MODULE 7

Module 7: Geology Information
[§77.404]

7.1 Stratigraphy.

a) Rock Unit: Period (e.g., Lower Ordovician) **Upper Precambrian**
Formation (e.g., Rookdale Run) **Catoctin Metabasalt**

b) Attach Geologic Logs of test holes or equivalent information on attached data sheet (test holes should be drilled to the ultimate depth of mining unless waived by the Department based on acceptable equivalent information). Log description must include the surface elevation of each hole submitted, lowest elevation of proposed excavation, elevation of static groundwater (method and date of measurement), lithologic description, location and extent of voids and thickness of strata encountered. Drill holes, highwall sections, or equivalent information should be located to represent the thickness of mineral and overburden to be disturbed in areas of maximum thickness. **See attached.**

c) Provide stratigraphic correlation of the strata by geologic cross sections or fence diagrams to include lithology, stratigraphy, existing ground surface, proposed mining limits, proposed benching, final reclamation slopes, postmining water table, aquifers to be encountered or affected, directions of groundwater movement and underground mines and cave systems. [Horizontal scale shall not be smaller than the scale of Exhibit 6.2 (i.e. not less than 1 inch: 400 feet, or 1 inch: 200 feet), larger scales are acceptable (e.g. 1 inch: 100 feet)] **See attached the attached Exhibit 7.1: Geological Cross-Sections.**

7.2 Structure.

a) Describe the local geologic structure and its relationship to the regional structure. Use diagrams and regional structural relief maps where applicable.

The local geologic structure and its relationship to the regional structure are described in the following sections. Monitoring Well Drilling and Construction Logs in support of Module 7 are included as Attachment A. Geologic cross-sections showing well construction details relative to the geologic structure and groundwater elevations are included as Attachment B. A detailed description of the local geologic structure is provided below.

South Mountain, the local name given to the northern portion of the Blue Ridge physiographic and structural province, is an anticlinorium with a core of Precambrian age volcanics and marginal belts of Cambrian graywackes and quartzites. The Iron Springs quadrangle and the Pennsylvania portion of the Blue Ridge Summit quadrangle are located on the western limb and crestal portions of this regional structure (Fauth, 1978). As depicted on the well drilling and construction logs (Attachment A), subsurface materials encountered in the boreholes and wells consist of overburden soils, weathered bedrock (cap rock), greenstone (metabasalt), and metarhyolite. The greenstone is characterized as dark green with purplish banding and a platy, agglomeritic, or porphyritic texture. The metabasalt contains chlorite, epidote, and quartz inclusions, porphyroblasts of epidote and quartz, epidote and feldspar phenocrysts, and veining comprised of calcite and quartz. The metarhyolite occurs as layers within the metabasalt and was described as a purplish rock with quartz veining, epidote porphyroblasts, and epidote and chlorite inclusions.

Review of the well drilling and construction logs (Attachment A) and available geologic cross-sections (Attachment B) indicate that cap rock, interpreted as weathered bedrock and/or saprolite, was encountered in all of the Northern Tract Quarry perimeter monitoring wells (MW-8S, MW-8D, MW-9S, MW-9D, MW-10D, MW-11D, MW-12D, MW-13D, and MW-14D). As shown on Exhibit 6.2, these wells are situated along the perimeter of the proposed Northern Tract Quarry mine buffer boundary. The cap rock underlies unconsolidated materials (i.e., clay, clay with gravel, silt, sandy silt with gravel, silt with gravel, or gravelly silt with sand) and was encountered in the boreholes used to construct monitoring wells MW-8S (27 feet bgs), MW-8D (23 feet bgs), MW-9S (41 feet bgs), MW-9D (40 feet bgs), MW-10D (7 feet bgs), MW-11D (3 feet bgs), MW-12D (5.5 feet bgs), MW-13D (5 feet bgs), MW-14S (49 feet bgs), and MW-14D (53 feet bgs). Based on monitoring data collected from these wells from April 2015 through September 2015, groundwater was encountered at variable depths in these monitoring wells including MW-8S (18.38-29.90 feet bgs), MW-8D (17.66-28.41 feet bgs), MW-9S (25.57-46.44 feet bgs), MW-9D (25.46-32.45 feet bgs), MW-10D (57.28-68.27 feet bgs), MW-11D (19.91-41.45 feet bgs), MW-12D (9.22-31.10 feet bgs), MW-13D (30.41-50.20 feet bgs), MW-14S (18.93-32.70 feet bgs), and MW-14D (26.04-43.55 feet bgs). In wells MW-9S and MW-14S, the depth to water primarily occurs within the overburden soil above the cap rock interface. In well MW-8S the depth to water generally corresponds to the overburden soil/cap rock interface. The depth to groundwater in the other above-referenced wells was encountered below the overburden soil/cap rock interface within competent (unweathered) bedrock.

The geologic structure of the Iron Springs and Blue Ridge Summit quadrangles comprises a portion of the South Mountain anticlinorium, and thus is characterized by the structural fabric of that belt. Southwest-plunging folds, and southeast-dipping flow cleavage with related downdip lineation, dominate the structure of the mapped area. These structural features are impressed upon all rocks of the area except those of post-paleozoic age. All folds in the project area are coaxial, except for locally developed, small kink folds and bands produced by the crinkling of the regional cleavage by a later slip cleavage, and those associated with the Tunnel Hill fault. Folds in the area are the product of flexural-slip and passive mechanisms. Major faults are primarily high-angle reverse faults (Fauth, 1978). The metarhyolite overlies the metabasalt in wells MW-9S/D and MW-10D confirming the presence of a thrust fault trending from southwest to northeast and extending across the easternmost portion of the proposed Northern Tract Quarry.

Groundwater moves principally through joints, locally along cleavage planes, or other regularly distributed fracture zones and is generally characterized by a considerable range in mineral content and hardness with objectionable quantities of iron locally (Fauth, 1978).

7.3 Indicate joint and fracture orientations on the Module 6.2 map (or Module 6.1 if locations not within limits of Module 6.2), using standard joint strike and dip symbols, where fracture/joint measurements were taken. Rose diagrams may be submitted if available.

Type of Joint Or Fracture*	Lithology	Number of Measurements	Depth Below Surface	Aperture (width)	Key to 6.2 (or 6.1)
Regional Axial Plane Cleavage	Metabasalt	22	N/A	N/A	6.2
Multiple Joint System	Metabasalt	2	N/A	N/A	6.2
Subordinate Slip or Crenulation Cleavage	Metabasalt	1	N/A	N/A	6.2
Fault	Metabasalt	2	N/A	N/A	6.2

Type of Joint or Fracture refers to tectonic, stress relief, bedding plane, etc.

Source of information (site specific measurements, publication source, etc.) Fauth, John L., 1978, Geologic Map of the Iron Springs and Blue Ridge summit Quadrangles, Adams and Frankline Counties, Pennsylvania; URS, December 2012, Hydrogeologic and Hydraulic Analysis Report – Modules 7 and 8, Specialty Granules, Inc. Charmian Facility, Hamiltonban and Washington Townships, Adams and Franklin Counties, Blue Ridge summit, Pennsylvania

7.4 Overburden Analysis.

Note: Typically overburden analysis is not required for noncoal mining operations. However, there are geologic conditions that may make overburden analysis necessary due to the potential for surface and/or groundwater pollution. Examples are mines in coal field strata that may be acid-forming, and sites where rock has undergone sulfide mineralization. The necessity for overburden analysis should be determined prior to permit application submittal. This can be done by contacting the appropriate District Mining Office.

a) Overburden Analysis Report **Not Applicable (N/A)**

The overburden analysis report must include at a minimum:

1) geologic logs of overburden analysis test holes including Munsell color codes. This must include the information requested in Module 7.1b. Overburden holes must be logged by a geologist. Water condition information is the same as that requested in Module 7.1b. This information is to be presented on a completed Module 7.1(B) "Geologic Log Drill Holes/ Overburden Analysis Data."

2) an explanation of considerations employed in determining

   aa) drill hole spacing and number of holes,
   bb) sampling depth; and
   cc) sampling intervals of overburden analysis test holes.

3) a series of stratigraphic cross-sections or fence diagrams including all overburden analysis test holes, plus other representative test holes. The vertical scale must be sufficient to show all potentially acidic and alkaline zones and any zones proposed for special handling; a scale of one (1) inch to twenty (20) feet or greater is recommended. The stratigraphic correlations between overburden holes and other test holes must be shown. In addition, hydrogeologic information (such as water table, perched systems and so forth) should be portrayed.

4) overburden holes accurately located on Exhibit 6.2. Overburden holes must be surveyed such that surface elevations and hole locations are accurately determined and plotted.

5) results of the chemical analysis of all overburden strata and strata immediately below the lowest stratum being mined. Acid-base accounting data must be presented on Module 7.1(B) "Geologic Log Drill Holes/ Overburden Analysis Data." Actual laboratory analysis sheets may be submitted in addition to Module 7.1(B). Forms of sulfur (when submitted) should be submitted on a separate sheet.

6) techniques and methods of chemical analyses. References pertaining to technique or method should be cited as appropriate (e.g. Sobek, and others 1978, p. 47-50; ASTM Method D2492-84) and where a standard method is not used or has been modified, the method used should be described in detail.

7) an identification of any stratigraphic units possessing the potential for significant acid or alkaline production and an overall interpretation of the overburden analysis data. The criterion and rationale by which the overburden is being judged must be explained.

8) the name, address and telephone number of the individual(s) responsible for the collection and analysis of the data and interpretation of the data.

Note: The interpretation of overburden analysis should be provided in this Module. However, the operational plans for material placement should be provided in Module 10.

7.1(B) GEOLOGIC LOG DRILL HOLES/OVERBURDEN ANALYSIS DATA

Hole No.: _____
(Key locations to Modules 6.2 and 9)
Surface Elevation: _____
Bottom Elevations: _____
_____
_____
Groundwater Elevations and Date Measured
_____ _____
_____ _____
Surveyed by: _____
Method _____
Remarks: _____

Operation Name: _____
Method of Drilling: _____
Date Drilled: _____
Drilled By: _____
Logged By: _____
Township: _____
County: _____
Quadrangle: _____
Laboratory: _____
Latitude: ____° ____′ ____.″ Longitude: ____° ____′ ____.″

Depth	Thick-ness	Scale	Graphic Log	Lithologic Description and Water Conditions	Overburden Analysis Logs*					
					Color or Munsell Code	OBA Sample Number	Log Interval	% Total Sulfur	Fizz Rating	Neutralization Potential
		10								
		20								
		30								
		40								
		50								
		60								
		70								

*When requested by the Department

7.1(B) GEOLOGIC LOG DRILL HOLES/OVERBURDEN ANALYSIS DATA - CONTINUED

Hole No.: _____ Operation Name: _____

Remarks:

Depth	Thick-ness	Scale	Graphic Log	Lithologic Description and Water Conditions	Overburden Analysis Logs*					
					Color or Munsell Code	OBA Sample Number	Log Interval	% Total Sulfur	Fizz Rating	Neutralization Potential

*When requested by the Department

7.5 Mine Workings and Solid Waste Sites.

Submit the following data on all active, completed and abandoned underground and surface mines and coal refuse disposal sites which are in or within 1000 feet of the permit area: (Key location to Modules 6.2, 9 and 18.)

Surface and Underground Mines

Operator	*Permit No.*	*Map Key*	*Status*	*Mineral*	*Water Sample No.(s)*
Specialty Granules, LLC	SMP#01930302 (Pitts Quarry)	Modules 6.2, 9, and 18	Active	Metabasalt	MW-1, MW-2, MW-3, MW-4, MW-3R, MW-4R, and MW-7; SP-5, SP-21; and SS-1 through SS-5, SS-9, and SS-10
Specialty Granules, LLC	SMP#6477SM5 (West Ridge)	Modules 6.2, 9, and 18	Active	Metabasalt	MW-5, MW-6, SS-6, SS-13, and SP-6
Specialty Granules, LLC	Pending (Northern Tract Quarry)	Modules 6.2, 9, and 18	Proposed	Metabasalt	MW-8S, MW-8D, MW-9S, MW-9D, MW-10D, MW-11D, MW-12D, MW-13D, MW-14S, MW-14D; Wetland C, Wetland D, Chn 1 US, Chn 1 DS, TC DS, DCNR Seep 1, DCNR Seep 2, Lower Seep, DCNR chn, PFO Wetland, Pond 1, Upper Seep, and TC US; PWS's Shank and Holbrook
	Inactive underground mine	Modules 6.2, 9, and 18	Inactive	N/A	Controlled discharge to permitted sediment pond. NPDES 0009059 Outfall 001
	Abandoned Underground Mine	Modules 6.2, 9, and 18	Inactive	Copper	

Solid Waste Disposal Sites:

There are no solid waste disposal sites in or within 1,000 feet of the permit area.

List the operator permit number, and type of any solid waste disposal sites in or within 1000 feet of the permit area.

N/A

ATTACHMENT A

GEOLOGIC LOGS

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GEOLOGIC LOG DRILL HOLES/OVERBURDEN ANALYSIS DATA

Hole No.: NT-13-01
Surface Elevation: 1141.05 ft.
Bottom Elevations: 940.05 ft.

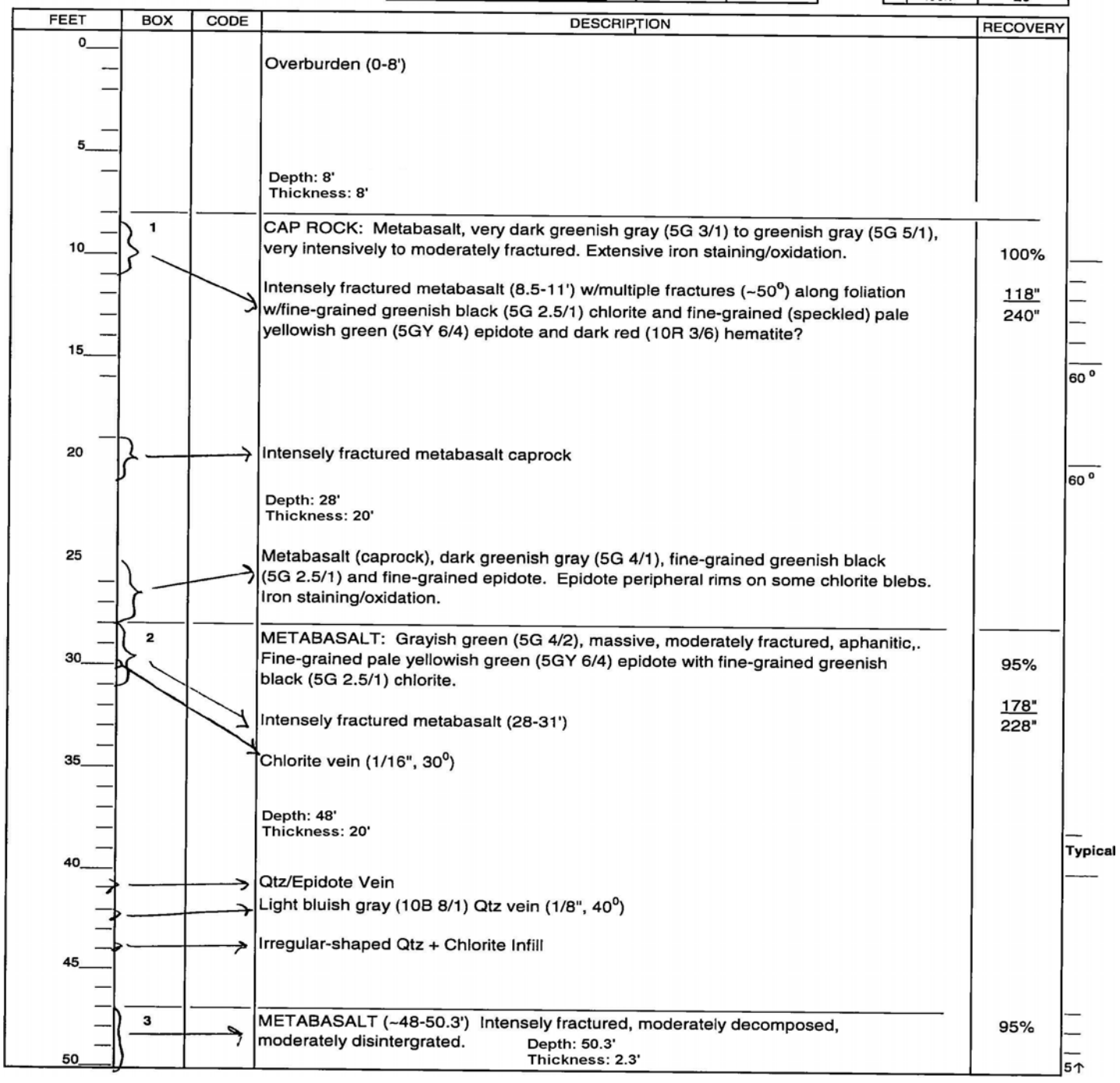
Static Water Elevations n/a
and Date Measured: n/a

Surveyed by: n/a Method: n/a
Remarks: n/a

Operation Name: Charmian Northern Tract
Method of Drilling: Rock Core, NQ Wireline
Date Drilled: September-October 2013
Drilled By: Logan Drilling Group
Logged By: Don Coleman – Geologist (URS/AECOM)
Quadrangle: Iron Springs, PA

Township/County: Hamiltonban Township, Adams County
Laboratory: SGI Technical Center
Latitude: 39° 46' 07.31" Longitude: 77° 25' 35.85"
Grid Coordinates:

Depth	Thick-ness	Scale	Graphic Log	Lithologic Description: rock type, weathering, color, fossils, carbonate minerals concentrations, pyrite, etc.	Water Conditions	Overburden Analysis Logs: Munsell Color Code	OBA Sample No.	Log Interval	%Total Sulfur	Fizz Rating	NP



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FEET	BOX	CODE	DESCRIPTION	RECOVERY
50	3		METABASALT: Dark greenish gray (5G 4/1), massive, moderately fractrued, aphanitic. Fine-grained (speckled) pale yellowish green (5GY 6/4) epidote, greenish black (5G 2.5/1) chlorite, some w/peripheral epidote rims.	95% 142"/228"
55				
60			Intensely fractured metabasalt (60-61') Depth: 65.3 Thickness: 15'	
65			Intensely fractured metabasalt (~64.8-65.3')	
	4		METABASALT, grayish green (5G 5/2), massive, slightly fractured, aphanitic. Fine-grained (speckled) pale yellowish green (5GY 6/4) epidote, minor greenish black (5G 2.5/1) chorite, some oriented to foliation (~30-40^0). Epidote peripheral rims on some chlorite blebs.	95% 191"/228"
70				
75			Light bluish gray (5PB 7/1) Qtz. Infill	
80			Depth: 85' Thickness: 19.7'	
85	5		METABASALT, grayish green (5G 5/2), massive, slightly fractured, aphanitic Fine-grained (speckled) pale yellowish green (5GY 6/4) epidote w/v. fine-grained greenish black (5G 2.5/1) chorite, some w/epidote peripheral rims.	95% 202"/228"
90				
95				
100				

6↓ Typical
40° Typical
25° 50° 40° 42°
6↑

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and Date Measured: n/a

Surveyed by: n/a Method: n/a
Remarks: n/a

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Depth	Thick-ness	Scale	Graphic Log	Lithologic Description: rock type, weathering, color, fossils, carbonate minerals concentrations, pyrite, etc.	Water Conditions	Overburden Analysis Logs: Munsell Color Code	OBA Sample No.	Log Interval	%Total Sulfur	Fizz Rating	NP

FEET	BOX	CODE	DESCRIPTION	RECOVERY
100	5		Depth: 104' Thickness: 19'	95%
105	6		METABASALT, grayish green (5G 4/2), massive, moderately fractured, aphanitic. Fine-grained pale yellowish green (5GY 6/4) epidote, minor irregular greenish black (5G 2.5/1) chlorite	95% 182" 228"
110				
115			Intensely fractured metabasalt (114-114.5') along foliation Dark gray (2.5YR 3/6) laminated bands of hematite (~111-119')	
120			Depth: 123' Thickness: 19'	
125	7		METABASALT, grayish green (5G 5/2), massive, slightly fractured, aphanitic. Fine-grained (speckled) pale yellowish green (5GY 6/4) epidote, minor greenish black (5G 2.5/1) chlorite w/some epidote peripheral rims.	95% 210" 228"
130			(~128.5-128.8') Amygdaloidal metabasalt w/irregular-shaped vesicles filled with white (9.5/N) to light bluish gray (5PB 8/1) Qtz.	
135			(~137.5') Amygdaloidial w/irregular-shaped vesicles filled w/Qtz, minor epidote and chlorite.	
140			Depth: 142' Thickness: 19'	
145	8		(~143-143.5') Hematite (?) vein rimmed w/epidote METABASALT, grayish green (5G 4/2), massive, slightly to moderately fractured, aphanitic. Fine-grained (speckled) pale yellowish green (5GY 6/4) epidote w/ irregular greenish black (5G 2.5/1) chlorite, some epidote rims on chlorite	95% 192" 228"
150				

Typical

Typical

7↓ 40° 30° 7↑

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Bottom Elevations: 940.05 ft.

Static Water Elevations n/a
and Date Measured: n/a

Surveyed by: n/a Method: n/a
Remarks: n/a

Operation Name: Charmian Northern Tract
Method of Drilling: Rock Core, NQ Wireline
Date Drilled: September-October 2013
Drilled By: Logan Drilling Group
Logged By: Don Coleman – Geologist (URS/AECOM)
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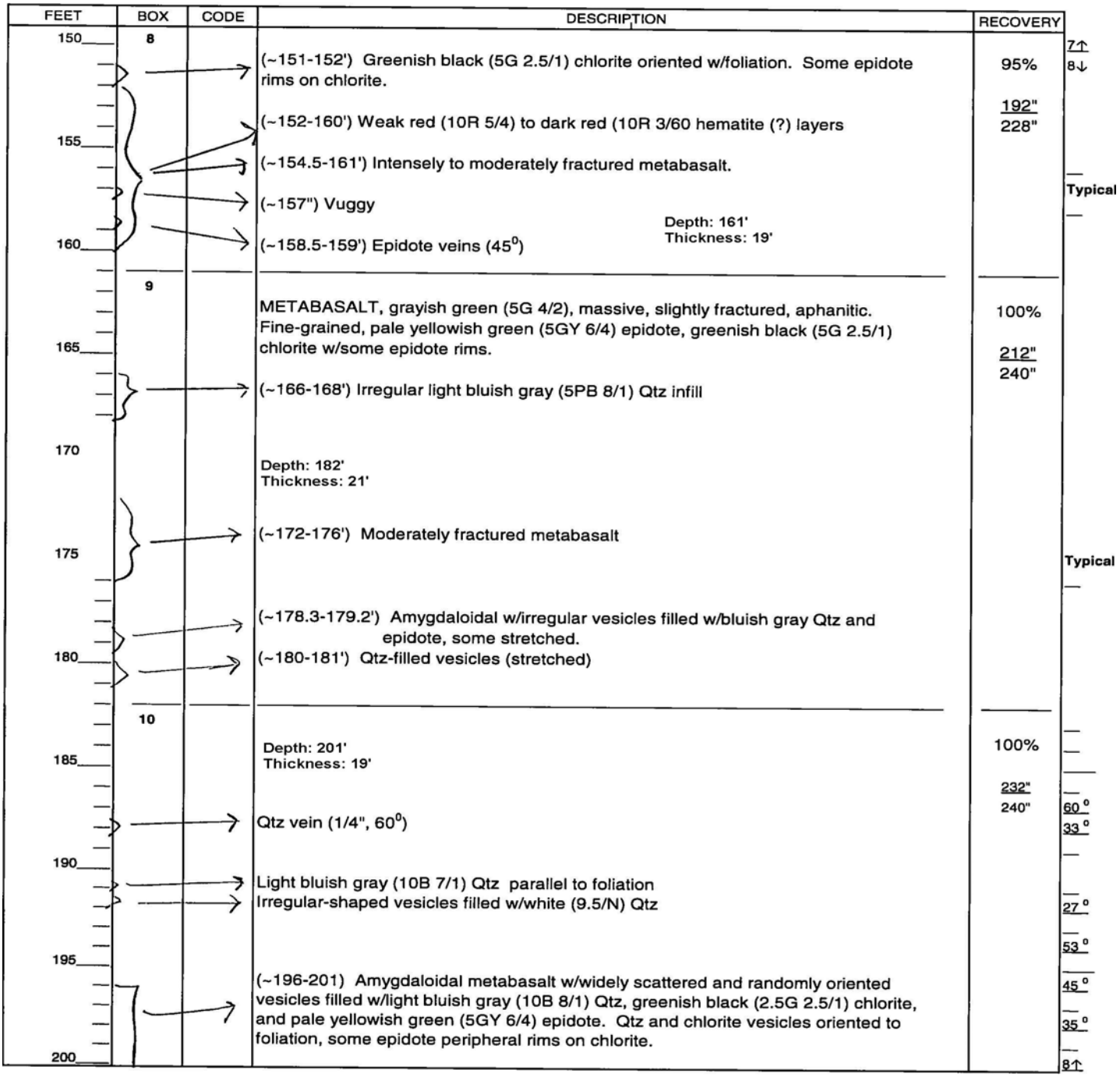
Depth	Thick-ness	Scale	Graphic Log	Lithologic Description: rock type, weathering, color, fossils, carbonate minerals concentrations, pyrite, etc.	Water Conditions	Overburden Analysis Logs: Munsell Color Code	OBA Sample No.	Log Interval	%Total Sulfur	Fizz Rating	NP



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GEOLOGIC LOG DRILL HOLES/OVERBURDEN ANALYSIS DATA

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Static Water Elevations n/a
and Date Measured: n/a

Surveyed by: n/a Method: n/a
Remarks: n/a

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FEET | BOX | CODE | DESCRIPTION | RECOVERY

200 — BOX 10

Corehole NT-13-01 completed at a depth of 201 feet below collar elevation of 1140 feet amsl.

RECOVERY: 8↑ 9↓

205 210 215 220 225 230 235 240 245 250

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GEOLOGIC LOG DRILL HOLES/OVERBURDEN ANALYSIS DATA

Hole No.: NT-13-02
Surface Elevation: 1146.60 ft.
Bottom Elevations: 1011.60 ft.

Static Water Elevations n/a
and Date Measured: n/a

Surveyed by: n/a Method: n/a
Remarks: n/a

Operation Name: Charmian Northern Tract
Method of Drilling: Rock Core, NQ Wireline
Date Drilled: September-October 2013
Drilled By: Logan Drilling Group
Logged By: Don Coleman – Geologist (URS/AECOM)
Quadrangle: Iron Springs, PA

Township/County: Hamiltonban Township, Adams County
Laboratory: SGI Technical Center
Latitude: 39° 46' 07.56" Longitude: 77° 26' 25.40"
Grid Coordinates:

Depth	Thick-ness	Scale	Graphic Log	Lithologic Description: rock type, weathering, color, fossils, carbonate minerals concentrations, pyrite, etc.	Water Conditions	Overburden Analysis Logs: Munsell Color Code	OBA Sample No.	Log Interval	%Total Sulfur	Fizz Rating	NP

FEET	BOX	CODE	DESCRIPTION	RECOVERY
0				
5				4↑ 5↓
	1		CAP ROCK: Metabasalt, grayish green (5G 4/2)	
				95%
10			METABASALT: Grayish green (5G 5/2), massive, moderately fractured, aphanitic. Fine-grained (speckled) pale yellowish green (5GY 6/4) epidote w/oval, irregular, and tabuluar (stretched) greenish black (5G 2.5/1) chlorite, some w/epidote peripheral rims. Some chlorite stretched (oriented) in direction of foliation (~30°)	168" 228"
15			Qtz vein (1/8", 50°)	
20			Depth: 26' Thickness: 19'	Typical
			(~24.5-25') Very intensely fractured metabasalt	
25			Vuggy	
	2			
			METABASALT: Grayish green (5G 5/2), massive, slighlty to moderately fractured, aphanitic. Fine-grained (speckled) pale yellowish green (5GY 6/4) epidote w/ greenish black (5G 2.5/1) irregular chlorite and Qtz oriented to foliation (~30-40°)	100% 173" 240"
30			(~31-32') Intensely fractured w/iron staining/oxidation and some vugs present	
35			Vugs oriented to foliation	Typical
			1" Qtz-filled cavity	
40			(~41-42') Intensely fractured metabasalt w/vugs oriented to foliation (~30°), iron staining	
45			_(~42.5-45') Chlorite banding (~40°) w/Qtz and speckled epidote Depth: 46' Thickness: 20'	
	3			
50				55° 20°

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and Date Measured: n/a

Surveyed by: n/a Method: n/a
Remarks: n/a

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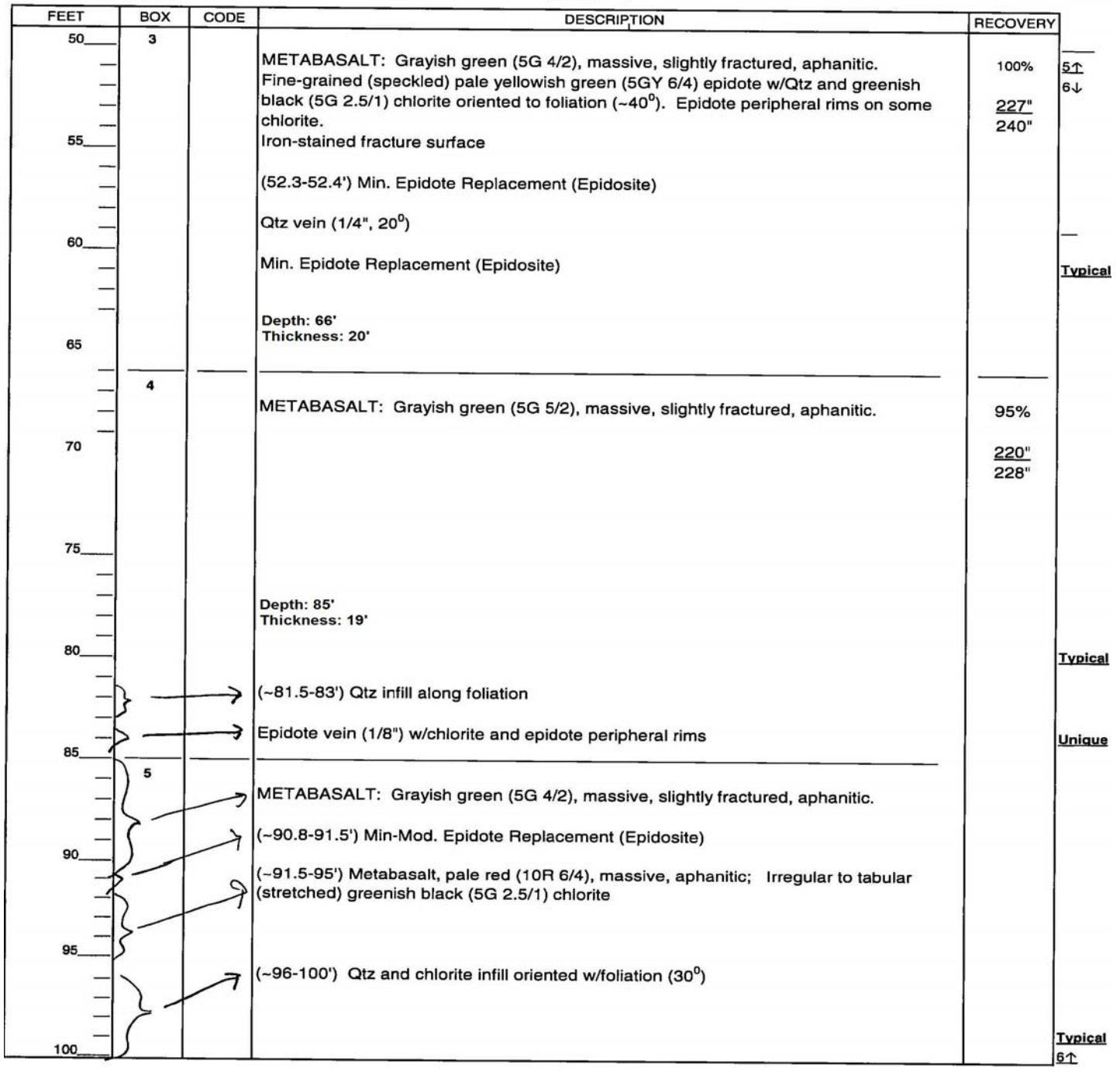

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Static Water Elevations n/a
and Date Measured: n/a

Surveyed by: n/a Method: n/a
Remarks: n/a

Operation Name: Charmian Northern Tract
Method of Drilling: Rock Core, NQ Wireline
Date Drilled: September-October 2013
Drilled By: Logan Drilling Group
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Quadrangle: Iron Springs, PA

Township/County: Hamiltonban Township, Adams County
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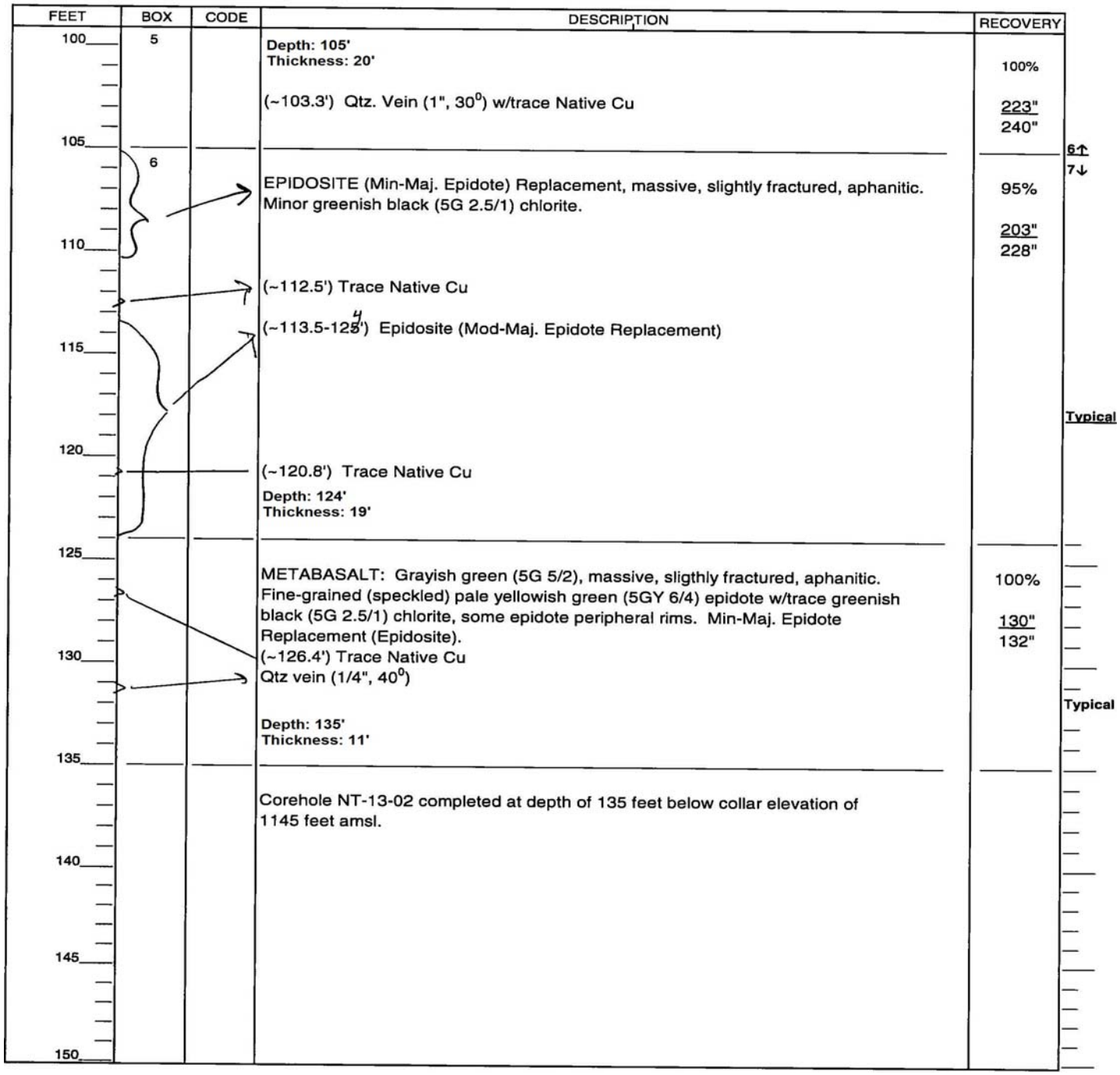
Latitude: 39° 46' 07.56" Longitude: 77° 26' 25.40"
Grid Coordinates:

Depth	Thick-ness	Scale	Graphic Log	Lithologic Description: rock type, weathering, color, fossils, carbonate minerals concentrations, pyrite, etc.	Water Conditions	Overburden Analysis Logs: Munsell Color Code	OBA Sample No.	Log Interval	%Total Sulfur	Fizz Rating	NP



COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF MINING PROGRAMS

GEOLOGIC LOG DRILL HOLES/OVERBURDEN ANALYSIS DATA

Hole No.: NT-13-03
Surface Elevation: 1095.31 ft.
Bottom Elevations: 970.31 ft.

Static Water Elevations n/a
and Date Measured: n/a

Surveyed by: n/a Method: n/a
Remarks: n/a

Operation Name: Charmian Northern Tract
Method of Drilling: Rock Core, NQ Wireline
Date Drilled: September-October 2013
Drilled By: Logan Drilling Group
Logged By: Don Coleman – Geologist (URS/AECOM)
Quadrangle: Iron Springs, PA

Township/County: Hamiltonban Township, Adams County
Laboratory: SGI Technical Center
Latitude: 39° 46' 08.29" Longitude: 77° 26' 17.07"
Grid Coordinates:

Depth	Thick-ness	Scale	Graphic Log	Lithologic Description: rock type, weathering, color, fossils, carbonate minerals concentrations, pyrite, etc.	Water Conditions	Overburden Analysis Logs: Munsell Color Code	OBA Sample No.	Log Interval	%Total Sulfur	Fizz Rating	NP

FEET	BOX	CODE	DESCRIPTION	RECOVERY
0				
5				5↑ 6↓
10	1		CAPROCK (9-13'): Metabasalt, grayish green (5G 4/2), moderately to intensely fractured. Irregular greenish black (5G 2.5/1) chlorite, fine-grained pale yellowish green (5GY 6/4) epidote, and red (7.5R 4/8) hematite (?) aligned to foliation. Iron staining/oxidation observed on core surfaces.	90% 183" 216"
15			METABASALT: Grayish green (5G 4/2), massive, slightly fractured, aphanitic. Greenish black (5G 2.5/1) chlorite, fine-grained (speckled) pale yellowish green (5GY 6/4) epidote. Trace red (7.5R 4/8) hematite (?) parallel to foliation.	45°
20		→	(18.6-18.7') EPIDOSITE (Mod. Epidote Replacement)	
25		→	(~24.3-26.1') Intensely fractured zone w/iron staining/oxidation. Depth: 27' Thickness: 18'	50°
	2		METABALT: Grayish green (5G 4/2), massive, slightly fractured, aphanitic. Fine-grained (speckled) pale yellowish green (5GY 6/4) epidote, greenish black (5G 2.5/1) chlorite. Epidote peripheral rims on some chlorite observed. Trace red (7.5R 4/8) hematite.	95% 224" 228"
30				
		→	(~34.5-34.6') EPIDOSITE (Min. Epidote Replacement)	55°
35				
40				Typical 60°
45			Depth: 46' Thickness: 19'	
	3			
50				

COMMONWEALTH OF PENNSYLVANIA
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GEOLOGIC LOG DRILL HOLES/OVERBURDEN ANALYSIS DATA

Hole No.: NT-13-03
Surface Elevation: 1095.31 ft.
Bottom Elevations: 970.31 ft.

Static Water Elevations n/a
and Date Measured: n/a

Surveyed by: n/a Method: n/a
Remarks: n/a

Operation Name: Charmian Northern Tract
Method of Drilling: Rock Core, NQ Wireline
Date Drilled: September-October 2013
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Quadrangle: Iron Springs, PA

Township/County: Hamiltonban Township, Adams County
Laboratory: SGI Technical Center
Latitude: 39° 46' 08.29" Longitude: 77° 26' 17.07"
Grid Coordinates:

Depth	Thick-ness	Scale	Graphic Log	Lithologic Description: rock type, weathering, color, fossils, carbonate minerals concentrations, pyrite, etc.	Water Conditions	Overburden Analysis Logs: Munsell Color Code	OBA Sample No.	Log Interval	%Total Sulfur	Fizz Rating	NP

FEET	BOX	CODE	DESCRIPTION	RECOVERY	
50	3		METABASALT: Grayish green (5G 4/2), massive, slightly fractured, aphanitic. Fine-grained, pale yellowish green (5GY 6/4) epidote w/oval to irregular greenish black (5G 2.5/1) chlorite, trace red (7.5R 4/8) hematite, trace light bluish gray (5B 8/1) Qtz. Infill,	100% 234" 240"	6↑ 7↓
55					
60			Depth: 66' Thickness: 20'		
			Epidote fracture filling		
65			Amygdaloidal w/irregular vesicles filled w/hematite, rimmed by epidote and Qtz. Qtz. Vein (1/8", 65°)		Typical
	4		METABASALT: Grayish green (5G 4/2), massive, slightly fractured, aphanitic. Oval to irregular greenish black (5G 2.5/1) chlorite, fine-grained (specked) to irregular pale yellowish green (5GY 6/4) epidote. Epidote peripheral rims around some chlorite infill. Some chlorite vesicles elongated (stretched) in direction of foliation.	95% 212" 228"	
70			(~72.3") Light bluish gray (5B 7/1) to white (9.5/N) Qtz infill w/trace red (7.5R 4/8) hematite.		Typical
75			(~75-82.1') EPIDOSITE: Mod-Maj. Epidote Replacement w/minor greenish black (5G 2.5/1) chlorite and bluish gray (10B 5/1) Qtz.		40 Typical
80			Light bluish gray (10B 7/1) Qtz vein (1/8", 45°)		50°
			(~82-85') METABASALT: Grayish green (5G 5/2) w/mod. Epidote replacement.		
85			Depth: 85' Thickness: 19'		
	5		EPIDOSITE: Pale yellowish green (5GY 6/4) w/minor bluish gray (10B 6/1) Qtz infill, minor greenish black (5G 2.5/1) chlorite.		
90					
95			(~91.5-95') METABASALT: Grayish green (5G 5/2), massive, slightly fractured, aphanitic. Min-Mod. Epidote Replacement w/bluish gray to white, irregular Qtz. infill and greenish black (5G 2.5/1) chlorite, epidote rims present on some chlorite, trace red (7.5R 4.8) hematite.		
			(~95-100') EPIDOSITE (Mod-Maj. Epidote Replacement)		Typical
100			Depth: 105' Thickness: 20'		

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COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF MINING PROGRAMS

GEOLOGIC LOG DRILL HOLES/OVERBURDEN ANALYSIS DATA

Hole No.: NT-13-03
Surface Elevation: 1095.31 ft.
Bottom Elevations: 970.31 ft.

Static Water Elevations n/a
and Date Measured: n/a

Surveyed by: n/a Method: n/a
Remarks: n/a

Operation Name: Charmian Northern Tract
Method of Drilling: Rock Core, NQ Wireline
Date Drilled: September-October 2013
Drilled By: Logan Drilling Group
Logged By: Don Coleman – Geologist (URS/AECOM)
Quadrangle: Iron Springs, PA

Township/County: Hamiltonban Township, Adams County
Laboratory: SGI Technical Center
Latitude: 39° 46' 08.29" Longitude: 77° 26' 17.07"
Grid Coordinates:

Depth	Thick-ness	Scale	Graphic Log	Lithologic Description: rock type, weathering, color, fossils, carbonate minerals concentrations, pyrite, etc.	Water Conditions	Overburden Analysis Logs: Munsell Color Code	OBA Sample No.	Log Interval	%Total Sulfur	Fizz Rating	NP

FEET | BOX | CODE | DESCRIPTION | RECOVERY

100 — 5

METABASALT: Grayish green (5G 5/2), massive, slightly fractured. Fine-grained pale yellowish green (5GY 6/4) epiodite w/greenish black (5G 2.5/1) chlorite, some w/epidote peripheral rims.

100%

(~101.7') White to light bluish gray Qtz vein w/greenish black chlorite

224"
240"

105 — 6

METABASALT: Grayish green (5G 5/2), massive, slightly fractured. Fine-grained pale yellowish green (5GY 6/4) epiodite w/greenish black (5G 2.5/1) chlorite, some w/epidote peripheral rims.

95%

110 — (~109-109.5') Red (7.5R 4/8) hematite infill

211"
228"

115

Depth: 125'
Thickness: 20'

120

SAA

125 — 7

100% RQD

Corehole NT-13-03 completed at depth of 125 feet below collar elevation of 1095 ft. amsl.

130

135

140

145

150

7↑
8↓
65°
Typical

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DEPARTMENT OF ENVIRONMENTAL PROTECTION
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GEOLOGIC LOG DRILL HOLES/OVERBURDEN ANALYSIS DATA

Hole No.: NT-13-04
Surface Elevation: 1131.21 ft.
Bottom Elevations: 1036.21 ft.

Static Water Elevations n/a
and Date Measured: n/a

Surveyed by: n/a Method: n/a
Remarks: n/a

Operation Name: Charmian Northern Tract
Method of Drilling: Rock Core, NQ Wireline
Date Drilled: September-October 2013
Drilled By: Logan Drilling Group
Logged By: Don Coleman – Geologist (URS/AECOM)
Quadrangle: Iron Springs, PA

Township/County: Hamiltonban Township, Adams County
Laboratory: SGI Technical Center
Latitude: 39° 46' 02.41" Longitude: 77° 26' 36.84"
Grid Coordinates:

Depth	Thick-ness	Scale	Graphic Log	Lithologic Description: rock type, weathering, color, fossils, carbonate minerals concentrations, pyrite, etc.	Water Conditions	Overburden Analysis Logs: Munsell Color Code	OBA Sample No.	Log Interval	%Total Sulfur	Fizz Rating	NP

FEET	BOX	CODE	DESCRIPTION	RECOVERY
0			OVERBURDEN (0-8')	
5				
10	1		CAP ROCK (8-12'): Very dark greenish gray (5G 3/1), moderately to intensely fractured, aphanitic. Porphyritic w/randomly oriented oval, lenticular, and irregular white (5Y 8/1) to pale yellow (5Y 8/2) feldspars w/minor greenish black (5G 2.5/1) chlorite METABASALT: Dark greenish gray (5G 4/1), massive, slightly to moderately fractured, aphanitic. Randomly oriented white (5Y 8/1) to pale yellow (5Y 8/2) feldspar phenocrysts oriented to foliation (~30°). (~18.2') Chlorite vein (1/8", 50°)	
15				
20			(~21-31') Stretched feldspar phenocrysts oreinted w/foliation (~40°) (~19-27') Intensely fractured metabasalt	25° Typical
25			Depth: 27' Thickness: 19'	55°
30	2		METABASALT: greenish gray (5G 5/2), massive, slightly to moderately fractured, aphanitic. Fine-grained greenish-black (5G 2.5/1) chlorite elongated (stretched) in oriented w/foilation (~40°)	40° 95% 201" 228
35			(`35.2') Epidote infill Depth: 46' Thickness: 19'	45°
40			(~40.5') Qtz vein, white (9/N) to light bluish gray (10B 7/1). (~41.5-42') Qtz vein, light bluish gray (10B 7/1), 1/16", 35°	Typical 55°
45			(~44') Irregular vesicles filled w/pale yellowish green (5GY 6/4) epidote	5↑ 6↓
50	3			100% 218" 240"

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GEOLOGIC LOG DRILL HOLES/OVERBURDEN ANALYSIS DATA

Hole No.: NT-13-04
Surface Elevation: 1131.21 ft.
Bottom Elevations: 1036.21 ft.

Static Water Elevations n/a
and Date Measured: n/a

Surveyed by: n/a Method: n/a
Remarks: n/a

Operation Name: Charmian Northern Tract
Method of Drilling: Rock Core, NQ Wireline
Date Drilled: September-October 2013
Drilled By: Logan Drilling Group
Logged By: Don Coleman – Geologist (URS/AECOM)
Quadrangle: Iron Springs, PA

Township/County: Hamiltonban Township, Adams County
Laboratory: SGI Technical Center
Latitude: 39° 46' 02.41" Longitude: 77° 26' 36.84"
Grid Coordinates:

Depth	Thick-ness	Scale	Graphic Log	Lithologic Description: rock type, weathering, color, fossils, carbonate minerals concentrations, pyrite, etc.	Water Conditions	Overburden Analysis Logs: Munsell Color Code	OBA Sample No.	Log Interval	%Total Sulfur	Fizz Rating	NP

FEET	BOX	CODE	DESCRIPTION	RECOVERY	
50	3		METABASALT: Dark greenish gray (10GY 4/1), massive, slight to moderately fractured, aphanitic. Greenish black (5G 2.5/1) chlorite, irregular to elongate (stretched) w/minor fine-grained, pale yellowish green (5GY 6/4) epidote.	100%	
			Qtz vein (1/8", 40°)	218"	
55			Qtz vein (1/4", 30°)	240"	
60			Qtz vein (1/4", 40°), light bluish gray (10PB 8/1)		Typical
			(~62.7') Qtz vein (3/16", 30°), light bluish gray (10B 8/1)		
65			**Depth: 66'** **Thickness: 20'**		
	4		METABASALT: Dark greenish gray (10GY 4/1), massive, slightly fractured, aphanitic. Irregular greenish black (5G 2.5/1) chlorite w/fine-grained (stretched) epidote	95%	
70			(~68') Qtz vein (1/2", 40°), light bluish gray (10B 7/1) to white (9.5/N)	212"	
			(~70-71) Intensely fractured metabasalt	228"	
			(~71') Qtz vein (1/2", 35°)		
75					
			(~78-79') Stretched chlorite oriented to foliation (~30°)		
			(~78.3') Epidote vein (1/16", 40°)		
80					
			(~82.3') Epidote vein (1/8", 30°)		
			Depth: 85' **Thickness: 19'**		
85					
	5		METABASALT: Dark greenish gray (5G 4/1), massive, slightly to moderately fractured, aphanitic. Greenish black (5G 2.5/1) chlorite, irregular to elongate (stretched) w/minor fine-grained, pale yellowish green (5GY 6/4) epidote.	100%	
				101"	
90				120"	Typical
			Qtz and epidote veins		
			Depth: 95' **Thickness: 10'**		
95					
			Corehole NT-13-04 completed at depth of 95 feet below collar elevation of 1135 ft. amsl (and floor elevation of Level 6).		
100					

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COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF MINING PROGRAMS

GEOLOGIC LOG DRILL HOLES/OVERBURDEN ANALYSIS DATA

Hole No.: NT-13-05
Surface Elevation: 1217.89 ft.
Bottom Elevations: 882.89 ft.

