ATTACHMENT D

SLOPE STABILITY
AND
SETTLEMENT ANALYSIS

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SLOPE STABILITY AND SETTLEMENT ANALYSIS

1. General. In order to properly assess the feasibility of the projects at James Island and Barren Island and create an accurate cost estimate, the foundation conditions at the sites must be assessed. Soft, weak, compressible foundation conditions can cause construction problems, quantity overruns, cost increases, and schedule slippage if not identified properly during the design phase. The design analysis performed during this feasibility phase is intended to identify major potential foundation problems. The amount of borings performed for this feasibility phase is enough to generally characterize the site, but not enough to develop a detailed final foundation plan. Additional subsurface explorations will be required during the next design phase to more thoroughly characterize the foundation reaches along the dike alignment.

For this feasibility study, a slope stability analysis and a settlement analysis were performed based on the drilling and testing information obtained from the feasibility phase borings. This information was used to identify reaches where soft silts and clays appeared to be present. The slope stability and settlement analyses were performed using testing information obtained from undisturbed Shelby tube samples. Testing performed included consolidation tests, unconfined compression tests, and triaxial shear tests. See Attachment E – Subsurface Investigations and Laboratory Testing for a more thorough description of the testing performed and the testing results.

2. Slope Stability Analysis. The slope stability analysis was performed using the computer program UTEXAS4, which was developed for the US Army Corps of Engineers by Dr. Stephen Wright. A circular failure arc analysis was used, with selected analytical method being Spencer's Method. The "end of construction" condition (undrained shearing) was selected for analysis. Based on engineering judgment and experience from the Poplar Island Phase 2 analysis, the undrained condition is the most critical when constructing on soft clays and silts.

The saturated portion of the fine silty sand used for dike construction is susceptible to liquefaction when subjected to seismic loading. However, the Chesapeake Bay is an area of historically low seismicity. The magnitude and duration of seismic loading within the region is not expected to be sufficient to cause liquefaction. Based on ER 1110-2-1806, *Earthquake Design and Evaluation for Civil Works Projects*, this project is located in a region where no seismic evaluation is required for embankments.

2.1. Conditions Analyzed. Several different conditions were analyzed for slope stability. Reaches having very soft deposits of silts and clays were analyzed. Additionally, the required offset from the dike toe for dredging operations was also analyzed. Both exterior (bayside) and interior potential failures were analyzed.

2.2. Foundation Material Strength. The results of the consolidated-undrained triaxial shear tests were used in evaluating the shear strengths of the soft silts and clays in the foundation. The total stress strength envelope for the sample tested from DH-203a was c=112 psf and ϕ=15.5°.

The total stress strength envelope for the sample tested from DH-204a was c=0 psf and ϕ=15.8°. Total stress analyses are performed in fine-grained materials where pore pressures generated during the shearing process are unknown. This is the case for the proposed dike construction over soft silts and clays, and thus the analyses use undrained strengths for the foundation silts and clays. The undrained shear strengths used in the analysis were conservatively based upon the total stress present at the top of the clay/silt layer when construction would commence. Using the strength envelopes, a shear strength value can be determined at any normal stress point. This shear strength value was then used as the cohesion value in the analysis for that clay layer. The ϕ-value was then set to zero to simulate the undrained loading condition. The shear strength values were interpolated for different boring locations that did not have triaxial tests performed. The typical range of shear strengths of the foundation materials ranged from approximately 400 psf to 800 psf, depending on the stress conditions at each location.

Shear strengths for the foundation sands used in the stability analysis were determined by using correlations for the Standard Penetration Test, based on soil type. The chart found in NAVFAC Manual 7.1, page 149, was used to determine the effective shear strength parameters. Since pore pressures are assumed to dissipate rapidly in the sands, effective shear strength parameters were the only parameters necessary for use in the sands.

2.3 Strength of Dike Materials. The shear strengths for the dike materials were estimated based on previous analyses performed for Poplar Island. Since the a very similar dike section and construction method is expected for the James Island Project, it was considered adequate to use the Poplar Island shear strengths. The armor stone was assumed to have a ϕ'=40° and c=0. The dike sand placed below the water level was assumed to have a ϕ'=28° and c=0. The dike sand placed above the water level was assumed to have a ϕ'=30° and c=0.

2.4 Results of Stability Analysis. The minimum factors of safety required for adequate slope stability are 1.3 for both the interior and exterior slopes. This criteria is based on EM 1110-2-5027, Engineering and Design-Confined Disposal of Dredged Material. The analysis included dike sections to +25 ft MLLW, +10 ft MLLW, and +25 ft MLLW with removal of material for borrowing operations on the inside toe.

The results of the analysis are attached. Due to the very low factors of safety in some sections, the northeast portion of the dike alignment was shifted to avoid some of the poorest foundation conditions. Specifically, the dike alignment was originally placed through borings JB-202, 203, and 204. The alignment was modified to pass nearer to borings showing more favorable foundation conditions, such as JB-102, and JB-201. A reach of the dike is still located near a poor deposit identified in JB-101. To account for potential problems in this area, an estimate of 50,000 cy of foundation removal and replacement has been estimated for this section. If, in the next design phase, it becomes clear that it is impossible to avoid poor foundation conditions in this area, removal and replacement will likely be the option considered to deal with the conditions.

Additionally, the offset for borrowing adjacent to the dike is currently set at 100 feet. This is based on the results of the portion of the stability analysis that dealt with this issue. Reaches

having sand foundations without soft clay were not analyzed. This is based on engineering judgment that there will be minimal stability problems in such reaches. The dike construction at Poplar Island did not encounter any loose sand deposits that affected dike construction.

3. Settlement Analysis. The settlement analysis performed assessed the potential impacts to the dike sections from long-term consolidation settlement. Quick, elastic settlement of loose sand zones was not accounted for in this analysis. This is due to the fact that the magnitudes of such settlement are much smaller than the consolidation settlement caused by soft clays and silts. Also, any elastic settlement in sands occurs during construction and will therefore not require any overbuild. No time rate of consolidation calculations were performed. If the project is eventually phased vertically, a time rate of consolidation analysis may be warranted.

The results of the consolidation tests performed on the appropriate Shelby tube samples were used in the analysis. The Casagrande method for graphical determination of the preconsolidation pressure was used. The laboratory e-log p curves were corrected for disturbance using the method developed by Schmertmann. The loadings used in the analysis were based on idealized trapezoidal sections which approximated the proposed dikes. The stress distribution charts from NAVFAC Manual 7.1, pg. 170 were used to find the increased stress at the midpoint of each sublayer used in the analysis.

3.1 Sections Analyzed. Dike sections at borings JB-203, 204, 212, 215, 217, 218, and 229 were analyzed. At the time of the analysis, the final perimeter dike heights for the wetlands were not known. Therefore, dike heights ranging from +10 ft MLLW to +12 ft MLLW were investigated for the wetlands. The upland dike section was analyzed at a top elevation of +25 ft MLLW.

3.2 Results. The attached calculations show the results for the various sections. Based on these results, for quantity estimates, the perimeter dike from station 320+00 to 355+00 and from 385+00 to 15+00 will be estimated to be overbuilt by 6 inches to account for the predicted long-term settlement. The settlement analysis for the northeast upland dike reach shows very substantial long-term settlement due to consolidation. However, based on the results of the slope stability analysis, the dike was realigned in the northeast portion to avoid the worst areas. Remaining poor foundation areas will be removed and replaced, thus limiting long-term consolidation settlement in those areas and not requiring an overbuilt section.

REFERENCES

Das, Braja M., *Principles of Geotechnical Engineering,* 3rd Edition, PWS Publishing, 1994.

Duncan, J.M, and Buchignani, A.L., *An Engineering Manual for Settlement Studies,* University of California-Berkeley, 1976.

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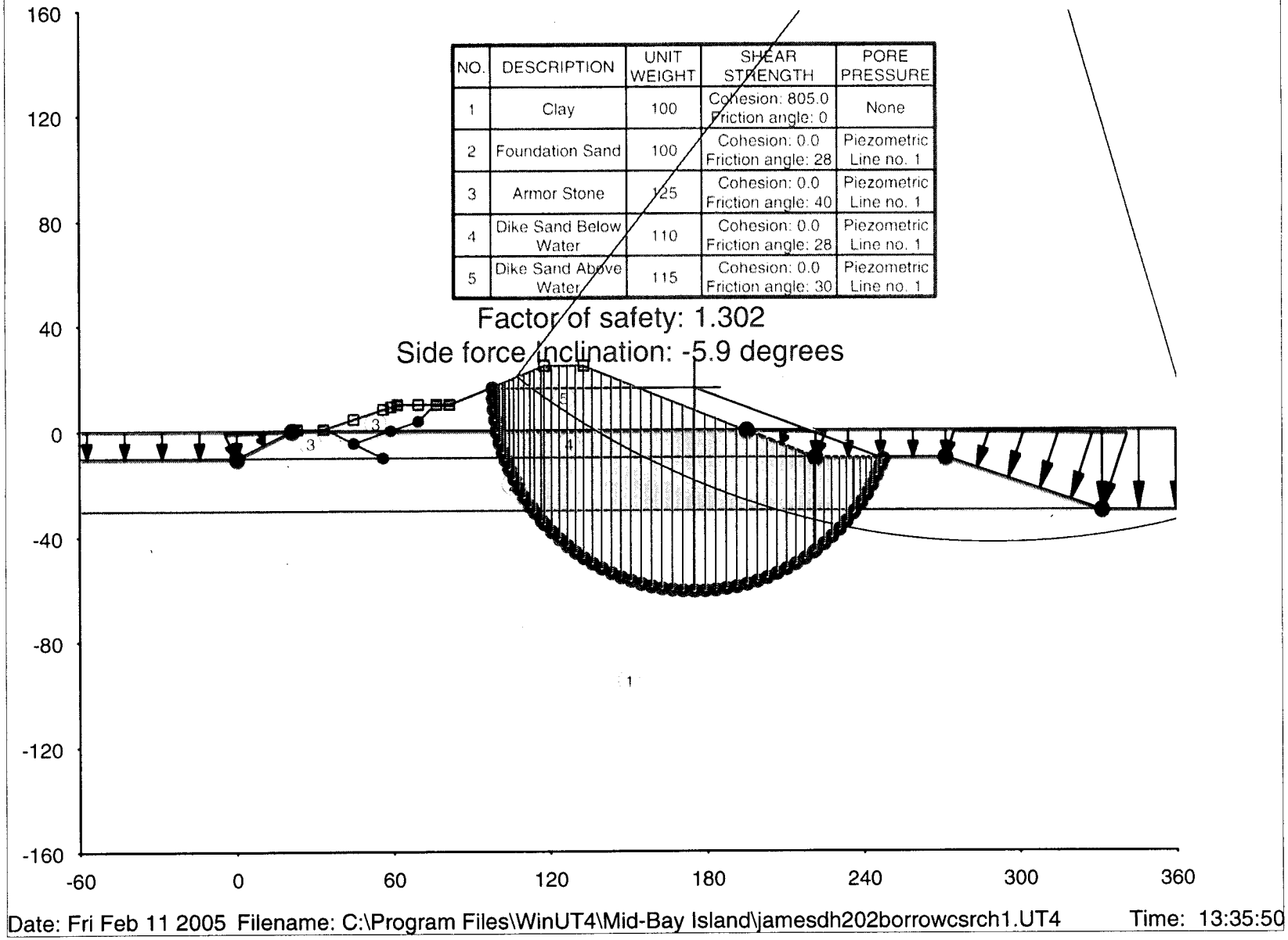
US Army Corps of Engineers, *Slope Stability,* EM 1110-2-1902, Department of the Army, 2003.

US Army Corps of Engineers, *Settlement Analysis*, EM 1110-1-1904, Department of the Army, 1990.

James Island DH-202 Stability Analysis - +25 Dike - Borrow Excavation



NO.	DESCRIPTION	UNIT WEIGHT	SHEAR STRENGTH	PORE PRESSURE
1	Clay	100	Cohesion: 805.0 Friction angle: 0	None
2	Foundation Sand	100	Cohesion: 0.0 Friction angle: 28	Piezometric Line no. 1
3	Armor Stone	125	Cohesion: 0.0 Friction angle: 40	Piezometric Line no. 1
4	Dike Sand Below Water	110	Cohesion: 0.0 Friction angle: 28	Piezometric Line no. 1
5	Dike Sand Above Water	115	Cohesion: 0.0 Friction angle: 30	Piezometric Line no. 1

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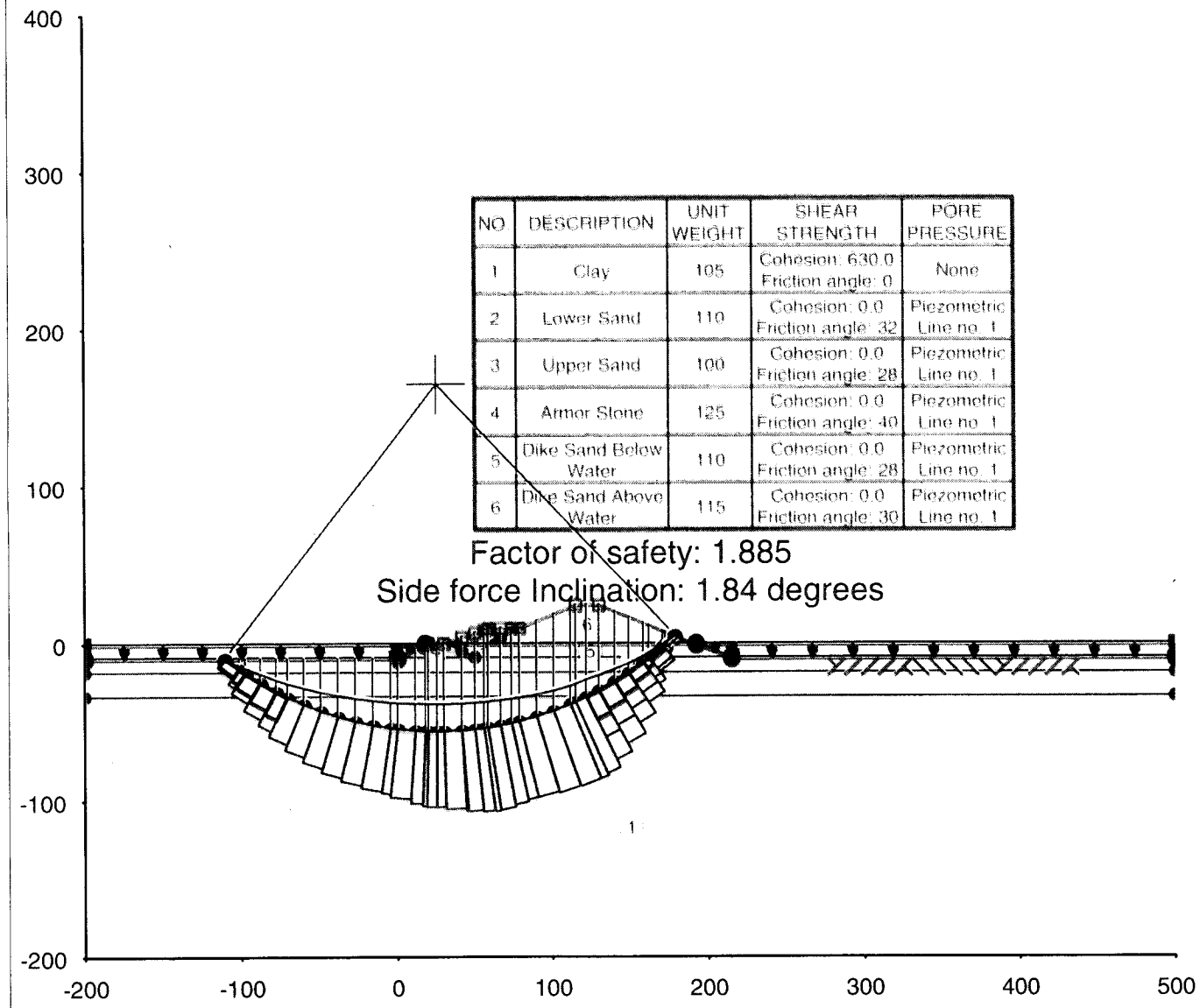
James Island DH-202 Stability Analysis - +25 Dike



NO	DESCRIPTION	UNIT WEIGHT	SHEAR STRENGTH	PORE PRESSURE
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2	Lower Sand	110	Cohesion: 0.0 Friction angle: 32	Piezometric Line no. 1
3	Upper Sand	100	Cohesion: 0.0 Friction angle: 28	Piezometric Line no. 1
4	Armor Stone	125	Cohesion: 0.0 Friction angle: 40	Piezometric Line no. 1
5	Dike Sand Below Water	110	Cohesion: 0.0 Friction angle: 28	Piezometric Line no. 1
6	Dike Sand Above Water	115	Cohesion: 0.0 Friction angle: 30	Piezometric Line no. 1

Factor of safety: 1.885

Side force Inclination: 1.84 degrees

Date: Thu Feb 10 20Filename: C:\Program Files\WinUT4\Mid-Bay Island\jamesdh202c1-630-10removal.UT4 Time: 07:55:28

James Island DH-202 Stability Analysis - +25 Dike

NO.	DESCRIPTION	UNIT WEIGHT	SHEAR STRENGTH	PORE PRESSURE
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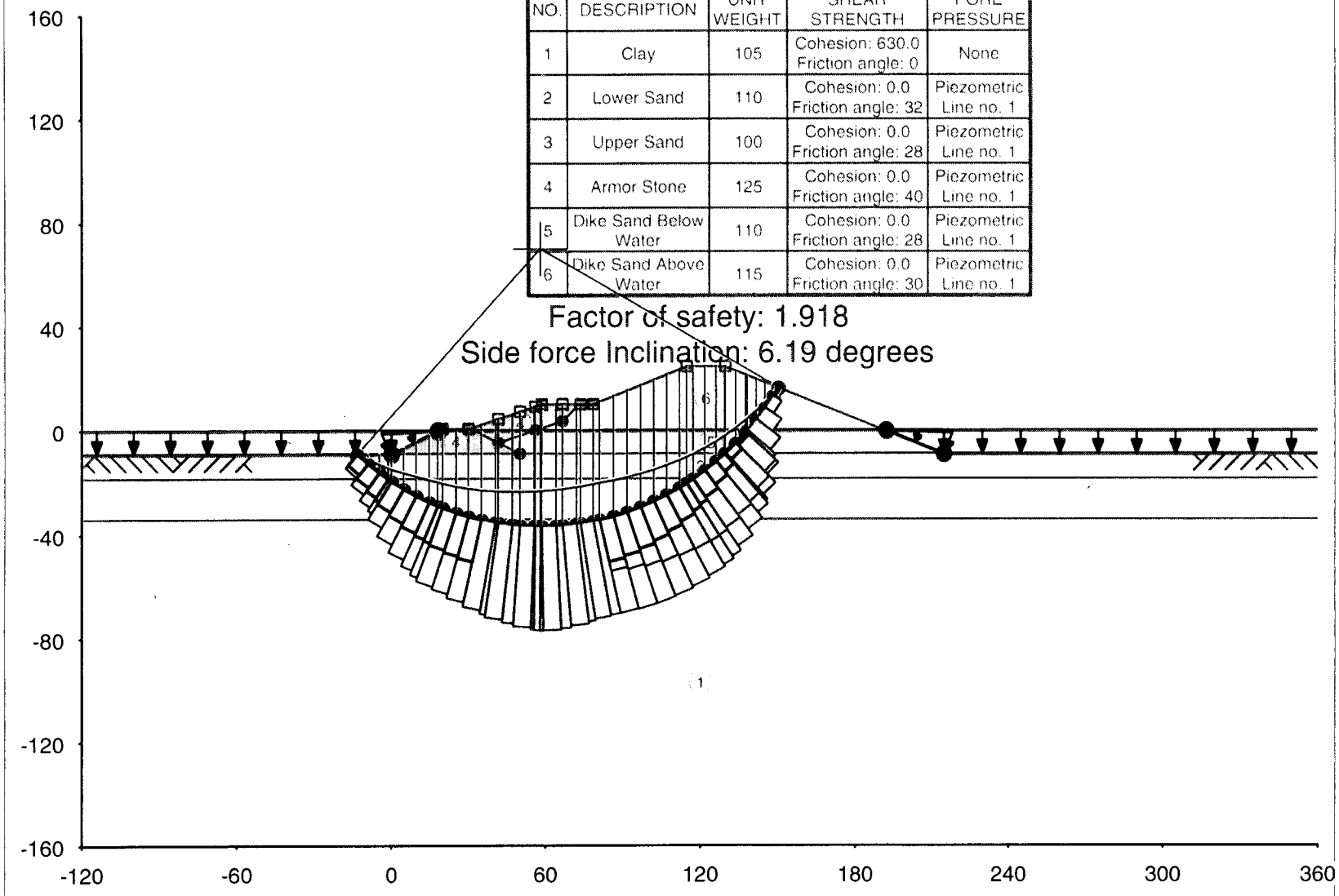
3	Upper Sand	100	Cohesion: 0.0 Friction angle: 28	Piezometric Line no. 1
4	Armor Stone	125	Cohesion: 0.0 Friction angle: 40	Piezometric Line no. 1
5	Dike Sand Below Water	110	Cohesion: 0.0 Friction angle: 28	Piezometric Line no. 1
6	Dike Sand Above Water	115	Cohesion: 0.0 Friction angle: 30	Piezometric Line no. 1



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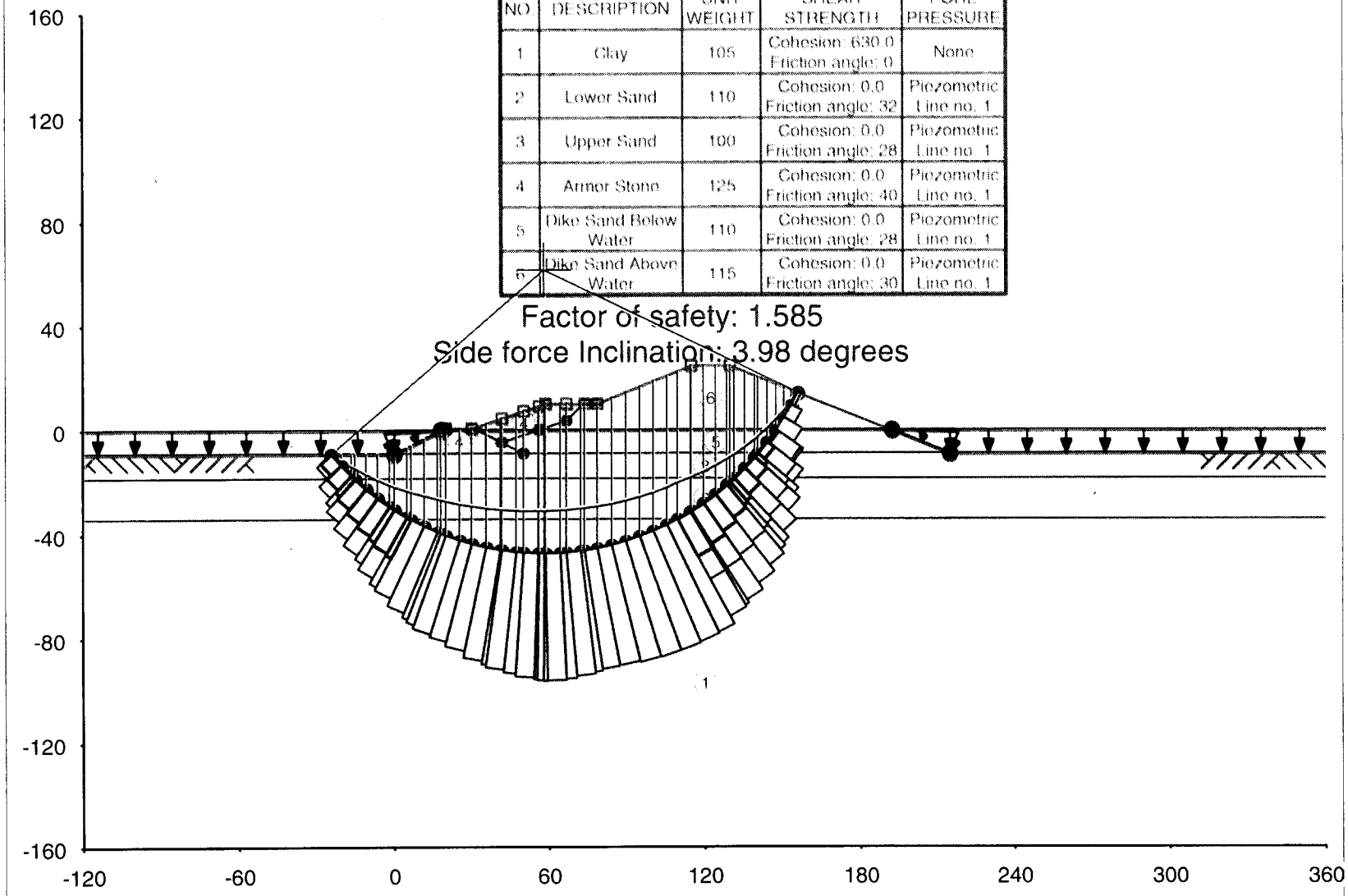
3	Upper Sand	100	Cohesion: 0.0 Friction angle: 28	Piezometric Line no. 1
4	Armor Stone	125	Cohesion: 0.0 Friction angle: 40	Piezometric Line no. 1
5	Dike Sand Below Water	110	Cohesion: 0.0 Friction angle: 28	Piezometric Line no. 1
6	Dike Sand Above Water	115	Cohesion: 0.0 Friction angle: 30	Piezometric Line no. 1

Factor of safety: 1.585

Side force Inclination: 3.98 degrees



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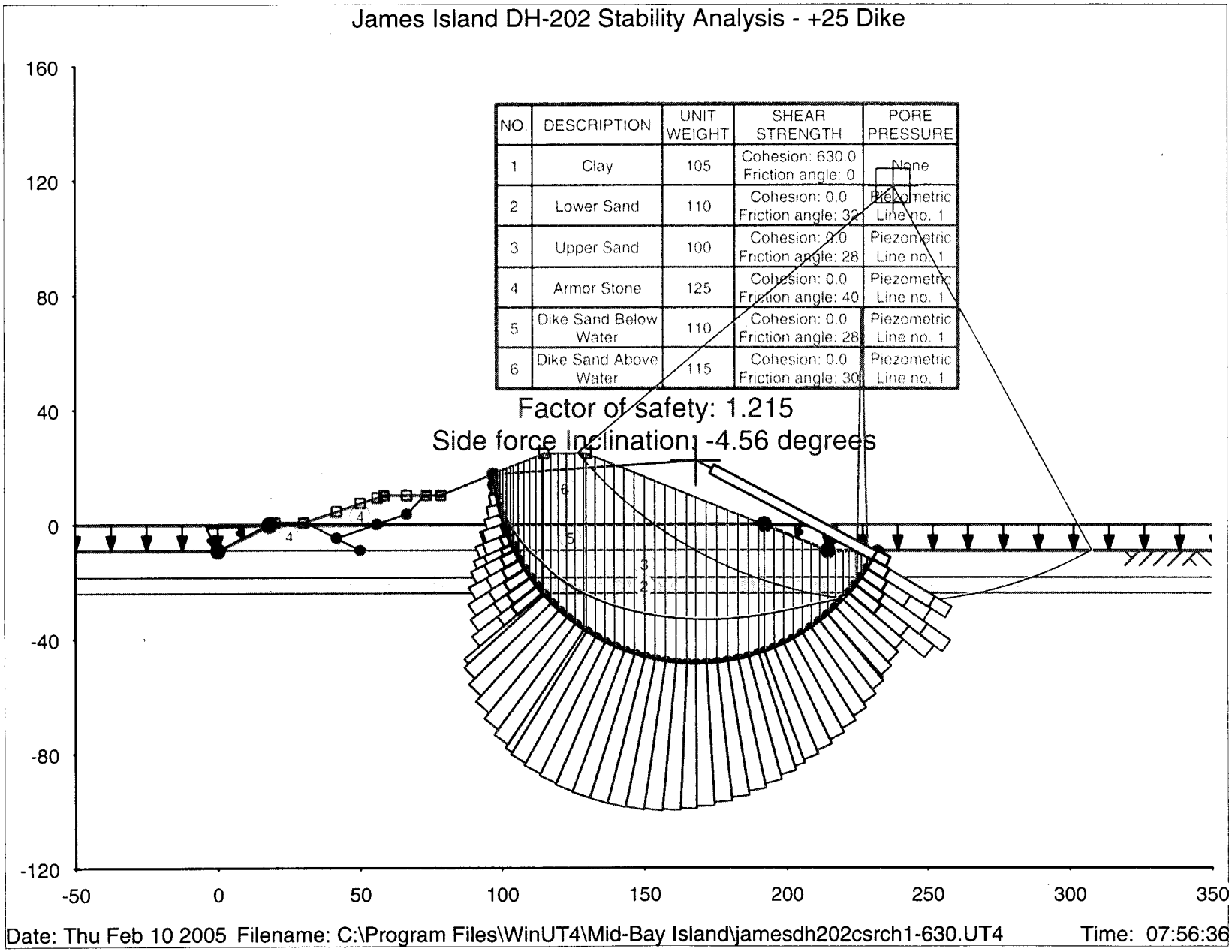
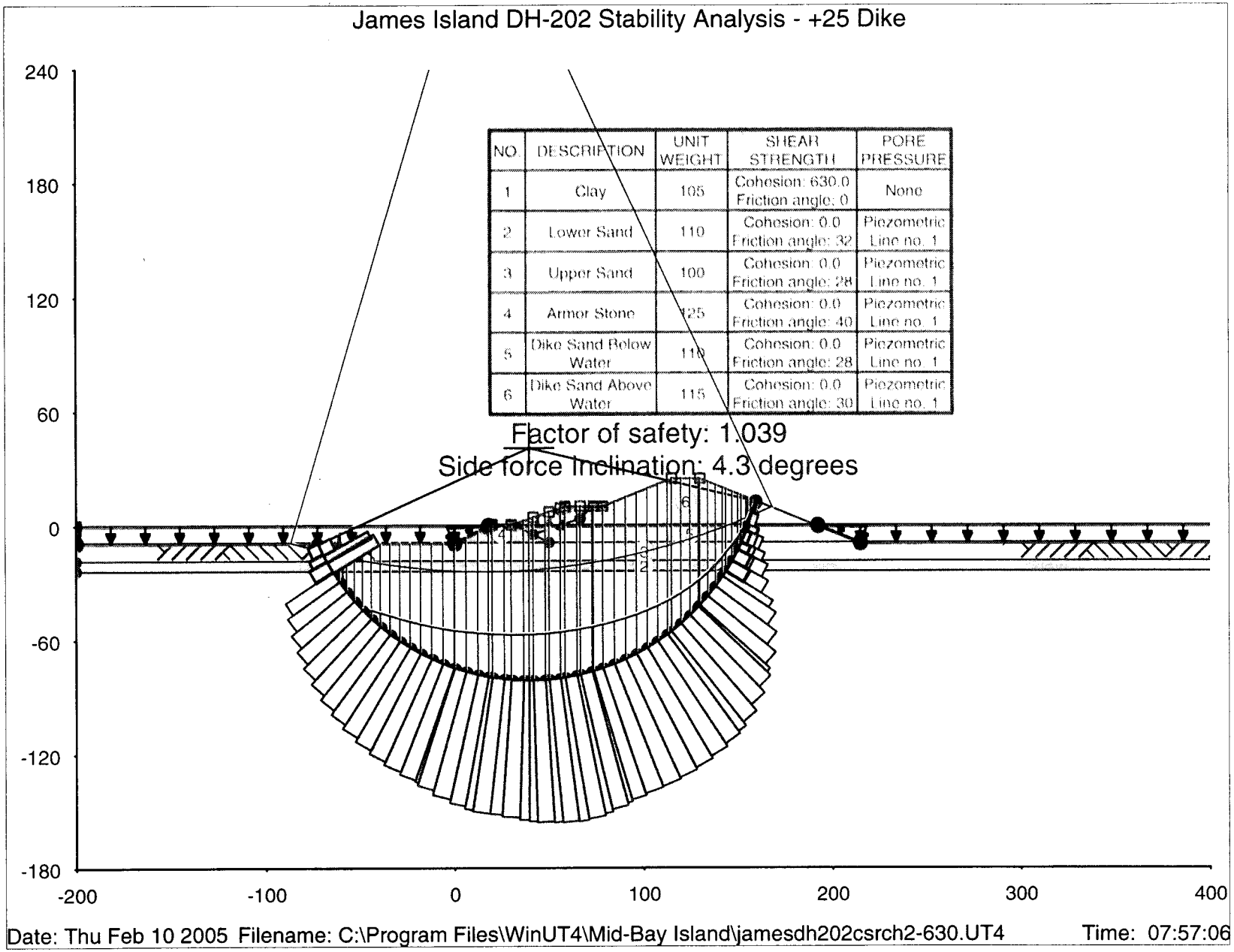
James Island DH-202 Stability Analysis - +25 Dike



James Island DH-202 Stability Analysis - +25 Dike



NO.	DESCRIPTION	UNIT WEIGHT	SHEAR STRENGTH	PORE PRESSURE
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2	Lower Sand	110	Cohesion: 0.0 Friction angle: 32	Piezometric Line no. 1
3	Upper Sand	100	Cohesion: 0.0 Friction angle: 28	Piezometric Line no. 1
4	Armor Stone	125	Cohesion: 0.0 Friction angle: 40	Piezometric Line no. 1
5	Dike Sand Below Water	110	Cohesion: 0.0 Friction angle: 28	Piezometric Line no. 1
6	Dike Sand Above Water	115	Cohesion: 0.0 Friction angle: 30	Piezometric Line no. 1

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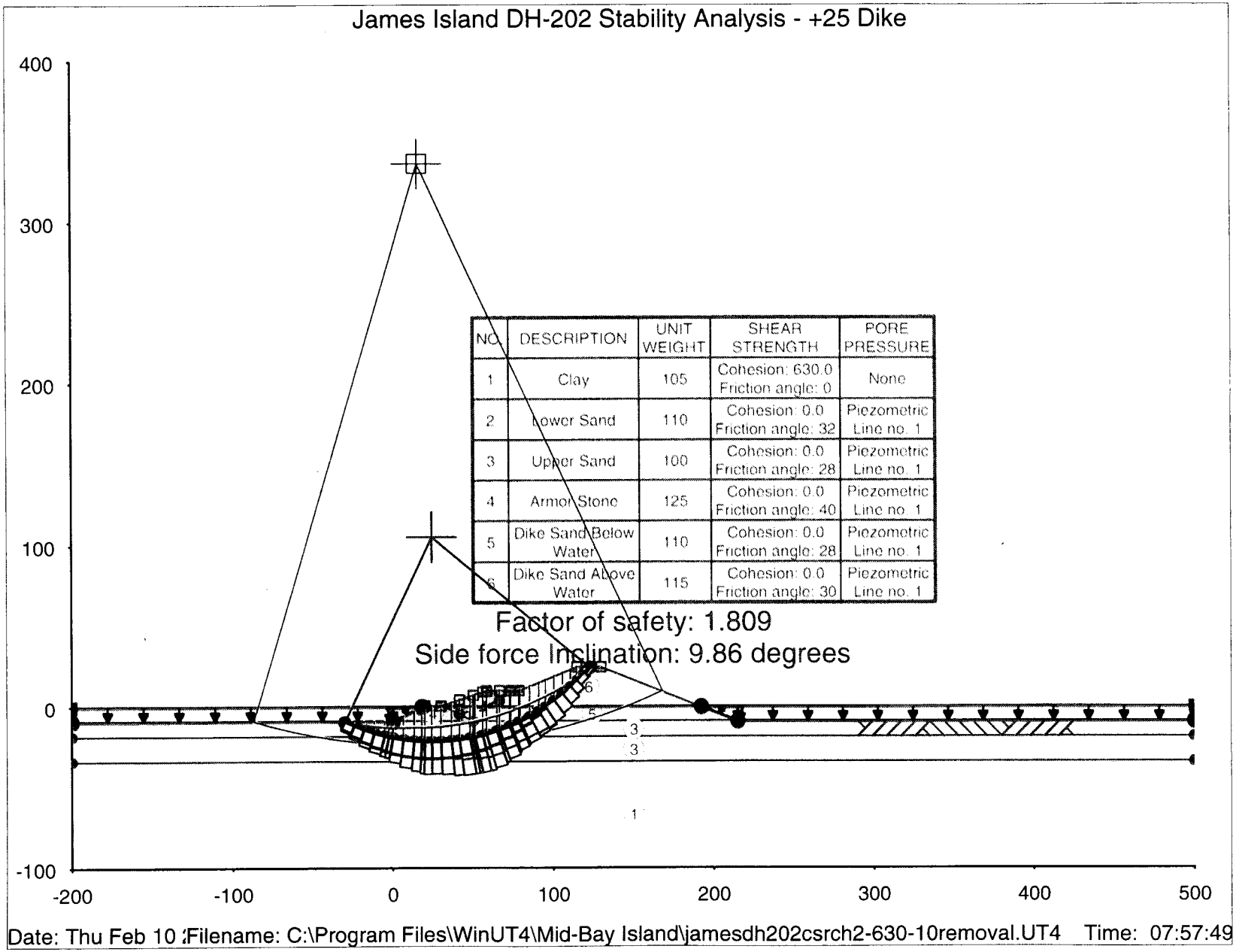
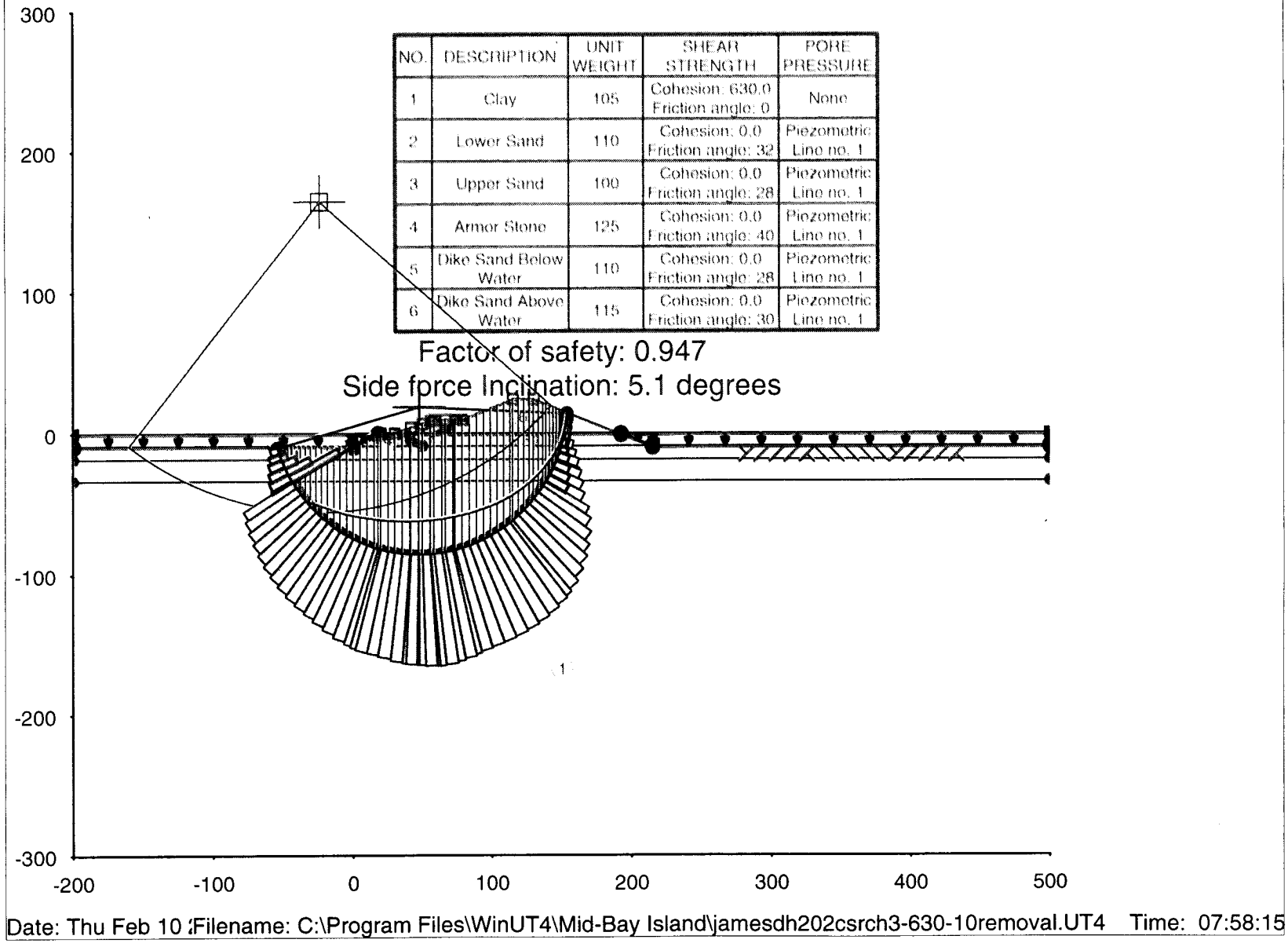

James Island DH-202 Stability Analysis - +25 Dike
400
300
200
100
0
-100
-200
-100
0
100
200
300
400
500
NO.
DESCRIPTION
UNIT WEIGHT
SHEAR STRENGTH
PORE PRESSURE
1
Clay
105
Cohesion: 630.0 Friction angle: 0
None
2
Lower Sand
110
Cohesion: 0.0 Friction angle: 32
Piezometric Line no. 1
3
Upper Sand
100
Cohesion: 0.0 Friction angle: 28
Piezometric Line no. 1
4
Armor Stone
125
Cohesion: 0.0 Friction angle: 40
Piezometric Line no. 1
5
Dike Sand Below Water
110
Cohesion: 0.0 Friction angle: 28
Piezometric Line no. 1
6
Dike Sand Above Water
115
Cohesion: 0.0 Friction angle: 30
Piezometric Line no. 1
Factor of safety: 1.809
Side force Inclination: 9.86 degrees
6
5
3
3
1
Date: Thu Feb 10 ;Filename: C:\Program Files\WinUT4\Mid-Bay Island\jamesdh202csrch2-630-10removal.UT4 Time: 07:57:49

James Island DH-202 Stability Analysis - +25 Dike



NO.	DESCRIPTION	UNIT WEIGHT	SHEAR STRENGTH	PORE PRESSURE
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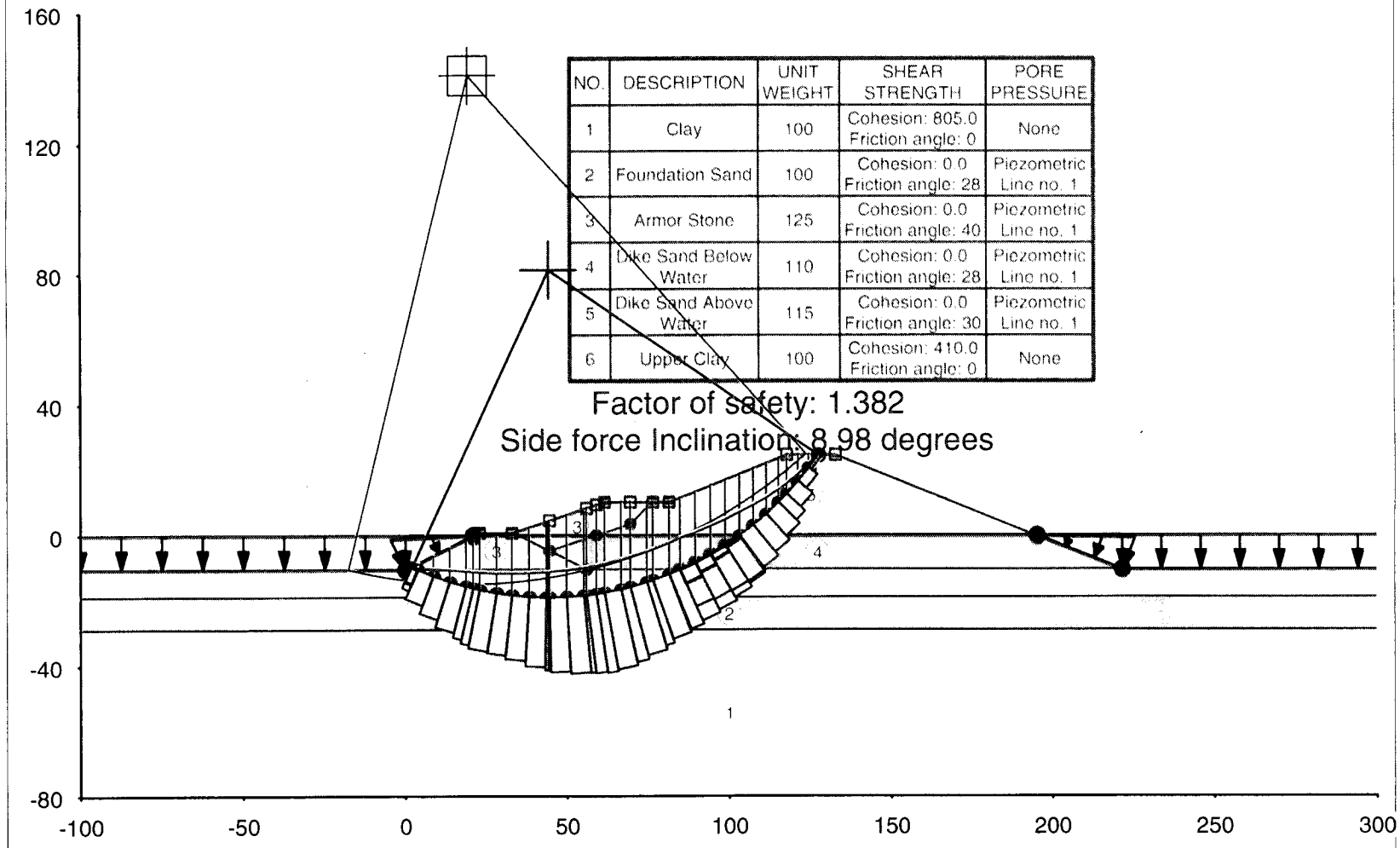
2	Lower Sand	110	Cohesion: 0.0 Friction angle: 32	Piezometric Line no. 1
3	Upper Sand	100	Cohesion: 0.0 Friction angle: 28	Piezometric Line no. 1
4	Armor Stone	125	Cohesion: 0.0 Friction angle: 40	Piezometric Line no. 1
5	Dike Sand Below Water	110	Cohesion: 0.0 Friction angle: 28	Piezometric Line no. 1
6	Dike Sand Above Water	115	Cohesion: 0.0 Friction angle: 30	Piezometric Line no. 1

Date: Thu Feb 10 ;Filename: C:\Program Files\WinUT4\Mid-Bay Island\jamesdh202csrch3-630-10removal.UT4 Time: 07:58:15

James Island DH-203 Stability Analysis - +25 Dike



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2	Foundation Sand	100	Cohesion: 0.0 Friction angle: 28	Piezometric Line no. 1
3	Armor Stone	125	Cohesion: 0.0 Friction angle: 40	Piezometric Line no. 1
4	Dike Sand Below Water	110	Cohesion: 0.0 Friction angle: 28	Piezometric Line no. 1
5	Dike Sand Above Water	115	Cohesion: 0.0 Friction angle: 30	Piezometric Line no. 1
6	Upper Clay	100	Cohesion: 410.0 Friction angle: 0	None

Factor of safety: 1.382

Side force Inclination: 8.98 degrees

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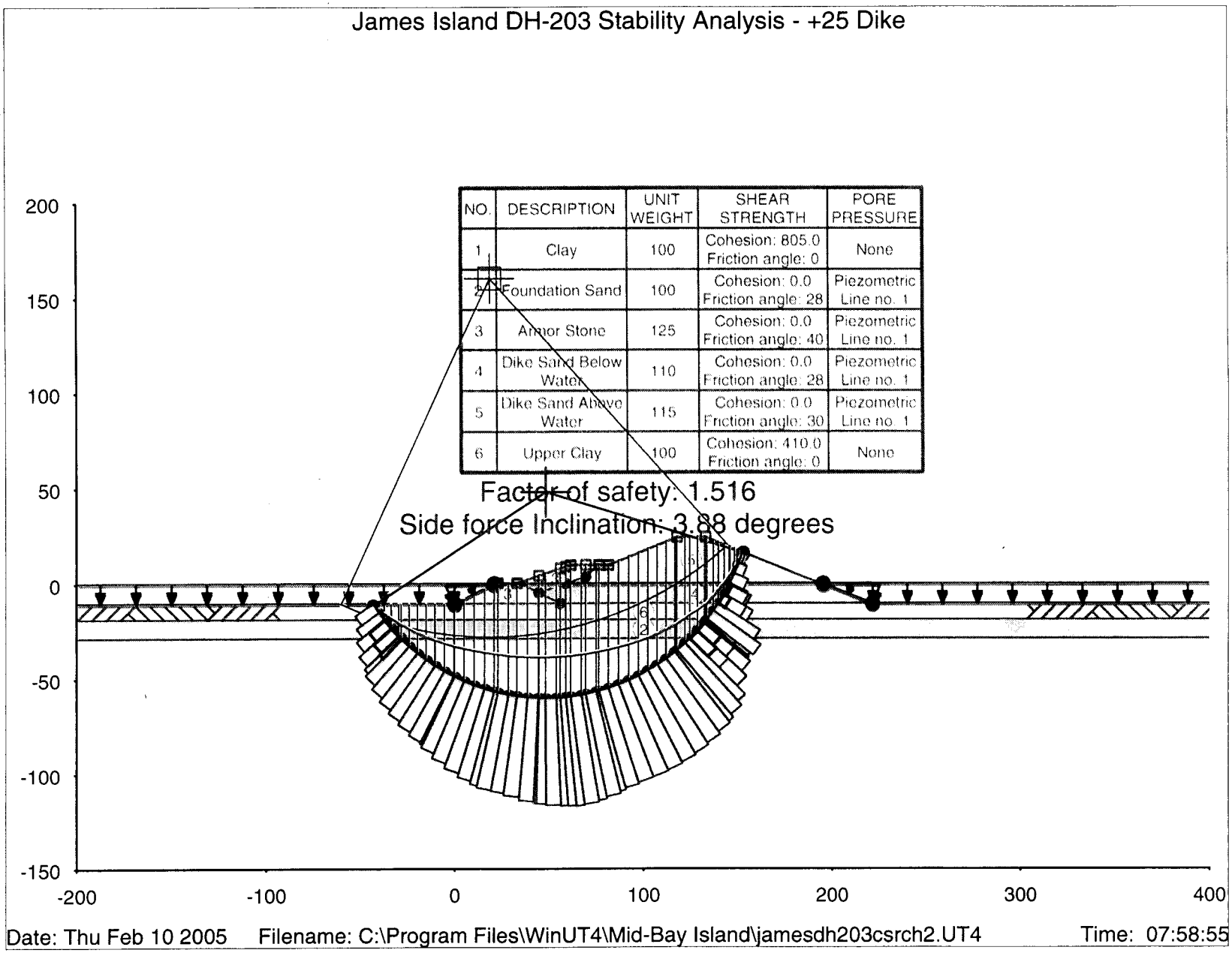
James Island DH-203 Stability Analysis - +25 Dike



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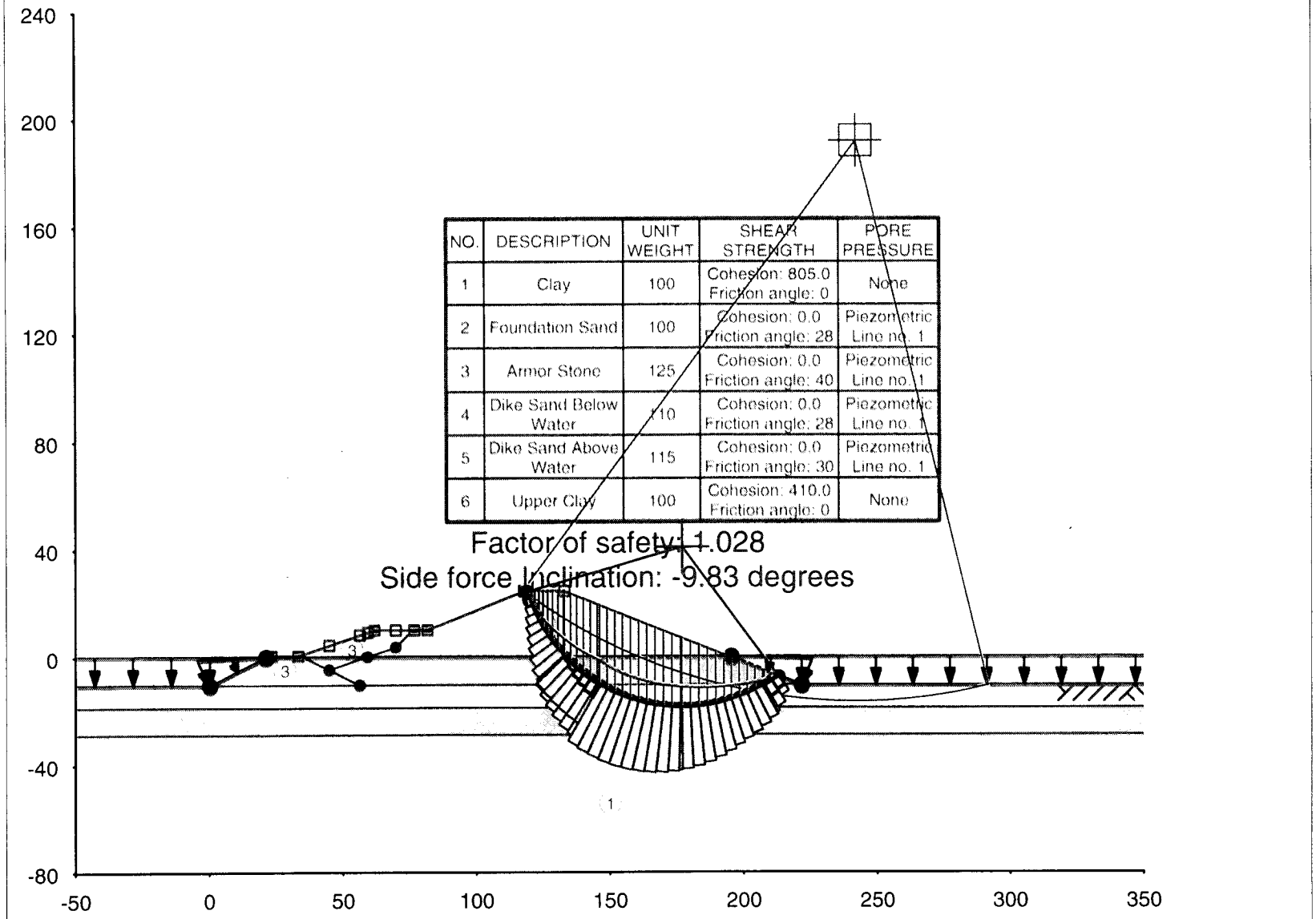

NO.	DESCRIPTION	UNIT WEIGHT	SHEAR STRENGTH	PORE PRESSURE
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2	Foundation Sand	100	Cohesion: 0.0 Friction angle: 28	Piezometric Line no. 1
3	Armor Stone	125	Cohesion: 0.0 Friction angle: 40	Piezometric Line no. 1
4	Dike Sand Below Water	110	Cohesion: 0.0 Friction angle: 28	Piezometric Line no. 1
5	Dike Sand Above Water	115	Cohesion: 0.0 Friction angle: 30	Piezometric Line no. 1
6	Upper Clay	100	Cohesion: 410.0 Friction angle: 0	None

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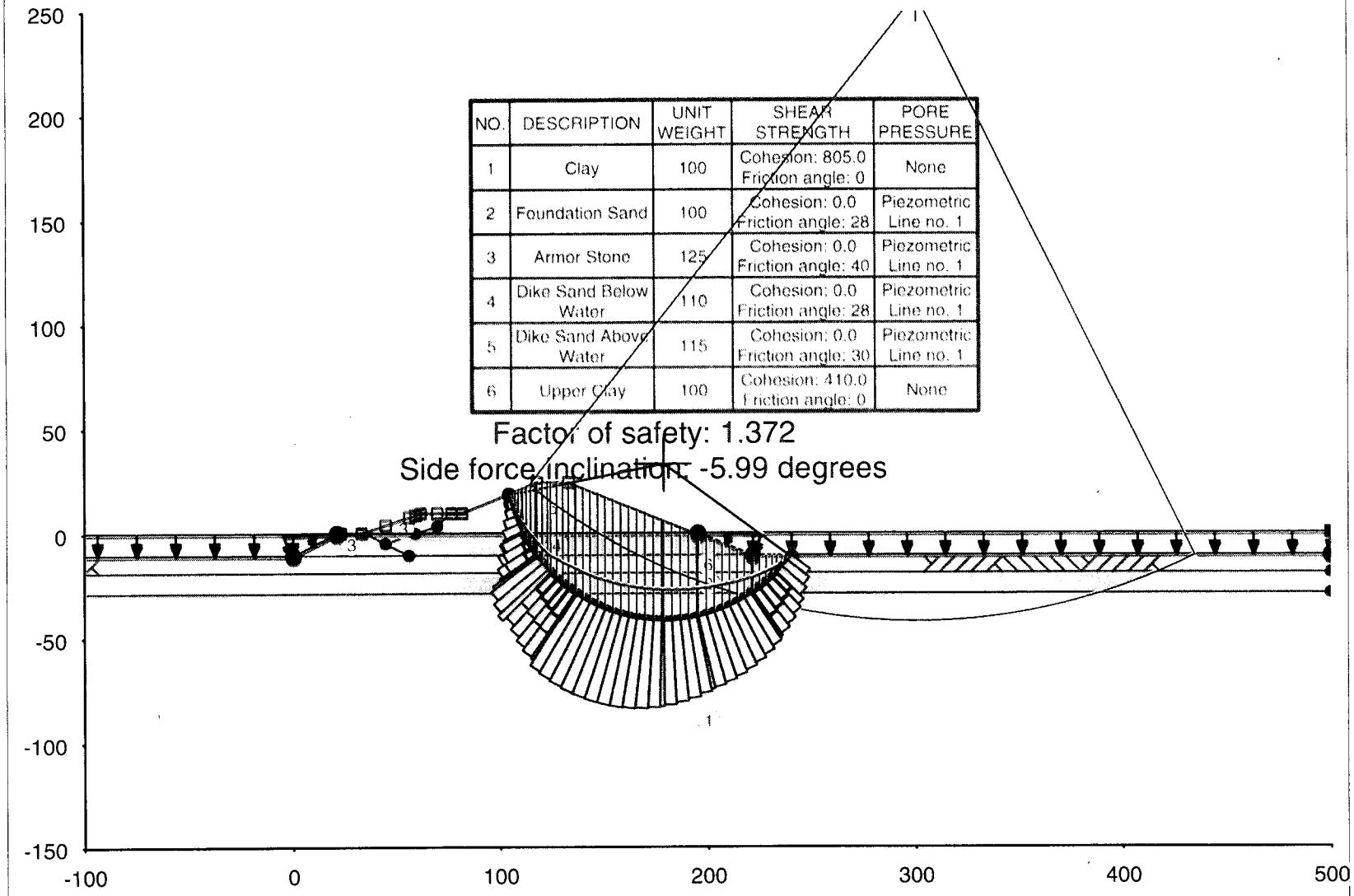
James Island DH-203 Stability Analysis - +25 Dike



NO.	DESCRIPTION	UNIT WEIGHT	SHEAR STRENGTH	PORE PRESSURE
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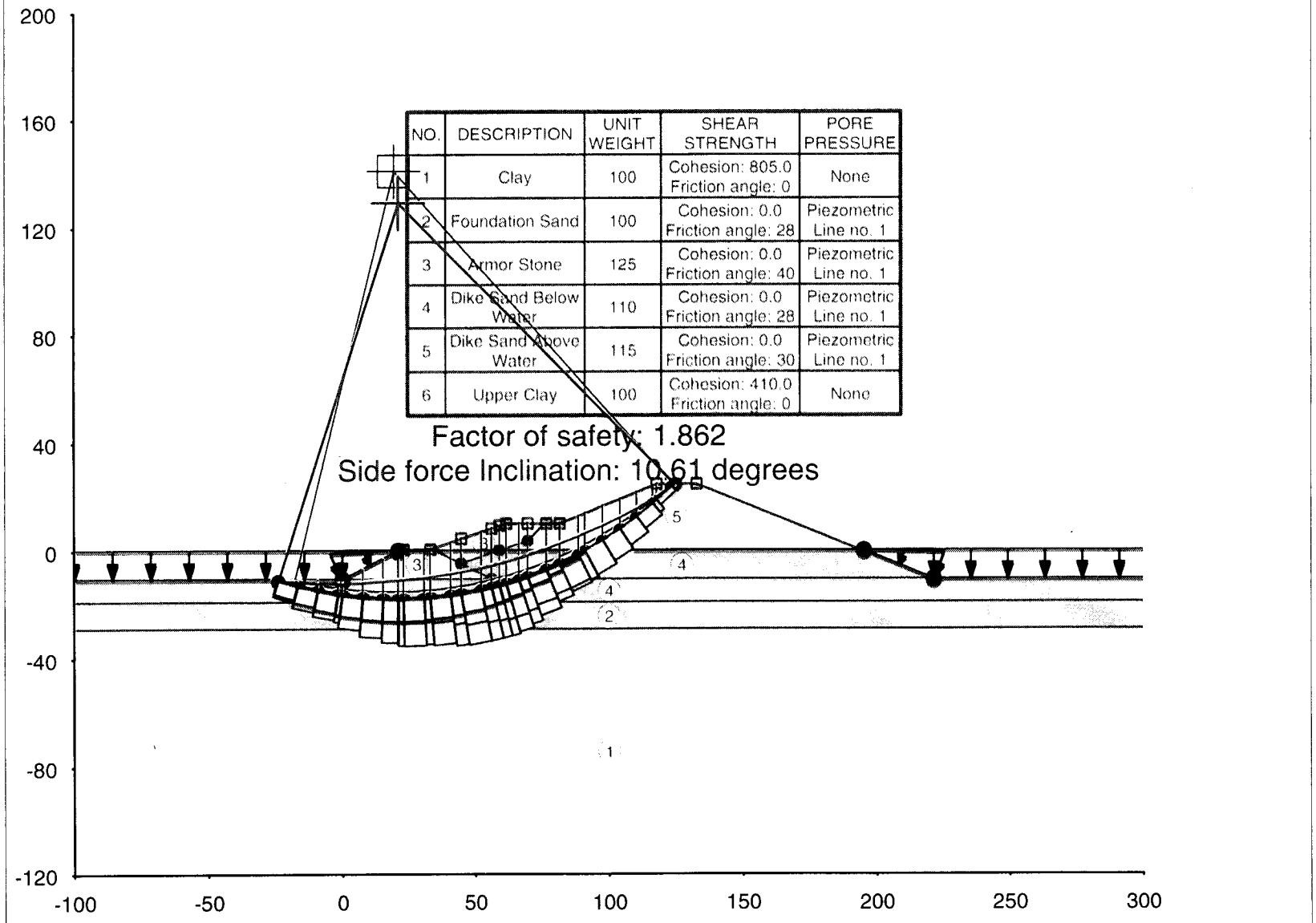
3	Armor Stone	125	Cohesion: 0.0 Friction angle: 40	Piezometric Line no. 1
4	Dike Sand Below Water	110	Cohesion: 0.0 Friction angle: 28	Piezometric Line no. 1
5	Dike Sand Above Water	115	Cohesion: 0.0 Friction angle: 30	Piezometric Line no. 1
6	Upper Clay	100	Cohesion: 410.0 Friction angle: 0	None

Factor of safety: 1.372

Side force inclination: -5.99 degrees

Date: Thu Feb 10 2005 Filename: C:\Program Files\WinUT4\Mid-Bay Island\jamesdh203csrch4.UT4 Time: 07:59:32

James Island DH-203 Stability Analysis - +25 Dike - Remove Upper Clay



NO.	DESCRIPTION	UNIT WEIGHT	SHEAR STRENGTH	PORE PRESSURE
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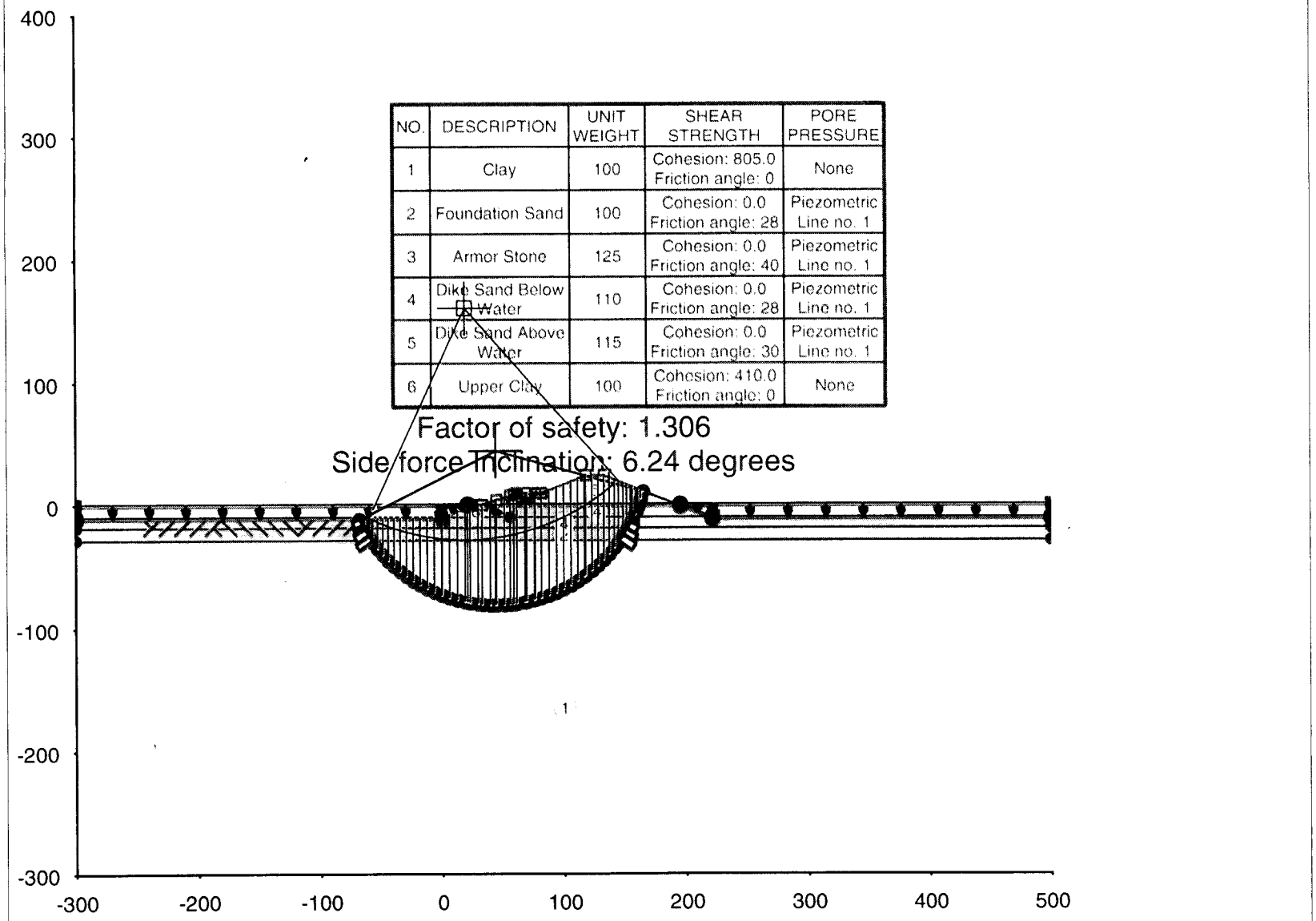
2	Foundation Sand	100	Cohesion: 0.0 Friction angle: 28	Piezometric Line no. 1
3	Armor Stone	125	Cohesion: 0.0 Friction angle: 40	Piezometric Line no. 1
4	Dike Sand Below Water	110	Cohesion: 0.0 Friction angle: 28	Piezometric Line no. 1
5	Dike Sand Above Water	115	Cohesion: 0.0 Friction angle: 30	Piezometric Line no. 1
6	Upper Clay	100	Cohesion: 410.0 Friction angle: 0	None

