

January 26, 2023

Anthony T. Gonzon, Jr.  
DNREC – Division of Fish and Wildlife  
89 Kings Highway  
Dover, DE 19901

**SUBJECT: Assawoman Wildlife Area Viewing Tower Geotechnical Exploration**

Dear Mr. Gonzon:

On behalf of DNREC Division of Fish and Wildlife Century Engineering, LLC performed and oversaw a geotechnical exploration of the above referenced project that included hand augers, visual soil classifications and dynamic cone penetrometer (DCP) testing for the proposed viewing tower in the Assawoman Wildlife Area.

Testing was performed over a series of site visits in June of 2022 in accordance with the proposed layout at that time. All testing was performed with the intention of determining soil characteristics only for the proposed wildlife viewing tower and approach boardwalk. Collected data includes field logs and visual classifications of the existing soil, underlying lithology, and approximate soil density. A more detailed geotechnical investigation was not desired due to potential impacts to nearby wetlands, woodlands, and habitat.

#### **Dynamic Cone Penetrometer Testing**

The geotechnical exploration program began with conducting a series of dynamic cone penetrometer (DCP) tests using a manually operated Wildcat. The use of the Wildcat dynamic cone penetrometer in this instance allowed for minimal disturbance to the existing area and increased flexibility when compared to a typical drill-rig used to conduct standard penetration testing (SPT). After additional analysis, blow counts resulting from the DCP testing can be used in lieu of SPTs.

A total of four DCP tests (B1 – B4) were conducted within the footprint of the proposed tower and access ramp, as shown on the map provided in Attachment A. The tests were advanced to depths ranging between 8' and 12.6' below existing grade. Blow counts measured in the field were input into a software designed to correlate the observed blow counts with those expected from SPT testing. The corrected field blow counts are denoted as N'. All borings yielded similar results, with some slight variations noted. The top 2' – 3' in B2 – B4 yielded soils characterized as very soft to soft soils before transitioning to stiff or medium stiff soils as the depth of testing increased. Wildcat blow counts ranged from 0 to 3 blows (per 10 cm of penetration). B1 presented soils classified as stiff to very stiff near the surface with blow counts ranging from 3 to 16 in the same interval. The proximity of B1 to the existing wildlife tower and parking area could account for the stiffer, more compacted, soil observed. All borings yielded results classified as very stiff to hard by the terminus of the boring with blow counts ranging from the teens to 25+ (per 10 cm of penetration). DCP data and soil classifications are available in Attachment B.

### **Hand Augers and Visual Soil Classifications**

A series of two hand augers (HA1 – HA2) were advanced in proximity to the DCP tests as shown on the map in Attachment A. Both hand augers were advanced to depths of 5' below the existing grade. Groundwater was encountered in both hand augers appearing between 2'-10" and 3'-6" below existing grade. Although groundwater was observed, the seasonal high groundwater table could not be definitively determined. Given the proximity to Mulberry Pond, it is assumed that groundwater was not observed at the peak elevation and would likely be shallower in the wet season.

A visual classification of the soils excavated in the hand augers indicated that the overall soil composition, thickness, and order remained largely consistent throughout the site. Silty sand and sand were the dominant soil types noted and were consistent with our expectations based on regional geology. Approximately 12" to 18" of a silty sand topsoil, characterized by organics, was noted in the augers. HA2 exhibited a thicker topsoil layer than HA1 which is to be expected given its location within the wooded area. The underlying soil profile across the hand augers remained consistent. Under the topsoil layer a fine-medium grained silty sand or silt-sand layer was observed. The layer varied in thickness from approximately 12" in HA2 and 18" in HA1. A fine-medium grained sand with some silt was observed under the silty sand layer in both hand augers. This final sand layer was the final layer observed and remained consistent to the terminus of each auger. This final layer is also where groundwater was observed in both explorations. The hand auger field logs and associated soil classifications are available in Attachment C.

**Further Investigation and Additional Services Recommended:** Additional soil and foundation engineering, testing, and consulting services recommended for this project are summarized below:

- **Geotechnical Exploration and Laboratory Analysis:** At the time of testing, it was understood that the intended foundation type would be helical piles. If detailed design parameters for foundations are required, additional geotechnical exploration and laboratory testing will be warranted. This second phase of site analysis could include laboratory testing to determine moisture content, soil classification, Atterberg limits, and others.

