



REPORT OF GEOTECHNICAL EVALUATION

Canal Run Regional SWM Pond Frederick County, Maryland

November 15, 2012

Prepared For:

Property Management People, Inc.
c/o Canal Run Homeowners Association, Inc.
92 Thomas Johnson Drive
Suite 170
Frederick, MD 21702

Attn: Mr. Mark Hershfield

Prepared By:

GEO-TECHNOLOGY ASSOCIATES, INC.
Geotechnical and Environmental Consultants
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Sterling, Virginia 20166
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GTA Job No: 121294

GEO-TECHNOLOGY ASSOCIATES, INC.

GEOTECHNICAL AND
ENVIRONMENTAL CONSULTANTS

A Practicing ASFE Member Firm

November 15, 2012



Property Management People, Inc.
c/o Canal Run Homeowners Association, Inc.
92 Thomas Johnson Drive
Suite 170
Frederick, MD 21702

Attn: Mr. Mark Hershfield

Re: Review and Evaluation of Existing Regional SWM Pond
Canal Run
Frederick County, Maryland

Gentlemen:

In accordance with your request, Geo-Technology Associates, Incorporated (GTA) has completed a review and evaluation of the existing Regional SWM pond at the above referenced project. Transmitted herein is a letter of our findings and conclusions regarding the construction of the SWM facility. The work was completed in accordance with GTA's proposal dated October 17, 2012.

INTRODUCTION

According to the letter from Mr. Rick Masser of Community Development Division, Frederick County dated October 10, 2012, the pond was constructed between December 2004 and June 2006 and was inspected by Specialized Engineering. A letter from Specialized Engineering dated January 30, 2007 confirms the construction of the pond in accordance with approved plans and specifications.

Although the pond was planned as a wet pond within a Karst geology, the geotechnical report by Specialized Engineering or plans prepared by Loiederman Soltesz Associates (LSA) did not recommend a clay liner for the pond. Due to the presence of limestone pinnacles and blasting required in the pond area to accommodate the basin during construction, Frederick County

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♦ Abingdon, MD ♦ Laurel, MD ♦ Frederick, MD ♦ Waldorf, MD ♦ Sterling, VA ♦ Somerset, NJ
♦ New Castle, DE ♦ Georgetown, DE ♦ York, PA ♦ Quakertown, PA ♦ Charlotte, NC

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recommended a clay liner. This was confirmed by Specialized Engineering in their letter dated March 14, 2006. The letter recommended a 12-inch thick clay liner with a minimum permeability of 10^{-7} cm/sec for the material. However, the letter did not indicate to what elevation that the proposed clay liner should be installed. The approved site plan indicated that the wet pool would be at El. 266 feet above MSL.

The daily report by Specialized Engineering indicates that the clay liner was placed at the bottom of the pond. The clay liner was placed from March 8, 2006 and compacted at the bottom of the pond. During the process of placement of the clay liner, rock was removed from the area.

SITE OBSERVATIONS

The typical wet pool is significantly lower than El. 266. Several sink holes were observed between the wet pool and El. 266 (bottom of existing retaining wall) as shown on photographs #2 through #4. In addition, when the pool gets to be near the normal wet pool elevation, bubbles are observed in the middle of the lake as shown on photograph #1.

Rock outcrops are seen throughout the site between the normal pool and the El. 266. In addition, large boulder size rocks are present at the southwestern corner of the pond, in front of Canal Run Drive.

SOIL SAMPLING AND TESTING

In order to evaluate the natural soil near the base of the existing wall at El. 266, 3 soil samples were taken and classified in accordance with Unified Soil Classification System (USCS). The laboratory testing indicated that the soil samples can be classified as USCS CL, Sandy Clay. The material appeared to be natural and is not considered as fill. The sample locations and laboratory test results are included at the end of the letter.

CONCLUSIONS AND RECOMMENDATIONS

Based upon review of available documentation, site observation and laboratory test results, it is GTA's opinion that the clay liner was not placed to appropriate elevation, and presence of sink hole is affecting the function of the SWM pond.

The Specialized Engineering letter indicated a 12-inch thick clay liner for the pond but did not indicate the elevation to which it needs to be installed. The permeability of the clay liner material should be at least 10^{-7} cm/sec. The daily reports indicated that liner was placed at the bottom of the pond. The presence of rock outcrops indicate that clay liner was not installed in the area below the existing wall.

Typically, for a wet pond that requires blasting to accommodate the basin, an 18-inch thick clay liner is installed at least one foot above the wet pool elevation. The wet pool elevation for the pond is at El. 266. In addition, the rock outcrops present in the area is required to be completely removed from the entire area of the clay liner and be replaced with the compacted clay liner.

Therefore, during construction of the pond, the clay liner was not of adequate thickness and was not installed to proper elevation. Although the material at the base of the wall was lean clay, it appears that it was not compacted, especially due to the presence of the rock outcrops.

