wildcat DCP tests, the materials exhibited a medium dense to very dense relative density.

Groundwater Observations

Groundwater was not present in any of the hand auger probes at completion or during drilling. It is important to note that fluctuations in groundwater levels may occur due to variations in environmental conditions, recent precipitation events, surface drainage, and other factors which may not have been evident at the time measurements were made and reported herein.

LABORATORY TESTING

Laboratory tests were performed to supplement the field classifications. All laboratory tests were performed in accordance with appropriate ASTM standard test methods. Detailed results of the laboratory tests are contained in Appendix C. A summary of the test results is presented below.

TEST TYPE	TEST RESULTS
Natural Moisture Contents	3.0% to 23.0%
Atterberg Limits: Liquid Limit Plasticity Index	32 and 41 13 and 18
Percent Passing No. 200 Sieve	2.3% to 46.7%
USCS Soil Classification	SC

CONCLUSIONS AND RECOMMENDATIONS

The subsurface information obtained from the field exploration, our past experience with similar projects, and the noted design criteria were the basis for our assessment. Our recommendations associated with the existing pavement and proposed additional traffic loading are provided below.

It has been our experience that older roads with topography similar to Rabbit Road North are generally constructed to follow previous dirt paths. As a result, the construction of these roads is not typical of current construction practices for new roads. Current construction practices for a new roadway section would generally involve stripping topsoil, preparing the subgrade, placement of base stone and then placement of asphaltic pavement.

Beneath the pavement placed in 2009, we encountered tar and chip asphalt pavement, dirty crusher run, shale, silty gravel and large diameter crushed stone. This indicates that the subgrade and base materials for the existing roadway vary significantly along the roadway alignment. As a result of this variance, it is likely that some sections of the roadway can support higher loads than others. Therefore, it is anticipated that failure of the pavement surface may be realized in some sections while other sections may show no signs of distress.

Based on the materials encountered, the thinnest pavement sections were present at C-1, approximately 100 feet north of the shale pit entrance, and at C-6, at the intersection with Route 16. The thicker pavement sections were encountered at the locations of cores C-2, C-3, C-4 and C-5. The relative strength of each of these sections was analyzed using the AASHTO 1993 pavement design guidelines to determine the total Equivalent Single Axle Loads (ESALs) that each section is capable of supporting. The following table summarizes the result of those analyses. The layer coefficients assigned for each material are as follows: 0.40 for asphalt, 0.26 for tar and chip asphalt, 0.10 for crushed stone and dirty crusher run. Based on the materials encountered and results of the Wildcat DCP tests, a California Bearing Ratio (C.B.R.) value of 5 was assumed for the subgrade.

Test Location	ESALs
C-1	546,068
C-2	2,308,481
C-3	8,486,720
C-4	4,072,003
C-5	5,527,585
C-6	645,621

At this time, a traffic study has not been performed. We assume that the current use of the roadway mostly consists of passenger vehicles (cars and pick-up trucks) with a few heavy trucks per day. For the shale pit operations, the loading on the pavement will increase to include the trucks hauling materials to and from the pit. We have assumed that the trucks will be fully loaded tandem axle dump trucks having a total load of 20 tons or less.

With the current traffic loading, Rabbit Road North can be classified as a local street. The typical required design ESALs for this classification are on the order of 415,000. With the increase in truck traffic, the classification of this section of Rabbit Road North will be closer to a collector street, and the typical required ESALs for this classification are on the order of 1,910,000. As seen in the table above, the road sections encountered at test locations C-2, C-3, C-4 and C-5 meet this requirement, while the road sections encountered at test locations C-1 and C-6 do not. However, as previously mentioned the constructed section varies significantly at each test location and is expected to be highly variable along the length of the roadway study section.

Pavement sections are typically designed for a useful life of 20 years with consideration given to minor maintenance, such as crack sealing and pothole repair, through the design life. We understand that the last pavement was placed in 2009. Considering the current traffic, this section would likely require a major rehabilitation such as mill and overlay towards the end of the design life.

Due to the increase in traffic associated with the shale pit operations, and as a result of the thinner sections encountered at C-1 and C-6, rehabilitation of the pavement should be expected prior to the end of the design life. Rehabilitation prior to the end of design life will likely be necessary at other locations where thin pavement sections are present along Rabbit Road North. Areas subject to heavy turning and stopping, such as the entrance to the shale pit and intersection with Route 16, are expected to require rehabilitation prior to the end of the design life. Lastly, at areas where shallow culverts cross Rabbit Road North, these areas are expected to have thin pavement sections due to the limited cover over the culverts. These areas are also expected to require rehabilitation prior to the end of the design life. Although areas where thicker pavement sections are present, such as those encountered at C-2, C-3, C-4 and C-5, may not exhibit major distress, they will likely require minor maintenance throughout the design life of the pavement.

LIMITATIONS

This report has been prepared by Triad for the exclusive use of Antrim Township and their design team for specific application to the Rabbit Road North project located in Antrim Township, Pennsylvania. The work on the project has been carried out in accordance with reasonable and acceptable engineering practices. No other warranty, either written or implied, is applicable to this project.