**Remarks:** This report has been prepared to aid in geotechnical evaluation of the proposed site improvements. Our professional services have been performed in accordance with generally accepted engineering principles and practices; no other warranty, expressed or implied, is made. Century Engineering, LLC assumes no responsibility for interpretations made by others on the work performed by Century.

We appreciate the opportunity to have been of service to you on this project. Please contact us if you have any questions or need additional information.

Please feel free to reach out with any questions or concerns.

Sincerely,



**CENTURY ENGINEERING, LLC, A KLEINFELDER COMPANY**

Elizabeth Chandler, P.E., P.G.

Engineer II

**CENTURY ENGINEERING, LLC, A KLEINFELDER COMPANY**  
550 Bay Road, Dover, DE 19901 p | 302.734.9188




LEGEND:  
 HA HAND AUGER  
 B (WILDCAT) DYNAMIC CONE PENETROMETER BORING

REVISIONS:	
DATE:	DESCRIPTION:

ASSAWOMAN WILDLIFE AREA  
 VIEWING TOWER  
 SOIL BORING PLAN

SEAL:

CIVIL ENGINEER:



**CENTURY**  
 ENGINEERING  
 A Kleinfelder Company

CEI CONTRACT NO.: 175013.97



DESIGNED BY:  
 WJH

DRAWN BY:  
 WJH

CHECKED BY:  
 JB

DATE:  
 FEBRUARY 2023

SCALE:  
 1" = 20'

SHEET NO.:  
 C304

CONTRACT NO.:  
 NAT-02022-ASSAWOMANTOWER

WILDCAT DYNAMIC CONE LOG  
 \*\* DATA ENTRY SHEET \*\*

PROJECT NO.: 175013.97  
 PROJECT NAME: Assawoman Wildlife Tower  
 PROJECT ADDRESS: 37604 Mulberry Landing Road  
 PROJECT CITY, STATE: Frankford, DE 19945

HOLE NUMBER: B-1  
 CREW: AES & EMC  
 DATE STARTED: 06-07-2022  
 DATE COMPLETED: 06-07-2022  
 SURFACE ELEVATION: 1  
 WATER ON COMPL.:

TOTAL DEPTH (cm): 350

FILENAME: C:\My Documents\Wildcat\WC\_XL97.XLS

CONSISTENCY ALPHA VALUES:			
NON-COHESIVE:		COHESIVE:	
0	VERY LOOSE	0	VERY SOFT
5	LOOSE	2	SOFT
11	MEDIUM DENSE	5	MEDIUM STIFF
31	DENSE	9	STIFF
51	VERY DENSE	16	VERY STIFF
		31	HARD

GRAPH FACTOR:  
3.45

DEPTH	BLOWS PER 10 cm	DEPTH (cm)	FACTOR
10 cm	8	10	4.44
20 cm	7	20	4.44
30 cm	11	30	4.44
40 cm	13	40	4.44
50 cm	8	50	4.44
60 cm	4	60	4.44
70 cm	4	70	4.44
80 cm	4	80	4.44
90 cm	3	90	4.44
100 cm	3	100	4.44
110 cm	1	110	3.86
120 cm	3	120	3.86
130 cm	11	130	3.86
140 cm	14	140	3.86
150 cm	13	150	3.86
160 cm	13	160	3.86
170 cm	15	170	3.86
180 cm	17	180	3.86
190 cm	12	190	3.86
200 cm	11	200	3.86
210 cm	17	210	3.42
220 cm	19	220	3.42
230 cm	23	230	3.42
240 cm	23	240	3.42
250 cm	27	250	3.42
260 cm	33	260	3.42
270 cm	24	270	3.42
280 cm	23	280	3.42
290 cm	20	290	3.42
300 cm	21	300	3.42
310 cm	20	310	3.06
320 cm	21	320	3.06
330 cm	17	330	3.06
340 cm	19	340	3.06
350 cm	19	350	3.06
360 cm		360	3.06
370 cm		370	3.06
380 cm		380	3.06
390 cm		390	3.06
400 cm		400	3.06
410 cm		410	2.77
420 cm		420	2.77
430 cm		430	2.77
440 cm		440	2.77
450 cm		450	2.77