Due to lack of clay liner, sinkholes are forming throughout the basin area. The bubbles within the water surface indicate that water is being lost through possible path at the bottom of the pond and releasing the air causing the bubbles at the surface. The possible paths can be sinkholes formed at the bottom of the lake.

The formation of the sinkholes and presence of rock outcrops indicate that the procedure followed during the construction of the pond was inadequate. It did not follow the industry standards for the construction of similar wet ponds in known Karst geology. The presence of rock outcrops and sinkholes are a common issue in Frederick County, and installation of clay liner in wet ponds to

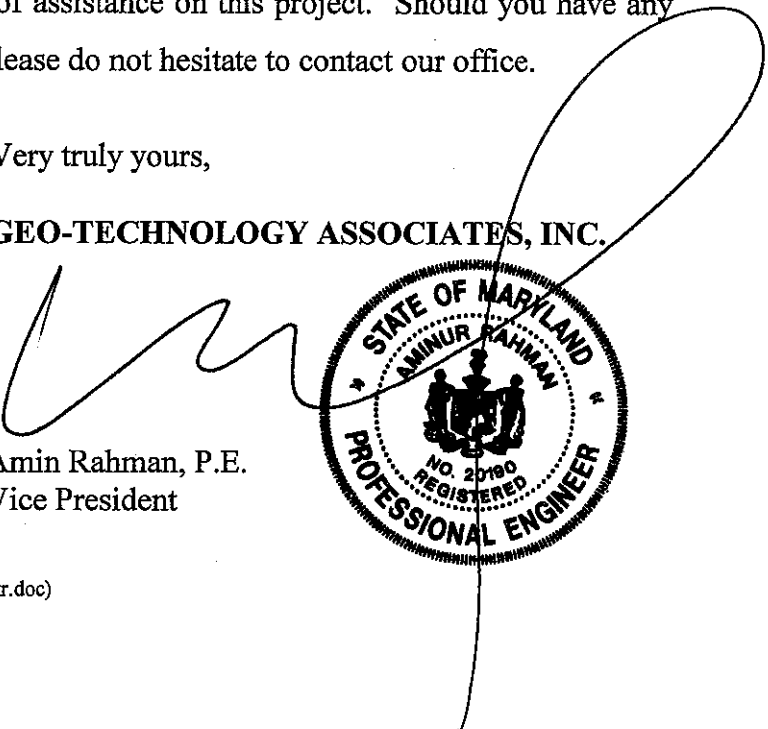
at least the elevation of the wet pool is common practice during construction to mitigate the issue for proper functioning of the pond.

The issues present that is hindering the proper functioning of the pond is construction related and not related to maintenance of the pond. GTA recommends that the facility be dewatered and the clay liner be installed to El. 266. The clay liner should be at least 18-inches thick and consist of material having a minimum permeability of 10^{-7} cm/sec. During the same process and prior to placement of the clay liner, the sinkholes present at the bottom of the basin should be filled up to the throat of the hole with zero slump concrete.

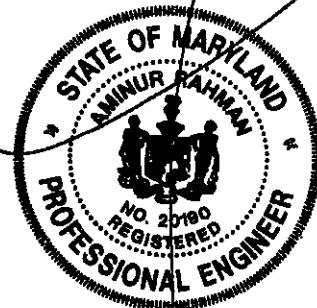
Thank you for the opportunity to be of assistance on this project. Should you have any questions or require additional information, please do not hesitate to contact our office.

Very truly yours,

GEO-TECHNOLOGY ASSOCIATES, INC.


Amin Rahman, P.E.
Vice President

Professional Certification. I hereby certify that these documents were prepared or approved by me, and that I am a duly licensed professional engineer under the laws of the State of Maryland. License No.: 20190, Expiration Date: 9-21-2013. AR





Photograph 1: View of the lake with “bubble” in the middle of pond.

Photograph 2: View of sinkhole between the pool and retaining wall.