Static Water Elevations n/a
and Date Measured: n/a

Surveyed by: n/a Method: n/a
Remarks: n/a

Operation Name: Charmian Northern Tract
Method of Drilling: Rock Core, NQ Wireline
Date Drilled: September-October 2013
Drilled By: Logan Drilling Group
Logged By: Don Coleman – Geologist (URS/AECOM)
Quadrangle: Iron Springs, PA

Township/County: Hamiltonban Township, Adams County
Laboratory: SGI Technical Center
Latitude: 39° 46' 02.45" Longitude: 77° 26' 29.18"
Grid Coordinates:

Depth	Thick-ness	Scale	Graphic Log	Lithologic Description: rock type, weathering, color, fossils, carbonate minerals concentrations, pyrite, etc.	Water Conditions	Overburden Analysis Logs: Munsell Color Code	OBA Sample No.	Log Interval	%Total Sulfur	Fizz Rating	NP

FEET	BOX	CODE	DESCRIPTION	RECOVERY
0			OVERBURDEN (0-17')	
5				
10				
15				
20	1		CAP ROCK (17-25') Dark greenish gray (5G 4/1), mdoerately fractured, aphanitic. Fine-grained (speckled) and irregular pale yellowish green (5GY 6/4) epidote, greenish black (5G 2.5/1) chlorite, some elongate (stretched) in direction of foliation (40-50°). Some vugs and epidote peripheral rims observed. Pervasive iron staining/oxidation on core surfaces. Intensely fractured (17-18.5'). **Depth: 36'** **Thickness: 19'**	95% 180" 228"
25			METABASALT: Dark greenish gray (5G 4/1), slightly to moderately fractured, aphanitic. (~26.7') Possible flow boundary w/Qtz and epidote (~28.8') Qtz vein (1/4", 30°), light bluish gray (10B 7/1), cuts across foliation (~29.5') Irregular Qtz, epidote, and chlorite elongate in direction of foliation (~40°)	3↑ 4↓
30			(31-37') Intensely fractured metabasalt (33-34') Highly weathered metabasalt (34-36') Amygdaloidal w/irregular vesicles filled w/white (9/N) to light bluish gray (5B 7/1) Qtz oriented to foliation.	
35				
40	2		METABASALT: Grayish green (5G 4/2), massive, slightly to moderately fractured, aphanitic. Irregular white (9.5/N) to light bluish gray (10B 7/1) Qtz, elongate (stretched) greenish black (5G 2.5/1) chlorite, and pale yellowish green (5GY 6/4) epidote. Some epidote peripheral rims on chlorite	100% 215" 240
45			(40-46') Amygdaloidal metabasalt w/irregular to elongate vesicles filled w/light bluish gray (10B 7/1) Qtz, minor pale yellowish green (5Y 8/3) epidote.	
50			(~48-49') Metabasalt breccia w/epidote, Qtz, and chorite (~49-51') Min-Mod. Epidote Replacement w/minor Chlorite.	Typical

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF MINING PROGRAMS

GEOLOGIC LOG DRILL HOLES/OVERBURDEN ANALYSIS DATA

Hole No.: NT-13-05
Surface Elevation: 1217.89 ft.
Bottom Elevations: 882.89 ft.

Static Water Elevations n/a
and Date Measured: n/a

Surveyed by: n/a Method: n/a
Remarks: n/a

Operation Name: Charmian Northern Tract
Method of Drilling: Rock Core, NQ Wireline
Date Drilled: September-October 2013
Drilled By: Logan Drilling Group
Logged By: Don Coleman – Geologist (URS/AECOM)
Quadrangle: Iron Springs, PA

Township/County: Hamiltonban Township, Adams County
Laboratory: SGI Technical Center
Latitude: 39° 46' 02.45" Longitude: 77° 26' 29.18"
Grid Coordinates:

Depth	Thick-ness	Scale	Graphic Log	Lithologic Description: rock type, weathering, color, fossils, carbonate minerals concentrations, pyrite, etc.	Water Conditions	Overburden Analysis Logs: Munsell Color Code	OBA Sample No.	Log Interval	%Total Sulfur	Fizz Rating	NP

FEET	BOX	CODE	DESCRIPTION	RECOVERY	
50	2		**Depth: 56'** **Thickness: 20'**	100%	
				215" / 240"	
55			(54-56') Irregular pale red (10R 6/3) hematite(?) layers		
	3		METABASALT: Grayish green (5G 4/2), slightly fractured, aphanitic. Qtz infill, light bluish gray (10B 7/1) w/elongate (stretched) greenish black (5G 2.5/1) chlorite along foliation (40^0)	95%	
60				213" / 228"	
			(~63.5-65') Healed Metabasalt Breccia: Epidote, minor Qtz infill and trace native Cu flecks.		
65			(~65-66) EPIDOSITE: Major Epidote Replacement w/minor Qtz infill, trace native Cu		
			(~67-75') Metabasalt, grayish green w/epidote, chlorite, and irregular to elongate (stretched) light bluish gray (5PB 8/1) to white (9.5/N) Qtz.		
70			**Depth: 75'** **Thickness: 19'**		Typical
75			METABASALT: Grayish green (5G 4/2), massive, lightly fractured, aphanitic. Fine-grained (speckled) pale yellowish green (5GY 6/4) epoidote, minor greenish black (5G 2.5/1) chlorite, and irregular to elongate (stretched) light bluish gray (5PB 8/1) Qtz.	95%	
				200" / 228	4↑ 5↓
80	4		(~78.2-79') Randomly oriented irregular to elongate white (9.5/N) to light bluish gray (10BG 7/1) Qtz infill		
			(`83.7') 1" Cavity filling w/Qtz, minor greenish black (5G 2.5/1) chlorite		
85					
90			(89-94') Irregular and elongate (stretched) Qtz parallel to foliation (40^0) w/minor epidote and chlorite.		
			Depth: 94' **Thickness: 19'**		
95	5			95%	
				216" / 228"	
100					

COMMONWEALTH OF PENNSYLVANIA
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GEOLOGIC LOG DRILL HOLES/OVERBURDEN ANALYSIS DATA

Hole No.: NT-13-05
Surface Elevation: 1217.89 ft.
Bottom Elevations: 882.89 ft.

Static Water Elevations n/a
and Date Measured: n/a

Surveyed by: n/a Method: n/a
Remarks: n/a

Operation Name: Charmian Northern Tract
Method of Drilling: Rock Core, NQ Wireline
Date Drilled: September-October 2013
Drilled By: Logan Drilling Group
Logged By: Don Coleman – Geologist (URS/AECOM)
Quadrangle: Iron Springs, PA

Township/County: Hamiltonban Township, Adams County
Laboratory: SGI Technical Center
Latitude: 39° 46' 02.45" Longitude: 77° 26' 29.18"
Grid Coordinates:

Depth	Thick-ness	Scale	Graphic Log	Lithologic Description: rock type, weathering, color, fossils, carbonate minerals concentrations, pyrite, etc.	Water Conditions	Overburden Analysis Logs: Munsell Color Code	OBA Sample No.	Log Interval	%Total Sulfur	Fizz Rating	NP

FEET	BOX	CODE	DESCRIPTION	RECOVERY
100			METABASALT: Grayish green (5G 4/2), massive, slightly to moderately fractured, aphanitic. Fine-grained (speckled) pale yellowish green (5GY 6/4) epidote w/light bluish gray (5PB 8/1) to white (9.5/N) Qtz infill, minor greenish black (5G 2.5/1) chlorite.	95%
	5		(~101.5-104') Six approximately regularly spaced fractures along foliation (40°)	216" / 228"
105			(~105-106.5') Amygdaloidal Metabasalt w/epidote-filled vesicles, Qtz infill, and minor chlorite. Some epidote peripheral rims present.	
110			(~108-110') Mod. Epidote infill	
			Depth: 113' **Thickness: 19'**	
115			METABASALT: Grayish green (5G 4/2), massive, slightly fractured, aphanitic. Fine-grained (speckled) pale yellowish green (5GY 6/4) epidote w/light bluish gray (5PB 8/1) Qtz and trace greenish black (5G 2.5/1) chlorite, some w/epidote peripheral rims. Epidote and Qtz oriented to foliation (40°).	95%
	6			221" / 228"
120			(`117-118.3') Amygdaloidal Metabasalt w/densely packed oval to irregular vesicles filled w/bluish gray (10B 5/1) Qtz and pale yellowish green (5GY 6/4) epidote	
			(~119-119.8') Metabasalt Breccia w/Qtz and $CaCO_3$	
125			(~125.3-126.7') Irregular pale yellowish green (5GY 6/4) epidote layers w/greenish black (5G 2.5/1) chlorite oriented to foliation (35-40°)	
	7		**Depth: 132'** **Thickness: 19'**	
130			(131-132') Oval, elongate (stretched) to irregular vesicles filled w/white (9.5/N) to bluish gray (5PB 8/1) to white (9.5/N) Qtz infill, minor greenish black (10B 7/1 Qtz oriented to foliation (30°).	
135			METABASALT: Grayish green (5G 4/2), massive, slightly to moderately fractured, aphanitic. Fine-grained (speckled) pale yellowish green (5GY 6/4) epidote w/Qtz infill parallel to foliation (~40°). Minor irregular chlorite	100%
	7			208" / 240"
			(~132.3-132.7') Qtz-filled fractures (1/4", 1/2", 40°) w/minor chlorite	
			(~137') Mod. Epidote Replacement w/light bluish gray (5B 8/1) Qtz, trace dark red (5R 3/6) hematite(?)	
140			(~140') 1" fracture filling w/white (9.5/N) to light bluish gray (10B 7/1) Qtz	
145				
			Depth: 152' **Thickness: 20'**	
150				

Typical

30°

47°

30° 38° 20°

5↑ 6↓

Typical

35°

25° 35° 55°

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GEOLOGIC LOG DRILL HOLES/OVERBURDEN ANALYSIS DATA

Hole No.: NT-13-05
Surface Elevation: 1217.89 ft.
Bottom Elevations: 882.89 ft.

Static Water Elevations n/a
and Date Measured: n/a

Surveyed by: n/a Method: n/a
Remarks: n/a

Operation Name: Charmian Northern Tract
Method of Drilling: Rock Core, NQ Wireline
Date Drilled: September-October 2013
Drilled By: Logan Drilling Group
Logged By: Don Coleman – Geologist (URS/AECOM)
Quadrangle: Iron Springs, PA

Township/County: Hamiltonban Township, Adams County
Laboratory: SGI Technical Center
Latitude: 39° 46' 02.45" Longitude: 77° 26' 29.18"
Grid Coordinates:

Depth	Thick-ness	Scale	Graphic Log	Lithologic Description: rock type, weathering, color, fossils, carbonate minerals concentrations, pyrite, etc.	Water Conditions	Overburden Analysis Logs: Munsell Color Code	OBA Sample No.	Log Interval	%Total Sulfur	Fizz Rating	NP

FEET	BOX	CODE	DESCRIPTION	RECOVERY	
150	7		(151-152') Epidote-filled vesicles		
	8		METABASALT: Grayish green (5G 4/2), massive, slightly to moderately fractured, aphanitic. Fine-grained (speckled) and irregular pale yellowish green (5GY 6/4) epidote w/minor greenish black (5G 2.5/1) chlorite aligned to foliatino (40^0)	205" / 228"	20 ^{0}
155			(`155.3-155.8') Pale red (7.5R 3/6) irregular hematite (?) cavity filling		18 ^{0}
					38 ^{0}
160			(~159.5-162') Six approximately evenly spaced fractures along foliation (40^0)		
			Depth: 171' **Thickness: 19'**		
165					
			(~167-168') Four fractures along foliation (40^0) (~167-171') Amygdaloidal Metabasalt w/oval, irregular, and elongate (stretched) vesicles filled w/pale yellowish green (5GY 6/4) to pale yellow (5Y 8/3) epidote, light bluish gray (10B 6/1) qtz and chlorite oriented to foliation.		
170					
	9		METABASALT: Dark greenish gray (5G 4/1) to grayish green (5G 4/2), massive, slightly fractured, aphanitic. Fine-grained (specked) epidote w/minor chlorite, some w/epidote peripheral rims	100%	Unique
175			(~174.6-175.4') Amygdaloidal Metabasalt w/oval to irregular vesicles filled w/epidote and minor chlorite	236" / 240"	
180			(~180-182') Widely spaced irregular vesicles filled w/white (9.5/N) to light bluish gray (10B 6/1) Qtz.		6↑ 7↓
185					
			Depth: 192' **Thickness: 21'**		
190					
	10		METABASALT: Grayish green (5G 4/2), massive, slightly fractured, aphanitic. Fine-grained (speckled) pale yellowish green (5GY 6/4) epidote w/minor greenish black (5G 2.5/1) chlorite, some w/epidote peripheral rims.	95%	
195				215" / 228"	
200					Typical

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF MINING PROGRAMS

GEOLOGIC LOG DRILL HOLES/OVERBURDEN ANALYSIS DATA

Hole No.: NT-13-05
Surface Elevation: 1217.89 ft.
Bottom Elevations: 882.89 ft.

Static Water Elevations n/a
and Date Measured: n/a

Surveyed by: n/a Method: n/a
Remarks: n/a

Operation Name: Charmian Northern Tract
Method of Drilling: Rock Core, NQ Wireline
Date Drilled: September-October 2013
Drilled By: Logan Drilling Group
Logged By: Don Coleman – Geologist (URS/AECOM)
Quadrangle: Iron Springs, PA

Township/County: Hamiltonban Township, Adams County
Laboratory: SGI Technical Center
Latitude: 39° 46' 02.45" Longitude: 77° 26' 29.18"
Grid Coordinates:

Depth	Thick-ness	Scale	Graphic Log	Lithologic Description: rock type, weathering, color, fossils, carbonate minerals concentrations, pyrite, etc.	Water Conditions	Overburden Analysis Logs: Munsell Color Code	OBA Sample No.	Log Interval	%Total Sulfur	Fizz Rating	NP

FEET	BOX	CODE	DESCRIPTION	RECOVERY
200	10		**Depth: 211'** **Thickness: 19'**	95% 215" 228"
205			(205.1') Native Cu specks	
210			(~208.5-209') Mod. Epidote Replacement w/minor chlorite and trace native Cu (~209') Elongate (stretched) chlorite oriented to foliation (30°)	
	11		METABASALT: Grayish green (5G 4/2), massive, slightly fractured, aphanitic. Fine-grained (speckled) and irregular pale yellowish green (5GY 6/4) epidote, minor greenish black (5G 2.5/1) chlrote, some w/epidote peripheral rims. Trace native Cu flecks.	95% 222" 228"
215				30°
220				30° 20°
225			**Depth: 232'** **Thickness: 19'**	
230	12		(~230.5') Chlorite-filled vugs	7↑ 8↓
			METABASALT: Grayish green (5G 4/2), massive, slightly fractured, aphanitic. Fine-grained (speckled) and irregular pale yellowish green (5GY 6/4) epidote w/minor greenish black (5G 2.5/1) chlorite, some w/epidote peripheral rims.	95% 220" 228"
235				
240				30°
245			**Depth: 249'** **Thickness: 19'**	
250	13			

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BUREAU OF MINING PROGRAMS

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Surveyed by: n/a Method: n/a
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Depth	Thick-ness	Scale	Graphic Log	Lithologic Description: rock type, weathering, color, fossils, carbonate minerals concentrations, pyrite, etc.	Water Conditions	Overburden Analysis Logs: Munsell Color Code	OBA Sample No.	Log Interval	%Total Sulfur	Fizz Rating	NP

FEET	BOX	CODE	DESCRIPTION	RECOVERY
250	13		METABASALT: Grayish green (5G 4/2), massive, slightly fractured, aphanitic. Fine-grained (speckled) and irregular pale yellowish green (5GY 6/4) epidote w/minor greenish black (5G 2.5/1) chlorite, some w/epidote peripheral rims.	95% 222" 228"
255			(~257') Trace native Cu flecks	
260			(~262') $CaCO_3$ -filled vugs	
265			**Depth: 268'** **Thickness: 19'**	
270	14		METABASALT: Grayish green (5G 4/2), massive, slightly fractured, aphanitic. Fine-grained (speckled) and irregular pale yellowish green (5GY 6/4) epidote w/minor greenish black (5G 2.5/1) chlorite, some w/epidote peripheral rims.	95% 211" 228"
275				
280			(~279-282') Metabasalt Breccia w/irregular epidote and chlorite and hematite (?) Sharp contact w/underlying metabasalt.	8↑ 9↓
			(`282-284') Amygdaloidal Metabasalt w/irregular vesicles filled w/epidote and chlorite	
285			**Depth: 287'** **Thickness: 19'**	
290	15		METABASALT: Grayish green (5G 4/2), massive, slightly fractured, aphanitic. Fine-grained (speckled) and irregular pale yellowish green (5GY 6/4) epidote w/minor greenish black (5G 2.5/1) chlorite, some w/epidote peripheral rims.	100% 230" 240"
295			(~294.6-295.1) Amygdaloidal Metabasalt w/irregular vesicles filled w/epidore	
			(`295.5') $CaCO_3$ veins (1/4-1/2", 30^0)	
300				

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Bottom Elevations: 882.89 ft.

Static Water Elevations n/a
and Date Measured: n/a

Surveyed by: n/a Method: n/a
Remarks: n/a

Operation Name: Charmian Northern Tract
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Grid Coordinates:

Depth	Thick-ness	Scale	Graphic Log	Lithologic Description: rock type, weathering, color, fossils, carbonate minerals concentrations, pyrite, etc.	Water Conditions	Overburden Analysis Logs: Munsell Color Code	OBA Sample No.	Log Interval	%Total Sulfur	Fizz Rating	NP

FEET	BOX	CODE	DESCRIPTION	RECOVERY	
300	15		**Depth: 307'** **Thickness: 20'**	100%	
			(~302-305') Amygdaloidal Metabasalt w/irregular vesicles filled w/epidote, minor chlorite	230"	
305			(~305-311') Metabasalt, grayish green (5G 4/2), massive, slightly fractured.	240"	Typical
	16		METABASALT: Massive, moderately fractured, aphanitic.	95%	
310			(~310-311.3') Metabasalt Breccia: White (9.5/N) to light bluish gray (10B 7/1) Qtz and greenish black (5G 2.5/1) chlorite.	216"	
			(~313.8') Qtz vein w/minor chlorite	228"	
			(~313-315') EPIDOSITE: Maj. Epidote Replacement w/irregular and elongate (stretched) chlorite		
315			(~316.5') Qtz vein (1/4" 30°), white (9.5/N) to bluish gray (10B 6/1)		
			Depth: 326' **Thickness: 19'**		
320			(~318-320.7') EPIDOSITE: Mod.-Maj. Epidote Replacement w/minor chlorite and Qtz		Typical
			(~319.5-320') Qtz vein (1/4", 60°) white to bluish gray w/trace chlorite. Sharp contact w/overlying metabasalt.		
325			(~323-325.5') EPIDOSITE: Mod-Maj. Epidote Replacement w/irregular Qtz and chlorite		
			(~324.3') Qtz infill 2", (~325.7') Qtz vein (1/4", 40°)		
	17		METABASALT: Massive, moderately fractured, aphanitic. Fine-grained (speckled) epidote w/chlorite and Qtz, trace hematite(?).	100%	
330			(~327.6-330') EPIDOSITE: Mod. To Maj. Epidote Replacement	91"	9↑
			(~331-332') EPIDOSITE: Maj. Epidote Replacement	108"	10↓
335			(332-335') Metabasalt, grayish green w/mod. Epidote replacement (333.7-334') w/ minor red (7.5R 4/8) hematite (?).		
			Corehole NT-13-05 completed at depth of 335 feet below collar elevation of 1220 ft amsl.		
			Depth: 335' **Thickness: 9'**		
340					
345					
350					

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COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
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GEOLOGIC LOG DRILL HOLES/OVERBURDEN ANALYSIS DATA

Hole No.: NT-13-06
Surface Elevation: 1048.86 ft.
Bottom Elevations: 853.86 ft.

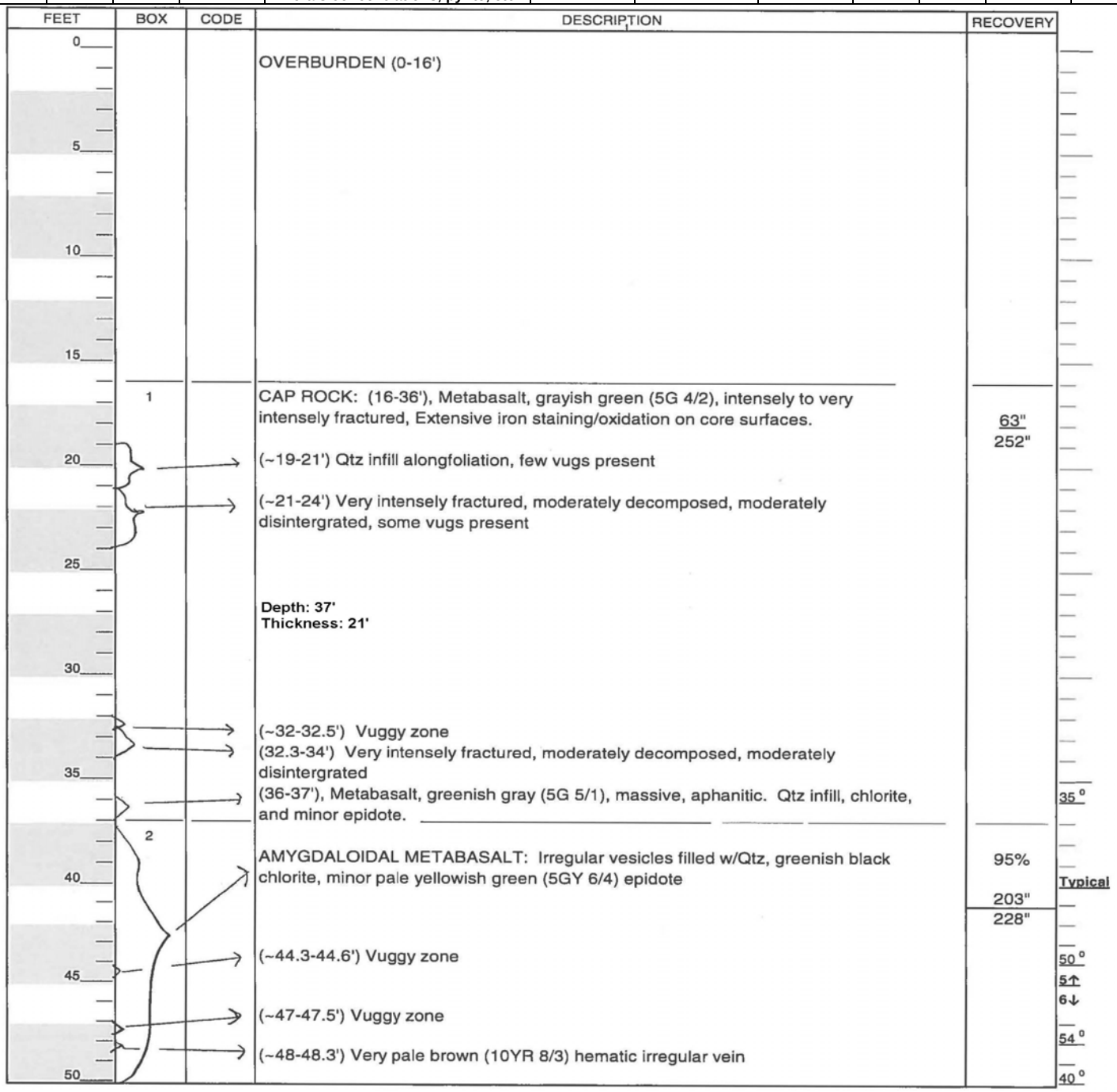
Static Water Elevations n/a
and Date Measured: n/a

Surveyed by: n/a Method: n/a
Remarks: n/a

Operation Name: Charmian Northern Tract
Method of Drilling: Rock Core, NQ Wireline
Date Drilled: September-October 2013
Drilled By: Logan Drilling Group
Logged By: Don Coleman – Geologist (URS/AECOM)
Quadrangle: Iron Springs, PA

Township/County: Hamiltonban Township, Adams County
Laboratory: SGI Technical Center
Latitude: 39° 46' 06.14" Longitude: 77° 26' 11.94"
Grid Coordinates:

Depth	Thick-ness	Scale	Graphic Log	Lithologic Description: rock type, weathering, color, fossils, carbonate minerals concentrations, pyrite, etc.	Water Conditions	Overburden Analysis Logs: Munsell Color Code	OBA Sample No.	Log Interval	%Total Sulfur	Fizz Rating	NP



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and Date Measured: n/a

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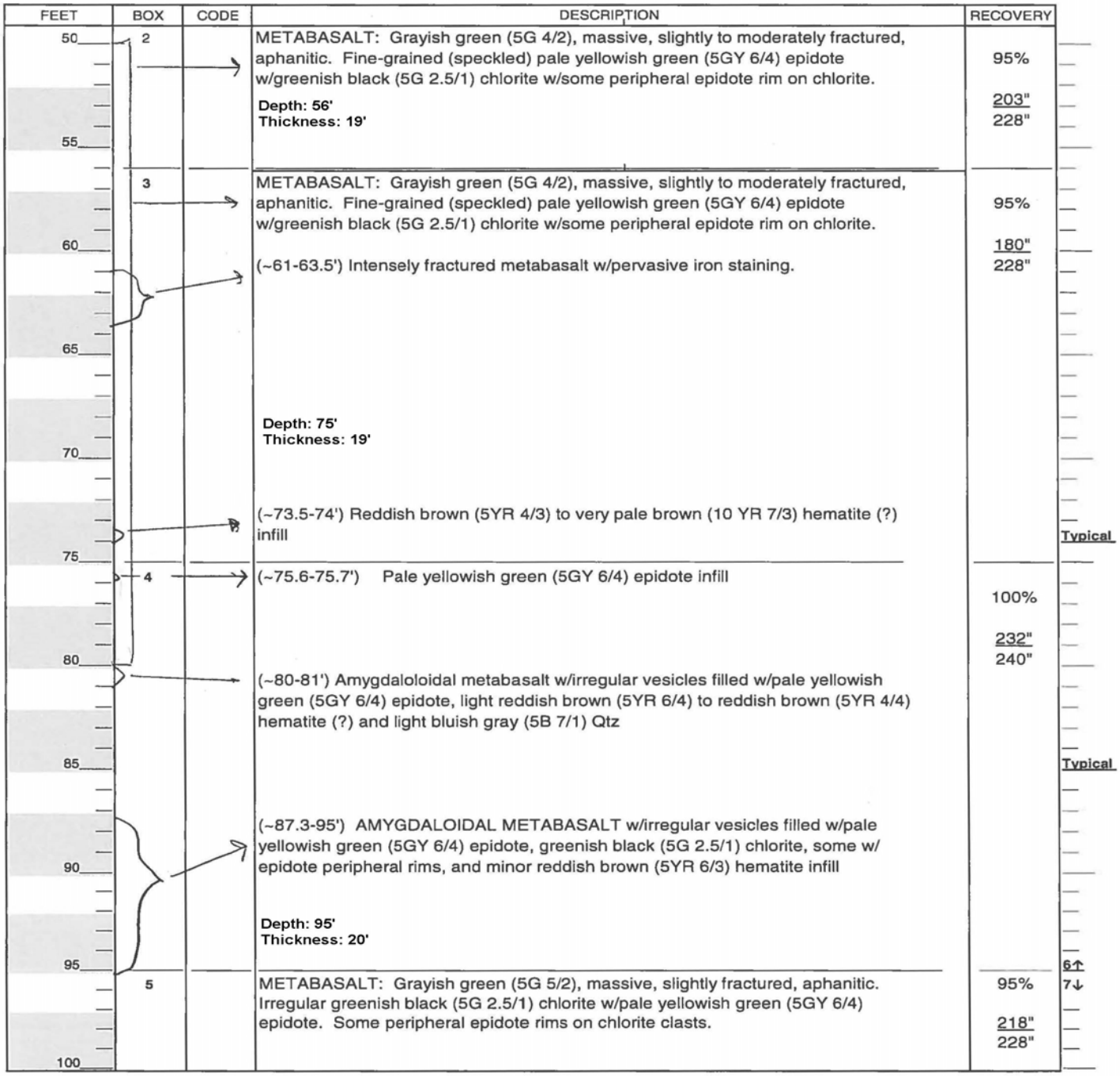

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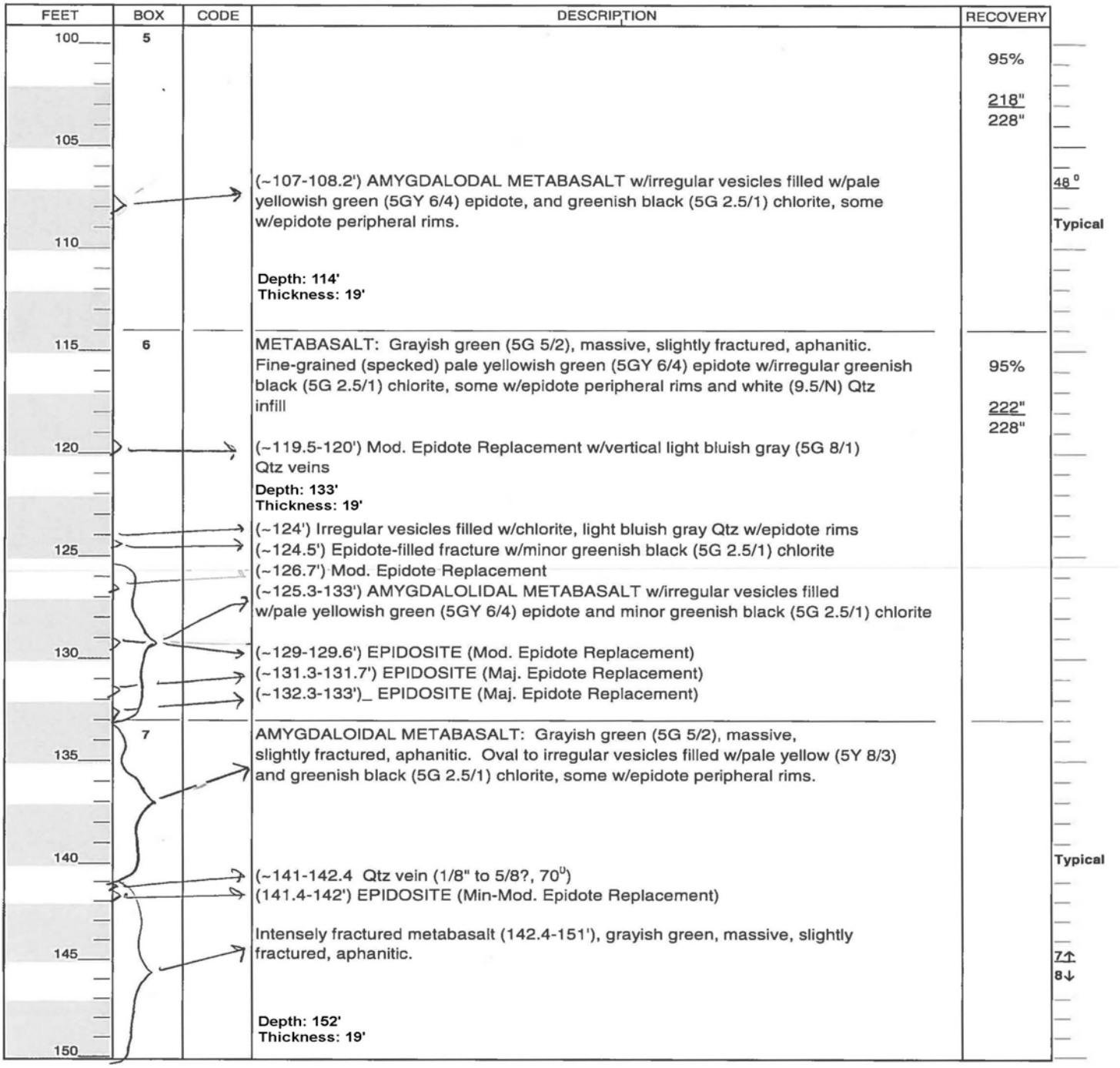

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FEET	BOX	CODE	DESCRIPTION	RECOVERY
150	7			
	8		METABASALT: grayish green (5G 4/2), massive, slightly fractured, aphanitic. Irregular vesicles filled w/greenish black (5G 2.5/1) chlorite, pale yellowish green (5GY 6/4) epidote, some w/epidote peripheral rims.	95% 225" 228"
155				
160				
165				
170			**Depth: 171'** **Thickness: 19'**	
	9		METABASALT, dark greenish gray (5G 4/1), massive, unfractured, aphanitic. Irregular chlorite, some w/epidote periperal rims and fine-grained, pale yellowish green (5GY 6/4) epidote.	100% 240" 240"
175				
180				
185				
190			**Depth: 191'** **Thickness: 20'**	
	10		METABASALT: grayish green (5G 4/2), massive, UNfractured, aphanitic. Fine-grained pale yellowish green (5GY 6/4) epidote w/oval, irregular, and elongate (stretched) greenish black (5G 2.5/1) chlorite.	100% 48" 48"
195			Corehole NT-13-06 completed at depth of 195 feet below collar elevation of 1135 ft amsl and floor elevation of Level 8 (940 ft amsl).	
200			**Depth: 195'** **Thickness: 4'**	

Typical

Typical

81

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GEOLOGIC LOG DRILL HOLES/OVERBURDEN ANALYSIS DATA

Hole No.: NT-13-07
Surface Elevation: 1200.61 ft.
Bottom Elevations: 730.61 ft.

Static Water Elevations n/a
and Date Measured: n/a

Surveyed by: n/a Method: n/a
Remarks: n/a

Operation Name: Charmian Northern Tract
Method of Drilling: Rock Core, NQ Wireline
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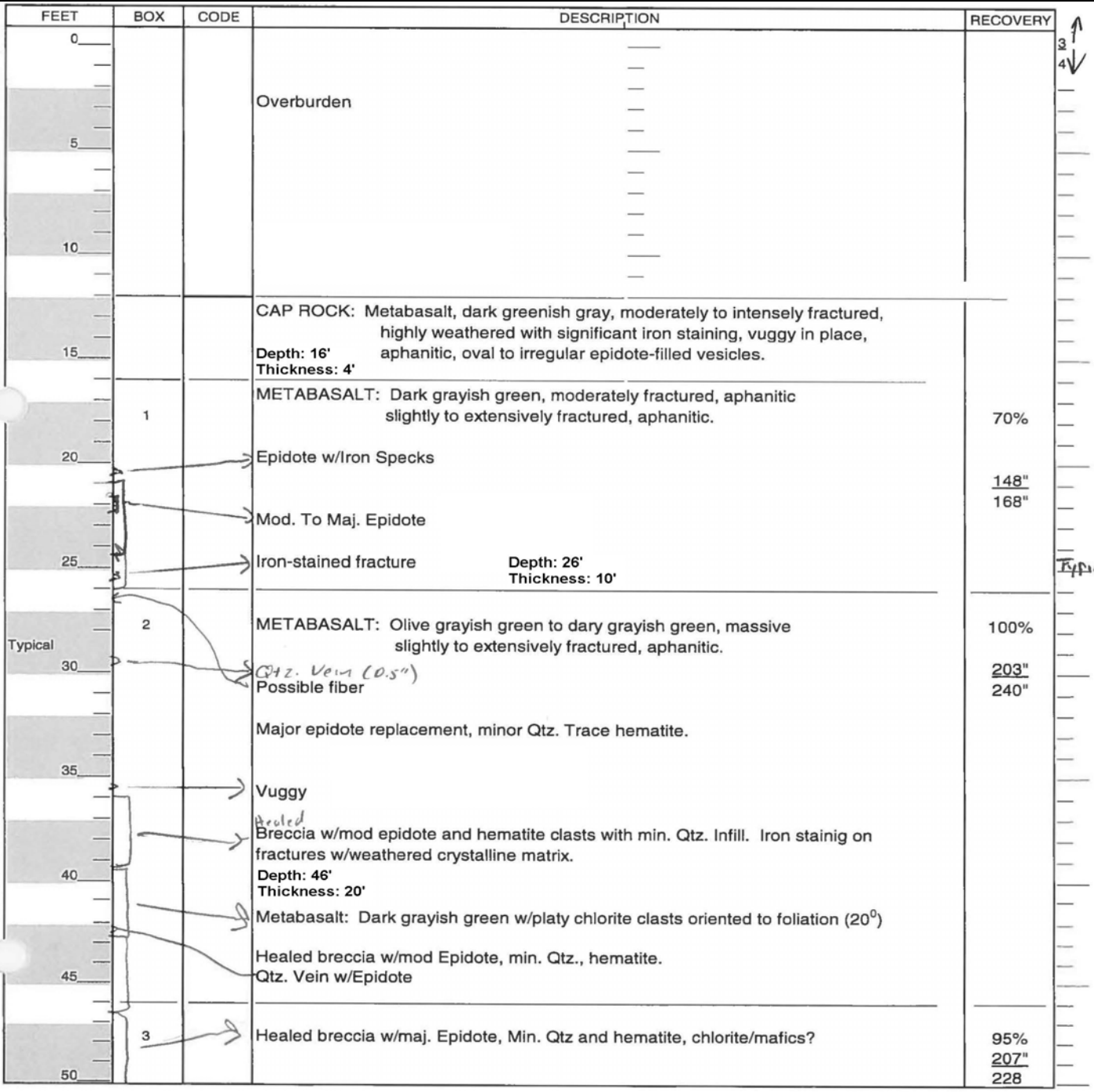
Latitude: 39° 46' 03.98" Longitude: 77° 26' 22.03"
Grid Coordinates:

Depth	Thick-ness	Scale	Graphic Log	Lithologic Description: rock type, weathering, color, fossils, carbonate minerals concentrations, pyrite, etc.	Water Conditions	Overburden Analysis Logs: Munsell Color Code	OBA Sample No.	Log Interval	%Total Sulfur	Fizz Rating	NP



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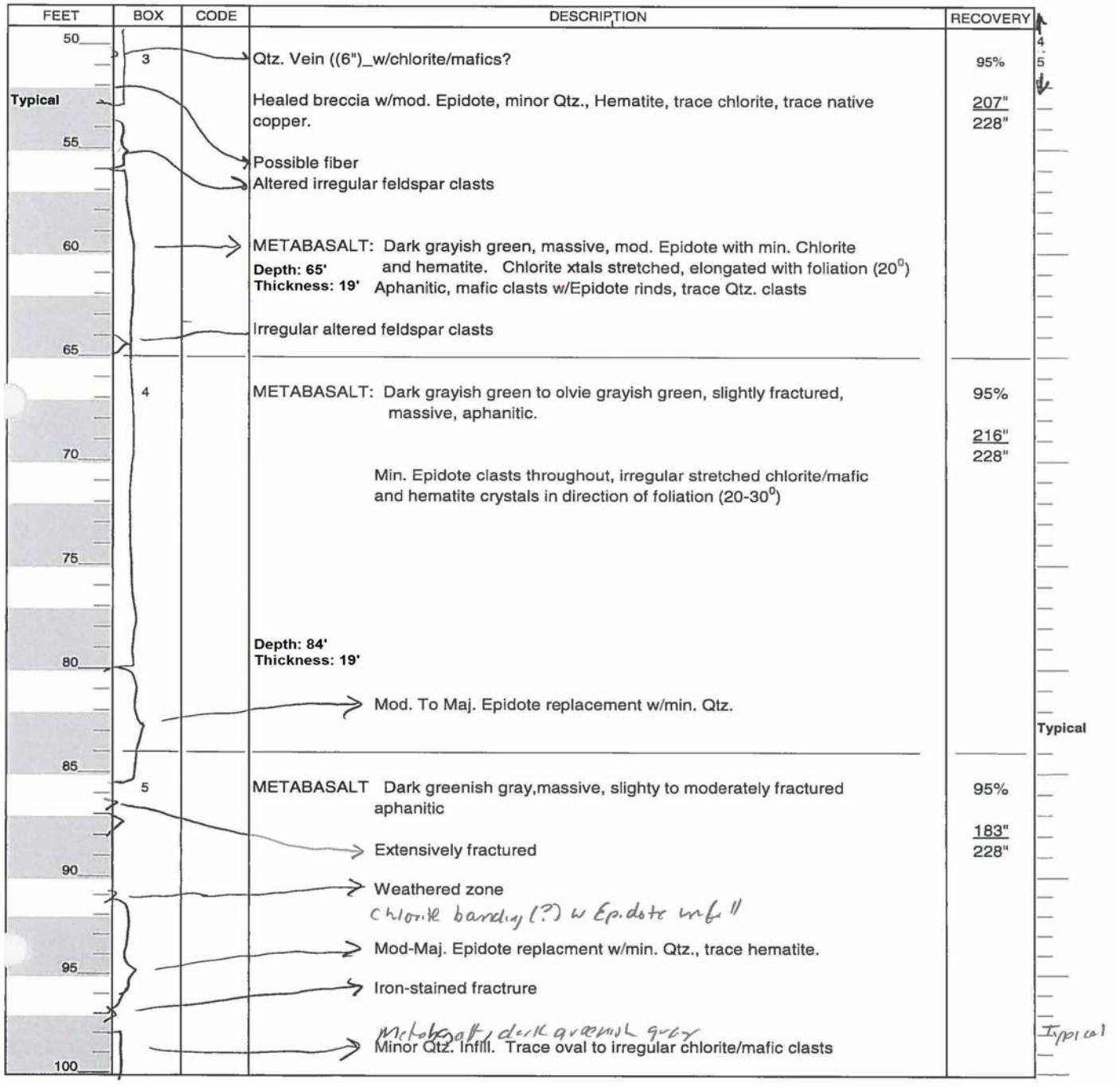

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FEET	BOX	CODE	DESCRIPTION	RECOVERY
100	5		**Depth: 103' Thickness: 19'** Qtz. And chlorite crystals elongated, stretched in direction of foliation (20-30^0)	95% 207" 228"
105	6		METABASALT: Dark grayish green, massive, slightly fractured, aphanitic	95% 208" 228"
110			Irregular $CaCO_3$, Qtz, Chlorite, and Epidote clasts, some stetched in direction of foliation (20-30^0)	
115				
120			**Depth: 122' Thickness: 19'** Epidote rim on chlorite/mafic crystals, Qtz. Infill.	
Typical 125	7		METABASALT: Dark greenish gray, sligthly fractured, massive, aphanitc. Qtz. Infill parallel to foliation, Chlorite/mafic clasts some stretched in direction of foliation. Epidote rims on chlorite/mafic clasts	100% 240" 240"
130				
135			**Depth: 142' Thickness: 20'**	
140			Healed breccia w/large clasts of chlorite/mafics, qtz., and epidote	
145	8		METABASALT: Dark grayish green, massive, slightly fractured, aphanitic.	95% 215" 228"
150				

5↑ 6↓ Typical Typical

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and Date Measured: n/a

Surveyed by: n/a Method: n/a
Remarks: n/a

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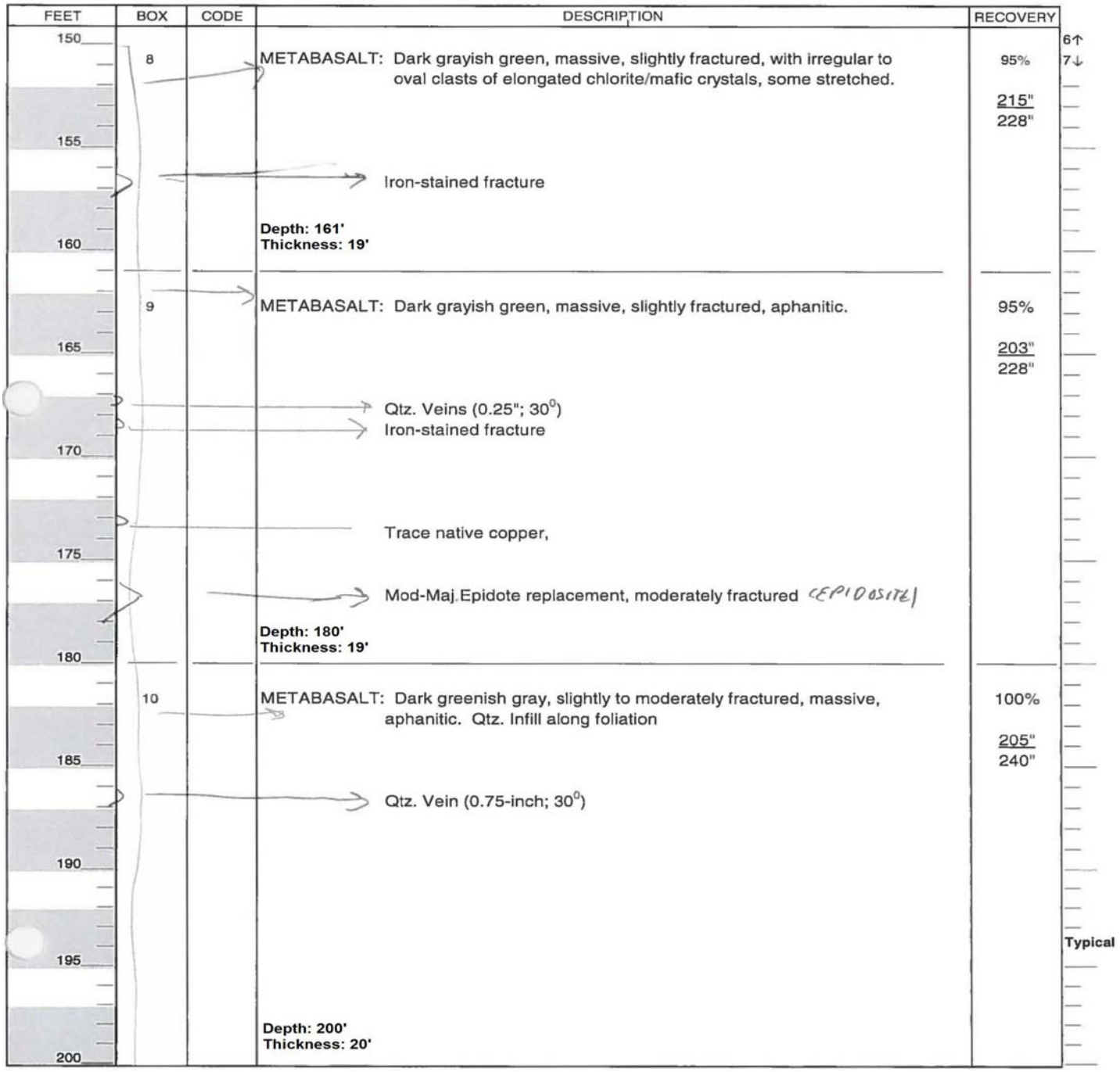

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and Date Measured: n/a

Surveyed by: n/a Method: n/a
Remarks: n/a

Operation Name: Charmian Northern Tract
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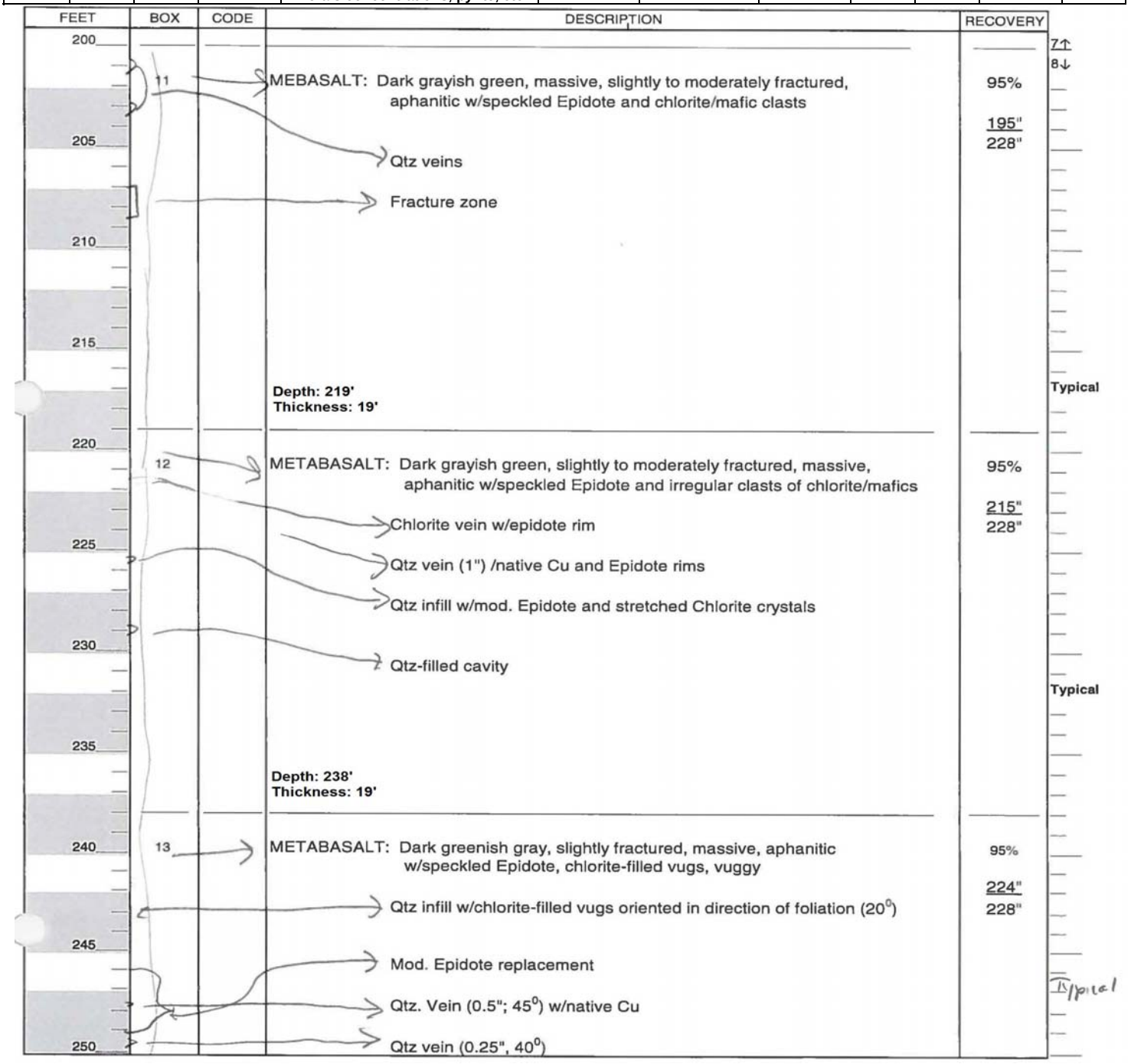

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Method of Drilling: Rock Core, NQ Wireline
Date Drilled: September-October 2013
Drilled By: Logan Drilling Group
Logged By: Don Coleman – Geologist (URS/AECOM)
Quadrangle: Iron Springs, PA

Township/County: Hamiltonban Township, Adams County
Laboratory: SGI Technical Center
Latitude: 39° 46' 03.98" Longitude: 77° 26' 22.03"
Grid Coordinates:

Depth	Thick-ness	Scale	Graphic Log	Lithologic Description: rock type, weathering, color, fossils, carbonate minerals concentrations, pyrite, etc.	Water Conditions	Overburden Analysis Logs: Munsell Color Code	OBA Sample No.	Log Interval	%Total Sulfur	Fizz Rating	NP

FEET	BOX	CODE	DESCRIPTION	RECOVERY
250	13		Mod. Epidote replacement (Epidosite)	95%
			Depth: 257' **Thickness: 19'**	224" 228
255			Hematite layers	
	14		METABASALT Dark greenish gray, slightly fractured, massive, aphanitic	100%
260			Speckled Epidote	223" 240"
265				
270			Qtz. Vein (0.25"; 30°)	
			Irregular chlorite/mafic-filled vugs, some stretched	
			Depth: 277' **Thickness: 20'**	
275			Qtz vein (0.25")	
	15		METABASALT : Dark grayish green, slightly fractured, massive, aphanitic. Stretched and randomly oriented chlorite/mafic-filled vugs	95%
280				226" 228"
			Qtz infill	
285			Iron-stained fracture (40°)	
290			**Depth: 296'** **Thickness: 19'**	
295			Speckled Epidote	
	16		METABASALT: Dark grayish green, slightly fractured, massive, aphanitic	95%
300			Qtz. Infill	206" 228"

8↑ 9↓ Typical Typical

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COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF MINING PROGRAMS

GEOLOGIC LOG DRILL HOLES/OVERBURDEN ANALYSIS DATA

Hole No.: NT-13-07
Surface Elevation: 1200.61 ft.
Bottom Elevations: 730.61 ft.