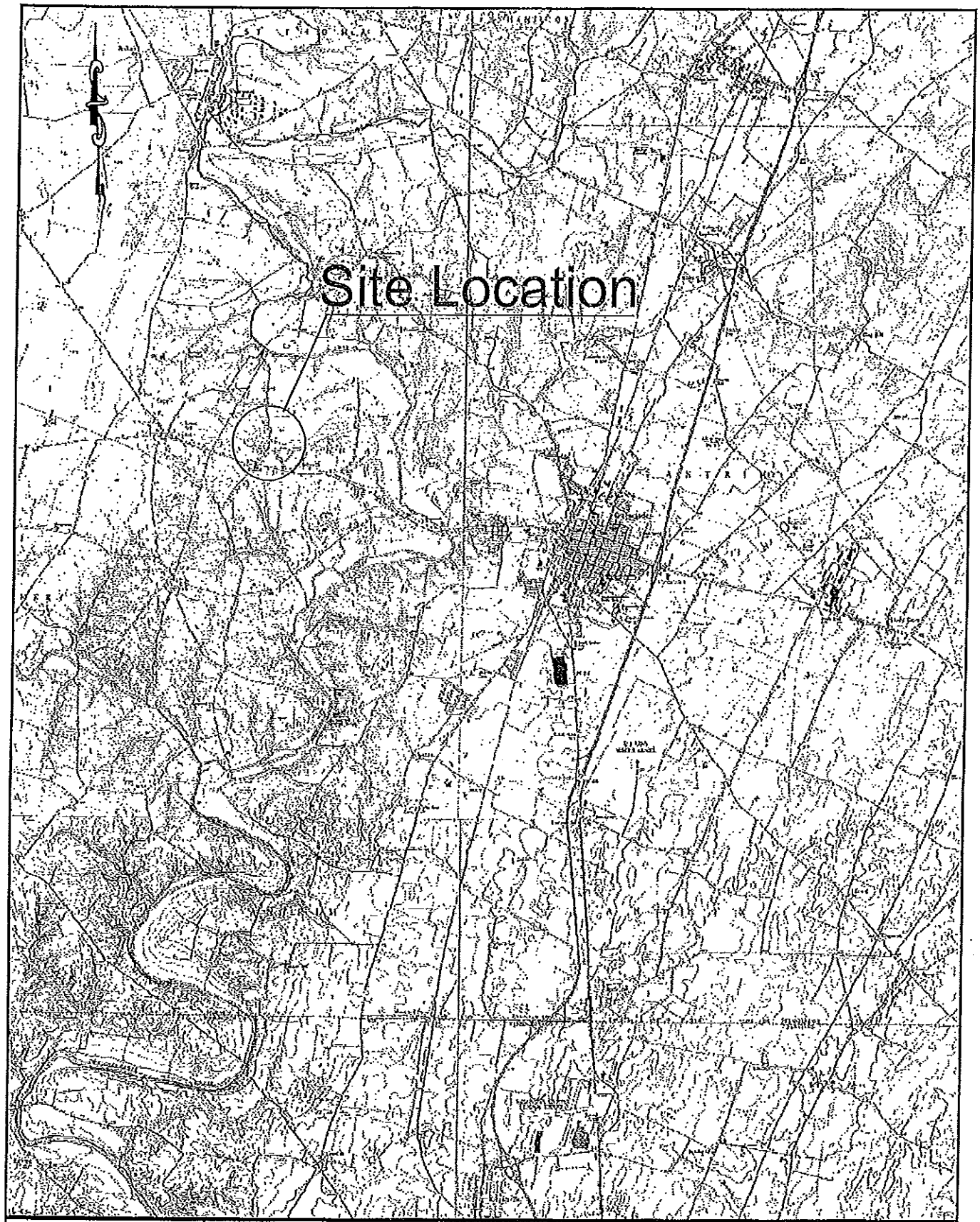
Subsurface conditions may vary from those encountered at the test locations. The logs are intended to only represent the conditions at each location when the sampling occurred. Classifications of the recovered soil samples are based on recognized standards.

The interpretations and recommendations in this report are based solely on the information available at the time this report was prepared.