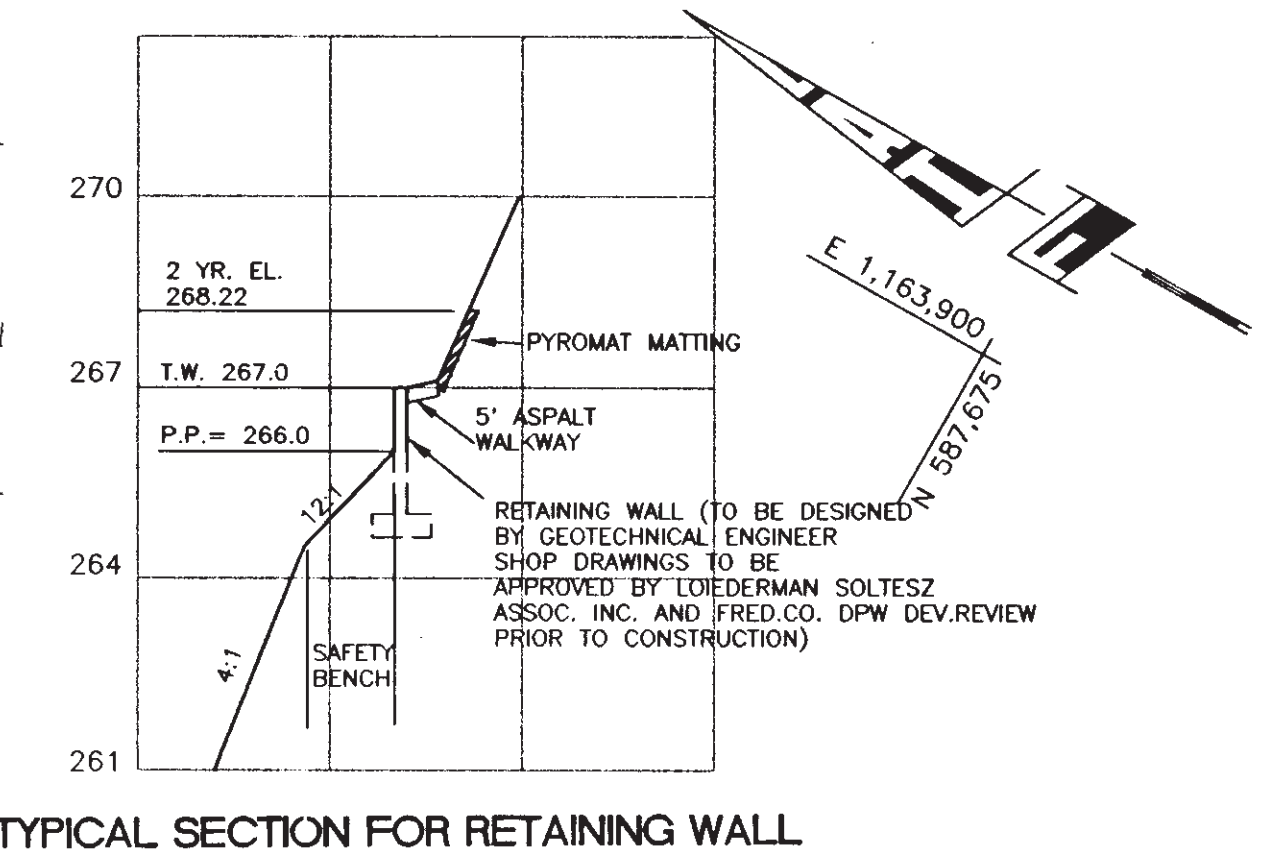
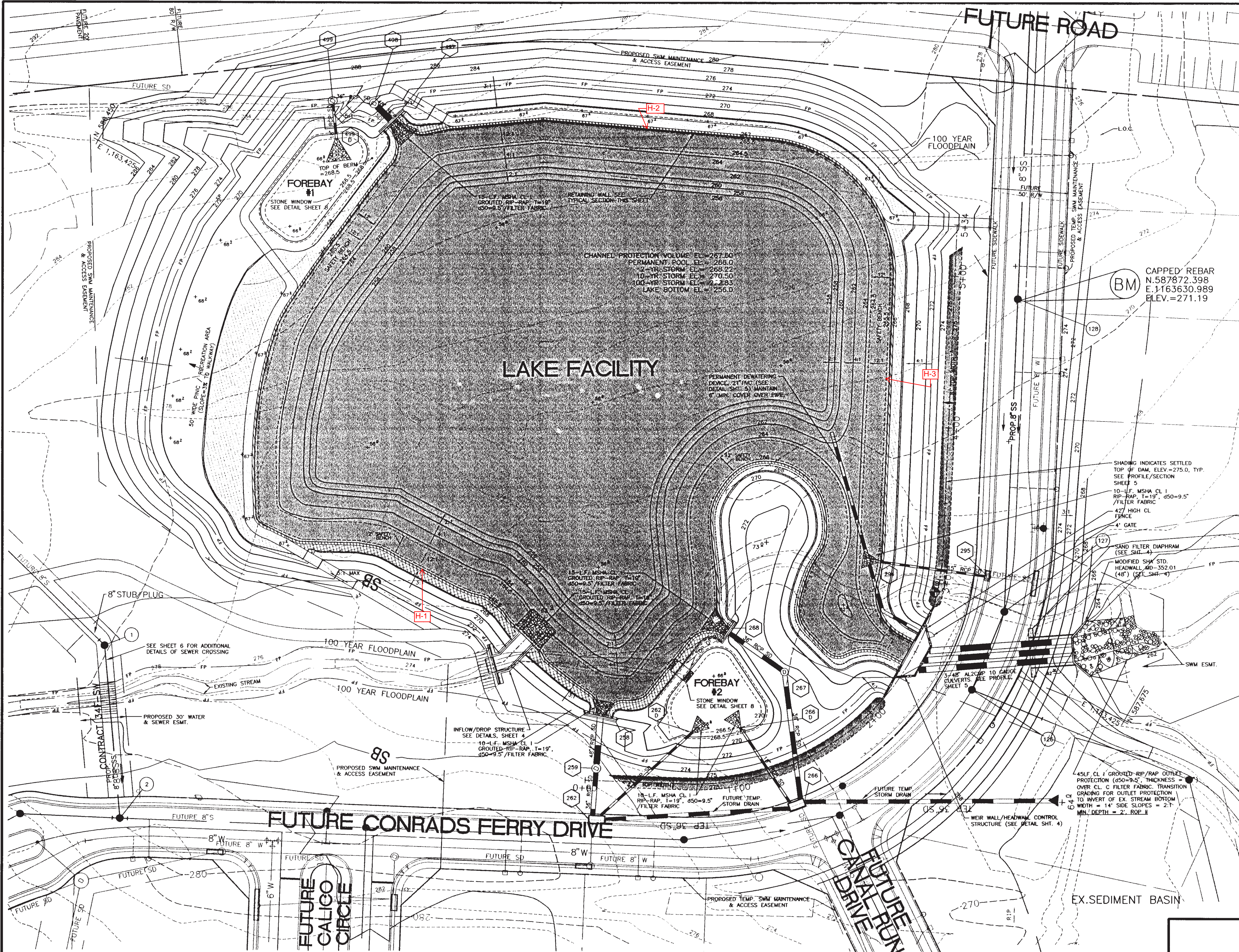




