# MACTEC ENGINEERING AND CONSULTING, INC.

**REPORT OF THE STANDARD TEST METHOD FOR SPECIFIC GRAVITY OF SOILS**
**Performed in General Accordance with ASTM D 854-06 (Method B)**

PROJECT NAME:EXELON COL PROJECT (VICTORIA)

PROJECT NUMBER: 6468071777

DATE: 3/19/08

SAMPLE IDENTIFICATION: B-2359UD,UD-17 @ 110-111.7 Ft.

| | |
|---|---|
| (A) Mass of oven-dried soil, grams: | 37.25 |
| (B) Mass of pycnometer filled with water at test temperature (T), grams: | 341.15 |
| (C) Mass of pycnometer, water and soil, grams: | 364.64 |
| (T) Temperature of pycnometer, water and soil, °C when mass (C) determined: | 24.2 |
| (G) Specific Gravity at observed temperature: A / [ B - ( C - A )] | 2.707 |
| (F) ***Correction factor:*** | 0.99904 |
| (G x F) **SPECIFIC GRAVITY @ 20°C:** | 2.705 |

**MATERIAL TESTED:** [ ] **- # 4** [X] **- # 10**

**PREPARATION METHOD:** [X] **DRY** [ ] **WET (dispersed)**

**REMARKS: Estimated % Passing # 4 : 98**

**Silty SAND (SM)**

**EQUIPMENT USED**

**SCALES : 418**

**OVEN : 144**

**THERMOMETER :2759**

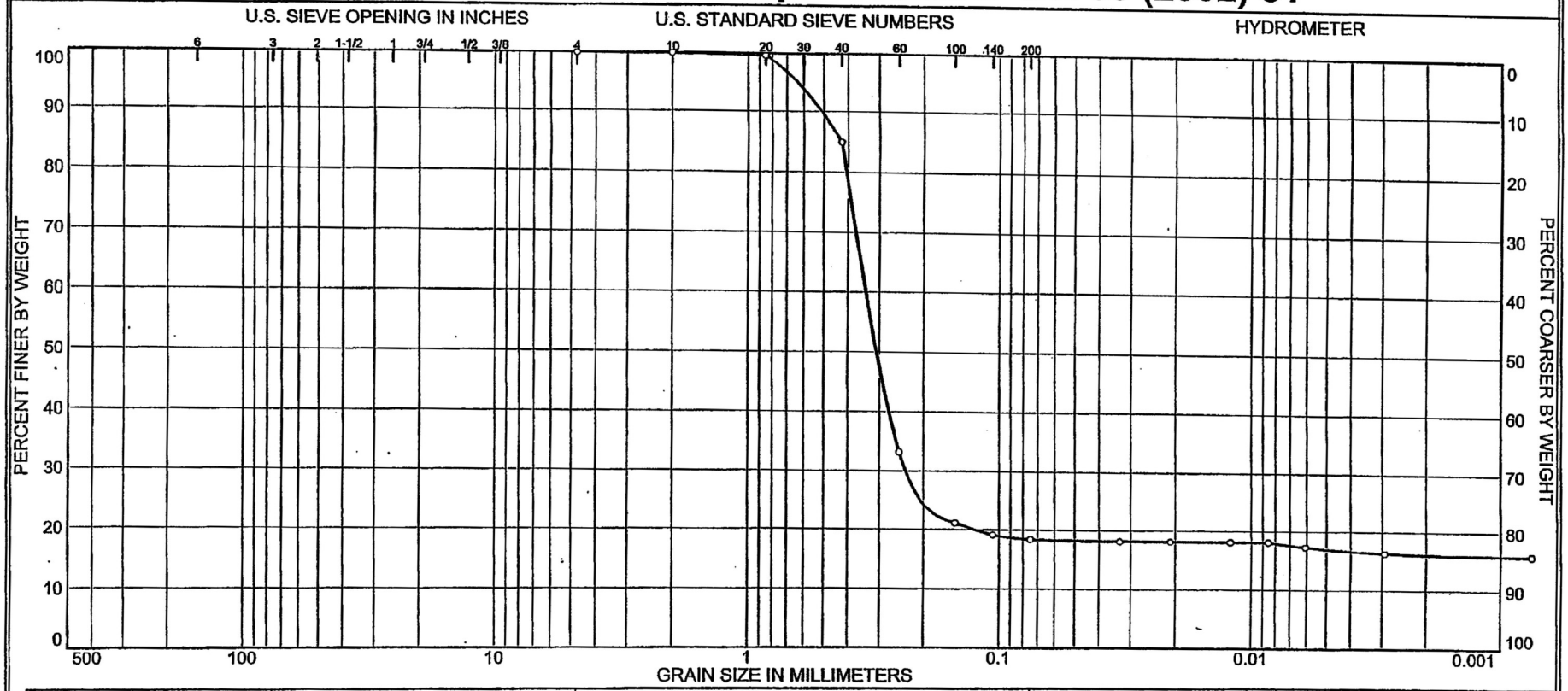
**PYCNOMETER : 2055**

**TESTED BY: EH**

**\Test Reports\Soils\SPECIFIC GRAVITY(ref).xls** **REVIEWED BY:** Harry Johnson

KAW 4.15.08

# Particle Size Distribution Report ASTM D 422-63 (2002) e1




| | % COBBLES | % GRAVEL | | % SAND | | | % FINES | |
|---|---|---|---|---|---|---|---|---|
| | | COARSE | FINE | COARSE | MEDIUM | FINE | SILT | CLAY |
| ○ | 0.0 | 0.0 | 0.0 | 0.0 | 15.0 | 66.7 | 1.5 | 16.8 |

| | SOURCE | SAMPLE # | DEPTH/ELEV. | DATE SAMPLED | USCS | MATERIAL DESCRIPTION | NM % | LL | PL |
|---|---|---|---|---|---|---|---|---|---|
| ○ | B-2359UD | UD-18 | 112-113.1 Ft | 1/31/08 | SC | Yellowish Brown Clayey SAND | 25.5 | 27 | 15 |

