

ONE - DIMENSIONAL CONSOLIDATION TEST: Specimen Setup / Take Down

Project Number: 0411-08-1686 Test Station No.: CRS-4 File Name: B-2321_UD3a
 Task No.: NA Specific Gravity, G_s : 2.710 ☒ Meas.; ☐ Assumed Ring No.: 4
 Project Name: Exelon (Victoria) Assig. Remarks: Ring Area, A_r (cm²) = 31.755
 TEST TYPE: ☒ CRS (D 4186-06); ☐ Method A; ☐ Method B; ☐ Method C; ☐ Method D; Ring Height (mm) = NA
☐ Method E; ☐ Method F; ☐ Method G; ☐ Method H; ☐ Method I; ☐ Method J; Summary of Methods: NA

☒ Tube	☐ Field Extruded	☐ Liner	☐ Remolded	☐ Tamping	☐ Constant Effort:	Blows/Tamps per Layer =
Boring No.: B-2321UD	☐ LPC Core			Impact/Rammer	Rammer Wgt. (lbf) =	No. Layers =
Sample No.: UD-3	Compostite No.:			Pluviated:	Tamper Force (lbf) =	Drop (in.) =
Depth (ft): 10.0 - 11.7	Specimen No.: A			Kneading	☐ Undercompaction: U_{ni} (%) =	Dia. (in.) =
☐ Spec. Selection by X-ray;	☐ Geomarine Sample				Ref. Effort =	% Comp. = $\pm$ Opt. =

Water Content (W);	Initial - Trimming Location			Final, W _{at} (see below)	Soil and Ring Masses	Initial	Final	
	Top (W1)	Bottom (W2)	Sides (W3)		Mass Moist Soil + Ring (g)	329.81	332.49	
Container No.	2002	2005	5056	141	Mass Ring (g)	210.11		
Mass Moist Soil + Container (g)	119.83	129.37	111.41	71.16	Mass Moist Soil, M _{t,o} or M _{t,at} (g)	119.70	122.38	
Mass Dry Soil + Container (g)	107.58	116.43	100.80	64.58	EXCESS DRY SOIL (soil not incl. in final mass above)			
Mass Container (g)	30.54	30.54	30.41	30.60	Container No.		2017	
WATER CONTENT (%)	15.90	15.07	15.07	19.36	Mass Dry Soil + Container (g)		30.55	
Avg. Initial Water Content, W4 (%)	15.35	Final W _{at} : X		Slice ;	Whole Spec.	Mass Container (g)		30.47
See attached data sheet(s) for additional water contents					Mass Excess Dry Soil, M _{d,es} (g)		0.08	

Soil Height: Measurements (mm)				Soil Height: Calculations, (mm)		Initial	Final
Initial		Final		Height of Gauge Block, H_{gb} (1)		0.000	19.070
with Spec.	without Spec.	with Spec.	without Spec.	Reading on Gauge Block, d_{gb}		0.000	0.000
19.170	0.000	12.820	13.820	Avg. Reading on Soil, d_{soil}		19.142	12.808
19.120	0.000	12.570	13.700	Avg. Reading on Apparatus without Specimen, d_{app}		0.000	13.774
19.160	0.000	12.780	13.720	Soil Height, $H = d_{soil} - d_{app} + H_{gb} - d_{gb}$		19.142	18.104
19.110	0.000	13.040	13.790	Soil Height: Final by Dial Change During Test (mm)			
19.150	0.000	12.830	13.840	Initial Height, H_o		19.142	
☐ Yes ; ☒ No	☒ Yes ; ☐ No	☒ Yes ; ☐ No	☐ Yes ; ☒ No	Require H_{gb} & d_{gb} (1)	Final (end of test) Corr. Total Spec. Deformation, $\Delta H_{c,f}$	1.162	
☐ Yes ; ☒ No	☒ Yes ; ☐ No	☒ Yes ; ☐ No	☐ Yes ; ☒ No	Filter Paper Included:	Final Calculated Height, $H_{f,c} = H_o - \Delta H_{c,f}$	17.980	
(1) Req. block ht. to set bench comparator so the final soil ht. can be determined directly by the diff. between the reading with and without spec. : ~ 12.7 mm; CRS ~ 25 mm					Final Soil Height Measurement, $H_{f,m}$	18.104	
Enter value of H_{gb} & d_{gb} only when that value has to be included in the determination of the soil height.					Normalized Difference in %, $(H_{f,c} - H_{f,m})/H_o$	-0.65	

Estimated Initial Unit Weight			
Total, $\gamma_{t,o}$ (pcf) =	122.94	Dry, $\gamma_{d,o}$ (pcf) =	106.58
Filter Paper Used: ☒ Whatman No. 54; ☐ Other			
Incremental Test: Top & Bottom: ☐ Yes ; ☐ No			
CRS Test: Top Only: ☒ Yes ; ☐ No			

Soil Extruded During Loading	
Container No.	
Mass Dry Soil + Cont. (g)	NA
Mass Cont. (g)	NA
Dry Mass - Soil Extruded During Loading, $M_{d,et}$ (g)	0.00

Photo taken of Sliced Test Specimen: ☐ Yes ; ☒ No

Final Visual Description: Mottled Very Pale Brown and Brownish Yellow Fat CLAY (CH)

Trimming/Etc. Remarks:

Method of trimming periphery: ☒ "Casagrande" Lathe ; ☐ Cutting Shoe ; ☐ Wire Saw ; ☐ Other
 Method of trimming ends: ☐ Wire Saw & Sharp (knife) Straight Edge ; ☒ Wire Saw & Straight Edge ; ☐ Wire Saw

Trim./Recon. By: JTG Setup By: JTG Prelim. Calc. By: LF Take Down By: JTG
 Date: 3/25/2008 Date: 3/25/2008 Final Calc. By: LF Date: 4/2/2008
 Reviewed By: HP *H*

Note: NA - Not Applicable

KAW 7/16/08

ONE - DIMENSIONAL CONSOLIDATION TEST: Specimen Calculations & Summary

Project Number: 0411-08-1686 Test Station No.: CRS-4 File Name: B-2321_UD3a
 Task No.: NA Specific Gravity, G_s : 2.710 ☒ Measured ; ☐ Assumed.
 Calculations Corrected for Salt (dissolved solids): ☒ No or, ☐ Yes, with Concentration = _____ g/kg

Cal.- Routine	ITEM	Water Content, (%)	Mass Dry Soil, (g)	Degree of Saturation, S in %		
				Height Initial	Final Height Meas.	Dial
1	Initial, Top, W1	15.90	103.28	72.8	99.1	101.2
2	" Bottom, W2	15.07	104.03	70.3	96.6	98.6
3	" Sides, W3	15.07	104.02	70.3	96.6	98.7
4	" Average, W4	15.35	103.77	71.2	97.5	99.5
5	" Back Calculated (1)	16.66	102.61 (3)	74.9	101.3	103.4
6	Final	19.36	102.61 (2)	74.9	101.3	103.4