# WILDCAT DYNAMIC CONE LOG

company name  
 company address  
 company city, state, zip

PROJECT NUMBER: 175013.97  
 DATE STARTED: 06-07-2022  
 DATE COMPLETED: 06-07-2022

HOLE #: B-1  
 CREW: AES & EMC  
 PROJECT: Assawoman Wildlife Tower  
 ADDRESS: 37604 Mulberry Landing Road  
 LOCATION: Frankford, DE 19945

SURFACE ELEVATION: 1  
 WATER ON COMPLETION: \_\_\_\_\_  
 HAMMER WEIGHT: 35 lbs.  
 CONE AREA: 10 sq. cm

DEPTH	BLOWS PER 10 cm	RESISTANCE Kg/cm <sup>2</sup>	GRAPH OF CONE RESISTANCE 0      50      100      150	N'	TESTED CONSISTENCY	
					NON-COHESIVE	COHESIVE
-	8	35.5	.....	10	LOOSE	STIFF
-	7	31.1	.....	8	LOOSE	MEDIUM STIFF
- 1 ft	11	48.8	.....	13	MEDIUM DENSE	STIFF
-	13	57.7	.....	16	MEDIUM DENSE	VERY STIFF
-	8	35.5	.....	10	LOOSE	STIFF
- 2 ft	4	17.8	....	5	LOOSE	MEDIUM STIFF
-	4	17.8	....	5	LOOSE	MEDIUM STIFF
-	4	17.8	....	5	LOOSE	MEDIUM STIFF
- 3 ft	3	13.3	...	3	VERY LOOSE	SOFT
- 1 m	3	13.3	...	3	VERY LOOSE	SOFT
-	1	3.9	.	1	VERY LOOSE	VERY SOFT
- 4 ft	3	11.6	...	3	VERY LOOSE	SOFT
-	11	42.5	.....	12	MEDIUM DENSE	STIFF
-	14	54.0	.....	15	MEDIUM DENSE	STIFF
- 5 ft	13	50.2	.....	14	MEDIUM DENSE	STIFF
-	13	50.2	.....	14	MEDIUM DENSE	STIFF
-	15	57.9	.....	16	MEDIUM DENSE	VERY STIFF
- 6 ft	17	65.6	.....	18	MEDIUM DENSE	VERY STIFF
-	12	46.3	.....	13	MEDIUM DENSE	STIFF
- 2 m	11	42.5	.....	12	MEDIUM DENSE	STIFF
- 7 ft	17	58.1	.....	16	MEDIUM DENSE	VERY STIFF
-	19	65.0	.....	18	MEDIUM DENSE	VERY STIFF
-	23	78.7	.....	22	MEDIUM DENSE	VERY STIFF
- 8 ft	23	78.7	.....	22	MEDIUM DENSE	VERY STIFF
-	27	92.3	.....	25+	MEDIUM DENSE	VERY STIFF
-	33	112.9	.....	25+	DENSE	HARD
- 9 ft	24	82.1	.....	23	MEDIUM DENSE	VERY STIFF
-	23	78.7	.....	22	MEDIUM DENSE	VERY STIFF
-	20	68.4	.....	19	MEDIUM DENSE	VERY STIFF
- 3 m 10 ft	21	71.8	.....	20	MEDIUM DENSE	VERY STIFF
-	20	61.2	.....	17	MEDIUM DENSE	VERY STIFF
-	21	64.3	.....	18	MEDIUM DENSE	VERY STIFF
-	17	52.0	.....	14	MEDIUM DENSE	STIFF
- 11 ft	19	58.1	.....	16	MEDIUM DENSE	VERY STIFF
-	19	58.1	.....	16	MEDIUM DENSE	VERY STIFF
-						
- 12 ft						
-						
- 4 m 13 ft						

WILDCAT DYNAMIC CONE LOG  
 \*\* DATA ENTRY SHEET \*\*

PROJECT NO.: 175013.97  
 PROJECT NAME: Assawoman Wildlife Tower  
 PROJECT ADDRESS: 37604 Mulberry Landing Road  
 PROJECT CITY, STATE: Frankford, DE 19945