Client Bechtel

Project Exelon Texas COL (Victoria)

Project No. 6468-07-1777 Lab No. 8369

**MACTEC ENGINEERING AND CONSULTING, INC.**

○ Tested by: EH Reviewed by: HJ HJ

NM value from first strength test performed.
Specific Gravity = 2.77 (ASTM D 854-06)

KAW 4-15-08

## GRAIN SIZE DISTRIBUTION TEST DATA

**Client:** Bechtel
**Project:** Exelon Texas COL (Victoria)
**Project Number:** 6468-07-1777

## Sample Data

**Source:** B-2359UD
**Sample No.:** UD-18
**Elev. or Depth:** 112-113.1 Ft **Sample Length(in./cm.):** ID#8369
**Location:** B-2359UD
**Description:** Yellowish Brown Clayey SAND
**Date:** 1/31/08 **PL:** 15 **LL:** 27 **PI:** 12
**USCS Classification:** SC **AASHTO Classification:**
**Testing Remarks:** Tested by: EH Reviewed by: HJ

NM value from first strength test performed.
Specific Gravity = 2.77 (ASTM D 854-06)

## Mechanical Analysis Data

| | Initial |
|---|---|
| **Dry sample and tare=** | 77.95 |
| **Tare =** | 16.54 |
| **Dry sample weight =** | 61.41 |

**Tare for cumulative weight retained=** .00

| Sieve | Cumul. Wt. retained | Percent finer |
|---|---|---|
| # 4 | 0.00 | 100.0 |
| # 10 | 0.00 | 100.0 |
| # 20 | 0.26 | 99.6 |
| # 40 | 9.23 | 85.0 |
| # 60 | 41.04 | 33.2 |
| # 100 | 48.43 | 21.1 |
| # 140 | 49.66 | 19.1 |
| # 200 | 50.19 | 18.3 |

## Hydrometer Analysis Data

**Separation sieve is** #200
**Percent -#200 based upon complete sample=** 18.3
**Weight of hydrometer sample:** 11.22
**Calculated biased weight=** 61.31
**Automatic temperature correction**
**Composite correction at 20 deg C =** -5.4

**Meniscus correction only=** 0
**Specific gravity of solids=** 2.766
**Specific gravity correction factor=** 0.975
**Hydrometer type:** 152H
**Effective depth L= 16.294964 - 0.164 x Rm**

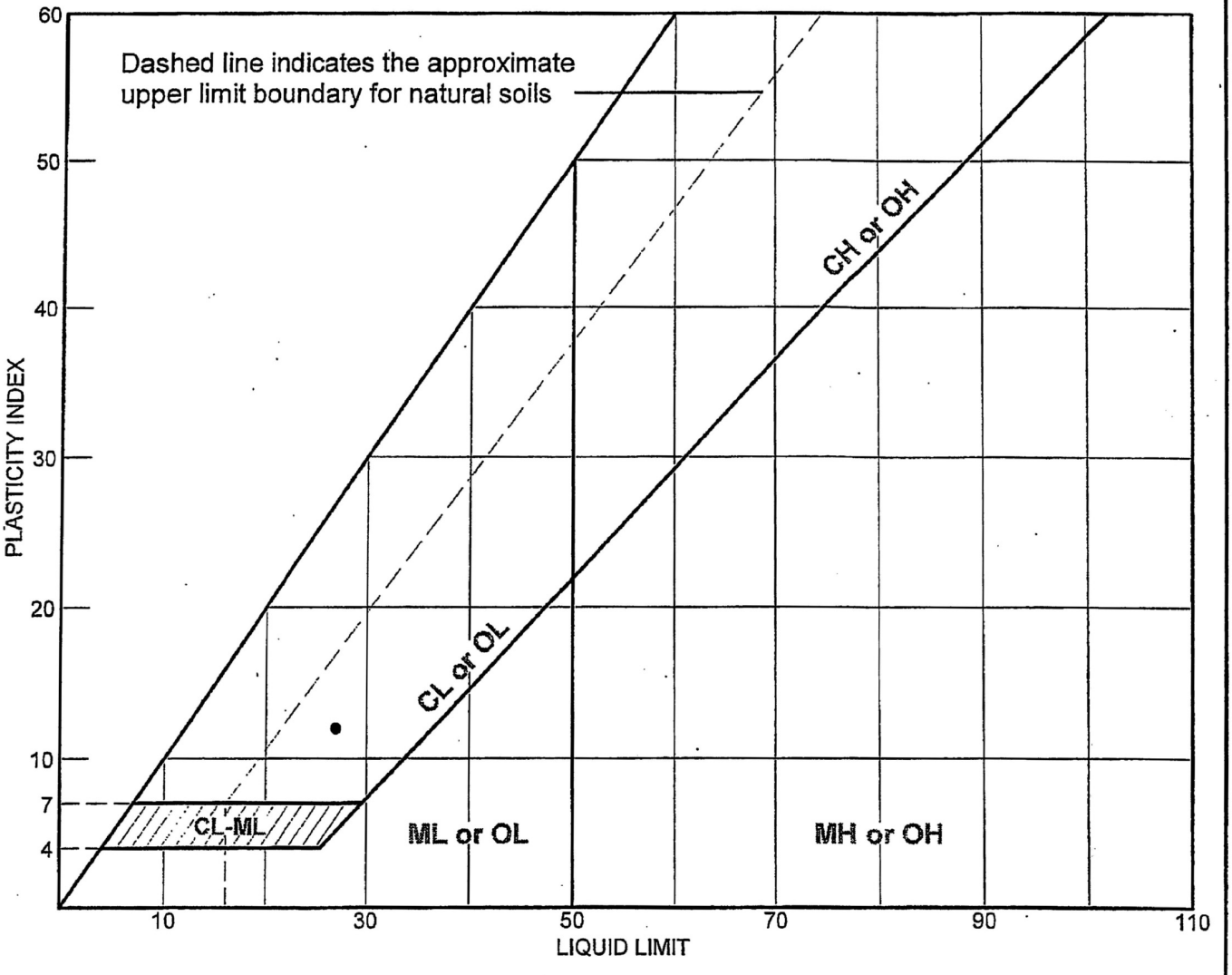
| Elapsed time, min | Temp, deg C | Actual reading | Corrected reading | K | Rm | Eff. depth | Diameter mm | Percent finer |
|---|---|---|---|---|---|---|---|---|
| 2.00 | 23.3 | 16.0 | 11.3 | 0.0127 | 16.0 | 13.7 | 0.0331 | 18.0 |
| 5.00 | 23.3 | 16.0 | 11.3 | 0.0127 | 16.0 | 13.7 | 0.0209 | 18.0 |
| 15.00 | 23.3 | 16.0 | 11.3 | 0.0127 | 16.0 | 13.7 | 0.0121 | 18.0 |
| 30.00 | 23.3 | 16.0 | 11.3 | 0.0127 | 16.0 | 13.7 | 0.0086 | 18.0 |
| 60.00 | 23.3 | 15.5 | 10.8 | 0.0127 | 15.5 | 13.8 | 0.0061 | 17.2 |
| 260.00 | 22.8 | 15.0 | 10.2 | 0.0127 | 15.0 | 13.8 | 0.0029 | 16.2 |
| 4140.00 | 21.7 | 15.0 | 9.9 | 0.0129 | 15.0 | 13.8 | 0.0007 | 15.8 |