Static Water Elevations n/a
and Date Measured: n/a

Surveyed by: n/a Method: n/a
Remarks: n/a

Operation Name: Charmian Northern Tract
Method of Drilling: Rock Core, NQ Wireline
Date Drilled: September-October 2013
Drilled By: Logan Drilling Group
Logged By: Don Coleman – Geologist (URS/AECOM)
Quadrangle: Iron Springs, PA

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Latitude: 39° 46' 03.98" Longitude: 77° 26' 22.03"
Grid Coordinates:

Depth	Thick-ness	Scale	Graphic Log	Lithologic Description: rock type, weathering, color, fossils, carbonate minerals concentrations, pyrite, etc.	Water Conditions	Overburden Analysis Logs: Munsell Color Code	OBA Sample No.	Log Interval	%Total Sulfur	Fizz Rating	NP

FEET	BOX	CODE	DESCRIPTION	RECOVERY	
300	16		Mod. Epidote replacement	95%	9↑ 10↓
			Iron-stained fracture	206" 208"	
305			Qtz vein (2")		
			Qtz. Vein (0.5") w/chlorite		
310			Qtz. Vein w/chlorite and min. Epidote		
			Qtz. Vein w/Epidote and chlorite Speckled Epidote		
315			**Depth: 315' Thickness: 19'**		Typical
	17		METABASALT: Dark grayish green, slightly fractured, massive, aphanitic	95%	
320				223" 228"	
325			Qtz vein (1/8"; 20°) Qtz vein (1/8"; 15°)		Unique
			METABASALT: Reddish purple w/amygdaloidal Epidote, Qtz. Infill and chlorite/mafic clasts.		
330			METABASALT: Greenish gray, massive		
			Depth: 334' Thickness: 19'		
335	18		METABASALT: Dark grayish green, slightly fractured, massive, aphanitic w/ speckled epidote, chlorite/mafic clasts	95%	
				222" 228"	
340					
345			Mod. Epidote Replacement		Typical
350					

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GEOLOGIC LOG DRILL HOLES/OVERBURDEN ANALYSIS DATA

Hole No.: NT-13-07
Surface Elevation: 1200.61 ft.
Bottom Elevations: 730.61 ft.

Static Water Elevations n/a
and Date Measured: n/a

Surveyed by: n/a Method: n/a
Remarks: n/a

Operation Name: Charmian Northern Tract
Method of Drilling: Rock Core, NQ Wireline
Date Drilled: September-October 2013
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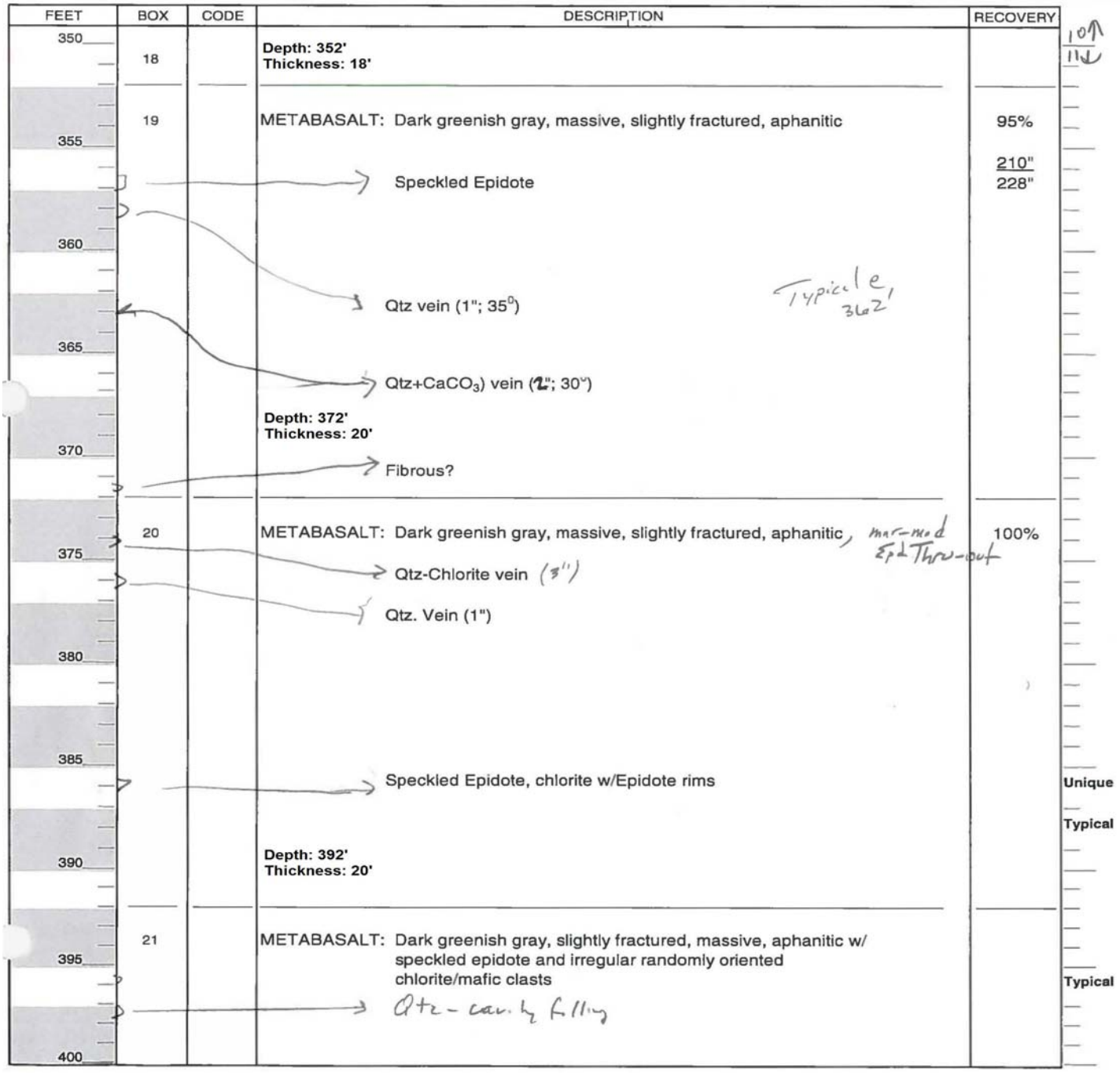
Depth	Thick-ness	Scale	Graphic Log	Lithologic Description: rock type, weathering, color, fossils, carbonate minerals concentrations, pyrite, etc.	Water Conditions	Overburden Analysis Logs: Munsell Color Code	OBA Sample No.	Log Interval	%Total Sulfur	Fizz Rating	NP



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DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF MINING PROGRAMS

GEOLOGIC LOG DRILL HOLES/OVERBURDEN ANALYSIS DATA

Hole No.: NT-13-07
Surface Elevation: 1200.61 ft.
Bottom Elevations: 730.61 ft.

Static Water Elevations n/a
and Date Measured: n/a

Surveyed by: n/a Method: n/a
Remarks: n/a

Operation Name: Charmian Northern Tract
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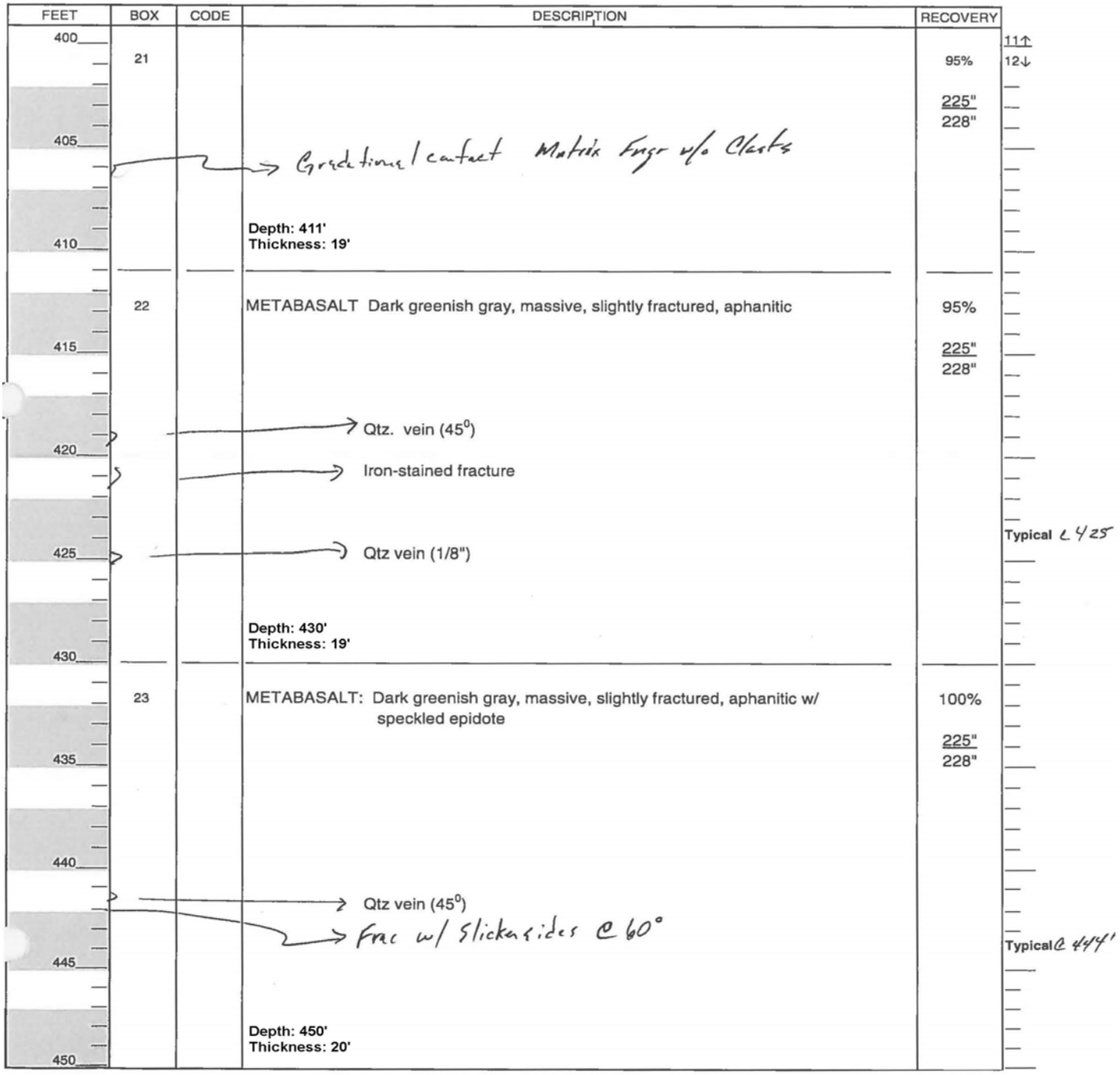

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GEOLOGIC LOG DRILL HOLES/OVERBURDEN ANALYSIS DATA

Hole No.: NT-13-07
Surface Elevation: 1200.61 ft.
Bottom Elevations: 730.61 ft.

Static Water Elevations n/a
and Date Measured: n/a

Surveyed by: n/a Method: n/a
Remarks: n/a

Operation Name: Charmian Northern Tract
Method of Drilling: Rock Core, NQ Wireline
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Depth	Thick-ness	Scale	Graphic Log	Lithologic Description: rock type, weathering, color, fossils, carbonate minerals concentrations, pyrite, etc.	Water Conditions	Overburden Analysis Logs: Munsell Color Code	OBA Sample No.	Log Interval	%Total Sulfur	Fizz Rating	NP

FEET	BOX	CODE	DESCRIPTION	RECOVERY
450				
	24		METABASALT: Dark greenish gray, massive, slightly fractured, aphanitic, few chlorite-filled vugs	100%
				234"
455				240"
460				
			Chlorite vein (0.5"; 30°) → contact 465'	
465			Mod Epidote Replacement	
			Qtz vein (2.5")	
			Fracture zone	
470				
			Depth: 470' **Thickness: 20'** Corehole NT-13-07 terminated at 470 feet below collar elevation of 1190 feet	
475				
480				
485				
490				
495				
500				

Typical 455'

COMMONWEALTH OF PENNSYLVANIA
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GEOLOGIC LOG DRILL HOLES/OVERBURDEN ANALYSIS DATA

Hole No.: NT-13-08
Surface Elevation: 1081.97 ft.
Bottom Elevations: 806.97 ft.

Static Water Elevations n/a
and Date Measured: n/a

Surveyed by: n/a Method: n/a
Remarks: n/a

Operation Name: Charmian Northern Tract
Method of Drilling: Rock Core, NQ Wireline
Date Drilled: September-October 2013
Drilled By: Logan Drilling Group
Logged By: Don Coleman – Geologist (URS/AECOM)
Quadrangle: Iron Springs, PA

Township/County: Hamiltonban Township, Adams County
Laboratory: SGI Technical Center
Latitude: 39° 45' 57.50" Longitude: 77° 26' 22.93"
Grid Coordinates:

Depth	Thick-ness	Scale	Graphic Log	Lithologic Description: rock type, weathering, color, fossils, carbonate minerals concentrations, pyrite, etc.	Water Conditions	Overburden Analysis Logs: Munsell Color Code	OBA Sample No.	Log Interval	%Total Sulfur	Fizz Rating	NP

FEET	BOX	CODE	DESCRIPTION	RECOVERY
0			OVERBURDEN (0-29')	
5				5↑ 6↓
10				
15				
20				
25				
30	1		CAP ROCK (29-39.5'): Metabasalt, grayish green (5G 4/2), intensively to very intensely fractured, moderately decomposed, moderately disintergrated, pervasive iron staining/oxidation.	100% 131" 264"
35				
40			METABASALT: Grayish green (5G 5/2), massive, moderately fractured. Greenish black (5G 2.5/1) chlorite with pale yellowish green (5GY 6/4) epidote. Iron staining oxidation on some core surfaces.	65° 55°
45				45°
50			Depth: 51' Thickness: 22'	Typical

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GEOLOGIC LOG DRILL HOLES/OVERBURDEN ANALYSIS DATA

Hole No.: NT-13-08
Surface Elevation: 1081.97 ft.
Bottom Elevations: 806.97 ft.

Static Water Elevations n/a
and Date Measured: n/a

Surveyed by: n/a Method: n/a
Remarks: n/a

Operation Name: Charmian Northern Tract
Method of Drilling: Rock Core, NQ Wireline
Date Drilled: September-October 2013
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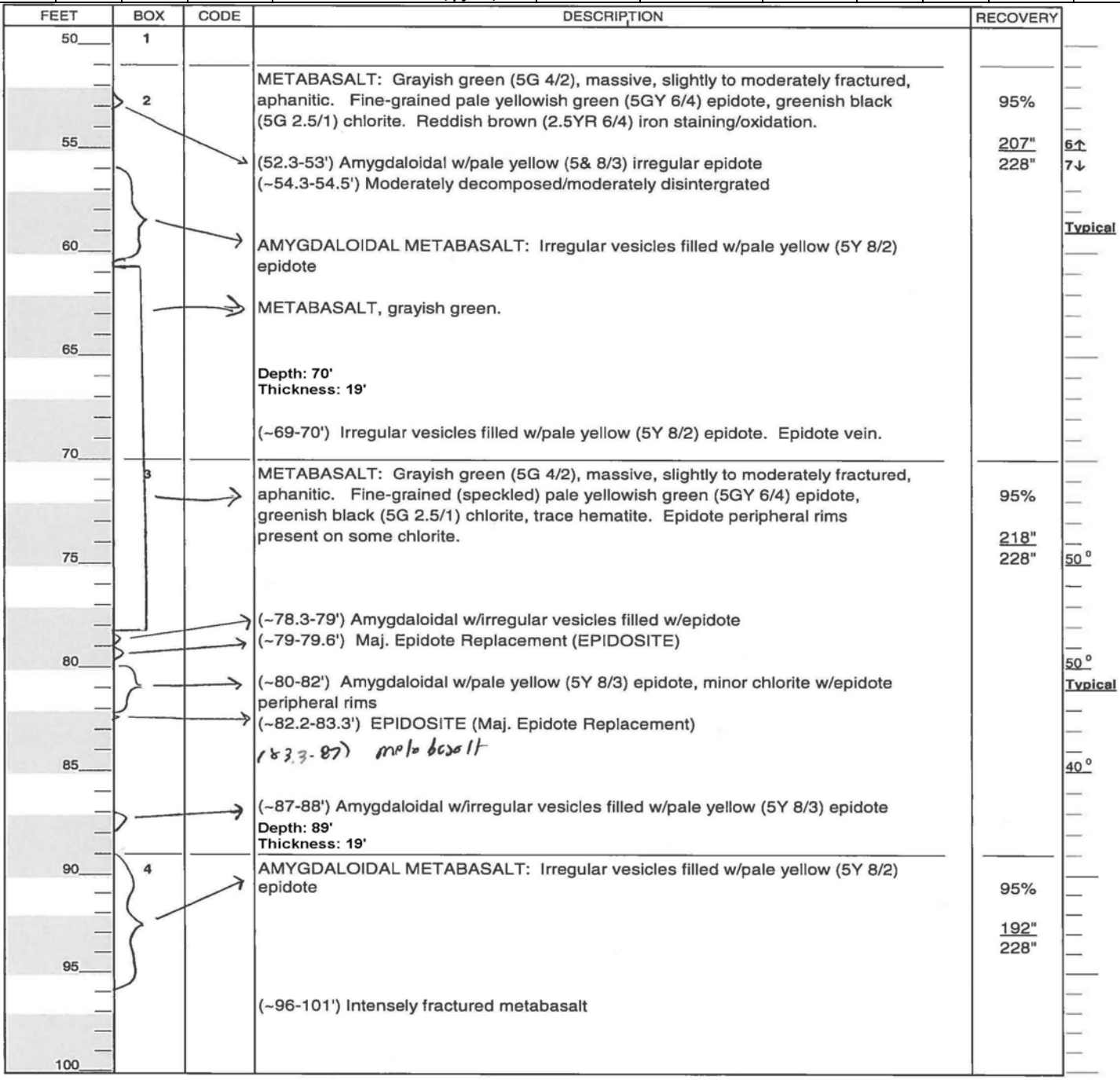
Depth	Thick-ness	Scale	Graphic Log	Lithologic Description: rock type, weathering, color, fossils, carbonate minerals concentrations, pyrite, etc.	Water Conditions	Overburden Analysis Logs: Munsell Color Code	OBA Sample No.	Log Interval	%Total Sulfur	Fizz Rating	NP



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GEOLOGIC LOG DRILL HOLES/OVERBURDEN ANALYSIS DATA

Hole No.: NT-13-08
Surface Elevation: 1081.97 ft.
Bottom Elevations: 806.97 ft.

Static Water Elevations n/a
and Date Measured: n/a

Surveyed by: n/a Method: n/a
Remarks: n/a

Operation Name: Charmian Northern Tract
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FEET | BOX | CODE | DESCRIPTION | RECOVERY

100 — Box 4

Metabasalt, grayish green (5G 5/2), massive, slightly to intensively fractured, aphanitic. Fine-grained (speckled) epidote w/minor chlorite. — 95%

(~101-104.5') Amygdaloidal Metabasalt w/irregular vesicles filled w/pale yellow (5Y 8/4) epidote, minor greenish black (5G 2.5/1) chlorite — 192" / 228" — Typical

105 — Qtz vein (1/4", 35°) — 7↑ 8↓

Metabasalt (104.5–107.5')

Depth: 108'
Thickness: 19'

Box 5

110 — EPIDOSITE (Mod.-Maj.) Epidote Replacement w/pale yellowish green (5GY 6/4) epidote and minor light bluish gray (5B 7/1) to bluish gray (5B 6/1) Qtz. — 95%

(~111.8') Qtz vein (1/2", 30°), light bluish gray (5B 7/1) — 213" / 228"

(~113.1') Qtz infill, light bluish gray (5B 8/1)

115 — (~114') Qtz vein (1", 40°), bluish gray (10B 6/1) w/greenish black (5G 2.5/1) chlorite — Unique — 35°

METABASALT: Grayish green (5G 4/2), massive, slightly fractured, aphanitic. Fine-grained (speckled) pale yellowish green (5GY 6/4) epidote, irregular chlorite w/ epidote peripheral rims. — 32°

120 — 48°

Typical — 43° — 36°

125 —

Depth: 127'
Thickness: 19'

Box 6

METABASALT: Grayish green (5G 4/2), massive, slightly fractured, aphanitic. Fine-grained (speckled) pale yellowish green (5GY 6/4) epidote, irregular chlorite w/ epidote peripheral rims. — 95%

130 — 216" / 228" — 42°

50°

135 — 40°

50°

140 — (~141-141.5') Irregular greenish black (5G 2.5/1) chlorite (stretched)

Depth: 146'
Thickness: 19'

145 — Typical

Box 7

(~148.3-148.8') intensely fractured metabasalt — 42°

150 —

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GEOLOGIC LOG DRILL HOLES/OVERBURDEN ANALYSIS DATA

Hole No.: NT-13-08
Surface Elevation: 1081.97 ft.
Bottom Elevations: 806.97 ft.

Static Water Elevations n/a
and Date Measured: n/a

Surveyed by: n/a Method: n/a
Remarks: n/a

Operation Name: Charmian Northern Tract
Method of Drilling: Rock Core, NQ Wireline
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Latitude: 39° 45' 57.50" Longitude: 77° 26' 22.93"
Grid Coordinates:

Depth	Thick-ness	Scale	Graphic Log	Lithologic Description: rock type, weathering, color, fossils, carbonate minerals concentrations, pyrite, etc.	Water Conditions	Overburden Analysis Logs: Munsell Color Code	OBA Sample No.	Log Interval	%Total Sulfur	Fizz Rating	NP

FEET	BOX	CODE	DESCRIPTION	RECOVERY	
150	7		METABASALT: Grayish Green (5G 4/2), massive, slightly fractured, aphanitic. Fine-grained (speckled) pale yellowish green (5GY 6/4) epidote, w/greenish black (5G 2.5/1) chlorite - oval, irregular, and elongate (stretched). Epidote peripheral rims observed on some chlorite.	100% 233" 240"	
155					8↑ 9↓
160			Trace Native Cu		
165			**Depth: 166'** **Thickness: 20'**		Typical 30° 30°
	8		METABASALT: Grayish Green (5G 5/2), massive, slightly fractured, aphanitic. Greenish black (5G 2.5/1) elongate (stretched) chlorite w/pale yellowish green (5GY 6/4) epidote (oval to irregular).	100%	
170			(~167.5-168') Fracture filled w/epidote and native Cu (1/4", 30°) (~170.5-171') Intensively fractured zone	207" 228"	
175			**Depth: 185'** **Thickness: 19'**		Typical 30° 25°
180			(~178-181'), EPIDOSITE (Min-Maj. Epidote Replacement) (~181-181.9') Metabasalt		Unique
			(~181.9-182.8') EPIDOSITE (Maj. Epidote Replacement); sharp contact w/ metabasalt. Qtz vein (~182.3') (1/4", 50°) light bluish gray (10B 8/1)		30°
185			(184.5-185') Amygdaloidal Metabasalt w/irregular vesicles filled w/epidote, chlorite		48°
	9		AMYGDALOIDAL METABASALT: Grayish green (5G 4/2), massive, slightly fractured, aphanitic. Irregular vesicles filled w/pale yellowish green (5GY 6/4) epidote and minor greenish black (5G 2.5/1) chlorite	100% 227" 240"	55°
190			(~191.3') Chlorite vein (3/16", 30°)		
195					40°
200			(~197-199.3') EPIDOSITE (Min-Mod. Epidote Replacement)		Typical

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GEOLOGIC LOG DRILL HOLES/OVERBURDEN ANALYSIS DATA

Hole No.: NT-13-08
Surface Elevation: 1081.97 ft.
Bottom Elevations: 806.97 ft.

Static Water Elevations and Date Measured: n/a, n/a

Surveyed by: n/a Method: n/a
Remarks: n/a

Operation Name: Charmian Northern Tract
Method of Drilling: Rock Core, NQ Wireline
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FEET	BOX	CODE	DESCRIPTION	RECOVERY	
200	9		METABASALT (200-209.3'): Grayish green (5G 4/2), massive, slightly fractured, aphanitic. Greenish black (5G 2.5/1) chlorite w/widely scattered epidote-filled vesicles. Chlorite aligned w/foliation. **Depth: 205' Thickness: 20'**	95% 227" / 240"	
205	10			95% 207" / 228"	9↑ 10↓
210			AMYGDALOIDAL METABASALT (209.3-217'): Grayish green (5G 4/2), massive, slightly fractured, aphanitic. Irregular vesicles filled w/pale yellowish green (5GY 6/4) epidote, minor greenish black (5G 2.5/1) chlorite. **Depth: 224' Thickness: 19'**		
215			METABASALT (217-219', 221-223.5'), Grayish green, slightly fractured, aphanitic		70°
220			AMYGDALOIDAL METABASALT (~219-221') w/irregular vesicles filled w/greenish black (5G 2.5/1) chlorite, pale yellowish green (5GY 6/4) epidote. metabasalt, grayish green, massive (221-223.5')		40° 45°
			AMYGDALOIDAL METABASALT (~223.5-224')		
225	11		METABASALT (224-235'): Grayish green (5G 5/2), massive, slightly fractured, aphanitic. Fine-grained (speckled) pale yellowish green (5GY 6/4) epidote w/ greenish black (5G 2.5/1) chlorite. Epidote rims on some chlorite present.	95% 216" / 228"	44°
230			(~225.7-226.3) Qtz veins (1/16", 1/8", 30^0), ligh bluish gray (10B 7/1)		
			(~228-230') Min-Mod. Epidote Replacement		Typical
235			AMYGDALOIDAL METABASALT (235-257'): Grayish green (5G 5/2), slightly fractured, aphanitic. Irregular veiscles filled w/pale yellowish green (5GY 6/4) epidote, minor greenish black (5G 2.5/1) chlorite, some w/epidote peripheral rims.		63°
240			**Depth: 243' Thickness: 19'**		Typical
245	12		(~245.3-246') Intensely fractured amygdaloidal metabasalt		Typical
250					

COMMONWEALTH OF PENNSYLVANIA
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Hole No.: NT-13-08
Surface Elevation: 1081.97 ft.
Bottom Elevations: 806.97 ft.

Static Water Elevations n/a
and Date Measured: n/a

Surveyed by: n/a Method: n/a
Remarks: n/a

Operation Name: Charmian Northern Tract
Method of Drilling: Rock Core, NQ Wireline
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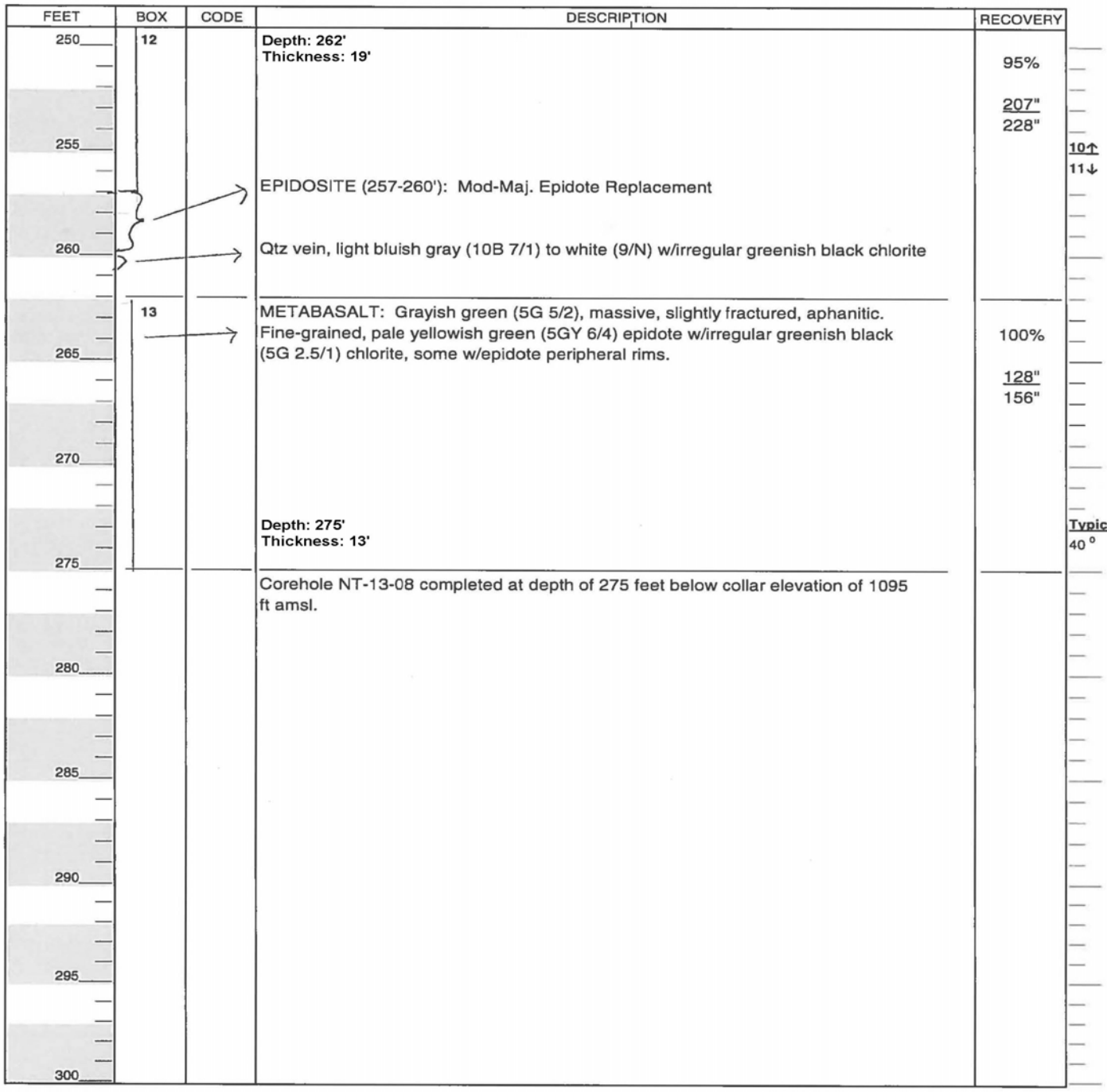

COMMONWEALTH OF PENNSYLVANIA
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GEOLOGIC LOG DRILL HOLES/OVERBURDEN ANALYSIS DATA

Hole No.: NT-13-09
Surface Elevation: 1136.07 ft.
Bottom Elevations: 1035.07 ft.

Static Water Elevations n/a
and Date Measured: n/a

Surveyed by: n/a Method: n/a
Remarks: n/a

Operation Name: Charmian Northern Tract
Method of Drilling: Rock Core, NQ Wireline
Date Drilled: September-October 2013
Drilled By: Logan Drilling Group
Logged By: Don Coleman – Geologist (URS/AECOM)
Quadrangle: Iron Springs, PA

Township/County: Hamiltonban Township, Adams County
Laboratory: SGI Technical Center
Latitude: 39° 45' 52.81" Longitude: 77° 26' 26.66"
Grid Coordinates:

Depth	Thick-ness	Scale	Graphic Log	Lithologic Description: rock type, weathering, color, fossils, carbonate minerals concentrations, pyrite, etc.	Water Conditions	Overburden Analysis Logs: Munsell Color Code	OBA Sample No.	Log Interval	%Total Sulfur	Fizz Rating	NP

FEET	BOX	CODE	DESCRIPTION	RECOVERY
0			OVERBURDEN (0-20')	
5				
10				
15				
20	1		CAP ROCK (20-34'): Metabasalt, grayish green (5G 4/2), moderately to intensely fractured, aphanitic. Extensive iron staining/oxidation on core surfaces. Fine-grained (speckled) pale yellowish green (5GY 6/4) epidote, minor irregular greenish black (5G 2.5/1) chlorite, some w/epidote peripheral rims **Depth: 39.5'** **Thickness: 19.5'**	85% 105" 204"
25			(~27.5-28') Vugs oriented to foliation (30^0)	
30			(~29.2-34') Amygdaloidal w/irregular vesicles filled w/pale yellowish green (5GY 6/4) epidote, minor greenish black (5G 2.5/1) chlorite. Vugs common, some stretched (30^0) w/foliation.	
35			METABASALT (34-39.5'): Grayish green (5G 4/2), massive, slightly fractured, aphanitic. Fine-grained, pale yellowish green (5GY 6/4) epidote w/trace light bluish gray (5PB 8/1) Qtz.	
40			AMYGDALOIDAL METABASALT (39.5-43'): Irregular vesicles filled w/pale yellowish green (5GY 6/4) epidote, minor greenish black (5G 2.5/1) chlorite, trace light bluish gray (5PB 8/1) Qtz.	95% 221" 228"
45			METABASALT (~43-46.5'): Grayish green (5G 4/2), massive, slightly fractured. Wavy chlorite lyayers aligned w/foliation. Minor epidote, trace Qtz.	
50			AMYGALOIDAL METABASALT: (~46.5-50'): Pale yellowish green (5GY 6/4) epidote filled vesicles w/minor chlorite, epidote rims. **Depth: 50'** **Thickness: 10.5'**	Typical 5↑

COMMONWEALTH OF PENNSYLVANIA
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GEOLOGIC LOG DRILL HOLES/OVERBURDEN ANALYSIS DATA

Hole No.: NT-13-09
Surface Elevation: 1136.07 ft.
Bottom Elevations: 1035.07 ft.

Static Water Elevations n/a
and Date Measured: n/a

Surveyed by: n/a Method: n/a
Remarks: n/a

Operation Name: Charmian Northern Tract
Method of Drilling: Rock Core, NQ Wireline
Date Drilled: September-October 2013
Drilled By: Logan Drilling Group
Logged By: Don Coleman – Geologist (URS/AECOM)
Quadrangle: Iron Springs, PA

Township/County: Hamiltonban Township, Adams County
Laboratory: SGI Technical Center
Latitude: 39° 45' 52.81" Longitude: 77° 26' 26.66"
Grid Coordinates:

Depth	Thick-ness	Scale	Graphic Log	Lithologic Description: rock type, weathering, color, fossils, carbonate minerals concentrations, pyrite, etc.	Water Conditions	Overburden Analysis Logs: Munsell Color Code	OBA Sample No.	Log Interval	%Total Sulfur	Fizz Rating	NP

FEET	BOX	CODE	DESCRIPTION	RECOVERY	
50	2		METABASALT (50-60'): Grayish green (5G 4/2), massive, slightly fractured, aphanitic. Fine-grained pale yellowish green (5GY 6/4) epidote w/scattered epidote filled vesicles, minor chlorite, some w/epidote peripheral rims.	95%	5↑ 6↓
				221"	
				228"	
55			**Depth: 56'** **Thickness: 6'**		
	3			95%	
60				197"	
			AMYGDALOIDAL METABASALT (60-65'): Pale yellowish green (5GY 6/4) epidote, w/minor light bluish gray (5PB 8/1) Qtz and greenish black (5G 2.5/1) Qtz. Some epidote rims on chlorite.	228"	
65			METABASALT (65-74.8'): Grayish green (5G 5/2), massiive, slightly fractured (~66'), Chlorite vein (1/8", 60°)		
			(~67-67.5') Qtz infill parallel to foliation		Typical
70			**Depth: 75'** **Thickness: 19'** Amygdaloidal (~72.4-73.6') w/irregular vesicles filled w/pale yellowish green (5GY 6/4) epidote, greenish black (5G 2.5/1) chlorite, some epidote rims. Chlorite oriented to foliation		
75			(~73.7') Qtz vein (1", 40°) light bluish gray (5PB 8/1)		
	4		AMYGALOIDAL METABASALT (75-85'): Irregular vesicles filled w/pale yellowish green (5GY 6/4) epidote, light bluish gray (10B 7/1) Qtz and minor greenish black (5G 2.5/1) chlorite, w/epidote peripheral rims.	95%	
80			(~78-80') Vuggy zone	189" 228"	
85			METABASALT (85-88'): Grayish green (5G 5/2), massive, slightly fractured, aphanitic.		
			AMYGALOIDAL METABASALT (~88-92')		
90			**Depth: 94'** **Thickness: 19'**		Typical
			METABASALT (92-94'): Grayish green (5G 4/2), massive, slightly to intensely (91-92.5') fractured, aphanitic.		
95	5		AMYGALOIDAL METABASALT (~94-95.3') w/irregular vesicles filled w/pale yellowish green (5GY 6/4), minor greenish black (5G 2.5/1) chlorite, some w/epidote peripheral rims.	100%	
			(~98.5') White (9.5/N) Qtz vein w/trace Native Cu	73"	Typical
100			(~97-100') Min. Epidote Replacement	84"	6↑

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF MINING PROGRAMS

GEOLOGIC LOG DRILL HOLES/OVERBURDEN ANALYSIS DATA

Hole No.: NT-13-09
Surface Elevation: 1136.07 ft.
Bottom Elevations: 1035.07 ft.

Static Water Elevations n/a
and Date Measured: n/a

Surveyed by: n/a Method: n/a
Remarks: n/a

Operation Name: Charmian Northern Tract
Method of Drilling: Rock Core, NQ Wireline
Date Drilled: September-October 2013
Drilled By: Logan Drilling Group
Logged By: Don Coleman – Geologist (URS/AECOM)
Quadrangle: Iron Springs, PA

Township/County: Hamiltonban Township, Adams County
Laboratory: SGI Technical Center
Latitude: 39° 45' 52.81" Longitude: 77° 26' 26.66"
Grid Coordinates:

Depth	Thick-ness	Scale	Graphic Log	Lithologic Description: rock type, weathering, color, fossils, carbonate minerals concentrations, pyrite, etc.	Water Conditions	Overburden Analysis Logs: Munsell Color Code	OBA Sample No.	Log Interval	%Total Sulfur	Fizz Rating	NP

FEET	BOX	CODE	DESCRIPTION	RECOVERY
100	5		METABASALT (~95.3-101'): Grayish green (5G 5/2), slightly fractured, aphanitic	6↑ 7↓
			Corehole NT-13-09 completed at depth of 101 feet below collar elevation of 1140 ft amsl. **Depth: 101' Thickness: 7'**	
105				
110				
115				
120				
125				
130				
135				
140				
145				
150				

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GEOLOGIC LOG DRILL HOLES/OVERBURDEN ANALYSIS DATA

Hole No.: NT-13-10
Surface Elevation: 1097.38 ft.
Bottom Elevations: 832.38 ft.

Static Water Elevations n/a
and Date Measured: n/a

Surveyed by: n/a Method: n/a
Remarks: n/a

Operation Name: Charmian Northern Tract
Method of Drilling: Rock Core, NQ Wireline
Date Drilled: September-October 2013
Drilled By: Logan Drilling Group
Logged By: Don Coleman – Geologist (URS/AECOM)
Quadrangle: Iron Springs, PA

Township/County: Hamiltonban Township, Adams County
Laboratory: SGI Technical Center
Latitude: 39° 46' 00.77" Longitude: 77° 26' 17.56"
Grid Coordinates:

Depth	Thick-ness	Scale	Graphic Log	Lithologic Description: rock type, weathering, color, fossils, carbonate minerals concentrations, pyrite, etc.	Water Conditions	Overburden Analysis Logs: Munsell Color Code	OBA Sample No.	Log Interval	%Total Sulfur	Fizz Rating	NP

FEET	BOX	CODE	DESCRIPTION	RECOVERY
0			OVERBURDEN (0-27')	
5				5↑ 5↓
10				
15				
20				
25				
30	1		CAP ROCK (27-42.8'): Metabasalt w/maj. Qtz, minor epidote and K-spar, foliated (35-40^0) (~27-29.6') Intensely fractured metabasalt	95% 132" 228"
35			(~35.5-36.5') Elongate (stetched) chlorite oriented to foliation (~35^0) to foliation (~37.2-42.8') Intensely to very intensely fractured (~37.6-38') Highly weathered zone	
40			**Depth: 46'** **Thickness: 19'**	
45			METABASALT: Grayish green (5G 4/2), slightly to moderately fractured. Fine-grained (speckled) and irregular epidote, minor chlorite.	
50	2			

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GEOLOGIC LOG DRILL HOLES/OVERBURDEN ANALYSIS DATA

Hole No.: NT-13-10
Surface Elevation: 1097.38 ft.
Bottom Elevations: 832.38 ft.

Static Water Elevations n/a
and Date Measured: n/a

Surveyed by: n/a Method: n/a
Remarks: n/a

Operation Name: Charmian Northern Tract
Method of Drilling: Rock Core, NQ Wireline
Date Drilled: September-October 2013
Drilled By: Logan Drilling Group
Logged By: Don Coleman – Geologist (URS/AECOM)
Quadrangle: Iron Springs, PA

Township/County: Hamiltonban Township, Adams County
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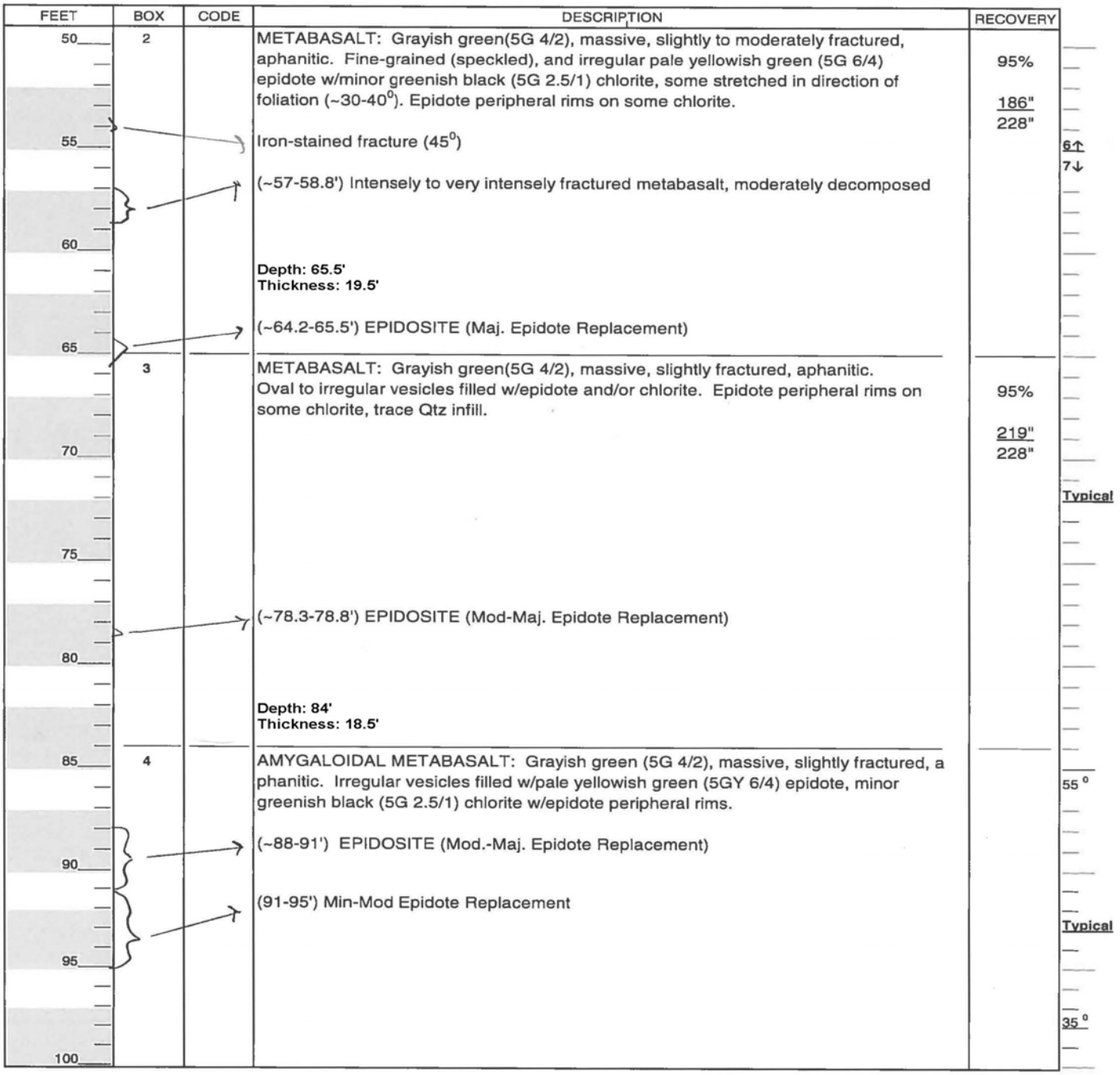
Latitude: 39° 46' 00.77" Longitude: 77° 26' 17.56"
Grid Coordinates:

Depth	Thick-ness	Scale	Graphic Log	Lithologic Description: rock type, weathering, color, fossils, carbonate minerals concentrations, pyrite, etc.	Water Conditions	Overburden Analysis Logs: Munsell Color Code	OBA Sample No.	Log Interval	%Total Sulfur	Fizz Rating	NP



COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF MINING PROGRAMS

GEOLOGIC LOG DRILL HOLES/OVERBURDEN ANALYSIS DATA

Hole No.: NT-13-10
Surface Elevation: 1097.38 ft.
Bottom Elevations: 832.38 ft.

Static Water Elevations n/a
and Date Measured: n/a

Surveyed by: n/a Method: n/a
Remarks: n/a

Operation Name: Charmian Northern Tract
Method of Drilling: Rock Core, NQ Wireline
Date Drilled: September-October 2013
Drilled By: Logan Drilling Group
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Latitude: 39° 46' 00.77" Longitude: 77° 26' 17.56"
Grid Coordinates:

Depth	Thick-ness	Scale	Graphic Log	Lithologic Description: rock type, weathering, color, fossils, carbonate minerals concentrations, pyrite, etc.	Water Conditions	Overburden Analysis Logs: Munsell Color Code	OBA Sample No.	Log Interval	%Total Sulfur	Fizz Rating	NP

FEET	BOX	CODE	DESCRIPTION	RECOVERY
100	4		**Depth: 103'** **Thickness: 19'**	
			(~102-104') Elongate (stretched) to oval chlorite oriented to foliation (30°)	
	5		METABASALT: Grayish green (5G 4/2), massive, slightly fractured, aphanitic.	
105			Fine-grained (speckled) pale yellowish green (5GY 6/4) epidote, greenish black (5G 2.5/1) chlorite	95% 219" 228"
110				
115				
			(~117.5-118') EPIDOSITE (Mod. Epidote Replacement)	
			Depth: 122' **Thickness: 19'**	
120			(~122.5') Min. Epidote Replacement	
	6		METABASALT: Grayish green (5G 4/2), massive, slightly fractured, aphanitic.	
125			Fine-grained (speckled) pale yellowish green (5GY 6/4) epidote w/minor greenish black (5G 2.5/1) chlorite w/epidote peripheral rims	95% 213" 228"
130			(~130-130.8') Intensely fractured metabasalt	
			(~131.5-132') EPIDOSITE (Maj. Epidote Replacement)	
135			(~134.6-136') EPIDOSITE (Mod.-Maj. Epidote Replacement) w/Epidote veins	
			(~137.5-138.2') Intensely fractured metabasalt	
140			**Depth: 141'** **Thickness: 19'**	
	7		(~141.2-142.1') EPIDOSITE: (141.2-142.1')	100%
145			(~143') Epidote vein (1/8", 30°)	224" 240"
			(~145.3-147') EPIDOSITE (Mod. Epidote Replacement	
150			(147-158.5') METABASALT: Grayish green (5G 5/2), massive, slightly fractured, aphanitic. Fine-grained (speckled) pale yellowish green (5GY 6/4) epidote w/irregular chlorite w/epidote peripheral rims.	