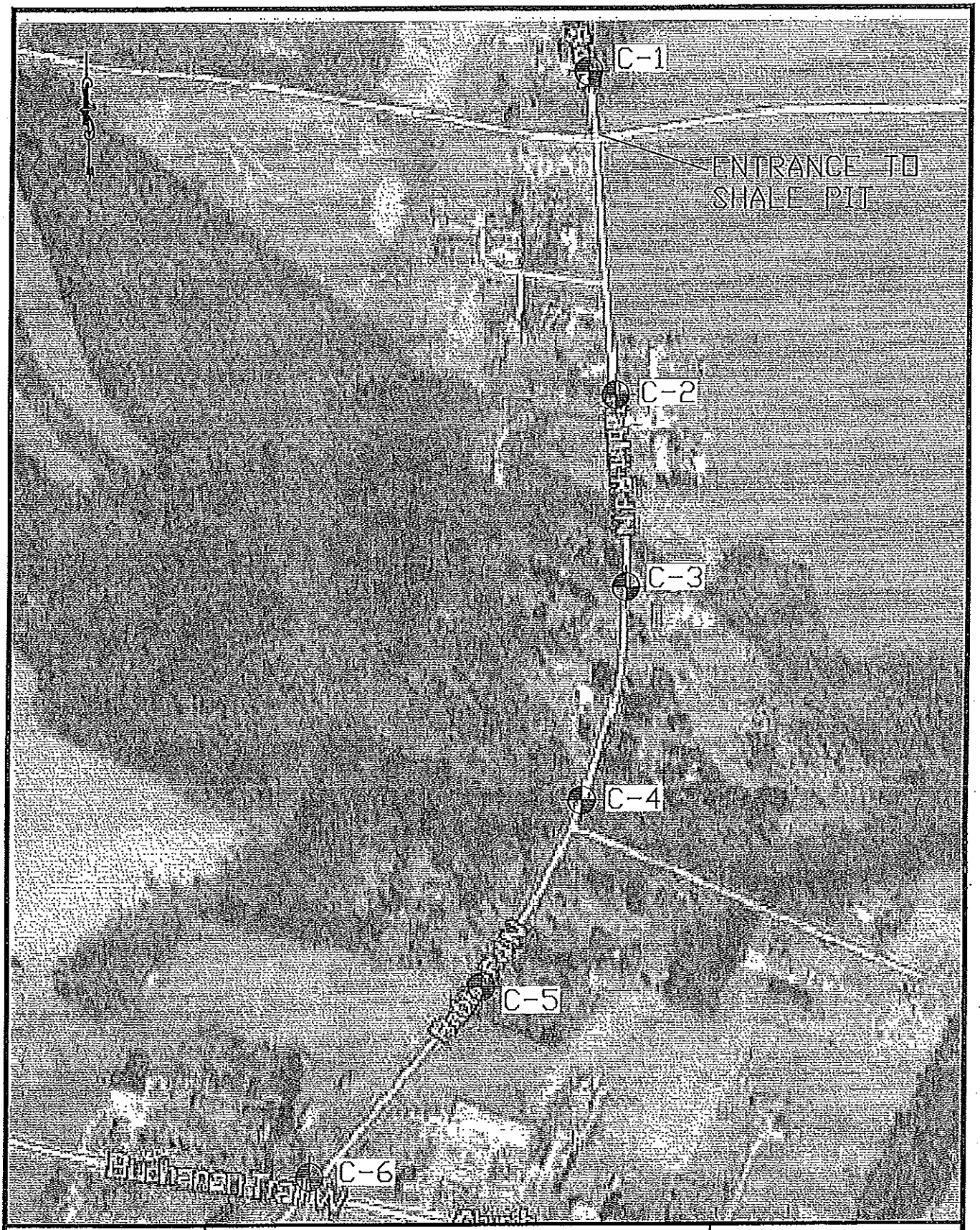
TRIAD ENGINEERING, INC.

APPENDIX A

Illustrations



Greencastle Quadrangle		SITE LOCATION PLAN	TRIAD ENGINEERING, INC.
DRAWN BY: JRW	CHECKED BY: SJG	Rabbit Road North Antrim Township, PA	www.triadeng.com
DATE: 5/7/13	SCALE: N/A	PROJECT NO: 03-13-0190 Figure: A-1	1075-D SHERMAN AVENUE HAGERSTOWN, MD 21740



C-# Approximate Test Location		TEST LOCATION PLAN	TRIAD ENGINEERING, INC.
DRAWN BY: JRW	CHECKED BY: SJG	Rabbit Road North Antrim Township, Pennsylvania	www.triadeng.com 1075-D SHERMAN AVENUE HAGERSTOWN, MD 21740
DATE: 5/7/13	SCALE: N/A	PROJECT NO:03-13-0190 Figure: A-2	

TRIAD ENGINEERING, INC.

APPENDIX B

Field Exploration

FIELD EXPLORATION

The field exploration included six test locations. Each test location included coring of the asphalt, Wildcat dynamic cone penetration testing (DCP) and hand augers. The field exploration was supervised by a geotechnical engineer from our office. The method utilized to classify the soils is defined in Figure 1, Key to Identification of Soil and Weathered Rock Samples.

TRIAD ENGINEERING, INC.

KEY TO IDENTIFICATION OF SOIL AND WEATHERED ROCK SAMPLES

The material descriptions on the logs indicate the visual identification of the soil and rock recovered from the exploration and are based on the following criteria. Major soil components are designated by capital letters and minor components are described by terms indicating the percentage by weight of each component. Standard Penetration Testing (SPT) and sampling was conducted in accordance with ASTM D1586. N-values in blows per foot are used to describe the *relative density* of coarse-grained soils or the *consistency* of fine-grained soils.

The MAJOR components constitute more than 50% of the sample and have the following size designation.

COMPONENT	PARTICLE SIZE
Boulders	12 inches plus
Cobbles	3 to 12 inches
Gravel -coarse	¾ to 3 inches
-fine	#4 to ¾ inches
Sand -coarse	#10 to #4
-medium	#40 to #10
-fine	#200 to #40
Silt or Clay	Minus #200 (fine-grained soil)

The MINOR components have the following percentage designation.