## Fractional Components

**Gravel/Sand based on** #4
**Sand/Fines based on** #200
**% COBBLES =** **% GRAVEL =**
**% SAND =** 81.7 **(% coarse =** 0.0 **% medium =** 15.0 **% fine =** 66.7)
**% SILT =** 1.5 **% CLAY =** 16.8 **(% CLAY COLLOIDS =** 15.8)

$D_{85}$= 0.43 $D_{60}$= 0.34 $D_{50}$= 0.31
$D_{30}$= 0.24

# LIQUID AND PLASTIC LIMITS TEST REPORT ASTM D4318 (05)




| SOIL DATA | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| SYMBOL | SOURCE | SAMPLE NO. | DEPTH (ft.) | NATURAL WATER CONTENT (%) | PLASTIC LIMIT (%) | LIQUID LIMIT (%) | PLASTICITY INDEX (%) | USCS |
| ● | B-2359UD | UD-18 | 112-113.1 Ft | 25.5 | 15 | 27 | 12 | SC |

| | |
|---|---|
| MACTEC ENGINEERING AND CONSULTING, INC. | **Client:** Bechtel<br>**Project:** Exelon Texas COL (Victoria)<br>**Project No.:** 6468-07-1777 **Lab No.** 8369 |

## LIQUID AND PLASTIC LIMIT TEST DATA

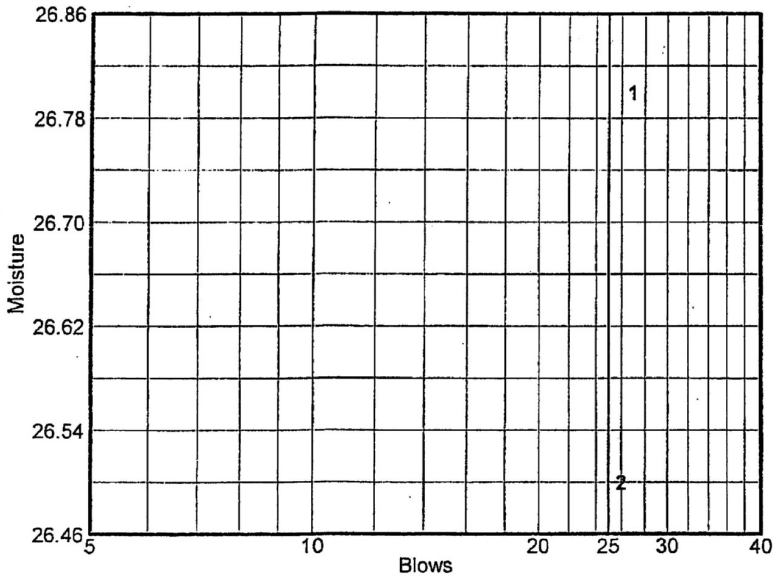
**Client:** Bechtel
**Project:** Exelon Texas COL (Victoria)
**Project Number:** 6468-07-1777

### Sample Data

**Source:** B-2359UD
**Sample No.:** UD-18
**Elev. or Depth:** 112-113.1 Ft **Sample Length(in./cm.):** ID#8369
**Location:** B-2359UD
**Description:** Yellowish Brown Clayey SAND
**Water Content:** 25.5 **USCS:** SC **AASHTO:**

### Liquid Limit Data

| Run No. | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| Wet+Tare | 35.43 | 32.66 | | | | |
| Dry+Tare | 32.27 | 30.07 | | | | |
| Tare | 20.47 | 20.30 | | | | |
| # Blows | 27 | 26 | | | | |
| Moisture | 26.8 | 26.5 | | | | |