HOLE NUMBER: B-2  
 CREW: AES & EMC  
 DATE STARTED: 06-07-2022  
 DATE COMPLETED: 06-07-2022  
 SURFACE ELEVATION: 1  
 WATER ON COMPL.:

TOTAL DEPTH (cm): 350

FILENAME: C:\My Documents\Wildcat\WC\_XL97.XLS

CONSISTENCY ALPHA VALUES:			
NON-COHESIVE:		COHESIVE:	
0	VERY LOOSE	0	VERY SOFT
5	LOOSE	2	SOFT
11	MEDIUM DENSE	5	MEDIUM STIFF
31	DENSE	9	STIFF
51	VERY DENSE	16	VERY STIFF
		31	HARD

GRAPH FACTOR:  
3.45

DEPTH	BLOWS PER 10 cm	DEPTH (cm)	FACTOR
10 cm	2	10	4.44
20 cm	2	20	4.44
30 cm	0	30	4.44
40 cm	0	40	4.44
50 cm	1	50	4.44
60 cm	2	60	4.44
70 cm	3	70	4.44
80 cm	4	80	4.44
90 cm	4	90	4.44
100 cm	4	100	4.44
110 cm	4	110	3.86
120 cm	11	120	3.86
130 cm	10	130	3.86
140 cm	8	140	3.86
150 cm	8	150	3.86
160 cm	7	160	3.86
170 cm	10	170	3.86
180 cm	11	180	3.86
190 cm	11	190	3.86
200 cm	11	200	3.86
210 cm	16	210	3.42
220 cm	19	220	3.42
230 cm	18	230	3.42
240 cm	13	240	3.42
250 cm	16	250	3.42
260 cm	18	260	3.42
270 cm	16	270	3.42
280 cm	20	280	3.42
290 cm	20	290	3.42
300 cm	19	300	3.42
310 cm	19	310	3.06
320 cm	21	320	3.06
330 cm	19	330	3.06
340 cm	21	340	3.06
350 cm	30	350	3.06
360 cm	21	360	3.06
370 cm	25	370	3.06
380 cm	26	380	3.06
390 cm		390	3.06
400 cm		400	3.06
410 cm		410	2.77
420 cm		420	2.77
430 cm		430	2.77
440 cm		440	2.77
450 cm		450	2.77

# WILDCAT DYNAMIC CONE LOG

company name  
 company address  
 company city, state, zip

PROJECT NUMBER: 175013.97  
 DATE STARTED: 06-07-2022  
 DATE COMPLETED: 06-07-2022

HOLE #: B-2  
 CREW: AES & EMC  
 PROJECT: Assawoman Wildlife Tower  
 ADDRESS: 37604 Mulberry Landing Road  
 LOCATION: Frankford, DE 19945