Date: Thu Feb 10 2005 Filename: C:\Program Files\WinUT4\Mid-Bay Island\jamesdh203replacecsrch1.UT4 Time: 07:59:51

James Island DH-203 Stability Analysis - +25 Dike - Remove Upper Clay



NO.	DESCRIPTION	UNIT WEIGHT	SHEAR STRENGTH	PORE PRESSURE
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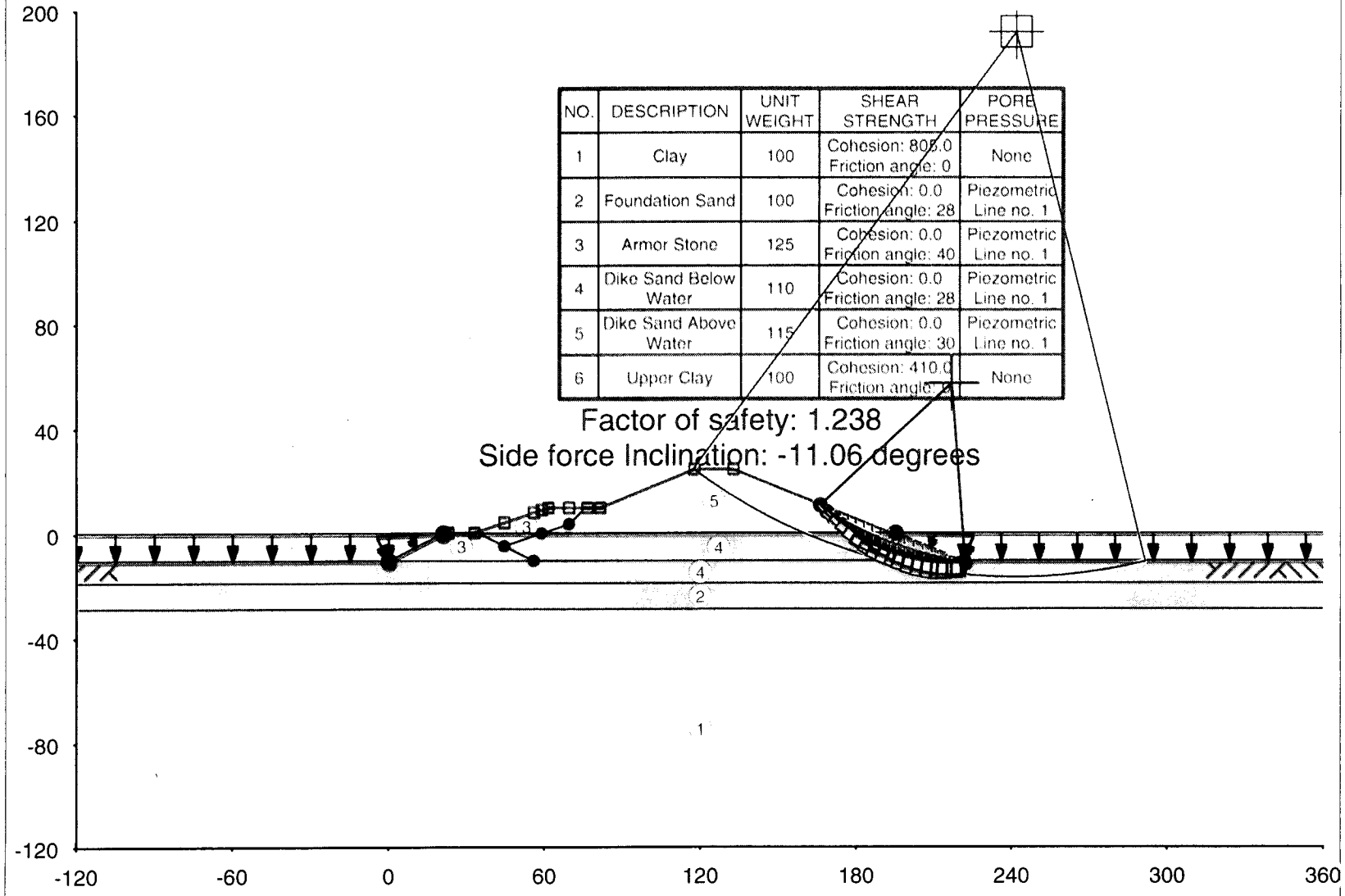
2	Foundation Sand	100	Cohesion: 0.0 Friction angle: 28	Piezometric Line no. 1
3	Armor Stone	125	Cohesion: 0.0 Friction angle: 40	Piezometric Line no. 1
4	Dike Sand Below Water	110	Cohesion: 0.0 Friction angle: 28	Piezometric Line no. 1
5	Dike Sand Above Water	115	Cohesion: 0.0 Friction angle: 30	Piezometric Line no. 1
6	Upper Clay	100	Cohesion: 410.0 Friction angle: 0	None

Date: Thu Feb 10 2005 Filename: C:\Program Files\WinUT4\Mid-Bay Island\jamesdh203replacecsrch2.UT4 Time: 08:00:43

James Island DH-203 Stability Analysis - +25 Dike - Remove Upper Clay



NO.	DESCRIPTION	UNIT WEIGHT	SHEAR STRENGTH	PORE PRESSURE
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2	Foundation Sand	100	Cohesion: 0.0 Friction angle: 28	Piezometric Line no. 1
3	Armor Stone	125	Cohesion: 0.0 Friction angle: 40	Piezometric Line no. 1
4	Dike Sand Below Water	110	Cohesion: 0.0 Friction angle: 28	Piezometric Line no. 1
5	Dike Sand Above Water	115	Cohesion: 0.0 Friction angle: 30	Piezometric Line no. 1
6	Upper Clay	100	Cohesion: 410.0 Friction angle: 0	None

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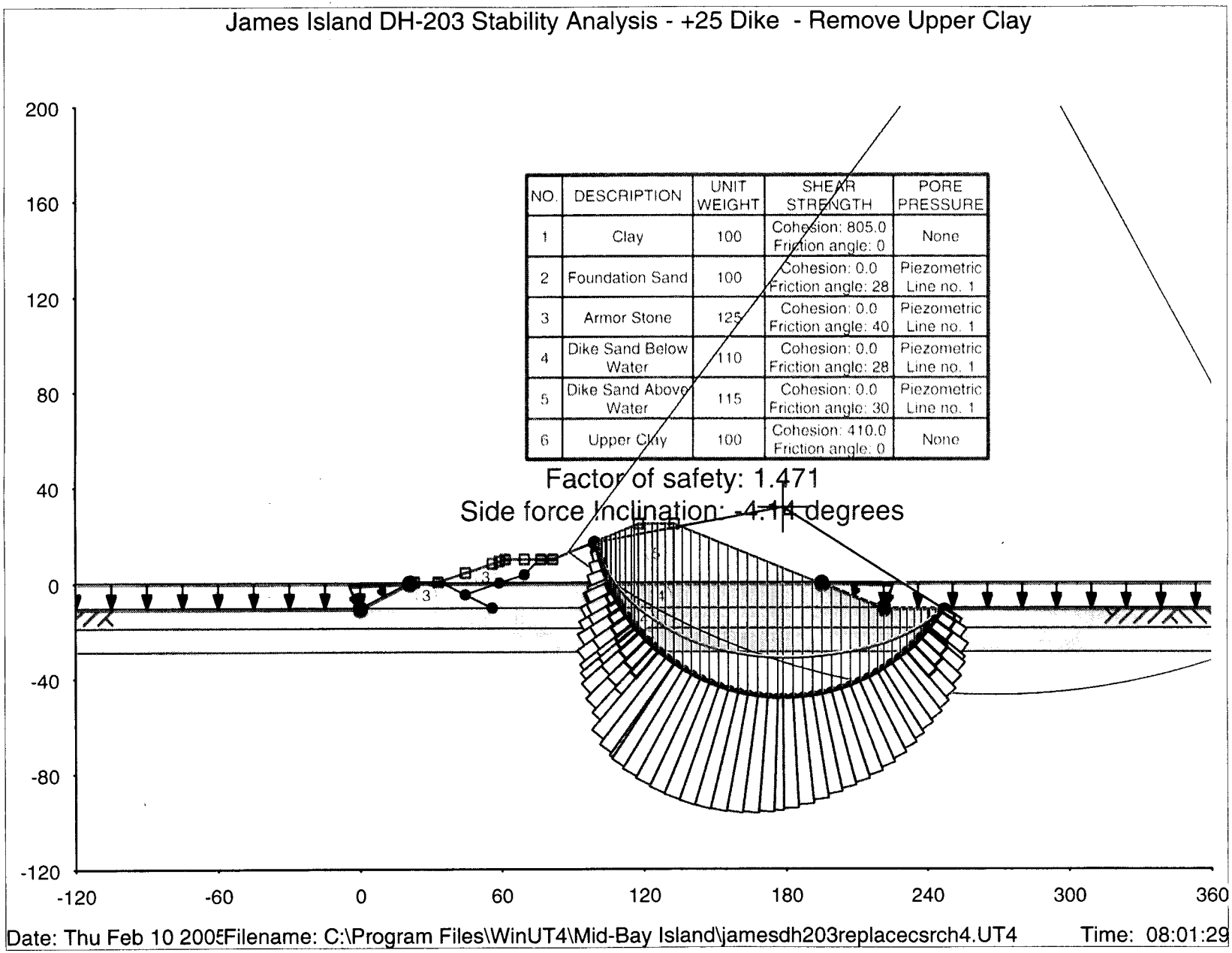
James Island DH-203 Stability Analysis - +25 Dike - Remove Upper Clay



NO.	DESCRIPTION	UNIT WEIGHT	SHEAR STRENGTH	PORE PRESSURE
1	Clay	100	Cohesion: 805.0 Friction angle: 0	None
2	Foundation Sand	100	Cohesion: 0.0 Friction angle: 28	Piezometric Line no. 1
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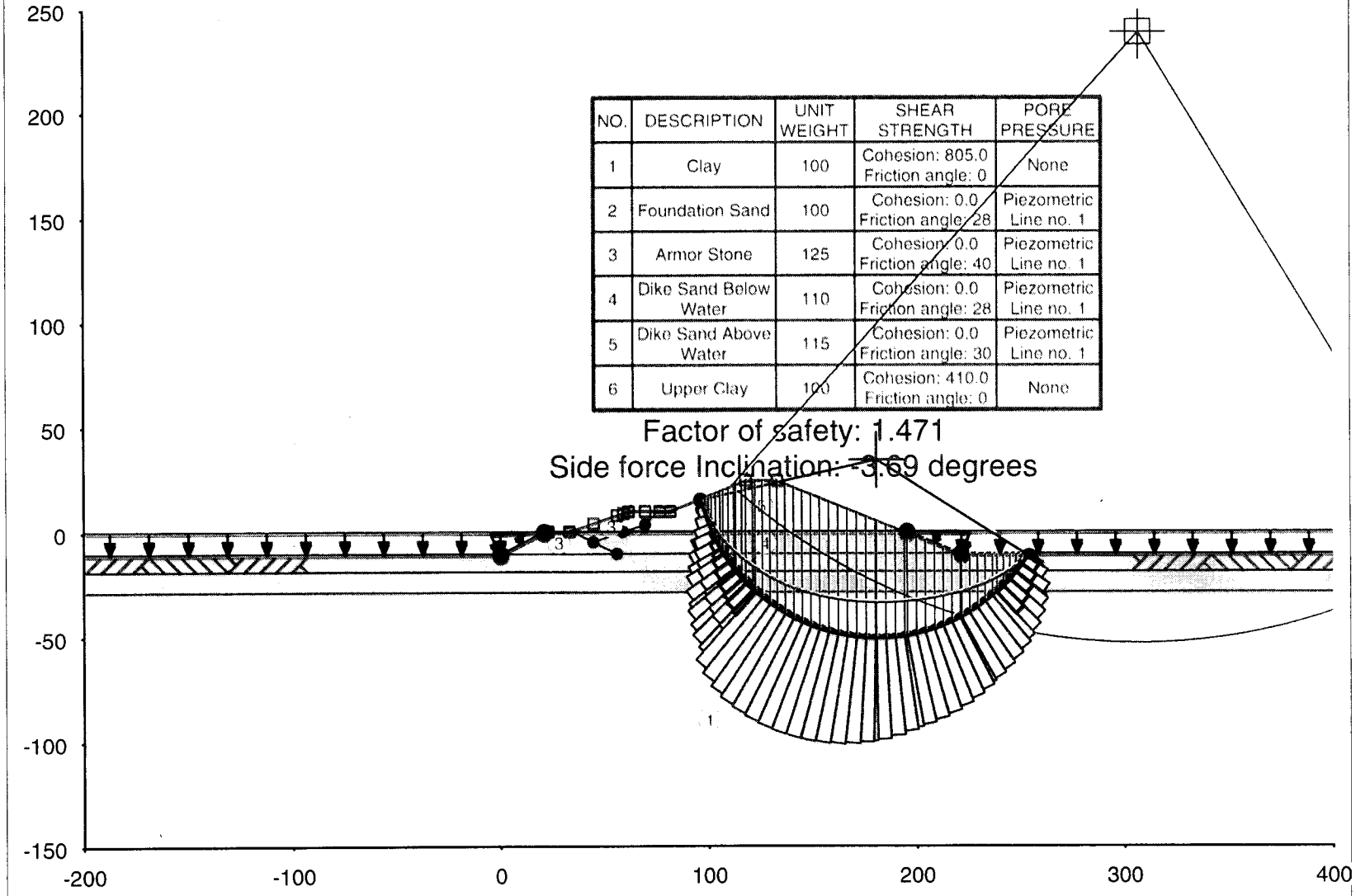
4	Dike Sand Below Water	110	Cohesion: 0.0 Friction angle: 28	Piezometric Line no. 1
5	Dike Sand Above Water	115	Cohesion: 0.0 Friction angle: 30	Piezometric Line no. 1
6	Upper Clay	100	Cohesion: 410.0 Friction angle: 0	None

James Island DH-203 Stability Analysis - +25 Dike - Remove Upper Clay



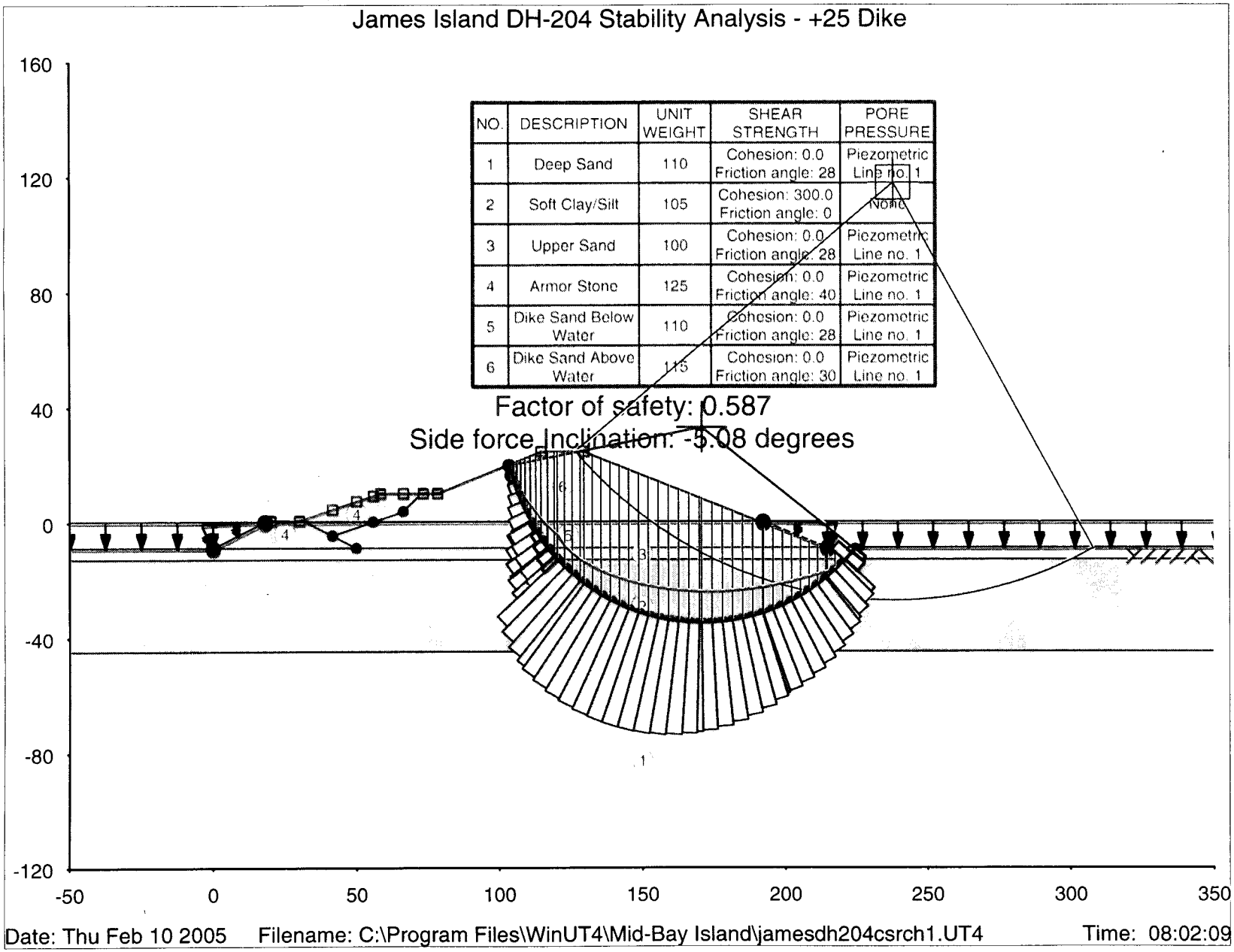
NO.	DESCRIPTION	UNIT WEIGHT	SHEAR STRENGTH	PORE PRESSURE
1	Clay	100	Cohesion: 805.0 Friction angle: 0	None
2	Foundation Sand	100	Cohesion: 0.0 Friction angle: 28	Piezometric Line no. 1
3	Armor Stone	125	Cohesion: 0.0 Friction angle: 40	Piezometric Line no. 1
4	Dike Sand Below Water	110	Cohesion: 0.0 Friction angle: 28	Piezometric Line no. 1
5	Dike Sand Above Water	115	Cohesion: 0.0 Friction angle: 30	Piezometric Line no. 1
6	Upper Clay	100	Cohesion: 410.0 Friction angle: 0	None

Factor of safety: 1.471

Side force Inclination: -3.69 degrees

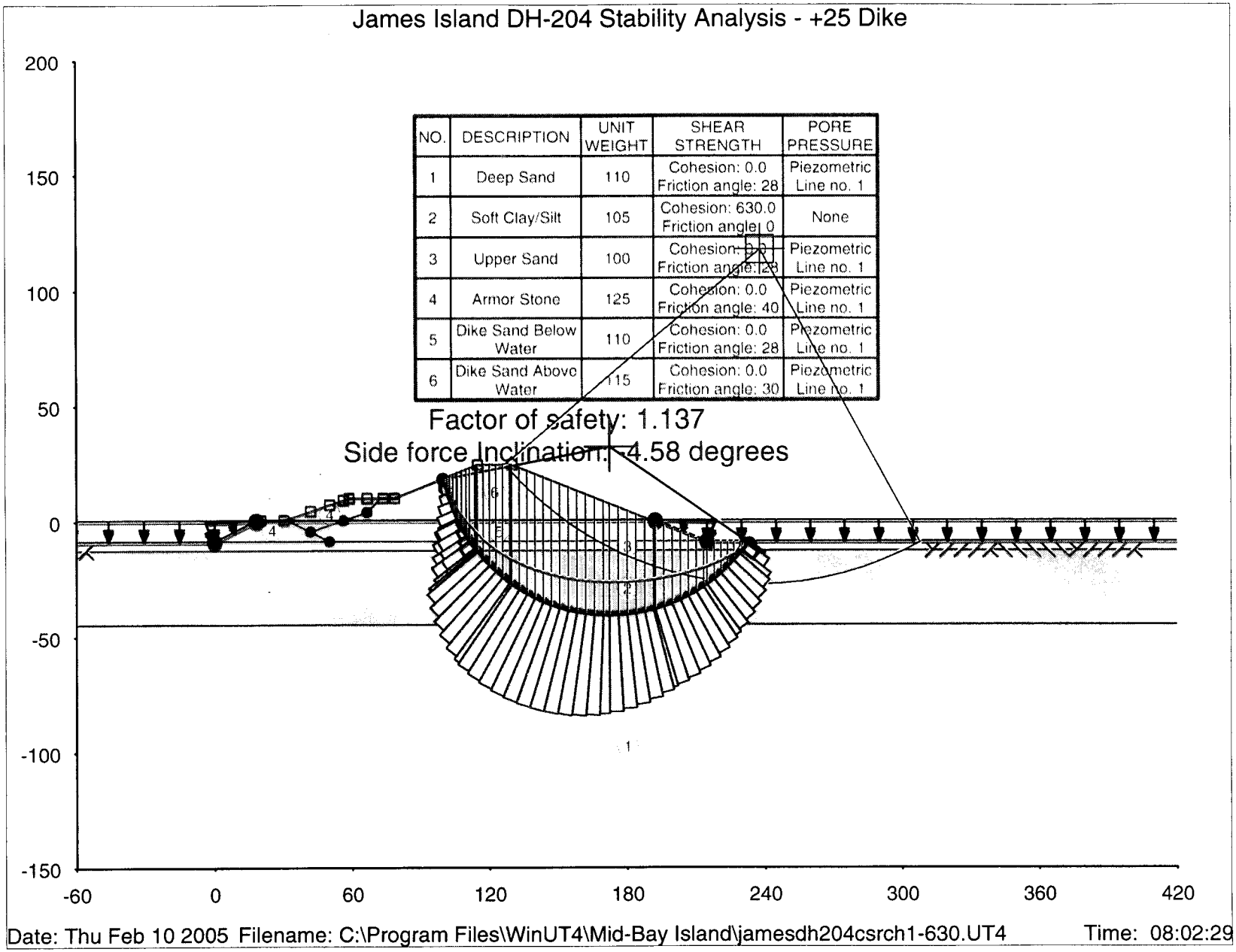
Date: Thu Feb 10 2005 Filename: C:\Program Files\WinUT4\Mid-Bay Island\jamesdh203replacecsrch5.UT4 Time: 08:01:49

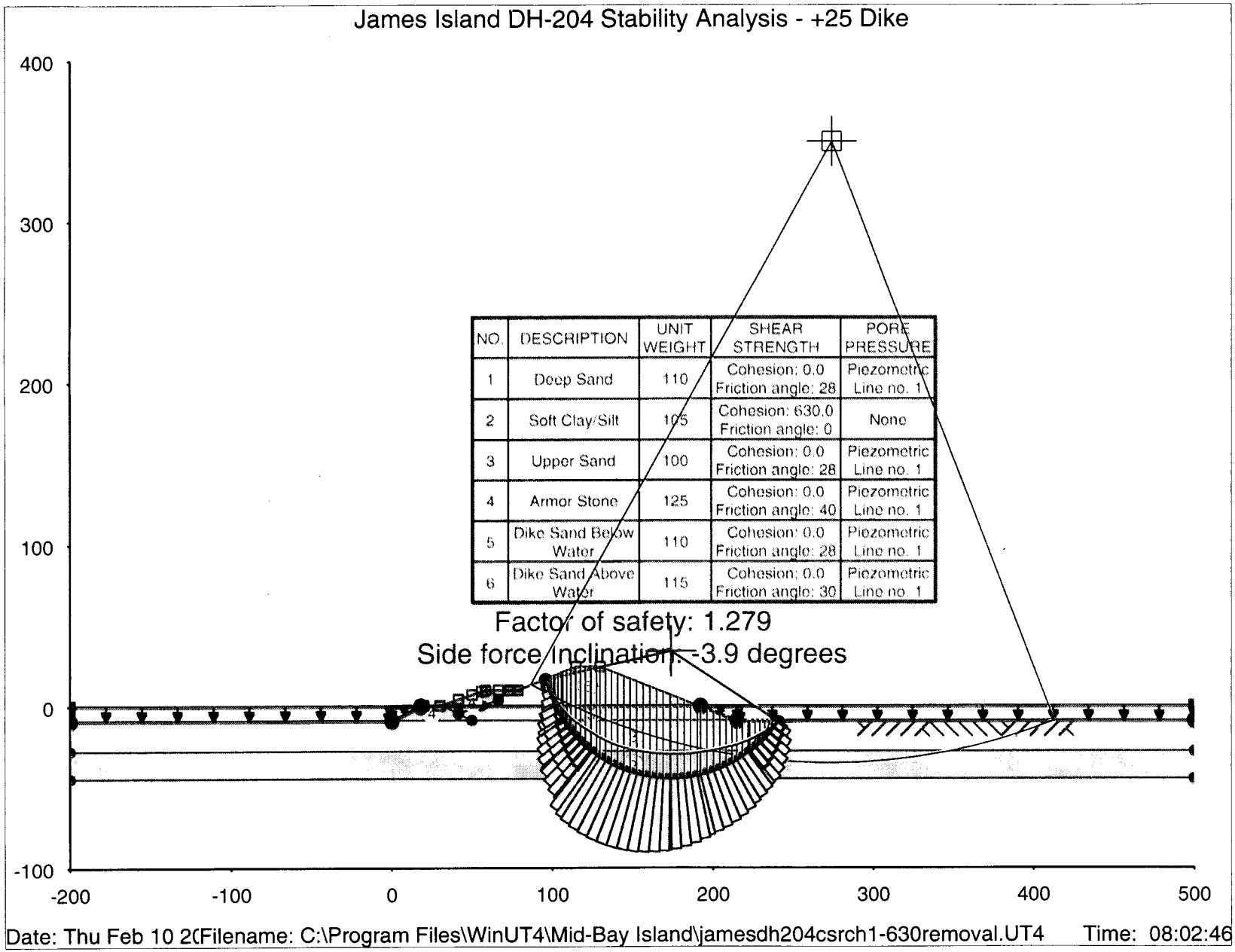
James Island DH-204 Stability Analysis - +25 Dike

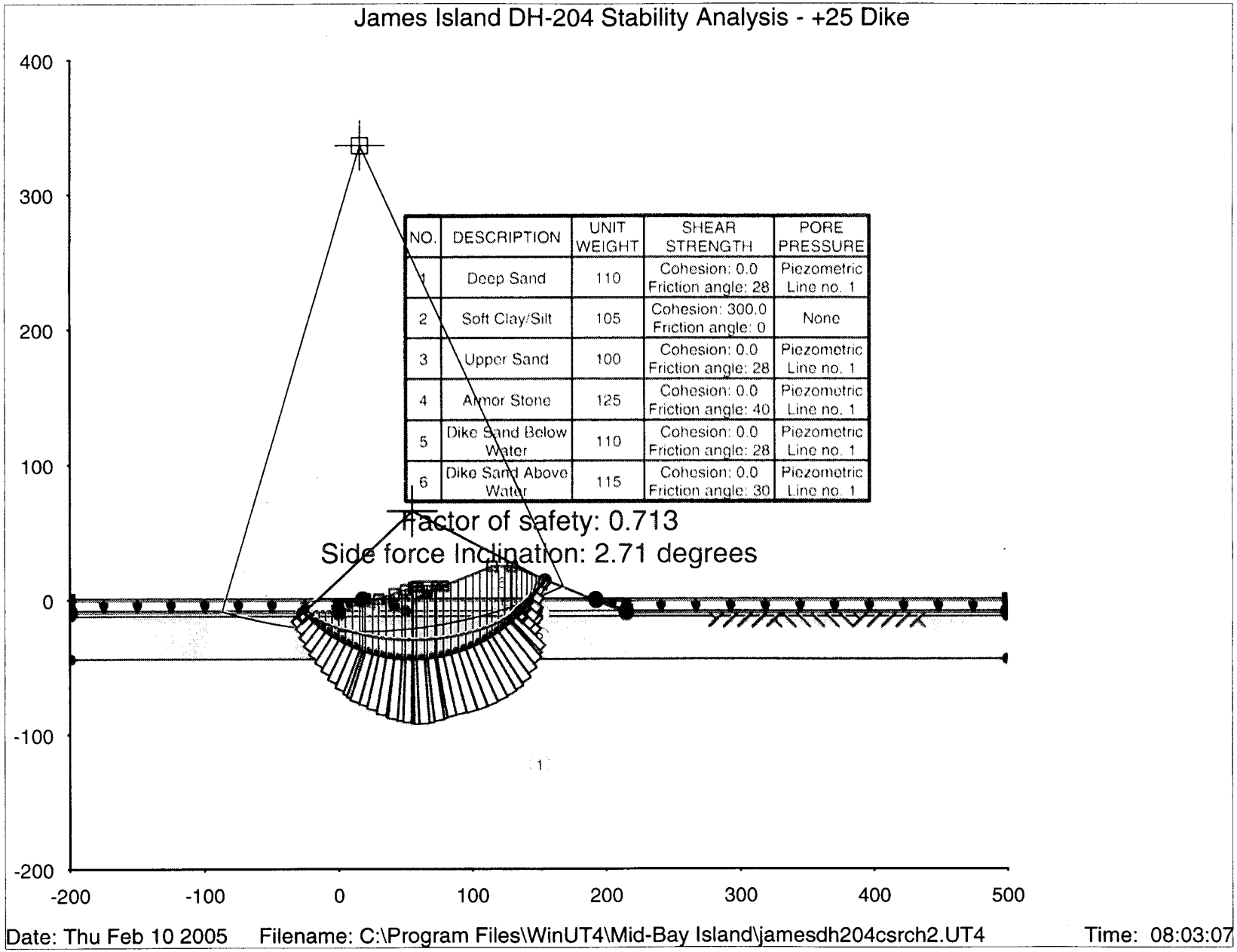


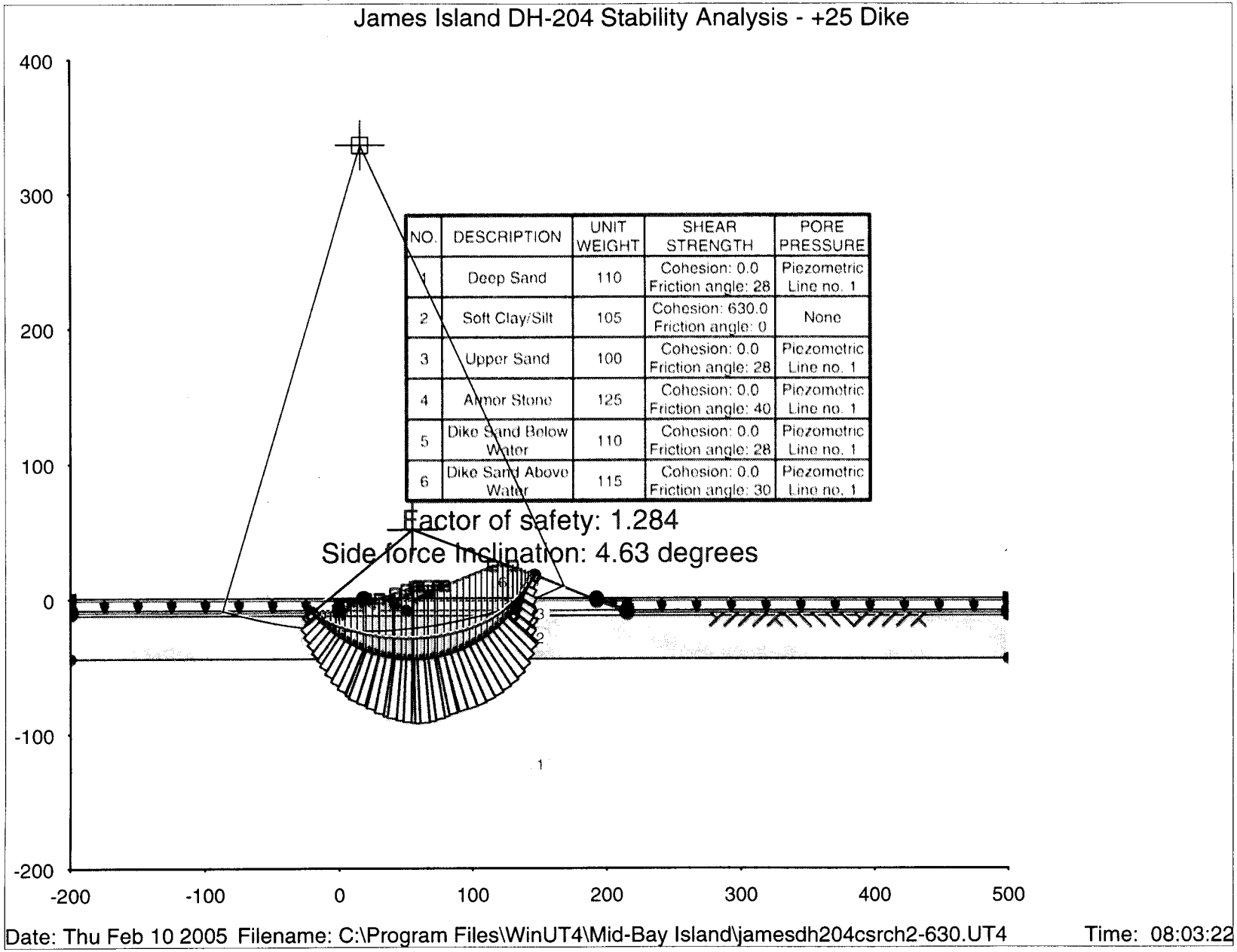
NO.	DESCRIPTION	UNIT WEIGHT	SHEAR STRENGTH	PORE PRESSURE
1	Deep Sand	110	Cohesion: 0.0 Friction angle: 28	Piezometric Line no. 1
2	Soft Clay/Silt	105	Cohesion: 300.0 Friction angle: 0	None
3	Upper Sand	100	Cohesion: 0.0 Friction angle: 28	Piezometric Line no. 1
4	Armor Stone	125	Cohesion: 0.0 Friction angle: 40	Piezometric Line no. 1
5	Dike Sand Below Water	110	Cohesion: 0.0 Friction angle: 28	Piezometric Line no. 1
6	Dike Sand Above Water	115	Cohesion: 0.0 Friction angle: 30	Piezometric Line no. 1

James Island DH-204 Stability Analysis - +25 Dike

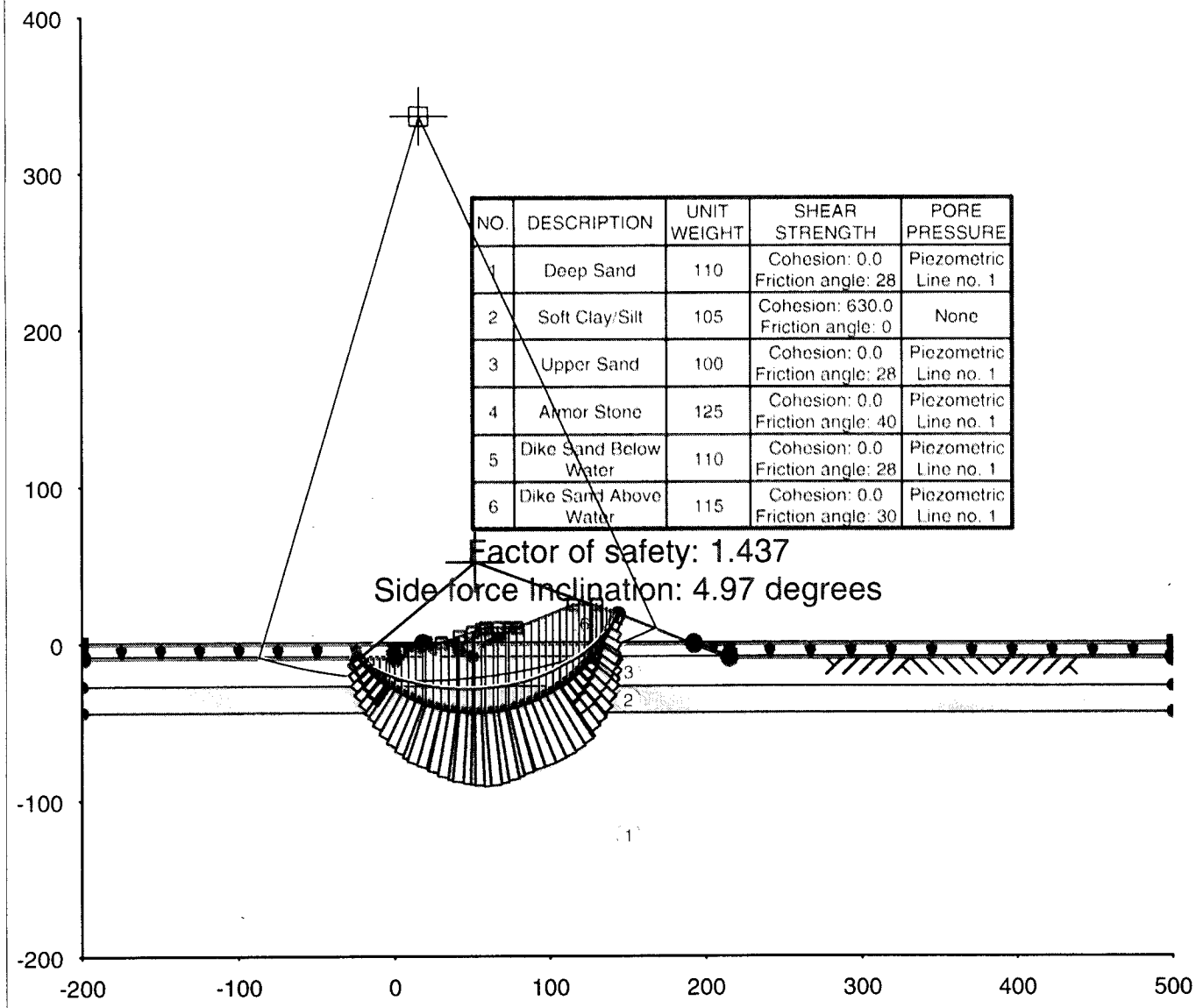



James Island DH-204 Stability Analysis - +25 Dike
400
300
200
100
0
-100
-200
-100
0
100
200
300
400
500
NO. | DESCRIPTION | UNIT WEIGHT | SHEAR STRENGTH | PORE PRESSURE
1 | Deep Sand | 110 | Cohesion: 0.0 Friction angle: 28 | Piezometric Line no. 1
2 | Soft Clay/Silt | 105 | Cohesion: 630.0 Friction angle: 0 | None
3 | Upper Sand | 100 | Cohesion: 0.0 Friction angle: 28 | Piezometric Line no. 1
4 | Armor Stone | 125 | Cohesion: 0.0 Friction angle: 40 | Piezometric Line no. 1
5 | Dike Sand Below Water | 110 | Cohesion: 0.0 Friction angle: 28 | Piezometric Line no. 1
6 | Dike Sand Above Water | 115 | Cohesion: 0.0 Friction angle: 30 | Piezometric Line no. 1
Factor of safety: 1.279
Side force inclination: -3.9 degrees
Date: Thu Feb 10 2(Filename: C:\Program Files\WinUT4\Mid-Bay Island\jamesdh204csrch1-630removal.UT4 Time: 08:02:46


James Island DH-204 Stability Analysis - +25 Dike
400
300
200
100
0
-100
-200
-200
-100
0
100
200
300
400
500
NO. | DESCRIPTION | UNIT WEIGHT | SHEAR STRENGTH | PORE PRESSURE
1 | Deep Sand | 110 | Cohesion: 0.0 Friction angle: 28 | Piezometric Line no. 1
2 | Soft Clay/Silt | 105 | Cohesion: 300.0 Friction angle: 0 | None
3 | Upper Sand | 100 | Cohesion: 0.0 Friction angle: 28 | Piezometric Line no. 1
4 | Armor Stone | 125 | Cohesion: 0.0 Friction angle: 40 | Piezometric Line no. 1
5 | Dike Sand Below Water | 110 | Cohesion: 0.0 Friction angle: 28 | Piezometric Line no. 1
6 | Dike Sand Above Water | 115 | Cohesion: 0.0 Friction angle: 30 | Piezometric Line no. 1
Factor of safety: 0.713
Side force Inclination: 2.71 degrees
1
Date: Thu Feb 10 2005
Filename: C:\Program Files\WinUT4\Mid-Bay Island\jamesdh204csrch2.UT4
Time: 08:03:07


James Island DH-204 Stability Analysis - +25 Dike
400
300
200
100
0
-100
-200
-200
-100
0
100
200
300
400
500
NO. | DESCRIPTION | UNIT WEIGHT | SHEAR STRENGTH | PORE PRESSURE
1 | Deep Sand | 110 | Cohesion: 0.0 Friction angle: 28 | Piezometric Line no. 1
2 | Soft Clay/Silt | 105 | Cohesion: 630.0 Friction angle: 0 | None
3 | Upper Sand | 100 | Cohesion: 0.0 Friction angle: 28 | Piezometric Line no. 1
4 | Armor Stone | 125 | Cohesion: 0.0 Friction angle: 40 | Piezometric Line no. 1
5 | Dike Sand Below Water | 110 | Cohesion: 0.0 Friction angle: 28 | Piezometric Line no. 1
6 | Dike Sand Above Water | 115 | Cohesion: 0.0 Friction angle: 30 | Piezometric Line no. 1
Factor of safety: 1.284
Side force inclination: 4.63 degrees
Date: Thu Feb 10 2005 Filename: C:\Program Files\WinUT4\Mid-Bay Island\jamesdh204csrch2-630.UT4
Time: 08:03:22

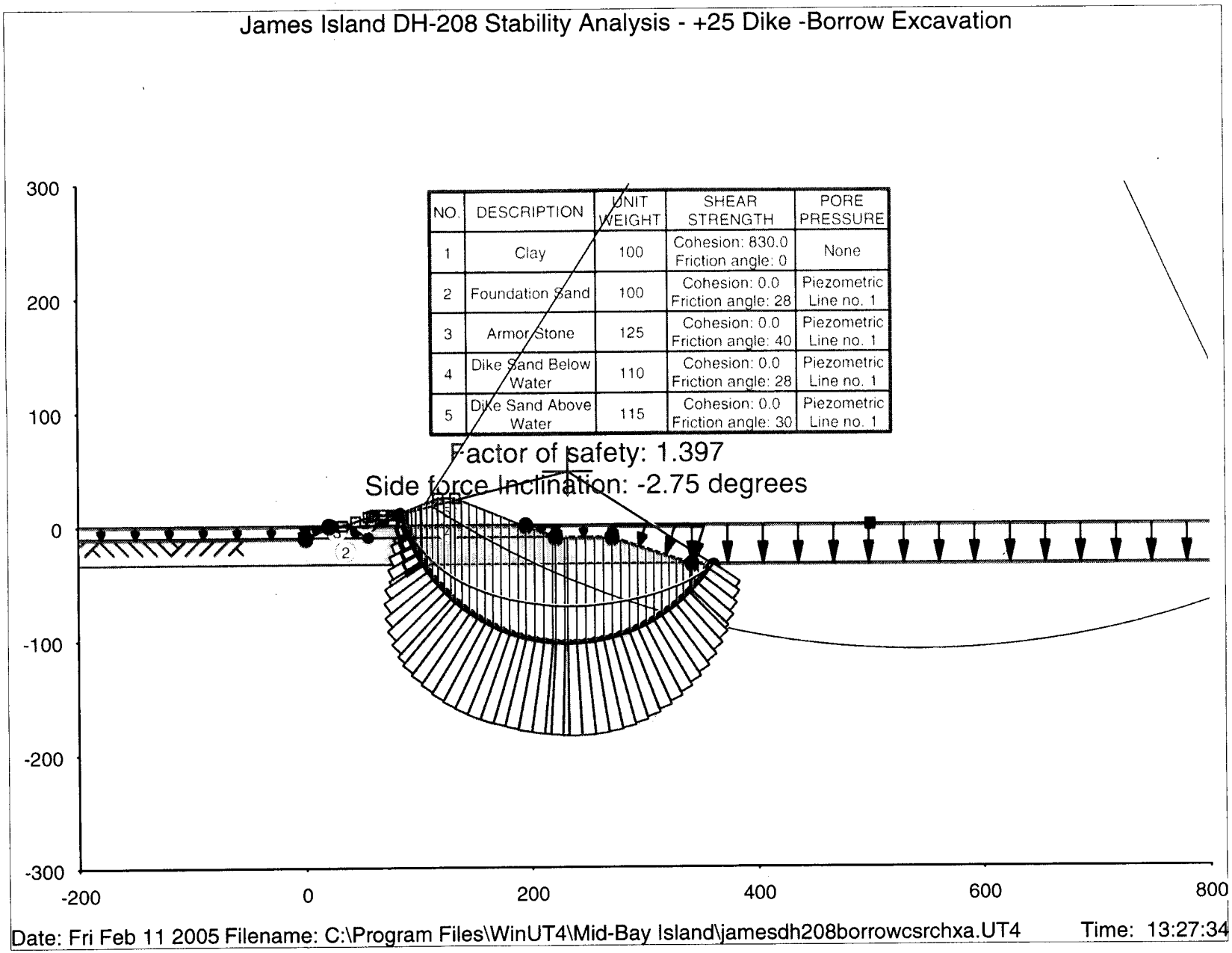
James Island DH-204 Stability Analysis - +25 Dike



NO.	DESCRIPTION	UNIT WEIGHT	SHEAR STRENGTH	PORE PRESSURE
1	Deep Sand	110	Cohesion: 0.0 Friction angle: 28	Piezometric Line no. 1
2	Soft Clay/Silt	105	Cohesion: 630.0 Friction angle: 0	None
3	Upper Sand	100	Cohesion: 0.0 Friction angle: 28	Piezometric Line no. 1
4	Armor Stone	125	Cohesion: 0.0 Friction angle: 40	Piezometric Line no. 1
5	Dike Sand Below Water	110	Cohesion: 0.0 Friction angle: 28	Piezometric Line no. 1
6	Dike Sand Above Water	115	Cohesion: 0.0 Friction angle: 30	Piezometric Line no. 1

Date: Thu Feb 10 2(Filename: C:\Program Files\WinUT4\Mid-Bay Island\jamesdh204csrch2-630removal.UT4 Time: 08:03:42

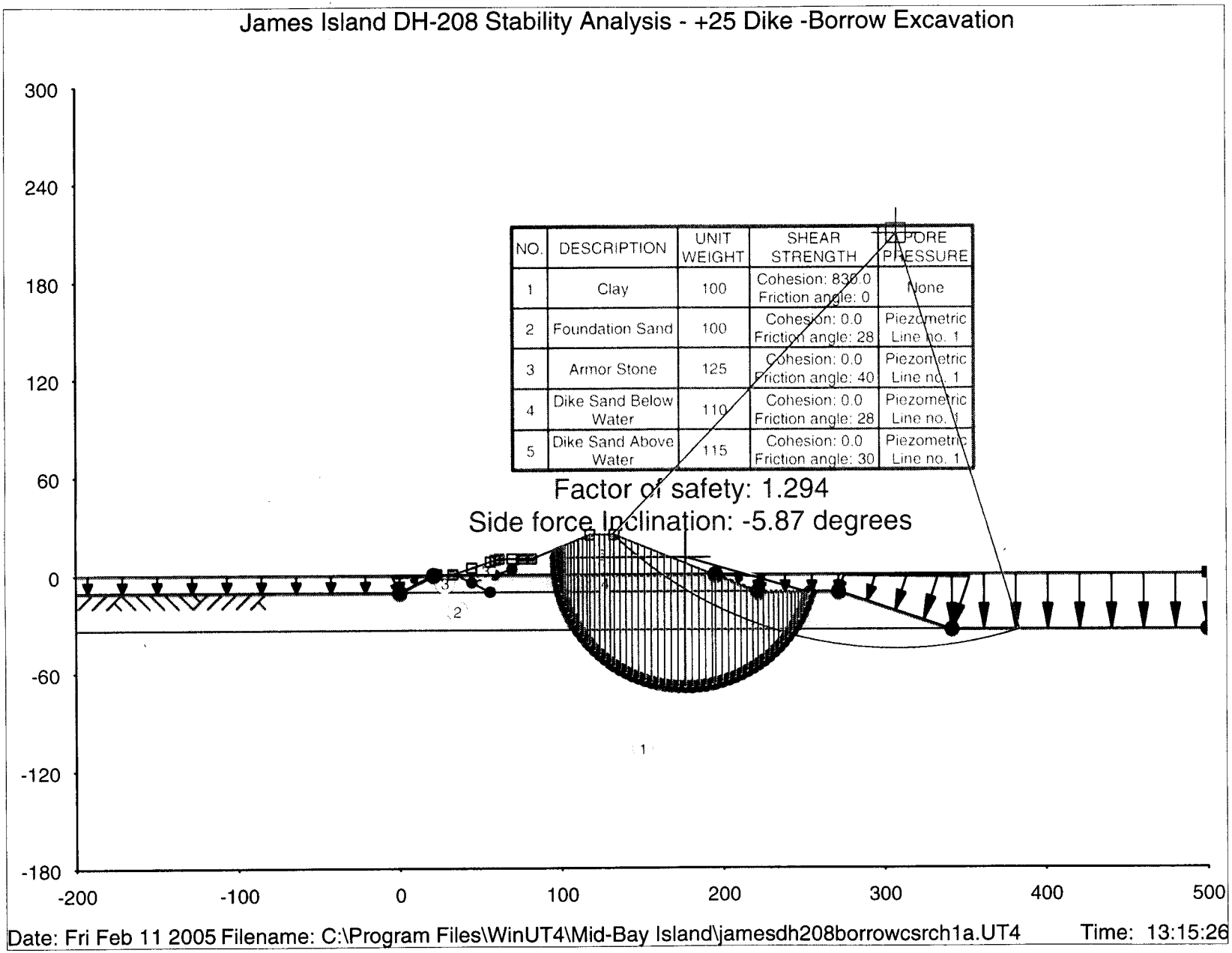
James Island DH-208 Stability Analysis - +25 Dike -Borrow Excavation



NO.	DESCRIPTION	UNIT WEIGHT	SHEAR STRENGTH	PORE PRESSURE
1	Clay	100	Cohesion: 830.0 Friction angle: 0	None
2	Foundation Sand	100	Cohesion: 0.0 Friction angle: 28	Piezometric Line no. 1
3	Armor Stone	125	Cohesion: 0.0 Friction angle: 40	Piezometric Line no. 1
4	Dike Sand Below Water	110	Cohesion: 0.0 Friction angle: 28	Piezometric Line no. 1
5	Dike Sand Above Water	115	Cohesion: 0.0 Friction angle: 30	Piezometric Line no. 1

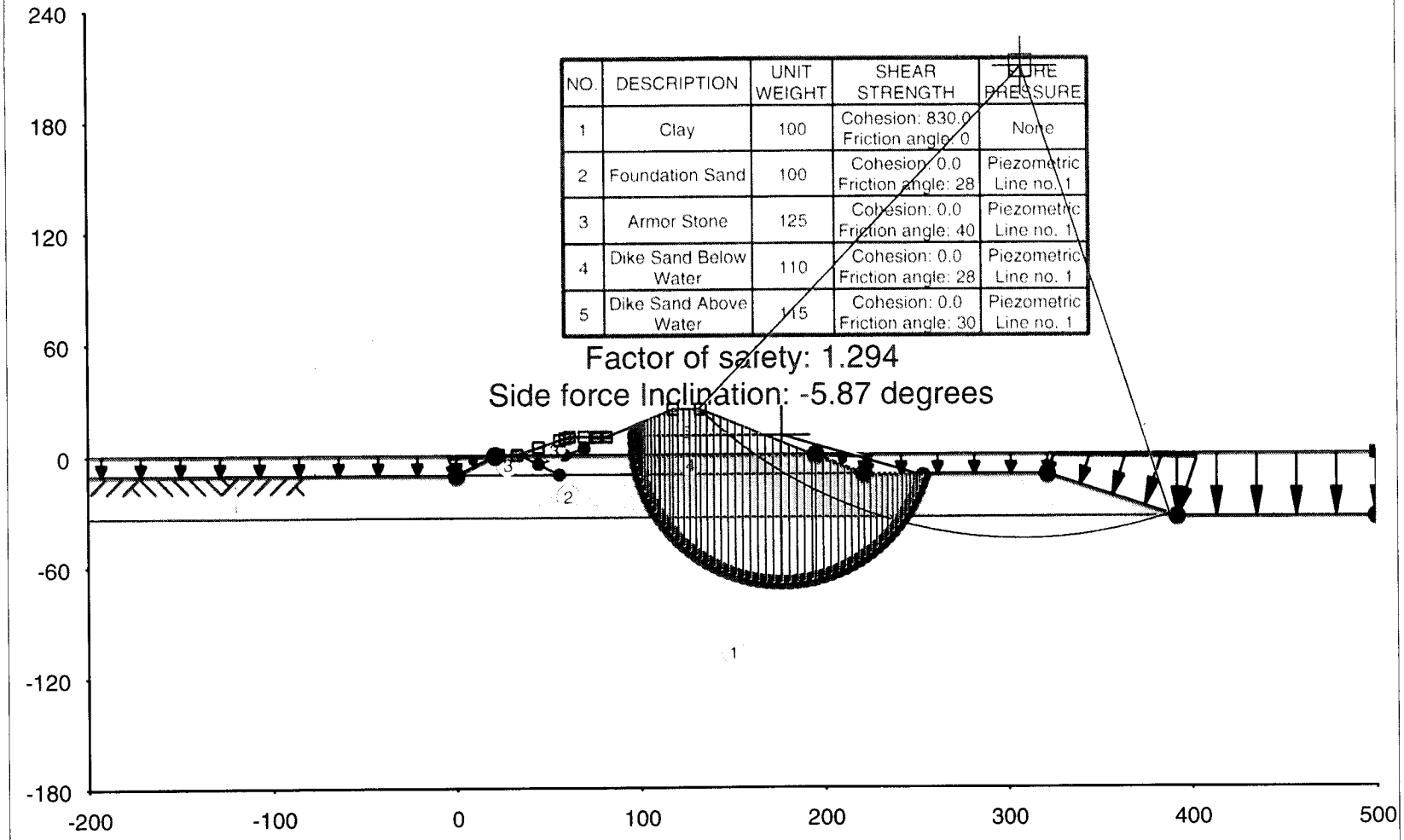
Date: Fri Feb 11 2005 Filename: C:\Program Files\WinUT4\Mid-Bay Island\jamesdh208borrowcsrchxa.UT4 Time: 13:27:34

James Island DH-208 Stability Analysis - +25 Dike -Borrow Excavation



Date: Fri Feb 11 2005 Filename: C:\Program Files\WinUT4\Mid-Bay Island\jamesdh208borrowcsrch1a.UT4 Time: 13:15:26

James Island DH-208 Stability Analysis - +25 Dike -Borrow Excavation

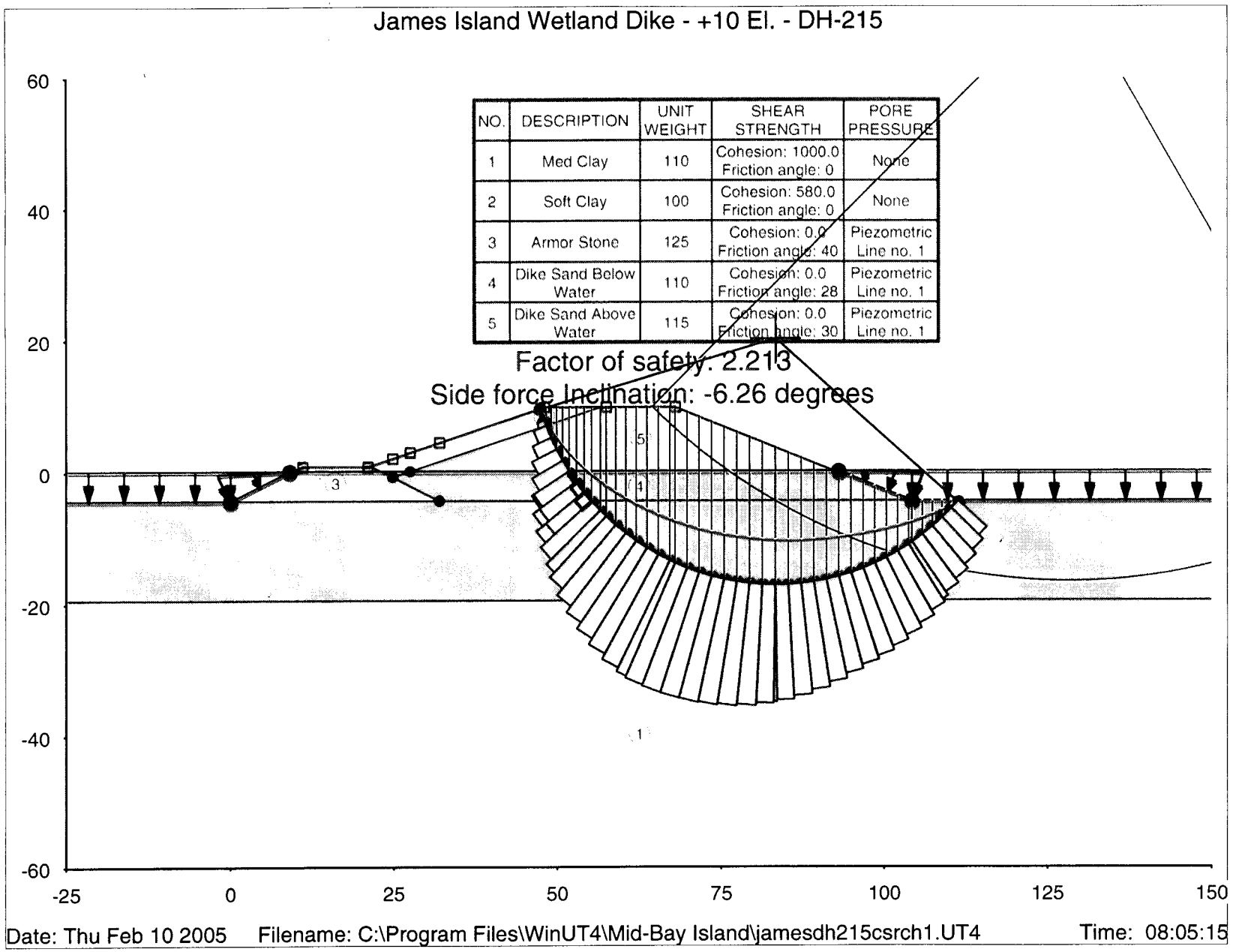


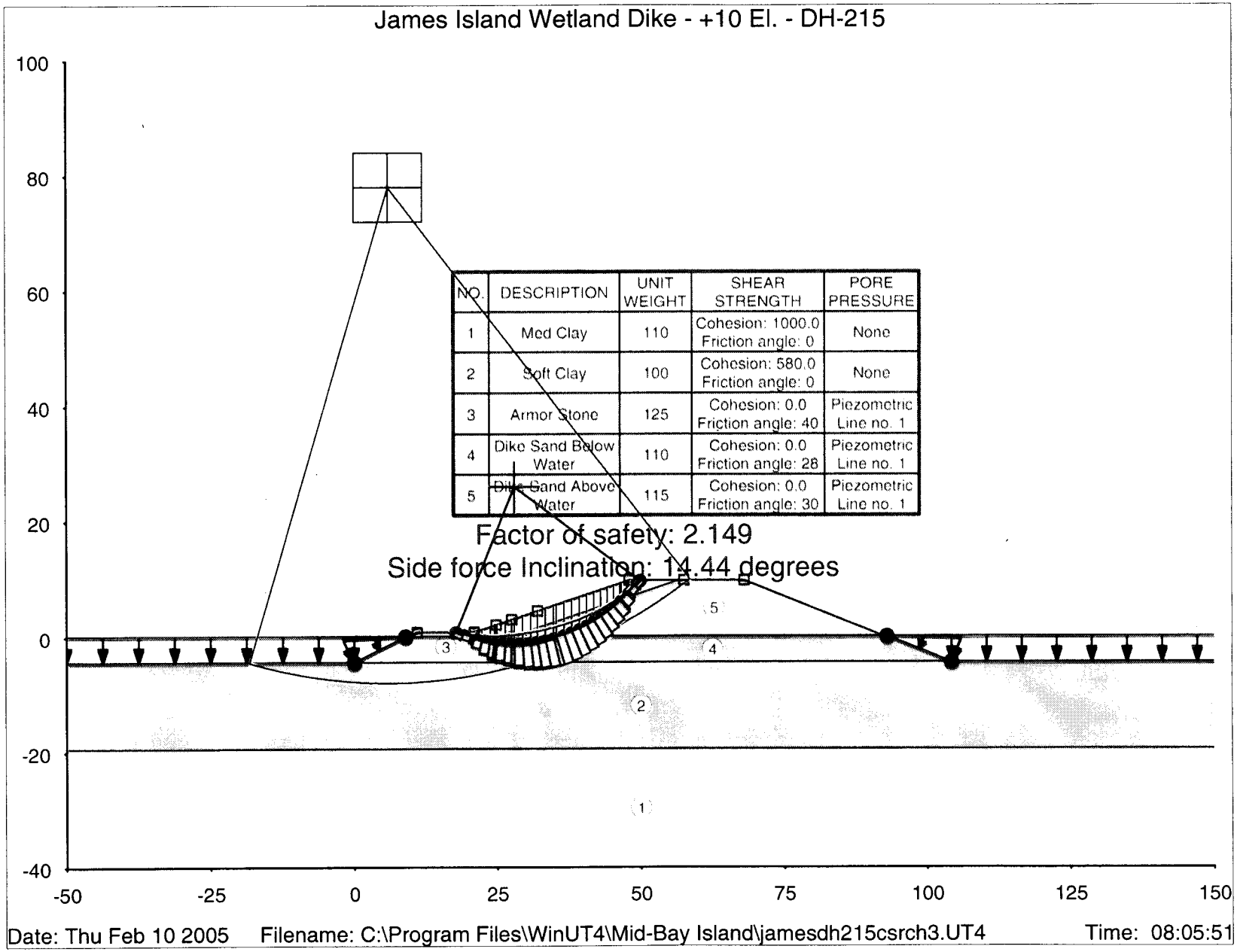
NO.	DESCRIPTION	UNIT WEIGHT	SHEAR STRENGTH	PORE PRESSURE
1	Clay	100	Cohesion: 830.0 Friction angle: 0	None
2	Foundation Sand	100	Cohesion: 0.0 Friction angle: 28	Piezometric Line no. 1
3	Armor Stone	125	Cohesion: 0.0 Friction angle: 40	Piezometric Line no. 1
4	Dike Sand Below Water	110	Cohesion: 0.0 Friction angle: 28	Piezometric Line no. 1
5	Dike Sand Above Water	115	Cohesion: 0.0 Friction angle: 30	Piezometric Line no. 1

Factor of safety: 1.294

Side force Inclination: -5.87 degrees

Date: Fri Feb 11 200 Filename: C:\Program Files\WinUT4\Mid-Bay Island\jamesdh208borrow100csrcha.UT4 Time: 13:20:18


James Island Wetland Dike - +10 El. - DH-215
NO. | DESCRIPTION | UNIT WEIGHT | SHEAR STRENGTH | PORE PRESSURE
1 | Med Clay | 110 | Cohesion: 1000.0 Friction angle: 0 | None
2 | Soft Clay | 100 | Cohesion: 580.0 Friction angle: 0 | None
3 | Armor Stone | 125 | Cohesion: 0.0 Friction angle: 40 | Piezometric Line no. 1
4 | Dike Sand Below Water | 110 | Cohesion: 0.0 Friction angle: 28 | Piezometric Line no. 1
5 | Dike Sand Above Water | 115 | Cohesion: 0.0 Friction angle: 30 | Piezometric Line no. 1
Factor of safety: 2.213
Side force Inclination: -6.26 degrees
60
40
20
0
-20
-40
-60
-25
0
25
50
75
100
125
150
Date: Thu Feb 10 2005
Filename: C:\Program Files\WinUT4\Mid-Bay Island\jamesdh215csrch1.UT4
Time: 08:05:15


James Island Wetland Dike - +10 El. - DH-215
100
80
60
40
20
0
-20
-40
-50
-25
0
25
50
75
100
125
150
NO. | DESCRIPTION | UNIT WEIGHT | SHEAR STRENGTH | PORE PRESSURE
1 | Med Clay | 110 | Cohesion: 1000.0 Friction angle: 0 | None
2 | Soft Clay | 100 | Cohesion: 580.0 Friction angle: 0 | None
3 | Armor Stone | 125 | Cohesion: 0.0 Friction angle: 40 | Piezometric Line no. 1
4 | Dike Sand Below Water | 110 | Cohesion: 0.0 Friction angle: 28 | Piezometric Line no. 1
5 | Dike Sand Above Water | 115 | Cohesion: 0.0 Friction angle: 30 | Piezometric Line no. 1
Factor of safety: 2.149
Side force Inclination: 14.44 degrees
Date: Thu Feb 10 2005
Filename: C:\Program Files\WinUT4\Mid-Bay Island\jamesdh215csrch3.UT4
Time: 08:05:51

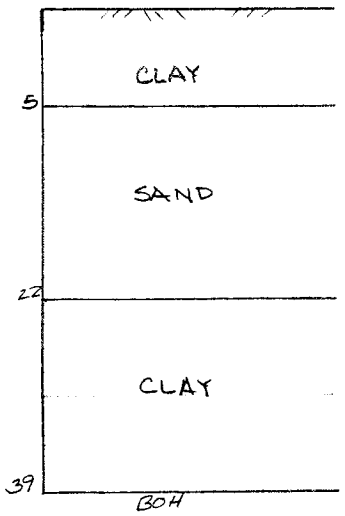
SETTLEMENT ANALYSIS FOR DH-203

ASSUME A DIKE SECTION TO +25 WITH SIDE SLOPES OF 3H:1V AND A CREST WIDTH OF 20 FEET. DEPTH OF WATER IS ASSUMED TO BE 10.8 FEET AT MLLW. USE EXTREME LOW TIDE OF -3.5 MLLW TO COMPUTE STRESS CHANGE FROM DIKE.

A CONSOLIDATION TEST WAS PERFORMED ON A CLAY SAMPLE OBTAINED FROM A DEPTH 3.0' - 5.0'. CONSOLIDATION TEST RESULTS SHOW A C_c OF 1.07 (FROM CORRECTED CURVE) AND A C_r OF 0.075. A PRECONSOLIDATION PRESSURE OF 0.399 TSF (798 PSF) WAS DETERMINED FROM THE e-log p CURVE.

OVERBURDEN PRESSURE, P_o = (70 - 62.4)(4) = 30.4 PSF = 0.0152 TSF

OCR = 798 / 30.4 = 26.6



ASSUMED COMPRESSIBLE LAYER IS 5.0 FT. IN THICKNESS. ESTIMATED CONSOLIDATION SETTLEMENT IS 14.81" (SEE ATTACHED SPREADSHEET).