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GEOLOGIC LOG DRILL HOLES/OVERBURDEN ANALYSIS DATA

Hole No.: NT-13-10
Surface Elevation: 1097.38 ft.
Bottom Elevations: 832.38 ft.

Static Water Elevations n/a
and Date Measured: n/a

Surveyed by: n/a Method: n/a
Remarks: n/a

Operation Name: Charmian Northern Tract
Method of Drilling: Rock Core, NQ Wireline
Date Drilled: September-October 2013
Drilled By: Logan Drilling Group
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Quadrangle: Iron Springs, PA

Township/County: Hamiltonban Township, Adams County
Laboratory: SGI Technical Center
Latitude: 39° 46' 00.77" Longitude: 77° 26' 17.56"
Grid Coordinates:

Depth	Thick-ness	Scale	Graphic Log	Lithologic Description: rock type, weathering, color, fossils, carbonate minerals concentrations, pyrite, etc.	Water Conditions	Overburden Analysis Logs: Munsell Color Code	OBA Sample No.	Log Interval	%Total Sulfur	Fizz Rating	NP

FEET	BOX	CODE	DESCRIPTION	RECOVERY	
150	7		Metabasalt	100%	
			Depth: 161' **Thickness: 20'**	224" / 240"	Typical
155			(~155.5') Epidote infill		8↑ 9↓
			(~158.5-161') EPIDOSITE (Maj-Mod. Epidote Replacement)		
160					
	8		METABASALT: Grayish green (5G 5/2), massive, slightly fractured, aphanitic. Fine-grained (speckled) pale yellowish green (5GY 6/4) epidote w/irregular greenish black (5G 2.5/1) chlorite, some w/epidote peripheral rims.	95%	
165			(~164-166') Amygaloidal, w\oval to irregular vesicles filled w/epidote, chlorite, some w/epidote peripheral rims.	225" / 228"	
			(~167.5') Epidote vein (0.5", 40°)		48°
170			(~170.2') Irregular chlorite w/epidote rims, oriented to foliation (35°)		Typical
			(~173.7') Vesicles filled w/chlorite w/epidote rims, oriented to foliation (35°)		
			(~174.1) Epidote vein w/minor chlorite (1/8", 40°)		
175					50°
			(~176-180') Amygdaloidal w/epidote-filled vesicles		
			Depth: 180' **Thickness: 19'**		50°
180					
	9		METABASALT: Grayish green (5G 5/2), massive, slightly fractured, aphanitic. Fine-grained (speckled) pale yellowish green (5GY 6/4) epidote w/irregular greenish black (5G 2.5/1) chlorite, some w/epidote peripheral rims.	100%	
185			(~185-186')_Amygdaloidal w/oval to irregular vesicles filled w/epidote, chlorite w/ epidote peripheral rims	228" / 240"	
			(~188.3-188.5') Amygdaloidal w/irregular vesicles filled w/epidote		
190			(~189.2-189.6') EPIDOSITE (Maj. Epidote Replacement)		
			(~193.2-193.6') EPIDOSITE (Maj. Epidote Replacement) w/cross-cutting Qtz vein (1/16", 60°)		
195			(~194-195'; 196.3-197') Amygdaloidal w/epidote-filled vesicles		
			Depth: 200' **Thickness: 20'**		
			(~199-200') Amygdaloildal w/epidote-fille vesicles, chlorite w/epidote peripheral rims		60°
200					

COMMONWEALTH OF PENNSYLVANIA
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BUREAU OF MINING PROGRAMS

GEOLOGIC LOG DRILL HOLES/OVERBURDEN ANALYSIS DATA

Hole No.: NT-13-10
Surface Elevation: 1097.38 ft.
Bottom Elevations: 832.38 ft.

Static Water Elevations n/a
and Date Measured: n/a

Surveyed by: n/a Method: n/a
Remarks: n/a

Operation Name: Charmian Northern Tract
Method of Drilling: Rock Core, NQ Wireline
Date Drilled: September-October 2013
Drilled By: Logan Drilling Group
Logged By: Don Coleman – Geologist (URS/AECOM)
Quadrangle: Iron Springs, PA

Township/County: Hamiltonban Township, Adams County
Laboratory: SGI Technical Center
Latitude: 39° 46' 00.77" Longitude: 77° 26' 17.56"
Grid Coordinates:

Depth	Thick-ness	Scale	Graphic Log	Lithologic Description: rock type, weathering, color, fossils, carbonate minerals concentrations, pyrite, etc.	Water Conditions	Overburden Analysis Logs: Munsell Color Code	OBA Sample No.	Log Interval	%Total Sulfur	Fizz Rating	NP

FEET	BOX	CODE	DESCRIPTION	RECOVERY
200	10		AMYGDALOIDAL METABASALT: Grayish green (5G 4/2), massive, slightly fractured aphanitic. Irregular vesicles filled w/pale yellowish green (5GY 6/4) epidote, greenish black (5G 2.5/1) chlorite w/epidote peripheral rims.	95% 225" 228"
205				9↑ 10↓
210			(~210-210.7') EPIDOSITE (Mod. Epidote Replacement	
215			**Depth: 219'** **Thickness: 19'**	Typical
			(~217.6-218.5') EPIDOSITE (Mod-Maj. Epidote Replacement)	
220	11		METABASALT: Grayish green (5G 4/2), massive, slightly fractured, aphanitic. Fine-grained (speckled) pale yellowish green (5GY 6/4) epidote, minor greenish black (5G 2.5/1) chlorite w/some epidote peripheral rims.	95% 206" 228"
225			(-227.5-228') Min-Mod Epidote Replacement	
230			(~229.5-233') Intensely fractured metabasalt w/iron staining/oxidation	
235			**Depth: 238'** **Thickness: 19'**	Typical
			(~237.4-238') EPIDOSITE (Mod-Maj.) Epidote Replacement	
240	12		(~239.5-239.8) EPIDOSITE (Mod. Epidote Replacement)	100%
			METABASALT: Grayish green (5G 5/2), massive, slightly fractured, aphanitic.	213" 228"
245			(~246-247') Amygdaloidal w/epidote-filled vesicles	
250			(~248.5-250.5') EPIDOSITE (Mod. Epidote Replacement)	

COMMONWEALTH OF PENNSYLVANIA
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GEOLOGIC LOG DRILL HOLES/OVERBURDEN ANALYSIS DATA

Hole No.: NT-13-10
Surface Elevation: 1097.38 ft.
Bottom Elevations: 832.38 ft.

Static Water Elevations n/a
and Date Measured: n/a

Surveyed by: n/a Method: n/a
Remarks: n/a

Operation Name: Charmian Northern Tract
Method of Drilling: Rock Core, NQ Wireline
Date Drilled: September-October 2013
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Grid Coordinates:

Depth	Thick-ness	Scale	Graphic Log	Lithologic Description: rock type, weathering, color, fossils, carbonate minerals concentrations, pyrite, etc.	Water Conditions	Overburden Analysis Logs: Munsell Color Code	OBA Sample No.	Log Interval	%Total Sulfur	Fizz Rating	NP

FEET	BOX	CODE	DESCRIPTION	RECOVERY
250	12		**Depth: 258', Thickness: 20'**	
			(`249.7-251.6') Amygdaloidal w/irregular vesicles filled w/pale yellowish green (5GY 6/4) epidote	100%
			(~253-254') Amygdaloidal w/epidote-filled vesicles	213" / 228"
255			(~255-256') Amygdaloidal w/epidote-fille vesicles	10↑
			(~256.2-257.3') Min. Epidote Replacement	11↓
	13		METABASALT: Grayish green (5G 4/2), massive, slightly fractured, aphanitic.	
260			Amygdaloidal w/irregular vesicles filled w/pale yellowish green (5GY 6/4) epidote, greenish black (5G 2.5/1) chlorite, some w/epidote peripheral rims.	100%
			(~260-260.8') EPIDOSITE (Mod. Epidote Replacement)	72" / 84"
265			**Depth: 265' Thickness: 7'**	
			Corehole NT-13-10 completed at depth of 265 feet below collar elevation of 1095 ft amsl.	
270				
275				
280				
285				
290				
295				
300				

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF MINING PROGRAMS

GEOLOGIC LOG DRILL HOLES/OVERBURDEN ANALYSIS DATA

Hole No.: NT-13-11
Surface Elevation: 1177.60 ft.
Bottom Elevations: 1027.60 ft.

Static Water Elevations n/a
and Date Measured: n/a

Surveyed by: n/a Method: n/a
Remarks: n/a

Operation Name: Charmian Northern Tract
Method of Drilling: Rock Core, NQ Wireline
Date Drilled: September-October 2013
Drilled By: Logan Drilling Group
Logged By: Don Coleman – Geologist (URS/AECOM)
Quadrangle: Iron Springs, PA

Township/County: Hamiltonban Township, Adams County
Laboratory: SGI Technical Center
Latitude: 39° 45' 58.60" Longitude: 77° 26' 30.90"
Grid Coordinates:

Depth	Thick-ness	Scale	Graphic Log	Lithologic Description: rock type, weathering, color, fossils, carbonate minerals concentrations, pyrite, etc.	Water Conditions	Overburden Analysis Logs: Munsell Color Code	OBA Sample No.	Log Interval	%Total Sulfur	Fizz Rating	NP

FEET	BOX	CODE	DESCRIPTION	RECOVERY
0			OVERBURDEN (0-38')	
5				
10				
15				
20				
25				
30				
35				
40	1 →		CAP ROCK (38-61'): Metabasalt, very dark grayish green (5G 3/2), intensely to very intensely fractured w/extensive iron staining/oxidation on core surfaces, moderately to highly decomposed.	100% 21" 240"
45				
50				

COMMONWEALTH OF PENNSYLVANIA
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BUREAU OF MINING PROGRAMS

GEOLOGIC LOG DRILL HOLES/OVERBURDEN ANALYSIS DATA

Hole No.: NT-13-11
Surface Elevation: 1177.60 ft.
Bottom Elevations: 1027.60 ft.

Static Water Elevations n/a
and Date Measured: n/a

Surveyed by: n/a Method: n/a
Remarks: n/a

Operation Name: Charmian Northern Tract
Method of Drilling: Rock Core, NQ Wireline
Date Drilled: September-October 2013
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Depth	Thick-ness	Scale	Graphic Log	Lithologic Description: rock type, weathering, color, fossils, carbonate minerals concentrations, pyrite, etc.	Water Conditions	Overburden Analysis Logs: Munsell Color Code	OBA Sample No.	Log Interval	%Total Sulfur	Fizz Rating	NP

FEET	BOX	CODE	DESCRIPTION	RECOVERY
50	1	→	CAP ROCK (38-61')	100% 21" 240"
55			**Depth: 59'** **Thickness: 21'**	
60	2			100%
			METABASALT: Very dark grayish green (5G 3/2), slightly to intensely (61-69') fractured, aphanitic. Minor fine-grained (speckled) pale yellowish green (5GY 6/4) epidote and greenish black (5G 2.5/1) chlorite; some epidote peripheral rims on chlorite	140" 240"
65		→	(61-69') Intensely fractured metabasalt	
70		→	(~70-71') EPIDOSITE (Mod. Epidote Replacement)	
			Depth: 79' **Thickness: 20'**	Typical
75		→	(~73-76') AMYGALOIDAL METABASALT: Grayish green (5G 4/2), slightly fractured w/irregular vesicles filled w/pale yellowish green (5GY 6/4) epidote, minor Qtz.	60°
		→	(~78-78.7') EPIDOSITE (Mod.-Maj. Epidote Replacement)	70°
80	3		METABASALT: Grayish green (5G 4/2), massive, slightly to moderately fractured, aphanitic.	95%
		→	(~79-79.2') 3" Qtz vein w/chlorite	
		→	(~79.5-80.5) EPIDOSITE (Mod-Maj. Epidote Replacement)	180"
		→	(~84-85.5') Chlorite infill parallel to foliation (~40°)	228"
85		→	(~84') Qtz vein (1/4", 50°)	
		→	(~85.5-86') Intensely fractured metabasalt w/iron staining/oxidation	
		→	(~88') Epdote and Qtz infill parallel to foliation (~40°)	
90				5↑ 6↓ Typical
			Depth: 98' **Thickness: 19'**	
95		→	Qtz vein (1/4", 35°)	
		→	(~97.5-98') Trace Native Cu specks	
100	4	→	(~98-100.5') Intensely fractured metabasalt w/trace Native Cu specks	

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF MINING PROGRAMS

GEOLOGIC LOG DRILL HOLES/OVERBURDEN ANALYSIS DATA

Hole No.: NT-13-11
Surface Elevation: 1177.60 ft.
Bottom Elevations: 1027.60 ft.

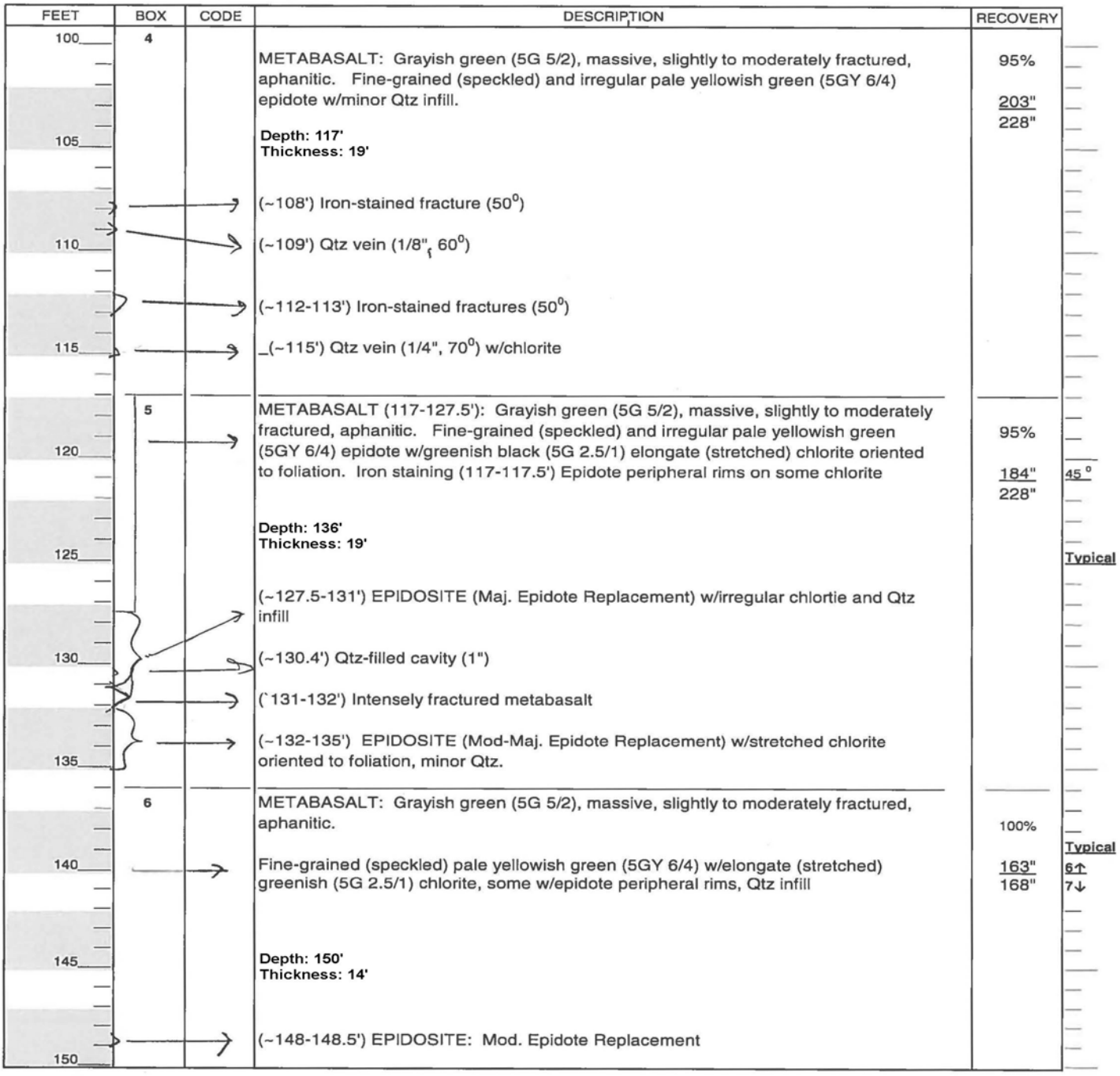
Static Water Elevations n/a
and Date Measured: n/a

Surveyed by: n/a Method: n/a
Remarks: n/a

Operation Name: Charmian Northern Tract
Method of Drilling: Rock Core, NQ Wireline
Date Drilled: September-October 2013
Drilled By: Logan Drilling Group
Logged By: Don Coleman – Geologist (URS/AECOM)
Quadrangle: Iron Springs, PA

Township/County: Hamiltonban Township, Adams County
Laboratory: SGI Technical Center
Latitude: 39° 45' 58.60" Longitude: 77° 26' 30.90"
Grid Coordinates:

Depth	Thick-ness	Scale	Graphic Log	Lithologic Description: rock type, weathering, color, fossils, carbonate minerals concentrations, pyrite, etc.	Water Conditions	Overburden Analysis Logs: Munsell Color Code	OBA Sample No.	Log Interval	%Total Sulfur	Fizz Rating	NP



COMMONWEALTH OF PENNSYLVANIA
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BUREAU OF MINING PROGRAMS

GEOLOGIC LOG DRILL HOLES/OVERBURDEN ANALYSIS DATA

Hole No.: NT-13-12
Surface Elevation: 1219.99 ft.
Bottom Elevations: 939.99 ft.

Static Water Elevations n/a
and Date Measured: n/a

Surveyed by: n/a Method: n/a
Remarks: n/a

Operation Name: Charmian Northern Tract
Method of Drilling: Rock Core, NQ Wireline
Date Drilled: September-October 2013
Drilled By: Logan Drilling Group
Logged By: Don Coleman – Geologist (URS/AECOM)
Quadrangle: Iron Springs, PA

Township/County: Hamiltonban Township, Adams County
Laboratory: SGI Technical Center
Latitude: 39° 46' 04.46" Longitude: 77° 26' 31.61"
Grid Coordinates:

Depth	Thick-ness	Scale	Graphic Log	Lithologic Description: rock type, weathering, color, fossils, carbonate minerals concentrations, pyrite, etc.	Water Conditions	Overburden Analysis Logs: Munsell Color Code	OBA Sample No.	Log Interval	%Total Sulfur	Fizz Rating	NP

FEET	BOX	CODE	DESCRIPTION	RECOVERY
0			OVERBURDEN (0-4')	
5	1		CAP ROCK (4-14.5'): Metabasalt, grayish green (5G 4/2), moderately to intensely fractured, moderately decomposed/disintergrated, scoriaceous (vuggy) and amygdaloidal w/irregular vesicles filled w/epidote and Qtz.	100% 108" 252"
10			(~12.5-13.5) Highly decomposed (weathered) metabasalt cap rock	
15			AMYGDALOIDAL METABASALT: Grayish green (5G 4/2), massive, moderately fractured, aphanitic. Qtz-filled vesicles oriented to foliation (~20°), minor randomly oriented chlorite and epidote.	
20			Depth: 25' Thickness: 21'	
25			(~23') Lost water circulation	35° Typical
	2		METABASALT: Grayish green (5G 5/2), massive, slightly to moderately fractured, aphanitic. Fine-grained (speckled) pale yellowish green (5GY 6/4) epidote and greenish black (5G 2.5/1) chlorite; epidote peripheral rims on some chlorite clasts. Qtz infill parallel to foliation	100% 216" 240"
30			(~28') Qtz vein (1/8", 40°)	Typical 3↑ 4↓ 30°
35				
40				Typical 60° 50°
45			Depth: 45' Thickness: 20'	
	3			45°
50				

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF MINING PROGRAMS

GEOLOGIC LOG DRILL HOLES/OVERBURDEN ANALYSIS DATA

Hole No.: NT-13-12
Surface Elevation: 1219.99 ft.
Bottom Elevations: 939.99 ft.

Static Water Elevations n/a
and Date Measured: n/a

Surveyed by: n/a Method: n/a
Remarks: n/a

Operation Name: Charmian Northern Tract
Method of Drilling: Rock Core, NQ Wireline
Date Drilled: September-October 2013
Drilled By: Logan Drilling Group
Logged By: Don Coleman – Geologist (URS/AECOM)
Quadrangle: Iron Springs, PA

Township/County: Hamiltonban Township, Adams County
Laboratory: SGI Technical Center
Latitude: 39° 46' 04.46" Longitude: 77° 26' 31.61"
Grid Coordinates:

Depth	Thick-ness	Scale	Graphic Log	Lithologic Description: rock type, weathering, color, fossils, carbonate minerals concentrations, pyrite, etc.	Water Conditions	Overburden Analysis Logs: Munsell Color Code	OBA Sample No.	Log Interval	%Total Sulfur	Fizz Rating	NP

FEET	BOX	CODE	DESCRIPTION	RECOVERY	
50	3		METABASALT: Grayish green (5G 4/2), massive, slightly to moderately fractured, aphanitic. Greenish black (5G 2.5/1) chlorite	95%	
			(~50-54') Fre-stained moderately fractured metabasalt	216" / 228"	Unique
55					Typical
60			(~59.5' iron-stained fracture 40^0)		
			(61' iron-stained fracture 30^0)		
			Depth: 64' **Thickness: 19'**		
65	4		METABASALT: Grayish green (5G 4/2), massive, slightly to moderately fractured, Fine-grained (speckled) pale yellowish green (5GY 6/4) epidote and greenish black chlorite	95%	20°
				206" / 228"	
70			(~71-73.5') Moderately fractured/weathered metabasalt		Unique
75					Typical
80			**Depth: 83'** **Thickness: 19'**		4↑ 5↓
			(~81.5') Chlorite vein (0.5", 35^0)		
85	5		METABASALT: Grayish green (5G 4/2), massive, slightly fractured, aphanitic. Fine-grained (speckled) pale yellowish green (5GY 6/4) epidote and greenish black 95G 2.5/1) oval to irregular chlorite.	95%	
				200" / 228"	
90					
95					Typical
			Depth: 102' **Thickness: 19'**		
100					

COMMONWEALTH OF PENNSYLVANIA
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BUREAU OF MINING PROGRAMS

GEOLOGIC LOG DRILL HOLES/OVERBURDEN ANALYSIS DATA

Hole No.: NT-13-12
Surface Elevation: 1219.99 ft.
Bottom Elevations: 939.99 ft.

Static Water Elevations n/a
and Date Measured: n/a

Surveyed by: n/a Method: n/a
Remarks: n/a

Operation Name: Charmian Northern Tract
Method of Drilling: Rock Core, NQ Wireline
Date Drilled: September-October 2013
Drilled By: Logan Drilling Group
Logged By: Don Coleman – Geologist (URS/AECOM)
Quadrangle: Iron Springs, PA

Township/County: Hamiltonban Township, Adams County
Laboratory: SGI Technical Center
Latitude: 39° 46' 04.46" Longitude: 77° 26' 31.61"
Grid Coordinates:

Depth	Thick-ness	Scale	Graphic Log	Lithologic Description: rock type, weathering, color, fossils, carbonate minerals concentrations, pyrite, etc.	Water Conditions	Overburden Analysis Logs: Munsell Color Code	OBA Sample No.	Log Interval	%Total Sulfur	Fizz Rating	NP

FEET	BOX	CODE	DESCRIPTION	RECOVERY
100	5			
	6		METABASALT: Grayish green (5G 5/2), massie, slightly fractured, aphanitic. Irregular and randomly oriented greenish black (5G 2.5/1) chlorite	95% 216" 228"
105				
110				
115				
			(~118') Chlorite w/epidote peripheral rims	
120			**Depth: 121'** **Thickness: 19'**	
	7		METABASALT: Grayish green (5G 5/2), massie, slightly fractured, aphanitic. Fine-grained (speckled) and irregular pale yellowish green (5GY 6/4) epidote and irregular to elongate (stretched) chlorite. Epidote rims common on chlorite	100% 218" 240"
125				
130			(~130-131') Qtz vein (0.25", 50°) w/irregular epidote	
135				
140			**Depth: 141'** **Thickness: 20'**	
	8		METABASALT: Grayish green (5G 5/2), massie, slightly fractured, aphanitic. Fine-grained (speckled) and irregular pale yellowish green (5GY 6/4) epidote and irregular to elongate (stretched) chlorite. Epidote rims common on chlorite	95% 218" 228"
145			(~146-147') METABASALT BRECCIA w/irregular pale yellowish green (5GY 6/4) epidote, greenish black (5G 2.5/1) chlorite, and red (10R 4/8) hematite	
150				

60°
55°
55°
51
61
Typical
45°

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF MINING PROGRAMS

GEOLOGIC LOG DRILL HOLES/OVERBURDEN ANALYSIS DATA

Hole No.: NT-13-12
Surface Elevation: 1219.99 ft.
Bottom Elevations: 939.99 ft.

Static Water Elevations n/a
and Date Measured: n/a

Surveyed by: n/a Method: n/a
Remarks: n/a

Operation Name: Charmian Northern Tract
Method of Drilling: Rock Core, NQ Wireline
Date Drilled: September-October 2013
Drilled By: Logan Drilling Group
Logged By: Don Coleman – Geologist (URS/AECOM)
Quadrangle: Iron Springs, PA

Township/County: Hamiltonban Township, Adams County
Laboratory: SGI Technical Center
Latitude: 39° 46' 04.46" Longitude: 77° 26' 31.61"
Grid Coordinates:

Depth	Thick-ness	Scale	Graphic Log	Lithologic Description: rock type, weathering, color, fossils, carbonate minerals concentrations, pyrite, etc.	Water Conditions	Overburden Analysis Logs: Munsell Color Code	OBA Sample No.	Log Interval	%Total Sulfur	Fizz Rating	NP

FEET	BOX	CODE	DESCRIPTION	RECOVERY
150	8		METABASALT BRECCIA (150-169.5'): Hematite, altered feldspars, and chlorite. Sharp contact w/overlying metabasalt.	95% 218" 228"
155				Typical
			Depth: 160' **Thickness: 19'**	
160	9			95%
			(162') 2-inch diameter Qtz-filled cavity	220" 228"
165			(~166') Qtz vein (1/4", 40°) (~167') Qtz vein (1/4", 40°)	Typical
170			(~170.5') Qtz vein (1/8", 25°) rimmed by epidote and hematite	6^ 7
			(~169.5-183') METABASALT: Grayish green (5G 5/2), massive, slightly fractured, aphanitic. Oval, irregular clasts and streaks of greenish black (5G 2.5/1) epidote,	
175			some w/epidote peripheral rims, minor fine-grained (speckled) pale yellowish green (5GY 6/4) epidote. Sharp contact w/overlying metabasalt breccia.	
			Depth: 179' **Thickness: 19'**	Typical
180	10		(~183-196') METABASALT BRECCIA: Pale yellowish green (5GY 6/4) epidote, red (10R 4/8) hematite, minor greenish black (5G 2.5/1) chlorite, and Qtz infill. Epidote peripheral rims on some chlorite clasts.	100% 208" 240"
185			(~184') Qtz, $CaCO_3$, and epidote veins (1/8", 35°)	
190				Typical
			Depth: 199' **Thickness: 20'**	
195			(~194.5') Qtz vein (4")	
			(~196') Chlorite-filled cavity w/epidote peripheral rim	
200				

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GEOLOGIC LOG DRILL HOLES/OVERBURDEN ANALYSIS DATA

Hole No.: NT-13-12
Surface Elevation: 1219.99 ft.
Bottom Elevations: 939.99 ft.

Static Water Elevations n/a
and Date Measured: n/a

Surveyed by: n/a Method: n/a
Remarks: n/a

Operation Name: Charmian Northern Tract
Method of Drilling: Rock Core, NQ Wireline
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Latitude: 39° 46' 04.46" Longitude: 77° 26' 31.61"
Grid Coordinates:

Depth	Thick-ness	Scale	Graphic Log	Lithologic Description: rock type, weathering, color, fossils, carbonate minerals concentrations, pyrite, etc.	Water Conditions	Overburden Analysis Logs: Munsell Color Code	OBA Sample No.	Log Interval	%Total Sulfur	Fizz Rating	NP

FEET	BOX	CODE	DESCRIPTION	RECOVERY
200	11		(~199.5') Qtz vein (3") METABASALT: Grayish green (5G 4/2), massive, slightly fractured, aphanitic. Irregular greenish black (5G 2.5/1) chlorite w/epidote peripheral rims.	95%
			(~200') Epidote vein (0.5", 20^0) w/chlorite rim	218" 228
205			(201, 202.5, 205') Qtz veins	
			(~208') Qtz cavity filling w/chlorite	
210				Typical
215			(~214-217') Mod. Hematite w/epidote infill **Depth: 218'** **Thickness: 19'**	
	12		METABASALT: Grayish green (5G 4/2), massive, slightly fractured, aphanitic. Min-Mod. Epidote replacement w/hematite, chlorite infill, epidote rims on some	95%
220			chlorite clasts, trace Qtz infill.	216" 228"
225				Typical
230				7↑ 8↓
			(~227-237') Metabasalt, SAA w/round to irregular greenish black (5G 2.5/1) chlorite some elongate (stretched) w/epidote peripheral rims	
235			**Depth: 237'** **Thickness: 19'**	
	13		METABASALT: Grayish green (5G 4/2), massive, slightly fractured, aphanitic. Fine-grained (speckled) pale yellowish green (5GY 6/4) epidote w/round, irregular,	100%
240			and elongate (stretched) greenish black (5G 2.5/1/) chlorite clasts	235" 240"
				55 ^{0}
245				Typical
250			Chlorite vein (1/16")	

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GEOLOGIC LOG DRILL HOLES/OVERBURDEN ANALYSIS DATA

Hole No.: NT-13-12
Surface Elevation: 1219.99 ft.
Bottom Elevations: 939.99 ft.

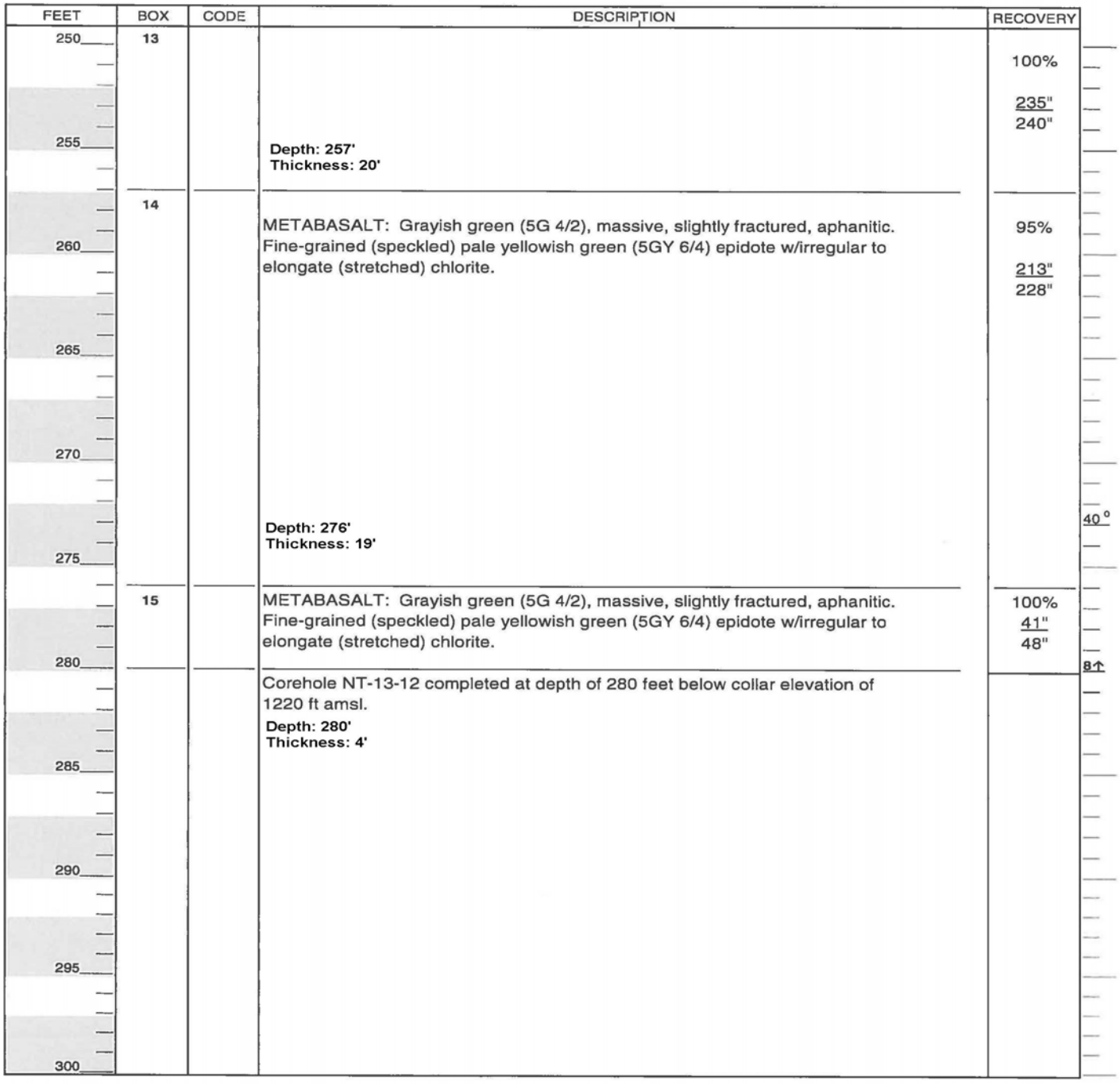
Static Water Elevations n/a
and Date Measured: n/a

Surveyed by: n/a Method: n/a
Remarks: n/a

Operation Name: Charmian Northern Tract
Method of Drilling: Rock Core, NQ Wireline
Date Drilled: September-October 2013
Drilled By: Logan Drilling Group
Logged By: Don Coleman – Geologist (URS/AECOM)
Quadrangle: Iron Springs, PA

Township/County: Hamiltonban Township, Adams County
Laboratory: SGI Technical Center
Latitude: 39° 46' 04.46" Longitude: 77° 26' 31.61"
Grid Coordinates:

Depth	Thick-ness	Scale	Graphic Log	Lithologic Description: rock type, weathering, color, fossils, carbonate minerals concentrations, pyrite, etc.	Water Conditions	Overburden Analysis Logs: Munsell Color Code	OBA Sample No.	Log Interval	%Total Sulfur	Fizz Rating	NP



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DEPARTMENT OF ENVIRONMENTAL PROTECTION

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF MINING PROGRAMS

GEOLOGIC LOG DRILL HOLES/OVERBURDEN ANALYSIS DATA

Hole No.: NT-13-13
Surface Elevation: 1178.04 ft.
Bottom Elevations: 938.04 ft.

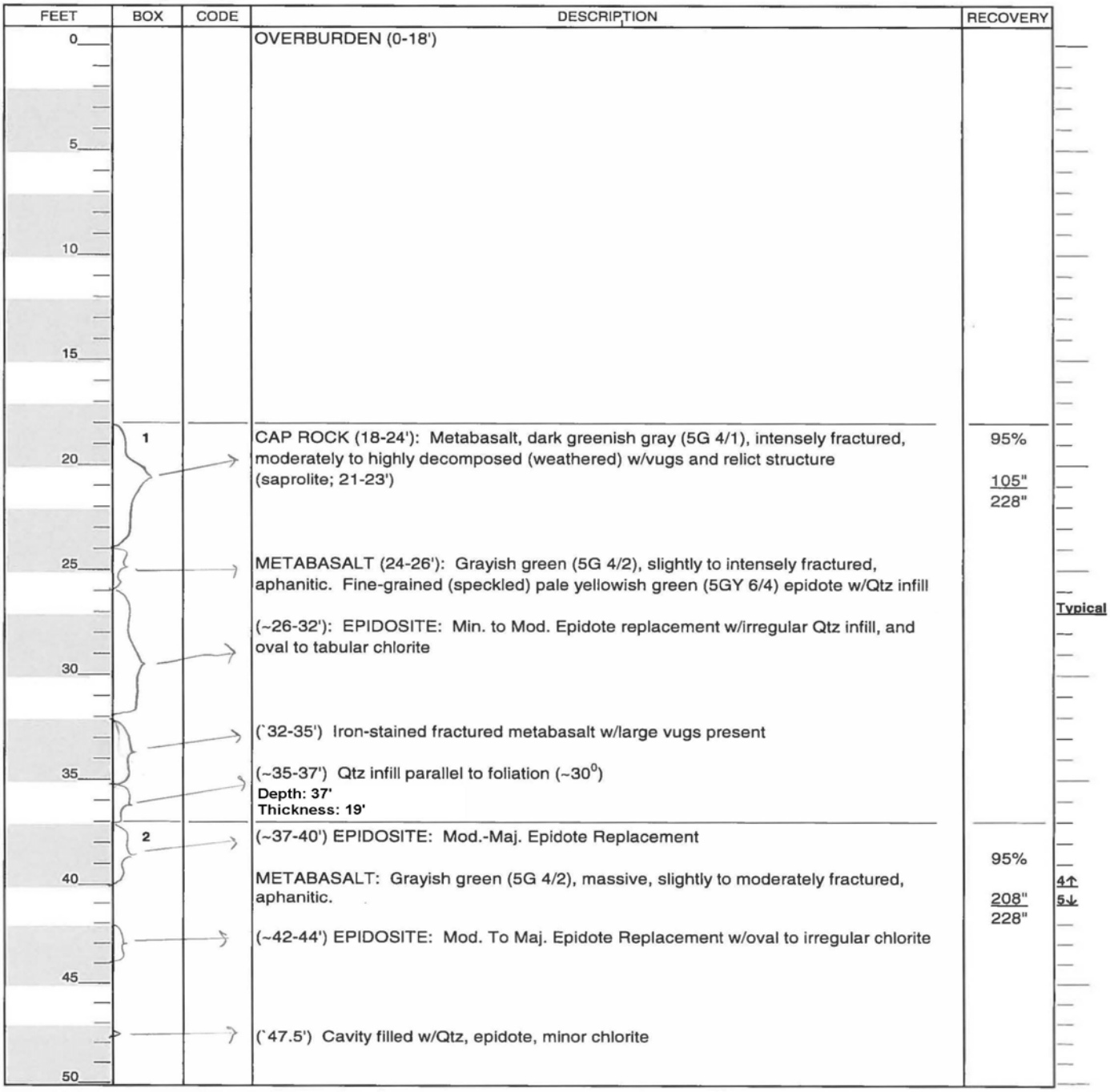
Static Water Elevations n/a
and Date Measured: n/a

Surveyed by: n/a Method: n/a
Remarks: n/a

Operation Name: Charmian Northern Tract
Method of Drilling: Rock Core, NQ Wireline
Date Drilled: September-October 2013
Drilled By: Logan Drilling Group
Logged By: Don Coleman – Geologist (URS/AECOM)
Quadrangle: Iron Springs, PA

Township/County: Hamiltonban Township, Adams County
Laboratory: SGI Technical Center
Latitude: 39° 46' 05.87" Longitude: 77° 26' 27.37"
Grid Coordinates:

Depth	Thick-ness	Scale	Graphic Log	Lithologic Description: rock type, weathering, color, fossils, carbonate minerals concentrations, pyrite, etc.	Water Conditions	Overburden Analysis Logs: Munsell Color Code	OBA Sample No.	Log Interval	%Total Sulfur	Fizz Rating	NP



COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF MINING PROGRAMS

GEOLOGIC LOG DRILL HOLES/OVERBURDEN ANALYSIS DATA

Hole No.: NT-13-13
Surface Elevation: 1178.04 ft.
Bottom Elevations: 938.04 ft.

Static Water Elevations n/a
and Date Measured: n/a

Surveyed by: n/a Method: n/a
Remarks: n/a

Operation Name: Charmian Northern Tract
Method of Drilling: Rock Core, NQ Wireline
Date Drilled: September-October 2013
Drilled By: Logan Drilling Group
Logged By: Don Coleman – Geologist (URS/AECOM)
Quadrangle: Iron Springs, PA

Township/County: Hamiltonban Township, Adams County
Laboratory: SGI Technical Center
Latitude: 39° 46' 05.87" Longitude: 77° 26' 27.37"
Grid Coordinates:

Depth	Thick-ness	Scale	Graphic Log	Lithologic Description: rock type, weathering, color, fossils, carbonate minerals concentrations, pyrite, etc.	Water Conditions	Overburden Analysis Logs: Munsell Color Code	OBA Sample No.	Log Interval	%Total Sulfur	Fizz Rating	NP

FEET	BOX	CODE	DESCRIPTION	RECOVERY	
50	2		**Depth: 56'** **Thickness: 19'**	95%	Typical
			(~52.5') Possible flow boundary	208"	
			(~55-56') Qtz infill parallel to foliation (~35^0), w/fine-grained (speckled) and irregular epidote	228"	
55					
	3		METABASALT: Grayish green (5G 4/2), massive, moderately fractured, aphanitic. Qtz infill parallel to foliation (40^0) w/minor oval, irregular and elongate (stretched) chlorite.	100%	45 °
60				200"	
			(~61') 2" Qtz cavity w/vertical chlorite veins	240"	
			(~60-66') EPIDOSITE: Mod.-Maj. Epidote Replacement w/irregular chlorite		
65			Qtz vein (0.5")		Typical
			(~66-66.5') 6" cavity filling w/white to light bluish gray Qtz, minor chlorite		
			(~68-68.5') Fractured metabasalt		
			(~69') Qtz vein (0.5", 30^0)		
70					45 °
			(~71-76') AMYGDALOIDAL METABASALT w/randomly oriented Qtz and epidote		
			(~73') Qtz vein (0.5", 40^0)		40 °
75			**Depth: 76'** **Thickness: 20'**		Unique
	4		METABASALT: Grayish green (5G 4/2), massive, slightly fractured, aphanitic. Fine-grained (speckled) pale yellowish green (5GY 6/4) epidote w/Qtz infill parallel to foliation (35-40^0)		
80					
			(~80-81') Fractured metabasalt		
			(`84-85') EPIDOSITE: Mod. Epidote Replacement w/Qtz infill		
85					
			(~86') Qtz vein (1/4", 30^0)		
90					5↑ 6↓
			Depth: 95' **Thickness: 19'**		30 °
			(~94') Trace hematite (?), epidote peripheral rims on chlorite clasts		
95					
	5		METABASALT: Grayish green (5G 5/2), massive, slightly fractured, aphanitic. Round to irregular epidote w/elongate chlorite	100%	
			(`97') Qtz-filled cavity (`1")	225"	
			(~99') Possible flow boundary	240"	
100					

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF MINING PROGRAMS

GEOLOGIC LOG DRILL HOLES/OVERBURDEN ANALYSIS DATA

Hole No.: NT-13-13
Surface Elevation: 1178.04 ft.
Bottom Elevations: 938.04 ft.

Static Water Elevations n/a
and Date Measured: n/a

Surveyed by: n/a Method: n/a
Remarks: n/a

Operation Name: Charmian Northern Tract
Method of Drilling: Rock Core, NQ Wireline
Date Drilled: September-October 2013
Drilled By: Logan Drilling Group
Logged By: Don Coleman – Geologist (URS/AECOM)
Quadrangle: Iron Springs, PA

Township/County: Hamiltonban Township, Adams County
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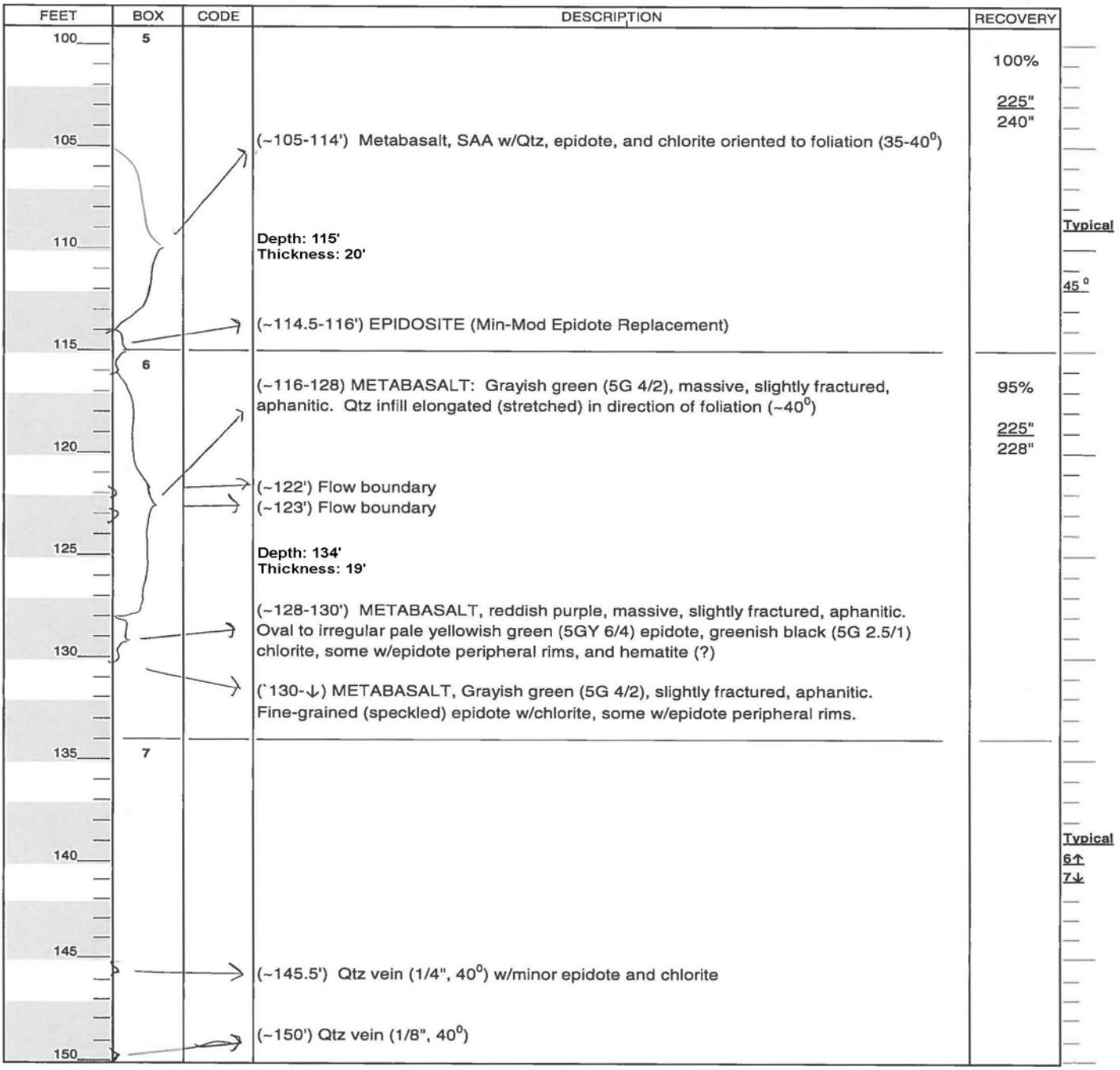
Latitude: 39° 46' 05.87" Longitude: 77° 26' 27.37"
Grid Coordinates:

Depth	Thick-ness	Scale	Graphic Log	Lithologic Description: rock type, weathering, color, fossils, carbonate minerals concentrations, pyrite, etc.	Water Conditions	Overburden Analysis Logs: Munsell Color Code	OBA Sample No.	Log Interval	%Total Sulfur	Fizz Rating	NP



COMMONWEALTH OF PENNSYLVANIA
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BUREAU OF MINING PROGRAMS

GEOLOGIC LOG DRILL HOLES/OVERBURDEN ANALYSIS DATA

Hole No.: NT-13-13
Surface Elevation: 1178.04 ft.
Bottom Elevations: 938.04 ft.

Static Water Elevations n/a
and Date Measured: n/a

Surveyed by: n/a Method: n/a
Remarks: n/a

Operation Name: Charmian Northern Tract
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Depth	Thick-ness	Scale	Graphic Log	Lithologic Description: rock type, weathering, color, fossils, carbonate minerals concentrations, pyrite, etc.	Water Conditions	Overburden Analysis Logs: Munsell Color Code	OBA Sample No.	Log Interval	%Total Sulfur	Fizz Rating	NP

FEET	BOX	CODE	DESCRIPTION	RECOVERY
150	7		(~150.5-159') Intensely fractured metabasalt w/iron staining/oxidation **Depth: 153'** **Thickness: 19'**	
	8			
155			METABASALT: Grayish green (5G 4/2), massive, moderately fractured, aphanitic. Fine-grained (speckled) pale yellowish green (5GY 6/4) epidote w/greenish black (5G 2.5/1) chlorite. Epidote peripheral rims on some chlorite.	95% 120" 228"
160				Typical
165				
			Depth: 172' **Thickness: 19'**	
170			(~171') Qtz vein (1/4", 90°) w/malachite	Unique
	9			
175			(~171-179') Very intensely fractured, iron-stained metabasalt METABASALT: Grayish green (5G 5/2), moderately fractured to very intensely fractured, aphanitic.	90% 107" 216"
180			(~180') 1" cavity filling w/epiodote and chlorite	Typical
			(~184-186') Iron-stained, very intensely fractured metabasalt	
185			**Depth: 190'** **Thickness: 18'**	
			(188-189') Intensely fractured metabasalt w/elongate (stretched) chlorite	
190				7↑ 8↓
	10		METABASALT: Grayish green (5G 5/2) , massive, moderately fractured, aphanitic. Fine-grained (speckled) pale yellowish green (5GY 6/4) epidote w/chlorite	100% 200" 240"
195			Actinolite (?)	
				35° Typical
200				

COMMONWEALTH OF PENNSYLVANIA
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GEOLOGIC LOG DRILL HOLES/OVERBURDEN ANALYSIS DATA

Hole No.: NT-13-13
Surface Elevation: 1178.04 ft.
Bottom Elevations: 938.04 ft.

