ATTACHMENT 2

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Figure 5 - Coupled Consolidation for Section OP-1 for In-Situ (Excavation)

INITIAL STRESS POST EXC.

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File Information

Title: Model City - RMU-2 CP-20 Section OP-1
Comments: Operation Conditions for CP-20 Section 1 Based on Maximum Fill Rate of 50,000 Cu Yds per Quarter
Created By: Peter J. Carey
Last Edited By: Peter J. Carey
Revision Number: 511
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Time: 3:48:00 PM
File Name: C20OP-1r1.gsz
Directory: N:\Model_City\154.002_rmu2\154.005_revsions\geoslope\operational\

Project Settings

Length(L) Units: feet
Time(t) Units: Days
Force(F) Units: lbf
Pressure(p) Units: psf
Strength Units: psf
Stiffness Units: psf
Unit Weight of Water: 62.4 pcf
Air Pressure: 101.33 psf
View: 2D

Analysis Settings

INITIAL STRESS POST EXC.

Description: Initial Conditions C-20 OP-1 progression
Kind: SIGMA/W
Method: Insitu
Settings
    Initial PWP: Water Table
Control
    Apply Body Force in All Steps: No
Convergence
    Equation Solver: Parallel Direct
Time
    Starting Time: 0 days
    Duration: 0 days
    Ending Time: 0 days

Materials

Waste Material

Model: Linear Elastic (Total)
Stress Strain
Young's Modulus (E): 400,000 psf
Unit Weight: 111 pcf
Poisson's Ratio: 0.45
Insitu Ko: 0.81818182

Upper Till

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 300,000 psf
Unit Weight: 125 pcf
Poisson's Ratio: 0.334
Insitu Ko: 0.5015015
Hydraulic
Vol. WC. Function: Till
K-Function: Upper Glacial Till
Ky'/Kx' Ratio: 1
Rotation: 0 °
Load Response Ratio: 1

GC-Drained

Model: Soft Clay (MCC w/ PWP Change)
Stress Strain
O.C. Ratio: 4
Poisson's Ratio: 0.334
Insitu Ko: 0.5015015
Lambda: 0.14
Kappa: 0.013
Initial Void Ratio: 1
Unit Weight: 118 pcf
Phi': 27 °
Hydraulic
Vol. WC. Function: Clay soils
K-Function: GC 5.7 E-4 ft/day
Ky'/Kx' Ratio: 1
Rotation: 0 °
K-Modifier Function: 1D consol derived k function rmu2 clay
Load Response Ratio: 1

GC OverConsolidated

Model: Soft Clay (MCC w/ PWP Change)
Stress Strain
O.C. Ratio: 8
Poisson's Ratio: 0.334
Insitu Ko: 0.5015015
Lambda: 0.06
Kappa: 0.01

Initial Void Ratio: 0.5
Unit Weight: 125 pcf
Phi': 30 °

Hydraulic

Vol. WC. Function: Clay soils OC
K-Function: GC 5.7 E-4 ft/day
Ky'/Kx' Ratio: 1
Rotation: 0 °
K-Modifier Function: 1D consol derived k function rmu2 clay
Load Response Ratio: 1

Sand/Silt

Model: Linear Elastic (w/ PWP Change)

Stress Strain

Effective Young's Modulus (E'): 300,000 psf
Unit Weight: 135 pcf
Poisson's Ratio: 0.334
Insitu Ko: 0.5015015

Hydraulic

Vol. WC. Function: silty sand
K-Function: Silty Sand, k = 0.567 ft/day 2 E-4cm/sec
Ky'/Kx' Ratio: 0.1
Rotation: 0 °
Load Response Ratio: 1

Lower Till

Model: Linear Elastic (w/ PWP Change)

Stress Strain

Effective Young's Modulus (E'): 600,000 psf
Unit Weight: 145 pcf
Poisson's Ratio: 0.334
Insitu Ko: 0.5015015

Hydraulic

Vol. WC. Function: Till
K-Function: Till
Ky'/Kx' Ratio: 1
Rotation: 0 °
Load Response Ratio: 1

UPPER SHALE

Model: Linear Elastic (w/ PWP Change)

Stress Strain

Effective Young's Modulus (E'): 1,000,000 psf
Unit Weight: 145 pcf
Poisson's Ratio: 0.334
Insitu Ko: 0.5015015

Hydraulic

Vol. WC. Function: Till
K-Function: Upper Rock
Ky'/Kx' Ratio: 1
Rotation: 0 °
Load Response Ratio: 1

NOT ACTIVE

Model: (none)

Boundary Conditions

Fixed X

X: X-Displacement 0

Fixed X/Y

X: X-Displacement 0
Y: Y-Displacement 0

Initial Water Tables

Initial Water Table 1

Max. negative head: 5
Coordinates
Coordinate 1: (0, 315) ft
Coordinate 2: (850, 315) ft

K Functions

Silty Sand, k = 0.567 ft/day 2 E-4cm/sec

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 36 %
K-Saturation: 0.567
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (0.005, 0.567)
Data Point: (0.01, 0.567)
Data Point: (0.035938, 0.567)
Data Point: (0.12915, 0.567)
Data Point: (0.46416, 0.567)
Data Point: (1.1111, 0.567)
Data Point: (1.6681, 0.567)
Data Point: (5.9948, 0.567)
Data Point: (21.544, 0.567)
Data Point: (77.426, 0.567)
Data Point: (105.93, 0.5402376)
Data Point: (210.74, 0.3387258)
Data Point: (278.26, 0.2567376)
Data Point: (315.56, 0.2232846)
Data Point: (420.37, 0.1406916)
Data Point: (525.19, 0.0779121)
Data Point: (630, 0.03843882)
Data Point: (734.81, 0.01673406)
Data Point: (839.63, 0.005422788)

Data Point: (944.44, 0.000745983)
Data Point: (1,000, 7.14735e-005)
Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Upper Glacial Till

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 36 %
K-Saturation: 0.0057
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (0.005, 0.0057)
Data Point: (0.01, 0.0057)
Data Point: (0.046416, 0.0057)
Data Point: (0.21544, 0.0057)
Data Point: (1, 0.0057)
Data Point: (4.6416, 0.0057)
Data Point: (11.111, 0.0057)
Data Point: (21.544, 0.0057)
Data Point: (100, 0.0057)
Data Point: (464.16, 0.0016245)
Data Point: (1,059.3, 0.0002427972)
Data Point: (2,107.4, 1.492716e-005)
Data Point: (2,154.4, 1.369596e-005)
Data Point: (3,155.6, 4.086672e-006)
Data Point: (4,203.7, 1.82115e-006)
Data Point: (5,251.9, 9.03222e-007)
Data Point: (6,300, 4.30521e-007)
Data Point: (7,348.1, 2.028516e-007)
Data Point: (8,396.3, 7.73661e-008)
Data Point: (9,444.4, 2.691312e-008)
Data Point: (10,000, 2.691312e-008)
Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Upper Rock

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 36 %
K-Saturation: 0.567

Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (0.005, 0.567)
Data Point: (0.01, 0.567)
Data Point: (10,000, 0.567)
Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Till

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 36 %
K-Saturation: 0.000567
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (0.005, 0.000567)
Data Point: (0.01, 0.000567)
Data Point: (10,000, 0.000567)
Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

GC 5.7 E-4 ft/day

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 100 %
K-Saturation: 0.00057
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (10, 0.00057)
Data Point: (1,000, 9e-006)
Data Point: (5,000, 5e-006)
Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Hydraulic K Modifier Functions

1D consol derived k function rmu2 clay

Model: Spline Data Point Function (Y Log)
Function: K-Modifier vs. Y-Effective Stress
Curve Fit to Data: 100 %
Segment Curvature: 75 %
Y-Intercept: 1.2
Data Points: Y-Effective Stress (psf), K-Modifier
Data Point: (1,000, 1.2)
Data Point: (2,000, 1)
Data Point: (4,000, 0.839)
Data Point: (8,000, 0.70417211)
Data Point: (12,000, 0.63551782)
Data Point: (16,000, 0.59090577)

Vol. Water Content Functions

Clay soils OC

Model: Vol WC Data Point Function
Function: Vol. Water Content vs. Pore-Water Pressure
Mv: 7e-005 /psf
Saturated Water Content: 0.31427274 ft^3/ft^3
Residual Water Content: 0.031427274 ft^3/ft^3
Curve Fit to Data: 100 %
Segment Curvature: 100 %
Porosity: 0.31427274
Data Points: Matric Suction (psf), Vol. Water Content (ft^3/ft^3)
Data Point: (0.01, 0.29999999)
Data Point: (0.018329807, 0.29999998)
Data Point: (0.033598183, 0.29999996)
Data Point: (0.061584821, 0.29999991)
Data Point: (0.11288379, 0.29999982)
Data Point: (0.20691381, 0.29999962)
Data Point: (0.37926902, 0.29999917)
Data Point: (0.6951928, 0.29999814)
Data Point: (1.274275, 0.29999578)
Data Point: (2.3357215, 0.29999026)
Data Point: (4.2813324, 0.2999772)
Data Point: (7.8475997, 0.29994599)
Data Point: (14.384499, 0.29987093)
Data Point: (26.366509, 0.29968944)
Data Point: (48.329302, 0.29924951)
Data Point: (88.586679, 0.29818464)
Data Point: (162.37767, 0.29563126)
Data Point: (297.63514, 0.28967022)
Data Point: (545.55948, 0.27661743)
Data Point: (1,000, 0.25163343)
Estimation Properties
Vol. WC Estimation Method: Sample functions

Saturated Water Content: 0.3 ft^3/ft^3
Sample Material: Clay
Liquid Limit: 0 %
Diameter at 10% passing: 0
Diameter at 60% passing: 0
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Clay soils

Model: Vol WC Data Point Function
Function: Vol. Water Content vs. Pore-Water Pressure
Mv: 0.0004 /psf
Saturated Water Content: 0.60995302 ft^3/ft^3
Residual Water Content: 0.060995302 ft^3/ft^3
Curve Fit to Data: 100 %
Segment Curvature: 100 %
Porosity: 0.60995302
Data Points: Matric Suction (psf), Vol. Water Content (ft^3/ft^3)
Data Point: (0.01, 0.43999998)
Data Point: (0.018329807, 0.43999997)
Data Point: (0.033598183, 0.43999994)
Data Point: (0.061584821, 0.43999987)
Data Point: (0.11288379, 0.43999974)
Data Point: (0.20691381, 0.43999944)
Data Point: (0.37926902, 0.43999878)
Data Point: (0.6951928, 0.43999728)
Data Point: (1.274275, 0.43999381)
Data Point: (2.3357215, 0.43998571)
Data Point: (4.2813324, 0.43996655)
Data Point: (7.8475997, 0.43992079)
Data Point: (14.384499, 0.4398107)
Data Point: (26.366509, 0.43954452)
Data Point: (48.329302, 0.43889927)
Data Point: (88.586679, 0.43733747)
Data Point: (162.37767, 0.43359251)
Data Point: (297.63514, 0.42484965)
Data Point: (545.55948, 0.40570556)
Data Point: (1,000, 0.36906236)
Estimation Properties
Vol. WC Estimation Method: Sample functions
Saturated Water Content: 0.44 ft^3/ft^3
Sample Material: Clay
Liquid Limit: 0 %
Diameter at 10% passing: 0
Diameter at 60% passing: 0
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Till

Model: Vol WC Data Point Function

Function: Vol. Water Content vs. Pore-Water Pressure
Mv: 5e-006 /psf
Saturated Water Content: 0.20000173 ft^3/ft^3
Residual Water Content: 0.020000173 ft^3/ft^3
Curve Fit to Data: 100 %
Segment Curvature: 100 %
Porosity: 0.20000173
Data Points: Matric Suction (psf), Vol. Water Content (ft^3/ft^3)
Data Point: (0.01, 0.19999999)
Data Point: (0.018329807, 0.19999999)
Data Point: (0.033598183, 0.19999997)
Data Point: (0.061584821, 0.19999993)
Data Point: (0.11288379, 0.19999985)
Data Point: (0.20691381, 0.19999967)
Data Point: (0.37926902, 0.19999922)
Data Point: (0.6951928, 0.19999811)
Data Point: (1.274275, 0.19999535)
Data Point: (2.3357215, 0.19998838)
Data Point: (4.2813324, 0.19997056)
Data Point: (7.8475997, 0.19992471)
Data Point: (14.384499, 0.19980625)
Data Point: (26.366509, 0.19949952)
Data Point: (48.329302, 0.19870702)
Data Point: (88.586679, 0.19668084)
Data Point: (162.37767, 0.19165467)
Data Point: (297.63514, 0.18009116)
Data Point: (545.55948, 0.15752337)
Data Point: (1,000, 0.12453739)
Estimation Properties
Vol. WC Estimation Method: Sample functions
Saturated Water Content: 0.2 ft^3/ft^3
Sample Material: Silty Clay
Liquid Limit: 0 %
Diameter at 10% passing: 0
Diameter at 60% passing: 0
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

silty sand

Model: Vol WC Data Point Function
Function: Vol. Water Content vs. Pore-Water Pressure
Mv: 1e-005 /psf
Saturated Water Content: 0.30000011 ft^3/ft^3
Residual Water Content: 0.030000011 ft^3/ft^3
Curve Fit to Data: 100 %
Segment Curvature: 100 %
Porosity: 0.30000011
Data Points: Matric Suction (psf), Vol. Water Content (ft^3/ft^3)
Data Point: (0.01, 0.29999996)
Data Point: (0.018329807, 0.29999991)
Data Point: (0.033598183, 0.29999977)

Data Point: (0.061584821, 0.29999942)
Data Point: (0.11288379, 0.29999854)
Data Point: (0.20691381, 0.29999626)
Data Point: (0.37926902, 0.29999039)
Data Point: (0.6951928, 0.29997521)
Data Point: (1.274275, 0.29993588)
Data Point: (2.3357215, 0.29983385)
Data Point: (4.2813324, 0.29956912)
Data Point: (7.8475997, 0.29888334)
Data Point: (14.384499, 0.29711648)
Data Point: (26.366509, 0.29263189)
Data Point: (48.329302, 0.28167657)
Data Point: (88.586679, 0.25725429)
Data Point: (162.37767, 0.21239326)
Data Point: (297.63514, 0.15298031)
Data Point: (545.55948, 0.099847233)
Data Point: (1,000, 0.064649441)

Estimation Properties

Vol. WC Estimation Method: Sample functions
Saturated Water Content: 0.3 ft^3/ft^3
Sample Material: Silty Sand
Liquid Limit: 0 %
Diameter at 10% passing: 0
Diameter at 60% passing: 0
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Points

	X (ft)	Y (ft)
Point 1	561.5172	329
Point 2	184.2753	329
Point 3	174.1934	323.83525
Point 4	351.3603	319.67886
Point 5	546.7523	324.07989
Point 6	139.5241	323.62981
Point 7	0	321.01609
Point 8	0	318.01563
Point 9	133.22	320.51124
Point 10	196.3072	335
Point 11	579.5227	335
Point 12	597.5282	341
Point 13	208.339	341
Point 14	608.5585	347
Point 15	240.1424	347

Point 16	234.9596	345.27685
Point 17	219.929	346.77965
Point 18	611.3486	345.60539
Point 19	596.5548	353
Point 20	258.1852	353
Point 21	250.6076	350.4794
Point 22	276.2227	359
Point 23	584.5511	359
Point 24	294.2603	365
Point 25	572.5474	365
Point 26	312.2978	371
Point 27	560.5437	371
Point 28	548.5399	377
Point 29	330.1036	377
Point 30	325.5389	375.4045
Point 31	337.8201	379.69712
Point 32	364.4177	380
Point 33	381.0855	380.33726
Point 34	395.5929	380.71635
Point 35	416.8543	381.25666
Point 36	438.0487	382
Point 37	479.1653	383
Point 38	511.5499	383
Point 39	512.0826	382.82242
Point 40	513.8708	383
Point 41	531.0491	383
Point 42	533.1096	382.31347
Point 43	533.1107	382.31305
Point 44	536.5271	381.01628
Point 45	537.9265	380.70839
Point 46	547.5083	377.51565
Point 47	346.883	383
Point 48	493.5541	389
Point 49	363.3465	389
Point 50	371.2953	391.89686
Point 51	372.0119	391.98713
Point 52	372.2345	391.99514
Point 53	372.3208	392
Point 54	374.2156	392.05341

Point 55	419.4544	394.02388
Point 56	423.1399	394.1518
Point 57	476.0285	394.84323
Point 58	0	275.56112
Point 59	82.561	276.49127
Point 60	84.7322	276.34451
Point 61	123.7177	276.54438
Point 62	191.6961	277.65321
Point 63	430.1918	279.01879
Point 64	487.7086	279.639
Point 65	509.7138	279.55021
Point 66	721.9937	279.02461
Point 67	839	278.53365
Point 68	839	283.95091
Point 69	694.2381	280.02879
Point 70	505.5772	282.211
Point 71	487.7086	281.69555
Point 72	430.1918	282.66537
Point 73	247.1163	283.77931
Point 74	191.6961	282.79673
Point 75	123.7177	280.19493
Point 76	93.9325	281.10076
Point 77	61.0988	279.7585
Point 78	0	281.01485
Point 79	839	292.1407
Point 80	505.5772	286.98428
Point 81	487.7086	287.07159
Point 82	430.1918	289.73652
Point 83	247.1163	297.70175
Point 84	123.7177	292.05467
Point 85	94.7708	289.80875
Point 86	84.7322	289.65003
Point 87	82.561	289.66397
Point 88	38.9609	289.4325
Point 89	0	289.19587
Point 90	0	300.53803
Point 91	17.729	300.30563
Point 92	61.8788	299.93669
Point 93	191.626	301.3549

Point 94	247.1555	301.9218
Point 95	430.2162	304.83853
Point 96	487.7442	304.85433
Point 97	505.6491	305.27434
Point 98	509.7473	305.37466
Point 99	564.3735	305.25518
Point 100	839	303.47923
Point 101	839	306.47929
Point 102	564.3865	308.25516
Point 103	509.7138	308.37474
Point 104	505.5772	308.27348
Point 105	487.7086	307.85432
Point 106	430.1918	307.83852
Point 107	247.1163	304.92156
Point 108	191.6961	304.35577
Point 109	123.7177	308.23059
Point 110	93.9325	306.13974
Point 111	81.2213	307.4429
Point 112	61.5521	302.93952
Point 113	17.7611	303.30547
Point 114	0	303.53785
Point 115	839	315.0402
Point 116	797.6335	315.91598
Point 117	788.4831	316.10833
Point 118	751.3873	316.84226
Point 119	746.5947	316.94222
Point 120	742.0308	317.02756
Point 121	740.5664	317.15339
Point 122	740.3716	317.22293
Point 123	737.8797	317.29393
Point 124	718.0152	324.01292
Point 125	711.8056	325.93525
Point 126	706.0898	327.46147
Point 127	700.0454	333.50592
Point 128	694.499	330.73293
Point 129	691.9982	333.23326
Point 130	680.0323	333.54954
Point 131	679.8975	333.54516
Point 132	674.9116	331.05465

Point 133	672.911	331.05491
Point 134	672.1929	333.92615
Point 135	648.0416	332
Point 136	642.1238	328.67972
Point 137	637.4622	326.05461
Point 138	633.8287	324
Point 139	632.6094	323.29395
Point 140	630.3447	322
Point 141	556.3265	322
Point 142	544.3989	318.02536
Point 143	351.3575	313.67727
Point 144	171.7713	317.89042
Point 145	158.9451	319.66188
Point 146	146.7629	317.7643
Point 147	0	315.01616
Point 148	126.916	317.39267
Point 149	624.2673	344.64
Point 150	642.7896	345.19608
Point 151	639.8757	348.10995
Point 152	623.7369	347.62543
Point 153	543.8794	321.01441
Point 154	351.3589	316.67806
Point 155	172.0125	320.88559
Point 156	158.9189	322.69398
Point 157	146.5027	320.75996
Point 158	161.8204	329.91734
Point 159	162.0292	329.91734
Point 160	169.8774	325.99323
Point 161	172.2537	323.88076
Point 162	158.8927	325.72607
Point 163	146.2426	323.75561
Point 164	144.6459	323.72571
Point 165	157.0292	329.91734
Point 166	643.2531	345.21
Point 167	651.9258	349.55
Point 168	666.9304	350
Point 169	668.3508	349.29
Point 170	707.4035	333.53244
Point 171	710.6052	333.51008

Point 172	711.3189	333.31046
Point 173	713.7443	332.66283
Point 174	720.1721	330.67297
Point 175	739.1283	324.2612
Point 176	741.6802	324.18848
Point 177	742.0676	324.05019
Point 178	742.3962	324.02195
Point 179	746.7331	323.94086
Point 180	751.5295	323.84082
Point 181	788.6259	323.10687
Point 182	797.7821	322.91441
Point 183	839	322.03859
Point 184	704.3877	335.67695
Point 185	758.6353	353.74048
Point 186	806.6964	369.75012
Point 187	818.5728	368.55874
Point 188	839	375.2318
Point 189	623.3833	349.61571
Point 190	636.5766	350.01181
Point 191	637.9727	350.01292
Point 192	0	260
Point 193	839	260

Lines

	Start Point	End Point	Stress/Strain Boundary
Line 1	1	2	
Line 2	2	3	
Line 3	3	4	
Line 4	4	5	
Line 5	5	1	
Line 6	6	7	
Line 7	7	8	Fixed X
Line 8	8	9	
Line 9	9	6	
Line 10	10	11	
Line 11	11	1	
Line 12	2	10	
Line 13	11	12	

Line 14	12	13	
Line 15	13	10	
Line 16	14	15	
Line 17	15	16	
Line 18	16	17	
Line 19	17	13	
Line 20	12	18	
Line 21	19	20	
Line 22	20	21	
Line 23	21	15	
Line 24	14	19	
Line 25	20	22	
Line 26	22	23	
Line 27	23	19	
Line 28	22	24	
Line 29	24	25	
Line 30	25	23	
Line 31	26	27	
Line 32	27	25	
Line 33	24	26	
Line 34	28	29	
Line 35	29	30	
Line 36	30	26	
Line 37	27	28	
Line 38	29	31	
Line 39	32	33	
Line 40	33	34	
Line 41	34	35	
Line 42	35	36	
Line 43	36	37	
Line 44	37	38	
Line 45	38	39	
Line 46	39	40	
Line 47	40	41	
Line 48	41	42	
Line 49	42	43	
Line 50	43	44	
Line 51	44	45	
Line 52	45	46	

Line 53	46	28	
Line 54	38	48	
Line 55	48	49	
Line 56	49	47	
Line 57	49	50	
Line 58	50	51	
Line 59	51	52	
Line 60	52	53	
Line 61	53	54	
Line 62	54	55	
Line 63	55	56	
Line 64	56	57	
Line 65	57	48	
Line 66	58	59	
Line 67	59	60	
Line 68	60	61	
Line 69	61	62	
Line 70	62	63	
Line 71	63	64	
Line 72	64	65	
Line 73	65	66	
Line 74	66	67	
Line 75	67	68	Fixed X
Line 76	68	69	
Line 77	69	70	
Line 78	70	71	
Line 79	71	72	
Line 80	72	73	
Line 81	73	74	
Line 82	74	75	
Line 83	75	76	
Line 84	76	77	
Line 85	77	78	
Line 86	68	79	Fixed X
Line 87	79	80	
Line 88	80	81	
Line 89	81	82	
Line 90	82	83	
Line 91	83	84	

Line 92	84	85	
Line 93	85	86	
Line 94	86	87	
Line 95	87	88	
Line 96	88	89	
Line 97	90	91	
Line 98	91	92	
Line 99	92	93	
Line 100	93	94	
Line 101	94	95	
Line 102	95	96	
Line 103	96	97	
Line 104	97	98	
Line 105	98	99	
Line 106	99	100	
Line 107	100	79	Fixed X
Line 108	100	101	Fixed X
Line 109	101	102	
Line 110	102	103	
Line 111	103	104	
Line 112	104	105	
Line 113	105	106	
Line 114	106	107	
Line 115	107	108	
Line 116	108	109	
Line 117	109	110	
Line 118	110	111	
Line 119	111	112	
Line 120	112	113	
Line 121	113	114	
Line 122	101	115	Fixed X
Line 123	115	116	
Line 124	116	117	
Line 125	117	118	
Line 126	118	119	
Line 127	119	120	
Line 128	120	121	
Line 129	121	122	
Line 130	122	123	

Line 131	123	124	
Line 132	124	125	
Line 133	125	126	
Line 134	126	127	
Line 135	127	128	
Line 136	128	129	
Line 137	129	130	
Line 138	130	131	
Line 139	131	132	
Line 140	132	133	
Line 141	133	134	
Line 142	134	135	
Line 143	135	136	
Line 144	136	137	
Line 145	137	138	
Line 146	138	139	
Line 147	139	140	
Line 148	140	141	
Line 149	141	142	
Line 150	142	143	
Line 151	143	144	
Line 152	144	145	
Line 153	145	146	
Line 154	146	147	
Line 155	147	148	
Line 156	148	9	
Line 157	148	146	
Line 158	141	149	
Line 159	149	150	
Line 160	150	151	
Line 161	151	152	
Line 162	152	153	
Line 163	153	154	
Line 164	154	155	
Line 165	155	156	
Line 166	156	157	
Line 167	157	9	
Line 168	158	159	
Line 169	159	160	

Line 170	160	3	
Line 171	3	161	
Line 172	161	162	
Line 173	162	163	
Line 174	163	164	
Line 175	164	165	
Line 176	165	158	
Line 177	150	166	
Line 178	166	167	
Line 179	167	168	
Line 180	168	169	
Line 181	169	134	
Line 182	127	170	
Line 183	170	171	
Line 184	171	172	
Line 185	172	173	
Line 186	173	174	
Line 187	174	175	
Line 188	175	176	
Line 189	176	177	
Line 190	177	178	
Line 191	178	179	
Line 192	179	180	
Line 193	180	181	
Line 194	181	182	
Line 195	182	183	
Line 196	183	115	Fixed X
Line 197	184	185	
Line 198	185	186	
Line 199	186	187	
Line 200	187	188	
Line 201	188	183	Fixed X
Line 202	127	184	
Line 203	6	164	
Line 204	189	190	
Line 205	190	191	
Line 206	191	151	
Line 207	18	189	
Line 208	18	14	

Line 209	47	31	
Line 210	31	32	
Line 211	58	192	Fixed X
Line 212	192	193	Fixed X/Y
Line 213	193	67	Fixed X
Line 214	78	58	Fixed X
Line 215	89	78	Fixed X
Line 216	89	90	Fixed X
Line 217	114	90	Fixed X
Line 218	147	114	Fixed X
Line 219	8	147	Fixed X

Regions

	Material	Points	Area (ft²)
Region 1	NOT ACTIVE	1,2,3,4,5	2,684.8
Region 2	NOT ACTIVE	6,7,8,9	409.18
Region 3	NOT ACTIVE	10,11,1,2	2,281.4
Region 4	NOT ACTIVE	10,11,12,13	2,317.2
Region 5	NOT ACTIVE	14,15,16,17,13,12,18	2,329.2
Region 6	NOT ACTIVE	19,20,21,15,14	2,120.4
Region 7	NOT ACTIVE	19,20,22,23	1,940.1
Region 8	NOT ACTIVE	23,22,24,25	1,759.8
Region 9	NOT ACTIVE	26,27,25,24	1,579.6
Region 10	NOT ACTIVE	28,29,30,26,27	1,399.5
Region 11	NOT ACTIVE	29,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,28	963.75
Region 12	NOT ACTIVE	47,31,32,33,34,35,36,37,38,48,49	1,129
Region 13	NOT ACTIVE	49,50,51,52,53,54,55,56,57,48	563.69
Region 14	Lower Till	58,59,60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78	3,000.7
Region 15	Sand/Silt	78,77,76,75,74,73,72,71,70,69,68,79,80,81,82,83,84,85,86,87,88,89	7,768.6
Region 16	GC-Drained	90,91,92,93,94,95,96,97,98,99,100,79,80,81,82,83,84,85,86,87,88,89	10,108
Region 17	GC OverConsolidated	90,91,92,93,94,95,96,97,98,99,100,101,102,103,104,105,106,107,108,109,110,111,112,113,114	2,873.1
Region 18	Upper Till	114,113,112,111,110,109,108,107,106,105,104,103,102,101,115,116,117,118,119,120,121,122,123,124,125,126,127,128,129,130,131,132,133,134,135,136,137,138,139,140,141,142,143,144,145,146,147	9,788.5
Region 19	NOT ACTIVE	8,147,148,9	390.2

Region 20	NOT ACTIVE	148,146,145,144,143,142,141,149,150,151,152,153,154,155,156,157,9	1,547.9
Region 21	NOT ACTIVE	158,159,160,3,161,162,163,164,165	80.098
Region 22	Waste Material	150,166,167,168,169,134,135,136,137,138,139,140,141,149	1,602.2
Region 23	Waste Material	127,170,171,172,173,174,175,176,177,178,179,180,181,182,183,115,116,117,118,119,120,121,122,123,124,125,126	957.6
Region 24	Waste Material	184,185,186,187,188,183,182,181,180,179,178,177,176,175,174,173,172,171,170,127	4,345.4
Region 25	NOT ACTIVE	157,9,6,164,163,162,161,3,4,5,1,11,12,18,189,190,191,151,152,153,154,155,156	1,423.6
Region 26	UPPER SHALE	58,192,193,67,66,65,64,63,62,61,60,59	15,370

Figure 6 - Coupled Consolidation for Section OP-1 for Liner Construction

LINER CONSTRUCTION

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File Information

Title: Model City - RMU-2 CP-20 Section OP-1
Comments: Operation Conditions for CP-20 Section 1 Based on Maximum Fill Rate of 50,000 Cu Yds per Quarter
Created By: Peter J. Carey
Last Edited By: Peter J. Carey
Revision Number: 511
File Version: 8.0
Tool Version: 8.0.10.6504
Date: 2/24/2013
Time: 3:48:00 PM
File Name: C20OP-1r1.gsz
Directory: N:\Model_City\154.002_rmu2\154.005_revsions\geoslope\operational\

Project Settings

Length(L) Units: feet
Time(t) Units: Days
Force(F) Units: lbf
Pressure(p) Units: psf
Strength Units: psf
Stiffness Units: psf
Unit Weight of Water: 62.4 pcf
Air Pressure: 101.33 psf
View: 2D

Analysis Settings

LINER CONSTRUCTION

Description: Initial Conditions C-20 OP-1 progression
Kind: SIGMA/W
Parent: INITIAL STRESS POST EXC.
Method: Coupled Stress/PWP
Settings
- Initial Stress: Parent Analysis
- Initial PWP: Parent Analysis
- Exclude cumulative values: No

Control
- Apply Body Force in All Steps: No
- Saturated Zone Only: No

Convergence
- Maximum Number of Iterations: 50
- Minimum Pressure Head Difference: 0.001
- Minimum Displacement Difference: 0.001

Significant Digits: 3
Hydraulic Under-Relaxation Criteria
Under-Relaxation Initial Rate: 1
Under-Relaxation Min. Rate: 0.1
Under-Relaxation Reduction Rate: 0.65
Under-Relaxation Iterations: 10
Equation Solver: Parallel Direct
Time
Starting Time: 0 days
Duration: 120 days
# of Steps: 10
Step Generation Method: Linear
Save Steps Every: 10

Materials

Waste Material

Model: Linear Elastic (Total)
Stress Strain
Young's Modulus (E): 400,000 psf
Unit Weight: 111 pcf
Poisson's Ratio: 0.45

Bottom Liner

Model: Linear Elastic (Total)
Stress Strain
Young's Modulus (E): 400,000 psf
Unit Weight: 120 pcf
Poisson's Ratio: 0.45

CCL

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 1,000,000 psf
Unit Weight: 120 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Clay soils OC
K-Function: GC 5.7 E-4 ft/day
Ky'/Kx' Ratio: 0.1
Rotation: 0 °
Load Response Ratio: 1

Upper Till

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 300,000 psf
Unit Weight: 125 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Till

K-Function: Upper Glacial Till
Ky'/Kx' Ratio: 1
Rotation: 0 °
Load Response Ratio: 1

GC-Drained

Model: Soft Clay (MCC w/ PWP Change)
Stress Strain
O.C. Ratio: 4
Poisson's Ratio: 0.334
Lambda: 0.14
Kappa: 0.013
Initial Void Ratio: 1
Unit Weight: 118 pcf
Phi': 27 °
Hydraulic
Vol. WC. Function: Clay soils
K-Function: GC 5.7 E-4 ft/day
Ky'/Kx' Ratio: 1
Rotation: 0 °
K-Modifier Function: 1D consol derived k function rmu2 clay
Load Response Ratio: 1

GC OverConsolidated

Model: Soft Clay (MCC w/ PWP Change)
Stress Strain
O.C. Ratio: 8
Poisson's Ratio: 0.334
Lambda: 0.06
Kappa: 0.01
Initial Void Ratio: 0.5
Unit Weight: 125 pcf
Phi': 30 °
Hydraulic
Vol. WC. Function: Clay soils OC
K-Function: GC 5.7 E-4 ft/day
Ky'/Kx' Ratio: 1
Rotation: 0 °
K-Modifier Function: 1D consol derived k function rmu2 clay
Load Response Ratio: 1

Sand/Silt

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 300,000 psf
Unit Weight: 135 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: silty sand
K-Function: Silty Sand, k = 0.567 ft/day 2 E-4cm/sec
Ky'/Kx' Ratio: 0.1
Rotation: 0 °

Load Response Ratio: 1

Lower Till

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 600,000 psf
Unit Weight: 145 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Till
K-Function: Till
Ky'/Kx' Ratio: 1
Rotation: 0 °
Load Response Ratio: 1

Structural Fill

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 100,000 psf
Unit Weight: 135 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Till
K-Function: Till
Ky'/Kx' Ratio: 1
Rotation: 0 °
Load Response Ratio: 1

UPPER SHALE

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 1,000,000 psf
Unit Weight: 145 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Till
K-Function: Upper Rock
Ky'/Kx' Ratio: 1
Rotation: 0 °
Load Response Ratio: 1

NOT ACTIVE

Model: (none)

Boundary Conditions

Fixed X

X: X-Displacement 0

Fixed X/Y

X: X-Displacement 0

Y: Y-Displacement 0

Drainage 315

Type: Head (H) 315
Review: No

no flow

Type: Total Flux (Q) 0
Review: No

noflowzeropress

Type: Total Flux (Q) 0
Review: Yes

Initial Water Tables

Initial Water Table 1

Max. negative head: 5
Coordinates
Coordinate 1: (0, 315) ft
Coordinate 2: (850, 315) ft

K Functions

Silty Sand, k = 0.567 ft/day 2 E-4cm/sec

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 36 %
K-Saturation: 0.567
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (0.005, 0.567)
Data Point: (0.01, 0.567)
Data Point: (0.035938, 0.567)
Data Point: (0.12915, 0.567)
Data Point: (0.46416, 0.567)
Data Point: (1.1111, 0.567)
Data Point: (1.6681, 0.567)
Data Point: (5.9948, 0.567)
Data Point: (21.544, 0.567)
Data Point: (77.426, 0.567)
Data Point: (105.93, 0.5402376)
Data Point: (210.74, 0.3387258)
Data Point: (278.26, 0.2567376)
Data Point: (315.56, 0.2232846)
Data Point: (420.37, 0.1406916)
Data Point: (525.19, 0.0779121)
Data Point: (630, 0.03843882)
Data Point: (734.81, 0.01673406)

Data Point: (839.63, 0.005422788)
Data Point: (944.44, 0.000745983)
Data Point: (1,000, 7.14735e-005)

Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Upper Glacial Till

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 36 %
K-Saturation: 0.0057
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (0.005, 0.0057)
Data Point: (0.01, 0.0057)
Data Point: (0.046416, 0.0057)
Data Point: (0.21544, 0.0057)
Data Point: (1, 0.0057)
Data Point: (4.6416, 0.0057)
Data Point: (11.111, 0.0057)
Data Point: (21.544, 0.0057)
Data Point: (100, 0.0057)
Data Point: (464.16, 0.0016245)
Data Point: (1,059.3, 0.0002427972)
Data Point: (2,107.4, 1.492716e-005)
Data Point: (2,154.4, 1.369596e-005)
Data Point: (3,155.6, 4.086672e-006)
Data Point: (4,203.7, 1.82115e-006)
Data Point: (5,251.9, 9.03222e-007)
Data Point: (6,300, 4.30521e-007)
Data Point: (7,348.1, 2.028516e-007)
Data Point: (8,396.3, 7.73661e-008)
Data Point: (9,444.4, 2.691312e-008)
Data Point: (10,000, 2.691312e-008)

Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Upper Rock

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 36 %

K-Saturation: 0.567
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (0.005, 0.567)
Data Point: (0.01, 0.567)
Data Point: (10,000, 0.567)
Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Till

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 36 %
K-Saturation: 0.000567
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (0.005, 0.000567)
Data Point: (0.01, 0.000567)
Data Point: (10,000, 0.000567)
Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

GC 5.7 E-4 ft/day

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 100 %
K-Saturation: 0.00057
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (10, 0.00057)
Data Point: (1,000, 9e-006)
Data Point: (5,000, 5e-006)
Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Hydraulic K Modifier Functions

1D consol derived k function rmu2 clay

Model: Spline Data Point Function (Y Log)
Function: K-Modifier vs. Y-Effective Stress
Curve Fit to Data: 100 %
Segment Curvature: 75 %
Y-Intercept: 1.2
Data Points: Y-Effective Stress (psf), K-Modifier
Data Point: (1,000, 1.2)
Data Point: (2,000, 1)
Data Point: (4,000, 0.839)
Data Point: (8,000, 0.70417211)
Data Point: (12,000, 0.63551782)
Data Point: (16,000, 0.59090577)

Vol. Water Content Functions

Clay soils OC

Model: Vol WC Data Point Function
Function: Vol. Water Content vs. Pore-Water Pressure
Mv: 7e-005 /psf
Saturated Water Content: 0.31427274 ft^3/ft^3
Residual Water Content: 0.031427274 ft^3/ft^3
Curve Fit to Data: 100 %
Segment Curvature: 100 %
Porosity: 0.31427274
Data Points: Matric Suction (psf), Vol. Water Content (ft^3/ft^3)
Data Point: (0.01, 0.29999999)
Data Point: (0.018329807, 0.29999998)
Data Point: (0.033598183, 0.29999996)
Data Point: (0.061584821, 0.29999991)
Data Point: (0.11288379, 0.29999982)
Data Point: (0.20691381, 0.29999962)
Data Point: (0.37926902, 0.29999917)
Data Point: (0.6951928, 0.29999814)
Data Point: (1.274275, 0.29999578)
Data Point: (2.3357215, 0.29999026)
Data Point: (4.2813324, 0.2999772)
Data Point: (7.8475997, 0.29994599)
Data Point: (14.384499, 0.29987093)
Data Point: (26.366509, 0.29968944)
Data Point: (48.329302, 0.29924951)
Data Point: (88.586679, 0.29818464)
Data Point: (162.37767, 0.29563126)
Data Point: (297.63514, 0.28967022)
Data Point: (545.55948, 0.27661743)
Data Point: (1,000, 0.25163343)
Estimation Properties
Vol. WC Estimation Method: Sample functions

Saturated Water Content: 0.3 ft^3/ft^3
Sample Material: Clay
Liquid Limit: 0 %
Diameter at 10% passing: 0
Diameter at 60% passing: 0
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Clay soils

Model: Vol WC Data Point Function
Function: Vol. Water Content vs. Pore-Water Pressure
Mv: 0.0004 /psf
Saturated Water Content: 0.60995302 ft^3/ft^3
Residual Water Content: 0.060995302 ft^3/ft^3
Curve Fit to Data: 100 %
Segment Curvature: 100 %
Porosity: 0.60995302
Data Points: Matric Suction (psf), Vol. Water Content (ft^3/ft^3)
Data Point: (0.01, 0.43999998)
Data Point: (0.018329807, 0.43999997)
Data Point: (0.033598183, 0.43999994)
Data Point: (0.061584821, 0.43999987)
Data Point: (0.11288379, 0.43999974)
Data Point: (0.20691381, 0.43999944)
Data Point: (0.37926902, 0.43999878)
Data Point: (0.6951928, 0.43999728)
Data Point: (1.274275, 0.43999381)
Data Point: (2.3357215, 0.43998571)
Data Point: (4.2813324, 0.43996655)
Data Point: (7.8475997, 0.43992079)
Data Point: (14.384499, 0.4398107)
Data Point: (26.366509, 0.43954452)
Data Point: (48.329302, 0.43889927)
Data Point: (88.586679, 0.43733747)
Data Point: (162.37767, 0.43359251)
Data Point: (297.63514, 0.42484965)
Data Point: (545.55948, 0.40570556)
Data Point: (1,000, 0.36906236)
Estimation Properties
Vol. WC Estimation Method: Sample functions
Saturated Water Content: 0.44 ft^3/ft^3
Sample Material: Clay
Liquid Limit: 0 %
Diameter at 10% passing: 0
Diameter at 60% passing: 0
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Till

Model: Vol WC Data Point Function

Function: Vol. Water Content vs. Pore-Water Pressure
- Mv: 5e-006 /psf
- Saturated Water Content: 0.20000173 ft^3/ft^3
- Residual Water Content: 0.020000173 ft^3/ft^3
- Curve Fit to Data: 100 %
- Segment Curvature: 100 %

Porosity: 0.20000173

Data Points: Matric Suction (psf), Vol. Water Content (ft^3/ft^3)
- Data Point: (0.01, 0.19999999)
- Data Point: (0.018329807, 0.19999999)
- Data Point: (0.033598183, 0.19999997)
- Data Point: (0.061584821, 0.19999993)
- Data Point: (0.11288379, 0.19999985)
- Data Point: (0.20691381, 0.19999967)
- Data Point: (0.37926902, 0.19999922)
- Data Point: (0.6951928, 0.19999811)
- Data Point: (1.274275, 0.19999535)
- Data Point: (2.3357215, 0.19998838)
- Data Point: (4.2813324, 0.19997056)
- Data Point: (7.8475997, 0.19992471)
- Data Point: (14.384499, 0.19980625)
- Data Point: (26.366509, 0.19949952)
- Data Point: (48.329302, 0.19870702)
- Data Point: (88.586679, 0.19668084)
- Data Point: (162.37767, 0.19165467)
- Data Point: (297.63514, 0.18009116)
- Data Point: (545.55948, 0.15752337)
- Data Point: (1,000, 0.12453739)

Estimation Properties
- Vol. WC Estimation Method: Sample functions
- Saturated Water Content: 0.2 ft^3/ft^3
- Sample Material: Silty Clay
- Liquid Limit: 0 %
- Diameter at 10% passing: 0
- Diameter at 60% passing: 0
- Maximum: 1,000
- Minimum: 0.01
- Num. Points: 20

silty sand

Model: Vol WC Data Point Function

Function: Vol. Water Content vs. Pore-Water Pressure
- Mv: 1e-005 /psf
- Saturated Water Content: 0.30000011 ft^3/ft^3
- Residual Water Content: 0.030000011 ft^3/ft^3
- Curve Fit to Data: 100 %
- Segment Curvature: 100 %

Porosity: 0.30000011

Data Points: Matric Suction (psf), Vol. Water Content (ft^3/ft^3)
- Data Point: (0.01, 0.29999996)
- Data Point: (0.018329807, 0.29999991)
- Data Point: (0.033598183, 0.29999977)

Data Point: (0.061584821, 0.29999942)
Data Point: (0.11288379, 0.29999854)
Data Point: (0.20691381, 0.29999626)
Data Point: (0.37926902, 0.29999039)
Data Point: (0.6951928, 0.29997521)
Data Point: (1.274275, 0.29993588)
Data Point: (2.3357215, 0.29983385)
Data Point: (4.2813324, 0.29956912)
Data Point: (7.8475997, 0.29888334)
Data Point: (14.384499, 0.29711648)
Data Point: (26.366509, 0.29263189)
Data Point: (48.329302, 0.28167657)
Data Point: (88.586679, 0.25725429)
Data Point: (162.37767, 0.21239326)
Data Point: (297.63514, 0.15298031)
Data Point: (545.55948, 0.099847233)
Data Point: (1,000, 0.064649441)

Estimation Properties

Vol. WC Estimation Method: Sample functions
Saturated Water Content: 0.3 ft^3/ft^3
Sample Material: Silty Sand
Liquid Limit: 0 %
Diameter at 10% passing: 0
Diameter at 60% passing: 0
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Points

	X (ft)	Y (ft)
Point 1	561.5172	329
Point 2	184.2753	329
Point 3	174.1934	323.83525
Point 4	351.3603	319.67886
Point 5	546.7523	324.07989
Point 6	139.5241	323.62981
Point 7	0	321.01609
Point 8	0	318.01563
Point 9	133.22	320.51124
Point 10	196.3072	335
Point 11	579.5227	335
Point 12	597.5282	341
Point 13	208.339	341
Point 14	608.5585	347
Point 15	240.1424	347

Point 16	234.9596	345.27685
Point 17	219.929	346.77965
Point 18	611.3486	345.60539
Point 19	596.5548	353
Point 20	258.1852	353
Point 21	250.6076	350.4794
Point 22	276.2227	359
Point 23	584.5511	359
Point 24	294.2603	365
Point 25	572.5474	365
Point 26	312.2978	371
Point 27	560.5437	371
Point 28	548.5399	377
Point 29	330.1036	377
Point 30	325.5389	375.4045
Point 31	337.8201	379.69712
Point 32	364.4177	380
Point 33	381.0855	380.33726
Point 34	395.5929	380.71635
Point 35	416.8543	381.25666
Point 36	438.0487	382
Point 37	479.1653	383
Point 38	511.5499	383
Point 39	512.0826	382.82242
Point 40	513.8708	383
Point 41	531.0491	383
Point 42	533.1096	382.31347
Point 43	533.1107	382.31305
Point 44	536.5271	381.01628
Point 45	537.9265	380.70839
Point 46	547.5083	377.51565
Point 47	346.883	383
Point 48	493.5541	389
Point 49	363.3465	389
Point 50	371.2953	391.89686
Point 51	372.0119	391.98713
Point 52	372.2345	391.99514
Point 53	372.3208	392
Point 54	374.2156	392.05341

Point 55	419.4544	394.02388
Point 56	423.1399	394.1518
Point 57	476.0285	394.84323
Point 58	0	275.56112
Point 59	82.561	276.49127
Point 60	84.7322	276.34451
Point 61	123.7177	276.54438
Point 62	191.6961	277.65321
Point 63	430.1918	279.01879
Point 64	487.7086	279.639
Point 65	509.7138	279.55021
Point 66	721.9937	279.02461
Point 67	839	278.53365
Point 68	839	283.95091
Point 69	694.2381	280.02879
Point 70	505.5772	282.211
Point 71	487.7086	281.69555
Point 72	430.1918	282.66537
Point 73	247.1163	283.77931
Point 74	191.6961	282.79673
Point 75	123.7177	280.19493
Point 76	93.9325	281.10076
Point 77	61.0988	279.7585
Point 78	0	281.01485
Point 79	839	292.1407
Point 80	505.5772	286.98428
Point 81	487.7086	287.07159
Point 82	430.1918	289.73652
Point 83	247.1163	297.70175
Point 84	123.7177	292.05467
Point 85	94.7708	289.80875
Point 86	84.7322	289.65003
Point 87	82.561	289.66397
Point 88	38.9609	289.4325
Point 89	0	289.19587
Point 90	0	300.53803
Point 91	17.729	300.30563
Point 92	61.8788	299.93669
Point 93	191.626	301.3549

Point 94	247.1555	301.9218
Point 95	430.2162	304.83853
Point 96	487.7442	304.85433
Point 97	505.6491	305.27434
Point 98	509.7473	305.37466
Point 99	564.3735	305.25518
Point 100	839	303.47923
Point 101	839	306.47929
Point 102	564.3865	308.25516
Point 103	509.7138	308.37474
Point 104	505.5772	308.27348
Point 105	487.7086	307.85432
Point 106	430.1918	307.83852
Point 107	247.1163	304.92156
Point 108	191.6961	304.35577
Point 109	123.7177	308.23059
Point 110	93.9325	306.13974
Point 111	81.2213	307.4429
Point 112	61.5521	302.93952
Point 113	17.7611	303.30547
Point 114	0	303.53785
Point 115	839	315.0402
Point 116	797.6335	315.91598
Point 117	788.4831	316.10833
Point 118	751.3873	316.84226
Point 119	746.5947	316.94222
Point 120	742.0308	317.02756
Point 121	740.5664	317.15339
Point 122	740.3716	317.22293
Point 123	737.8797	317.29393
Point 124	718.0152	324.01292
Point 125	711.8056	325.93525
Point 126	706.0898	327.46147
Point 127	700.0454	333.50592
Point 128	694.499	330.73293
Point 129	691.9982	333.23326
Point 130	680.0323	333.54954
Point 131	679.8975	333.54516
Point 132	674.9116	331.05465

Point 133	672.911	331.05491
Point 134	672.1929	333.92615
Point 135	648.0416	332
Point 136	642.1238	328.67972
Point 137	637.4622	326.05461
Point 138	633.8287	324
Point 139	632.6094	323.29395
Point 140	630.3447	322
Point 141	556.3265	322
Point 142	544.3989	318.02536
Point 143	351.3575	313.67727
Point 144	171.7713	317.89042
Point 145	158.9451	319.66188
Point 146	146.7629	317.7643
Point 147	0	315.01616
Point 148	126.916	317.39267
Point 149	624.2673	344.64
Point 150	642.7896	345.19608
Point 151	639.8757	348.10995
Point 152	623.7369	347.62543
Point 153	543.8794	321.01441
Point 154	351.3589	316.67806
Point 155	172.0125	320.88559
Point 156	158.9189	322.69398
Point 157	146.5027	320.75996
Point 158	161.8204	329.91734
Point 159	162.0292	329.91734
Point 160	169.8774	325.99323
Point 161	172.2537	323.88076
Point 162	158.8927	325.72607
Point 163	146.2426	323.75561
Point 164	144.6459	323.72571
Point 165	157.0292	329.91734
Point 166	643.2531	345.21
Point 167	651.9258	349.55
Point 168	666.9304	350
Point 169	668.3508	349.29
Point 170	707.4035	333.53244
Point 171	710.6052	333.51008