STA.
OFFSET:
TOP ELEV:

MID-BAY ISLAND FEASIBILITY STUDY
JAMES ISLAND, DORCHESTER COUNTY, MD

N 317350.08
E 1505037.75

COMPLETED: September 11, 2004

JB-203
1 of 1

DEPTH(ft)	(c)	(d)	(a)	(b)
2.00	EMPTY JAR		WR/1.0-WH	
4.50 P	Wet, dk. gray, v. soft lean CLAY (CL) PPR 2.5'-4.0': <0.5, <0.5, <0.5		WR/1.0-WH	
7.00	Wet, dk. gray, v. soft silty fine SAND (SM) PPR 5.0'-6.5': <0.5, <0.5, <0.5	5	WH/1.5	
9.50	Wet, grayish brown, silty fine SAND (SM)		WH-1-1	
12.00	Wet, olive brown, silty fine SAND (SM)	10	1-1-1	26.1
14.50	Wet, yellowish brown, silty fine SAND (SM)		1-1-2	
17.00	Wet, dk. yellowish brown, poorly graded fine SAND w/silt (SP-SM)	15	1-2-12	
22.00	V. moist, v. dk. gray, soft clayey SAND (SC) PPR 17.5'-19.0': <0.5, <0.5, <0.5 PPR 20.0'-21.5': <0.5, <0.5, <0.5	20	4-3-3 WH/1.5	31.7
24.50	V. moist, v. dk. gray, soft lean CLAY w/sand (CL) PPR 22.5'-24.0': <0.5, <0.5, <0.5		2-2-3	
27.00	V. moist, v. dk. gray, soft lean CLAY w/tr. sand (CL) PPR 25.0'-26.5': <0.5, <0.5, <0.5	25	WH/1.0-2	
29.50	V. moist, dk. gray, soft lean CLAY (CL/CH) PPR 27.5'-29.0': <0.5, <0.5, <0.5		1/1.5	
39.00	V. moist, dk. gray, sandy fat CLAY (CH) PPR 30.0'-31.5': 0.5, 0.8, 0.8 PPR 32.5'-34.0': 0.5, 0.5, 0.8 PPR 35.05'-36.5': 0.8, 0.5, 0.8 PPR 37.5'-39.0': 0.8, 0.5, 0.5	30 35	1-1-2 1-1-1 1-2-2 1-3-2	51.3
	BOTTOM OF HOLE Depth of bay water @ start of boring 12.2' @ 1330 Hrs. Depth of bay water @ completion 12.2' @ 1600 Hrs.	40 45		

JB-203
GROUNDWATER DATA
WHILE DRILLING:
ON COMPLETION:
Hr. READING:

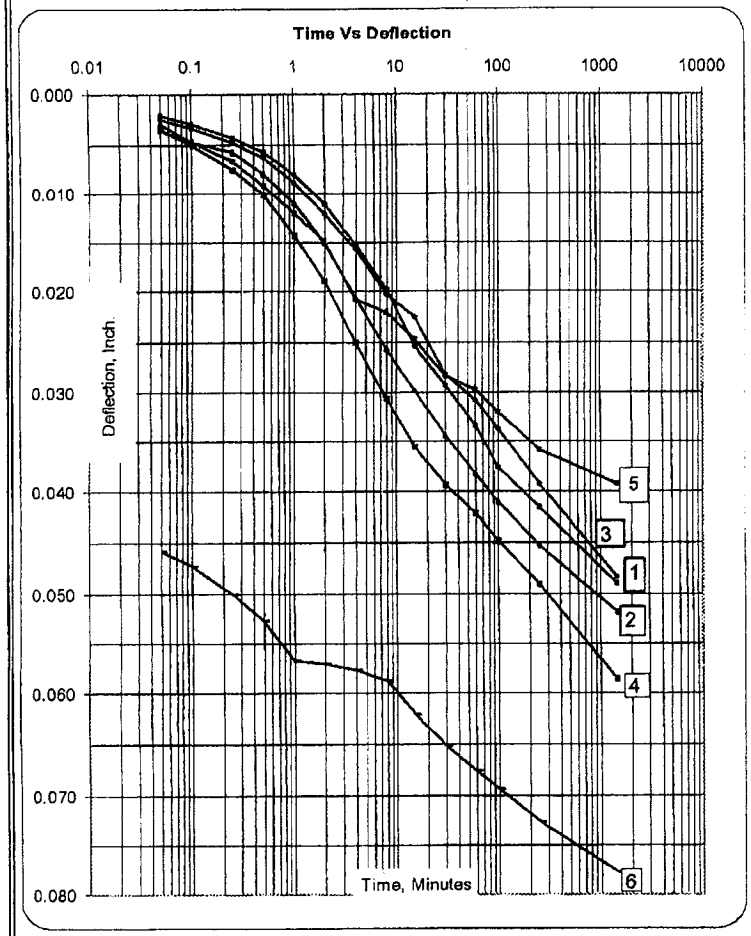
GROUNDWATER DATA
WHILE DRILLING:
ON COMPLETION:
Hr. READING:

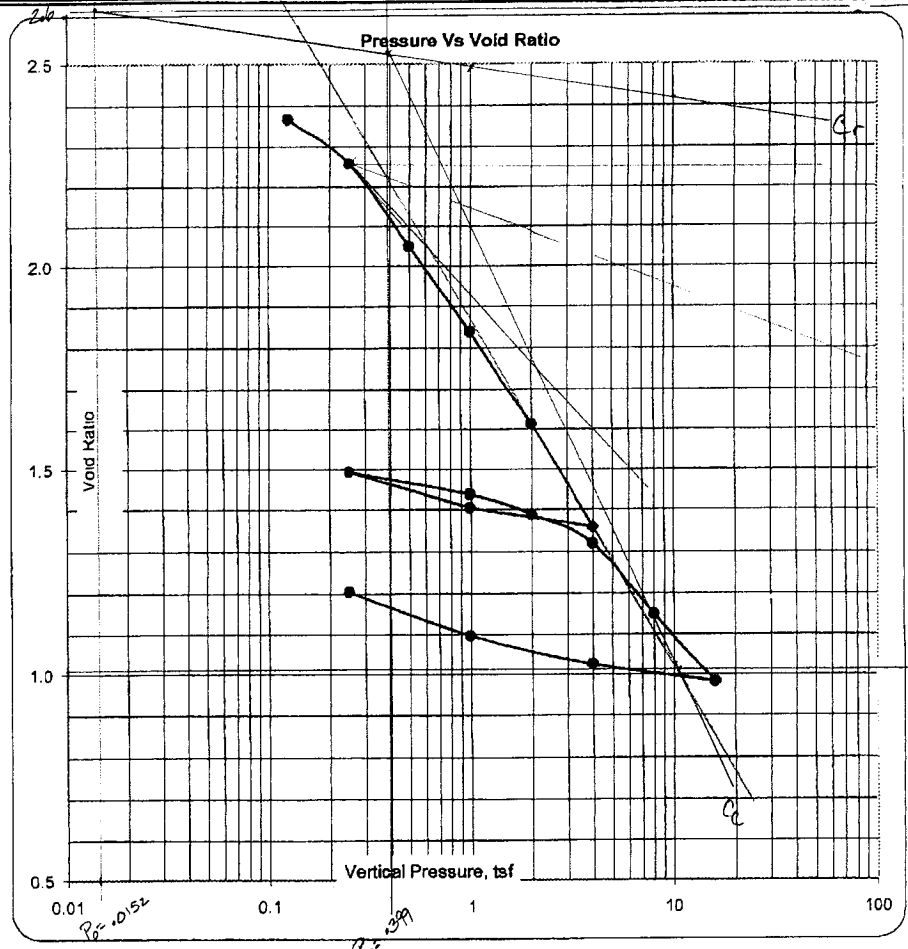
P - indicates pressed shelby tube sample obtained from an additional boring.

Fill | Auger | SPT | RB
Cored | 300 lb | Tubex | Hand
Fish Tail | Vibra Core | Water Jet | Odex

GEO-2 JAMESISL.GPJ 12/21/04 10:03

JB-203
$h_w = 7.3'$
$h_e = 28.5$
Clay = 0'-5'





$e_o = 2.603$

$.4C_o = 1.0412$

Jan. 6. 2005 2:13PM

No.5724 P. 2

One-Dimensional Consolidation Test (ASTMD-2435)

Curve No.	Pressure Incren TSF	C_v cm²/sec	T_{50} Min.	T_{90} Min.	Description of Specimen: Dark gray lean clay			Consolidation Properties		Project No 2004G677
1	0.125	1.9E-03	2.1	9.0	Nat.Water Content (%)	44.8	(From Trims.)			
2	0.25	1.2E-03	2.8	12.3	Liquid Limit (%)	48	(From Trims.)	Compression Ratio (Cc)	1.07	Project Name James Island
3	0.5	1.4E-03	2.2	9.6	Plastic Limit (%)	22	(From Trims.)	Recompression Ratio (Cr)	0.075	
4	1	1.2E-03	2.4	10.2	Plastic Index (%)	26	(From Trims.)	Swelling Ratio (Cs)		
5	2	1.3E-03	2.1	9.0	Specific Gravity	2.76	(From Trims.)	Preconsolidation Stress, Pp (tsf)	.399	Boring No. DH-203A
6	4	1.6E-03	1.6	6.8	**Test Specimen Properties**			Existing Overburden Stress, Po (tsf)	.0152	Sample No. JB-203
7	8	2.1E-03	1.1	4.8	Diameter,inch.	2.600				Depth, ft. 3.0-5.0
8	16	6.6E-03	0.3	1.4	Initial And Final Thickness, inch.	0.850	0.622			Tested By TV
					Initial And Final Water Content (%)	115.8	100.7			Reviewed By KAN
					Initial And Final Void Ratio	2.603	1.192	$.4e_o$	1.0412	Date 04-Nov-04
					Initial And Final Saturation (%)	97.9	111.1			File No. 2004677Con-203A
					Unit Dry Weight (pcf)	46.4				

GeoSystems Consultants

+25.0

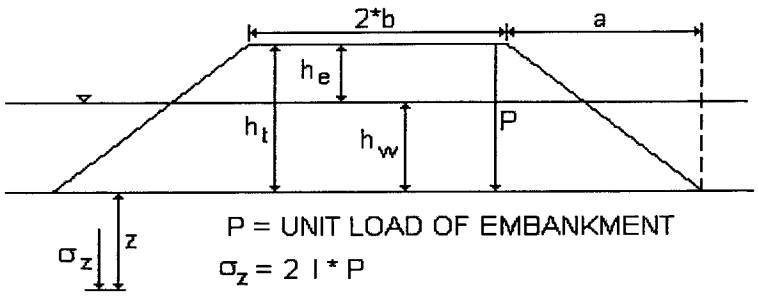
COMPUTATION SHEET FOR CONSOLIDATION SETTLEMENT
PROJECT: JAMES ISLAND DIKE (JB-203)

CALCULATED BY: SKC
DATE: 1/72005

Sublayer Depth (ft)			Sublayer Thickness	Effective Overburden Pressure	Preconsoli-dation Pressure	Pressure Change	Final Pressure	Recompress-ion Index	Compress-ion Index	Initial Void Ratio	Compression Ratio		Vertical Strain	Change in Thickness (in)
Top	Bottom	Average	H_o (ft)	p_o (psf)	p_p (psf)	Δp (psf)	p_f (psf)	c_r	c_c	e_o	Rebound Curve $C\varepsilon r$	Virgin Curve $C\varepsilon c$	εz^*	$\varepsilon z \times H_o$ = DH
0	1	0.5	1	3.8	771.4	4019.48	4023.28	0.075	1.07	2.603	0.020816	0.296975	0.2611	3.13
1	2	1.5	1	11.4	779	4019.48	4030.88	0.075	1.07	2.603	0.020816	0.296975	0.2502	3.00
2	3	2.5	1	19	786.6	4019.48	4038.48	0.075	1.07	2.603	0.020816	0.296975	0.2446	2.94
3	4	3.5	1	26.6	794.2	4019.48	4046.08	0.075	1.07	2.603	0.020816	0.296975	0.2407	2.89
4	5	4.5	1	34.2	801.8	4019.48	4053.68	0.075	1.07	2.603	0.020816	0.296975	0.2375	2.85

Using Boring Information and consolidation test results from JB-203

Total Settlement: 14.81



Only modify h_w and I, all others are established formulas.

γ_{STONE} (pcf) = 125.0 Slope = 3.0 h_w = 7.3 h_e = 28.5 h_t = 35.8 b = 10.0	$P = \gamma_{STONE} * h_e + (\gamma_{STONE} - \gamma_{WATER}) * h_w$ P = 4019.48

z	a/z	b/z	I	2 I	$\sigma_z = 2\ I * P$
0.5	214.800	20.000	0.500	1.000	4019.48
1.5	71.600	6.667	0.500	1.000	4019.48
2.5	42.960	4.000	0.500	1.000	4019.48
3.5	30.686	2.857	0.500	1.000	4019.48
4.5	23.867	2.222	0.500	1.000	4019.48
5.5	19.527	1.818	0.500	1.000	4019.48
6.5	16.523	1.538	0.500	1.000	4019.48
7.5	14.320	1.333	0.500	1.000	4019.48
8.5	12.635	1.176	0.500	1.000	4019.48
9.5	11.305	1.053	0.500	1.000	4019.48
10.5	10.229	0.952	0.500	1.000	4019.48
11.5	9.339	0.870	0.490	0.980	3939.09
12.5	8.592	0.800	0.487	0.974	3914.97
13.5	7.956	0.741	0.485	0.970	3898.90
14.5	7.407	0.690	0.483	0.966	3882.82
15.5	6.929	0.645	0.480	0.960	3858.70
16.5	6.509	0.606	0.479	0.958	3850.66
17.5	6.137	0.571	0.477	0.954	3834.58

h_w is adjusted for extreme low tide of -3.5 MLLW.

BALTIMORE DISTRICT, CORPS OF ENGINEERS PAGE _____

SUBJECT MID-BAY DH-204

COMPUTATIONS _____ SHEET _____ OF _____ SHEETS

COMPUTED BY SKC CHECKED BY _____ DATE 10-JAN-04

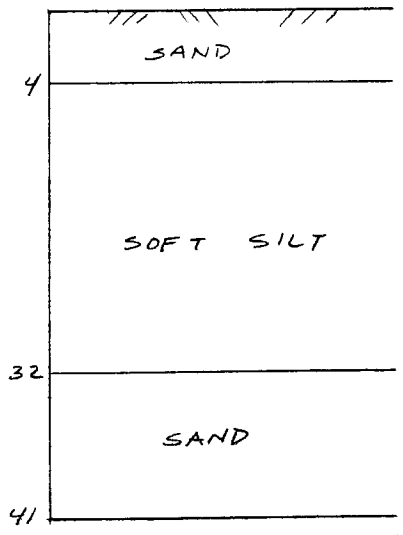
SETTLEMENT ANALYSIS FOR DH-204

ASSUME A DIKE SECTION TO +25 WITH SIDE SLOPES OF 3H:1V AND A CREST WIDTH OF 20 FEET. DEPTH OF WATER IS ASSUMED TO BE 9.1 FEET AT MLLW. USE EXTREME LOW TIDE OF -3.5 MLLW TO COMPUTE STRESS CHANGE FROM DIKE.

A CONSOLIDATION TEST WAS PERFORMED ON A CLAY SAMPLE OBTAINED FROM A DEPTH 15.0' - 17.0'. CONSOLIDATION TEST RESULTS SHOW A C_c OF 0.68 (FROM CORRECTED CURVE) AND A C_r OF 0.035. A PRECONSOLIDATION PRESSURE OF 0.75 TSF (1500 PSF) WAS DETERMINED FROM THE e-log p CURVE.

OVERBURDEN PRESSURE, P_o = (115-62.4)(16) = 841.6 PSF = 0.421 TSF

OCR = 1500/842 = 1.78



ASSUMED COMPLESIBLE LAYER IS 28.0 FT IN THICKNESS.
ESTIMATED CONSOLIDATION SETTLEMENT IS 53.31"
(SEE ATTACHED SPREADSHEETS.)

STA.
OFFSET:
TOP ELEV:

MID-BAY ISLAND FEASIBILITY STUDY
JAMES ISLAND, DORCHESTER COUNTY, MD

N 315051.71
E 1504776.58

JB-204
1 of 1

COMPLETED: September 12, 2004

DEPTH(ft)	(c)	(d)	(a)	(b)
2.00	Wet, v. dk. gray, poorly graded fine SAND w/shells (SP)		1-1-1	
4.50	Wet, dk. gray, silty fine SAND w/tr. shells (SM) PPR 2.5'-4.0': <0.5, <0.5, <0.5		WH/1.5	
7.00	Wet, dk. gray, sandy soft SILT (ML) PPR 5.0'-6.5': 0.5, 0.5, <0.5		WH/1.5	
	V. moist, olive gray, soft elastic SILT (MH) PPR 7.5'-9.0': 0.5, 0.5, 0.5		WH/1.5	
	PPR 10.0'-11.5': 0.5, 0.5, 0.5		WH/1.5	57.9
	PPR 12.5'-14.0': 0.5, 0.5, <0.5		WH/1.5	
	PPR 15.0'-16.5': <0.5, <0.5, 0.5		WH/1.5	
	PPR 17.5'-19.0': 0.5, 0.5, 0.5		WH/1.5	
	PPR 20.0'-21.5': 0.5, 0.5, 0.5		WH/1.5	
	PPR 22.5'-24.0': 0.5, <0.5, 0.5		WH/1.5	
	PPR 25.0'-26.5': <0.5, <0.5, 0.5		WH/1.5	
	PPR 27.5'-29.0': 0.5, 0.5, <0.5		WH/1.5	
	PPR 30.0'-31.5': 0.5, 0.5, 0.5		WH/1.5	
32.00	Wet, dk. gray, silty fine SAND (SM/SC) PPR 32.5'-34.0': <0.5, <0.5, 0.5		WH/1.5	
34.50	Wet, dk. gray, silty fine SAND w/tr. shells (SM) PPR 35.0'-36.5': 0.5, 0.5, <0.5		WH/1.5	
37.00	Wet, dk. gray, clayey fine SAND w/tr. shells (SC) PPR 37.5'-39.0': <0.5, <0.5, <0.5		1-1/1.0	
39.50	V. moist, v. dk. gray, silty fine SAND (SM) PPR 40.0'-41.5': <0.5, <0.5, <0.5		1-1-1	
41.50	BOTTOM OF HOLE			

Depth of bay water @ start of boring 10.4' @ 0835 Hrs.
Depth of bay water @ completion 10.9' @ 1100 Hrs.

JB-204
GROUNDWATER DATA
WHILE DRILLING:
ON COMPLETION:
Hr. READING:

GROUNDWATER DATA
WHILE DRILLING:
ON COMPLETION:
Hr. READING:

P - indicates pressed shelby tube sample obtained from an additional boring.

Fill | Auger | SPT | RB
Cored | 300 lb | Tubex | Hand
Fish Tail | Vibra Core | Water Jet | Odex

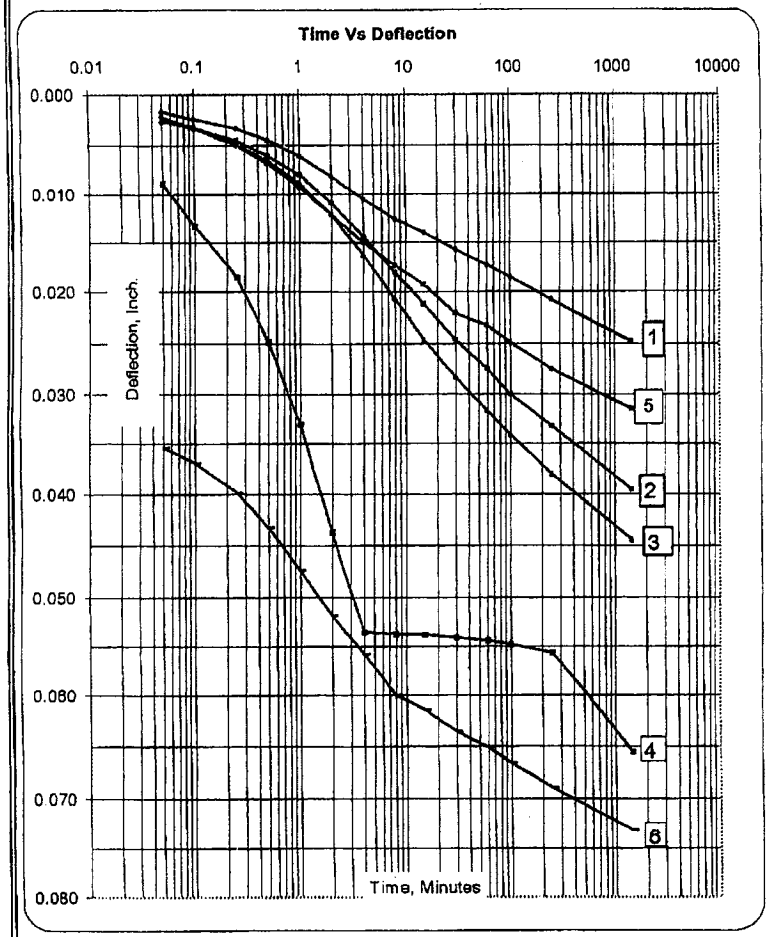
GEO-2 JAMESISL.GPJ 12/21/04 10:03

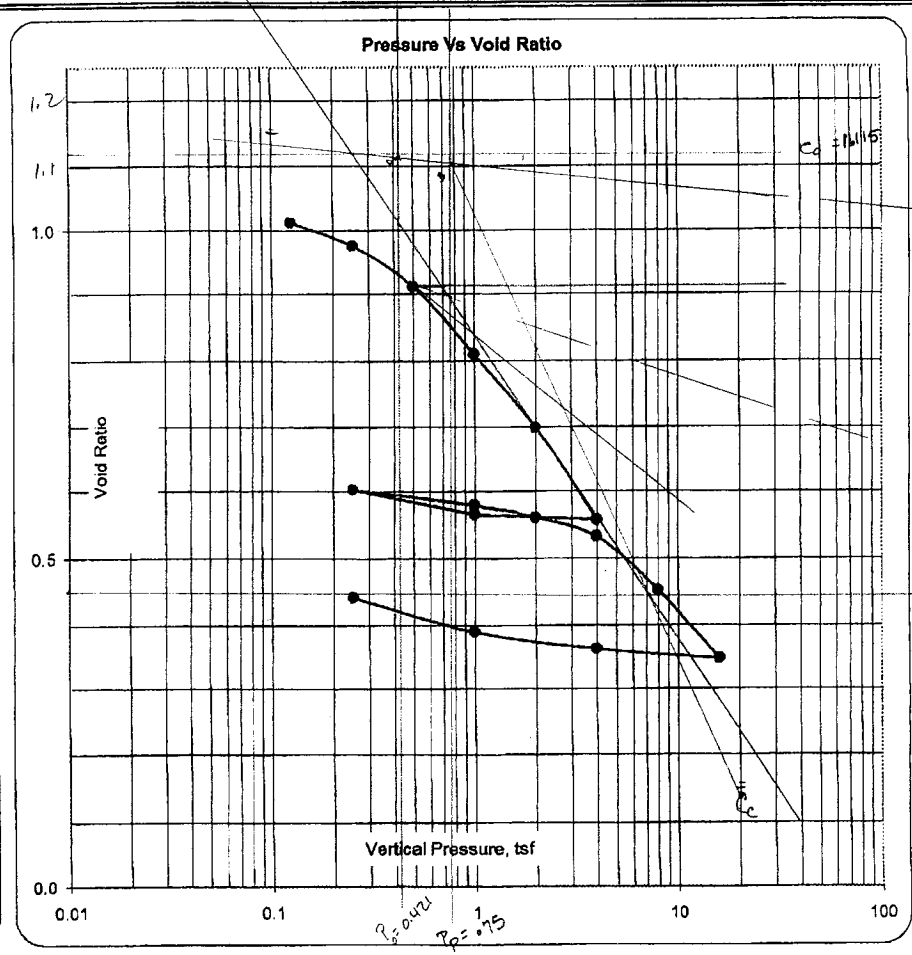
JB-204

h_w = 5.6'

h_e = 28.5'

h_{clay} 4'-32'





One-Dimensional Consolidation Test (ASTMD-2435)

Curve No.	Pressure TSF	C_v cm²/sec.	T_{50} Min.	$T9_0$ Min.	Description of Specimen:			Dark gray fat clay with sand		
					Nat.Water Content (%)	44.800	(From Trims.)	**Consolidation Properties**		
1	0.125	2.0E-03	1.8	7.8	Liquid Limit (%)	101.000	(From Trims.)	Compression Ratio (Cc)	0.68	
2	0.25	3.5E-03	1	4.4	Plastic Limit (%)	31.0	(From Trims.)	Recompression Ratio (Cr)	0.035	
3	0.5	2.8E-03	1.2	5.3	Plastic Index (%)	70.000	(From Trims.)	Swelling Ratio (Cs)		
4	1	2.7E-03	1.2	5.3	Specific Gravity	2.6	(From Trims.)	Preconsolidation Stress, Pc (tsf)	0.75	
5	2	1.5E-03	2.1	9.0	**Test Specimen Properties**			Existing Overburden Stress, Po (tsf)	0.421	
6	4	2.8E-03	1	4.4	Diameter,inch.	2.490				
7	8	4.6E-03	0.6	2.6	Initial And Final Thickness, inch.	0.850	0.622			
8	16	4.3E-03	0.6	2.6	Initial And Final Water Content (%)	115.8	100.7			
					Initial And Final Void Ratio	1.115	0.810	.4eo	.446	
					Initial And Final Saturation (%)	46.1	85.2			
					Unit Dry Weight (pcf)	79.1				

Project No	2004G677
Project Name	James Island
Boring No.	DH-204A
Sample No.	JB-204
Depth, ft.	15.0-17.0
Tested By	TV
Reviewed By	KAN
Date	04-Nov-04
File No.	2004677Con-204A

GeoSystems Consultants

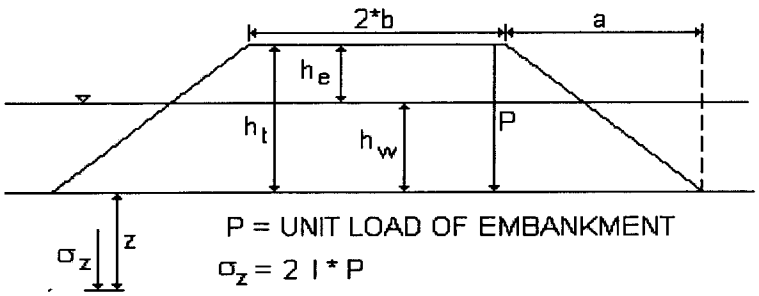
+25.0

COMPUTATION SHEET FOR CONSOLIDATION SETTLEMENT — CALCULATED BY: SKC
PROJECT JAMES ISLAND DIKE (JB-204) — DATE: 1/7/2005

Sublayer Depth (ft)			Sublayer Thickness	Effective Overburden Pressure	Preconsoli-dation Pressure	Pressure Change	Final Pressure	Recompress-ion Index	Compress-ion Index	Initial Void Ratio	Compression Ratio		Vertical Strain	Change in Thickness (in)
Top	Bottom	Average	H_o (ft)	p_o (psf)	p_p (psf)	Δp (psf)	p_f (psf)	c_r	c_c	e_o	Rebound Curve $C\varepsilon r$	Virgin Curve $C\varepsilon c$	εz^*	$\varepsilon z \times H_o$ = DH
4	8	6	4	315.6	974	3913.06	4228.66	0.035	0.68	1.115	0.016548	0.321513	0.2131	10.23
8	12	10	4	526	1184.4	3913.06	4439.06	0.035	0.68	1.115	0.016548	0.321513	0.1903	9.14
12	16	14	4	736.4	1394.8	3819.15	4555.55	0.035	0.68	1.115	0.016548	0.321513	0.1699	8.15
16	20	18	4	946.8	1605.2	3795.67	4742.47	0.035	0.68	1.115	0.016548	0.321513	0.1551	7.44
20	24	22	4	1157.2	1815.6	3639.15	4796.35	0.035	0.68	1.115	0.016548	0.321513	0.1389	6.67
24	28	26	4	1367.6	2026	3560.88	4928.48	0.035	0.68	1.115	0.016548	0.321513	0.1270	6.09
28	32	30	4	1578	2236.4	3482.62	5060.62	0.035	0.68	1.115	0.016548	0.321513	0.1165	5.59

Using Boring Information and consolidation test results from JB-204 — Total Settlement: 53.31

25-ft



Only modify h_w and I, all others are established formulas.

γ_{STONE} (pcf) = 125.0 Slope = 3.0 h_w = 5.6 h_e = 28.5 h_t = 34.1 b = 10.0	$P = \gamma_{STONE} * h_e + (\gamma_{STONE} - \gamma_{WATER}) * h_w$ P = 3913.06

z	a/z	b/z	I	2 I	$\sigma_z = 2\ I * P$
6.0	17.050	1.667	0.500	1.000	3913.06
10.0	10.230	1.000	0.500	1.000	3913.06
14.0	7.307	0.714	0.488	0.976	3819.15
18.0	5.683	0.556	0.485	0.970	3795.67
22.0	4.650	0.455	0.465	0.930	3639.15
26.0	3.935	0.385	0.455	0.910	3560.88
30.0	3.410	0.333	0.445	0.890	3482.62
34.0	3.009	0.294	0.435	0.870	3404.36
38.0	2.692	0.263	0.425	0.850	3326.10

h_w is adjusted for extreme low tide of -3.5 MLLW.

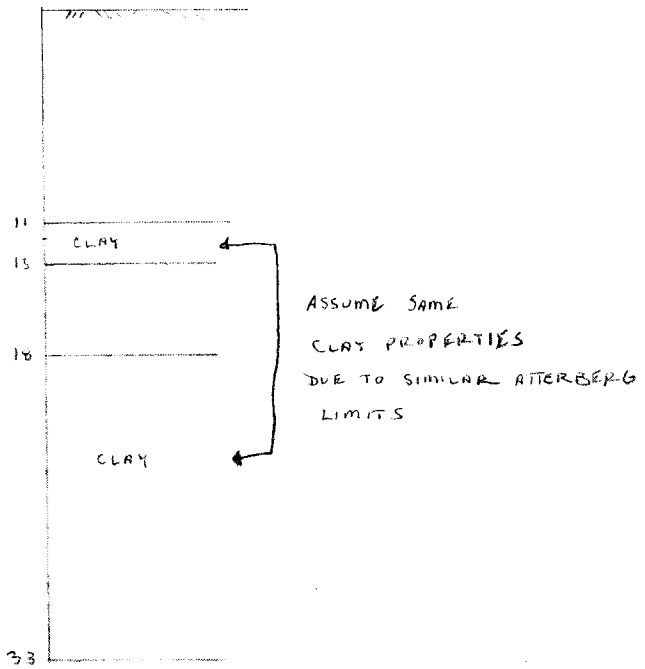
SETTLEMENT ANALYSIS FOR DH-212

ASSUME A DIKE SECTION TO VARYING ELEVATIONS (+10, +10.5, +11.0, +11.5, +12.0) WITH SIDESLOPES OF 3H:1V AND A CREST WIDTH OF 20 FEET. DEPTH OF WATER IS ASSUMED TO BE 7 FEET AT MLLW. USE EXTREME LOW TIDE OF -3.5 MLLW TO COMPUTE STRESS CHANGES FROM DIKE.

A CONSOLIDATION TEST WAS PERFORMED ON A CLAY SAMPLE OBTAINED FROM A DEPTH OF 18'-20'. CONSOLIDATION TEST RESULTS SHOW A C_c OF .80 (FROM CORRECTED CURVE) AND A C_r OF .11. A PRECONSOLIDATION PRESSURE OF 1.91 TSF (3820 psf) WAS DETERMINED FROM THE e-log p CURVE.

OVERBURDEN PRESSURE, P_o: $(120-62.4)(19) = 1094.4$ psf

OCR: $3820/1094 = 3.49$ (DUE TO JAMES ISLAND PREVIOUSLY EXISTING AT THIS LOCATION)



ASSUMED COMPRESSIBLE LAYER END AT 33' DEPTH BELOW MUDLINE. ASSUMPTION REQUIRED DUE TO BORING STOPPING IN CLAY AT 26.5' DEPTH.

ESTIMATED CONSOLIDATION SETTLEMENT RANGES FROM 2.5"-3.0" (SEE ATTACHED SPREADSHEETS)

TUBE CLASSIFICATION

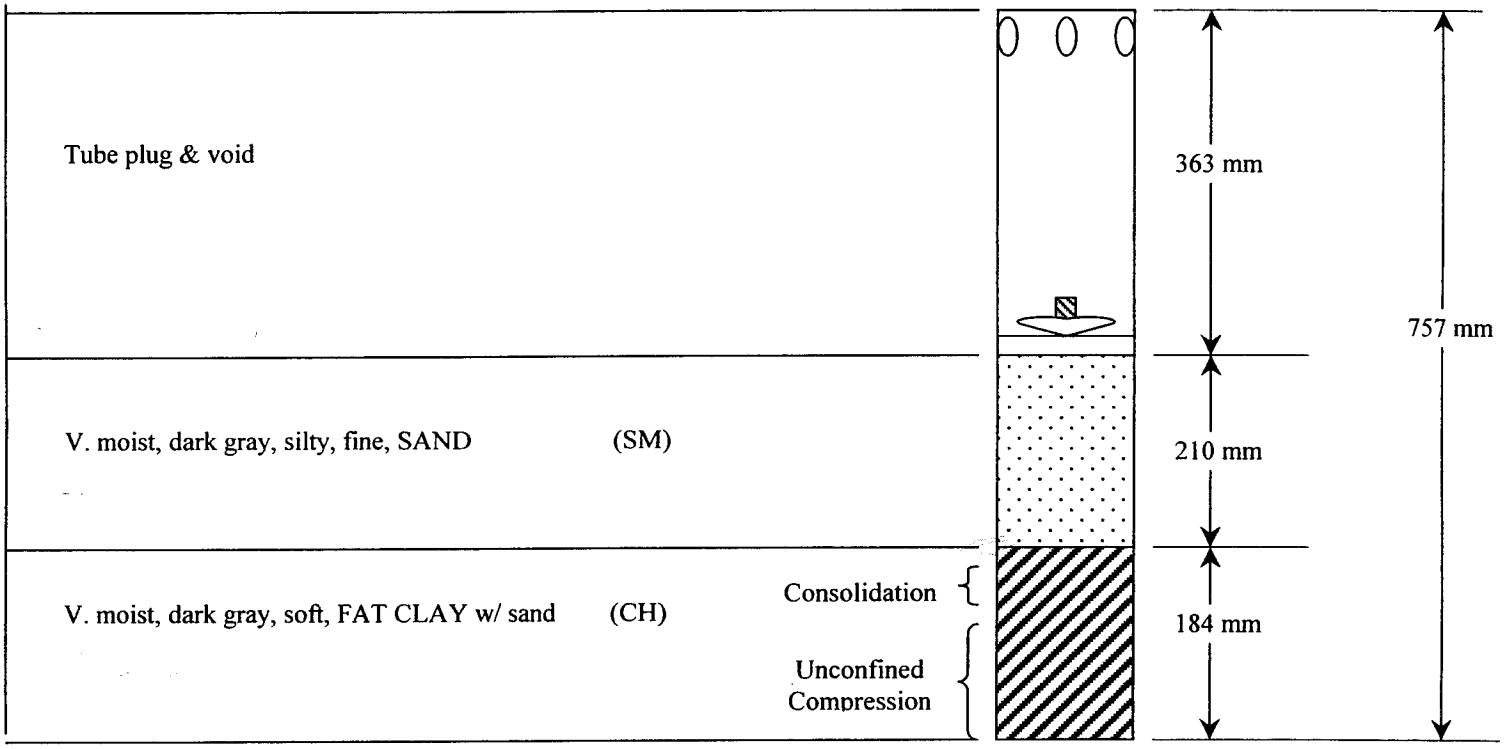
ASTM D2487

PROJECT: Mid-Bay Feasibility Study
James Island

AREA: Dorchester County, MD

DATE: Nov 2004

Hole No.	Sample No.	Depth (ft)
DH-212A	Shelby-1	18.0-20.0



STA.
OFFSET:
TOP ELEV:

MID-BAY ISLAND FEASIBILITY STUDY
JAMES ISLAND, DORCHESTER COUNTY, MD

N 310611.29
E 1500708.18

COMPLETED: September 16, 2004

JB-212
1 of 1

DEPTH(ft)	(c)	(d)	(a)	(b)
	Wet, gray, silty fine SAND (SM)		WH/1.0-1	
2.00				
	Wet, lt. olive brown & reddish brown, poorly graded fine SAND w/ silt (SP-SM)		2-12-10	23.5
4.50				
	Wet, brownsih yellow, poorly graded fine SAND w/silt (SP-SM)		8-9-5	25.9
7.00				
	Wet, lt olive brown, poorly graded fine SAND (SP)		WH/1.0-2	
9.50				
	V. moist, dk. gray, soft fat CLAY w/sand (CH) PPR 10.0'-11.5': <0.5, <0.5, <0.5		WH/1.5	41.1
12.00				
	Wet, dk. gray, poorly graded fine-med. SAND w/silt (SP-SM)		2-3-4	
				25.1
			5-6-2	
17.00				
	V. moist, dk. greenish gray, firm fat CLAY (CH) PPR 17.5'-19.0': <0.5, <0.5, <0.5		WH-1-1	
19.00	P			51.0
19.50	V. moist, dk. gray, silty fine SAND (SM)			
20.00	V. moist, dk. greenish gray, firm fat CLAY w/sand (CH)		1-1-1	
	V. moist, dk. greenish gray, firm fat CLAY (CH) PPR 20.0'-21.5': <0.5, <0.5, <0.5			
22.00				
	V. moist, dk. greenish gray, soft fat CLAY w/sand lense (CH) PPR 22.5'-24.0': <0.5, <0.5, <0.5		1-1-1	
24.50				
	V. moist, dk. greenish gray, soft-firm fat CLAY w/tr. shells (CH) PPR 25'-26.5': <0.5, <0.5, <0.5		2-1-2	
26.50				
	BOTTOM OF HOLE			

Depth of bay water @ start of boring 7.5' @ 1030 Hrs.
Depth of bay water @ completion 7.4' @ 1200 Hrs.

JB-212
GROUNDWATER DATA
WHILE DRILLING:
ON COMPLETION:
Hr. READING:

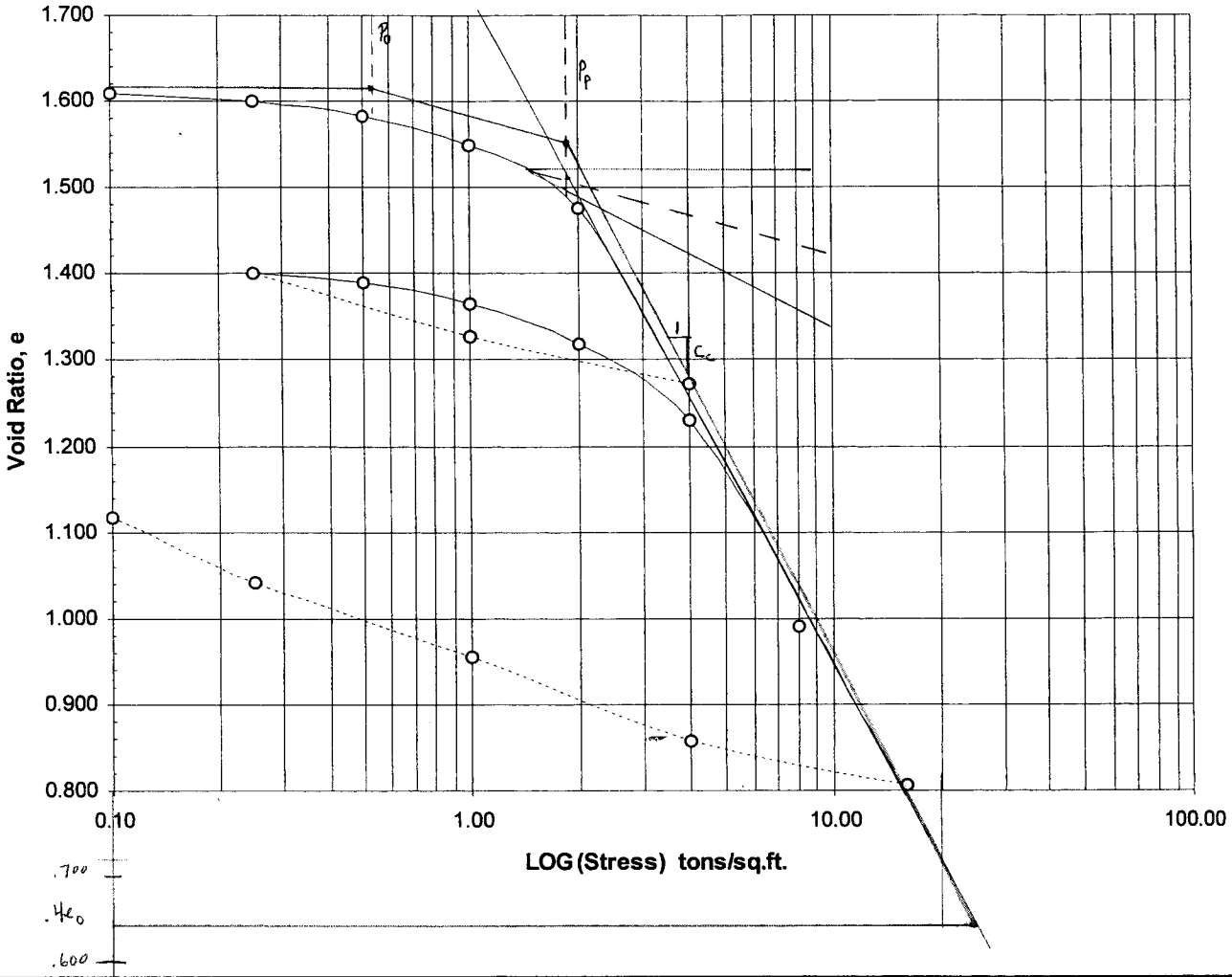
GROUNDWATER DATA
WHILE DRILLING:
ON COMPLETION:
Hr. READING:

P - indicates pressed shelby tube sample obtained from an additional boring.

Fill **Auger** **SPT** **RB**
Cored **300 lb** **Tubex** **Hand**
Fish Tail **Vibra Core** **Water Jet** **Odex**

GEO-2 JAMESISL.GPJ 12/21/04 10:03

1.52 - .72 = .80



Type of Specimen: **Undisturbed**			Before Test		After Test	
Diameter= **2.50** in.	Height= **0.75** in.	Water Content, %	w_o	56.9	w_f	42.4
Overburden Pressure, p_o = .547 tons/sq.ft.		Void Ratio	e_o	1.615	e_f	1.171
Preconsol. Pressure, p_c = 1.91 tons/sq.ft.		Saturation, %	S_o	97.2	S_f	100.0
Compression Index, C_c = ~~0.776~~ .80		Dry Density	γ_d	65.8	lbs./cu.ft.	

Classification (ASTM D2487): Very moist, dark gray, soft, FAT CLAY w/sand. (CH)

LL = 64	PL = 25	PI= 39 (ASTM D4318)	G_s = 2.76 (ASTM D854)

Remarks:	**PROJECT:** Dorchester County, MD	
	Mid-Bay Feasibility Study	
	AREA: James Island	
	Hole No.: JB-212A	**Sample No.:** Shelby-1
	Depth (ft.): 18.0-20.0	**Date:** Dec.2004
ENG FORM 2090 (Test method: ASTM D2435)	**CONSOLIDATION TEST REPORT**	

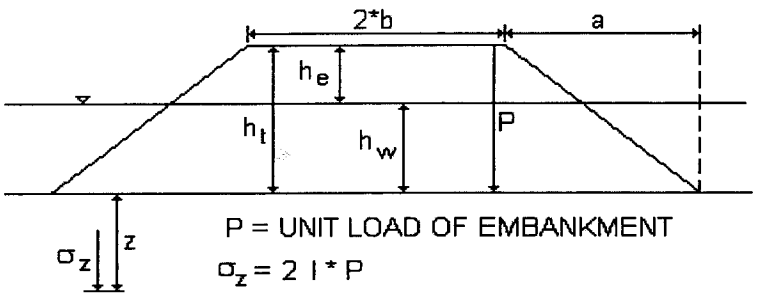
+10.0

COMPUTATION SHEET FOR CONSOLIDATION SETTLEMENT — CALCULATED BY: DEC
PROJECT: JAMES ISLAND DIKE (DH-212) — DATE: 12/16/2004

Sublayer Depth (ft)			Sublayer Thickness	Effective Overburden Pressure	Preconsoli-dation Pressure	Pressure Change	Final Pressure	Recompress-ion Index	Compress-ion Index	Initial Void Ratio	Compression Ratio		Vertical Strain	Change in Thickness (in)
Top	Bottom	Average	H_o (ft)	p_o (psf)	p_p (psf)	Δp (psf)	p_f (psf)	c_r	c_c	e_o	Rebound Curve $C\varepsilon r$	Virgin Curve $C\varepsilon c$	εz^*	$\varepsilon z \times H_o$ = DH
11	13	12	2	691.2	3416.8	1830.3	2521.5	0.11	0.80	1.615	0.042065	0.305927	0.0236	0.57
18	21	19.5	3	1123.2	3848.8	1715.9	2839.1	0.11	0.80	1.615	0.042065	0.305927	0.0169	0.61
21	24	22.5	3	1296	4021.6	1639.68	2935.68	0.11	0.80	1.615	0.042065	0.305927	0.0149	0.54
24	27	25.5	3	1468.8	4194.4	1620.61	3089.41	0.11	0.80	1.615	0.042065	0.305927	0.0136	0.49
27	30	28.5	3	1641.6	4367.2	1563.4	3205	0.11	0.80	1.615	0.042065	0.305927	0.0122	0.44
30	33	31.5	3	1814.4	4539.1	1487.2	3301.6	0.11	0.80	1.615	0.042065	0.305927	0.0109	0.39

Using Boring Information and consolidation test results from DH-212 — Total Settlement: 2.64

10-ft



Only modify h_w and I, all others are established formulas.

γ_{STONE} (pcf) = 125.0 Slope = 3.0 h_w = 3.5 h_e = 13.5 h_t = 17.0 b = 10.0	$P = \gamma_{STONE} * h_e + (\gamma_{STONE} - \gamma_{WATER}) * h_w$ P = 1906.60

z	a/z	b/z	I	2 I	$\sigma_z = 2\ I * P$
1.5	34.000	6.667	0.500	1.000	1906.60
4.5	11.333	2.222	0.500	1.000	1906.60
7.5	6.800	1.333	0.490	0.980	1868.47
10.5	4.857	0.952	0.485	0.970	1849.40
12.0	4.250	0.833	0.480	0.960	1830.34
13.5	3.778	0.741	0.475	0.950	1811.27
16.5	3.091	0.606	0.460	0.920	1754.07
19.5	2.615	0.513	0.450	0.900	1715.94
22.5	2.267	0.444	0.430	0.860	1639.68
25.5	2.000	0.392	0.425	0.850	1620.61
28.5	1.789	0.351	0.410	0.820	1563.41
31.5	1.619	0.317	0.390	0.780	1487.15

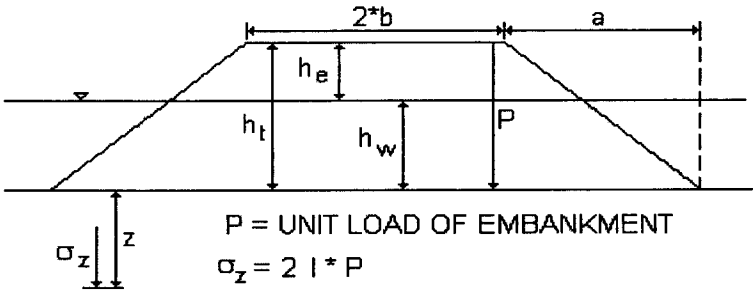
h_w is adjusted for extreme low tide of -3.5 MLLW.

COMPUTATION SHEET FOR CONSOLIDATION SETTLEMENT — CALCULATED BY: DEC
PROJECT JAMES ISLAND DIKE (DH-212) — DATE: 12/16/2004

Sublayer Depth (ft)			Sublayer Thickness	Effective Overburden Pressure	Preconsolidation Pressure	Pressure Change	Final Pressure	Recompression Index	Compression Index	Initial Void Ratio	Compression Ratio		Vertical Strain	Change in Thickness (in)
Top	Bottom	Average	H_o (ft)	p_o (psf)	p_p (psf)	Δp (psf)	p_f (psf)	c_r	c_c	e_o	Rebound Curve $C\varepsilon r$	Virgin Curve $C\varepsilon c$	εz^*	$\varepsilon z \times H_o$ = DH
11	13	12	2	691.2	3416.8	1890.3	2581.5	0.11	0.80	1.615	0.042065	0.30593	0.0241	0.58
18	21	19.5	3	1123.2	3848.8	1772.2	2895.4	0.11	0.80	1.615	0.042065	0.30593	0.0173	0.62
21	24	22.5	3	1296	4021.6	1713.1	3009.1	0.11	0.80	1.615	0.042065	0.30593	0.0154	0.55
24	27	25.5	3	1468.8	4194.4	1673.7	3142.5	0.11	0.80	1.615	0.042065	0.30593	0.0139	0.50
27	30	28.5	3	1641.6	4367.2	1634.4	3276	0.11	0.80	1.615	0.042065	0.30593	0.0126	0.45
30	33	31.5	3	1814.4	4539.1	1555.6	3370	0.11	0.80	1.615	0.042065	0.30593	0.0113	0.41

Using Boring Information and consolidation test results from DH-212 — Total Settlement: 2.71

10.5-ft



P = UNIT LOAD OF EMBANKMENT

$\sigma_z = 2\ I * P$

Only modify h_w and I, all others are established formulas.

γ_{STONE} (pcf) = 125.0 Slope = 3.0 h_w = 3.5 h_e = 14.0 h_t = 17.5 b = 10.0	$P = \gamma_{STONE} * h_e + (\gamma_{STONE} - \gamma_{WATER}) * h_w$ P = 1969.10

z	a/z	b/z	I	2 I	$\sigma_z = 2\ I * P$
1.5	35.000	6.667	0.500	1.000	1969.10
4.5	11.667	2.222	0.500	1.000	1969.10
7.5	7.000	1.333	0.490	0.980	1929.72
10.5	5.000	0.952	0.485	0.970	1910.03
12.0	4.375	0.833	0.480	0.960	1890.34
13.5	3.889	0.741	0.475	0.950	1870.65
16.5	3.182	0.606	0.465	0.930	1831.26
19.5	2.692	0.513	0.450	0.900	1772.19
22.5	2.333	0.444	0.435	0.870	1713.12
25.5	2.059	0.392	0.425	0.850	1673.74
28.5	1.842	0.351	0.415	0.830	1634.35
31.5	1.667	0.317	0.395	0.790	1555.59

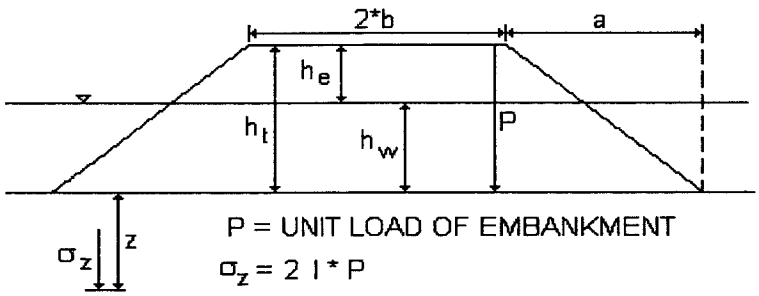
h_w is adjusted for extreme low tide of -3.5 MLLW.

+11.0

COMPUTATION SHEET FOR CONSOLIDATION SETTLEMENT — CALCULATED BY: DEC
PROJECT JAMES ISLAND DIKE (DH-212) — DATE: 12/16/2004

Sublayer Depth (ft)			Sublayer Thickness	Effective Overburden Pressure	Preconsolidation Pressure	Pressure Change	Final Pressure	Recompression Index	Compression Index	Initial Void Ratio	Compression Ratio		Vertical Strain	Change in Thickness (in)
Top	Bottom	Average	H_o (ft)	p_o (psf)	p_p (psf)	Δp (psf)	p_f (psf)	c_r	c_c	e_o	Rebound Curve $C\varepsilon r$	Virgin Curve $C\varepsilon c$	εz^*	$\varepsilon z \times H_o$ = DH
11	13	12	2	691.2	3416.8	1950.3	2641.5	0.11	0.80	1.615	0.042065	0.30593	0.0245	0.59
18	21	19.5	3	1123.2	3848.8	1828.4	2951.6	0.11	0.80	1.615	0.042065	0.30593	0.0177	0.64
21	24	22.5	3	1296	4021.6	1767.5	3063.5	0.11	0.80	1.615	0.042065	0.30593	0.0157	0.57
24	27	25.5	3	1468.8	4194.4	1726.9	3195.7	0.11	0.80	1.615	0.042065	0.30593	0.0142	0.51
27	30	28.5	3	1641.6	4367.2	1686.2	3327.8	0.11	0.80	1.615	0.042065	0.30593	0.0129	0.46
30	33	31.5	3	1814.4	4539.1	1625.3	3439.7	0.11	0.80	1.615	0.042065	0.30593	0.0117	0.42

Using Boring Information and consolidation test results from DH-212 — Total Settlement: 2.76



Only modify h_w and I, all others are established formulas.

γ_{STONE} (pcf) = 125.0 Slope = 3.0 h_w = 3.5 h_e = 14.5 h_t = 18.0 b = 10.0	$P = \gamma_{STONE} * h_e + (\gamma_{STONE} - \gamma_{WATER}) * h_w$ P = 2031.60

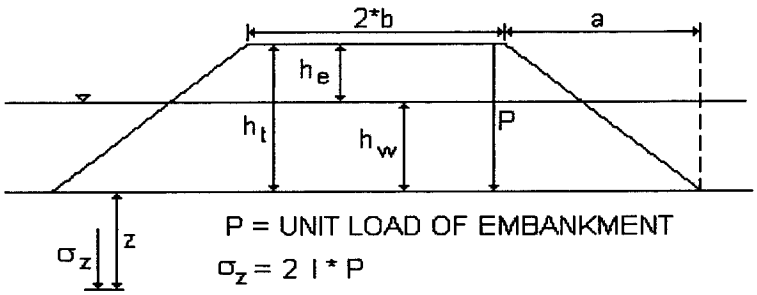
z	a/z	b/z	I	2 I	$\sigma_z = 2\ I * P$
1.5	36.000	6.667	0.500	1.000	2031.60
4.5	12.000	2.222	0.500	1.000	2031.60
7.5	7.200	1.333	0.490	0.980	1990.97
10.5	5.143	0.952	0.485	0.970	1970.65
12.0	4.500	0.833	0.480	0.960	1950.34
13.5	4.000	0.741	0.475	0.950	1930.02
16.5	3.273	0.606	0.465	0.930	1889.39
19.5	2.769	0.513	0.450	0.900	1828.44
22.5	2.400	0.444	0.435	0.870	1767.49
25.5	2.118	0.392	0.425	0.850	1726.86
28.5	1.895	0.351	0.415	0.830	1686.23
31.5	1.714	0.317	0.400	0.800	1625.28

h_w is adjusted for extreme low tide of -3.5 MLLW.

COMPUTATION SHEET FOR CONSOLIDATION SETTLEMENT — CALCULATED BY: DEC
PROJECT JAMES ISLAND DIKE (DH-212) — DATE: 12/16/2004

Sublayer Depth (ft)			Sublayer Thickness	Effective Overburden Pressure	Preconsoli-dation Pressure	Pressure Change	Final Pressure	Recompress-ion Index	Compress-ion Index	Initial Void Ratio	Compression Ratio		Vertical Strain	Change in Thickness (in)
Top	Bottom	Average	H_o (ft)	p_o (psf)	p_p (psf)	Δp (psf)	p_f (psf)	c_r	c_c	e_o	Rebound Curve $C\varepsilon r$	Virgin Curve $C\varepsilon c$	εz^*	$\varepsilon z \times H_o$ = DH
11	13	12	2	691.2	3416.8	2010.3	2701.5	0.11	0.80	1.615	0.042065	0.30593	0.0249	0.60
18	21	19.5	3	1123.2	3848.8	1884.7	3007.9	0.11	0.80	1.615	0.042065	0.30593	0.0180	0.65
21	24	22.5	3	1296	4021.6	1842.8	3138.8	0.11	0.80	1.615	0.042065	0.30593	0.0162	0.58
24	27	25.5	3	1468.8	4194.4	1800.9	3269.7	0.11	0.80	1.615	0.042065	0.30593	0.0146	0.53
27	30	28.5	3	1641.6	4367.2	1738.1	3379.7	0.11	0.80	1.615	0.042065	0.30593	0.0132	0.47
30	33	31.5	3	1814.4	4539.1	1696.2	3510.6	0.11	0.80	1.615	0.042065	0.30593	0.0121	0.43

Using Boring Information and consolidation test results from DH-212 — Total Settlement: 2.83



Only modify h_w and I, all others are established formulas.

γ_{STONE} (pcf) = 125.0 Slope = 3.0 h_w = 3.5 h_e = 15.0 h_t = 18.5 b = 10.0	$P = \gamma_{STONE} * h_e + (\gamma_{STONE} - \gamma_{WATER}) * h_w$ P = 2094.10

z	a/z	b/z	I	2 I	$\sigma_z = 2\ I * P$
1.5	37.000	6.667	0.500	1.000	2094.10
4.5	12.333	2.222	0.500	1.000	2094.10
7.5	7.400	1.333	0.490	0.980	2052.22
10.5	5.286	0.952	0.485	0.970	2031.28
12.0	4.625	0.833	0.480	0.960	2010.34
13.5	4.111	0.741	0.475	0.950	1989.40
16.5	3.364	0.606	0.465	0.930	1947.51
19.5	2.846	0.513	0.450	0.900	1884.69
22.5	2.467	0.444	0.440	0.880	1842.81
25.5	2.176	0.392	0.430	0.860	1800.93
28.5	1.947	0.351	0.415	0.830	1738.10
31.5	1.762	0.317	0.405	0.810	1696.22

h_w is adjusted for extreme low tide of -3.5 MLLW.

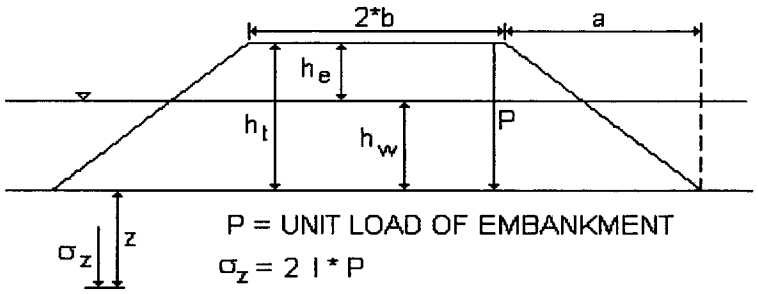
+12.0

COMPUTATION SHEET FOR CONSOLIDATION SETTLEMENT — CALCULATED BY: DEC
PROJECT JAMES ISLAND DIKE (DH-212) — DATE: 12/16/2004

Sublayer Depth (ft)			Sublayer Thickness	Effective Overburden Pressure	Preconsoli-dation Pressure	Pressure Change	Final Pressure	Recompress-ion Index	Compress-ion Index	Initial Void Ratio	Compression Ratio		Vertical Strain	Change in Thickness (in)
Top	Bottom	Average	H_o (ft)	p_o (psf)	p_p (psf)	Δp (psf)	p_f (psf)	c_r	c_c	e_o	Rebound Curve $C\varepsilon r$	Virgin Curve $C\varepsilon c$	εz^*	$\varepsilon z \times H_o$ = DH
11	13	12	2	691.2	3416.8	2070.3	2761.5	0.11	0.8	1.615	0.042065	0.305927	0.0253	0.61
18	21	19.5	3	1123.2	3848.8	1962.5	3085.7	0.11	0.8	1.615	0.042065	0.305927	0.0185	0.66
21	24	22.5	3	1296	4021.6	1897.8	3193.8	0.11	0.8	1.615	0.042065	0.305927	0.0165	0.59
24	27	25.5	3	1468.8	4194.4	1854.7	3323.5	0.11	0.8	1.615	0.042065	0.305927	0.0149	0.54
27	30	28.5	3	1641.6	4367.2	1811.5	3453.1	0.11	0.8	1.615	0.042065	0.305927	0.0136	0.49
30	33	31.5	3	1814.4	4539.1	1746.9	3561.3	0.11	0.8	1.615	0.042065	0.305927	0.0123	0.44

Using Boring Information and consolidation test results from DH-212 — Total Settlement: 2.89

12-ft



Only modify h_w and I, all others are established formulas.

γ_{STONE} (pcf) = 125.0 Slope = 3.0 h_w = 3.5 h_e = 15.5 h_t = 19.0 b = 10.0	$P = \gamma_{STONE} * h_e + (\gamma_{STONE} - \gamma_{WATER}) * h_w$ P = 2156.60

z	a/z	b/z	I	2 I	$\sigma_z = 2\ I * P$
1.5	38.000	6.667	0.500	1.000	2156.60
4.5	12.667	2.222	0.500	1.000	2156.60
7.5	7.600	1.333	0.495	0.990	2135.03
10.5	5.429	0.952	0.485	0.970	2091.90
12.0	4.750	0.833	0.480	0.960	2070.34
13.5	4.222	0.741	0.475	0.950	2048.77
16.5	3.455	0.606	0.465	0.930	2005.64
19.5	2.923	0.513	0.455	0.910	1962.51
22.5	2.533	0.444	0.440	0.880	1897.81
25.5	2.235	0.392	0.430	0.860	1854.68
28.5	2.000	0.351	0.420	0.840	1811.54
31.5	1.810	0.317	0.405	0.810	1746.85

h_w is adjusted for extreme low tide of -3.5 MLLW.