SURFACE ELEVATION: 1  
 WATER ON COMPLETION: \_\_\_\_\_  
 HAMMER WEIGHT: 35 lbs.  
 CONE AREA: 10 sq. cm

DEPTH	BLOWS PER 10 cm	RESISTANCE Kg/cm <sup>2</sup>	GRAPH OF CONE RESISTANCE				N'	TESTED CONSISTENCY	
			0	50	100	150		NON-COHESIVE	COHESIVE
-	2	8.9	••				2	VERY LOOSE	SOFT
-	2	8.9	••				2	VERY LOOSE	SOFT
- 1 ft	0	0.0					0	VERY LOOSE	VERY SOFT
-	0	0.0					0	VERY LOOSE	VERY SOFT
-	1	4.4	•				1	VERY LOOSE	VERY SOFT
- 2 ft	2	8.9	••				2	VERY LOOSE	SOFT
-	3	13.3	•••				3	VERY LOOSE	SOFT
-	4	17.8	••••				5	LOOSE	MEDIUM STIFF
- 3 ft	4	17.8	••••				5	LOOSE	MEDIUM STIFF
- 1 m	4	17.8	••••				5	LOOSE	MEDIUM STIFF
-	4	15.4	••••				4	VERY LOOSE	SOFT
- 4 ft	11	42.5	••••••••••				12	MEDIUM DENSE	STIFF
-	10	38.6	••••••••••				11	MEDIUM DENSE	STIFF
-	8	30.9	••••••••••				8	LOOSE	MEDIUM STIFF
- 5 ft	8	30.9	••••••••••				8	LOOSE	MEDIUM STIFF
-	7	27.0	••••••••••				7	LOOSE	MEDIUM STIFF
-	10	38.6	••••••••••				11	MEDIUM DENSE	STIFF
- 6 ft	11	42.5	••••••••••				12	MEDIUM DENSE	STIFF
-	11	42.5	••••••~				12	MEDIUM DENSE	STIFF
- 2 m	11	42.5	••••~				12	MEDIUM DENSE	STIFF
- 7 ft	16	54.7	••••••••••				15	MEDIUM DENSE	STIFF
-	19	65.0	••••••••••				18	MEDIUM DENSE	VERY STIFF
-	18	61.6	••••••~				17	MEDIUM DENSE	VERY STIFF
- 8 ft	13	44.5	••••••~				12	MEDIUM DENSE	STIFF
-	16	54.7	••••~				15	MEDIUM DENSE	STIFF
-	18	61.6	••••~				17	MEDIUM DENSE	VERY STIFF
- 9 ft	16	54.7	••••~				15	MEDIUM DENSE	STIFF
-	20	68.4	••••~				19	MEDIUM DENSE	VERY STIFF
-	20	68.4	••••~				19	MEDIUM DENSE	VERY STIFF
- 3 m 10 ft	19	65.0	••••~				18	MEDIUM DENSE	VERY STIFF
-	19	58.1	••••~				16	MEDIUM DENSE	VERY STIFF
-	21	64.3	••••~				18	MEDIUM DENSE	VERY STIFF
-	19	58.1	••••~				16	MEDIUM DENSE	VERY STIFF
- 11 ft	21	64.3	••••~				18	MEDIUM DENSE	VERY STIFF
-	30	91.8	••••~				25+	MEDIUM DENSE	VERY STIFF
- 12 ft									
- 4 m 13 ft									

WILDCAT DYNAMIC CONE LOG  
 \*\* DATA ENTRY SHEET \*\*

PROJECT NO.: 175013.97  
 PROJECT NAME: Assawoman Wildlife Tower  
 PROJECT ADDRESS: 37604 Mulberry Landing Road  
 PROJECT CITY, STATE: Frankford, DE 19945

HOLE NUMBER: B-3  
 CREW: AES & EMC  
 DATE STARTED: 06-21-2022  
 DATE COMPLETED: 06-21-2022  
 SURFACE ELEVATION: 1  
 WATER ON COMPL.:

TOTAL DEPTH (cm): 350

FILENAME: C:\My Documents\Wildcat\WC\_XL97.XLS

CONSISTENCY ALPHA VALUES:			
NON-COHESIVE:		COHESIVE:	
0	VERY LOOSE	0	VERY SOFT
5	LOOSE	2	SOFT
11	MEDIUM DENSE	5	MEDIUM STIFF
31	DENSE	9	STIFF
51	VERY DENSE	16	VERY STIFF
		31	HARD

GRAPH FACTOR:

3.45

DEPTH	BLOWS PER 10 cm	DEPTH (cm)	FACTOR
10 cm	0	10	4.44
20 cm	3	20	4.44
30 cm	3	30	4.44
40 cm	3	40	4.44
50 cm	3	50	4.44
60 cm	3	60	4.44
70 cm	2	70	4.44
80 cm	6	80	4.44
90 cm	16	90	4.44
100 cm	13	100	4.44
110 cm	14	110	3.86
120 cm	15	120	3.86
130 cm	22	130	3.86
140 cm	21	140	3.86
150 cm	18	150	3.86
160 cm	18	160	3.86
170 cm	21	170	3.86
180 cm	16	180	3.86
190 cm	15	190	3.86
200 cm	18	200	3.86
210 cm	18	210	3.42
220 cm	17	220	3.42
230 cm	22	230	3.42
240 cm	47	240	3.42
250 cm		250	3.42
260 cm		260	3.42
270 cm		270	3.42
280 cm		280	3.42
290 cm		290	3.42
300 cm		300	3.42
310 cm		310	3.06
320 cm		320	3.06
330 cm		330	3.06
340 cm		340	3.06
350 cm		350	3.06
360 cm		360	3.06
370 cm		370	3.06
380 cm		380	3.06
390 cm		390	3.06
400 cm		400	3.06
410 cm		410	2.77
420 cm		420	2.77
430 cm		430	2.77
440 cm		440	2.77
450 cm		450	2.77