Photograph 3: View of the sinkhole location (with a stick).



Photograph 4: Sinkhole in between the pool and the retaining wall.



- NOTES:
- SEE SEQUENCE OF CONSTRUCTION, SHEET 7.
 - SEE CONSTRUCTION SPECIFICATIONS, SHEET 5.
 - SEE STRUCTURAL DETAILS, SHEET 4.
 - SEE TEMP. SWM/SWM ACCESS ESMT. THIS SHEET.
 - FUTURE CONRADS FERRY DRIVE TO BE CONSTRUCTED AND INSPECTED PER THE "SUBDIVISION CONSTRUCTION INSPECTION GENERAL NOTES", SHEET 1.
 - STORM DRAIN STRUCTURES 499A, 499, 498, 497, 258, 259, 262, 262A, 268, 267, 266, 266A, 294, 295 AND ASSOCIATED STORM DRAINAGE IS BEING INSTALLED AT THIS TIME TO REDUCE DISTURBANCE TO FACILITY DURING FUTURE PLANNED DEVELOPMENT. ALL INLET STRUCTURES TO BE BLOCKED SHUT UNTIL FUTURE CONSTRUCTION DOCUMENTS AND SEQUENCING INSTRUCT. STRUCTURES 262, 266 WILL ULTIMATELY HAVE STD COG TOPS. THESE STRUCTURES ARE TO BE BLOCKED SHUT AT THIS TIME AND HAVE ORANGE CONSTRUCTION FENCE AROUND THEM TO PREVENT ACCIDENTS WITH PEOPLE OR EQUIPMENT.
 - FOR PROFILES AND ADDITIONAL INFORMATION ON STORM DRAINAGE SEE SHEET 12.
 - FOR ADDITIONAL INFORMATION ON PROPOSED DRY SANITARY SEWER SEE SHEET 11.

- LEGEND OF LAKE FEATURES:
- RETAINING WALL (T = 267.0)
 - 5' ASPHALT WALKWAY
 - PYROMAT MATTING OR APPROVED EQUAL UP TO 2-YR WSE

LAKE FACILITY SUMMARY TABLE

TOTAL DRAINAGE AREA =	263.1 ACRES
TOTAL ONSITE DRAINAGE AREA =	113.7 ACRES
WET POOL ELEVATION =	266.0
LAKE DEPTH =	10 FEET
LAKE STORAGE @ WET POOL EL. 266.0 =	18.52 AC.- FT
STORAGE AVAILABLE BETWEEN WET POOL EL. 266.0 UP TO EL. 274.0 =	25.83 AC.FT.
STORAGE REQUIRED FOR 100 YEAR STORM =	21.42 AC.FT.
SETTLED TOP-OF-DAM ELEV. =	275.00

FREDERICK COUNTY DIVISION OF PUBLIC WORKS

APPROVED: *[Signature]* PUBLIC WORKS DIRECTOR DATE: 9/16/03

APPROVED: *[Signature]* DEVELOPMENT REVIEW CHIEF DATE: 9/5/03

APPROVED: *[Signature]* STORMWATER MANAGEMENT DATE: 8/27/03

REV #	DATE	REVISION DESCRIPTION	ENGINEER / CONSULTANT DATE AND INITIAL	DEV REVIEW DATE AND INITIAL

BENCHMARK
 CAPPED REBAR #411 - S.E. CORNER
 LOT 16, NORTH SIDE MISTY HOLLOW ROAD
 ELEVATION = 290.03

Loiederman Soltesz Associates

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 Land Planning
 Land Surveying
 Environmental Sciences