Hole No. JB212

DRILLING LOG | DIVISION: NAD | INSTALLATION: BALTIMORE | SHEET 1 OF 2 SHEETS

1. PROJECT: Feasibility Study
2. LOCATION (Coordinates or Station): James Island, MD
3. DRILLING AGENCY: CENAB-EN-GGE
4. HOLE NO. (As shown on drawing title and file number): JB212
5. NAME OF DRILLER: ALBERT McNAMARA
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN: 26.5'
8. DEPTH DRILLED INTO ROCK: N/A
9. TOTAL DEPTH OF HOLE: 26.5'
10. SIZE AND TYPE OF BIT: 2¼" HSA
11. DATUM FOR ELEVATION SHOWN (TBM or MSL):
12. MANUFACTURER'S DESIGNATION OF DRILL: CME 45 SKID RIG
13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 11 | UNDISTURBED Ø
14. TOTAL NUMBER CORE BOXES: Ø
15. ELEVATION GROUND WATER: See Remarks
16. DATE HOLE: STARTED 9/16/04 | COMPLETED 9/16/04
17. ELEVATION TOP OF HOLE:
18. TOTAL CORE RECOVERY FOR BORING: %
19. SIGNATURE OF INSPECTOR: Jace F. Andrus

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	1–2		Black and Med. Gray, Wet, Very Fine SAND w/ trace silt and fine shell fragments	73	J-1	Boring was drilled with the CME45 using 2¼" Hollow Stem Augers. Samples were obtained by SPT method (1⅜" Split Spoon driven 18 inches by an automatic hammer w/a 30 inch drop). All sample depths are measured from top of Sediment.
	3–4		Yellow-Brown, Orange-Brown, and Red-Brown, Wet, Fine SAND	93	J-2	
	5–6		Light Orange-Brown, Wet, Fine SAND w/tr. silt	87	J-3	
	7–8		Light Brown, Wet, Fine to Very Fine SAND	80	J-4	
	9–10		Same As Above top 1.0' (Not in Jar)	100	J-5	
	11–12		Med Gray, Moist, Soft, Fat CLAY			
	12–13		Same As Above top 0.5' (Not in Jar)	100	J-6	
	13–14		Med Gray and Brown, Wet Fine SAND w/tr. silt			
	15–16		Med Dark Gray, Wet, Fine SAND	100	J-7	
	17–18		Med Gray, Wet, Soft Fat CLAY	100	J-8	
	19					

SAMPLES

#	Depth	BlowCount	Hem.
J-1	0.0-1.5	WH/1.0-1	N/A
J-2	2.5-4.0	2-12-10	
J-3	5.0-6.5	8-9-5	
J-4	7.5-9.0	WH/1.0-2	
J-5	10.0-11.5	WH/1.5	<0.5, <0.5, <0.5
J-6	12.5-14.0	2-3-4	N/A
J-7	15.0-16.5	5-6-2	
J-8	17.5-19.0	WH-1-1	<0.5, <0.5, <0.5
J-9	20.0-21.5	1-1-1	<0.5, <0.5, <0.5
J-10	22.5-24.0	1-1-1	<0.5, <0.5, <0.5
J-11	25.0-26.5	2-1-2	<0.5, <0.5, <0.5

PRELIMINARY INSPECTOR'S LOG CLASSIFICATION NOT FINAL

As Drilled Location:
N 38° 31' 03.7"
W 76° 20' 29.8"
GPS Accuracy: 24.2'

Water Depth @ start (1030): 7.5' hrs

Water Depth @ completion (1200): 7.4' hrs

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT)

PROJECT: Feasibility Study | HOLE NO. JB212

DRILLING LOG (Cont Sheet) | ELEVATION TOP OF HOLE | **Hole No.** JB 212

PROJECT Feasibility Study | INSTALLATION Baltimore | SHEET 2 OF 2 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	21		Med Gray, Wet, Soft, Fat CLAY w/tr. shell fragments	100	J-9	
	22					
	23		Alternating lenses of Gray, Moist, Soft CLAY and Gray, Wet, Soft Sandy CLAY	100	J-10	PRELIMINARY INSPECTOR'S LOG CLASSIFICATION NOT FINAL
	24					
	25		Med Gray, Moist, Soft, Fat CLAY w/ trace shell fragments	100	J-11	
	26					
	27		BOH 26.5'			

VISUAL-MANUAL CLASSIFICATION

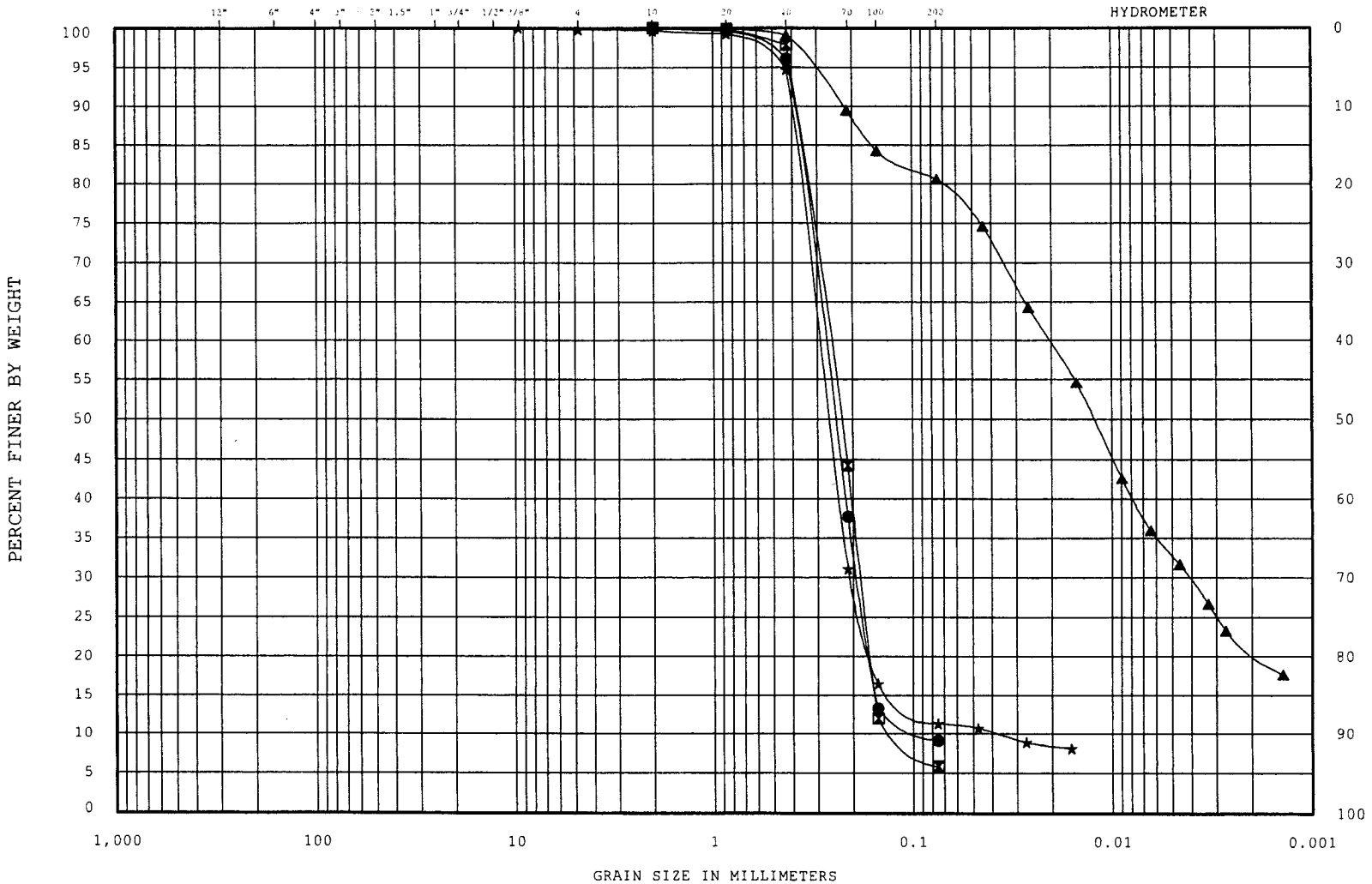
(Test method: ASTM D 2488)

PROJECT: James Island **DATE:** Oct 2004

AREA: Mid-Bay Feasibility Study **CLASSIFIED BY:** KUHN

Dorchester County, MD

SAMPLE NO.	DEPTH (ft)	VISUAL CLASSIFICATION	SYMBOL
JB -	212		
JAR-1	0.0-1.5	Wet gray silty fine sand	(SM)
-2	2.5-4.0	Wet lt olive brn + red. brn silty fine sand	(SM)
-3	5.0-6.5	Wet brn, yellow poorly graded fine sand w/ silt	(SP-SM)
-4	7.5-9.0	Wet lt olive brn poorly graded fine sand	(SP)
-5	10.0-11.5	V. moist dk gray soft fat clay	(CH)
-6	12.5-14.0	Wet dk gray poorly graded fine-med sand w/ silt	(SP-SM)
-7	15.0-16.5	- ditto -	(SP-SM)
-8	17.5-19.0	V. moist dk greenish gray firm fat clay	(CH)
-9	20.0-21.5	- ditto -	(CH)
-10	22.5-24.0	V. moist dk greenish gray soft fat clay w/ Sd lenses	(CH)
-11	25.0-26.5	V. moist dk greenish gray soft-firm fat clay (Tr shells)	(CH)



Legend	Sample No.	Depth (ft)	Classification (ASTM D 2487)		Nat wc%	LL	PL	PI
—●—	Jar-2	2.5-4.0	POORLY GRADED SAND with SILT	SP-SM	23.5			
—⊠—	Jar-3	5.0-6.5	POORLY GRADED SAND with SILT	SP-SM	25.9			
—▲—	Jar-5	10.0-11.5	FAT CLAY with SAND	CH	41.1	54	20	34
—★—	Jars 6&7	12.5-16.5	POORLY GRADED SAND with SILT	SP-SM	25.1			

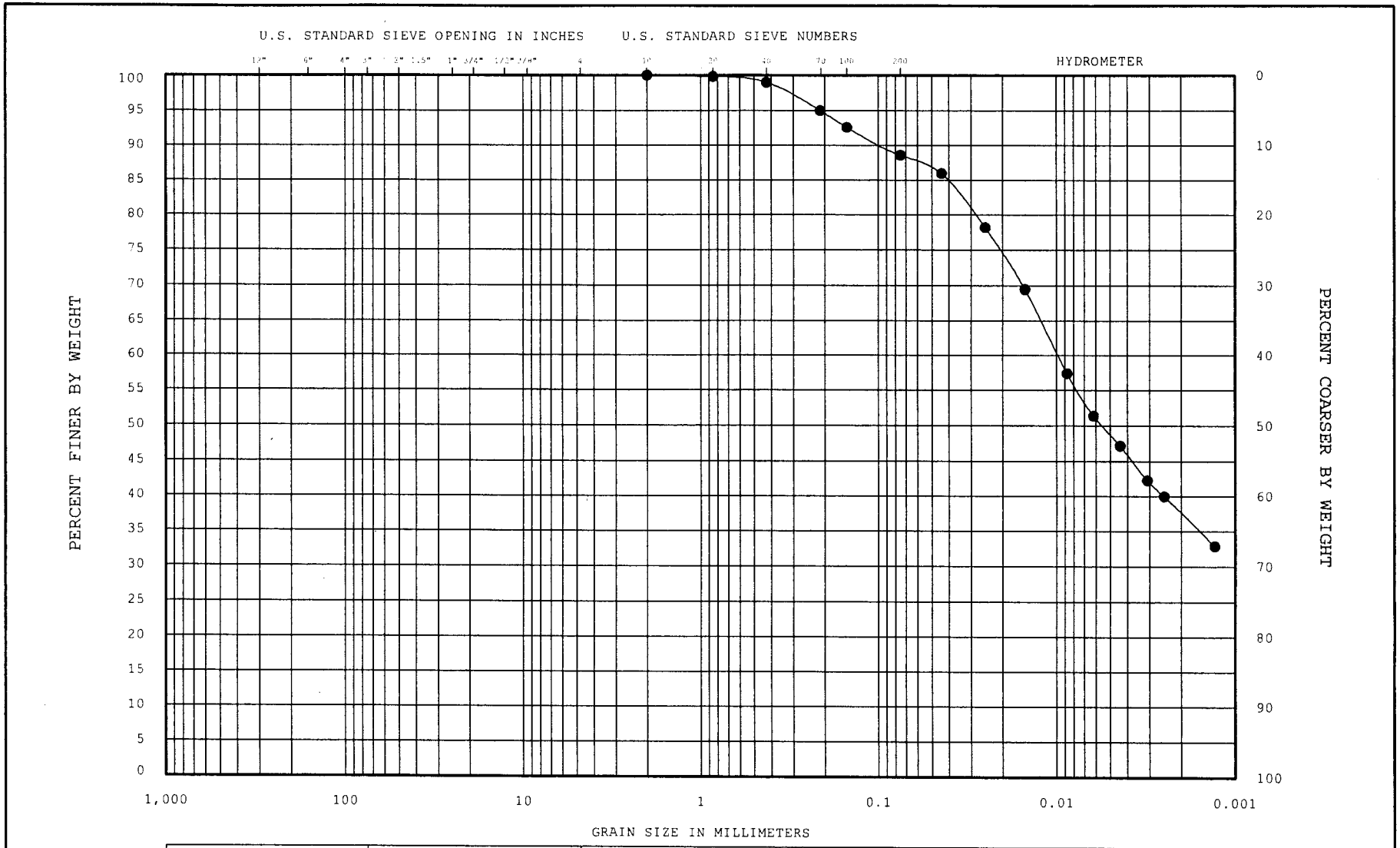
REMARKS :

ENG FORM ENG2087JAMES ISLAND, MID-BAY FEASIBILITY STUDY.GPJ **GRADATION CURVES** TEST METHODS: ASTM D 422, D4318, D2216

PROJECT: *James Island*
AREA: *Mid-Bay Feasibility Study*
Dorchester County, MD

BORING NO.: *JB-212*

DATE: *Nov 2004*



Legend	Sample No.	Depth (ft)	Classification (ASTM D 2487)		Nat wc%	LL	PL	PI
—●—	Jar-8	17.5-19.0	FAT CLAY	CH	51.4	71	27	44
— —								
— —								
— —								

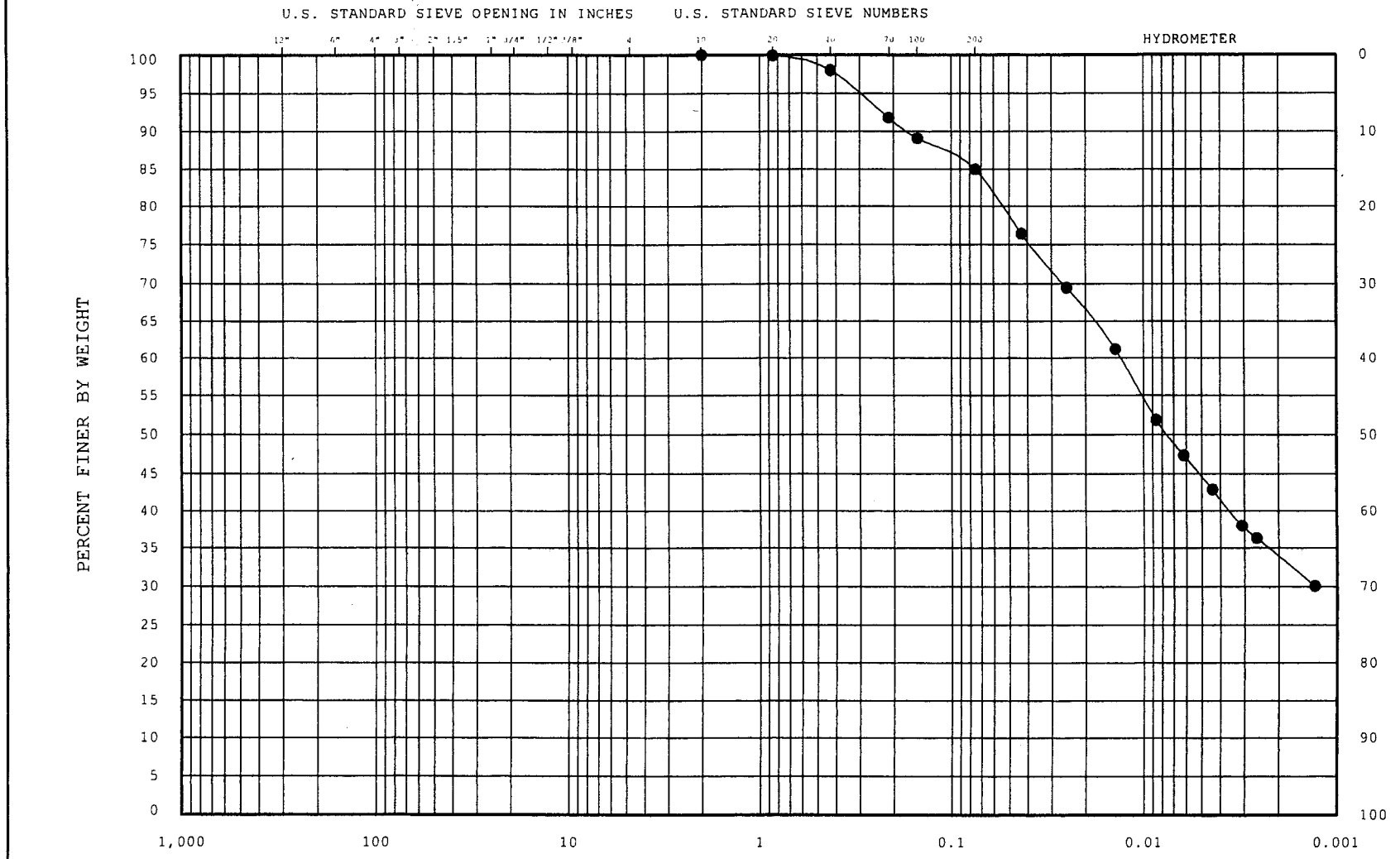
REMARKS :

ENG FORM ENG2087JAMES ISLAND, MID-BAY FEASIBILITY STUDY.GPJ **GRADATION CURVES** TEST METHODS: ASTM D 422, D4318, D2216

PROJECT: *James Island*
AREA: *Mid-Bay Feasibility Study*
Dorchester County, MD

BORING NO.: *JB-212*

DATE: *Nov 2004*



Legend	Sample No.	Depth (ft)	Classification (ASTM D 2487)		Nat wc%	LL	PL	PI
—●—	Shelby-1	18.0-20.0	FAT CLAY with SAND	CH	51.0	64	25	39
— —								
— —								
— —								

REMARKS :

ENG FORM ENG2087JAMES ISLAND, MID-BAY FEASIBILITY STUDY.GPJ **GRADATION CURVES** TEST METHODS: ASTM D 422, D4318, D2216

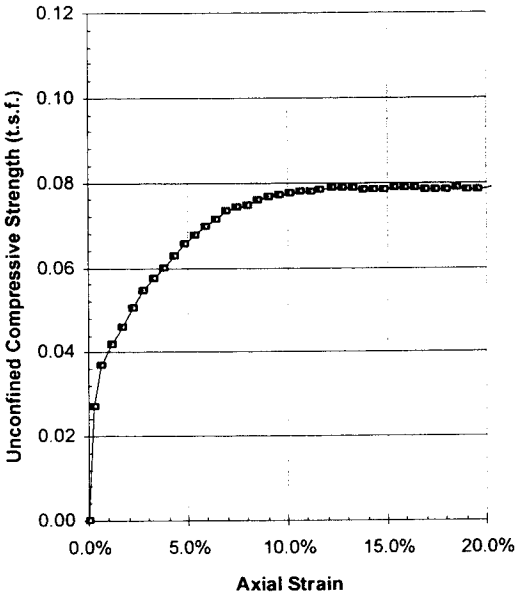
PROJECT: *James Island*
AREA: *Mid-Bay Feasibility Study*
Dorchester County, MD

BORING NO.: *JB-212A*

DATE: *Nov 2004*

UNCONFINED COMPRESSION TEST

FAILURE SKETCHES



CONTROLLED STRAIN

TEST NO.		1	2	3	4
TYPE OF SPECIMEN		Undisturbed			
WATER CONTENT, %	w_o	52.4			
VOID RATIO	e_o	1.262			
SATURATION, %	S_o	100+			
DRY UNIT WEIGHT, LB./CU.FT.	γ_d	70.4			
TIME TO FAILURE, MIN.	t_f	------			
UNCONFINED COMPRESSIVE STRENGTH, TSF	q_u	0.08			
UNDRAINED SHEAR STRENGTH, TSF	s_u	0.04			
SENSITIVTY RATIO	S_t	------			
INITIAL SPECIMEN DIAMETER, IN.	D_o	2.84			
INITIAL SPECIMEN HEIGHT, IN.	H_o	6.00			

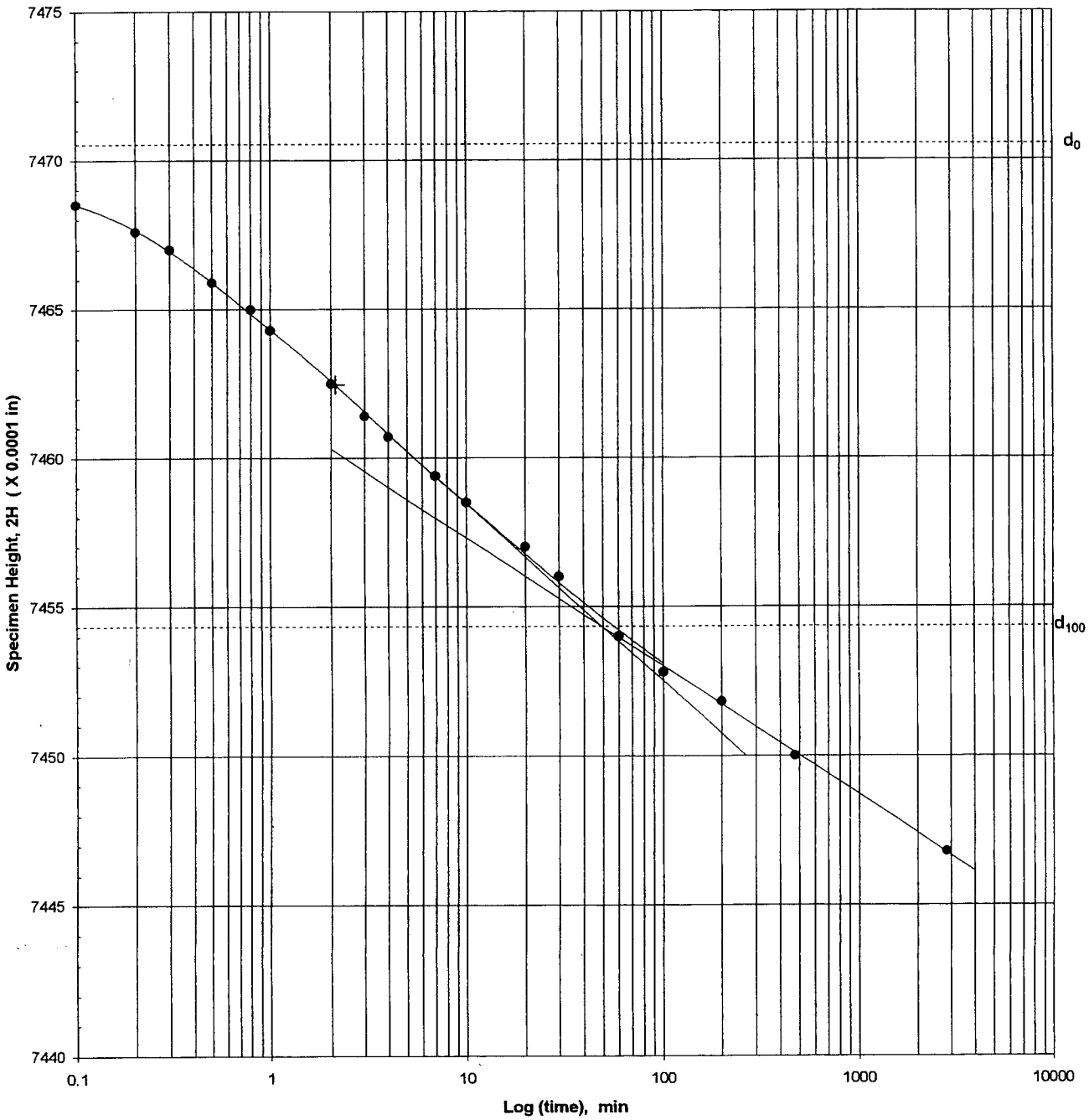
CLASSIFICATION: (ASTM D2487)

V. moist, dk gray, soft, FAT CLAY w/ sand (CH)

LL= 64	PL= 25	PI= 39 (ASTM D4318)	G_S= 2.55 (ASTM D854)

REMARKS:	PROJECT: James Island	
	Mid-Bay Feasiblity Study	
	AREA: Dorchester County, MD	
	Hole No.: DH-212A	Sample No.: Shelby-1
	Depth (ft.): 18.0-20.0	Date: Dec.2004
ENG FORM 3659 (Test method: ASTM D2166)	UNCONFINED COMPRESSION TEST REPORT	

t_{50} TIME CURVE



U.S.Army Corps of Engineers
Materials & Instrumentation Section
Baltimore, Maryland 21230

PROJECT: Dorchester County, MD
Mid-Bay Feasibility Study

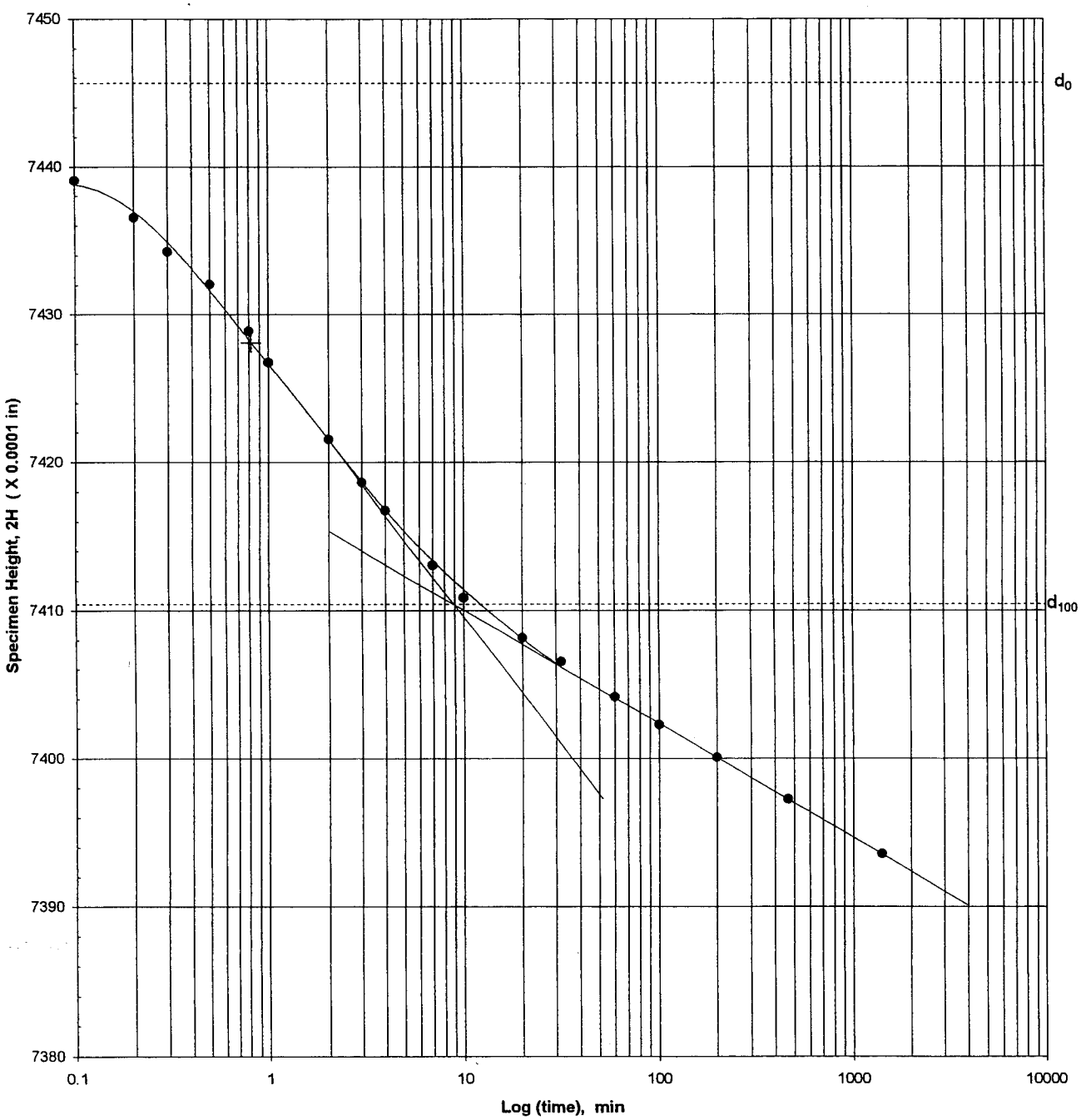
AREA: James Island

Normal Stess =	**0.25**	tons/ft²
t_{50} =	2.1	min
H =	0.3731	in
c_v =	2.17 X 10^{-4}	in²/sec

Hole No.:	Sample No.:	Depth (ft):
JB-212A	Shelby-1	18.0-20.0

ENG Form 2088 **CONSOLIDATION TEST - TIME CURVE**

t_{50} TIME CURVE



U.S.Army Corps of Engineers
Materials & Instrumentation Section
Baltimore, Maryland 21230

PROJECT: Dorchester County, MD
Mid-Bay Feasibility Study

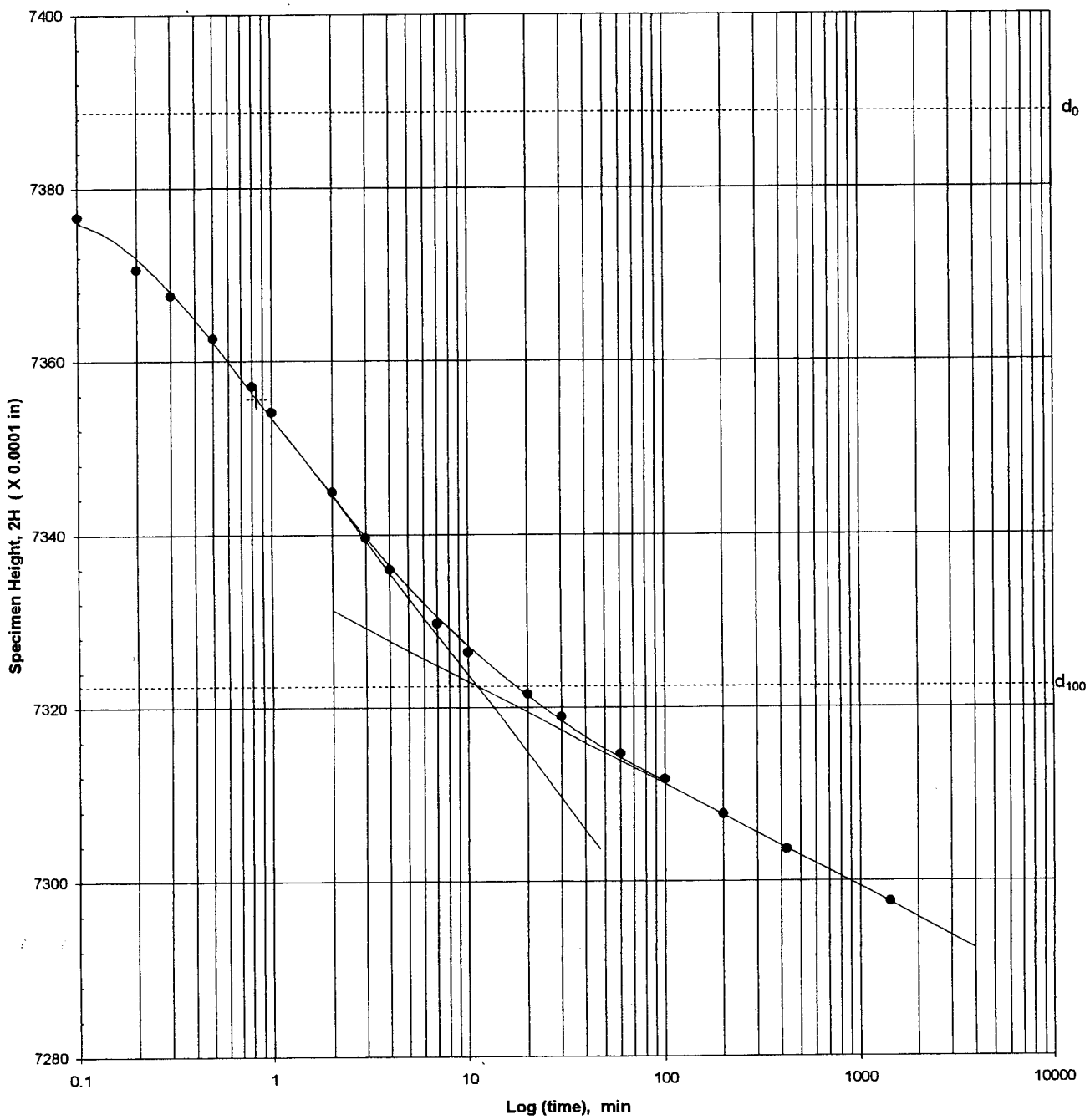
AREA: James Island

Normal Stess =	**0.50**	tons/ft²
t_{50} =	0.82	min
H =	0.3714	in
c_v =	5.50 X 10^{-4}	in²/sec

Hole No.:	Sample No.:	Depth (ft):
JB-212A	Shelby-1	18.0-20.0

ENG Form 2088 **CONSOLIDATION TEST - TIME CURVE**

t_{50} TIME CURVE



U.S.Army Corps of Engineers
Materials & Instrumentation Section
Baltimore, Maryland 21230

PROJECT: Dorchester County, MD
Mid-Bay Feasibility Study

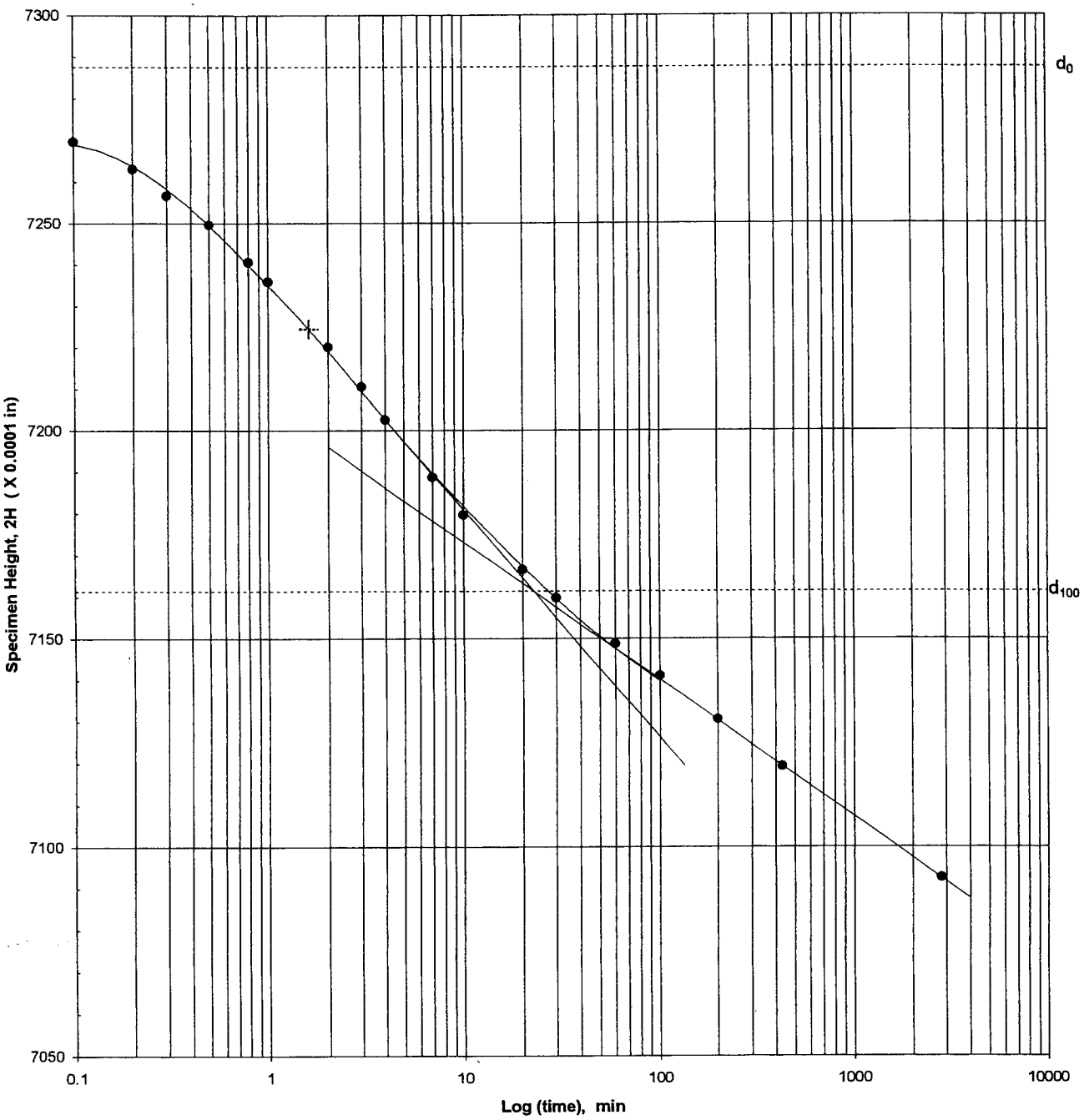
AREA: James Island

Normal Stess =	**1.0**	tons/ft²
t_{50} =	0.84	min
H =	0.3678	in
c_v =	5.26 X 10^{-4}	in²/sec

Hole No.:	**Sample No.:**	**Depth (ft):**
JB-212A	Shelby-1	18.0-20.0

ENG Form 2088 — **CONSOLIDATION TEST - TIME CURVE**

t_{50} TIME CURVE



U.S.Army Corps of Engineers
Materials & Instrumentation Section
Baltimore, Maryland 21230

PROJECT: Dorchester County, MD
Mid-Bay Feasibility Study

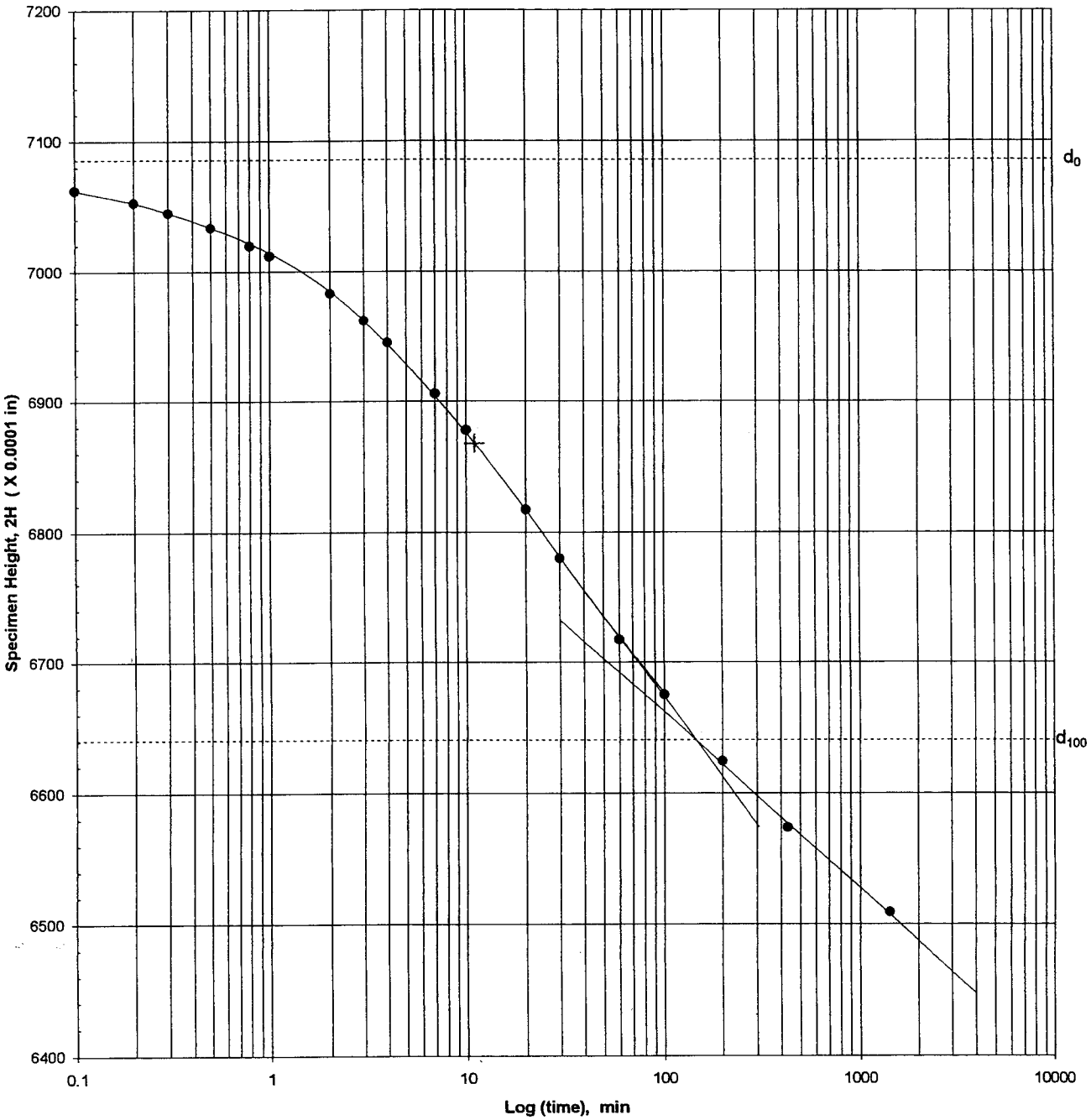
AREA: James Island

Normal Stess =	**2.0**		tons/ft²
t_{50} =	1.59		min
H =	0.3612		in
c_v =	2.68	X 10^{-4}	in²/sec

Hole No.:	**Sample No.:**	**Depth (ft):**
JB-212A	Shelby-1	18.0-20.0

ENG Form 2088 **CONSOLIDATION TEST - TIME CURVE**

t_{50} TIME CURVE



U.S.Army Corps of Engineers
Materials & Instrumentation Section
Baltimore, Maryland 21230

PROJECT: Dorchester County, MD
Mid-Bay Feasibility Study

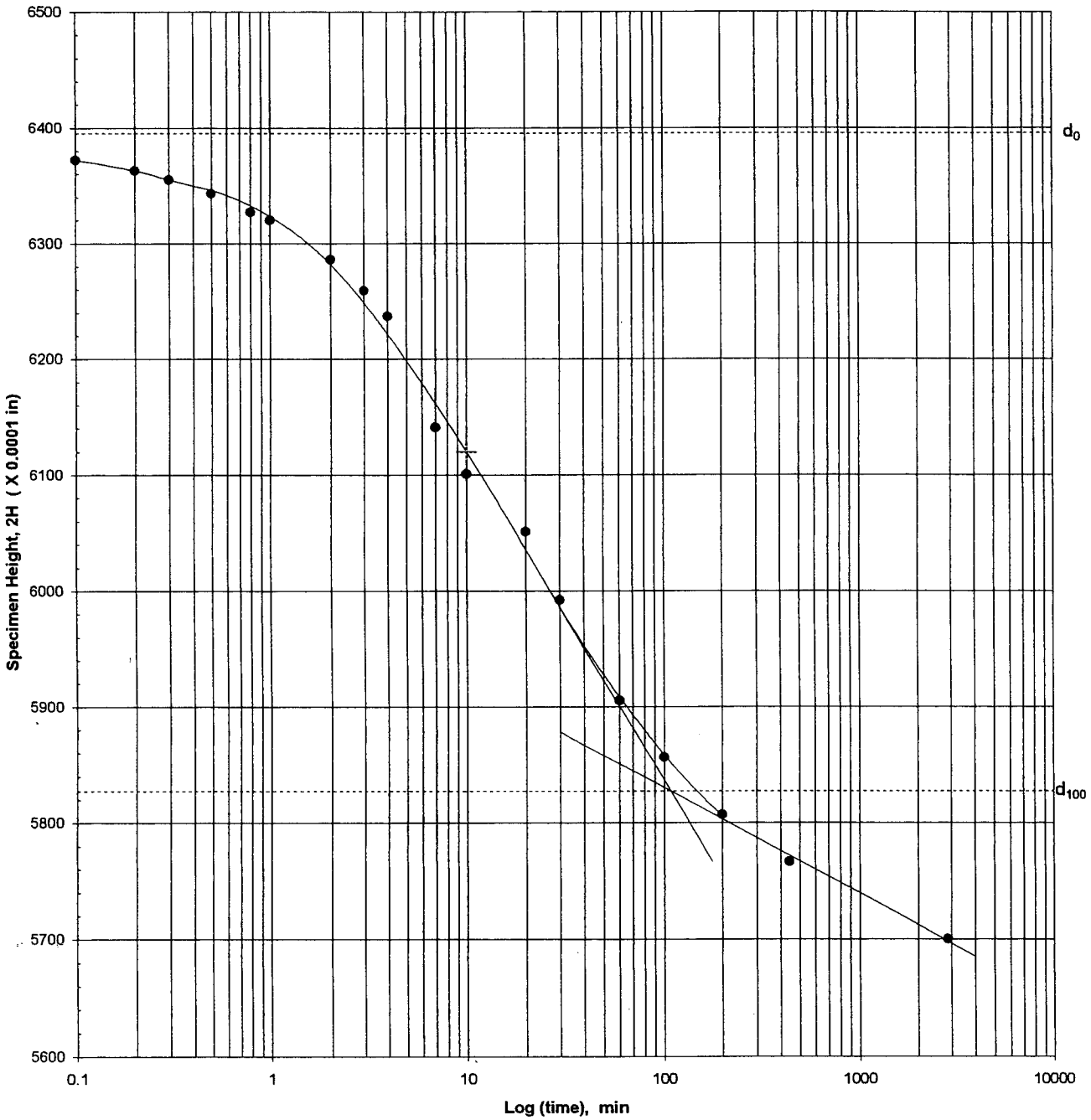
AREA: James Island

Normal Stess =	**4.0**		tons/ft²
t_{50} =	11		min
H =	0.3431		in
c_v =	3.50	X 10^{-5}	in²/sec

Hole No.:	**Sample No.:**	**Depth (ft):**
JB-212A	Shelby-1	18.0-20.0

ENG Form 2088 **CONSOLIDATION TEST - TIME CURVE**

t_{50} TIME CURVE



U.S.Army Corps of Engineers
Materials & Instrumentation Section
Baltimore, Maryland 21230

PROJECT: Dorchester County, MD
Mid-Bay Feasibility Study

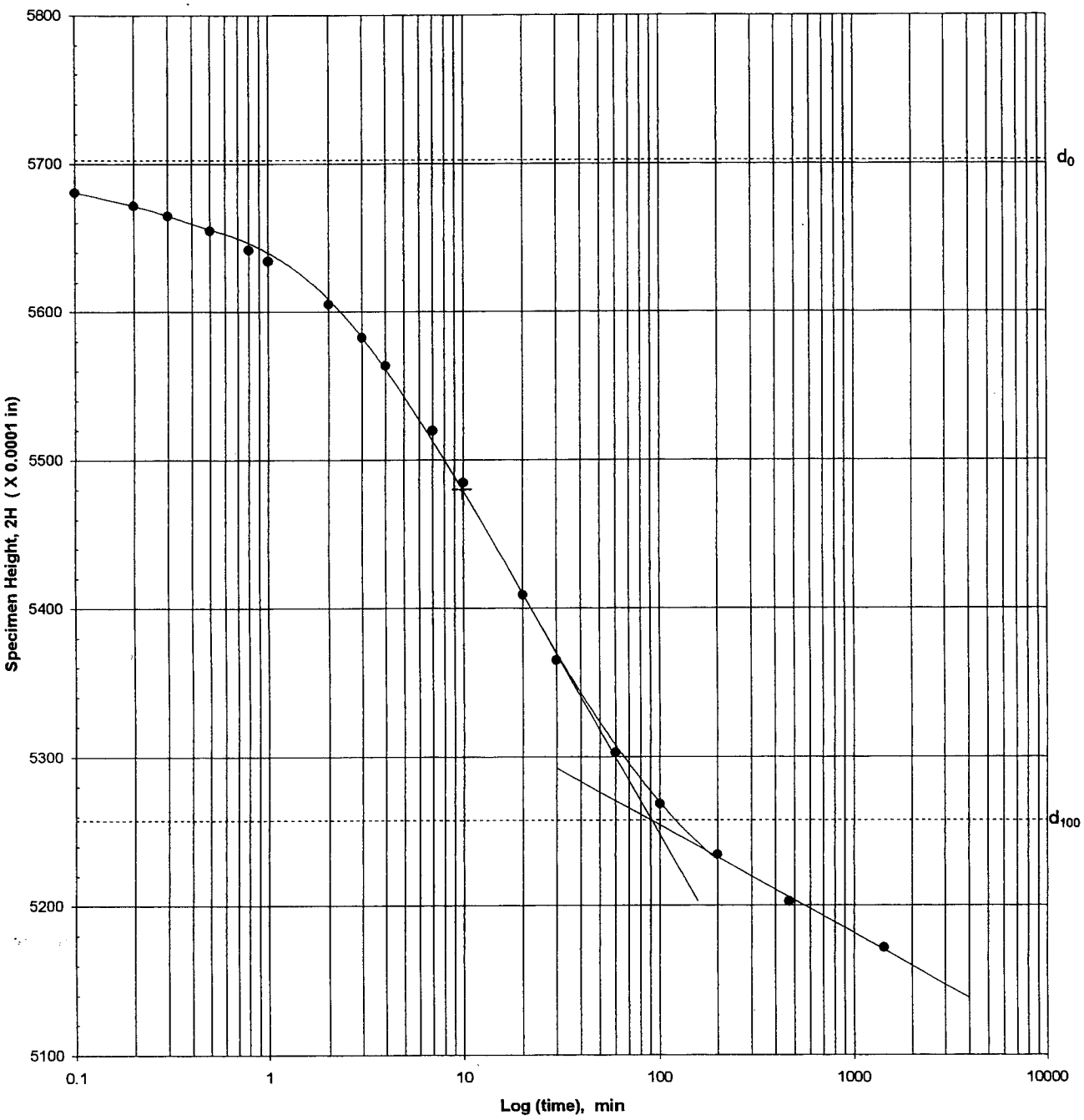
AREA: James Island

Normal Stess =	**8.0**	tons/ft²
t_{50} =	10	min
H =	0.3056	in
c_v =	3.05 X 10^{-5}	in²/sec

Hole No.:	**Sample No.:**	**Depth (ft):**
JB-212A	Shelby-1	18.0-20.0

ENG Form 2088 — **CONSOLIDATION TEST - TIME CURVE**

t_{50} TIME CURVE



U.S.Army Corps of Engineers
Materials & Instrumentation Section
Baltimore, Maryland 21230

PROJECT: Dorchester County, MD
Mid-Bay Feasibility Study

AREA: James Island

Normal Stess =	**16.0**	tons/ft²
t_{50} =	9.86	min
H =	0.2740	in
c_v =	2.49 X 10^{-5}	in²/sec

Hole No.:	Sample No.:	Depth (ft):
JB-212A	Shelby-1	18.0-20.0

ENG Form 2088 **CONSOLIDATION TEST - TIME CURVE**

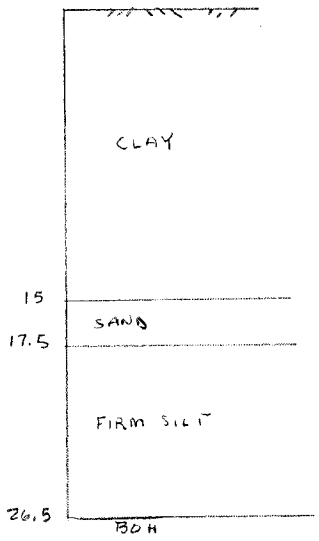
SETTLEMENT ANALYSIS FOR DH-215

ASSUME A DIKE SECTION TO VARYING ELEVATIONS (+10, +10.5, +11, +11.5, +12) WITH SIDESLOPES OF 3H:1V AND A CREST WIDTH OF 20 FEET. DEPTH OF WATER IS ASSUMED TO BE 44 FEET AT MLLW. USE EXTREME LOW TIDE OF -3.5 MLLW TO COMPUTE STRESS CHANGES FROM DIKE.

A CONSOLIDATION TEST WAS PERFORMED ON A CLAY SAMPLE OBTAINED FROM A DEPTH OF 9'-11'. CONSOLIDATION TEST RESULTS SHOW A C_c OF 0.116 (FROM CORRECTED CURVE) AND A C_r OF .014. A PRECONSOLIDATION PRESSURE OF 1.1 TSF (2200 psf) WAS DETERMINED FROM THE e-log p CURVE.

OVERBURDEN PRESSURE, $P_o = (120 - 62.4)(10) = 576$ psf

OCR = 2200/576 = 3.82 (DUE TO JAMES ISLAND PREVIOUSLY EXISTING AT THIS LOCATION)



ASSUMED COMPRESSIBLE LAYER 15-FT IN THICKNESS.

ESTIMATED CONSOLIDATION SETTLEMENT RANGES FROM 1.5'-2.0' (SEE ATTACHED SPREADSHEETS)

TUBE CLASSIFICATION

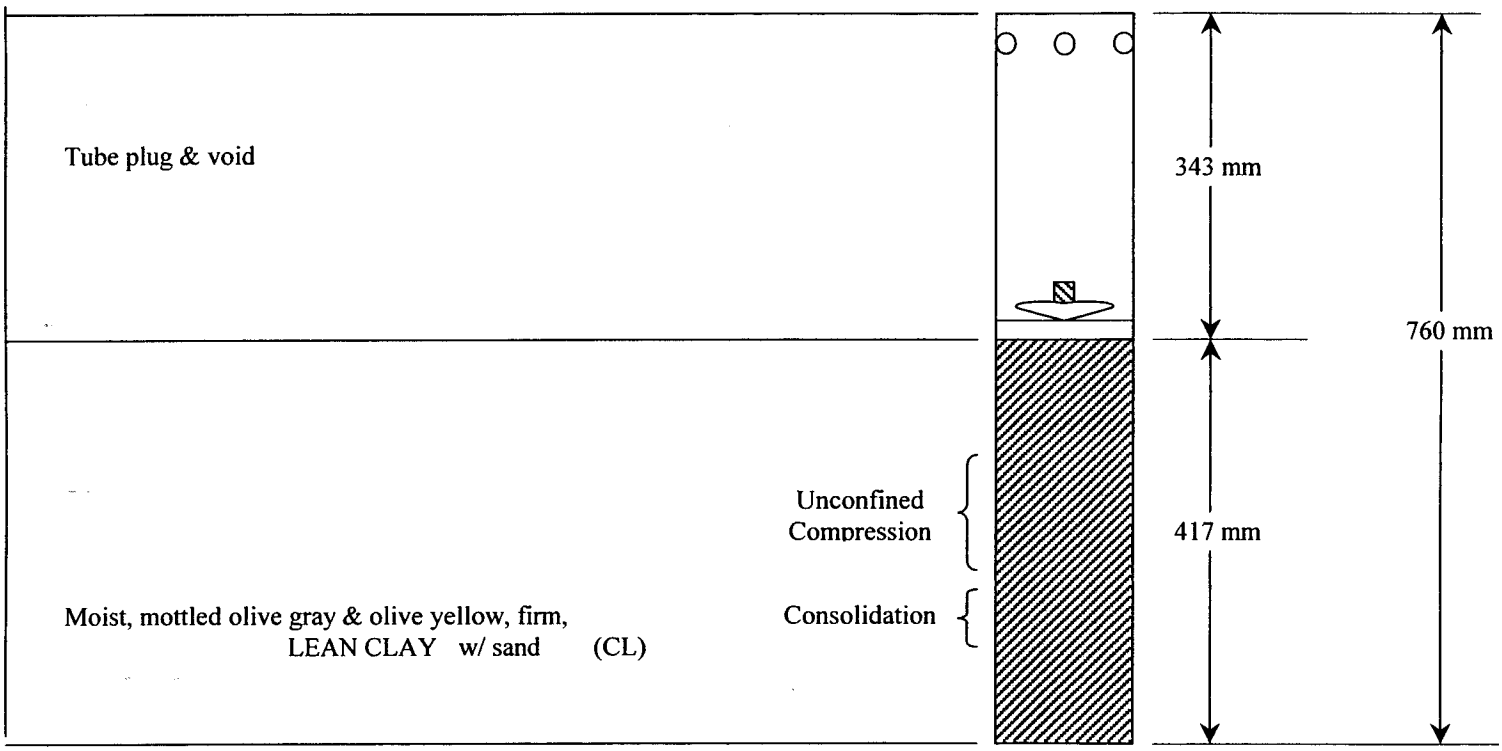
ASTM D2487

PROJECT: Mid-Bay Feasibility Study
James Island

AREA: Dorchester County, MD

DATE: Nov 2004

Hole No.	Sample No.	Depth (ft)
DH-215A	Shelby-1	9.0-11.0



STA.
OFFSET:
TOP ELEV:

MID-BAY ISLAND FEASIBILITY STUDY
JAMES ISLAND, DORCHESTER COUNTY, MD

N 305713.99
E 1500576.56

JB-215
1 of 1
COMPLETED: September 20, 2004

DEPTH(ft)	(c)	(d)	(a)	(b)
	Wet, dk. gray, soft lean CLAY (CL)		WH/1.5	
2.00				
	Wet, olive gray, soft lean clayey SAND (SC)		WH-1-1	34.1
4.50				
	Wet, olive gray, soft sandy lean CLAY (CL)		WH-1-2	
7.00				
	Wet, olive gray, soft lean CLAY w/sand (CL)		WH-1-2	26.5
	P		WH/1.5	29.9
			WH/1.5	
14.50				
	Wet, dk. gray, clayey SAND (SC)		1-1/1.0	
17.00				
	Moist, olive gray, soft to firm sandy fat CLAY (CH)		3-5-7	42.1
	PPR 17.5'-19.0': 2.5, 2.5, 2.0			
	PPR 20.0'-21.5': 3.0, 3.5, 2.5		3-5-7	
	PPR 22.5'-24.0': 4.5, 4.0, 4.0		3-7-9	
	PPR 25.0'-26.5': 3.0, 3.5, 3.0			
26.50			6-7-23	
	BOTTOM OF HOLE			

Depth of bay water @ start of boring 6.3' @ 1626 Hrs.
Depth of bay water @ completion 6.9' @ 1742 Hrs.

5 10 15 20 25 30 35 40 45

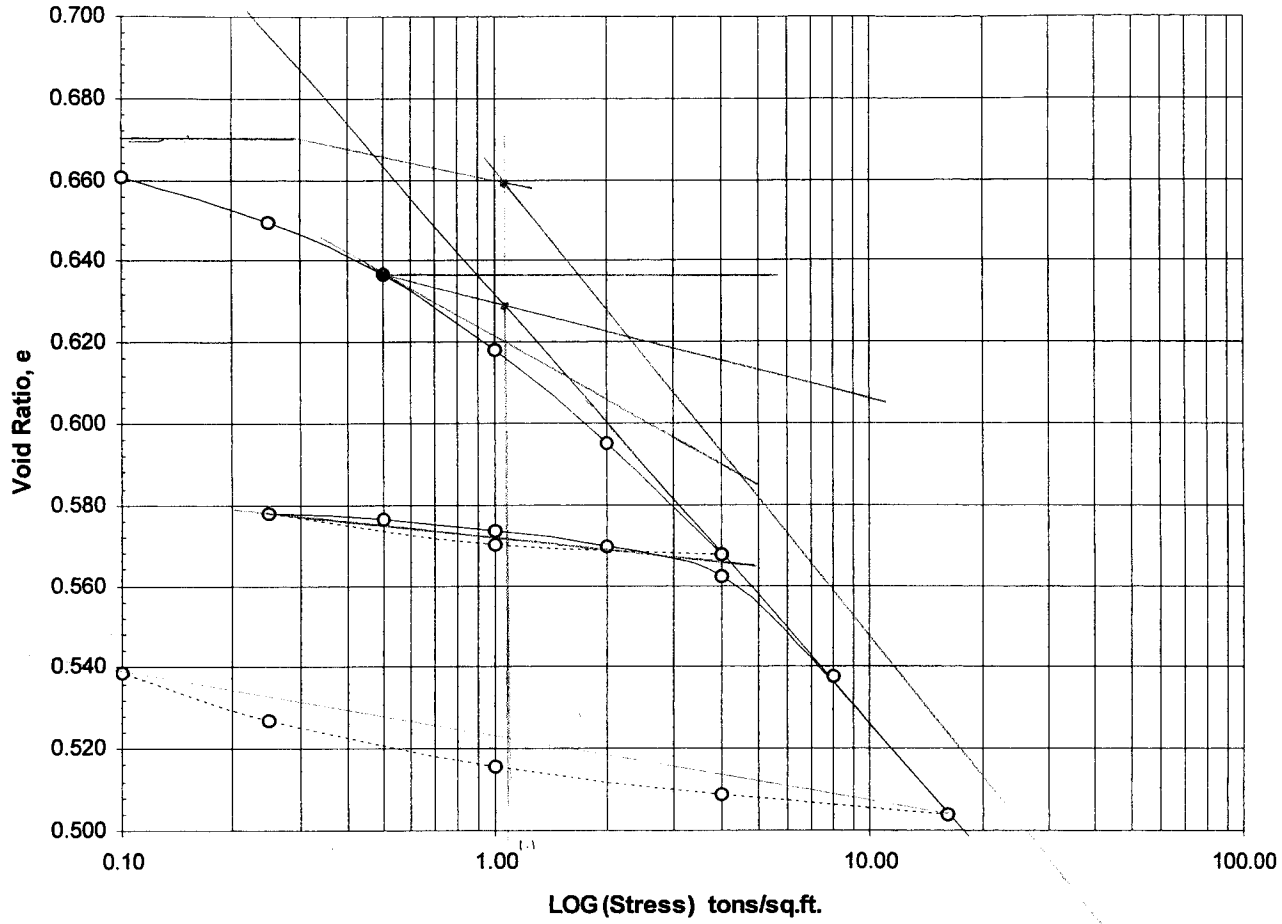
JB-215
GROUNDWATER DATA
WHILE DRILLING:
ON COMPLETION:
Hr. READING:

GROUNDWATER DATA
WHILE DRILLING:
ON COMPLETION:
Hr. READING:

P - indicates pressed shelby tube sample obtained from an additional boring.

Fill **Auger** **SPT** **RB**
Cored **300 lb** **Tubex** **Hand**
Fish Tail **Vibra Core** **Water Jet** **Odex**

GEO-2 JAMESISL.GPJ 12/21/04 10:03



Type of Specimen: **Undisturbed**			Before Test			After Test
Diameter= **2.50** in.	Height= **0.75** in.	Water Content, %	w_o	24.0	w_f	20.0
Overburden Pressure, p_o = .288 tons/sq.ft.		Void Ratio	e_o	0.670	e_f	0.551
Preconsol. Pressure, p_c = 1.1 tons/sq.ft.		Saturation, %	S_o	98.5	S_f	100.0
Compression Index, C_c = ~~0.106~~ .116		Dry Density	γ_d	102.8 lbs./cu.ft.		

Classification (ASTM D2487): Moist, mottled olive gray & olive yellow, firm, LEAN CLAY w/sand. (CL)

LL = 29	PL = 18	PI= 11 (ASTM D4318)	G_s = 2.75 (ASTM D854)

Remarks:	**PROJECT:** Dorchester County, MD	
	Mid-Bay Feasibility Study	
	AREA: James Island	
	Hole No.: JB-215A	**Sample No.:** Shelby-1
	Depth (ft.): 9.0-11.0	**Date:** Dec.2004
ENG FORM 2090 (Test method: ASTM D2435)	**CONSOLIDATION TEST REPORT**	

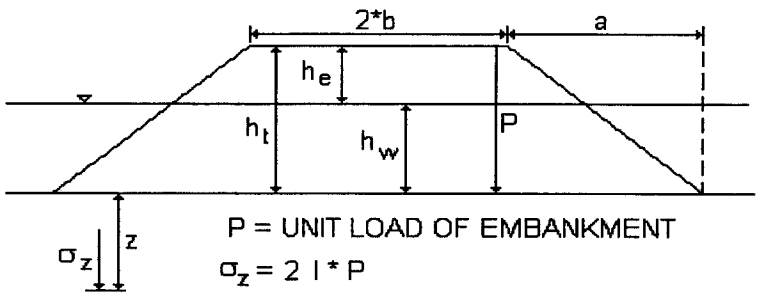
+10.0

COMPUTATION SHEET FOR CONSOLIDATION SETTLEMENT — CALCULATED BY: DEC
PROJECT: JAMES ISLAND DIKE (DH-215) — DATE: 12/16/2004

Sublayer Depth (ft)			Sublayer Thickness	Effective Overburden Pressure	Preconsolidation Pressure	Pressure Change	Final Pressure	Recompression Index	Compression Index	Initial Void Ratio	Compression Ratio		Vertical Strain	Change in Thickness (in)
Top	Bottom	Average	H_o (ft)	p_o (psf)	p_p (psf)	Δp (psf)	p_f (psf)	c_r	c_c	e_o	Rebound Curve $C_{\varepsilon r}$	Virgin Curve $C_{\varepsilon c}$	εz^*	$\varepsilon z \times H_o$ = DH
0	3	1.5	3	86.4	1710.4	1743.84	1830.24	0.014	0.116	0.67	0.008383	0.069461	0.0129	0.46
3	6	4.5	3	259.2	1883.2	1743.84	2003.04	0.014	0.116	0.67	0.008383	0.069461	0.0091	0.33
6	9	7.5	3	432	2056	1708.96	2140.96	0.014	0.116	0.67	0.008383	0.069461	0.0069	0.25
9	12	10.5	3	604.8	2228.8	1691.52	2296.32	0.014	0.116	0.67	0.008383	0.069461	0.0056	0.20
12	15	13.5	3	777.6	2401.6	1639.21	2416.81	0.014	0.116	0.67	0.008383	0.069461	0.0043	0.15

Using Boring Information and consolidation test results from DH-215 — Total Settlement: 1.40

10-ft



Only modify h_w and I, all others are established formulas.

γ_{STONE} (pcf) = 125.0 Slope = 3.0 h_w = 0.9 h_e = 13.5 h_t = 14.4 b = 10.0	$P = \gamma_{STONE} * h_e + (\gamma_{STONE} - \gamma_{WATER}) * h_w$ P = 1743.84

z	a/z	b/z	I	2 I	$\sigma_z = 2\ I * P$
1.5	28.800	6.667	0.500	1.000	1743.84
4.5	9.600	2.222	0.500	1.000	1743.84
7.5	5.760	1.333	0.490	0.980	1708.96
10.5	4.114	0.952	0.485	0.970	1691.52
12.0	3.600	0.833	0.475	0.950	1656.65
13.5	3.200	0.741	0.470	0.940	1639.21
16.5	2.618	0.606	0.455	0.910	1586.89
19.5	2.215	0.513	0.440	0.880	1534.58
22.5	1.920	0.444	0.425	0.850	1482.26
25.5	1.694	0.392	0.415	0.830	1447.39
28.5	1.516	0.351	0.395	0.790	1377.63
31.5	1.371	0.317	0.385	0.770	1342.76

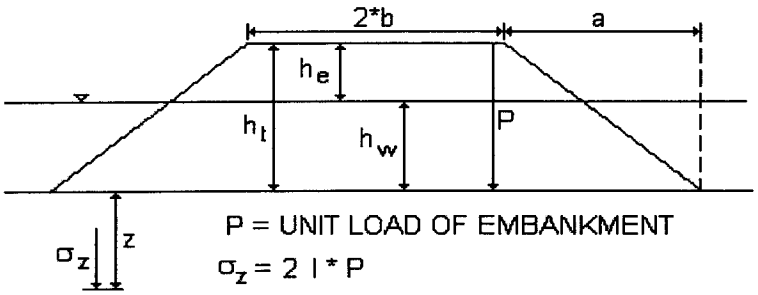
h_w is adjusted for extreme low tide of -3.5 MLLW.

COMPUTATION SHEET FOR CONSOLIDATION SETTLEMENT — CALCULATED BY: DEC
PROJECT JAMES ISLAND DIKE (DH-215) — DATE: 12/16/2004

Sublayer Depth (ft)			Sublayer Thickness	Effective Overburden Pressure	Preconsolidation Pressure	Pressure Change	Final Pressure	Recompression Index	Compression Index	Initial Void Ratio	Compression Ratio		Vertical Strain	Change in Thickness (in)
Top	Bottom	Average	H_o (ft)	p_o (psf)	p_p (psf)	Δp (psf)	p_f (psf)	c_r	c_c	e_o	Rebound Curve $C_{\varepsilon r}$	Virgin Curve $C_{\varepsilon c}$	εz^*	$\varepsilon z \times H_o$ = DH
0	3	1.5	3	86.4	1710.4	1806.34	1892.74	0.014	0.116	0.67	0.008383	0.06946	0.0139	0.50
3	6	4.5	3	259.2	1883.2	1806.34	2065.54	0.014	0.116	0.67	0.008383	0.06946	0.0100	0.36
6	9	7.5	3	432	2056	1770.21	2202.21	0.014	0.116	0.67	0.008383	0.06946	0.0078	0.28
9	12	10.5	3	604.8	2228.8	1752.15	2356.95	0.014	0.116	0.67	0.008383	0.06946	0.0064	0.23
12	15	13.5	3	777.6	2401.6	1697.96	2475.56	0.014	0.116	0.67	0.008383	0.06946	0.0050	0.18

Using Boring Information and consolidation test results from DH-215 — Total Settlement: 1.55

10.5-ft



P = UNIT LOAD OF EMBANKMENT

$\sigma_z = 2\ I * P$

Only modify h_w and I, all others are established formulas.

γ_{STONE} (pcf) = 125.0 Slope = 3.0 h_w = 0.9 h_e = 14.0 h_t = 14.9 b = 10.0	$P = \gamma_{STONE} * h_e + (\gamma_{STONE} - \gamma_{WATER}) * h_w$ P = 1806.34

z	a/z	b/z	I	2 I	$\sigma_z = 2\ I * P$
1.5	29.800	6.667	0.500	1.000	1806.34
4.5	9.933	2.222	0.500	1.000	1806.34
7.5	5.960	1.333	0.490	0.980	1770.21
10.5	4.257	0.952	0.485	0.970	1752.15
12.0	3.725	0.833	0.475	0.950	1716.02
13.5	3.311	0.741	0.470	0.940	1697.96
16.5	2.709	0.606	0.460	0.920	1661.83
19.5	2.292	0.513	0.445	0.890	1607.64
22.5	1.987	0.444	0.430	0.860	1553.45
25.5	1.753	0.392	0.415	0.830	1499.26
28.5	1.568	0.351	0.400	0.800	1445.07
31.5	1.419	0.317	0.385	0.770	1390.88

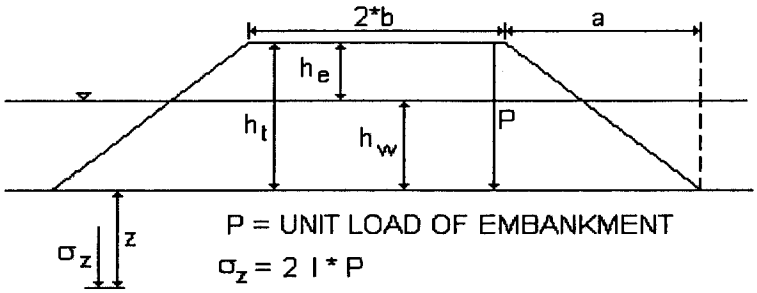
h_w is adjusted for extreme low tide of -3.5 MLLW.

+11.0

COMPUTATION SHEET FOR CONSOLIDATION SETTLEMENT — CALCULATED BY: DEC
PROJECT JAMES ISLAND DIKE (DH-215) — DATE: 12/16/2004

Sublayer Depth (ft)			Sublayer Thickness	Effective Overburden Pressure	Preconsolidation Pressure	Pressure Change	Final Pressure	Recompression Index	Compression Index	Initial Void Ratio	Compression Ratio		Vertical Strain	Change in Thickness (in)
Top	Bottom	Average	H_o (ft)	p_o (psf)	p_p (psf)	Δp (psf)	p_f (psf)	c_r	c_c	e_o	Rebound Curve $C_{\varepsilon r}$	Virgin Curve $C_{\varepsilon c}$	εz^*	$\varepsilon z \times H_o$ = DH
0	3	1.5	3	86.4	1710.4	1868.84	1955.24	0.014	0.116	0.67	0.008383	0.06946	0.0149	0.54
3	6	4.5	3	259.2	1883.2	1868.84	2128.04	0.014	0.116	0.67	0.008383	0.06946	0.0109	0.39
6	9	7.5	3	432	2056	1831.46	2263.46	0.014	0.116	0.67	0.008383	0.06946	0.0086	0.31
9	12	10.5	3	604.8	2228.8	1812.77	2417.57	0.014	0.116	0.67	0.008383	0.06946	0.0072	0.26
12	15	13.5	3	777.6	2401.6	1756.71	2534.31	0.014	0.116	0.67	0.008383	0.06946	0.0057	0.21

Using Boring Information and consolidation test results from DH-215 — Total Settlement: 1.70



Only modify h_w and I, all others are established formulas.

γ_{STONE} (pcf) = 125.0 Slope = 3.0 h_w = 0.9 h_e = 14.5 h_t = 15.4 b = 10.0	$P = \gamma_{STONE} * h_e + (\gamma_{STONE} - \gamma_{WATER}) * h_w$ P = 1868.84

z	a/z	b/z	I	2 I	$\sigma_z = 2\ I * P$
1.5	30.800	6.667	0.500	1.000	1868.84
4.5	10.267	2.222	0.500	1.000	1868.84
7.5	6.160	1.333	0.490	0.980	1831.46
10.5	4.400	0.952	0.485	0.970	1812.77
12.0	3.850	0.833	0.480	0.960	1794.09
13.5	3.422	0.741	0.470	0.940	1756.71
16.5	2.800	0.606	0.460	0.920	1719.33
19.5	2.369	0.513	0.445	0.890	1663.27
22.5	2.053	0.444	0.430	0.860	1607.20
25.5	1.812	0.392	0.415	0.830	1551.14
28.5	1.621	0.351	0.405	0.810	1513.76
31.5	1.467	0.317	0.390	0.780	1457.70

h_w is adjusted for extreme low tide of -3.5 MLLW.