Static Water Elevations n/a
and Date Measured: n/a

Surveyed by: n/a Method: n/a
Remarks: n/a

Operation Name: Charmian Northern Tract
Method of Drilling: Rock Core, NQ Wireline
Date Drilled: September-October 2013
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Depth	Thick-ness	Scale	Graphic Log	Lithologic Description: rock type, weathering, color, fossils, carbonate minerals concentrations, pyrite, etc.	Water Conditions	Overburden Analysis Logs: Munsell Color Code	OBA Sample No.	Log Interval	%Total Sulfur	Fizz Rating	NP

FEET	BOX	CODE	DESCRIPTION	RECOVERY
200	10		(~201') 2" Qtz-filled cavity	100%
			(~202-203') Amygdaloidal metabasalt w/epidote fille vesicles, minor chlorite, some epidote peripheral rims on chlorite clasts	200" / 240"
205			(~203-205') EPIDOSITE: Mod.-Maj. Epidote Replacement **Depth: 210'** **Thickness: 20'**	
			(~209-210') Intensely fractured metabasalt w/some iron staining	
210	11		METABASALT: Grayish green (5G 5/2), massive, slightly fractured, aphanitic. Fine-grained (speckled) pale yellowish green (5GY 6/4) epidote w/irregular greenish black (5G 2.5/1) chlorite, some w/epidote peripheral rims.	95%
				196" / 228"
215			(~216-217') Min Epidote Replacement	
220				
				Typical
225			(~225') Qtz-filled cavity	
			Depth: 229' **Thickness: 19'**	
230	12		METABASALT: Grayish green (5G 5/2), massive, moderately fractured, aphanitic.	100%
				45° 40°
				70" / 132
235				
			Depth: 240' **Thickness: 11'**	
240			Corehole NT-13-13 completed at depth of 240 feet below collar elevation of 1180 ft amsl.	81
245				
250				

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COMMONWEALTH OF PENNSYLVANIA
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GEOLOGIC LOG DRILL HOLES/OVERBURDEN ANALYSIS DATA

Hole No.: NT-13-14
Surface Elevation: 1200.51 ft.
Bottom Elevations: 929.51 ft.

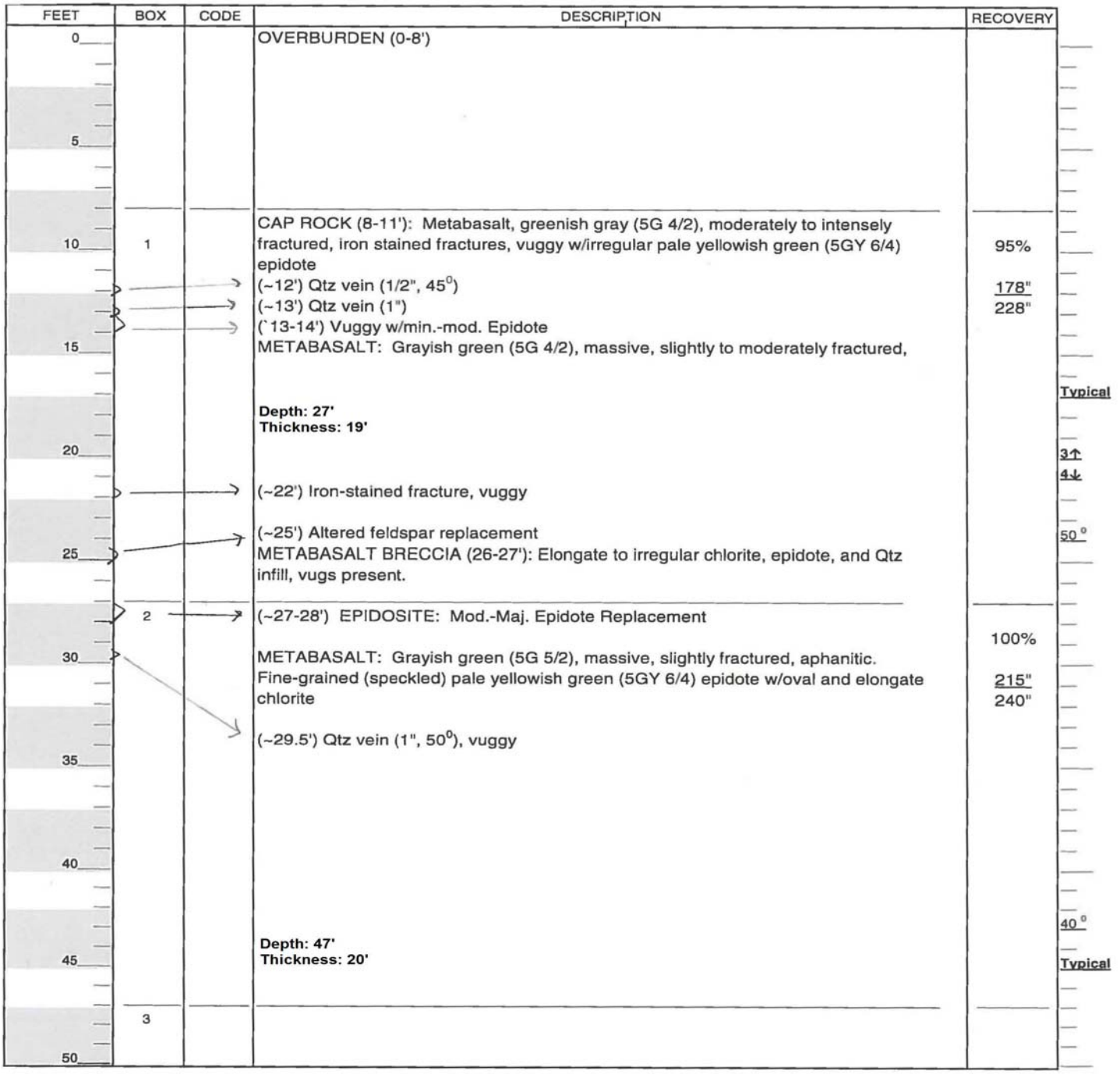
Static Water Elevations n/a
and Date Measured: n/a

Surveyed by: n/a Method: n/a
Remarks: n/a

Operation Name: Charmian Northern Tract
Method of Drilling: Rock Core, NQ Wireline
Date Drilled: September-October 2013
Drilled By: Logan Drilling Group
Logged By: Don Coleman – Geologist (URS/AECOM)
Quadrangle: Iron Springs, PA

Township/County: Hamiltonban Township, Adams County
Laboratory: SGI Technical Center
Latitude: 39° 46' 01.35" Longitude: 77° 26' 25.94"
Grid Coordinates:

Depth	Thick-ness	Scale	Graphic Log	Lithologic Description: rock type, weathering, color, fossils, carbonate minerals concentrations, pyrite, etc.	Water Conditions	Overburden Analysis Logs: Munsell Color Code	OBA Sample No.	Log Interval	%Total Sulfur	Fizz Rating	NP



COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF MINING PROGRAMS

GEOLOGIC LOG DRILL HOLES/OVERBURDEN ANALYSIS DATA

Hole No.: NT-13-14
Surface Elevation: 1200.51 ft.
Bottom Elevations: 929.51 ft.

Static Water Elevations n/a
and Date Measured: n/a

Surveyed by: n/a Method: n/a
Remarks: n/a

Operation Name: Charmian Northern Tract
Method of Drilling: Rock Core, NQ Wireline
Date Drilled: September-October 2013
Drilled By: Logan Drilling Group
Logged By: Don Coleman – Geologist (URS/AECOM)
Quadrangle: Iron Springs, PA

Township/County: Hamiltonban Township, Adams County
Laboratory: SGI Technical Center
Latitude: 39° 46' 01.35" Longitude: 77° 26' 25.94"
Grid Coordinates:

Depth	Thick-ness	Scale	Graphic Log	Lithologic Description: rock type, weathering, color, fossils, carbonate minerals concentrations, pyrite, etc.	Water Conditions	Overburden Analysis Logs: Munsell Color Code	OBA Sample No.	Log Interval	%Total Sulfur	Fizz Rating	NP

FEET	BOX	CODE	DESCRIPTION	RECOVERY
50	3		METABASALT: Grayish green (5G 4/2), massive, slightly fractured, aphanitic.	95%
				208"
55				228"
			(~58-61') Irregular epidote w/minor chlorite and hematite layers	
60				Typical
				35°
			(~63-66') Widely spaced fractures (~30°)	
65			Depth: 66' Thickness: 19'	
	4		METABASALT: Grayish green (5G 4/2), massive, slightly to moderately fractured, aphanitic. Epidote w/oval and elongate chlorite oriented w/foliation	95%
70			(~67-69') Widely spaced fractures 30-40°)	204" 4↑
			(~71-72') Min-Mod. Epidote Replacement	228" 5↓
75				Typical
80			Mod. Epidote, chlorite w/epidote peripheral rims	
			Depth: 85' Thickness: 19'	
				40°
85			(`83.5-85') Mod. Epidote, chlorite w/epidote peripheral rims	Unique
	5		METABASALT: Grayish green, massive, sligthly to moderately fractured, aphantic Fine-grained (speckled) epidote w/oval to elongate chlorite, epidote peripheral rims.	100% 45°
90			(~87') Qtz vein (1"m, 40°)	220"
			(87.5') Qtz-filled fracture (70°) w/minor chlorite	240"
			(~91.5-92') Minor Epidote	
95			(!~94-95') Epidote and hematite infill (flow boundary?)	
100				

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and Date Measured: n/a

Surveyed by: n/a Method: n/a
Remarks: n/a

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Grid Coordinates:

Depth	Thick-ness	Scale	Graphic Log	Lithologic Description: rock type, weathering, color, fossils, carbonate minerals concentrations, pyrite, etc.	Water Conditions	Overburden Analysis Logs: Munsell Color Code	OBA Sample No.	Log Interval	%Total Sulfur	Fizz Rating	NP

FEET	BOX	CODE	DESCRIPTION	RECOVERY	
100			(~100-100.5') Qtz cavity filling	100%	
				220"	
			Depth: 105'	240"	Typical
			Thickness: 20'		
105	6		METABASALT: Grayish green (5G 4/2), massive, slightly fractured, aphanitic. Fine-grained (speckled) pale yellowish green (5GY 6/4) epidote w/irregular greenish black (5G 2.5/1) chlorite.	95%	
				218"	
110			(`108') Qtz vein (1/8", 40°)	228"	
			(`110') Qtz infill		
			(`113.5-114') Qtz cavity filling		
115					
			(~116.5') Cavity fillingw/chlorite, Qtz, and epidote		
120			(~119.5') Chlorite vein (1/8", 45°)		5↑
			(~120') Altered feldspar infill		6↓
			Depth: 124'		
			Thickness: 19'		
125	7		METABASALT: Grayish green (5G 4/2), massive, slightly fractured, aphanitic. Fine-grained (speckled) pale yellowish green (5GY 6/4) epidote w/irregular greenish black (5G 2.5/1) chlorite and Qtz infill.	95%	
				214"	
				228"	
130					
			(~132') Native Cu specks		
135					70°
140			**Depth: 143'**		
			Thickness: 19'		
			(~142') Iron-stained fracture (10°)		Typical
145	8		METABASALT: Grayish green (5G 4/2), massive, slightly fractured, aphanitic. Fine-grained (speckled) pale yellowish green (5GY 6/4) epidote.	95%	
				215"	
				228"	
			(~148-149') Iron-stained fracture zone		
150					

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Bottom Elevations: 929.51 ft.

Static Water Elevations n/a
and Date Measured: n/a

Surveyed by: n/a Method: n/a
Remarks: n/a

Operation Name: Charmian Northern Tract
Method of Drilling: Rock Core, NQ Wireline
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Grid Coordinates:

Depth	Thick-ness	Scale	Graphic Log	Lithologic Description: rock type, weathering, color, fossils, carbonate minerals concentrations, pyrite, etc.	Water Conditions	Overburden Analysis Logs: Munsell Color Code	OBA Sample No.	Log Interval	%Total Sulfur	Fizz Rating	NP

FEET | BOX | CODE | DESCRIPTION | RECOVERY

150 — 8

Fine-grained specular hematite — 95% — Unique

215"
228"

155 — Iron staining (hematite?) — Typical

Depth: 162'
Thickness: 19'

160

9

METABASALT: Grayish green (5G 4/2), massive, slightly fractured, aphanitic. Fine-grained (speckled) pale yellowish green (5GY 6/4) epidote, trace greenish black (5G 2.5/1) chlorite, some w/epidote peripheral rims. — 95%

165

226"
228"

170 — Typical 6↑ 7↓

175

Depth: 181'
Thickness: 19'

180

10

(~183.5-184') EPIDOSITE: Mod. Epidote Replacement — 100%

185

228"
240"

METABASALT: Grayish green (5G 4/2), massive, slightly fractured, aphanitic. Fine-grained (speckled) pale yellowish green (5GY 6/4) epidote, trace greenish black (5G 2.5/1) chlorite, some w/epidote peripheral rims.

190

195

Depth: 200'
Thickness: 19'

200

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Bottom Elevations: 929.51 ft.

Static Water Elevations n/a
and Date Measured: n/a

Surveyed by: n/a Method: n/a
Remarks: n/a

Operation Name: Charmian Northern Tract
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Grid Coordinates:

Depth	Thick-ness	Scale	Graphic Log	Lithologic Description: rock type, weathering, color, fossils, carbonate minerals concentrations, pyrite, etc.	Water Conditions	Overburden Analysis Logs: Munsell Color Code	OBA Sample No.	Log Interval	%Total Sulfur	Fizz Rating	NP

FEET | BOX | CODE | DESCRIPTION | RECOVERY

200

11

METABASALT: Grayish green (5G 4/2), massive, slightly fractured, aphanitic.

95%

220"
228"

205

(~206') Qtz vein (0.5")
(~207') Qtz vein (1/8", 35°)
(~207.5-208') Qtz-$CaCO_3$ vein (1", 45°)

210

(~214') Qtz vein (1/8") w/epidote-filled vugs

Typical

215

(~215') Qtz cavity filling

(~218') Qtz vein (40°) w/epidote

Depth: 220'
Thickness: 20'

220

7↑
8↓

12

(220-224') METABASALT: Grayish green (5G 4/2), massive, slightly fractured, aphanitic. Fine-grained (speckled) pale yellowish green (5GY 6/4) epidote, trace round to irregular greenish black (5G 2.5/1) chlorite, some epidote peripheral rims on chlorite present

100%

230"
240"

225

(~224-235') EPIDOSITE (Mod.-Maj. Epidote Replacement) w/Qtz infill, irregular chlorite. Sharp contact w/overlying metabasalt.

230

(~232') Chlorite vein (0.5", 40°)

Depth: 240'
Thickness: 20'

235

Typical

(~235-246') METABASALT: Grayish green (5G 5/2), slightly fractured, aphanitic. Fine-grained (speckled) pale yellowish green (5GY 6/4) epidote, trace greenish black (5G 2.5/1) chlorite
(~238') Qtz vein (25°)

240

13

95%

218"
228"

245

(~246-252') EPIDOSITE: Mod-Maj. Epidote Replacement w/oval to irregular hematite, Qtz infill

Typical

250

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Static Water Elevations n/a
and Date Measured: n/a

Surveyed by: n/a Method: n/a
Remarks: n/a

Operation Name: Charmian Northern Tract
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Depth	Thick-ness	Scale	Graphic Log	Lithologic Description: rock type, weathering, color, fossils, carbonate minerals concentrations, pyrite, etc.	Water Conditions	Overburden Analysis Logs: Munsell Color Code	OBA Sample No.	Log Interval	%Total Sulfur	Fizz Rating	NP

FEET | BOX | CODE | DESCRIPTION | RECOVERY

250

BOX 13

(~251') Qtz cavity filling w/hematite (?) rim — 95%

Metabasalt, grayish green (5G 5/2), massive, slightly fractured, aphanitic. Min-mod. epidote replacement. — 218" / 228"

255

Depth: 259'
Thickness: 19'

260

BOX 14

(~259.5-260') EPIDOSITE: Mod. Epidote Replacement — 100%

METABASALT: Grayish green (5G 4/2), massive, slightly fractured, aphanitic. Fine-grained (speckled) and irregular pale yellowish green (5GY 6/4) epidote w/ oval to irregular greenish black (5G 2.5/1) chlorite, some oriented to foliation (30°), some epidote peripheral rims on chlorite clasts. — 141" / 144"

265

Depth: 271'
Thickness: 12'

270

8↑
9↓

Corehole NT-13-14 completed at depth of 271 feet below collar elevation of 1210 feet amsl.

275

280

285

290

295

300

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DEPARTMENT OF ENVIRONMENTAL PROTECTION
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GEOLOGIC LOG DRILL HOLES/OVERBURDEN ANALYSIS DATA

Hole No.: NT-13-15
Surface Elevation: 1169.83 ft.
Bottom Elevations: 954.83 ft.

Static Water Elevations n/a
and Date Measured: n/a

Surveyed by: n/a Method: n/a
Remarks: n/a

Operation Name: Charmian Northern Tract
Method of Drilling: Rock Core, NQ Wireline
Date Drilled: September-October 2013
Drilled By: Logan Drilling Group
Logged By: Don Coleman – Geologist (URS/AECOM)
Quadrangle: Iron Springs, PA

Township/County: Hamiltonban Township, Adams County
Laboratory: SGI Technical Center
7Latitude: 39° 46' 01.99" Longitude: 77° 26' 21.17"
Grid Coordinates:

Depth	Thick-ness	Scale	Graphic Log	Lithologic Description: rock type, weathering, color, fossils, carbonate minerals concentrations, pyrite, etc.	Water Conditions	Overburden Analysis Logs: Munsell Color Code	OBA Sample No.	Log Interval	%Total Sulfur	Fizz Rating	NP

FEET	BOX	CODE	DESCRIPTION	RECOVERY
0			OVERBURDEN (0-7')	
5				
10	1		METABASALT: Greenish gray (5G 4/2), massive, slightly fractured, aphanitic. Fine-grained (speckled) and irregular pale yellowish green (5GY 6/4) epidote w/ greenish black (5G 2.5/1) chlorite, some w/epidote peripheral rims.	95% 210" 228"
			(~12') Highly weathered metabasalt	
15			(`14') Highly weathered metabasalt	4↑ 5↓
20				Typical
25			(`21-25') Trace Native Cu specks **Depth: 26'** **Thickness: 19'**	
30	2		METABASALT: Greenish gray (5G 4/2), massive, slightly fractured to moderately fractured, aphanitic. Fine-grained (speckled) pale yellowish green (5GY 6/4) epidote w/irregular greenish black (5G 2.5/1) chlorite, some w/epidote peripheral rims.	95% 191" 228"
35			(~31-37') AMYGDALOIDAL METABASALT w/irregular vesicles filled w/pale yellowish green (5GY 6/4) epidote, greenish black (5G 2.5/1) chlorite, and pale yellow (5Y 8/3) feldspars (?). Chlorite elongated (stretched) in direction of foliation	45° Typical
			(~37-39') Grayish green metabasalt	
40			(~39-49.3') EPIDOSITE: Maj. Epidote Replacement (~40-41') Intensely fractured zone	
45			**Depth: 45'** **Thickness: 19'**	Unique
	3		(~46') Malachite, trave native Cu, chlorite, and K-spar. Sharp contact w/Epidosite. (~47') Qtz vein (0.5", 40°) w/chlorite (~47.3-47.8') Cavity filling/breccia? w/chlorite, epidote, in Qtz matrix.	95% Unique 198" 228"
50				60°

COMMONWEALTH OF PENNSYLVANIA
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Bottom Elevations: 954.83 ft.

Static Water Elevations n/a
and Date Measured: n/a

Surveyed by: n/a Method: n/a
Remarks: n/a

Operation Name: Charmian Northern Tract
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Grid Coordinates:

Depth	Thick-ness	Scale	Graphic Log	Lithologic Description: rock type, weathering, color, fossils, carbonate minerals concentrations, pyrite, etc.	Water Conditions	Overburden Analysis Logs: Munsell Color Code	OBA Sample No.	Log Interval	%Total Sulfur	Fizz Rating	NP

FEET	BOX	CODE	DESCRIPTION	RECOVERY	
50	3		(~49.3-52.7') METABASALT: Grayish green, massie, slightly fractured, aphanitic. Fine-grained (speckled) pale yellowish green (5GY 6/4) epidote	95%	
			(~52.7-65') AMYGDALOIDAL METABASALT w/irregular vesicles filled w/pale yellowish green (5GY 6/4) epidote	198" 228"	Typical
55			(~56.7') Qtz vein (0.5", 30°)		
			(~56-58) EPIDOSITE: Mod-Maj Epidote Replacement		
60			**Depth: 64'** **Thickness: 19'**		
65	4		METABASALT: Grayish green (5G 4/2), massive, slightly fractured, aphanitic. Fine-grained (speckled) pale yellowish green (5GY 6/4) epidote w/minor greenish black (5G 2.5/1) chlorite. Min-Mod. Epidote replacement (~65-66.2')		51↑ 6↓
70			(~71') Qtz vein (0.5", 30°)		Typical
75					
80			**Depth: 83'** **Thickness: 19'**		
			(~82-83') Irregular feldspar		
	5		METABASALT: Grayish green (5G 4/2), massive, slightly to moderately fractured, aphanitic.	95%	
85			(~87') Qtz vein (2", 20°)		
			(~85-88.5') EPIDOSITE: Mod.-Maj. Epidote Replacement w/oval to irregular greenish black (5G 2.5/1) chlorite	218" 219"	
90			(~89') Fibrous		
			Metabasalt, grayish green, massive, slightly fractured, aphanitic		70°
95			(`95.5-97.5') Elongate (stretched) chlorite clasts oreinted to foliation		Typical
100					35°

COMMONWEALTH OF PENNSYLVANIA
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Static Water Elevations n/a
and Date Measured: n/a

Surveyed by: n/a Method: n/a
Remarks: n/a

Operation Name: Charmian Northern Tract
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Depth	Thick-ness	Scale	Graphic Log	Lithologic Description: rock type, weathering, color, fossils, carbonate minerals concentrations, pyrite, etc.	Water Conditions	Overburden Analysis Logs: Munsell Color Code	OBA Sample No.	Log Interval	%Total Sulfur	Fizz Rating	NP

FEET	BOX	CODE	DESCRIPTION	RECOVERY
100	5		**Depth: 102'** **Thickness: 19'**	
	6		METABASALT: Grayish green (5G 5/2), massive, slightly to intensely fractured, aphanitic. Fine-grained (speckled) and irregular pale yellowish green (5GY 6/4) epidote	100%
105			(~104.5-107') Intensely fractured metabasalt	207" 240"
			(~106.5-111') AMYGDALOIDAL METABASALT w/irregular vesicles filled w/epidote, minor chlorite, some w/epidote rims	35°
110				Typical
			(~112-113.5') EPIDOSITE: Maj. Epidote Replacement (~113.5') Qtz vein (5/8", 35°) w/trace Native Cu	
115			(~114-115) Amygdaloidal Metabasalt w/irregular vesicle filled w/epidote	61↑ 7↓
			(~115-117') EPIDOSITE: Mod-Maj. Epidote Replacement w/minor Qtz and Chlorite	60°
120			Metabasalt, grayish green, massive, aphanitic. Fine-grained (speckled) epidote w/ irregular chlorite, some oriented to foliation. **Depth: 122'** **Thickness: 20'**	40°
	7		METABASALT: Grayish green (5G 5/2), massive, slightly fractured, aphanitic. Fine-grained (speckled) pale yellowish green (5GY 6/4) epidote w/greenish black (5G 2.5/1) chlorite	95%
125				218" 228"
130				
			(~131.5') Epidote vein (1/8", 20°)	33°
135			(~135.5-136') Chlorite banding ?	
140			**Depth: 141'** **Thickness: 19'**	
	8		METABASALT: Grayish green (5G 5/2), massive, slightly fractured, aphanitic. Fine-grained (speckled) pale yellowish green (5GY 6/4) epidote w/irregular greenish black (5G 2.5/1) chlorite	95%
145				70° 222" 45° 228 35°
150				48°

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Surface Elevation: 1169.83 ft.
Bottom Elevations: 954.83 ft.

Static Water Elevations n/a
and Date Measured: n/a

Surveyed by: n/a Method: n/a
Remarks: n/a

Operation Name: Charmian Northern Tract
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Depth	Thick-ness	Scale	Graphic Log	Lithologic Description: rock type, weathering, color, fossils, carbonate minerals concentrations, pyrite, etc.	Water Conditions	Overburden Analysis Logs: Munsell Color Code	OBA Sample No.	Log Interval	%Total Sulfur	Fizz Rating	NP

FEET	BOX	CODE	DESCRIPTION	RECOVERY
150	8			95%
				222"
155				224" 55°
			Depth: 160' **Thickness: 19'**	
160				Typical
	9		METABASALT: Grayish green (5G 4/2), massive, slighlty fractured, aphanitic. Fine-grained (speckled) pale yellowish green (5GY 6/4) epidote w/oval to irregular greenish black (5G 2.5/1) chlorite, trace red (7.5R 3.6) hematite. Some epidote peripheral rims on chlorite observed.	95%
165				222 228 7↑ 8↓ 30°
170				
175			**Depth: 179'** **Thickness: 19'**	
			(`178') Minor Epidote Replacement	Typical
180	10		METABASALT: Grayish green (5G 4/2), massive, slighlty fractured, aphanitic. Fine-grained (speckled) pale yellowish green (5GY 6/4) epidote w/rregular greenish black (5G 2./1) chlorite, some w/epidote peripheral rims, trace hematite (?) (~179.5-180') Min Epidote Replacement (~181.2-181.7, 182-182.3') EPIDOSITE: Maj. Epidote Replacement	100% 218" 228"
185				Typical
190			(~191') Mod. Epidote Replacement	
195			(194.5-196') EPIDOSITE: Mod. Epidote Replacement	
			Depth: 199' **Thickness: 20'**	
200				

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Static Water Elevations n/a
and Date Measured: n/a

Surveyed by: n/a Method: n/a
Remarks: n/a

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Depth	Thick-ness	Scale	Graphic Log	Lithologic Description: rock type, weathering, color, fossils, carbonate minerals concentrations, pyrite, etc.	Water Conditions	Overburden Analysis Logs: Munsell Color Code	OBA Sample No.	Log Interval	%Total Sulfur	Fizz Rating	NP

FEET	BOX	CODE	DESCRIPTION	RECOVERY
200	11		METABASALT: Grayish green (5G 5/2), massive, slightly fractured. Min-Mod. epidote replacement (~204', 213-213.5') w/irregular chlorite, some epidote peripheral rims on chlorite clasts.	100% 176" 192"
205				
210				
			Depth: 215' **Thickness: 16'**	
215			Corehole NT-13-15 completed at depht of 215 feet below collar elevation of 1155 ft amsl.	
220				
225				
230				
235				
240				
245				
250				

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DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF MINING PROGRAMS

GEOLOGIC LOG DRILL HOLES/OVERBURDEN ANALYSIS DATA

Hole No.: NT-13-16
Surface Elevation: 1080.00 ft.
Bottom Elevations: 990 ft.

Static Water Elevations n/a
and Date Measured: n/a

Surveyed by: n/a Method: n/a
Remarks: n/a

Operation Name: Charmian Northern Tract
Method of Drilling: Rock Core, NQ Wireline
Date Drilled: September-October 2013
Drilled By: Logan Drilling Group
Logged By: Don Coleman – Geologist (URS/AECOM)
Quadrangle: Iron Springs, PA

Township/County: Hamiltonban Township, Adams County
Laboratory: SGI Technical Center
7Latitude: 39° 46' 02.07" Longitude: 77° 26' 41.05"
Grid Coordinates:

Depth	Thick-ness	Scale	Graphic Log	Lithologic Description: rock type, weathering, color, fossils, carbonate minerals concentrations, pyrite, etc.	Water Conditions	Overburden Analysis Logs					
						Munsell Color Code	OBA Sample No.	Log Interval	%Total Sulfur	Fizz Rating	NP

FEET	BOX	CODE	DESCRIPTION	RECOVERY
0			OVERBURDEN (0-52')	
5				
10				
15				
20				
25				
30				
35				
40				
45				
50				

6↑
7↓

COMMONWEALTH OF PENNSYLVANIA
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GEOLOGIC LOG DRILL HOLES/OVERBURDEN ANALYSIS DATA

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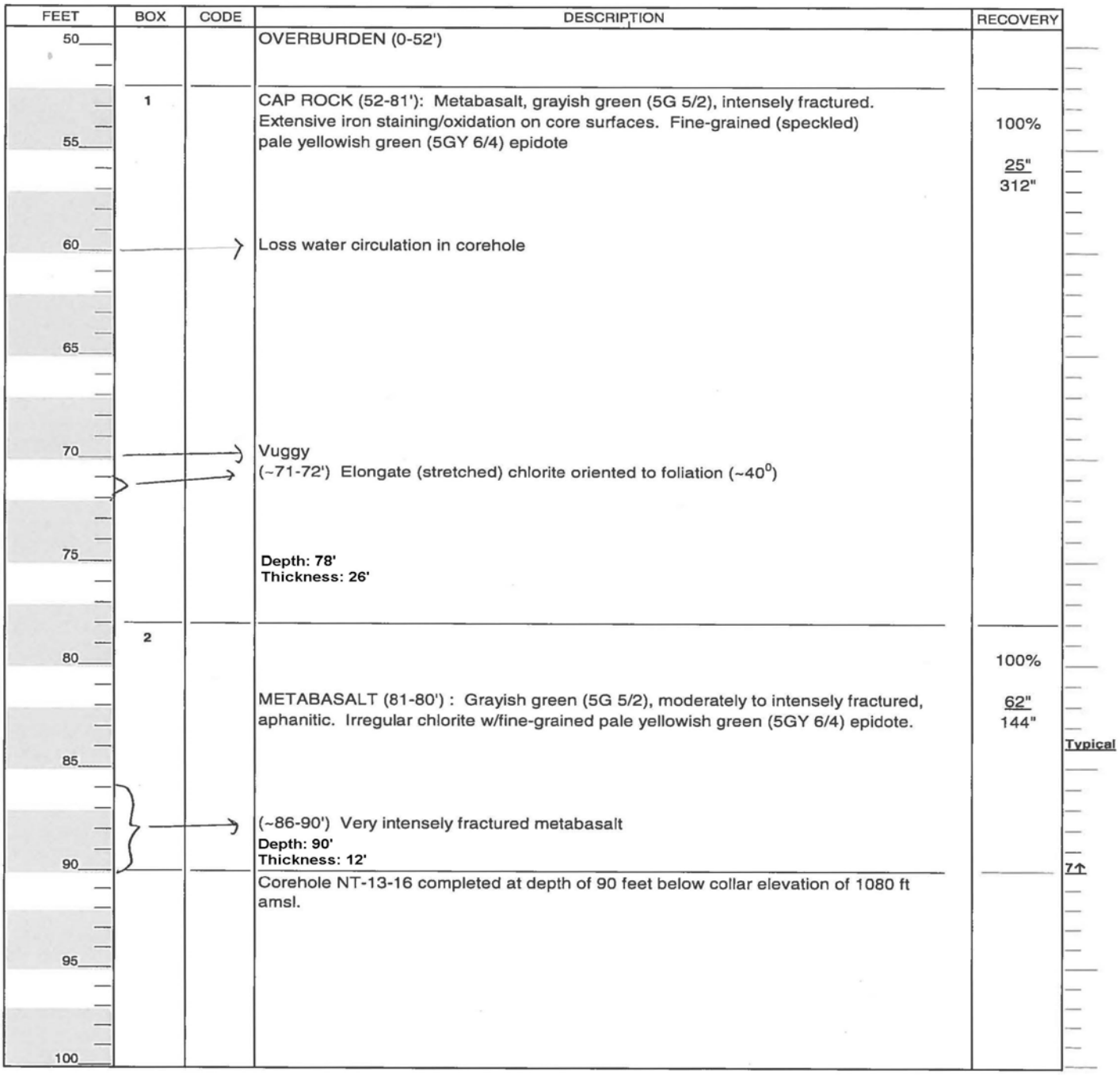
Depth	Thick-ness	Scale	Graphic Log	Lithologic Description: rock type, weathering, color, fossils, carbonate minerals concentrations, pyrite, etc.	Water Conditions	Overburden Analysis Logs: Munsell Color Code	OBA Sample No.	Log Interval	%Total Sulfur	Fizz Rating	NP



pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF MINING PROGRAMS

GEOLOGIC LOG DRILL HOLES/OVERBURDEN ANALYSIS DATA

Hole No.: NT-13-17
Surface Elevation: 1126.35 ft.
Bottom Elevations: 941.35 ft.

Static Water Elevations n/a
and Date Measured: n/a

Surveyed by: n/a Method: n/a
Remarks: n/a

Operation Name: Charmian Northern Tract
Method of Drilling: Rock Core, NQ Wireline
Date Drilled: September-October 2013
Drilled By: Logan Drilling Group
Logged By: Don Coleman – Geologist (URS/AECOM)
Quadrangle: Iron Springs, PA

Township/County: Hamiltonban Township, Adams County
Laboratory: SGI Technical Center
7Latitude: 39° 46' 04.93" Longitude: 77° 26' 16.40"
Grid Coordinates:

Depth	Thick-ness	Scale	Graphic Log	Lithologic Description: rock type, weathering, color, fossils, carbonate minerals concentrations, pyrite, etc.	Water Conditions	Overburden Analysis Logs: Munsell Color Code	OBA Sample No.	Log Interval	%Total Sulfur	Fizz Rating	NP

FEET	BOX	CODE	DESCRIPTION	RECOVERY	
0					
5					
10	1		METABASALT Grayish green (5G 4/2), massive, slightly to moderately fractured, aphanitic. Fine-grained (speckled) pale yellowish green (5GY 6/4) epidote and irregular and randomly oriented greenish black (5G 2.5/1) clorite, some w/epidote peripheral rims.	100% 216" 240"	35° 37° 40° 25°
15			(~16.4') Trace Native Cu		
20			(~19') Cavity filled w/epidote, chlorite, and trace native Cu		Typical 23° 50°
25			**Depth: 27'** **Thickness: 20'**		
30	2		METABASALT: Grayish green (5G 5/2), massive, slightly to moderately fractured, aphanitic. Fine-grained (speckled) pale yellowish green (5GY 6/4) epidote w/oval to irregular greenish black (5G 2.5/1) chlorite, some w/epidote peripheral rims.	100% 202" 240"	Typical 5↑ 6↓
35					
40			(~41.5-42') Minor Epidote Replacement		15°
45			(~43.6') Epidote-filled vein (1/8") **Depth: 46'** **Thickness: 19'**		
50	3				30°

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
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GEOLOGIC LOG DRILL HOLES/OVERBURDEN ANALYSIS DATA

Hole No.: NT-13-17
Surface Elevation: 1126.35 ft.
Bottom Elevations: 941.35 ft.

Static Water Elevations n/a
and Date Measured: n/a

Surveyed by: n/a Method: n/a
Remarks: n/a

Operation Name: Charmian Northern Tract
Method of Drilling: Rock Core, NQ Wireline
Date Drilled: September-October 2013
Drilled By: Logan Drilling Group
Logged By: Don Coleman – Geologist (URS/AECOM)
Quadrangle: Iron Springs, PA

Township/County: Hamiltonban Township, Adams County
Laboratory: SGI Technical Center
7Latitude: 39° 46' 04.93" Longitude: 77° 26' 16.40"
Grid Coordinates:

Depth	Thick-ness	Scale	Graphic Log	Lithologic Description: rock type, weathering, color, fossils, carbonate minerals concentrations, pyrite, etc.	Water Conditions	Overburden Analysis Logs: Munsell Color Code	OBA Sample No.	Log Interval	%Total Sulfur	Fizz Rating	NP

FEET	BOX	CODE	DESCRIPTION	RECOVERY
50	3		METABASALT: Grayish green (5G 5/2), massive, slightly fractured, aphanitic Fine-grained (speckled) pale yellowish green (5GY 6/4) epidote w/greenish black (5G 2.5/1) chlorite. Chlorite oval to elongate (stretched) in direction of foliation.	95% 204" 228"
55			Depth: 65' Thickness: 19'	
60			(~61-62.5') Fe-stained moderately fractured metabasalt	
65			(~63.8-64.5') Fe-stained intensely fractured metabasalt	
	4		METABASALT: Grayish green (5G 5/2), massive, slightly to intensely fractured, aphanitic . Oval, irregular, and elongate (stretched) greenish black (5G 2.5/1) chlorite oriented to foliation. Chlorite commonly contains pale yellowish green (5GY 6/4) epidote peripheral rims.	100% 202" 240"
70				
75			(~73-80') Moderately to intensely fractured metabasalt, iron stained/oxidation. Greenish black (5G 2.5/1) chlorite w/pale yellowish green (5GY 6/4) epidote. Chlorite oriented to foliation.	
80			Depth: 85' Thickness: 20'	
85			(~84-85') AMYGDALOIDAL METABASALT: Irregular and randomly oriented vesicles filled w/pale yellowish green (5GY 6/4) epidote	
	5		AMYGDALOIDAL METABASALT: Grayish green (5G 4/2), slightly to moderately fractured, aphanitic. Oval to irregular vesicles filled w/pale yellow (5Y 8/3) epidote, oval, irregular, and elongate (stretched) greenish black (5G 2.5/1) chlorite; Chlorite oriented to foliation.	95% 212" 228"
90				
95				
100				

300 Typical

420 Typical

6↑ 7↓

Typical 35°

COMMONWEALTH OF PENNSYLVANIA
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GEOLOGIC LOG DRILL HOLES/OVERBURDEN ANALYSIS DATA

Hole No.: NT-13-17
Surface Elevation: 1126.35 ft.
Bottom Elevations: 941.35 ft.

Static Water Elevations n/a
and Date Measured: n/a

Surveyed by: n/a Method: n/a
Remarks: n/a

Operation Name: Charmian Northern Tract
Method of Drilling: Rock Core, NQ Wireline
Date Drilled: September-October 2013
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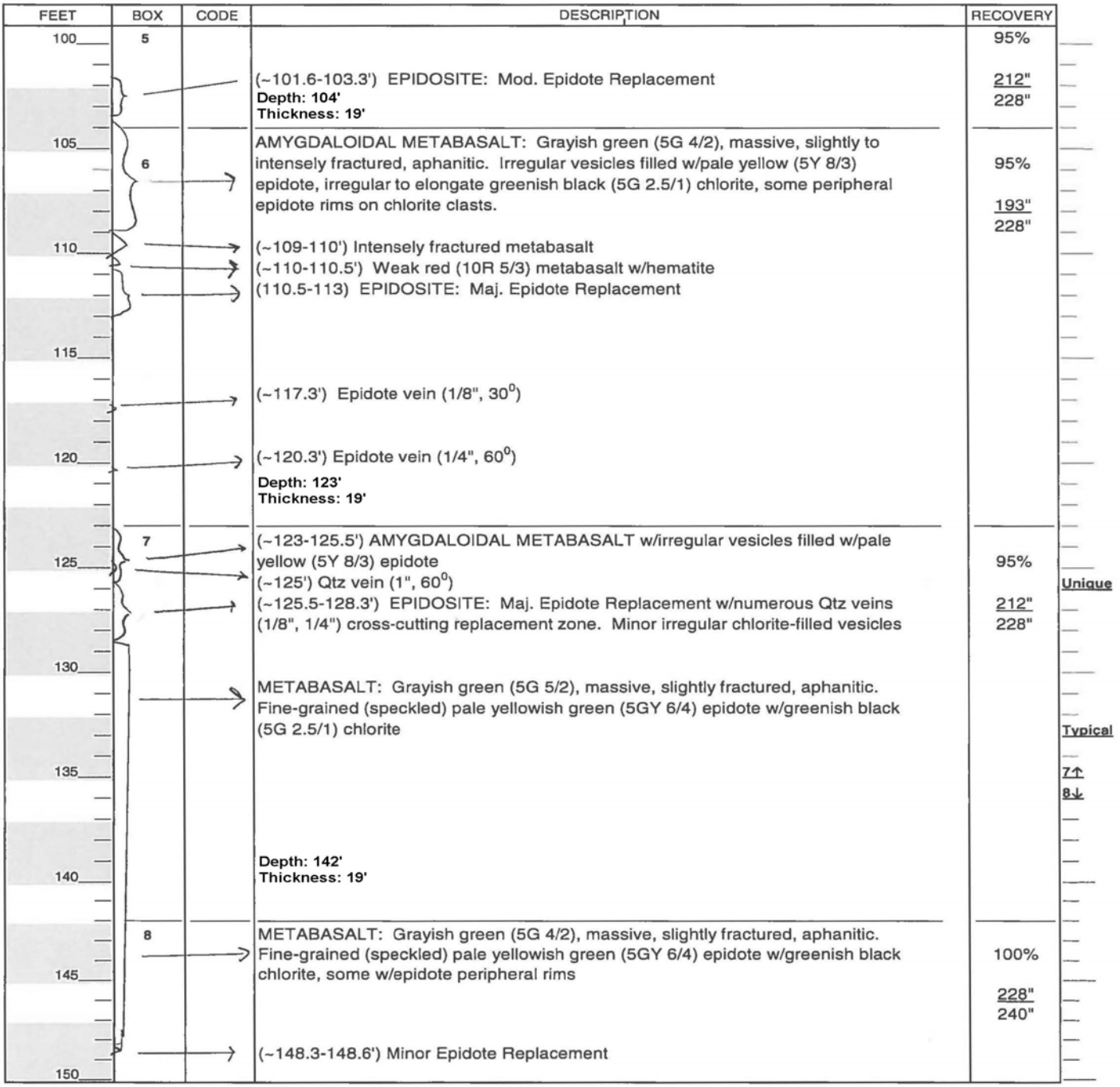
Depth	Thick-ness	Scale	Graphic Log	Lithologic Description: rock type, weathering, color, fossils, carbonate minerals concentrations, pyrite, etc.	Water Conditions	Overburden Analysis Logs: Munsell Color Code	OBA Sample No.	Log Interval	%Total Sulfur	Fizz Rating	NP



COMMONWEALTH OF PENNSYLVANIA
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GEOLOGIC LOG DRILL HOLES/OVERBURDEN ANALYSIS DATA

Hole No.: NT-13-17
Surface Elevation: 1126.35 ft.
Bottom Elevations: 941.35 ft.

Static Water Elevations n/a
and Date Measured: n/a

Surveyed by: n/a Method: n/a
Remarks: n/a

Operation Name: Charmian Northern Tract
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Date Drilled: September-October 2013
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Quadrangle: Iron Springs, PA

Township/County: Hamiltonban Township, Adams County
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7Latitude: 39° 46' 04.93" Longitude: 77° 26' 16.40"
Grid Coordinates:

Depth	Thick-ness	Scale	Graphic Log	Lithologic Description: rock type, weathering, color, fossils, carbonate minerals concentrations, pyrite, etc.	Water Conditions	Overburden Analysis Logs: Munsell Color Code	OBA Sample No.	Log Interval	%Total Sulfur	Fizz Rating	NP

FEET	BOX	CODE	DESCRIPTION	RECOVERY
150	8			100% Typical
				228"
				240"
155				
160			**Depth: 162'** **Thickness: 20'**	
	9		METABASALT: Grayish green (5G 5/2), massive, slightly fractured, aphanitic.	
			Fine-grained (speckled) pale yellowish green (5GY 6/4) epidote.	95%
165				215"
			(~167-174') AMYGDALOIDAL METABASALT; Irregular to oval vesicles filled w/pale	228"
			yellow (5Y 8.4) epidote and greenish black (5G 2.5/1) chlorite	
			(~168.5') Min. Epidote Replacement	
170				
175				
			(~174-179') Metabasalt, dark greenish gray (5G 4/1)	
			(~179.5-179.8') Amygdaloidal metabasalt w/epidote-filled vesicles	
180			**Depth: 181'** **Thickness: 19'**	
	10		METABASALT: Grayish green (5G 5/2), massive, slightly fractured, aphanitic.	100%
			Fine-grained (speckled) pale yellowish green (5GY 6/4) epidote w/greenish black.	48"
			(5G 2.5/1) chlorite. (184-184.5') Amygdaloidal w/epidote filled vesicles.	48"
185				8↑
			Corehole NT-13-17 completed at depth of 185 feet below collar elevation of 1125 ft aml.	
			Depth: 185' **Thickness: 4'**	
190				
195				
200				

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Fax: 717-635-7902

WELL NUMBER MW-8D

CLIENT Specialty Granules, Inc.
PROJECT NAME Bruce Skubon
PROJECT NUMBER 20498193
PROJECT LOCATION Blue Ridge Summit, PA
DATE STARTED 11/07/13 **COMPLETED** 11/12/13
GROUND ELEVATION 1068.27 ft **HOLE SIZE** 6 inches
DRILLING CONTRACTOR Eichelbergers Inc.
GROUND WATER LEVELS:
DRILLING METHOD Air Rotary
AT TIME OF DRILLING ---
LOGGED BY Bruce Skubon **CHECKED BY** Don Coleman
AT END OF DRILLING ---
NOTES Northern Tract
AFTER DRILLING ---

DEPTH (ft)	SAMPLE TYPE NUMBER	DRILL TIMES	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION		WELL DIAGRAM
0							Casing Top Elev: 1070.26 (ft) Casing Type: Steel
			CL		LEAN CLAY WITH SAND, GRAVEL, (CL) brown (10YR 5/3), moist, little fine to coarse sand, little fine to coarse gravel, gravel is weathered metabasalt		
						8.0 / 1060.3	
10			ML		SILT WITH SAND, GRAVEL, (ML) yellowish brown (10YR 5/4), moist, little clay, little fine to coarse sand, little fine to coarse gravel, gravel is weathered metabasalt, increasing gravel content with depth		6" Steel Casing
						18.0 / 1050.3	
20			ML		SILT WITH GRAVEL, SILT, (ML) yellowish brown (10YR 5/4), moist, some fine to coarse gravel, little fine to coarse sand, gravel is weathered metabasalt		10" Borehole Backfilled with Cement / 5% Bentonite Grout
						23.0 / 1045.3	
30					METABASALT, highly weathered, dark brownish gray, dry, [Catoctin Formation]	30.0 / 1038.3	
40					METABASALT, unweathered, dark gray, [Catoctin Formation]	40.0 / 1028.3	6" Open Borehole
					METABASALT, unweathered, dark gray, major epidote, [Catoctin Formation]	42.0 / 1026.3	
					METABASALT, moderately weathered, dark gray and brown, [Catoctin Formation]	43.0 / 1025.3	
		38-50': 9:39			METABASALT, unweathered, dark gray, [Catoctin Formation]	45.0 / 1023.3	
					METABASALT, moderately weathered, dark gray and brown, [Catoctin Formation]	46.0 / 1022.3	
50					METABASALT, unweathered, dark gray, major epidote, [Catoctin Formation]		

(Continued Next Page)

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WELL NUMBER MW-8D

CLIENT Specialty Granules, Inc. **PROJECT NAME** Bruce Skubon

PROJECT NUMBER 20498193 **PROJECT LOCATION** Blue Ridge Summit, PA

DEPTH (ft)	SAMPLE TYPE NUMBER	DRILL TIMES	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
50					METABASALT, unweathered, dark gray, major epidote, [Catoctin Formation] *(continued)*	
		50-62': 9:55				
60						
		62-74': 9:47			68.0 1000.3	
					METABASALT, unweathered, dark gray and brown, moderate epidote, [Catoctin Formation]	
70					70.0 998.3	
					METABASALT, unweathered, dark gray, moderate to major epidote, [Catoctin Formation]	
		74-84': 9:11				6" Open Borehole
80						
90		84-94': 9:03				
100		94-104': 10:26				

GENERAL BH / TP / WELL - GINT STD US LAB.GDT - 04/02/14 21:00 - C:\DOCUMENTS AND SETTINGS\BRUCE_SKUBON\DESKTOP\BORING LOGS\MW_LOGS2013.GPJ

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WELL NUMBER MW-8D

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PROJECT NUMBER 20498193 **PROJECT LOCATION** Blue Ridge Summit, PA

DEPTH (ft)	SAMPLE TYPE NUMBER	DRILL TIMES	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
110		104-114': 9:06			METABASALT, unweathered, dark gray, moderate to major epidote, [Catoctin Formation] *(continued)*	
120		114-124': 7:55				
130		124-134': 8:11			127.0 941.3 METABASALT, unweathered, very dark reddish purple and dark gray, [Catoctin Formation] 129.0 939.3 METABASALT, unweathered, dark gray and dark reddish gray, moderate epidote, [Catoctin Formation] 134.0 934.3	
140		134-144': 11:55			METABASALT, unweathered, dark gray, moderate epidote, [Catoctin Formation]	6" Open Borehole
150		144-154': 11:37			150.0 918.3 METABASALT, unweathered, dark greenish gray, trace epidote, [Catoctin Formation]	
160		154-164': 9:59				

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WELL NUMBER MW-8D

CLIENT Specialty Granules, Inc. **PROJECT NAME** Bruce Skubon

PROJECT NUMBER 20498193 **PROJECT LOCATION** Blue Ridge Summit, PA

DEPTH (ft)	SAMPLE TYPE NUMBER	DRILL TIMES	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
170		164-174': 10:50			METABASALT, unweathered, dark greenish gray, trace epidote, [Catoctin Formation] *(continued)*	
180		174-184': 9:51				
190		184-194': 11:58				6" Open Borehole
200		194-204': 13:47				
210		204-214': 10:46			210.0 858.3 METABASALT, unweathered, dark greenish gray, [Catoctin Formation]	
220		214-224': 10:50				

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WELL NUMBER MW-8D

CLIENT Specialty Granules, Inc. **PROJECT NAME** Bruce Skubon

PROJECT NUMBER 20498193 **PROJECT LOCATION** Blue Ridge Summit, PA

DEPTH (ft)	SAMPLE TYPE NUMBER	DRILL TIMES	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
230		224-234': 10:18			METABASALT, unweathered, dark greenish gray, [Catoctin Formation] *(continued)*	
240		234-244': 10:14				
250		244-254': 10:36			250.0 818.3 METABASALT, unweathered, dark greenish gray, moderate to major epidote, [Catoctin Formation]	6" Open Borehole
260		254-264': 9:12				
270		264-274': 9:39				

(Continued Next Page)

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CLIENT Specialty Granules, Inc. **PROJECT NAME** Bruce Skubon

PROJECT NUMBER 20498193 **PROJECT LOCATION** Blue Ridge Summit, PA

DEPTH (ft)	SAMPLE TYPE NUMBER	DRILL TIMES	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
280		274-284': 8:28			METABASALT, unweathered, dark greenish gray, moderate to major epidote, [Catoctin Formation] *(continued)*	
290		284-294': 8:15			290.0 778.3 METABASALT, unweathered, dark greenish gray, major epidote, trace quartz, [Catoctin Formation]	
300		294-304': 9:47			300.0 768.3 METABASALT, unweathered, dark gray, moderate epidote, [Catoctin Formation]	
310		304-314': 8:40			310.0 758.3 METABASALT, unweathered, dark gray, major epidote, trace copper, [Catoctin Formation]	6" Open Borehole
320		314-324': 9:35			313.0 755.3 METABASALT, unweathered, dark gray, moderate to major epidote, [Catoctin Formation]	
330		324-334': 10:06				

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WELL NUMBER MW-8D

CLIENT Specialty Granules, Inc. **PROJECT NAME** Bruce Skubon

PROJECT NUMBER 20498193 **PROJECT LOCATION** Blue Ridge Summit, PA

DEPTH (ft)	SAMPLE TYPE NUMBER	DRILL TIMES	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
340		334-344': 9:53			METABASALT, unweathered, dark gray, moderate to major epidote, [Catoctin Formation] *(continued)*	
350		344-354': 10:05				6" Open Borehole
360		354-364': 10:20				
370		364-374': 9:45				
					374.0	694.3

Bottom of borehole at 374.0 feet.