**Liquid Limit=** 27
**Plastic Limit=** 15
**Plasticity Index=** 12

### Plastic Limit Data

| Run No. | 1 | 2 | 3 | 4 | |
|---|---|---|---|---|---|
| Wet+Tare | 29.55 | 29.28 | | | |
| Dry+Tare | 28.36 | 28.02 | | | |
| Tare | 20.59 | 19.94 | | | |
| Moisture | 15.3 | 15.6 | | | |

# MACTEC ENGINEERING AND CONSULTING, INC.

**REPORT OF THE STANDARD TEST METHOD FOR SPECIFIC GRAVITY OF SOILS**
**Performed in General Accordance with ASTM D 854-06 (Method B)**

PROJECT NAME:EXELON COL PROJECT (VICTORIA)

PROJECT NUMBER: 6468071777

DATE: 3/19/08

SAMPLE IDENTIFICATION: B-2359UD,UD-18 @ 112-113.1 Ft.

| | |
|---|---|
| (A) Mass of oven-dried soil, grams: | 37.42 |
| (B) Mass of pycnometer filled with water at test temperature (T), grams: | 366.20 |
| (C) Mass of pycnometer, water and soil, grams: | 390.10 |
| (T) Temperature of pycnometer, water and soil, °C when mass (C) determined: | 23.3 |
| (G) Specific Gravity at observed temperature: A / [ B - ( C - A )] | 2.768 |
| (F) ***Correction factor:*** | 0.99926 |
| (G x F) **SPECIFIC GRAVITY @ 20°C:** | 2.766 |

**MATERIAL TESTED:** [ ] **- # 4** [X] **- # 10**

**PREPARATION METHOD:** [X] **DRY** [ ] **WET (dispersed)**

**REMARKS: Estimated % Passing # 4 : 100**

**Clayey SAND (SC)**

**EQUIPMENT USED**

**SCALES : 418**

**OVEN : 144**

**THERMOMETER :2759**

**PYCNOMETER : 2192**

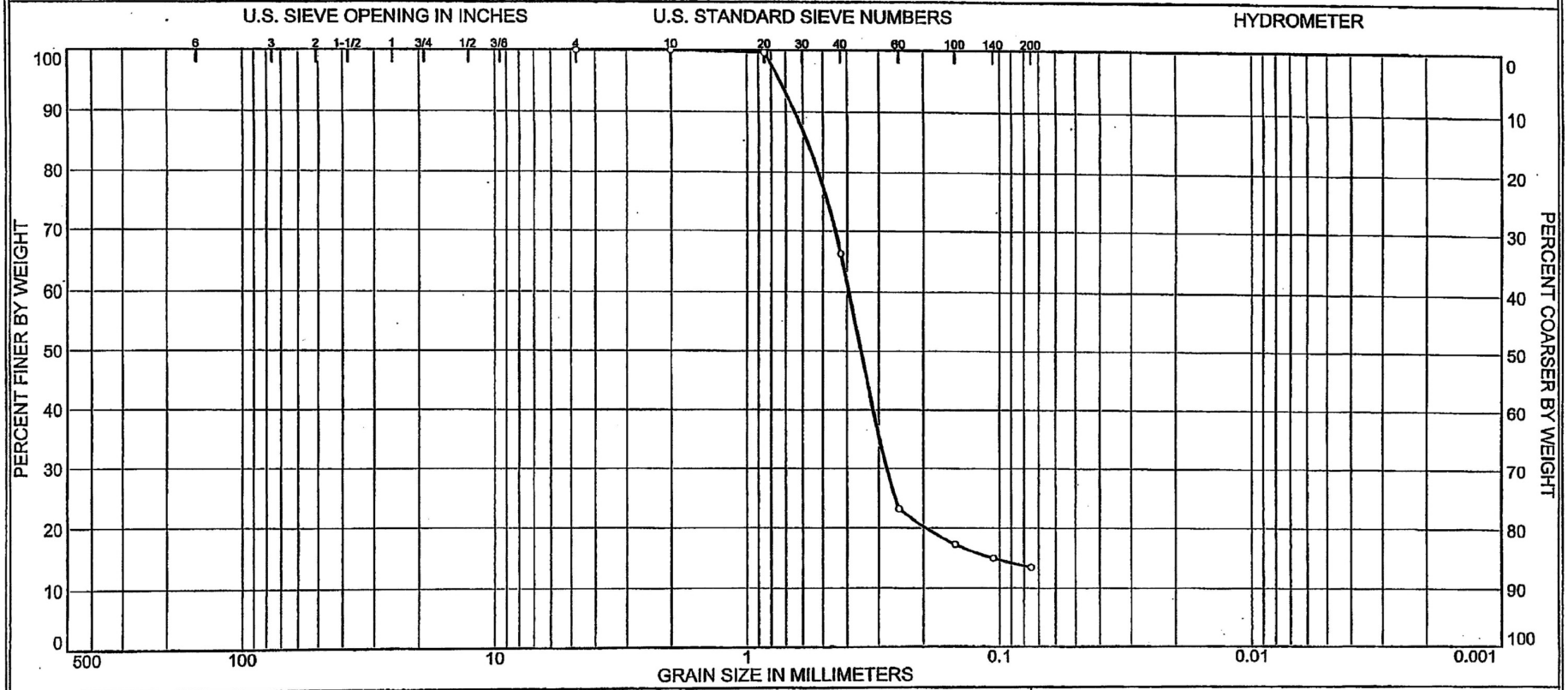
**TESTED BY: EH**

**\Test Reports\Soils\SPECIFIC GRAVITY(ref).xls**

**REVIEWED BY:** Harry Johnson HJ

KAW 4.15.08

# Particle Size Distribution Report ASTM D6913-04 e1




| | % COBBLES | % GRAVEL | | % SAND | | | % FINES | |
|---|---|---|---|---|---|---|---|---|
| | | COARSE | FINE | COARSE | MEDIUM | FINE | SILT | CLAY |
| ○ | 0.0 | 0.0 | 0.0 | 0.0 | 33.7 | 52.8 | 13.5 | |