Point 172	711.3189	333.31046
Point 173	713.7443	332.66283
Point 174	720.1721	330.67297
Point 175	739.1283	324.2612
Point 176	741.6802	324.18848
Point 177	742.0676	324.05019
Point 178	742.3962	324.02195
Point 179	746.7331	323.94086
Point 180	751.5295	323.84082
Point 181	788.6259	323.10687
Point 182	797.7821	322.91441
Point 183	839	322.03859
Point 184	704.3877	335.67695
Point 185	758.6353	353.74048
Point 186	806.6964	369.75012
Point 187	818.5728	368.55874
Point 188	839	375.2318
Point 189	623.3833	349.61571
Point 190	636.5766	350.01181
Point 191	637.9727	350.01292
Point 192	0	260
Point 193	839	260

Lines

	Start Point	End Point	Stress/Strain Boundary	Hydraulic Boundary
Line 1	1	2		
Line 2	2	3		
Line 3	3	4		
Line 4	4	5		
Line 5	5	1		
Line 6	6	7		
Line 7	7	8	Fixed X	
Line 8	8	9		noflowzeropress
Line 9	9	6		
Line 10	10	11		
Line 11	11	1		
Line 12	2	10		
Line 13	11	12		

Line 14	12	13		
Line 15	13	10		
Line 16	14	15		
Line 17	15	16		
Line 18	16	17		
Line 19	17	13		
Line 20	12	18		
Line 21	19	20		
Line 22	20	21		
Line 23	21	15		
Line 24	14	19		
Line 25	20	22		
Line 26	22	23		
Line 27	23	19		
Line 28	22	24		
Line 29	24	25		
Line 30	25	23		
Line 31	26	27		
Line 32	27	25		
Line 33	24	26		
Line 34	28	29		
Line 35	29	30		
Line 36	30	26		
Line 37	27	28		
Line 38	29	31		
Line 39	32	33		
Line 40	33	34		
Line 41	34	35		
Line 42	35	36		
Line 43	36	37		
Line 44	37	38		
Line 45	38	39		
Line 46	39	40		
Line 47	40	41		
Line 48	41	42		
Line 49	42	43		
Line 50	43	44		
Line 51	44	45		
Line 52	45	46		

Line 53	46	28		
Line 54	38	48		
Line 55	48	49		
Line 56	49	47		
Line 57	49	50		
Line 58	50	51		
Line 59	51	52		
Line 60	52	53		
Line 61	53	54		
Line 62	54	55		
Line 63	55	56		
Line 64	56	57		
Line 65	57	48		
Line 66	58	59		
Line 67	59	60		
Line 68	60	61		
Line 69	61	62		
Line 70	62	63		
Line 71	63	64		
Line 72	64	65		
Line 73	65	66		
Line 74	66	67		
Line 75	67	68	Fixed X	Drainage 315
Line 76	68	69		
Line 77	69	70		
Line 78	70	71		
Line 79	71	72		
Line 80	72	73		
Line 81	73	74		
Line 82	74	75		
Line 83	75	76		
Line 84	76	77		
Line 85	77	78		
Line 86	68	79	Fixed X	Drainage 315
Line 87	79	80		
Line 88	80	81		
Line 89	81	82		
Line 90	82	83		
Line 91	83	84		

Line 92	84	85		
Line 93	85	86		
Line 94	86	87		
Line 95	87	88		
Line 96	88	89		
Line 97	90	91		
Line 98	91	92		
Line 99	92	93		
Line 100	93	94		
Line 101	94	95		
Line 102	95	96		
Line 103	96	97		
Line 104	97	98		
Line 105	98	99		
Line 106	99	100		
Line 107	100	79	Fixed X	Drainage 315
Line 108	100	101	Fixed X	Drainage 315
Line 109	101	102		
Line 110	102	103		
Line 111	103	104		
Line 112	104	105		
Line 113	105	106		
Line 114	106	107		
Line 115	107	108		
Line 116	108	109		
Line 117	109	110		
Line 118	110	111		
Line 119	111	112		
Line 120	112	113		
Line 121	113	114		
Line 122	101	115	Fixed X	Drainage 315
Line 123	115	116		no flow
Line 124	116	117		no flow
Line 125	117	118		no flow
Line 126	118	119		no flow
Line 127	119	120		no flow
Line 128	120	121		no flow
Line 129	121	122		
Line 130	122	123		no flow

Line 131	123	124		no flow
Line 132	124	125		no flow
Line 133	125	126		no flow
Line 134	126	127		no flow
Line 135	127	128		noflowzeropress
Line 136	128	129		noflowzeropress
Line 137	129	130		noflowzeropress
Line 138	130	131		
Line 139	131	132		noflowzeropress
Line 140	132	133		noflowzeropress
Line 141	133	134		
Line 142	134	135		
Line 143	135	136		
Line 144	136	137		
Line 145	137	138		
Line 146	138	139		
Line 147	139	140		
Line 148	140	141		
Line 149	141	142		
Line 150	142	143		
Line 151	143	144		
Line 152	144	145		
Line 153	145	146		
Line 154	146	147		
Line 155	147	148		
Line 156	148	9		
Line 157	148	146		
Line 158	141	149		
Line 159	149	150		
Line 160	150	151		
Line 161	151	152		no flow
Line 162	152	153		no flow
Line 163	153	154		no flow
Line 164	154	155		no flow
Line 165	155	156		no flow
Line 166	156	157		no flow
Line 167	157	9		no flow
Line 168	158	159		
Line 169	159	160		

Line 170	160	3		
Line 171	3	161		
Line 172	161	162		
Line 173	162	163		
Line 174	163	164		
Line 175	164	165		
Line 176	165	158		
Line 177	150	166		
Line 178	166	167		
Line 179	167	168		
Line 180	168	169		
Line 181	169	134		
Line 182	127	170		
Line 183	170	171		
Line 184	171	172		
Line 185	172	173		
Line 186	173	174		
Line 187	174	175		
Line 188	175	176		
Line 189	176	177		
Line 190	177	178		
Line 191	178	179		
Line 192	179	180		
Line 193	180	181		
Line 194	181	182		
Line 195	182	183		
Line 196	183	115	Fixed X	
Line 197	184	185		
Line 198	185	186		
Line 199	186	187		
Line 200	187	188		
Line 201	188	183	Fixed X	
Line 202	127	184		
Line 203	6	164		
Line 204	189	190		
Line 205	190	191		
Line 206	191	151		
Line 207	18	189		
Line 208	18	14		

Line 209	47	31		
Line 210	31	32		
Line 211	58	192	Fixed X	Drainage 315
Line 212	192	193	Fixed X/Y	Drainage 315
Line 213	193	67	Fixed X	Drainage 315
Line 214	78	58	Fixed X	Drainage 315
Line 215	89	78	Fixed X	Drainage 315
Line 216	89	90	Fixed X	Drainage 315
Line 217	114	90	Fixed X	Drainage 315
Line 218	147	114	Fixed X	Drainage 315
Line 219	8	147	Fixed X	

Regions

	Material	Points	Area (ft²)
Region 1	NOT ACTIVE	1,2,3,4,5	2,684.8
Region 2	NOT ACTIVE	6,7,8,9	409.18
Region 3	NOT ACTIVE	10,11,1,2	2,281.4
Region 4	NOT ACTIVE	10,11,12,13	2,317.2
Region 5	NOT ACTIVE	14,15,16,17,13,12,18	2,329.2
Region 6	NOT ACTIVE	19,20,21,15,14	2,120.4
Region 7	NOT ACTIVE	19,20,22,23	1,940.1
Region 8	NOT ACTIVE	23,22,24,25	1,759.8
Region 9	NOT ACTIVE	26,27,25,24	1,579.6
Region 10	NOT ACTIVE	28,29,30,26,27	1,399.5
Region 11	NOT ACTIVE	29,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,28	963.75
Region 12	NOT ACTIVE	47,31,32,33,34,35,36,37,38,48,49	1,129
Region 13	NOT ACTIVE	49,50,51,52,53,54,55,56,57,48	563.69
Region 14	Lower Till	58,59,60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78	3,000.7
Region 15	Sand/Silt	78,77,76,75,74,73,72,71,70,69,68,79,80,81,82,83,84,85,86,87,88,89	7,768.6
Region 16	GC-Drained	90,91,92,93,94,95,96,97,98,99,100,79,80,81,82,83,84,85,86,87,88,89	10,108
Region 17	GC OverConsolidated	90,91,92,93,94,95,96,97,98,99,100,101,102,103,104,105,106,107,108,109,110,111,112,113,114	2,873.1
Region 18	Upper Till	114,113,112,111,110,109,108,107,106,105,104,103,102,101,115,116,117,118,119,120,121,122,123,124,125,126,127,128,129,130,131,132,133,134,135,136,137,138,139,140,141,142,143,144,145,146,147	9,788.5

Region 19	Structural Fill	8,147,148,9	390.2
Region 20	CCL	148,146,145,144,143,142,141,149,150,151,152,153,154,155,156,157,9	1,547.9
Region 21	Structural Fill	158,159,160,3,161,162,163,164,165	80.098
Region 22	Waste Material	150,166,167,168,169,134,135,136,137,138,139,140,141,149	1,602.2
Region 23	CCL	127,170,171,172,173,174,175,176,177,178,179,180,181,182,183,115,116,117,118,119,120,121,122,123,124,125,126	957.6
Region 24	Waste Material	184,185,186,187,188,183,182,181,180,179,178,177,176,175,174,173,172,171,170,127	4,345.4
Region 25	Bottom Liner	157,9,6,164,163,162,161,3,4,5,1,11,12,18,189,190,191,151,152,153,154,155,156	1,423.6
Region 26	UPPER SHALE	58,192,193,67,66,65,64,63,62,61,60,59	15,370

Figure 7 - Coupled Consolidation for Section OP-1 for Waste Lift 1

WASTE LIFT 1 EL. 329

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File Information

Title: Model City - RMU-2 CP-20 Section OP-1
Comments: Operation Conditions for CP-20 Section 1 Based on Maximum Fill Rate of 50,000 Cu Yds per Quarter
Created By: Peter J. Carey
Last Edited By: Peter J. Carey
Revision Number: 511
File Version: 8.0
Tool Version: 8.0.10.6504
Date: 2/24/2013
Time: 3:48:00 PM
File Name: C20OP-1r1.gsz
Directory: N:\Model_City\154.002_rmu2\154.005_revsions\geoslope\operational\

Project Settings

Length(L) Units: feet
Time(t) Units: Days
Force(F) Units: lbf
Pressure(p) Units: psf
Strength Units: psf
Stiffness Units: psf
Unit Weight of Water: 62.4 pcf
Air Pressure: 101.33 psf
View: 2D

Analysis Settings

WASTE LIFT 1 EL. 329

Description: WASTE LIFT 1 C-20 OP-1 progression
Kind: SIGMA/W
Parent: LINER CONSTRUCTION
Method: Coupled Stress/PWP
Settings
- Initial Stress: Parent Analysis
- Initial PWP: Parent Analysis
- Exclude cumulative values: No

Control
- Apply Body Force in All Steps: No
- Saturated Zone Only: No

Convergence
- Maximum Number of Iterations: 50
- Minimum Pressure Head Difference: 0.001
- Minimum Displacement Difference: 0.001

Significant Digits: 3
Hydraulic Under-Relaxation Criteria
Under-Relaxation Initial Rate: 1
Under-Relaxation Min. Rate: 0.1
Under-Relaxation Reduction Rate: 0.65
Under-Relaxation Iterations: 10
Equation Solver: Parallel Direct
Time
Starting Time: 120 days
Duration: 88 days
# of Steps: 12
Step Generation Method: Linear
Save Steps Every: 4

Materials

Waste Material

Model: Linear Elastic (Total)
Stress Strain
Young's Modulus (E): 400,000 psf
Unit Weight: 111 pcf
Poisson's Ratio: 0.45

Bottom Liner

Model: Linear Elastic (Total)
Stress Strain
Young's Modulus (E): 400,000 psf
Unit Weight: 120 pcf
Poisson's Ratio: 0.45

CCL

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 1,000,000 psf
Unit Weight: 120 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Clay soils OC
K-Function: GC 5.7 E-4 ft/day
Ky'/Kx' Ratio: 0.1
Rotation: 0 °
Load Response Ratio: 1

Upper Till

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 300,000 psf
Unit Weight: 125 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Till

K-Function: Upper Glacial Till
Ky'/Kx' Ratio: 1
Rotation: 0 °
Load Response Ratio: 1

GC-Drained

Model: Soft Clay (MCC w/ PWP Change)
Stress Strain
O.C. Ratio: 4
Poisson's Ratio: 0.334
Lambda: 0.14
Kappa: 0.013
Initial Void Ratio: 1
Unit Weight: 118 pcf
Phi': 27 °
Hydraulic
Vol. WC. Function: Clay soils
K-Function: GC 5.7 E-4 ft/day
Ky'/Kx' Ratio: 1
Rotation: 0 °
K-Modifier Function: 1D consol derived k function rmu2 clay
Load Response Ratio: 1

GC OverConsolidated

Model: Soft Clay (MCC w/ PWP Change)
Stress Strain
O.C. Ratio: 8
Poisson's Ratio: 0.334
Lambda: 0.06
Kappa: 0.01
Initial Void Ratio: 0.5
Unit Weight: 125 pcf
Phi': 30 °
Hydraulic
Vol. WC. Function: Clay soils OC
K-Function: GC 5.7 E-4 ft/day
Ky'/Kx' Ratio: 1
Rotation: 0 °
K-Modifier Function: 1D consol derived k function rmu2 clay
Load Response Ratio: 1

Sand/Silt

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 300,000 psf
Unit Weight: 135 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: silty sand
K-Function: Silty Sand, k = 0.567 ft/day 2 E-4cm/sec
Ky'/Kx' Ratio: 0.1
Rotation: 0 °

Load Response Ratio: 1

Lower Till

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 600,000 psf
Unit Weight: 145 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Till
K-Function: Till
Ky'/Kx' Ratio: 1
Rotation: 0 °
Load Response Ratio: 1

Structural Fill

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 100,000 psf
Unit Weight: 135 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Till
K-Function: Till
Ky'/Kx' Ratio: 1
Rotation: 0 °
Load Response Ratio: 1

UPPER SHALE

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 1,000,000 psf
Unit Weight: 145 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Till
K-Function: Upper Rock
Ky'/Kx' Ratio: 1
Rotation: 0 °
Load Response Ratio: 1

NOT ACTIVE

Model: (none)

Boundary Conditions

Fixed X

X: X-Displacement 0

Fixed X/Y

X: X-Displacement 0

Y: Y-Displacement 0

Drainage 315

Type: Head (H) 315
Review: No

no flow

Type: Total Flux (Q) 0
Review: No

noflowzeropress

Type: Total Flux (Q) 0
Review: Yes

Initial Water Tables

Initial Water Table 1

Max. negative head: 5
Coordinates
Coordinate 1: (0, 315) ft
Coordinate 2: (850, 315) ft

K Functions

Silty Sand, k = 0.567 ft/day 2 E-4cm/sec

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 36 %
K-Saturation: 0.567
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (0.005, 0.567)
Data Point: (0.01, 0.567)
Data Point: (0.035938, 0.567)
Data Point: (0.12915, 0.567)
Data Point: (0.46416, 0.567)
Data Point: (1.1111, 0.567)
Data Point: (1.6681, 0.567)
Data Point: (5.9948, 0.567)
Data Point: (21.544, 0.567)
Data Point: (77.426, 0.567)
Data Point: (105.93, 0.5402376)
Data Point: (210.74, 0.3387258)
Data Point: (278.26, 0.2567376)
Data Point: (315.56, 0.2232846)
Data Point: (420.37, 0.1406916)
Data Point: (525.19, 0.0779121)
Data Point: (630, 0.03843882)
Data Point: (734.81, 0.01673406)

Data Point: (839.63, 0.005422788)
Data Point: (944.44, 0.000745983)
Data Point: (1,000, 7.14735e-005)

Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Upper Glacial Till

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 36 %
K-Saturation: 0.0057
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (0.005, 0.0057)
Data Point: (0.01, 0.0057)
Data Point: (0.046416, 0.0057)
Data Point: (0.21544, 0.0057)
Data Point: (1, 0.0057)
Data Point: (4.6416, 0.0057)
Data Point: (11.111, 0.0057)
Data Point: (21.544, 0.0057)
Data Point: (100, 0.0057)
Data Point: (464.16, 0.0016245)
Data Point: (1,059.3, 0.0002427972)
Data Point: (2,107.4, 1.492716e-005)
Data Point: (2,154.4, 1.369596e-005)
Data Point: (3,155.6, 4.086672e-006)
Data Point: (4,203.7, 1.82115e-006)
Data Point: (5,251.9, 9.03222e-007)
Data Point: (6,300, 4.30521e-007)
Data Point: (7,348.1, 2.028516e-007)
Data Point: (8,396.3, 7.73661e-008)
Data Point: (9,444.4, 2.691312e-008)
Data Point: (10,000, 2.691312e-008)

Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Upper Rock

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 36 %

K-Saturation: 0.567
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (0.005, 0.567)
Data Point: (0.01, 0.567)
Data Point: (10,000, 0.567)
Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Till

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 36 %
K-Saturation: 0.000567
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (0.005, 0.000567)
Data Point: (0.01, 0.000567)
Data Point: (10,000, 0.000567)
Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

GC 5.7 E-4 ft/day

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 100 %
K-Saturation: 0.00057
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (10, 0.00057)
Data Point: (1,000, 9e-006)
Data Point: (5,000, 5e-006)
Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Hydraulic K Modifier Functions

1D consol derived k function rmu2 clay

Model: Spline Data Point Function (Y Log)
Function: K-Modifier vs. Y-Effective Stress
Curve Fit to Data: 100 %
Segment Curvature: 75 %
Y-Intercept: 1.2
Data Points: Y-Effective Stress (psf), K-Modifier
Data Point: (1,000, 1.2)
Data Point: (2,000, 1)
Data Point: (4,000, 0.839)
Data Point: (8,000, 0.70417211)
Data Point: (12,000, 0.63551782)
Data Point: (16,000, 0.59090577)

Vol. Water Content Functions

Clay soils OC

Model: Vol WC Data Point Function
Function: Vol. Water Content vs. Pore-Water Pressure
Mv: 7e-005 /psf
Saturated Water Content: 0.31427274 ft^3/ft^3
Residual Water Content: 0.031427274 ft^3/ft^3
Curve Fit to Data: 100 %
Segment Curvature: 100 %
Porosity: 0.31427274
Data Points: Matric Suction (psf), Vol. Water Content (ft^3/ft^3)
Data Point: (0.01, 0.29999999)
Data Point: (0.018329807, 0.29999998)
Data Point: (0.033598183, 0.29999996)
Data Point: (0.061584821, 0.29999991)
Data Point: (0.11288379, 0.29999982)
Data Point: (0.20691381, 0.29999962)
Data Point: (0.37926902, 0.29999917)
Data Point: (0.6951928, 0.29999814)
Data Point: (1.274275, 0.29999578)
Data Point: (2.3357215, 0.29999026)
Data Point: (4.2813324, 0.2999772)
Data Point: (7.8475997, 0.29994599)
Data Point: (14.384499, 0.29987093)
Data Point: (26.366509, 0.29968944)
Data Point: (48.329302, 0.29924951)
Data Point: (88.586679, 0.29818464)
Data Point: (162.37767, 0.29563126)
Data Point: (297.63514, 0.28967022)
Data Point: (545.55948, 0.27661743)
Data Point: (1,000, 0.25163343)
Estimation Properties
Vol. WC Estimation Method: Sample functions

Saturated Water Content: 0.3 ft^3/ft^3
Sample Material: Clay
Liquid Limit: 0 %
Diameter at 10% passing: 0
Diameter at 60% passing: 0
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Clay soils

Model: Vol WC Data Point Function
Function: Vol. Water Content vs. Pore-Water Pressure
Mv: 0.0004 /psf
Saturated Water Content: 0.60995302 ft^3/ft^3
Residual Water Content: 0.060995302 ft^3/ft^3
Curve Fit to Data: 100 %
Segment Curvature: 100 %
Porosity: 0.60995302
Data Points: Matric Suction (psf), Vol. Water Content (ft^3/ft^3)
Data Point: (0.01, 0.43999998)
Data Point: (0.018329807, 0.43999997)
Data Point: (0.033598183, 0.43999994)
Data Point: (0.061584821, 0.43999987)
Data Point: (0.11288379, 0.43999974)
Data Point: (0.20691381, 0.43999944)
Data Point: (0.37926902, 0.43999878)
Data Point: (0.6951928, 0.43999728)
Data Point: (1.274275, 0.43999381)
Data Point: (2.3357215, 0.43998571)
Data Point: (4.2813324, 0.43996655)
Data Point: (7.8475997, 0.43992079)
Data Point: (14.384499, 0.4398107)
Data Point: (26.366509, 0.43954452)
Data Point: (48.329302, 0.43889927)
Data Point: (88.586679, 0.43733747)
Data Point: (162.37767, 0.43359251)
Data Point: (297.63514, 0.42484965)
Data Point: (545.55948, 0.40570556)
Data Point: (1,000, 0.36906236)
Estimation Properties
Vol. WC Estimation Method: Sample functions
Saturated Water Content: 0.44 ft^3/ft^3
Sample Material: Clay
Liquid Limit: 0 %
Diameter at 10% passing: 0
Diameter at 60% passing: 0
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Till

Model: Vol WC Data Point Function

Function: Vol. Water Content vs. Pore-Water Pressure
Mv: 5e-006 /psf
Saturated Water Content: 0.20000173 ft^3/ft^3
Residual Water Content: 0.020000173 ft^3/ft^3
Curve Fit to Data: 100 %
Segment Curvature: 100 %
Porosity: 0.20000173
Data Points: Matric Suction (psf), Vol. Water Content (ft^3/ft^3)
Data Point: (0.01, 0.19999999)
Data Point: (0.018329807, 0.19999999)
Data Point: (0.033598183, 0.19999997)
Data Point: (0.061584821, 0.19999993)
Data Point: (0.11288379, 0.19999985)
Data Point: (0.20691381, 0.19999967)
Data Point: (0.37926902, 0.19999922)
Data Point: (0.6951928, 0.19999811)
Data Point: (1.274275, 0.19999535)
Data Point: (2.3357215, 0.19998838)
Data Point: (4.2813324, 0.19997056)
Data Point: (7.8475997, 0.19992471)
Data Point: (14.384499, 0.19980625)
Data Point: (26.366509, 0.19949952)
Data Point: (48.329302, 0.19870702)
Data Point: (88.586679, 0.19668084)
Data Point: (162.37767, 0.19165467)
Data Point: (297.63514, 0.18009116)
Data Point: (545.55948, 0.15752337)
Data Point: (1,000, 0.12453739)
Estimation Properties
Vol. WC Estimation Method: Sample functions
Saturated Water Content: 0.2 ft^3/ft^3
Sample Material: Silty Clay
Liquid Limit: 0 %
Diameter at 10% passing: 0
Diameter at 60% passing: 0
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

silty sand

Model: Vol WC Data Point Function
Function: Vol. Water Content vs. Pore-Water Pressure
Mv: 1e-005 /psf
Saturated Water Content: 0.30000011 ft^3/ft^3
Residual Water Content: 0.030000011 ft^3/ft^3
Curve Fit to Data: 100 %
Segment Curvature: 100 %
Porosity: 0.30000011
Data Points: Matric Suction (psf), Vol. Water Content (ft^3/ft^3)
Data Point: (0.01, 0.29999996)
Data Point: (0.018329807, 0.29999991)
Data Point: (0.033598183, 0.29999977)

Data Point: (0.061584821, 0.29999942)
Data Point: (0.11288379, 0.29999854)
Data Point: (0.20691381, 0.29999626)
Data Point: (0.37926902, 0.29999039)
Data Point: (0.6951928, 0.29997521)
Data Point: (1.274275, 0.29993588)
Data Point: (2.3357215, 0.29983385)
Data Point: (4.2813324, 0.29956912)
Data Point: (7.8475997, 0.29888334)
Data Point: (14.384499, 0.29711648)
Data Point: (26.366509, 0.29263189)
Data Point: (48.329302, 0.28167657)
Data Point: (88.586679, 0.25725429)
Data Point: (162.37767, 0.21239326)
Data Point: (297.63514, 0.15298031)
Data Point: (545.55948, 0.099847233)
Data Point: (1,000, 0.064649441)

Estimation Properties

Vol. WC Estimation Method: Sample functions
Saturated Water Content: 0.3 ft^3/ft^3
Sample Material: Silty Sand
Liquid Limit: 0 %
Diameter at 10% passing: 0
Diameter at 60% passing: 0
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Points

	X (ft)	Y (ft)
Point 1	561.5172	329
Point 2	184.2753	329
Point 3	174.1934	323.83525
Point 4	351.3603	319.67886
Point 5	546.7523	324.07989
Point 6	139.5241	323.62981
Point 7	0	321.01609
Point 8	0	318.01563
Point 9	133.22	320.51124
Point 10	196.3072	335
Point 11	579.5227	335
Point 12	597.5282	341
Point 13	208.339	341
Point 14	608.5585	347
Point 15	240.1424	347

Point 16	234.9596	345.27685
Point 17	219.929	346.77965
Point 18	611.3486	345.60539
Point 19	596.5548	353
Point 20	258.1852	353
Point 21	250.6076	350.4794
Point 22	276.2227	359
Point 23	584.5511	359
Point 24	294.2603	365
Point 25	572.5474	365
Point 26	312.2978	371
Point 27	560.5437	371
Point 28	548.5399	377
Point 29	330.1036	377
Point 30	325.5389	375.4045
Point 31	337.8201	379.69712
Point 32	364.4177	380
Point 33	381.0855	380.33726
Point 34	395.5929	380.71635
Point 35	416.8543	381.25666
Point 36	438.0487	382
Point 37	479.1653	383
Point 38	511.5499	383
Point 39	512.0826	382.82242
Point 40	513.8708	383
Point 41	531.0491	383
Point 42	533.1096	382.31347
Point 43	533.1107	382.31305
Point 44	536.5271	381.01628
Point 45	537.9265	380.70839
Point 46	547.5083	377.51565
Point 47	346.883	383
Point 48	493.5541	389
Point 49	363.3465	389
Point 50	371.2953	391.89686
Point 51	372.0119	391.98713
Point 52	372.2345	391.99514
Point 53	372.3208	392
Point 54	374.2156	392.05341

Point 55	419.4544	394.02388
Point 56	423.1399	394.1518
Point 57	476.0285	394.84323
Point 58	0	275.56112
Point 59	82.561	276.49127
Point 60	84.7322	276.34451
Point 61	123.7177	276.54438
Point 62	191.6961	277.65321
Point 63	430.1918	279.01879
Point 64	487.7086	279.639
Point 65	509.7138	279.55021
Point 66	721.9937	279.02461
Point 67	839	278.53365
Point 68	839	283.95091
Point 69	694.2381	280.02879
Point 70	505.5772	282.211
Point 71	487.7086	281.69555
Point 72	430.1918	282.66537
Point 73	247.1163	283.77931
Point 74	191.6961	282.79673
Point 75	123.7177	280.19493
Point 76	93.9325	281.10076
Point 77	61.0988	279.7585
Point 78	0	281.01485
Point 79	839	292.1407
Point 80	505.5772	286.98428
Point 81	487.7086	287.07159
Point 82	430.1918	289.73652
Point 83	247.1163	297.70175
Point 84	123.7177	292.05467
Point 85	94.7708	289.80875
Point 86	84.7322	289.65003
Point 87	82.561	289.66397
Point 88	38.9609	289.4325
Point 89	0	289.19587
Point 90	0	300.53803
Point 91	17.729	300.30563
Point 92	61.8788	299.93669
Point 93	191.626	301.3549

Point 94	247.1555	301.9218
Point 95	430.2162	304.83853
Point 96	487.7442	304.85433
Point 97	505.6491	305.27434
Point 98	509.7473	305.37466
Point 99	564.3735	305.25518
Point 100	839	303.47923
Point 101	839	306.47929
Point 102	564.3865	308.25516
Point 103	509.7138	308.37474
Point 104	505.5772	308.27348
Point 105	487.7086	307.85432
Point 106	430.1918	307.83852
Point 107	247.1163	304.92156
Point 108	191.6961	304.35577
Point 109	123.7177	308.23059
Point 110	93.9325	306.13974
Point 111	81.2213	307.4429
Point 112	61.5521	302.93952
Point 113	17.7611	303.30547
Point 114	0	303.53785
Point 115	839	315.0402
Point 116	797.6335	315.91598
Point 117	788.4831	316.10833
Point 118	751.3873	316.84226
Point 119	746.5947	316.94222
Point 120	742.0308	317.02756
Point 121	740.5664	317.15339
Point 122	740.3716	317.22293
Point 123	737.8797	317.29393
Point 124	718.0152	324.01292
Point 125	711.8056	325.93525
Point 126	706.0898	327.46147
Point 127	700.0454	333.50592
Point 128	694.499	330.73293
Point 129	691.9982	333.23326
Point 130	680.0323	333.54954
Point 131	679.8975	333.54516
Point 132	674.9116	331.05465

Point 133	672.911	331.05491
Point 134	672.1929	333.92615
Point 135	648.0416	332
Point 136	642.1238	328.67972
Point 137	637.4622	326.05461
Point 138	633.8287	324
Point 139	632.6094	323.29395
Point 140	630.3447	322
Point 141	556.3265	322
Point 142	544.3989	318.02536
Point 143	351.3575	313.67727
Point 144	171.7713	317.89042
Point 145	158.9451	319.66188
Point 146	146.7629	317.7643
Point 147	0	315.01616
Point 148	126.916	317.39267
Point 149	624.2673	344.64
Point 150	642.7896	345.19608
Point 151	639.8757	348.10995
Point 152	623.7369	347.62543
Point 153	543.8794	321.01441
Point 154	351.3589	316.67806
Point 155	172.0125	320.88559
Point 156	158.9189	322.69398
Point 157	146.5027	320.75996
Point 158	161.8204	329.91734
Point 159	162.0292	329.91734
Point 160	169.8774	325.99323
Point 161	172.2537	323.88076
Point 162	158.8927	325.72607
Point 163	146.2426	323.75561
Point 164	144.6459	323.72571
Point 165	157.0292	329.91734
Point 166	643.2531	345.21
Point 167	651.9258	349.55
Point 168	666.9304	350
Point 169	668.3508	349.29
Point 170	707.4035	333.53244
Point 171	710.6052	333.51008

Point 172	711.3189	333.31046
Point 173	713.7443	332.66283
Point 174	720.1721	330.67297
Point 175	739.1283	324.2612
Point 176	741.6802	324.18848
Point 177	742.0676	324.05019
Point 178	742.3962	324.02195
Point 179	746.7331	323.94086
Point 180	751.5295	323.84082
Point 181	788.6259	323.10687
Point 182	797.7821	322.91441
Point 183	839	322.03859
Point 184	704.3877	335.67695
Point 185	758.6353	353.74048
Point 186	806.6964	369.75012
Point 187	818.5728	368.55874
Point 188	839	375.2318
Point 189	623.3833	349.61571
Point 190	636.5766	350.01181
Point 191	637.9727	350.01292
Point 192	0	260
Point 193	839	260

Lines

	Start Point	End Point	Stress/Strain Boundary	Hydraulic Boundary
Line 1	1	2		
Line 2	2	3		
Line 3	3	4		
Line 4	4	5		
Line 5	5	1		
Line 6	6	7		
Line 7	7	8	Fixed X	
Line 8	8	9		noflowzeropress
Line 9	9	6		
Line 10	10	11		
Line 11	11	1		
Line 12	2	10		
Line 13	11	12		

Line 14	12	13		
Line 15	13	10		
Line 16	14	15		
Line 17	15	16		
Line 18	16	17		
Line 19	17	13		
Line 20	12	18		
Line 21	19	20		
Line 22	20	21		
Line 23	21	15		
Line 24	14	19		
Line 25	20	22		
Line 26	22	23		
Line 27	23	19		
Line 28	22	24		
Line 29	24	25		
Line 30	25	23		
Line 31	26	27		
Line 32	27	25		
Line 33	24	26		
Line 34	28	29		
Line 35	29	30		
Line 36	30	26		
Line 37	27	28		
Line 38	29	31		
Line 39	32	33		
Line 40	33	34		
Line 41	34	35		
Line 42	35	36		
Line 43	36	37		
Line 44	37	38		
Line 45	38	39		
Line 46	39	40		
Line 47	40	41		
Line 48	41	42		
Line 49	42	43		
Line 50	43	44		
Line 51	44	45		
Line 52	45	46		

Line 53	46	28		
Line 54	38	48		
Line 55	48	49		
Line 56	49	47		
Line 57	49	50		
Line 58	50	51		
Line 59	51	52		
Line 60	52	53		
Line 61	53	54		
Line 62	54	55		
Line 63	55	56		
Line 64	56	57		
Line 65	57	48		
Line 66	58	59		
Line 67	59	60		
Line 68	60	61		
Line 69	61	62		
Line 70	62	63		
Line 71	63	64		
Line 72	64	65		
Line 73	65	66		
Line 74	66	67		
Line 75	67	68	Fixed X	Drainage 315
Line 76	68	69		
Line 77	69	70		
Line 78	70	71		
Line 79	71	72		
Line 80	72	73		
Line 81	73	74		
Line 82	74	75		
Line 83	75	76		
Line 84	76	77		
Line 85	77	78		
Line 86	68	79	Fixed X	Drainage 315
Line 87	79	80		
Line 88	80	81		
Line 89	81	82		
Line 90	82	83		
Line 91	83	84		

Line 92	84	85		
Line 93	85	86		
Line 94	86	87		
Line 95	87	88		
Line 96	88	89		
Line 97	90	91		
Line 98	91	92		
Line 99	92	93		
Line 100	93	94		
Line 101	94	95		
Line 102	95	96		
Line 103	96	97		
Line 104	97	98		
Line 105	98	99		
Line 106	99	100		
Line 107	100	79	Fixed X	Drainage 315
Line 108	100	101	Fixed X	Drainage 315
Line 109	101	102		
Line 110	102	103		
Line 111	103	104		
Line 112	104	105		
Line 113	105	106		
Line 114	106	107		
Line 115	107	108		
Line 116	108	109		
Line 117	109	110		
Line 118	110	111		
Line 119	111	112		
Line 120	112	113		
Line 121	113	114		
Line 122	101	115	Fixed X	Drainage 315
Line 123	115	116		no flow
Line 124	116	117		no flow
Line 125	117	118		no flow
Line 126	118	119		no flow
Line 127	119	120		no flow
Line 128	120	121		no flow
Line 129	121	122		
Line 130	122	123		no flow

Line 131	123	124		no flow
Line 132	124	125		no flow
Line 133	125	126		no flow
Line 134	126	127		no flow
Line 135	127	128		noflowzeropress
Line 136	128	129		noflowzeropress
Line 137	129	130		noflowzeropress
Line 138	130	131		
Line 139	131	132		noflowzeropress
Line 140	132	133		noflowzeropress
Line 141	133	134		
Line 142	134	135		
Line 143	135	136		
Line 144	136	137		
Line 145	137	138		
Line 146	138	139		
Line 147	139	140		
Line 148	140	141		
Line 149	141	142		
Line 150	142	143		
Line 151	143	144		
Line 152	144	145		
Line 153	145	146		
Line 154	146	147		
Line 155	147	148		
Line 156	148	9		
Line 157	148	146		
Line 158	141	149		
Line 159	149	150		
Line 160	150	151		
Line 161	151	152		no flow
Line 162	152	153		no flow
Line 163	153	154		no flow
Line 164	154	155		no flow
Line 165	155	156		no flow
Line 166	156	157		no flow
Line 167	157	9		no flow
Line 168	158	159		
Line 169	159	160		

Line 170	160	3		
Line 171	3	161		
Line 172	161	162		
Line 173	162	163		
Line 174	163	164		
Line 175	164	165		
Line 176	165	158		
Line 177	150	166		
Line 178	166	167		
Line 179	167	168		
Line 180	168	169		
Line 181	169	134		
Line 182	127	170		
Line 183	170	171		
Line 184	171	172		
Line 185	172	173		
Line 186	173	174		
Line 187	174	175		
Line 188	175	176		
Line 189	176	177		
Line 190	177	178		
Line 191	178	179		
Line 192	179	180		
Line 193	180	181		
Line 194	181	182		
Line 195	182	183		
Line 196	183	115	Fixed X	
Line 197	184	185		
Line 198	185	186		
Line 199	186	187		
Line 200	187	188		
Line 201	188	183	Fixed X	
Line 202	127	184		
Line 203	6	164		
Line 204	189	190		
Line 205	190	191		
Line 206	191	151		
Line 207	18	189		
Line 208	18	14		

Line 209	47	31		
Line 210	31	32		
Line 211	58	192	Fixed X	Drainage 315
Line 212	192	193	Fixed X/Y	Drainage 315
Line 213	193	67	Fixed X	Drainage 315
Line 214	78	58	Fixed X	Drainage 315
Line 215	89	78	Fixed X	Drainage 315
Line 216	89	90	Fixed X	Drainage 315
Line 217	114	90	Fixed X	Drainage 315
Line 218	147	114	Fixed X	Drainage 315
Line 219	8	147	Fixed X	

Regions

	Material	Points	Area (ft²)
Region 1	Waste Material	1,2,3,4,5	2,684.8
Region 2	NOT ACTIVE	6,7,8,9	409.18
Region 3	NOT ACTIVE	10,11,1,2	2,281.4
Region 4	NOT ACTIVE	10,11,12,13	2,317.2
Region 5	NOT ACTIVE	14,15,16,17,13,12,18	2,329.2
Region 6	NOT ACTIVE	19,20,21,15,14	2,120.4
Region 7	NOT ACTIVE	19,20,22,23	1,940.1
Region 8	NOT ACTIVE	23,22,24,25	1,759.8
Region 9	NOT ACTIVE	26,27,25,24	1,579.6
Region 10	NOT ACTIVE	28,29,30,26,27	1,399.5
Region 11	NOT ACTIVE	29,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,28	963.75
Region 12	NOT ACTIVE	47,31,32,33,34,35,36,37,38,48,49	1,129
Region 13	NOT ACTIVE	49,50,51,52,53,54,55,56,57,48	563.69
Region 14	Lower Till	58,59,60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78	3,000.7
Region 15	Sand/Silt	78,77,76,75,74,73,72,71,70,69,68,79,80,81,82,83,84,85,86,87,88,89	7,768.6
Region 16	GC-Drained	90,91,92,93,94,95,96,97,98,99,100,79,80,81,82,83,84,85,86,87,88,89	10,108
Region 17	GC OverConsolidated	90,91,92,93,94,95,96,97,98,99,100,101,102,103,104,105,106,107,108,109,110,111,112,113,114	2,873.1
Region 18	Upper Till	114,113,112,111,110,109,108,107,106,105,104,103,102,101,115,116,117,118,119,120,121,122,123,124,125,126,127,128,129,130,131,132,133,134,135,136,137,138,139,140,141,142,143,144,145,146,147	9,788.5
Region 19	Structural Fill	8,147,148,9	390.2
Region 20	CCL	148,146,145,144,143,142,141,149,150,151,152,153,154,155,156,157,9	1,547.9

Region 21	Structural Fill	158,159,160,3,161,162,163,164,165	80.098
Region 22	Waste Material	150,166,167,168,169,134,135,136,137,138,139,140,141,149	1,602.2
Region 23	CCL	127,170,171,172,173,174,175,176,177,178,179,180,181,182,183,115,116,117,118,119,120,121,122,123,124,125,126	957.6
Region 24	Waste Material	184,185,186,187,188,183,182,181,180,179,178,177,176,175,174,173,172,171,170,127	4,345.4
Region 25	Bottom Liner	157,9,6,164,163,162,161,3,4,5,1,11,12,18,189,190,191,151,152,153,154,155,156	1,423.6
Region 26	UPPER SHALE	58,192,193,67,66,65,64,63,62,61,60,59	15,370

Figure 8 - Coupled Consolidation for Section OP-1 for Waste Lift 2

WASTE LIFT 2 EL. 335

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File Information

Title: Model City - RMU-2 CP-20 Section OP-1
Comments: Operation Conditions for CP-20 Section 1 Based on Maximum Fill Rate of 50,000 Cu Yds per Quarter
Created By: Peter J. Carey
Last Edited By: Peter J. Carey
Revision Number: 511
File Version: 8.0
Tool Version: 8.0.10.6504
Date: 2/24/2013
Time: 3:48:00 PM
File Name: C20OP-1r1.gsz
Directory: N:\Model_City\154.002_rmu2\154.005_revsions\geoslope\operational\

Project Settings

Length(L) Units: feet
Time(t) Units: Days
Force(F) Units: lbf
Pressure(p) Units: psf
Strength Units: psf
Stiffness Units: psf
Unit Weight of Water: 62.4 pcf
Air Pressure: 101.33 psf
View: 2D

Analysis Settings

WASTE LIFT 2 EL. 335

Description: WASTE LIFT 2 C-20 OP-1 progression
Kind: SIGMA/W
Parent: WASTE LIFT 1 EL. 329
Method: Coupled Stress/PWP
Settings
- Initial Stress: Parent Analysis
- Initial PWP: Parent Analysis
- Exclude cumulative values: No

Control
- Apply Body Force in All Steps: No
- Saturated Zone Only: No

Convergence
- Maximum Number of Iterations: 50
- Minimum Pressure Head Difference: 0.001
- Minimum Displacement Difference: 0.001

Significant Digits: 3
Hydraulic Under-Relaxation Criteria
Under-Relaxation Initial Rate: 1
Under-Relaxation Min. Rate: 0.1
Under-Relaxation Reduction Rate: 0.65
Under-Relaxation Iterations: 10
Equation Solver: Parallel Direct
Time
Starting Time: 208 days
Duration: 74 days
# of Steps: 12
Step Generation Method: Linear
Save Steps Every: 4

Materials

Waste Material

Model: Linear Elastic (Total)
Stress Strain
Young's Modulus (E): 400,000 psf
Unit Weight: 111 pcf
Poisson's Ratio: 0.45

Bottom Liner

Model: Linear Elastic (Total)
Stress Strain
Young's Modulus (E): 400,000 psf
Unit Weight: 120 pcf
Poisson's Ratio: 0.45

CCL

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 1,000,000 psf
Unit Weight: 120 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Clay soils OC
K-Function: GC 5.7 E-4 ft/day
Ky'/Kx' Ratio: 0.1
Rotation: 0 °
Load Response Ratio: 1

Upper Till

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 300,000 psf
Unit Weight: 125 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Till

K-Function: Upper Glacial Till
Ky'/Kx' Ratio: 1
Rotation: 0 °
Load Response Ratio: 1

GC-Drained

Model: Soft Clay (MCC w/ PWP Change)
Stress Strain
O.C. Ratio: 4
Poisson's Ratio: 0.334
Lambda: 0.14
Kappa: 0.013
Initial Void Ratio: 1
Unit Weight: 118 pcf
Phi': 27 °
Hydraulic
Vol. WC. Function: Clay soils
K-Function: GC 5.7 E-4 ft/day
Ky'/Kx' Ratio: 1
Rotation: 0 °
K-Modifier Function: 1D consol derived k function rmu2 clay
Load Response Ratio: 1

GC OverConsolidated

Model: Soft Clay (MCC w/ PWP Change)
Stress Strain
O.C. Ratio: 8
Poisson's Ratio: 0.334
Lambda: 0.06
Kappa: 0.01
Initial Void Ratio: 0.5
Unit Weight: 125 pcf
Phi': 30 °
Hydraulic
Vol. WC. Function: Clay soils OC
K-Function: GC 5.7 E-4 ft/day
Ky'/Kx' Ratio: 1
Rotation: 0 °
K-Modifier Function: 1D consol derived k function rmu2 clay
Load Response Ratio: 1

Sand/Silt

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 300,000 psf
Unit Weight: 135 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: silty sand
K-Function: Silty Sand, k = 0.567 ft/day 2 E-4cm/sec
Ky'/Kx' Ratio: 0.1
Rotation: 0 °

Load Response Ratio: 1

Lower Till

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 600,000 psf
Unit Weight: 145 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Till
K-Function: Till
Ky'/Kx' Ratio: 1
Rotation: 0 °
Load Response Ratio: 1

Structural Fill

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 100,000 psf
Unit Weight: 135 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Till
K-Function: Till
Ky'/Kx' Ratio: 1
Rotation: 0 °
Load Response Ratio: 1

UPPER SHALE

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 1,000,000 psf
Unit Weight: 145 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Till
K-Function: Upper Rock
Ky'/Kx' Ratio: 1
Rotation: 0 °
Load Response Ratio: 1

NOT ACTIVE

Model: (none)

Boundary Conditions

Fixed X

X: X-Displacement 0

Fixed X/Y

X: X-Displacement 0

Y: Y-Displacement 0

Drainage 315

Type: Head (H) 315
Review: No

no flow

Type: Total Flux (Q) 0
Review: No

noflowzeropress

Type: Total Flux (Q) 0
Review: Yes

Initial Water Tables

Initial Water Table 1

Max. negative head: 5
Coordinates
Coordinate 1: (0, 315) ft
Coordinate 2: (850, 315) ft

K Functions

Silty Sand, k = 0.567 ft/day 2 E-4cm/sec

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 36 %
K-Saturation: 0.567
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (0.005, 0.567)
Data Point: (0.01, 0.567)
Data Point: (0.035938, 0.567)
Data Point: (0.12915, 0.567)
Data Point: (0.46416, 0.567)
Data Point: (1.1111, 0.567)
Data Point: (1.6681, 0.567)
Data Point: (5.9948, 0.567)
Data Point: (21.544, 0.567)
Data Point: (77.426, 0.567)
Data Point: (105.93, 0.5402376)
Data Point: (210.74, 0.3387258)
Data Point: (278.26, 0.2567376)
Data Point: (315.56, 0.2232846)
Data Point: (420.37, 0.1406916)
Data Point: (525.19, 0.0779121)
Data Point: (630, 0.03843882)
Data Point: (734.81, 0.01673406)

Data Point: (839.63, 0.005422788)
Data Point: (944.44, 0.000745983)
Data Point: (1,000, 7.14735e-005)
Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Upper Glacial Till

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 36 %
K-Saturation: 0.0057
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (0.005, 0.0057)
Data Point: (0.01, 0.0057)
Data Point: (0.046416, 0.0057)
Data Point: (0.21544, 0.0057)
Data Point: (1, 0.0057)
Data Point: (4.6416, 0.0057)
Data Point: (11.111, 0.0057)
Data Point: (21.544, 0.0057)
Data Point: (100, 0.0057)
Data Point: (464.16, 0.0016245)
Data Point: (1,059.3, 0.0002427972)
Data Point: (2,107.4, 1.492716e-005)
Data Point: (2,154.4, 1.369596e-005)
Data Point: (3,155.6, 4.086672e-006)
Data Point: (4,203.7, 1.82115e-006)
Data Point: (5,251.9, 9.03222e-007)
Data Point: (6,300, 4.30521e-007)
Data Point: (7,348.1, 2.028516e-007)
Data Point: (8,396.3, 7.73661e-008)
Data Point: (9,444.4, 2.691312e-008)
Data Point: (10,000, 2.691312e-008)
Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Upper Rock

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 36 %

K-Saturation: 0.567
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (0.005, 0.567)
Data Point: (0.01, 0.567)
Data Point: (10,000, 0.567)
Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Till

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 36 %
K-Saturation: 0.000567
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (0.005, 0.000567)
Data Point: (0.01, 0.000567)
Data Point: (10,000, 0.000567)
Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

GC 5.7 E-4 ft/day

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 100 %
K-Saturation: 0.00057
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (10, 0.00057)
Data Point: (1,000, 9e-006)
Data Point: (5,000, 5e-006)
Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Hydraulic K Modifier Functions

1D consol derived k function rmu2 clay

Model: Spline Data Point Function (Y Log)
Function: K-Modifier vs. Y-Effective Stress
Curve Fit to Data: 100 %
Segment Curvature: 75 %
Y-Intercept: 1.2
Data Points: Y-Effective Stress (psf), K-Modifier
Data Point: (1,000, 1.2)
Data Point: (2,000, 1)
Data Point: (4,000, 0.839)
Data Point: (8,000, 0.70417211)
Data Point: (12,000, 0.63551782)
Data Point: (16,000, 0.59090577)

Vol. Water Content Functions

Clay soils OC

Model: Vol WC Data Point Function
Function: Vol. Water Content vs. Pore-Water Pressure
Mv: 7e-005 /psf
Saturated Water Content: 0.31427274 ft^3/ft^3
Residual Water Content: 0.031427274 ft^3/ft^3
Curve Fit to Data: 100 %
Segment Curvature: 100 %
Porosity: 0.31427274
Data Points: Matric Suction (psf), Vol. Water Content (ft^3/ft^3)
Data Point: (0.01, 0.29999999)
Data Point: (0.018329807, 0.29999998)
Data Point: (0.033598183, 0.29999996)
Data Point: (0.061584821, 0.29999991)
Data Point: (0.11288379, 0.29999982)
Data Point: (0.20691381, 0.29999962)
Data Point: (0.37926902, 0.29999917)
Data Point: (0.6951928, 0.29999814)
Data Point: (1.274275, 0.29999578)
Data Point: (2.3357215, 0.29999026)
Data Point: (4.2813324, 0.2999772)
Data Point: (7.8475997, 0.29994599)
Data Point: (14.384499, 0.29987093)
Data Point: (26.366509, 0.29968944)
Data Point: (48.329302, 0.29924951)
Data Point: (88.586679, 0.29818464)
Data Point: (162.37767, 0.29563126)
Data Point: (297.63514, 0.28967022)
Data Point: (545.55948, 0.27661743)
Data Point: (1,000, 0.25163343)
Estimation Properties
Vol. WC Estimation Method: Sample functions