Calculated Specific Gravity for Final Saturation = 100%:	
Used Cal. Routine No. <u>5</u>	to obtain the mass of dry soil
and final height by: ☒ Measurement; ☐ Dial Change.	
Back Cal. G_s = <u>2.728</u>	
Avg. G_s (measured/assumed) & Back Cal. G_s = <u>2.719</u>	

Calculation Constant, K	
= (unit conversion) / $G_s \times \rho_w \times A_r$	
Estimated, K_s	0.11641
Final Selected, K_r	0.11641

Calculated Mass Dry Soil for Final Saturation = 100%:		using measured/assumed G_s
and final height by: ☒ Measurement; ☐ Dial Change.		
Back Cal. Mass Dry Soil, (g) = <u>103.00</u>		
Avg. Back Calculated and Measured Mass Dry Soil (g) = <u>102.80</u>		

Summary of Specimen Physical Properties									
Specific Gravity $G_s = 2.710$			Assumed		To make $S_r = 100\%$ at end of test.				
		X	Measured		Avg. of measured/assumed G_s and G_s to make $S_r = 100\%$				
Mass Dry Soil, (g)	Initial: 102.61		X	From Cal. Routine No. 5		Note: Routine #5 is based on final measurements.			
	Final (4): NA			Make $S_r = 100\%$, or,		Avg. of measured & make $S_r = 100\%$			
Initial Height (mm) = 19.14			X	Measured ;			Back Calculated Back-cal. Sat. (%) = NA		
Final Height (mm) = 18.10			X	Measured ;			Initial H_o & dial change during loading		
	Water Content, w (%)	Void Ratio, e	Degree of Saturation, S (%)	Total Unit Weight, γ_t (pcf)	Dry Unit Weight, γ_d (pcf)	Height of Solids, H_s (2,4) (mm)	Extruded soil loss proportioned in increasing loading increments (5) :		
Initial	16.7	0.603	74.9	122.9	105.4	11.945	From	To (ksf)	
Final	19.3	0.516	101.3	132.9	111.4	NA	NA	NA	

Graphical Construction	σ'_p (ksf)	ϵ_a (%)	CR	RR	OCR	Liquid Limit (LL)	51	Minus 200 (%)
Casagrande Method	6.00	NA	0.102	0.025	4.2	Plastic Limit (PL)	16	93.5
Becker Method	NA	Becker minimum σ'_p (ksf):		NA		Plasticity Index (PI)	35	

NA - Indicates not applicable

Notes:

- (1) Back Calculated based on final mass of oven-dry soil (corrected for dry mass of any excess and extruded soil).
- (2) Corrected for any excess dry soil (soil stuck to ring, filter paper, etc.).
- (3) This value is only different from the final value if there is soil extrusion during loading.
- (4) Final is only different from the initial value if there is soil extrusion during loading.
- (5) There should not be any soil loss in a CRS test, unless stress increments are applied.

Calculated By: LF Reviewed By: HP
 Date: 4/4/2008

ONE - DIMENSIONAL CONSOLIDATION TEST: CALCULATED CRS LOADING DATA

Project Number: 0411-08-1686 Test Station No.: CRS-4 File Name: B-2321_UD3a
Task No.: NA Date; Start: 3/25/2008 Initial Height, H_o (mm): 19.14
Project Name: Exelon (Victoria) Completed: 4/2/2008 Ring Area, A_r (cm²): 31.7546
Test: Initial / Pressure Gauge Back Pressure, U_G (psi): 70 ☒ Undisturbed or ; ☐ Reconstituted - Specimen.
Reference Values: Back Pressure, $U_{b, BE}$ (psi): 70.72298, V : 0.02294669 Piston Uplift, P_{up} (lbf): 34.75
Back Pressure, $U_{b, CS}$ (psi): 70.72316, V : 0.02294675 Setup DT_{ref} (V): 0.04991041
Displacement Transducer No.: DT-104 Calib. Factor (mm/V): -214.04 Ch. No.: 10
Pore Press. Transducer No.: PT-111 Calib. Factor (psi/V): 3094.921 Ref. Zero (V): 0.000095 Ch. No.: 11
Force Cell No.: FT-104 Calib. Factor (lbf/V): 96642.037 Ref. Zero (V): -0.000039 Ch. No.: 12

Notes:

- (1) S - Seating, BS - Start of Back Pressure, BE - End of Back Pressure, SC - Stress Controlled, CS - Constant Rate of Strain
US - Start of Uniform Strain Rate, UE - End of Uniform Strain Rate
- (2) Total Vertical Stress (σ_v) corrected to account for the force caused by the back pressure acting on the piston (Piston Uplift).
- (3) Increasing deformation value indicates: ☒ compression; or ☐ swell.
- (4) "App. Flex. Corr." values based on the apparatus calibration.

Data Management By: LF Reviewed By: HP 

Remarks:

Load- ing Info. (1)	Julian Day (dd)	Hour (hr.:min.:s)	Elapsed Time from Start of Loading, Δt_n (min)	Total Vertical Stress, $\sigma_{v,n}$ (2) (ksf)	Excess Pore-Water Pressure, ΔU_n (ksf)	Total Specimen Deformation, ΔH_n (3) (mm)	Apparatus Flexibility Correction, $\Delta d_{afc,n}$ (mm)	Corr. Total Specimen Deformation, $\Delta H_{c,n}$ (4) (mm)	Strain Rate, between n & $n-1$, $\Delta \epsilon_{ac,rate}$ (%/hr)
S	85	15 : 39 : 00		0.30		0.000			
BS	85	16 : 28 : 00		0.62		0.047	0.020	0.027	
BE	86	09 : 31 : 00		0.46	0.000	0.026	0.000	0.026	
CS	86	09 : 32 : 00	0	0.42	0.000	0.025	0.020	0.005	
	86	10 : 04 : 00	32	0.68	0.000	0.042	0.021	0.021	0.155
	86	10 : 36 : 00	64	0.99	0.001	0.099	0.030	0.069	0.477
US	86	11 : 28 : 00	116	1.43	0.000	0.204	0.043	0.161	0.555
	86	12 : 32 : 00	180	2.01	-0.002	0.330	0.058	0.273	0.545
	86	13 : 36 : 00	244	2.67	0.005	0.441	0.071	0.370	0.476
	86	14 : 40 : 00	308	3.41	0.006	0.542	0.083	0.459	0.436
	86	15 : 44 : 00	372	4.38	0.008	0.654	0.097	0.558	0.483
	86	16 : 48 : 00	436	5.52	0.008	0.768	0.110	0.658	0.494
	86	17 : 52 : 00	500	6.91	0.009	0.882	0.123	0.759	0.492
	86	18 : 56 : 00	564	9.01	0.009	1.023	0.140	0.883	0.608
	86	20 : 00 : 00	628	11.46	0.007	1.169	0.157	1.011	0.630
	86	21 : 04 : 00	692	14.29	0.005	1.313	0.175	1.138	0.622
	86	22 : 08 : 00	756	17.49	0.007	1.461	0.193	1.267	0.632
	86	23 : 12 : 00	820	21.05	0.004	1.607	0.212	1.395	0.625
	87	00 : 16 : 00	884	25.01	0.010	1.751	0.231	1.519	0.609
	87	01 : 20 : 00	948	29.51	0.075	1.893	0.252	1.640	0.593
	87	02 : 24 : 00	1012	34.49	0.294	2.034	0.274	1.759	0.583
	87	03 : 28 : 00	1076	39.99	0.788	2.175	0.298	1.877	0.578
	87	04 : 32 : 00	1140	46.09	1.683	2.314	0.322	1.992	0.559
UE	87	05 : 36 : 00	1204	53.00	3.189	2.450	0.349	2.101	0.536