ADJECTIVE	PERCENTAGE
and	35 - 50
some	20 - 35
little	10 - 20
trace	0 - 10

Relative Density – Coarse-grained Soils

Term	*N-Value*
Very Loose	4
Loose	5 to 10
Medium Dense	11 to 30
Dense	31 to 50
Very Dense	>50

Consistency – Fine-grained Soils

Term	*N-Value*
Very Soft	2
Soft	3 to 4
Medium Stiff	5 to 8
Stiff	9 to 16
Very Stiff	>16

Soil Plasticity	Plasticity Index (PI)
None	Nonplastic
Low	1 to 5
Medium	5 to 20
High	20 to 40
Very High	over 40

Rock Hardness

Term	*N-Value*
Very Weathered	50/.5
Weathered	50/.4
Soft	50/.3
Medium hard	50/.2 to 50/.1
Hard	Auger Refusal

Moisture Description

- Dry - Dusty, dry to touch
- Slightly Moist - damp
- Moist - no visible free water
- Wet - visible free water, saturated

FIGURE NO. 1

TRIAD ENGINEERING, INC.

Test Location Logs
03-12-0190 Rabbit Road North

C-1	
Depth (in.)	Materials Encountered/Comments
0 - 6.25	Asphalt
6.25 - 6.5	Crushed Stone
6.5 - 10	Dirty Crusher Run
10 - 14	Brown SHALE fill
14 - 24	Tan brown silty GRAVEL
	Hand Auger Terminated at 24 inches

C-2	
Depth (in.)	Materials Encountered/Comments
0 - 7.75	Asphalt
7.75 - 12.75	Dirty Crusher Run
12.75 - 36	Tan brown SHALE
	Hand Auger Terminated at 36 inches

C-3	
Depth (in.)	Materials Encountered/Comments
0 - 5	Asphalt
5 -14	Asphalt (Tar and Chip)
14- 27	Tan brown clayey SAND, some gravel
	Hand Auger Terminated at 27 inches

C-4	
Depth (in.)	Materials Encountered/Comments
0 - 7.5	Asphalt
7.5 - 11	Asphalt (Tar and Chip)
11 - 16	Brown SHALE fill
16 - 24	Tan brown silty GRAVEL
	Hand Auger Terminated at 24 inches

C-5	
Depth (in.)	Materials Encountered/Comments
0 - 3.75	Asphalt
3.75 - 13.5	Asphalt (Tar and Chip)
13.5 - 14	Dirty Crusher Run
14 - 26	Tan brown clayey SAND, trace gravel
	Hand Auger Terminated at 26 inches

C-6	
Depth (in.)	Materials Encountered/Comments
0 - 5.25	Asphalt
5.25 - 14	Crushed Stone (1" - 3" diameter)
14 - 15	Tan brown silty GRAVEL
	Hand Auger Refusal at 15 inches

WILDCAT DYNAMIC CONE LOG

Triad Engineering, Inc.
1075 D Sherman Avenue
Hagerstown, Maryland 21740

PROJECT NUMBER: 03-13-0190
DATE STARTED: 05-10-2013
DATE COMPLETED: 05-10-2013

HOLE #: C-1
CREW: JRW
PROJECT: Rabbit Road North
ADDRESS: Rabbit Road North
LOCATION: Antrim Township, Pennsylvania

SURFACE ELEVATION: 6.25" B.E.G.
WATER ON COMPLETION: None
HAMMER WEIGHT: 35 lbs.
CONE AREA: 10 sq. cm

DEPTH	BLOWS PER 10 cm	RESISTANCE Kg/cm²	GRAPH OF CONE RESISTANCE 0 50 100 150	N'	TESTED CONSISTENCY NON-COHESIVE	TESTED CONSISTENCY COHESIVE
	42	186.5		25+	VERY DENSE	HARD
	27	119.9		25+	DENSE	HARD
1 ft	25	111.0		25+	DENSE	HARD
	24	106.6		25+	MEDIUM DENSE	VERY STIFF
	27	119.9		25+	DENSE	HARD
2 ft	30	133.2		25+	DENSE	HARD
3 ft						
1 m						
4 ft						
5 ft						
6 ft						
2 m						
7 ft						
8 ft						
9 ft						
3 m 10 ft						
11 ft						
12 ft						
4 m 13 ft						

WILDCAT DYNAMIC CONE LOG

Triad Engineering, Inc.
1075 D Sherman Avenue
Hagerstown, Maryland 21740

PROJECT NUMBER: 03-13-0190
DATE STARTED: 05-10-2013
DATE COMPLETED: 05-10-2013

HOLE #: C-2
CREW: JRW
PROJECT: Rabbit Road North
ADDRESS: Rabbit Road North
LOCATION: Antrim Township, Pennsylvania