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 Rockville, Maryland 20850
 301-945-2750
 Fax: 301-948-8067

4407 Forbes Boulevard
 Lanham, Maryland 20706
 301-794-7555
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7 North Market Street
 Frederick, Maryland 21701
 301-696-1240
 301-870-2188
 Fax: 301-570-2884

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Page 43 Grid H - 4 & 5

Tax Map	Zoning Category:
TAX MAP 102 PARCEL 23	PUD
TAX MAP 108 PARCEL 17	
M-NCPPC 200' Sheet	
WSSC 200' Sheet	
N/A	
N/A	

NO.	REVISIONS	BY	DATE
2	PER MAY 21 03 OCD, AND JUNE 23 DPW COMMENTS	MLB/KC	6/24/2003
1	PER APRIL 29 03 DPW COMMENTS	MLB	5/16/2003

Date: DECEMBER, 2002
 Designed: LDN/CED
 CAD Standards Version: Microstation Standards 2000
 Technician: MAS/MLS
 Checked: MJS

MISS UTILITY NOTE

INFORMATION CONCERNING EXISTING UNDERGROUND UTILITIES WAS OBTAINED FROM AVAILABLE RECORDS. THE CONTRACTOR MUST DETERMINE THE EXACT LOCATION AND ELEVATION OF ALL EXISTING UTILITIES AND UTILITY CROSSINGS BY DIGGING TEST PITS BY HAND, WELL IN ADVANCE OF THE START OF EXCAVATION. CONTACT "MISS UTILITY" AT 1-800-257-7777, 72 HOURS PRIOR TO THE START OF EXCAVATION. IF CLEARANCES ARE LESS THAN SHOWN ON THIS PLAN OR 1' VERTICAL OR 5' HORIZONTAL, WHICHEVER IS LESS, CONTACT THE ENGINEER AND THE UTILITY COMPANY BEFORE PROCEEDING WITH CONSTRUCTION. CLEARANCES LESS THAN NOTED MAY REQUIRE REVISIONS TO THIS PLAN.

STATE OF MARYLAND
 MICHAEL JOSEPH SCHEIDT
 REGISTERED PROFESSIONAL ENGINEER
 No. 12018
 7/24/03
 FOR LOIEDERMAN SOLTESZ ASSOCIATES

LAKE FACILITY PLAN

CANAL RUN

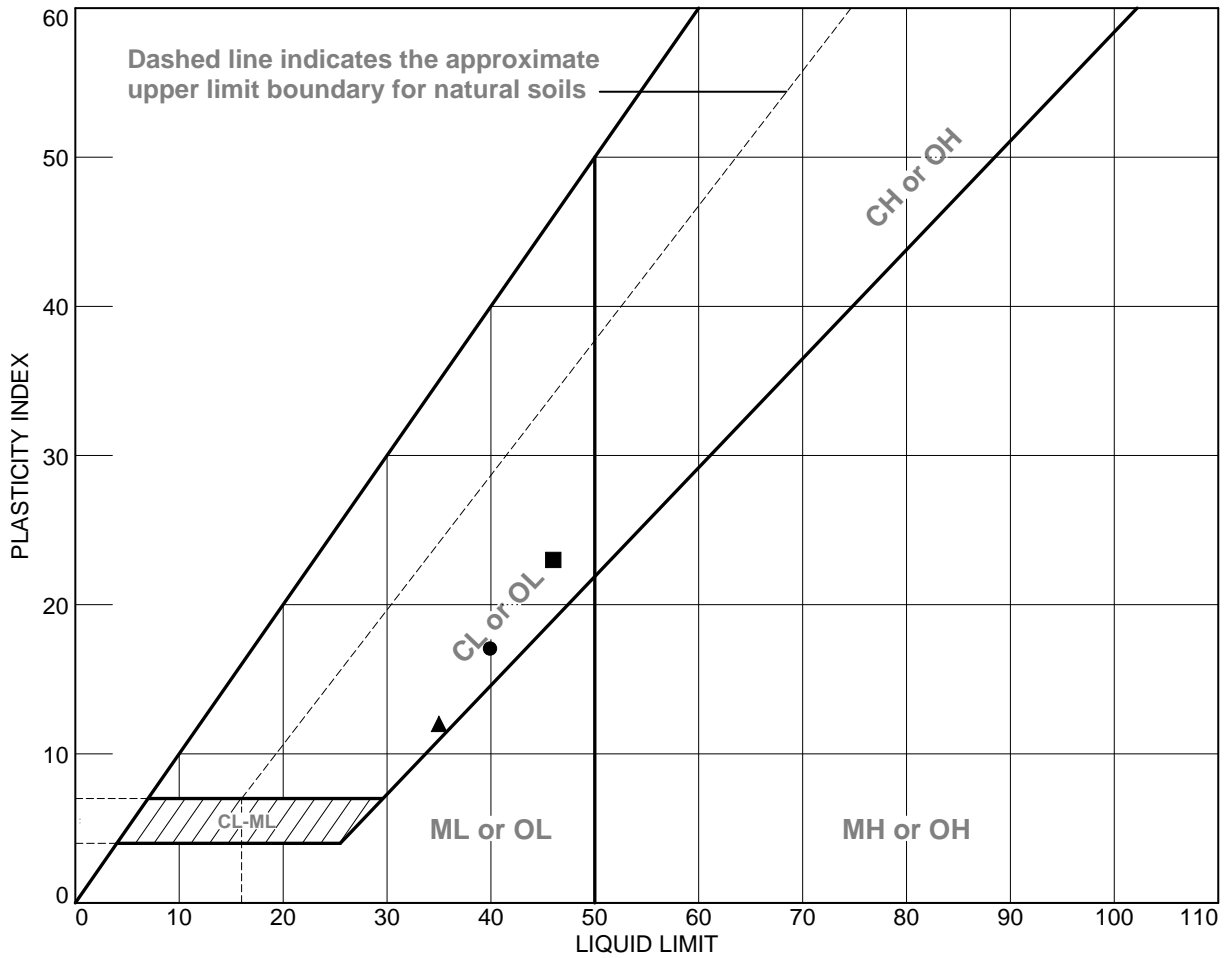
EAST OF U.S. ROUTE 15 AND
 NORTH OF MARYLAND ROUTE 28
 BUCKEYSTOWN ELECTION DISTRICT NO. 1
 FREDERICK COUNTY, MARYLAND