**ONE - DIMENSIONAL CONSOLIDATION TEST:
CALCULATED CRS LOADING DATA**

Load- ing Info. (1)	Julian Day (dd)	Hour (hr.:min.:s)	Elapsed Time from Start of Loading, Δt_n (min)	Total Vertical Stress, $\sigma_{v,n}$ (2) (ksf)	Excess Pore-Water Pressure, ΔU_n (ksf)	Total Specimen Deformation, ΔH_n (3) (mm)	Apparatus Flexibility Correction, $\Delta d_{afc,n}$ (mm)	Corr. Total Specimen Deformation, $\Delta H_{c,n}$ (4) (mm)	Strain Rate, between n & n-1, $\Delta \varepsilon_{ac,rate}$ (%/hr)
	87	05 : 48 : 00	1216	54.41	3.547	2.476	0.354	2.122	0.534
	87	05 : 50 : 00	1218	53.98	3.279	2.477	0.353	2.124	0.351
	87	07 : 04 : 00	1292	45.22	-0.331	2.469	0.324	2.145	0.089
	87	08 : 18 : 00	1366	35.63	-0.850	2.425	0.291	2.135	-0.042
	87	09 : 32 : 00	1440	27.67	-1.153	2.372	0.261	2.111	-0.103
	87	10 : 46 : 00	1514	21.28	-1.408	2.312	0.236	2.076	-0.147
	87	12 : 00 : 00	1588	16.25	-1.599	2.249	0.215	2.034	-0.178
US	87	13 : 14 : 00	1662	12.35	-1.682	2.183	0.198	1.985	-0.205
	87	14 : 28 : 00	1736	9.38	-1.648	2.114	0.182	1.932	-0.228
	87	15 : 42 : 00	1810	7.15	-1.527	2.044	0.169	1.875	-0.240
	87	16 : 56 : 00	1884	5.52	-1.342	1.974	0.158	1.816	-0.250
	87	18 : 08 : 00	1956	4.48	-1.057	1.913	0.149	1.764	-0.225
UE	87	18 : 10 : 00	1958	4.33	-1.129	1.910	0.147	1.763	-0.250
	87	18 : 28 : 00	1976	6.45	0.157	1.924	0.164	1.759	-0.062
	87	18 : 46 : 00	1994	9.05	1.113	1.954	0.180	1.773	0.246
	87	19 : 04 : 00	2012	11.39	1.660	1.987	0.193	1.794	0.362
US	87	19 : 22 : 00	2030	13.62	2.087	2.021	0.204	1.818	0.407
	87	19 : 40 : 00	2048	15.84	2.468	2.056	0.214	1.843	0.434
	87	19 : 58 : 00	2066	18.03	2.782	2.092	0.223	1.869	0.462
	87	20 : 16 : 00	2084	20.31	3.064	2.128	0.232	1.895	0.459
	87	20 : 34 : 00	2102	22.64	3.314	2.164	0.242	1.923	0.471
	87	20 : 52 : 00	2120	24.99	3.482	2.198	0.251	1.947	0.432
	87	21 : 10 : 00	2138	27.49	3.673	2.235	0.261	1.974	0.469
	87	21 : 28 : 00	2156	30.03	3.823	2.270	0.270	2.000	0.452
	87	21 : 46 : 00	2174	32.65	3.957	2.305	0.280	2.025	0.434
	87	22 : 04 : 00	2192	35.42	4.124	2.340	0.290	2.050	0.432
	87	22 : 22 : 00	2210	38.21	4.256	2.374	0.300	2.075	0.428
	87	22 : 40 : 00	2228	41.06	4.408	2.408	0.310	2.099	0.421
	87	22 : 58 : 00	2246	44.03	4.632	2.443	0.320	2.123	0.415
	87	23 : 16 : 00	2264	46.99	4.874	2.475	0.330	2.145	0.396
	87	23 : 34 : 00	2282	49.89	5.186	2.510	0.340	2.170	0.431
	87	23 : 52 : 00	2300	52.78	5.574	2.545	0.349	2.196	0.453
UE	88	00 : 10 : 00	2318	55.54	5.978	2.580	0.359	2.221	0.439
	88	00 : 14 : 00	2322	56.16	6.085	2.588	0.361	2.227	0.447
	88	00 : 16 : 00	2324	55.78	5.800	2.589	0.360	2.230	0.400
	88	03 : 10 : 00	2498	34.32	-1.535	2.519	0.287	2.232	0.005
	88	06 : 04 : 00	2672	18.52	-2.748	2.385	0.226	2.159	-0.131
	88	08 : 58 : 00	2846	9.37	-3.080	2.228	0.183	2.045	-0.207
US	88	11 : 52 : 00	3020	4.85	-2.454	2.065	0.153	1.912	-0.239
	88	14 : 46 : 00	3194	3.17	-1.425	1.932	0.136	1.797	-0.208
	88	17 : 40 : 00	3368	2.12	-0.901	1.821	0.120	1.701	-0.172
	88	20 : 34 : 00	3542	1.27	-0.642	1.705	0.103	1.602	-0.178

ONE - DIMENSIONAL CONSOLIDATION TEST: CALCULATED CRS LOADING DATA

[illegible]

ONE - DIMENSIONAL CONSOLIDATION TEST: CRS LOADING RESULTS (Load Time - Deformation Properties)

Project Number: 0411-08-1686 Test Station No.: CRS-4 ☒ Undisturbed or ; ☐ Reconstituted - Specimen. File Name: B-2321_UD3
 Task No.: NA Date, Start: 3/25/2008 Back Pressure, $U_{b,CS}$ (psi): 70.7 Piston Uplift, P_{up} (lb): 34.75
 Project Name: Exelon (Victoria) Completed: 4/2/2008 Transient Time Factor, $T_v = (C_v \cdot t) / H^2 = 0.5$
 4186-06-Summary of Methods: NA ☐ Data corrected for salt _____; in ☐ g/kg