SURFACE ELEVATION: 7.75" B.E.G.
WATER ON COMPLETION: None
HAMMER WEIGHT: 35 lbs.
CONE AREA: 10 sq. cm

DEPTH	BLOWS PER 10 cm	RESISTANCE Kg/cm²	GRAPH OF CONE RESISTANCE 0 50 100 150	N'	TESTED CONSISTENCY NON-COHESIVE	TESTED CONSISTENCY COHESIVE
	27	119.9		25+	DENSE	HARD
	31	137.6		25+	DENSE	HARD
1 ft	20	88.8		25	MEDIUM DENSE	VERY STIFF
	22	97.7		25+	MEDIUM DENSE	VERY STIFF
	30	133.2		25+	DENSE	HARD
2 ft	29	128.8		25+	DENSE	HARD
3 ft						
1 m						
4 ft						
5 ft						
6 ft						
2 m						
7 ft						
8 ft						
9 ft						
3 m 10 ft						
11 ft						
12 ft						
4 m 13 ft						

WILDCAT DYNAMIC CONE LOG

Triad Engineering, Inc.
1075 D Sherman Avenue
Hagerstown, Maryland 21740

PROJECT NUMBER: 03-13-0190
DATE STARTED: 05-10-2013
DATE COMPLETED: 05-10-2013

HOLE #: C-3
CREW: JRW
PROJECT: Rabbit Road North
ADDRESS: Rabbit Road North
LOCATION: Antrim Township, Pennsylvania

SURFACE ELEVATION: 20" B.E.G.
WATER ON COMPLETION: None
HAMMER WEIGHT: 35 lbs.
CONE AREA: 10 sq. cm

DEPTH	BLOWS PER 10 cm	RESISTANCE Kg/cm²	GRAPH OF CONE RESISTANCE 0 50 100 150	N'	TESTED CONSISTENCY NON-COHESIVE	TESTED CONSISTENCY COHESIVE
	28	124.3		25+	DENSE	HARD
	25	111.0		25+	DENSE	HARD
1 ft	27	119.9		25+	DENSE	HARD
	25	111.0		25+	DENSE	HARD
	35	155.4		25+	DENSE	HARD
2 ft						
3 ft						
1 m						
4 ft						
5 ft						
6 ft						
2 m						
7 ft						
8 ft						
9 ft						
3 m 10 ft						
11 ft						
12 ft						
4 m 13 ft						

WILDCAT DYNAMIC CONE LOG

Triad Engineering, Inc.
1075 D Sherman Avenue
Hagerstown, Maryland 21740

PROJECT NUMBER: 03-13-0190
DATE STARTED: 05-10-2013
DATE COMPLETED: 05-10-2013

HOLE #: C-4
CREW: JRW
PROJECT: Rabbit Road North
ADDRESS: Rabbit Road North
LOCATION: Antrim Township, Pennsylvania

SURFACE ELEVATION: 14" B.E.G.
WATER ON COMPLETION: None
HAMMER WEIGHT: 35 lbs.
CONE AREA: 10 sq. cm

DEPTH	BLOWS PER 10 cm	RESISTANCE Kg/cm²	GRAPH OF CONE RESISTANCE 0 50 100 150	N'	TESTED CONSISTENCY NON-COHESIVE	TESTED CONSISTENCY COHESIVE
	11	48.8	•••••••••••••	13	MEDIUM DENSE	STIFF
	18	79.9	••••••••••••••••••••	22	MEDIUM DENSE	VERY STIFF
1 ft	13	57.7	••••••••••••••	16	MEDIUM DENSE	VERY STIFF
	17	75.5	••••••••••••••••••	21	MEDIUM DENSE	VERY STIFF
	34	151.0	••	25+	DENSE	HARD
2 ft	14	62.2	••••••••••••••	17	MEDIUM DENSE	VERY STIFF
3 ft						
1 m						
4 ft						
5 ft						
6 ft						
2 m						
7 ft						
8 ft						
9 ft						
3 m 10 ft						
11 ft						
12 ft						
4 m 13 ft						

WILDCAT DYNAMIC CONE LOG

Triad Engineering, Inc.
1075 D Sherman Avenue
Hagerstown, Maryland 21740

PROJECT NUMBER: 03-13-0190
DATE STARTED: 05-10-2013
DATE COMPLETED: 05-10-2013

HOLE #: C-5
CREW: JRW
PROJECT: Rabbit Road North
ADDRESS: Rabbit Road North
LOCATION: Antrim Township, Pennsylvania

SURFACE ELEVATION: 14" B.E.G.
WATER ON COMPLETION: None
HAMMER WEIGHT: 35 lbs.
CONE AREA: 10 sq. cm

DEPTH	BLOWS PER 10 cm	RESISTANCE Kg/cm²	GRAPH OF CONE RESISTANCE 0 50 100 150	N'	TESTED CONSISTENCY NON-COHESIVE	TESTED CONSISTENCY COHESIVE
	23	102.1	•••••••••••••••••••••••••••••	25+	MEDIUM DENSE	VERY STIFF
	39	173.2	•••	25+	DENSE	HARD
1 ft	59	262.0	•••	25+	VERY DENSE	HARD
	47	208.7	•••	25+	VERY DENSE	HARD
	28	124.3	••••••••••••••••••••••••••••••••••	25+	DENSE	HARD
2 ft	27	119.9	••••••••••••••••••••••••••••••••	25+	DENSE	HARD
	21	93.2	•••••••••••••••••••••••••	25+	MEDIUM DENSE	VERY STIFF
3 ft						
1 m						
4 ft						
5 ft						
6 ft						
2 m						
7 ft						
8 ft						
9 ft						
3 m 10 ft						
11 ft						
12 ft						
4 m 13 ft						