# WILDCAT DYNAMIC CONE LOG

company name  
 company address  
 company city, state, zip

PROJECT NUMBER: 175013.97  
 DATE STARTED: 06-21-2022  
 DATE COMPLETED: 06-21-2022

HOLE #: B-3  
 CREW: AES & EMC  
 PROJECT: Assawoman Wildlife Tower  
 ADDRESS: 37604 Mulberry Landing Road  
 LOCATION: Frankford, DE 19945

SURFACE ELEVATION: 1  
 WATER ON COMPLETION: \_\_\_\_\_  
 HAMMER WEIGHT: 35 lbs.  
 CONE AREA: 10 sq. cm

DEPTH	BLOWS PER 10 cm	RESISTANCE Kg/cm <sup>2</sup>	GRAPH OF CONE RESISTANCE				N'	TESTED CONSISTENCY	
			0	50	100	150		NON-COHESIVE	COHESIVE
-	0	0.0					0	VERY LOOSE	VERY SOFT
-	3	13.3	•••				3	VERY LOOSE	SOFT
- 1 ft	3	13.3	•••				3	VERY LOOSE	SOFT
-	3	13.3	•••				3	VERY LOOSE	SOFT
-	3	13.3	•••				3	VERY LOOSE	SOFT
- 2 ft	3	13.3	•••				3	VERY LOOSE	SOFT
-	2	8.9	••				2	VERY LOOSE	SOFT
-	6	26.6	••••••				7	LOOSE	MEDIUM STIFF
- 3 ft	16	71.0	••••••••••••••••••••				20	MEDIUM DENSE	VERY STIFF
- 1 m	13	57.7	••••••••••••••••••••				16	MEDIUM DENSE	VERY STIFF
-	14	54.0	••••••••••••••••••••				15	MEDIUM DENSE	STIFF
- 4 ft	15	57.9	••••••••••••••••••••				16	MEDIUM DENSE	VERY STIFF
-	22	84.9	••••••••••••••••••••				24	MEDIUM DENSE	VERY STIFF
-	21	81.1	••••••~••••••~••••••				23	MEDIUM DENSE	VERY STIFF
- 5 ft	18	69.5	••••••~••••••~••••••				19	MEDIUM DENSE	VERY STIFF
-	18	69.5	••••~••••~••••~••••~••••				19	MEDIUM DENSE	VERY STIFF
-	21	81.1	••••~••••~••••~••••~••••				23	MEDIUM DENSE	VERY STIFF
- 6 ft	16	61.8	••••~••••~••••~••••~••••				17	MEDIUM DENSE	VERY STIFF
-	15	57.9	••••~••••~••••~••••~••••				16	MEDIUM DENSE	VERY STIFF
- 2 m	18	69.5	••••~••••~••••~••••~••••				19	MEDIUM DENSE	VERY STIFF
- 7 ft	18	61.6	••••~••••~••••~••••~••••				17	MEDIUM DENSE	VERY STIFF
-	17	58.1	••••~••••~••••~••••~••••				16	MEDIUM DENSE	VERY STIFF
-	22	75.2	••••~••••~••••~••••~••••				21	MEDIUM DENSE	VERY STIFF
- 8 ft	47	160.7	••••~••••~••••~••••~••••				25+	DENSE	HARD
-									
- 9 ft									
- 3 m 10 ft									
-									
- 11 ft									
-									
- 12 ft									
-									
- 4 m 13 ft									

WILDCAT DYNAMIC CONE LOG  
 \*\* DATA ENTRY SHEET \*\*

PROJECT NO.: 175013.97  
 PROJECT NAME: Assawoman Wildlife Tower  
 PROJECT ADDRESS: 37604 Mulberry Landing Road  
 PROJECT CITY, STATE: Frankford, DE 19945