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WELL NUMBER MW-8S

CLIENT Specialty Granules, Inc.
PROJECT NAME Bruce Skubon
PROJECT NUMBER 20498193
PROJECT LOCATION Blue Ridge Summit, PA
DATE STARTED 11/08/13 **COMPLETED** 11/08/13
GROUND ELEVATION 1069.84 ft **HOLE SIZE** 6 inches
DRILLING CONTRACTOR Eichelbergers Inc.
GROUND WATER LEVELS:
DRILLING METHOD Air Rotary
AT TIME OF DRILLING ---
LOGGED BY Bruce Skubon **CHECKED BY** Don Coleman
AT END OF DRILLING ---
NOTES Northern Tract
AFTER DRILLING ---

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
0					Casing Top Elev: 1073.33 (ft) Casing Type: PVC
		CL		LEAN CLAY WITH SAND, GRAVEL, (CL) brown, moist, little fine to coarse sand, little fine to coarse gravel, gravel is weathered metabasalt	Cement / 5% Bentonite Grout
					Bentonite Seal
10					2" PVC Sch. 40 Riser Pipe
				14.0 1055.8	
		ML		SILT WITH SAND, GRAVEL, (ML) yellowish brown (10YR 5/4), moist, little fine to coarse sand, little fine to coarse gravel, gravel is weathered metabasalt	2" 10-Slot PVC Sch. 40 Well Screen
20					
				27.0 1042.8	Fil-pro #1 Sand
				METABASALT, highly weathered, brown and gray, dry, [Catoctin Formation]	
30				30.0 1039.8	

Bottom of borehole at 30.0 feet.

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WELL NUMBER MW-9D

CLIENT Specialty Granules, Inc.
PROJECT NAME Bruce Skubon
PROJECT NUMBER 20498193
PROJECT LOCATION Blue Ridge Summit, PA
DATE STARTED 11/01/13 **COMPLETED** 11/06/13
GROUND ELEVATION 1018.2 ft **HOLE SIZE** 6 inches
DRILLING CONTRACTOR Eichelbergers Inc.
GROUND WATER LEVELS:
DRILLING METHOD Air Rotary
AT TIME OF DRILLING ---
LOGGED BY Bruce Skubon **CHECKED BY** Don Coleman
AT END OF DRILLING ---
NOTES Northern Tract
48hrs AFTER DRILLING 79.45 ft / Elev 938.75 ft (11/8/13)

DEPTH (ft)	SAMPLE TYPE NUMBER	DRILL TIMES	GRAPHIC LOG	MATERIAL DESCRIPTION		WELL DIAGRAM
0						Casing Top Elev: 1019.95 (ft) Casing Type: Steel
				SANDY SILT WITH GRAVEL, yellowish brown (10YR 5/6), moist, little fine to coarse gravel		
				4.0	1014.2	
				SILTY SAND WITH GRAVEL, grayish red (5R 4/2), dry, little fine to medium gravel		
				6.0	1012.2	
				SILT, light red (5R 6/2), moist		
10				10.0	1008.2	6" Steel Casing
				SILTY SAND WITH GRAVEL, grayish red (5R 4/2), dry, some fine to medium gravel, very weathered metarhyolite		
				17.0	1001.2	
				SILT, purpleish red, dry		
20						
						10" Borehole Backfilled with Cement / 5% Bentonite Grout
30						
40				40.0	978.2	6" Steel Casing
				METARHYOLITE, highly weathered, light purple, [Catoctin Formation]		
				45.0	973.2	
				METARHYOLITE, unweathered, light pink, [Catoctin Formation]		
50						

(Continued Next Page)

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WELL NUMBER MW-9D

CLIENT Specialty Granules, Inc. **PROJECT NAME** Bruce Skubon

PROJECT NUMBER 20498193 **PROJECT LOCATION** Blue Ridge Summit, PA

DEPTH (ft)	SAMPLE TYPE NUMBER	DRILL TIMES	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
50				METARHYOLITE, unweathered, light pink, [Catoctin Formation] *(continued)*	
		50-62': 6:58			
60				60.0 958.2	
				PHYLLITE, unweathered, fissile, light gray and light pink, [Catoctin Formation] platy	
				63.0 955.2	
				PHYLLITE, unweathered, fissile, light gray, [Catoctin Formation] some light pink, platy	
		62-74': 5:04			
70					
80		74-84': 4:35		80.0 938.2	6" Open Borehole
				PHYLLITE, unweathered, fissile, light gray and light pink, [Catoctin Formation] platy	
				88.0 930.2	
90		84-94': 4:59		PHYLLITE, slightly weathered, fissile, light gray, [Catoctin Formation] some dark brown, platy, softer zone	
				93.0 925.2	
				PHYLLITE, unweathered, fissile, gray, [Catoctin Formation]	
100		94-104': 6:19			

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WELL NUMBER MW-9D

CLIENT Specialty Granules, Inc. **PROJECT NAME** Bruce Skubon

PROJECT NUMBER 20498193 **PROJECT LOCATION** Blue Ridge Summit, PA

DEPTH (ft)	SAMPLE TYPE NUMBER	DRILL TIMES	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
110		104-114': 5:12		PHYLLITE, unweathered, fissile, gray, [Catoctin Formation] *(continued)* 110.0 908.2 PHYLLITE, slightly weathered, fissile, gray, [Catoctin Formation] some dark brown, softer zone 116.0 902.2 PHYLLITE, unweathered, fissile, gray, [Catoctin Formation] trace light pink	
120		114-124': 5:24		126.0 892.2 PHYLLITE, slightly weathered, fissile, gray, [Catoctin Formation] some dark brown, softer zone	
130		124-134': 5:19		132.0 886.2 PHYLLITE, unweathered, fissile, gray, [Catoctin Formation]	
140		134-144': 5:47			6" Open Borehole
150		144-154': 5:09		150.0 868.2 PHYLLITE, slightly weathered, fissile, gray, [Catoctin Formation] some dark brown, softer zone 155.0 863.2 PHYLLITE, unweathered, fissile, gray, [Catoctin Formation]	
160		154-164': 6:22		160.0 858.2 METABASALT, unweathered, dark gray, [Catoctin Formation] platy, harder zone	

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WELL NUMBER MW-9D

CLIENT Specialty Granules, Inc. **PROJECT NAME** Bruce Skubon

PROJECT NUMBER 20498193 **PROJECT LOCATION** Blue Ridge Summit, PA

DEPTH (ft)	SAMPLE TYPE NUMBER	DRILL TIMES	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
				165.0 853.2 PHYLLITE, unweathered, fissile, light gray and light pink, [Catoctin Formation]	
170		164-174': 5:21			
180		174-184': 4:44		182.0 836.2 PHYLLITE, unweathered, fissile, light gray and gray, [Catoctin Formation] some light pink	
				187.0 831.2 PHYLLITE, unweathered, fissile, light greenish gray and very light gray, [Catoctin Formation]	
190		184-194': 6:10			6" Open Borehole
200		194-204': 5:24		200.0 818.2 METABASALT, unweathered, light greenish gray and dark reddish gray, [Catoctin Formation]	
				208.0 810.2 METABASALT, unweathered, light greenish gray and dark gray, [Catoctin Formation]	
210		204-214': 5:24		212.0 806.2 PHYLLITE, unweathered, fissile, light greenish gray, [Catoctin Formation] softer zone	
				215.0 803.2 METABASALT, unweathered, light greenish gray and dark reddish gray, [Catoctin Formation]	
220		214-224': 5:03			

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WELL NUMBER MW-9D

CLIENT Specialty Granules, Inc. **PROJECT NAME** Bruce Skubon

PROJECT NUMBER 20498193 **PROJECT LOCATION** Blue Ridge Summit, PA

DEPTH (ft)	SAMPLE TYPE NUMBER	DRILL TIMES	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
				METABASALT, unweathered, light greenish gray and dark reddish gray, [Catoctin Formation] *(continued)*	
				228.0 790.2	
230		224-234': 4:12		METABASALT, unweathered, greenish gray, [Catoctin Formation] increasing hardness	
				237.0 781.2	
				METABASALT, unweathered, gray and dark gray, [Catoctin Formation]	
240		234-244': 4:49			
				245.0 773.2	
				METABASALT, unweathered, dark gray, [Catoctin Formation]	
250		244-254': 6:02			6" Open Borehole
260		254-264': 7:24		260.0 758.2	
				METABASALT, unweathered, dark gray, minor to moderate quartz, [Catoctin Formation]	
270		264-274': 7:40			

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WELL NUMBER MW-9D

CLIENT Specialty Granules, Inc. **PROJECT NAME** Bruce Skubon

PROJECT NUMBER 20498193 **PROJECT LOCATION** Blue Ridge Summit, PA

DEPTH (ft)	SAMPLE TYPE NUMBER	DRILL TIMES	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
280		274-284': 10:30		METABASALT, unweathered, dark gray, minor to moderate quartz, [Catoctin Formation] *(continued)*	
				281.0 737.2	
				METABASALT, unweathered, dark gray, moderate to major epidote, [Catoctin Formation]	
290		284-294': 13:25			
300		294-304': 12:12			
310		304-314': 10:52			6" Open Borehole
320		314-324': 15:25			
				325.0 693.2	

Bottom of borehole at 325.0 feet.

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WELL NUMBER MW-9S

CLIENT Specialty Granules, Inc.
PROJECT NAME Bruce Skubon
PROJECT NUMBER 20498193
PROJECT LOCATION Blue Ridge Summit, PA
DATE STARTED 11/06/13 **COMPLETED** 11/06/13
GROUND ELEVATION 1018.41 ft **HOLE SIZE** 6 inches
DRILLING CONTRACTOR Eichelbergers Inc.
GROUND WATER LEVELS:
DRILLING METHOD Air Rotary
AT TIME OF DRILLING ---
LOGGED BY Bruce Skubon **CHECKED BY** Don Coleman
AT END OF DRILLING ---
NOTES Northern Tract
48hrs AFTER DRILLING 44.25 ft / Elev 974.16 ft (11/8/13)

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
0		ML		SANDY SILT WITH GRAVEL, (ML) yellowish brown (10YR 5/6), moist, little fine to coarse gravel	Casing Top Elev: 1020.39 (ft) Casing Type: PVC
4.0				1014.4	
		SM		SILTY SAND WITH GRAVEL, (SM) grayish red (5R 4/2), dry, little fine to medium gravel	
7.0				1011.4	
		ML		SILT, (ML) light red (5R 6/2), moist	Cement / 5% Bentonite Grout
10					
13.0				1005.4	2" PVC Sch. 40 Riser Pipe
		ML		SANDY SILT WITH GRAVEL, (ML) grayish red (5R 4/2), dry, some fine to medium gravel, very weathered metarhyolite	
16.0				1002.4	
		ML		SILT, (ML) purpleish red, dry	Bentonite Seal
20					
30					Fil-pro #1 Sand
					2" 10-Slot PVC Sch. 40 Well Screen
40					
41.0				977.4	
				METARHYOLITE, highly weathered, light purple, dry, [Catoctin Formation]	
45.0				973.4	

Bottom of borehole at 45.0 feet.

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WELL NUMBER MW-10D

CLIENT Specialty Granules, Inc.
PROJECT NAME Bruce Skubon
PROJECT NUMBER 20498193
PROJECT LOCATION Blue Ridge Summit, PA
DATE STARTED 10/30/13 **COMPLETED** 11/01/13
GROUND ELEVATION 1006.93 ft **HOLE SIZE** 6 inches
DRILLING CONTRACTOR Eichelbergers Inc.
GROUND WATER LEVELS:
DRILLING METHOD Air Rotary
AT TIME OF DRILLING ---
LOGGED BY Bruce Skubon **CHECKED BY** Don Coleman
AT END OF DRILLING ---
NOTES Northern Tract
72hrs AFTER DRILLING 74.93 ft / Elev 932.00 ft (11/4/13)

DEPTH (ft)	SAMPLE TYPE NUMBER	DRILL TIMES	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION		WELL DIAGRAM
0							Casing Top Elev: 1008.37 (ft) Casing Type: Steel
			ML		SILT WITH GRAVEL, (ML) yellowish brown (10YR 5/4), dry, some fine to coarse gravel, gravel is weathered metarhyolite		6" Steel Casing
						999.9	
					7.0		
					METARHYOLITE, highly weathered, grayish purple, [Catoctin Formation]		10" Borehole Backfilled with Cement / 5% Bentonite Grout
						997.9	
					9.0		
10					METARHYOLITE, unweathered, dark purple, [Catoctin Formation]		
20		14-26': 6:07					
						978.9	
					28.0		
					METARHYOLITE, moderately weathered, dark purple with dark brown, [Catoctin Formation] no water		6" Open Borehole
30						975.9	
					31.0		
		16-38': 5:01			METARHYOLITE, unweathered, dark purple, [Catoctin Formation] hard zone		
40							
		38-50': 5:37					
50					50.0	956.9	

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WELL NUMBER MW-10D

CLIENT Specialty Granules, Inc. **PROJECT NAME** Bruce Skubon

PROJECT NUMBER 20498193 **PROJECT LOCATION** Blue Ridge Summit, PA

DEPTH (ft)	SAMPLE TYPE NUMBER	DRILL TIMES	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
50					METARHYOLITE, unweathered, very dark purple, [Catoctin Formation] water bearing fracture at 82' bgs	
		50-62': 5:21				
60						
		62-74': 5:36				
70						
		74-84': 6:15				6" Open Borehole
80						
					88.0 / 918.9	
		84-94': 4:40			METARHYOLITE, slightly weathered, very thinly foliated, light pink and light brownish gray, [Catoctin Formation] soft zone, large rock fragments	
90						
					94.0 / 912.9	
					METARHYOLITE, unweathered, very dark purple, [Catoctin Formation] hard zone	
		94-104': 4:35				
100						

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WELL NUMBER MW-10D

CLIENT Specialty Granules, Inc. **PROJECT NAME** Bruce Skubon

PROJECT NUMBER 20498193 **PROJECT LOCATION** Blue Ridge Summit, PA

DEPTH (ft)	SAMPLE TYPE NUMBER	DRILL TIMES	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
110		104-114': 4:56			METARHYOLITE, unweathered, very dark purple, [Catoctin Formation] hard zone *(continued)*	
					116.0 890.9	
					METARHYOLITE, unweathered, very dark grayish purple, [Catoctin Formation] soft zone	
120		114-124': 3:21			120.0 886.9	
					METARHYOLITE, unweathered, very dark purple, [Catoctin Formation] hard zone	
130		124-134': 7:35				
					138.0 868.9	
140		134-144': 5:03			METARHYOLITE, unweathered, dark purple and very dark purple, [Catoctin Formation] hard zone	6" Open Borehole
					148.0 858.9	
150		144-154': 5:07			METARHYOLITE, unweathered, dark purpleish red, [Catoctin Formation] hard zone	
160		154-164': 4:55			160.0 846.9	
					METARHYOLITE, unweathered, very dark purple and dark purpleish red, [Catoctin Formation]	
					162.0 844.9	
					METARHYOLITE/PHYLLITE, unweathered, fissile, light gray and dark purpleish red, [Catoctin Formation] very soft zone	

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WELL NUMBER MW-10D

CLIENT Specialty Granules, Inc. **PROJECT NAME** Bruce Skubon

PROJECT NUMBER 20498193 **PROJECT LOCATION** Blue Ridge Summit, PA

DEPTH (ft)	SAMPLE TYPE NUMBER	DRILL TIMES	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION		WELL DIAGRAM
					METARHYOLITE/PHYLLITE, unweathered, fissile, light gray and dark purpleish red, [Catoctin Formation] very soft zone *(continued)*		
170		164-174': 3:51					
180		174-184': 4:17			180.0	826.9	
					PHYLLITE, unweathered, fissile, light gray and gray, [Catoctin Formation]		
					182.0	824.9	
					PHYLLITE, unweathered, fissile, light greenish gray, moderate calcite, [Catoctin Formation] soft zone		
					189.0	817.9	
190		184-194': 4:39			METARHYOLITE/PHYLLITE, unweathered, fissile, light gray and dark purpleish red, [Catoctin Formation] soft zone		6" Open Borehole
					197.0	809.9	
					METABASALT, unweathered, dark gray, [Catoctin Formation] platy		
					199.0	807.9	
200		194-204': 6:13			200.0 METABASALT, unweathered, white, quartz vein, [Catoctin Formation]	806.9	
					METABASALT, unweathered, dark gray and very dark reddish gray, [Catoctin Formation] platy, hard zone		
					206.0	800.9	
					METABASALT, unweathered, dark gray, moderate quartz, [Catoctin Formation] hard zone, lost circulation at 213' bgs		
210		204-214': 5:48					
					214.0	792.9	
					PHYLLITE, unweathered, fissile, light gray, [Catoctin Formation] soft zone, water recovery at 214' bgs		
220		214-224': 5:49					

GENERAL BH / TP / WELL - GINT STD US LAB.GDT - 04/02/14 21:00 - C:\DOCUMENTS AND SETTINGS\BRUCE_SKUBON\DESKTOP\BORING LOGS\MW_LOGS2013.GPJ

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WELL NUMBER MW-10D

CLIENT Specialty Granules, Inc. **PROJECT NAME** Bruce Skubon

PROJECT NUMBER 20498193 **PROJECT LOCATION** Blue Ridge Summit, PA

DEPTH (ft)	SAMPLE TYPE NUMBER	DRILL TIMES	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
230		224-234': 5:41			PHYLLITE, unweathered, fissile, light gray, [Catoctin Formation] soft zone, water recovery at 214' bgs *(continued)*	
					238.0 768.9	
240		234-244': 5:00			PHYLLITE, unweathered, fissile, light gray and gray, [Catoctin Formation] very soft zone, chalky water return	
250		244-254': 4:04				6" Open Borehole
					256.0 750.9	
260		254-264': 4:35			PHYLLITE, unweathered, fissile, gray, [Catoctin Formation] very soft zone	
					268.0 738.9	
270		264-274': 5:52			METABASALT, unweathered, dark gray, [Catoctin Formation] platy, hard zone	
					276.0 730.9	
					METABASALT, unweathered, dark greenish gray, [Catoctin Formation] platy, alternating hard/soft zones	

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WELL NUMBER MW-10D

CLIENT Specialty Granules, Inc. **PROJECT NAME** Bruce Skubon

PROJECT NUMBER 20498193 **PROJECT LOCATION** Blue Ridge Summit, PA

DEPTH (ft)	SAMPLE TYPE NUMBER	DRILL TIMES	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
280		274-284': 7:13			METABASALT, unweathered, dark greenish gray, [Catoctin Formation] platy, alternating hard/soft zones *(continued)*	
290		284-294': 7:11				
300		294-304': 6:51				
310		304-314': 6:30				6" Open Borehole
					314.0 692.9	

Bottom of borehole at 314.5 feet.

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WELL NUMBER MW-11D

CLIENT Specialty Granules, Inc.
PROJECT NAME Bruce Skubon
PROJECT NUMBER 20498193
PROJECT LOCATION Blue Ridge Summit, PA
DATE STARTED 10/21/13 **COMPLETED** 10/24/13
GROUND ELEVATION 1046.29 ft **HOLE SIZE** 6 inches
DRILLING CONTRACTOR Eichelbergers Inc.
GROUND WATER LEVELS:
DRILLING METHOD Air Rotary
AT TIME OF DRILLING ---
LOGGED BY Bruce Skubon **CHECKED BY** Don Coleman
AT END OF DRILLING ---
NOTES Northern Tract
24hrs AFTER DRILLING --- > 300 ft (10/25/13)

DEPTH (ft)	SAMPLE TYPE NUMBER	DRILL TIMES	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
0						Casing Top Elev: 1047.16 (ft) Casing Type: Steel
			CL		LEAN CLAY WITH GRAVEL, (CL) yellowish brown (10YR 5/4), moist, some cobbles, gravel and cobbles are weathered metabasalt	6" Steel Casing
3.0					1043.3	
					METABASALT, highly weathered, brown, dry, [Catoctin Formation]	
7.0					1039.3	10" Borehole Backfilled with Cement / 5% Bentonite Grout
					METABASALT, unweathered, dark greenish gray, [Catoctin Formation]	
10						
20		15-27': 8:29				
30		27-39': 8:18				6" Open Borehole
40						
40.0					1006.3	
					METABASALT, unweathered, dark greenish gray, moderate epidote and quartz, [Catoctin Formation]	
		39-51': 9:47				
50						
50.0					996.3	

GENERAL BH / TP / WELL - GINT STD US LAB.GDT - 04/02/14 21:00 - C:\DOCUMENTS AND SETTINGS\BRUCE_SKUBON\DESKTOP\BORING LOGS\MW_LOGS2013.GPJ

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WELL NUMBER MW-11D

CLIENT Specialty Granules, Inc. **PROJECT NAME** Bruce Skubon

PROJECT NUMBER 20498193 **PROJECT LOCATION** Blue Ridge Summit, PA

DEPTH (ft)	SAMPLE TYPE NUMBER	DRILL TIMES	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION		WELL DIAGRAM
50					METABASALT, unweathered, dark greenish gray, moderate epidote, [Catoctin Formation]		
		51-63': 8:32					
60					60.0	986.3	
					METABASALT, unweathered, dark greenish gray, minor epidote and quartz, [Catoctin Formation]		
		63-75': 7:30					
70					70.0	976.3	
					METABASALT, unweathered, dark greenish gray, trace epidote and quartz, [Catoctin Formation]		
80		75-85': 7:15			80.0	966.3	6" Open Borehole
					METABASALT, unweathered, dark greenish gray, [Catoctin Formation]		
90		85-95': 7:17			90.0	956.3	
					METABASALT, unweathered, dark greenish gray, moderate epidote, [Catoctin Formation]		
100		95-105': 9:13			100.0	946.3	
					METABASALT, unweathered, dark greenish gray, major epidote, [Catoctin Formation]		

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WELL NUMBER MW-11D

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DEPTH (ft)	SAMPLE TYPE NUMBER	DRILL TIMES	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
110		105-115': 7:04			METABASALT, unweathered, dark greenish gray, major epidote, [Catoctin Formation] *(continued)*	
					112.0 934.3	
					METABASALT, unweathered, dark greenish gray, moderate epidote, [Catoctin Formation]	
120		115-125': 8:57			120.0 926.3	
					METABASALT, unweathered, dark greenish gray, major epidote, [Catoctin Formation]	
130		125-135': 8:03				
140		135-145': 7:58				6" Open Borehole
150		145-155': 9:19			150.0 896.3	
					METABASALT, unweathered, dark greenish gray, minor epidote, moderate hematite, [Catoctin Formation]	
160		155-165': 9:24			160.0 886.3	
					METABASALT, unweathered, dark greenish gray, moderate epidote, quartz and hematite, [Catoctin Formation]	

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CLIENT Specialty Granules, Inc. **PROJECT NAME** Bruce Skubon

PROJECT NUMBER 20498193 **PROJECT LOCATION** Blue Ridge Summit, PA

DEPTH (ft)	SAMPLE TYPE NUMBER	DRILL TIMES	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
170		165-175': 8:21			METABASALT, unweathered, dark greenish gray, moderate epidote, quartz and hematite, [Catoctin Formation] *(continued)*	
					170.0 876.3 METABASALT, unweathered, dark greenish gray, trace to minor epidote and quartz, [Catoctin Formation]	
180		175-185': 8:29			180.0 866.3 METABASALT, unweathered, dark greenish gray, [Catoctin Formation]	
					183.0 863.3 METABASALT, unweathered, dark greenish gray, major quartz and hematite, [Catoctin Formation]	
190		185-195': 12:21			190.0 856.3 METABASALT, unweathered, dark greenish gray, trace hematite, [Catoctin Formation]	6" Open Borehole
200		195-205': 14:15			200.0 846.3 METABASALT, unweathered, dark greenish gray, major epidote, minor quartz, [Catoctin Formation]	
210		205-215': 15:01			210.0 836.3 METABASALT, unweathered, dark greenish gray, major epidote, [Catoctin Formation]	
220		215-225': 14:17				

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PROJECT NUMBER 20498193 **PROJECT LOCATION** Blue Ridge Summit, PA

DEPTH (ft)	SAMPLE TYPE NUMBER	DRILL TIMES	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
					METABASALT, unweathered, dark greenish gray, major epidote, [Catoctin Formation] *(continued)*	
230		225-235': 20:52			230.0 816.3	
					METABASALT, unweathered, dark greenish gray, major epidote, minor quartz and hematite, [Catoctin Formation]	
					232.0 814.3	
					METABASALT, unweathered, dark greenish gray, major epidote, [Catoctin Formation]	
240		235-245': 14:26			240.0 806.3	
					METABASALT, unweathered, dark greenish gray, moderate epidote and quartz, [Catoctin Formation]	
					245.0 801.3	
					METABASALT, unweathered, dark greenish gray, major epidote, quartz and hematite, [Catoctin Formation] softer zone, slight increase in water return	
					248.0 798.3	
250		245-255': 11:31			METABASALT, unweathered, dark greenish gray, moderate epidote and quartz, [Catoctin Formation]	6" Open Borehole
260		255-265': 16:00			260.0 786.3	
					METABASALT, unweathered, dark greenish gray, [Catoctin Formation]	
270		265-275': 13:01			270.0 776.3	
					METABASALT, unweathered, dark greenish gray, moderate epidote, [Catoctin Formation]	

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WELL NUMBER MW-11D

CLIENT Specialty Granules, Inc. **PROJECT NAME** Bruce Skubon

PROJECT NUMBER 20498193 **PROJECT LOCATION** Blue Ridge Summit, PA

DEPTH (ft)	SAMPLE TYPE NUMBER	DRILL TIMES	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
280		275-285': 12:35			280.0 766.3 METABASALT, unweathered, dark greenish gray, [Catoctin Formation]	
290		285-295': 11:13				
300		295-305': 10:54				
310		305-315': 7:03				6" Open Borehole
320		315-325': 7:57				
330		325-335': 7:41			330.0 716.3 METABASALT, unweathered, dark greenish gray, minor epidote, quartz and hematite, [Catoctin Formation]	

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WELL NUMBER MW-11D

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PROJECT NUMBER 20498193 **PROJECT LOCATION** Blue Ridge Summit, PA

DEPTH (ft)	SAMPLE TYPE NUMBER	DRILL TIMES	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
340		335-345': 6:54			METABASALT, unweathered, dark greenish gray, minor epidote, quartz and hematite, [Catoctin Formation] *(continued)*	
					340.0	
					METABASALT, unweathered, dark greenish gray and dark reddish gray, trace epidote and quartz, [Catoctin Formation]	6" Open Borehole
		345-350': 4:08				
350					350.0	
					706.3	
					696.3	

Bottom of borehole at 350.0 feet.

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WELL NUMBER MW-12D

CLIENT Specialty Granules, Inc.
PROJECT NAME Bruce Skubon
PROJECT NUMBER 20498193
PROJECT LOCATION Blue Ridge Summit, PA
DATE STARTED 10/10/13 **COMPLETED** 10/15/13
GROUND ELEVATION 1077.58 ft **HOLE SIZE** 6 inches
DRILLING CONTRACTOR Eichelbergers Inc.
GROUND WATER LEVELS:
DRILLING METHOD Air Rotary
AT TIME OF DRILLING 13.10 ft / Elev 1064.48 ft (10/14/13)
LOGGED BY Bruce Skubon **CHECKED BY** Don Coleman
AT END OF DRILLING ---
NOTES Northern Tract
AFTER DRILLING 90.70 ft / Elev 986.88 ft (10/21/13)

DEPTH (ft)	SAMPLE TYPE NUMBER	DRILL TIMES	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
0						Casing Top Elev: 1079.18 (ft) Casing Type: Steel
			ML		SILT WITH GRAVEL, (ML) reddish brown (5YR 4/4), dry, gravel is weathered metabasalt	6" Steel Casing
					5.5 1072.1	
					METABASALT, unweathered, dark gray, [Catoctin Formation]	10" Borehole Backfilled with Cement / 5% Bentonite Grout
10						
20						
					28.0 1049.6	
30		Rig chatter 29-30'			METABASALT, unweathered, dark gray, [Catoctin Formation] water bearing zone 28-30 ft, minimal water	6" Open Borehole
					30.0 1047.6	
					METABASALT, unweathered, dark gray, minor epidote, [Catoctin Formation]	
40					40.0 1037.6	
					METABASALT, unweathered, dark gray, [Catoctin Formation]	
50					50.0 1027.6	

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WELL NUMBER MW-12D

CLIENT Specialty Granules, Inc. **PROJECT NAME** Bruce Skubon

PROJECT NUMBER 20498193 **PROJECT LOCATION** Blue Ridge Summit, PA

DEPTH (ft)	SAMPLE TYPE NUMBER	DRILL TIMES	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
50					METABASALT, unweathered, dark gray, minor epidote, [Catoctin Formation]	
60						
70						
80						6" Open Borehole
90					90.0 987.6 METABASALT, unweathered, dark gray, [Catoctin Formation]	
100		94-104': 7:44			100.0 977.6 METABASALT, unweathered, dark greenish gray, moderate epidote and quartz, [Catoctin Formation]	

GENERAL BH / TP / WELL - GINT STD US LAB.GDT - 04/02/14 21:00 - C:\DOCUMENTS AND SETTINGS\BRUCE_SKUBON\DESKTOP\BORING LOGS\MW_LOGS2013.GPJ

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WELL NUMBER MW-12D

CLIENT Specialty Granules, Inc. **PROJECT NAME** Bruce Skubon

PROJECT NUMBER 20498193 **PROJECT LOCATION** Blue Ridge Summit, PA

DEPTH (ft)	SAMPLE TYPE NUMBER	DRILL TIMES	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
110		104-114': 8:72			METABASALT, unweathered, dark greenish gray, moderate epidote and quartz, [Catoctin Formation] *(continued)*	
					110.0 967.6	
					METABASALT, unweathered, dark greenish gray, [Catoctin Formation]	
120		114-124': 8:45			120.0 957.6	
					METABASALT, unweathered, dark greenish gray and dark reddish gray, [Catoctin Formation]	
					125.0 952.6	
					METABASALT, unweathered, dark greenish gray, [Catoctin Formation]	
130		124-134': 6:47				
140		134-144': 8:11				6" Open Borehole
150		144-154': 8:14				
160		154-164': 8:39				

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WELL NUMBER MW-12D

CLIENT Specialty Granules, Inc. **PROJECT NAME** Bruce Skubon

PROJECT NUMBER 20498193 **PROJECT LOCATION** Blue Ridge Summit, PA

DEPTH (ft)	SAMPLE TYPE NUMBER	DRILL TIMES	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
170		164-174': 8:26			METABASALT, unweathered, dark greenish gray, [Catoctin Formation] *(continued)*	
180		174-184': 8:01			180.0 897.6 METABASALT, unweathered, dark green, major epidote, minor quartz, [Catoctin Formation] epidosite layer 183.0 894.6 METABASALT, unweathered, dark greenish gray, [Catoctin Formation]	
190		184-194': 10:27				6" Open Borehole
200		194-204': 8:30			200.0 877.6 METABASALT, unweathered, dark greenish gray, trace epidote, [Catoctin Formation]	
210		204-214': 7:56			210.0 867.6 METABASALT, unweathered, dark greenish gray, [Catoctin Formation]	
220		214-224': 6:52				

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PROJECT NUMBER 20498193 **PROJECT LOCATION** Blue Ridge Summit, PA

DEPTH (ft)	SAMPLE TYPE NUMBER	DRILL TIMES	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
					METABASALT, unweathered, dark greenish gray, [Catoctin Formation] *(continued)*	
230		224-234': 6:34			230.0 847.6 METABASALT, unweathered, dark greenish gray, minor epidote, [Catoctin Formation]	
240		234-244': 7:26			240.0 837.6 METABASALT, unweathered, dark greenish gray, [Catoctin Formation]	
250		244-254': 6:07			250.0 827.6 METABASALT, unweathered, dark greenish gray and dark reddish gray, [Catoctin Formation]	6" Open Borehole
260		254-264': 8:24			260.0 817.6 METABASALT, unweathered, dark greenish gray, [Catoctin Formation]	
270		264-274': 7:33			270.0 807.6 METABASALT, unweathered, dark greenish gray, trace epidote and quartz, [Catoctin Formation]	

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WELL NUMBER MW-12D

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PROJECT NUMBER 20498193 **PROJECT LOCATION** Blue Ridge Summit, PA

DEPTH (ft)	SAMPLE TYPE NUMBER	DRILL TIMES	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
280		274-284': 7:28			280.0 797.6 METABASALT, unweathered, dark greenish gray, [Catoctin Formation]	
290		284-294': 7:03				
300		294-304': 7:14			300.0 777.6 METABASALT, unweathered, dark greenish gray and dark reddish gray, [Catoctin Formation] 303.0 774.6 METABASALT, unweathered, dark greenish gray, [Catoctin Formation]	
310		304-314': 6:31				6" Open Borehole
320		314-324': 6:41				
330		324-334': 6:20				

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WELL NUMBER MW-12D

CLIENT Specialty Granules, Inc. **PROJECT NAME** Bruce Skubon

PROJECT NUMBER 20498193 **PROJECT LOCATION** Blue Ridge Summit, PA

DEPTH (ft)	SAMPLE TYPE NUMBER	DRILL TIMES	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
340		334-344': 8:30			METABASALT, unweathered, dark greenish gray, [Catoctin Formation] *(continued)* 340.0 737.6 METABASALT, unweathered, dark gray, minor quartz, [Catoctin Formation]	6" Open Borehole
350		344-354': 7:14			350.0 727.6 METABASALT, unweathered, dark greenish gray, [Catoctin Formation]	
360		354-364': 9:03			360.0 717.6 METABASALT, unweathered, dark greenish gray and dark reddish gray, [Catoctin Formation]	
370		364-374': 9:57				
380		374-380': 5:26			380.0 697.6	

Bottom of borehole at 380.0 feet.

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WELL NUMBER MW-13D

CLIENT Specialty Granules, Inc.
PROJECT NAME Bruce Skubon
PROJECT NUMBER 20498193
PROJECT LOCATION Blue Ridge Summit, PA
DATE STARTED 10/16/13 **COMPLETED** 10/21/13
GROUND ELEVATION 1077.27 ft **HOLE SIZE** 6 inches
DRILLING CONTRACTOR Eichelbergers Inc.
GROUND WATER LEVELS:
DRILLING METHOD Air Rotary
AT TIME OF DRILLING ---
LOGGED BY Bruce Skubon **CHECKED BY** Don Coleman
AT END OF DRILLING ---
NOTES Northern Tract
24hrs AFTER DRILLING 152.80 ft / Elev 924.47 ft (10/22/13)

DEPTH (ft)	SAMPLE TYPE NUMBER	DRILL TIMES	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	
0			ML		GRAVELLY SILT WITH SAND, (ML) yellowish brown (10YR 5/4), dry, gravel is weathered metabasalt	
5.0						1072.3
					METABASALT, highly weathered, brown, dry, [Catoctin Formation]	
8.0						1069.3
					METABASALT, unweathered, dark gray, dry, [Catoctin Formation]	
17.0						1060.3
					METABASALT, moderately weathered, brown, dry, [Catoctin Formation] softer zone	
25.0						1052.3
					METABASALT, unweathered, dark gray, dry, [Catoctin Formation]	

WELL DIAGRAM

Casing Top Elev: 1079.23 (ft)
Casing Type: Steel

- 6" Steel Casing
- 10" Borehole Backfilled with Cement / 5% Bentonite Grout
- 6" Open Borehole

10
20
30
40
50

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WELL NUMBER MW-13D

CLIENT Specialty Granules, Inc. **PROJECT NAME** Bruce Skubon

PROJECT NUMBER 20498193 **PROJECT LOCATION** Blue Ridge Summit, PA

DEPTH (ft)	SAMPLE TYPE NUMBER	DRILL TIMES	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
50					METABASALT, unweathered, dark gray, dry, [Catoctin Formation] *(continued)*	
60						
70					70.0 1007.3	
					METABASALT, unweathered, gray and dark reddish gray, dry, [Catoctin Formation]	
					73.0 1004.3	
					METABASALT, unweathered, dark gray, dry, [Catoctin Formation]	
80		74-84': 5:52				6" Open Borehole
90		84-94': 6:40				
100		94-104': 6:16				

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PROJECT NUMBER 20498193 **PROJECT LOCATION** Blue Ridge Summit, PA

DEPTH (ft)	SAMPLE TYPE NUMBER	DRILL TIMES	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
110		104-114': 6:50			METABASALT, unweathered, dark gray, dry, [Catoctin Formation] *(continued)*	
120		114-124': 9:22				
130		124-134': 7:55				
140		134-144': 7:37				6" Open Borehole
150		144-154': 6:07				
160		154-164': 6:49			160.0 917.3 METABASALT, unweathered, gray, [Catoctin Formation]	

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PROJECT NUMBER 20498193 **PROJECT LOCATION** Blue Ridge Summit, PA

DEPTH (ft)	SAMPLE TYPE NUMBER	DRILL TIMES	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
170		164-174': 7:12			METABASALT, unweathered, gray, [Catoctin Formation] *(continued)*	
180		174-184': 7:45				
190		184-194': 8:47				6" Open Borehole
200		194-204': 8:10				
210		204-214': 10:11				
220		214-224': 11:18			170.0 907.3 METABASALT, unweathered, dark gray, [Catoctin Formation] 220.0 857.3 METABASALT, unweathered, gray, [Catoctin Formation]	

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WELL NUMBER MW-13D

CLIENT Specialty Granules, Inc. **PROJECT NAME** Bruce Skubon

PROJECT NUMBER 20498193 **PROJECT LOCATION** Blue Ridge Summit, PA

DEPTH (ft)	SAMPLE TYPE NUMBER	DRILL TIMES	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
					METABASALT, unweathered, gray, [Catoctin Formation] *(continued)*	
230		224-234': 12:30				
240		234-244': 12:50				
250		244-254': 10:57				6" Open Borehole
260		254-264': 8:14			260.0 817.3 METABASALT, unweathered, dark gray and dark reddish gray, [Catoctin Formation]	
					263.0 814.3 METABASALT, unweathered, dark gray, [Catoctin Formation]	
270		264-274': 9:47				

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WELL NUMBER MW-13D

CLIENT Specialty Granules, Inc. **PROJECT NAME** Bruce Skubon

PROJECT NUMBER 20498193 **PROJECT LOCATION** Blue Ridge Summit, PA

DEPTH (ft)	SAMPLE TYPE NUMBER	DRILL TIMES	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
280		274-284': 7:37			METABASALT, unweathered, dark gray, [Catoctin Formation] *(continued)*	
290		284-294': 6:01				
300		294-304': 6:18				
310		304-314': 10:17				6" Open Borehole
320		314-324': 13:50				
330		324-334': 14:15			330.0 747.3 METABASALT, unweathered, dark gray and dark reddish gray, [Catoctin Formation]	

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WELL NUMBER MW-13D

CLIENT Specialty Granules, Inc. **PROJECT NAME** Bruce Skubon

PROJECT NUMBER 20498193 **PROJECT LOCATION** Blue Ridge Summit, PA

DEPTH (ft)	SAMPLE TYPE NUMBER	DRILL TIMES	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION		WELL DIAGRAM
					METABASALT, unweathered, dark gray and dark reddish gray, [Catoctin Formation] *(continued)*		
340		334-344': 8:01					6" Open Borehole
350		344-354': 7:14			350.0 METABASALT, unweathered, dark greenish gray, [Catoctin Formation]	727.3	
360		354-364': 10:08			360.0 METABASALT, unweathered, dark greenish gray and dark reddish gray, [Catoctin Formation]	717.3	
370		364-374': 9:40			370.0 METABASALT, unweathered, dark greenish gray, [Catoctin Formation]	707.3	
380		374-382': 8:01			380.0	697.3	
					382.0 METABASALT, unweathered, dark greenish gray, moderate epidote, [Catoctin Formation]	695.3	

Bottom of borehole at 382.0 feet.

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WELL NUMBER MW-14D

CLIENT Specialty Granules, Inc.
PROJECT NAME Bruce Skubon
PROJECT NUMBER 20498193
PROJECT LOCATION Blue Ridge Summit, PA
DATE STARTED 10/28/13 **COMPLETED** 10/29/13
GROUND ELEVATION 1088.41 ft **HOLE SIZE** 6 inches
DRILLING CONTRACTOR Eichelbergers Inc.
GROUND WATER LEVELS:
DRILLING METHOD Air Rotary
AT TIME OF DRILLING ---
LOGGED BY Bruce Skubon **CHECKED BY** Don Coleman
AT END OF DRILLING ---
NOTES Northern Tract
72hrs AFTER DRILLING 36.80 ft / Elev 1051.61 ft (11/1/13)

DEPTH (ft)	SAMPLE TYPE NUMBER	DRILL TIMES	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION		WELL DIAGRAM
0			ML		SILT WITH GRAVEL, (ML) reddish brown (5YR 4/4), moist, some clay, little fine to coarse gravel, gravel is weathered metabasalt, some cobbles and boulders		Casing Top Elev: 1090.34 (ft) Casing Type: Steel
					6.0	1082.4	
			CL		LEAN CLAY, (CL) reddish brown (5YR 4/4), moist, some fine to coarse sand, some fine to coarse gravel, gravel is weathered metabasalt, some cobbles and boulders		
10					12.0	1076.4	
			CL		LEAN CLAY, (CL) reddish brown (5YR 4/4), moist, little fine to coarse sand, little fine to coarse gravel, gravel is weathered metabasalt, few cobbles and boulders		
20					26.0	1062.4	
			CL		LEAN CLAY, (CL) yellowish brown (10YR 5/4), moist, some fine to coarse sand, some fine to coarse gravel, gravel is weathered metabasalt, some cobbles and boulders		6" Steel Casing
30					36.0	1052.4	
			ML		SILT, (ML) brown (10YR 5/3), moist, some clay, little fine to coarse sand, little fine to coarse gravel, gravel is weathered metabasalt, some cobbles and boulders		10" Borehole Backfilled with Cement / 5% Bentonite Grout
40					47.0	1041.4	
			ML		SILT, (ML) brown (10YR 5/3), moist, some fine to coarse sand, some fine to coarse gravel, gravel is weathered metabasalt, some cobbles and boulders		
50							

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DEPTH (ft)	SAMPLE TYPE NUMBER	DRILL TIMES	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
50			ML		SILT, (ML) brown (10YR 5/3), moist, some fine to coarse sand, some fine to coarse gravel, gravel is weathered metabasalt, some cobbles and boulders *(continued)*	
					53.0 1035.4 METABASALT, highly weathered, brown, dry, [Catoctin Formation] faster drilling rate	
60					60.0 1028.4 METABASALT, moderately weathered, grayish brown, [Catoctin Formation] water-bearing fracture at 65' bgs	6" Steel Casing
70					72.0 1016.4 METABASALT, unweathered, brownish gray, [Catoctin Formation] water-bearing fracture at 88' bgs	10" Borehole Backfilled with Cement / 5% Bentonite Grout
80						
90					90.0 998.4 METABASALT, unweathered, dark gray and dark reddish gray, [Catoctin Formation] soft zone	6" Open Borehole
					98.0 990.4 METABASALT, unweathered, dark gray, [Catoctin Formation] soft zone, platy	
100						

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WELL NUMBER MW-14D

CLIENT Specialty Granules, Inc. **PROJECT NAME** Bruce Skubon

PROJECT NUMBER 20498193 **PROJECT LOCATION** Blue Ridge Summit, PA

DEPTH (ft)	SAMPLE TYPE NUMBER	DRILL TIMES	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
110		104-114': 4' 57"			METABASALT, unweathered, dark gray, [Catoctin Formation] soft zone, platy *(continued)*	
120		114-124': 5' 29"				
130		124-134': 5' 28"			130.0 / 958.4 METABASALT, unweathered, dark gray and dark reddish gray, [Catoctin Formation] soft zone, platy 133.0 / 955.4 METABASALT, unweathered, dark gray, [Catoctin Formation] soft zone, platy 139.0 / 949.4	
140		134-144': 5' 21"			METABASALT, unweathered, dark gray and dark reddish gray, major mineralization, [Catoctin Formation] soft zone 144.0 / 944.4	6" Open Borehole
150		144-154': 5' 30"			METABASALT, unweathered, dark gray, [Catoctin Formation] soft zone 150.0 / 938.4 METABASALT, unweathered, dark gray with dark reddish gray, [Catoctin Formation] soft zone, slightly platy	
160		154-164': 5' 4"			164.0 / 924.4	

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PROJECT NUMBER 20498193 **PROJECT LOCATION** Blue Ridge Summit, PA

DEPTH (ft)	SAMPLE TYPE NUMBER	DRILL TIMES	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION		WELL DIAGRAM
					METABASALT, unweathered, dark greenish gray, [Catoctin Formation] platy *(continued)*		
170		164-174': 5' 41"			170.0	918.4	
					METABASALT, unweathered, dark gray, [Catoctin Formation] platy		
					173.0	915.4	
					METABASALT, unweathered, dark gray with dark reddish gray, trace quartz, [Catoctin Formation] platy		
180		174-184': 5' 47"					
					188.0	900.4	
					METABASALT, unweathered, dark gray, [Catoctin Formation] platy		6" Open Borehole
190		184-194': 5' 54"			192.0	896.4	
					METABASALT, unweathered, dark gray and dark reddish gray, trace mineralization, [Catoctin Formation] platy		
					199.0	889.4	
200		194-204': 6' 31"			METABASALT, unweathered, dark reddish gray and dark gray, trace mineralization, [Catoctin Formation] platy		
					207.0	881.4	
					METABASALT, unweathered, dark gray, trace quartz, [Catoctin Formation] increasing hardness, slightly platy		
210		204-214': 5' 51"					
220		214-224': 6' 34"			220.0	868.4	

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WELL NUMBER MW-14D

CLIENT Specialty Granules, Inc. **PROJECT NAME** Bruce Skubon

PROJECT NUMBER 20498193 **PROJECT LOCATION** Blue Ridge Summit, PA

DEPTH (ft)	SAMPLE TYPE NUMBER	DRILL TIMES	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
					METABASALT, unweathered, dark greenish gray, [Catoctin Formation] very slightly platy *(continued)*	
					225.0 863.4	
					METABASALT, unweathered, dark reddish gray, [Catoctin Formation] hard zone	
					228.0 860.4	
230		224-234': 5' 47"			METABASALT, unweathered, dark gray with dark reddish gray, [Catoctin Formation] very slightly platy	
					235.0 853.4	
					METABASALT, unweathered, dark gray, moderate epidote and hematite, [Catoctin Formation]	
					238.0 850.4	
240		234-244': 6' 51"			METABASALT, unweathered, dark reddish gray, [Catoctin Formation] hard zone	
					246.0 842.4	
					248.0 METABASALT, unweathered, dark gray, moderate epidote, [Catoctin Formation] 840.4	
250		244-254': 7' 37"			METABASALT, unweathered, dark gray and dark reddish gray, moderate epidote, [Catoctin Formation]	6" Open Borehole
					252.0 836.4	
					254.0 METABASALT, unweathered, dark gray, major epidote, minor quartz, [Catoctin Formation] soft zone 834.4	
					METABASALT, unweathered, dark greenish gray with dark reddish gray, [Catoctin Formation] hard zone	
260		254-264': 6' 15"				
270		264-274': 6' 10"			270.0 818.4	
					METABASALT, unweathered, dark greenish gray, minor quartz, [Catoctin Formation] hard zone	
					274.0 814.4	
					276.0 METABASALT, unweathered, dark gray with dark reddish gray, major epidote, [Catoctin Formation] soft zone 812.4	
					METABASALT, unweathered, dark gray with dark reddish gray, [Catoctin Formation]	

(Continued Next Page)

URS
4507 N. Front Street, Suite 200
Harrisburg, PA 17110
Telephone: 717-635-7901
Fax: 717-635-7902

WELL NUMBER MW-14D

CLIENT Specialty Granules, Inc. **PROJECT NAME** Bruce Skubon

PROJECT NUMBER 20498193 **PROJECT LOCATION** Blue Ridge Summit, PA

DEPTH (ft)	SAMPLE TYPE NUMBER	DRILL TIMES	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
280		274-284': 6' 5"			METABASALT, unweathered, dark gray with dark reddish gray, [Catoctin Formation] *(continued)*	
					285.0 803.4	
					METABASALT, unweathered, dark gray and dark reddish gray, moderate quartz, [Catoctin Formation]	
					288.0 800.4	
290		284-294': 6' 22"			METABASALT, unweathered, dark green and very dark red, major epidote, moderate hematite, [Catoctin Formation] Epidosite?	
					293.0 795.4	
					METABASALT, unweathered, dark gray and dark reddish gray, [Catoctin Formation]	
					297.0 791.4	
300		294-304': 5' 18"			METABASALT, unweathered, dark gray, [Catoctin Formation]	
					306.0 782.4	
					307.0 781.4 METABASALT, unweathered, dark gray and dark reddish gray, major epidote, [Catoctin Formation]	
310		304-314': 7' 36"			METABASALT, unweathered, dark gray and dark reddish gray, [Catoctin Formation]	6" Open Borehole
					317.0 771.4	
					METABASALT, unweathered, dark gray, [Catoctin Formation]	
					319.0 769.4	
320		314-324': 6' 39"			METABASALT, unweathered, dark reddish gray with dark gray, [Catoctin Formation]	
					322.0 766.4	
					METABASALT, unweathered, dark gray and dark reddish gray, trace epidote, [Catoctin Formation]	
330		324-334': 7' 15"				

GENERAL BH / TP / WELL - GINT STD US LAB.GDT - 04/02/14 21:01 - C:\DOCUMENTS AND SETTINGS\BRUCE_SKUBON\DESKTOP\BORING LOGS\MW_LOGS2013.GPJ

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WELL NUMBER MW-14D

CLIENT Specialty Granules, Inc. **PROJECT NAME** Bruce Skubon

PROJECT NUMBER 20498193 **PROJECT LOCATION** Blue Ridge Summit, PA

DEPTH (ft)	SAMPLE TYPE NUMBER	DRILL TIMES	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION		WELL DIAGRAM
					METABASALT, unweathered, dark gray and dark reddish gray, trace epidote, [Catoctin Formation] *(continued)*		
340		334-344': 8' 16"			340.0	748.4	6" Open Borehole
					METABASALT, unweathered, dark greenish gray, [Catoctin Formation]		
					342.0	746.4	
					METABASALT, unweathered, dark gray and dark reddish gray, moderate mineralization, [Catoctin Formation]		
350		344-354': 7' 53"					
360		354-364': 6' 55"			360.0	728.4	
					METABASALT, unweathered, dark greenish gray, minor mineralization, [Catoctin Formation]		
					367.0	721.4	
					METABASALT, unweathered, dark green, major epidote and quartz, [Catoctin Formation] Epidosite?		
					369.0	719.4	
370		364-374': 7' 51"			METABASALT, unweathered, dark gray, moderate to major epidote, moderate quartz, [Catoctin Formation]		
					372.0	716.4	
					METABASALT, unweathered, dark gray and dark reddish gray, [Catoctin Formation]		
					374.0	714.4	
					375.0 METABASALT, unweathered, dark green, major epidote and quartz, [Catoctin Formation] Epidosite?	713.4	
					METABASALT, unweathered, dark greenish gray with dark reddish gray, trace epidote, [Catoctin Formation]		
380		374-384': 9' 57"			380.0	708.4	
					METABASALT, unweathered, dark gray, [Catoctin Formation]		
					382.0	706.4	
					383.0 METABASALT, unweathered, dark reddish gray with dark gray, [Catoctin Formation]	705.4	
					METABASALT, unweathered, dark gray with dark red, major hematite, [Catoctin Formation]		
390		384-394': 8' 15"			390.0	698.4	
					METABASALT, unweathered, dark gray, trace quartz and hematite, [Catoctin Formation]		

(Continued Next Page)

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WELL NUMBER MW-14D

CLIENT Specialty Granules, Inc. **PROJECT NAME** Bruce Skubon

PROJECT NUMBER 20498193 **PROJECT LOCATION** Blue Ridge Summit, PA

DEPTH (ft)	SAMPLE TYPE NUMBER	DRILL TIMES	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
					394.0 694.4	

Bottom of borehole at 394.0 feet.