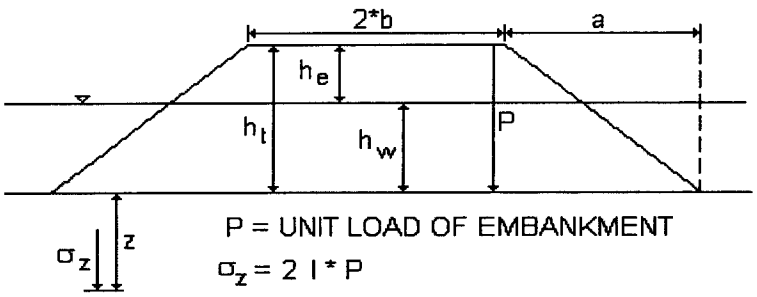
COMPUTATION SHEET FOR CONSOLIDATION SETTLEMENT
PROJECT JAMES ISLAND DIKE (DH-215)

CALCULATED BY: DEC
DATE: 12/16/2004

Sublayer Depth (ft)			Sublayer Thickness	Effective Overburden Pressure	Preconsoli-dation Pressure	Pressure Change	Final Pressure	Recompress-ion Index	Compress-ion Index	Initial Void Ratio	Compression Ratio		Vertical Strain	Change in Thickness (in)
Top	Bottom	Average	H_o (ft)	p_o (psf)	p_p (psf)	Δp (psf)	p_f (psf)	c_r	c_c	e_o	Rebound Curve $C\varepsilon r$	Virgin Curve $C\varepsilon c$	εz^*	$\varepsilon z \times H_o$ = DH
0	3	1.5	3	86.4	1710.4	1931.34	2017.74	0.014	0.116	0.67	0.008383	0.06946	0.0159	0.57
3	6	4.5	3	259.2	1883.2	1931.34	2190.54	0.014	0.116	0.67	0.008383	0.06946	0.0118	0.42
6	9	7.5	3	432	2056	1892.71	2324.71	0.014	0.116	0.67	0.008383	0.06946	0.0094	0.34
9	12	10.5	3	604.8	2228.8	1873.4	2478.2	0.014	0.116	0.67	0.008383	0.06946	0.0079	0.29
12	15	13.5	3	777.6	2401.6	1834.77	2612.37	0.014	0.116	0.67	0.008383	0.06946	0.0066	0.24

Using Boring Information and consolidation test results from DH-215

Total Settlement: 1.86



Only modify h_w and I, all others are established formulas.

γ_{STONE} (pcf) = 125.0 Slope = 3.0 h_w = 0.9 h_e = 15.0 h_t = 15.9 b = 10.0	$P = \gamma_{STONE} * h_e + (\gamma_{STONE} - \gamma_{WATER}) * h_w$ P = 1931.34

z	a/z	b/z	I	2 I	σ_z = 2 I * P
1.5	31.800	6.667	0.500	1.000	1931.34
4.5	10.600	2.222	0.500	1.000	1931.34
7.5	6.360	1.333	0.490	0.980	1892.71
10.5	4.543	0.952	0.485	0.970	1873.40
12.0	3.975	0.833	0.480	0.960	1854.09
13.5	3.533	0.741	0.475	0.950	1834.77
16.5	2.891	0.606	0.460	0.920	1776.83
19.5	2.446	0.513	0.450	0.900	1738.21
22.5	2.120	0.444	0.435	0.870	1680.27
25.5	1.871	0.392	0.420	0.840	1622.33
28.5	1.674	0.351	0.405	0.810	1564.39
31.5	1.514	0.317	0.390	0.780	1506.45

h_w is adjusted for extreme low tide of -3.5 MLLW.

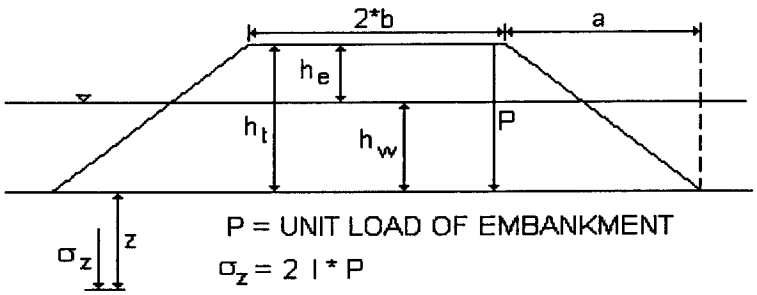
+12.0

COMPUTATION SHEET FOR CONSOLIDATION SETTLEMENT — CALCULATED BY: DEC
PROJECT JAMES ISLAND DIKE (DH-215) — DATE: 12/16/2004

Sublayer Depth (ft)			Sublayer Thickness	Effective Overburden Pressure	Preconsoli-dation Pressure	Pressure Change	Final Pressure	Recompress-ion Index	Compress-ion Index	Initial Void Ratio	Compression Ratio		Vertical Strain	Change in Thickness (in)
Top	Bottom	Average	H_o (ft)	p_o (psf)	p_p (psf)	Δp (psf)	p_f (psf)	c_r	c_c	e_o	Rebound Curve $C\varepsilon r$	Virgin Curve $C\varepsilon c$	εz^*	$\varepsilon z \times H_o$ = DH
0	3	1.5	3	86.4	1710.4	1993.84	2080.24	0.014	0.116	0.67	0.008383	0.069461	0.0168	0.60
3	6	4.5	3	259.2	1883.2	1993.84	2253.04	0.014	0.116	0.67	0.008383	0.069461	0.0126	0.45
6	9	7.5	3	432	2056	1953.96	2385.96	0.014	0.116	0.67	0.008383	0.069461	0.0102	0.37
9	12	10.5	3	604.8	2228.8	1934.02	2538.82	0.014	0.116	0.67	0.008383	0.069461	0.0087	0.31
12	15	13.5	3	777.6	2401.6	1894.15	2671.75	0.014	0.116	0.67	0.008383	0.069461	0.0073	0.26

Using Boring Information and consolidation test results from DH-215 — Total Settlement: 2.00

12-ft



P = UNIT LOAD OF EMBANKMENT

$\sigma_z = 2\ I * P$

Only modify h_w and I, all others are established formulas.

γ_{STONE} (pcf) = 125.0 Slope = 3.0 h_w = 0.9 h_e = 15.5 h_t = 16.4 b = 10.0	$P = \gamma_{STONE} * h_e + (\gamma_{STONE} - \gamma_{WATER}) * h_w$ P = 1993.84

z	a/z	b/z	I	2 I	$\sigma_z = 2\ I * P$
1.5	32.800	6.667	0.500	1.000	1993.84
4.5	10.933	2.222	0.500	1.000	1993.84
7.5	6.560	1.333	0.490	0.980	1953.96
10.5	4.686	0.952	0.485	0.970	1934.02
12.0	4.100	0.833	0.480	0.960	1914.09
13.5	3.644	0.741	0.475	0.950	1894.15
16.5	2.982	0.606	0.460	0.920	1834.33
19.5	2.523	0.513	0.450	0.900	1794.46
22.5	2.187	0.444	0.435	0.870	1734.64
25.5	1.929	0.392	0.420	0.840	1674.83
28.5	1.726	0.351	0.405	0.810	1615.01
31.5	1.562	0.317	0.395	0.790	1575.13

h_w is adjusted for extreme low tide of -3.5 MLLW.

Hole No. JB- 215

DRILLING LOG	DIVISION: NAD	INSTALLATION: Baltimore District	SHEET 1 OF 2 SHEETS

1. PROJECT: JAMES ISLAND FEASABILITY STUDY	10. SIZE AND TYPE OF BIT: 2¼" HSA
2. LOCATION (Coordinates or Station): JAMES Isl. SC	11. DATUM FOR ELEVATION SHOWN (TBM or MSL):
3. DRILLING AGENCY: CENAD-EN-GGE	12. MANUFACTURER'S DESIGNATION OF DRILL: CME 45
4. HOLE NO. (As shown on drawing title and file number): JB- 215	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 11; UNDISTURBED Ø
5. NAME OF DRILLER: McNamara	14. TOTAL NUMBER CORE BOXES:
6. DIRECTION OF HOLE: ☑ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.	15. ELEVATION GROUND WATER:
	16. DATE HOLE: STARTED 9/20/04; COMPLETED 9/20/04
7. THICKNESS OF OVERBURDEN: 26.5'	17. ELEVATION TOP OF HOLE:
8. DEPTH DRILLED INTO ROCK:	18. TOTAL CORE RECOVERY FOR BORING: %
9. TOTAL DEPTH OF HOLE: 26.5'	19. SIGNATURE OF INSPECTOR: William Q. Mc[illegible]

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	0–1		GRAY CLAY – w/Trace Shells – MOIST	100	J-1	Hole was drilled with CME 45 using 2¼" Hollow Stem Augers. Standard penetration test conducted using automatic hammer driving 1⅜" I.D. Split Spoon Blow Count per 6" in 0.5' intervals for total 1.5' advance per sample interval.
	2–3					
	3–4		– w/ Trace SAND & Stone Frags – wet	100	J-2	
	4–5					
	5–6		– w/ Sand & Iron Staining – wet	100	J-3	
	6–7					
	7–8		– w/ Brown oxidized specks – wet	100	J-4	
	8–9					
	9–10					
	10–11		– w/ Brown oxidized specks – wet	100	J-5	
	11–12					
	12–13		Gray (Fine) Sandy CLAY with ironite wet	100	J-6	
	13–14					
	14–15		Gray Silty (Fine) SAND wet	100	J-7	
	15–16					
	16–17					
	17–18		Gray Silt DAMP	100	J-8	
	18–19					

PRELIMINARY INSPECTOR'S LOG CLASSIFICATION NOT FINAL

JAR	DEPTH	BLOW COUNT	Pene-tro meter
1	0.0 – 1.5	WH/1.5	0- 0- 0-
2	2.5 – 4.0	WH-1-1	0- 0- 0-
3	5.0 – 6.5	WH-1-2	0- 0- 0-
4	7.5 – 9.0	WH-1-2	0- 0- 0-
5	10.0 – 11.5	WH/1.5	0- 0- 0-
6	12.5 – 14.0	WH/1.5	0- 0- 0-
7	15.0 – 16.5	1-1/1.0	–
8	17.5 – 19.0	3-5-7	2.5 2.5 2.0
9	20.0 – 21.5	3-5-7	3.0 3.5 2.5
10	22.5 – 24.0	3-7-9	3.5 4.0 4.0
11	25.0 – 26.5	6-7-23	3.0 3.5 3.0

DRILLING LOG (Cont Sheet) | ELEVATION TOP OF HOLE | Hole No. JB-215

PROJECT: JAMES Is. | INSTALLATION: Baltimore District | SHEET 2 OF 2 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	21		GRAY SILT			GPS Coordinates
			DAMP	100	J-9	N38°30'15.3"
	22					W076°20'31.9"
						Accuracy 15.2
	23			100	J-10	
			DAMP			
	24					Water level
						Time 1626 | 1742
	25					Depth 6.3' | 6.9'
				100	J-11	
	26		DAMP			
	27		BOH-26.5'			
	28					
	29					
	30					
	31					
	32					
	33					
	34					
	35					
	36					
	37					
	38					
	39					
	40					
	41					
	42					
	43					

PRELIMINARY INSPECTOR'S LOG CLASSIFICATION NOT FINAL

GPO 1980 OF - 623 - 603

PROJECT JAMES I

HOLE NO.

B/4

VISUAL-MANUAL CLASSIFICATION

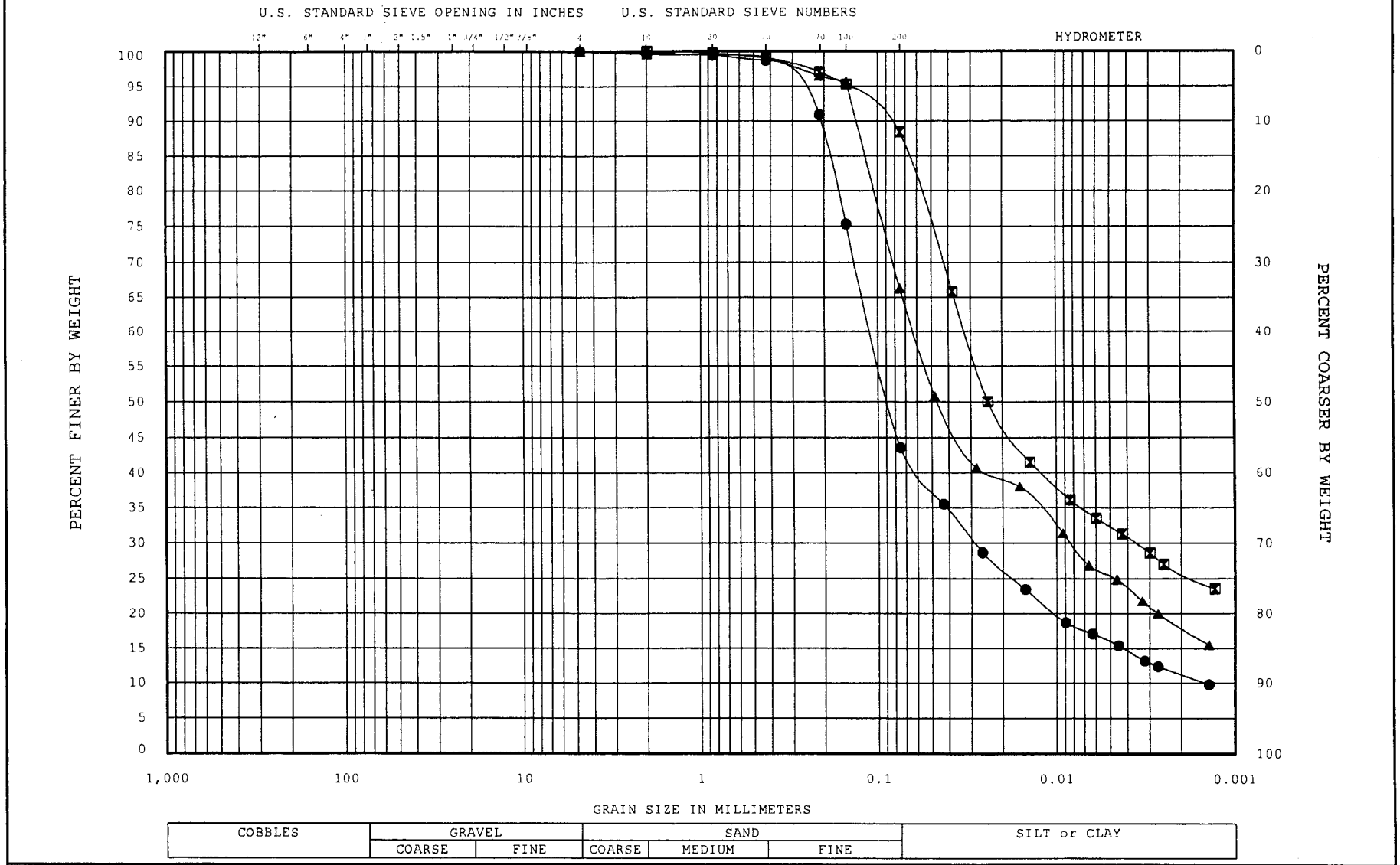
(Test method: ASTM D 2488)

PROJECT: James Island **DATE:** Oct 2004

AREA: Mid-Bay Feasibility Study **CLASSIFIED BY:** KUHN

Dorchester County, MD

SAMPLE NO.	DEPTH (ft)	VISUAL CLASSIFICATION	SYMBOL
JB - 215			
JAR-1	0.0 - 1.5	Wet dk gray soft lean clay	(CL)
✓AL - 2	2.5 - 4.0	Wet olive gray soft lean clay w/ sand	(CL)
- 3	5.0 - 6.5	Wet olive gray soft sandy lean clay	(CL)
- 4	7.5 - 9.0	Wet olive gray soft lean clay w/ sand	(CL)
✓AL - 5	10.0 - 11.5	Wet olive gray soft lean clay	(CL)
- 6	12.5 - 14.0	- ditto -	(CL)
- 7	15.0 - 16.5	Wet dk gray clayey sand	(SC)
✓AL - 8	17.5 - 19.0	Moist olive gray soft to firm fat clay	CH/CL
- 9	20.0 - 21.5	- ditto -	CH/CL
- 10	22.5 - 24.0	- ditto -	CH/CL
- 11	25.0 - 26.5	- ditto -	CH/CL



Legend	Sample No.	Depth (ft)	Classification (ASTM D 2487)		Nat wc%	LL	PL	PI
—●—	Jar-2	2.5-4.0	CLAYEY SAND	SC	34.1	28	19	9
—⊠—	Jar-5	10.0-11.5	LEAN CLAY	CL	29.9	29	17	12
—▲—	Jar-8	17.5-19.0	SANDY FAT CLAY	CH	42.1	66	24	42
— —								

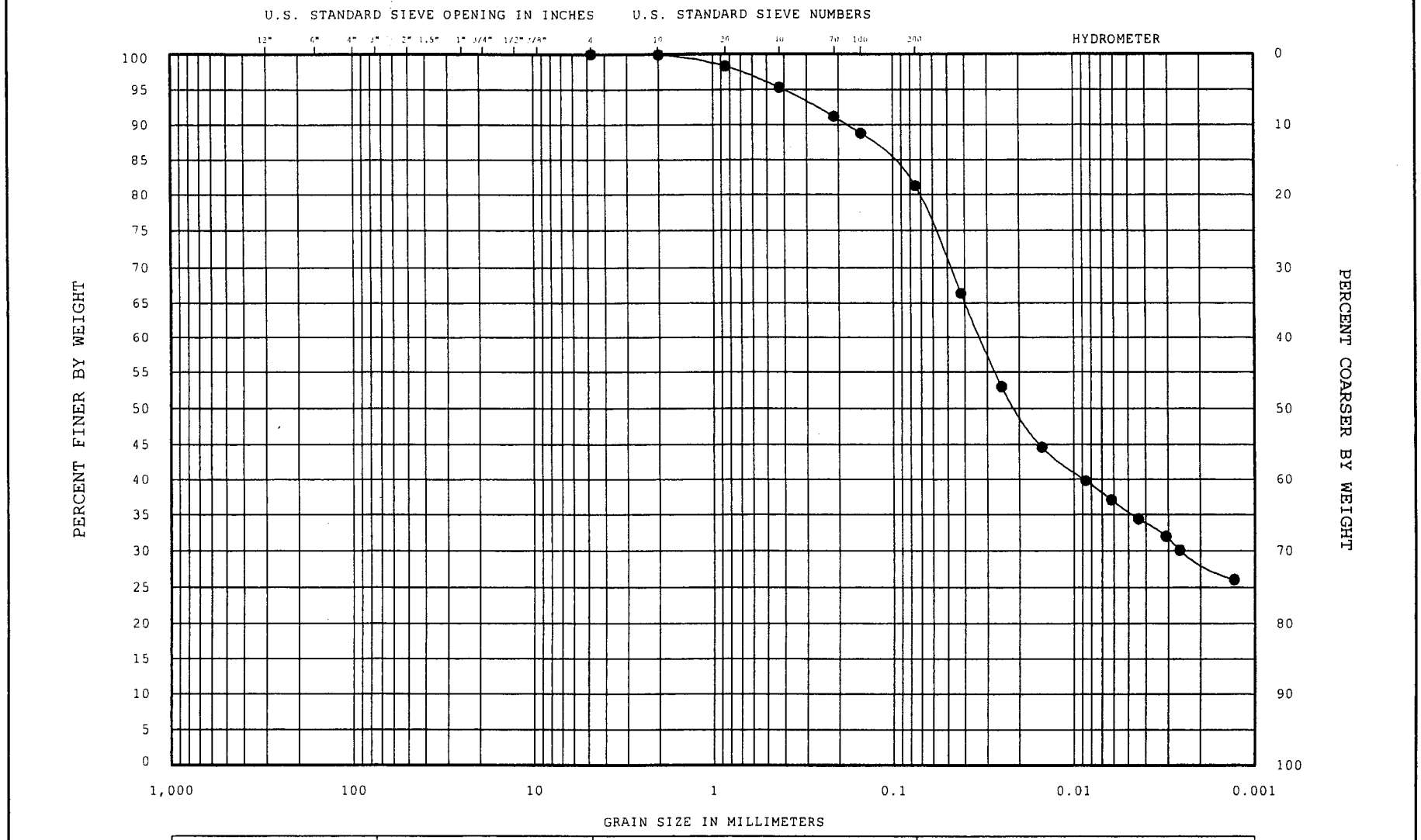
REMARKS :

ENG FORM ENG2087JAMES ISLAND, MID-BAY FEASIBILITY STUDY.GPJ **GRADATION CURVES** TEST METHODS: ASTM D 422, D4318, D2216

PROJECT: *James Island*
AREA: *Mid-Bay Feasibility Study*
Dorchester County, MD

BORING NO.: *JB-215*

DATE: *Nov 2004*



Legend	Sample No.	Depth (ft)	Classification (ASTM D 2487)		Nat wc%	LL	PL	PI
—●—	Shelby-1	9.0-11.0	LEAN CLAY with SAND	CL	26.5	29	18	11
— —								
— —								
— —								

REMARKS :

ENG FORM ENG2087JAMES ISLAND, MID-BAY FEASIBILITY STUDY.GPJ **GRADATION CURVES** TEST METHODS: ASTM D 422, D4318, D2216

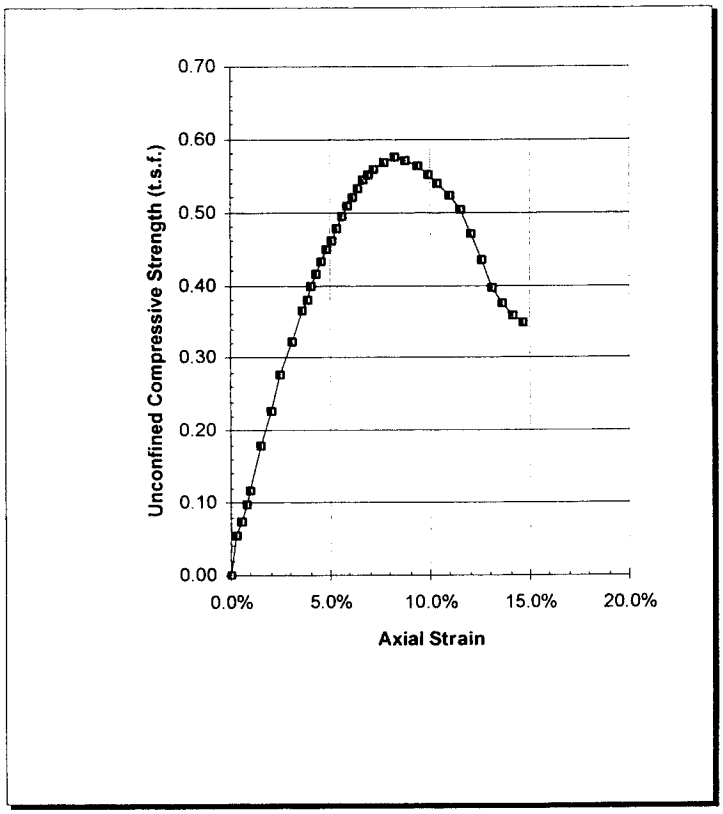
PROJECT: *James Island*
AREA: *Mid-Bay Feasibility Study*
Dorchester County, MD

BORING NO.: *JB-215A*

DATE: *Nov 2004*

UNCONFINED COMPRESSION TEST

FAILURE SKETCHES



CONTROLLED STRAIN

TEST NO.		1	2	3	4
TYPE OF SPECIMEN		Undisturbed			
WATER CONTENT, %	w_o	26.6			
VOID RATIO	e_o	0.685			
SATURATION, %	S_o	100+			
DRY UNIT WEIGHT, LB./CU.FT.	γ_d	97.4			
TIME TO FAILURE, MIN.	t_f	8.0			
UNCONFINED COMPRESSIVE STRENGTH, TSF	q_u	0.58			
UNDRAINED SHEAR STRENGTH, TSF	s_u	0.29			
SENSITIVTY RATIO	S_t	------			
INITIAL SPECIMEN DIAMETER, IN.	D_o	2.86			
INITIAL SPECIMEN HEIGHT, IN.	H_o	5.67			

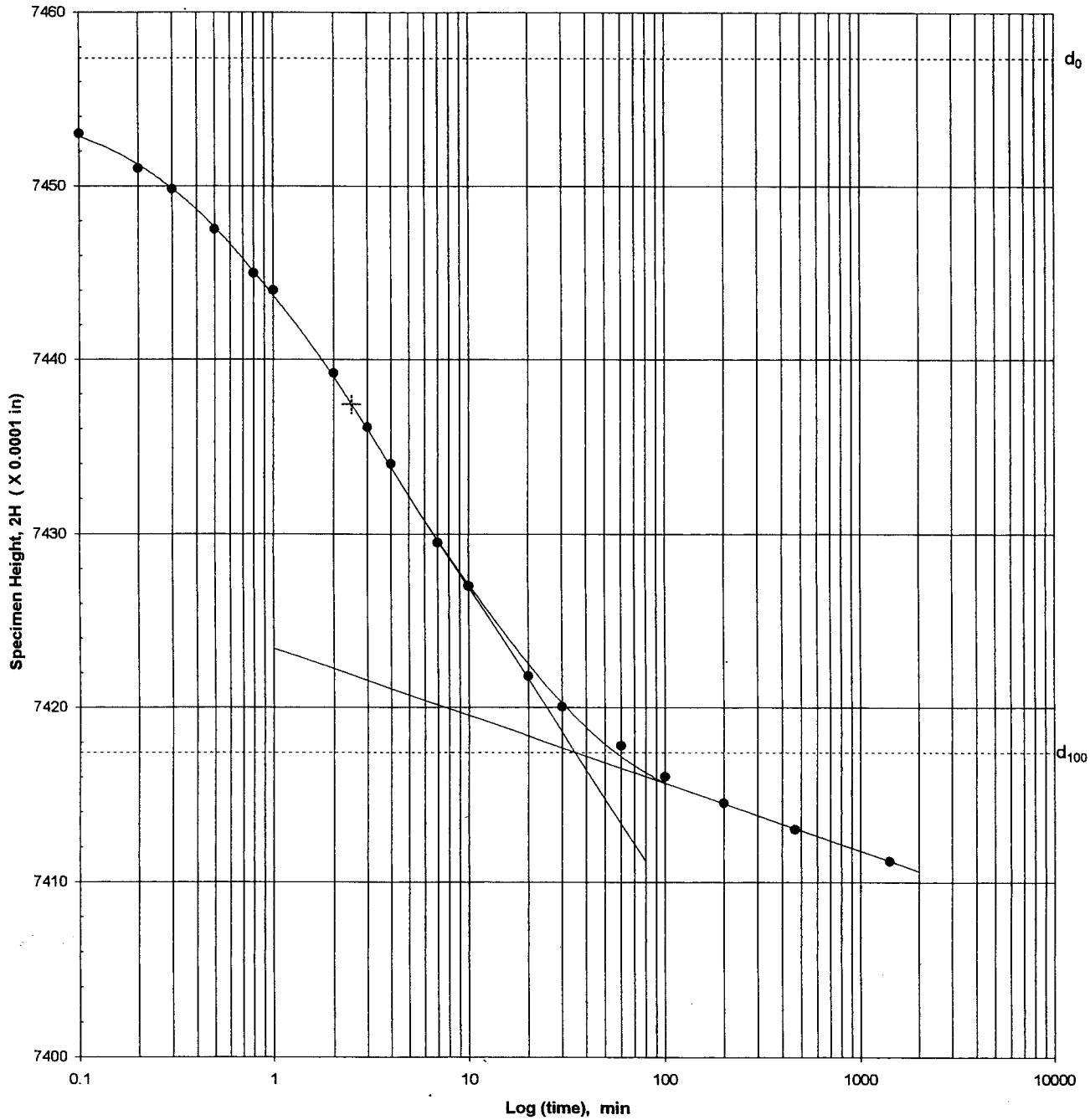
CLASSIFICATION: (ASTM D2487)

Moist, mottled olive gray & olive yell., firm, LEAN CLAY w/ sand (CL)

LL= 29	PL= 18	PI= 11 (ASTM D4318)	G_S= 2.63 (ASTM D854)

REMARKS:	PROJECT: James Island	
	Mid-Bay Feasiblity Study	
	AREA: Dorchester County, MD	
	Hole No.: DH-215A	Sample No.: Shelby-1
	Depth (ft.): 9.0-11.0	Date: Dec.2004
ENG FORM 3659 (Test method: ASTM D2166)	UNCONFINED COMPRESSION TEST REPORT	

t_{50} TIME CURVE



U.S.Army Corps of Engineers
Materials & Instrumentation Section
Baltimore, Maryland 21230

PROJECT: Dorchester County, MD
Mid-Bay Feasibility Study

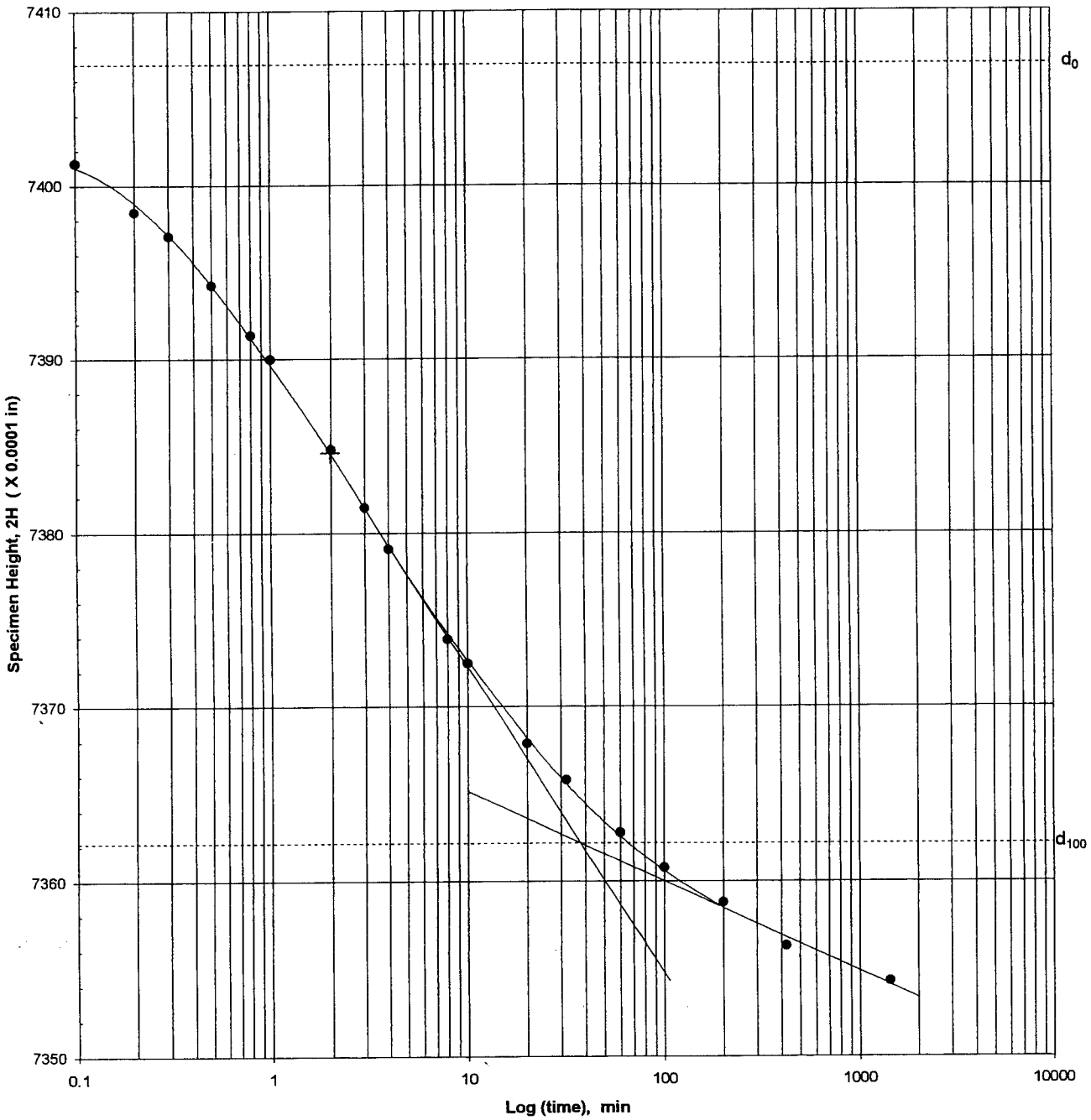
AREA: James Island

Normal Stess =	**0.25**	tons/ft²
t_{50} =	2.48	min
H =	0.3719	in
c_v =	1.82 X 10^{-4}	in²/sec

Hole No.:	Sample No.:	Depth (ft):
JB-215A	Shelby-1	9.0-11.0

ENG Form 2088 **CONSOLIDATION TEST - TIME CURVE**

t_{50} TIME CURVE



U.S.Army Corps of Engineers
Materials & Instrumentation Section
Baltimore, Maryland 21230

PROJECT: Dorchester County, MD
Mid-Bay Feasibility Study

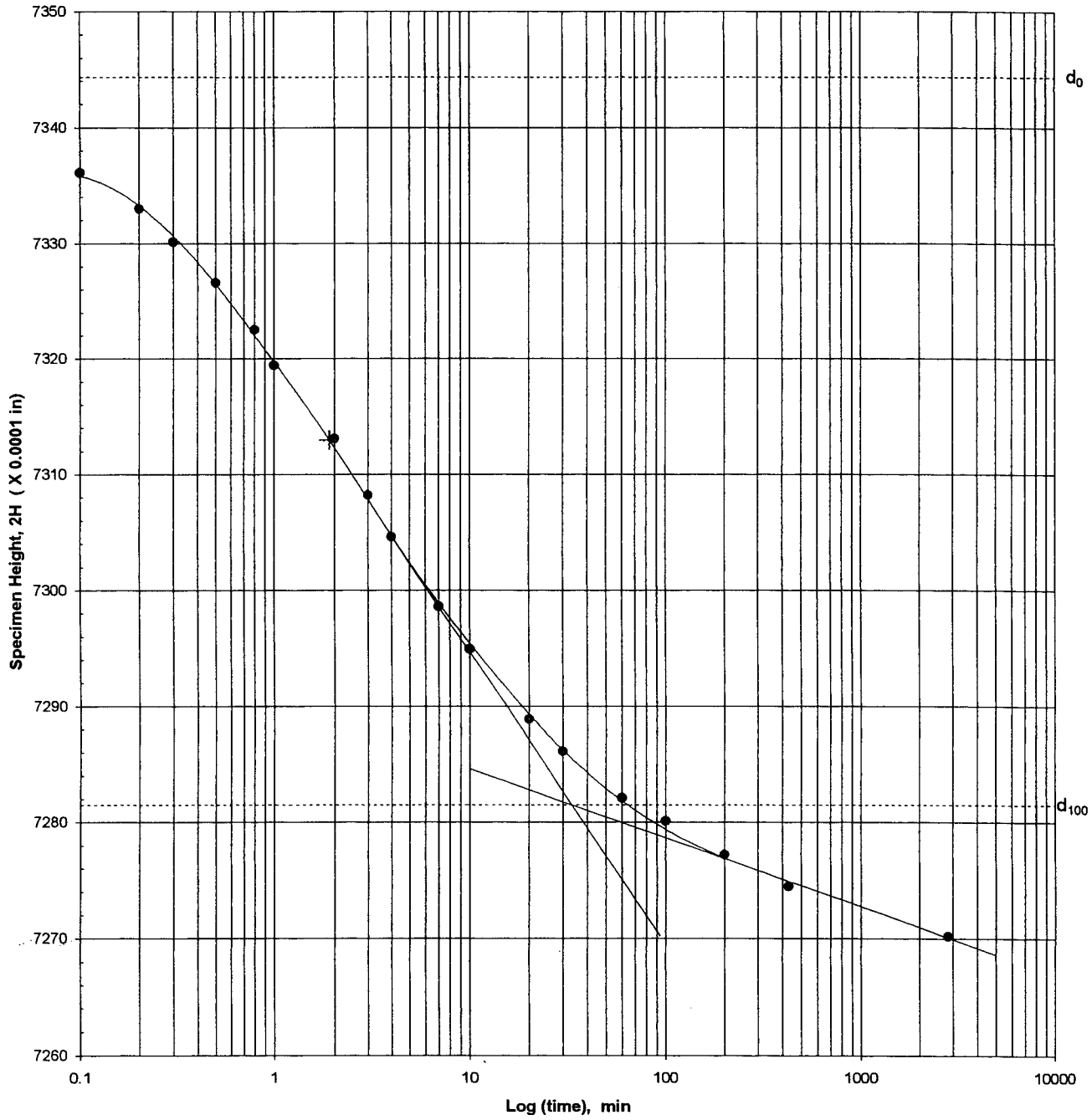
AREA: James Island

Normal Stess =	**0.50**	tons/ft²
t_{50} =	1.98	min
H =	0.3692	in
c_v =	2.25 X 10^{-4}	in²/sec

Hole No.:	**Sample No.:**	**Depth (ft):**
JB-215A	Shelby-1	9.0-11.0

ENG Form 2088 **CONSOLIDATION TEST - TIME CURVE**

t_{50} TIME CURVE



U.S.Army Corps of Engineers
Materials & Instrumentation Section
Baltimore, Maryland 21230

PROJECT: Dorchester County, MD
Mid-Bay Feasibility Study

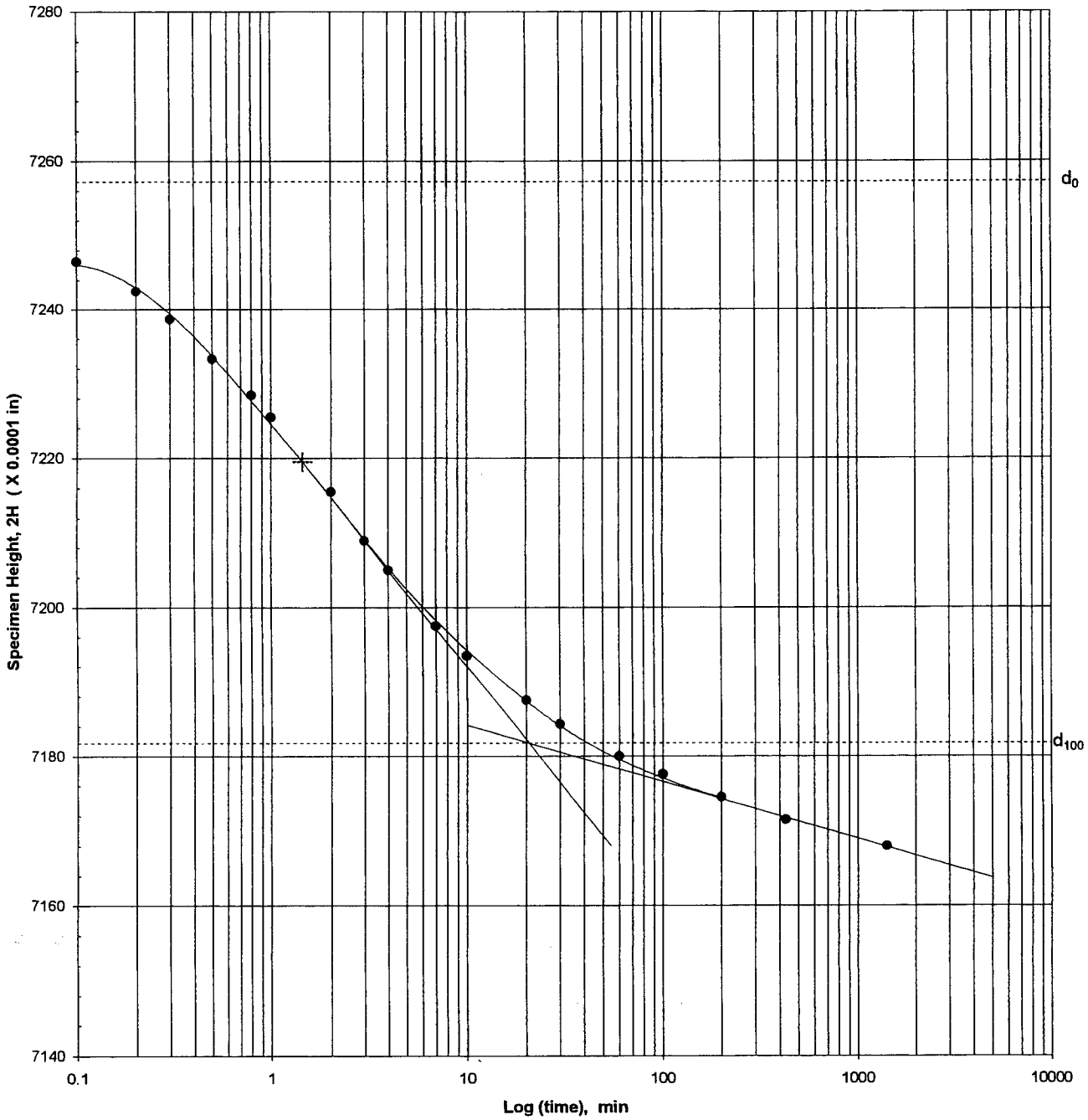
AREA: James Island

Normal Stess =	**1.0**	tons/ft²
t_{50} =	1.88	min
H =	0.3656	in
c_v =	2.32 X 10^{-4}	in²/sec

Hole No.:	**Sample No.:**	**Depth (ft):**
JB-215A	Shelby-1	9.0-11.0

ENG Form 2088 **CONSOLIDATION TEST - TIME CURVE**

t_{50} TIME CURVE



U.S.Army Corps of Engineers
Materials & Instrumentation Section
Baltimore, Maryland 21230

PROJECT: Dorchester County, MD
Mid-Bay Feasibility Study

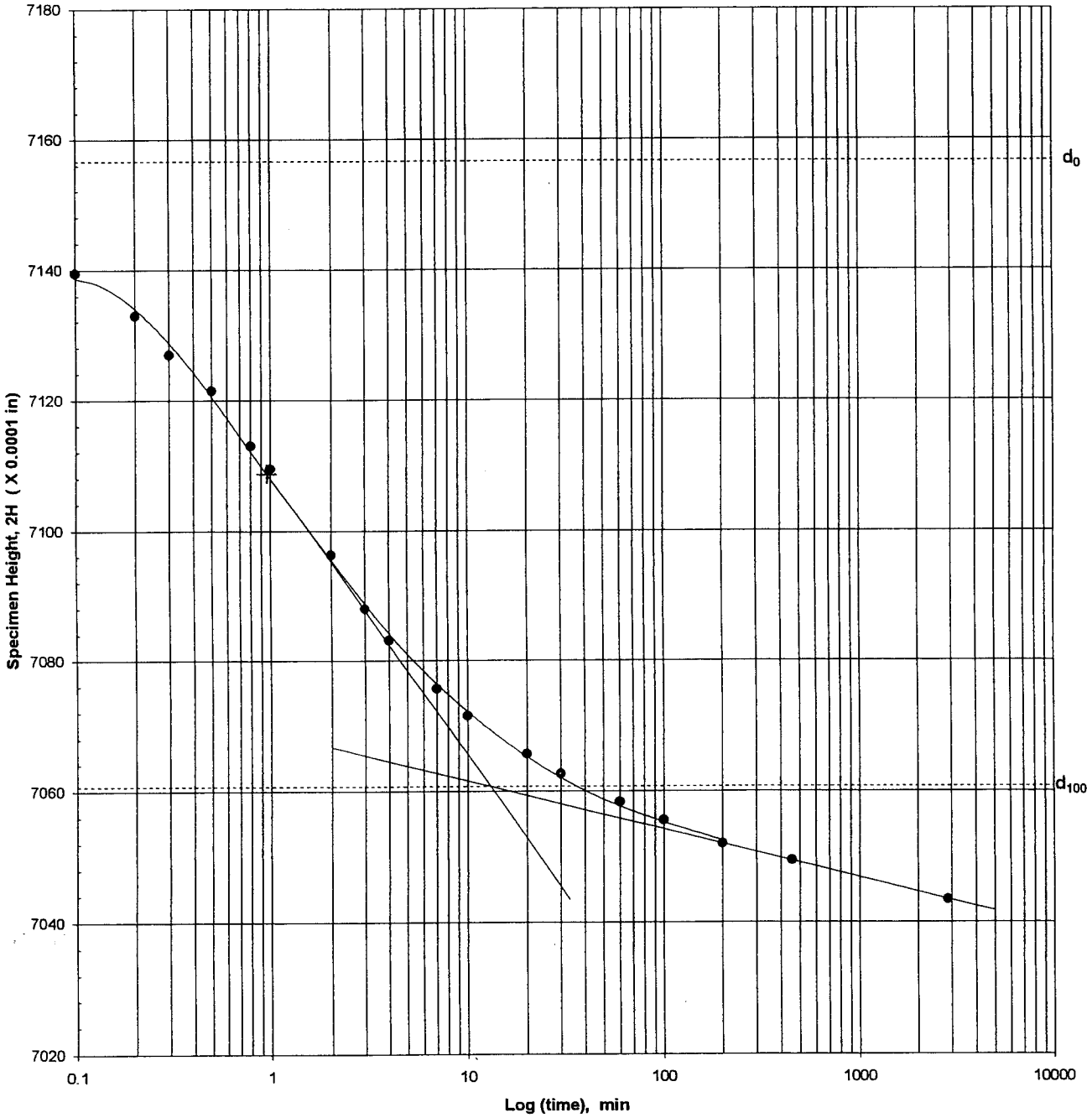
AREA: James Island

Normal Stess =	**2.0**		tons/ft²
t_{50} =	1.43		min
H =	0.3610		in
c_v =	2.98	X 10^{-4}	in²/sec

Hole No.:	Sample No.:	Depth (ft):
JB-215A	Shelby-1	9.0-11.0

ENG Form 2088 **CONSOLIDATION TEST - TIME CURVE**

t_{50} TIME CURVE



U.S.Army Corps of Engineers
Materials & Instrumentation Section
Baltimore, Maryland 21230

PROJECT: Dorchester County, MD
Mid-Bay Feasibility Study

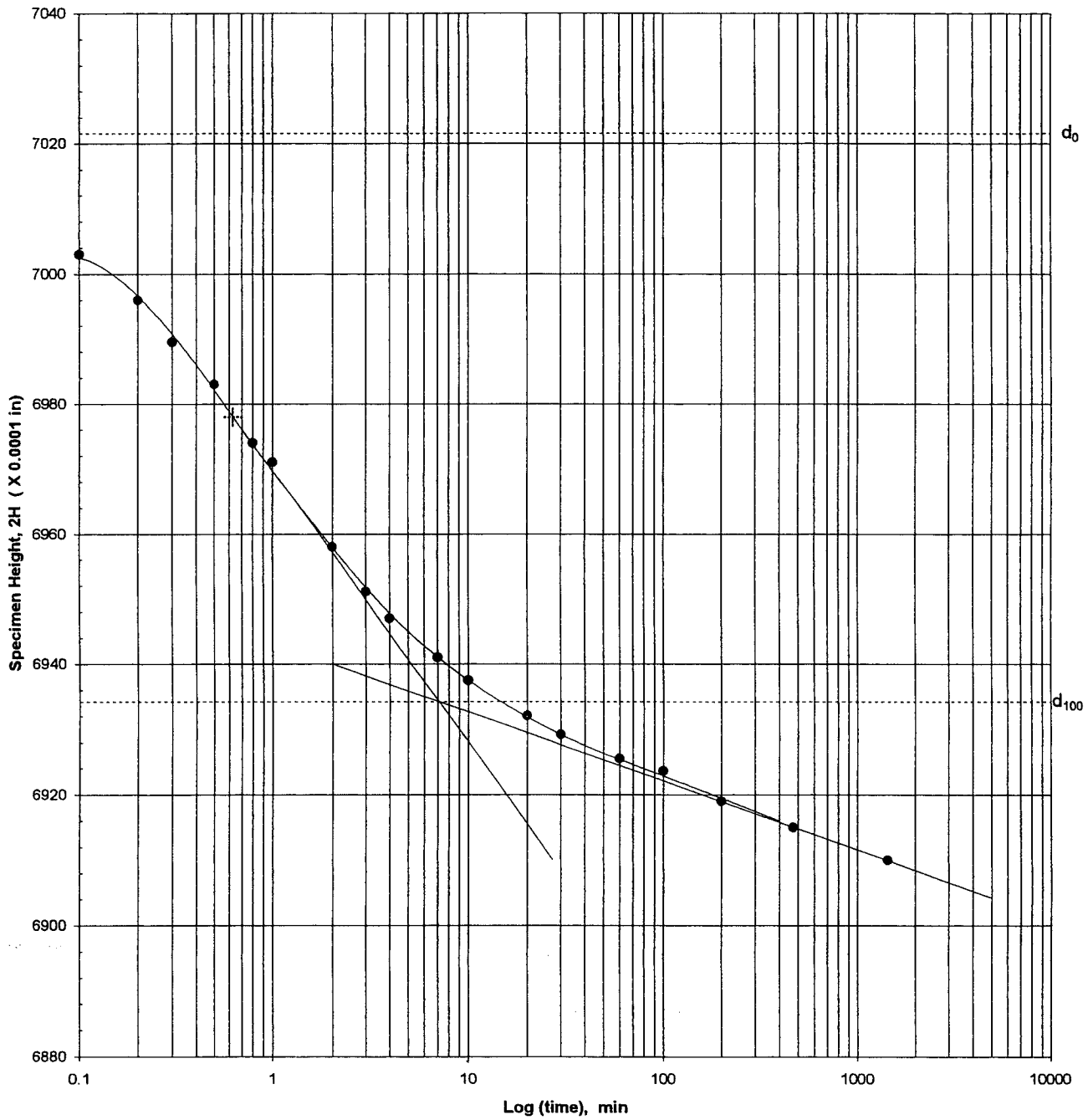
AREA: James Island

Normal Stess =	**4.0**	tons/ft²
t_{50} =	0.96	min
H =	0.3554	in
c_v =	4.30 X 10^{-4}	in²/sec

Hole No.:	Sample No.:	Depth (ft):
JB-215A	Shelby-1	9.0-11.0

ENG Form 2088 — **CONSOLIDATION TEST - TIME CURVE**

t_{50} TIME CURVE



U.S.Army Corps of Engineers
Materials & Instrumentation Section
Baltimore, Maryland 21230

PROJECT: Dorchester County, MD
Mid-Bay Feasibility Study

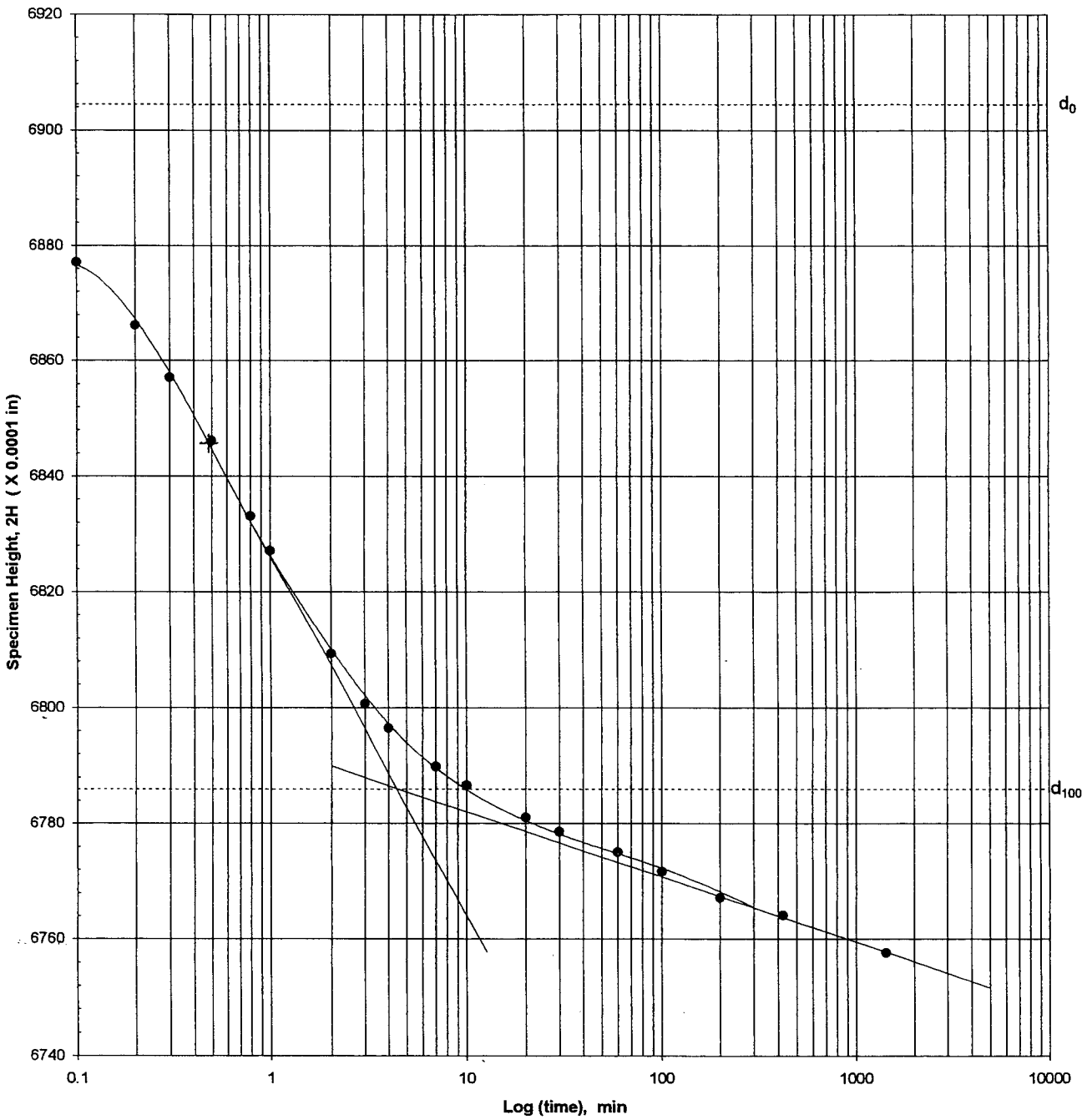
AREA: James Island

Normal Stess =	**8.0**	tons/ft²
t_{50} =	0.63	min
H =	0.3489	in
c_v =	6.31 X 10^{-4}	in²/sec

Hole No.:	**Sample No.:**	**Depth (ft):**
JB-215A	Shelby-1	9.0-11.0

ENG Form 2088 **CONSOLIDATION TEST - TIME CURVE**

t_{50} TIME CURVE



U.S.Army Corps of Engineers
Materials & Instrumentation Section
Baltimore, Maryland 21230

PROJECT: Dorchester County, MD
Mid-Bay Feasibility Study

AREA: James Island

Normal Stess =	**16.0**		tons/ft²
t_{50} =	0.48		min
H =	0.3423		in
c_v =	7.97	X 10^{-4}	in²/sec

Hole No.:	Sample No.:	Depth (ft):
JB-215A	Shelby-1	9.0-11.0

ENG Form 2088 **CONSOLIDATION TEST - TIME CURVE**

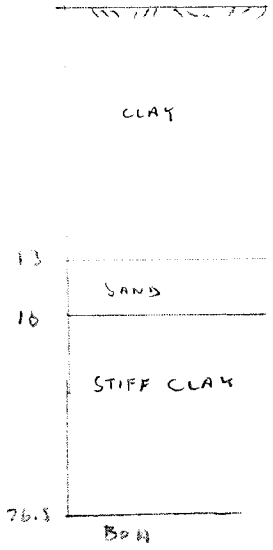
SETTLEMENT ANALYSIS FOR DH-217

ASSUME A DIKE SECTION TO VARYING ELEVATIONS (+10, +10.5, +11, +11.5, +12) WITH SIDESLOPES OF 3H:1V AND A CREST WIDTH OF 20 FEET DEPTH OF WATER IS ASSUMED TO BE 76 FEET AT MLLW. USE EXTREME LOW TIDE OF -3.5 MLLW TO COMPUTE STRESS CHANGES FROM DIKE.

A CONSOLIDATION TEST WAS PERFORMED ON A CLAY SAMPLE OBTAINED FROM A DEPTH OF 6'-8'. CONSOLIDATION TEST RESULTS SHOW A C_c OF .33 (FROM CORRECTED CURVE) AND A C_r OF .045. A PRECONSOLIDATION PRESSURE OF .83 tsf (1660 psf) WAS DETERMINED FROM THE e-log p CURVE.

OVERBURDEN PRESSURE, $P_o = (115-62.4)(7) = 368$ psf

OCR = 1660/368 = 4.51 (DUE TO JAMES ISLAND PREVIOUSLY EXISTING AT THIS LOCATION)



ASSUMED COMPRESSIBLE LAYER 13-FT IN THICKNESS.

ESTIMATED CONSOLIDATION SETTLEMENT RANGES FROM 6.0"-7.25" (SEE ATTACHED SPREADSHEETS)

TUBE CLASSIFICATION

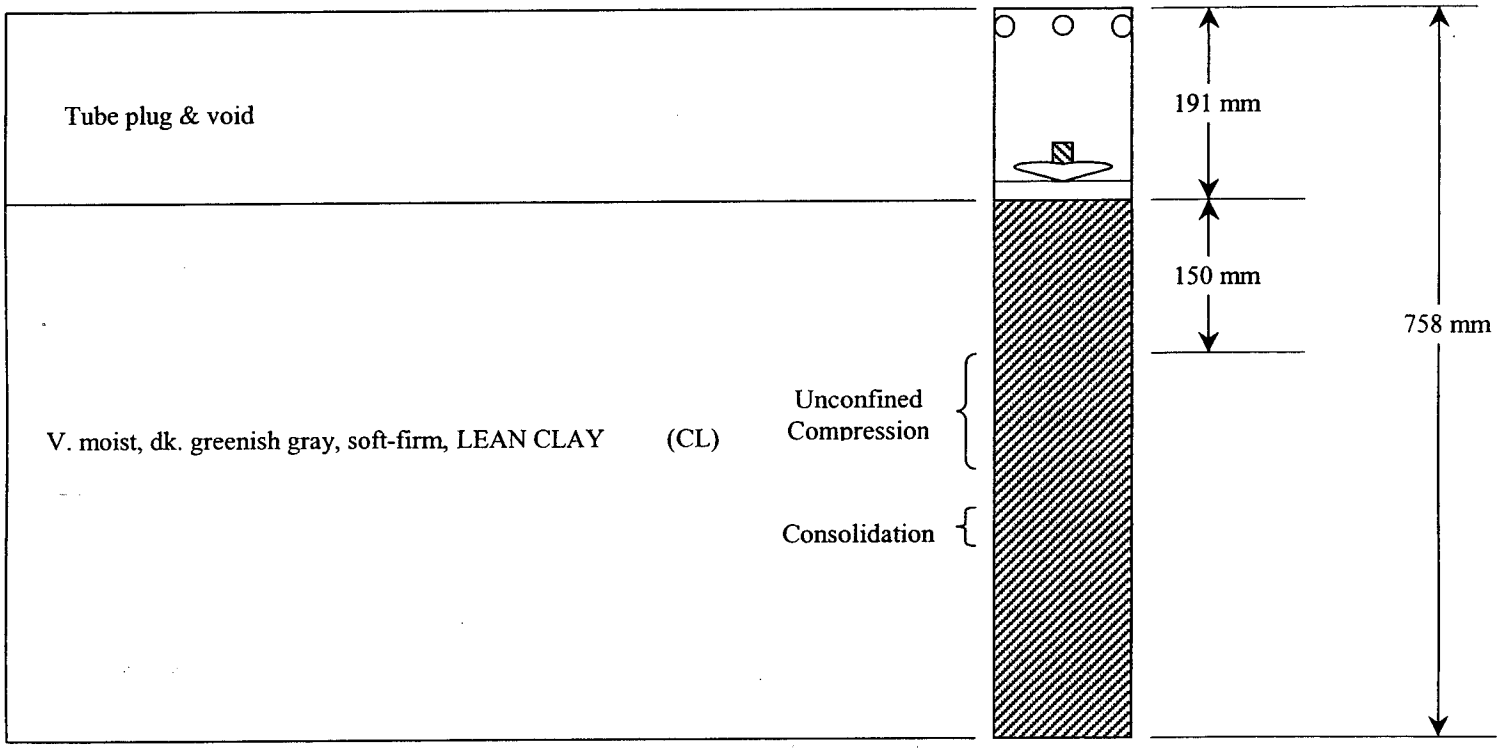
ASTM D2487

PROJECT: Mid-Bay Feasibility Study
James Island

AREA: Dorchester County, MD

DATE: Nov 2004

Hole No.	Sample No.	Depth (ft)
DH-217A	Shelby-1	6.0-8.0



STA.
OFFSET:
TOP ELEV:

MID-BAY ISLAND FEASIBILITY STUDY
JAMES ISLAND, DORCHESTER COUNTY, MD

N 304367.44
E 1497597.14

COMPLETED: September 21, 2004

JB-217
1 of 1

DEPTH(ft)	(c)	(d)	(a)	(b)
	Wet, black, poorly graded fine SAND w/silt & shells (SP-SM)		WH/1.5	
2.00				
	Wet, dk. gray, soft lean CLAY w/sand (CL)		WH/1.5	
				36.5
			5	
			WH/1.5	
7.00	P			39.2
	Wet, dk. gray, soft lean CLAY (CL/CH)		WH/1.5	
9.50				
	V. moist, dk. gray, soft fat CLAY (CH)		10	
			WH/1.5	
12.00				
	Moist, dk. grayish brown, silty fine SAND (SM)		11-8-7	
14.50				28.3
	Wet, dk. grayish brown, silty fine SAND (SM)		15	
			3-1-2	
17.00				
	Moist, olive gray, firm clayey SAND (SC)		4-7-11	
	PPR 17.5'-19.0': 4.5, 4.0, 4.0			30.3
	PPR 20.0'-21.5': 4.5, 4.5, >4.5		20	
			3-5-10	
22.00				
	V. moist, olive gray, silty fine SAND w/tr. of gravel (SM)		100/.4	
	PPR 22.5'-24.0': >4.5, >4.5, >4.5			
24.50				
	V. moist, olive gray, silty fine SAND (SM)		25	
	PPR 25.0'-26.5': 3.0, 3.0, 3.0		5-8-10	
26.50				
	BOTTOM OF HOLE			
	Depth of bay water @ start of boring 9.5' @ 1015 Hrs.			
	Depth of bay water @ completion 9.7' @ 1141 Hrs.			

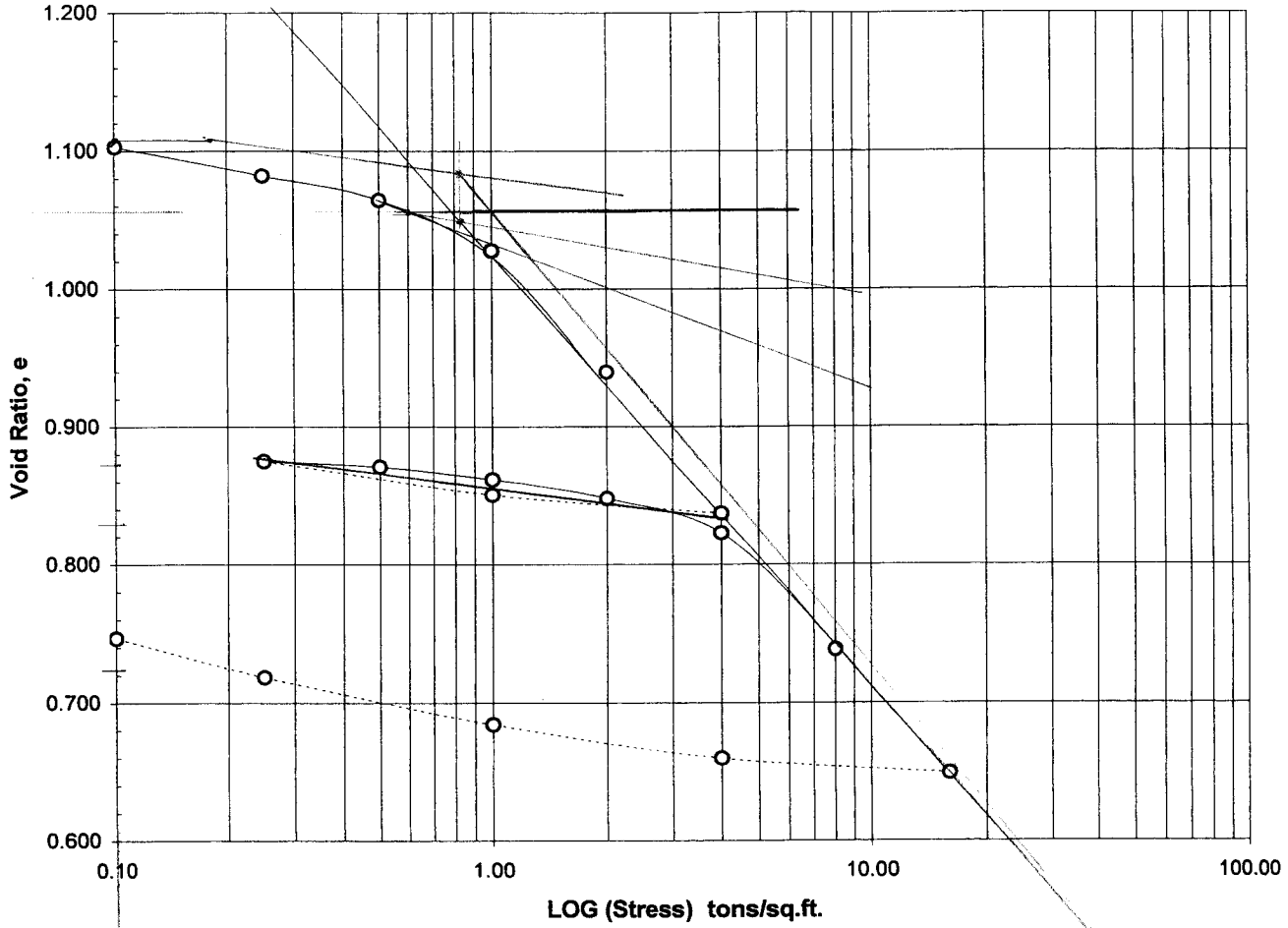
GEO-2 JAMESISL.GPJ 12/21/04 10:03

JB-217
GROUNDWATER DATA
WHILE DRILLING:
ON COMPLETION:
Hr. READING:

GROUNDWATER DATA
WHILE DRILLING:
ON COMPLETION:
Hr. READING:

P - indicates pressed shelby tube sample obtained from an additional boring.

Fill | Auger | SPT | RB
Cored | 300 lb | Tubex | Hand
Fish Tail | Vibra Core | Water Jet | Odex



Type of Specimen: **Undisturbed**			Before Test			After Test
Diameter= **2.50** in.	Height= **0.75** in.	Water Content, %	w_o	40.7	w_f	28.2
Overburden Pressure, p_o = .184 tons/sq.ft.		Void Ratio	e_o	1.111	e_f	0.770
Preconsol. Pressure, p_c = .83 tons/sq.ft.		Saturation, %	S_o	99.9	S_f	100.0
Compression Index, C_c = ~~0.312~~ .33		Dry Density	γ_d	80.7 lbs./cu.ft.		