Saturated Water Content: 0.3 ft^3/ft^3
Sample Material: Clay
Liquid Limit: 0 %
Diameter at 10% passing: 0
Diameter at 60% passing: 0
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Clay soils

Model: Vol WC Data Point Function
Function: Vol. Water Content vs. Pore-Water Pressure
Mv: 0.0004 /psf
Saturated Water Content: 0.60995302 ft^3/ft^3
Residual Water Content: 0.060995302 ft^3/ft^3
Curve Fit to Data: 100 %
Segment Curvature: 100 %
Porosity: 0.60995302
Data Points: Matric Suction (psf), Vol. Water Content (ft^3/ft^3)
Data Point: (0.01, 0.43999998)
Data Point: (0.018329807, 0.43999997)
Data Point: (0.033598183, 0.43999994)
Data Point: (0.061584821, 0.43999987)
Data Point: (0.11288379, 0.43999974)
Data Point: (0.20691381, 0.43999944)
Data Point: (0.37926902, 0.43999878)
Data Point: (0.6951928, 0.43999728)
Data Point: (1.274275, 0.43999381)
Data Point: (2.3357215, 0.43998571)
Data Point: (4.2813324, 0.43996655)
Data Point: (7.8475997, 0.43992079)
Data Point: (14.384499, 0.4398107)
Data Point: (26.366509, 0.43954452)
Data Point: (48.329302, 0.43889927)
Data Point: (88.586679, 0.43733747)
Data Point: (162.37767, 0.43359251)
Data Point: (297.63514, 0.42484965)
Data Point: (545.55948, 0.40570556)
Data Point: (1,000, 0.36906236)
Estimation Properties
Vol. WC Estimation Method: Sample functions
Saturated Water Content: 0.44 ft^3/ft^3
Sample Material: Clay
Liquid Limit: 0 %
Diameter at 10% passing: 0
Diameter at 60% passing: 0
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Till

Model: Vol WC Data Point Function

Function: Vol. Water Content vs. Pore-Water Pressure
- Mv: 5e-006 /psf
- Saturated Water Content: 0.20000173 ft^3/ft^3
- Residual Water Content: 0.020000173 ft^3/ft^3
- Curve Fit to Data: 100 %
- Segment Curvature: 100 %

Porosity: 0.20000173

Data Points: Matric Suction (psf), Vol. Water Content (ft^3/ft^3)
- Data Point: (0.01, 0.19999999)
- Data Point: (0.018329807, 0.19999999)
- Data Point: (0.033598183, 0.19999997)
- Data Point: (0.061584821, 0.19999993)
- Data Point: (0.11288379, 0.19999985)
- Data Point: (0.20691381, 0.19999967)
- Data Point: (0.37926902, 0.19999922)
- Data Point: (0.6951928, 0.19999811)
- Data Point: (1.274275, 0.19999535)
- Data Point: (2.3357215, 0.19998838)
- Data Point: (4.2813324, 0.19997056)
- Data Point: (7.8475997, 0.19992471)
- Data Point: (14.384499, 0.19980625)
- Data Point: (26.366509, 0.19949952)
- Data Point: (48.329302, 0.19870702)
- Data Point: (88.586679, 0.19668084)
- Data Point: (162.37767, 0.19165467)
- Data Point: (297.63514, 0.18009116)
- Data Point: (545.55948, 0.15752337)
- Data Point: (1,000, 0.12453739)

Estimation Properties
- Vol. WC Estimation Method: Sample functions
- Saturated Water Content: 0.2 ft^3/ft^3
- Sample Material: Silty Clay
- Liquid Limit: 0 %
- Diameter at 10% passing: 0
- Diameter at 60% passing: 0
- Maximum: 1,000
- Minimum: 0.01
- Num. Points: 20

silty sand

Model: Vol WC Data Point Function

Function: Vol. Water Content vs. Pore-Water Pressure
- Mv: 1e-005 /psf
- Saturated Water Content: 0.30000011 ft^3/ft^3
- Residual Water Content: 0.030000011 ft^3/ft^3
- Curve Fit to Data: 100 %
- Segment Curvature: 100 %

Porosity: 0.30000011

Data Points: Matric Suction (psf), Vol. Water Content (ft^3/ft^3)
- Data Point: (0.01, 0.29999996)
- Data Point: (0.018329807, 0.29999991)
- Data Point: (0.033598183, 0.29999977)

Data Point: (0.061584821, 0.29999942)
Data Point: (0.11288379, 0.29999854)
Data Point: (0.20691381, 0.29999626)
Data Point: (0.37926902, 0.29999039)
Data Point: (0.6951928, 0.29997521)
Data Point: (1.274275, 0.29993588)
Data Point: (2.3357215, 0.29983385)
Data Point: (4.2813324, 0.29956912)
Data Point: (7.8475997, 0.29888334)
Data Point: (14.384499, 0.29711648)
Data Point: (26.366509, 0.29263189)
Data Point: (48.329302, 0.28167657)
Data Point: (88.586679, 0.25725429)
Data Point: (162.37767, 0.21239326)
Data Point: (297.63514, 0.15298031)
Data Point: (545.55948, 0.099847233)
Data Point: (1,000, 0.064649441)

Estimation Properties

Vol. WC Estimation Method: Sample functions
Saturated Water Content: 0.3 ft^3/ft^3
Sample Material: Silty Sand
Liquid Limit: 0 %
Diameter at 10% passing: 0
Diameter at 60% passing: 0
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Points

	X (ft)	Y (ft)
Point 1	561.5172	329
Point 2	184.2753	329
Point 3	174.1934	323.83525
Point 4	351.3603	319.67886
Point 5	546.7523	324.07989
Point 6	139.5241	323.62981
Point 7	0	321.01609
Point 8	0	318.01563
Point 9	133.22	320.51124
Point 10	196.3072	335
Point 11	579.5227	335
Point 12	597.5282	341
Point 13	208.339	341
Point 14	608.5585	347
Point 15	240.1424	347

Point 16	234.9596	345.27685
Point 17	219.929	346.77965
Point 18	611.3486	345.60539
Point 19	596.5548	353
Point 20	258.1852	353
Point 21	250.6076	350.4794
Point 22	276.2227	359
Point 23	584.5511	359
Point 24	294.2603	365
Point 25	572.5474	365
Point 26	312.2978	371
Point 27	560.5437	371
Point 28	548.5399	377
Point 29	330.1036	377
Point 30	325.5389	375.4045
Point 31	337.8201	379.69712
Point 32	364.4177	380
Point 33	381.0855	380.33726
Point 34	395.5929	380.71635
Point 35	416.8543	381.25666
Point 36	438.0487	382
Point 37	479.1653	383
Point 38	511.5499	383
Point 39	512.0826	382.82242
Point 40	513.8708	383
Point 41	531.0491	383
Point 42	533.1096	382.31347
Point 43	533.1107	382.31305
Point 44	536.5271	381.01628
Point 45	537.9265	380.70839
Point 46	547.5083	377.51565
Point 47	346.883	383
Point 48	493.5541	389
Point 49	363.3465	389
Point 50	371.2953	391.89686
Point 51	372.0119	391.98713
Point 52	372.2345	391.99514
Point 53	372.3208	392
Point 54	374.2156	392.05341

Point 55	419.4544	394.02388
Point 56	423.1399	394.1518
Point 57	476.0285	394.84323
Point 58	0	275.56112
Point 59	82.561	276.49127
Point 60	84.7322	276.34451
Point 61	123.7177	276.54438
Point 62	191.6961	277.65321
Point 63	430.1918	279.01879
Point 64	487.7086	279.639
Point 65	509.7138	279.55021
Point 66	721.9937	279.02461
Point 67	839	278.53365
Point 68	839	283.95091
Point 69	694.2381	280.02879
Point 70	505.5772	282.211
Point 71	487.7086	281.69555
Point 72	430.1918	282.66537
Point 73	247.1163	283.77931
Point 74	191.6961	282.79673
Point 75	123.7177	280.19493
Point 76	93.9325	281.10076
Point 77	61.0988	279.7585
Point 78	0	281.01485
Point 79	839	292.1407
Point 80	505.5772	286.98428
Point 81	487.7086	287.07159
Point 82	430.1918	289.73652
Point 83	247.1163	297.70175
Point 84	123.7177	292.05467
Point 85	94.7708	289.80875
Point 86	84.7322	289.65003
Point 87	82.561	289.66397
Point 88	38.9609	289.4325
Point 89	0	289.19587
Point 90	0	300.53803
Point 91	17.729	300.30563
Point 92	61.8788	299.93669
Point 93	191.626	301.3549

Point 94	247.1555	301.9218
Point 95	430.2162	304.83853
Point 96	487.7442	304.85433
Point 97	505.6491	305.27434
Point 98	509.7473	305.37466
Point 99	564.3735	305.25518
Point 100	839	303.47923
Point 101	839	306.47929
Point 102	564.3865	308.25516
Point 103	509.7138	308.37474
Point 104	505.5772	308.27348
Point 105	487.7086	307.85432
Point 106	430.1918	307.83852
Point 107	247.1163	304.92156
Point 108	191.6961	304.35577
Point 109	123.7177	308.23059
Point 110	93.9325	306.13974
Point 111	81.2213	307.4429
Point 112	61.5521	302.93952
Point 113	17.7611	303.30547
Point 114	0	303.53785
Point 115	839	315.0402
Point 116	797.6335	315.91598
Point 117	788.4831	316.10833
Point 118	751.3873	316.84226
Point 119	746.5947	316.94222
Point 120	742.0308	317.02756
Point 121	740.5664	317.15339
Point 122	740.3716	317.22293
Point 123	737.8797	317.29393
Point 124	718.0152	324.01292
Point 125	711.8056	325.93525
Point 126	706.0898	327.46147
Point 127	700.0454	333.50592
Point 128	694.499	330.73293
Point 129	691.9982	333.23326
Point 130	680.0323	333.54954
Point 131	679.8975	333.54516
Point 132	674.9116	331.05465

Point 133	672.911	331.05491
Point 134	672.1929	333.92615
Point 135	648.0416	332
Point 136	642.1238	328.67972
Point 137	637.4622	326.05461
Point 138	633.8287	324
Point 139	632.6094	323.29395
Point 140	630.3447	322
Point 141	556.3265	322
Point 142	544.3989	318.02536
Point 143	351.3575	313.67727
Point 144	171.7713	317.89042
Point 145	158.9451	319.66188
Point 146	146.7629	317.7643
Point 147	0	315.01616
Point 148	126.916	317.39267
Point 149	624.2673	344.64
Point 150	642.7896	345.19608
Point 151	639.8757	348.10995
Point 152	623.7369	347.62543
Point 153	543.8794	321.01441
Point 154	351.3589	316.67806
Point 155	172.0125	320.88559
Point 156	158.9189	322.69398
Point 157	146.5027	320.75996
Point 158	161.8204	329.91734
Point 159	162.0292	329.91734
Point 160	169.8774	325.99323
Point 161	172.2537	323.88076
Point 162	158.8927	325.72607
Point 163	146.2426	323.75561
Point 164	144.6459	323.72571
Point 165	157.0292	329.91734
Point 166	643.2531	345.21
Point 167	651.9258	349.55
Point 168	666.9304	350
Point 169	668.3508	349.29
Point 170	707.4035	333.53244
Point 171	710.6052	333.51008

Point 172	711.3189	333.31046
Point 173	713.7443	332.66283
Point 174	720.1721	330.67297
Point 175	739.1283	324.2612
Point 176	741.6802	324.18848
Point 177	742.0676	324.05019
Point 178	742.3962	324.02195
Point 179	746.7331	323.94086
Point 180	751.5295	323.84082
Point 181	788.6259	323.10687
Point 182	797.7821	322.91441
Point 183	839	322.03859
Point 184	704.3877	335.67695
Point 185	758.6353	353.74048
Point 186	806.6964	369.75012
Point 187	818.5728	368.55874
Point 188	839	375.2318
Point 189	623.3833	349.61571
Point 190	636.5766	350.01181
Point 191	637.9727	350.01292
Point 192	0	260
Point 193	839	260

Lines

	Start Point	End Point	Stress/Strain Boundary	Hydraulic Boundary
Line 1	1	2		
Line 2	2	3		
Line 3	3	4		
Line 4	4	5		
Line 5	5	1		
Line 6	6	7		
Line 7	7	8	Fixed X	
Line 8	8	9		noflowzeropress
Line 9	9	6		
Line 10	10	11		
Line 11	11	1		
Line 12	2	10		
Line 13	11	12		

Line 14	12	13		
Line 15	13	10		
Line 16	14	15		
Line 17	15	16		
Line 18	16	17		
Line 19	17	13		
Line 20	12	18		
Line 21	19	20		
Line 22	20	21		
Line 23	21	15		
Line 24	14	19		
Line 25	20	22		
Line 26	22	23		
Line 27	23	19		
Line 28	22	24		
Line 29	24	25		
Line 30	25	23		
Line 31	26	27		
Line 32	27	25		
Line 33	24	26		
Line 34	28	29		
Line 35	29	30		
Line 36	30	26		
Line 37	27	28		
Line 38	29	31		
Line 39	32	33		
Line 40	33	34		
Line 41	34	35		
Line 42	35	36		
Line 43	36	37		
Line 44	37	38		
Line 45	38	39		
Line 46	39	40		
Line 47	40	41		
Line 48	41	42		
Line 49	42	43		
Line 50	43	44		
Line 51	44	45		
Line 52	45	46		

Line 53	46	28		
Line 54	38	48		
Line 55	48	49		
Line 56	49	47		
Line 57	49	50		
Line 58	50	51		
Line 59	51	52		
Line 60	52	53		
Line 61	53	54		
Line 62	54	55		
Line 63	55	56		
Line 64	56	57		
Line 65	57	48		
Line 66	58	59		
Line 67	59	60		
Line 68	60	61		
Line 69	61	62		
Line 70	62	63		
Line 71	63	64		
Line 72	64	65		
Line 73	65	66		
Line 74	66	67		
Line 75	67	68	Fixed X	Drainage 315
Line 76	68	69		
Line 77	69	70		
Line 78	70	71		
Line 79	71	72		
Line 80	72	73		
Line 81	73	74		
Line 82	74	75		
Line 83	75	76		
Line 84	76	77		
Line 85	77	78		
Line 86	68	79	Fixed X	Drainage 315
Line 87	79	80		
Line 88	80	81		
Line 89	81	82		
Line 90	82	83		
Line 91	83	84		

Line 92	84	85		
Line 93	85	86		
Line 94	86	87		
Line 95	87	88		
Line 96	88	89		
Line 97	90	91		
Line 98	91	92		
Line 99	92	93		
Line 100	93	94		
Line 101	94	95		
Line 102	95	96		
Line 103	96	97		
Line 104	97	98		
Line 105	98	99		
Line 106	99	100		
Line 107	100	79	Fixed X	Drainage 315
Line 108	100	101	Fixed X	Drainage 315
Line 109	101	102		
Line 110	102	103		
Line 111	103	104		
Line 112	104	105		
Line 113	105	106		
Line 114	106	107		
Line 115	107	108		
Line 116	108	109		
Line 117	109	110		
Line 118	110	111		
Line 119	111	112		
Line 120	112	113		
Line 121	113	114		
Line 122	101	115	Fixed X	Drainage 315
Line 123	115	116		no flow
Line 124	116	117		no flow
Line 125	117	118		no flow
Line 126	118	119		no flow
Line 127	119	120		no flow
Line 128	120	121		no flow
Line 129	121	122		
Line 130	122	123		no flow

Line 131	123	124		no flow
Line 132	124	125		no flow
Line 133	125	126		no flow
Line 134	126	127		no flow
Line 135	127	128		noflowzeropress
Line 136	128	129		noflowzeropress
Line 137	129	130		noflowzeropress
Line 138	130	131		
Line 139	131	132		noflowzeropress
Line 140	132	133		noflowzeropress
Line 141	133	134		
Line 142	134	135		
Line 143	135	136		
Line 144	136	137		
Line 145	137	138		
Line 146	138	139		
Line 147	139	140		
Line 148	140	141		
Line 149	141	142		
Line 150	142	143		
Line 151	143	144		
Line 152	144	145		
Line 153	145	146		
Line 154	146	147		
Line 155	147	148		
Line 156	148	9		
Line 157	148	146		
Line 158	141	149		
Line 159	149	150		
Line 160	150	151		
Line 161	151	152		no flow
Line 162	152	153		no flow
Line 163	153	154		no flow
Line 164	154	155		no flow
Line 165	155	156		no flow
Line 166	156	157		no flow
Line 167	157	9		no flow
Line 168	158	159		
Line 169	159	160		

Line 170	160	3		
Line 171	3	161		
Line 172	161	162		
Line 173	162	163		
Line 174	163	164		
Line 175	164	165		
Line 176	165	158		
Line 177	150	166		
Line 178	166	167		
Line 179	167	168		
Line 180	168	169		
Line 181	169	134		
Line 182	127	170		
Line 183	170	171		
Line 184	171	172		
Line 185	172	173		
Line 186	173	174		
Line 187	174	175		
Line 188	175	176		
Line 189	176	177		
Line 190	177	178		
Line 191	178	179		
Line 192	179	180		
Line 193	180	181		
Line 194	181	182		
Line 195	182	183		
Line 196	183	115	Fixed X	
Line 197	184	185		
Line 198	185	186		
Line 199	186	187		
Line 200	187	188		
Line 201	188	183	Fixed X	
Line 202	127	184		
Line 203	6	164		
Line 204	189	190		
Line 205	190	191		
Line 206	191	151		
Line 207	18	189		
Line 208	18	14		

Line 209	47	31		
Line 210	31	32		
Line 211	58	192	Fixed X	Drainage 315
Line 212	192	193	Fixed X/Y	Drainage 315
Line 213	193	67	Fixed X	Drainage 315
Line 214	78	58	Fixed X	Drainage 315
Line 215	89	78	Fixed X	Drainage 315
Line 216	89	90	Fixed X	Drainage 315
Line 217	114	90	Fixed X	Drainage 315
Line 218	147	114	Fixed X	Drainage 315
Line 219	8	147	Fixed X	

Regions

	Material	Points	Area (ft²)
Region 1	Waste Material	1,2,3,4,5	2,684.8
Region 2	NOT ACTIVE	6,7,8,9	409.18
Region 3	Waste Material	10,11,1,2	2,281.4
Region 4	NOT ACTIVE	10,11,12,13	2,317.2
Region 5	NOT ACTIVE	14,15,16,17,13,12,18	2,329.2
Region 6	NOT ACTIVE	19,20,21,15,14	2,120.4
Region 7	NOT ACTIVE	19,20,22,23	1,940.1
Region 8	NOT ACTIVE	23,22,24,25	1,759.8
Region 9	NOT ACTIVE	26,27,25,24	1,579.6
Region 10	NOT ACTIVE	28,29,30,26,27	1,399.5
Region 11	NOT ACTIVE	29,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,28	963.75
Region 12	NOT ACTIVE	47,31,32,33,34,35,36,37,38,48,49	1,129
Region 13	NOT ACTIVE	49,50,51,52,53,54,55,56,57,48	563.69
Region 14	Lower Till	58,59,60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78	3,000.7
Region 15	Sand/Silt	78,77,76,75,74,73,72,71,70,69,68,79,80,81,82,83,84,85,86,87,88,89	7,768.6
Region 16	GC-Drained	90,91,92,93,94,95,96,97,98,99,100,79,80,81,82,83,84,85,86,87,88,89	10,108
Region 17	GC OverConsolidated	90,91,92,93,94,95,96,97,98,99,100,101,102,103,104,105,106,107,108,109,110,111,112,113,114	2,873.1
Region 18	Upper Till	114,113,112,111,110,109,108,107,106,105,104,103,102,101,115,116,117,118,119,120,121,122,123,124,125,126,127,128,129,130,131,132,133,134,135,136,137,138,139,140,141,142,143,144,145,146,147	9,788.5
Region 19	Structural Fill	8,147,148,9	390.2
Region 20	CCL	148,146,145,144,143,142,141,149,150,151,152,153,154,155,156,157,9	1,547.9
Region 21	Structural Fill	158,159,160,3,161,162,163,164,165	80.098
Region 22	Waste Material	150,166,167,168,169,134,135,136,137,138,139,140,141,149	1,602.2

Region 23	CCL	127,170,171,172,173,174,175,176,177,178,179,180,181,182,183,115,116,117,118,119,120,121,122,123,124,125,126	957.6
Region 24	Waste Material	184,185,186,187,188,183,182,181,180,179,178,177,176,175,174,173,172,171,170,127	4,345.4
Region 25	Bottom Liner	157,9,6,164,163,162,161,3,4,5,1,11,12,18,189,190,191,151,152,153,154,155,156	1,423.6
Region 26	UPPER SHALE	58,192,193,67,66,65,64,63,62,61,60,59	15,370

Figure 9 - Coupled Consolidation for Section OP-1 for Waste Lift 3

WASTE LIFT3 EL. 341

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File Information

Title: Model City - RMU-2 CP-20 Section OP-1
Comments: Operation Conditions for CP-20 Section 1 Based on Maximum Fill Rate of 50,000 Cu Yds per Quarter
Created By: Peter J. Carey
Last Edited By: Peter J. Carey
Revision Number: 511
File Version: 8.0
Tool Version: 8.0.10.6504
Date: 2/24/2013
Time: 3:48:00 PM
File Name: C20OP-1r1.gsz
Directory: N:\Model_City\154.002_rmu2\154.005_revsions\geoslope\operational\

Project Settings

Length(L) Units: feet
Time(t) Units: Days
Force(F) Units: lbf
Pressure(p) Units: psf
Strength Units: psf
Stiffness Units: psf
Unit Weight of Water: 62.4 pcf
Air Pressure: 101.33 psf
View: 2D

Analysis Settings

WASTE LIFT3 EL. 341

Description: WASTE LIFT 3 C-20 OP-1 progression
Kind: SIGMA/W
Parent: WASTE LIFT 2 EL. 335
Method: Coupled Stress/PWP
Settings
- Initial Stress: Parent Analysis
- Initial PWP: Parent Analysis
- Exclude cumulative values: No

Control
- Apply Body Force in All Steps: No
- Saturated Zone Only: No

Convergence
- Maximum Number of Iterations: 50
- Minimum Pressure Head Difference: 0.001
- Minimum Displacement Difference: 0.001

Significant Digits: 3
Hydraulic Under-Relaxation Criteria
Under-Relaxation Initial Rate: 1
Under-Relaxation Min. Rate: 0.1
Under-Relaxation Reduction Rate: 0.65
Under-Relaxation Iterations: 10
Equation Solver: Parallel Direct
Time
Starting Time: 282 days
Duration: 79 days
# of Steps: 12
Step Generation Method: Linear
Save Steps Every: 4

Materials

Waste Material

Model: Linear Elastic (Total)
Stress Strain
Young's Modulus (E): 400,000 psf
Unit Weight: 111 pcf
Poisson's Ratio: 0.45

Bottom Liner

Model: Linear Elastic (Total)
Stress Strain
Young's Modulus (E): 400,000 psf
Unit Weight: 120 pcf
Poisson's Ratio: 0.45

CCL

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 1,000,000 psf
Unit Weight: 120 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Clay soils OC
K-Function: GC 5.7 E-4 ft/day
Ky'/Kx' Ratio: 0.1
Rotation: 0 °
Load Response Ratio: 1

Upper Till

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 300,000 psf
Unit Weight: 125 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Till

K-Function: Upper Glacial Till
Ky'/Kx' Ratio: 1
Rotation: 0 °
Load Response Ratio: 1

GC-Drained

Model: Soft Clay (MCC w/ PWP Change)
Stress Strain
O.C. Ratio: 4
Poisson's Ratio: 0.334
Lambda: 0.14
Kappa: 0.013
Initial Void Ratio: 1
Unit Weight: 118 pcf
Phi': 27 °
Hydraulic
Vol. WC. Function: Clay soils
K-Function: GC 5.7 E-4 ft/day
Ky'/Kx' Ratio: 1
Rotation: 0 °
K-Modifier Function: 1D consol derived k function rmu2 clay
Load Response Ratio: 1

GC OverConsolidated

Model: Soft Clay (MCC w/ PWP Change)
Stress Strain
O.C. Ratio: 8
Poisson's Ratio: 0.334
Lambda: 0.06
Kappa: 0.01
Initial Void Ratio: 0.5
Unit Weight: 125 pcf
Phi': 30 °
Hydraulic
Vol. WC. Function: Clay soils OC
K-Function: GC 5.7 E-4 ft/day
Ky'/Kx' Ratio: 1
Rotation: 0 °
K-Modifier Function: 1D consol derived k function rmu2 clay
Load Response Ratio: 1

Sand/Silt

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 300,000 psf
Unit Weight: 135 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: silty sand
K-Function: Silty Sand, k = 0.567 ft/day 2 E-4cm/sec
Ky'/Kx' Ratio: 0.1
Rotation: 0 °

Load Response Ratio: 1

Lower Till

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 600,000 psf
Unit Weight: 145 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Till
K-Function: Till
Ky'/Kx' Ratio: 1
Rotation: 0 °
Load Response Ratio: 1

Structural Fill

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 100,000 psf
Unit Weight: 135 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Till
K-Function: Till
Ky'/Kx' Ratio: 1
Rotation: 0 °
Load Response Ratio: 1

UPPER SHALE

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 1,000,000 psf
Unit Weight: 145 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Till
K-Function: Upper Rock
Ky'/Kx' Ratio: 1
Rotation: 0 °
Load Response Ratio: 1

NOT ACTIVE

Model: (none)

Boundary Conditions

Fixed X

X: X-Displacement 0

Fixed X/Y

X: X-Displacement 0

Y: Y-Displacement 0

Drainage 315

Type: Head (H) 315
Review: No

no flow

Type: Total Flux (Q) 0
Review: No

noflowzeropress

Type: Total Flux (Q) 0
Review: Yes

Initial Water Tables

Initial Water Table 1

Max. negative head: 5
Coordinates
Coordinate 1: (0, 315) ft
Coordinate 2: (850, 315) ft

K Functions

Silty Sand, k = 0.567 ft/day 2 E-4cm/sec

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 36 %
K-Saturation: 0.567
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (0.005, 0.567)
Data Point: (0.01, 0.567)
Data Point: (0.035938, 0.567)
Data Point: (0.12915, 0.567)
Data Point: (0.46416, 0.567)
Data Point: (1.1111, 0.567)
Data Point: (1.6681, 0.567)
Data Point: (5.9948, 0.567)
Data Point: (21.544, 0.567)
Data Point: (77.426, 0.567)
Data Point: (105.93, 0.5402376)
Data Point: (210.74, 0.3387258)
Data Point: (278.26, 0.2567376)
Data Point: (315.56, 0.2232846)
Data Point: (420.37, 0.1406916)
Data Point: (525.19, 0.0779121)
Data Point: (630, 0.03843882)
Data Point: (734.81, 0.01673406)

Data Point: (839.63, 0.005422788)
Data Point: (944.44, 0.000745983)
Data Point: (1,000, 7.14735e-005)
Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Upper Glacial Till

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 36 %
K-Saturation: 0.0057
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (0.005, 0.0057)
Data Point: (0.01, 0.0057)
Data Point: (0.046416, 0.0057)
Data Point: (0.21544, 0.0057)
Data Point: (1, 0.0057)
Data Point: (4.6416, 0.0057)
Data Point: (11.111, 0.0057)
Data Point: (21.544, 0.0057)
Data Point: (100, 0.0057)
Data Point: (464.16, 0.0016245)
Data Point: (1,059.3, 0.0002427972)
Data Point: (2,107.4, 1.492716e-005)
Data Point: (2,154.4, 1.369596e-005)
Data Point: (3,155.6, 4.086672e-006)
Data Point: (4,203.7, 1.82115e-006)
Data Point: (5,251.9, 9.03222e-007)
Data Point: (6,300, 4.30521e-007)
Data Point: (7,348.1, 2.028516e-007)
Data Point: (8,396.3, 7.73661e-008)
Data Point: (9,444.4, 2.691312e-008)
Data Point: (10,000, 2.691312e-008)
Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Upper Rock

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 36 %

K-Saturation: 0.567
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (0.005, 0.567)
Data Point: (0.01, 0.567)
Data Point: (10,000, 0.567)
Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Till

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 36 %
K-Saturation: 0.000567
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (0.005, 0.000567)
Data Point: (0.01, 0.000567)
Data Point: (10,000, 0.000567)
Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

GC 5.7 E-4 ft/day

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 100 %
K-Saturation: 0.00057
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (10, 0.00057)
Data Point: (1,000, 9e-006)
Data Point: (5,000, 5e-006)
Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Hydraulic K Modifier Functions

1D consol derived k function rmu2 clay

Model: Spline Data Point Function (Y Log)
Function: K-Modifier vs. Y-Effective Stress
Curve Fit to Data: 100 %
Segment Curvature: 75 %
Y-Intercept: 1.2
Data Points: Y-Effective Stress (psf), K-Modifier
Data Point: (1,000, 1.2)
Data Point: (2,000, 1)
Data Point: (4,000, 0.839)
Data Point: (8,000, 0.70417211)
Data Point: (12,000, 0.63551782)
Data Point: (16,000, 0.59090577)

Vol. Water Content Functions

Clay soils OC

Model: Vol WC Data Point Function
Function: Vol. Water Content vs. Pore-Water Pressure
Mv: 7e-005 /psf
Saturated Water Content: 0.31427274 ft^3/ft^3
Residual Water Content: 0.031427274 ft^3/ft^3
Curve Fit to Data: 100 %
Segment Curvature: 100 %
Porosity: 0.31427274
Data Points: Matric Suction (psf), Vol. Water Content (ft^3/ft^3)
Data Point: (0.01, 0.29999999)
Data Point: (0.018329807, 0.29999998)
Data Point: (0.033598183, 0.29999996)
Data Point: (0.061584821, 0.29999991)
Data Point: (0.11288379, 0.29999982)
Data Point: (0.20691381, 0.29999962)
Data Point: (0.37926902, 0.29999917)
Data Point: (0.6951928, 0.29999814)
Data Point: (1.274275, 0.29999578)
Data Point: (2.3357215, 0.29999026)
Data Point: (4.2813324, 0.2999772)
Data Point: (7.8475997, 0.29994599)
Data Point: (14.384499, 0.29987093)
Data Point: (26.366509, 0.29968944)
Data Point: (48.329302, 0.29924951)
Data Point: (88.586679, 0.29818464)
Data Point: (162.37767, 0.29563126)
Data Point: (297.63514, 0.28967022)
Data Point: (545.55948, 0.27661743)
Data Point: (1,000, 0.25163343)
Estimation Properties
Vol. WC Estimation Method: Sample functions

Saturated Water Content: 0.3 ft^3/ft^3
Sample Material: Clay
Liquid Limit: 0 %
Diameter at 10% passing: 0
Diameter at 60% passing: 0
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Clay soils

Model: Vol WC Data Point Function
Function: Vol. Water Content vs. Pore-Water Pressure
Mv: 0.0004 /psf
Saturated Water Content: 0.60995302 ft^3/ft^3
Residual Water Content: 0.060995302 ft^3/ft^3
Curve Fit to Data: 100 %
Segment Curvature: 100 %
Porosity: 0.60995302
Data Points: Matric Suction (psf), Vol. Water Content (ft^3/ft^3)
Data Point: (0.01, 0.43999998)
Data Point: (0.018329807, 0.43999997)
Data Point: (0.033598183, 0.43999994)
Data Point: (0.061584821, 0.43999987)
Data Point: (0.11288379, 0.43999974)
Data Point: (0.20691381, 0.43999944)
Data Point: (0.37926902, 0.43999878)
Data Point: (0.6951928, 0.43999728)
Data Point: (1.274275, 0.43999381)
Data Point: (2.3357215, 0.43998571)
Data Point: (4.2813324, 0.43996655)
Data Point: (7.8475997, 0.43992079)
Data Point: (14.384499, 0.4398107)
Data Point: (26.366509, 0.43954452)
Data Point: (48.329302, 0.43889927)
Data Point: (88.586679, 0.43733747)
Data Point: (162.37767, 0.43359251)
Data Point: (297.63514, 0.42484965)
Data Point: (545.55948, 0.40570556)
Data Point: (1,000, 0.36906236)
Estimation Properties
Vol. WC Estimation Method: Sample functions
Saturated Water Content: 0.44 ft^3/ft^3
Sample Material: Clay
Liquid Limit: 0 %
Diameter at 10% passing: 0
Diameter at 60% passing: 0
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Till

Model: Vol WC Data Point Function

Function: Vol. Water Content vs. Pore-Water Pressure
Mv: 5e-006 /psf
Saturated Water Content: 0.20000173 ft^3/ft^3
Residual Water Content: 0.020000173 ft^3/ft^3
Curve Fit to Data: 100 %
Segment Curvature: 100 %
Porosity: 0.20000173
Data Points: Matric Suction (psf), Vol. Water Content (ft^3/ft^3)
Data Point: (0.01, 0.19999999)
Data Point: (0.018329807, 0.19999999)
Data Point: (0.033598183, 0.19999997)
Data Point: (0.061584821, 0.19999993)
Data Point: (0.11288379, 0.19999985)
Data Point: (0.20691381, 0.19999967)
Data Point: (0.37926902, 0.19999922)
Data Point: (0.6951928, 0.19999811)
Data Point: (1.274275, 0.19999535)
Data Point: (2.3357215, 0.19998838)
Data Point: (4.2813324, 0.19997056)
Data Point: (7.8475997, 0.19992471)
Data Point: (14.384499, 0.19980625)
Data Point: (26.366509, 0.19949952)
Data Point: (48.329302, 0.19870702)
Data Point: (88.586679, 0.19668084)
Data Point: (162.37767, 0.19165467)
Data Point: (297.63514, 0.18009116)
Data Point: (545.55948, 0.15752337)
Data Point: (1,000, 0.12453739)
Estimation Properties
Vol. WC Estimation Method: Sample functions
Saturated Water Content: 0.2 ft^3/ft^3
Sample Material: Silty Clay
Liquid Limit: 0 %
Diameter at 10% passing: 0
Diameter at 60% passing: 0
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

silty sand

Model: Vol WC Data Point Function
Function: Vol. Water Content vs. Pore-Water Pressure
Mv: 1e-005 /psf
Saturated Water Content: 0.30000011 ft^3/ft^3
Residual Water Content: 0.030000011 ft^3/ft^3
Curve Fit to Data: 100 %
Segment Curvature: 100 %
Porosity: 0.30000011
Data Points: Matric Suction (psf), Vol. Water Content (ft^3/ft^3)
Data Point: (0.01, 0.29999996)
Data Point: (0.018329807, 0.29999991)
Data Point: (0.033598183, 0.29999977)

Data Point: (0.061584821, 0.29999942)
Data Point: (0.11288379, 0.29999854)
Data Point: (0.20691381, 0.29999626)
Data Point: (0.37926902, 0.29999039)
Data Point: (0.6951928, 0.29997521)
Data Point: (1.274275, 0.29993588)
Data Point: (2.3357215, 0.29983385)
Data Point: (4.2813324, 0.29956912)
Data Point: (7.8475997, 0.29888334)
Data Point: (14.384499, 0.29711648)
Data Point: (26.366509, 0.29263189)
Data Point: (48.329302, 0.28167657)
Data Point: (88.586679, 0.25725429)
Data Point: (162.37767, 0.21239326)
Data Point: (297.63514, 0.15298031)
Data Point: (545.55948, 0.099847233)
Data Point: (1,000, 0.064649441)

Estimation Properties

Vol. WC Estimation Method: Sample functions
Saturated Water Content: 0.3 ft^3/ft^3
Sample Material: Silty Sand
Liquid Limit: 0 %
Diameter at 10% passing: 0
Diameter at 60% passing: 0
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Points

	X (ft)	Y (ft)
Point 1	561.5172	329
Point 2	184.2753	329
Point 3	174.1934	323.83525
Point 4	351.3603	319.67886
Point 5	546.7523	324.07989
Point 6	139.5241	323.62981
Point 7	0	321.01609
Point 8	0	318.01563
Point 9	133.22	320.51124
Point 10	196.3072	335
Point 11	579.5227	335
Point 12	597.5282	341
Point 13	208.339	341
Point 14	608.5585	347
Point 15	240.1424	347

Point 16	234.9596	345.27685
Point 17	219.929	346.77965
Point 18	611.3486	345.60539
Point 19	596.5548	353
Point 20	258.1852	353
Point 21	250.6076	350.4794
Point 22	276.2227	359
Point 23	584.5511	359
Point 24	294.2603	365
Point 25	572.5474	365
Point 26	312.2978	371
Point 27	560.5437	371
Point 28	548.5399	377
Point 29	330.1036	377
Point 30	325.5389	375.4045
Point 31	337.8201	379.69712
Point 32	364.4177	380
Point 33	381.0855	380.33726
Point 34	395.5929	380.71635
Point 35	416.8543	381.25666
Point 36	438.0487	382
Point 37	479.1653	383
Point 38	511.5499	383
Point 39	512.0826	382.82242
Point 40	513.8708	383
Point 41	531.0491	383
Point 42	533.1096	382.31347
Point 43	533.1107	382.31305
Point 44	536.5271	381.01628
Point 45	537.9265	380.70839
Point 46	547.5083	377.51565
Point 47	346.883	383
Point 48	493.5541	389
Point 49	363.3465	389
Point 50	371.2953	391.89686
Point 51	372.0119	391.98713
Point 52	372.2345	391.99514
Point 53	372.3208	392
Point 54	374.2156	392.05341

Point 55	419.4544	394.02388
Point 56	423.1399	394.1518
Point 57	476.0285	394.84323
Point 58	0	275.56112
Point 59	82.561	276.49127
Point 60	84.7322	276.34451
Point 61	123.7177	276.54438
Point 62	191.6961	277.65321
Point 63	430.1918	279.01879
Point 64	487.7086	279.639
Point 65	509.7138	279.55021
Point 66	721.9937	279.02461
Point 67	839	278.53365
Point 68	839	283.95091
Point 69	694.2381	280.02879
Point 70	505.5772	282.211
Point 71	487.7086	281.69555
Point 72	430.1918	282.66537
Point 73	247.1163	283.77931
Point 74	191.6961	282.79673
Point 75	123.7177	280.19493
Point 76	93.9325	281.10076
Point 77	61.0988	279.7585
Point 78	0	281.01485
Point 79	839	292.1407
Point 80	505.5772	286.98428
Point 81	487.7086	287.07159
Point 82	430.1918	289.73652
Point 83	247.1163	297.70175
Point 84	123.7177	292.05467
Point 85	94.7708	289.80875
Point 86	84.7322	289.65003
Point 87	82.561	289.66397
Point 88	38.9609	289.4325
Point 89	0	289.19587
Point 90	0	300.53803
Point 91	17.729	300.30563
Point 92	61.8788	299.93669
Point 93	191.626	301.3549

Point 94	247.1555	301.9218
Point 95	430.2162	304.83853
Point 96	487.7442	304.85433
Point 97	505.6491	305.27434
Point 98	509.7473	305.37466
Point 99	564.3735	305.25518
Point 100	839	303.47923
Point 101	839	306.47929
Point 102	564.3865	308.25516
Point 103	509.7138	308.37474
Point 104	505.5772	308.27348
Point 105	487.7086	307.85432
Point 106	430.1918	307.83852
Point 107	247.1163	304.92156
Point 108	191.6961	304.35577
Point 109	123.7177	308.23059
Point 110	93.9325	306.13974
Point 111	81.2213	307.4429
Point 112	61.5521	302.93952
Point 113	17.7611	303.30547
Point 114	0	303.53785
Point 115	839	315.0402
Point 116	797.6335	315.91598
Point 117	788.4831	316.10833
Point 118	751.3873	316.84226
Point 119	746.5947	316.94222
Point 120	742.0308	317.02756
Point 121	740.5664	317.15339
Point 122	740.3716	317.22293
Point 123	737.8797	317.29393
Point 124	718.0152	324.01292
Point 125	711.8056	325.93525
Point 126	706.0898	327.46147
Point 127	700.0454	333.50592
Point 128	694.499	330.73293
Point 129	691.9982	333.23326
Point 130	680.0323	333.54954
Point 131	679.8975	333.54516
Point 132	674.9116	331.05465

Point 133	672.911	331.05491
Point 134	672.1929	333.92615
Point 135	648.0416	332
Point 136	642.1238	328.67972
Point 137	637.4622	326.05461
Point 138	633.8287	324
Point 139	632.6094	323.29395
Point 140	630.3447	322
Point 141	556.3265	322
Point 142	544.3989	318.02536
Point 143	351.3575	313.67727
Point 144	171.7713	317.89042
Point 145	158.9451	319.66188
Point 146	146.7629	317.7643
Point 147	0	315.01616
Point 148	126.916	317.39267
Point 149	624.2673	344.64
Point 150	642.7896	345.19608
Point 151	639.8757	348.10995
Point 152	623.7369	347.62543
Point 153	543.8794	321.01441
Point 154	351.3589	316.67806
Point 155	172.0125	320.88559
Point 156	158.9189	322.69398
Point 157	146.5027	320.75996
Point 158	161.8204	329.91734
Point 159	162.0292	329.91734
Point 160	169.8774	325.99323
Point 161	172.2537	323.88076
Point 162	158.8927	325.72607
Point 163	146.2426	323.75561
Point 164	144.6459	323.72571
Point 165	157.0292	329.91734
Point 166	643.2531	345.21
Point 167	651.9258	349.55
Point 168	666.9304	350
Point 169	668.3508	349.29
Point 170	707.4035	333.53244
Point 171	710.6052	333.51008

Point 172	711.3189	333.31046
Point 173	713.7443	332.66283
Point 174	720.1721	330.67297
Point 175	739.1283	324.2612
Point 176	741.6802	324.18848
Point 177	742.0676	324.05019
Point 178	742.3962	324.02195
Point 179	746.7331	323.94086
Point 180	751.5295	323.84082
Point 181	788.6259	323.10687
Point 182	797.7821	322.91441
Point 183	839	322.03859
Point 184	704.3877	335.67695
Point 185	758.6353	353.74048
Point 186	806.6964	369.75012
Point 187	818.5728	368.55874
Point 188	839	375.2318
Point 189	623.3833	349.61571
Point 190	636.5766	350.01181
Point 191	637.9727	350.01292
Point 192	0	260
Point 193	839	260

Lines

	Start Point	End Point	Stress/Strain Boundary	Hydraulic Boundary
Line 1	1	2		
Line 2	2	3		
Line 3	3	4		
Line 4	4	5		
Line 5	5	1		
Line 6	6	7		
Line 7	7	8	Fixed X	
Line 8	8	9		noflowzeropress
Line 9	9	6		
Line 10	10	11		
Line 11	11	1		
Line 12	2	10		
Line 13	11	12		

Line 14	12	13		
Line 15	13	10		
Line 16	14	15		
Line 17	15	16		
Line 18	16	17		
Line 19	17	13		
Line 20	12	18		
Line 21	19	20		
Line 22	20	21		
Line 23	21	15		
Line 24	14	19		
Line 25	20	22		
Line 26	22	23		
Line 27	23	19		
Line 28	22	24		
Line 29	24	25		
Line 30	25	23		
Line 31	26	27		
Line 32	27	25		
Line 33	24	26		
Line 34	28	29		
Line 35	29	30		
Line 36	30	26		
Line 37	27	28		
Line 38	29	31		
Line 39	32	33		
Line 40	33	34		
Line 41	34	35		
Line 42	35	36		
Line 43	36	37		
Line 44	37	38		
Line 45	38	39		
Line 46	39	40		
Line 47	40	41		
Line 48	41	42		
Line 49	42	43		
Line 50	43	44		
Line 51	44	45		
Line 52	45	46		

Line 53	46	28		
Line 54	38	48		
Line 55	48	49		
Line 56	49	47		
Line 57	49	50		
Line 58	50	51		
Line 59	51	52		
Line 60	52	53		
Line 61	53	54		
Line 62	54	55		
Line 63	55	56		
Line 64	56	57		
Line 65	57	48		
Line 66	58	59		
Line 67	59	60		
Line 68	60	61		
Line 69	61	62		
Line 70	62	63		
Line 71	63	64		
Line 72	64	65		
Line 73	65	66		
Line 74	66	67		
Line 75	67	68	Fixed X	Drainage 315
Line 76	68	69		
Line 77	69	70		
Line 78	70	71		
Line 79	71	72		
Line 80	72	73		
Line 81	73	74		
Line 82	74	75		
Line 83	75	76		
Line 84	76	77		
Line 85	77	78		
Line 86	68	79	Fixed X	Drainage 315
Line 87	79	80		
Line 88	80	81		
Line 89	81	82		
Line 90	82	83		
Line 91	83	84		

Line 92	84	85		
Line 93	85	86		
Line 94	86	87		
Line 95	87	88		
Line 96	88	89		
Line 97	90	91		
Line 98	91	92		
Line 99	92	93		
Line 100	93	94		
Line 101	94	95		
Line 102	95	96		
Line 103	96	97		
Line 104	97	98		
Line 105	98	99		
Line 106	99	100		
Line 107	100	79	Fixed X	Drainage 315
Line 108	100	101	Fixed X	Drainage 315
Line 109	101	102		
Line 110	102	103		
Line 111	103	104		
Line 112	104	105		
Line 113	105	106		
Line 114	106	107		
Line 115	107	108		
Line 116	108	109		
Line 117	109	110		
Line 118	110	111		
Line 119	111	112		
Line 120	112	113		
Line 121	113	114		
Line 122	101	115	Fixed X	Drainage 315
Line 123	115	116		no flow
Line 124	116	117		no flow
Line 125	117	118		no flow
Line 126	118	119		no flow
Line 127	119	120		no flow
Line 128	120	121		no flow
Line 129	121	122		
Line 130	122	123		no flow

Line 131	123	124		no flow
Line 132	124	125		no flow
Line 133	125	126		no flow
Line 134	126	127		no flow
Line 135	127	128		noflowzeropress
Line 136	128	129		noflowzeropress
Line 137	129	130		noflowzeropress
Line 138	130	131		
Line 139	131	132		noflowzeropress
Line 140	132	133		noflowzeropress
Line 141	133	134		
Line 142	134	135		
Line 143	135	136		
Line 144	136	137		
Line 145	137	138		
Line 146	138	139		
Line 147	139	140		
Line 148	140	141		
Line 149	141	142		
Line 150	142	143		
Line 151	143	144		
Line 152	144	145		
Line 153	145	146		
Line 154	146	147		
Line 155	147	148		
Line 156	148	9		
Line 157	148	146		
Line 158	141	149		
Line 159	149	150		
Line 160	150	151		
Line 161	151	152		no flow
Line 162	152	153		no flow
Line 163	153	154		no flow
Line 164	154	155		no flow
Line 165	155	156		no flow
Line 166	156	157		no flow
Line 167	157	9		no flow
Line 168	158	159		
Line 169	159	160		

Line 170	160	3		
Line 171	3	161		
Line 172	161	162		
Line 173	162	163		
Line 174	163	164		
Line 175	164	165		
Line 176	165	158		
Line 177	150	166		
Line 178	166	167		
Line 179	167	168		
Line 180	168	169		
Line 181	169	134		
Line 182	127	170		
Line 183	170	171		
Line 184	171	172		
Line 185	172	173		
Line 186	173	174		
Line 187	174	175		
Line 188	175	176		
Line 189	176	177		
Line 190	177	178		
Line 191	178	179		
Line 192	179	180		
Line 193	180	181		
Line 194	181	182		
Line 195	182	183		
Line 196	183	115	Fixed X	
Line 197	184	185		
Line 198	185	186		
Line 199	186	187		
Line 200	187	188		
Line 201	188	183	Fixed X	
Line 202	127	184		
Line 203	6	164		
Line 204	189	190		
Line 205	190	191		
Line 206	191	151		
Line 207	18	189		
Line 208	18	14		

Line 209	47	31		
Line 210	31	32		
Line 211	58	192	Fixed X	Drainage 315
Line 212	192	193	Fixed X/Y	Drainage 315
Line 213	193	67	Fixed X	Drainage 315
Line 214	78	58	Fixed X	Drainage 315
Line 215	89	78	Fixed X	Drainage 315
Line 216	89	90	Fixed X	Drainage 315
Line 217	114	90	Fixed X	Drainage 315
Line 218	147	114	Fixed X	Drainage 315
Line 219	8	147	Fixed X	

Regions

	Material	Points	Area (ft²)
Region 1	Waste Material	1,2,3,4,5	2,684.8
Region 2	NOT ACTIVE	6,7,8,9	409.18
Region 3	Waste Material	10,11,1,2	2,281.4
Region 4	Waste Material	10,11,12,13	2,317.2
Region 5	NOT ACTIVE	14,15,16,17,13,12,18	2,329.2
Region 6	NOT ACTIVE	19,20,21,15,14	2,120.4
Region 7	NOT ACTIVE	19,20,22,23	1,940.1
Region 8	NOT ACTIVE	23,22,24,25	1,759.8
Region 9	NOT ACTIVE	26,27,25,24	1,579.6
Region 10	NOT ACTIVE	28,29,30,26,27	1,399.5
Region 11	NOT ACTIVE	29,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,28	963.75
Region 12	NOT ACTIVE	47,31,32,33,34,35,36,37,38,48,49	1,129
Region 13	NOT ACTIVE	49,50,51,52,53,54,55,56,57,48	563.69
Region 14	Lower Till	58,59,60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78	3,000.7
Region 15	Sand/Silt	78,77,76,75,74,73,72,71,70,69,68,79,80,81,82,83,84,85,86,87,88,89	7,768.6
Region 16	GC-Drained	90,91,92,93,94,95,96,97,98,99,100,79,80,81,82,83,84,85,86,87,88,89	10,108
Region 17	GC OverConsolidated	90,91,92,93,94,95,96,97,98,99,100,101,102,103,104,105,106,107,108,109,110,111,112,113,114	2,873.1
Region 18	Upper Till	114,113,112,111,110,109,108,107,106,105,104,103,102,101,115,116,117,118,119,120,121,122,123,124,125,126,127,128,129,130,131,132,133,134,135,136,137,138,139,140,141,142,143,144,145,146,147	9,788.5
Region 19	Structural Fill	8,147,148,9	390.2
Region 20	CCL	148,146,145,144,143,142,141,149,150,151,152,153,154,155,156,157,9	1,547.9
Region 21	Structural Fill	158,159,160,3,161,162,163,164,165	80.098
Region 22	Waste Material	150,166,167,168,169,134,135,136,137,138,139,140,141,149	1,602.2