Final Description of Specimen: Mottled Very Pale Brown and Brownish Yellow Fat CLAY (CH)

Ring No.: 4 Area, A_r (cm²): 31.755 Solids Ht., H_s (mm): 11.945 Specific Gravity, $G_s = 2.710$ ☒ Meas. ; ☐ Assumed
Initial: Height H_o : 19.14 Water 16.7 Void 0.603 Deg. of 74.9 Total Unit 122.9 Dry Unit 105.4
Final: (mm): H_f : 18.10 Content, w (%): 19.3 Ratio, e : 0.516 Sat., S (%): 101.3 Weight, γ_t (pcf): 132.9 Weight, γ_d (pcf): 111.4

Notes:

- (1) S - Seating, BS - Start of Back Pressure, BE - End of Back Pressure, SC - Stress Controlled, CS - Constant Rate of Strain, US - Start of Uniform Strain Rate, UE - End of Uniform Strain Rate or ΔU_n to erratic
- (2) Excess pore-water pressure measured at the base of the specimen.
- (3) Only applicable during stress controlled (SC) loading.

Data Management by: LF

Reviewed By: HP *HP*

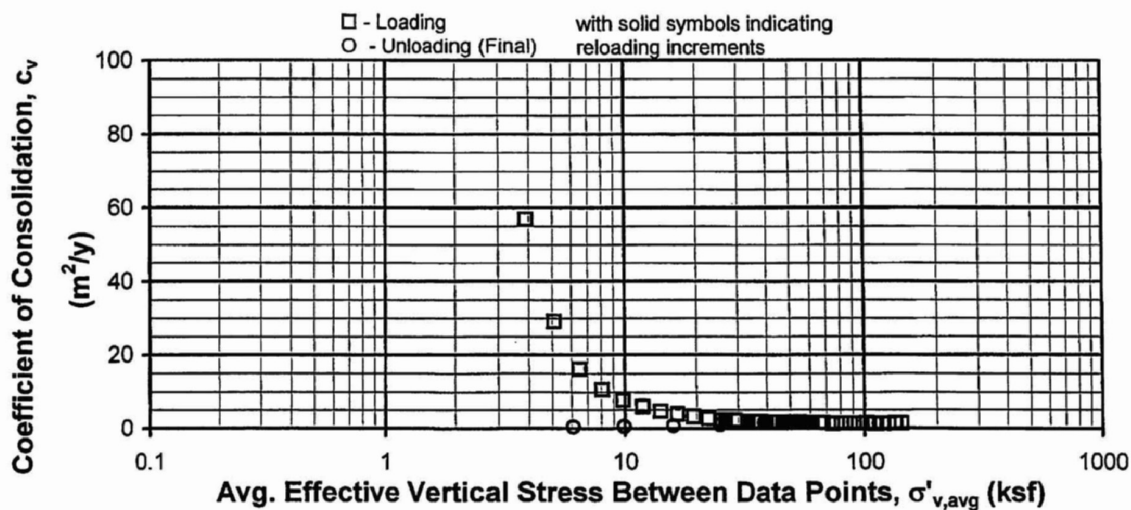
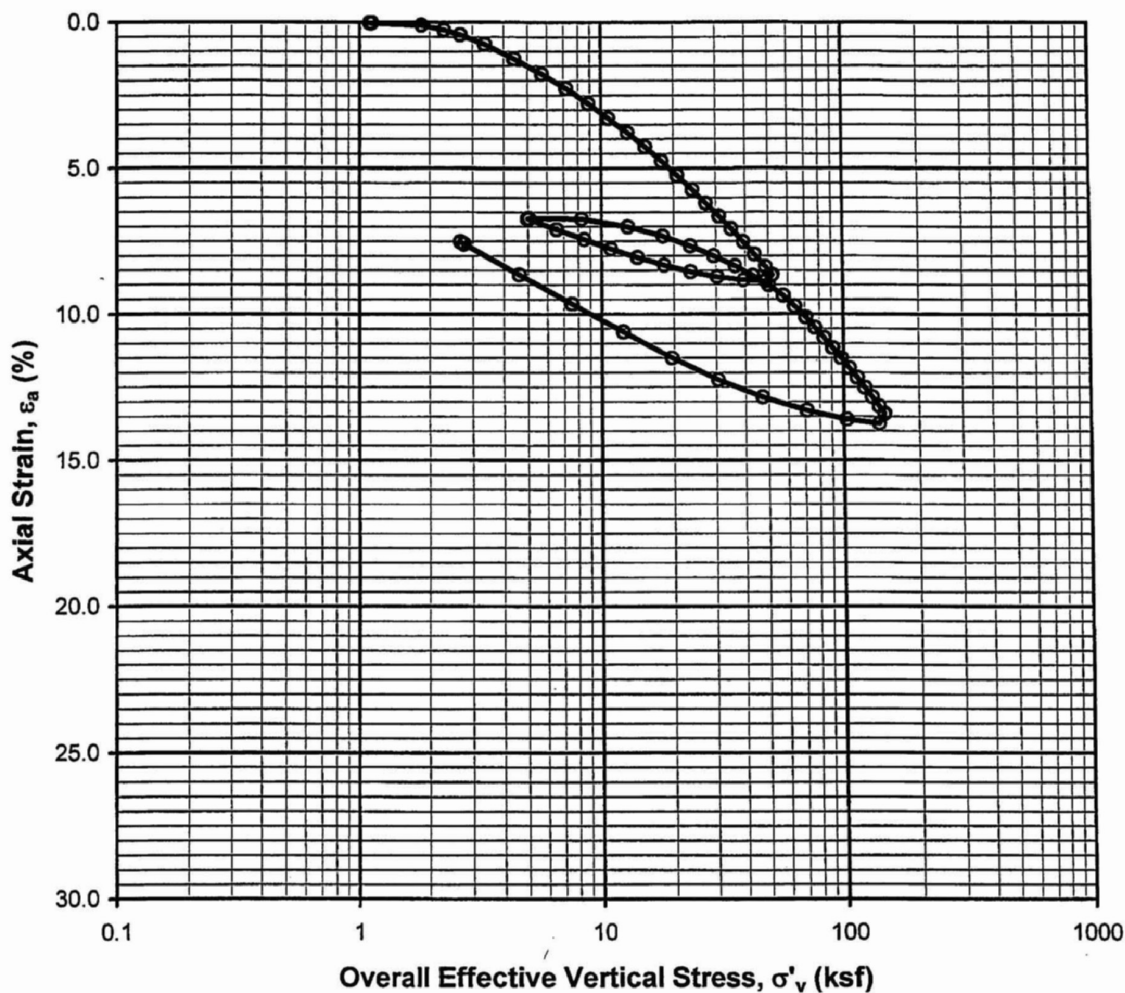
Loading Info. (1)	Elapsed Time from Start of Loading, Δt_n (min)	Overall Effective Vertical Stress, $\sigma'_{v,n}$ (ksf)	Corrected Volumetric (Axial) Strain, $\epsilon_{v,n}$ ($\epsilon_{ac,n}$) $\Delta H_{c,n} / H_o$ (%)	Overall Void Ratio, e_n	Total Vertical Stress, $\sigma_{v,n}$ (ksf)	Excess Pore-Water Pressure, ΔU_n (2) (ksf)	Loading Pore-Water Pressure Ratio, R_u $\Delta U_n / \sigma_{v,n}$ (%)	Corrected Specimen Height, $H_{c,n}$ (mm)	Calculations Between n and n-1				Steady State Ratio, $SSR_n = \frac{C_v \cdot t_n \cdot UCF}{T_v \cdot (H_{c,avg})^2}$	Rate of Secondary Comp. (3), $C_\alpha = \frac{\Delta d_{a,sc}}{H_o} (\times 10^{-4})$
									Average Effective Vertical Stress, $\sigma'_{v,avg}$ (ksf)	Coefficient of Consolidation, C_v (m ² /y)	Average Void Ratio, e_{avg}	Hydraulic Conductivity, k @ 20°C (m/y)		
S					0.30				Data on given line represents average conditions					
BS			0.14	0.600	0.62			19.115	between that line and the previous line of data.					
BE		0.46	0.14	0.600	0.46	0.000	0.0	19.116			0.600			
CS	0	0.42	0.03	0.602	0.42	0.000	0.0	19.137			0.601			
	32	0.68	0.11	0.601	0.68	0.000	0.1	19.121	0.55		0.601			
	64	0.99	0.36	0.597	0.99	0.001	0.1	19.073	0.83		0.599			
US	116	1.43	0.84	0.589	1.43	0.000	0.0	18.981	1.21		0.593			
	180	2.02	1.42	0.580	2.01	-0.002	-0.1	18.869	1.72		0.584		-513.48	
	244	2.66	1.93	0.572	2.67	0.005	0.2	18.772	2.34	623.93	0.576	9.84E-01	857.92	
	308	3.40	2.40	0.564	3.41	0.006	0.2	18.683	3.03	195.65	0.568	2.51E-01	407.57	
	372	4.38	2.91	0.556	4.38	0.008	0.2	18.584	3.89	205.28	0.560	2.21E-01	575.93	
	436	5.52	3.44	0.547	5.52	0.008	0.1	18.484	4.95	199.96	0.552	1.88E-01	708.82	
	500	6.90	3.96	0.539	6.91	0.009	0.1	18.383	6.21	221.48	0.543	1.71E-01	952.42	
	564	9.00	4.61	0.529	9.01	0.009	0.1	18.259	7.95	318.61	0.534	2.00E-01	1618.10	
	628	11.45	5.28	0.518	11.46	0.007	0.1	18.131	10.23	425.16	0.523	2.37E-01	2502.12	
	692	14.29	5.95	0.507	14.29	0.005	0.0	18.004	12.87	665.07	0.513	3.16E-01	4465.71	
	756	17.49	6.62	0.496	17.49	0.007	0.0	17.875	15.89	754.04	0.502	3.23E-01	5706.23	