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Fax: 717-635-7902

WELL NUMBER MW-14S

CLIENT Specialty Granules, Inc.
PROJECT NAME Bruce Skubon
PROJECT NUMBER 20498193
PROJECT LOCATION Blue Ridge Summit, PA
DATE STARTED 10/30/13 **COMPLETED** 10/30/13
GROUND ELEVATION 1087.99 ft **HOLE SIZE** 6 inches
DRILLING CONTRACTOR Eichelbergers Inc.
GROUND WATER LEVELS:
DRILLING METHOD Air Rotary
AT TIME OF DRILLING ---
LOGGED BY Bruce Skubon **CHECKED BY** Don Coleman
AT END OF DRILLING ---
NOTES Northern Tract
48hrs AFTER DRILLING 28.90 ft / Elev 1059.09 ft (11/1/13)

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
0		ML		SILT WITH GRAVEL, (ML) reddish brown (5YR 4/4), dry, little fine to coarse gravel, gravel is weathered metabasalt, some cobbles and boulders	Casing Top Elev: 1090.71 (ft) Casing Type: PVC
3.0				1085.0	
		ML		SILT, (ML) reddish brown (5YR 4/4), dry, some clay	
10					2" PVC Sch. 40 Riser Pipe
20					
25.0				1063.0	
		ML		SILT, (ML) reddish brown (5YR 4/4), dry, some fine to coarse gravel, gravel is weathered metabasalt, some cobbles and boulders	Cement / 5% Bentonite Grout
30					
40					
41.0				1047.0	
		ML		SILT, (ML) reddish brown (5YR 4/4), moist, some clay	
49.0				1039.0	
50				METABASALT, highly weathered, yellowish brown, dry, [Catoctin Formation]	

(Continued Next Page)

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WELL NUMBER MW-14S

CLIENT Specialty Granules, Inc. **PROJECT NAME** Bruce Skubon

PROJECT NUMBER 20498193 **PROJECT LOCATION** Blue Ridge Summit, PA

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
50				METABASALT, highly weathered, yellowish brown, dry, [Catoctin Formation] *(continued)*	2" PVC Sch. 40 Riser Pipe
60					Bentonite Seal
				65.0 1023.0 METABASALT, moderately weathered, grayish brown, [Catoctin Formation] water at 69' bgs	Fil-pro #1 Sand
70					2" 10-Slot PVC Sch. 40 Well Screen
				74.0 1014.0 Bottom of borehole at 74.0 feet.	

ATTACHMENT B

SUPPLEMENTAL CORE HOLE LOGS

ENGINEERS FIELD BORING LOG

BORING NO. ITB-1
SHEET 1 OF 1
DATE: START 9-11-13
END 9-11-13
O.G. ELEV

PROJECT NAME SGI North Tract COUNTY Adams
SR SECT. SEGMENT OFFSET
STATION OFFSET FROM CENTERLINE
INSPECTOR (SIGNED) Bruce Skuban DRILLERS NAME/COMPANY Eric Benko / Eichelbergers
EQUIPMENT USED Diedrich D-50 Track Rig
DRILLING METHODS Hollow-Stem Auger / Split-Spoon Sampling
CASING SIZE: 4 1/2" DEPTH: WATER DEPTH: TIME: DATE:
CHECKED BY: DATE: DEPTH: TIME: DATE:
NOT ENCOUNTERED ☒

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT. ON SAMPLER	RECOVERY (FT)	RECOVERY % / RQD %	POCKET PENT/ TORVANE (TSF)	USCS	H_2O CONTENT	DESCRIPTION	REMARKS
1	S-1	6 7 8 13	1.6	80%			D	0.0-2.3: Stiff, yellowish brown (10YR 5/6), SILT, dry, noncohesive, trace to little coarse angular sand	
3	S-2	13 14 22 22	1.8	90%			D	2.3-5.5: Hard, reddish brown (5YR 4/4) and light gray (7.5YR 7/1), clayey SILT, dry, noncohesive, mottled	
5	S-3	8 14 23 50/0.0	1.5	100%			D		• Rock Fragment in shoe at 5.5'
6	S-4	50/0.2	0.2	100%			D	6.0-6.2: Very dense, gray (2.5Y6/1), SAND with GRAVEL, dry (broken metabasalt)	• Strong chatter ~5.3-7.5' bgs (boulder)
8									• broke through boulder at ~7.5' bgs
9	S-5	12 13 21 30	2.0	100%			D	8.0-11.3: Hard, yellowish brown (10YR 5/6), SILT, dry, noncohesive, trace to little medium to coarse-grained sand	
11	S-6	26 32 50/0.4	1.4	100%			D	11.3-11.4: Rock Fragment	
13	S-7	50/0.4	0.4	100%			D	13.0-13.4: Hard, yellowish brown (10YR 5/6), SILT with SAND, dry, few fine to coarse grained sand, trace small gravel	• Augered down to 15.0' bgs; set a Piezometer
15									

NOTE: DRAW STRATIFICATION LINES AT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES FOR THIS BORING LOCATION AND SHOW DEPTHS

ENGINEERS FIELD BORING LOG

BORING NO. ITB-2
SHEET 1 OF 1
DATE: START 9-11-13
END 9-11-13
O.G. ELEV

PROJECT NAME SGI North Tract COUNTY Adams
SR ____ SECT. ____ SEGMENT ____ OFFSET ____
STATION ____ OFFSET FROM CENTERLINE ____
INSPECTOR (SIGNED) Bruce Skuban DRILLERS NAME/COMPANY Eric Benko / Eichelbergers
EQUIPMENT USED Diedrich D-50 Track Rig
DRILLING METHODS Hollow-Stem Auger / Split Spoon Sampling
CASING SIZE: 4 1/2" DEPTH: ____ WATER DEPTH: ____ TIME: ____ DATE: ____
CHECKED BY: ____ DATE: ____ DEPTH: ____ TIME: ____ DATE: ____
NOT ENCOUNTERED ☒

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT. ON SAMPLER	RECOVERY (FT)	RECOVERY % / RQD %	POCKET PENT/ TORVANE (TSF)	USCS	H_2O CONTENT	DESCRIPTION	REMARKS
1	S-1	6 5 6 12	1.8	90%			M	0.0-2.4': Stiff, Strong brown (7.5 YR 4/6), SILT, moist, noncohesive, trace coarse sand, quartz fragment at 1.8-1.9'	
2									
3	S-2	10 15 33	1.7	89%			M	2.4-3.2': Stiff to very stiff, light gray (5Y 7/1) and Strong brown (7.5 YR 4/6), clayey SILT, moist, talcy feel, noncohesive	
4		50/0.4					D	3.2-9.0 Very dense, light grey (5Y 7/1) Silty GRAVEL, dry, talcy feel, Visible laminated bedding (Saprolite)	
	S-3	50/0.5	0.5	100%			D		
5									• Chatter at 5.0' bgs
6									
	S-4	50/0.1	0.1	100%			D		• Strong chatter, slow drilling 6.0-9.0' bgs
7									
8									• collected bulk sample 5-9' bgs
	S-5	50/0.2	0.1	50%			D		
9									
10									Auger refusal at 9.0' bgs
11									
12									
13									
14									
15									

NOTE: DRAW STRATIFICATION LINES AT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES FOR THIS BORING LOCATION AND SHOW DEPTHS

ENGINEERS FIELD BORING LOG

BORING NO. ITB-3
SHEET 1 OF 1
DATE: START 9-12-13
END 9-12-13
O.G. ELEV

PROJECT NAME SGI North Tract COUNTY Adams
SR ____ SECT. ____ SEGMENT ____ OFFSET ____
STATION ____ OFFSET FROM CENTERLINE ____
INSPECTOR (SIGNED) Bruce Skuhon DRILLERS NAME/COMPANY Eric Benko / Eichelbergers
EQUIPMENT USED Diedrich D-50 Track Rig
DRILLING METHODS Hollow-Stem Auger / Split-Spoon Sampling
CASING SIZE: 4 1/2" DEPTH: ____ WATER DEPTH: ____ TIME: ____ DATE: ____
CHECKED BY: ____ DATE: ____ DEPTH: ____ TIME: ____ DATE: ____
NOT ENCOUNTERED ☒

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT. ON SAMPLER	RECOVERY (FT)	RECOVERY % / RQD %	POCKET PENT/ TORVANE (TSF)	USCS	H_2O CONTENT	DESCRIPTION	REMARKS
0								0.0-1.4: Very stiff, strong brown (7.5YR 4/6), SILT, dry, trace to little small angular gravel and coarse angular sand	
1	S-1	7, 9, 11, 13	2.0	100%			D		
2							M	1.4-4.9: Very stiff to hard, reddish brown (5YR 4/4), clayey SILT with sand, moist, noncohesive, trace small angular gravel	
3	S-2	14, 15, 21, 30	1.7	85%			M		
4									
5	S-3	5, 6, 8, 11	1.8	90%			M	4.9-5.8: Very stiff, gray (5Y 6/1), SILT, moist, tacky feel, some light brown mottling	
6								5.8-6.0: Very stiff, pale red (5R 6/2), SILT, moist, tacky feel	
7	S-4	9, 9, 9, 12	2.0	100%			M	6.0-8.0: Very stiff, pale red (5R 6/2), light gray (5Y 6/1) and reddish brown (5YR 4/4), SILT, moist, noncohesive, visible laminated bedding present	Saprolite (weathered metarhyolite)
8									
9	S-5	4, 4, 7, 8	2.0	100%			M	8.0-15.0: Stiff to very stiff, weak red (5R 5/2), SILT, moist, some strong brown mottling 9.2-9.6', trace fine sand	
10									
11	S-6	7, 7, 9, 10	1.6	80%			M		
12									
13									
14	S-7	6, 6, 7, 10	2.0	100%			M		• Augered down to 15.0' bgs; set a piezometer
15									

NOTE: DRAW STRATIFICATION LINES AT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES FOR THIS BORING LOCATION AND SHOW DEPTHS

ENGINEERS FIELD BORING LOG

BORING NO. ITB-4
SHEET 1 OF 1
DATE: START 9-12-13
END 9-12-13
O.G. ELEV

PROJECT NAME SGI North Tract COUNTY Adams
SR ____ SECT. ____ SEGMENT ____ OFFSET ____
STATION ____ OFFSET FROM CENTERLINE ____
INSPECTOR (SIGNED) Bruce Skuhon DRILLERS NAME/COMPANY Eric Benko / Eichelbergers
EQUIPMENT USED Diedrich D-50 Track Rig
DRILLING METHODS Hollow-Stem Auger / Split-Spoon Sampling
CASING SIZE: 4 1/2" DEPTH: ____ WATER DEPTH: ____ TIME: ____ DATE: ____
CHECKED BY: ____ DATE: ____ DEPTH: ____ TIME: ____ DATE: ____
NOT ENCOUNTERED ☒

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT. ON SAMPLER	RECOVERY (FT)	RECOVERY % / RQD %	POCKET PENT/ TORVANE (TSF)	USCS	H_2O CONTENT	DESCRIPTION	REMARKS
1	S-1	8 9 15 22	1.8	90%			D D	0.0-1.7: Very stiff, yellowish brown (10YR 5/6), SILT, dry, trace coarse sand, some organics, nonadhesive 1.7-3.2: Dense, pale red (5R 6/2), Silty GRAVEL, dry, visible laminated bedding present	Saprolite
3	S-2	20 28 43 50	2.0	100%			D	3.2-4.5: Hard, pale red (5R 6/2) and yellowish brown (10YR 5/6), SILT with gravel, dry, little coarse sand, nonadhesive	
5	S-3	20 38 50/0.5	1.5	100%			D	4.5-5.5: Very dense, pale red (5R 6/2), Silty SAND with GRAVEL, dry, small to large angular gravel, fine to coarse grained sand	Weathered metarhyolite
7	S-4	28 35 50/0.2	1.2	100%			D	6.0-7.2: Very dense, weak red (5R 5/2), Silty GRAVEL, dry, small to large angular gravel	• Bulk sample collected 6-10' bgs
9	S-5	12 50/0.1	0.6	100%			D	8.0-8.6: Very dense, weak red (5R 5/2), silty SAND and GRAVEL, dry, small to large angular gravel, fine to coarse sand, some light brown clayey silt laminations	• Chatter from 8.5 to 15.0' bgs; slow drilling
10	S-6	50/0.5	0.3	60%			D	10.0-15.0: Very dense, weak red (5R 5/2), silty SAND and GRAVEL, dry, small to large angular gravel, fine to coarse grained sand	
13	S-7	50/0.1	0.1	100%			D		
15									15' EOB

NOTE: DRAW STRATIFICATION LINES AT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES FOR THIS BORING LOCATION AND SHOW DEPTHS

ENGINEERS FIELD BORING LOG

BORING NO. ITB-5
SHEET 1 OF 1
DATE: START 9-12-13
END 9-12-13
O.G. ELEV

PROJECT NAME SGI North Tract COUNTY Adams
SR ____ SECT. ____ SEGMENT ____ OFFSET ____
STATION ____ OFFSET FROM CENTERLINE ____
INSPECTOR (SIGNED) Bruce Skubon DRILLERS NAME/COMPANY Eric Benko / Eichelbergers
EQUIPMENT USED Diedrich D-50 Track Rig
DRILLING METHODS Hollow-Stem Auger / Split Spoon Sampling
CASING SIZE: 4 1/2" DEPTH: ____ WATER DEPTH: ____ TIME: ____ DATE: ____
CHECKED BY: ____ DATE: ____ DEPTH: ____ TIME: ____ DATE: ____
NOT ENCOUNTERED ☒

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT. ON SAMPLER	RECOVERY (FT)	RECOVERY % / RQD %	POCKET PENT/ TORVANE (TSF)	USCS	H_2O CONTENT	DESCRIPTION	REMARKS
0									
1	S-1	8 8 10 14	2.0	100%			D	0.0-0.8: Stiff, yellowish brown (10YR 5/6), SILT, dry, noncohesive, trace coarse sand 0.8-2.0: Very Stiff, strong brown (7.5YR 4/6), SILT, dry, noncohesive, little Fine to coarse grained sand, small angular gravel	
2									
3	S-2	10 50/0.5	0.8	80%			D	2.0-3.0: Hard, reddish brown (5YR 4/4), clayey SILT, dry, noncohesive, little Fine to coarse-grained sand, small angular gravel, rock at bottom	• Very strong chatter from 3.0-3.5' bgs
4									Auger refusal at ~3.5' bgs, offset a Few Feet and drilled ITB-5A
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									

NOTE: DRAW STRATIFICATION LINES AT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES FOR THIS BORING LOCATION AND SHOW DEPTHS

ENGINEERS FIELD BORING LOG

BORING NO. ITB-5A
SHEET 1 OF 1
DATE: START 9-13-13
END 9-13-13
O.G. ELEV

PROJECT NAME SGI North Tract COUNTY Adams
SR ____ SECT. ____ SEGMENT ____ OFFSET ____
STATION ____ OFFSET FROM CENTERLINE ____
INSPECTOR (SIGNED) Bruce Skuban DRILLERS NAME/COMPANY Eric Benko / Eichelbergers
EQUIPMENT USED Diedrich D-50 Track Rig
DRILLING METHODS Hollow-Stem Auger / Split-Spoon Sampling
CASING SIZE: 4 1/2" DEPTH: ____ WATER DEPTH: ____ TIME: ____ DATE: ____
CHECKED BY: ____ DATE: ____ DEPTH: ____ TIME: ____ DATE: ____
NOT ENCOUNTERED ☒

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT. ON SAMPLER	RECOVERY (FT)	RECOVERY % / RQD %	POCKET PENT/ TORVANE (TSF)	USCS	H_2O CONTENT	DESCRIPTION	REMARKS
1	S-1	7 6 10 14	1.7	85%			D	0.0-2.8: Very stiff to hard, Yellowish brown (10YR 5/6), SILT, dry, noncohesive, little coarse angular sand	
2									
3	S-2	11 22 13 13	1.7	85%			M	2.8-5.7: Very stiff, reddish brown (5YR 4/4), clayey SILT, moist, noncohesive, little small angular gravel and fine to coarse-grained sand	
4									
5	S-3	10 12 16 19	1.9	95%			M D	5.7-8.0: Medium dense, pale red (5R 6/2), silty SAND with GRAVEL, dry, small angular gravel, fine to coarse-grained sand, some brown silt	Saprolite
6									
7	S-4	13 11 18 19	1.6	80%			D		
8									
9	S-5	4 5 8 10	1.5	75%			M	8.0-10.0: Medium dense, pale red (5R 6/2), silty SAND with GRAVEL, moist, small angular gravel, fine to coarse-grained sand	
10									
11	S-6	12 12 15 20	1.8	90%			M	10.0-12.0: Very stiff, pale red (5R 6/2), sandy SILT, moist, noncohesive, little small angular gravel, some reddish-brown mottling	
12									
13									
14	S-7	11 13 23 50/0.3	1.8	100%			M D	13.0-14.0: Very stiff, pale red (5R 6/2), SILT, moist, trace fine to medium-grained sand 14.0-14.3: Hard, weak red (5R 5/2), SILT with sand and Gravel, dry, small angular gravel, fine to coarse grained sand	Weathered metarhyolite • Augered to 15.0' bgs and installed a piezometer
15									

NOTE: DRAW STRATIFICATION LINES AT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES FOR THIS BORING LOCATION AND SHOW DEPTHS

ENGINEERS FIELD BORING LOG

BORING NO. ITB-6
SHEET 1 OF 1
DATE: START 9-13-13
END 9-13-13
O.G. ELEV

PROJECT NAME SGI North Tract COUNTY Adams
SR ____ SECT. ____ SEGMENT ____ OFFSET ____
STATION ____ OFFSET FROM CENTERLINE ____
INSPECTOR (SIGNED) Bruce Skuhon DRILLERS NAME/COMPANY Eric Benko / Eichelbergers
EQUIPMENT USED Diedrich D-50 Track Rig
DRILLING METHODS Hollow-Stem Auger / Split-Spoon Sampling
CASING SIZE: 4 1/2" DEPTH: ____ WATER DEPTH: ____ TIME: ____ DATE: ____
CHECKED BY: ____ DATE: ____ DEPTH: ____ TIME: ____ DATE: ____
NOT ENCOUNTERED ☒

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT. ON SAMPLER	RECOVERY (FT)	RECOVERY % / RQD %	POCKET PENT/ TORVANE (TSF)	USCS	H_2O CONTENT	DESCRIPTION	REMARKS
0									
1	S-1	4 5 10 10	1.7	85%			D	0.0-2.0: Stiff, yellowish brown (10YR 5/6), SILT, dry, little coarse angular sand, noncohesive	
2									
3	S-2	11 13 17 19	1.9	95%			M	2.0-2.8: Very stiff, yellowish brown (10YR 5/6) and pale red (5R 6/2), SILT, moist, noncohesive, mottled, trace coarse sand	
4								2.8-14.0: Very stiff, pale red (5R 6/2) and bluish gray, SILT, moist, noncohesive, mottled	• Saprolite
5	S-3	11 14 16 17	1.6	80%			M		
6									
7	S-4	7 9 12 11	1.6	80%			M		
8									
9	S-5	6 8 8 11	2.0	100%			M		• Bulk sample collected 8-12' bgs
10									• Installed piezometer in this boring
11	S-6	9 11 13 14	1.7	85%			M	• little coarse gravel 10-14'	
12									
13									
14	S-7	5 6 6 8	2.0	100%			M	14.0-15.0: Stiff, weak red (5R 4/3), SILT, moist, noncohesive	• 14-15'; increase in moisture; more moist but not wet
15									15': EOB

NOTE: DRAW STRATIFICATION LINES AT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES FOR THIS BORING LOCATION AND SHOW DEPTHS

ENGINEERS FIELD BORING LOG

BORING NO. ITB-7
SHEET 1 OF 1
DATE: START 9-13-13
END 9-13-13
O.G. ELEV

PROJECT NAME SGI North Tract COUNTY Adams
SR ____ SECT. ____ SEGMENT ____ OFFSET ____
STATION ____ OFFSET FROM CENTERLINE ____
INSPECTOR (SIGNED) Bruce Skubon DRILLERS NAME/COMPANY Eric Benko / Eichelbergers
EQUIPMENT USED Diedrich D-50 Track Rig
DRILLING METHODS Hollow-Stem Auger / Split-Spoon Sampling
CASING SIZE: 4 1/2" DEPTH: ____ WATER DEPTH: ____ TIME: ____ DATE: ____
CHECKED BY: ____ DATE: ____ DEPTH: ____ TIME: ____ DATE: ____
NOT ENCOUNTERED ☒

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT. ON SAMPLER	RECOVERY (FT)	RECOVERY % / RQD %	POCKET PENT/ TORVANE (TSF)	USCS	H_2O CONTENT	DESCRIPTION	REMARKS
1	S-1	8 8 11 16	1.7	85%			D D	0.0-0.5: Loose to medium dense, yellowish brown (10YR 5/6), silty SAND and GRAVEL, dry, small to large angular gravel, fine to coarse grained sand 0.5-2.2: Very stiff, yellowish brown (10YR 5/6), SILT, dry, noncohesive, little coarse sand	
3	S-2	27 50/0.5	1.0	100%			D	2.2-11.1: Very dense, weak red (5R 4/3), silty SAND and GRAVEL, dry, small to large angular gravel, fine to coarse grained sand (weathered metarhyolite)	• Chatter at 3.0' bgs
5	S-3	43 50/0.3	0.8	100%			D		
7	S-4	37 50/0.1	0.6	100%			D		• Strong chatter from 6.5-7.5' • Slight chatter from ~7.5-8.0'
9	S-5	20 49 50/0.4	1.4	100%			D		• Bulk sample collected 8-10' bgs
11	S-6	23 50/0.4	0.9	100%			D	• 10-11.1': Some yellowish brown silt throughout	
12									Auger refusal at 11.1 feet bgs
13									
14									
15									

NOTE: DRAW STRATIFICATION LINES AT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES FOR THIS BORING LOCATION AND SHOW DEPTHS

ENGINEERS FIELD BORING LOG

BORING NO. ITB-8
SHEET 1 OF 1
DATE: START 9/16/13
END 9/16/13
O.G. ELEV

PROJECT NAME SGI- Northern Tract COUNTY Adams
SR ____ SECT. ____ SEGMENT ____ OFFSET ____
STATION B OFFSET FROM CENTERLINE ____
INSPECTOR (SIGNED) Bentley Martin DRILLERS NAME/COMPANY Eric Benko / Eschelbergers
EQUIPMENT USED Diedrich D-50
DRILLING METHODS Hollow-stem Auger / split spoon sampling
CASING SIZE: 4.1/2 DEPTH: ____ WATER DEPTH: ____ TIME: ____ DATE: ____
CHECKED BY: ____ DATE: ____ DEPTH: ____ TIME: ____ DATE: ____
NOT ENCOUNTERED ☒

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT. ON SAMPLER	RECOVERY (FT)	RECOVERY % / RQD %	POCKET PENT/ TORVANE (TSF)	USCS	H_2O CONTENT	DESCRIPTION	REMARKS
2	S-1	5-5-4-16	1.1	55			D	Stiff, Light brown (7.5YR 6/4) SILT noncohesive, non plastic	
4	S-2	15-22-29-44	1.9	95			D	grades into Hard pale red (2.5YR 6/2) SILT with little gravel noncohesive, non plastic	
6	S-3	22-36-38-50	1.8	90			D	Hard, pale red, SILT w/ little gravel (2.5YR 6/2) noncohesive, non plastic	
8	S-4	34-37-36-27	1.6	80			D	SAME AS ABOVE	
10	S-5	6-11-16-18	1.7	85			D	SAME AS ABOVE - VERY STIFF	
12	S-6	13-17-35-41	1.5	75			D	SAME AS ABOVE - HARD	
15	S-7	17-54-46-50	1.5	75			D	SAME AS ABOVE	
								Highly Weathered Metarhyolite 15' end of boring Pz installed here	

NOTE: DRAW STRATIFICATION LINES AT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES FOR THIS BORING LOCATION AND SHOW DEPTHS

ENGINEERS FIELD BORING LOG

BORING NO. ITB-9
SHEET 1 OF 1
DATE: START 9/16/13
END 9/16/13
O.G. ELEV

PROJECT NAME SGI-Northern Tract COUNTY Adams
SR SECT. SEGMENT OFFSET
STATION 9 OFFSET FROM CENTERLINE
INSPECTOR (SIGNED) Brittany Martin DRILLERS NAME/COMPANY Eric Bonko/Eichelbergers
EQUIPMENT USED Diedrich D-50 track Rig
DRILLING METHODS Hollow stem Auger/split spoon sampling
CASING SIZE: 3.5 DEPTH: WATER DEPTH: TIME: DATE:
CHECKED BY: DATE: DEPTH: TIME: DATE:
NOT ENCOUNTERED ☒

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT. ON SAMPLER	RECOVERY (FT)	RECOVERY % / RQD %	POCKET PENT/ TORVANE (TSF)	USCS	H_2O CONTENT	DESCRIPTION	REMARKS
2	S-1	7-9-19-36	1.2	60			D	very stiff, light brown (7.5YR 6/4) to pale red (2.5YR 6/2) SILT w/ few gravel, noncohesive, nonplastic	
4	S-2	29-38-30-17	1.6	80			D	SAME AS ABVE - HARD 2.7-2.9 - green laminated weathered metabasalt	
6	S-3	10-14-13-17	1.7	85			D	SAME AS ABVE - VERY STIFF 5.4-5.6 - light gray (5Y 7/1) SILT w/ few gravel	
8	S-4	15-17-24-30	1.5	75			D	SAME AS ABVE - HARD	
10	S-5	17-21-25-30	1.8	90			D	SAME AS ABVE - SILT w/ little gravel	
12	S-6	28-31-21-23	1.5	75			D	HARD, PALE RED (5R 6/2) SILT w/ little gravel, non cohesive, non plastic	
15	S-7	14-24-32-53	1.8	90			D	SAME AS ABVE - SILT w/ few gravel	
								Extremely weathered metarhyolite 15' end of boring	

NOTE: DRAW STRATIFICATION LINES AT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES FOR THIS BORING LOCATION AND SHOW DEPTHS

ENGINEERS FIELD BORING LOG

BORING NO. ITB-10
SHEET 1 OF 1
DATE: START 9/17/13
END 9/17/13
O.G. ELEV

PROJECT NAME SGI-Northern Tract COUNTY Adams
SR SECT. SEGMENT OFFSET
STATION 10 OFFSET FROM CENTERLINE
INSPECTOR (SIGNED) Bartley Marta DRILLERS NAME/COMPANY Eric Benko / Eichelbergers
EQUIPMENT USED Diedrich D-50 Track rig
DRILLING METHODS Hollow stem auger / split spoon Sampling
CASING SIZE: 4.25 DEPTH: WATER DEPTH: TIME: DATE:
CHECKED BY: DATE: DEPTH: TIME: DATE:
NOT ENCOUNTERED ☒

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT. ON SAMPLER	RECOVERY (FT)	RECOVERY % / RQD %	POCKET PENT/ TORVANE (TSF)	USCS	H_2O CONTENT	DESCRIPTION	REMARKS
2	S-1	5-6-6-9	1.7	85			D	STIFF, reddish brown (5YR 4/4) Clayey SILT, slightly cohesive, low plasticity	
4	S-2	9-20-37-44	2.0	100			D	2-3- SAME AS ABOVE-HARD, 3-4- HARD PALE RED (5R 6/2) mottled into SAA, some lamination, noncohesive nonplastic	
6	S-3	10-49-24-24	1.7	85			D	4-4.7 SAME AS ABOVE grades into pale Red (5R 6/2) SILT w/ Gravel (few) non cohesive, nonplastic	
8	S-4	15-18-21-15	2.0	100			D	HARD - SAME AS ABOVE	
10	S-5	9-9-20-20	1.5	75			D	8-9.2- SAME AS ABOVE 9.2-10- PALE RED (5R 6/2) SILT w/ trace gravel, hard, slightly cohesive, nonplastic	
12	S-6	12-26-32-34	1.5	75			D	SAME AS ABOVE (9.2-10), of reddish brown (5YR 4/4) look, rusted looking)	some areas (not a "fresh"
15	S-7	15-17-50/0.4	1.4	70			D	SAME AS ABOVE- no areas of rust-color	
								15' End of Boring PZ Installed here	

NOTE: DRAW STRATIFICATION LINES AT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES FOR THIS BORING LOCATION AND SHOW DEPTHS

ENGINEERS FIELD BORING LOG

BORING NO. ITB-11
SHEET 1 OF 1
DATE: START 9/17/13
END 9/17/13
O.G. ELEV

PROJECT NAME SGI - Northern Tract COUNTY Adams
SR ____ SECT. ____ SEGMENT ____ OFFSET ____
STATION 11 OFFSET FROM CENTERLINE ____
INSPECTOR (SIGNED) Bentley Morta DRILLERS NAME/COMPANY Eric Benko / Eichelberger's
EQUIPMENT USED Diedrich D-50 Track Rig
DRILLING METHODS Hollow Stem Auger / Split spoon sampling
CASING SIZE: 3 1/4 DEPTH: ____ WATER DEPTH: ____ TIME: ____ DATE: ____
CHECKED BY: ____ DATE: ____ DEPTH: ____ TIME: ____ DATE: ____
NOT ENCOUNTERED ☑

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT. ON SAMPLER	RECOVERY (FT)	RECOVERY % / RQD %	POCKET PENT/ TORVANE (TSF)	USCS	H_2O CONTENT	DESCRIPTION	REMARKS
2	S-1	4-4-6-9	1.9	95			D	(BM) STIFF, Strong brown Clayey SILT, noncohesive non plastic	(5YR 4/6)
4	S-2	21-50/0.3	0.8	40			D	SAME AS ABOVE - HARD Hard pale Red (5R 6/2) SILT w/ gravel	grades into
6	S-3	47-49-38-26	1.8	90			D	Hard pale red (5R 6/2) SILT w/ little gravel, noncohesive, nonplastic	
8	S-4	17-17-13-13	1.5	75			D	VERY STIFF PALE RED (5R 6/2) SILT w/ few gravel, noncohesive, non plastic	
10	S-5	13-17-20-20	1.2	60			D	SAME AS ABOVE - HARD	
12	S-6	21-20-17-20	1.5	75			D	SAME AS ABOVE -	
15	S-7	14-38-50/0.1	0.8	40			D	SAME AS ABOVE	
								Highly Weathered metarhyolite	

NOTE: DRAW STRATIFICATION LINES AT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES FOR THIS BORING LOCATION AND SHOW DEPTHS

ENGINEERS FIELD BORING LOG

BORING NO. ITB-12
SHEET 1 OF 1
DATE: START 9/17/13
END 9/17/13
O.G. ELEV

PROJECT NAME SGI northern tract COUNTY Adams
SR ____ SECT. ____ SEGMENT ____ OFFSET ____
STATION 12 OFFSET FROM CENTERLINE ____
INSPECTOR (SIGNED) Brittny Martz DRILLERS NAME/COMPANY Eric Benko/Eichelbergers
EQUIPMENT USED Diedrich D-50 track rig
DRILLING METHODS Hollow stem Auger / Split spoon sampling
CASING SIZE: 4 1/4 DEPTH: ____ WATER DEPTH: ____ TIME: ____ DATE: ____
CHECKED BY: ____ DATE: ____ DEPTH: ____ TIME: ____ DATE: ____
NOT ENCOUNTERED ☒

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT. ON SAMPLER	RECOVERY (FT)	RECOVERY % / RQD %	POCKET PENT/ TORVANE (TSF)	USCS	H_2O CONTENT	DESCRIPTION	REMARKS
2	S-1	6-7-10-15	1.6	80			D	VERY STIFF, reddish brown (5YR 4/4) Clayey SILT, noncohesive,	non plastic
4	S-2	13-30-37-40	1.6	80			D	SAME AS ABOVE - HARD (2.0 - 3.2) 3.2-4. - pale red (5R 6/2) SILT w/ trace gravel, nonc, nonp, gravel zone = 3.6-3.8	
6	S-3	12-23-23-25	1.8	90			D	HARD, reddish brown (5YR 4/4) and pale red (5R 6/2) SILT w/ trace gravel, non cohesive, nonplastic, gravel zone = 5.5-5.7	
8	S-4	16-20-20-24	1.5	75			D	SAME AS ABOVE 7.1-8 - HARD PALE RED SILT w/ few gravel, noncohesive, non plastic	
10	S-5	8-9-14-23	1.5	75			D	SAME AS ABOVE (7.1-8) VERY STIFF	-
12	S-6	12-6-11-21	1.2	60			D	SAME AS ABOVE	
15	S-7	12-22-31-26	1.0	50			D	SAME AS ABOVE - HARD	
								15 End of Boring piezometer installed	

NOTE: DRAW STRATIFICATION LINES AT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES FOR THIS BORING LOCATION AND SHOW DEPTHS

ENGINEERS FIELD BORING LOG

BORING NO. ITB-13
SHEET 1 OF 1
DATE: START 9/18/13
END 9/18/13
O.G. ELEV

PROJECT NAME SGI - northern tract COUNTY Adams
SR ____ SECT. ____ SEGMENT ____ OFFSET ____
STATION 13 OFFSET FROM CENTERLINE ____
INSPECTOR (SIGNED) Buddy Martin DRILLERS NAME/COMPANY Eric Benko / Eichelbergers
EQUIPMENT USED Diedrich D-50 track Rig
DRILLING METHODS Hollow stem Auger / split spoon sampling
CASING SIZE: 3¼ DEPTH: ____ WATER DEPTH: ____ TIME: ____ DATE: ____
CHECKED BY: ____ DATE: ____ DEPTH: ____ TIME: ____ DATE: ____
NOT ENCOUNTERED ☒

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT. ON SAMPLER	RECOVERY (FT)	RECOVERY % / RQD %	POCKET PENT/ TORVANE (TSF)	USCS	H_2O CONTENT	DESCRIPTION	REMARKS
2	S-1	6-9-13-18	1.7	85			D	very stiff, ~~dark~~ reddish brown (5YR 4/3) clayey SILT w/ trace gravel, noncohesive non plastic	
4	S-2	16-25-45-24	1.6	80			D	SAME AS ABWE - HARD gravel zone (3.7-4.0)	
6	S-3	7-10-16-19	1.4	70			D	SAME AS ABWE - very stiff mottled pale red (5R 6/2) at 5.2-6	
8	S-4	15-19-50/0.5	1.5	75			D	Hard reddish brown (5YR 4/3) and mottled pale red (5R 6/2) SILT slightly cohesive, nonplastic	
10	S-5	15-33-20-14	1.2	60			D	8-8.4 - SAME AS ABWE 8.4-10.3 - pale red (5R 6/2) SILT w/ trace gravel, hard, noncohesive, nonplastic	
12	S-6	11-12-14-17	1.4	70			D	10.3-12. - very stiff, reddish brown (5YR 4/3) clayey SILT w/ ~~trace~~ gravel zone (11.6-11.8) ⇒ pale red mottled, noncohesive nonplastic	
15	S-7	9-8-10-20	1.5	75			D	SAME AS ABWE - pale red mottled SILT increases w/ depth, very stiff	
								End of Boring - 15'	

NOTE DRAW STRATIFICATION LINES AT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES FOR THIS BORING LOCATION AND SHOW DEPTHS

ENGINEERS FIELD BORING LOG

BORING NO. ITB-14
SHEET 1 OF 1
DATE: START 9/10/13
END 9/18/13
O.G. ELEV

PROJECT NAME SGI Northern tract COUNTY Adams
SR SECT. SEGMENT OFFSET
STATION 14 OFFSET FROM CENTERLINE
INSPECTOR (SIGNED) Brittney Manta DRILLERS NAME/COMPANY Eric Benko/Eichelbergers
EQUIPMENT USED Diedrich D-50 track rig
DRILLING METHODS Hollow Stem Auger / split spoon Sampling
CASING SIZE: 4¼ DEPTH: WATER DEPTH: TIME: DATE:
CHECKED BY: DATE: DEPTH: TIME: DATE:
NOT ENCOUNTERED ☒

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT. ON SAMPLER	RECOVERY (FT)	RECOVERY % / RQD %	POCKET PENT/ TORVANE (TSF)	USCS	H_2O CONTENT	DESCRIPTION	REMARKS
2	S-1	7-11-11-21	1.2	60			D	Strong Brown (7.5YR 4/6) SILT w/ pale red (5R 6/2) gravel, noncohesive, non-plastic, very stiff	
4	S-2	20-20-40-21	1.5	75			D	Strong Brown (7.5YR 4/6) and pale red (5R 6/2) SILT w/ few gravel, some lamination, noncohesive, nonplastic, HARD	
6	S-3	12-16-24-28	1.2	60			D	HARD, pale red (5R 6/2) SILT w/ many gravel, noncohesive, non plastic,	
8	S-4	22-22-20-14	1.6	80			D	SAME AS ABOVE	
10	S-5	15-45-50-50	1.4	70			D	SAME AS ABOVE	
12	S-6	50/0.4	0.4	20			D	SAME AS ABOVE	
								Refusal @ 12.6'	
								gravel is medium to coarse sized	
								piezometer installed here	

NOTE: DRAW STRATIFICATION LINES AT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES FOR THIS BORING LOCATION AND SHOW DEPTHS

ENGINEERS FIELD BORING LOG

BORING NO. ETB-15
SHEET 1 OF 1
DATE: START 9/18/13
END 9/18/13
O.G. ELEV

PROJECT NAME SGI-northern tract COUNTY Adams
SR SECT. SEGMENT OFFSET
STATION 15 OFFSET FROM CENTERLINE
INSPECTOR (SIGNED) Bradley Martin DRILLERS NAME/COMPANY Eric Benko/Eichelbergers
EQUIPMENT USED Diedrich D-50 track Rig
DRILLING METHODS Hollow Stem Auger / Split spoon Sampling
CASING SIZE: 3.5" DEPTH: WATER DEPTH: TIME: DATE:
CHECKED BY: DATE: DEPTH: TIME: DATE:
NOT ENCOUNTERED ☒

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT. ON SAMPLER	RECOVERY (FT)	RECOVERY % / RQD %	POCKET PENT/ TORVANE (TSF)	USCS	H_2O CONTENT	DESCRIPTION	REMARKS
2	S-1	9-11-11-7	0.5	25			D	very stiff, broken up metatuyolite w/ very little strong brown (7.5YR 4/6) SILT noncohesive, nonplastic	
4	S-2	6-7-12-12	0.7	35			D	very stiff, Strong brown (7.5YR 4/6) SILT w/ few gravel, non plastic, noncohesive	
6	S-3	25-29-16-42	1.2	60			D	4.0-4.3 (SAME AS ABOVE) 4.3-6 - pale red (5R 6/2) SILT w/ many gravel hard, nonplastic, noncohesive	
8	S-4	24-50/0.0	0.5	25			D	SAME AS ABOVE	
10	S-5	8-12-13-12	1.1	55			D	very stiff, pale red (5R 6/2) and some strong brown (7.5YR 4/6) SILT, noncohesive, nonplastic	
12	S-6	14-21-21-50/.2	1.4	70			D	Hard, pale red (5R 6/2) SILT w/ many gravel, noncohesive, non plastic	
								Refusal @ 12.4' (metatuyolite) Gravel ranges from small to coarse	

NOTE: DRAW STRATIFICATION LINES AT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES FOR THIS BORING LOCATION AND SHOW DEPTHS

ENGINEERS FIELD BORING LOG

BORING NO. ITB-16
SHEET 1 OF 1
DATE: START 9-20-13
END 9-20-13
O.G. ELEV

PROJECT NAME SGI North Tract COUNTY Adams
SR SECT. SEGMENT OFFSET
STATION OFFSET FROM CENTERLINE
INSPECTOR (SIGNED) Bruce Skuban DRILLERS NAME/COMPANY Eric Benko / Eichelbergers
EQUIPMENT USED Diedrich D-50 Track Rig
DRILLING METHODS Hollow-Stem Auger / Split-Spoon Sampling
CASING SIZE: 3¼" DEPTH: WATER DEPTH: TIME: DATE:
CHECKED BY: DATE: DEPTH: TIME: DATE:
NOT ENCOUNTERED ☒

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT. ON SAMPLER	RECOVERY (FT)	RECOVERY % / RQD %	POCKET PEN./ TORVANE (TSF)	USCS	H_2O CONTENT	DESCRIPTION	REMARKS
1	S-1	3 5 7 10	1.7	85%			D	0.0-2.0: Stiff, yellowish brown (10YR 5/6), SILT, dry	
3	S-2	8 8 8 10	1.6	80%			D	2.0-4.4: Very stiff, yellowish brown (10YR 5/6), SILT, dry, trace coarse angular sand	
5	S-3	7 11 15 23	1.8	90%			D	4.4-15.0: Medium to very dense, light pink (5R 8/2), Silty GRAVEL, dry, small to large angular gravel, talay feel • increasing large gravel with depth	Saprolite (Phyllite?)
7	S-4	38 50/0.3	0.8	100%			D		
9	S-5	23 40 30 15	1.6	80%			D		
11	S-6	8 48 28 50	1.9	95%			D		
13	S-7	50/0.2	0.1	50%			D		• Strong chatter at 14.0', grinding • Augered to 15.0' bgs, install piezometer
15									

NOTE: DRAW STRATIFICATION LINES AT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES FOR THIS BORING LOCATION AND SHOW DEPTHS

ENGINEERS FIELD BORING LOG

BORING NO. ITB-17
SHEET 1 OF 1
DATE: START 9-20-13
END 9-20-13
O.G. ELEV

PROJECT NAME SGI North Tract COUNTY Adams
SR ____ SECT. ____ SEGMENT ____ OFFSET ____
STATION ____ OFFSET FROM CENTERLINE ____
INSPECTOR (SIGNED) Bruce Skuban DRILLERS NAME/COMPANY Eric Benko / Eichelbergers
EQUIPMENT USED Diedrich D-50 Track Rig
DRILLING METHODS Hollow-Stem Auger / Split-Spoon Sampling
CASING SIZE: 3 1/4" DEPTH: ____ WATER DEPTH: ____ TIME: ____ DATE: ____
CHECKED BY: ____ DATE: ____ DEPTH: ____ TIME: ____ DATE: ____
NOT ENCOUNTERED ☒

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT. ON SAMPLER	RECOVERY (FT)	RECOVERY % / RQD %	POCKET PENT/ TORVANE (TSF)	USCS	H_2O CONTENT	DESCRIPTION	REMARKS
1	S-1	4 4 11 30	1.2	60%			M	0.0-2.0: Stiff, yellowish brown (10YR 5/6), SILT, moist, little coarse sand, trace small angular gravel	
3	S-2	20 17 19 21	1.6	80%			D	2.0-4.5: Hard, strong brown (7.5YR 4/6), SILT with GRAVEL, dry, small to large angular grey gravel	
5	S-3	10 13 18 23	1.6	80%			D	4.5-6.0: Hard, light grey (5Y 7/1), clayey SILT, dry	- Saprolite - Collected bulk sample 2-10'
7	S-4	16 18 21 30	1.9	95%			M	6.0-10.0: Hard, light grey (5Y 7/1), SILT, moist, talcy feel	
9	S-5	13 25 36 45	1.8	90%			M		
11	S-6	25 27 50/0.3	1.3	100%			M	10.0-11.3: Hard, light grey (5Y 7/1) and strong brown (7.5YR 4/6), SILT, moist, mottled	
13	S-7	50/0.2	0.2	100%			D	13.0-13.2: Hard, light grey (5Y 7/1), SILT, dry, little coarse sand	- Augured down to 15.0' bgs
15									

NOTE: DRAW STRATIFICATION LINES AT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES FOR THIS BORING LOCATION AND SHOW DEPTHS

ENGINEERS FIELD BORING LOG

BORING NO. ITB-18
SHEET 1 OF 1
DATE: START 9-23-13
END
O.G. ELEV

PROJECT NAME SGI North Tract COUNTY Adams
SR SECT. SEGMENT OFFSET
STATION OFFSET FROM CENTERLINE
INSPECTOR (SIGNED) Bruce Skuban DRILLERS NAME/COMPANY Eric Benko / Eichelbergers
EQUIPMENT USED Diedrich D-50 Track Rig
DRILLING METHODS Hollow-Stem Auger / Split-Spoon Sampling
CASING SIZE: 3 1/4" DEPTH: WATER DEPTH: TIME: DATE:
CHECKED BY: DATE: DEPTH: TIME: DATE:
NOT ENCOUNTERED ☒

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT. ON SAMPLER	RECOVERY (FT)	RECOVERY % / RQD %	POCKET PENT/ TORVANE (TSF)	USCS	H_2O CONTENT	DESCRIPTION	REMARKS
1	S-1	3 4 8 10	1.5	75%			D	0.0-2.0: Stiff, yellowish brown (10YR 5/6), SILT, dry, trace coarse sand, small gravel	
3	S-2	14 17 21 29	1.6	80%			M M	2.0-3.0: Hard, strong brown (7.5YR 4/6), clayey SILT, moist, trace coarse sand, small gravel 3.0-4.3: Hard, light gray (5Y 7/1) and strong brown (7.5YR 4/6), SILT, moist, little small angular gravel and coarse sand	- Saprolite
5	S-3	8 10 12 17	1.8	90%			M	4.3-6.0: Very stiff, light pinkish gray, SILT, moist, noncohesive, talcy feel	
7	S-4	15 17 20 24	1.8	90%			D	6.0-10.0: Hard, pale red (5R 6/2), SILT, dry, visible laminations present, noncohesive, talcy feel	
9	S-5	7 13 20 27	1.5	75%			D		
11	S-6	20 23 28 46	2.0	100%			D	10.0-12.0: Hard, pale red (5R 6/2) and light gray (5Y 7/1), SILT, dry, visible vertical laminations, noncohesive, mottled, talcy feel	
13									
14	S-7	14 25 49 50/0.3	1.6	89%			M	13.0-15.0: Hard, pale red (5R 6/2), SILT, moist, noncohesive, talcy feel	• Augered down to 15' bgs, installed piezometer
15									