WILDCAT DYNAMIC CONE LOG

Triad Engineering, Inc.
1075 D Sherman Avenue
Hagerstown, Maryland 21740

PROJECT NUMBER: 03-13-0190
DATE STARTED: 05-10-2013
DATE COMPLETED: 05-10-2013

HOLE #: C-6
CREW: JRW
PROJECT: Rabbit Road North
ADDRESS: Rabbit Road North
LOCATION: Antrim Township, Pennsylvania

SURFACE ELEVATION: 14" B.E.G.
WATER ON COMPLETION: None
HAMMER WEIGHT: 35 lbs.
CONE AREA: 10 sq. cm

DEPTH	BLOWS PER 10 cm	RESISTANCE Kg/cm²	GRAPH OF CONE RESISTANCE 0 50 100 150	N'	TESTED CONSISTENCY NON-COHESIVE	TESTED CONSISTENCY COHESIVE
	28	124.3		25+	DENSE	HARD
	33	146.5		25+	DENSE	HARD
1 ft	40	177.6		25+	DENSE	HARD
	44	195.4		25+	VERY DENSE	HARD
	46	204.2		25+	VERY DENSE	HARD
2 ft	38	168.7		25+	DENSE	HARD
3 ft						
1 m						
4 ft						
5 ft						
6 ft						
2 m						
7 ft						
8 ft						
9 ft						
3 m 10 ft						
11 ft						
12 ft						
4 m 13 ft						

TRIAD ENGINEERING, INC.

APPENDIX C

Laboratory Testing

LABORATORY TESTING

The soil samples obtained from the test boring operations were visually classified in the field by a geotechnical engineer from Triad. The recovered soils were further evaluated by laboratory testing. Laboratory soil tests were conducted in accordance with applicable ASTM Standards as listed below:

1) Moisture content tests were performed in accordance with ASTM D 2216.

2) Atterberg Limits test, consisting of the liquid limit, plastic limit, and plasticity index, were performed in accordance with ASTM D 4318.

3) Sieve analysis with washed No. 200 sieve test was performed in accordance with ASTM D 422.

A summary and details of the laboratory tests are included on the following pages of this appendix.

TRIAD ENGINEERING, INC.

SOIL DATA SUMMARY

SAMPLE NO.	SAMPLE DEPTH	SAMPLE TYPE	NATURAL MOISTURE (%)	ATTERBERG LIMITS			GRADATION			USCS SOIL CLASS.	PROCTOR		ADDITIONAL TESTS CONDUCTED
				LL	PL	PI	% GRAVEL	% SAND	% FINES		MAX. DD (pcf)	OPT. M (%)	
C-1	7.0"-10.0"	Bag	3.0				79.3	18.4	2.3				
C-1	14.0"-24.0"	Bag	15.9										
C-2	13.0"-36.0"	Bag	23.0										
C-3	14.0"-27.0"	Bag	19.1	41	23	18	21.4	36.7	41.9	SC			
C-4	11.0"-16.0"	Bag	18.4										
C-4	16.0"-24.0"	Bag	10.5										
C-5	14.0"-26.0"	Bag	12.1	32	19	13	8.3	45.0	46.7	SC			

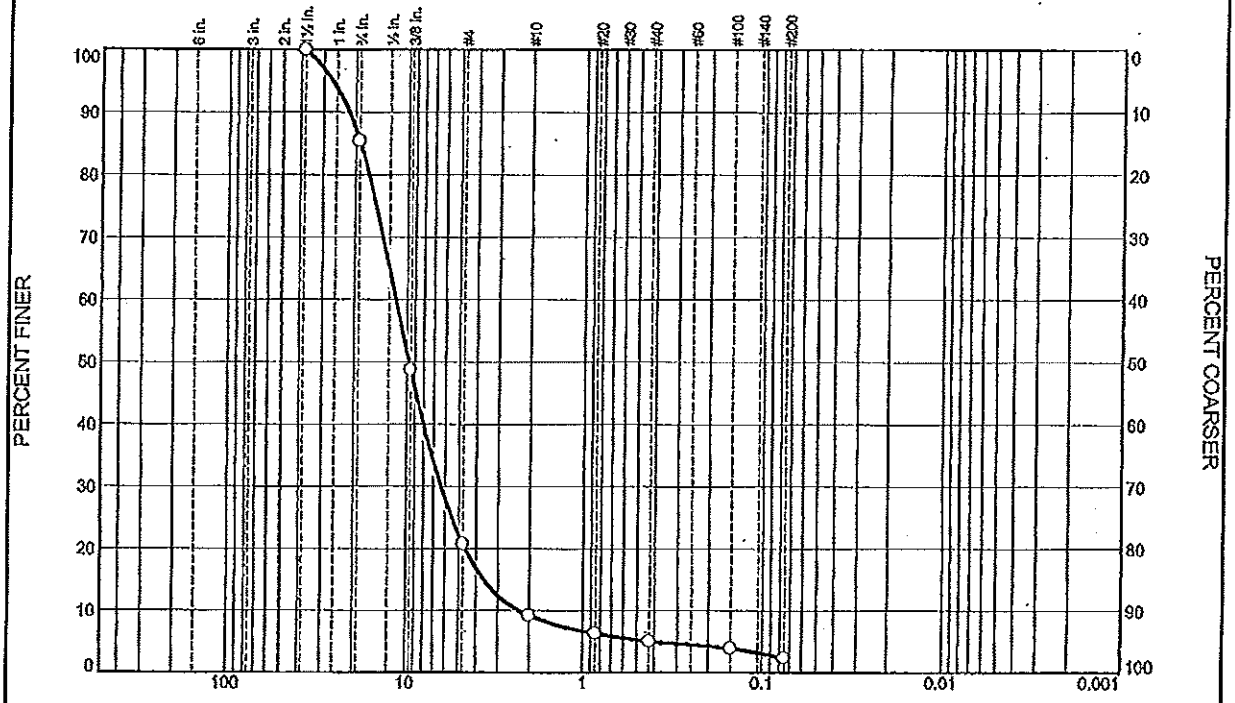
TRIAD ENGINEERING, INC.