| | SOURCE | SAMPLE # | DEPTH/ELEV. | DATE SAMPLED | USCS | MATERIAL DESCRIPTION | NM % | LL | PL |
|---|---|---|---|---|---|---|---|---|---|
| ○ | B-2359UD | UD-19 | 114-116.6 Ft | 1/31/08 | SM | Light Gray Silty SAND (Visual) | 17.3 | ND | ND |

Client Bechtel

Project Exelon Texas COL (Victoria)

Project No. 6468-07-1777 Lab No. 8370

**MACTEC ENGINEERING AND CONSULTING, INC.**

○ Tested by: EH Reviewed by: HJ HJ

Sieve Analysis Only
NM value from average of strength tests performed.
Specific Gravity = 2.70 (ASTM D 854-06)
ND = Not Determined

KAW 4.15.08

## GRAIN SIZE DISTRIBUTION TEST DATA

**Client:** Bechtel
**Project:** Exelon Texas COL (Victoria)
**Project Number:** 6468-07-1777

## Sample Data

**Source:** B-2359UD
**Sample No.:** UD-19
**Elev. or Depth:** 114-116.6 Ft **Sample Length(in./cm.):** ID#8310
**Location:** B-2359UD
**Description:** Light Gray Silty SAND (Visual)
**Date:** 1/31/08 **PL:** ND **LL:** ND **PI:** ND
**USCS Classification:** SM **AASHTO Classification:**
**Testing Remarks:** Tested by: EH Reviewed by: HJ

Sieve Analysis Only
NM value from average of strength tests performed.
Specific Gravity = 2.70 (ASTM D 854-06)
ND = Not Determined

## Mechanical Analysis Data

| | Initial |
|---|---|
| **Dry sample and tare=** | 303.05 |
| **Tare =** | 100.19 |
| **Dry sample weight =** | 202.86 |

**Tare for cumulative weight retained=** .00

| Sieve | Cumul. Wt. retained | Percent finer |
|---|---|---|
| # 4 | 0.00 | 100.0 |
| # 10 | 0.00 | 100.0 |
| # 20 | 0.84 | 99.6 |
| # 40 | 68.44 | 66.3 |
| # 60 | 155.91 | 23.1 |
| # 100 | 167.79 | 17.3 |
| # 140 | 172.49 | 15.0 |
| # 200 | 175.57 | 13.5 |

## Fractional Components

**Gravel/Sand based on** #4
**Sand/Fines based on** #200
**% COBBLES =** **% GRAVEL =**
**% SAND =** 86.5 **(% coarse =** 0.0 **% medium =** 33.7 **% fine =** 52.8)
**% FINES =** 13.5

$D_{85}$= 0.57 $D_{60}$= 0.39 $D_{50}$= 0.35
$D_{30}$= 0.28 $D_{15}$= 0.11

# MACTEC ENGINEERING AND CONSULTING, INC.

**REPORT OF THE STANDARD TEST METHOD FOR SPECIFIC GRAVITY OF SOILS**
**Performed in General Accordance with ASTM D 854-06 (Method B)**

PROJECT NAME:EXELON COL PROJECT (VICTORIA)

PROJECT NUMBER: 6468071777

DATE: 4/7/08

SAMPLE IDENTIFICATION: B-2359UD,UD-19 @ 114-116.6 Ft.

| | | |
|---|---|---|
| (A) Mass of oven-dried soil, grams: | | 37.58 |
| (B) Mass of pycnometer filled with water at test temperature (T), grams: | | 363.70 |
| (C) Mass of pycnometer, water and soil, grams: | | 387.36 |
| (T) Temperature of pycnometer, water and soil, °C when mass (C) determined: | | 23.1 |
| (G) Specific Gravity at observed temperature: | A / [ B - ( C - A )] | 2.700 |
| (F) | ***Correction factor:*** | 0.99931 |
| (G x F) | **SPECIFIC GRAVITY @ 20°C:** | 2.698 |