NOTE: DRAW STRATIFICATION LINES AT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES FOR THIS BORING LOCATION AND SHOW DEPTHS

ENGINEERS FIELD BORING LOG

BORING NO. ITB-19
SHEET 1 OF 1
DATE: START 9-23-13
END 9-23-13
O.G. ELEV

PROJECT NAME SGI North Tract COUNTY Adams
SR SECT. SEGMENT OFFSET
STATION OFFSET FROM CENTERLINE
INSPECTOR (SIGNED) Bruce Skuban DRILLERS NAME/COMPANY Eric Benko / Eichelbergers
EQUIPMENT USED Diedrich D-50 Track Rig
DRILLING METHODS Hollow-Stem Auger / Split-Spoon Sampling
CASING SIZE: 3 1/4" DEPTH: WATER DEPTH: TIME: DATE:
CHECKED BY: DATE: DEPTH: TIME: DATE:
NOT ENCOUNTERED ☒

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT. ON SAMPLER	RECOVERY (FT)	RECOVERY % / RQD %	POCKET PENT/ TORVANE (TSF)	USCS	H_2O CONTENT	DESCRIPTION	REMARKS
1	S-1	4 7 9 11	1.8	90%			M	0.0-2.0 Very Stiff, yellowish brown (10YR 5/6), SILT, moist, noncohesive, little coarse sand	
3	S-2	16 24 44 50/10.4	1.6	84%			M D	2.0-3.8: Hard, yellowish brown (10YR 5/6) and weak red (5R 4/3), SANDY SILT with GRAVEL, moist, noncohesive, small to large angular gravel, 3.8-6.0: Very dense, weak red (5R 4/3), SILTY SAND AND GRAVEL, dry, small to large angular gravel, fine to coarse sand, little to few brown silt	• Weathered meterhyolite • Weathered meterhyolite
5	S-3	27 37 40 45	1.8	90%			D		• Bulk sample 2-8' bgs
7	S-4	33 26 27 40	1.7	85%			M M	6.0-6.5: Hard, pale red (5R 6/2), SILT, moist, trace coarse sand and small angular gravel 6.5-8.0: Hard, pale red (5R 6/2) and weak red, SILT, moist, mottled, few yellowish brown silt	• Saprolite
9	S-5	13 15 21 30	1.6	80%			M	8.0-10.0: Hard, pale red (5R 6/2), SILT, moist, few yellowish brown silt	
11	S-6	21 21 24 50/10.4	1.7	89%			M	10.0-15.0: Hard, pale red (5R 6/2) and weak red (5R 4/3), SILT, moist, some yellowish brown silt, visible lamination present, weathered meterhyolite at bottom	• Slight grinding ~12-13' bgs
13									
14	S-7	13 15 45 50/10.3	1.7	94%			M		• Vertical lamination 13-15' bgs
15									

NOTE: DRAW STRATIFICATION LINES AT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES FOR THIS BORING LOCATION AND SHOW DEPTHS

ENGINEERS FIELD BORING LOG

BORING NO. ITB-20
SHEET 1 OF 1
DATE: START 9-24-13
END 9-24-13
O.G. ELEV

PROJECT NAME SGI North Tract COUNTY Adams
SR ____ SECT. ____ SEGMENT ____ OFFSET ____
STATION ____ OFFSET FROM CENTERLINE ____
INSPECTOR (SIGNED) Bruce Skuban DRILLERS NAME/COMPANY Eric Benko / Eichelbergers
EQUIPMENT USED Diedrich D-50 Track Rig
DRILLING METHODS Hollow-Stem Auger / Split-Spoon Sampling
CASING SIZE: 3 1/4" DEPTH: ____ WATER DEPTH: ____ TIME: ____ DATE: ____
CHECKED BY: ____ DATE: ____ DEPTH: ____ TIME: ____ DATE: ____
NOT ENCOUNTERED ☒

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT. ON SAMPLER	RECOVERY (FT)	RECOVERY % / RQD %	POCKET PENT/ TORVANE (TSF)	USCS	H_2O CONTENT	DESCRIPTION	REMARKS
1	S-1	3 5 5 12	1.1	55%			D	0.0-2.0: Stiff, lt. brownish gray (2.5Y 6/2), GRAVELY SILT WITH SAND, dry, small to large angular gravel	• Gravel is weathered metabasalt
2									• Chatter at 2' bgs
3	S-2	16 26 27 50/0.4	1.7	89%			D	2.0-4.8: Hard, lt. brownish gray (2.5Y 6/2), GRAVELY SILT WITH SAND, dry, small to large angular gravel.	• Some cobbles/boulders
4									• Grinding from 4.0-4.8'
	S-3	50/0.2	0.2	100%			D		• Auger refusal at 4.8' bgs
5									• Bulk sample collected 0-4.8', combined with ITB-20A 0-4.6'
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									

NOTE: DRAW STRATIFICATION LINES AT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES FOR THIS BORING LOCATION AND SHOW DEPTHS

ENGINEERS FIELD BORING LOG

BORING NO. ITB-20A
SHEET 1 OF 1
DATE: START 9-24-13
END 9-24-13
O.G. ELEV

PROJECT NAME SGI North Tract COUNTY Adams
SR ____ SECT. ____ SEGMENT ____ OFFSET ~5' west
STATION ____ OFFSET FROM CENTERLINE ____
INSPECTOR (SIGNED) Bruce Skuban DRILLERS NAME/COMPANY Eric Benko / Eichelbergers
EQUIPMENT USED Diedrich D-50 Track Rig
DRILLING METHODS Hollow-Stem Auger / Split-Spoon Sampling
CASING SIZE: 3 1/4" DEPTH: ____ WATER DEPTH: ____ TIME: ____ DATE: ____
CHECKED BY: ____ DATE: ____ DEPTH: ____ TIME: ____ DATE: ____
NOT ENCOUNTERED ☒

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT. ON SAMPLER	RECOVERY (FT)	RECOVERY % / RQD %	POCKET PENT/ TORVANE (TSF)	USCS	H_2O CONTENT	DESCRIPTION	REMARKS
1								• Offset ~ 5' west from ITB-20. Attempted to auger to 6' to resume sampling	• Chatter at 2' bgs
2									• Slight chatter at 4' bgs
3									• Auger refusal at 4.6'
4									
5									• Bulk sample combined with ITB-20
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									

NOTE: DRAW STRATIFICATION LINES AT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES FOR THIS BORING LOCATION AND SHOW DEPTHS

ENGINEERS FIELD BORING LOG

BORING NO. ITB-21
SHEET 1 OF 1
DATE: START 9-24-13
END 9-24-13
O.G. ELEV

PROJECT NAME SGI North Tract COUNTY Adams
SR ____ SECT. ____ SEGMENT ____ OFFSET ____
STATION ____ OFFSET FROM CENTERLINE ____
INSPECTOR (SIGNED) Bruce Skuban DRILLERS NAME/COMPANY Eric Benko / Eichelbergers
EQUIPMENT USED Diedrich D-50 Track Rig
DRILLING METHODS Hollow-Stem Auger / Split-Spoon Sampling
CASING SIZE: 3 1/4" DEPTH: ____ WATER DEPTH: ____ TIME: ____ DATE: ____
CHECKED BY: ____ DATE: ____ DEPTH: ____ TIME: ____ DATE: ____
NOT ENCOUNTERED ☒

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT. ON SAMPLER	RECOVERY (FT)	RECOVERY % / RQD %	POCKET PENT/ TORVANE (TSF)	USCS	H_2O CONTENT	DESCRIPTION	REMARKS
1	S-1	3 5 7 15	1.5	75%			D	0.0-2.0': Medium dense, pale brown (10YR 6/3), SILTY GRAVEL, dry, small to large angular gravel, little Fine to coarse Sand	• Gravel is weathered metabasalt
2									
3	S-2	20 20 32 42	1.8	90%			D	2.0-4.2: Hard, brown (10YR 5/3), SILT, dry, noncohesive, little small angular gravel and fine to coarse sand	• Slight clatter at 4.0' bgs
4									• Grinding 4.5-5.1' bgs
5	S-3	21 50/0.4	0.9	100%			D	4.2-5.1: Very dense, dark greyish green, SILTY SAND AND GRAVEL, dry, small to large angular gravel, fine to coarse sand; weathered metabasalt	Auger refusal at 5.1' bgs
6									Bulk sample collected 0-5.1'
7									
8									
9									
10									
11									
12									
13									
14									
15									

NOTE DRAW STRATIFICATION LINES AT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES FOR THIS BORING LOCATION AND SHOW DEPTHS

ENGINEERS FIELD BORING LOG

BORING NO. ITB-21A
SHEET 1 OF 1
DATE: START 9-24-13
END 9-24-13
O.G. ELEV

PROJECT NAME SGI North Tract COUNTY Adams
SR ____ SECT. ____ SEGMENT ____ OFFSET ~5' east
STATION ____ OFFSET FROM CENTERLINE ____
INSPECTOR (SIGNED) Bruce Skuban DRILLERS NAME/COMPANY Eric Benko / Eichelbergers
EQUIPMENT USED Diedrich D-50 Track Rig
DRILLING METHODS Hollow-Stem Auger / Split-Spoon Sampling
CASING SIZE: 3 1/4" DEPTH: ____ WATER DEPTH: ____ TIME: ____ DATE: ____
CHECKED BY: ____ DATE: ____ DEPTH: ____ TIME: ____ DATE: ____
NOT ENCOUNTERED ☒

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT. ON SAMPLER	RECOVERY (FT)	RECOVERY % / RQD %	POCKET PENT/ TORVANE (TSF)	USCS	H_2O CONTENT	DESCRIPTION	REMARKS
1								• Offset ~5' east from ITB-21. Attempted to auger to 6' to resume sampling	
2									• Chatter at 2.5' bgs to 3.5' bgs
3									
4									
5									
6								6.0-6.4': Hard, brown (10YR 5/3) and lt brownish gray (2.5Y 6/2), SILT, moist, noncohesive, mottled, trace coarse sand	
7	S-1	13 21 25 50/0.2	1.5	88%			M D	6.4-7.8': Very dense, dark greyish green, SILTY SAND AND GRAVEL, dry, small to large angular gravel, fine to coarse sand, weathered metabasalt	• Grinding at 7.5' bgs • Auger refusal at 7.8' bgs
8									
9									
10									
11									
12									
13									
14									
15									

NOTE: DRAW STRATIFICATION LINES AT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES FOR THIS BORING LOCATION AND SHOW DEPTHS

ENGINEERS FIELD BORING LOG

BORING NO. ITB-22
SHEET 1 OF 1
DATE: START 9/25/13
END 9/25/13
O.G. ELEV

PROJECT NAME SGI Northern Tract COUNTY Adams
SR ____ SECT. ____ SEGMENT ____ OFFSET ____
STATION 22 OFFSET FROM CENTERLINE ____
INSPECTOR (SIGNED) Buttrey Martz DRILLERS NAME/COMPANY Eric Benko/Eichelbergers
EQUIPMENT USED Diedrich D-150 track rig
DRILLING METHODS Hollow Stem auger 3¼
CASING SIZE: 3¼ DEPTH: ____ WATER DEPTH: ____ TIME: ____ DATE: ____
CHECKED BY: ____ DATE: ____ DEPTH: ____ TIME: ____ DATE: ____
NOT ENCOUNTERED ☒

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT. ON SAMPLER	RECOVERY (FT)	RECOVERY % / RQD %	POCKET PENT/ TORVANE (TSF)	USCS	H_2O CONTENT	DESCRIPTION	REMARKS
2	S-1	7-8-14-18	0.9	45			D	Reddish Brown (5YR 4/3) clayey SILT w/ green Metabasalt gravel noncohesive, nonplastic very stiff	
4	S-2	15-50/.3	0.7	35			D	SAA – SILT w/... HARD	
6	S-3	18-26-50/.2	1.0	50			D	Highly weathered Metabasalt w/ very little reddish brown (5YR 4/3) SILT noncohesive, non plastic, HARD	
8	S-4	50/0.4	0.3	15			D	SAA / NO SILT HARD	grinding good at 6'
10								Auger Refusal 6.5' Offset 5' to North Auger Refusal at 3.8'	

NOTE: DRAW STRATIFICATION LINES AT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES FOR THIS BORING LOCATION AND SHOW DEPTHS

ENGINEERS FIELD BORING LOG

BORING NO. ITB - 23
SHEET 1 OF 1
DATE: START 9/25/13
END 9/25/13
O.G. ELEV

PROJECT NAME SGI - northern tract COUNTY Adams
SR SECT. SEGMENT OFFSET
STATION 2+24 23 OFFSET FROM CENTERLINE
INSPECTOR (SIGNED) Brittany Maste DRILLERS NAME/COMPANY Eric Benko / Eichleybergers
EQUIPMENT USED Diedrich D-150 track rig
DRILLING METHODS Hollow Stem Auger
CASING SIZE: 3 1/4 DEPTH: WATER DEPTH: TIME: DATE:
CHECKED BY: DATE: DEPTH: TIME: DATE:
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT. ON SAMPLER	RECOVERY (FT)	RECOVERY % / RQD %	POCKET PENT/ TORVANE (TSF)	USCS	H_2O CONTENT	DESCRIPTION	REMARKS
								STIFF	
2	S-1	3-6-7-10	1.2	60			D.	Reddish Brown 5YR 4/4 very weathered metabasalt, crumbles in hand, noncohesive, nonplastic	Silt w/
4	S-2	24-4a 50/.4	1.1	55			D	SAA - Slight increase in green color and little gravel HARD	
6	S-3	50/.1	0.1	5			D	~~No Sample~~ (BH) SAA	Auger grinding
8	S-4	12-50/.1	0.2	10			D	SAA	
								Auger refusal at 6.6' off-set refusal 6.5'	

NOTE: DRAW STRATIFICATION LINES AT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES FOR THIS BORING LOCATION AND SHOW DEPTHS

ENGINEERS FIELD BORING LOG

BORING NO. ITB-24
SHEET 1 OF 1
DATE: START 9/20/13
END 9/26/13
O.G. ELEV

PROJECT NAME SGI - Northern tract COUNTY Adams
SR SECT. SEGMENT OFFSET
STATION 24 OFFSET FROM CENTERLINE
INSPECTOR (SIGNED) Brittny Mantz DRILLERS NAME/COMPANY Eric Benko / Eichelbergers
EQUIPMENT USED Diedrich D-150 track Rig
DRILLING METHODS Hollow stem Auger
CASING SIZE: 3.25 DEPTH: WATER DEPTH: TIME: DATE:
CHECKED BY: DATE: DEPTH: TIME: DATE:
NOT ENCOUNTERED ☒

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT. ON SAMPLER	RECOVERY (FT)	RECOVERY % / RQD %	POCKET PENT/ TORVANE (TSF)	USCS	H_2O CONTENT	DESCRIPTION	REMARKS
2	S-1	2-3-7-11	0.9	45			D	Brownish red (5Y 4/4) SILT w/ highly weathered metabasalt - crumbled noncohesive, nonplastic, stiff	
4	S-2	17-29-30-50/6	0.9	45			D	layered metabasalt weathered noncohesive, nonplastic, Reddish and (5Y 5/2) olive gray	crumbles w/ SILT brown (5Y 4/4) HARD
6	S-3	26-25-43-50*	2.0	100			D	SAA - very little gravel HARD	
8	S-4	50/.4	6.4	20			D	SAA - Harder at the HARD	
10	S-5	50/.2	0.2	10			D	SAA HARD	
								9.5 - Auger refusal 5'-screen 6.5'-riser	
								Bulk collected 0-6	

NOTE: DRAW STRATIFICATION LINES AT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES FOR THIS BORING LOCATION AND SHOW DEPTHS

ENGINEERS FIELD BORING LOG

BORING NO. ITB-25
SHEET 1 OF 1
DATE: START 9/26/13
END 9/26/13
O.G. ELEV

PROJECT NAME SLI Northern tract COUNTY Adams
SR SECT. SEGMENT OFFSET
STATION 25 OFFSET FROM CENTERLINE
INSPECTOR (SIGNED) Bradley Hartz DRILLERS NAME/COMPANY Eric Benko / Eichelbergers
EQUIPMENT USED Diedrich D-150 track rig
DRILLING METHODS Hollow-stem auger
CASING SIZE: 3 1/4 DEPTH: WATER DEPTH: TIME: DATE:
CHECKED BY: DATE: DEPTH: TIME: DATE:
NOT ENCOUNTERED ☒

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT. ON SAMPLER	RECOVERY (FT)	RECOVERY % / RQD %	POCKET PENT/ TORVANE (TSF)	USCS	H_2O CONTENT	DESCRIPTION	REMARKS
2	S-1	4-5-6-5	0.9	45			D	Brown (7.5YR 5/4) SILT w/ couple gravel pieces low noncohesive, ~~NON~~plastic	, STIFF
4	S-2	12-17-28-50	1.5	75			D	SAA - HARD	
6	S-3	22-38 50/.3	1.0	80			D	SAA w/ green metabasalt fragment zone from 5.3-5.6 HARD	
8	S-4	50/.3	0.3	15			D	SAA - no fragment zone HARD	
10									
								Auger refusal 6.6'	
								Slight grinding @ 2.5'	
								Bulk collected 0-6.6	

NOTE: DRAW STRATIFICATION LINES AT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES FOR THIS BORING LOCATION AND SHOW DEPTHS

ENGINEERS FIELD BORING LOG

BORING NO. FTB-26
SHEET 1 OF 1
DATE: START 9/26/13
END
O.G. ELEV

PROJECT NAME SGI - Northern tract COUNTY Adams
SR SECT. SEGMENT OFFSET
STATION 26 OFFSET FROM CENTERLINE
INSPECTOR (SIGNED) Bentley Marks DRILLERS NAME/COMPANY Eric Benko/Eichelbergers
EQUIPMENT USED Diedrich D-150 track Rig
DRILLING METHODS Hollw Stem Auger
CASING SIZE: 3¼ DEPTH: WATER DEPTH: TIME: DATE:
CHECKED BY: DATE: DEPTH: TIME: DATE:
NOT ENCOUNTERED ☒

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT. ON SAMPLER	RECOVERY (FT)	RECOVERY % / RQD %	POCKET PENT/ TORVANE (TSF)	USCS	H_2O CONTENT	DESCRIPTION	REMARKS
2	S-1	4-5-7-8	0.8	40			D	Brown (7.5 YR 5/4) SILT w/ slightly cohesive (4mm balls) stiff	gravel low plasticity
4	S-2	12-15-22-44	1.2	60			D	SAA - Gravel zone Harder Hard	3.8-4.0
6	S-3	41-50-50/0.3	1.1	55			D	Brown (7.5 YR 5/4) SILT + olive gray (5Y 5/2) SILT w/ gravel, noncohesive, nonplastic HARD Gravel zone 5.4-5.7 (MB)	
8	S-4	41-41-50/1.4	1.4	70			D	SAA (6.0-6.2) → Highly weathered layered metabasalt (6.2-7.4) → BACK to SAA HARD	
10	S-5	15-16-10-12	1.4	70			D	SAA - Brown + olive gray SILT w/ gravel very stiff	
12	S-6	14-15-38-50/.3	1.8	80			D	SAA Gravel Zone 10.6-10.9 / Quartz	
								Refusal at 12.0 feet 8' screen, 6" # 6' riser	

NOTE: DRAW STRATIFICATION LINES AT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES FOR THIS BORING LOCATION AND SHOW DEPTHS

ENGINEERS FIELD BORING LOG

BORING NO. FTB-27
SHEET 1 OF 1
DATE: START 9/27/13
END 9/27/13
O.G. ELEV

PROJECT NAME SGL Northern Tract COUNTY Adams
SR ____ SECT. ____ SEGMENT ____ OFFSET ____
STATION 27 OFFSET FROM CENTERLINE ____
INSPECTOR (SIGNED) Bobby Marta DRILLERS NAME/COMPANY Eric Benko / Eichelbergers
EQUIPMENT USED Diedrich D-150 track Rig
DRILLING METHODS Hollow Stem Auger
CASING SIZE: 3 1/4 DEPTH: ____ WATER DEPTH: ____ TIME: ____ DATE: ____
CHECKED BY: ____ DATE: ____ DEPTH: ____ TIME: ____ DATE: ____
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT. ON SAMPLER	RECOVERY (FT)	RECOVERY % / RQD %	POCKET PENT/ TORVANE (TSF)	USCS	H_2O CONTENT	DESCRIPTION	REMARKS
2	S-1	6-5-13-17	0.9	45			D	Brown SILT w/ gravel (7.5YR 4/4) 1.5-1.8 Metabasalt gravel Very stiff, noncohesive, nonplastic	
4	S-2	20-26-34-36	1.9	95			D	Brown silt grades into, Brown SILT w/ gravel + olive gray SILT w/ gravel (few) HARD, NC, NP	
6	S-3	15-23-25-34	1.7	85			D	SAA Hard ~~quartz - 4.2-4.4, metabasalt 5.7-5.8~~	
8	S-4	37-31-36-34	1.8	90			D	SAA Hard quartz 6.2-6.4 metabasalt @ 7.7-7.8	
10	S-5	41-50/4	0.6	30			D	SAA → Hard (5Y 6/1) 9-10 - Metabasalt ~~olive~~ gray no structure	
12	S-6	50/0.1	0.1	5			D	~~ground up~~ ~~olive~~ gray SILT w/ little gravel, NC, NP, Hard	
14	S-7	50/0.1	0.1	5			D	SAA	
								Auger refusal 12.1' very hard - probably competent BR	

NOTE: DRAW STRATIFICATION LINES AT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES FOR THIS BORING LOCATION AND SHOW DEPTHS

ENGINEERS FIELD BORING LOG

BORING NO. ITB-28
SHEET 1 OF 1
DATE: START 9/27/13
END 9/27/13
O.G. ELEV

PROJECT NAME SGI - Northern Tract COUNTY Adams
SR SECT. SEGMENT OFFSET
STATION 28 OFFSET FROM CENTERLINE
INSPECTOR (SIGNED) Bradley Mortz DRILLERS NAME/COMPANY Eric Benko / Eichelbergers
EQUIPMENT USED Diedrich D-150 track Rig
DRILLING METHODS Hollow stem Auger
CASING SIZE: 3¼ DEPTH: WATER DEPTH: TIME: DATE:
CHECKED BY: DATE: DEPTH: TIME: DATE:
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT. ON SAMPLER	RECOVERY (FT)	RECOVERY % / RQD %	POCKET PENT/ TORVANE (TSF)	USCS	H_2O CONTENT	DESCRIPTION	REMARKS
2	S-1	5-10-17-20	1.4	70			D	Brown (7.5YR 5/4) SILT & small amounts of olive gray (5Y 5/2) SILT w/ gravel Ha very stiff, NC, NP	
4	S-2	29-48-50.4	1.1	55			D	SAA → 3.7-4.0 - Metabasalt	
6	S-3	46-50/.2	0.6	30			D	SAA - small pieces of quartz	
8	S-4	15-17-20-41	1.9	95			D	SAA - Increase in the olive gray SILT w/ gravel @ ±0.6.7 - 7.6-8.0 - metabasalt gravel (grinding)	
10	S-5	12-27-50/0	0.8	40			D	Brown (10YR 4/3) SILT w/ few gravel NC, NP, HARD	
								Auger Refusal @ 9.0' NO PZ	

NOTE: DRAW STRATIFICATION LINES AT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES FOR THIS BORING LOCATION AND SHOW DEPTHS

ENGINEERS FIELD BORING LOG

BORING NO. ITB-29
SHEET 1 OF 1
DATE: START 9/30/13
END 9/30/13
O.G. ELEV

PROJECT NAME SR 17 - Northern tract COUNTY Adams
SR SECT. SEGMENT OFFSET
STATION 29 OFFSET FROM CENTERLINE
INSPECTOR (SIGNED) Brady Mentz DRILLERS NAME/COMPANY Eric Benko / Eichelbergers
EQUIPMENT USED Diedrich D-150 track rig
DRILLING METHODS HSA
CASING SIZE: 3 1/4 DEPTH: WATER DEPTH: TIME: DATE:
CHECKED BY: DATE: DEPTH: TIME: DATE:
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT. ON SAMPLER	RECOVERY (FT)	RECOVERY % / ROD %	POCKET PENT/ TORVANE (TSF)	USCS	H_2O CONTENT	DESCRIPTION	REMARKS
0	S-1	3-6-9-23	0.9	45			D	dark yellowish Brown 10YR 4/6, (0-0.7) 0.7-0.9 (tree root). 0.9-2.0 olive gray 5Y 4/2 SILT w/ MB gravel, NC, NP, stiff	
2	S-2	18-28-13-11	0.9	45				Hard Brown & olive gray SILT w/ grave few 2.5-3.0 - metabasalt layered NC, NP, HARD	
4	S-3	11-15-32-41	1.5	75				SAA	
6	S-4	39-38-50/.4	1.5	75				SAA	
8	S-5	50/.2	0.2	10				SAA - NO Brown SILT	w/ gravel
10								Auger Refusal 9.1' bgs	
								Brown - 7.5YR 5/4	

NOTE: DRAW STRATIFICATION LINES AT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES FOR THIS BORING LOCATION AND SHOW DEPTHS

ENGINEERS FIELD BORING LOG

BORING NO. ITB-30
SHEET 1 OF 1
DATE: START 9/30/13
END
O.G. ELEV

PROJECT NAME SGI - Northern Tract COUNTY Adams
SR SECT. SEGMENT OFFSET
STATION 30 OFFSET FROM CENTERLINE
INSPECTOR (SIGNED) Buckey Mata DRILLERS NAME/COMPANY EricBenKo/Eichelbergers
EQUIPMENT USED Diedrich D-150 trucking
DRILLING METHODS HSA
CASING SIZE: 3 1/4 DEPTH: WATER DEPTH: TIME: DATE:
CHECKED BY: DATE: DEPTH: TIME: DATE:
NOT ENCOUNTERED ☐

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT. ON SAMPLER	RECOVERY (FT)	RECOVERY % / RQD %	POCKET PENT/ TORVANE (TSF)	USCS	H_2O CONTENT	DESCRIPTION	REMARKS
2	S-1	13-50/0.0	0.2	10			D	Brown (7.5YR 5/4) SILT w/ little gravel HARD, noncohesive, nonplastic	
4	S-2	15-16-12-18	1.7	85			D	SAA grades into reddish Brown (7.5YR 4/3) SILT w/ very little gravel + some fine sand noncohesive, nonplastic, very stiff	
6	S-3	12-17-19-40	1.5	75			D	SAA - Hard	
8	S-4	28-31-40-54.4	1.9	95			D	SAA, no gravel starting at ~ 6.6'	
10	S-5	10-14-24-50	1.8	90			D	SAA	
12	S-6	40-48 50/.4	1.3	65			D	SAA	
13									
15	S-7	50/.3	0.3	15			D	SAA - gravel at base and in tip	
								15' EOB Set PZ here 10' - screen 7' riser 12' Sand	

NOTE: DRAW STRATIFICATION LINES AT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES FOR THIS BORING LOCATION AND SHOW DEPTHS

ENGINEERS FIELD BORING LOG

BORING NO. ITB-31
SHEET 1 OF 1
DATE: START 10-1-13
END 10-1-13
O.G. ELEV

PROJECT NAME SGI North Tract COUNTY Adams
SR ____ SECT. ____ SEGMENT ____ OFFSET ____
STATION ____ OFFSET FROM CENTERLINE ____
INSPECTOR (SIGNED) Bruce Skuban DRILLERS NAME/COMPANY Eric Benko / Eichelbergers
EQUIPMENT USED Diedrich D-50 Track Rig
DRILLING METHODS Hollow-Stem Auger / Split-Spoon Sampling
CASING SIZE: 3 1/4" DEPTH: ____ WATER DEPTH: ____ TIME: ____ DATE: ____
CHECKED BY: ____ DATE: ____ DEPTH: ____ TIME: ____ DATE: ____
NOT ENCOUNTERED ☒

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT. ON SAMPLER	RECOVERY (FT)	RECOVERY % / RQD %	POCKET PENT/ TORVANE (TSF)	USCS	H_2O CONTENT	DESCRIPTION	REMARKS
1	S-1	1 5 50/0.0	0.9	90%			M	0.0-1.0: Medium, brown (7.5YR 4/4), SILT, moist, few small to large angular gravel, noncohesive 1.0-2.0: Boulder (metabasalt)	
2	–	–	–	–	–	–	–		
3	S-2	17 28 50/0.4	1.2	86%			M D	2.0-2.5: Very stiff to hard, reddish brown (5YR 4/4) with greenish grey matrix, SANDY SILT WITH GRAVEL, moist, coarse sand, small angular gravel, noncohesive 2.5-4.0: Very dense, dk. greyish green, SILTY GRAVEL, dry, small to large angular gravel; weathered metabasalt	• Gravel is metabasalt
4	–	–	–	–	–	–	–		
5	S-3	28 21 24 28	2.0	100%			D	4.0-5.1: Hard, brown, (10YR 5/3), SILT WITH GRAVEL, dry, small to large angular gravel; weathered metabasalt. 5.1-6.0: Hard, brown (10YR 5/3), SILT, dry, trace coarse sand, noncohesive	
6								6.0-6.8: Hard, brown (10YR 5/3) and yellowish red (5YR 4/6), SILT, dry, noncohesive, little coarse sand	
7	S-4	31 50/0.3	0.8	100%			D	6.8-8.0: SILT and Boulders/Cobbles	• Grinding 7.0-8.0'
8	–	–	–	–	–	–	–	8.0-8.6: Very dense, dk. greyish green, SILTY GRAVEL, dry, small to large angular gravel; weathered metabasalt	• Grinding 8.6-8.8'
9	S-5	24 50/0.1	0.6	100%			D		Auger refusal @ 8.8' bgs
10									Bulk sample collected 0.0-8.0' bgs
11									
12									
13									
14									
15									

NOTE: DRAW STRATIFICATION LINES AT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES FOR THIS BORING LOCATION AND SHOW DEPTHS

ENGINEERS FIELD BORING LOG

BORING NO. ITB-32
SHEET 1 OF 1
DATE: START 10-1-13
END 10-1-13
O.G. ELEV

PROJECT NAME SGI North Tract COUNTY Adams
SR ____ SECT. ____ SEGMENT ____ OFFSET ____
STATION ____ OFFSET FROM CENTERLINE ____
INSPECTOR (SIGNED) Bruce Skuban DRILLERS NAME/COMPANY Eric Benko / Eichelbergers
EQUIPMENT USED Diedrich D-50 Track Rig
DRILLING METHODS Hollow-Stem Auger / Split-Spoon Sampling
CASING SIZE: 3 1/4" DEPTH: ____ WATER DEPTH: ____ TIME: ____ DATE: ____
CHECKED BY: ____ DATE: ____ DEPTH: ____ TIME: ____ DATE: ____
NOT ENCOUNTERED ☒

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT. ON SAMPLER	RECOVERY (FT)	RECOVERY % / RQD %	POCKET PENT/ TORVANE (TSF)	USCS	H_2O CONTENT	DESCRIPTION	REMARKS
1	S-1	6 8 15 40	1.6	80%			D	0.0-2.0: Very stiff, brown (7.5YR 4/4), SILT with GRAVEL, dry, non-cohesive, little small to large angular gravel	
2	S-2	50/0.5	0.3	60%			D	2.0-2.3: Very dense, lt. brownish grey (10YR 6/2), SILTY SAND WITH GRAVEL, dry, some boulders/cobbles of metabasalt	• Chatter @ 2.5' bgs
3	—	—	—	—	—	—	—		
4								4.0-4.7: Very dense, yellowish brown (10YR 5/4), SILTY GRAVEL, dry, small to large angular gravel	
5	S-3	19 33 50 50/0.2	1.7	100%			D	4.7-6.4: Very dense, lt. brownish grey (10YR 6/2), SILTY SAND AND GRAVEL, dry, fine to coarse sand, small to large angular gravel	
6	S-4	50/0.1	0.1	100%			D		• Grinding 5.0-6.4' Auger refusal at 6.4' bgs
7									Bulk sample collected 0.0-6.0' bss
8									
9									
10									
11									
12									
13									
14									
15									

NOTE: DRAW STRATIFICATION LINES AT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES FOR THIS BORING LOCATION AND SHOW DEPTHS

ENGINEERS FIELD BORING LOG

BORING NO. ITB-33
SHEET 1 OF 1
DATE: START 10-1-13
END 10-1-13
O.G. ELEV

PROJECT NAME SGI North Tract COUNTY Adams
SR ____ SECT. ____ SEGMENT ____ OFFSET ____
STATION ____ OFFSET FROM CENTERLINE ____
INSPECTOR (SIGNED) Bruce Skuban DRILLERS NAME/COMPANY Eric Benko / Eichelbergers
EQUIPMENT USED Diedrich D-50 Track Rig
DRILLING METHODS Hollow-Stem Auger / Split-Spoon Sampling
CASING SIZE: 3 1/4" DEPTH: ____ WATER DEPTH: ____ TIME: ____ DATE: ____
CHECKED BY: ____ DATE: ____ DEPTH: ____ TIME: ____ DATE: ____
NOT ENCOUNTERED ☒

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT. ON SAMPLER	RECOVERY (FT)	RECOVERY % / RQD %	POCKET PENT/ TORVANE (TSF)	USCS	H_2O CONTENT	DESCRIPTION	REMARKS
1	S-1	4 5 5 6	1.0	50%			D	0.0-2.0: Loose, grayish brown (2.5Y 5/2), silty SAND and GRAVEL, dry, Fine to coarse sand, little small to large angular gravel	
3	S-2	10 16 36 38	1.7	85%			D	2.0-4.0: Very dense, brown (7.5YR 4/4) and grayish green (5GY 5/2), silty SAND and GRAVEL, dry, Fine to coarse sand, some small to large angular gravel (some cobbles/boulders)	• Chatter 3-4' bgs • cobbles boulders of weathered metabasalt
5	S-3	12 13 13 22	1.7	85%			D	4.0-6.0: Medium dense, brown (7.5YR 4/4) and grayish green (5GY 5/2), silty SAND and GRAVEL, dry, Fine to coarse sand, some small to large angular gravel	
7	S-4	19 50/0.5	1.0	100%			D	6.0-7.0: Hard, yellowish brown (10YR 5/4), gravelly SILT with SAND, dry, Fine to coarse sand, small to large greyish green angular metabasalt gravel - cobbles/boulders	•Chatter 6.5-7.0'
8	S-5	50/0.4	0.4	100%			D	8.0-8.4' Hard, olive gray (5Y 5/2), SILT with GRAVEL, dry, Fine to coarse sand, small angular gravel	Auger refusal at 8.8' bgs
9									Bulk sample collected 0.0-6.5' bgs
10									
11									
12									
13									
14									
15									

NOTE: DRAW STRATIFICATION LINES AT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES FOR THIS BORING LOCATION AND SHOW DEPTHS

ENGINEERS FIELD BORING LOG

BORING NO. ITB-34
SHEET 1 OF 1
DATE: START 10-2-13
END 10-2-13
O.G. ELEV

PROJECT NAME SGI North Tract COUNTY Adams
SR ____ SECT. ____ SEGMENT ____ OFFSET ____
STATION ____ OFFSET FROM CENTERLINE ____
INSPECTOR (SIGNED) Bruce Skuban DRILLERS NAME/COMPANY Eric Benko / Eichelbergers
EQUIPMENT USED Diedrich D-50 Track Rig
DRILLING METHODS Hollow-Stem Auger / Split-Spoon Sampling
CASING SIZE: 3 1/4" DEPTH: ____ WATER DEPTH: ____ TIME: ____ DATE: ____
CHECKED BY: ____ DATE: ____ DEPTH: ____ TIME: ____ DATE: ____
NOT ENCOUNTERED ☒

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT. ON SAMPLER	RECOVERY (FT)	RECOVERY % / RQD %	POCKET PENT/ TORVANE (TSF)	USCS	H_2O CONTENT	DESCRIPTION	REMARKS
1	S-1	5 17 50/0.3	0.9	69%			D	0.0-1.3: Very dense, light greyish olive (10Y 6/2), silty SAND with GRAVEL, dry, Fine to coarse sand, small to large angular metabasalt gravel • rock in bottom of spoon	
2									Auger refusal at 2.0' bgs
3								• Due to refusal, offset 5.0' north and completed ITB-34A	
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									

NOTE: DRAW STRATIFICATION LINES AT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES FOR THIS BORING LOCATION AND SHOW DEPTHS

ENGINEERS FIELD BORING LOG

BORING NO. ITB-34A
SHEET 1 OF 1
DATE: START 10-2-13
END 10-2-13
O.G. ELEV

PROJECT NAME SGI North Tract COUNTY Adams
SR SECT. SEGMENT OFFSET
STATION OFFSET FROM CENTERLINE
INSPECTOR (SIGNED) Bruce Skuban DRILLERS NAME/COMPANY Eric Benko / Eichelbergers
EQUIPMENT USED Diedrich D-50 Track Rig
DRILLING METHODS Hollow-Stem Auger / Split-Spoon Sampling
CASING SIZE: 3 1/4" DEPTH: WATER DEPTH: TIME: DATE:
CHECKED BY: DATE: DEPTH: TIME: DATE:
NOT ENCOUNTERED [X]

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT. ON SAMPLER	RECOVERY (FT)	RECOVERY % / RQD %	POCKET PENT/ TORVANE (TSF)	USCS	H_2O CONTENT	DESCRIPTION	REMARKS
1								0.0-4.0: Very dense, light grayish olive (10Y6/2), Silty SAND with GRAVEL, dry, Fine to coarse sand, small to large angular metabasalt gravel	• Cobbles/boulders throughout
2	S-1	50/0.4	0.4	100%			D		
3									
4									
5	S-2	4 8 11 22	2.0	100%			D	4.0-5.7: Stiff, yellowish brown (10YR 5/6), SILT, dry, non cohesive, little fine to coarse sand, small gravel 5.7-6.9: Very dense, light grayish olive (10Y 6/2), Silty SAND with GRAVEL, dry, Fine to coarse sand, small to large angular metabasalt gravel	
6									
7	S-3	40 50/0.4	0.6	67%			D		• Grinding 8.2-9.0'
8	S-4	50/0.4	0.4	100%			D	8.0-8.4: Hard, grayish green (5GY 5/2), Sandy SILT, dry, little small gravel (weathered metabasalt)	Auger refusal at 9.0'
9									
10									• Bulk sample collected 0.0-8.0'
11									• Installed piezometer down to 9.0' bgs with 5.0' screen
12									
13									
14									
15									

NOTE: DRAW STRATIFICATION LINES AT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES FOR THIS BORING LOCATION AND SHOW DEPTHS

ENGINEERS FIELD BORING LOG

BORING NO. ITB-35
SHEET 1 OF 1
DATE: START 10-2-13
END 10-2-13
O.G. ELEV

PROJECT NAME SGI North Tract COUNTY Adams
SR ____ SECT. ____ SEGMENT ____ OFFSET ____
STATION ____ OFFSET FROM CENTERLINE ____
INSPECTOR (SIGNED) Bruce Skuban DRILLERS NAME/COMPANY Eric Benko / Eichelbergers
EQUIPMENT USED Diedrich D-50 Track Rig
DRILLING METHODS Hollow-Stem Auger / Split-Spoon Sampling
CASING SIZE: 3 1/4" DEPTH: ____ WATER DEPTH: ____ TIME: ____ DATE: ____
CHECKED BY: ____ DATE: ____ DEPTH: ____ TIME: ____ DATE: ____
NOT ENCOUNTERED ☒

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT. ON SAMPLER	RECOVERY (FT)	RECOVERY % / RQD %	POCKET PENT/ TORVANE (TSF)	USCS	H_2O CONTENT	DESCRIPTION	REMARKS
0									
1	S-1	3 6 7 11	1.7	85%			D	0.0-2.0: Stiff, yellowish brown (10YR 5/6), SILT, dry, noncohesive, little small gravel, fine to coarse sand	
2									
3	S-2	12 12 15 20	1.5	75%			D	2.0-4.2: Very stiff, strong brown (7.5YR 4/6), clayey SILT, noncohesive, few fine to coarse sand and small angular gravel, dry	
4									
	S-3	50/0.4	0.4	100%			D	4.2-4.4: Very dense, grayish green (5GY 5/2), silty GRAVEL, dry, small to large angular gravel (weathered metabasalt)	• Grinding 4.5-5.6'
5									Auger refusal at 5.6'
6								• Due to refusal, offset 5.0' north and attempted ITB-35A	• Bulk sample collected 0.0-5.6'
7									
8									
9									
10									
11									
12									
13									
14									
15									

NOTE: DRAW STRATIFICATION LINES AT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES FOR THIS BORING LOCATION AND SHOW DEPTHS

ENGINEERS FIELD BORING LOG

BORING NO. ITB-35A
SHEET 1 OF 1
DATE: START 10-3-13
END 10-3-13
O.G. ELEV

PROJECT NAME SGI North Tract COUNTY Adams
SR ____ SECT. ____ SEGMENT ____ OFFSET ____
STATION ____ OFFSET FROM CENTERLINE ____
INSPECTOR (SIGNED) Bruce Skuban DRILLERS NAME/COMPANY Eric Benko / Eichelbergers
EQUIPMENT USED Diedrich D-50 Track Rig
DRILLING METHODS Hollow-Stem Auger / Split-Spoon Sampling
CASING SIZE: 3 1/4" DEPTH: ____ WATER DEPTH: ____ TIME: ____ DATE: ____
CHECKED BY: ____ DATE: ____ DEPTH: ____ TIME: ____ DATE: ____
NOT ENCOUNTERED ☒

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT. ON SAMPLER	RECOVERY (FT)	RECOVERY % / RQD %	POCKET PENT/ TORVANE (TSF)	USCS	H_2O CONTENT	DESCRIPTION	REMARKS
0									
1									
2									
3									
4									Auger refusal at 4.9'
5									No samples collected
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									

NOTE: DRAW STRATIFICATION LINES AT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES FOR THIS BORING LOCATION AND SHOW DEPTHS

ENGINEERS FIELD BORING LOG

BORING NO. ITB-36
SHEET 1 OF 1
DATE: START 10-3-13
END 10-3-13
O.G. ELEV

PROJECT NAME SGI North Tract COUNTY Adams
SR ____ SECT. ____ SEGMENT ____ OFFSET ____
STATION ____ OFFSET FROM CENTERLINE ____
INSPECTOR (SIGNED) Bruce Skuban DRILLERS NAME/COMPANY Eric Benko / Eichelbergers
EQUIPMENT USED Diedrich D-50 Track Rig
DRILLING METHODS Hollow-Stem Auger / Split-Spoon Sampling
CASING SIZE: 3 1/4" DEPTH: ____ WATER DEPTH: ____ TIME: ____ DATE: ____
CHECKED BY: ____ DATE: ____ DEPTH: ____ TIME: ____ DATE: ____
NOT ENCOUNTERED ☒

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT. ON SAMPLER	RECOVERY (FT)	RECOVERY % / RQD %	POCKET PENT/ TORVANE (TSF)	USCS	H_2O CONTENT	DESCRIPTION	REMARKS
1	S-1	5 9 9 11	1.5	75%			D	0.0-2.9: Very stiff, yellowish brown (10YR 5/6), sandy SILT with GRAVEL, dry, noncohesive, fine to coarse sand, small to large angular gravel	
3	S-2	9 16 22 28	2.0	100%			D	2.9-3.4: Very stiff, yellowish brown (10YR 5/6), SILT, dry, noncohesive, little coarse sand and small gravel 3.4-4.7: Dense, pale brown (10YR 6/3), silty SAND with GRAVEL, dry, fine to coarse sand, small to large angular gravel	
5	S-3	9 32 33 50	1.9	95%			D	4.7-5.0: Dense, greyish green (5GY 5/2), silty GRAVEL, dry (weathered metabasalt)	
6	S-4	50/0.4	0.4	100%			D	5.0-15.0: Hard, very pale brown (10YR 7/4) and light gray (5Y 7/1), SILT with GRAVEL, dry, noncohesive, talcy feel (weathered phyllite)	
7									
8									
9	S-5	25 50/0.1	0.5	83%			D		
10									
11	S-6	50/0.2	0.2	100%			D		• Chatter at 11'
12									
13	S-7	50/0.2	0.2	100%			D		
14									• Augered down to 15' bgs, installed piezometer
15									

NOTE: DRAW STRATIFICATION LINES AT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES FOR THIS BORING LOCATION AND SHOW DEPTHS

ENGINEERS FIELD BORING LOG

BORING NO. ITB-37
SHEET 1 OF 1
DATE: START 10-3-13
END 10-3-13
O.G. ELEV

PROJECT NAME SGI North Tract COUNTY Adams
SR ____ SECT. ____ SEGMENT ____ OFFSET ____
STATION ____ OFFSET FROM CENTERLINE ____
INSPECTOR (SIGNED) Bruce Skuban DRILLERS NAME/COMPANY Eric Benko / Eichelbergers
EQUIPMENT USED Diedrich D-50 Track Rig
DRILLING METHODS Hollow-Stem Auger / Split-Spoon Sampling
CASING SIZE: 3 1/4" DEPTH: ____ WATER DEPTH: ____ TIME: ____ DATE: ____
CHECKED BY: ____ DATE: ____ DEPTH: ____ TIME: ____ DATE: ____
NOT ENCOUNTERED X

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT. ON SAMPLER	RECOVERY (FT)	RECOVERY % / RQD %	POCKET PENT/ TORVANE (TSF)	USCS	H_2O CONTENT	DESCRIPTION	REMARKS
1	S-1	3, 6, 10, 12	1.5	75%			D	0.0-3.0: Very stiff, yellowish brown (10YR 5/6), SILT with GRAVEL, dry, noncohesive, small to large angular weathered gray phyllite gravel	
3	S-2	14, 16, 20, 31	2.0	100%			D	3.0-4.6: Hard, dark yellowish brown (10YR 4/6), clayey SILT, dry, noncohesive, little small angular gravel	
5	S-3	14, 15, 19, 24	1.7	85%			D / M	4.6-5.8: Hard, very pale brown (10YR 7/3), SILT, noncohesive, moist, little small angular weathered gray phyllite gravel, talcy feel 5.8-6.0: weathered meta basalt	
7	S-4	5, 7, 9, 11	2.0	100%			M	6.0-7.1: Stiff, very pale brown (10YR 7/3), SILT, moist, noncohesive, little small angular weathered gray phyllite gravel	
9	S-5	12, 11, 13, 15	1.6	80%			M	7.1-9.2: Very stiff to hard, pale red (5R 6/3) and weak red (5R 5/2) mottled, SILT, moist, noncohesive, trace small gravel 9.2-15.0: Very stiff, light gray (5Y 7/1), SILT, moist, noncohesive, talcy feel, some yellowish brown (10YR 5/6) staining	8.0-9.2': Vertical Chevron type folding appearance / lamination 
11	S-6	11, 12, 13, 14	1.8	90%			M		
13									• 13-15': 60° visible laminations
14	S-7	5, 7, 10, 13	2.0	100%			M		Bulk Sample collected 0.0-15.0' bgs
15									

NOTE: DRAW STRATIFICATION LINES AT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES FOR THIS BORING LOCATION AND SHOW DEPTHS

ENGINEERS FIELD BORING LOG

BORING NO. ITB-38
SHEET 1 OF 1
DATE: START 10-4-13
END 10-4-13
O.G. ELEV

PROJECT NAME SGI North Tract COUNTY Adams
SR SECT. SEGMENT OFFSET
STATION OFFSET FROM CENTERLINE
INSPECTOR (SIGNED) Bruce Skuban DRILLERS NAME/COMPANY Eric Benko / Eichelbergers
EQUIPMENT USED Diedrich D-50 Track Rig
DRILLING METHODS Hollow-Stem Auger / Split-Spoon Sampling
CASING SIZE: 3 1/4" DEPTH: WATER DEPTH: TIME: DATE:
CHECKED BY: DATE: DEPTH: TIME: DATE:
NOT ENCOUNTERED ☒

DEPTH (FT)	SAMPLE NO./ TYPE/CORE RUN	BLOWS/0.5 FT. ON SAMPLER	RECOVERY (FT)	RECOVERY % / RQD %	POCKET PENT/ TORVANE (TSF)	USCS	H_2O CONTENT	DESCRIPTION	REMARKS
1	S-1	4 5 7 10	1.7	85%			D	0.0-2.0: Stiff, yellowish brown (10YR 5/6), sandy SILT with GRAVEL, dry, noncohesive, Fine to coarse sand, small to large weathered metarhyolite gravel	
3	S-2	14 23 21 20	1.7	85%			D	2.0-4.0: Hard, yellowish brown (10YR 5/6), Sandy SILT with GRAVEL, dry, noncohesive, Fine to coarse sand, small to large weathered metarhyolite gravel	
5	S-3	17 18 24 27	1.8	90%			D	4.0-6.0: Hard, weak red (5R 5/2), sandy SILT with GRAVEL, dry, non-cohesive, some light brown silt,	
7	S-4	13 11 13 10	1.2	60%			D	6.0-8.0: Very stiff, weak red (5R 5/2), sandy SILT with GRAVEL, dry, non-cohesive, some light brown silt	
9	S-5	7 10 11 30	1.1	55%			D	8.0-10.0: medium dense, weak red (5R 5/2), silty GRAVEL with SAND, dry, Fine to coarse sand, small to large angular weathered metarhyolite gravel	
11	S-6	13 21 27 48	1.1	55%			D	10.0-15.0: Dense to very dense, weak red (5R 5/2), silty GRAVEL with SAND, dry, Fine to coarse sand, small to large angular weathered metarhyolite gravel	• Chatter at 10.0'
13									
	S-7	50/0.4	0.3	75%			D		
14									
15									• Augered down to 15' bgs; installed piezometer

NOTE: DRAW STRATIFICATION LINES AT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES FOR THIS BORING LOCATION AND SHOW DEPTHS