Notes: 1) Soil tests performed in accordance with recognized ASTM testing standards.
2) SS = Split Spoon; UD = Undisturbed

Project Number: 03-13-0190
Project Name: Rabbit Road North
Location: Antrim Township, Pennsylvania

FIGURE
C-1

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	14.6	64.7	11.5	4.2	2.7	2.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5	100.0		
3/4	85.4		
3/8	48.7		
#4	20.7		
#10	9.2		
#20	6.3		
#40	5.0		
#100	3.9		
#200	2.3		

* (no specification provided)

Soil Description

Stone

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 21.7929 D_{85}= 18.8581 D_{60}= 11.6504
D_{50}= 9.7572 D_{30}= 6.3383 D_{15}= 3.6288
D_{10}= 2.2889 C_u= 5.09 C_c= 1.51

Classification

USCS= GW AASHTO=

Remarks

Source of Sample: Bag Depth: 7.0"-10.0"
Sample Number: C-1

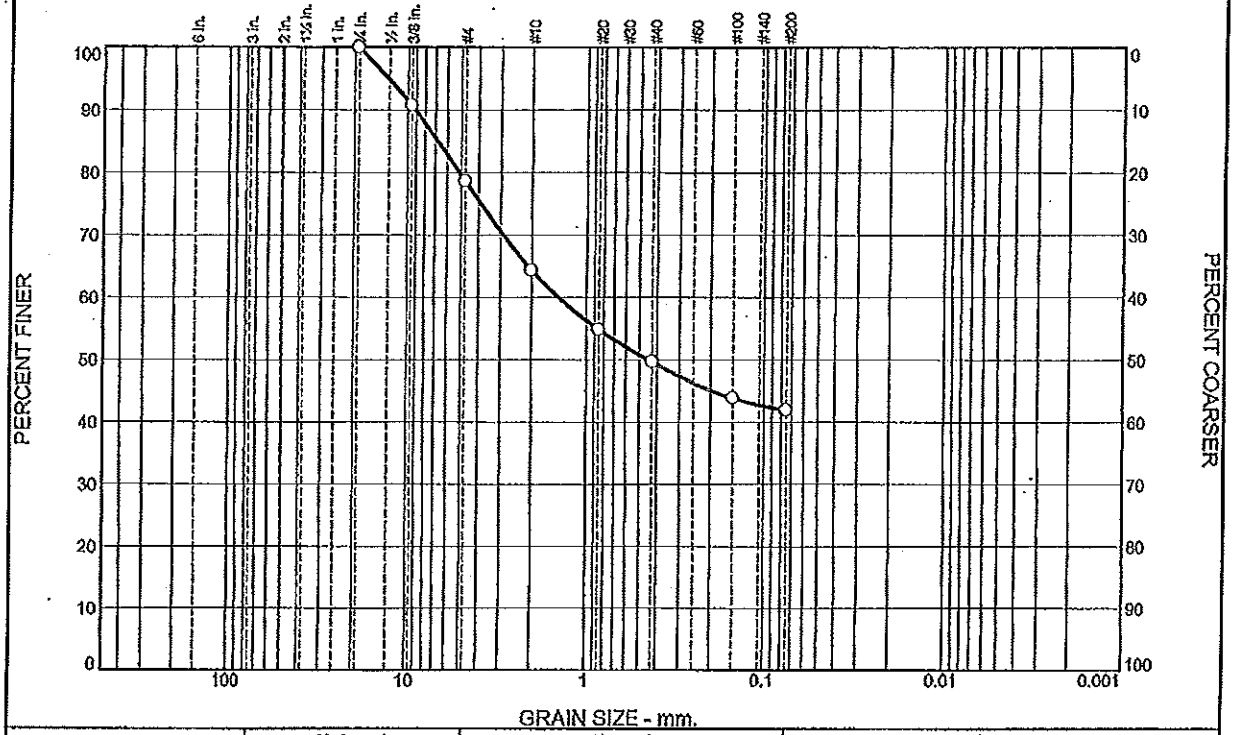
Date: 5/16/13

Triad Engineering, Inc.