Region 23	CCL	127,170,171,172,173,174,175,176,177,178,179,180,181,182,183,115,116,117,118,119,120,121,122,123,124,125,126	957.6
Region 24	Waste Material	184,185,186,187,188,183,182,181,180,179,178,177,176,175,174,173,172,171,170,127	4,345.4
Region 25	Bottom Liner	157,9,6,164,163,162,161,3,4,5,1,11,12,18,189,190,191,151,152,153,154,155,156	1,423.6
Region 26	UPPER SHALE	58,192,193,67,66,65,64,63,62,61,60,59	15,370

Figure 10 - Coupled Consolidation for Section OP-1 for Waste Lift 4

WASTE LIFT4 EL. 347

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File Information

Title: Model City - RMU-2 CP-20 Section OP-1
Comments: Operation Conditions for CP-20 Section 1 Based on Maximum Fill Rate of 50,000 Cu Yds per Quarter
Created By: Peter J. Carey
Last Edited By: Peter J. Carey
Revision Number: 511
File Version: 8.0
Tool Version: 8.0.10.6504
Date: 2/24/2013
Time: 3:48:00 PM
File Name: C20OP-1r1.gsz
Directory: N:\Model_City\154.002_rmu2\154.005_revsions\geoslope\operational\

Project Settings

Length(L) Units: feet
Time(t) Units: Days
Force(F) Units: lbf
Pressure(p) Units: psf
Strength Units: psf
Stiffness Units: psf
Unit Weight of Water: 62.4 pcf
Air Pressure: 101.33 psf
View: 2D

Analysis Settings

WASTE LIFT4 EL. 347

Description: WASTE LIFT4 C-20 OP-1 progression
Kind: SIGMA/W
Parent: WASTE LIFT3 EL. 341
Method: Coupled Stress/PWP
Settings
- Initial Stress: Parent Analysis
- Initial PWP: Parent Analysis
- Exclude cumulative values: No

Control
- Apply Body Force in All Steps: No
- Saturated Zone Only: No

Convergence
- Maximum Number of Iterations: 50
- Minimum Pressure Head Difference: 0.001
- Minimum Displacement Difference: 0.001

Significant Digits: 3
Hydraulic Under-Relaxation Criteria
Under-Relaxation Initial Rate: 1
Under-Relaxation Min. Rate: 0.1
Under-Relaxation Reduction Rate: 0.65
Under-Relaxation Iterations: 10
Equation Solver: Parallel Direct
Time
Starting Time: 361 days
Duration: 76 days
# of Steps: 12
Step Generation Method: Linear
Save Steps Every: 4

Materials

Waste Material

Model: Linear Elastic (Total)
Stress Strain
Young's Modulus (E): 400,000 psf
Unit Weight: 111 pcf
Poisson's Ratio: 0.45

Bottom Liner

Model: Linear Elastic (Total)
Stress Strain
Young's Modulus (E): 400,000 psf
Unit Weight: 120 pcf
Poisson's Ratio: 0.45

CCL

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 1,000,000 psf
Unit Weight: 120 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Clay soils OC
K-Function: GC 5.7 E-4 ft/day
Ky'/Kx' Ratio: 0.1
Rotation: 0 °
Load Response Ratio: 1

Upper Till

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 300,000 psf
Unit Weight: 125 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Till

K-Function: Upper Glacial Till
Ky'/Kx' Ratio: 1
Rotation: 0 °
Load Response Ratio: 1

GC-Drained

Model: Soft Clay (MCC w/ PWP Change)
Stress Strain
O.C. Ratio: 4
Poisson's Ratio: 0.334
Lambda: 0.14
Kappa: 0.013
Initial Void Ratio: 1
Unit Weight: 118 pcf
Phi': 27 °
Hydraulic
Vol. WC. Function: Clay soils
K-Function: GC 5.7 E-4 ft/day
Ky'/Kx' Ratio: 1
Rotation: 0 °
K-Modifier Function: 1D consol derived k function rmu2 clay
Load Response Ratio: 1

GC OverConsolidated

Model: Soft Clay (MCC w/ PWP Change)
Stress Strain
O.C. Ratio: 8
Poisson's Ratio: 0.334
Lambda: 0.06
Kappa: 0.01
Initial Void Ratio: 0.5
Unit Weight: 125 pcf
Phi': 30 °
Hydraulic
Vol. WC. Function: Clay soils OC
K-Function: GC 5.7 E-4 ft/day
Ky'/Kx' Ratio: 1
Rotation: 0 °
K-Modifier Function: 1D consol derived k function rmu2 clay
Load Response Ratio: 1

Sand/Silt

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 300,000 psf
Unit Weight: 135 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: silty sand
K-Function: Silty Sand, k = 0.567 ft/day 2 E-4cm/sec
Ky'/Kx' Ratio: 0.1
Rotation: 0 °

Load Response Ratio: 1

Lower Till

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 600,000 psf
Unit Weight: 145 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Till
K-Function: Till
Ky'/Kx' Ratio: 1
Rotation: 0 °
Load Response Ratio: 1

Structural Fill

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 100,000 psf
Unit Weight: 135 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Till
K-Function: Till
Ky'/Kx' Ratio: 1
Rotation: 0 °
Load Response Ratio: 1

UPPER SHALE

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 1,000,000 psf
Unit Weight: 145 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Till
K-Function: Upper Rock
Ky'/Kx' Ratio: 1
Rotation: 0 °
Load Response Ratio: 1

NOT ACTIVE

Model: (none)

Boundary Conditions

Fixed X

X: X-Displacement 0

Fixed X/Y

X: X-Displacement 0

Y: Y-Displacement 0

Drainage 315

Type: Head (H) 315
Review: No

no flow

Type: Total Flux (Q) 0
Review: No

noflowzeropress

Type: Total Flux (Q) 0
Review: Yes

Initial Water Tables

Initial Water Table 1

Max. negative head: 5
Coordinates
Coordinate 1: (0, 315) ft
Coordinate 2: (850, 315) ft

K Functions

Silty Sand, k = 0.567 ft/day 2 E-4cm/sec

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 36 %
K-Saturation: 0.567
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (0.005, 0.567)
Data Point: (0.01, 0.567)
Data Point: (0.035938, 0.567)
Data Point: (0.12915, 0.567)
Data Point: (0.46416, 0.567)
Data Point: (1.1111, 0.567)
Data Point: (1.6681, 0.567)
Data Point: (5.9948, 0.567)
Data Point: (21.544, 0.567)
Data Point: (77.426, 0.567)
Data Point: (105.93, 0.5402376)
Data Point: (210.74, 0.3387258)
Data Point: (278.26, 0.2567376)
Data Point: (315.56, 0.2232846)
Data Point: (420.37, 0.1406916)
Data Point: (525.19, 0.0779121)
Data Point: (630, 0.03843882)
Data Point: (734.81, 0.01673406)

Data Point: (839.63, 0.005422788)
Data Point: (944.44, 0.000745983)
Data Point: (1,000, 7.14735e-005)
Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Upper Glacial Till

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 36 %
K-Saturation: 0.0057
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (0.005, 0.0057)
Data Point: (0.01, 0.0057)
Data Point: (0.046416, 0.0057)
Data Point: (0.21544, 0.0057)
Data Point: (1, 0.0057)
Data Point: (4.6416, 0.0057)
Data Point: (11.111, 0.0057)
Data Point: (21.544, 0.0057)
Data Point: (100, 0.0057)
Data Point: (464.16, 0.0016245)
Data Point: (1,059.3, 0.0002427972)
Data Point: (2,107.4, 1.492716e-005)
Data Point: (2,154.4, 1.369596e-005)
Data Point: (3,155.6, 4.086672e-006)
Data Point: (4,203.7, 1.82115e-006)
Data Point: (5,251.9, 9.03222e-007)
Data Point: (6,300, 4.30521e-007)
Data Point: (7,348.1, 2.028516e-007)
Data Point: (8,396.3, 7.73661e-008)
Data Point: (9,444.4, 2.691312e-008)
Data Point: (10,000, 2.691312e-008)
Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Upper Rock

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 36 %

K-Saturation: 0.567
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (0.005, 0.567)
Data Point: (0.01, 0.567)
Data Point: (10,000, 0.567)
Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Till

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 36 %
K-Saturation: 0.000567
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (0.005, 0.000567)
Data Point: (0.01, 0.000567)
Data Point: (10,000, 0.000567)
Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

GC 5.7 E-4 ft/day

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 100 %
K-Saturation: 0.00057
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (10, 0.00057)
Data Point: (1,000, 9e-006)
Data Point: (5,000, 5e-006)
Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Hydraulic K Modifier Functions

1D consol derived k function rmu2 clay

Model: Spline Data Point Function (Y Log)
Function: K-Modifier vs. Y-Effective Stress
Curve Fit to Data: 100 %
Segment Curvature: 75 %
Y-Intercept: 1.2
Data Points: Y-Effective Stress (psf), K-Modifier
Data Point: (1,000, 1.2)
Data Point: (2,000, 1)
Data Point: (4,000, 0.839)
Data Point: (8,000, 0.70417211)
Data Point: (12,000, 0.63551782)
Data Point: (16,000, 0.59090577)

Vol. Water Content Functions

Clay soils OC

Model: Vol WC Data Point Function
Function: Vol. Water Content vs. Pore-Water Pressure
Mv: 7e-005 /psf
Saturated Water Content: 0.31427274 ft^3/ft^3
Residual Water Content: 0.031427274 ft^3/ft^3
Curve Fit to Data: 100 %
Segment Curvature: 100 %
Porosity: 0.31427274
Data Points: Matric Suction (psf), Vol. Water Content (ft^3/ft^3)
Data Point: (0.01, 0.29999999)
Data Point: (0.018329807, 0.29999998)
Data Point: (0.033598183, 0.29999996)
Data Point: (0.061584821, 0.29999991)
Data Point: (0.11288379, 0.29999982)
Data Point: (0.20691381, 0.29999962)
Data Point: (0.37926902, 0.29999917)
Data Point: (0.6951928, 0.29999814)
Data Point: (1.274275, 0.29999578)
Data Point: (2.3357215, 0.29999026)
Data Point: (4.2813324, 0.2999772)
Data Point: (7.8475997, 0.29994599)
Data Point: (14.384499, 0.29987093)
Data Point: (26.366509, 0.29968944)
Data Point: (48.329302, 0.29924951)
Data Point: (88.586679, 0.29818464)
Data Point: (162.37767, 0.29563126)
Data Point: (297.63514, 0.28967022)
Data Point: (545.55948, 0.27661743)
Data Point: (1,000, 0.25163343)
Estimation Properties
Vol. WC Estimation Method: Sample functions

Saturated Water Content: 0.3 ft^3/ft^3
Sample Material: Clay
Liquid Limit: 0 %
Diameter at 10% passing: 0
Diameter at 60% passing: 0
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Clay soils

Model: Vol WC Data Point Function
Function: Vol. Water Content vs. Pore-Water Pressure
Mv: 0.0004 /psf
Saturated Water Content: 0.60995302 ft^3/ft^3
Residual Water Content: 0.060995302 ft^3/ft^3
Curve Fit to Data: 100 %
Segment Curvature: 100 %
Porosity: 0.60995302
Data Points: Matric Suction (psf), Vol. Water Content (ft^3/ft^3)
Data Point: (0.01, 0.43999998)
Data Point: (0.018329807, 0.43999997)
Data Point: (0.033598183, 0.43999994)
Data Point: (0.061584821, 0.43999987)
Data Point: (0.11288379, 0.43999974)
Data Point: (0.20691381, 0.43999944)
Data Point: (0.37926902, 0.43999878)
Data Point: (0.6951928, 0.43999728)
Data Point: (1.274275, 0.43999381)
Data Point: (2.3357215, 0.43998571)
Data Point: (4.2813324, 0.43996655)
Data Point: (7.8475997, 0.43992079)
Data Point: (14.384499, 0.4398107)
Data Point: (26.366509, 0.43954452)
Data Point: (48.329302, 0.43889927)
Data Point: (88.586679, 0.43733747)
Data Point: (162.37767, 0.43359251)
Data Point: (297.63514, 0.42484965)
Data Point: (545.55948, 0.40570556)
Data Point: (1,000, 0.36906236)
Estimation Properties
Vol. WC Estimation Method: Sample functions
Saturated Water Content: 0.44 ft^3/ft^3
Sample Material: Clay
Liquid Limit: 0 %
Diameter at 10% passing: 0
Diameter at 60% passing: 0
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Till

Model: Vol WC Data Point Function

Function: Vol. Water Content vs. Pore-Water Pressure
Mv: 5e-006 /psf
Saturated Water Content: 0.20000173 ft^3/ft^3
Residual Water Content: 0.020000173 ft^3/ft^3
Curve Fit to Data: 100 %
Segment Curvature: 100 %
Porosity: 0.20000173
Data Points: Matric Suction (psf), Vol. Water Content (ft^3/ft^3)
Data Point: (0.01, 0.19999999)
Data Point: (0.018329807, 0.19999999)
Data Point: (0.033598183, 0.19999997)
Data Point: (0.061584821, 0.19999993)
Data Point: (0.11288379, 0.19999985)
Data Point: (0.20691381, 0.19999967)
Data Point: (0.37926902, 0.19999922)
Data Point: (0.6951928, 0.19999811)
Data Point: (1.274275, 0.19999535)
Data Point: (2.3357215, 0.19998838)
Data Point: (4.2813324, 0.19997056)
Data Point: (7.8475997, 0.19992471)
Data Point: (14.384499, 0.19980625)
Data Point: (26.366509, 0.19949952)
Data Point: (48.329302, 0.19870702)
Data Point: (88.586679, 0.19668084)
Data Point: (162.37767, 0.19165467)
Data Point: (297.63514, 0.18009116)
Data Point: (545.55948, 0.15752337)
Data Point: (1,000, 0.12453739)
Estimation Properties
Vol. WC Estimation Method: Sample functions
Saturated Water Content: 0.2 ft^3/ft^3
Sample Material: Silty Clay
Liquid Limit: 0 %
Diameter at 10% passing: 0
Diameter at 60% passing: 0
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

silty sand

Model: Vol WC Data Point Function
Function: Vol. Water Content vs. Pore-Water Pressure
Mv: 1e-005 /psf
Saturated Water Content: 0.30000011 ft^3/ft^3
Residual Water Content: 0.030000011 ft^3/ft^3
Curve Fit to Data: 100 %
Segment Curvature: 100 %
Porosity: 0.30000011
Data Points: Matric Suction (psf), Vol. Water Content (ft^3/ft^3)
Data Point: (0.01, 0.29999996)
Data Point: (0.018329807, 0.29999991)
Data Point: (0.033598183, 0.29999977)

Data Point: (0.061584821, 0.29999942)
Data Point: (0.11288379, 0.29999854)
Data Point: (0.20691381, 0.29999626)
Data Point: (0.37926902, 0.29999039)
Data Point: (0.6951928, 0.29997521)
Data Point: (1.274275, 0.29993588)
Data Point: (2.3357215, 0.29983385)
Data Point: (4.2813324, 0.29956912)
Data Point: (7.8475997, 0.29888334)
Data Point: (14.384499, 0.29711648)
Data Point: (26.366509, 0.29263189)
Data Point: (48.329302, 0.28167657)
Data Point: (88.586679, 0.25725429)
Data Point: (162.37767, 0.21239326)
Data Point: (297.63514, 0.15298031)
Data Point: (545.55948, 0.099847233)
Data Point: (1,000, 0.064649441)

Estimation Properties

Vol. WC Estimation Method: Sample functions
Saturated Water Content: 0.3 ft^3/ft^3
Sample Material: Silty Sand
Liquid Limit: 0 %
Diameter at 10% passing: 0
Diameter at 60% passing: 0
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Points

	X (ft)	Y (ft)
Point 1	561.5172	329
Point 2	184.2753	329
Point 3	174.1934	323.83525
Point 4	351.3603	319.67886
Point 5	546.7523	324.07989
Point 6	139.5241	323.62981
Point 7	0	321.01609
Point 8	0	318.01563
Point 9	133.22	320.51124
Point 10	196.3072	335
Point 11	579.5227	335
Point 12	597.5282	341
Point 13	208.339	341
Point 14	608.5585	347
Point 15	240.1424	347

Point 16	234.9596	345.27685
Point 17	219.929	346.77965
Point 18	611.3486	345.60539
Point 19	596.5548	353
Point 20	258.1852	353
Point 21	250.6076	350.4794
Point 22	276.2227	359
Point 23	584.5511	359
Point 24	294.2603	365
Point 25	572.5474	365
Point 26	312.2978	371
Point 27	560.5437	371
Point 28	548.5399	377
Point 29	330.1036	377
Point 30	325.5389	375.4045
Point 31	337.8201	379.69712
Point 32	364.4177	380
Point 33	381.0855	380.33726
Point 34	395.5929	380.71635
Point 35	416.8543	381.25666
Point 36	438.0487	382
Point 37	479.1653	383
Point 38	511.5499	383
Point 39	512.0826	382.82242
Point 40	513.8708	383
Point 41	531.0491	383
Point 42	533.1096	382.31347
Point 43	533.1107	382.31305
Point 44	536.5271	381.01628
Point 45	537.9265	380.70839
Point 46	547.5083	377.51565
Point 47	346.883	383
Point 48	493.5541	389
Point 49	363.3465	389
Point 50	371.2953	391.89686
Point 51	372.0119	391.98713
Point 52	372.2345	391.99514
Point 53	372.3208	392
Point 54	374.2156	392.05341

Point 55	419.4544	394.02388
Point 56	423.1399	394.1518
Point 57	476.0285	394.84323
Point 58	0	275.56112
Point 59	82.561	276.49127
Point 60	84.7322	276.34451
Point 61	123.7177	276.54438
Point 62	191.6961	277.65321
Point 63	430.1918	279.01879
Point 64	487.7086	279.639
Point 65	509.7138	279.55021
Point 66	721.9937	279.02461
Point 67	839	278.53365
Point 68	839	283.95091
Point 69	694.2381	280.02879
Point 70	505.5772	282.211
Point 71	487.7086	281.69555
Point 72	430.1918	282.66537
Point 73	247.1163	283.77931
Point 74	191.6961	282.79673
Point 75	123.7177	280.19493
Point 76	93.9325	281.10076
Point 77	61.0988	279.7585
Point 78	0	281.01485
Point 79	839	292.1407
Point 80	505.5772	286.98428
Point 81	487.7086	287.07159
Point 82	430.1918	289.73652
Point 83	247.1163	297.70175
Point 84	123.7177	292.05467
Point 85	94.7708	289.80875
Point 86	84.7322	289.65003
Point 87	82.561	289.66397
Point 88	38.9609	289.4325
Point 89	0	289.19587
Point 90	0	300.53803
Point 91	17.729	300.30563
Point 92	61.8788	299.93669
Point 93	191.626	301.3549

Point 94	247.1555	301.9218
Point 95	430.2162	304.83853
Point 96	487.7442	304.85433
Point 97	505.6491	305.27434
Point 98	509.7473	305.37466
Point 99	564.3735	305.25518
Point 100	839	303.47923
Point 101	839	306.47929
Point 102	564.3865	308.25516
Point 103	509.7138	308.37474
Point 104	505.5772	308.27348
Point 105	487.7086	307.85432
Point 106	430.1918	307.83852
Point 107	247.1163	304.92156
Point 108	191.6961	304.35577
Point 109	123.7177	308.23059
Point 110	93.9325	306.13974
Point 111	81.2213	307.4429
Point 112	61.5521	302.93952
Point 113	17.7611	303.30547
Point 114	0	303.53785
Point 115	839	315.0402
Point 116	797.6335	315.91598
Point 117	788.4831	316.10833
Point 118	751.3873	316.84226
Point 119	746.5947	316.94222
Point 120	742.0308	317.02756
Point 121	740.5664	317.15339
Point 122	740.3716	317.22293
Point 123	737.8797	317.29393
Point 124	718.0152	324.01292
Point 125	711.8056	325.93525
Point 126	706.0898	327.46147
Point 127	700.0454	333.50592
Point 128	694.499	330.73293
Point 129	691.9982	333.23326
Point 130	680.0323	333.54954
Point 131	679.8975	333.54516
Point 132	674.9116	331.05465

Point 133	672.911	331.05491
Point 134	672.1929	333.92615
Point 135	648.0416	332
Point 136	642.1238	328.67972
Point 137	637.4622	326.05461
Point 138	633.8287	324
Point 139	632.6094	323.29395
Point 140	630.3447	322
Point 141	556.3265	322
Point 142	544.3989	318.02536
Point 143	351.3575	313.67727
Point 144	171.7713	317.89042
Point 145	158.9451	319.66188
Point 146	146.7629	317.7643
Point 147	0	315.01616
Point 148	126.916	317.39267
Point 149	624.2673	344.64
Point 150	642.7896	345.19608
Point 151	639.8757	348.10995
Point 152	623.7369	347.62543
Point 153	543.8794	321.01441
Point 154	351.3589	316.67806
Point 155	172.0125	320.88559
Point 156	158.9189	322.69398
Point 157	146.5027	320.75996
Point 158	161.8204	329.91734
Point 159	162.0292	329.91734
Point 160	169.8774	325.99323
Point 161	172.2537	323.88076
Point 162	158.8927	325.72607
Point 163	146.2426	323.75561
Point 164	144.6459	323.72571
Point 165	157.0292	329.91734
Point 166	643.2531	345.21
Point 167	651.9258	349.55
Point 168	666.9304	350
Point 169	668.3508	349.29
Point 170	707.4035	333.53244
Point 171	710.6052	333.51008

Point 172	711.3189	333.31046
Point 173	713.7443	332.66283
Point 174	720.1721	330.67297
Point 175	739.1283	324.2612
Point 176	741.6802	324.18848
Point 177	742.0676	324.05019
Point 178	742.3962	324.02195
Point 179	746.7331	323.94086
Point 180	751.5295	323.84082
Point 181	788.6259	323.10687
Point 182	797.7821	322.91441
Point 183	839	322.03859
Point 184	704.3877	335.67695
Point 185	758.6353	353.74048
Point 186	806.6964	369.75012
Point 187	818.5728	368.55874
Point 188	839	375.2318
Point 189	623.3833	349.61571
Point 190	636.5766	350.01181
Point 191	637.9727	350.01292
Point 192	0	260
Point 193	839	260

Lines

	Start Point	End Point	Stress/Strain Boundary	Hydraulic Boundary
Line 1	1	2		
Line 2	2	3		
Line 3	3	4		
Line 4	4	5		
Line 5	5	1		
Line 6	6	7		
Line 7	7	8	Fixed X	
Line 8	8	9		noflowzeropress
Line 9	9	6		
Line 10	10	11		
Line 11	11	1		
Line 12	2	10		
Line 13	11	12		

Line 14	12	13		
Line 15	13	10		
Line 16	14	15		
Line 17	15	16		
Line 18	16	17		
Line 19	17	13		
Line 20	12	18		
Line 21	19	20		
Line 22	20	21		
Line 23	21	15		
Line 24	14	19		
Line 25	20	22		
Line 26	22	23		
Line 27	23	19		
Line 28	22	24		
Line 29	24	25		
Line 30	25	23		
Line 31	26	27		
Line 32	27	25		
Line 33	24	26		
Line 34	28	29		
Line 35	29	30		
Line 36	30	26		
Line 37	27	28		
Line 38	29	31		
Line 39	32	33		
Line 40	33	34		
Line 41	34	35		
Line 42	35	36		
Line 43	36	37		
Line 44	37	38		
Line 45	38	39		
Line 46	39	40		
Line 47	40	41		
Line 48	41	42		
Line 49	42	43		
Line 50	43	44		
Line 51	44	45		
Line 52	45	46		

Line 53	46	28		
Line 54	38	48		
Line 55	48	49		
Line 56	49	47		
Line 57	49	50		
Line 58	50	51		
Line 59	51	52		
Line 60	52	53		
Line 61	53	54		
Line 62	54	55		
Line 63	55	56		
Line 64	56	57		
Line 65	57	48		
Line 66	58	59		
Line 67	59	60		
Line 68	60	61		
Line 69	61	62		
Line 70	62	63		
Line 71	63	64		
Line 72	64	65		
Line 73	65	66		
Line 74	66	67		
Line 75	67	68	Fixed X	Drainage 315
Line 76	68	69		
Line 77	69	70		
Line 78	70	71		
Line 79	71	72		
Line 80	72	73		
Line 81	73	74		
Line 82	74	75		
Line 83	75	76		
Line 84	76	77		
Line 85	77	78		
Line 86	68	79	Fixed X	Drainage 315
Line 87	79	80		
Line 88	80	81		
Line 89	81	82		
Line 90	82	83		
Line 91	83	84		

Line 92	84	85		
Line 93	85	86		
Line 94	86	87		
Line 95	87	88		
Line 96	88	89		
Line 97	90	91		
Line 98	91	92		
Line 99	92	93		
Line 100	93	94		
Line 101	94	95		
Line 102	95	96		
Line 103	96	97		
Line 104	97	98		
Line 105	98	99		
Line 106	99	100		
Line 107	100	79	Fixed X	Drainage 315
Line 108	100	101	Fixed X	Drainage 315
Line 109	101	102		
Line 110	102	103		
Line 111	103	104		
Line 112	104	105		
Line 113	105	106		
Line 114	106	107		
Line 115	107	108		
Line 116	108	109		
Line 117	109	110		
Line 118	110	111		
Line 119	111	112		
Line 120	112	113		
Line 121	113	114		
Line 122	101	115	Fixed X	Drainage 315
Line 123	115	116		no flow
Line 124	116	117		no flow
Line 125	117	118		no flow
Line 126	118	119		no flow
Line 127	119	120		no flow
Line 128	120	121		no flow
Line 129	121	122		
Line 130	122	123		no flow

Line 131	123	124		no flow
Line 132	124	125		no flow
Line 133	125	126		no flow
Line 134	126	127		no flow
Line 135	127	128		noflowzeropress
Line 136	128	129		noflowzeropress
Line 137	129	130		noflowzeropress
Line 138	130	131		
Line 139	131	132		noflowzeropress
Line 140	132	133		noflowzeropress
Line 141	133	134		
Line 142	134	135		
Line 143	135	136		
Line 144	136	137		
Line 145	137	138		
Line 146	138	139		
Line 147	139	140		
Line 148	140	141		
Line 149	141	142		
Line 150	142	143		
Line 151	143	144		
Line 152	144	145		
Line 153	145	146		
Line 154	146	147		
Line 155	147	148		
Line 156	148	9		
Line 157	148	146		
Line 158	141	149		
Line 159	149	150		
Line 160	150	151		
Line 161	151	152		no flow
Line 162	152	153		no flow
Line 163	153	154		no flow
Line 164	154	155		no flow
Line 165	155	156		no flow
Line 166	156	157		no flow
Line 167	157	9		no flow
Line 168	158	159		
Line 169	159	160		

Line 170	160	3		
Line 171	3	161		
Line 172	161	162		
Line 173	162	163		
Line 174	163	164		
Line 175	164	165		
Line 176	165	158		
Line 177	150	166		
Line 178	166	167		
Line 179	167	168		
Line 180	168	169		
Line 181	169	134		
Line 182	127	170		
Line 183	170	171		
Line 184	171	172		
Line 185	172	173		
Line 186	173	174		
Line 187	174	175		
Line 188	175	176		
Line 189	176	177		
Line 190	177	178		
Line 191	178	179		
Line 192	179	180		
Line 193	180	181		
Line 194	181	182		
Line 195	182	183		
Line 196	183	115	Fixed X	
Line 197	184	185		
Line 198	185	186		
Line 199	186	187		
Line 200	187	188		
Line 201	188	183	Fixed X	
Line 202	127	184		
Line 203	6	164		
Line 204	189	190		
Line 205	190	191		
Line 206	191	151		
Line 207	18	189		
Line 208	18	14		

Line 209	47	31		
Line 210	31	32		
Line 211	58	192	Fixed X	Drainage 315
Line 212	192	193	Fixed X/Y	Drainage 315
Line 213	193	67	Fixed X	Drainage 315
Line 214	78	58	Fixed X	Drainage 315
Line 215	89	78	Fixed X	Drainage 315
Line 216	89	90	Fixed X	Drainage 315
Line 217	114	90	Fixed X	Drainage 315
Line 218	147	114	Fixed X	Drainage 315
Line 219	8	147	Fixed X	

Regions

	Material	Points	Area (ft²)
Region 1	Waste Material	1,2,3,4,5	2,684.8
Region 2	NOT ACTIVE	6,7,8,9	409.18
Region 3	Waste Material	10,11,1,2	2,281.4
Region 4	Waste Material	10,11,12,13	2,317.2
Region 5	Waste Material	14,15,16,17,13,12,18	2,329.2
Region 6	NOT ACTIVE	19,20,21,15,14	2,120.4
Region 7	NOT ACTIVE	19,20,22,23	1,940.1
Region 8	NOT ACTIVE	23,22,24,25	1,759.8
Region 9	NOT ACTIVE	26,27,25,24	1,579.6
Region 10	NOT ACTIVE	28,29,30,26,27	1,399.5
Region 11	NOT ACTIVE	29,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,28	963.75
Region 12	NOT ACTIVE	47,31,32,33,34,35,36,37,38,48,49	1,129
Region 13	NOT ACTIVE	49,50,51,52,53,54,55,56,57,48	563.69
Region 14	Lower Till	58,59,60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78	3,000.7
Region 15	Sand/Silt	78,77,76,75,74,73,72,71,70,69,68,79,80,81,82,83,84,85,86,87,88,89	7,768.6
Region 16	GC-Drained	90,91,92,93,94,95,96,97,98,99,100,79,80,81,82,83,84,85,86,87,88,89	10,108
Region 17	GC OverConsolidated	90,91,92,93,94,95,96,97,98,99,100,101,102,103,104,105,106,107,108,109,110,111,112,113,114	2,873.1
Region 18	Upper Till	114,113,112,111,110,109,108,107,106,105,104,103,102,101,115,116,117,118,119,120,121,122,123,124,125,126,127,128,129,130,131,132,133,134,135,136,137,138,139,140,141,142,143,144,145,146,147	9,788.5
Region 19	Structural Fill	8,147,148,9	390.2
Region 20	CCL	148,146,145,144,143,142,141,149,150,151,152,153,154,155,156,157,9	1,547.9
Region 21	Structural Fill	158,159,160,3,161,162,163,164,165	80.098
Region 22	Waste Material	150,166,167,168,169,134,135,136,137,138,139,140,141,149	1,602.2

Region 23	CCL	127,170,171,172,173,174,175,176,177,178,179,180,181,182,183,115,116,117,118,119,120,121,122,123,124,125,126	957.6
Region 24	Waste Material	184,185,186,187,188,183,182,181,180,179,178,177,176,175,174,173,172,171,170,127	4,345.4
Region 25	Bottom Liner	157,9,6,164,163,162,161,3,4,5,1,11,12,18,189,190,191,151,152,153,154,155,156	1,423.6
Region 26	UPPER SHALE	58,192,193,67,66,65,64,63,62,61,60,59	15,370

Figure 11 - Coupled Consolidation for Section OP-1 for Waste Lift 5

WASTE LIFT5 EL. 353

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File Information

Title: Model City - RMU-2 CP-20 Section OP-1
Comments: Operation Conditions for CP-20 Section 1 Based on Maximum Fill Rate of 50,000 Cu Yds per Quarter
Created By: Peter J. Carey
Last Edited By: Peter J. Carey
Revision Number: 511
File Version: 8.0
Tool Version: 8.0.10.6504
Date: 2/24/2013
Time: 3:48:00 PM
File Name: C20OP-1r1.gsz
Directory: N:\Model_City\154.002_rmu2\154.005_revsions\geoslope\operational\

Project Settings

Length(L) Units: feet
Time(t) Units: Days
Force(F) Units: lbf
Pressure(p) Units: psf
Strength Units: psf
Stiffness Units: psf
Unit Weight of Water: 62.4 pcf
Air Pressure: 101.33 psf
View: 2D

Analysis Settings

WASTE LIFT5 EL. 353

Description: WASTE LIFT5 C-20 OP-1 progression
Kind: SIGMA/W
Parent: WASTE LIFT4 EL. 347
Method: Coupled Stress/PWP
Settings
- Initial Stress: Parent Analysis
- Initial PWP: Parent Analysis
- Exclude cumulative values: No

Control
- Apply Body Force in All Steps: No
- Saturated Zone Only: No

Convergence
- Maximum Number of Iterations: 50
- Minimum Pressure Head Difference: 0.001
- Minimum Displacement Difference: 0.001

Significant Digits: 3
Hydraulic Under-Relaxation Criteria
Under-Relaxation Initial Rate: 1
Under-Relaxation Min. Rate: 0.1
Under-Relaxation Reduction Rate: 0.65
Under-Relaxation Iterations: 10
Equation Solver: Parallel Direct
Time
Starting Time: 437 days
Duration: 66 days
# of Steps: 12
Step Generation Method: Linear
Save Steps Every: 4

Materials

Waste Material

Model: Linear Elastic (Total)
Stress Strain
Young's Modulus (E): 400,000 psf
Unit Weight: 111 pcf
Poisson's Ratio: 0.45

Bottom Liner

Model: Linear Elastic (Total)
Stress Strain
Young's Modulus (E): 400,000 psf
Unit Weight: 120 pcf
Poisson's Ratio: 0.45

CCL

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 1,000,000 psf
Unit Weight: 120 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Clay soils OC
K-Function: GC 5.7 E-4 ft/day
Ky'/Kx' Ratio: 0.1
Rotation: 0 °
Load Response Ratio: 1

Upper Till

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 300,000 psf
Unit Weight: 125 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Till

K-Function: Upper Glacial Till
Ky'/Kx' Ratio: 1
Rotation: 0 °
Load Response Ratio: 1

GC-Drained

Model: Soft Clay (MCC w/ PWP Change)
Stress Strain
O.C. Ratio: 4
Poisson's Ratio: 0.334
Lambda: 0.14
Kappa: 0.013
Initial Void Ratio: 1
Unit Weight: 118 pcf
Phi': 27 °
Hydraulic
Vol. WC. Function: Clay soils
K-Function: GC 5.7 E-4 ft/day
Ky'/Kx' Ratio: 1
Rotation: 0 °
K-Modifier Function: 1D consol derived k function rmu2 clay
Load Response Ratio: 1

GC OverConsolidated

Model: Soft Clay (MCC w/ PWP Change)
Stress Strain
O.C. Ratio: 8
Poisson's Ratio: 0.334
Lambda: 0.06
Kappa: 0.01
Initial Void Ratio: 0.5
Unit Weight: 125 pcf
Phi': 30 °
Hydraulic
Vol. WC. Function: Clay soils OC
K-Function: GC 5.7 E-4 ft/day
Ky'/Kx' Ratio: 1
Rotation: 0 °
K-Modifier Function: 1D consol derived k function rmu2 clay
Load Response Ratio: 1

Sand/Silt

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 300,000 psf
Unit Weight: 135 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: silty sand
K-Function: Silty Sand, k = 0.567 ft/day 2 E-4cm/sec
Ky'/Kx' Ratio: 0.1
Rotation: 0 °

Load Response Ratio: 1

Lower Till

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 600,000 psf
Unit Weight: 145 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Till
K-Function: Till
Ky'/Kx' Ratio: 1
Rotation: 0 °
Load Response Ratio: 1

Structural Fill

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 100,000 psf
Unit Weight: 135 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Till
K-Function: Till
Ky'/Kx' Ratio: 1
Rotation: 0 °
Load Response Ratio: 1

UPPER SHALE

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 1,000,000 psf
Unit Weight: 145 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Till
K-Function: Upper Rock
Ky'/Kx' Ratio: 1
Rotation: 0 °
Load Response Ratio: 1

NOT ACTIVE

Model: (none)

Boundary Conditions

Fixed X

X: X-Displacement 0

Fixed X/Y

X: X-Displacement 0

Y: Y-Displacement 0

Drainage 315

Type: Head (H) 315
Review: No

no flow

Type: Total Flux (Q) 0
Review: No

noflowzeropress

Type: Total Flux (Q) 0
Review: Yes

Initial Water Tables

Initial Water Table 1

Max. negative head: 5
Coordinates
Coordinate 1: (0, 315) ft
Coordinate 2: (850, 315) ft

K Functions

Silty Sand, k = 0.567 ft/day 2 E-4cm/sec

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 36 %
K-Saturation: 0.567
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (0.005, 0.567)
Data Point: (0.01, 0.567)
Data Point: (0.035938, 0.567)
Data Point: (0.12915, 0.567)
Data Point: (0.46416, 0.567)
Data Point: (1.1111, 0.567)
Data Point: (1.6681, 0.567)
Data Point: (5.9948, 0.567)
Data Point: (21.544, 0.567)
Data Point: (77.426, 0.567)
Data Point: (105.93, 0.5402376)
Data Point: (210.74, 0.3387258)
Data Point: (278.26, 0.2567376)
Data Point: (315.56, 0.2232846)
Data Point: (420.37, 0.1406916)
Data Point: (525.19, 0.0779121)
Data Point: (630, 0.03843882)
Data Point: (734.81, 0.01673406)

Data Point: (839.63, 0.005422788)
Data Point: (944.44, 0.000745983)
Data Point: (1,000, 7.14735e-005)

Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Upper Glacial Till

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 36 %
K-Saturation: 0.0057
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (0.005, 0.0057)
Data Point: (0.01, 0.0057)
Data Point: (0.046416, 0.0057)
Data Point: (0.21544, 0.0057)
Data Point: (1, 0.0057)
Data Point: (4.6416, 0.0057)
Data Point: (11.111, 0.0057)
Data Point: (21.544, 0.0057)
Data Point: (100, 0.0057)
Data Point: (464.16, 0.0016245)
Data Point: (1,059.3, 0.0002427972)
Data Point: (2,107.4, 1.492716e-005)
Data Point: (2,154.4, 1.369596e-005)
Data Point: (3,155.6, 4.086672e-006)
Data Point: (4,203.7, 1.82115e-006)
Data Point: (5,251.9, 9.03222e-007)
Data Point: (6,300, 4.30521e-007)
Data Point: (7,348.1, 2.028516e-007)
Data Point: (8,396.3, 7.73661e-008)
Data Point: (9,444.4, 2.691312e-008)
Data Point: (10,000, 2.691312e-008)

Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Upper Rock

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 36 %

K-Saturation: 0.567
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (0.005, 0.567)
Data Point: (0.01, 0.567)
Data Point: (10,000, 0.567)
Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Till

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 36 %
K-Saturation: 0.000567
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (0.005, 0.000567)
Data Point: (0.01, 0.000567)
Data Point: (10,000, 0.000567)
Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

GC 5.7 E-4 ft/day

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 100 %
K-Saturation: 0.00057
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (10, 0.00057)
Data Point: (1,000, 9e-006)
Data Point: (5,000, 5e-006)
Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Hydraulic K Modifier Functions

1D consol derived k function rmu2 clay

Model: Spline Data Point Function (Y Log)
Function: K-Modifier vs. Y-Effective Stress
Curve Fit to Data: 100 %
Segment Curvature: 75 %
Y-Intercept: 1.2
Data Points: Y-Effective Stress (psf), K-Modifier
Data Point: (1,000, 1.2)
Data Point: (2,000, 1)
Data Point: (4,000, 0.839)
Data Point: (8,000, 0.70417211)
Data Point: (12,000, 0.63551782)
Data Point: (16,000, 0.59090577)

Vol. Water Content Functions

Clay soils OC

Model: Vol WC Data Point Function
Function: Vol. Water Content vs. Pore-Water Pressure
Mv: 7e-005 /psf
Saturated Water Content: 0.31427274 ft^3/ft^3
Residual Water Content: 0.031427274 ft^3/ft^3
Curve Fit to Data: 100 %
Segment Curvature: 100 %
Porosity: 0.31427274
Data Points: Matric Suction (psf), Vol. Water Content (ft^3/ft^3)
Data Point: (0.01, 0.29999999)
Data Point: (0.018329807, 0.29999998)
Data Point: (0.033598183, 0.29999996)
Data Point: (0.061584821, 0.29999991)
Data Point: (0.11288379, 0.29999982)
Data Point: (0.20691381, 0.29999962)
Data Point: (0.37926902, 0.29999917)
Data Point: (0.6951928, 0.29999814)
Data Point: (1.274275, 0.29999578)
Data Point: (2.3357215, 0.29999026)
Data Point: (4.2813324, 0.2999772)
Data Point: (7.8475997, 0.29994599)
Data Point: (14.384499, 0.29987093)
Data Point: (26.366509, 0.29968944)
Data Point: (48.329302, 0.29924951)
Data Point: (88.586679, 0.29818464)
Data Point: (162.37767, 0.29563126)
Data Point: (297.63514, 0.28967022)
Data Point: (545.55948, 0.27661743)
Data Point: (1,000, 0.25163343)
Estimation Properties
Vol. WC Estimation Method: Sample functions

Saturated Water Content: 0.3 ft^3/ft^3
Sample Material: Clay
Liquid Limit: 0 %
Diameter at 10% passing: 0
Diameter at 60% passing: 0
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Clay soils

Model: Vol WC Data Point Function
Function: Vol. Water Content vs. Pore-Water Pressure
Mv: 0.0004 /psf
Saturated Water Content: 0.60995302 ft^3/ft^3
Residual Water Content: 0.060995302 ft^3/ft^3
Curve Fit to Data: 100 %
Segment Curvature: 100 %
Porosity: 0.60995302
Data Points: Matric Suction (psf), Vol. Water Content (ft^3/ft^3)
Data Point: (0.01, 0.43999998)
Data Point: (0.018329807, 0.43999997)
Data Point: (0.033598183, 0.43999994)
Data Point: (0.061584821, 0.43999987)
Data Point: (0.11288379, 0.43999974)
Data Point: (0.20691381, 0.43999944)
Data Point: (0.37926902, 0.43999878)
Data Point: (0.6951928, 0.43999728)
Data Point: (1.274275, 0.43999381)
Data Point: (2.3357215, 0.43998571)
Data Point: (4.2813324, 0.43996655)
Data Point: (7.8475997, 0.43992079)
Data Point: (14.384499, 0.4398107)
Data Point: (26.366509, 0.43954452)
Data Point: (48.329302, 0.43889927)
Data Point: (88.586679, 0.43733747)
Data Point: (162.37767, 0.43359251)
Data Point: (297.63514, 0.42484965)
Data Point: (545.55948, 0.40570556)
Data Point: (1,000, 0.36906236)
Estimation Properties
Vol. WC Estimation Method: Sample functions
Saturated Water Content: 0.44 ft^3/ft^3
Sample Material: Clay
Liquid Limit: 0 %
Diameter at 10% passing: 0
Diameter at 60% passing: 0
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Till

Model: Vol WC Data Point Function

Function: Vol. Water Content vs. Pore-Water Pressure
- Mv: 5e-006 /psf
- Saturated Water Content: 0.20000173 ft^3/ft^3
- Residual Water Content: 0.020000173 ft^3/ft^3
- Curve Fit to Data: 100 %
- Segment Curvature: 100 %

Porosity: 0.20000173

Data Points: Matric Suction (psf), Vol. Water Content (ft^3/ft^3)
- Data Point: (0.01, 0.19999999)
- Data Point: (0.018329807, 0.19999999)
- Data Point: (0.033598183, 0.19999997)
- Data Point: (0.061584821, 0.19999993)
- Data Point: (0.11288379, 0.19999985)
- Data Point: (0.20691381, 0.19999967)
- Data Point: (0.37926902, 0.19999922)
- Data Point: (0.6951928, 0.19999811)
- Data Point: (1.274275, 0.19999535)
- Data Point: (2.3357215, 0.19998838)
- Data Point: (4.2813324, 0.19997056)
- Data Point: (7.8475997, 0.19992471)
- Data Point: (14.384499, 0.19980625)
- Data Point: (26.366509, 0.19949952)
- Data Point: (48.329302, 0.19870702)
- Data Point: (88.586679, 0.19668084)
- Data Point: (162.37767, 0.19165467)
- Data Point: (297.63514, 0.18009116)
- Data Point: (545.55948, 0.15752337)
- Data Point: (1,000, 0.12453739)

Estimation Properties
- Vol. WC Estimation Method: Sample functions
- Saturated Water Content: 0.2 ft^3/ft^3
- Sample Material: Silty Clay
- Liquid Limit: 0 %
- Diameter at 10% passing: 0
- Diameter at 60% passing: 0
- Maximum: 1,000
- Minimum: 0.01
- Num. Points: 20

silty sand

Model: Vol WC Data Point Function

Function: Vol. Water Content vs. Pore-Water Pressure
- Mv: 1e-005 /psf
- Saturated Water Content: 0.30000011 ft^3/ft^3
- Residual Water Content: 0.030000011 ft^3/ft^3
- Curve Fit to Data: 100 %
- Segment Curvature: 100 %

Porosity: 0.30000011

Data Points: Matric Suction (psf), Vol. Water Content (ft^3/ft^3)
- Data Point: (0.01, 0.29999996)
- Data Point: (0.018329807, 0.29999991)
- Data Point: (0.033598183, 0.29999977)

Data Point: (0.061584821, 0.29999942)
Data Point: (0.11288379, 0.29999854)
Data Point: (0.20691381, 0.29999626)
Data Point: (0.37926902, 0.29999039)
Data Point: (0.6951928, 0.29997521)
Data Point: (1.274275, 0.29993588)
Data Point: (2.3357215, 0.29983385)
Data Point: (4.2813324, 0.29956912)
Data Point: (7.8475997, 0.29888334)
Data Point: (14.384499, 0.29711648)
Data Point: (26.366509, 0.29263189)
Data Point: (48.329302, 0.28167657)
Data Point: (88.586679, 0.25725429)
Data Point: (162.37767, 0.21239326)
Data Point: (297.63514, 0.15298031)
Data Point: (545.55948, 0.099847233)
Data Point: (1,000, 0.064649441)

Estimation Properties

Vol. WC Estimation Method: Sample functions
Saturated Water Content: 0.3 ft^3/ft^3
Sample Material: Silty Sand
Liquid Limit: 0 %
Diameter at 10% passing: 0
Diameter at 60% passing: 0
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Points

	X (ft)	Y (ft)
Point 1	561.5172	329
Point 2	184.2753	329
Point 3	174.1934	323.83525
Point 4	351.3603	319.67886
Point 5	546.7523	324.07989
Point 6	139.5241	323.62981
Point 7	0	321.01609
Point 8	0	318.01563
Point 9	133.22	320.51124
Point 10	196.3072	335
Point 11	579.5227	335
Point 12	597.5282	341
Point 13	208.339	341
Point 14	608.5585	347
Point 15	240.1424	347

Point 16	234.9596	345.27685
Point 17	219.929	346.77965
Point 18	611.3486	345.60539
Point 19	596.5548	353
Point 20	258.1852	353
Point 21	250.6076	350.4794
Point 22	276.2227	359
Point 23	584.5511	359
Point 24	294.2603	365
Point 25	572.5474	365
Point 26	312.2978	371
Point 27	560.5437	371
Point 28	548.5399	377
Point 29	330.1036	377
Point 30	325.5389	375.4045
Point 31	337.8201	379.69712
Point 32	364.4177	380
Point 33	381.0855	380.33726
Point 34	395.5929	380.71635
Point 35	416.8543	381.25666
Point 36	438.0487	382
Point 37	479.1653	383
Point 38	511.5499	383
Point 39	512.0826	382.82242
Point 40	513.8708	383
Point 41	531.0491	383
Point 42	533.1096	382.31347
Point 43	533.1107	382.31305
Point 44	536.5271	381.01628
Point 45	537.9265	380.70839
Point 46	547.5083	377.51565
Point 47	346.883	383
Point 48	493.5541	389
Point 49	363.3465	389
Point 50	371.2953	391.89686
Point 51	372.0119	391.98713
Point 52	372.2345	391.99514
Point 53	372.3208	392
Point 54	374.2156	392.05341

Point 55	419.4544	394.02388
Point 56	423.1399	394.1518
Point 57	476.0285	394.84323
Point 58	0	275.56112
Point 59	82.561	276.49127
Point 60	84.7322	276.34451
Point 61	123.7177	276.54438
Point 62	191.6961	277.65321
Point 63	430.1918	279.01879
Point 64	487.7086	279.639
Point 65	509.7138	279.55021
Point 66	721.9937	279.02461
Point 67	839	278.53365
Point 68	839	283.95091
Point 69	694.2381	280.02879
Point 70	505.5772	282.211
Point 71	487.7086	281.69555
Point 72	430.1918	282.66537
Point 73	247.1163	283.77931
Point 74	191.6961	282.79673
Point 75	123.7177	280.19493
Point 76	93.9325	281.10076
Point 77	61.0988	279.7585
Point 78	0	281.01485
Point 79	839	292.1407
Point 80	505.5772	286.98428
Point 81	487.7086	287.07159
Point 82	430.1918	289.73652
Point 83	247.1163	297.70175
Point 84	123.7177	292.05467
Point 85	94.7708	289.80875
Point 86	84.7322	289.65003
Point 87	82.561	289.66397
Point 88	38.9609	289.4325
Point 89	0	289.19587
Point 90	0	300.53803
Point 91	17.729	300.30563
Point 92	61.8788	299.93669
Point 93	191.626	301.3549