**MATERIAL TESTED:** [ ] **- # 4** [X] **- # 10**

**PREPARATION METHOD:** [X] **DRY** [ ] **WET (dispersed)**

**REMARKS: Estimated % Passing # 4 : 100**

**Silty SAND (SM) - Visual**

**EQUIPMENT USED**

**SCALES : 418**

**OVEN : 144**

**THERMOMETER :2759**

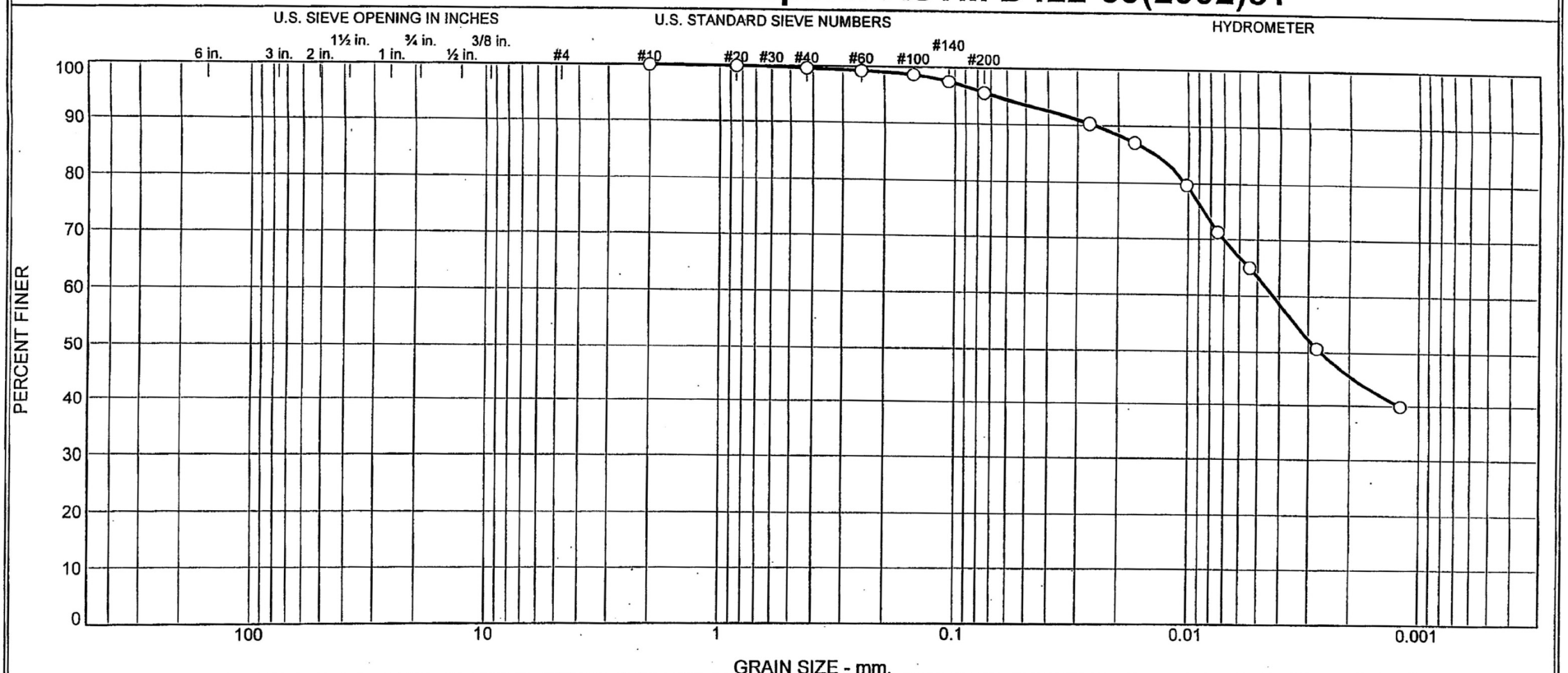
**PYCNOMETER : 2184**

**TESTED BY: EH**

**\Test Reports\Soils\SPECIFIC GRAVITY(ref).xls** **REVIEWED BY:** Harry Johnson HJ

KAW 4.15.08

# Particle Size Distribution Report / ASTM D422-63(2002)e1




| | % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|---|
| | | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| ○ | 0.0 | 0.0 | 0.0 | 0.0 | 0.4 | 4.2 | 32.0 | 63.4 |

| | Source | Sample # | Depth/Elev. | Date Sampled | USCS | Material Description | NM % | LL | PL |
|---|---|---|---|---|---|---|---|---|---|
| ○ | Boring B-2359UD | UD-20 | 120.0-121.7 | 1/31/08 | CH | Light Gray Fat CLAY | 34.0 | 51 | 15 |

Client Bechtel

Project Exelon Texas COL (Victoria Reservoir)

Project No. 6468071777 Figure NA

**MACTEC, Inc.**

**Raleigh, North Carolina**

○ Specific Gravity = 2.721 (ASTM D854-06)
NM obtained from consolidation test specimen

KAW 5/8/08

**Tested By:** CS **Checked By:** LBJ

## GRAIN SIZE DISTRIBUTION TEST DATA

5/7/2008

**Client:** Bechtel
**Project:** Exelon Texas COL (Victoria Reservoir)
**Project Number:** 6468071777
**Location:** Boring B-2359UD
**Depth:** 120.0-121.7 **Sample Number:** UD-20
**Material Description:** Light Gray Fat CLAY
**Date:** 1/31/08 **Natural Moisture:** 34.0
**Liquid Limit:** 51 **Plastic Limit:** 15 **USCS Class.:** CH
**Testing Remarks:** Specific Gravity = 2.721 (ASTM D854-06)
NM obtained from consolidation test specimen
**Tested by:** CS **Checked by:** LBJ

### Sieve Test Data

| Dry Sample and Tare (grams) | Tare (grams) | Cumulative Pan Tare Weight (grams) | Sieve Opening Size | Cumulative Weight Retained (grams) | Percent Finer |
|---|---|---|---|---|---|
| 171.38 | 0.00 | 0.00 | #10 | 0.00 | 100.0 |
| 48.73 | 0.00 | 0.00 | #20 | 0.04 | 99.9 |
| | | | #40 | 0.18 | 99.6 |
| | | | #60 | 0.38 | 99.2 |
| | | | #100 | 0.68 | 98.6 |
| | | | #140 | 1.27 | 97.4 |
| | | | #200 | 2.24 | 95.4 |