ONE - DIMENSIONAL CONSOLIDATION TEST: CRS LOADING RESULTS (Load Time - Deformation Properties)

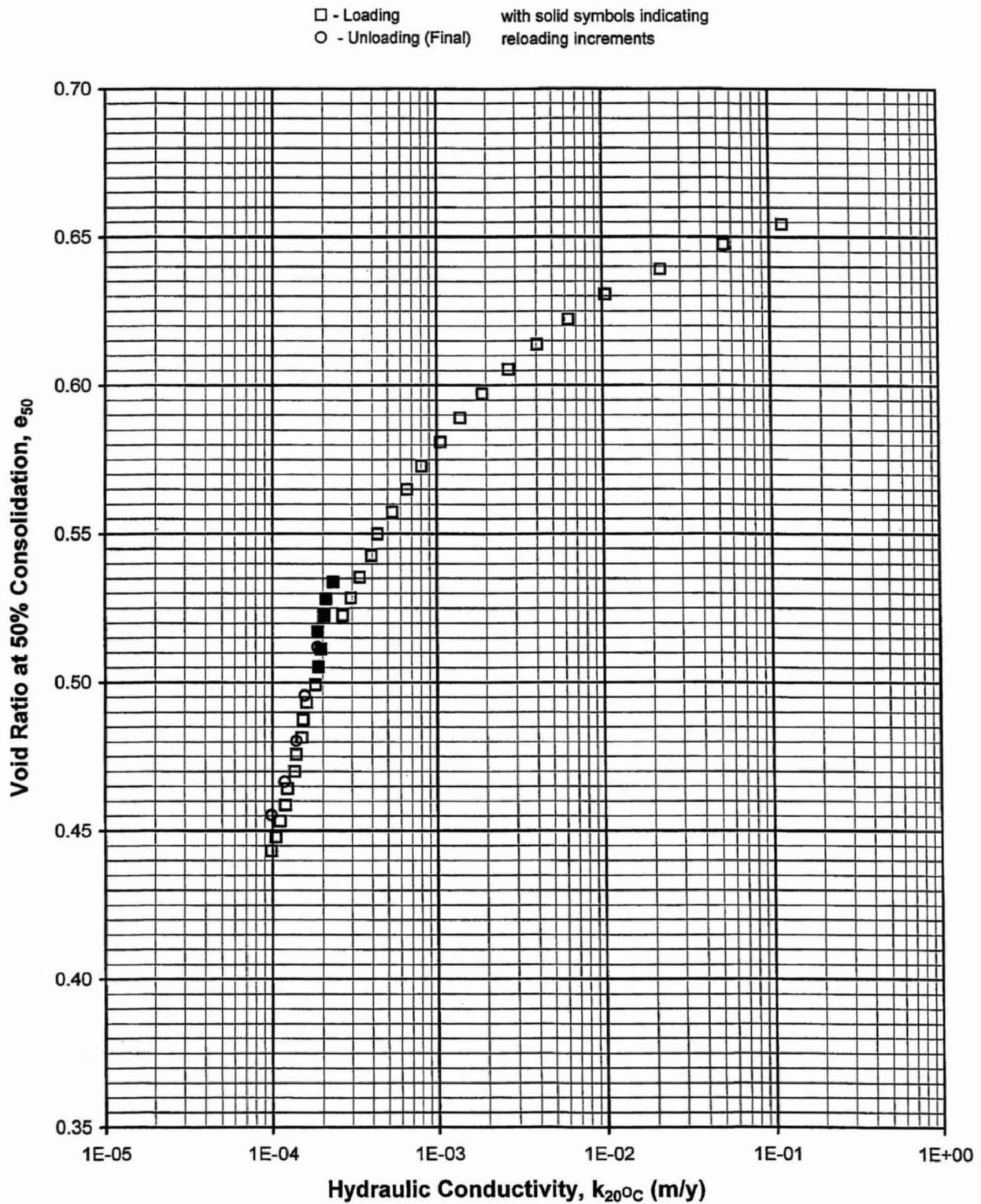
Load- ing Info. (1)	Elapsed Time from Start of Loading, Δt_n (min)	Overall Effective Vertical Stress, $\sigma'_{v,n}$ (ksf)	Corrected Volumetric (Axial) Strain, $\epsilon_{v,n} (\epsilon_{ac,n})$ $\Delta H_{c,n} / H_o$ (%)	Overall Void Ratio, e_n	Total Vertical Stress, $\sigma_{v,n}$ (ksf)	Excess Pore-Water Pressure, $\Delta U_n (2)$ (ksf)	Loading Pore-Water Pressure Ratio, R_u $\Delta U_n / \sigma_{v,n}$ (%)	Corrected Specimen Height, $H_{c,n}$ (mm)	Calculations Between n and n-1				Steady State Ratio, $SSR_n =$ $\frac{c_v \cdot t_n \cdot UCF}{T_v \cdot (H_{c,avg})^2}$	Rate of Secondary Comp. (3), $C_\alpha =$ $\Delta d_{s,sc} / H_o$ ($\times 10^{-4}$)
									Average Effective Vertical Stress, $\sigma'_{v,avg}$ (ksf)	Coefficient of Consolidation, C_v (m^2/y)	Average Void Ratio, e_{avg}	Hydraulic Conductivity, $k @ 20^\circ C$ (m/y)		
	820	21.05	7.29	0.486	21.05	0.004	0.0	17.747	19.27	864.94	0.491	3.30E-01	7304.16	
	884	25.00	7.94	0.475	25.01	0.010	0.0	17.623	23.02	743.56	0.481	2.49E-01	6947.93	
	948	29.46	8.57	0.465	29.51	0.075	0.3	17.502	27.23	135.02	0.470	3.87E-02	1385.95	
	1012	34.29	9.19	0.455	34.49	0.294	0.9	17.383	31.87	33.68	0.460	8.60E-03	377.43	
	1076	39.47	9.81	0.445	39.99	0.788	2.0	17.265	36.88	12.48	0.450	2.87E-03	151.86	
	1140	44.96	10.40	0.436	46.09	1.683	3.7	17.150	42.21	5.92	0.441	1.21E-03	77.90	
UE	1204	50.85	10.98	0.427	53.00	3.189	6.0	17.041	47.90	3.33	0.431	5.81E-04	47.12	
	1216	52.02	11.08	0.425	54.41	3.547	6.5	17.020	51.43		0.426			
	1218	51.77	11.09	0.425	53.98	3.279	6.1	17.018	51.90		0.425			
	1292	45.44	11.20	0.423	45.22	-0.331	-0.7	16.997	48.60		0.424			
	1366	36.19	11.15	0.424	35.63	-0.850	-2.4	17.007	40.81		0.423			
	1440	28.43	11.03	0.426	27.67	-1.153	-4.2	17.031	32.31		0.425			
	1514	22.20	10.84	0.429	21.28	-1.408	-6.6	17.066	25.32		0.427			