HOLE NUMBER: B-4  
 CREW: AES & EMC  
 DATE STARTED: 06-29-2022  
 DATE COMPLETED: 06-29-2022  
 SURFACE ELEVATION: 1' Below Water  
 WATER ON COMPL.: At Surface

TOTAL DEPTH (cm): 350

FILENAME: C:\My Documents\Wildcat\WC\_XL97.XLS

CONSISTENCY ALPHA VALUES:			
NON-COHESIVE:		COHESIVE:	
0	VERY LOOSE	0	VERY SOFT
5	LOOSE	2	SOFT
11	MEDIUM DENSE	5	MEDIUM STIFF
31	DENSE	9	STIFF
51	VERY DENSE	16	VERY STIFF
		31	HARD

GRAPH FACTOR:

3.45

DEPTH	BLOWS PER 10 cm	DEPTH (cm)	FACTOR
10 cm	0	10	4.44
20 cm	0	20	4.44
30 cm	3	30	4.44
40 cm	3	40	4.44
50 cm	3	50	4.44
60 cm	2	60	4.44
70 cm	1	70	4.44
80 cm	3	80	4.44
90 cm	7	90	4.44
100 cm	7	100	4.44
110 cm	8	110	3.86
120 cm	8	120	3.86
130 cm	10	130	3.86
140 cm	11	140	3.86
150 cm	7	150	3.86
160 cm	13	160	3.86
170 cm	18	170	3.86
180 cm	18	180	3.86
190 cm	20	190	3.86
200 cm	22	200	3.86
210 cm	22	210	3.42
220 cm	24	220	3.42
230 cm	29	230	3.42
240 cm	26	240	3.42
250 cm		250	3.42
260 cm		260	3.42
270 cm		270	3.42
280 cm		280	3.42
290 cm		290	3.42
300 cm		300	3.42
310 cm		310	3.06
320 cm		320	3.06
330 cm		330	3.06
340 cm		340	3.06
350 cm		350	3.06
360 cm		360	3.06
370 cm		370	3.06
380 cm		380	3.06
390 cm		390	3.06
400 cm		400	3.06
410 cm		410	2.77
420 cm		420	2.77
430 cm		430	2.77
440 cm		440	2.77
450 cm		450	2.77

# WILDCAT DYNAMIC CONE LOG

company name  
 company address  
 company city, state, zip

PROJECT NUMBER: 175013.97  
 DATE STARTED: 06-29-2022  
 DATE COMPLETED: 06-29-2022

HOLE #: B-4  
 CREW: AES & EMC  
 PROJECT: Assawoman Wildlife Tower  
 ADDRESS: 37604 Mulberry Landing Road  
 LOCATION: Frankford, DE 19945

SURFACE ELEVATION: 1' Below Water  
 WATER ON COMPLETION: At Surface  
 HAMMER WEIGHT: 35 lbs.  
 CONE AREA: 10 sq. cm