### Hydrometer Test Data

**Hydrometer test uses material passing#10**
**Percent passing #10 based upon complete sample =**100.0
**Weight of hydrometer sample =**48.73
**Hygroscopic moisture correction:**
**Moist weight and tare =** 28.86
**Dry weight and tare =** 28.31
**Tare weight =** 15.62
**Hygroscopic moisture =**4.3%
**Table of composite correction values:**

| Temp., deg. C: | 11.3 | 29.5 |
|---|---|---|
| Comp. corr.: | -8.0 | -3.0 |

**Meniscus correction only =**1.0
**Specific gravity of solids =**2.721
**Hydrometer type =**152H
**Hydrometer effective depth equation: L =**16.294964 - 0.164 **x Rm**

| Elapsed Time (min.) | Temp. (deg. C.) | Actual Reading | Corrected Reading | K | Rm | Eff. Depth | Diameter (mm.) | Percent Finer |
|---|---|---|---|---|---|---|---|---|
| 2.00 | 21.6 | 48.0 | 42.8 | 0.0131 | 49.0 | 8.3 | 0.0266 | 90.3 |
| 5.00 | 21.6 | 46.5 | 41.3 | 0.0131 | 47.5 | 8.5 | 0.0171 | 87.1 |
| 15.00 | 21.6 | 43.0 | 37.8 | 0.0131 | 44.0 | 9.1 | 0.0102 | 79.7 |
| 30.00 | 21.6 | 39.0 | 33.8 | 0.0131 | 40.0 | 9.7 | 0.0075 | 71.3 |
| 60.00 | 21.6 | 36.0 | 30.8 | 0.0131 | 37.0 | 10.2 | 0.0054 | 65.0 |
| 250.00 | 22.4 | 29.0 | 24.0 | 0.0130 | 30.0 | 11.4 | 0.0028 | 50.7 |
| 1440.00 | 21.9 | 24.0 | 18.9 | 0.0131 | 25.0 | 12.2 | 0.0012 | 39.9 |

MACTEC, Inc.

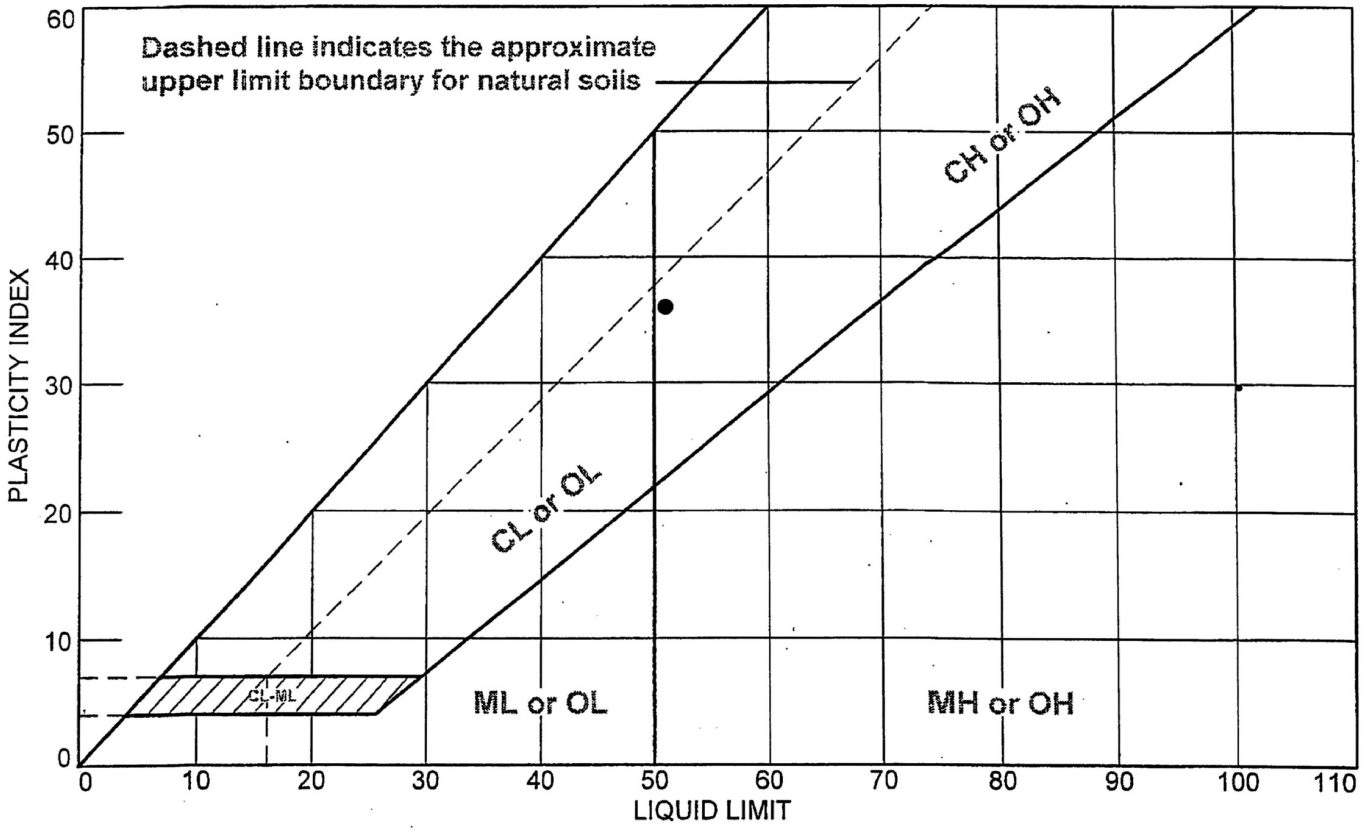
## Fractional Components

| Cobbles | Gravel | | | Sand | | | | Fines | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Coarse | Fine | Total | Coarse | Medium | Fine | Total | Silt | Clay | Total |
| 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.4 | 4.2 | 4.6 | 32.0 | 63.4 | 95.4 |