	1588	17.30	10.62	0.432	16.25	-1.599	-9.8	17.108	19.75		0.431			
US	1662	13.45	10.37	0.436	12.35	-1.682	-13.6	17.157	15.37		0.434			
	1736	10.45	10.09	0.441	9.38	-1.648	-17.6	17.210	11.95	2.02	0.439	3.53E-04	1.93	
	1810	8.13	9.80	0.446	7.15	-1.527	-21.4	17.267	9.29	1.63	0.443	3.91E-04	3.09	
	1884	6.38	9.49	0.450	5.52	-1.342	-24.3	17.326	7.26	1.35	0.448	4.51E-04	3.80	
	1956	5.16	9.22	0.455	4.48	-1.057	-23.6	17.378	5.77	1.07	0.453	4.88E-04	3.97	
UE	1958	5.05	9.21	0.455	4.33	-1.129	-26.1	17.379	5.10	6.07	0.455	5.97E-04	22.64	
	1976	6.34	9.19	0.455	6.45	0.157	2.4	17.383	5.70		0.455			
	1994	8.29	9.26	0.454	9.05	1.113	12.3	17.369	7.32		0.455			
	2012	10.26	9.37	0.452	11.39	1.660	14.6	17.348	9.27		0.453			
US	2030	12.19	9.50	0.450	13.62	2.087	15.3	17.324	11.22		0.451			
	2048	14.15	9.63	0.448	15.84	2.468	15.6	17.299	13.17		0.449		0.90	
	2066	16.13	9.76	0.446	18.03	2.782	15.4	17.273	15.14	3.36	0.447	4.85E-04	1.54	
	2084	18.21	9.90	0.444	20.31	3.064	15.1	17.247	17.17	3.12	0.445	4.30E-04	2.15	
	2102	20.37	10.04	0.442	22.64	3.314	14.6	17.219	19.29	2.94	0.443	4.03E-04	2.71	
	2120	22.61	10.17	0.440	24.99	3.482	13.9	17.195	21.49	2.78	0.441	3.46E-04	3.21	
	2138	24.98	10.31	0.437	27.49	3.673	13.4	17.168	23.80	2.80	0.438	3.55E-04	3.89	

DCN# EXE808

FUGRO CONSULTANTS, INC.



1-D CONSOLIDATION TEST: CRS
 Sample No. UD-4A - Depth 13.5 - 15.2 ft
 Boring B-2321UD



1-D CONSOLIDATION TEST: CRS
Sample No. UD-4A - Depth 13.5 - 15.2 ft
Boring B-2321UD

KAW 7/16/08

ONE - DIMENSIONAL CONSOLIDATION TEST: Specimen Setup / Take Down

Project Number: 0411-08-1686 Test Station No.: CRS-1 File Name: B-2321_UD4a
 Task No.: NA Specific Gravity, G_s: 2.720 ☒ Meas.; ☐ Assumed Ring No.: 1
 Project Name: Exelon (Victoria) Assig. Remarks: Ring Area, A_r (cm²) = 31.739
 TEST TYPE: ☒ CRS (D 4186-06); ☐ Method A; ☐ Method B; ☐ Method C; ☐ Method D; Ring Height (mm) = NA
☐ Method E; ☐ Method F; ☐ Method G; ☐ Method H; ☐ Method I; ☐ Method J; Summary of Methods: NA