1" = 30'

SHEET 3 OF 13


PROJECT NO. 903-18

LIQUID AND PLASTIC LIMITS TEST REPORT - ASTM D4318



ASTM Specifications performed may include: D421, D422, D2216, D2217, and D4318.

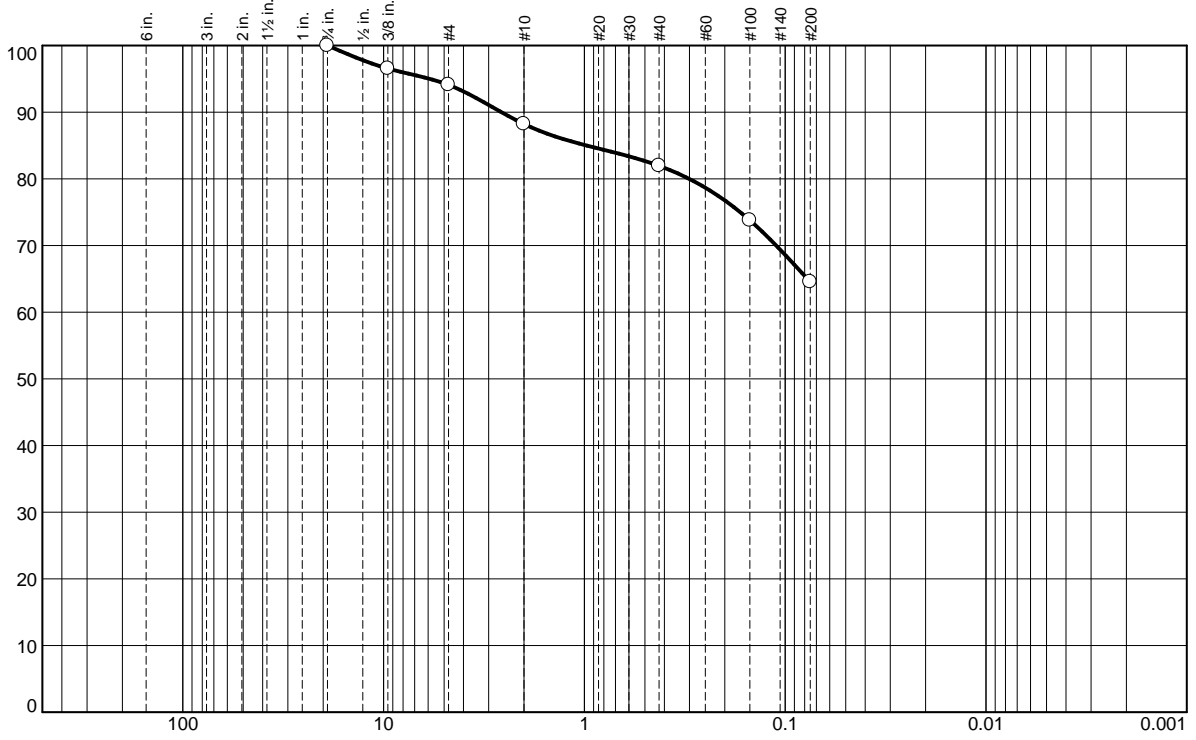
SOIL DATA								
SYMBOL	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	H-1	1	0	N/A	23	40	17	CL
■	H-2	1	0	N/A	23	46	23	CL
▲	H-3	1	0	N/A	23	35	12	CL