Point 94	247.1555	301.9218
Point 95	430.2162	304.83853
Point 96	487.7442	304.85433
Point 97	505.6491	305.27434
Point 98	509.7473	305.37466
Point 99	564.3735	305.25518
Point 100	839	303.47923
Point 101	839	306.47929
Point 102	564.3865	308.25516
Point 103	509.7138	308.37474
Point 104	505.5772	308.27348
Point 105	487.7086	307.85432
Point 106	430.1918	307.83852
Point 107	247.1163	304.92156
Point 108	191.6961	304.35577
Point 109	123.7177	308.23059
Point 110	93.9325	306.13974
Point 111	81.2213	307.4429
Point 112	61.5521	302.93952
Point 113	17.7611	303.30547
Point 114	0	303.53785
Point 115	839	315.0402
Point 116	797.6335	315.91598
Point 117	788.4831	316.10833
Point 118	751.3873	316.84226
Point 119	746.5947	316.94222
Point 120	742.0308	317.02756
Point 121	740.5664	317.15339
Point 122	740.3716	317.22293
Point 123	737.8797	317.29393
Point 124	718.0152	324.01292
Point 125	711.8056	325.93525
Point 126	706.0898	327.46147
Point 127	700.0454	333.50592
Point 128	694.499	330.73293
Point 129	691.9982	333.23326
Point 130	680.0323	333.54954
Point 131	679.8975	333.54516
Point 132	674.9116	331.05465

Point 133	672.911	331.05491
Point 134	672.1929	333.92615
Point 135	648.0416	332
Point 136	642.1238	328.67972
Point 137	637.4622	326.05461
Point 138	633.8287	324
Point 139	632.6094	323.29395
Point 140	630.3447	322
Point 141	556.3265	322
Point 142	544.3989	318.02536
Point 143	351.3575	313.67727
Point 144	171.7713	317.89042
Point 145	158.9451	319.66188
Point 146	146.7629	317.7643
Point 147	0	315.01616
Point 148	126.916	317.39267
Point 149	624.2673	344.64
Point 150	642.7896	345.19608
Point 151	639.8757	348.10995
Point 152	623.7369	347.62543
Point 153	543.8794	321.01441
Point 154	351.3589	316.67806
Point 155	172.0125	320.88559
Point 156	158.9189	322.69398
Point 157	146.5027	320.75996
Point 158	161.8204	329.91734
Point 159	162.0292	329.91734
Point 160	169.8774	325.99323
Point 161	172.2537	323.88076
Point 162	158.8927	325.72607
Point 163	146.2426	323.75561
Point 164	144.6459	323.72571
Point 165	157.0292	329.91734
Point 166	643.2531	345.21
Point 167	651.9258	349.55
Point 168	666.9304	350
Point 169	668.3508	349.29
Point 170	707.4035	333.53244
Point 171	710.6052	333.51008

Point 172	711.3189	333.31046
Point 173	713.7443	332.66283
Point 174	720.1721	330.67297
Point 175	739.1283	324.2612
Point 176	741.6802	324.18848
Point 177	742.0676	324.05019
Point 178	742.3962	324.02195
Point 179	746.7331	323.94086
Point 180	751.5295	323.84082
Point 181	788.6259	323.10687
Point 182	797.7821	322.91441
Point 183	839	322.03859
Point 184	704.3877	335.67695
Point 185	758.6353	353.74048
Point 186	806.6964	369.75012
Point 187	818.5728	368.55874
Point 188	839	375.2318
Point 189	623.3833	349.61571
Point 190	636.5766	350.01181
Point 191	637.9727	350.01292
Point 192	0	260
Point 193	839	260

Lines

	Start Point	End Point	Stress/Strain Boundary	Hydraulic Boundary
Line 1	1	2		
Line 2	2	3		
Line 3	3	4		
Line 4	4	5		
Line 5	5	1		
Line 6	6	7		
Line 7	7	8	Fixed X	
Line 8	8	9		noflowzeropress
Line 9	9	6		
Line 10	10	11		
Line 11	11	1		
Line 12	2	10		
Line 13	11	12		

Line 14	12	13		
Line 15	13	10		
Line 16	14	15		
Line 17	15	16		
Line 18	16	17		
Line 19	17	13		
Line 20	12	18		
Line 21	19	20		
Line 22	20	21		
Line 23	21	15		
Line 24	14	19		
Line 25	20	22		
Line 26	22	23		
Line 27	23	19		
Line 28	22	24		
Line 29	24	25		
Line 30	25	23		
Line 31	26	27		
Line 32	27	25		
Line 33	24	26		
Line 34	28	29		
Line 35	29	30		
Line 36	30	26		
Line 37	27	28		
Line 38	29	31		
Line 39	32	33		
Line 40	33	34		
Line 41	34	35		
Line 42	35	36		
Line 43	36	37		
Line 44	37	38		
Line 45	38	39		
Line 46	39	40		
Line 47	40	41		
Line 48	41	42		
Line 49	42	43		
Line 50	43	44		
Line 51	44	45		
Line 52	45	46		

Line 53	46	28		
Line 54	38	48		
Line 55	48	49		
Line 56	49	47		
Line 57	49	50		
Line 58	50	51		
Line 59	51	52		
Line 60	52	53		
Line 61	53	54		
Line 62	54	55		
Line 63	55	56		
Line 64	56	57		
Line 65	57	48		
Line 66	58	59		
Line 67	59	60		
Line 68	60	61		
Line 69	61	62		
Line 70	62	63		
Line 71	63	64		
Line 72	64	65		
Line 73	65	66		
Line 74	66	67		
Line 75	67	68	Fixed X	Drainage 315
Line 76	68	69		
Line 77	69	70		
Line 78	70	71		
Line 79	71	72		
Line 80	72	73		
Line 81	73	74		
Line 82	74	75		
Line 83	75	76		
Line 84	76	77		
Line 85	77	78		
Line 86	68	79	Fixed X	Drainage 315
Line 87	79	80		
Line 88	80	81		
Line 89	81	82		
Line 90	82	83		
Line 91	83	84		

Line 92	84	85		
Line 93	85	86		
Line 94	86	87		
Line 95	87	88		
Line 96	88	89		
Line 97	90	91		
Line 98	91	92		
Line 99	92	93		
Line 100	93	94		
Line 101	94	95		
Line 102	95	96		
Line 103	96	97		
Line 104	97	98		
Line 105	98	99		
Line 106	99	100		
Line 107	100	79	Fixed X	Drainage 315
Line 108	100	101	Fixed X	Drainage 315
Line 109	101	102		
Line 110	102	103		
Line 111	103	104		
Line 112	104	105		
Line 113	105	106		
Line 114	106	107		
Line 115	107	108		
Line 116	108	109		
Line 117	109	110		
Line 118	110	111		
Line 119	111	112		
Line 120	112	113		
Line 121	113	114		
Line 122	101	115	Fixed X	Drainage 315
Line 123	115	116		no flow
Line 124	116	117		no flow
Line 125	117	118		no flow
Line 126	118	119		no flow
Line 127	119	120		no flow
Line 128	120	121		no flow
Line 129	121	122		
Line 130	122	123		no flow

Line 131	123	124		no flow
Line 132	124	125		no flow
Line 133	125	126		no flow
Line 134	126	127		no flow
Line 135	127	128		noflowzeropress
Line 136	128	129		noflowzeropress
Line 137	129	130		noflowzeropress
Line 138	130	131		
Line 139	131	132		noflowzeropress
Line 140	132	133		noflowzeropress
Line 141	133	134		
Line 142	134	135		
Line 143	135	136		
Line 144	136	137		
Line 145	137	138		
Line 146	138	139		
Line 147	139	140		
Line 148	140	141		
Line 149	141	142		
Line 150	142	143		
Line 151	143	144		
Line 152	144	145		
Line 153	145	146		
Line 154	146	147		
Line 155	147	148		
Line 156	148	9		
Line 157	148	146		
Line 158	141	149		
Line 159	149	150		
Line 160	150	151		
Line 161	151	152		no flow
Line 162	152	153		no flow
Line 163	153	154		no flow
Line 164	154	155		no flow
Line 165	155	156		no flow
Line 166	156	157		no flow
Line 167	157	9		no flow
Line 168	158	159		
Line 169	159	160		

Line 170	160	3		
Line 171	3	161		
Line 172	161	162		
Line 173	162	163		
Line 174	163	164		
Line 175	164	165		
Line 176	165	158		
Line 177	150	166		
Line 178	166	167		
Line 179	167	168		
Line 180	168	169		
Line 181	169	134		
Line 182	127	170		
Line 183	170	171		
Line 184	171	172		
Line 185	172	173		
Line 186	173	174		
Line 187	174	175		
Line 188	175	176		
Line 189	176	177		
Line 190	177	178		
Line 191	178	179		
Line 192	179	180		
Line 193	180	181		
Line 194	181	182		
Line 195	182	183		
Line 196	183	115	Fixed X	
Line 197	184	185		
Line 198	185	186		
Line 199	186	187		
Line 200	187	188		
Line 201	188	183	Fixed X	
Line 202	127	184		
Line 203	6	164		
Line 204	189	190		
Line 205	190	191		
Line 206	191	151		
Line 207	18	189		
Line 208	18	14		

Line 209	47	31		
Line 210	31	32		
Line 211	58	192	Fixed X	Drainage 315
Line 212	192	193	Fixed X/Y	Drainage 315
Line 213	193	67	Fixed X	Drainage 315
Line 214	78	58	Fixed X	Drainage 315
Line 215	89	78	Fixed X	Drainage 315
Line 216	89	90	Fixed X	Drainage 315
Line 217	114	90	Fixed X	Drainage 315
Line 218	147	114	Fixed X	Drainage 315
Line 219	8	147	Fixed X	

Regions

	Material	Points	Area (ft²)
Region 1	Waste Material	1,2,3,4,5	2,684.8
Region 2	NOT ACTIVE	6,7,8,9	409.18
Region 3	Waste Material	10,11,1,2	2,281.4
Region 4	Waste Material	10,11,12,13	2,317.2
Region 5	Waste Material	14,15,16,17,13,12,18	2,329.2
Region 6	Waste Material	19,20,21,15,14	2,120.4
Region 7	NOT ACTIVE	19,20,22,23	1,940.1
Region 8	NOT ACTIVE	23,22,24,25	1,759.8
Region 9	NOT ACTIVE	26,27,25,24	1,579.6
Region 10	NOT ACTIVE	28,29,30,26,27	1,399.5
Region 11	NOT ACTIVE	29,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,28	963.75
Region 12	NOT ACTIVE	47,31,32,33,34,35,36,37,38,48,49	1,129
Region 13	NOT ACTIVE	49,50,51,52,53,54,55,56,57,48	563.69
Region 14	Lower Till	58,59,60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78	3,000.7
Region 15	Sand/Silt	78,77,76,75,74,73,72,71,70,69,68,79,80,81,82,83,84,85,86,87,88,89	7,768.6
Region 16	GC-Drained	90,91,92,93,94,95,96,97,98,99,100,79,80,81,82,83,84,85,86,87,88,89	10,108
Region 17	GC OverConsolidated	90,91,92,93,94,95,96,97,98,99,100,101,102,103,104,105,106,107,108,109,110,111,112,113,114	2,873.1
Region 18	Upper Till	114,113,112,111,110,109,108,107,106,105,104,103,102,101,115,116,117,118,119,120,121,122,123,124,125,126,127,128,129,130,131,132,133,134,135,136,137,138,139,140,141,142,143,144,145,146,147	9,788.5

Region 19	Structural Fill	8,147,148,9	390.2
Region 20	CCL	148,146,145,144,143,142,141,149,150,151,152,153,154,155,156,157,9	1,547.9
Region 21	Structural Fill	158,159,160,3,161,162,163,164,165	80.098
Region 22	Waste Material	150,166,167,168,169,134,135,136,137,138,139,140,141,149	1,602.2
Region 23	CCL	127,170,171,172,173,174,175,176,177,178,179,180,181,182,183,115,116,117,118,119,120,121,122,123,124,125,126	957.6
Region 24	Waste Material	184,185,186,187,188,183,182,181,180,179,178,177,176,175,174,173,172,171,170,127	4,345.4
Region 25	Bottom Liner	157,9,6,164,163,162,161,3,4,5,1,11,12,18,189,190,191,151,152,153,154,155,156	1,423.6
Region 26	UPPER SHALE	58,192,193,67,66,65,64,63,62,61,60,59	15,370

Figure 12 - Coupled Consolidation for Section OP-1 for Waste Lift 6

WASTE LIFT6 EL. 359

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File Information

Title: Model City - RMU-2 CP-20 Section OP-1
Comments: Operation Conditions for CP-20 Section 1 Based on Maximum Fill Rate of 50,000 Cu Yds per Quarter
Created By: Peter J. Carey
Last Edited By: Peter J. Carey
Revision Number: 511
File Version: 8.0
Tool Version: 8.0.10.6504
Date: 2/24/2013
Time: 3:48:00 PM
File Name: C20OP-1r1.gsz
Directory: N:\Model_City\154.002_rmu2\154.005_revsions\geoslope\operational\

Project Settings

Length(L) Units: feet
Time(t) Units: Days
Force(F) Units: lbf
Pressure(p) Units: psf
Strength Units: psf
Stiffness Units: psf
Unit Weight of Water: 62.4 pcf
Air Pressure: 101.33 psf
View: 2D

Analysis Settings

WASTE LIFT6 EL. 359

Description: WASTE LIFT6 C-20 OP-1 progression
Kind: SIGMA/W
Parent: WASTE LIFT5 EL. 353
Method: Coupled Stress/PWP
Settings
- Initial Stress: Parent Analysis
- Initial PWP: Parent Analysis
- Exclude cumulative values: No

Control
- Apply Body Force in All Steps: No
- Saturated Zone Only: No

Convergence
- Maximum Number of Iterations: 50
- Minimum Pressure Head Difference: 0.001
- Minimum Displacement Difference: 0.001

Significant Digits: 3
Hydraulic Under-Relaxation Criteria
Under-Relaxation Initial Rate: 1
Under-Relaxation Min. Rate: 0.1
Under-Relaxation Reduction Rate: 0.65
Under-Relaxation Iterations: 10
Equation Solver: Parallel Direct
Time
Starting Time: 503 days
Duration: 54 days
# of Steps: 12
Step Generation Method: Linear
Save Steps Every: 4

Materials

Waste Material

Model: Linear Elastic (Total)
Stress Strain
Young's Modulus (E): 400,000 psf
Unit Weight: 111 pcf
Poisson's Ratio: 0.45

Bottom Liner

Model: Linear Elastic (Total)
Stress Strain
Young's Modulus (E): 400,000 psf
Unit Weight: 120 pcf
Poisson's Ratio: 0.45

CCL

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 1,000,000 psf
Unit Weight: 120 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Clay soils OC
K-Function: GC 5.7 E-4 ft/day
Ky'/Kx' Ratio: 0.1
Rotation: 0 °
Load Response Ratio: 1

Upper Till

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 300,000 psf
Unit Weight: 125 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Till

K-Function: Upper Glacial Till
Ky'/Kx' Ratio: 1
Rotation: 0 °
Load Response Ratio: 1

GC-Drained

Model: Soft Clay (MCC w/ PWP Change)
Stress Strain
O.C. Ratio: 4
Poisson's Ratio: 0.334
Lambda: 0.14
Kappa: 0.013
Initial Void Ratio: 1
Unit Weight: 118 pcf
Phi': 27 °
Hydraulic
Vol. WC. Function: Clay soils
K-Function: GC 5.7 E-4 ft/day
Ky'/Kx' Ratio: 1
Rotation: 0 °
K-Modifier Function: 1D consol derived k function rmu2 clay
Load Response Ratio: 1

GC OverConsolidated

Model: Soft Clay (MCC w/ PWP Change)
Stress Strain
O.C. Ratio: 8
Poisson's Ratio: 0.334
Lambda: 0.06
Kappa: 0.01
Initial Void Ratio: 0.5
Unit Weight: 125 pcf
Phi': 30 °
Hydraulic
Vol. WC. Function: Clay soils OC
K-Function: GC 5.7 E-4 ft/day
Ky'/Kx' Ratio: 1
Rotation: 0 °
K-Modifier Function: 1D consol derived k function rmu2 clay
Load Response Ratio: 1

Sand/Silt

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 300,000 psf
Unit Weight: 135 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: silty sand
K-Function: Silty Sand, k = 0.567 ft/day 2 E-4cm/sec
Ky'/Kx' Ratio: 0.1
Rotation: 0 °

Load Response Ratio: 1

Lower Till

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 600,000 psf
Unit Weight: 145 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Till
K-Function: Till
Ky'/Kx' Ratio: 1
Rotation: 0 °
Load Response Ratio: 1

Structural Fill

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 100,000 psf
Unit Weight: 135 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Till
K-Function: Till
Ky'/Kx' Ratio: 1
Rotation: 0 °
Load Response Ratio: 1

UPPER SHALE

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 1,000,000 psf
Unit Weight: 145 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Till
K-Function: Upper Rock
Ky'/Kx' Ratio: 1
Rotation: 0 °
Load Response Ratio: 1

NOT ACTIVE

Model: (none)

Boundary Conditions

Fixed X

X: X-Displacement 0

Fixed X/Y

X: X-Displacement 0

Y: Y-Displacement 0

Drainage 315

Type: Head (H) 315
Review: No

no flow

Type: Total Flux (Q) 0
Review: No

noflowzeropress

Type: Total Flux (Q) 0
Review: Yes

Initial Water Tables

Initial Water Table 1

Max. negative head: 5
Coordinates
Coordinate 1: (0, 315) ft
Coordinate 2: (850, 315) ft

K Functions

Silty Sand, k = 0.567 ft/day 2 E-4cm/sec

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 36 %
K-Saturation: 0.567
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (0.005, 0.567)
Data Point: (0.01, 0.567)
Data Point: (0.035938, 0.567)
Data Point: (0.12915, 0.567)
Data Point: (0.46416, 0.567)
Data Point: (1.1111, 0.567)
Data Point: (1.6681, 0.567)
Data Point: (5.9948, 0.567)
Data Point: (21.544, 0.567)
Data Point: (77.426, 0.567)
Data Point: (105.93, 0.5402376)
Data Point: (210.74, 0.3387258)
Data Point: (278.26, 0.2567376)
Data Point: (315.56, 0.2232846)
Data Point: (420.37, 0.1406916)
Data Point: (525.19, 0.0779121)
Data Point: (630, 0.03843882)
Data Point: (734.81, 0.01673406)

Data Point: (839.63, 0.005422788)
Data Point: (944.44, 0.000745983)
Data Point: (1,000, 7.14735e-005)

Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Upper Glacial Till

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 36 %
K-Saturation: 0.0057
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (0.005, 0.0057)
Data Point: (0.01, 0.0057)
Data Point: (0.046416, 0.0057)
Data Point: (0.21544, 0.0057)
Data Point: (1, 0.0057)
Data Point: (4.6416, 0.0057)
Data Point: (11.111, 0.0057)
Data Point: (21.544, 0.0057)
Data Point: (100, 0.0057)
Data Point: (464.16, 0.0016245)
Data Point: (1,059.3, 0.0002427972)
Data Point: (2,107.4, 1.492716e-005)
Data Point: (2,154.4, 1.369596e-005)
Data Point: (3,155.6, 4.086672e-006)
Data Point: (4,203.7, 1.82115e-006)
Data Point: (5,251.9, 9.03222e-007)
Data Point: (6,300, 4.30521e-007)
Data Point: (7,348.1, 2.028516e-007)
Data Point: (8,396.3, 7.73661e-008)
Data Point: (9,444.4, 2.691312e-008)
Data Point: (10,000, 2.691312e-008)

Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Upper Rock

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 36 %

K-Saturation: 0.567
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (0.005, 0.567)
Data Point: (0.01, 0.567)
Data Point: (10,000, 0.567)
Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Till

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 36 %
K-Saturation: 0.000567
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (0.005, 0.000567)
Data Point: (0.01, 0.000567)
Data Point: (10,000, 0.000567)
Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

GC 5.7 E-4 ft/day

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 100 %
K-Saturation: 0.00057
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (10, 0.00057)
Data Point: (1,000, 9e-006)
Data Point: (5,000, 5e-006)
Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Hydraulic K Modifier Functions

1D consol derived k function rmu2 clay

Model: Spline Data Point Function (Y Log)
Function: K-Modifier vs. Y-Effective Stress
Curve Fit to Data: 100 %
Segment Curvature: 75 %
Y-Intercept: 1.2
Data Points: Y-Effective Stress (psf), K-Modifier
Data Point: (1,000, 1.2)
Data Point: (2,000, 1)
Data Point: (4,000, 0.839)
Data Point: (8,000, 0.70417211)
Data Point: (12,000, 0.63551782)
Data Point: (16,000, 0.59090577)

Vol. Water Content Functions

Clay soils OC

Model: Vol WC Data Point Function
Function: Vol. Water Content vs. Pore-Water Pressure
Mv: 7e-005 /psf
Saturated Water Content: 0.31427274 ft^3/ft^3
Residual Water Content: 0.031427274 ft^3/ft^3
Curve Fit to Data: 100 %
Segment Curvature: 100 %
Porosity: 0.31427274
Data Points: Matric Suction (psf), Vol. Water Content (ft^3/ft^3)
Data Point: (0.01, 0.29999999)
Data Point: (0.018329807, 0.29999998)
Data Point: (0.033598183, 0.29999996)
Data Point: (0.061584821, 0.29999991)
Data Point: (0.11288379, 0.29999982)
Data Point: (0.20691381, 0.29999962)
Data Point: (0.37926902, 0.29999917)
Data Point: (0.6951928, 0.29999814)
Data Point: (1.274275, 0.29999578)
Data Point: (2.3357215, 0.29999026)
Data Point: (4.2813324, 0.2999772)
Data Point: (7.8475997, 0.29994599)
Data Point: (14.384499, 0.29987093)
Data Point: (26.366509, 0.29968944)
Data Point: (48.329302, 0.29924951)
Data Point: (88.586679, 0.29818464)
Data Point: (162.37767, 0.29563126)
Data Point: (297.63514, 0.28967022)
Data Point: (545.55948, 0.27661743)
Data Point: (1,000, 0.25163343)
Estimation Properties
Vol. WC Estimation Method: Sample functions

Saturated Water Content: 0.3 ft^3/ft^3
Sample Material: Clay
Liquid Limit: 0 %
Diameter at 10% passing: 0
Diameter at 60% passing: 0
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Clay soils

Model: Vol WC Data Point Function
Function: Vol. Water Content vs. Pore-Water Pressure
Mv: 0.0004 /psf
Saturated Water Content: 0.60995302 ft^3/ft^3
Residual Water Content: 0.060995302 ft^3/ft^3
Curve Fit to Data: 100 %
Segment Curvature: 100 %
Porosity: 0.60995302
Data Points: Matric Suction (psf), Vol. Water Content (ft^3/ft^3)
Data Point: (0.01, 0.43999998)
Data Point: (0.018329807, 0.43999997)
Data Point: (0.033598183, 0.43999994)
Data Point: (0.061584821, 0.43999987)
Data Point: (0.11288379, 0.43999974)
Data Point: (0.20691381, 0.43999944)
Data Point: (0.37926902, 0.43999878)
Data Point: (0.6951928, 0.43999728)
Data Point: (1.274275, 0.43999381)
Data Point: (2.3357215, 0.43998571)
Data Point: (4.2813324, 0.43996655)
Data Point: (7.8475997, 0.43992079)
Data Point: (14.384499, 0.4398107)
Data Point: (26.366509, 0.43954452)
Data Point: (48.329302, 0.43889927)
Data Point: (88.586679, 0.43733747)
Data Point: (162.37767, 0.43359251)
Data Point: (297.63514, 0.42484965)
Data Point: (545.55948, 0.40570556)
Data Point: (1,000, 0.36906236)
Estimation Properties
Vol. WC Estimation Method: Sample functions
Saturated Water Content: 0.44 ft^3/ft^3
Sample Material: Clay
Liquid Limit: 0 %
Diameter at 10% passing: 0
Diameter at 60% passing: 0
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Till

Model: Vol WC Data Point Function

Function: Vol. Water Content vs. Pore-Water Pressure
Mv: 5e-006 /psf
Saturated Water Content: 0.20000173 ft^3/ft^3
Residual Water Content: 0.020000173 ft^3/ft^3
Curve Fit to Data: 100 %
Segment Curvature: 100 %
Porosity: 0.20000173
Data Points: Matric Suction (psf), Vol. Water Content (ft^3/ft^3)
Data Point: (0.01, 0.19999999)
Data Point: (0.018329807, 0.19999999)
Data Point: (0.033598183, 0.19999997)
Data Point: (0.061584821, 0.19999993)
Data Point: (0.11288379, 0.19999985)
Data Point: (0.20691381, 0.19999967)
Data Point: (0.37926902, 0.19999922)
Data Point: (0.6951928, 0.19999811)
Data Point: (1.274275, 0.19999535)
Data Point: (2.3357215, 0.19998838)
Data Point: (4.2813324, 0.19997056)
Data Point: (7.8475997, 0.19992471)
Data Point: (14.384499, 0.19980625)
Data Point: (26.366509, 0.19949952)
Data Point: (48.329302, 0.19870702)
Data Point: (88.586679, 0.19668084)
Data Point: (162.37767, 0.19165467)
Data Point: (297.63514, 0.18009116)
Data Point: (545.55948, 0.15752337)
Data Point: (1,000, 0.12453739)
Estimation Properties
Vol. WC Estimation Method: Sample functions
Saturated Water Content: 0.2 ft^3/ft^3
Sample Material: Silty Clay
Liquid Limit: 0 %
Diameter at 10% passing: 0
Diameter at 60% passing: 0
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

silty sand

Model: Vol WC Data Point Function
Function: Vol. Water Content vs. Pore-Water Pressure
Mv: 1e-005 /psf
Saturated Water Content: 0.30000011 ft^3/ft^3
Residual Water Content: 0.030000011 ft^3/ft^3
Curve Fit to Data: 100 %
Segment Curvature: 100 %
Porosity: 0.30000011
Data Points: Matric Suction (psf), Vol. Water Content (ft^3/ft^3)
Data Point: (0.01, 0.29999996)
Data Point: (0.018329807, 0.29999991)
Data Point: (0.033598183, 0.29999977)

Data Point: (0.061584821, 0.29999942)
Data Point: (0.11288379, 0.29999854)
Data Point: (0.20691381, 0.29999626)
Data Point: (0.37926902, 0.29999039)
Data Point: (0.6951928, 0.29997521)
Data Point: (1.274275, 0.29993588)
Data Point: (2.3357215, 0.29983385)
Data Point: (4.2813324, 0.29956912)
Data Point: (7.8475997, 0.29888334)
Data Point: (14.384499, 0.29711648)
Data Point: (26.366509, 0.29263189)
Data Point: (48.329302, 0.28167657)
Data Point: (88.586679, 0.25725429)
Data Point: (162.37767, 0.21239326)
Data Point: (297.63514, 0.15298031)
Data Point: (545.55948, 0.099847233)
Data Point: (1,000, 0.064649441)

Estimation Properties

Vol. WC Estimation Method: Sample functions
Saturated Water Content: 0.3 ft^3/ft^3
Sample Material: Silty Sand
Liquid Limit: 0 %
Diameter at 10% passing: 0
Diameter at 60% passing: 0
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Points

	X (ft)	Y (ft)
Point 1	561.5172	329
Point 2	184.2753	329
Point 3	174.1934	323.83525
Point 4	351.3603	319.67886
Point 5	546.7523	324.07989
Point 6	139.5241	323.62981
Point 7	0	321.01609
Point 8	0	318.01563
Point 9	133.22	320.51124
Point 10	196.3072	335
Point 11	579.5227	335
Point 12	597.5282	341
Point 13	208.339	341
Point 14	608.5585	347
Point 15	240.1424	347

Point 16	234.9596	345.27685
Point 17	219.929	346.77965
Point 18	611.3486	345.60539
Point 19	596.5548	353
Point 20	258.1852	353
Point 21	250.6076	350.4794
Point 22	276.2227	359
Point 23	584.5511	359
Point 24	294.2603	365
Point 25	572.5474	365
Point 26	312.2978	371
Point 27	560.5437	371
Point 28	548.5399	377
Point 29	330.1036	377
Point 30	325.5389	375.4045
Point 31	337.8201	379.69712
Point 32	364.4177	380
Point 33	381.0855	380.33726
Point 34	395.5929	380.71635
Point 35	416.8543	381.25666
Point 36	438.0487	382
Point 37	479.1653	383
Point 38	511.5499	383
Point 39	512.0826	382.82242
Point 40	513.8708	383
Point 41	531.0491	383
Point 42	533.1096	382.31347
Point 43	533.1107	382.31305
Point 44	536.5271	381.01628
Point 45	537.9265	380.70839
Point 46	547.5083	377.51565
Point 47	346.883	383
Point 48	493.5541	389
Point 49	363.3465	389
Point 50	371.2953	391.89686
Point 51	372.0119	391.98713
Point 52	372.2345	391.99514
Point 53	372.3208	392
Point 54	374.2156	392.05341

Point 55	419.4544	394.02388
Point 56	423.1399	394.1518
Point 57	476.0285	394.84323
Point 58	0	275.56112
Point 59	82.561	276.49127
Point 60	84.7322	276.34451
Point 61	123.7177	276.54438
Point 62	191.6961	277.65321
Point 63	430.1918	279.01879
Point 64	487.7086	279.639
Point 65	509.7138	279.55021
Point 66	721.9937	279.02461
Point 67	839	278.53365
Point 68	839	283.95091
Point 69	694.2381	280.02879
Point 70	505.5772	282.211
Point 71	487.7086	281.69555
Point 72	430.1918	282.66537
Point 73	247.1163	283.77931
Point 74	191.6961	282.79673
Point 75	123.7177	280.19493
Point 76	93.9325	281.10076
Point 77	61.0988	279.7585
Point 78	0	281.01485
Point 79	839	292.1407
Point 80	505.5772	286.98428
Point 81	487.7086	287.07159
Point 82	430.1918	289.73652
Point 83	247.1163	297.70175
Point 84	123.7177	292.05467
Point 85	94.7708	289.80875
Point 86	84.7322	289.65003
Point 87	82.561	289.66397
Point 88	38.9609	289.4325
Point 89	0	289.19587
Point 90	0	300.53803
Point 91	17.729	300.30563
Point 92	61.8788	299.93669
Point 93	191.626	301.3549

Point 94	247.1555	301.9218
Point 95	430.2162	304.83853
Point 96	487.7442	304.85433
Point 97	505.6491	305.27434
Point 98	509.7473	305.37466
Point 99	564.3735	305.25518
Point 100	839	303.47923
Point 101	839	306.47929
Point 102	564.3865	308.25516
Point 103	509.7138	308.37474
Point 104	505.5772	308.27348
Point 105	487.7086	307.85432
Point 106	430.1918	307.83852
Point 107	247.1163	304.92156
Point 108	191.6961	304.35577
Point 109	123.7177	308.23059
Point 110	93.9325	306.13974
Point 111	81.2213	307.4429
Point 112	61.5521	302.93952
Point 113	17.7611	303.30547
Point 114	0	303.53785
Point 115	839	315.0402
Point 116	797.6335	315.91598
Point 117	788.4831	316.10833
Point 118	751.3873	316.84226
Point 119	746.5947	316.94222
Point 120	742.0308	317.02756
Point 121	740.5664	317.15339
Point 122	740.3716	317.22293
Point 123	737.8797	317.29393
Point 124	718.0152	324.01292
Point 125	711.8056	325.93525
Point 126	706.0898	327.46147
Point 127	700.0454	333.50592
Point 128	694.499	330.73293
Point 129	691.9982	333.23326
Point 130	680.0323	333.54954
Point 131	679.8975	333.54516
Point 132	674.9116	331.05465

Point 133	672.911	331.05491
Point 134	672.1929	333.92615
Point 135	648.0416	332
Point 136	642.1238	328.67972
Point 137	637.4622	326.05461
Point 138	633.8287	324
Point 139	632.6094	323.29395
Point 140	630.3447	322
Point 141	556.3265	322
Point 142	544.3989	318.02536
Point 143	351.3575	313.67727
Point 144	171.7713	317.89042
Point 145	158.9451	319.66188
Point 146	146.7629	317.7643
Point 147	0	315.01616
Point 148	126.916	317.39267
Point 149	624.2673	344.64
Point 150	642.7896	345.19608
Point 151	639.8757	348.10995
Point 152	623.7369	347.62543
Point 153	543.8794	321.01441
Point 154	351.3589	316.67806
Point 155	172.0125	320.88559
Point 156	158.9189	322.69398
Point 157	146.5027	320.75996
Point 158	161.8204	329.91734
Point 159	162.0292	329.91734
Point 160	169.8774	325.99323
Point 161	172.2537	323.88076
Point 162	158.8927	325.72607
Point 163	146.2426	323.75561
Point 164	144.6459	323.72571
Point 165	157.0292	329.91734
Point 166	643.2531	345.21
Point 167	651.9258	349.55
Point 168	666.9304	350
Point 169	668.3508	349.29
Point 170	707.4035	333.53244
Point 171	710.6052	333.51008

Point 172	711.3189	333.31046
Point 173	713.7443	332.66283
Point 174	720.1721	330.67297
Point 175	739.1283	324.2612
Point 176	741.6802	324.18848
Point 177	742.0676	324.05019
Point 178	742.3962	324.02195
Point 179	746.7331	323.94086
Point 180	751.5295	323.84082
Point 181	788.6259	323.10687
Point 182	797.7821	322.91441
Point 183	839	322.03859
Point 184	704.3877	335.67695
Point 185	758.6353	353.74048
Point 186	806.6964	369.75012
Point 187	818.5728	368.55874
Point 188	839	375.2318
Point 189	623.3833	349.61571
Point 190	636.5766	350.01181
Point 191	637.9727	350.01292
Point 192	0	260
Point 193	839	260

Lines

	Start Point	End Point	Stress/Strain Boundary	Hydraulic Boundary
Line 1	1	2		
Line 2	2	3		
Line 3	3	4		
Line 4	4	5		
Line 5	5	1		
Line 6	6	7		
Line 7	7	8	Fixed X	
Line 8	8	9		noflowzeropress
Line 9	9	6		
Line 10	10	11		
Line 11	11	1		
Line 12	2	10		
Line 13	11	12		

Line 14	12	13		
Line 15	13	10		
Line 16	14	15		
Line 17	15	16		
Line 18	16	17		
Line 19	17	13		
Line 20	12	18		
Line 21	19	20		
Line 22	20	21		
Line 23	21	15		
Line 24	14	19		
Line 25	20	22		
Line 26	22	23		
Line 27	23	19		
Line 28	22	24		
Line 29	24	25		
Line 30	25	23		
Line 31	26	27		
Line 32	27	25		
Line 33	24	26		
Line 34	28	29		
Line 35	29	30		
Line 36	30	26		
Line 37	27	28		
Line 38	29	31		
Line 39	32	33		
Line 40	33	34		
Line 41	34	35		
Line 42	35	36		
Line 43	36	37		
Line 44	37	38		
Line 45	38	39		
Line 46	39	40		
Line 47	40	41		
Line 48	41	42		
Line 49	42	43		
Line 50	43	44		
Line 51	44	45		
Line 52	45	46		

Line 53	46	28		
Line 54	38	48		
Line 55	48	49		
Line 56	49	47		
Line 57	49	50		
Line 58	50	51		
Line 59	51	52		
Line 60	52	53		
Line 61	53	54		
Line 62	54	55		
Line 63	55	56		
Line 64	56	57		
Line 65	57	48		
Line 66	58	59		
Line 67	59	60		
Line 68	60	61		
Line 69	61	62		
Line 70	62	63		
Line 71	63	64		
Line 72	64	65		
Line 73	65	66		
Line 74	66	67		
Line 75	67	68	Fixed X	Drainage 315
Line 76	68	69		
Line 77	69	70		
Line 78	70	71		
Line 79	71	72		
Line 80	72	73		
Line 81	73	74		
Line 82	74	75		
Line 83	75	76		
Line 84	76	77		
Line 85	77	78		
Line 86	68	79	Fixed X	Drainage 315
Line 87	79	80		
Line 88	80	81		
Line 89	81	82		
Line 90	82	83		
Line 91	83	84		

Line 92	84	85		
Line 93	85	86		
Line 94	86	87		
Line 95	87	88		
Line 96	88	89		
Line 97	90	91		
Line 98	91	92		
Line 99	92	93		
Line 100	93	94		
Line 101	94	95		
Line 102	95	96		
Line 103	96	97		
Line 104	97	98		
Line 105	98	99		
Line 106	99	100		
Line 107	100	79	Fixed X	Drainage 315
Line 108	100	101	Fixed X	Drainage 315
Line 109	101	102		
Line 110	102	103		
Line 111	103	104		
Line 112	104	105		
Line 113	105	106		
Line 114	106	107		
Line 115	107	108		
Line 116	108	109		
Line 117	109	110		
Line 118	110	111		
Line 119	111	112		
Line 120	112	113		
Line 121	113	114		
Line 122	101	115	Fixed X	Drainage 315
Line 123	115	116		no flow
Line 124	116	117		no flow
Line 125	117	118		no flow
Line 126	118	119		no flow
Line 127	119	120		no flow
Line 128	120	121		no flow
Line 129	121	122		
Line 130	122	123		no flow

Line 131	123	124		no flow
Line 132	124	125		no flow
Line 133	125	126		no flow
Line 134	126	127		no flow
Line 135	127	128		noflowzeropress
Line 136	128	129		noflowzeropress
Line 137	129	130		noflowzeropress
Line 138	130	131		
Line 139	131	132		noflowzeropress
Line 140	132	133		noflowzeropress
Line 141	133	134		
Line 142	134	135		
Line 143	135	136		
Line 144	136	137		
Line 145	137	138		
Line 146	138	139		
Line 147	139	140		
Line 148	140	141		
Line 149	141	142		
Line 150	142	143		
Line 151	143	144		
Line 152	144	145		
Line 153	145	146		
Line 154	146	147		
Line 155	147	148		
Line 156	148	9		
Line 157	148	146		
Line 158	141	149		
Line 159	149	150		
Line 160	150	151		
Line 161	151	152		no flow
Line 162	152	153		no flow
Line 163	153	154		no flow
Line 164	154	155		no flow
Line 165	155	156		no flow
Line 166	156	157		no flow
Line 167	157	9		no flow
Line 168	158	159		
Line 169	159	160		

Line 170	160	3		
Line 171	3	161		
Line 172	161	162		
Line 173	162	163		
Line 174	163	164		
Line 175	164	165		
Line 176	165	158		
Line 177	150	166		
Line 178	166	167		
Line 179	167	168		
Line 180	168	169		
Line 181	169	134		
Line 182	127	170		
Line 183	170	171		
Line 184	171	172		
Line 185	172	173		
Line 186	173	174		
Line 187	174	175		
Line 188	175	176		
Line 189	176	177		
Line 190	177	178		
Line 191	178	179		
Line 192	179	180		
Line 193	180	181		
Line 194	181	182		
Line 195	182	183		
Line 196	183	115	Fixed X	
Line 197	184	185		
Line 198	185	186		
Line 199	186	187		
Line 200	187	188		
Line 201	188	183	Fixed X	
Line 202	127	184		
Line 203	6	164		
Line 204	189	190		
Line 205	190	191		
Line 206	191	151		
Line 207	18	189		
Line 208	18	14		

Line 209	47	31		
Line 210	31	32		
Line 211	58	192	Fixed X	Drainage 315
Line 212	192	193	Fixed X/Y	Drainage 315
Line 213	193	67	Fixed X	Drainage 315
Line 214	78	58	Fixed X	Drainage 315
Line 215	89	78	Fixed X	Drainage 315
Line 216	89	90	Fixed X	Drainage 315
Line 217	114	90	Fixed X	Drainage 315
Line 218	147	114	Fixed X	Drainage 315
Line 219	8	147	Fixed X	

Regions

	Material	Points	Area (ft²)
Region 1	Waste Material	1,2,3,4,5	2,684.8
Region 2	NOT ACTIVE	6,7,8,9	409.18
Region 3	Waste Material	10,11,1,2	2,281.4
Region 4	Waste Material	10,11,12,13	2,317.2
Region 5	Waste Material	14,15,16,17,13,12,18	2,329.2
Region 6	Waste Material	19,20,21,15,14	2,120.4
Region 7	Waste Material	19,20,22,23	1,940.1
Region 8	NOT ACTIVE	23,22,24,25	1,759.8
Region 9	NOT ACTIVE	26,27,25,24	1,579.6
Region 10	NOT ACTIVE	28,29,30,26,27	1,399.5
Region 11	NOT ACTIVE	29,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,28	963.75
Region 12	NOT ACTIVE	47,31,32,33,34,35,36,37,38,48,49	1,129
Region 13	NOT ACTIVE	49,50,51,52,53,54,55,56,57,48	563.69
Region 14	Lower Till	58,59,60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78	3,000.7
Region 15	Sand/Silt	78,77,76,75,74,73,72,71,70,69,68,79,80,81,82,83,84,85,86,87,88,89	7,768.6
Region 16	GC-Drained	90,91,92,93,94,95,96,97,98,99,100,79,80,81,82,83,84,85,86,87,88,89	10,108
Region 17	GC OverConsolidated	90,91,92,93,94,95,96,97,98,99,100,101,102,103,104,105,106,107,108, 109,110,111,112,113,114	2,873.1
Region 18	Upper Till	114,113,112,111,110,109,108,107,106,105,104,103,102,101,115,116, 117,118,119,120,121,122,123,124,125,126,127,128,129,130,131,132, 133,134,135,136,137,138,139,140,141,142,143,144,145,146,147	9,788.5
Region 19	Structural Fill	8,147,148,9	390.2
Region 20	CCL	148,146,145,144,143,142,141,149,150,151,152,153,154,155,156,157, 9	1,547.9
Region 21	Structural Fill	158,159,160,3,161,162,163,164,165	80.098

Region 22	Waste Material	150,166,167,168,169,134,135,136,137,138,139,140,141,149	1,602.2
Region 23	CCL	127,170,171,172,173,174,175,176,177,178,179,180,181,182,183,115,116,117,118,119,120,121,122,123,124,125,126	957.6
Region 24	Waste Material	184,185,186,187,188,183,182,181,180,179,178,177,176,175,174,173,172,171,170,127	4,345.4
Region 25	Bottom Liner	157,9,6,164,163,162,161,3,4,5,1,11,12,18,189,190,191,151,152,153,154,155,156	1,423.6
Region 26	UPPER SHALE	58,192,193,67,66,65,64,63,62,61,60,59	15,370

Figure 13 - Coupled Consolidation for Section OP-1 for Waste Lift 7

WASTE LIFT7 EL. 365

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File Information

Title: Model City - RMU-2 CP-20 Section OP-1
Comments: Operation Conditions for CP-20 Section 1 Based on Maximum Fill Rate of 50,000 Cu Yds per Quarter
Created By: Peter J. Carey
Last Edited By: Peter J. Carey
Revision Number: 511
File Version: 8.0
Tool Version: 8.0.10.6504
Date: 2/24/2013
Time: 3:48:00 PM
File Name: C20OP-1r1.gsz
Directory: N:\Model_City\154.002_rmu2\154.005_revsions\geoslope\operational\

Project Settings

Length(L) Units: feet
Time(t) Units: Days
Force(F) Units: lbf
Pressure(p) Units: psf
Strength Units: psf
Stiffness Units: psf
Unit Weight of Water: 62.4 pcf
Air Pressure: 101.33 psf
View: 2D

Analysis Settings

WASTE LIFT7 EL. 365

Description: WASTE LIFT 7 C-20 OP-1 progression
Kind: SIGMA/W
Parent: WASTE LIFT6 EL. 359
Method: Coupled Stress/PWP
Settings
- Initial Stress: Parent Analysis
- Initial PWP: Parent Analysis
- Exclude cumulative values: No

Control
- Apply Body Force in All Steps: No
- Saturated Zone Only: No

Convergence
- Maximum Number of Iterations: 50
- Minimum Pressure Head Difference: 0.001
- Minimum Displacement Difference: 0.001

Significant Digits: 3
Hydraulic Under-Relaxation Criteria
Under-Relaxation Initial Rate: 1
Under-Relaxation Min. Rate: 0.1
Under-Relaxation Reduction Rate: 0.65
Under-Relaxation Iterations: 10
Equation Solver: Parallel Direct
Time
Starting Time: 557 days
Duration: 44 days
# of Steps: 12
Step Generation Method: Linear
Save Steps Every: 4

Materials

Waste Material

Model: Linear Elastic (Total)
Stress Strain
Young's Modulus (E): 400,000 psf
Unit Weight: 111 pcf
Poisson's Ratio: 0.45

Bottom Liner

Model: Linear Elastic (Total)
Stress Strain
Young's Modulus (E): 400,000 psf
Unit Weight: 120 pcf
Poisson's Ratio: 0.45

CCL

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 1,000,000 psf
Unit Weight: 120 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Clay soils OC
K-Function: GC 5.7 E-4 ft/day
Ky'/Kx' Ratio: 0.1
Rotation: 0 °
Load Response Ratio: 1

Upper Till

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 300,000 psf
Unit Weight: 125 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Till

K-Function: Upper Glacial Till
Ky'/Kx' Ratio: 1
Rotation: 0 °
Load Response Ratio: 1

GC-Drained

Model: Soft Clay (MCC w/ PWP Change)
Stress Strain
O.C. Ratio: 4
Poisson's Ratio: 0.334
Lambda: 0.14
Kappa: 0.013
Initial Void Ratio: 1
Unit Weight: 118 pcf
Phi': 27 °
Hydraulic
Vol. WC. Function: Clay soils
K-Function: GC 5.7 E-4 ft/day
Ky'/Kx' Ratio: 1
Rotation: 0 °
K-Modifier Function: 1D consol derived k function rmu2 clay
Load Response Ratio: 1

GC OverConsolidated

Model: Soft Clay (MCC w/ PWP Change)
Stress Strain
O.C. Ratio: 8
Poisson's Ratio: 0.334
Lambda: 0.06
Kappa: 0.01
Initial Void Ratio: 0.5
Unit Weight: 125 pcf
Phi': 30 °
Hydraulic
Vol. WC. Function: Clay soils OC
K-Function: GC 5.7 E-4 ft/day
Ky'/Kx' Ratio: 1
Rotation: 0 °
K-Modifier Function: 1D consol derived k function rmu2 clay
Load Response Ratio: 1

Sand/Silt

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 300,000 psf
Unit Weight: 135 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: silty sand
K-Function: Silty Sand, k = 0.567 ft/day 2 E-4cm/sec
Ky'/Kx' Ratio: 0.1
Rotation: 0 °

Load Response Ratio: 1

Lower Till

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 600,000 psf
Unit Weight: 145 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Till
K-Function: Till
Ky'/Kx' Ratio: 1
Rotation: 0 °
Load Response Ratio: 1

Structural Fill

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 100,000 psf
Unit Weight: 135 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Till
K-Function: Till
Ky'/Kx' Ratio: 1
Rotation: 0 °
Load Response Ratio: 1

UPPER SHALE

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 1,000,000 psf
Unit Weight: 145 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Till
K-Function: Upper Rock
Ky'/Kx' Ratio: 1
Rotation: 0 °
Load Response Ratio: 1

NOT ACTIVE

Model: (none)

Boundary Conditions

Fixed X

X: X-Displacement 0

Fixed X/Y

X: X-Displacement 0

Y: Y-Displacement 0

Drainage 315

Type: Head (H) 315
Review: No

no flow

Type: Total Flux (Q) 0
Review: No

noflowzeropress

Type: Total Flux (Q) 0
Review: Yes

Initial Water Tables

Initial Water Table 1

Max. negative head: 5
Coordinates
Coordinate 1: (0, 315) ft
Coordinate 2: (850, 315) ft

K Functions

Silty Sand, k = 0.567 ft/day 2 E-4cm/sec

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 36 %
K-Saturation: 0.567
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (0.005, 0.567)
Data Point: (0.01, 0.567)
Data Point: (0.035938, 0.567)
Data Point: (0.12915, 0.567)
Data Point: (0.46416, 0.567)
Data Point: (1.1111, 0.567)
Data Point: (1.6681, 0.567)
Data Point: (5.9948, 0.567)
Data Point: (21.544, 0.567)
Data Point: (77.426, 0.567)
Data Point: (105.93, 0.5402376)
Data Point: (210.74, 0.3387258)
Data Point: (278.26, 0.2567376)
Data Point: (315.56, 0.2232846)
Data Point: (420.37, 0.1406916)
Data Point: (525.19, 0.0779121)
Data Point: (630, 0.03843882)
Data Point: (734.81, 0.01673406)

Data Point: (839.63, 0.005422788)
Data Point: (944.44, 0.000745983)
Data Point: (1,000, 7.14735e-005)

Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Upper Glacial Till

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 36 %
K-Saturation: 0.0057
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (0.005, 0.0057)
Data Point: (0.01, 0.0057)
Data Point: (0.046416, 0.0057)
Data Point: (0.21544, 0.0057)
Data Point: (1, 0.0057)
Data Point: (4.6416, 0.0057)
Data Point: (11.111, 0.0057)
Data Point: (21.544, 0.0057)
Data Point: (100, 0.0057)
Data Point: (464.16, 0.0016245)
Data Point: (1,059.3, 0.0002427972)
Data Point: (2,107.4, 1.492716e-005)
Data Point: (2,154.4, 1.369596e-005)
Data Point: (3,155.6, 4.086672e-006)
Data Point: (4,203.7, 1.82115e-006)
Data Point: (5,251.9, 9.03222e-007)
Data Point: (6,300, 4.30521e-007)
Data Point: (7,348.1, 2.028516e-007)
Data Point: (8,396.3, 7.73661e-008)
Data Point: (9,444.4, 2.691312e-008)
Data Point: (10,000, 2.691312e-008)

Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Upper Rock

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 36 %

K-Saturation: 0.567
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (0.005, 0.567)
Data Point: (0.01, 0.567)
Data Point: (10,000, 0.567)
Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Till

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 36 %
K-Saturation: 0.000567
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (0.005, 0.000567)
Data Point: (0.01, 0.000567)
Data Point: (10,000, 0.000567)
Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

GC 5.7 E-4 ft/day

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 100 %
K-Saturation: 0.00057
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (10, 0.00057)
Data Point: (1,000, 9e-006)
Data Point: (5,000, 5e-006)
Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Hydraulic K Modifier Functions

1D consol derived k function rmu2 clay

Model: Spline Data Point Function (Y Log)
Function: K-Modifier vs. Y-Effective Stress
Curve Fit to Data: 100 %
Segment Curvature: 75 %
Y-Intercept: 1.2
Data Points: Y-Effective Stress (psf), K-Modifier
Data Point: (1,000, 1.2)
Data Point: (2,000, 1)
Data Point: (4,000, 0.839)
Data Point: (8,000, 0.70417211)
Data Point: (12,000, 0.63551782)
Data Point: (16,000, 0.59090577)

Vol. Water Content Functions

Clay soils OC

Model: Vol WC Data Point Function
Function: Vol. Water Content vs. Pore-Water Pressure
Mv: 7e-005 /psf
Saturated Water Content: 0.31427274 ft^3/ft^3
Residual Water Content: 0.031427274 ft^3/ft^3
Curve Fit to Data: 100 %
Segment Curvature: 100 %
Porosity: 0.31427274
Data Points: Matric Suction (psf), Vol. Water Content (ft^3/ft^3)
Data Point: (0.01, 0.29999999)
Data Point: (0.018329807, 0.29999998)
Data Point: (0.033598183, 0.29999996)
Data Point: (0.061584821, 0.29999991)
Data Point: (0.11288379, 0.29999982)
Data Point: (0.20691381, 0.29999962)
Data Point: (0.37926902, 0.29999917)
Data Point: (0.6951928, 0.29999814)
Data Point: (1.274275, 0.29999578)
Data Point: (2.3357215, 0.29999026)
Data Point: (4.2813324, 0.2999772)
Data Point: (7.8475997, 0.29994599)
Data Point: (14.384499, 0.29987093)
Data Point: (26.366509, 0.29968944)
Data Point: (48.329302, 0.29924951)
Data Point: (88.586679, 0.29818464)
Data Point: (162.37767, 0.29563126)
Data Point: (297.63514, 0.28967022)
Data Point: (545.55948, 0.27661743)
Data Point: (1,000, 0.25163343)
Estimation Properties
Vol. WC Estimation Method: Sample functions

Saturated Water Content: 0.3 ft^3/ft^3
Sample Material: Clay
Liquid Limit: 0 %
Diameter at 10% passing: 0
Diameter at 60% passing: 0
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Clay soils

Model: Vol WC Data Point Function
Function: Vol. Water Content vs. Pore-Water Pressure
Mv: 0.0004 /psf
Saturated Water Content: 0.60995302 ft^3/ft^3
Residual Water Content: 0.060995302 ft^3/ft^3
Curve Fit to Data: 100 %
Segment Curvature: 100 %
Porosity: 0.60995302
Data Points: Matric Suction (psf), Vol. Water Content (ft^3/ft^3)
Data Point: (0.01, 0.43999998)
Data Point: (0.018329807, 0.43999997)
Data Point: (0.033598183, 0.43999994)
Data Point: (0.061584821, 0.43999987)
Data Point: (0.11288379, 0.43999974)
Data Point: (0.20691381, 0.43999944)
Data Point: (0.37926902, 0.43999878)
Data Point: (0.6951928, 0.43999728)
Data Point: (1.274275, 0.43999381)
Data Point: (2.3357215, 0.43998571)
Data Point: (4.2813324, 0.43996655)
Data Point: (7.8475997, 0.43992079)
Data Point: (14.384499, 0.4398107)
Data Point: (26.366509, 0.43954452)
Data Point: (48.329302, 0.43889927)
Data Point: (88.586679, 0.43733747)
Data Point: (162.37767, 0.43359251)
Data Point: (297.63514, 0.42484965)
Data Point: (545.55948, 0.40570556)
Data Point: (1,000, 0.36906236)
Estimation Properties
Vol. WC Estimation Method: Sample functions
Saturated Water Content: 0.44 ft^3/ft^3
Sample Material: Clay
Liquid Limit: 0 %
Diameter at 10% passing: 0
Diameter at 60% passing: 0
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Till

Model: Vol WC Data Point Function

Function: Vol. Water Content vs. Pore-Water Pressure
- Mv: 5e-006 /psf
- Saturated Water Content: 0.20000173 ft^3/ft^3
- Residual Water Content: 0.020000173 ft^3/ft^3
- Curve Fit to Data: 100 %
- Segment Curvature: 100 %

Porosity: 0.20000173

Data Points: Matric Suction (psf), Vol. Water Content (ft^3/ft^3)
- Data Point: (0.01, 0.19999999)
- Data Point: (0.018329807, 0.19999999)
- Data Point: (0.033598183, 0.19999997)
- Data Point: (0.061584821, 0.19999993)
- Data Point: (0.11288379, 0.19999985)
- Data Point: (0.20691381, 0.19999967)
- Data Point: (0.37926902, 0.19999922)
- Data Point: (0.6951928, 0.19999811)
- Data Point: (1.274275, 0.19999535)
- Data Point: (2.3357215, 0.19998838)
- Data Point: (4.2813324, 0.19997056)
- Data Point: (7.8475997, 0.19992471)
- Data Point: (14.384499, 0.19980625)
- Data Point: (26.366509, 0.19949952)
- Data Point: (48.329302, 0.19870702)
- Data Point: (88.586679, 0.19668084)
- Data Point: (162.37767, 0.19165467)
- Data Point: (297.63514, 0.18009116)
- Data Point: (545.55948, 0.15752337)
- Data Point: (1,000, 0.12453739)

Estimation Properties
- Vol. WC Estimation Method: Sample functions
- Saturated Water Content: 0.2 ft^3/ft^3
- Sample Material: Silty Clay
- Liquid Limit: 0 %
- Diameter at 10% passing: 0
- Diameter at 60% passing: 0
- Maximum: 1,000
- Minimum: 0.01
- Num. Points: 20

silty sand

Model: Vol WC Data Point Function

Function: Vol. Water Content vs. Pore-Water Pressure
- Mv: 1e-005 /psf
- Saturated Water Content: 0.30000011 ft^3/ft^3
- Residual Water Content: 0.030000011 ft^3/ft^3
- Curve Fit to Data: 100 %
- Segment Curvature: 100 %

Porosity: 0.30000011

Data Points: Matric Suction (psf), Vol. Water Content (ft^3/ft^3)
- Data Point: (0.01, 0.29999996)
- Data Point: (0.018329807, 0.29999991)
- Data Point: (0.033598183, 0.29999977)

Data Point: (0.061584821, 0.29999942)
Data Point: (0.11288379, 0.29999854)
Data Point: (0.20691381, 0.29999626)
Data Point: (0.37926902, 0.29999039)
Data Point: (0.6951928, 0.29997521)
Data Point: (1.274275, 0.29993588)
Data Point: (2.3357215, 0.29983385)
Data Point: (4.2813324, 0.29956912)
Data Point: (7.8475997, 0.29888334)
Data Point: (14.384499, 0.29711648)
Data Point: (26.366509, 0.29263189)
Data Point: (48.329302, 0.28167657)
Data Point: (88.586679, 0.25725429)
Data Point: (162.37767, 0.21239326)
Data Point: (297.63514, 0.15298031)
Data Point: (545.55948, 0.099847233)
Data Point: (1,000, 0.064649441)

Estimation Properties

Vol. WC Estimation Method: Sample functions
Saturated Water Content: 0.3 ft^3/ft^3
Sample Material: Silty Sand
Liquid Limit: 0 %
Diameter at 10% passing: 0
Diameter at 60% passing: 0
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Points

	X (ft)	Y (ft)
Point 1	561.5172	329
Point 2	184.2753	329
Point 3	174.1934	323.83525
Point 4	351.3603	319.67886
Point 5	546.7523	324.07989
Point 6	139.5241	323.62981
Point 7	0	321.01609
Point 8	0	318.01563
Point 9	133.22	320.51124
Point 10	196.3072	335
Point 11	579.5227	335
Point 12	597.5282	341
Point 13	208.339	341
Point 14	608.5585	347
Point 15	240.1424	347

Point 16	234.9596	345.27685
Point 17	219.929	346.77965
Point 18	611.3486	345.60539
Point 19	596.5548	353
Point 20	258.1852	353
Point 21	250.6076	350.4794
Point 22	276.2227	359
Point 23	584.5511	359
Point 24	294.2603	365
Point 25	572.5474	365
Point 26	312.2978	371
Point 27	560.5437	371
Point 28	548.5399	377
Point 29	330.1036	377
Point 30	325.5389	375.4045
Point 31	337.8201	379.69712
Point 32	364.4177	380
Point 33	381.0855	380.33726
Point 34	395.5929	380.71635
Point 35	416.8543	381.25666
Point 36	438.0487	382
Point 37	479.1653	383
Point 38	511.5499	383
Point 39	512.0826	382.82242
Point 40	513.8708	383
Point 41	531.0491	383
Point 42	533.1096	382.31347
Point 43	533.1107	382.31305
Point 44	536.5271	381.01628
Point 45	537.9265	380.70839
Point 46	547.5083	377.51565
Point 47	346.883	383
Point 48	493.5541	389
Point 49	363.3465	389
Point 50	371.2953	391.89686
Point 51	372.0119	391.98713
Point 52	372.2345	391.99514
Point 53	372.3208	392
Point 54	374.2156	392.05341

Point 55	419.4544	394.02388
Point 56	423.1399	394.1518
Point 57	476.0285	394.84323
Point 58	0	275.56112
Point 59	82.561	276.49127
Point 60	84.7322	276.34451
Point 61	123.7177	276.54438
Point 62	191.6961	277.65321
Point 63	430.1918	279.01879
Point 64	487.7086	279.639
Point 65	509.7138	279.55021
Point 66	721.9937	279.02461
Point 67	839	278.53365
Point 68	839	283.95091
Point 69	694.2381	280.02879
Point 70	505.5772	282.211
Point 71	487.7086	281.69555
Point 72	430.1918	282.66537
Point 73	247.1163	283.77931
Point 74	191.6961	282.79673
Point 75	123.7177	280.19493
Point 76	93.9325	281.10076
Point 77	61.0988	279.7585
Point 78	0	281.01485
Point 79	839	292.1407
Point 80	505.5772	286.98428
Point 81	487.7086	287.07159
Point 82	430.1918	289.73652
Point 83	247.1163	297.70175
Point 84	123.7177	292.05467
Point 85	94.7708	289.80875
Point 86	84.7322	289.65003
Point 87	82.561	289.66397
Point 88	38.9609	289.4325
Point 89	0	289.19587
Point 90	0	300.53803
Point 91	17.729	300.30563
Point 92	61.8788	299.93669
Point 93	191.626	301.3549

Point 94	247.1555	301.9218
Point 95	430.2162	304.83853
Point 96	487.7442	304.85433
Point 97	505.6491	305.27434
Point 98	509.7473	305.37466
Point 99	564.3735	305.25518
Point 100	839	303.47923
Point 101	839	306.47929
Point 102	564.3865	308.25516
Point 103	509.7138	308.37474
Point 104	505.5772	308.27348
Point 105	487.7086	307.85432
Point 106	430.1918	307.83852
Point 107	247.1163	304.92156
Point 108	191.6961	304.35577
Point 109	123.7177	308.23059
Point 110	93.9325	306.13974
Point 111	81.2213	307.4429
Point 112	61.5521	302.93952
Point 113	17.7611	303.30547
Point 114	0	303.53785
Point 115	839	315.0402
Point 116	797.6335	315.91598
Point 117	788.4831	316.10833
Point 118	751.3873	316.84226
Point 119	746.5947	316.94222
Point 120	742.0308	317.02756
Point 121	740.5664	317.15339
Point 122	740.3716	317.22293
Point 123	737.8797	317.29393
Point 124	718.0152	324.01292
Point 125	711.8056	325.93525
Point 126	706.0898	327.46147
Point 127	700.0454	333.50592
Point 128	694.499	330.73293
Point 129	691.9982	333.23326
Point 130	680.0323	333.54954
Point 131	679.8975	333.54516
Point 132	674.9116	331.05465

Point 133	672.911	331.05491
Point 134	672.1929	333.92615
Point 135	648.0416	332
Point 136	642.1238	328.67972
Point 137	637.4622	326.05461
Point 138	633.8287	324
Point 139	632.6094	323.29395
Point 140	630.3447	322
Point 141	556.3265	322
Point 142	544.3989	318.02536
Point 143	351.3575	313.67727
Point 144	171.7713	317.89042
Point 145	158.9451	319.66188
Point 146	146.7629	317.7643
Point 147	0	315.01616
Point 148	126.916	317.39267
Point 149	624.2673	344.64
Point 150	642.7896	345.19608
Point 151	639.8757	348.10995
Point 152	623.7369	347.62543
Point 153	543.8794	321.01441
Point 154	351.3589	316.67806
Point 155	172.0125	320.88559
Point 156	158.9189	322.69398
Point 157	146.5027	320.75996
Point 158	161.8204	329.91734
Point 159	162.0292	329.91734
Point 160	169.8774	325.99323
Point 161	172.2537	323.88076
Point 162	158.8927	325.72607
Point 163	146.2426	323.75561
Point 164	144.6459	323.72571
Point 165	157.0292	329.91734
Point 166	643.2531	345.21
Point 167	651.9258	349.55
Point 168	666.9304	350
Point 169	668.3508	349.29
Point 170	707.4035	333.53244
Point 171	710.6052	333.51008

Point 172	711.3189	333.31046
Point 173	713.7443	332.66283
Point 174	720.1721	330.67297
Point 175	739.1283	324.2612
Point 176	741.6802	324.18848
Point 177	742.0676	324.05019
Point 178	742.3962	324.02195
Point 179	746.7331	323.94086
Point 180	751.5295	323.84082
Point 181	788.6259	323.10687
Point 182	797.7821	322.91441
Point 183	839	322.03859
Point 184	704.3877	335.67695
Point 185	758.6353	353.74048
Point 186	806.6964	369.75012
Point 187	818.5728	368.55874
Point 188	839	375.2318
Point 189	623.3833	349.61571
Point 190	636.5766	350.01181
Point 191	637.9727	350.01292
Point 192	0	260
Point 193	839	260

Lines

	Start Point	End Point	Stress/Strain Boundary	Hydraulic Boundary
Line 1	1	2		
Line 2	2	3		
Line 3	3	4		
Line 4	4	5		
Line 5	5	1		
Line 6	6	7		
Line 7	7	8	Fixed X	
Line 8	8	9		noflowzeropress
Line 9	9	6		
Line 10	10	11		
Line 11	11	1		
Line 12	2	10		
Line 13	11	12		

Line 14	12	13		
Line 15	13	10		
Line 16	14	15		
Line 17	15	16		
Line 18	16	17		
Line 19	17	13		
Line 20	12	18		
Line 21	19	20		
Line 22	20	21		
Line 23	21	15		
Line 24	14	19		
Line 25	20	22		
Line 26	22	23		
Line 27	23	19		
Line 28	22	24		
Line 29	24	25		
Line 30	25	23		
Line 31	26	27		
Line 32	27	25		
Line 33	24	26		
Line 34	28	29		
Line 35	29	30		
Line 36	30	26		
Line 37	27	28		
Line 38	29	31		
Line 39	32	33		
Line 40	33	34		
Line 41	34	35		
Line 42	35	36		
Line 43	36	37		
Line 44	37	38		
Line 45	38	39		
Line 46	39	40		
Line 47	40	41		
Line 48	41	42		
Line 49	42	43		
Line 50	43	44		
Line 51	44	45		
Line 52	45	46		

Line 53	46	28		
Line 54	38	48		
Line 55	48	49		
Line 56	49	47		
Line 57	49	50		
Line 58	50	51		
Line 59	51	52		
Line 60	52	53		
Line 61	53	54		
Line 62	54	55		
Line 63	55	56		
Line 64	56	57		
Line 65	57	48		
Line 66	58	59		
Line 67	59	60		
Line 68	60	61		
Line 69	61	62		
Line 70	62	63		
Line 71	63	64		
Line 72	64	65		
Line 73	65	66		
Line 74	66	67		
Line 75	67	68	Fixed X	Drainage 315
Line 76	68	69		
Line 77	69	70		
Line 78	70	71		
Line 79	71	72		
Line 80	72	73		
Line 81	73	74		
Line 82	74	75		
Line 83	75	76		
Line 84	76	77		
Line 85	77	78		
Line 86	68	79	Fixed X	Drainage 315
Line 87	79	80		
Line 88	80	81		
Line 89	81	82		
Line 90	82	83		
Line 91	83	84		

Line 92	84	85		
Line 93	85	86		
Line 94	86	87		
Line 95	87	88		
Line 96	88	89		
Line 97	90	91		
Line 98	91	92		
Line 99	92	93		
Line 100	93	94		
Line 101	94	95		
Line 102	95	96		
Line 103	96	97		
Line 104	97	98		
Line 105	98	99		
Line 106	99	100		
Line 107	100	79	Fixed X	Drainage 315
Line 108	100	101	Fixed X	Drainage 315
Line 109	101	102		
Line 110	102	103		
Line 111	103	104		
Line 112	104	105		
Line 113	105	106		
Line 114	106	107		
Line 115	107	108		
Line 116	108	109		
Line 117	109	110		
Line 118	110	111		
Line 119	111	112		
Line 120	112	113		
Line 121	113	114		
Line 122	101	115	Fixed X	Drainage 315
Line 123	115	116		no flow
Line 124	116	117		no flow
Line 125	117	118		no flow
Line 126	118	119		no flow
Line 127	119	120		no flow
Line 128	120	121		no flow
Line 129	121	122		
Line 130	122	123		no flow

Line 131	123	124		no flow
Line 132	124	125		no flow
Line 133	125	126		no flow
Line 134	126	127		no flow
Line 135	127	128		noflowzeropress
Line 136	128	129		noflowzeropress
Line 137	129	130		noflowzeropress
Line 138	130	131		
Line 139	131	132		noflowzeropress
Line 140	132	133		noflowzeropress
Line 141	133	134		
Line 142	134	135		
Line 143	135	136		
Line 144	136	137		
Line 145	137	138		
Line 146	138	139		
Line 147	139	140		
Line 148	140	141		
Line 149	141	142		
Line 150	142	143		
Line 151	143	144		
Line 152	144	145		
Line 153	145	146		
Line 154	146	147		
Line 155	147	148		
Line 156	148	9		
Line 157	148	146		
Line 158	141	149		
Line 159	149	150		
Line 160	150	151		
Line 161	151	152		no flow
Line 162	152	153		no flow
Line 163	153	154		no flow
Line 164	154	155		no flow
Line 165	155	156		no flow
Line 166	156	157		no flow
Line 167	157	9		no flow
Line 168	158	159		
Line 169	159	160		

Line 170	160	3		
Line 171	3	161		
Line 172	161	162		
Line 173	162	163		
Line 174	163	164		
Line 175	164	165		
Line 176	165	158		
Line 177	150	166		
Line 178	166	167		
Line 179	167	168		
Line 180	168	169		
Line 181	169	134		
Line 182	127	170		
Line 183	170	171		
Line 184	171	172		
Line 185	172	173		
Line 186	173	174		
Line 187	174	175		
Line 188	175	176		
Line 189	176	177		
Line 190	177	178		
Line 191	178	179		
Line 192	179	180		
Line 193	180	181		
Line 194	181	182		
Line 195	182	183		
Line 196	183	115	Fixed X	
Line 197	184	185		
Line 198	185	186		
Line 199	186	187		
Line 200	187	188		
Line 201	188	183	Fixed X	
Line 202	127	184		
Line 203	6	164		
Line 204	189	190		
Line 205	190	191		
Line 206	191	151		
Line 207	18	189		
Line 208	18	14		

Line 209	47	31		
Line 210	31	32		
Line 211	58	192	Fixed X	Drainage 315
Line 212	192	193	Fixed X/Y	Drainage 315
Line 213	193	67	Fixed X	Drainage 315
Line 214	78	58	Fixed X	Drainage 315
Line 215	89	78	Fixed X	Drainage 315
Line 216	89	90	Fixed X	Drainage 315
Line 217	114	90	Fixed X	Drainage 315
Line 218	147	114	Fixed X	Drainage 315
Line 219	8	147	Fixed X	

Regions

	Material	Points	Area (ft²)
Region 1	Waste Material	1,2,3,4,5	2,684.8
Region 2	NOT ACTIVE	6,7,8,9	409.18
Region 3	Waste Material	10,11,1,2	2,281.4
Region 4	Waste Material	10,11,12,13	2,317.2
Region 5	Waste Material	14,15,16,17,13,12,18	2,329.2
Region 6	Waste Material	19,20,21,15,14	2,120.4
Region 7	Waste Material	19,20,22,23	1,940.1
Region 8	Waste Material	23,22,24,25	1,759.8
Region 9	NOT ACTIVE	26,27,25,24	1,579.6
Region 10	NOT ACTIVE	28,29,30,26,27	1,399.5
Region 11	NOT ACTIVE	29,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,28	963.75
Region 12	NOT ACTIVE	47,31,32,33,34,35,36,37,38,48,49	1,129
Region 13	NOT ACTIVE	49,50,51,52,53,54,55,56,57,48	563.69
Region 14	Lower Till	58,59,60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78	3,000.7
Region 15	Sand/Silt	78,77,76,75,74,73,72,71,70,69,68,79,80,81,82,83,84,85,86,87,88,89	7,768.6
Region 16	GC-Drained	90,91,92,93,94,95,96,97,98,99,100,79,80,81,82,83,84,85,86,87,88,89	10,108
Region 17	GC OverConsolidated	90,91,92,93,94,95,96,97,98,99,100,101,102,103,104,105,106,107,108,109,110,111,112,113,114	2,873.1
Region 18	Upper Till	114,113,112,111,110,109,108,107,106,105,104,103,102,101,115,116,117,118,119,120,121,122,123,124,125,126,127,128,129,130,131,132,133,134,135,136,137,138,139,140,141,142,143,144,145,146,147	9,788.5
Region 19	Structural Fill	8,147,148,9	390.2

Region 20	CCL	148,146,145,144,143,142,141,149,150,151,152,153,154,155,156,157,9	1,547.9
Region 21	Structural Fill	158,159,160,3,161,162,163,164,165	80.098
Region 22	Waste Material	150,166,167,168,169,134,135,136,137,138,139,140,141,149	1,602.2
Region 23	CCL	127,170,171,172,173,174,175,176,177,178,179,180,181,182,183,115,116,117,118,119,120,121,122,123,124,125,126	957.6
Region 24	Waste Material	184,185,186,187,188,183,182,181,180,179,178,177,176,175,174,173,172,171,170,127	4,345.4
Region 25	Bottom Liner	157,9,6,164,163,162,161,3,4,5,1,11,12,18,189,190,191,151,152,153,154,155,156	1,423.6
Region 26	UPPER SHALE	58,192,193,67,66,65,64,63,62,61,60,59	15,370

Figure 14 - Coupled Consolidation for Section OP-1 for Waste Lift 8

WASTE LIFT 8 EL. 371

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File Information

Title: Model City - RMU-2 CP-20 Section OP-1
Comments: Operation Conditions for CP-20 Section 1 Based on Maximum Fill Rate of 50,000 Cu Yds per Quarter
Created By: Peter J. Carey
Last Edited By: Peter J. Carey
Revision Number: 511
File Version: 8.0
Tool Version: 8.0.10.6504
Date: 2/24/2013
Time: 3:48:00 PM
File Name: C20OP-1r1.gsz
Directory: N:\Model_City\154.002_rmu2\154.005_revsions\geoslope\operational\

Project Settings

Length(L) Units: feet
Time(t) Units: Days
Force(F) Units: lbf
Pressure(p) Units: psf
Strength Units: psf
Stiffness Units: psf
Unit Weight of Water: 62.4 pcf
Air Pressure: 101.33 psf
View: 2D

Analysis Settings

WASTE LIFT 8 EL. 371

Description: WASTE LIFT 8 C-20 OP-1 progression
Kind: SIGMA/W
Parent: WASTE LIFT7 EL. 365
Method: Coupled Stress/PWP
Settings
    Initial Stress: Parent Analysis
    Initial PWP: Parent Analysis
    Exclude cumulative values: No
Control
    Apply Body Force in All Steps: No
    Saturated Zone Only: No
Convergence
    Maximum Number of Iterations: 50
    Minimum Pressure Head Difference: 0.001
    Minimum Displacement Difference: 0.001

Significant Digits: 3
Hydraulic Under-Relaxation Criteria
Under-Relaxation Initial Rate: 1
Under-Relaxation Min. Rate: 0.1
Under-Relaxation Reduction Rate: 0.65
Under-Relaxation Iterations: 10
Equation Solver: Parallel Direct
Time
Starting Time: 601 days
Duration: 34 days
# of Steps: 12
Step Generation Method: Linear
Save Steps Every: 4

Materials

Waste Material

Model: Linear Elastic (Total)
Stress Strain
Young's Modulus (E): 400,000 psf
Unit Weight: 111 pcf
Poisson's Ratio: 0.45

Bottom Liner

Model: Linear Elastic (Total)
Stress Strain
Young's Modulus (E): 400,000 psf
Unit Weight: 120 pcf
Poisson's Ratio: 0.45

CCL

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 1,000,000 psf
Unit Weight: 120 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Clay soils OC
K-Function: GC 5.7 E-4 ft/day
Ky'/Kx' Ratio: 0.1
Rotation: 0 °
Load Response Ratio: 1

Upper Till

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 300,000 psf
Unit Weight: 125 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Till

K-Function: Upper Glacial Till
Ky'/Kx' Ratio: 1
Rotation: 0 °
Load Response Ratio: 1

GC-Drained

Model: Soft Clay (MCC w/ PWP Change)
Stress Strain
O.C. Ratio: 4
Poisson's Ratio: 0.334
Lambda: 0.14
Kappa: 0.013
Initial Void Ratio: 1
Unit Weight: 118 pcf
Phi': 27 °
Hydraulic
Vol. WC. Function: Clay soils
K-Function: GC 5.7 E-4 ft/day
Ky'/Kx' Ratio: 1
Rotation: 0 °
K-Modifier Function: 1D consol derived k function rmu2 clay
Load Response Ratio: 1

GC OverConsolidated

Model: Soft Clay (MCC w/ PWP Change)
Stress Strain
O.C. Ratio: 8
Poisson's Ratio: 0.334
Lambda: 0.06
Kappa: 0.01
Initial Void Ratio: 0.5
Unit Weight: 125 pcf
Phi': 30 °
Hydraulic
Vol. WC. Function: Clay soils OC
K-Function: GC 5.7 E-4 ft/day
Ky'/Kx' Ratio: 1
Rotation: 0 °
K-Modifier Function: 1D consol derived k function rmu2 clay
Load Response Ratio: 1

Sand/Silt

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 300,000 psf
Unit Weight: 135 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: silty sand
K-Function: Silty Sand, k = 0.567 ft/day 2 E-4cm/sec
Ky'/Kx' Ratio: 0.1
Rotation: 0 °

Load Response Ratio: 1

Lower Till

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 600,000 psf
Unit Weight: 145 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Till
K-Function: Till
Ky'/Kx' Ratio: 1
Rotation: 0 °
Load Response Ratio: 1

Structural Fill

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 100,000 psf
Unit Weight: 135 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Till
K-Function: Till
Ky'/Kx' Ratio: 1
Rotation: 0 °
Load Response Ratio: 1

UPPER SHALE

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 1,000,000 psf
Unit Weight: 145 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Till
K-Function: Upper Rock
Ky'/Kx' Ratio: 1
Rotation: 0 °
Load Response Ratio: 1

NOT ACTIVE

Model: (none)

Boundary Conditions

Fixed X

X: X-Displacement 0

Fixed X/Y

X: X-Displacement 0

Y: Y-Displacement 0

Drainage 315

Type: Head (H) 315
Review: No

no flow

Type: Total Flux (Q) 0
Review: No

noflowzeropress

Type: Total Flux (Q) 0
Review: Yes

Initial Water Tables

Initial Water Table 1

Max. negative head: 5
Coordinates
Coordinate 1: (0, 315) ft
Coordinate 2: (850, 315) ft

K Functions

Silty Sand, k = 0.567 ft/day 2 E-4cm/sec

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 36 %
K-Saturation: 0.567
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (0.005, 0.567)
Data Point: (0.01, 0.567)
Data Point: (0.035938, 0.567)
Data Point: (0.12915, 0.567)
Data Point: (0.46416, 0.567)
Data Point: (1.1111, 0.567)
Data Point: (1.6681, 0.567)
Data Point: (5.9948, 0.567)
Data Point: (21.544, 0.567)
Data Point: (77.426, 0.567)
Data Point: (105.93, 0.5402376)
Data Point: (210.74, 0.3387258)
Data Point: (278.26, 0.2567376)
Data Point: (315.56, 0.2232846)
Data Point: (420.37, 0.1406916)
Data Point: (525.19, 0.0779121)
Data Point: (630, 0.03843882)
Data Point: (734.81, 0.01673406)

Data Point: (839.63, 0.005422788)
Data Point: (944.44, 0.000745983)
Data Point: (1,000, 7.14735e-005)

Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Upper Glacial Till

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 36 %
K-Saturation: 0.0057
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (0.005, 0.0057)
Data Point: (0.01, 0.0057)
Data Point: (0.046416, 0.0057)
Data Point: (0.21544, 0.0057)
Data Point: (1, 0.0057)
Data Point: (4.6416, 0.0057)
Data Point: (11.111, 0.0057)
Data Point: (21.544, 0.0057)
Data Point: (100, 0.0057)
Data Point: (464.16, 0.0016245)
Data Point: (1,059.3, 0.0002427972)
Data Point: (2,107.4, 1.492716e-005)
Data Point: (2,154.4, 1.369596e-005)
Data Point: (3,155.6, 4.086672e-006)
Data Point: (4,203.7, 1.82115e-006)
Data Point: (5,251.9, 9.03222e-007)
Data Point: (6,300, 4.30521e-007)
Data Point: (7,348.1, 2.028516e-007)
Data Point: (8,396.3, 7.73661e-008)
Data Point: (9,444.4, 2.691312e-008)
Data Point: (10,000, 2.691312e-008)

Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Upper Rock

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 36 %

K-Saturation: 0.567
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (0.005, 0.567)
Data Point: (0.01, 0.567)
Data Point: (10,000, 0.567)
Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Till

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 36 %
K-Saturation: 0.000567
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (0.005, 0.000567)
Data Point: (0.01, 0.000567)
Data Point: (10,000, 0.000567)
Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

GC 5.7 E-4 ft/day

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 100 %
K-Saturation: 0.00057
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (10, 0.00057)
Data Point: (1,000, 9e-006)
Data Point: (5,000, 5e-006)
Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Hydraulic K Modifier Functions

1D consol derived k function rmu2 clay

Model: Spline Data Point Function (Y Log)
Function: K-Modifier vs. Y-Effective Stress
Curve Fit to Data: 100 %
Segment Curvature: 75 %
Y-Intercept: 1.2
Data Points: Y-Effective Stress (psf), K-Modifier
Data Point: (1,000, 1.2)
Data Point: (2,000, 1)
Data Point: (4,000, 0.839)
Data Point: (8,000, 0.70417211)
Data Point: (12,000, 0.63551782)
Data Point: (16,000, 0.59090577)

Vol. Water Content Functions

Clay soils OC

Model: Vol WC Data Point Function
Function: Vol. Water Content vs. Pore-Water Pressure
Mv: 7e-005 /psf
Saturated Water Content: 0.31427274 ft^3/ft^3
Residual Water Content: 0.031427274 ft^3/ft^3
Curve Fit to Data: 100 %
Segment Curvature: 100 %
Porosity: 0.31427274
Data Points: Matric Suction (psf), Vol. Water Content (ft^3/ft^3)
Data Point: (0.01, 0.29999999)
Data Point: (0.018329807, 0.29999998)
Data Point: (0.033598183, 0.29999996)
Data Point: (0.061584821, 0.29999991)
Data Point: (0.11288379, 0.29999982)
Data Point: (0.20691381, 0.29999962)
Data Point: (0.37926902, 0.29999917)
Data Point: (0.6951928, 0.29999814)
Data Point: (1.274275, 0.29999578)
Data Point: (2.3357215, 0.29999026)
Data Point: (4.2813324, 0.2999772)
Data Point: (7.8475997, 0.29994599)
Data Point: (14.384499, 0.29987093)
Data Point: (26.366509, 0.29968944)
Data Point: (48.329302, 0.29924951)
Data Point: (88.586679, 0.29818464)
Data Point: (162.37767, 0.29563126)
Data Point: (297.63514, 0.28967022)
Data Point: (545.55948, 0.27661743)
Data Point: (1,000, 0.25163343)
Estimation Properties
Vol. WC Estimation Method: Sample functions

Saturated Water Content: 0.3 ft^3/ft^3
Sample Material: Clay
Liquid Limit: 0 %
Diameter at 10% passing: 0
Diameter at 60% passing: 0
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Clay soils

Model: Vol WC Data Point Function
Function: Vol. Water Content vs. Pore-Water Pressure
Mv: 0.0004 /psf
Saturated Water Content: 0.60995302 ft^3/ft^3
Residual Water Content: 0.060995302 ft^3/ft^3
Curve Fit to Data: 100 %
Segment Curvature: 100 %
Porosity: 0.60995302
Data Points: Matric Suction (psf), Vol. Water Content (ft^3/ft^3)
Data Point: (0.01, 0.43999998)
Data Point: (0.018329807, 0.43999997)
Data Point: (0.033598183, 0.43999994)
Data Point: (0.061584821, 0.43999987)
Data Point: (0.11288379, 0.43999974)
Data Point: (0.20691381, 0.43999944)
Data Point: (0.37926902, 0.43999878)
Data Point: (0.6951928, 0.43999728)
Data Point: (1.274275, 0.43999381)
Data Point: (2.3357215, 0.43998571)
Data Point: (4.2813324, 0.43996655)
Data Point: (7.8475997, 0.43992079)
Data Point: (14.384499, 0.4398107)
Data Point: (26.366509, 0.43954452)
Data Point: (48.329302, 0.43889927)
Data Point: (88.586679, 0.43733747)
Data Point: (162.37767, 0.43359251)
Data Point: (297.63514, 0.42484965)
Data Point: (545.55948, 0.40570556)
Data Point: (1,000, 0.36906236)
Estimation Properties
Vol. WC Estimation Method: Sample functions
Saturated Water Content: 0.44 ft^3/ft^3
Sample Material: Clay
Liquid Limit: 0 %
Diameter at 10% passing: 0
Diameter at 60% passing: 0
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Till

Model: Vol WC Data Point Function

Function: Vol. Water Content vs. Pore-Water Pressure
Mv: 5e-006 /psf
Saturated Water Content: 0.20000173 ft^3/ft^3
Residual Water Content: 0.020000173 ft^3/ft^3
Curve Fit to Data: 100 %
Segment Curvature: 100 %
Porosity: 0.20000173
Data Points: Matric Suction (psf), Vol. Water Content (ft^3/ft^3)
Data Point: (0.01, 0.19999999)
Data Point: (0.018329807, 0.19999999)
Data Point: (0.033598183, 0.19999997)
Data Point: (0.061584821, 0.19999993)
Data Point: (0.11288379, 0.19999985)
Data Point: (0.20691381, 0.19999967)
Data Point: (0.37926902, 0.19999922)
Data Point: (0.6951928, 0.19999811)
Data Point: (1.274275, 0.19999535)
Data Point: (2.3357215, 0.19998838)
Data Point: (4.2813324, 0.19997056)
Data Point: (7.8475997, 0.19992471)
Data Point: (14.384499, 0.19980625)
Data Point: (26.366509, 0.19949952)
Data Point: (48.329302, 0.19870702)
Data Point: (88.586679, 0.19668084)
Data Point: (162.37767, 0.19165467)
Data Point: (297.63514, 0.18009116)
Data Point: (545.55948, 0.15752337)
Data Point: (1,000, 0.12453739)
Estimation Properties
Vol. WC Estimation Method: Sample functions
Saturated Water Content: 0.2 ft^3/ft^3
Sample Material: Silty Clay
Liquid Limit: 0 %
Diameter at 10% passing: 0
Diameter at 60% passing: 0
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

silty sand

Model: Vol WC Data Point Function
Function: Vol. Water Content vs. Pore-Water Pressure
Mv: 1e-005 /psf
Saturated Water Content: 0.30000011 ft^3/ft^3
Residual Water Content: 0.030000011 ft^3/ft^3
Curve Fit to Data: 100 %
Segment Curvature: 100 %
Porosity: 0.30000011
Data Points: Matric Suction (psf), Vol. Water Content (ft^3/ft^3)
Data Point: (0.01, 0.29999996)
Data Point: (0.018329807, 0.29999991)
Data Point: (0.033598183, 0.29999977)

Data Point: (0.061584821, 0.29999942)
Data Point: (0.11288379, 0.29999854)
Data Point: (0.20691381, 0.29999626)
Data Point: (0.37926902, 0.29999039)
Data Point: (0.6951928, 0.29997521)
Data Point: (1.274275, 0.29993588)
Data Point: (2.3357215, 0.29983385)
Data Point: (4.2813324, 0.29956912)
Data Point: (7.8475997, 0.29888334)
Data Point: (14.384499, 0.29711648)
Data Point: (26.366509, 0.29263189)
Data Point: (48.329302, 0.28167657)
Data Point: (88.586679, 0.25725429)
Data Point: (162.37767, 0.21239326)
Data Point: (297.63514, 0.15298031)
Data Point: (545.55948, 0.099847233)
Data Point: (1,000, 0.064649441)

Estimation Properties

Vol. WC Estimation Method: Sample functions
Saturated Water Content: 0.3 ft^3/ft^3
Sample Material: Silty Sand
Liquid Limit: 0 %
Diameter at 10% passing: 0
Diameter at 60% passing: 0
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Points

	X (ft)	Y (ft)
Point 1	561.5172	329
Point 2	184.2753	329
Point 3	174.1934	323.83525
Point 4	351.3603	319.67886
Point 5	546.7523	324.07989
Point 6	139.5241	323.62981
Point 7	0	321.01609
Point 8	0	318.01563
Point 9	133.22	320.51124
Point 10	196.3072	335
Point 11	579.5227	335
Point 12	597.5282	341
Point 13	208.339	341
Point 14	608.5585	347
Point 15	240.1424	347

Point 16	234.9596	345.27685
Point 17	219.929	346.77965
Point 18	611.3486	345.60539
Point 19	596.5548	353
Point 20	258.1852	353
Point 21	250.6076	350.4794
Point 22	276.2227	359
Point 23	584.5511	359
Point 24	294.2603	365
Point 25	572.5474	365
Point 26	312.2978	371
Point 27	560.5437	371
Point 28	548.5399	377
Point 29	330.1036	377
Point 30	325.5389	375.4045
Point 31	337.8201	379.69712
Point 32	364.4177	380
Point 33	381.0855	380.33726
Point 34	395.5929	380.71635
Point 35	416.8543	381.25666
Point 36	438.0487	382
Point 37	479.1653	383
Point 38	511.5499	383
Point 39	512.0826	382.82242
Point 40	513.8708	383
Point 41	531.0491	383
Point 42	533.1096	382.31347
Point 43	533.1107	382.31305
Point 44	536.5271	381.01628
Point 45	537.9265	380.70839
Point 46	547.5083	377.51565
Point 47	346.883	383
Point 48	493.5541	389
Point 49	363.3465	389
Point 50	371.2953	391.89686
Point 51	372.0119	391.98713
Point 52	372.2345	391.99514
Point 53	372.3208	392
Point 54	374.2156	392.05341

Point 55	419.4544	394.02388
Point 56	423.1399	394.1518
Point 57	476.0285	394.84323
Point 58	0	275.56112
Point 59	82.561	276.49127
Point 60	84.7322	276.34451
Point 61	123.7177	276.54438
Point 62	191.6961	277.65321
Point 63	430.1918	279.01879
Point 64	487.7086	279.639
Point 65	509.7138	279.55021
Point 66	721.9937	279.02461
Point 67	839	278.53365
Point 68	839	283.95091
Point 69	694.2381	280.02879
Point 70	505.5772	282.211
Point 71	487.7086	281.69555
Point 72	430.1918	282.66537
Point 73	247.1163	283.77931
Point 74	191.6961	282.79673
Point 75	123.7177	280.19493
Point 76	93.9325	281.10076
Point 77	61.0988	279.7585
Point 78	0	281.01485
Point 79	839	292.1407
Point 80	505.5772	286.98428
Point 81	487.7086	287.07159
Point 82	430.1918	289.73652
Point 83	247.1163	297.70175
Point 84	123.7177	292.05467
Point 85	94.7708	289.80875
Point 86	84.7322	289.65003
Point 87	82.561	289.66397
Point 88	38.9609	289.4325
Point 89	0	289.19587
Point 90	0	300.53803
Point 91	17.729	300.30563
Point 92	61.8788	299.93669
Point 93	191.626	301.3549

Point 94	247.1555	301.9218
Point 95	430.2162	304.83853
Point 96	487.7442	304.85433
Point 97	505.6491	305.27434
Point 98	509.7473	305.37466
Point 99	564.3735	305.25518
Point 100	839	303.47923
Point 101	839	306.47929
Point 102	564.3865	308.25516
Point 103	509.7138	308.37474
Point 104	505.5772	308.27348
Point 105	487.7086	307.85432
Point 106	430.1918	307.83852
Point 107	247.1163	304.92156
Point 108	191.6961	304.35577
Point 109	123.7177	308.23059
Point 110	93.9325	306.13974
Point 111	81.2213	307.4429
Point 112	61.5521	302.93952
Point 113	17.7611	303.30547
Point 114	0	303.53785
Point 115	839	315.0402
Point 116	797.6335	315.91598
Point 117	788.4831	316.10833
Point 118	751.3873	316.84226
Point 119	746.5947	316.94222
Point 120	742.0308	317.02756
Point 121	740.5664	317.15339
Point 122	740.3716	317.22293
Point 123	737.8797	317.29393
Point 124	718.0152	324.01292
Point 125	711.8056	325.93525
Point 126	706.0898	327.46147
Point 127	700.0454	333.50592
Point 128	694.499	330.73293
Point 129	691.9982	333.23326
Point 130	680.0323	333.54954
Point 131	679.8975	333.54516
Point 132	674.9116	331.05465

Point 133	672.911	331.05491
Point 134	672.1929	333.92615
Point 135	648.0416	332
Point 136	642.1238	328.67972
Point 137	637.4622	326.05461
Point 138	633.8287	324
Point 139	632.6094	323.29395
Point 140	630.3447	322
Point 141	556.3265	322
Point 142	544.3989	318.02536
Point 143	351.3575	313.67727
Point 144	171.7713	317.89042
Point 145	158.9451	319.66188
Point 146	146.7629	317.7643
Point 147	0	315.01616
Point 148	126.916	317.39267
Point 149	624.2673	344.64
Point 150	642.7896	345.19608
Point 151	639.8757	348.10995
Point 152	623.7369	347.62543
Point 153	543.8794	321.01441
Point 154	351.3589	316.67806
Point 155	172.0125	320.88559
Point 156	158.9189	322.69398
Point 157	146.5027	320.75996
Point 158	161.8204	329.91734
Point 159	162.0292	329.91734
Point 160	169.8774	325.99323
Point 161	172.2537	323.88076
Point 162	158.8927	325.72607
Point 163	146.2426	323.75561
Point 164	144.6459	323.72571
Point 165	157.0292	329.91734
Point 166	643.2531	345.21
Point 167	651.9258	349.55
Point 168	666.9304	350
Point 169	668.3508	349.29
Point 170	707.4035	333.53244
Point 171	710.6052	333.51008

Point 172	711.3189	333.31046
Point 173	713.7443	332.66283
Point 174	720.1721	330.67297
Point 175	739.1283	324.2612
Point 176	741.6802	324.18848
Point 177	742.0676	324.05019
Point 178	742.3962	324.02195
Point 179	746.7331	323.94086
Point 180	751.5295	323.84082
Point 181	788.6259	323.10687
Point 182	797.7821	322.91441
Point 183	839	322.03859
Point 184	704.3877	335.67695
Point 185	758.6353	353.74048
Point 186	806.6964	369.75012
Point 187	818.5728	368.55874
Point 188	839	375.2318
Point 189	623.3833	349.61571
Point 190	636.5766	350.01181
Point 191	637.9727	350.01292
Point 192	0	260
Point 193	839	260

Lines

	Start Point	End Point	Stress/Strain Boundary	Hydraulic Boundary
Line 1	1	2		
Line 2	2	3		
Line 3	3	4		
Line 4	4	5		
Line 5	5	1		
Line 6	6	7		
Line 7	7	8	Fixed X	
Line 8	8	9		noflowzeropress
Line 9	9	6		
Line 10	10	11		
Line 11	11	1		
Line 12	2	10		
Line 13	11	12		

Line 14	12	13		
Line 15	13	10		
Line 16	14	15		
Line 17	15	16		
Line 18	16	17		
Line 19	17	13		
Line 20	12	18		
Line 21	19	20		
Line 22	20	21		
Line 23	21	15		
Line 24	14	19		
Line 25	20	22		
Line 26	22	23		
Line 27	23	19		
Line 28	22	24		
Line 29	24	25		
Line 30	25	23		
Line 31	26	27		
Line 32	27	25		
Line 33	24	26		
Line 34	28	29		
Line 35	29	30		
Line 36	30	26		
Line 37	27	28		
Line 38	29	31		
Line 39	32	33		
Line 40	33	34		
Line 41	34	35		
Line 42	35	36		
Line 43	36	37		
Line 44	37	38		
Line 45	38	39		
Line 46	39	40		
Line 47	40	41		
Line 48	41	42		
Line 49	42	43		
Line 50	43	44		
Line 51	44	45		
Line 52	45	46		

Line 53	46	28		
Line 54	38	48		
Line 55	48	49		
Line 56	49	47		
Line 57	49	50		
Line 58	50	51		
Line 59	51	52		
Line 60	52	53		
Line 61	53	54		
Line 62	54	55		
Line 63	55	56		
Line 64	56	57		
Line 65	57	48		
Line 66	58	59		
Line 67	59	60		
Line 68	60	61		
Line 69	61	62		
Line 70	62	63		
Line 71	63	64		
Line 72	64	65		
Line 73	65	66		
Line 74	66	67		
Line 75	67	68	Fixed X	Drainage 315
Line 76	68	69		
Line 77	69	70		
Line 78	70	71		
Line 79	71	72		
Line 80	72	73		
Line 81	73	74		
Line 82	74	75		
Line 83	75	76		
Line 84	76	77		
Line 85	77	78		
Line 86	68	79	Fixed X	Drainage 315
Line 87	79	80		
Line 88	80	81		
Line 89	81	82		
Line 90	82	83		
Line 91	83	84		

Line 92	84	85		
Line 93	85	86		
Line 94	86	87		
Line 95	87	88		
Line 96	88	89		
Line 97	90	91		
Line 98	91	92		
Line 99	92	93		
Line 100	93	94		
Line 101	94	95		
Line 102	95	96		
Line 103	96	97		
Line 104	97	98		
Line 105	98	99		
Line 106	99	100		
Line 107	100	79	Fixed X	Drainage 315
Line 108	100	101	Fixed X	Drainage 315
Line 109	101	102		
Line 110	102	103		
Line 111	103	104		
Line 112	104	105		
Line 113	105	106		
Line 114	106	107		
Line 115	107	108		
Line 116	108	109		
Line 117	109	110		
Line 118	110	111		
Line 119	111	112		
Line 120	112	113		
Line 121	113	114		
Line 122	101	115	Fixed X	Drainage 315
Line 123	115	116		no flow
Line 124	116	117		no flow
Line 125	117	118		no flow
Line 126	118	119		no flow
Line 127	119	120		no flow
Line 128	120	121		no flow
Line 129	121	122		
Line 130	122	123		no flow

Line 131	123	124		no flow
Line 132	124	125		no flow
Line 133	125	126		no flow
Line 134	126	127		no flow
Line 135	127	128		noflowzeropress
Line 136	128	129		noflowzeropress
Line 137	129	130		noflowzeropress
Line 138	130	131		
Line 139	131	132		noflowzeropress
Line 140	132	133		noflowzeropress
Line 141	133	134		
Line 142	134	135		
Line 143	135	136		
Line 144	136	137		
Line 145	137	138		
Line 146	138	139		
Line 147	139	140		
Line 148	140	141		
Line 149	141	142		
Line 150	142	143		
Line 151	143	144		
Line 152	144	145		
Line 153	145	146		
Line 154	146	147		
Line 155	147	148		
Line 156	148	9		
Line 157	148	146		
Line 158	141	149		
Line 159	149	150		
Line 160	150	151		
Line 161	151	152		no flow
Line 162	152	153		no flow
Line 163	153	154		no flow
Line 164	154	155		no flow
Line 165	155	156		no flow
Line 166	156	157		no flow
Line 167	157	9		no flow
Line 168	158	159		
Line 169	159	160		