☒ Tube	☐ Field Extruded	☐ Liner	☐ Remolded	☐ Tamping	☐ Constant Effort:	Blows/Tamps per Layer =
Boring No.: B-2321UD	☐ LPC Core	☐ Impact/Rammer		Rammer Wgt.(lb)=	No. Layers =	
Sample No.: UD-4	Composite No.:	☐ Pluviated:		Tamper Force (lb)=	Drop (in.) =	
Depth (ft): 13.5 - 15.2	Specimen No.: A	☐ Kneading		☐ Undercompaction:	U _{ni} (%) =	Dia. (in.) =
☐ Spec. Selection by X-ray;	☐ Geomarine Sample			Ref. Effort=	% Comp. =	± Opt.=

Water Content (W);		Initial - Trimming Location			Final, W _{at} (see below)	Soil and Ring Masses	Initial	Final
		Top (W1)	Bottom (W2)	Sides (W3)		Mass Moist Soil + Ring (g)	329.02	328.02
Container No.		2004	2007	2031	56	Mass Ring (g)	208.35	
Mass Moist Soil + Container (g)		125.91	121.81	102.05	69.59	Mass Moist Soil, M _{t,o} or M _{t,at} (g)	120.67	119.67
Mass Dry Soil + Container (g)		108.31	106.06	89.16	63.04	EXCESS DRY SOIL (soil not incl. in final mass above)		
Mass Container (g)		30.45	30.46	30.60	30.33	Container No.		829
WATER CONTENT (%)		22.60	20.83	22.01	20.02	Mass Dry Soil + Container (g)		32.59
Avg. Initial Water Content, W4 (%)		21.82	Final W _{at} : X		Slice ;	Whole Spec.	Mass Container (g)	32.30
See attached data sheet(s) for additional water contents						Mass Excess Dry Soil, M _{d,es} (g)		0.29

Soil Height: Measurements (mm)				Soil Height: Calculations, (mm)		Initial	Final
Initial		Final		Height of Gauge Block, H _{gb} (1)		0.000	19.070
with Spec.	without Spec.	with Spec.	without Spec.	Reading on Gauge Block, d _{gb}		0.000	0.000
19.070	0.000	11.980	13.430	Avg. Reading on Soil, d _{soil}		19.100	11.966
19.140	0.000	11.780	13.360	Avg. Reading on Apparatus without Specimen, d _{app}		0.000	13.382
19.110	0.000	11.920	13.390	Soil Height, H = d _{soil} - d _{app} + H _{gb} - d _{gb}		19.100	17.654
19.100	0.000	12.130	13.410	Soil Height: Final by Dial Change During Test (mm)			
19.080	0.000	12.020	13.320	Initial Height, H _o		19.100	
☐ Yes ;	☒ No	☒ Yes ;	☐ No	Require H _{gb} & d _{gb} (1)	Final (end of test) Corr. Total Spec. Deformation, ΔH _{c,t}	1.437	
☐ Yes ;	☒ No	☒ Yes ;	☐ No	Filter Paper Included:	Final Calculated Height, H _{f,c} = H _o - ΔH _{c,t}	17.663	
(1) Req. block ht. to set bench comparator so the final soil ht. can be determined directly by the diff. between the reading with and without spec.: ~ 12.7 mm; CRS ~ 25 mm					Final Soil Height Measurement, H _{f,m}	17.654	
Enter value of H _{gb} & d _{gb} only when that value has to be included in the determination of the soil height.					Normalized Difference in %, (H _{f,c} - H _{f,m})/H _o	0.05	

Estimated Initial Unit Weight		Soil Extruded During Loading	
Total, γ _{t,o} (pcf)= 124.27	Dry, γ _{d,o} (pcf)= 102.01	Container No.	
Filter Paper Used: ☒ Whatman No. 54; ☐ Other		Mass Dry Soil + Cont. (g)	NA
Incremental Test: Top & Bottom: ☐ Yes ; ☐ No		Mass Cont. (g)	NA
CRS Test: Top Only: ☒ Yes ; ☐ No		Dry Mass - Soil Extruded During Loading, M _{d,el} (g)	0.00

Photo taken of Sliced Test Specimen: ☐ Yes ; ☒ No

Final Visual Description: Mottled Brownish Yellow and Light Gray Fat CLAY (CH)

Trimming/Etc. Remarks:

Method of trimming periphery: ☒ "Casagrande" Lathe ; ☐ Cutting Shoe ; ☐ Wire Saw ; ☐ Other
 Method of trimming ends: ☐ Wire Saw & Sharp (knife) Straight Edge; ☒ Wire Saw & Straight Edge; ☐ Wire Saw

Trim./Recon. By: JTG Setup By: JTG Prelim. Calc. By: DH Take Down By: JTG
 Date: 4/6/2008 Date: 4/6/2008 Final Calc. By: DH Date: 4/10/2008
 Reviewed By: HP HF

Note: NA - Not Applicable

KAW 7/16/08

ONE - DIMENSIONAL CONSOLIDATION TEST: Specimen Calculations & Summary

Project Number: 0411-08-1686 Test Station No.: CRS-1 File Name: B-2321_UD4a
 Task No.: NA Specific Gravity, G_s : 2.720 ☒ Measured ; ☐ Assumed.
 Calculations Corrected for Salt (dissolved solids): ☒ No or, ☐ Yes, with Concentration = _____ g/kg

Cal.- Routine	ITEM	Water Content, (%)	Mass Dry Soil, (g)	Degree of Saturation, S in %		
				Height Initial	Final Height Meas.	Dial
1	Initial, Top, W1	22.60	98.42	91.5	107.6	107.4
2	" Bottom, W2	20.83	99.86	87.4	103.1	102.9
3	" Sides, W3	22.01	98.90	90.1	106.1	106.0
4	" Average, W4	21.82	99.06	89.7	105.6	105.5
5	" Back Calculated (1)	20.68	99.99 (3)	87.1	102.6	102.5
6	Final	20.02	99.99 (2)	87.1	102.6	102.5

Calculated Specific Gravity for Final Saturation = 100%:	
Used Cal. Routine No. 5	to obtain the mass of dry soil
and final height by: ☒ Measurement; ☐ Dial Change.	
Back Cal. G_s = 2.758	
Avg. G_s (measured/assumed) & Back Cal. G_s = 2.739	

Calculation Constant, K = (unit conversion) / $G_s \times \rho_w \times A_r$	
Estimated, K_e	0.11604
Final Selected, K_f	0.11604

Calculated Mass Dry Soil for Final Saturation = 100%:		using measured/assumed G_s
and final height by: ☒ Measurement; ☐ Dial Change.		
Back Cal. Mass Dry Soil, (g) = 100.80		
Avg. Back Calculated and Measured Mass Dry Soil (g) = 100.40		