	<p>GEO-TECHNOLOGY ASSOCIATES, INC.</p> <p>43760 Trade Center Place, Suite 110 Sterling, VA 20166</p>	<p>Client: Canal Run Homeowners Association, Inc.</p> <p>Project: Canal Run</p> <p>Project No.: 121294</p>	<p>Figure</p>
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Tested By: DV _____ **Checked By:** AR _____

Particle Size Distribution Report

PERCENT FINER



GRAIN SIZE - mm.

% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	5.9	5.9	6.2	17.5	64.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4"	100.0		
3/8"	96.5		
#4	94.1		
#10	88.2		
#40	82.0		
#100	73.8		
#200	64.5		

Soil Description

Brown, Sandy Lean CLAY trace Gravel

Atterberg Limits

PL= 23 LL= 40 PI= 17 NM= N/A

Coefficients

D₉₀= 2.5870 D₈₅= 0.9739 D₆₀=
D₅₀= D₃₀= D₁₅=
D₁₀= C_u= C_c=

Classification

USCS= CL AASHTO= A-6(9)

Remarks

* (no specification provided)

Source of Sample: H-1 Depth: 0
Sample Number: 1

Date: 11/12/2012

ASTM Specifications performed may include: D421, D422, D2216, D2217, and D4318.



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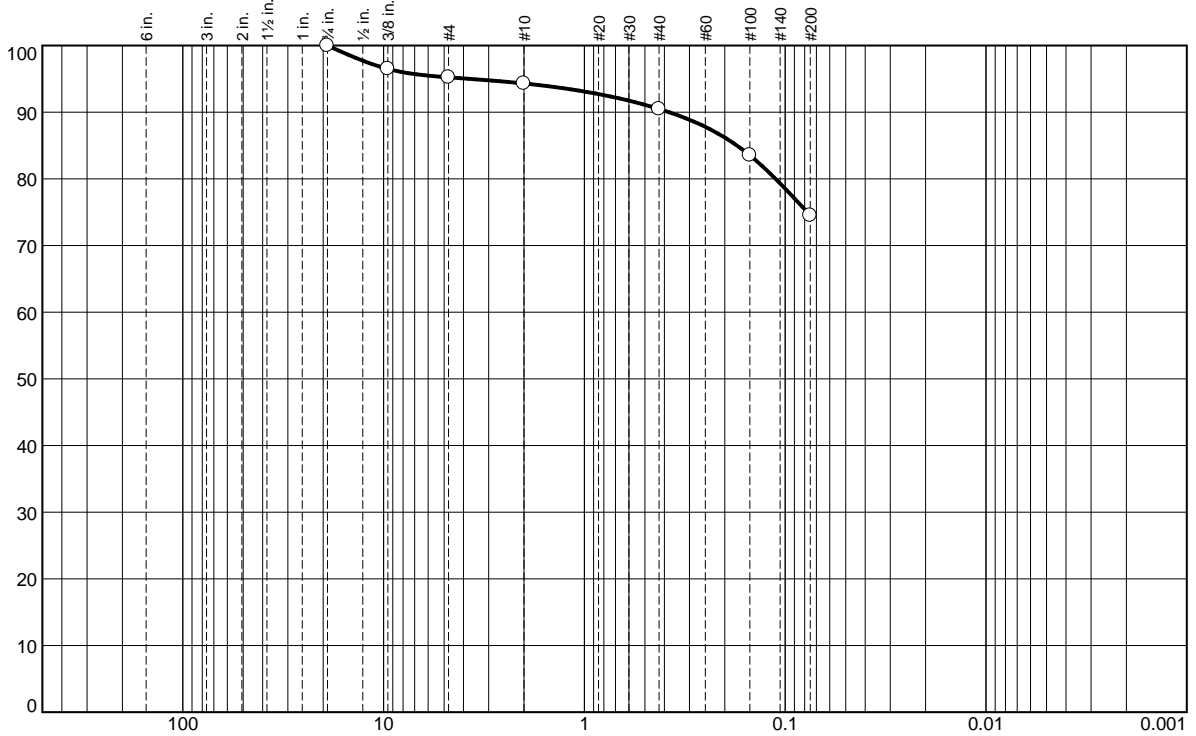
Figure

Tested By: DV

Checked By: AR

Particle Size Distribution Report

PERCENT FINER



GRAIN SIZE - mm.

% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	4.8	0.9	3.8	16.0	74.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4"	100.0		
3/8"	96.5		
#4	95.2		
#10	94.3		
#40	90.5		
#100	83.5		
#200	74.5		

Soil Description

Brown, Lean CLAY with Sand trace Gravel

Atterberg Limits

PL= 23 LL= 46 PI= 23 NM= N/A

Coefficients

D₉₀= 0.3790 D₈₅= 0.1739 D₆₀=
D₅₀= D₃₀= D₁₅=
D₁₀= C_u= C_c=

Classification

USCS= CL AASHTO= A-7-6(17)

Remarks

* (no specification provided)

Source of Sample: H-2 Depth: 0
Sample Number: 1

Date: 11/12/2012

ASTM Specifications performed may include: D421, D422, D2216, D2217, and D4318.



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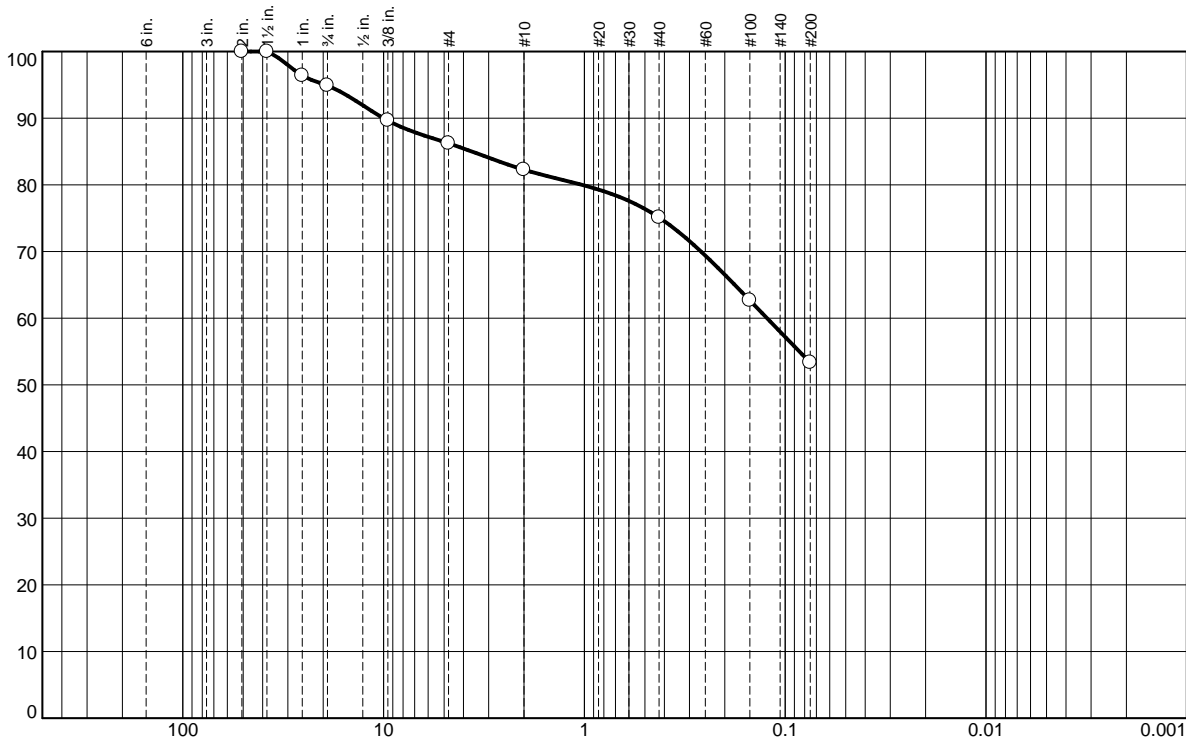
Figure

Tested By: DV

Checked By: AR

Particle Size Distribution Report

PERCENT FINER



GRAIN SIZE - mm.

% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	5.1	8.7	3.9	7.2	21.8	53.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
2"	100.0		
1.5"	100.0		
1"	96.4		
3/4"	94.9		
3/8"	89.7		
#4	86.2		
#10	82.3		
#40	75.1		
#100	62.7		
#200	53.3		

<u>Soil Description</u>			
Brown, Sandy lean CLAY trace Gravel			
<u>Atterberg Limits</u>			
PL= 23	LL= 35	PI= 12	NM= N/A
<u>Coefficients</u>			
D ₉₀ = 9.9970	D ₈₅ = 3.6356	D ₆₀ = 0.1231	
D ₅₀ =	D ₃₀ =	D ₁₅ =	
D ₁₀ =	C _u =	C _c =	
<u>Classification</u>			
USCS= CL	AASHTO= A-6(4)		
<u>Remarks</u>			

* (no specification provided)

Source of Sample: H-3 Depth: 0
 Sample Number: 1

Date: 11/12/2012

ASTM Specifications performed may include: D421, D422, D2216, D2217, and D4318.



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Figure

Tested By: DV

Checked By: AR