DEPTH	BLOWS PER 10 cm	RESISTANCE Kg/cm <sup>2</sup>	GRAPH OF CONE RESISTANCE				N'	TESTED CONSISTENCY	
			0	50	100	150		NON-COHESIVE	COHESIVE
-	0	0.0					0	VERY LOOSE	VERY SOFT
-	0	0.0					0	VERY LOOSE	VERY SOFT
- 1 ft	3	13.3	•••				3	VERY LOOSE	SOFT
-	3	13.3	•••				3	VERY LOOSE	SOFT
-	3	13.3	•••				3	VERY LOOSE	SOFT
- 2 ft	2	8.9	••				2	VERY LOOSE	SOFT
-	1	4.4	•				1	VERY LOOSE	VERY SOFT
-	3	13.3	•••				3	VERY LOOSE	SOFT
- 3 ft	7	31.1	••••••••				8	LOOSE	MEDIUM STIFF
- 1 m	7	31.1	••••••••				8	LOOSE	MEDIUM STIFF
-	8	30.9	••••••••				8	LOOSE	MEDIUM STIFF
- 4 ft	8	30.9	••••••••				8	LOOSE	MEDIUM STIFF
-	10	38.6	••••••••				11	MEDIUM DENSE	STIFF
-	11	42.5	••••••••				12	MEDIUM DENSE	STIFF
- 5 ft	7	27.0	••••••				7	LOOSE	MEDIUM STIFF
-	13	50.2	••••••••••				14	MEDIUM DENSE	STIFF
-	18	69.5	••••••••••••••				19	MEDIUM DENSE	VERY STIFF
- 6 ft	18	69.5	••••••••••••••				19	MEDIUM DENSE	VERY STIFF
-	20	77.2	••••••••••••••••				22	MEDIUM DENSE	VERY STIFF
- 2 m	22	84.9	••••••••••~••••••••				24	MEDIUM DENSE	VERY STIFF
- 7 ft	22	75.2	••••••~••••••••••••••				21	MEDIUM DENSE	VERY STIFF
-	24	82.1	••••••~••••••••••••••				23	MEDIUM DENSE	VERY STIFF
-	29	99.2	••••••~••••••~••••••••••				25+	MEDIUM DENSE	VERY STIFF
- 8 ft	26	88.9	••••••~••••••~••••••~•••				25	MEDIUM DENSE	VERY STIFF
-									
- 9 ft									
- 3 m 10 ft									
-									
- 11 ft									
-									
- 12 ft									
-									
- 4 m 13 ft									

SOIL CLASSIFICATION FIELD DATA



PROJECT NUMBER	175013.97	DATE	6-21-22
TECHNICIAN	AEG + EMC	TEMP.	80S
LICENSE NUMBER	16139 + 25243	ELEV.	
WEATHER	Sunny		


PROJECT NAME & TEST LOCATION	EQUIPMENT USED
Assawoman Wildlife Area HA #1	( ) SHOVEL ( ) OTHER ( ) EXCAVATOR (x) HAND AUGER

DEPTH OF EXCAVATION	5'	DEPTH TO GROUNDWATER	2'10"
DEPTH OF LIMITING LAYER		TYPE	Gw
		ELEV.	

REMARKS: ( ) Post-Construction Test  
 - HA associated w/ WC #1 performed on a different day  
 - SHGW not determined. Gw observed @ 2'10"

TOP OF LAYER	BOTTOM OF LAYER	THICKNESS OF LAYER	SOIL DESCRIPTION
0	12"	12"	Topsoil. Thick fine needle layer. Roots + organics present. Fragrant/ Earthy. Silty F-M SAND. Damp.
12"	30"	18"	Silty F-M SAND. Less silt than in the topsoil layer. Wet. Holds shape. Uniform/poorly graded. Dk greyish Brown
30'	5' Bottom	unknown	F-M SAND. Trace Silt. Loose. Uniform/poorly graded. Wet. Becomes looser/more wet w/ depth.

## SOIL CLASSIFICATION FIELD DATA

 <b>CENTURY</b> ENGINEERING		PROJECT NUMBER	175013.97	DATE	6-21-22	
		TECHNICIAN	AES + EMC	TEMP.	80's	
		LICENSE NUMBER	16139 + 25243	ELEV.		
		WEATHER	Cloudy			
PROJECT NAME & TEST LOCATION		EQUIPMENT USED				
Assawoman Wildlife Tower HA #2		( ) SHOVEL ( ) EXCAVATOR (x) HAND AUGER	( ) OTHER			
DEPTH OF EXCAVATION		5'	DEPTH TO GROUNDWATER		3.5'	
DEPTH OF LIMITING LAYER			TYPE	GW	ELEV.	
REMARKS:	- Associated w/ WC #2 - SHGW not determined. GW observed at 3' 6"					
( ) Post-Construction Test						
TOP OF LAYER	BOTTOM OF LAYER	THICKNESS OF LAYER	SOIL DESCRIPTION			
0	18"	18"	Topsoil. Thick pine needle matting. Roots + organics present. Damp. Silty SAND. F-M. Dk Brown-black			
18"	30"	12"	Well sorted Silty SAND. F-M. Damp-Wet. Uniform. Loose. Dk Greyish Brown.			
30"	5' Bottom	Unknown	F-M SAND. Trace Silt. Well sorted. Wet. Loose Beige. Becomes more loose/wet w/ depth			