Summary of Specimen Physical Properties									
Specific Gravity $G_s = 2.720$			Assumed		To make $S_r = 100\%$ at end of test.				
		X	Measured		Avg. of measured/assumed G_s and G_s to make $S_r = 100\%$				
Mass Dry Soil, (g)	Initial:	99.99	X	From Cal. Routine No.	5	Note: Routine #5 is based on final measurements.			
	Final (4):	NA		Make $S_r = 100\%$, or;		Avg. of measured & make $S_r = 100\%$			
Initial Height (mm) =			19.10	X	Measured ;		Back Calculated Back-cal. Sat. (%) = NA		
Final Height (mm) =			17.65	X	Measured ;		Initial H_o & dial change during loading		
	Water Content, w (%)	Void Ratio, e	Degree of Saturation, S (%)	Total Unit Weight, γ_t (pcf)	Dry Unit Weight, γ_d (pcf)	Height of Solids, H_s (2,4) (mm)	Extruded soil loss proportioned in increasing loading increments (5) :		
Initial	20.7	0.646	87.1	124.3	103.0	11.604	From	To (ksf)	
Final	19.7	0.521	102.6	133.3	111.4	NA	NA	NA	

Graphical Construction	σ'_p (ksf)	ϵ_a (%)	CR	RR	OCR	Liquid Limit (LL)	81	Minus 200 (%)
Casagrande Method	9.30	NA	0.104	0.027	4.9	Plastic Limit (PL)	22	92.2
Becker Method	NA	Becker minimum σ'_p (ksf):			NA	Plasticity Index (PI)	59	

NA - Indicates not applicable

Notes:

- (1) Back Calculated based on final mass of oven-dry soil (corrected for dry mass of any excess and extruded soil).
- (2) Corrected for any excess dry soil (soil stuck to ring, filter paper, etc.).
- (3) This value is only different from the final value if there is soil extrusion during loading.
- (4) Final is only different from the initial value if there is soil extrusion during loading.
- (5) There should not be any soil loss in a CRS test, unless stress increments are applied.

Calculated By: DH Reviewed By: HP HP
 Date: 4/14/2008

ONE - DIMENSIONAL CONSOLIDATION TEST: CALCULATED CRS LOADING DATA

Project Number: 0411-08-1686 Test Station No.: CRS-1 File Name: B-2321_UD4a
 Task No.: NA Date; Start: 4/6/2008 Initial Height, H_o (mm): 19.10
 Project Name: Exelon (Victoria) Completed: 4/10/2008 Ring Area, A_r (cm²): 31.7385
 Test: Initial / Pressure Gauge Back Pressure, U_G (psi): 70 ☒ Undisturbed or ; ☐ Reconstituted - Specimen.
 Reference Values: Back Pressure, $U_{b,BE}$ (psi): 70.57599, V : 0.02283221 Piston Uplift, P_{up} (lbf): 34.67
 Back Pressure, $U_{b,CS}$ (psi): 70.58469, V : 0.02283503 Setup DT_{ref} (V): 0.04607446
 Displacement Transducer No.: DT-101 Calib. Factor (mm/V): -213.274 Ch. No.: 1
 Pore Press. Transducer No.: PT-107 Calib. Factor (psi/V): 3086.313 Ref. Zero (V): -0.000035 Ch. No.: 2
 Force Cell No.: FT-099 Calib. Factor (lbf/V): 161209.607 Ref. Zero (V): 0.000116 Ch. No.: 3

Notes:

- (1) S - Seating, BS - Start of Back Pressure, BE - End of Back Pressure, SC - Stress Controlled, CS - Constant Rate of Strain
 US - Start of Uniform Strain Rate, UE - End of Uniform Strain Rate
- (2) Total Vertical Stress (σ_v) corrected to account for the force caused by the back pressure acting on the piston (Piston Uplift).
- (3) Increasing deformation value indicates: ☒ compression; or ☐ swell.
- (4) "App. Flex. Corr." values based on the apparatus calibration.

Data Management By: DH Reviewed By: HP

Remarks:

Load- ing Info. (1)	Julian Day (dd)	Hour (hr.:min.:s)	Elapsed Time from Start of Loading, Δt_n (min)	Total Vertical Stress, $\sigma_{v,n}$ (2) (ksf)	Excess Pore-Water Pressure, ΔU_n (ksf)	Total Specimen Deformation, ΔH_n (3) (mm)	Apparatus Flexibility Correction, $\Delta d_{afc,n}$ (mm)	Corr. Total Specimen Deformation, $\Delta H_{c,n}$ (4) (mm)	Strain Rate, between n & n-1, $\Delta \epsilon_{ac,rate}$ (%/hr)
S	97	16 : 37 : 00		0.32		0.000			
BS	97	16 : 56 : 00		1.22		0.047	0.026	0.021	
BE	98	12 : 07 : 00		1.11	-0.001	0.027	0.023	0.004	
CS	98	12 : 08 : 00	0	1.13	0.000	0.028	0.024	0.004	
	98	12 : 26 : 00	18	1.85	0.004	0.055	0.036	0.019	0.261
	98	12 : 44 : 00	36	2.30	0.008	0.094	0.043	0.050	0.550
US	98	13 : 02 : 00	54	2.70	0.012	0.131	0.049	0.081	0.542
	98	13 : 28 : 00	80	3.39	0.029	0.202	0.059	0.143	0.749
	98	14 : 04 : 00	116	4.47	0.071	0.312	0.072	0.240	0.843
	98	14 : 40 : 00	152	5.83	0.168	0.424	0.086	0.338	0.853
	98	15 : 16 : 00	188	7.42	0.329	0.532	0.100	0.432	0.822
	98	15 : 52 : 00	224	9.24	0.528	0.643	0.113	0.530	0.858
	98	16 : 28 : 00	260	11.32	0.781	0.752	0.125	0.628	0.848
	98	17 : 04 : 00	296	13.68	1.109	0.860	0.137	0.723	0.835
	98	17 : 40 : 00	332	16.31	1.506	0.964	0.148	0.816	0.809
	98	18 : 16 : 00	368	19.34	2.048	1.068	0.159	0.909	0.812
	98	18 : 52 : 00	404	22.62	2.628	1.173	0.170	1.003	0.820
	98	19 : 28 : 00	440	26.16	3.234	1.275	0.181	1.094	0.793
	98	20 : 04 : 00	476	29.89	3.825	1.376	0.192	1.184	0.784
	98	20 : 40 : 00	512	34.11	4.453	1.474	0.203	1.270	0.758
	98	21 : 16 : 00	548	38.33	4.996	1.566	0.214	1.351	0.706
	98	21 : 52 : 00	584	43.16	5.706	1.663	0.226	1.436	0.740
	98	22 : 28 : 00	620	48.25	6.389	1.757	0.239	1.518	0.714
	98	23 : 04 : 00	656	53.61	7.018	1.851	0.252	1.599	0.705