Line 170	160	3		
Line 171	3	161		
Line 172	161	162		
Line 173	162	163		
Line 174	163	164		
Line 175	164	165		
Line 176	165	158		
Line 177	150	166		
Line 178	166	167		
Line 179	167	168		
Line 180	168	169		
Line 181	169	134		
Line 182	127	170		
Line 183	170	171		
Line 184	171	172		
Line 185	172	173		
Line 186	173	174		
Line 187	174	175		
Line 188	175	176		
Line 189	176	177		
Line 190	177	178		
Line 191	178	179		
Line 192	179	180		
Line 193	180	181		
Line 194	181	182		
Line 195	182	183		
Line 196	183	115	Fixed X	
Line 197	184	185		
Line 198	185	186		
Line 199	186	187		
Line 200	187	188		
Line 201	188	183	Fixed X	
Line 202	127	184		
Line 203	6	164		
Line 204	189	190		
Line 205	190	191		
Line 206	191	151		
Line 207	18	189		
Line 208	18	14		

Line 209	47	31		
Line 210	31	32		
Line 211	58	192	Fixed X	Drainage 315
Line 212	192	193	Fixed X/Y	Drainage 315
Line 213	193	67	Fixed X	Drainage 315
Line 214	78	58	Fixed X	Drainage 315
Line 215	89	78	Fixed X	Drainage 315
Line 216	89	90	Fixed X	Drainage 315
Line 217	114	90	Fixed X	Drainage 315
Line 218	147	114	Fixed X	Drainage 315
Line 219	8	147	Fixed X	

Regions

	Material	Points	Area (ft²)
Region 1	Waste Material	1,2,3,4,5	2,684.8
Region 2	NOT ACTIVE	6,7,8,9	409.18
Region 3	Waste Material	10,11,1,2	2,281.4
Region 4	Waste Material	10,11,12,13	2,317.2
Region 5	Waste Material	14,15,16,17,13,12,18	2,329.2
Region 6	Waste Material	19,20,21,15,14	2,120.4
Region 7	Waste Material	19,20,22,23	1,940.1
Region 8	Waste Material	23,22,24,25	1,759.8
Region 9	Waste Material	26,27,25,24	1,579.6
Region 10	NOT ACTIVE	28,29,30,26,27	1,399.5
Region 11	NOT ACTIVE	29,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,28	963.75
Region 12	NOT ACTIVE	47,31,32,33,34,35,36,37,38,48,49	1,129
Region 13	NOT ACTIVE	49,50,51,52,53,54,55,56,57,48	563.69
Region 14	Lower Till	58,59,60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78	3,000.7
Region 15	Sand/Silt	78,77,76,75,74,73,72,71,70,69,68,79,80,81,82,83,84,85,86,87,88,89	7,768.6
Region 16	GC-Drained	90,91,92,93,94,95,96,97,98,99,100,79,80,81,82,83,84,85,86,87,88,89	10,108
Region 17	GC OverConsolidated	90,91,92,93,94,95,96,97,98,99,100,101,102,103,104,105,106,107,108,109,110,111,112,113,114	2,873.1
Region 18	Upper Till	114,113,112,111,110,109,108,107,106,105,104,103,102,101,115,116,117,118,119,120,121,122,123,124,125,126,127,128,129,130,131,132,133,134,135,136,137,138,139,140,141,142,143,144,145,146,147	9,788.5
Region 19	Structural Fill	8,147,148,9	390.2

Region 20	CCL	148,146,145,144,143,142,141,149,150,151,152,153,154,155,156,157,9	1,547.9
Region 21	Structural Fill	158,159,160,3,161,162,163,164,165	80.098
Region 22	Waste Material	150,166,167,168,169,134,135,136,137,138,139,140,141,149	1,602.2
Region 23	CCL	127,170,171,172,173,174,175,176,177,178,179,180,181,182,183,115,116,117,118,119,120,121,122,123,124,125,126	957.6
Region 24	Waste Material	184,185,186,187,188,183,182,181,180,179,178,177,176,175,174,173,172,171,170,127	4,345.4
Region 25	Bottom Liner	157,9,6,164,163,162,161,3,4,5,1,11,12,18,189,190,191,151,152,153,154,155,156	1,423.6
Region 26	UPPER SHALE	58,192,193,67,66,65,64,63,62,61,60,59	15,370

Figure 15 - Coupled Consolidation for Section OP-1 for Waste Lift 9

WASTE LIFT 9 EL. 377

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File Information

Title: Model City - RMU-2 CP-20 Section OP-1
Comments: Operation Conditions for CP-20 Section 1 Based on Maximum Fill Rate of 50,000 Cu Yds per Quarter
Created By: Peter J. Carey
Last Edited By: Peter J. Carey
Revision Number: 511
File Version: 8.0
Tool Version: 8.0.10.6504
Date: 2/24/2013
Time: 3:48:00 PM
File Name: C20OP-1r1.gsz
Directory: N:\Model_City\154.002_rmu2\154.005_revsions\geoslope\operational\

Project Settings

Length(L) Units: feet
Time(t) Units: Days
Force(F) Units: lbf
Pressure(p) Units: psf
Strength Units: psf
Stiffness Units: psf
Unit Weight of Water: 62.4 pcf
Air Pressure: 101.33 psf
View: 2D

Analysis Settings

WASTE LIFT 9 EL. 377

Description: WASTE LIFT 9 C-20 OP-1 progression
Kind: SIGMA/W
Parent: WASTE LIFT 8 EL. 371
Method: Coupled Stress/PWP
Settings
- Initial Stress: Parent Analysis
- Initial PWP: Parent Analysis
- Exclude cumulative values: No

Control
- Apply Body Force in All Steps: No
- Saturated Zone Only: No

Convergence
- Maximum Number of Iterations: 50
- Minimum Pressure Head Difference: 0.001
- Minimum Displacement Difference: 0.001

Significant Digits: 3
Hydraulic Under-Relaxation Criteria
Under-Relaxation Initial Rate: 1
Under-Relaxation Min. Rate: 0.1
Under-Relaxation Reduction Rate: 0.65
Under-Relaxation Iterations: 10
Equation Solver: Parallel Direct
Time
Starting Time: 635 days
Duration: 25 days
# of Steps: 12
Step Generation Method: Linear
Save Steps Every: 4

Materials

Waste Material

Model: Linear Elastic (Total)
Stress Strain
Young's Modulus (E): 400,000 psf
Unit Weight: 111 pcf
Poisson's Ratio: 0.45

Bottom Liner

Model: Linear Elastic (Total)
Stress Strain
Young's Modulus (E): 400,000 psf
Unit Weight: 120 pcf
Poisson's Ratio: 0.45

CCL

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 1,000,000 psf
Unit Weight: 120 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Clay soils OC
K-Function: GC 5.7 E-4 ft/day
Ky'/Kx' Ratio: 0.1
Rotation: 0 °
Load Response Ratio: 1

Upper Till

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 300,000 psf
Unit Weight: 125 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Till

K-Function: Upper Glacial Till
Ky'/Kx' Ratio: 1
Rotation: 0 °
Load Response Ratio: 1

GC-Drained

Model: Soft Clay (MCC w/ PWP Change)
Stress Strain
O.C. Ratio: 4
Poisson's Ratio: 0.334
Lambda: 0.14
Kappa: 0.013
Initial Void Ratio: 1
Unit Weight: 118 pcf
Phi': 27 °
Hydraulic
Vol. WC. Function: Clay soils
K-Function: GC 5.7 E-4 ft/day
Ky'/Kx' Ratio: 1
Rotation: 0 °
K-Modifier Function: 1D consol derived k function rmu2 clay
Load Response Ratio: 1

GC OverConsolidated

Model: Soft Clay (MCC w/ PWP Change)
Stress Strain
O.C. Ratio: 8
Poisson's Ratio: 0.334
Lambda: 0.06
Kappa: 0.01
Initial Void Ratio: 0.5
Unit Weight: 125 pcf
Phi': 30 °
Hydraulic
Vol. WC. Function: Clay soils OC
K-Function: GC 5.7 E-4 ft/day
Ky'/Kx' Ratio: 1
Rotation: 0 °
K-Modifier Function: 1D consol derived k function rmu2 clay
Load Response Ratio: 1

Sand/Silt

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 300,000 psf
Unit Weight: 135 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: silty sand
K-Function: Silty Sand, k = 0.567 ft/day 2 E-4cm/sec
Ky'/Kx' Ratio: 0.1
Rotation: 0 °

Load Response Ratio: 1

Lower Till

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 600,000 psf
Unit Weight: 145 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Till
K-Function: Till
Ky'/Kx' Ratio: 1
Rotation: 0 °
Load Response Ratio: 1

Structural Fill

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 100,000 psf
Unit Weight: 135 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Till
K-Function: Till
Ky'/Kx' Ratio: 1
Rotation: 0 °
Load Response Ratio: 1

UPPER SHALE

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 1,000,000 psf
Unit Weight: 145 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Till
K-Function: Upper Rock
Ky'/Kx' Ratio: 1
Rotation: 0 °
Load Response Ratio: 1

NOT ACTIVE

Model: (none)

Boundary Conditions

Fixed X

X: X-Displacement 0

Fixed X/Y

X: X-Displacement 0

Y: Y-Displacement 0

Drainage 315

Type: Head (H) 315
Review: No

no flow

Type: Total Flux (Q) 0
Review: No

noflowzeropress

Type: Total Flux (Q) 0
Review: Yes

Initial Water Tables

Initial Water Table 1

Max. negative head: 5
Coordinates
Coordinate 1: (0, 315) ft
Coordinate 2: (850, 315) ft

K Functions

Silty Sand, k = 0.567 ft/day 2 E-4cm/sec

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 36 %
K-Saturation: 0.567
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (0.005, 0.567)
Data Point: (0.01, 0.567)
Data Point: (0.035938, 0.567)
Data Point: (0.12915, 0.567)
Data Point: (0.46416, 0.567)
Data Point: (1.1111, 0.567)
Data Point: (1.6681, 0.567)
Data Point: (5.9948, 0.567)
Data Point: (21.544, 0.567)
Data Point: (77.426, 0.567)
Data Point: (105.93, 0.5402376)
Data Point: (210.74, 0.3387258)
Data Point: (278.26, 0.2567376)
Data Point: (315.56, 0.2232846)
Data Point: (420.37, 0.1406916)
Data Point: (525.19, 0.0779121)
Data Point: (630, 0.03843882)
Data Point: (734.81, 0.01673406)

Data Point: (839.63, 0.005422788)
Data Point: (944.44, 0.000745983)
Data Point: (1,000, 7.14735e-005)

Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Upper Glacial Till

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 36 %
K-Saturation: 0.0057
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (0.005, 0.0057)
Data Point: (0.01, 0.0057)
Data Point: (0.046416, 0.0057)
Data Point: (0.21544, 0.0057)
Data Point: (1, 0.0057)
Data Point: (4.6416, 0.0057)
Data Point: (11.111, 0.0057)
Data Point: (21.544, 0.0057)
Data Point: (100, 0.0057)
Data Point: (464.16, 0.0016245)
Data Point: (1,059.3, 0.0002427972)
Data Point: (2,107.4, 1.492716e-005)
Data Point: (2,154.4, 1.369596e-005)
Data Point: (3,155.6, 4.086672e-006)
Data Point: (4,203.7, 1.82115e-006)
Data Point: (5,251.9, 9.03222e-007)
Data Point: (6,300, 4.30521e-007)
Data Point: (7,348.1, 2.028516e-007)
Data Point: (8,396.3, 7.73661e-008)
Data Point: (9,444.4, 2.691312e-008)
Data Point: (10,000, 2.691312e-008)

Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Upper Rock

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 36 %

K-Saturation: 0.567
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (0.005, 0.567)
Data Point: (0.01, 0.567)
Data Point: (10,000, 0.567)
Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Till

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 36 %
K-Saturation: 0.000567
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (0.005, 0.000567)
Data Point: (0.01, 0.000567)
Data Point: (10,000, 0.000567)
Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

GC 5.7 E-4 ft/day

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 100 %
K-Saturation: 0.00057
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (10, 0.00057)
Data Point: (1,000, 9e-006)
Data Point: (5,000, 5e-006)
Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Hydraulic K Modifier Functions

1D consol derived k function rmu2 clay

Model: Spline Data Point Function (Y Log)
Function: K-Modifier vs. Y-Effective Stress
Curve Fit to Data: 100 %
Segment Curvature: 75 %
Y-Intercept: 1.2
Data Points: Y-Effective Stress (psf), K-Modifier
Data Point: (1,000, 1.2)
Data Point: (2,000, 1)
Data Point: (4,000, 0.839)
Data Point: (8,000, 0.70417211)
Data Point: (12,000, 0.63551782)
Data Point: (16,000, 0.59090577)

Vol. Water Content Functions

Clay soils OC

Model: Vol WC Data Point Function
Function: Vol. Water Content vs. Pore-Water Pressure
Mv: 7e-005 /psf
Saturated Water Content: 0.31427274 ft^3/ft^3
Residual Water Content: 0.031427274 ft^3/ft^3
Curve Fit to Data: 100 %
Segment Curvature: 100 %
Porosity: 0.31427274
Data Points: Matric Suction (psf), Vol. Water Content (ft^3/ft^3)
Data Point: (0.01, 0.29999999)
Data Point: (0.018329807, 0.29999998)
Data Point: (0.033598183, 0.29999996)
Data Point: (0.061584821, 0.29999991)
Data Point: (0.11288379, 0.29999982)
Data Point: (0.20691381, 0.29999962)
Data Point: (0.37926902, 0.29999917)
Data Point: (0.6951928, 0.29999814)
Data Point: (1.274275, 0.29999578)
Data Point: (2.3357215, 0.29999026)
Data Point: (4.2813324, 0.2999772)
Data Point: (7.8475997, 0.29994599)
Data Point: (14.384499, 0.29987093)
Data Point: (26.366509, 0.29968944)
Data Point: (48.329302, 0.29924951)
Data Point: (88.586679, 0.29818464)
Data Point: (162.37767, 0.29563126)
Data Point: (297.63514, 0.28967022)
Data Point: (545.55948, 0.27661743)
Data Point: (1,000, 0.25163343)
Estimation Properties
Vol. WC Estimation Method: Sample functions

Saturated Water Content: 0.3 ft^3/ft^3
Sample Material: Clay
Liquid Limit: 0 %
Diameter at 10% passing: 0
Diameter at 60% passing: 0
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Clay soils

Model: Vol WC Data Point Function
Function: Vol. Water Content vs. Pore-Water Pressure
Mv: 0.0004 /psf
Saturated Water Content: 0.60995302 ft^3/ft^3
Residual Water Content: 0.060995302 ft^3/ft^3
Curve Fit to Data: 100 %
Segment Curvature: 100 %
Porosity: 0.60995302
Data Points: Matric Suction (psf), Vol. Water Content (ft^3/ft^3)
Data Point: (0.01, 0.43999998)
Data Point: (0.018329807, 0.43999997)
Data Point: (0.033598183, 0.43999994)
Data Point: (0.061584821, 0.43999987)
Data Point: (0.11288379, 0.43999974)
Data Point: (0.20691381, 0.43999944)
Data Point: (0.37926902, 0.43999878)
Data Point: (0.6951928, 0.43999728)
Data Point: (1.274275, 0.43999381)
Data Point: (2.3357215, 0.43998571)
Data Point: (4.2813324, 0.43996655)
Data Point: (7.8475997, 0.43992079)
Data Point: (14.384499, 0.4398107)
Data Point: (26.366509, 0.43954452)
Data Point: (48.329302, 0.43889927)
Data Point: (88.586679, 0.43733747)
Data Point: (162.37767, 0.43359251)
Data Point: (297.63514, 0.42484965)
Data Point: (545.55948, 0.40570556)
Data Point: (1,000, 0.36906236)
Estimation Properties
Vol. WC Estimation Method: Sample functions
Saturated Water Content: 0.44 ft^3/ft^3
Sample Material: Clay
Liquid Limit: 0 %
Diameter at 10% passing: 0
Diameter at 60% passing: 0
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Till

Model: Vol WC Data Point Function

Function: Vol. Water Content vs. Pore-Water Pressure
- Mv: 5e-006 /psf
- Saturated Water Content: 0.20000173 ft^3/ft^3
- Residual Water Content: 0.020000173 ft^3/ft^3
- Curve Fit to Data: 100 %
- Segment Curvature: 100 %

Porosity: 0.20000173

Data Points: Matric Suction (psf), Vol. Water Content (ft^3/ft^3)
- Data Point: (0.01, 0.19999999)
- Data Point: (0.018329807, 0.19999999)
- Data Point: (0.033598183, 0.19999997)
- Data Point: (0.061584821, 0.19999993)
- Data Point: (0.11288379, 0.19999985)
- Data Point: (0.20691381, 0.19999967)
- Data Point: (0.37926902, 0.19999922)
- Data Point: (0.6951928, 0.19999811)
- Data Point: (1.274275, 0.19999535)
- Data Point: (2.3357215, 0.19998838)
- Data Point: (4.2813324, 0.19997056)
- Data Point: (7.8475997, 0.19992471)
- Data Point: (14.384499, 0.19980625)
- Data Point: (26.366509, 0.19949952)
- Data Point: (48.329302, 0.19870702)
- Data Point: (88.586679, 0.19668084)
- Data Point: (162.37767, 0.19165467)
- Data Point: (297.63514, 0.18009116)
- Data Point: (545.55948, 0.15752337)
- Data Point: (1,000, 0.12453739)

Estimation Properties
- Vol. WC Estimation Method: Sample functions
- Saturated Water Content: 0.2 ft^3/ft^3
- Sample Material: Silty Clay
- Liquid Limit: 0 %
- Diameter at 10% passing: 0
- Diameter at 60% passing: 0
- Maximum: 1,000
- Minimum: 0.01
- Num. Points: 20

silty sand

Model: Vol WC Data Point Function

Function: Vol. Water Content vs. Pore-Water Pressure
- Mv: 1e-005 /psf
- Saturated Water Content: 0.30000011 ft^3/ft^3
- Residual Water Content: 0.030000011 ft^3/ft^3
- Curve Fit to Data: 100 %
- Segment Curvature: 100 %

Porosity: 0.30000011

Data Points: Matric Suction (psf), Vol. Water Content (ft^3/ft^3)
- Data Point: (0.01, 0.29999996)
- Data Point: (0.018329807, 0.29999991)
- Data Point: (0.033598183, 0.29999977)

Data Point: (0.061584821, 0.29999942)
Data Point: (0.11288379, 0.29999854)
Data Point: (0.20691381, 0.29999626)
Data Point: (0.37926902, 0.29999039)
Data Point: (0.6951928, 0.29997521)
Data Point: (1.274275, 0.29993588)
Data Point: (2.3357215, 0.29983385)
Data Point: (4.2813324, 0.29956912)
Data Point: (7.8475997, 0.29888334)
Data Point: (14.384499, 0.29711648)
Data Point: (26.366509, 0.29263189)
Data Point: (48.329302, 0.28167657)
Data Point: (88.586679, 0.25725429)
Data Point: (162.37767, 0.21239326)
Data Point: (297.63514, 0.15298031)
Data Point: (545.55948, 0.099847233)
Data Point: (1,000, 0.064649441)

Estimation Properties

Vol. WC Estimation Method: Sample functions
Saturated Water Content: 0.3 ft^3/ft^3
Sample Material: Silty Sand
Liquid Limit: 0 %
Diameter at 10% passing: 0
Diameter at 60% passing: 0
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Points

	X (ft)	Y (ft)
Point 1	561.5172	329
Point 2	184.2753	329
Point 3	174.1934	323.83525
Point 4	351.3603	319.67886
Point 5	546.7523	324.07989
Point 6	139.5241	323.62981
Point 7	0	321.01609
Point 8	0	318.01563
Point 9	133.22	320.51124
Point 10	196.3072	335
Point 11	579.5227	335
Point 12	597.5282	341
Point 13	208.339	341
Point 14	608.5585	347
Point 15	240.1424	347

Point 16	234.9596	345.27685
Point 17	219.929	346.77965
Point 18	611.3486	345.60539
Point 19	596.5548	353
Point 20	258.1852	353
Point 21	250.6076	350.4794
Point 22	276.2227	359
Point 23	584.5511	359
Point 24	294.2603	365
Point 25	572.5474	365
Point 26	312.2978	371
Point 27	560.5437	371
Point 28	548.5399	377
Point 29	330.1036	377
Point 30	325.5389	375.4045
Point 31	337.8201	379.69712
Point 32	364.4177	380
Point 33	381.0855	380.33726
Point 34	395.5929	380.71635
Point 35	416.8543	381.25666
Point 36	438.0487	382
Point 37	479.1653	383
Point 38	511.5499	383
Point 39	512.0826	382.82242
Point 40	513.8708	383
Point 41	531.0491	383
Point 42	533.1096	382.31347
Point 43	533.1107	382.31305
Point 44	536.5271	381.01628
Point 45	537.9265	380.70839
Point 46	547.5083	377.51565
Point 47	346.883	383
Point 48	493.5541	389
Point 49	363.3465	389
Point 50	371.2953	391.89686
Point 51	372.0119	391.98713
Point 52	372.2345	391.99514
Point 53	372.3208	392
Point 54	374.2156	392.05341

Point 55	419.4544	394.02388
Point 56	423.1399	394.1518
Point 57	476.0285	394.84323
Point 58	0	275.56112
Point 59	82.561	276.49127
Point 60	84.7322	276.34451
Point 61	123.7177	276.54438
Point 62	191.6961	277.65321
Point 63	430.1918	279.01879
Point 64	487.7086	279.639
Point 65	509.7138	279.55021
Point 66	721.9937	279.02461
Point 67	839	278.53365
Point 68	839	283.95091
Point 69	694.2381	280.02879
Point 70	505.5772	282.211
Point 71	487.7086	281.69555
Point 72	430.1918	282.66537
Point 73	247.1163	283.77931
Point 74	191.6961	282.79673
Point 75	123.7177	280.19493
Point 76	93.9325	281.10076
Point 77	61.0988	279.7585
Point 78	0	281.01485
Point 79	839	292.1407
Point 80	505.5772	286.98428
Point 81	487.7086	287.07159
Point 82	430.1918	289.73652
Point 83	247.1163	297.70175
Point 84	123.7177	292.05467
Point 85	94.7708	289.80875
Point 86	84.7322	289.65003
Point 87	82.561	289.66397
Point 88	38.9609	289.4325
Point 89	0	289.19587
Point 90	0	300.53803
Point 91	17.729	300.30563
Point 92	61.8788	299.93669
Point 93	191.626	301.3549

Point 94	247.1555	301.9218
Point 95	430.2162	304.83853
Point 96	487.7442	304.85433
Point 97	505.6491	305.27434
Point 98	509.7473	305.37466
Point 99	564.3735	305.25518
Point 100	839	303.47923
Point 101	839	306.47929
Point 102	564.3865	308.25516
Point 103	509.7138	308.37474
Point 104	505.5772	308.27348
Point 105	487.7086	307.85432
Point 106	430.1918	307.83852
Point 107	247.1163	304.92156
Point 108	191.6961	304.35577
Point 109	123.7177	308.23059
Point 110	93.9325	306.13974
Point 111	81.2213	307.4429
Point 112	61.5521	302.93952
Point 113	17.7611	303.30547
Point 114	0	303.53785
Point 115	839	315.0402
Point 116	797.6335	315.91598
Point 117	788.4831	316.10833
Point 118	751.3873	316.84226
Point 119	746.5947	316.94222
Point 120	742.0308	317.02756
Point 121	740.5664	317.15339
Point 122	740.3716	317.22293
Point 123	737.8797	317.29393
Point 124	718.0152	324.01292
Point 125	711.8056	325.93525
Point 126	706.0898	327.46147
Point 127	700.0454	333.50592
Point 128	694.499	330.73293
Point 129	691.9982	333.23326
Point 130	680.0323	333.54954
Point 131	679.8975	333.54516
Point 132	674.9116	331.05465

Point 133	672.911	331.05491
Point 134	672.1929	333.92615
Point 135	648.0416	332
Point 136	642.1238	328.67972
Point 137	637.4622	326.05461
Point 138	633.8287	324
Point 139	632.6094	323.29395
Point 140	630.3447	322
Point 141	556.3265	322
Point 142	544.3989	318.02536
Point 143	351.3575	313.67727
Point 144	171.7713	317.89042
Point 145	158.9451	319.66188
Point 146	146.7629	317.7643
Point 147	0	315.01616
Point 148	126.916	317.39267
Point 149	624.2673	344.64
Point 150	642.7896	345.19608
Point 151	639.8757	348.10995
Point 152	623.7369	347.62543
Point 153	543.8794	321.01441
Point 154	351.3589	316.67806
Point 155	172.0125	320.88559
Point 156	158.9189	322.69398
Point 157	146.5027	320.75996
Point 158	161.8204	329.91734
Point 159	162.0292	329.91734
Point 160	169.8774	325.99323
Point 161	172.2537	323.88076
Point 162	158.8927	325.72607
Point 163	146.2426	323.75561
Point 164	144.6459	323.72571
Point 165	157.0292	329.91734
Point 166	643.2531	345.21
Point 167	651.9258	349.55
Point 168	666.9304	350
Point 169	668.3508	349.29
Point 170	707.4035	333.53244
Point 171	710.6052	333.51008

Point 172	711.3189	333.31046
Point 173	713.7443	332.66283
Point 174	720.1721	330.67297
Point 175	739.1283	324.2612
Point 176	741.6802	324.18848
Point 177	742.0676	324.05019
Point 178	742.3962	324.02195
Point 179	746.7331	323.94086
Point 180	751.5295	323.84082
Point 181	788.6259	323.10687
Point 182	797.7821	322.91441
Point 183	839	322.03859
Point 184	704.3877	335.67695
Point 185	758.6353	353.74048
Point 186	806.6964	369.75012
Point 187	818.5728	368.55874
Point 188	839	375.2318
Point 189	623.3833	349.61571
Point 190	636.5766	350.01181
Point 191	637.9727	350.01292
Point 192	0	260
Point 193	839	260

Lines

	Start Point	End Point	Stress/Strain Boundary	Hydraulic Boundary
Line 1	1	2		
Line 2	2	3		
Line 3	3	4		
Line 4	4	5		
Line 5	5	1		
Line 6	6	7		
Line 7	7	8	Fixed X	
Line 8	8	9		noflowzeropress
Line 9	9	6		
Line 10	10	11		
Line 11	11	1		
Line 12	2	10		
Line 13	11	12		

Line 14	12	13		
Line 15	13	10		
Line 16	14	15		
Line 17	15	16		
Line 18	16	17		
Line 19	17	13		
Line 20	12	18		
Line 21	19	20		
Line 22	20	21		
Line 23	21	15		
Line 24	14	19		
Line 25	20	22		
Line 26	22	23		
Line 27	23	19		
Line 28	22	24		
Line 29	24	25		
Line 30	25	23		
Line 31	26	27		
Line 32	27	25		
Line 33	24	26		
Line 34	28	29		
Line 35	29	30		
Line 36	30	26		
Line 37	27	28		
Line 38	29	31		
Line 39	32	33		
Line 40	33	34		
Line 41	34	35		
Line 42	35	36		
Line 43	36	37		
Line 44	37	38		
Line 45	38	39		
Line 46	39	40		
Line 47	40	41		
Line 48	41	42		
Line 49	42	43		
Line 50	43	44		
Line 51	44	45		
Line 52	45	46		

Line 53	46	28		
Line 54	38	48		
Line 55	48	49		
Line 56	49	47		
Line 57	49	50		
Line 58	50	51		
Line 59	51	52		
Line 60	52	53		
Line 61	53	54		
Line 62	54	55		
Line 63	55	56		
Line 64	56	57		
Line 65	57	48		
Line 66	58	59		
Line 67	59	60		
Line 68	60	61		
Line 69	61	62		
Line 70	62	63		
Line 71	63	64		
Line 72	64	65		
Line 73	65	66		
Line 74	66	67		
Line 75	67	68	Fixed X	Drainage 315
Line 76	68	69		
Line 77	69	70		
Line 78	70	71		
Line 79	71	72		
Line 80	72	73		
Line 81	73	74		
Line 82	74	75		
Line 83	75	76		
Line 84	76	77		
Line 85	77	78		
Line 86	68	79	Fixed X	Drainage 315
Line 87	79	80		
Line 88	80	81		
Line 89	81	82		
Line 90	82	83		
Line 91	83	84		

Line 92	84	85		
Line 93	85	86		
Line 94	86	87		
Line 95	87	88		
Line 96	88	89		
Line 97	90	91		
Line 98	91	92		
Line 99	92	93		
Line 100	93	94		
Line 101	94	95		
Line 102	95	96		
Line 103	96	97		
Line 104	97	98		
Line 105	98	99		
Line 106	99	100		
Line 107	100	79	Fixed X	Drainage 315
Line 108	100	101	Fixed X	Drainage 315
Line 109	101	102		
Line 110	102	103		
Line 111	103	104		
Line 112	104	105		
Line 113	105	106		
Line 114	106	107		
Line 115	107	108		
Line 116	108	109		
Line 117	109	110		
Line 118	110	111		
Line 119	111	112		
Line 120	112	113		
Line 121	113	114		
Line 122	101	115	Fixed X	Drainage 315
Line 123	115	116		no flow
Line 124	116	117		no flow
Line 125	117	118		no flow
Line 126	118	119		no flow
Line 127	119	120		no flow
Line 128	120	121		no flow
Line 129	121	122		
Line 130	122	123		no flow

Line 131	123	124		no flow
Line 132	124	125		no flow
Line 133	125	126		no flow
Line 134	126	127		no flow
Line 135	127	128		noflowzeropress
Line 136	128	129		noflowzeropress
Line 137	129	130		noflowzeropress
Line 138	130	131		
Line 139	131	132		noflowzeropress
Line 140	132	133		noflowzeropress
Line 141	133	134		
Line 142	134	135		
Line 143	135	136		
Line 144	136	137		
Line 145	137	138		
Line 146	138	139		
Line 147	139	140		
Line 148	140	141		
Line 149	141	142		
Line 150	142	143		
Line 151	143	144		
Line 152	144	145		
Line 153	145	146		
Line 154	146	147		
Line 155	147	148		
Line 156	148	9		
Line 157	148	146		
Line 158	141	149		
Line 159	149	150		
Line 160	150	151		
Line 161	151	152		no flow
Line 162	152	153		no flow
Line 163	153	154		no flow
Line 164	154	155		no flow
Line 165	155	156		no flow
Line 166	156	157		no flow
Line 167	157	9		no flow
Line 168	158	159		
Line 169	159	160		

Line 170	160	3		
Line 171	3	161		
Line 172	161	162		
Line 173	162	163		
Line 174	163	164		
Line 175	164	165		
Line 176	165	158		
Line 177	150	166		
Line 178	166	167		
Line 179	167	168		
Line 180	168	169		
Line 181	169	134		
Line 182	127	170		
Line 183	170	171		
Line 184	171	172		
Line 185	172	173		
Line 186	173	174		
Line 187	174	175		
Line 188	175	176		
Line 189	176	177		
Line 190	177	178		
Line 191	178	179		
Line 192	179	180		
Line 193	180	181		
Line 194	181	182		
Line 195	182	183		
Line 196	183	115	Fixed X	
Line 197	184	185		
Line 198	185	186		
Line 199	186	187		
Line 200	187	188		
Line 201	188	183	Fixed X	
Line 202	127	184		
Line 203	6	164		
Line 204	189	190		
Line 205	190	191		
Line 206	191	151		
Line 207	18	189		
Line 208	18	14		

Line 209	47	31		
Line 210	31	32		
Line 211	58	192	Fixed X	Drainage 315
Line 212	192	193	Fixed X/Y	Drainage 315
Line 213	193	67	Fixed X	Drainage 315
Line 214	78	58	Fixed X	Drainage 315
Line 215	89	78	Fixed X	Drainage 315
Line 216	89	90	Fixed X	Drainage 315
Line 217	114	90	Fixed X	Drainage 315
Line 218	147	114	Fixed X	Drainage 315
Line 219	8	147	Fixed X	

Regions

	Material	Points	Area (ft²)
Region 1	Waste Material	1,2,3,4,5	2,684.8
Region 2	NOT ACTIVE	6,7,8,9	409.18
Region 3	Waste Material	10,11,1,2	2,281.4
Region 4	Waste Material	10,11,12,13	2,317.2
Region 5	Waste Material	14,15,16,17,13,12,18	2,329.2
Region 6	Waste Material	19,20,21,15,14	2,120.4
Region 7	Waste Material	19,20,22,23	1,940.1
Region 8	Waste Material	23,22,24,25	1,759.8
Region 9	Waste Material	26,27,25,24	1,579.6
Region 10	Waste Material	28,29,30,26,27	1,399.5
Region 11	NOT ACTIVE	29,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,28	963.75
Region 12	NOT ACTIVE	47,31,32,33,34,35,36,37,38,48,49	1,129
Region 13	NOT ACTIVE	49,50,51,52,53,54,55,56,57,48	563.69
Region 14	Lower Till	58,59,60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78	3,000.7
Region 15	Sand/Silt	78,77,76,75,74,73,72,71,70,69,68,79,80,81,82,83,84,85,86,87,88,89	7,768.6
Region 16	GC-Drained	90,91,92,93,94,95,96,97,98,99,100,79,80,81,82,83,84,85,86,87,88,89	10,108
Region 17	GC OverConsolidated	90,91,92,93,94,95,96,97,98,99,100,101,102,103,104,105,106,107,108,109,110,111,112,113,114	2,873.1
Region 18	Upper Till	114,113,112,111,110,109,108,107,106,105,104,103,102,101,115,116,117,118,119,120,121,122,123,124,125,126,127,128,129,130,131,132,133,134,135,136,137,138,139,140,141,142,143,144,145,146,147	9,788.5
Region 19	Structural Fill	8,147,148,9	390.2

Region 20	CCL	148,146,145,144,143,142,141,149,150,151,152,153,154,155,156,157,9	1,547.9
Region 21	Structural Fill	158,159,160,3,161,162,163,164,165	80.098
Region 22	Waste Material	150,166,167,168,169,134,135,136,137,138,139,140,141,149	1,602.2
Region 23	CCL	127,170,171,172,173,174,175,176,177,178,179,180,181,182,183,115,116,117,118,119,120,121,122,123,124,125,126	957.6
Region 24	Waste Material	184,185,186,187,188,183,182,181,180,179,178,177,176,175,174,173,172,171,170,127	4,345.4
Region 25	Bottom Liner	157,9,6,164,163,162,161,3,4,5,1,11,12,18,189,190,191,151,152,153,154,155,156	1,423.6
Region 26	UPPER SHALE	58,192,193,67,66,65,64,63,62,61,60,59	15,370

Figure 16 - Coupled Consolidation for Section OP-1 for Waste Lift 10

WASTE LIFT 10 EL. 383

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File Information

Title: Model City - RMU-2 CP-20 Section OP-1
Comments: Operation Conditions for CP-20 Section 1 Based on Maximum Fill Rate of 50,000 Cu Yds per Quarter
Created By: Peter J. Carey
Last Edited By: Peter J. Carey
Revision Number: 511
File Version: 8.0
Tool Version: 8.0.10.6504
Date: 2/24/2013
Time: 3:48:00 PM
File Name: C20OP-1r1.gsz
Directory: N:\Model_City\154.002_rmu2\154.005_revsions\geoslope\operational\

Project Settings

Length(L) Units: feet
Time(t) Units: Days
Force(F) Units: lbf
Pressure(p) Units: psf
Strength Units: psf
Stiffness Units: psf
Unit Weight of Water: 62.4 pcf
Air Pressure: 101.33 psf
View: 2D

Analysis Settings

WASTE LIFT 10 EL. 383

Description: WASTE LIFT 10 C-20 OP-1 progression
Kind: SIGMA/W
Parent: WASTE LIFT 9 EL. 377
Method: Coupled Stress/PWP
Settings
- Initial Stress: Parent Analysis
- Initial PWP: Parent Analysis
- Exclude cumulative values: No

Control
- Apply Body Force in All Steps: No
- Saturated Zone Only: No

Convergence
- Maximum Number of Iterations: 50
- Minimum Pressure Head Difference: 0.001
- Minimum Displacement Difference: 0.001

Significant Digits: 3
Hydraulic Under-Relaxation Criteria
Under-Relaxation Initial Rate: 1
Under-Relaxation Min. Rate: 0.1
Under-Relaxation Reduction Rate: 0.65
Under-Relaxation Iterations: 10
Equation Solver: Parallel Direct
Time
Starting Time: 660 days
Duration: 13 days
# of Steps: 12
Step Generation Method: Linear
Save Steps Every: 4

Materials

Waste Material

Model: Linear Elastic (Total)
Stress Strain
Young's Modulus (E): 400,000 psf
Unit Weight: 111 pcf
Poisson's Ratio: 0.45

Bottom Liner

Model: Linear Elastic (Total)
Stress Strain
Young's Modulus (E): 400,000 psf
Unit Weight: 120 pcf
Poisson's Ratio: 0.45

CCL

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 1,000,000 psf
Unit Weight: 120 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Clay soils OC
K-Function: GC 5.7 E-4 ft/day
Ky'/Kx' Ratio: 0.1
Rotation: 0 °
Load Response Ratio: 1

Upper Till

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 300,000 psf
Unit Weight: 125 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Till

K-Function: Upper Glacial Till
Ky'/Kx' Ratio: 1
Rotation: 0 °
Load Response Ratio: 1

GC-Drained

Model: Soft Clay (MCC w/ PWP Change)
Stress Strain
O.C. Ratio: 4
Poisson's Ratio: 0.334
Lambda: 0.14
Kappa: 0.013
Initial Void Ratio: 1
Unit Weight: 118 pcf
Phi': 27 °
Hydraulic
Vol. WC. Function: Clay soils
K-Function: GC 5.7 E-4 ft/day
Ky'/Kx' Ratio: 1
Rotation: 0 °
K-Modifier Function: 1D consol derived k function rmu2 clay
Load Response Ratio: 1

GC OverConsolidated

Model: Soft Clay (MCC w/ PWP Change)
Stress Strain
O.C. Ratio: 8
Poisson's Ratio: 0.334
Lambda: 0.06
Kappa: 0.01
Initial Void Ratio: 0.5
Unit Weight: 125 pcf
Phi': 30 °
Hydraulic
Vol. WC. Function: Clay soils OC
K-Function: GC 5.7 E-4 ft/day
Ky'/Kx' Ratio: 1
Rotation: 0 °
K-Modifier Function: 1D consol derived k function rmu2 clay
Load Response Ratio: 1

Sand/Silt

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 300,000 psf
Unit Weight: 135 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: silty sand
K-Function: Silty Sand, k = 0.567 ft/day 2 E-4cm/sec
Ky'/Kx' Ratio: 0.1
Rotation: 0 °

Load Response Ratio: 1

Lower Till

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 600,000 psf
Unit Weight: 145 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Till
K-Function: Till
Ky'/Kx' Ratio: 1
Rotation: 0 °
Load Response Ratio: 1

Structural Fill

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 100,000 psf
Unit Weight: 135 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Till
K-Function: Till
Ky'/Kx' Ratio: 1
Rotation: 0 °
Load Response Ratio: 1

UPPER SHALE

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 1,000,000 psf
Unit Weight: 145 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Till
K-Function: Upper Rock
Ky'/Kx' Ratio: 1
Rotation: 0 °
Load Response Ratio: 1

NOT ACTIVE

Model: (none)

Boundary Conditions

Fixed X

X: X-Displacement 0

Fixed X/Y

X: X-Displacement 0

Y: Y-Displacement 0

Drainage 315

Type: Head (H) 315
Review: No

no flow

Type: Total Flux (Q) 0
Review: No

noflowzeropress

Type: Total Flux (Q) 0
Review: Yes

Initial Water Tables

Initial Water Table 1

Max. negative head: 5
Coordinates
Coordinate 1: (0, 315) ft
Coordinate 2: (850, 315) ft

K Functions

Silty Sand, k = 0.567 ft/day 2 E-4cm/sec

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 36 %
K-Saturation: 0.567
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (0.005, 0.567)
Data Point: (0.01, 0.567)
Data Point: (0.035938, 0.567)
Data Point: (0.12915, 0.567)
Data Point: (0.46416, 0.567)
Data Point: (1.1111, 0.567)
Data Point: (1.6681, 0.567)
Data Point: (5.9948, 0.567)
Data Point: (21.544, 0.567)
Data Point: (77.426, 0.567)
Data Point: (105.93, 0.5402376)
Data Point: (210.74, 0.3387258)
Data Point: (278.26, 0.2567376)
Data Point: (315.56, 0.2232846)
Data Point: (420.37, 0.1406916)
Data Point: (525.19, 0.0779121)
Data Point: (630, 0.03843882)
Data Point: (734.81, 0.01673406)

Data Point: (839.63, 0.005422788)
Data Point: (944.44, 0.000745983)
Data Point: (1,000, 7.14735e-005)

Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Upper Glacial Till

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 36 %
K-Saturation: 0.0057
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (0.005, 0.0057)
Data Point: (0.01, 0.0057)
Data Point: (0.046416, 0.0057)
Data Point: (0.21544, 0.0057)
Data Point: (1, 0.0057)
Data Point: (4.6416, 0.0057)
Data Point: (11.111, 0.0057)
Data Point: (21.544, 0.0057)
Data Point: (100, 0.0057)
Data Point: (464.16, 0.0016245)
Data Point: (1,059.3, 0.0002427972)
Data Point: (2,107.4, 1.492716e-005)
Data Point: (2,154.4, 1.369596e-005)
Data Point: (3,155.6, 4.086672e-006)
Data Point: (4,203.7, 1.82115e-006)
Data Point: (5,251.9, 9.03222e-007)
Data Point: (6,300, 4.30521e-007)
Data Point: (7,348.1, 2.028516e-007)
Data Point: (8,396.3, 7.73661e-008)
Data Point: (9,444.4, 2.691312e-008)
Data Point: (10,000, 2.691312e-008)

Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Upper Rock

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 36 %

K-Saturation: 0.567
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (0.005, 0.567)
Data Point: (0.01, 0.567)
Data Point: (10,000, 0.567)
Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Till

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 36 %
K-Saturation: 0.000567
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (0.005, 0.000567)
Data Point: (0.01, 0.000567)
Data Point: (10,000, 0.000567)
Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

GC 5.7 E-4 ft/day

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 100 %
K-Saturation: 0.00057
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (10, 0.00057)
Data Point: (1,000, 9e-006)
Data Point: (5,000, 5e-006)
Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Hydraulic K Modifier Functions

1D consol derived k function rmu2 clay

Model: Spline Data Point Function (Y Log)
Function: K-Modifier vs. Y-Effective Stress
Curve Fit to Data: 100 %
Segment Curvature: 75 %
Y-Intercept: 1.2
Data Points: Y-Effective Stress (psf), K-Modifier
Data Point: (1,000, 1.2)
Data Point: (2,000, 1)
Data Point: (4,000, 0.839)
Data Point: (8,000, 0.70417211)
Data Point: (12,000, 0.63551782)
Data Point: (16,000, 0.59090577)

Vol. Water Content Functions

Clay soils OC

Model: Vol WC Data Point Function
Function: Vol. Water Content vs. Pore-Water Pressure
Mv: 7e-005 /psf
Saturated Water Content: 0.31427274 ft^3/ft^3
Residual Water Content: 0.031427274 ft^3/ft^3
Curve Fit to Data: 100 %
Segment Curvature: 100 %
Porosity: 0.31427274
Data Points: Matric Suction (psf), Vol. Water Content (ft^3/ft^3)
Data Point: (0.01, 0.29999999)
Data Point: (0.018329807, 0.29999998)
Data Point: (0.033598183, 0.29999996)
Data Point: (0.061584821, 0.29999991)
Data Point: (0.11288379, 0.29999982)
Data Point: (0.20691381, 0.29999962)
Data Point: (0.37926902, 0.29999917)
Data Point: (0.6951928, 0.29999814)
Data Point: (1.274275, 0.29999578)
Data Point: (2.3357215, 0.29999026)
Data Point: (4.2813324, 0.2999772)
Data Point: (7.8475997, 0.29994599)
Data Point: (14.384499, 0.29987093)
Data Point: (26.366509, 0.29968944)
Data Point: (48.329302, 0.29924951)
Data Point: (88.586679, 0.29818464)
Data Point: (162.37767, 0.29563126)
Data Point: (297.63514, 0.28967022)
Data Point: (545.55948, 0.27661743)
Data Point: (1,000, 0.25163343)
Estimation Properties
Vol. WC Estimation Method: Sample functions

Saturated Water Content: 0.3 ft^3/ft^3
Sample Material: Clay
Liquid Limit: 0 %
Diameter at 10% passing: 0
Diameter at 60% passing: 0
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Clay soils

Model: Vol WC Data Point Function
Function: Vol. Water Content vs. Pore-Water Pressure
Mv: 0.0004 /psf
Saturated Water Content: 0.60995302 ft^3/ft^3
Residual Water Content: 0.060995302 ft^3/ft^3
Curve Fit to Data: 100 %
Segment Curvature: 100 %
Porosity: 0.60995302
Data Points: Matric Suction (psf), Vol. Water Content (ft^3/ft^3)
Data Point: (0.01, 0.43999998)
Data Point: (0.018329807, 0.43999997)
Data Point: (0.033598183, 0.43999994)
Data Point: (0.061584821, 0.43999987)
Data Point: (0.11288379, 0.43999974)
Data Point: (0.20691381, 0.43999944)
Data Point: (0.37926902, 0.43999878)
Data Point: (0.6951928, 0.43999728)
Data Point: (1.274275, 0.43999381)
Data Point: (2.3357215, 0.43998571)
Data Point: (4.2813324, 0.43996655)
Data Point: (7.8475997, 0.43992079)
Data Point: (14.384499, 0.4398107)
Data Point: (26.366509, 0.43954452)
Data Point: (48.329302, 0.43889927)
Data Point: (88.586679, 0.43733747)
Data Point: (162.37767, 0.43359251)
Data Point: (297.63514, 0.42484965)
Data Point: (545.55948, 0.40570556)
Data Point: (1,000, 0.36906236)
Estimation Properties
Vol. WC Estimation Method: Sample functions
Saturated Water Content: 0.44 ft^3/ft^3
Sample Material: Clay
Liquid Limit: 0 %
Diameter at 10% passing: 0
Diameter at 60% passing: 0
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Till

Model: Vol WC Data Point Function

Function: Vol. Water Content vs. Pore-Water Pressure
Mv: 5e-006 /psf
Saturated Water Content: 0.20000173 ft^3/ft^3
Residual Water Content: 0.020000173 ft^3/ft^3
Curve Fit to Data: 100 %
Segment Curvature: 100 %
Porosity: 0.20000173
Data Points: Matric Suction (psf), Vol. Water Content (ft^3/ft^3)
Data Point: (0.01, 0.19999999)
Data Point: (0.018329807, 0.19999999)
Data Point: (0.033598183, 0.19999997)
Data Point: (0.061584821, 0.19999993)
Data Point: (0.11288379, 0.19999985)
Data Point: (0.20691381, 0.19999967)
Data Point: (0.37926902, 0.19999922)
Data Point: (0.6951928, 0.19999811)
Data Point: (1.274275, 0.19999535)
Data Point: (2.3357215, 0.19998838)
Data Point: (4.2813324, 0.19997056)
Data Point: (7.8475997, 0.19992471)
Data Point: (14.384499, 0.19980625)
Data Point: (26.366509, 0.19949952)
Data Point: (48.329302, 0.19870702)
Data Point: (88.586679, 0.19668084)
Data Point: (162.37767, 0.19165467)
Data Point: (297.63514, 0.18009116)
Data Point: (545.55948, 0.15752337)
Data Point: (1,000, 0.12453739)
Estimation Properties
Vol. WC Estimation Method: Sample functions
Saturated Water Content: 0.2 ft^3/ft^3
Sample Material: Silty Clay
Liquid Limit: 0 %
Diameter at 10% passing: 0
Diameter at 60% passing: 0
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

silty sand

Model: Vol WC Data Point Function
Function: Vol. Water Content vs. Pore-Water Pressure
Mv: 1e-005 /psf
Saturated Water Content: 0.30000011 ft^3/ft^3
Residual Water Content: 0.030000011 ft^3/ft^3
Curve Fit to Data: 100 %
Segment Curvature: 100 %
Porosity: 0.30000011
Data Points: Matric Suction (psf), Vol. Water Content (ft^3/ft^3)
Data Point: (0.01, 0.29999996)
Data Point: (0.018329807, 0.29999991)
Data Point: (0.033598183, 0.29999977)

Data Point: (0.061584821, 0.29999942)
Data Point: (0.11288379, 0.29999854)
Data Point: (0.20691381, 0.29999626)
Data Point: (0.37926902, 0.29999039)
Data Point: (0.6951928, 0.29997521)
Data Point: (1.274275, 0.29993588)
Data Point: (2.3357215, 0.29983385)
Data Point: (4.2813324, 0.29956912)
Data Point: (7.8475997, 0.29888334)
Data Point: (14.384499, 0.29711648)
Data Point: (26.366509, 0.29263189)
Data Point: (48.329302, 0.28167657)
Data Point: (88.586679, 0.25725429)
Data Point: (162.37767, 0.21239326)
Data Point: (297.63514, 0.15298031)
Data Point: (545.55948, 0.099847233)
Data Point: (1,000, 0.064649441)

Estimation Properties

Vol. WC Estimation Method: Sample functions
Saturated Water Content: 0.3 ft^3/ft^3
Sample Material: Silty Sand
Liquid Limit: 0 %
Diameter at 10% passing: 0
Diameter at 60% passing: 0
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Points

	X (ft)	Y (ft)
Point 1	561.5172	329
Point 2	184.2753	329
Point 3	174.1934	323.83525
Point 4	351.3603	319.67886
Point 5	546.7523	324.07989
Point 6	139.5241	323.62981
Point 7	0	321.01609
Point 8	0	318.01563
Point 9	133.22	320.51124
Point 10	196.3072	335
Point 11	579.5227	335
Point 12	597.5282	341
Point 13	208.339	341
Point 14	608.5585	347
Point 15	240.1424	347