Classification (ASTM D2487): Very moist, dark greenish gray, soft to firm, LEAN CLAY. (CL)

LL = 44	PL = 20	PI= 24 (ASTM D4318)	G_s = 2.73 (ASTM D854)

Remarks:	**PROJECT:** Dorchester County, MD	
	Mid-Bay Feasibility Study	
	AREA: James Island	
	Hole No.: JB-217A	**Sample No.:** Shelby-1
	Depth (ft.): 6.0-8.0	**Date:** Dec.2004
ENG FORM 2090 (Test method: ASTM D2435)	**CONSOLIDATION TEST REPORT**	

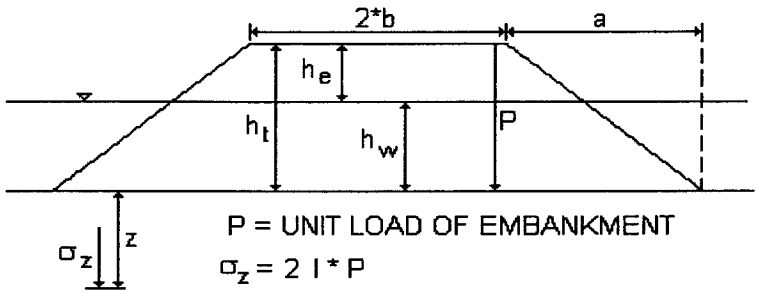
+10.0

COMPUTATION SHEET FOR CONSOLIDATION SETTLEMENT — CALCULATED BY: DEC
PROJECT: JAMES ISLAND DIKE (DH-217) — DATE: 12/16/2004

Sublayer Depth (ft)			Sublayer Thickness	Effective Overburden Pressure	Preconsolidation Pressure	Pressure Change	Final Pressure	Recompression Index	Compression Index	Initial Void Ratio	Compression Ratio		Vertical Strain	Change in Thickness (in)
Top	Bottom	Average	H_o (ft)	p_o (psf)	p_p (psf)	Δp (psf)	p_f (psf)	c_r	c_c	e_o	Rebound Curve $C_{\varepsilon r}$	Virgin Curve $C_{\varepsilon c}$	εz^*	$\varepsilon z \times H_o$ = DH
0	3	1.5	3	78.9	1370.7	1944.16	2023.06	0.045	0.33	1.111	0.021317	0.156324	0.0529	1.90
3	6	4.5	3	236.7	1528.5	1944.16	2180.86	0.045	0.33	1.111	0.021317	0.156324	0.0414	1.49
6	9	7.5	3	394.5	1686.3	1905.28	2299.78	0.045	0.33	1.111	0.021317	0.156324	0.0345	1.24
9	12	10.5	3	552.3	1844.1	1885.84	2438.14	0.045	0.33	1.111	0.021317	0.156324	0.0301	1.08
12	13	12.5	1	657.5	1949.3	1854.73	2512.23	0.045	0.33	1.111	0.021317	0.156324	0.0273	0.33

Using Boring Information and consolidation test results from DH-217 — Total Settlement: 6.05

10-ft



Only modify h_w and I, all others are established formulas.

γ_{STONE} (pcf) = 125.0 Slope = 3.0 h_w = 4.1 h_e = 13.5 h_t = 17.6 b = 10.0	$P = \gamma_{STONE} * h_e + (\gamma_{STONE} - \gamma_{WATER}) * h_w$ P = 1944.16

z	a/z	b/z	I	2 I	$\sigma_z = 2\ I * P$
1.5	35.200	6.667	0.500	1.000	1944.16
4.5	11.733	2.222	0.500	1.000	1944.16
7.5	7.040	1.333	0.490	0.980	1905.28
10.5	5.029	0.952	0.485	0.970	1885.84
12.0	4.400	0.833	0.480	0.960	1866.39
12.5	4.224	0.800	0.477	0.954	1854.73
13.5	3.911	0.741	0.475	0.950	1846.95
16.5	3.200	0.606	0.465	0.930	1808.07
19.5	2.708	0.513	0.455	0.910	1769.19
22.5	2.347	0.444	0.440	0.880	1710.86
25.5	2.071	0.392	0.415	0.830	1613.65
28.5	1.853	0.351	0.410	0.820	1594.21
31.5	1.676	0.317	0.395	0.790	1535.89

h_w is adjusted for extreme low tide of -3.5 MLLW.

COMPUTATION SHEET FOR CONSOLIDATION SETTLEMENT
PROJECT JAMES ISLAND DIKE (DH-217)

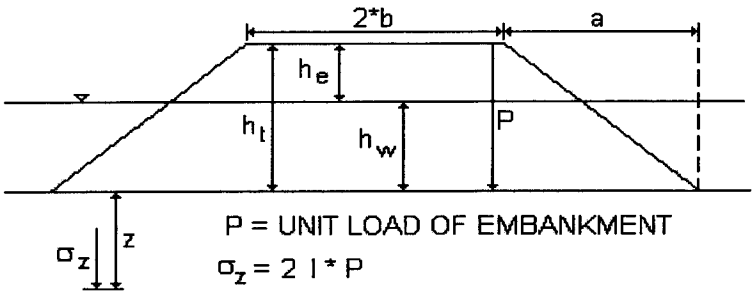
CALCULATED BY: DEC
DATE: 12/16/2004

Sublayer Depth (ft)			Sublayer Thickness	Effective Overburden Pressure	Preconsoli-dation Pressure	Pressure Change	Final Pressure	Recompress-ion Index	Compress-ion Index	Initial Void Ratio	Compression Ratio		Vertical Strain	Change in Thickness (in)
Top	Bottom	Average	H_o (ft)	p_o (psf)	p_p (psf)	Δp (psf)	p_f (psf)	c_r	c_c	e_o	Rebound Curve $C\varepsilon r$	Virgin Curve $C\varepsilon c$	εz^*	$\varepsilon z \times H_o$ = DH
0	3	1.5	3	78.9	1370.7	2006.66	2085.56	0.045	0.33	1.111	0.021317	0.15632	0.0549	1.98
3	6	4.5	3	236.7	1528.5	2006.66	2243.36	0.045	0.33	1.111	0.021317	0.15632	0.0433	1.56
6	9	7.5	3	394.5	1686.3	1966.53	2361.03	0.045	0.33	1.111	0.021317	0.15632	0.0363	1.31
9	12	10.5	3	552.3	1844.1	1946.46	2498.76	0.045	0.33	1.111	0.021317	0.15632	0.0318	1.14
12	13	12.5	1	657.5	1949.3	1914.35	2571.85	0.045	0.33	1.111	0.021317	0.15632	0.0289	0.35

Using Boring Information and consolidation test results from DH-217

Total Settlement: 6.33

10.5-ft



P = UNIT LOAD OF EMBANKMENT

$\sigma_z = 2\ I * P$

Only modify h_w and I, all others are established formulas.

γ_{STONE} (pcf) = 125.0 Slope = 3.0 h_w = 4.1 h_e = 14.0 h_t = 18.1 b = 10.0	$P = \gamma_{STONE} * h_e + (\gamma_{STONE} - \gamma_{WATER}) * h_w$ P = 2006.66

z	a/z	b/z	I	2 I	$\sigma_z = 2\ I * P$
1.5	36.200	6.667	0.500	1.000	2006.66
4.5	12.067	2.222	0.500	1.000	2006.66
7.5	7.240	1.333	0.490	0.980	1966.53
10.5	5.171	0.952	0.485	0.970	1946.46
12.0	4.525	0.833	0.480	0.960	1926.39
12.5	4.344	0.800	0.477	0.954	1914.35
13.5	4.022	0.741	0.475	0.950	1906.33
16.5	3.291	0.606	0.465	0.930	1866.19
19.5	2.785	0.513	0.455	0.910	1826.06
22.5	2.413	0.444	0.440	0.880	1765.86
25.5	2.129	0.392	0.425	0.850	1705.66
28.5	1.905	0.351	0.415	0.830	1665.53
31.5	1.724	0.317	0.405	0.810	1625.39

h_w is adjusted for extreme low tide of -3.5 MLLW.

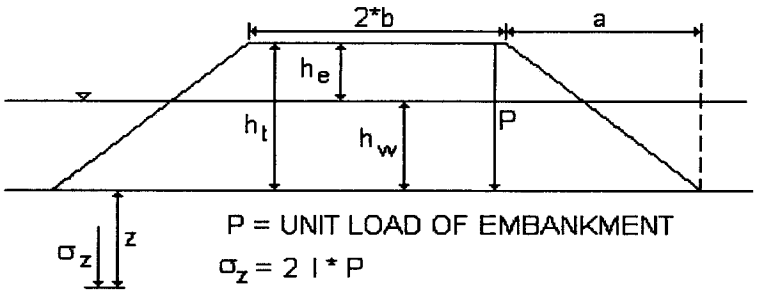
+11.0

COMPUTATION SHEET FOR CONSOLIDATION SETTLEMENT — CALCULATED BY: DEC
PROJECT JAMES ISLAND DIKE (DH-217) — DATE: 12/16/2004

Sublayer Depth (ft)			Sublayer Thickness	Effective Overburden Pressure	Preconsoli-dation Pressure	Pressure Change	Final Pressure	Recompress-ion Index	Compress-ion Index	Initial Void Ratio	Compression Ratio		Vertical Strain	Change in Thickness (in)
Top	Bottom	Average	H_o (ft)	p_o (psf)	p_p (psf)	Δp (psf)	p_f (psf)	c_r	c_c	e_o	Rebound Curve $C_{\varepsilon r}$	Virgin Curve $C_{\varepsilon c}$	εz^*	$\varepsilon z \times H_o$ = DH
0	3	1.5	3	78.9	1370.7	2069.16	2148.06	0.045	0.33	1.111	0.021317	0.15632	0.0569	2.05
3	6	4.5	3	236.7	1528.5	2069.16	2305.86	0.045	0.33	1.111	0.021317	0.15632	0.0452	1.63
6	9	7.5	3	394.5	1686.3	2027.78	2422.28	0.045	0.33	1.111	0.021317	0.15632	0.0380	1.37
9	12	10.5	3	552.3	1844.1	2007.09	2559.39	0.045	0.33	1.111	0.021317	0.15632	0.0334	1.20
12	13	12.5	1	657.5	1949.3	1973.98	2631.48	0.045	0.33	1.111	0.021317	0.15632	0.0304	0.37

Using Boring Information and consolidation test results from DH-217 — Total Settlement: 6.61

11-ft



P = UNIT LOAD OF EMBANKMENT

$\sigma_z = 2\ I * P$

Only modify h_w and I, all others are established formulas.

γ_{STONE} (pcf) = 125.0 Slope = 3.0 h_w = 4.1 h_e = 14.5 h_t = 18.6 b = 10.0	$P = \gamma_{STONE} * h_e + (\gamma_{STONE} - \gamma_{WATER}) * h_w$ P = 2069.16

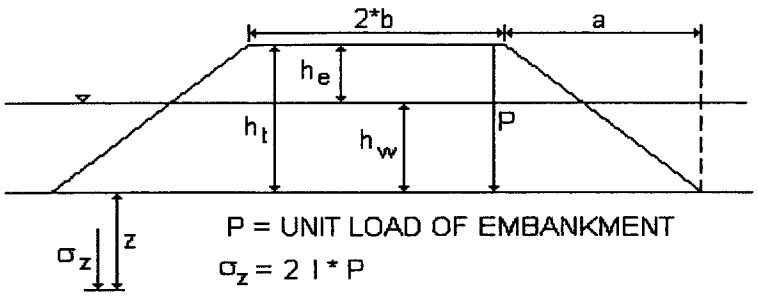
z	a/z	b/z	I	2 I	$\sigma_z = 2\ I * P$
1.5	37.200	6.667	0.500	1.000	2069.16
4.5	12.400	2.222	0.500	1.000	2069.16
7.5	7.440	1.333	0.490	0.980	2027.78
10.5	5.314	0.952	0.485	0.970	2007.09
12.0	4.650	0.833	0.480	0.960	1986.39
12.5	4.464	0.800	0.477	0.954	1973.98
13.5	4.133	0.741	0.475	0.950	1965.70
16.5	3.382	0.606	0.465	0.930	1924.32
19.5	2.862	0.513	0.455	0.910	1882.94
22.5	2.480	0.444	0.440	0.880	1820.86
25.5	2.188	0.392	0.430	0.860	1779.48
28.5	1.958	0.351	0.415	0.830	1717.40
31.5	1.771	0.317	0.405	0.810	1676.02

h_w is adjusted for extreme low tide of -3.5 MLLW.

COMPUTATION SHEET FOR CONSOLIDATION SETTLEMENT — CALCULATED BY: DEC
PROJECT JAMES ISLAND DIKE (DH-217) — DATE: 12/16/2004

Sublayer Depth (ft)			Sublayer Thickness	Effective Overburden Pressure	Preconsoli-dation Pressure	Pressure Change	Final Pressure	Recompress-ion Index	Compress-ion Index	Initial Void Ratio	Compression Ratio		Vertical Strain	Change in Thickness (in)
Top	Bottom	Average	H_o (ft)	p_o (psf)	p_p (psf)	Δp (psf)	p_f (psf)	c_r	c_c	e_o	Rebound Curve $C\varepsilon r$	Virgin Curve $C\varepsilon c$	εz^*	$\varepsilon z \times H_o$ = DH
0	3	1.5	3	78.9	1370.7	2131.66	2210.56	0.045	0.33	1.111	0.021317	0.15632	0.0589	2.12
3	6	4.5	3	236.7	1528.5	2131.66	2368.36	0.045	0.33	1.111	0.021317	0.15632	0.0470	1.69
6	9	7.5	3	394.5	1686.3	2089.03	2483.53	0.045	0.33	1.111	0.021317	0.15632	0.0397	1.43
9	12	10.5	3	552.3	1844.1	2067.71	2620.01	0.045	0.33	1.111	0.021317	0.15632	0.0350	1.26
12	13	12.5	1	657.5	1949.3	2033.6	2691.1	0.045	0.33	1.111	0.021317	0.15632	0.0320	0.38

Using Boring Information and consolidation test results from DH-217 — Total Settlement: 6.89



Only modify h_w and I, all others are established formulas.

γ_{STONE} (pcf) = 125.0 Slope = 3.0 h_w = 4.1 h_e = 15.0 h_t = 19.1 b = 10.0	$P = \gamma_{STONE} * h_e + (\gamma_{STONE} - \gamma_{WATER}) * h_w$ P = 2131.66

z	a/z	b/z	I	2 I	$\sigma_z = 2\ I * P$
1.5	38.200	6.667	0.500	1.000	2131.66
4.5	12.733	2.222	0.500	1.000	2131.66
7.5	7.640	1.333	0.490	0.980	2089.03
10.5	5.457	0.952	0.485	0.970	2067.71
12.0	4.775	0.833	0.480	0.960	2046.39
12.5	4.584	0.800	0.477	0.954	2033.60
13.5	4.244	0.741	0.475	0.950	2025.08
16.5	3.473	0.606	0.465	0.930	1982.44
19.5	2.938	0.513	0.455	0.910	1939.81
22.5	2.547	0.444	0.440	0.880	1875.86
25.5	2.247	0.392	0.430	0.860	1833.23
28.5	2.011	0.351	0.415	0.830	1769.28
31.5	1.819	0.317	0.405	0.810	1726.64

h_w is adjusted for extreme low tide of -3.5 MLLW.

+12.0

COMPUTATION SHEET FOR CONSOLIDATION SETTLEMENT
PROJECT JAMES ISLAND DIKE (DH-217)

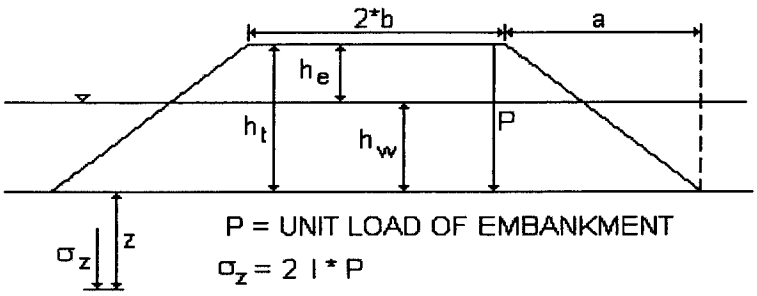
CALCULATED BY: DEC
DATE: 12/16/2004

Sublayer Depth (ft)			Sublayer Thickness	Effective Overburden Pressure	Preconsoli-dation Pressure	Pressure Change	Final Pressure	Recompress-ion Index	Compress-ion Index	Initial Void Ratio	Compression Ratio		Vertical Strain	Change in Thickness (in)
Top	Bottom	Average	H_o (ft)	p_o (psf)	p_p (psf)	Δp (psf)	p_f (psf)	c_r	c_c	e_o	Rebound Curve $C\varepsilon r$	Virgin Curve $C\varepsilon c$	εz^*	$\varepsilon z \times H_o$ = DH
0	3	1.5	3	78.9	1370.7	2194.16	2273.06	0.045	0.33	1.111	0.021317	0.156324	0.0608	2.19
3	6	4.5	3	236.7	1528.5	2194.16	2430.86	0.045	0.33	1.111	0.021317	0.156324	0.0488	1.76
6	9	7.5	3	394.5	1686.3	2150.28	2544.78	0.045	0.33	1.111	0.021317	0.156324	0.0414	1.49
9	12	10.5	3	552.3	1844.1	2128.34	2680.64	0.045	0.33	1.111	0.021317	0.156324	0.0366	1.32
12	13	12.5	1	657.5	1949.3	2093.23	2750.73	0.045	0.33	1.111	0.021317	0.156324	0.0334	0.40

Using Boring Information and consolidation test results from DH-217

Total Settlement: 7.15

12-ft



P = UNIT LOAD OF EMBANKMENT

$\sigma_z = 2\ I * P$

Only modify h_w and I, all others are established formulas.

γ_{STONE} (pcf) = 125.0 Slope = 3.0 h_w = 4.1 h_e = 15.5 h_t = 19.6 b = 10.0	$P = \gamma_{STONE} * h_e + (\gamma_{STONE} - \gamma_{WATER}) * h_w$ P = 2194.16

z	a/z	b/z	I	2 I	$\sigma_z = 2\ I * P$
1.5	39.200	6.667	0.500	1.000	2194.16
4.5	13.067	2.222	0.500	1.000	2194.16
7.5	7.840	1.333	0.490	0.980	2150.28
10.5	5.600	0.952	0.485	0.970	2128.34
12.0	4.900	0.833	0.480	0.960	2106.39
12.5	4.704	0.800	0.477	0.954	2093.23
13.5	4.356	0.741	0.475	0.950	2084.45
16.5	3.564	0.606	0.465	0.930	2040.57
19.5	3.015	0.513	0.455	0.910	1996.69
22.5	2.613	0.444	0.445	0.890	1952.80
25.5	2.306	0.392	0.435	0.870	1908.92
28.5	2.063	0.351	0.420	0.840	1843.09
31.5	1.867	0.317	0.410	0.820	1799.21

h_w is adjusted for extreme low tide of -3.5 MLLW.

Hole No. JB- 217

DRILLING LOG	DIVISION NAD	INSTALLATION Baltimore District	SHEET 1 OF 2 SHEETS

1. PROJECT JAMES ESSEX FEASABILITY STUDY	10. SIZE AND TYPE OF BIT 2 ¼" HSA
2. LOCATION (Coordinates or Station) JAMES R. MD	11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
3. DRILLING AGENCY CENAD-EN-GGE	12. MANUFACTURER'S DESIGNATION OF DRILL CME 45
4. HOLE NO. (As shown on drawing title and file number) JB 217	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 11; UNDISTURBED Ø
5. NAME OF DRILLER McNamara	14. TOTAL NUMBER CORE BOXES
6. DIRECTION OF HOLE ☑ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.	15. ELEVATION GROUND WATER
7. THICKNESS OF OVERBURDEN 26.5'	16. DATE HOLE STARTED 9/21/04 COMPLETED 9/21/04
8. DEPTH DRILLED INTO ROCK	17. ELEVATION TOP OF HOLE
9. TOTAL DEPTH OF HOLE 26.5'	18. TOTAL CORE RECOVERY FOR BORING %
	19. SIGNATURE OF INSPECTOR William G. Mc[illegible]

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	0					Hole was drilled with CME 45 using 2¼" Hollow Stem Augers. Standard penetration test conducted using automatic hammer, driving 1⅜" split-spoon. Blow count performed in 0.5' intervals for total 1.5' advance per sample interval.
	1		BLACK FINE SAND w/ Shells wet	53	J-1	
	2					
	3		GRAY CLAY w/ BLACK Fine SAND LENSES wet	93	J-2	
	4					
	5		GRAY CLAY			
	6		wet	100	J-3	
	7					
	8		GRAY CLAY wet	100	J-4	
	9					
	10		GRAY CLAY			
	11		-11.0-11.5 w/ SAND- wet	100	J-5	
	12					
	13		GRAY CLAY wet			
		13.3'	Brown Very Fine Sand wet	100	J-6	
	14					
	15		Brown Very Fine Sand wet	100	J-7	
	16	16.2'	GRAY CLAY DAMP			
	17					
	18		GRAY CLAY DRY	100	J-8	
	19					

PRELIMINARY INSPECTOR'S LOG CLASSIFICATION NOT FINAL

JAR	DEPTH	BLOW COUNT	PENETRO METER
1	0.0 - 1.5	WH/1.5	
2	2.5 - 4.0	WH/1.5	0 0 0
3	5.0 - 6.5	WH/1.5	0 0 0
4	7.5 - 9.0	WH/1.5	0 0 0
5	10.0 - 11.5	WH/1.5	0 0 0
6	12.5 - 14.0	11-8-7	0 0 0
7	15.0 - 16.5	3-1-2	
8	17.5 - 19.0	4-7-11	4.5 4.0 4.0
9	20.0 - 21.5	3-5-10	4.5 4.5 4.5+
10	22.5 - 24.0	100/.4	4.5+ 4.5+ 4.5+
11	25.0 - 26.5	5-8-10	3.0 3.0 3.0

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE.

PROJECT

HOLE NO.

DRILLING LOG (Cont Sheet) | ELEVATION TOP OF HOLE | Hole No. JB 217

PROJECT: JAMES Is. | INSTALLATION: Baltimore District | SHEET 2 OF 2 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	21–26		GRAY CLAY			GPS COORDINATES
			Dry	100	J-9	N38° 30' 02.2"
						W076° 21' 09.5"
						Accuracy 20.4'
				100	J-10	
			DRY			WATER LEVEL
						Time 1015 | 1141
						Depth 9.5' | 9.7'
			DRY	100	J-11	
	27		B.O.H. - 26.5'			

PRELIMINARY INSPECTOR'S LOG CLASSIFICATION NOT FINAL

GPO 1980 OF - 628 - 603

PROJECT JAMES I. | HOLE NO. JB 217 | 5/4

VISUAL-MANUAL CLASSIFICATION

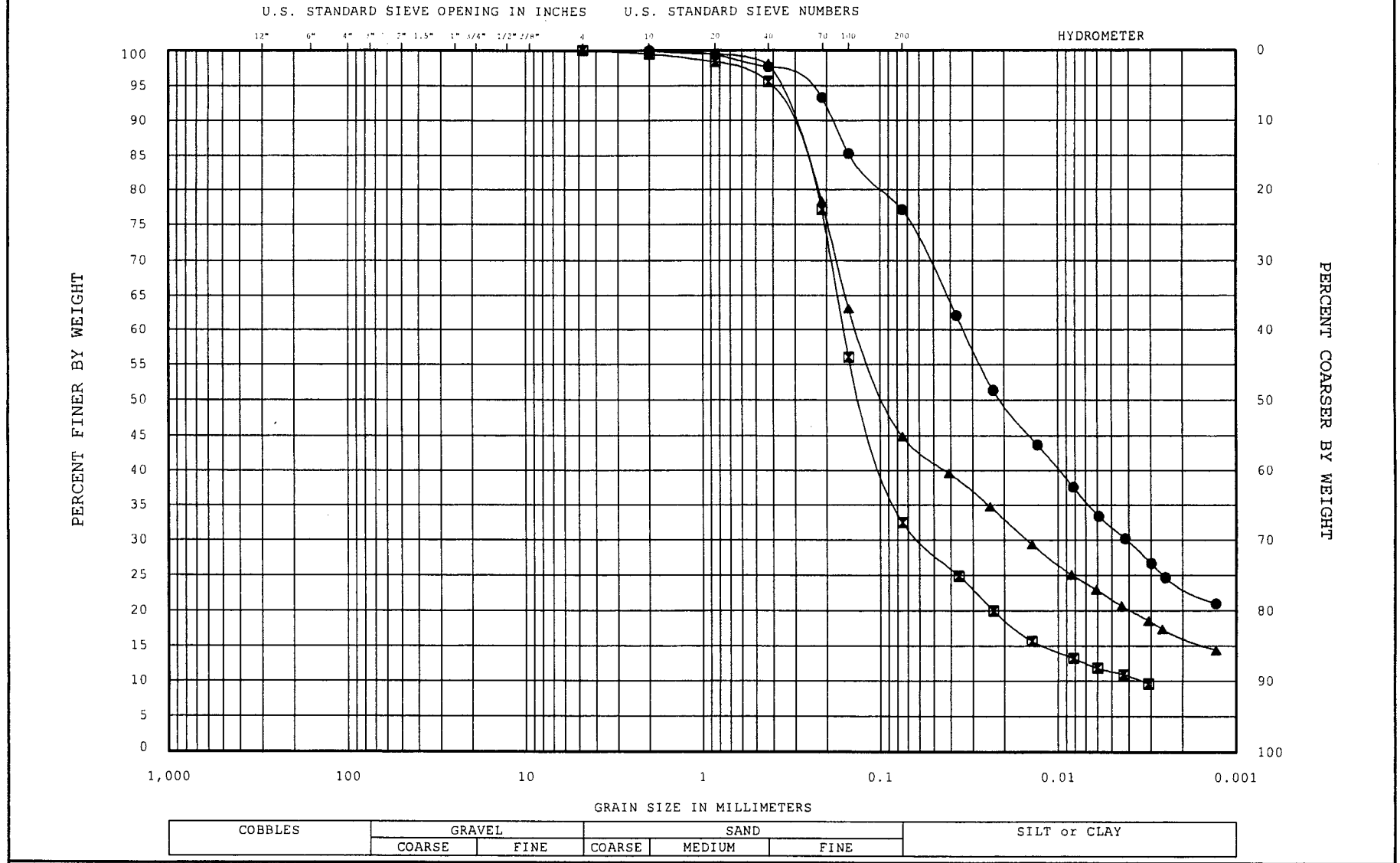
(Test method: ASTM D 2488)

PROJECT: James Island **DATE:** Oct 2004

AREA: Mid-Bay Feasibility Study **CLASSIFIED BY:** KUHN

Dorchester County, MD

SAMPLE NO.	DEPTH (ft)	VISUAL CLASSIFICATION	SYMBOL
JB -	217 DIKE		
JAR-1	0.0-1.5	Wet black poorly graded fine sand w/ silt & shells	(SP-SM)
-2	2.5-4.0	Wet dk gray soft sandy clay	(CL)
MAL -3	5.0-6.5	Wet dk gray soft lean clay	(CL)
-4	7.5-9.0	Wet dk gray soft lean clay	CL/CH
-5	10.0-11.5	V. moist dk gray soft fat clay	(CH)
MA -6	12.5-14.0	Moist dk grayish brn silty fine sand	(SM)
-7	15.0-16.5	Wet -ditto-	(SM)
-8	17.5-19.0	Moist olive gray firm fat clay	CH/CL
MAL -9	20.0-21.5	Moist olive gray firm fat clay w/ sand	CH/CL
-10	22.5-24.0	V. moist olive gray silty fine sand (Tr. gravel)	(SM)
-11	25.0-26.5	V. moist olive gray silty fine sand	(SM)



Legend		Depth (ft)	Classification (ASTM D 2487)		Nat wc%	LL	PL	PI
—●—	Jars 2&3	2.5-6.5	LEAN CLAY with SAND	CL	36.5	37	18	19
—⊠—	Jars 6&7	12.5-16.5	SILTY SAND	SM	28.3			
—▲—	Jars 8&9	17.5-21.5	CLAYEY SAND	SC	30.3	53	20	33
— —								

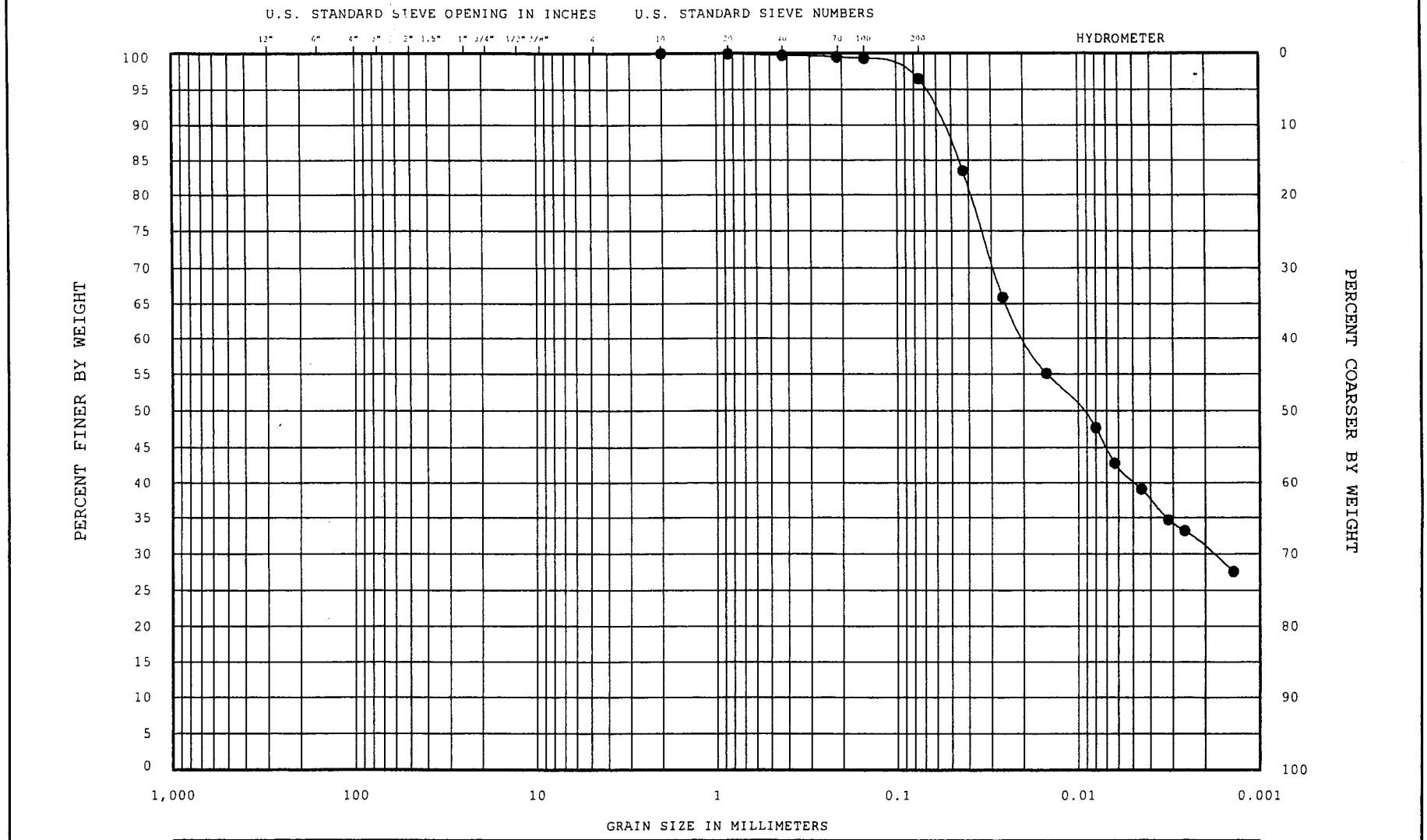
REMARKS :

ENG FORM ENG2087JAMES ISLAND, MID-BAY FEASIBILITY STUDY.GPJ **GRADATION CURVES** TEST METHODS: ASTM D 422, D4318, D2216

PROJECT: *James Island*
AREA: *Mid-Bay Feasibility Study*
Dorchester County, MD

BORING NO.: *JB-217*

DATE: *Dec 2004*



Legend	Sample No.	Depth (ft)	Classification (ASTM D 2487)		Nat wc%	LL	PL	PI
—●—	Shelby-1	6.0-8.0	LEAN CLAY	CL	39.2	44	20	24

REMARKS :

ENG FORM ENG2087JAMES ISLAND, MID-BAY FEASIBILITY STUDY.GPJ **GRADATION CURVES** TEST METHODS: ASTM D 422, D4318, D2216

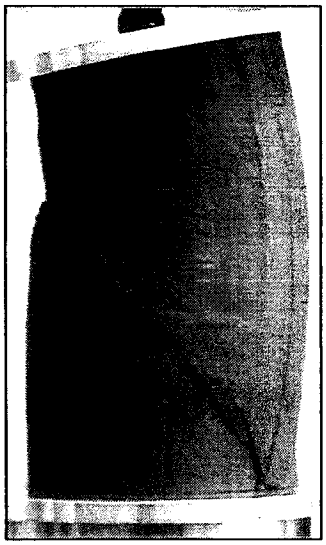
PROJECT: *James Island*
AREA: *Mid-Bay Feasibility Study*
Dorchester County, MD

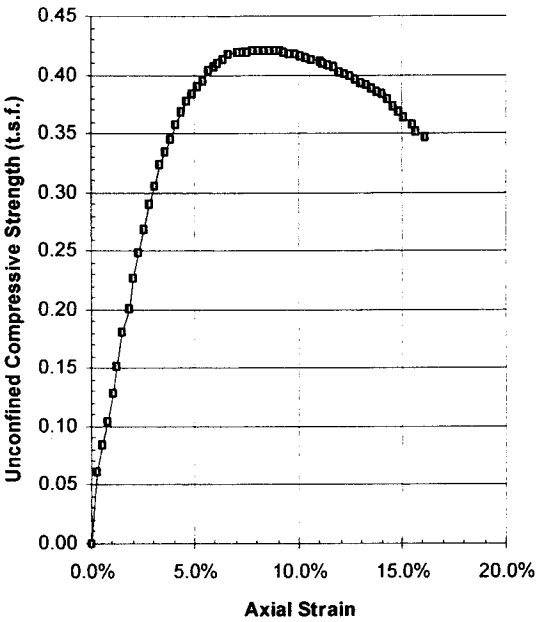
BORING NO.: *JB-217A*

DATE: *Nov 2004*

UNCONFINED COMPRESSION TEST

FAILURE SKETCHES





CONTROLLED STRAIN

TEST NO.		1	2	3	4
TYPE OF SPECIMEN		Undisturbed			
WATER CONTENT, %	w_o	38.5			
VOID RATIO	e_o	0.964			
SATURATION, %	S_o	100+			
DRY UNIT WEIGHT, LB./CU.FT.	γ_d	82.3			
TIME TO FAILURE, MIN.	t_f	8.0			
UNCONFINED COMPRESSIVE STRENGTH, TSF	q_u	0.42			
UNDRAINED SHEAR STRENGTH, TSF	s_u	0.21			
SENSITIVTY RATIO	S_t	------			
INITIAL SPECIMEN DIAMETER, IN.	D_o	2.84			
INITIAL SPECIMEN HEIGHT, IN.	H_o	6.10			

CLASSIFICATION: (ASTM D2487)

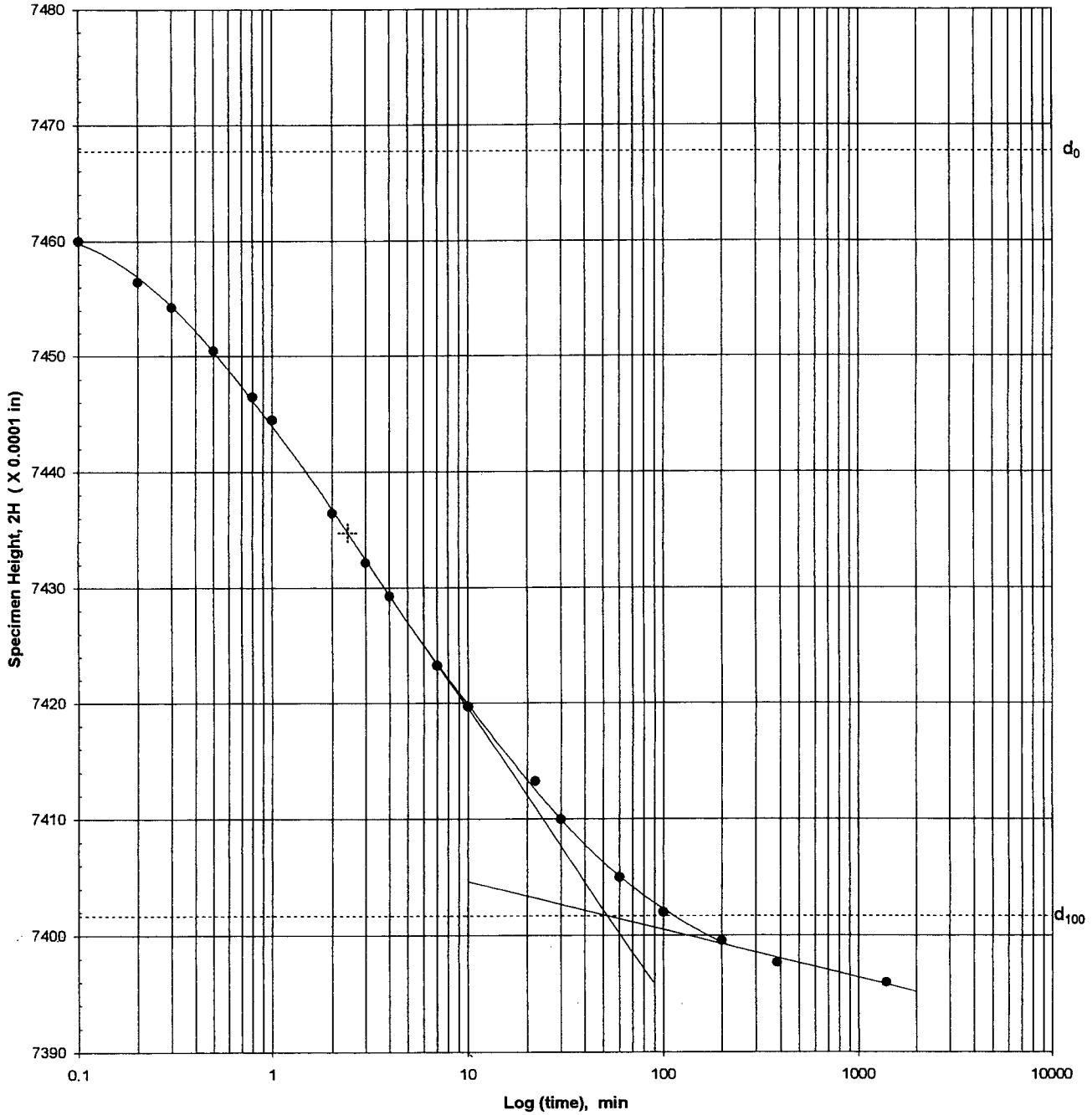
V.moist, dk. greenish gray, soft-firm, LEAN CLAY (CL)

LL= 44	PL= 20	PI= 24 (ASTM D4318)	G_S= 2.59 (ASTM D854)

REMARKS:	PROJECT: James Island	
	Mid-Bay Feasiblity Study	
	AREA: Dorchester County, MD	
	Hole No.: DH-217A	Sample No.: Shelby-1
	Depth (ft.): 6.0-8.0	Date: Dec.2004

ENG FORM 3659 (Test method: ASTM D2166) — UNCONFINED COMPRESSION TEST REPORT

t_{50} TIME CURVE



U.S.Army Corps of Engineers
Materials & Instrumentation Section
Baltimore, Maryland 21230

PROJECT: Dorchester County, MD
Mid-Bay Feasibility Study

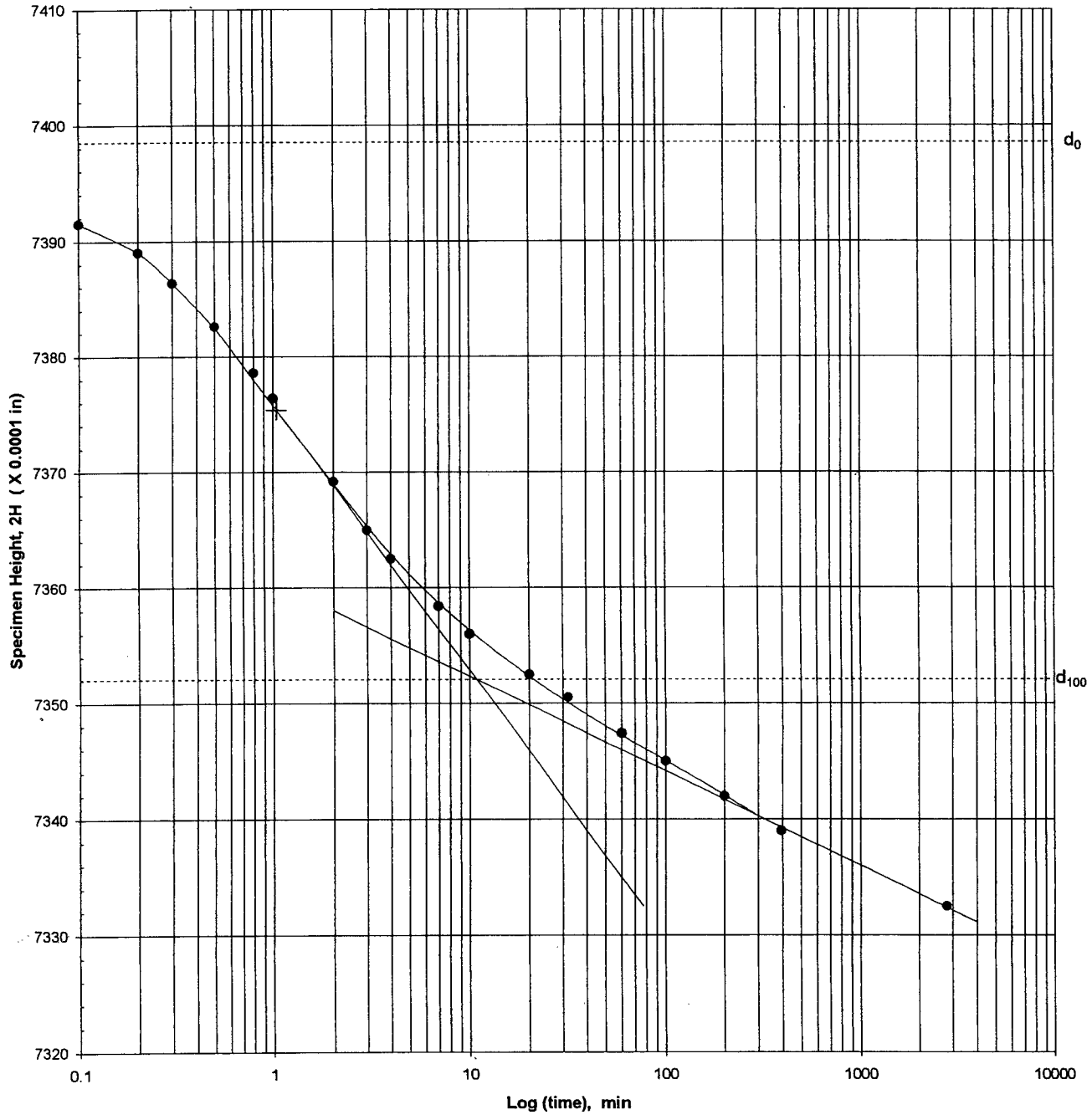
AREA: James Island

Normal Stess =	**0.25**		tons/ft²
t_{50} =	2.42		min
H =	0.3717		in
c_v =	1.87	X 10^{-4}	in²/sec

Hole No.:	**Sample No.:**	**Depth (ft):**
JB-217A	Shelby-1	6.0-8.0

ENG Form 2088 **CONSOLIDATION TEST - TIME CURVE**

t_{50} TIME CURVE



U.S.Army Corps of Engineers
Materials & Instrumentation Section
Baltimore, Maryland 21230

PROJECT: Dorchester County, MD
Mid-Bay Feasibility Study

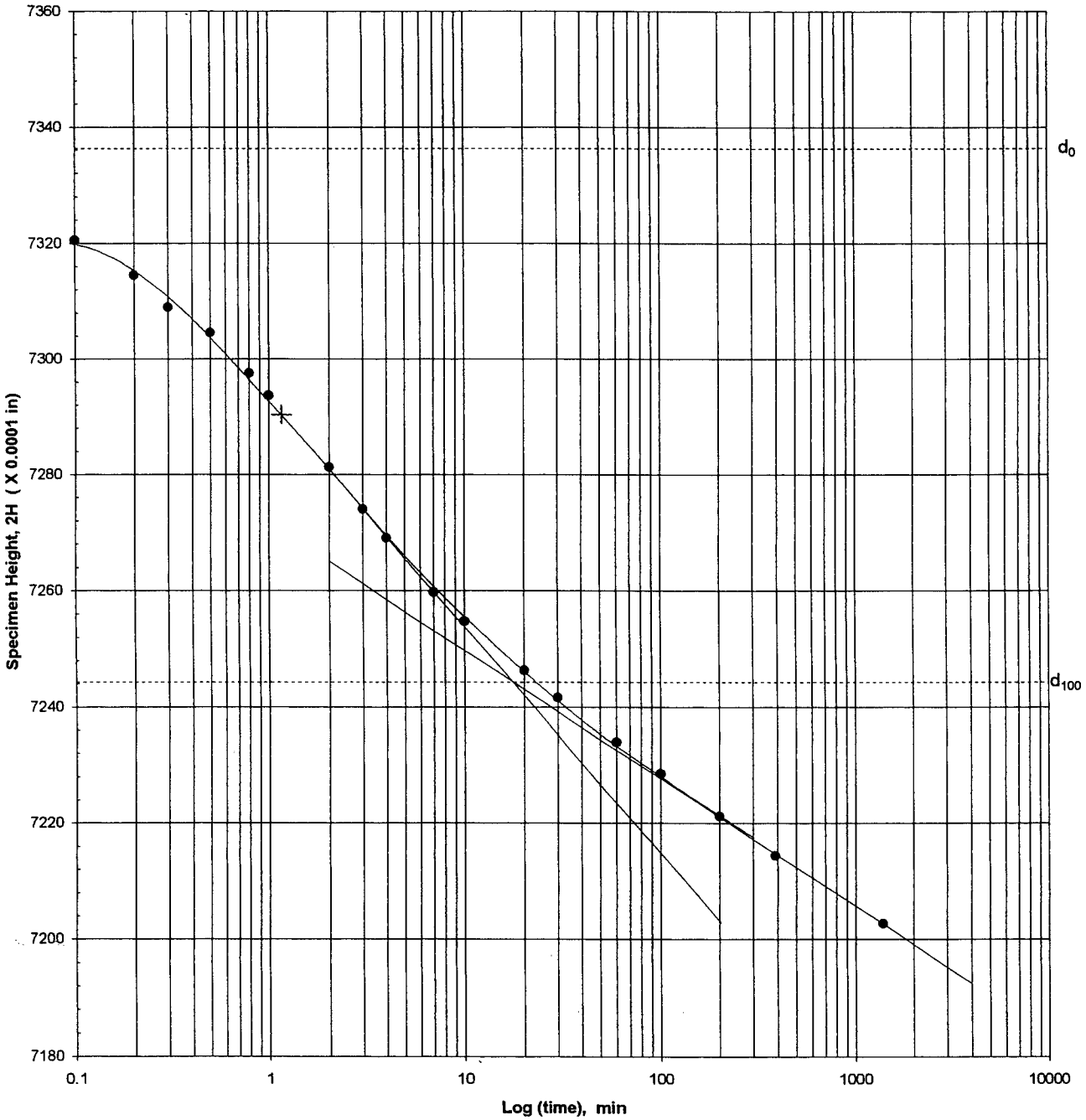
AREA: James Island

Normal Stess =	**0.50**		tons/ft²
t_{50} =	1.04		min
H =	0.3688		in
c_v =	4.27	X 10^{-4}	in²/sec

Hole No.:	**Sample No.:**	**Depth (ft):**
JB-217A	Shelby-1	6.0-8.0

ENG Form 2088 — **CONSOLIDATION TEST - TIME CURVE**

t_{50} TIME CURVE



U.S.Army Corps of Engineers
Materials & Instrumentation Section
Baltimore, Maryland 21230

PROJECT: Dorchester County, MD
Mid-Bay Feasibility Study

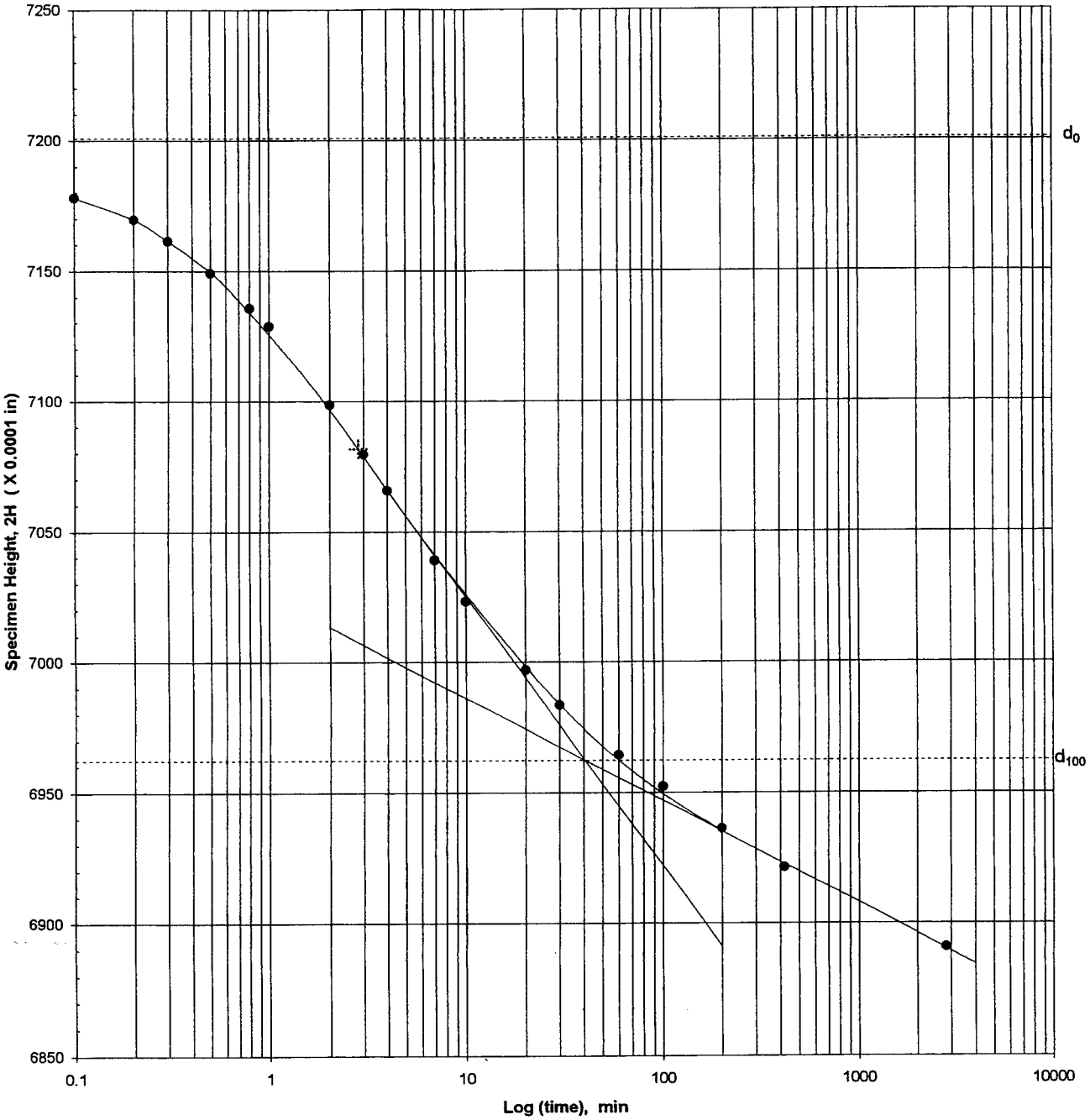
AREA: James Island

Normal Stess =	**1.0**		tons/ft²
t_{50} =	1.15		min
H =	0.3645		in
c_v =	3.77	X 10^{-4}	in²/sec

Hole No.:	Sample No.:	Depth (ft):
JB-217A	Shelby-1	6.0-8.0

ENG Form 2088 — **CONSOLIDATION TEST - TIME CURVE**

t_{50} TIME CURVE



U.S.Army Corps of Engineers
Materials & Instrumentation Section
Baltimore, Maryland 21230

PROJECT: Dorchester County, MD
Mid-Bay Feasibility Study

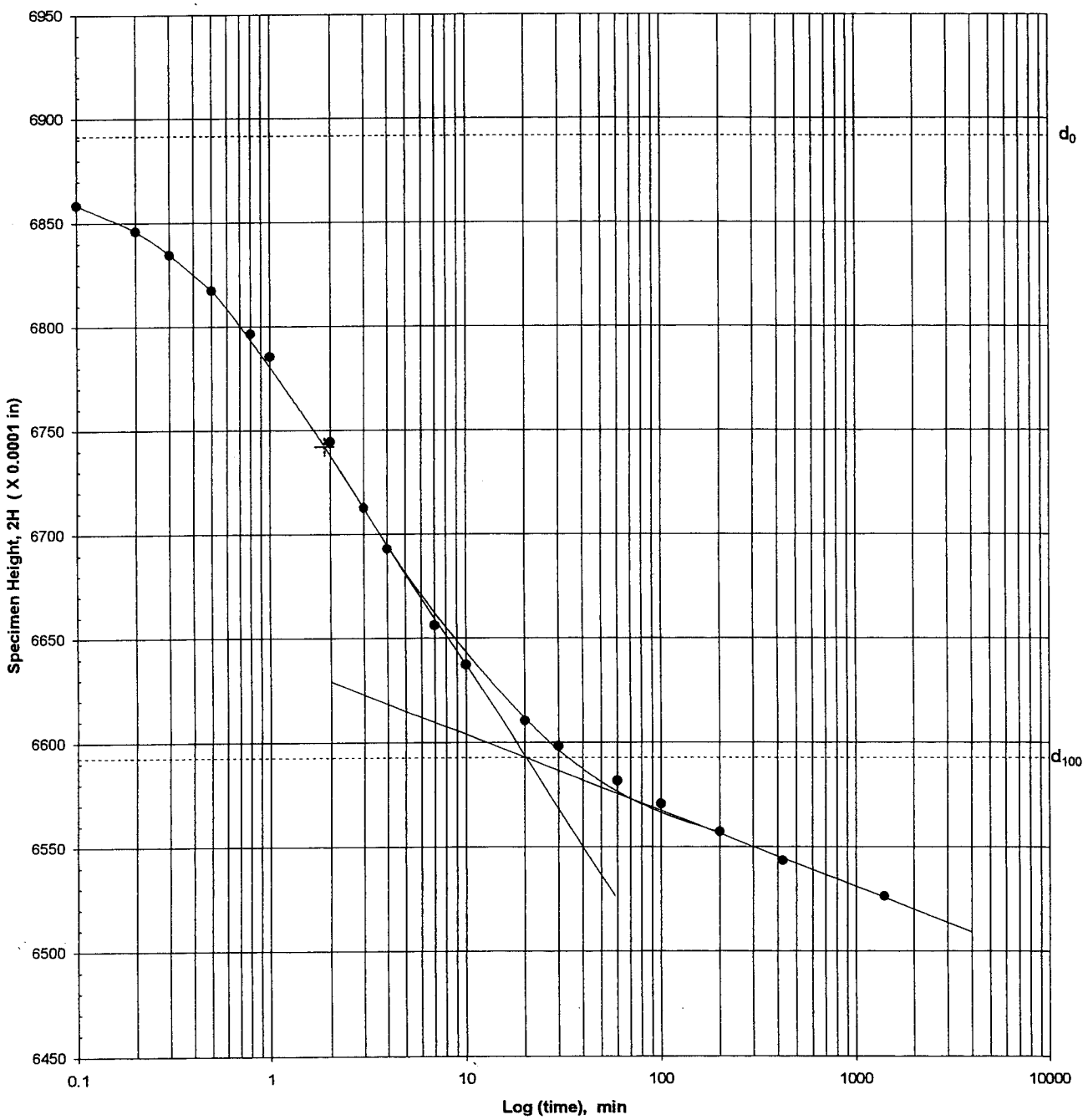
AREA: James Island

Normal Stess =	**2.0**	tons/ft²
t_{50} =	2.82	min
H =	0.3541	in
c_v =	1.45 X 10^{-4}	in²/sec

Hole No.:	**Sample No.:**	**Depth (ft):**
JB-217A	Shelby-1	6.0-8.0

ENG Form 2088 **CONSOLIDATION TEST - TIME CURVE**

t_{50} TIME CURVE



U.S.Army Corps of Engineers
Materials & Instrumentation Section
Baltimore, Maryland 21230

PROJECT: Dorchester County, MD
Mid-Bay Feasibility Study

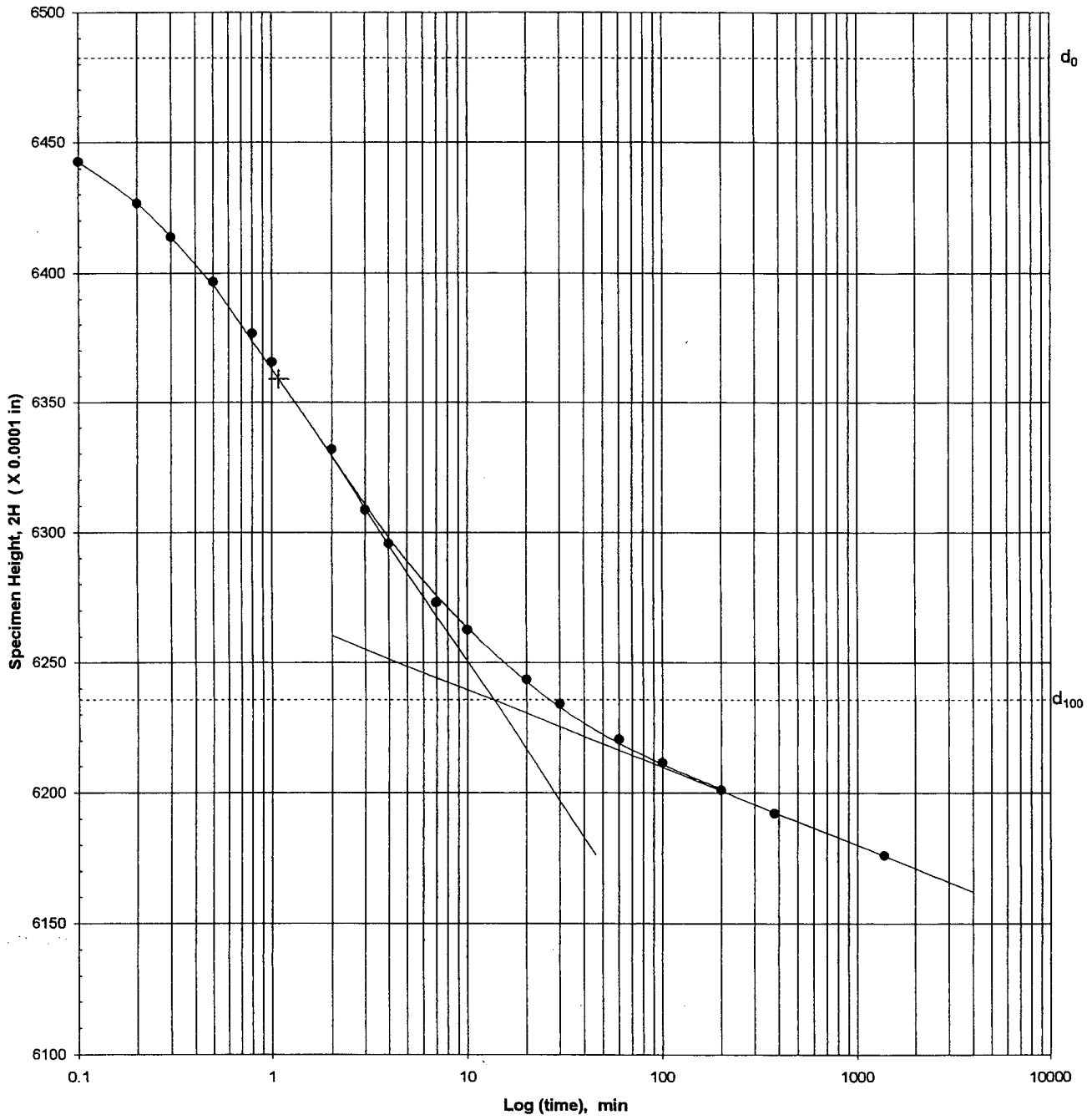
AREA: James Island

Normal Stess =	**4.0**	tons/ft²
t_{50} =	1.87	min
H =	0.3371	in
c_v =	1.99 X 10^{-4}	in²/sec

Hole No.:	Sample No.:	Depth (ft):
JB-217A	Shelby-1	6.0-8.0

ENG Form 2088 — **CONSOLIDATION TEST - TIME CURVE**

t_{50} TIME CURVE



U.S.Army Corps of Engineers
Materials & Instrumentation Section
Baltimore, Maryland 21230

PROJECT: Dorchester County, MD
Mid-Bay Feasibility Study

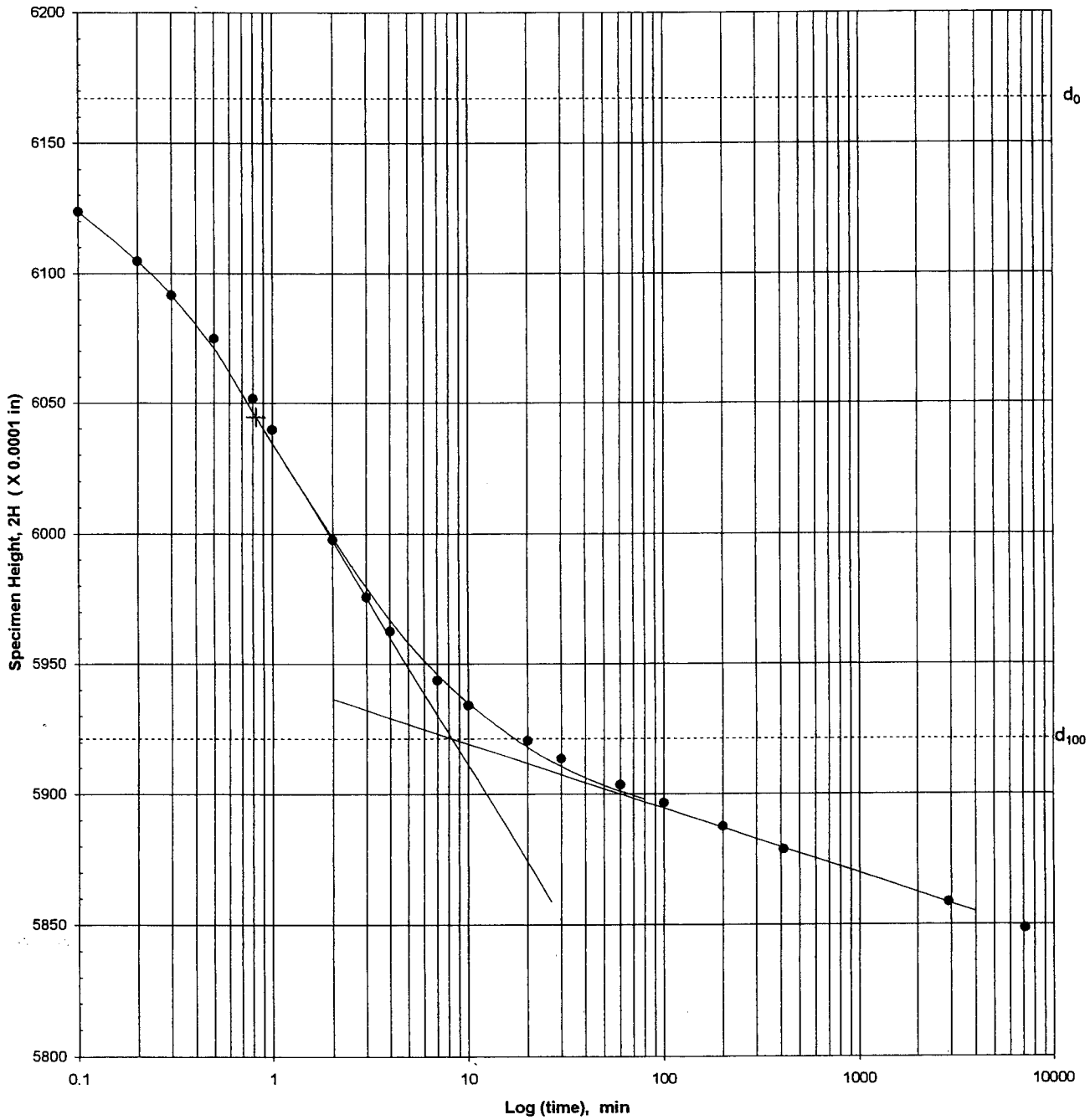
AREA: James Island

Normal Stess =	**8.0**	tons/ft²
t_{50} =	1.08	min
H =	0.3179	in
c_v =	3.06 X 10^{-4}	in²/sec

Hole No.:	Sample No.:	Depth (ft):
JB-217A	Shelby-1	6.0-8.0

ENG Form 2088 **CONSOLIDATION TEST - TIME CURVE**

t_{50} TIME CURVE



U.S.Army Corps of Engineers
Materials & Instrumentation Section
Baltimore, Maryland 21230

PROJECT: Dorchester County, MD
Mid-Bay Feasibility Study

AREA: James Island

Normal Stess =	**16.0**	tons/ft²
t_{50} =	0.83	min
H =	0.3022	in
c_v =	3.59 X 10^{-4}	in²/sec

Hole No.:	**Sample No.:**	**Depth (ft):**
JB-217A	Shelby-1	6.0-8.0

ENG Form 2088 **CONSOLIDATION TEST - TIME CURVE**

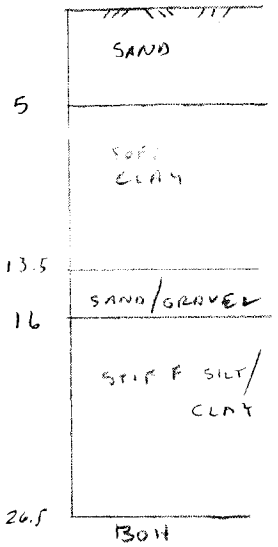
SETTLEMENT ANALYSIS FOR DH-218

ASSUME A DIKE SECTION TO VARYING ELEVATIONS (+10, +10.5, +11, +11.5, +12) WITH SIDESLOPES OF 3H:1V AND A CREST WIDTH OF 20 FEET. DEPTH OF WATER IS ASSUMED TO BE 8.5 FEET AT MLLW. USE EXTREME LOW TIDE OF -3.5 MLLW TO COMPUTE STRESS CHANGES FROM DIKE.

A CONSOLIDATION TEST WAS PERFORMED ON A CLAY SAMPLE OBTAINED FROM A DEPTH OF 8'-10'. CONSOLIDATION TEST RESULTS SHOW A C_c OF .140 (FROM CORRECTED CURVE) AND A C_r OF .055. A PRECONSOLIDATION PRESSURE OF 1.2 tsf (2400 psf) WAS DETERMINED FROM THE e-log p CURVE.

OVERBURDEN PRESSURE, $P_o = (115-62.4)(9) = 473.4\ psf$

OCR = 2400/473.4 = 5.07 (DUE TO JAMES ISLAND PREVIOUSLY EXISTING AT THIS LOCATION)



ASSUMED COMPRESSIBLE LAYER 8.5-FT IN THICKNESS.