Client: Antrim Township
Project: Rabbit Road North
Antrim Township, Pennsylvania
Project No: 03-13-0190 Figure C-2

Tested By: DLS

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	21.4	14.3	14.7	7.7	41.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100.0		
3/8	90.7		
#4	78.6		
#10	64.3		
#20	54.8		
#40	49.6		
#100	43.8		
#200	41.9		

* (no specification provided)

Soil Description

Tan brown clayey SAND, some gravel.

Atterberg Limits

PL= 23 LL= 41 PI= 18

Coefficients

D_{90}= 9.1091 D_{85}= 6.7732 D_{60}= 1.4277
D_{50}= 0.4509 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SC AASHTO= A-7-6(4)

Remarks

Source of Sample: Bag Depth: 14.0"-27.0"
Sample Number: C-3

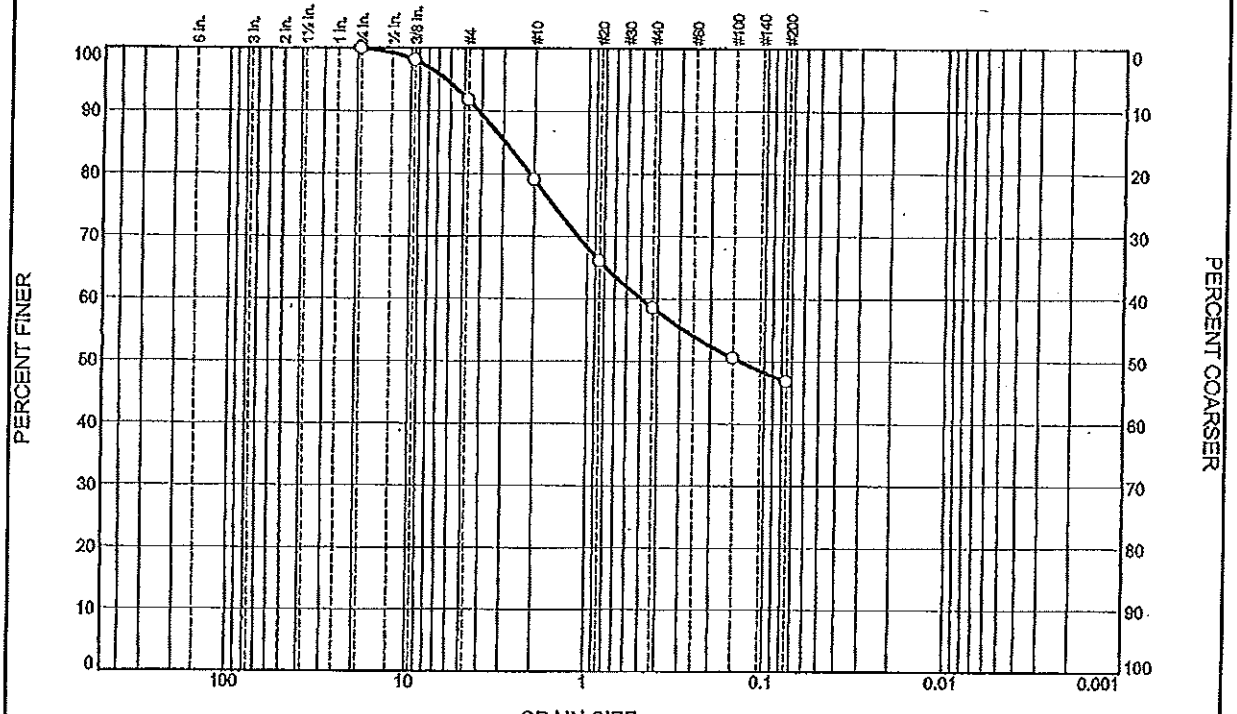
Date: 5/16/13

Triad Engineering, Inc.

Client: Antrim Township
Project: Rabbit Road North
Antrim Township, Pennsylvania
Project No: 03-13-0190 Figure C-3

Tested By: DLS

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	8.3	12.7	20.5	11.8	46.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100.0		
3/8	98.1		
#4	91.7		
#10	79.0		
#20	66.0		
#40	58.5		
#100	50.5		
#200	46.7		

* (no specification provided)

Soil Description

Brown clayey SAND, trace gravel.

Atterberg Limits

PL= 19 LL= 32 PI= 13

Coefficients

D_{90}= 4.1607 D_{85}= 2.9319 D_{60}= 0.4979
D_{50}= 0.1381 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SC AASHTO= A-6(3)

Remarks

Source of Sample: Bag Depth: 14.0"-26.0"
Sample Number: C-5

Date: 5/16/13

Triad Engineering, Inc.

Client: Antrim Township
Project: Rabbit Road North
Antrim Township, Pennsylvania
Project No: 03-13-0190 Figure C-4

Tested By: DLS