| $D_{10}$ | $D_{15}$ | $D_{20}$ | $D_{30}$ | $D_{50}$ | $D_{60}$ | $D_{80}$ | $D_{85}$ | $D_{90}$ | $D_{95}$ |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 0.0027 | 0.0043 | 0.0103 | 0.0138 | 0.0254 | 0.0698 |

| Fineness Modulus |
|---|
| 0.02 |

# LIQUID AND PLASTIC LIMITS TEST REPORT ASTM D4318 (05)




| SOIL DATA | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | SOURCE | SAMPLE NO. | DEPTH | NATURAL WATER CONTENT (%) | PLASTIC LIMIT (%) | LIQUID LIMIT (%) | PLASTICITY INDEX (%) | USCS |
| ● | Boring B-2359UD | UD-20 | 120.0-121.7 | 34.0 | 15 | 51 | 36 | CH |

**MACTEC, Inc.**

**Raleigh, North Carolina**

**Client:** Bechtel
**Project:** Exelon Texas COL (Victoria Reservoir)
**Project No.:** 6468071777

Figure A-4

**Tested By:** CS **Checked By:** LBJ

KAW 5/8/08

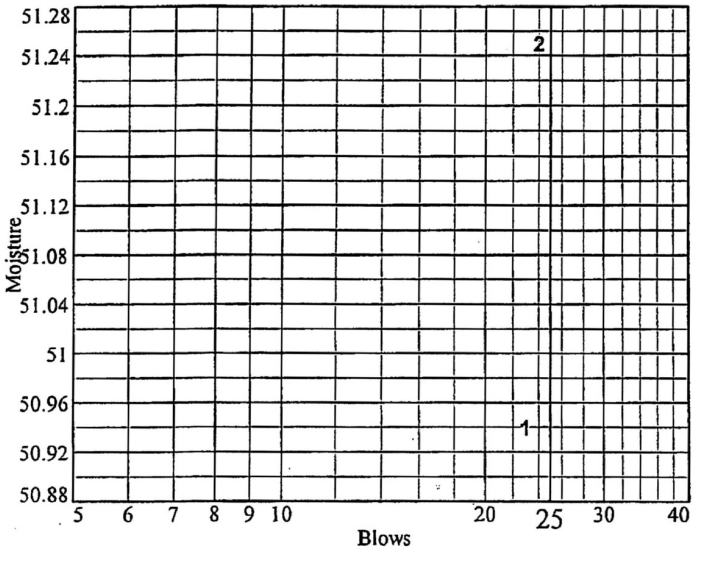
## LIQUID AND PLASTIC LIMIT TEST DATA

5/7/2008

**Client:** Bechtel
**Project:** Exelon Texas COL (Victoria Reservoir)
**Project Number:** 6468071777
**Location:** Boring B-2359UD
**Depth:** 120.0-121.7 **Sample Number:** UD-20
**Material Description:** Light Gray Fat CLAY
**USCS:** CH **AASHTO:** A-7-6(36)
**Tested by:** CS **Checked by:** LBJ

### Liquid Limit Data

| Run No. | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| Wet+Tare | 23.47 | 25.46 | | | | |
| Dry+Tare | 20.76 | 22.18 | | | | |
| Tare | 15.44 | 15.78 | | | | |
| # Blows | 23 | 24 | | | | |
| Moisture | 50.9 | 51.3 | | | | |




**Liquid Limit=** 51
**Plastic Limit=** 15
**Plasticity Index=** 36
**Natural Moisture=** 34.0
**Liquidity Index=** 0.5

### Plastic Limit Data

| Run No. | 1 | 2 | 3 | 4 | |
|---|---|---|---|---|---|
| Wet+Tare | 21.65 | 17.32 | | | |
| Dry+Tare | 20.87 | 16.53 | | | |
| Tare | 15.55 | 11.24 | | | |
| Moisture | 14.7 | 14.9 | | | |

MACTEC, Inc.

# MACTEC ENGINEERING AND CONSULTING, INC.
# RALEIGH, NORTH CAROLINA

**REPORT OF THE STANDARD TEST METHOD FOR SPECIFIC GRAVITY OF SOILS**
**Performed in General Accordance with ASTM D 854-06 (Method B)**

PROJECT NAME:EXELON COL PROJECT (VICTORIA)

PROJECT NUMBER: 6468071777

DATE: 4/17/08

SAMPLE IDENTIFICATION: B-2359UD, UD-20

| | |
|---|---|
| (A) Mass of oven-dried soil, grams: | 51.09 |
| (B) Mass of pycnometer filled with water at test temperature (T), grams: | 655.71 |
| (C) Mass of pycnometer, water and soil, grams: | 688.03 |
| (T) Temperature of pycnometer, water and soil, °C when mass (C) determined: | 21.6 |
| (G) Specific Gravity at observed temperature: A / [ B - ( C - A )] | 2.722 |
| (F) ***Correction factor:*** | 0.99966 |
| (G x F) **SPECIFIC GRAVITY @ 20°C:** | 2.721 |

**MATERIAL TESTED:** [X] **- # 4** [ ] **- # 10**

**PREPARATION METHOD:** [X] **DRY** [ ] **WET (dispersed)**

**REMARKS: Estimated % Passing # 4 : 100**

**Fat CLAY (CH)**

**EQUIPMENT USED**

**SCALES : 3.1.99**

**OVEN : 5.1.16**

**THERMOMETER :5.1.01**

**PYCNOMETER : P-3**

**TESTED BY: CS**

**REVIEWED BY:** Brian Johnson

KAW 5/8/08

# Unconsolidated Undrained Triaxial Compression Tests