ESTIMATED CONSOLIDATION SETTLEMENT RANGES FROM 2.0"-3.0" (SEE ATTACHED SPREADSHEETS)

TUBE CLASSIFICATION

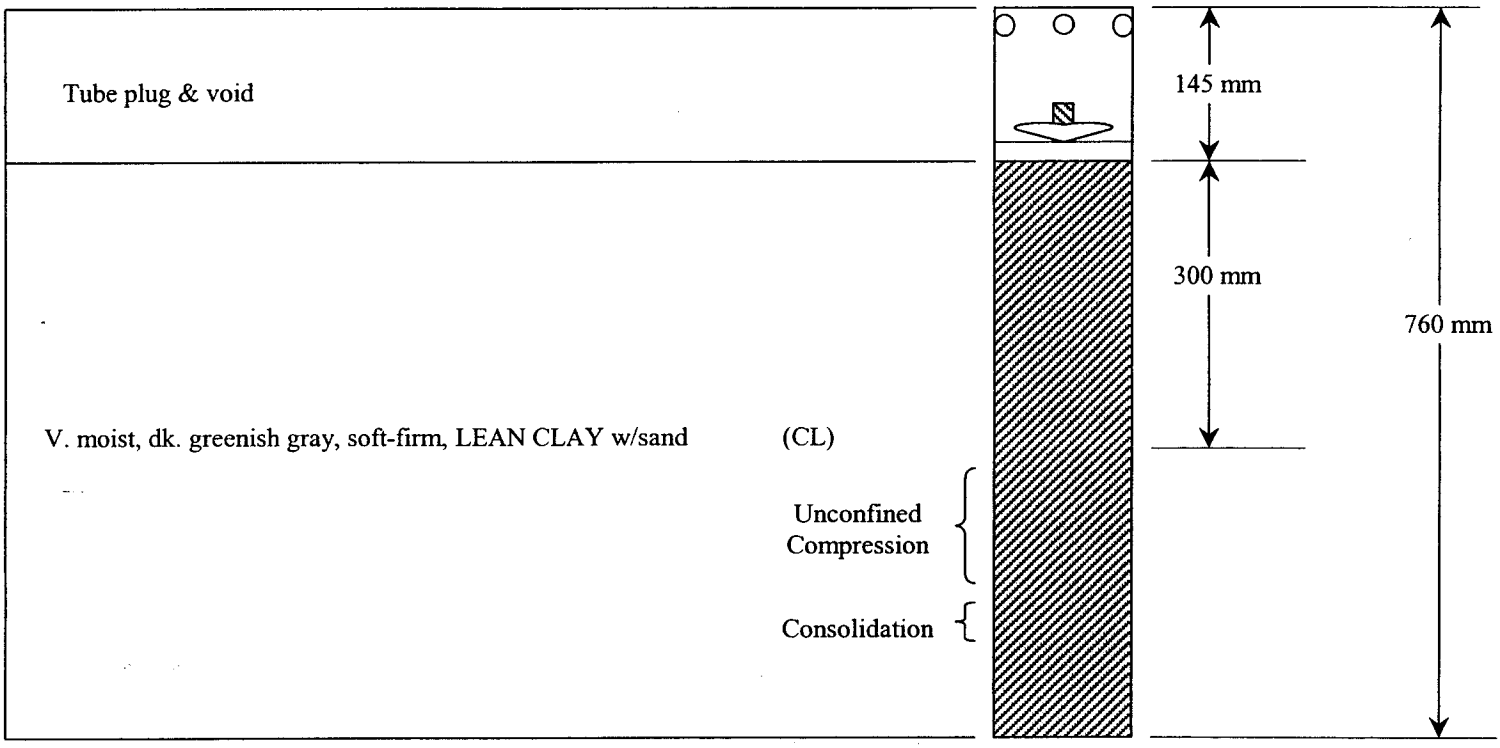
ASTM D2487

PROJECT: Mid-Bay Feasibility Study
James Island

AREA: Dorchester County, MD

DATE: Nov 2004

Hole No.	Sample No.	Depth (ft)
DH-218A	Shelby-1	8.0-10.0



STA. MID-BAY ISLAND FEASIBILITY STUDY N 307041.74 **JB-218**
OFFSET: JAMES ISLAND, DORCHESTER COUNTY, MD E 1496671.99 **1 of 1**
TOP ELEV: COMPLETED: September 21, 2004

DEPTH(ft)		(c)	(d)	(a)	(b)
		Wet, dk. gray, poorly graded fine SAND w/silt & shells (SP-SM)		WH/1.5	
2.00					20.6
		Wet, dk. gray, poorly graded fine SAND w/silt (SP-SM)		5-3-3	
4.50					
		V. moist, dk. greenish gray, soft-firm lean CLAY w/sand (CL)		1/1.0-1	
					32.4
				WH/1.5	
9.50	P				39.7
		V. moist, dk. gray, soft lean CLAY w/sand (CL)		WH/1.0-1	
				3-10-6	
14.50					
		Wet, v. dk. grayish brown, silty fine SAND w/gravel (SM)		3-10-5	
17.00					
		Moist, lt. olive brown, soft to firm SILT (ML) PPR 17.5'-19.0': 2.0, 2.0, 1.0		5-5-8	
19.50					
		Moist, dk. greenish gray, firm lean CLAY (CL) PPR 20.0'-21.5': 4.0, >4.5, 4.0		3-4-7	
		PPR 22.5'-24.0': 4.0, 4.0, 4.0		8-8-10	
		PPR 25.0'-26.5': 3.0, 3.0, 4.0		6-8-14	
26.50					
		BOTTOM OF HOLE			
		Depth of bay water @ start of boring 9.5' @ 1015 Hrs.			
		Depth of bay water @ completion 9.7' @ 1141 Hrs.			

5 10 15 20 25

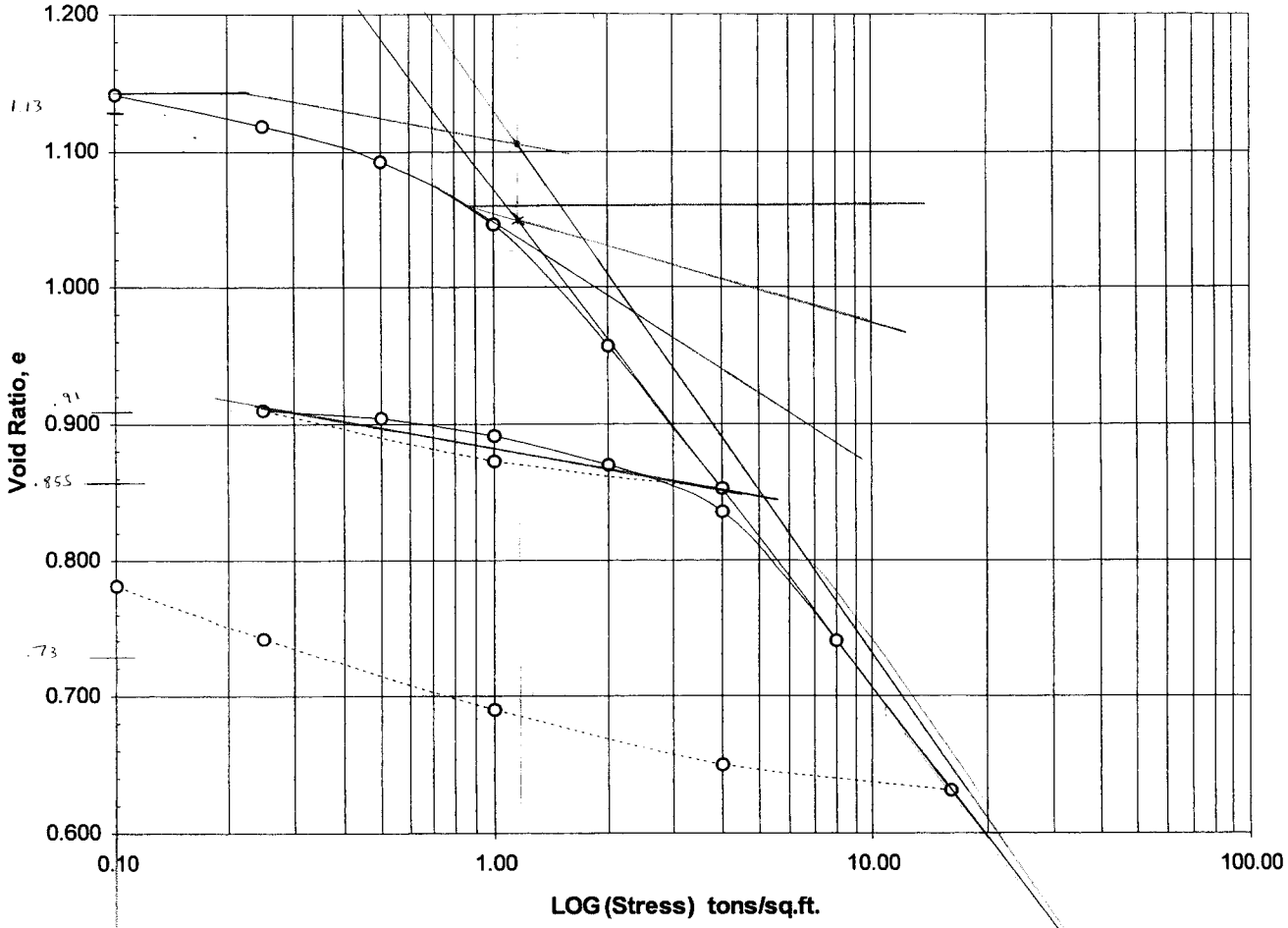
JB-218
GROUNDWATER DATA
WHILE DRILLING:
ON COMPLETION:
Hr. READING:

GROUNDWATER DATA
WHILE DRILLING:
ON COMPLETION:
Hr. READING:

P - indicates pressed shelby tube sample obtained from an additional boring.

Fill | Auger | SPT | RB
Cored | 300 lb | Tubex | Hand
Fish Tail | Vibra Core | Water Jet | Odex

GEO-2 JAMESISL.GPJ 12/21/04 10:03



.400 .46

Type of Specimen: **Undisturbed**			Before Test			After Test
Diameter= **2.50** in.	Height= **0.75** in.	Water Content, %	w_o	39.7	w_f	29.4
Overburden Pressure, p_o = .237 tons/sq.ft.		Void Ratio	e_o	1.151	e_f	0.806
Preconsol. Pressure, p_c = 1.2 tons/sq.ft.		Saturation, %	S_o	94.4	S_f	100.0
Compression Index, C_c = ~~0.366~~ .40		Dry Density	γ_d	79.5 lbs./cu.ft.		

Classification (ASTM D2487): Very moist, dark greenish gray, soft to firm, LEAN CLAY w/sand. (CL)

LL = 42	PL = 19	PI= 23 (ASTM D4318)	G_s = 2.74 (ASTM D854)

Remarks:	**PROJECT:** Dorchester County, MD	
	Mid-Bay Feasibility Study	
	AREA: James Island	
	Hole No.: JB-218A	**Sample No.:** Shelby-1
	Depth (ft.): 8.0-10.0	**Date:** Dec.2004
ENG FORM 2090 (Test method: ASTM D2435)	**CONSOLIDATION TEST REPORT**	

+10.0

COMPUTATION SHEET FOR CONSOLIDATION SETTLEMENT
PROJECT: JAMES ISLAND DIKE (DH-218)

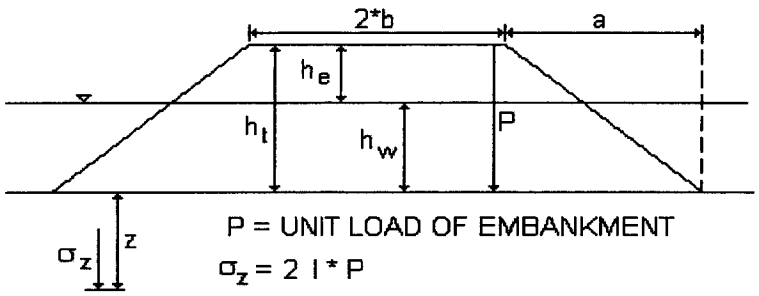
CALCULATED BY: DEC
DATE: 12/16/2004

Sublayer Depth (ft)			Sublayer Thickness	Effective Overburden Pressure	Preconsolidation Pressure	Pressure Change	Final Pressure	Recompression Index	Compression Index	Initial Void Ratio	Compression Ratio		Vertical Strain	Change in Thickness (in)
Top	Bottom	Average	H_o (ft)	p_o (psf)	p_p (psf)	Δp (psf)	p_f (psf)	c_r	c_c	e_o	Rebound Curve $C\varepsilon r$	Virgin Curve $C\varepsilon c$	εz^*	$\varepsilon z \times H_o$ = DH
5	7	6	2	315.6	2242.2	2000.5	2316.1	0.055	0.4	1.151	0.02557	0.18596	0.0244	0.59
7	9	8	2	420.8	2347.4	1980.5	2401.3	0.055	0.4	1.151	0.02557	0.18596	0.0209	0.50
9	11	10	2	526	2452.6	1960.49	2486.49	0.055	0.4	1.151	0.02557	0.18596	0.0182	0.44
11	13.5	12.25	2.5	644.35	2584.1	1920.48	2564.83	0.055	0.4	1.151	0.02557	0.18596	0.0153	0.46

Using Boring Information and consolidation test results from DH-218

Total Settlement: 1.98

10-ft



Only modify h_w and I, all others are established formulas.

γ_{STONE} (pcf) = 125.0 Slope = 3.0 h_w = 5.0 h_e = 13.5 h_t = 18.5 b = 10.0	$P = \gamma_{STONE} * h_e + (\gamma_{STONE} - \gamma_{WATER}) * h_w$ P = 2000.50

z	a/z	b/z	I	2 I	$\sigma_z = 2\ I * P$
6.0	9.250	1.667	0.500	1.000	2000.50
8.0	6.938	1.250	0.495	0.990	1980.50
10.0	5.550	1.000	0.490	0.980	1960.49
12.25	4.531	0.816	0.480	0.960	1920.48

h_w is adjusted for extreme low tide of -3.5 MLLW.

COMPUTATION SHEET FOR CONSOLIDATION SETTLEMENT
PROJECT JAMES ISLAND DIKE (DH-218)

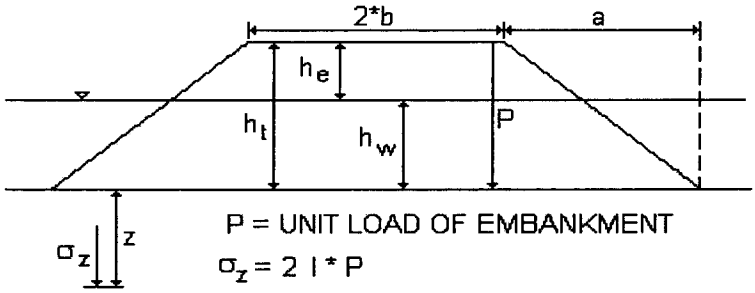
CALCULATED BY: DEC
DATE: 12/16/2004

Sublayer Depth (ft)			Sublayer Thickness	Effective Overburden Pressure	Preconsoli-dation Pressure	Pressure Change	Final Pressure	Recompress-ion Index	Compress-ion Index	Initial Void Ratio	Compression Ratio		Vertical Strain	Change in Thickness (in)
Top	Bottom	Average	H_o (ft)	p_o (psf)	p_p (psf)	Δp (psf)	p_f (psf)	c_r	c_c	e_o	Rebound Curve $C\varepsilon r$	Virgin Curve $C\varepsilon c$	εz^*	$\varepsilon z \times H_o$ = DH
5	7	6	2	315.6	2242.2	2006.66	2322.26	0.055	0.4	1.151	0.02557	0.18596	0.0246	0.59
7	9	8	2	420.8	2347.4	2006.66	2427.46	0.055	0.4	1.151	0.02557	0.18596	0.0218	0.52
9	11	10	2	526	2452.6	1966.53	2492.53	0.055	0.4	1.151	0.02557	0.18596	0.0184	0.44
11	13.5	12.25	2.5	644.35	2584.1	1946.46	2590.81	0.055	0.4	1.151	0.02557	0.18596	0.0156	0.47

Using Boring Information and consolidation test results from DH-218

Total Settlement: 2.02

10.5-ft



P = UNIT LOAD OF EMBANKMENT

$\sigma_z = 2\ I * P$

Only modify h_w and I, all others are established formulas.

γ_{STONE} (pcf) = 125.0 Slope = 3.0 h_w = 5.0 h_e = 14.0 h_t = 19.0 b = 10.0	$P = \gamma_{STONE} * h_e + (\gamma_{STONE} - \gamma_{WATER}) * h_w$ P = 2063.00

z	a/z	b/z	I	2 I	$\sigma_z = 2\ I * P$
6.0	9.500	1.667	0.500	1.000	2063.00
8.0	7.125	1.250	0.495	0.990	2042.37
10.0	5.700	1.000	0.490	0.980	2021.74
12.25	4.653	0.816	0.485	0.970	2001.11

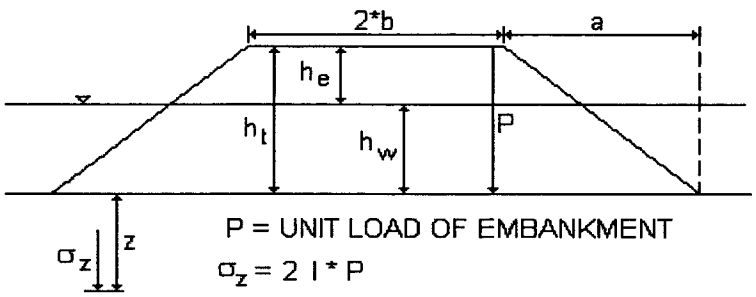
h_w is adjusted for extreme low tide of -3.5 MLLW.

+11.0

COMPUTATION SHEET FOR CONSOLIDATION SETTLEMENT — CALCULATED BY: DEC
PROJECT JAMES ISLAND DIKE (DH-218) — DATE: 12/16/2004

Sublayer Depth (ft)			Sublayer Thickness	Effective Overburden Pressure	Preconsoli-dation Pressure	Pressure Change	Final Pressure	Recompress-ion Index	Compress-ion Index	Initial Void Ratio	Compression Ratio		Vertical Strain	Change in Thickness (in)
Top	Bottom	Average	H_o (ft)	p_o (psf)	p_p (psf)	Δp (psf)	p_f (psf)	c_r	c_c	e_o	Rebound Curve $C\varepsilon r$	Virgin Curve $C\varepsilon c$	εz^*	$\varepsilon z \times H_o$ = DH
5	7	6	2	315.6	2242.2	2069.16	2384.76	0.055	0.4	1.151	0.02557	0.18596	0.0268	0.64
7	9	8	2	420.8	2347.4	2069.16	2489.96	0.055	0.4	1.151	0.02557	0.18596	0.0238	0.57
9	11	10	2	526	2452.6	2027.78	2553.78	0.055	0.4	1.151	0.02557	0.18596	0.0204	0.49
11	13.5	12.25	2.5	644.35	2584.1	2007.09	2651.44	0.055	0.4	1.151	0.02557	0.18596	0.0175	0.53

Using Boring Information and consolidation test results from DH-218 — Total Settlement: 2.23



P = UNIT LOAD OF EMBANKMENT

$\sigma_z = 2\ I * P$

Only modify h_w and I, all others are established formulas.

γ_{STONE} (pcf) = 125.0 Slope = 3.0 h_w = 5.0 h_e = 14.5 h_t = 19.5 b = 10.0	$P = \gamma_{STONE} * h_e + (\gamma_{STONE} - \gamma_{WATER}) * h_w$ P = 2125.50

z	a/z	b/z	I	2 I	$\sigma_z = 2\ I * P$
6.0	9.750	1.667	0.500	1.000	2125.50
8.0	7.313	1.250	0.495	0.990	2104.25
10.0	5.850	1.000	0.490	0.980	2082.99
12.25	4.776	0.816	0.485	0.970	2061.74

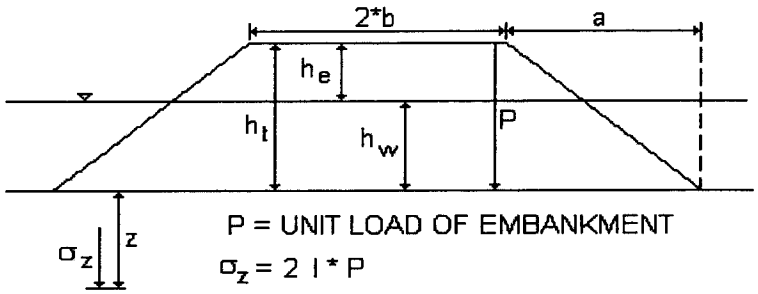
h_w is adjusted for extreme low tide of -3.5 MLLW.

COMPUTATION SHEET FOR CONSOLIDATION SETTLEMENT — CALCULATED BY: DEC
PROJECT JAMES ISLAND DIKE (DH-218) — DATE: 12/16/2004

Sublayer Depth (ft)			Sublayer Thickness	Effective Overburden Pressure	Preconsolidation Pressure	Pressure Change	Final Pressure	Recompression Index	Compression Index	Initial Void Ratio	Compression Ratio		Vertical Strain	Change in Thickness (in)
Top	Bottom	Average	H_o (ft)	p_o (psf)	p_p (psf)	Δp (psf)	p_f (psf)	c_r	c_c	e_o	Rebound Curve $C_{\varepsilon r}$	Virgin Curve $C_{\varepsilon c}$	εz^*	$\varepsilon z \times H_o$ = DH
5	7	6	2	315.6	2242.2	2188	2503.6	0.055	0.4	1.151	0.02557	0.18596	0.0307	0.74
7	9	8	2	420.8	2347.4	2166.12	2586.92	0.055	0.4	1.151	0.02557	0.18596	0.0269	0.65
9	11	10	2	526	2452.6	2144.24	2670.24	0.055	0.4	1.151	0.02557	0.18596	0.0240	0.58
11	13.5	12.25	2.5	644.35	2584.1	2122.36	2766.71	0.055	0.4	1.151	0.02557	0.18596	0.0209	0.63

Using Boring Information and consolidation test results from DH-218 — Total Settlement: 2.59

11.5-ft



P = UNIT LOAD OF EMBANKMENT

$\sigma_z = 2\ I * P$

Only modify h_w and I, all others are established formulas.

γ_{STONE} (pcf) = 125.0 Slope = 3.0 h_w = 5.0 h_e = 15.0 h_t = 20.0 b = 10.0	$P = \gamma_{STONE} * h_e + (\gamma_{STONE} - \gamma_{WATER}) * h_w$ P = 2188.00

z	a/z	b/z	I	2 I	$\sigma_z = 2\ I * P$
6.0	10.000	1.667	0.500	1.000	2188.00
8.0	7.500	1.250	0.495	0.990	2166.12
10.0	6.000	1.000	0.490	0.980	2144.24
12.25	4.898	0.816	0.485	0.970	2122.36

h_w is adjusted for extreme low tide of -3.5 MLLW.

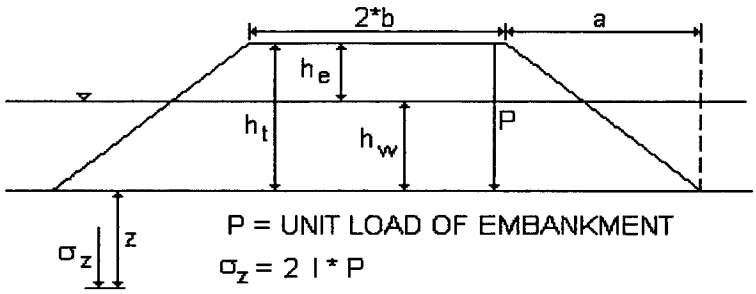
+12.0

COMPUTATION SHEET FOR CONSOLIDATION SETTLEMENT — CALCULATED BY: DEC
PROJECT JAMES ISLAND DIKE (DH-218) — DATE: 12/16/2004

Sublayer Depth (ft)			Sublayer Thickness	Effective Overburden Pressure	Preconsoli-dation Pressure	Pressure Change	Final Pressure	Recompress-ion Index	Compress-ion Index	Initial Void Ratio	Compression Ratio		Vertical Strain	Change in Thickness (in)
Top	Bottom	Average	H_o (ft)	p_o (psf)	p_p (psf)	Δp (psf)	p_f (psf)	c_r	c_c	e_o	Rebound Curve $C\varepsilon r$	Virgin Curve $C\varepsilon c$	εz^*	$\varepsilon z \times H_o$ = DH
5	7	6	2	315.6	2242.2	2250.5	2566.1	0.055	0.4	1.151	0.02557	0.18596	0.0327	0.78
7	9	8	2	420.8	2347.4	2228	2648.8	0.055	0.4	1.151	0.02557	0.18596	0.0288	0.69
9	11	10	2	526	2452.6	2205.49	2731.49	0.055	0.4	1.151	0.02557	0.18596	0.0258	0.62
11	13.5	12.25	2.5	644.35	2584.1	2182.99	2827.34	0.055	0.4	1.151	0.02557	0.18596	0.0227	0.68

Using Boring Information and consolidation test results from DH-218 — Total Settlement: 2.78

12-ft



Only modify h_w and I, all others are established formulas.

γ_{STONE} (pcf) = 125.0 Slope = 3.0 h_w = 5.0 h_e = 15.5 h_t = 20.5 b = 10.0	$P = \gamma_{STONE} * h_e + (\gamma_{STONE} - \gamma_{WATER}) * h_w$ P = 2250.50

z	a/z	b/z	I	2 I	$\sigma_z = 2\ I * P$
6.0	10.250	1.667	0.500	1.000	2250.50
8.0	7.688	1.250	0.495	0.990	2228.00
10.0	6.150	1.000	0.490	0.980	2205.49
12.25	5.020	0.816	0.485	0.970	2182.99

h_w is adjusted for extreme low tide of -3.5 MLLW.

Hole No. JB-218

DRILLING LOG	DIVISION NAD	INSTALLATION Baltimore District	SHEET 1 OF 2 SHEETS
1. PROJECT James Island Feasability Study		10. SIZE AND TYPE OF BIT 2 1/4" HSA	
2. LOCATION (Coordinates or Station) James Island, SC		11. DATUM FOR ELEVATION SHOWN (TBM or MSL)	
3. DRILLING AGENCY CENAD-EN-GGE		12. MANUFACTURER'S DESIGNATION OF DRILL CME 45 Barge Mounted	
4. HOLE NO. (As shown on drawing title and file number) JB-218		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 11	UNDISTURBED Ø
5. NAME OF DRILLER McNamara		14. TOTAL NUMBER CORE BOXES	
6. DIRECTION OF HOLE ☑ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.		15. ELEVATION GROUND WATER	
		16. DATE HOLE STARTED 9/21/04 COMPLETED 9/21/04	
7. THICKNESS OF OVERBURDEN 26.5'		17. ELEVATION TOP OF HOLE	
8. DEPTH DRILLED INTO ROCK		18. TOTAL CORE RECOVERY FOR BORING %	
9. TOTAL DEPTH OF HOLE 26.5'		19. SIGNATURE OF INSPECTOR William Q. Hazard	

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	0		GRAY FINE SAND w/ Shells wet	47	J-1	Hole was drilled with CME 45 using 2¼" Hollow Stem Augers. Standard penetration test conducted using automatic hammer, driving 1⅜" sp. Spoon Blow Count performed in 0.5' intervals for total 1.5' (drive) per sample interval.
	1					
	2					
	3			100	J-2	
	4		wet			
	5		GRAY & Brown Clay			
	6			100	J-3	
	7		MOIST			
	8			100	J-4	
	9		MOIST			
	10		GRAY CLAY		J-5	
	11		MOIST	100		
	12					
	13		GRAY CLAY MOIST	100	J-6	
13.4						
	14		BLACK Very Fine SAND w/ Gravel wet			
	15				J7	
	16		wet	100		
	17		GREEN SILT w/ Gravel DAMP			
	18		GREEN SILT		J-8	
	19		DAMP	100		

PRELIMINARY INSPECTOR'S LOG CLASSIFICATION NOT FINAL

JAR	DEPTH	BLOW COUNT	Percentro meter
1	0.0 - 1.5	WH/15	
2	2.5 - 4.0	5-3-3	
3	5.0 - 6.5	1/1.0-1	0-0-0
4	7.5 - 9.0	WH/1.5	0-0-0
5	10.0 - 11.5	WH/1.0-1	0-0-0
6	12.5 - 14.0	3-10-6	0-0-0
7	15.0 - 16.5	3-10-5	0-0-0
8	17.5 - 19.0	5-5-8	2.0 2.0 1.0
9	20.0 - 21.5	3-4-7	4.0 4.5+ 4.0
10	22.5 - 24.0	8-8-10	4.0 4.0 4.0
11	25.0 - 26.5	6-8-14	3.0 3.0 4.0

DRILLING LOG (Cont Sheet) | ELEVATION TOP OF HOLE | Hole No. JB-218

PROJECT: James Is. | INSTALLATION: Baltimore District | SHEET 2 OF 2 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	21		GRAY CLAY			GPS Coordinates
			DRY	100	J-9	N38° 30' 02.2"
	22					W076° 21' 09.5"
						ACCURACY 20.4'
	23			100	J-10	Water level
			DRY			Time 1015 1141
	24					Depth 9.5' 9.7'
	25					
	26			100	J-11	
			DRY			
	27		BOH - 26.5'			
	28					
	29					
	30					
	31					
	32					
	33					
	34					
	35					
	36					
	37					
	38					
	39					
	40					
	41					
	42					
	43					

PRELIMINARY INSPECTOR'S LOG CLASSIFICATION NOT FINAL

GPO 1980 OF - 623 - 603

PROJECT: James Is. | HOLE NO. JB-218

VISUAL-MANUAL CLASSIFICATION

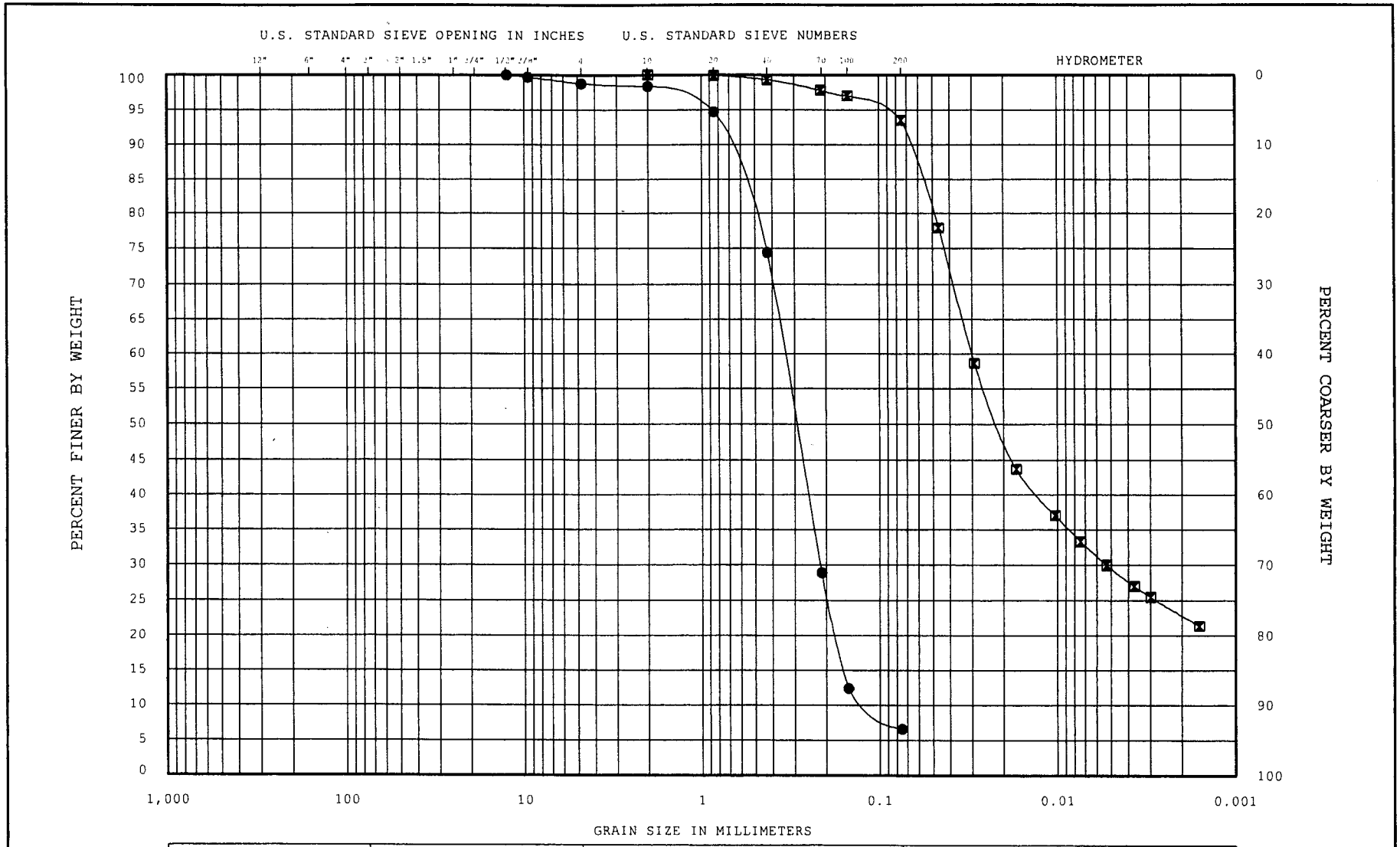
(Test method: ASTM D 2488)

PROJECT: James Island **DATE:** Oct 2004

AREA: Mid-Bay Feasibility Study **CLASSIFIED BY:** KUHN

Dorchester County, MD

SAMPLE NO.	DEPTH (ft)	VISUAL CLASSIFICATION	SYMBOL
JB -	218 DIKE		
JAR-1	0.0 - 1.5	Wet dk gray poorly graded fine sand w/ silt & shells	(SP-SM)
MA 1 - 2	2.5 - 4.0	- ditto -	(SP-SM)
- 3	5.0 - 6.5	Wet gray & lt. olive brn soft lean clay	(CL)
MA 1 - 4	7.5 - 9.0	- ditto -	(CL)
- 5	10.0 - 11.5	V. moist dk gray soft lean clay w/ sand	(CL)
- 6	12.5 - 14.0	- ditto -	(CL)
- 7	15.0 - 16.5	Wet v. dk grayish brn silty fine sand w/ gravel	(SM)
- 8	17.5 - 19.0	Moist lt. olive brn soft to firm silt	(ML)
- 9	20.0 - 21.5	Moist dk greenish gray firm lean clay	(CL)
- 10	22.5 - 24.0	- ditto -	(CL)
- 11	25.0 - 26.5	- ditto -	(CL)



Legend	Sample No.	Depth (ft)	Classification (ASTM D 2487)		Nat wc%	LL	PL	PI
—●—	Jars 1&2	0.0-4.0	POORLY GRADED SAND with SILT	SP-SM	20.6			
—⊠—	Jars 3&4	5.0-9.0	LEAN CLAY	CL	32.4	30	18	12
— —								
— —								

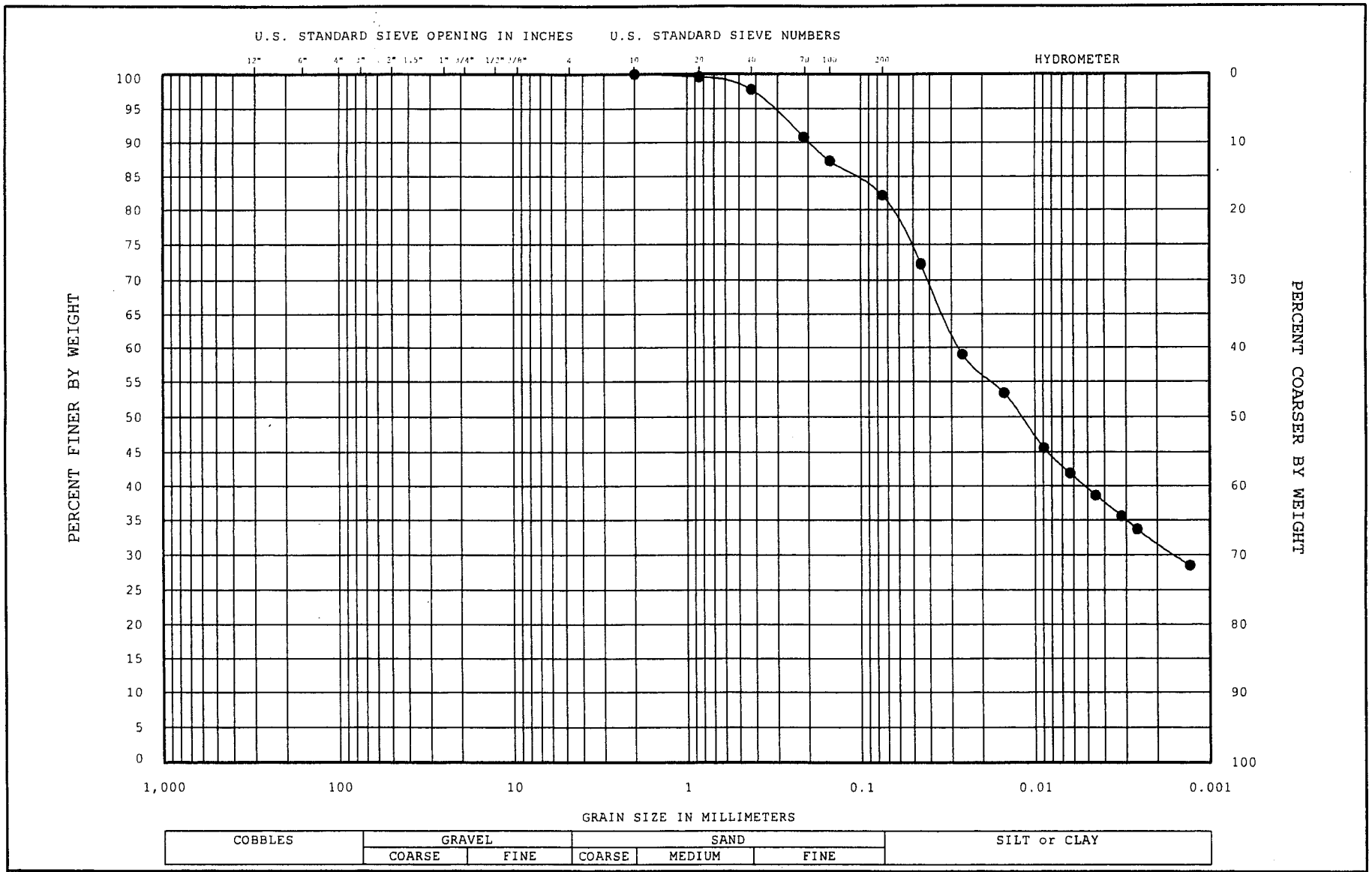
REMARKS :

ENG FORM ENG2087JAMES ISLAND, MID-BAY FEASIBILITY STUDY.GPJ **GRADATION CURVES** TEST METHODS: ASTM D 422, D4318, D2216

PROJECT: *James Island*
AREA: *Mid-Bay Feasibility Study*
Dorchester County, MD

BORING NO.: *JB-218*

DATE: *Dec 2004*



Legend	Sample No.	Depth (ft)	Classification (ASTM D 2487)		Nat wc%	LL	PL	PI
—●—	Shelby-1	8.0-10.0	LEAN CLAY with SAND	CL	39.7	42	19	23

REMARKS :

PROJECT: *James Island*
AREA: *Mid-Bay Feasibility Study*
Dorchester County, MD

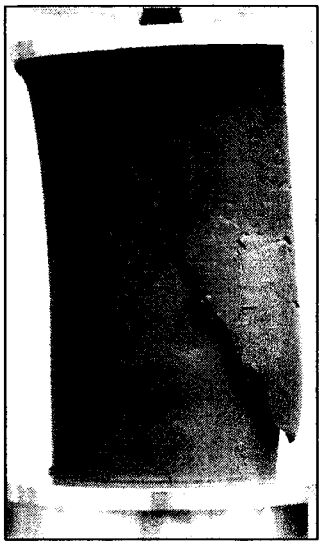
BORING NO.: *JB-218A*

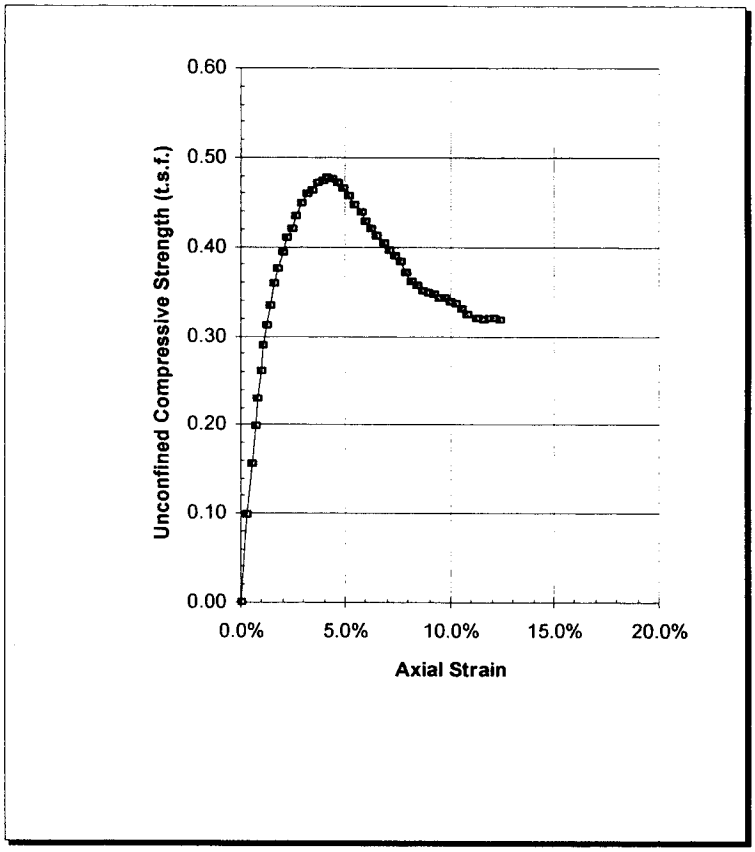
DATE: *Nov 2004*

ENG FORM ENG2087JAMES ISLAND, MID-BAY FEASIBILITY STUDY.GPJ **GRADATION CURVES** TEST METHODS: ASTM D 422, D4318, D2216

UNCONFINED COMPRESSION TEST

FAILURE SKETCHES





CONTROLLED STRAIN

TEST NO.		1	2	3	4
TYPE OF SPECIMEN		Undisturbed			
WATER CONTENT, %	w_o	35.7			
VOID RATIO	e_o	0.842			
SATURATION, %	S_o	100+			
DRY UNIT WEIGHT, LB./CU.FT.	γ_d	86.4			
TIME TO FAILURE, MIN.	t_f	5.0			
UNCONFINED COMPRESSIVE STRENGTH, TSF	q_u	0.48			
UNDRAINED SHEAR STRENGTH, TSF	s_u	0.24			
SENSITIVTY RATIO	S_t	------			
INITIAL SPECIMEN DIAMETER, IN.	D_o	2.87			
INITIAL SPECIMEN HEIGHT, IN.	H_o	6.14			

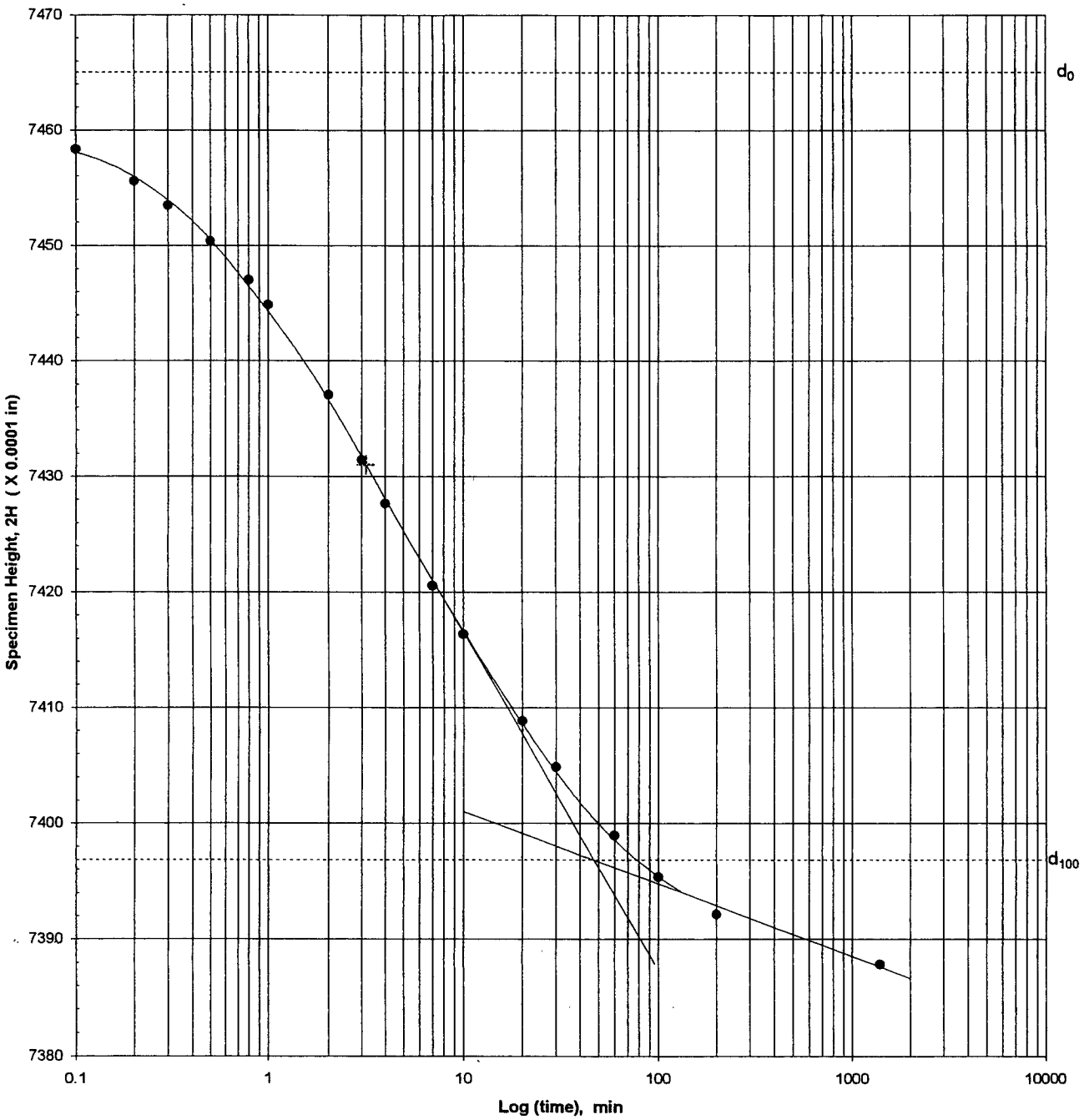
CLASSIFICATION: (ASTM D2487)

V.moist, dk. greenish gray, soft-firm, LEAN CLAY w/ sand (CL)

LL= 42	PL= 19	PI= 23 (ASTM D4318)	G_S= 2.55 (ASTM D854)

REMARKS:	**PROJECT:** James Island
	Mid-Bay Feasiblity Study
	AREA: Dorchester County, MD
	Hole No.: DH-218A **Sample No.:** Shelby-1
	Depth (ft.): 8.0-10.0 **Date:** Dec.2004
ENG FORM 3659 (Test method: ASTM D2166)	**UNCONFINED COMPRESSION TEST REPORT**

t_{50} TIME CURVE



U.S.Army Corps of Engineers
Materials & Instrumentation Section
Baltimore, Maryland 21230

PROJECT: Dorchester County, MD
Mid-Bay Feasibility Study

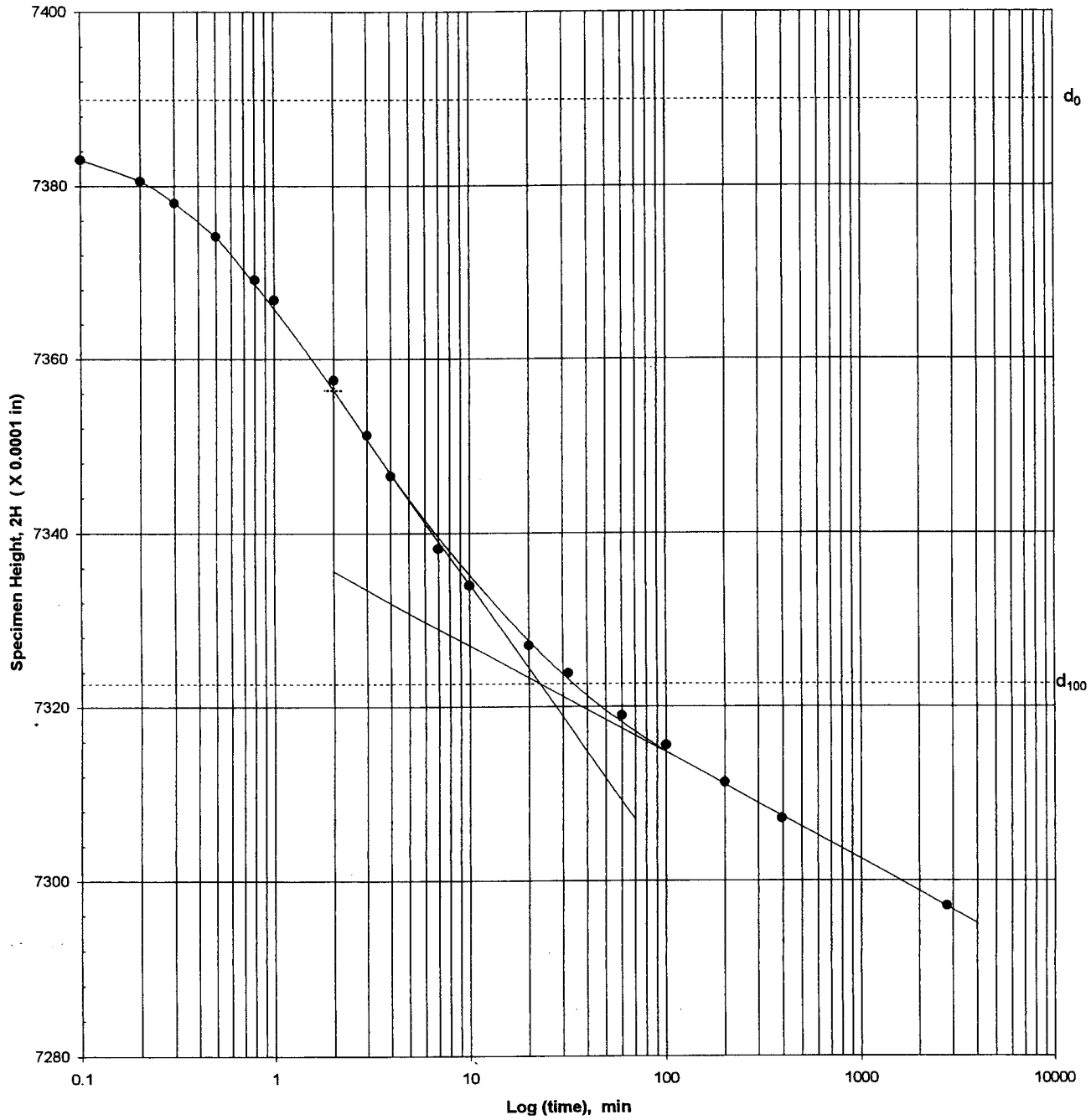
AREA: James Island

Normal Stess =	**0.25**	tons/ft²
t_{50} =	3.18	min
H =	0.3715	in
c_v =	1.42 X 10^{-4}	in²/sec

Hole No.:	Sample No.:	Depth (ft):
JB-218A	Shelby-1	8.0-10.0

ENG Form 2088 **CONSOLIDATION TEST - TIME CURVE**

t_{50} TIME CURVE



U.S.Army Corps of Engineers
Materials & Instrumentation Section
Baltimore, Maryland 21230

PROJECT: Dorchester County, MD
Mid-Bay Feasibility Study

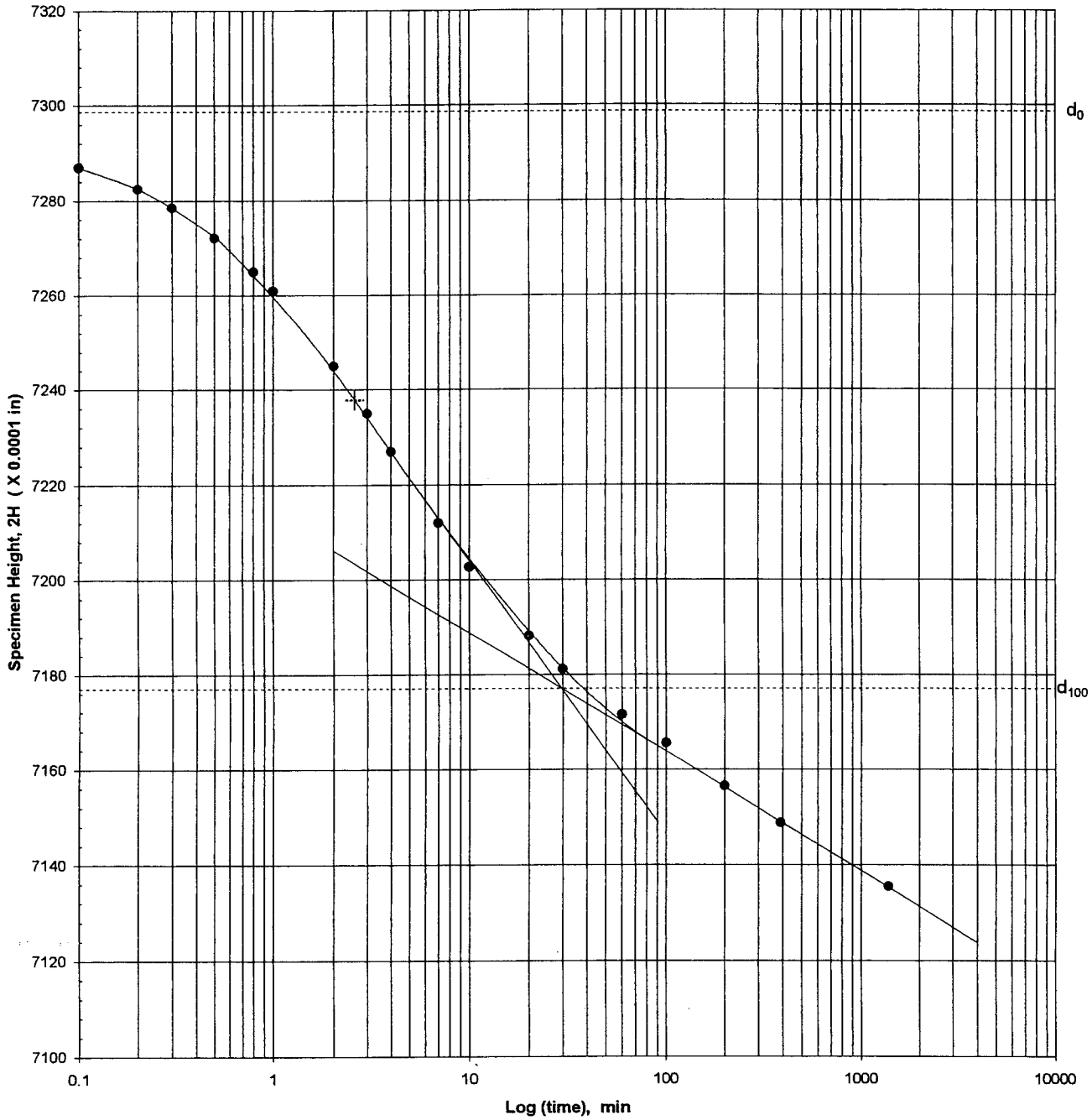
AREA: James Island

Normal Stess =	**0.5**	tons/ft²
t_{50} =	2	min
H =	0.3678	in
c_v =	2.21 X 10^{-4}	in²/sec

Hole No.:	**Sample No.:**	**Depth (ft):**
JB-218A	Shelby-1	8.0-10.0

ENG Form 2088 **CONSOLIDATION TEST - TIME CURVE**

t_{50} TIME CURVE



U.S.Army Corps of Engineers
Materials & Instrumentation Section
Baltimore, Maryland 21230

PROJECT: Dorchester County, MD
Mid-Bay Feasibility Study

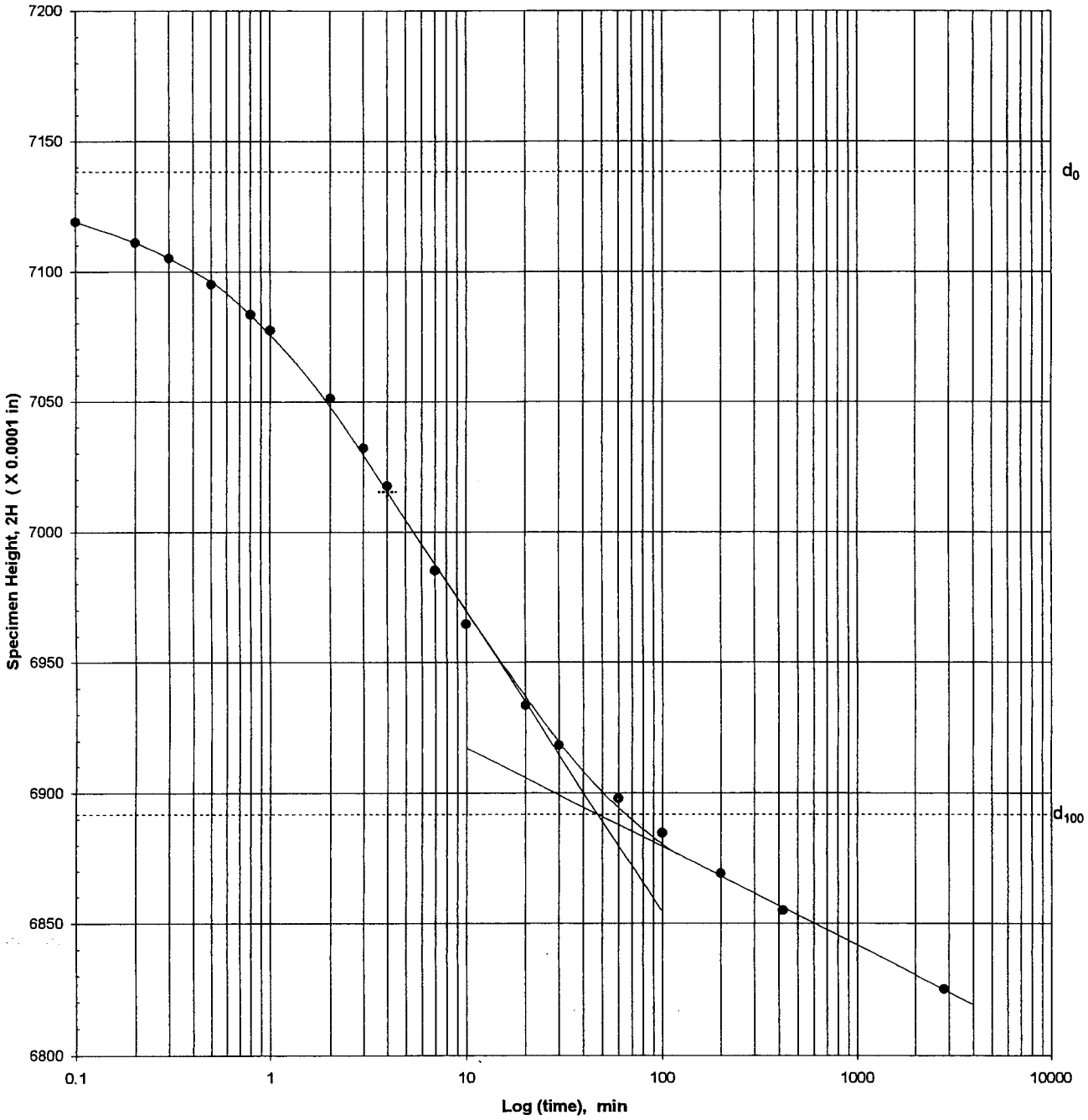
AREA: James Island

Normal Stess =	**1.0**	tons/ft²
t_{50} =	2.58	min
H =	0.3619	in
c_v =	1.66 X 10^{-4}	in²/sec

Hole No.:	**Sample No.:**	**Depth (ft):**
JB-218A	Shelby-1	8.0-10.0

ENG Form 2088 **CONSOLIDATION TEST - TIME CURVE**

t_{50} TIME CURVE



U.S.Army Corps of Engineers
Materials & Instrumentation Section
Baltimore, Maryland 21230

PROJECT: Dorchester County, MD
Mid-Bay Feasibility Study

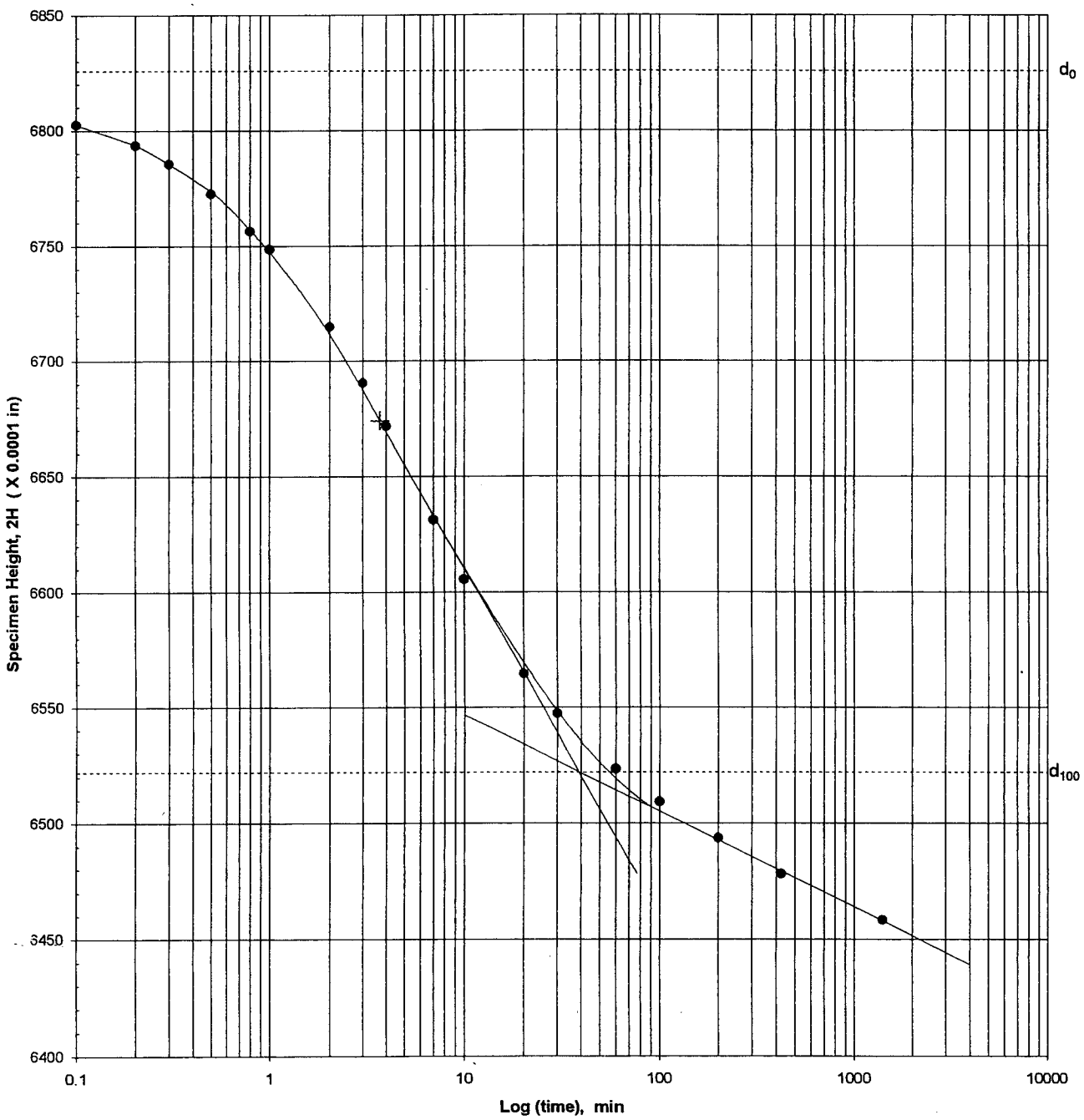
AREA: James Island

Normal Stess =	**2.0**		tons/ft²
t_{50} =	4.02		min
H =	0.3508		in
c_v =	1.00	X 10^{-4}	in²/sec

Hole No.:	**Sample No.:**	**Depth (ft):**
JB-218A	Shelby-1	8.0-10.0

ENG Form 2088 **CONSOLIDATION TEST - TIME CURVE**

t_{50} TIME CURVE



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Materials & Instrumentation Section
Baltimore, Maryland 21230

PROJECT: Dorchester County, MD
Mid-Bay Feasibility Study

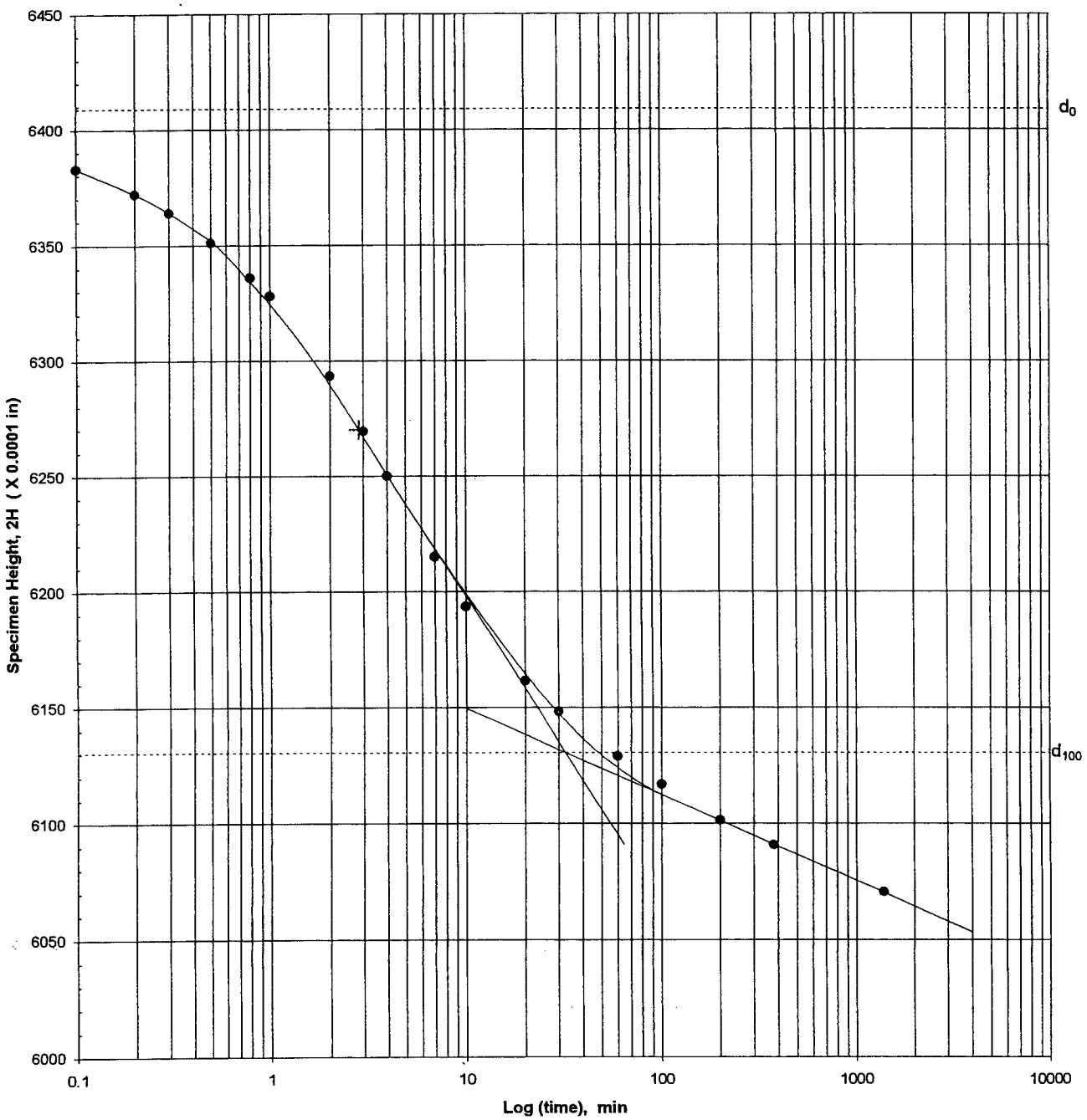
AREA: James Island

Normal Stess =	**4.0**		tons/ft²
t_{50} =	3.72		min
H =	0.3337		in
c_v =	9.78	X 10^{-5}	in²/sec

Hole No.:	Sample No.:	Depth (ft):
JB-218A	Shelby-1	8.0-10.0

ENG Form 2088 — CONSOLIDATION TEST - TIME CURVE

t_{50} TIME CURVE



U.S.Army Corps of Engineers
Materials & Instrumentation Section
Baltimore, Maryland 21230

PROJECT: Dorchester County, MD
Mid-Bay Feasibility Study

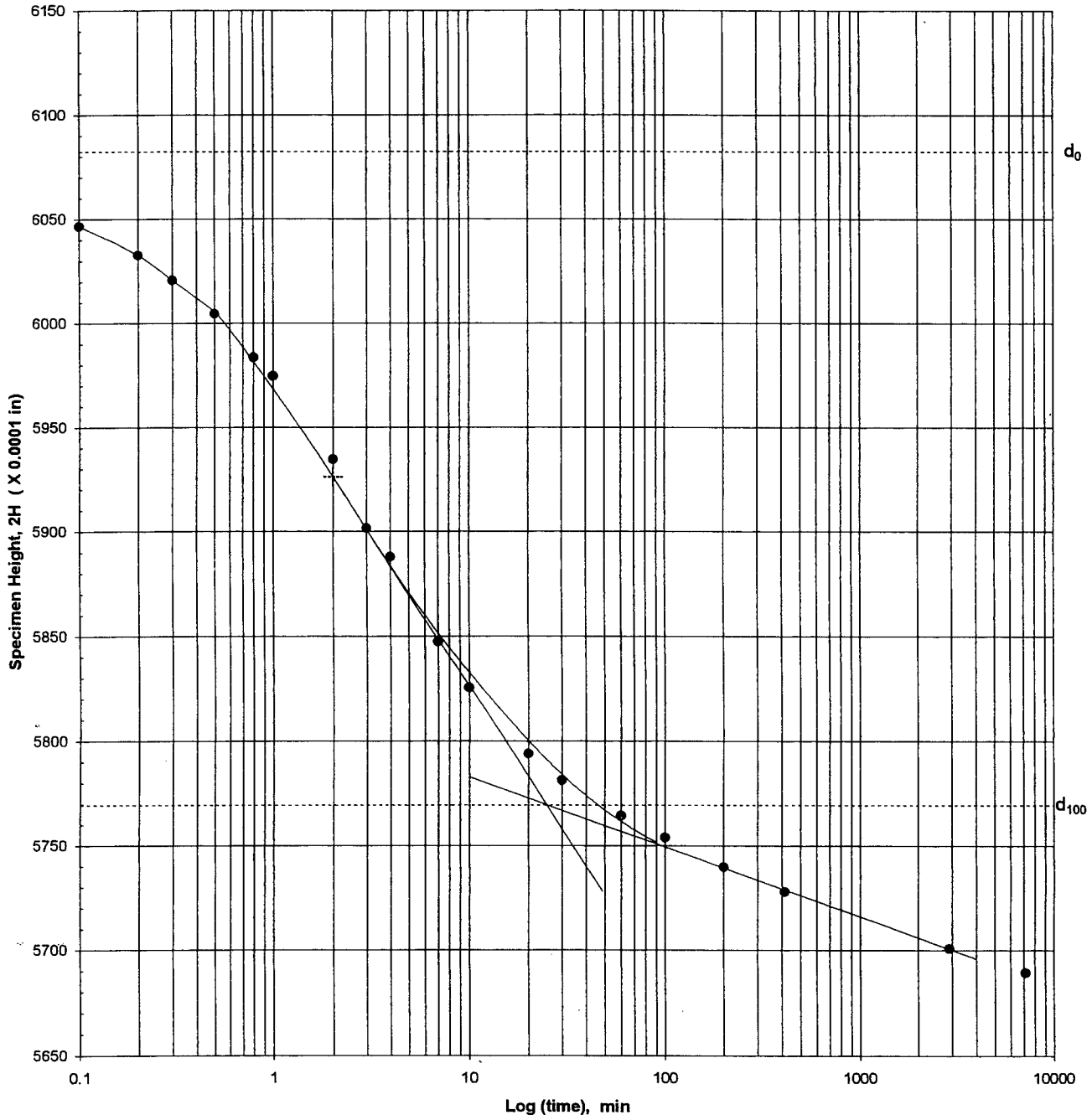
AREA: James Island

Normal Stess =	**8.0**	tons/ft²
t_{50} =	2.84	min
H =	0.3135	in
c_v =	1.13 X 10^{-4}	in²/sec

Hole No.:	**Sample No.:**	**Depth (ft):**
JB-218A	Shelby-1	8.0-10.0

ENG Form 2088 — **CONSOLIDATION TEST - TIME CURVE**

t_{50} TIME CURVE



U.S.Army Corps of Engineers
Materials & Instrumentation Section
Baltimore, Maryland 21230

PROJECT: Dorchester County, MD
Mid-Bay Feasibility Study

AREA: James Island

Normal Stess =	**16.0**		tons/ft²
t_{50} =	2		min
H =	0.2963		in
c_v =	1.43	X 10^{-4}	in²/sec

Hole No.:	Sample No.:	Depth (ft):
JB-218A	Shelby-1	8.0-10.0

ENG Form 2088 **CONSOLIDATION TEST - TIME CURVE**

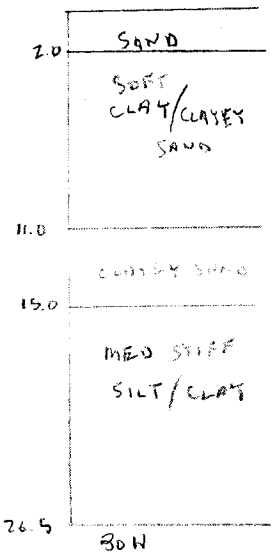
SETTLEMENT ANALYSIS FOR DH-229

ASSUME A DIKE SECTION TO +25 WITH SIDESLOPES OF 3H:1V AND A CREST WIDTH OF 20 FEET. DEPTH OF WATER IS ASSUMED TO BE 8.7 FEET AT MLLW. USE EXTREME LOW TIDE OF -3.5 MLLW TO COMPUTE STRESS CHANGES FROM DIKE.

A CONSOLIDATION TEST WAS PERFORMED ON A CLAYEY SAND SAMPLE OBTAINED FROM A DEPTH OF 6.6-8.0'. CONSOLIDATION TEST RESULTS SHOW A C_c OF .263 (FROM CORRELTED CURVE) AND A C_r OF .023. A PRECONSOLIDATION PRESSURE OF .9 tsf (1800 psf) WAS DETERMINED FROM THE e-log p CURVE.

OVERBURDEN PRESSURE, $P_o = (115-62.4)(7) = 368.2$ psf

OCR = 1800/368.2 = 4.89 (DUE TO JAMES ISLAND PREVIOUSLY EXISTING AT THIS LOCATION)



ASSUMED COMPRESSIBLE LAYER 9.0-FT IN THICKNESS.

ESTIMATED CONSOLIDATION SETTLEMENT IS 6.5". (SEE ATTACHED SPREADSHEET)

TUBE CLASSIFICATION

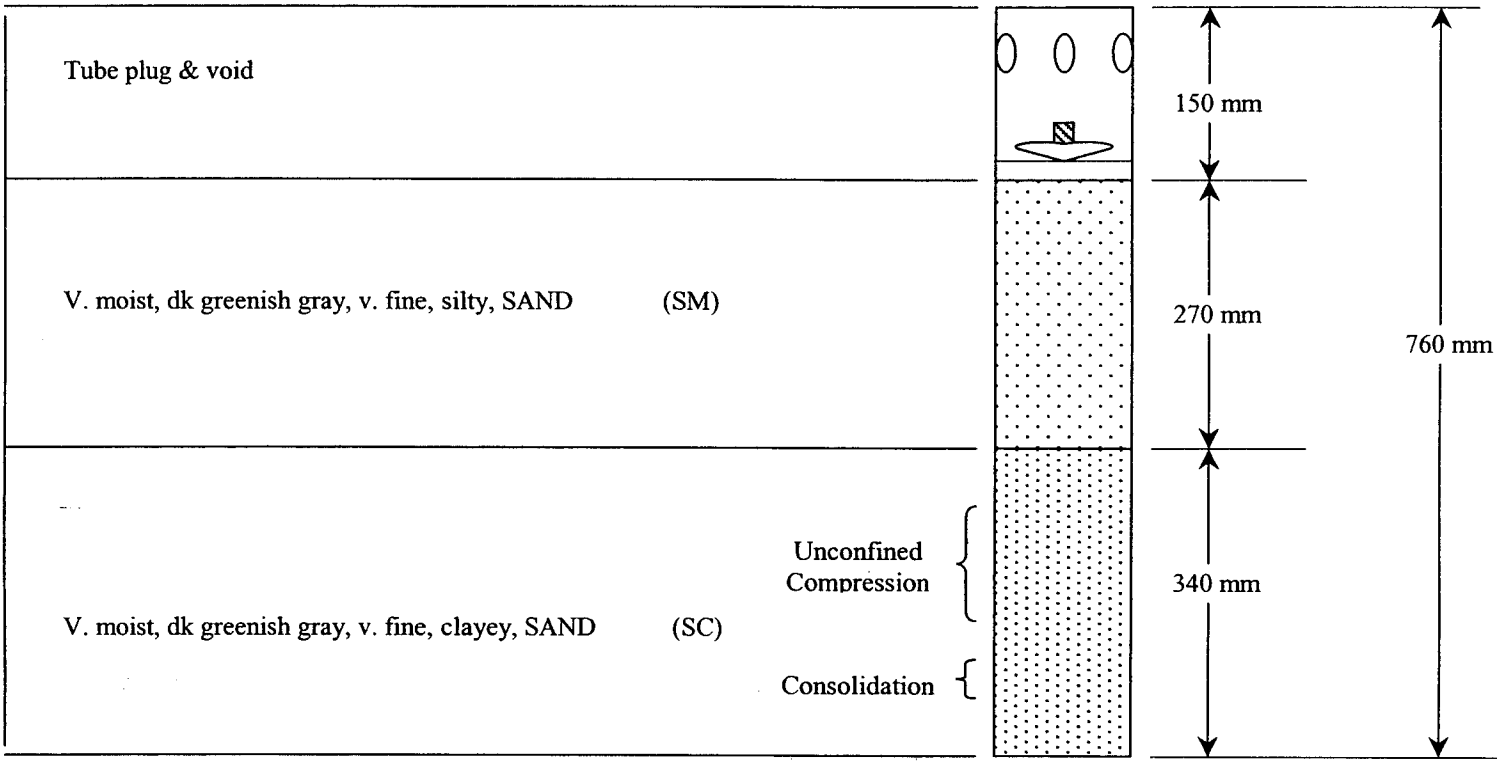
ASTM D2487

PROJECT: Mid-Bay Feasibility Study
James Island

AREA: Dorchester County, MD

DATE: Nov 2004

Hole No.	Sample No.	Depth (ft)
DH-229A	Shelby-1	6.0-8.0



STA.
OFFSET:
TOP ELEV:

MID-BAY ISLAND FEASIBILITY STUDY
JAMES ISLAND, DORCHESTER COUNTY, MD

N 314904.49
E 1495559.61

JB-229
1 of 1
COMPLETED: September 24, 2004

DEPTH(ft)	(c)	(d)	(a)	(b)
	Wet, lt. yellowish brown, silty med. to fine SAND w/tr. of gravel & shell frags. (SM) PPR 0.0'-1.5': 0.5, 0.5, --		2-1-1	
2.00				
	V. moist, gray, sandy lean CLAY (CL)		1/1.5	35.8
			5	
			WH/1.5	
6.50				
7.25 P	V. moist, dk. greenish gray, v. fine silty SAND (SM)			31.4
8.00	V. moist, dk. greenish gray, v. fine clayey SAND (SC)			
	V. moist, dk. gray, sandy lean to fat CLAY (CL/CH)		WH/1.5	
9.50				
	V. moist, dk. gray, clayey med. to fine SAND w a +1" rock (SC)		10	
			WH/1.0-3	
12.00				
	Wet, gray, clayey med. to fine SAND w/tr. of gravel (SC)		2-3-4	35.8
14.50				
	Moist, gray, clayey fine SAND (SC) PPR 15.0'-16.5': 3.0, 3.0, 3.0		15	
			2-5-8	
17.00				
	Moist, grayish brown, fine sandy lean to fat CLAY (CL/CH) PPR 17.5'-19.0': >4.5, >4.5, >4.5		4-7-10	
19.50				
	Moist, grayish brown, clayey fine SAND w/tr. of shell frags. (SC/CL) PPR 20.0'-21.5': 3.0, 3.0, 3.0		20	
			6-4-8	
	PPR 22.5-24.0': 3.0, >4.5, 3.0		3-6-8	
24.50				
	Moist, grayish brown, clayey fine SAND w/tr. of gravel & shell frags. (SC)		25	
	PPR 25.0'-26.5': 3.0, 3.5, 3.5		3-8-12	
26.50				
	BOTTOM OF HOLE			
	Depth of bay water @ start of boring 10.1' @ 1649 Hrs. Depth of bay water @ completion 10.0' @ 1756 Hrs.			

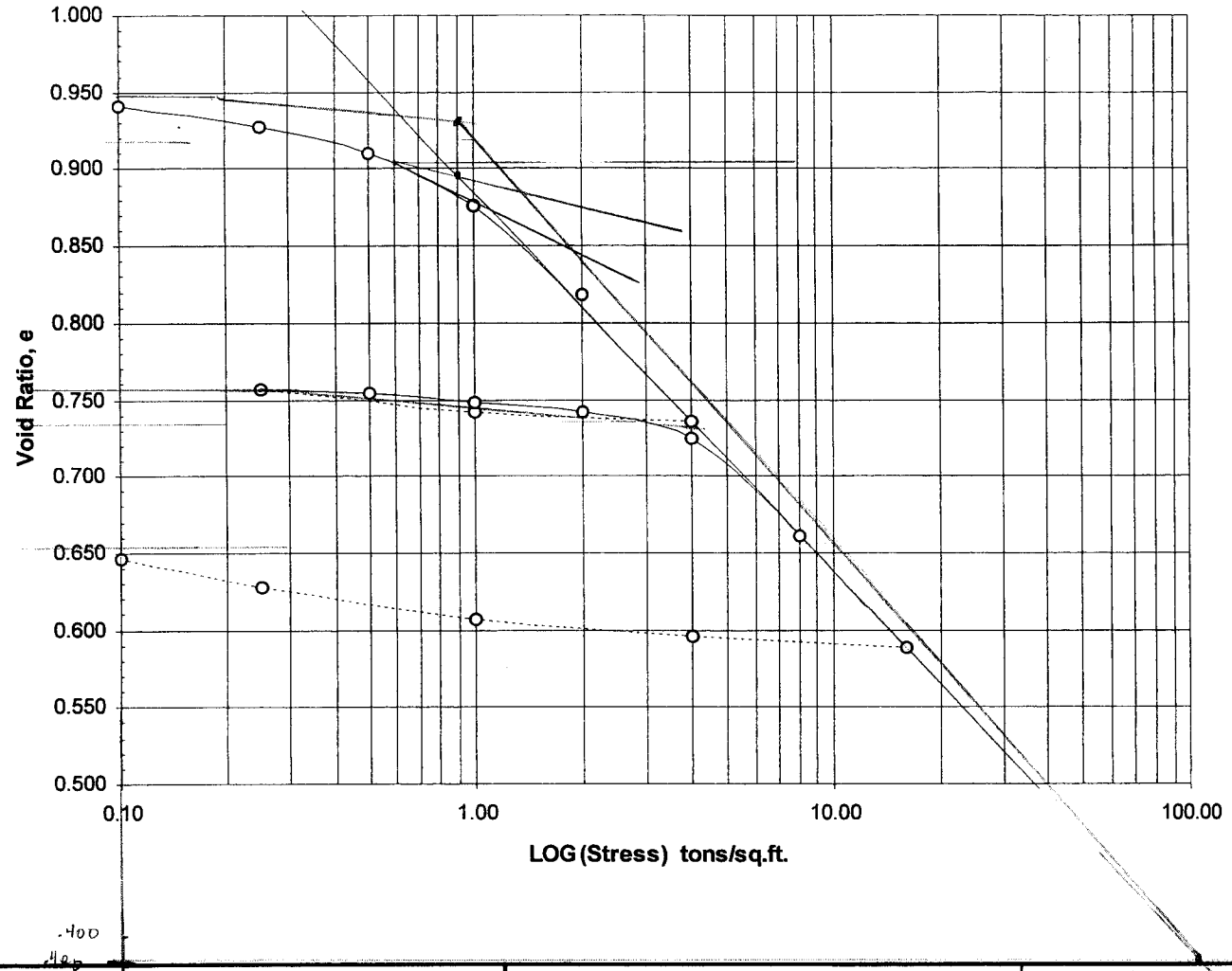
JB-229
GROUNDWATER DATA
WHILE DRILLING:
ON COMPLETION:
Hr. READING:

GROUNDWATER DATA
WHILE DRILLING:
ON COMPLETION:
Hr. READING:

P - indicates pressed shelby tube sample obtained from an additional boring.

Fill | Auger | SPT | RB
Cored | 300 lb | Tubex | Hand
Fish Tail | Vibra Core | Water Jet | Odex

GEO-2 JAMESISL.GPJ 12/21/04 10:03



Type of Specimen: **Undisturbed**			Before Test			After Test
Diameter= **2.50** in.	Height= **0.75** in.	Water Content, %	w_o	33.0	w_f	24.4
Overburden Pressure, p_o = .184 tons/sq.ft.		Void Ratio	e_o	0.948	e_f	0.668
Preconsol. Pressure, p_c = .900 tons/sq.ft.		Saturation, %	S_o	95.4	S_f	100.1
Compression Index, C_c = ~~0.246~~ .263		Dry Density	γ_d	87.8	lbs./cu.ft.	
Classification (ASTM D2487): Very moist, dark greenish gray, very fine, clayey, SAND. (SC)						

LL = 38	PL = 16	PI= 22 (ASTM D4318)	G_s = 2.74 (ASTM D854)

Remarks:	**PROJECT:** Dorchester County, MD	
	Mid-Bay Feasibility Study	
	AREA: James Island	
	Hole No.: JB-229A	**Sample No.:** Shelby-1
	Depth (ft.): 6.0-8.0	**Date:** Dec.2004
ENG FORM 2090 (Test method: ASTM D2435)	**CONSOLIDATION TEST REPORT**	

COMPUTATION SHEET FOR CONSOLIDATION SETTLEMENT
PROJECT: JAMES ISLAND DIKE (DH-229)

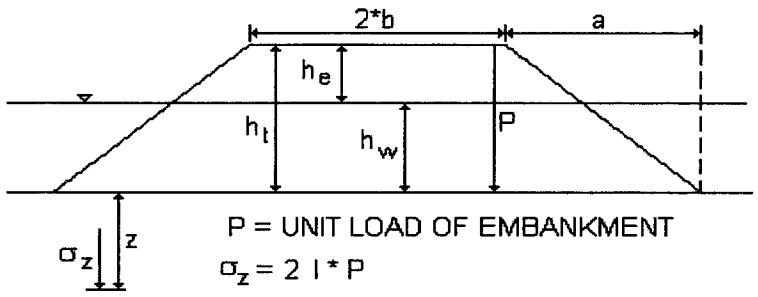
CALCULATED BY: DEC
DATE: 12/16/2004

Sublayer Depth (ft)			Sublayer Thickness	Effective Overburden Pressure	Preconsoli-dation Pressure	Pressure Change	Final Pressure	Recompress-ion Index	Compress-ion Index	Initial Void Ratio	Compression Ratio		Vertical Strain	Change in Thickness (in)
Top	Bottom	Average	H_o (ft)	p_o (psf)	p_p (psf)	Δp (psf)	p_f (psf)	c_r	c_c	e_o	Rebound Curve $C_{\varepsilon r}$	Virgin Curve $C_{\varepsilon c}$	εz^*	$\varepsilon z \times H_o$ = DH
2	5	3.5	3	184.1	1615.9	3888.02	4072.12	0.023	0.263	0.948	0.011807	0.13501	0.0653	2.35
5	8	6.5	3	341.9	1773.7	3888.02	4229.92	0.023	0.263	0.948	0.011807	0.13501	0.0594	2.14
8	11	9.5	3	499.7	1931.5	3888.02	4387.72	0.023	0.263	0.948	0.011807	0.13501	0.0550	1.98

Using Boring Information and consolidation test results from DH-229

Total Settlement: 6.47

25-ft



Only modify h_w and I, all others are established formulas.

γ_{STONE} (pcf) = 125.0 Slope = 3.0 h_w = 5.2 h_e = 28.5 h_t = 33.7 b = 10.0	$P = \gamma_{STONE} * h_e + (\gamma_{STONE} - \gamma_{WATER}) * h_w$ P = 3888.02

z	a/z	b/z	I	2 I	$\sigma_z = 2\ I * P$
3.5	28.886	2.857	0.500	1.000	3888.02
6.5	15.554	1.538	0.500	1.000	3888.02
9.5	10.642	1.053	0.500	1.000	3888.02

h_w is adjusted for extreme low tide of -3.5 MLLW.

Hole No. JB- 229

DRILLING LOG	DIVISION: NAD	INSTALLATION: Baltimore District	SHEET 1 OF 2 SHEETS
1. PROJECT: JAMES ISLAND FEASABILITY STUDY		10. SIZE AND TYPE OF BIT: 2¼" HSA	
2. LOCATION (Coordinates or Station): JAMES Is., MD		11. DATUM FOR ELEVATION SHOWN (TBM or MSL):	
3. DRILLING AGENCY: CENAD-EN-GGE		12. MANUFACTURER'S DESIGNATION OF DRILL: CME 45 Barge Mounted	
4. HOLE NO. (As shown on drawing title and file number): JB- 229		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 11 / UNDISTURBED Ø	
5. NAME OF DRILLER: McNamara		14. TOTAL NUMBER CORE BOXES:	
6. DIRECTION OF HOLE: ☑ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.		15. ELEVATION GROUND WATER:	
7. THICKNESS OF OVERBURDEN: 26.5'		16. DATE HOLE: STARTED 9/24/04 COMPLETED 9/24/04	
8. DEPTH DRILLED INTO ROCK:		17. ELEVATION TOP OF HOLE:	
9. TOTAL DEPTH OF HOLE: 26.5		18. TOTAL CORE RECOVERY FOR BORING: %	
		19. SIGNATURE OF INSPECTOR: William J. Merrill	

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	0		BLACK FINE SAND w/shells -0.6'- wet	67	J-1	Hole was drilled with CME 45 using 2¼" Hollow Stem Augers. Standard penetration Test conducted using automatic hammer, driving 1⅜" split-spoon. Blow Count performed in 0.5' intervals for total 1.5' Advance per sample interval.
	1		TAN CLAY - 0.4' moist			
	2					
	3		GRAY CLAY	73	J-2	
	4		wet			
	5					
	6			100	J-3	
	7		wet			
	8			100	J-4	
	9		wet			
	10		GRAY SANDY CLAY w/STONE FRAGS	100	J-5	
	11		wet			
	12					
	13			100	J-6	
	14		wet			
	15		GRAY SILT w/shells	100	J-7	
	16		wet			
	17					
	18			100	J-8	
	19		Dry			

PRELIMINARY INSPECTOR'S LOG CLASSIFICATION NOT FINAL

JAR	DEPTH	BLOW COUNT	Penetrometer
1	1.0 - 1.5	2-1-1	0.5 0.5 0-
2	2.5 - 4.0	1/1.5	0- 0- 0-
3	5.0 - 6.5	WH/1.5	0- 0- 0-
4	7.5 - 9.0	WH/1.5	0- 0- 0-
5	10.0 - 11.5	WH/1.0-3	
6	12.5 - 14.0	2-3-4	
7	15.0 - 16.5	2-5-8	3.0 3.0 3.0
8	17.5 - 19.0	4-7-10	4.5+ 4.5+ 4.5+
9	20.0 - 21.5	6-4-8	5.0 5.0 5.0
10	22.5 - 24.0	3-6-8	3.0 4.5+ 5.0
11	25.0 - 26.5	3-8-12	3.0 3.5 3.5

DRILLING LOG (Cont Sheet) | ELEVATION TOP OF HOLE | Hole No. JB 229

PROJECT: JAMES Is. | INSTALLATION: Baltimore District | SHEET 2 OF 2 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	21		GRAY SILT	100	J-9	GPS Coordinates
	22		Dry			N 38° 31' 46.5"
	23			100	J-10	W 76° 21' 34.2"
	24		DAMP			Accuracy 18.2'
	25					Water Level
	26		DAMP	100	J-11	Depth 10.1' 10.0'
	27		B.O.H. -26.5'			Time 1649 1756
	28					
	29					
	30					
	31					
	32					
	33					
	34					
	35					
	36					
	37					
	38					
	39					
	40					
	41					
	42					
	43					

PRELIMINARY INSPECTOR'S LOG CLASSIFICATION NOT FINAL

GPO 1900 OF - 620 - 603

PROJECT: JAMES Is | HOLE NO. JB-229

VISUAL-MANUAL CLASSIFICATION

(Test method: ASTM D 2488)

PROJECT: James Island **DATE:** Oct 2004

AREA: Mid-Bay Feasibility Study **CLASSIFIED BY:** Estes

Dorchester County, MD

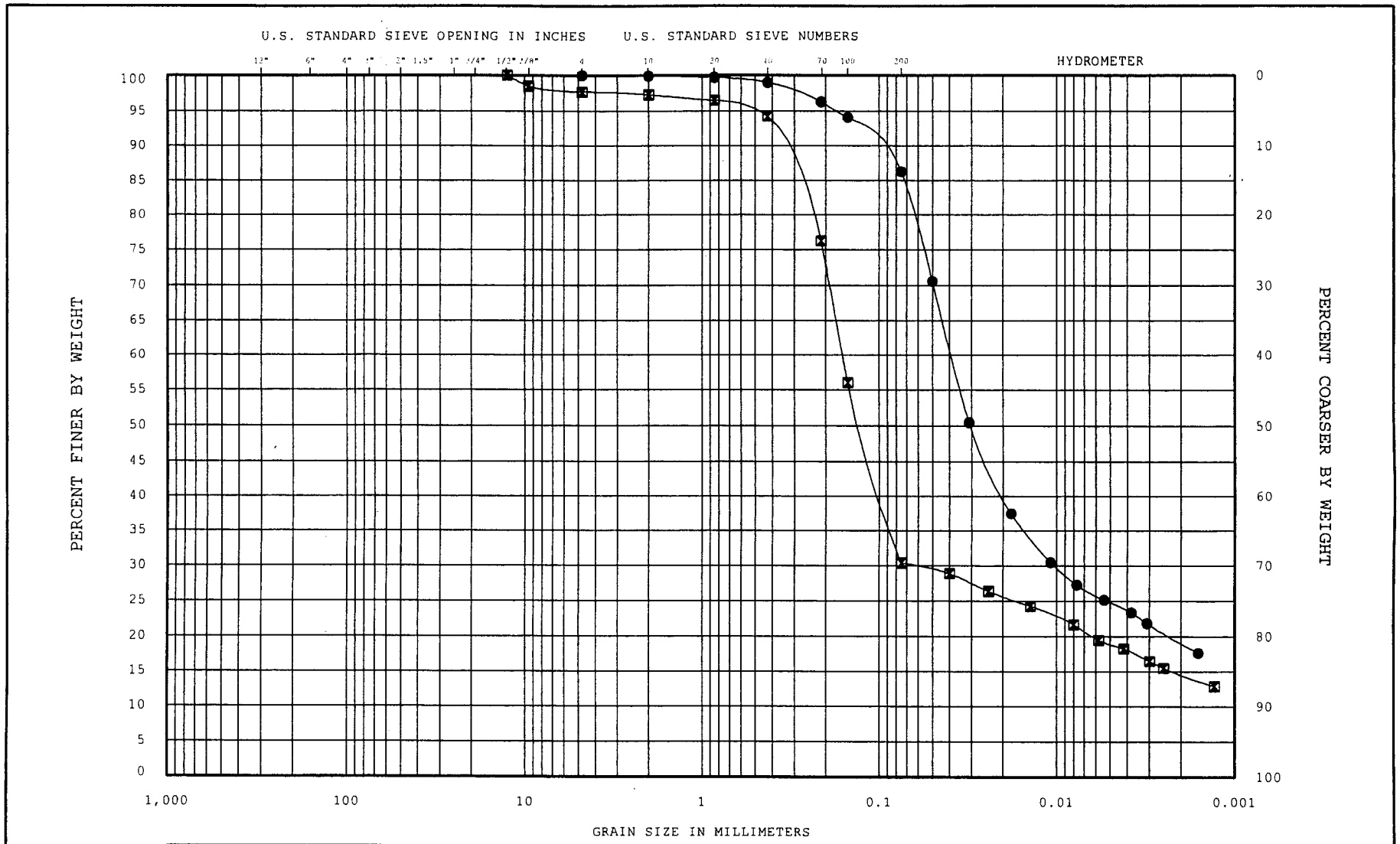
SAMPLE NO.	DEPTH (ft)	VISUAL CLASSIFICATION	SYMBOL
JB-229			
JAR-1	0.0-1.5	wet ltyelbrn silty sand ①② trace of gravel	(SM)
-2	2.5-4.0	very moist gry sandy lean clay	(CL)
MAL -3	5.0-6.5	ditto	(CL)
-4	7.5-9.0	very moist dk gry sandy lean to fat clay	CL/CH
-5	10.0-11.5	very moist dk gry clayey sand ①③	(SC)
MA -6	12.5-14.0	wet gry clayey sand ① trace of gravel	(SC)
-7	15.0-16.5	moist gry clayey sand ④	(SC)
-8	17.5-19.0	moist grybrn sandy ④ lean to fat clay	CL/CH
-9	20.0-21.5	moist grybrn clayey sand ④②	SC/CL
-10	22.5-24.0	ditto ④②	SC/CL
-11	25.0-26.5	moist grybrn clayey sand ④② trace of gravel	(SC)

① medium to fine sand

② trace of shell fragments

③ with a +1" rock

④ fine sand



Legend	Sample No.	Depth (ft)	Classification (ASTM D 2487)		Nat wc%	LL	PL	PI
—●—	Jars 2&3	2.5-6.5	LEAN CLAY	CL	35.8	34	20	14
—⊠—	Jars 5-7	10.0-16.5	CLAYEY SAND	SC	35.8			
— —								
— —								

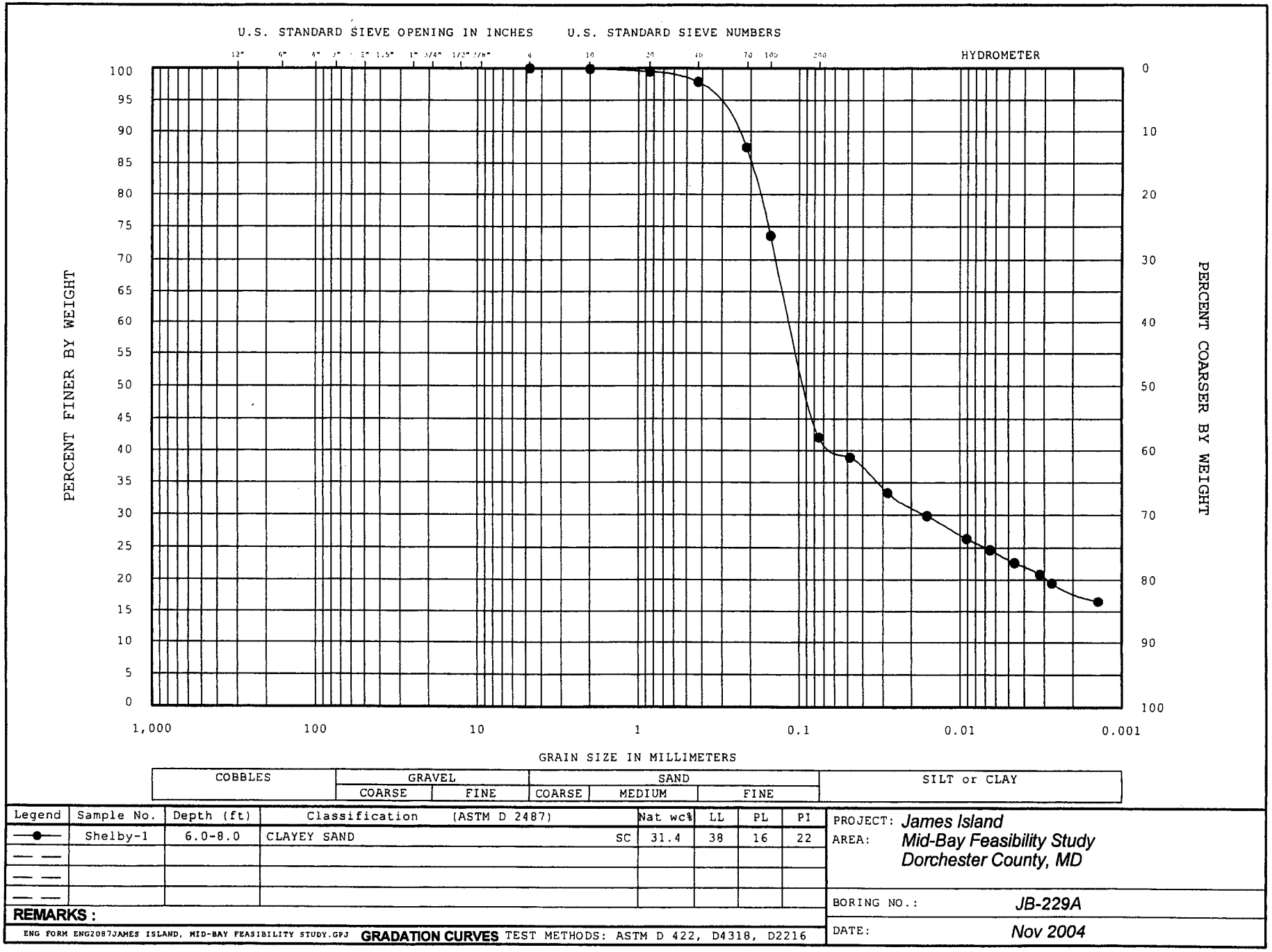
REMARKS :

ENG FORM ENG2087JAMES ISLAND, MID-BAY FEASIBILITY STUDY.GPJ **GRADATION CURVES** TEST METHODS: ASTM D 422, D4318, D2216

PROJECT: *James Island*
AREA: *Mid-Bay Feasibility Study*
Dorchester County, MD

BORING NO.: *JB-229*

DATE: *Dec 2004*



Legend	Sample No.	Depth (ft)	Classification (ASTM D 2487)		Nat wc%	LL	PL	PI
—●—	Shelby-1	6.0-8.0	CLAYEY SAND	SC	31.4	38	16	22
— —								
— —								
— —								

REMARKS :

ENG FORM ENG2087JAMES ISLAND, MID-BAY FEASIBILITY STUDY.GPJ **GRADATION CURVES** TEST METHODS: ASTM D 422, D4318, D2216

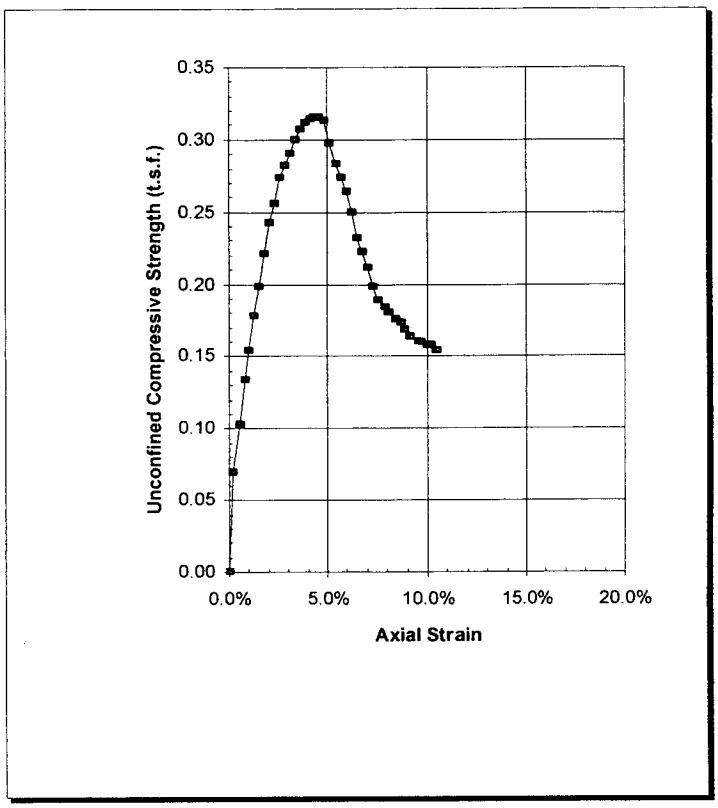
PROJECT: *James Island*
AREA: *Mid-Bay Feasibility Study*
Dorchester County, MD

BORING NO.: *JB-229A*

DATE: *Nov 2004*

UNCONFINED COMPRESSION TEST

FAILURE SKETCHES



CONTROLLED STRAIN

TEST NO.		1	2	3	4
TYPE OF SPECIMEN		Undisturbed			
WATER CONTENT, %	w_o	32.2			
VOID RATIO	e_o	0.787			
SATURATION, %	S_o	100+			
DRY UNIT WEIGHT, LB./CU.FT.	γ_d	88.7			
TIME TO FAILURE, MIN.	t_f	4.5			
UNCONFINED COMPRESSIVE STRENGTH, TSF	q_u	0.32			
UNDRAINED SHEAR STRENGTH, TSF	s_u	0.16			
SENSITIVTY RATIO	S_t	------			
INITIAL SPECIMEN DIAMETER, IN.	D_o	2.87			
INITIAL SPECIMEN HEIGHT, IN.	H_o	6.11			

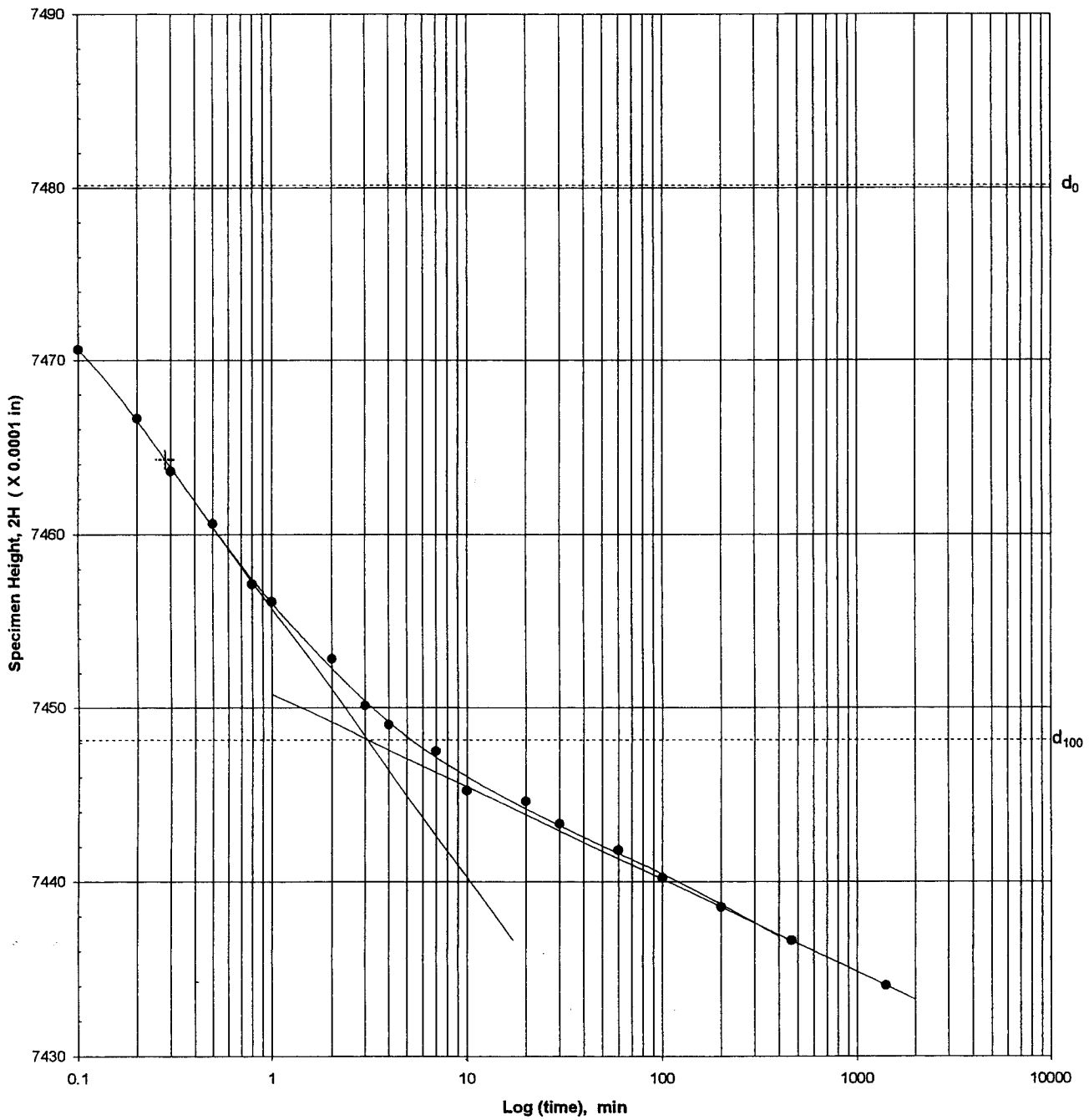
CLASSIFICATION: (ASTM D2487)

V. moist, dk greenish gray, v. fine, clayey, SAND (SC)

LL= 38	PL= 16	PI= 22 (ASTM D4318)	G_S= 2.54 (ASTM D854)

REMARKS:	PROJECT: James Island	
	Mid-Bay Feasiblity Study	
	AREA: Dorchester County, MD	
	Hole No.: DH-229A	Sample No.: Shelby-1
	Depth (ft.): 6.0-8.0	Date: Dec.2004
ENG FORM 3659 (Test method: ASTM D2166)	UNCONFINED COMPRESSION TEST REPORT	

t_{50} TIME CURVE



U.S.Army Corps of Engineers
Materials & Instrumentation Section
Baltimore, Maryland 21230

PROJECT: Dorchester County, MD
Mid-Bay Feasibility Study

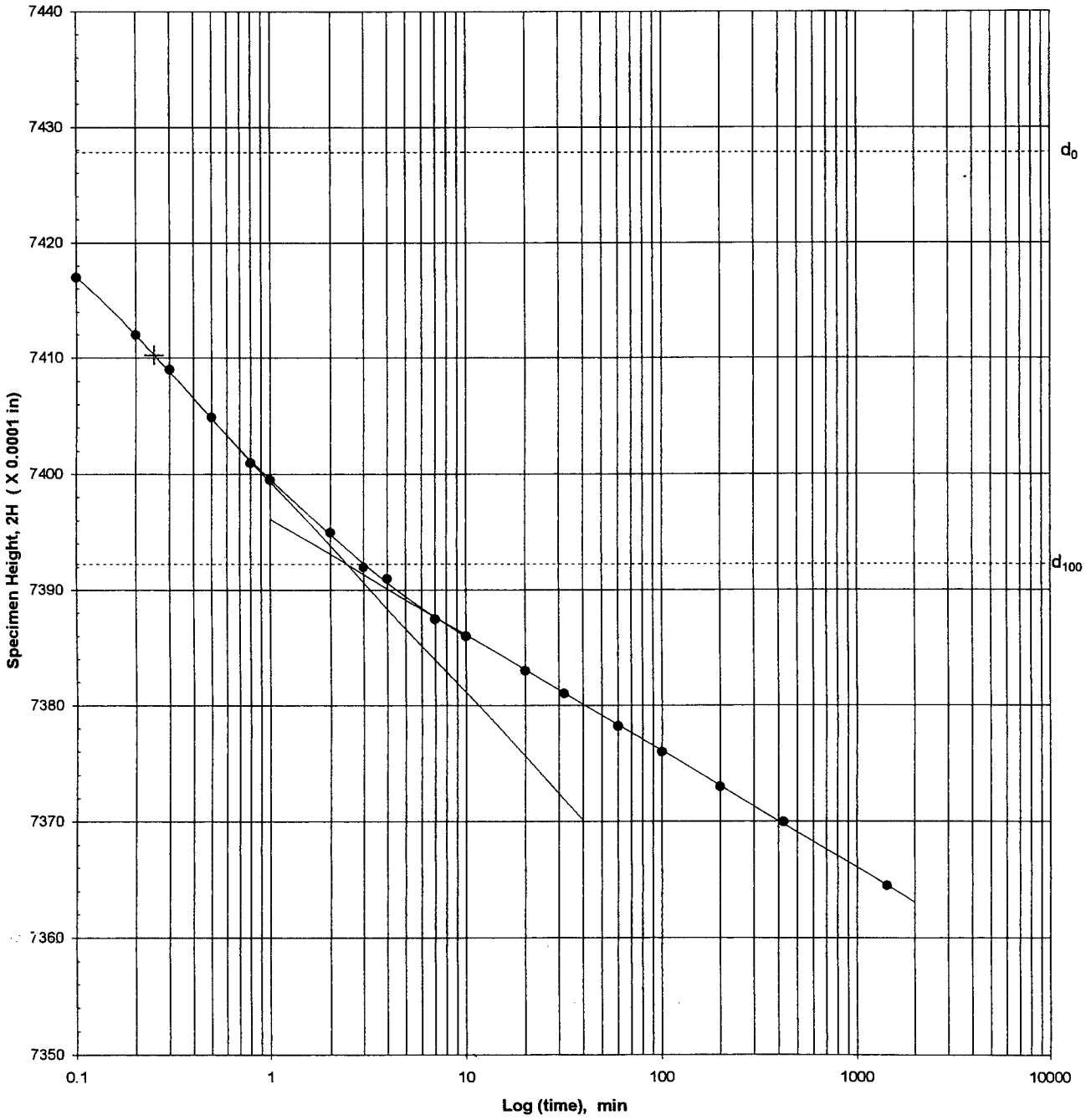
AREA: James Island

Normal Stess =	**0.25**	tons/ft²
t_{50} =	0.28	min
H =	0.3732	in
c_v =	1.62 X 10^{-3}	in²/sec

Hole No.:	Sample No.:	Depth (ft):
JB-229A	Shelby-1	6.0-8.0

ENG Form 2088 — CONSOLIDATION TEST - TIME CURVE

t_{50} TIME CURVE



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Materials & Instrumentation Section
Baltimore, Maryland 21230

PROJECT: Dorchester County, MD
Mid-Bay Feasibility Study

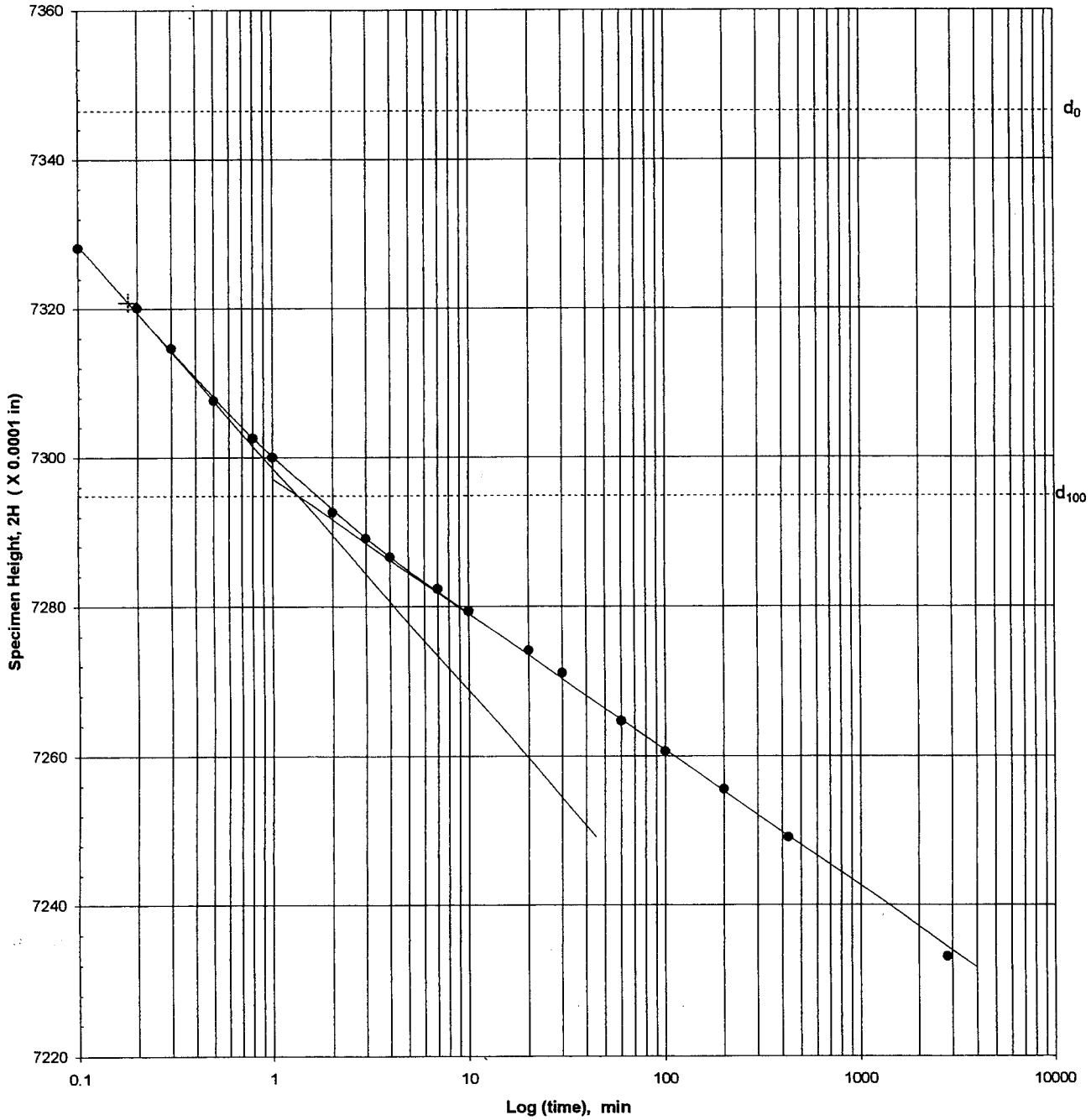
AREA: James Island

Normal Stess =	**0.50**		tons/ft²
t_{50} =	0.25		min
H =	0.3705		in
c_v =	1.79	X 10^{-3}	in²/sec

Hole No.:	Sample No.:	Depth (ft):
JB-229A	Shelby-1	6.0-8.0

ENG Form 2088 **CONSOLIDATION TEST - TIME CURVE**

t_{50} TIME CURVE



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Materials & Instrumentation Section
Baltimore, Maryland 21230

PROJECT: Dorchester County, MD
Mid-Bay Feasibility Study

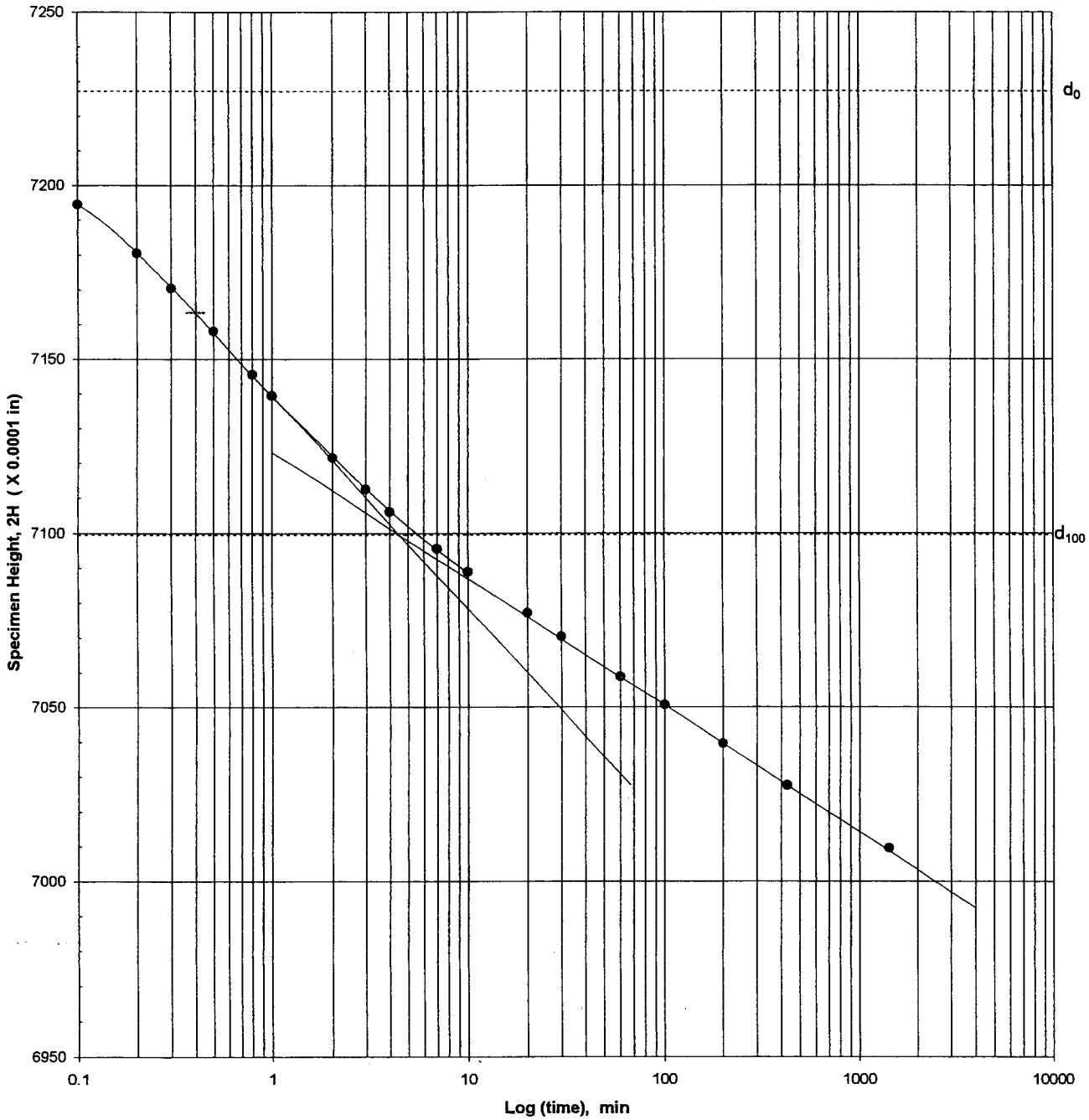
AREA: James Island

Normal Stess =	**1.0**		tons/ft²
t_{50} =	0.18		min
H =	0.3660		in
c_v =	2.43	X 10^{-3}	in²/sec

Hole No.:	Sample No.:	Depth (ft):
JB-229A	Shelby-1	6.0-8.0

ENG Form 2088 — **CONSOLIDATION TEST - TIME CURVE**

t_{50} TIME CURVE



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Materials & Instrumentation Section
Baltimore, Maryland 21230

PROJECT: Dorchester County, MD
Mid-Bay Feasibility Study

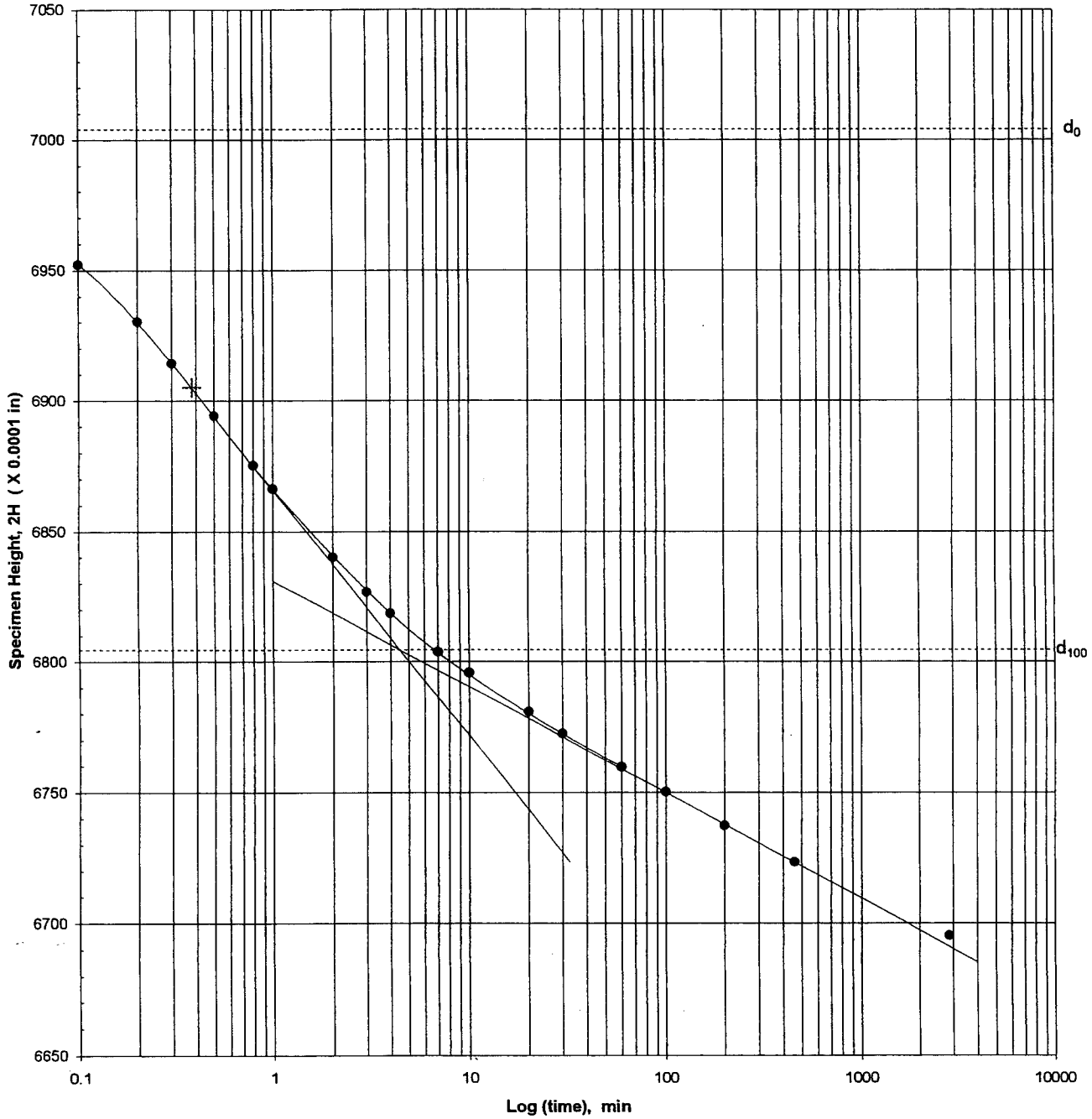
AREA: James Island

Normal Stess =	**2.0**		tons/ft²
t_{50} =	0.4		min
H =	0.3582		in
c_v =	1.05	X 10^{-3}	in²/sec

Hole No.:	**Sample No.:**	**Depth (ft):**
JB-229A	Shelby-1	6.0-8.0

ENG Form 2088 **CONSOLIDATION TEST - TIME CURVE**

t_{50} TIME CURVE



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Materials & Instrumentation Section
Baltimore, Maryland 21230

PROJECT: Dorchester County, MD
Mid-Bay Feasibility Study

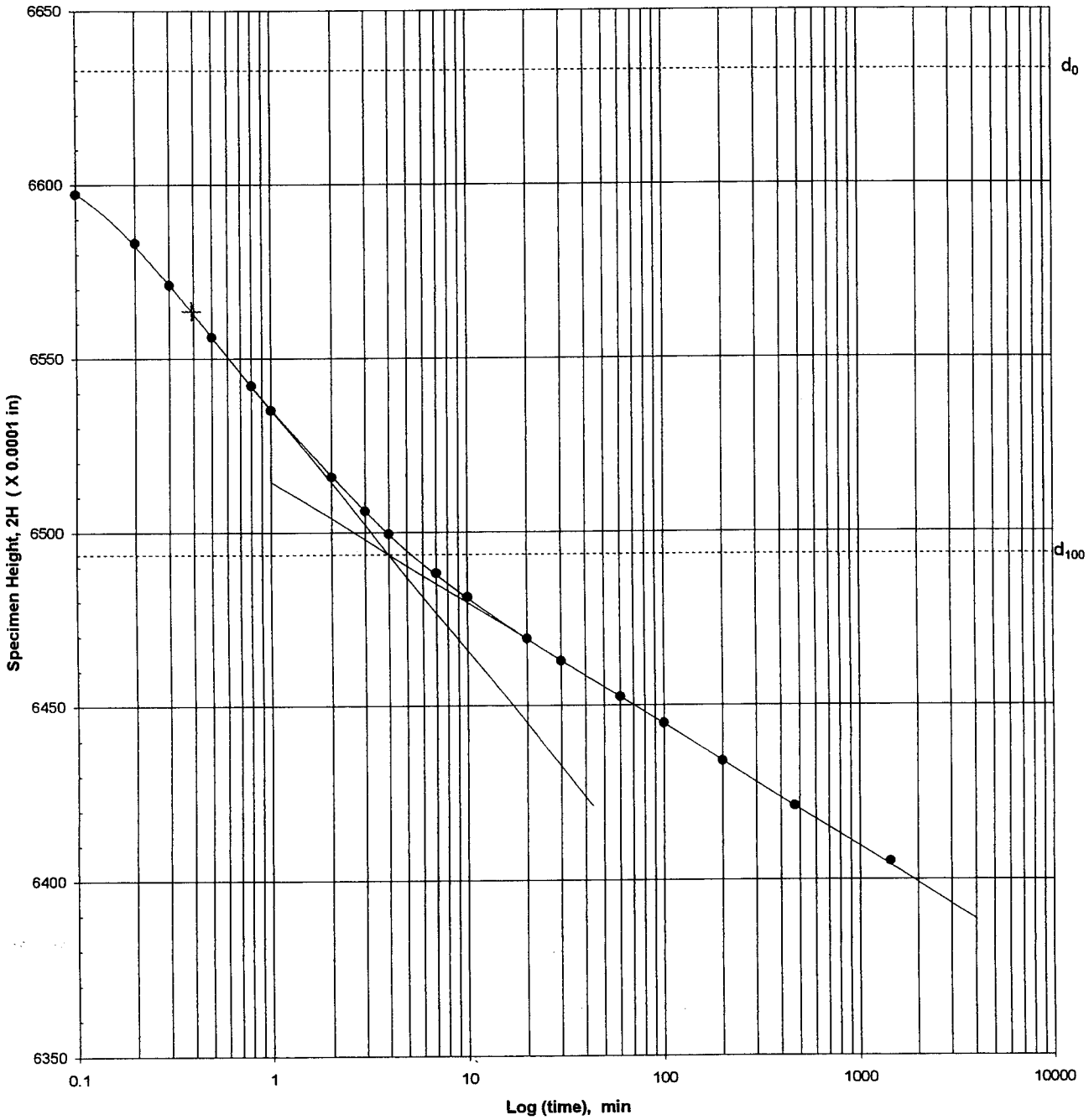
AREA: James Island

Normal Stess =	**4.0**	tons/ft²
t_{50} =	0.38	min
H =	0.3452	in
c_v =	1.02 X 10^{-3}	in²/sec

Hole No.:	Sample No.:	Depth (ft):
JB-229A	Shelby-1	6.0-8.0

ENG Form 2088 **CONSOLIDATION TEST - TIME CURVE**

t_{50} TIME CURVE



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Materials & Instrumentation Section
Baltimore, Maryland 21230

PROJECT: Dorchester County, MD
Mid-Bay Feasibility Study

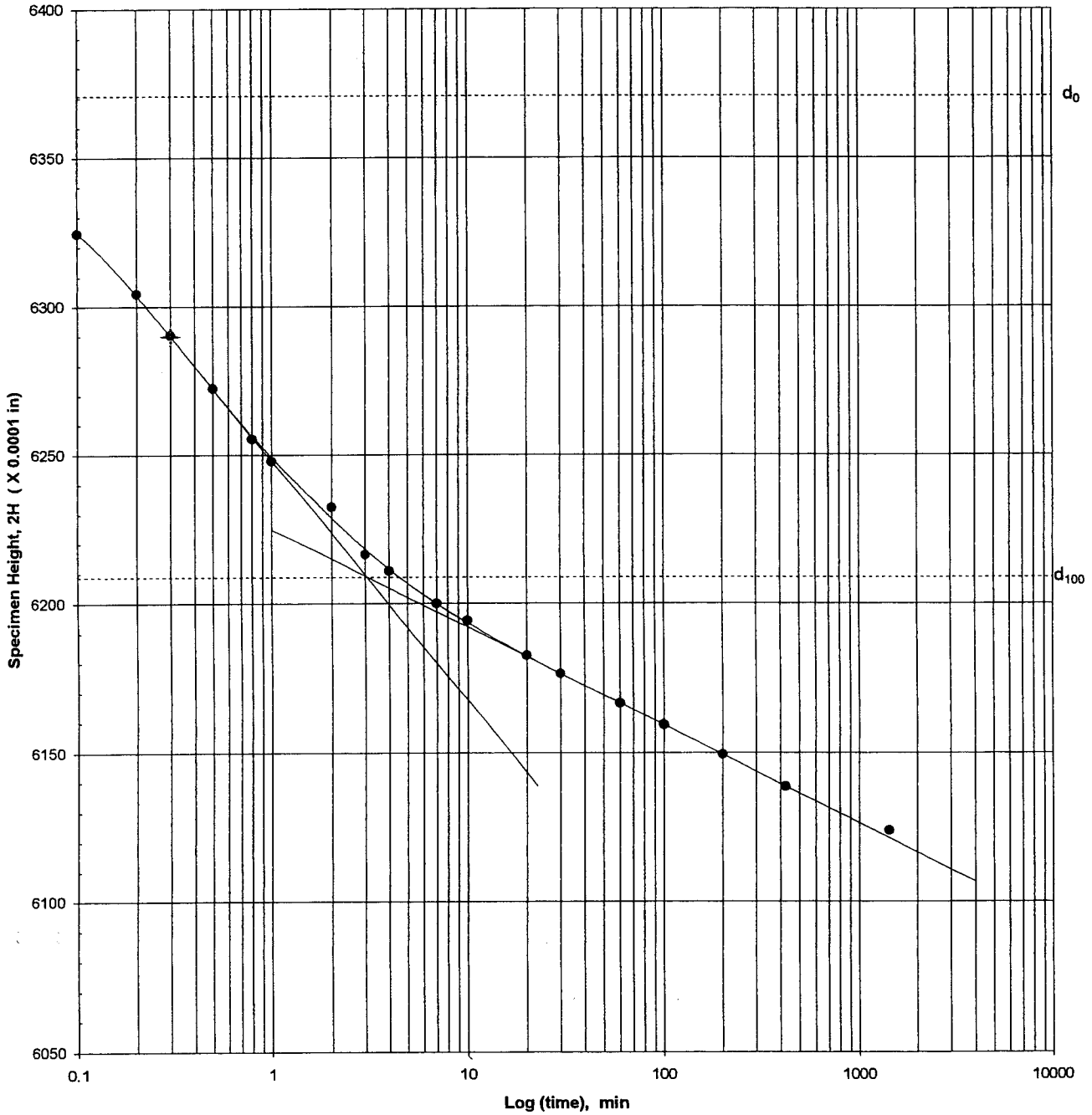
AREA: James Island

Normal Stess =	**8.0**	tons/ft²
t_{50} =	0.39	min
H =	0.3282	in
c_v =	9.02 X 10^{-4}	in²/sec

Hole No.:	**Sample No.:**	**Depth (ft):**
JB-229A	Shelby-1	6.0-8.0

ENG Form 2088 **CONSOLIDATION TEST - TIME CURVE**

t_{50} TIME CURVE



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Materials & Instrumentation Section
Baltimore, Maryland 21230

PROJECT: Dorchester County, MD
Mid-Bay Feasibility Study

AREA: James Island

Normal Stess =	**16.0**	tons/ft²
t_{50} =	0.3	min
H =	0.3145	in
c_v =	1.08 X 10^{-3}	in²/sec

Hole No.:	**Sample No.:**	**Depth (ft):**
JB-229A	Shelby-1	6.0-8.0

ENG Form 2088 **CONSOLIDATION TEST - TIME CURVE**