Point 16	234.9596	345.27685
Point 17	219.929	346.77965
Point 18	611.3486	345.60539
Point 19	596.5548	353
Point 20	258.1852	353
Point 21	250.6076	350.4794
Point 22	276.2227	359
Point 23	584.5511	359
Point 24	294.2603	365
Point 25	572.5474	365
Point 26	312.2978	371
Point 27	560.5437	371
Point 28	548.5399	377
Point 29	330.1036	377
Point 30	325.5389	375.4045
Point 31	337.8201	379.69712
Point 32	364.4177	380
Point 33	381.0855	380.33726
Point 34	395.5929	380.71635
Point 35	416.8543	381.25666
Point 36	438.0487	382
Point 37	479.1653	383
Point 38	511.5499	383
Point 39	512.0826	382.82242
Point 40	513.8708	383
Point 41	531.0491	383
Point 42	533.1096	382.31347
Point 43	533.1107	382.31305
Point 44	536.5271	381.01628
Point 45	537.9265	380.70839
Point 46	547.5083	377.51565
Point 47	346.883	383
Point 48	493.5541	389
Point 49	363.3465	389
Point 50	371.2953	391.89686
Point 51	372.0119	391.98713
Point 52	372.2345	391.99514
Point 53	372.3208	392
Point 54	374.2156	392.05341

Point 55	419.4544	394.02388
Point 56	423.1399	394.1518
Point 57	476.0285	394.84323
Point 58	0	275.56112
Point 59	82.561	276.49127
Point 60	84.7322	276.34451
Point 61	123.7177	276.54438
Point 62	191.6961	277.65321
Point 63	430.1918	279.01879
Point 64	487.7086	279.639
Point 65	509.7138	279.55021
Point 66	721.9937	279.02461
Point 67	839	278.53365
Point 68	839	283.95091
Point 69	694.2381	280.02879
Point 70	505.5772	282.211
Point 71	487.7086	281.69555
Point 72	430.1918	282.66537
Point 73	247.1163	283.77931
Point 74	191.6961	282.79673
Point 75	123.7177	280.19493
Point 76	93.9325	281.10076
Point 77	61.0988	279.7585
Point 78	0	281.01485
Point 79	839	292.1407
Point 80	505.5772	286.98428
Point 81	487.7086	287.07159
Point 82	430.1918	289.73652
Point 83	247.1163	297.70175
Point 84	123.7177	292.05467
Point 85	94.7708	289.80875
Point 86	84.7322	289.65003
Point 87	82.561	289.66397
Point 88	38.9609	289.4325
Point 89	0	289.19587
Point 90	0	300.53803
Point 91	17.729	300.30563
Point 92	61.8788	299.93669
Point 93	191.626	301.3549

Point 94	247.1555	301.9218
Point 95	430.2162	304.83853
Point 96	487.7442	304.85433
Point 97	505.6491	305.27434
Point 98	509.7473	305.37466
Point 99	564.3735	305.25518
Point 100	839	303.47923
Point 101	839	306.47929
Point 102	564.3865	308.25516
Point 103	509.7138	308.37474
Point 104	505.5772	308.27348
Point 105	487.7086	307.85432
Point 106	430.1918	307.83852
Point 107	247.1163	304.92156
Point 108	191.6961	304.35577
Point 109	123.7177	308.23059
Point 110	93.9325	306.13974
Point 111	81.2213	307.4429
Point 112	61.5521	302.93952
Point 113	17.7611	303.30547
Point 114	0	303.53785
Point 115	839	315.0402
Point 116	797.6335	315.91598
Point 117	788.4831	316.10833
Point 118	751.3873	316.84226
Point 119	746.5947	316.94222
Point 120	742.0308	317.02756
Point 121	740.5664	317.15339
Point 122	740.3716	317.22293
Point 123	737.8797	317.29393
Point 124	718.0152	324.01292
Point 125	711.8056	325.93525
Point 126	706.0898	327.46147
Point 127	700.0454	333.50592
Point 128	694.499	330.73293
Point 129	691.9982	333.23326
Point 130	680.0323	333.54954
Point 131	679.8975	333.54516
Point 132	674.9116	331.05465

Point 133	672.911	331.05491
Point 134	672.1929	333.92615
Point 135	648.0416	332
Point 136	642.1238	328.67972
Point 137	637.4622	326.05461
Point 138	633.8287	324
Point 139	632.6094	323.29395
Point 140	630.3447	322
Point 141	556.3265	322
Point 142	544.3989	318.02536
Point 143	351.3575	313.67727
Point 144	171.7713	317.89042
Point 145	158.9451	319.66188
Point 146	146.7629	317.7643
Point 147	0	315.01616
Point 148	126.916	317.39267
Point 149	624.2673	344.64
Point 150	642.7896	345.19608
Point 151	639.8757	348.10995
Point 152	623.7369	347.62543
Point 153	543.8794	321.01441
Point 154	351.3589	316.67806
Point 155	172.0125	320.88559
Point 156	158.9189	322.69398
Point 157	146.5027	320.75996
Point 158	161.8204	329.91734
Point 159	162.0292	329.91734
Point 160	169.8774	325.99323
Point 161	172.2537	323.88076
Point 162	158.8927	325.72607
Point 163	146.2426	323.75561
Point 164	144.6459	323.72571
Point 165	157.0292	329.91734
Point 166	643.2531	345.21
Point 167	651.9258	349.55
Point 168	666.9304	350
Point 169	668.3508	349.29
Point 170	707.4035	333.53244
Point 171	710.6052	333.51008

Point 172	711.3189	333.31046
Point 173	713.7443	332.66283
Point 174	720.1721	330.67297
Point 175	739.1283	324.2612
Point 176	741.6802	324.18848
Point 177	742.0676	324.05019
Point 178	742.3962	324.02195
Point 179	746.7331	323.94086
Point 180	751.5295	323.84082
Point 181	788.6259	323.10687
Point 182	797.7821	322.91441
Point 183	839	322.03859
Point 184	704.3877	335.67695
Point 185	758.6353	353.74048
Point 186	806.6964	369.75012
Point 187	818.5728	368.55874
Point 188	839	375.2318
Point 189	623.3833	349.61571
Point 190	636.5766	350.01181
Point 191	637.9727	350.01292
Point 192	0	260
Point 193	839	260

Lines

	Start Point	End Point	Stress/Strain Boundary	Hydraulic Boundary
Line 1	1	2		
Line 2	2	3		
Line 3	3	4		
Line 4	4	5		
Line 5	5	1		
Line 6	6	7		
Line 7	7	8	Fixed X	
Line 8	8	9		noflowzeropress
Line 9	9	6		
Line 10	10	11		
Line 11	11	1		
Line 12	2	10		
Line 13	11	12		

Line 14	12	13		
Line 15	13	10		
Line 16	14	15		
Line 17	15	16		
Line 18	16	17		
Line 19	17	13		
Line 20	12	18		
Line 21	19	20		
Line 22	20	21		
Line 23	21	15		
Line 24	14	19		
Line 25	20	22		
Line 26	22	23		
Line 27	23	19		
Line 28	22	24		
Line 29	24	25		
Line 30	25	23		
Line 31	26	27		
Line 32	27	25		
Line 33	24	26		
Line 34	28	29		
Line 35	29	30		
Line 36	30	26		
Line 37	27	28		
Line 38	29	31		
Line 39	32	33		
Line 40	33	34		
Line 41	34	35		
Line 42	35	36		
Line 43	36	37		
Line 44	37	38		
Line 45	38	39		
Line 46	39	40		
Line 47	40	41		
Line 48	41	42		
Line 49	42	43		
Line 50	43	44		
Line 51	44	45		
Line 52	45	46		

Line 53	46	28		
Line 54	38	48		
Line 55	48	49		
Line 56	49	47		
Line 57	49	50		
Line 58	50	51		
Line 59	51	52		
Line 60	52	53		
Line 61	53	54		
Line 62	54	55		
Line 63	55	56		
Line 64	56	57		
Line 65	57	48		
Line 66	58	59		
Line 67	59	60		
Line 68	60	61		
Line 69	61	62		
Line 70	62	63		
Line 71	63	64		
Line 72	64	65		
Line 73	65	66		
Line 74	66	67		
Line 75	67	68	Fixed X	Drainage 315
Line 76	68	69		
Line 77	69	70		
Line 78	70	71		
Line 79	71	72		
Line 80	72	73		
Line 81	73	74		
Line 82	74	75		
Line 83	75	76		
Line 84	76	77		
Line 85	77	78		
Line 86	68	79	Fixed X	Drainage 315
Line 87	79	80		
Line 88	80	81		
Line 89	81	82		
Line 90	82	83		
Line 91	83	84		

Line 92	84	85		
Line 93	85	86		
Line 94	86	87		
Line 95	87	88		
Line 96	88	89		
Line 97	90	91		
Line 98	91	92		
Line 99	92	93		
Line 100	93	94		
Line 101	94	95		
Line 102	95	96		
Line 103	96	97		
Line 104	97	98		
Line 105	98	99		
Line 106	99	100		
Line 107	100	79	Fixed X	Drainage 315
Line 108	100	101	Fixed X	Drainage 315
Line 109	101	102		
Line 110	102	103		
Line 111	103	104		
Line 112	104	105		
Line 113	105	106		
Line 114	106	107		
Line 115	107	108		
Line 116	108	109		
Line 117	109	110		
Line 118	110	111		
Line 119	111	112		
Line 120	112	113		
Line 121	113	114		
Line 122	101	115	Fixed X	Drainage 315
Line 123	115	116		no flow
Line 124	116	117		no flow
Line 125	117	118		no flow
Line 126	118	119		no flow
Line 127	119	120		no flow
Line 128	120	121		no flow
Line 129	121	122		
Line 130	122	123		no flow

Line 131	123	124		no flow
Line 132	124	125		no flow
Line 133	125	126		no flow
Line 134	126	127		no flow
Line 135	127	128		noflowzeropress
Line 136	128	129		noflowzeropress
Line 137	129	130		noflowzeropress
Line 138	130	131		
Line 139	131	132		noflowzeropress
Line 140	132	133		noflowzeropress
Line 141	133	134		
Line 142	134	135		
Line 143	135	136		
Line 144	136	137		
Line 145	137	138		
Line 146	138	139		
Line 147	139	140		
Line 148	140	141		
Line 149	141	142		
Line 150	142	143		
Line 151	143	144		
Line 152	144	145		
Line 153	145	146		
Line 154	146	147		
Line 155	147	148		
Line 156	148	9		
Line 157	148	146		
Line 158	141	149		
Line 159	149	150		
Line 160	150	151		
Line 161	151	152		no flow
Line 162	152	153		no flow
Line 163	153	154		no flow
Line 164	154	155		no flow
Line 165	155	156		no flow
Line 166	156	157		no flow
Line 167	157	9		no flow
Line 168	158	159		
Line 169	159	160		

Line 170	160	3		
Line 171	3	161		
Line 172	161	162		
Line 173	162	163		
Line 174	163	164		
Line 175	164	165		
Line 176	165	158		
Line 177	150	166		
Line 178	166	167		
Line 179	167	168		
Line 180	168	169		
Line 181	169	134		
Line 182	127	170		
Line 183	170	171		
Line 184	171	172		
Line 185	172	173		
Line 186	173	174		
Line 187	174	175		
Line 188	175	176		
Line 189	176	177		
Line 190	177	178		
Line 191	178	179		
Line 192	179	180		
Line 193	180	181		
Line 194	181	182		
Line 195	182	183		
Line 196	183	115	Fixed X	
Line 197	184	185		
Line 198	185	186		
Line 199	186	187		
Line 200	187	188		
Line 201	188	183	Fixed X	
Line 202	127	184		
Line 203	6	164		
Line 204	189	190		
Line 205	190	191		
Line 206	191	151		
Line 207	18	189		
Line 208	18	14		

Line 209	47	31		
Line 210	31	32		
Line 211	58	192	Fixed X	Drainage 315
Line 212	192	193	Fixed X/Y	Drainage 315
Line 213	193	67	Fixed X	Drainage 315
Line 214	78	58	Fixed X	Drainage 315
Line 215	89	78	Fixed X	Drainage 315
Line 216	89	90	Fixed X	Drainage 315
Line 217	114	90	Fixed X	Drainage 315
Line 218	147	114	Fixed X	Drainage 315
Line 219	8	147	Fixed X	

Regions

	Material	Points	Area (ft²)
Region 1	Waste Material	1,2,3,4,5	2,684.8
Region 2	NOT ACTIVE	6,7,8,9	409.18
Region 3	Waste Material	10,11,1,2	2,281.4
Region 4	Waste Material	10,11,12,13	2,317.2
Region 5	Waste Material	14,15,16,17,13,12,18	2,329.2
Region 6	Waste Material	19,20,21,15,14	2,120.4
Region 7	Waste Material	19,20,22,23	1,940.1
Region 8	Waste Material	23,22,24,25	1,759.8
Region 9	Waste Material	26,27,25,24	1,579.6
Region 10	Waste Material	28,29,30,26,27	1,399.5
Region 11	Waste Material	29,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,28	963.75
Region 12	NOT ACTIVE	47,31,32,33,34,35,36,37,38,48,49	1,129
Region 13	NOT ACTIVE	49,50,51,52,53,54,55,56,57,48	563.69
Region 14	Lower Till	58,59,60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78	3,000.7
Region 15	Sand/Silt	78,77,76,75,74,73,72,71,70,69,68,79,80,81,82,83,84,85,86,87,88,89	7,768.6
Region 16	GC-Drained	90,91,92,93,94,95,96,97,98,99,100,79,80,81,82,83,84,85,86,87,88,89	10,108
Region 17	GC OverConsolidated	90,91,92,93,94,95,96,97,98,99,100,101,102,103,104,105,106,107,108,109,110,111,112,113,114	2,873.1
Region 18	Upper Till	114,113,112,111,110,109,108,107,106,105,104,103,102,101,115,116,117,118,119,120,121,122,123,124,125,126,127,128,129,130,131,132,133,134,135,136,137,138,139,140,141,142,143,144,145,146,147	9,788.5
Region 19	Structural Fill	8,147,148,9	390.2

Region 20	CCL	148,146,145,144,143,142,141,149,150,151,152,153,154,155,156, 157,9	1,547.9
Region 21	Structural Fill	158,159,160,3,161,162,163,164,165	80.098
Region 22	Waste Material	150,166,167,168,169,134,135,136,137,138,139,140,141,149	1,602.2
Region 23	CCL	127,170,171,172,173,174,175,176,177,178,179,180,181,182,183, 115,116,117,118,119,120,121,122,123,124,125,126	957.6
Region 24	Waste Material	184,185,186,187,188,183,182,181,180,179,178,177,176,175,174, 173,172,171,170,127	4,345.4
Region 25	Bottom Liner	157,9,6,164,163,162,161,3,4,5,1,11,12,18,189,190,191,151,152,1 53,154,155,156	1,423.6
Region 26	UPPER SHALE	58,192,193,67,66,65,64,63,62,61,60,59	15,370

Figure 17 - Coupled Consolidation for Section OP-1 for Waste Lift 10 - 1 Year After Placement

WASTE LIFT 10 EL. 383 - consol

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File Information

Title: Model City - RMU-2 CP-20 Section OP-1
Comments: Operation Conditions for CP-20 Section 1 Based on Maximum Fill Rate of 50,000 Cu Yds per Quarter
Created By: Peter J. Carey
Last Edited By: Peter J. Carey
Revision Number: 511
File Version: 8.0
Tool Version: 8.0.10.6504
Date: 2/24/2013
Time: 3:48:00 PM
File Name: C20OP-1r1.gsz
Directory: N:\Model_City\154.002_rmu2\154.005_revsions\geoslope\operational\

Project Settings

Length(L) Units: feet
Time(t) Units: Days
Force(F) Units: lbf
Pressure(p) Units: psf
Strength Units: psf
Stiffness Units: psf
Unit Weight of Water: 62.4 pcf
Air Pressure: 101.33 psf
View: 2D

Analysis Settings

WASTE LIFT 10 EL. 383 - consol

Description: WASTE LIFT 10 C-20 OP-1 progression with consolidation
Kind: SIGMA/W
Parent: WASTE LIFT 10 EL. 383
Method: Coupled Stress/PWP
Settings
- Initial Stress: Parent Analysis
- Initial PWP: Parent Analysis
- Exclude cumulative values: No

Control
- Apply Body Force in All Steps: No
- Saturated Zone Only: No

Convergence
- Maximum Number of Iterations: 50
- Minimum Pressure Head Difference: 0.001
- Minimum Displacement Difference: 0.001

Significant Digits: 3
Hydraulic Under-Relaxation Criteria
Under-Relaxation Initial Rate: 1
Under-Relaxation Min. Rate: 0.1
Under-Relaxation Reduction Rate: 0.65
Under-Relaxation Iterations: 10
Equation Solver: Parallel Direct
Time
Starting Time: 673 days
Duration: 365 days
# of Steps: 12
Step Generation Method: Linear
Save Steps Every: 4

Materials

Waste Material

Model: Linear Elastic (Total)
Stress Strain
Young's Modulus (E): 400,000 psf
Unit Weight: 111 pcf
Poisson's Ratio: 0.45

Bottom Liner

Model: Linear Elastic (Total)
Stress Strain
Young's Modulus (E): 400,000 psf
Unit Weight: 120 pcf
Poisson's Ratio: 0.45

CCL

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 1,000,000 psf
Unit Weight: 120 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Clay soils OC
K-Function: GC 5.7 E-4 ft/day
Ky'/Kx' Ratio: 0.1
Rotation: 0 °
Load Response Ratio: 1

Upper Till

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 300,000 psf
Unit Weight: 125 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Till

K-Function: Upper Glacial Till
Ky'/Kx' Ratio: 1
Rotation: 0 °
Load Response Ratio: 1

GC-Drained

Model: Soft Clay (MCC w/ PWP Change)
Stress Strain
O.C. Ratio: 4
Poisson's Ratio: 0.334
Lambda: 0.14
Kappa: 0.013
Initial Void Ratio: 1
Unit Weight: 118 pcf
Phi': 27 °
Hydraulic
Vol. WC. Function: Clay soils
K-Function: GC 5.7 E-4 ft/day
Ky'/Kx' Ratio: 1
Rotation: 0 °
K-Modifier Function: 1D consol derived k function rmu2 clay
Load Response Ratio: 1

GC OverConsolidated

Model: Soft Clay (MCC w/ PWP Change)
Stress Strain
O.C. Ratio: 8
Poisson's Ratio: 0.334
Lambda: 0.06
Kappa: 0.01
Initial Void Ratio: 0.5
Unit Weight: 125 pcf
Phi': 30 °
Hydraulic
Vol. WC. Function: Clay soils OC
K-Function: GC 5.7 E-4 ft/day
Ky'/Kx' Ratio: 1
Rotation: 0 °
K-Modifier Function: 1D consol derived k function rmu2 clay
Load Response Ratio: 1

Sand/Silt

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 300,000 psf
Unit Weight: 135 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: silty sand
K-Function: Silty Sand, k = 0.567 ft/day 2 E-4cm/sec
Ky'/Kx' Ratio: 0.1
Rotation: 0 °

Load Response Ratio: 1

Lower Till

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 600,000 psf
Unit Weight: 145 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Till
K-Function: Till
Ky'/Kx' Ratio: 1
Rotation: 0 °
Load Response Ratio: 1

Structural Fill

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 100,000 psf
Unit Weight: 135 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Till
K-Function: Till
Ky'/Kx' Ratio: 1
Rotation: 0 °
Load Response Ratio: 1

UPPER SHALE

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 1,000,000 psf
Unit Weight: 145 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Till
K-Function: Upper Rock
Ky'/Kx' Ratio: 1
Rotation: 0 °
Load Response Ratio: 1

NOT ACTIVE

Model: (none)

Boundary Conditions

Fixed X

X: X-Displacement 0

Fixed X/Y

X: X-Displacement 0

Y: Y-Displacement 0

Drainage 315

Type: Head (H) 315
Review: No

no flow

Type: Total Flux (Q) 0
Review: No

noflowzeropress

Type: Total Flux (Q) 0
Review: Yes

Initial Water Tables

Initial Water Table 1

Max. negative head: 5
Coordinates
Coordinate 1: (0, 315) ft
Coordinate 2: (850, 315) ft

K Functions

Silty Sand, k = 0.567 ft/day 2 E-4cm/sec

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 36 %
K-Saturation: 0.567
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (0.005, 0.567)
Data Point: (0.01, 0.567)
Data Point: (0.035938, 0.567)
Data Point: (0.12915, 0.567)
Data Point: (0.46416, 0.567)
Data Point: (1.1111, 0.567)
Data Point: (1.6681, 0.567)
Data Point: (5.9948, 0.567)
Data Point: (21.544, 0.567)
Data Point: (77.426, 0.567)
Data Point: (105.93, 0.5402376)
Data Point: (210.74, 0.3387258)
Data Point: (278.26, 0.2567376)
Data Point: (315.56, 0.2232846)
Data Point: (420.37, 0.1406916)
Data Point: (525.19, 0.0779121)
Data Point: (630, 0.03843882)
Data Point: (734.81, 0.01673406)

Data Point: (839.63, 0.005422788)
Data Point: (944.44, 0.000745983)
Data Point: (1,000, 7.14735e-005)

Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Upper Glacial Till

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 36 %
K-Saturation: 0.0057
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (0.005, 0.0057)
Data Point: (0.01, 0.0057)
Data Point: (0.046416, 0.0057)
Data Point: (0.21544, 0.0057)
Data Point: (1, 0.0057)
Data Point: (4.6416, 0.0057)
Data Point: (11.111, 0.0057)
Data Point: (21.544, 0.0057)
Data Point: (100, 0.0057)
Data Point: (464.16, 0.0016245)
Data Point: (1,059.3, 0.0002427972)
Data Point: (2,107.4, 1.492716e-005)
Data Point: (2,154.4, 1.369596e-005)
Data Point: (3,155.6, 4.086672e-006)
Data Point: (4,203.7, 1.82115e-006)
Data Point: (5,251.9, 9.03222e-007)
Data Point: (6,300, 4.30521e-007)
Data Point: (7,348.1, 2.028516e-007)
Data Point: (8,396.3, 7.73661e-008)
Data Point: (9,444.4, 2.691312e-008)
Data Point: (10,000, 2.691312e-008)

Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Upper Rock

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 36 %

K-Saturation: 0.567
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (0.005, 0.567)
Data Point: (0.01, 0.567)
Data Point: (10,000, 0.567)
Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Till

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 36 %
K-Saturation: 0.000567
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (0.005, 0.000567)
Data Point: (0.01, 0.000567)
Data Point: (10,000, 0.000567)
Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

GC 5.7 E-4 ft/day

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 100 %
K-Saturation: 0.00057
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (10, 0.00057)
Data Point: (1,000, 9e-006)
Data Point: (5,000, 5e-006)
Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Hydraulic K Modifier Functions

1D consol derived k function rmu2 clay

Model: Spline Data Point Function (Y Log)
Function: K-Modifier vs. Y-Effective Stress
Curve Fit to Data: 100 %
Segment Curvature: 75 %
Y-Intercept: 1.2
Data Points: Y-Effective Stress (psf), K-Modifier
Data Point: (1,000, 1.2)
Data Point: (2,000, 1)
Data Point: (4,000, 0.839)
Data Point: (8,000, 0.70417211)
Data Point: (12,000, 0.63551782)
Data Point: (16,000, 0.59090577)

Vol. Water Content Functions

Clay soils OC

Model: Vol WC Data Point Function
Function: Vol. Water Content vs. Pore-Water Pressure
Mv: 7e-005 /psf
Saturated Water Content: 0.31427274 ft^3/ft^3
Residual Water Content: 0.031427274 ft^3/ft^3
Curve Fit to Data: 100 %
Segment Curvature: 100 %
Porosity: 0.31427274
Data Points: Matric Suction (psf), Vol. Water Content (ft^3/ft^3)
Data Point: (0.01, 0.29999999)
Data Point: (0.018329807, 0.29999998)
Data Point: (0.033598183, 0.29999996)
Data Point: (0.061584821, 0.29999991)
Data Point: (0.11288379, 0.29999982)
Data Point: (0.20691381, 0.29999962)
Data Point: (0.37926902, 0.29999917)
Data Point: (0.6951928, 0.29999814)
Data Point: (1.274275, 0.29999578)
Data Point: (2.3357215, 0.29999026)
Data Point: (4.2813324, 0.2999772)
Data Point: (7.8475997, 0.29994599)
Data Point: (14.384499, 0.29987093)
Data Point: (26.366509, 0.29968944)
Data Point: (48.329302, 0.29924951)
Data Point: (88.586679, 0.29818464)
Data Point: (162.37767, 0.29563126)
Data Point: (297.63514, 0.28967022)
Data Point: (545.55948, 0.27661743)
Data Point: (1,000, 0.25163343)
Estimation Properties
Vol. WC Estimation Method: Sample functions

Saturated Water Content: 0.3 ft^3/ft^3
Sample Material: Clay
Liquid Limit: 0 %
Diameter at 10% passing: 0
Diameter at 60% passing: 0
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Clay soils

Model: Vol WC Data Point Function
Function: Vol. Water Content vs. Pore-Water Pressure
Mv: 0.0004 /psf
Saturated Water Content: 0.60995302 ft^3/ft^3
Residual Water Content: 0.060995302 ft^3/ft^3
Curve Fit to Data: 100 %
Segment Curvature: 100 %
Porosity: 0.60995302
Data Points: Matric Suction (psf), Vol. Water Content (ft^3/ft^3)
Data Point: (0.01, 0.43999998)
Data Point: (0.018329807, 0.43999997)
Data Point: (0.033598183, 0.43999994)
Data Point: (0.061584821, 0.43999987)
Data Point: (0.11288379, 0.43999974)
Data Point: (0.20691381, 0.43999944)
Data Point: (0.37926902, 0.43999878)
Data Point: (0.6951928, 0.43999728)
Data Point: (1.274275, 0.43999381)
Data Point: (2.3357215, 0.43998571)
Data Point: (4.2813324, 0.43996655)
Data Point: (7.8475997, 0.43992079)
Data Point: (14.384499, 0.4398107)
Data Point: (26.366509, 0.43954452)
Data Point: (48.329302, 0.43889927)
Data Point: (88.586679, 0.43733747)
Data Point: (162.37767, 0.43359251)
Data Point: (297.63514, 0.42484965)
Data Point: (545.55948, 0.40570556)
Data Point: (1,000, 0.36906236)
Estimation Properties
Vol. WC Estimation Method: Sample functions
Saturated Water Content: 0.44 ft^3/ft^3
Sample Material: Clay
Liquid Limit: 0 %
Diameter at 10% passing: 0
Diameter at 60% passing: 0
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Till

Model: Vol WC Data Point Function

Function: Vol. Water Content vs. Pore-Water Pressure
- Mv: 5e-006 /psf
- Saturated Water Content: 0.20000173 ft^3/ft^3
- Residual Water Content: 0.020000173 ft^3/ft^3
- Curve Fit to Data: 100 %
- Segment Curvature: 100 %

Porosity: 0.20000173

Data Points: Matric Suction (psf), Vol. Water Content (ft^3/ft^3)
- Data Point: (0.01, 0.19999999)
- Data Point: (0.018329807, 0.19999999)
- Data Point: (0.033598183, 0.19999997)
- Data Point: (0.061584821, 0.19999993)
- Data Point: (0.11288379, 0.19999985)
- Data Point: (0.20691381, 0.19999967)
- Data Point: (0.37926902, 0.19999922)
- Data Point: (0.6951928, 0.19999811)
- Data Point: (1.274275, 0.19999535)
- Data Point: (2.3357215, 0.19998838)
- Data Point: (4.2813324, 0.19997056)
- Data Point: (7.8475997, 0.19992471)
- Data Point: (14.384499, 0.19980625)
- Data Point: (26.366509, 0.19949952)
- Data Point: (48.329302, 0.19870702)
- Data Point: (88.586679, 0.19668084)
- Data Point: (162.37767, 0.19165467)
- Data Point: (297.63514, 0.18009116)
- Data Point: (545.55948, 0.15752337)
- Data Point: (1,000, 0.12453739)

Estimation Properties
- Vol. WC Estimation Method: Sample functions
- Saturated Water Content: 0.2 ft^3/ft^3
- Sample Material: Silty Clay
- Liquid Limit: 0 %
- Diameter at 10% passing: 0
- Diameter at 60% passing: 0
- Maximum: 1,000
- Minimum: 0.01
- Num. Points: 20

silty sand

Model: Vol WC Data Point Function

Function: Vol. Water Content vs. Pore-Water Pressure
- Mv: 1e-005 /psf
- Saturated Water Content: 0.30000011 ft^3/ft^3
- Residual Water Content: 0.030000011 ft^3/ft^3
- Curve Fit to Data: 100 %
- Segment Curvature: 100 %

Porosity: 0.30000011

Data Points: Matric Suction (psf), Vol. Water Content (ft^3/ft^3)
- Data Point: (0.01, 0.29999996)
- Data Point: (0.018329807, 0.29999991)
- Data Point: (0.033598183, 0.29999977)

Data Point: (0.061584821, 0.29999942)
Data Point: (0.11288379, 0.29999854)
Data Point: (0.20691381, 0.29999626)
Data Point: (0.37926902, 0.29999039)
Data Point: (0.6951928, 0.29997521)
Data Point: (1.274275, 0.29993588)
Data Point: (2.3357215, 0.29983385)
Data Point: (4.2813324, 0.29956912)
Data Point: (7.8475997, 0.29888334)
Data Point: (14.384499, 0.29711648)
Data Point: (26.366509, 0.29263189)
Data Point: (48.329302, 0.28167657)
Data Point: (88.586679, 0.25725429)
Data Point: (162.37767, 0.21239326)
Data Point: (297.63514, 0.15298031)
Data Point: (545.55948, 0.099847233)
Data Point: (1,000, 0.064649441)

Estimation Properties

Vol. WC Estimation Method: Sample functions
Saturated Water Content: 0.3 ft^3/ft^3
Sample Material: Silty Sand
Liquid Limit: 0 %
Diameter at 10% passing: 0
Diameter at 60% passing: 0
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Points

	X (ft)	Y (ft)
Point 1	561.5172	329
Point 2	184.2753	329
Point 3	174.1934	323.83525
Point 4	351.3603	319.67886
Point 5	546.7523	324.07989
Point 6	139.5241	323.62981
Point 7	0	321.01609
Point 8	0	318.01563
Point 9	133.22	320.51124
Point 10	196.3072	335
Point 11	579.5227	335
Point 12	597.5282	341
Point 13	208.339	341
Point 14	608.5585	347
Point 15	240.1424	347

Point 16	234.9596	345.27685
Point 17	219.929	346.77965
Point 18	611.3486	345.60539
Point 19	596.5548	353
Point 20	258.1852	353
Point 21	250.6076	350.4794
Point 22	276.2227	359
Point 23	584.5511	359
Point 24	294.2603	365
Point 25	572.5474	365
Point 26	312.2978	371
Point 27	560.5437	371
Point 28	548.5399	377
Point 29	330.1036	377
Point 30	325.5389	375.4045
Point 31	337.8201	379.69712
Point 32	364.4177	380
Point 33	381.0855	380.33726
Point 34	395.5929	380.71635
Point 35	416.8543	381.25666
Point 36	438.0487	382
Point 37	479.1653	383
Point 38	511.5499	383
Point 39	512.0826	382.82242
Point 40	513.8708	383
Point 41	531.0491	383
Point 42	533.1096	382.31347
Point 43	533.1107	382.31305
Point 44	536.5271	381.01628
Point 45	537.9265	380.70839
Point 46	547.5083	377.51565
Point 47	346.883	383
Point 48	493.5541	389
Point 49	363.3465	389
Point 50	371.2953	391.89686
Point 51	372.0119	391.98713
Point 52	372.2345	391.99514
Point 53	372.3208	392
Point 54	374.2156	392.05341

Point 55	419.4544	394.02388
Point 56	423.1399	394.1518
Point 57	476.0285	394.84323
Point 58	0	275.56112
Point 59	82.561	276.49127
Point 60	84.7322	276.34451
Point 61	123.7177	276.54438
Point 62	191.6961	277.65321
Point 63	430.1918	279.01879
Point 64	487.7086	279.639
Point 65	509.7138	279.55021
Point 66	721.9937	279.02461
Point 67	839	278.53365
Point 68	839	283.95091
Point 69	694.2381	280.02879
Point 70	505.5772	282.211
Point 71	487.7086	281.69555
Point 72	430.1918	282.66537
Point 73	247.1163	283.77931
Point 74	191.6961	282.79673
Point 75	123.7177	280.19493
Point 76	93.9325	281.10076
Point 77	61.0988	279.7585
Point 78	0	281.01485
Point 79	839	292.1407
Point 80	505.5772	286.98428
Point 81	487.7086	287.07159
Point 82	430.1918	289.73652
Point 83	247.1163	297.70175
Point 84	123.7177	292.05467
Point 85	94.7708	289.80875
Point 86	84.7322	289.65003
Point 87	82.561	289.66397
Point 88	38.9609	289.4325
Point 89	0	289.19587
Point 90	0	300.53803
Point 91	17.729	300.30563
Point 92	61.8788	299.93669
Point 93	191.626	301.3549

Point 94	247.1555	301.9218
Point 95	430.2162	304.83853
Point 96	487.7442	304.85433
Point 97	505.6491	305.27434
Point 98	509.7473	305.37466
Point 99	564.3735	305.25518
Point 100	839	303.47923
Point 101	839	306.47929
Point 102	564.3865	308.25516
Point 103	509.7138	308.37474
Point 104	505.5772	308.27348
Point 105	487.7086	307.85432
Point 106	430.1918	307.83852
Point 107	247.1163	304.92156
Point 108	191.6961	304.35577
Point 109	123.7177	308.23059
Point 110	93.9325	306.13974
Point 111	81.2213	307.4429
Point 112	61.5521	302.93952
Point 113	17.7611	303.30547
Point 114	0	303.53785
Point 115	839	315.0402
Point 116	797.6335	315.91598
Point 117	788.4831	316.10833
Point 118	751.3873	316.84226
Point 119	746.5947	316.94222
Point 120	742.0308	317.02756
Point 121	740.5664	317.15339
Point 122	740.3716	317.22293
Point 123	737.8797	317.29393
Point 124	718.0152	324.01292
Point 125	711.8056	325.93525
Point 126	706.0898	327.46147
Point 127	700.0454	333.50592
Point 128	694.499	330.73293
Point 129	691.9982	333.23326
Point 130	680.0323	333.54954
Point 131	679.8975	333.54516
Point 132	674.9116	331.05465

Point 133	672.911	331.05491
Point 134	672.1929	333.92615
Point 135	648.0416	332
Point 136	642.1238	328.67972
Point 137	637.4622	326.05461
Point 138	633.8287	324
Point 139	632.6094	323.29395
Point 140	630.3447	322
Point 141	556.3265	322
Point 142	544.3989	318.02536
Point 143	351.3575	313.67727
Point 144	171.7713	317.89042
Point 145	158.9451	319.66188
Point 146	146.7629	317.7643
Point 147	0	315.01616
Point 148	126.916	317.39267
Point 149	624.2673	344.64
Point 150	642.7896	345.19608
Point 151	639.8757	348.10995
Point 152	623.7369	347.62543
Point 153	543.8794	321.01441
Point 154	351.3589	316.67806
Point 155	172.0125	320.88559
Point 156	158.9189	322.69398
Point 157	146.5027	320.75996
Point 158	161.8204	329.91734
Point 159	162.0292	329.91734
Point 160	169.8774	325.99323
Point 161	172.2537	323.88076
Point 162	158.8927	325.72607
Point 163	146.2426	323.75561
Point 164	144.6459	323.72571
Point 165	157.0292	329.91734
Point 166	643.2531	345.21
Point 167	651.9258	349.55
Point 168	666.9304	350
Point 169	668.3508	349.29
Point 170	707.4035	333.53244
Point 171	710.6052	333.51008

Point 172	711.3189	333.31046
Point 173	713.7443	332.66283
Point 174	720.1721	330.67297
Point 175	739.1283	324.2612
Point 176	741.6802	324.18848
Point 177	742.0676	324.05019
Point 178	742.3962	324.02195
Point 179	746.7331	323.94086
Point 180	751.5295	323.84082
Point 181	788.6259	323.10687
Point 182	797.7821	322.91441
Point 183	839	322.03859
Point 184	704.3877	335.67695
Point 185	758.6353	353.74048
Point 186	806.6964	369.75012
Point 187	818.5728	368.55874
Point 188	839	375.2318
Point 189	623.3833	349.61571
Point 190	636.5766	350.01181
Point 191	637.9727	350.01292
Point 192	0	260
Point 193	839	260

Lines

	Start Point	End Point	Stress/Strain Boundary	Hydraulic Boundary
Line 1	1	2		
Line 2	2	3		
Line 3	3	4		
Line 4	4	5		
Line 5	5	1		
Line 6	6	7		
Line 7	7	8	Fixed X	
Line 8	8	9		noflowzeropress
Line 9	9	6		
Line 10	10	11		
Line 11	11	1		
Line 12	2	10		
Line 13	11	12		

Line 14	12	13		
Line 15	13	10		
Line 16	14	15		
Line 17	15	16		
Line 18	16	17		
Line 19	17	13		
Line 20	12	18		
Line 21	19	20		
Line 22	20	21		
Line 23	21	15		
Line 24	14	19		
Line 25	20	22		
Line 26	22	23		
Line 27	23	19		
Line 28	22	24		
Line 29	24	25		
Line 30	25	23		
Line 31	26	27		
Line 32	27	25		
Line 33	24	26		
Line 34	28	29		
Line 35	29	30		
Line 36	30	26		
Line 37	27	28		
Line 38	29	31		
Line 39	32	33		
Line 40	33	34		
Line 41	34	35		
Line 42	35	36		
Line 43	36	37		
Line 44	37	38		
Line 45	38	39		
Line 46	39	40		
Line 47	40	41		
Line 48	41	42		
Line 49	42	43		
Line 50	43	44		
Line 51	44	45		
Line 52	45	46		

Line 53	46	28		
Line 54	38	48		
Line 55	48	49		
Line 56	49	47		
Line 57	49	50		
Line 58	50	51		
Line 59	51	52		
Line 60	52	53		
Line 61	53	54		
Line 62	54	55		
Line 63	55	56		
Line 64	56	57		
Line 65	57	48		
Line 66	58	59		
Line 67	59	60		
Line 68	60	61		
Line 69	61	62		
Line 70	62	63		
Line 71	63	64		
Line 72	64	65		
Line 73	65	66		
Line 74	66	67		
Line 75	67	68	Fixed X	Drainage 315
Line 76	68	69		
Line 77	69	70		
Line 78	70	71		
Line 79	71	72		
Line 80	72	73		
Line 81	73	74		
Line 82	74	75		
Line 83	75	76		
Line 84	76	77		
Line 85	77	78		
Line 86	68	79	Fixed X	Drainage 315
Line 87	79	80		
Line 88	80	81		
Line 89	81	82		
Line 90	82	83		
Line 91	83	84		

Line 92	84	85		
Line 93	85	86		
Line 94	86	87		
Line 95	87	88		
Line 96	88	89		
Line 97	90	91		
Line 98	91	92		
Line 99	92	93		
Line 100	93	94		
Line 101	94	95		
Line 102	95	96		
Line 103	96	97		
Line 104	97	98		
Line 105	98	99		
Line 106	99	100		
Line 107	100	79	Fixed X	Drainage 315
Line 108	100	101	Fixed X	Drainage 315
Line 109	101	102		
Line 110	102	103		
Line 111	103	104		
Line 112	104	105		
Line 113	105	106		
Line 114	106	107		
Line 115	107	108		
Line 116	108	109		
Line 117	109	110		
Line 118	110	111		
Line 119	111	112		
Line 120	112	113		
Line 121	113	114		
Line 122	101	115	Fixed X	Drainage 315
Line 123	115	116		no flow
Line 124	116	117		no flow
Line 125	117	118		no flow
Line 126	118	119		no flow
Line 127	119	120		no flow
Line 128	120	121		no flow
Line 129	121	122		
Line 130	122	123		no flow

Line 131	123	124		no flow
Line 132	124	125		no flow
Line 133	125	126		no flow
Line 134	126	127		no flow
Line 135	127	128		noflowzeropress
Line 136	128	129		noflowzeropress
Line 137	129	130		noflowzeropress
Line 138	130	131		
Line 139	131	132		noflowzeropress
Line 140	132	133		noflowzeropress
Line 141	133	134		
Line 142	134	135		
Line 143	135	136		
Line 144	136	137		
Line 145	137	138		
Line 146	138	139		
Line 147	139	140		
Line 148	140	141		
Line 149	141	142		
Line 150	142	143		
Line 151	143	144		
Line 152	144	145		
Line 153	145	146		
Line 154	146	147		
Line 155	147	148		
Line 156	148	9		
Line 157	148	146		
Line 158	141	149		
Line 159	149	150		
Line 160	150	151		
Line 161	151	152		no flow
Line 162	152	153		no flow
Line 163	153	154		no flow
Line 164	154	155		no flow
Line 165	155	156		no flow
Line 166	156	157		no flow
Line 167	157	9		no flow
Line 168	158	159		
Line 169	159	160		

Line 170	160	3		
Line 171	3	161		
Line 172	161	162		
Line 173	162	163		
Line 174	163	164		
Line 175	164	165		
Line 176	165	158		
Line 177	150	166		
Line 178	166	167		
Line 179	167	168		
Line 180	168	169		
Line 181	169	134		
Line 182	127	170		
Line 183	170	171		
Line 184	171	172		
Line 185	172	173		
Line 186	173	174		
Line 187	174	175		
Line 188	175	176		
Line 189	176	177		
Line 190	177	178		
Line 191	178	179		
Line 192	179	180		
Line 193	180	181		
Line 194	181	182		
Line 195	182	183		
Line 196	183	115	Fixed X	
Line 197	184	185		
Line 198	185	186		
Line 199	186	187		
Line 200	187	188		
Line 201	188	183	Fixed X	
Line 202	127	184		
Line 203	6	164		
Line 204	189	190		
Line 205	190	191		
Line 206	191	151		
Line 207	18	189		
Line 208	18	14		

Line 209	47	31		
Line 210	31	32		
Line 211	58	192	Fixed X	Drainage 315
Line 212	192	193	Fixed X/Y	Drainage 315
Line 213	193	67	Fixed X	Drainage 315
Line 214	78	58	Fixed X	Drainage 315
Line 215	89	78	Fixed X	Drainage 315
Line 216	89	90	Fixed X	Drainage 315
Line 217	114	90	Fixed X	Drainage 315
Line 218	147	114	Fixed X	Drainage 315
Line 219	8	147	Fixed X	

Regions

	Material	Points	Area (ft²)
Region 1	Waste Material	1,2,3,4,5	2,684.8
Region 2	NOT ACTIVE	6,7,8,9	409.18
Region 3	Waste Material	10,11,1,2	2,281.4
Region 4	Waste Material	10,11,12,13	2,317.2
Region 5	Waste Material	14,15,16,17,13,12,18	2,329.2
Region 6	Waste Material	19,20,21,15,14	2,120.4
Region 7	Waste Material	19,20,22,23	1,940.1
Region 8	Waste Material	23,22,24,25	1,759.8
Region 9	Waste Material	26,27,25,24	1,579.6
Region 10	Waste Material	28,29,30,26,27	1,399.5
Region 11	Waste Material	29,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,28	963.75
Region 12	NOT ACTIVE	47,31,32,33,34,35,36,37,38,48,49	1,129
Region 13	NOT ACTIVE	49,50,51,52,53,54,55,56,57,48	563.69
Region 14	Lower Till	58,59,60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78	3,000.7
Region 15	Sand/Silt	78,77,76,75,74,73,72,71,70,69,68,79,80,81,82,83,84,85,86,87,88,89	7,768.6
Region 16	GC-Drained	90,91,92,93,94,95,96,97,98,99,100,79,80,81,82,83,84,85,86,87,88,89	10,108
Region 17	GC OverConsolidated	90,91,92,93,94,95,96,97,98,99,100,101,102,103,104,105,106,107,108,109,110,111,112,113,114	2,873.1
Region 18	Upper Till	114,113,112,111,110,109,108,107,106,105,104,103,102,101,115,116,117,118,119,120,121,122,123,124,125,126,127,128,129,130,131,132,133,134,135,136,137,138,139,140,141,142,143,144,145,146,147	9,788.5

Region 19	Structural Fill	8,147,148,9	390.2
Region 20	CCL	148,146,145,144,143,142,141,149,150,151,152,153,154,155,156,157,9	1,547.9
Region 21	Structural Fill	158,159,160,3,161,162,163,164,165	80.098
Region 22	Waste Material	150,166,167,168,169,134,135,136,137,138,139,140,141,149	1,602.2
Region 23	CCL	127,170,171,172,173,174,175,176,177,178,179,180,181,182,183,115,116,117,118,119,120,121,122,123,124,125,126	957.6
Region 24	Waste Material	184,185,186,187,188,183,182,181,180,179,178,177,176,175,174,173,172,171,170,127	4,345.4
Region 25	Bottom Liner	157,9,6,164,163,162,161,3,4,5,1,11,12,18,189,190,191,151,152,153,154,155,156	1,423.6
Region 26	UPPER SHALE	58,192,193,67,66,65,64,63,62,61,60,59	15,370

Figure 18 - Coupled Consolidation for Section OP-2 for In-Situ (Excavation)

Insitu

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File Information

Title: Model City - RMU-2 CP-20 Section OP-2
Comments: Operation Conditions for CP-20 Section 2 Based on Maximum Fill Rate of 50,000 Cu Yds per Quarter
Created By: Peter J. Carey
Revision Number: 498
File Version: 8.0
Tool Version: 8.0.10.6504
Date: 2/25/2013
Time: 7:29:13 AM
File Name: C20OP-2r1.gsz
Directory: N:\Model_City\154.002_rmu2\154.005_revsions\geoslope\operational\

Project Settings

Length(L) Units: feet
Time(t) Units: Days
Force(F) Units: lbf
Pressure(p) Units: psf
Strength Units: psf
Stiffness Units: psf
Unit Weight of Water: 62.4 pcf
Air Pressure: 101.33 psf
View: 2D

Analysis Settings

Insitu

Description: Initial Conditions xs2200 fill progression
Kind: SIGMA/W
Method: Insitu
Settings
    Initial PWP: Water Table
Control
    Apply Body Force in All Steps: No
Convergence
    Equation Solver: Parallel Direct
Time
    Starting Time: 0 days
    Duration: 0 days
    Ending Time: 0 days

Materials

Upper Till

Model: Linear Elastic (w/ PWP Change)
Stress Strain
- Effective Young's Modulus (E'): 300,000 psf
- Unit Weight: 125 pcf
- Poisson's Ratio: 0.334
- Insitu Ko: 0.5015015

Hydraulic
- Vol. WC. Function: Till
- K-Function: Upper Glacial Till
- Ky'/Kx' Ratio: 1
- Rotation: 0 °
- Load Response Ratio: 1

GC-Drained

Model: Soft Clay (MCC w/ PWP Change)
Stress Strain
- O.C. Ratio: 4
- Poisson's Ratio: 0.334
- Insitu Ko: 0.5015015
- Lambda: 0.14
- Kappa: 0.013
- Initial Void Ratio: 1
- Unit Weight: 118 pcf
- Phi': 27 °

Hydraulic
- Vol. WC. Function: Clay soils
- K-Function: GC 5.7 E-4 ft/day
- Ky'/Kx' Ratio: 1
- Rotation: 0 °
- K-Modifier Function: 1D consol derived k function rmu2 clay
- Load Response Ratio: 1

GC OverConsolidated

Model: Soft Clay (MCC w/ PWP Change)
Stress Strain
- O.C. Ratio: 8
- Poisson's Ratio: 0.334
- Insitu Ko: 0.5015015
- Lambda: 0.06
- Kappa: 0.01
- Initial Void Ratio: 0.5
- Unit Weight: 125 pcf
- Phi': 30 °

Hydraulic
- Vol. WC. Function: Clay soils OC
- K-Function: GC 5.7 E-4 ft/day
- Ky'/Kx' Ratio: 1
- Rotation: 0 °

K-Modifier Function: 1D consol derived k function rmu2 clay
Load Response Ratio: 1

Sand/Silt

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 300,000 psf
Unit Weight: 135 pcf
Poisson's Ratio: 0.334
Insitu Ko: 0.5015015
Hydraulic
Vol. WC. Function: silty sand
K-Function: Silty Sand, k = 0.567 ft/day 2 E-4cm/sec
Ky'/Kx' Ratio: 0.1
Rotation: 0 °
Load Response Ratio: 1

Lower Till

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 600,000 psf
Unit Weight: 145 pcf
Poisson's Ratio: 0.334
Insitu Ko: 0.5015015
Hydraulic
Vol. WC. Function: Till
K-Function: Till
Ky'/Kx' Ratio: 1
Rotation: 0 °
Load Response Ratio: 1

UPPER SHALE

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 1,000,000 psf
Unit Weight: 145 pcf
Poisson's Ratio: 0.334
Insitu Ko: 0.5015015
Hydraulic
Vol. WC. Function: Till
K-Function: Upper Rock
Ky'/Kx' Ratio: 1
Rotation: 0 °
Load Response Ratio: 1

NOT ACTIVE

Model: (none)

Boundary Conditions

Fixed X

X: X-Displacement 0

Fixed X/Y

X: X-Displacement 0
Y: Y-Displacement 0

Initial Water Tables

Initial Water Table 1

Max. negative head: 5
Coordinates
Coordinate 1: (0, 315) ft
Coordinate 2: (850, 315) ft

K Functions

Silty Sand, k = 0.567 ft/day 2 E-4cm/sec

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 36 %
K-Saturation: 0.567
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (0.005, 0.567)
Data Point: (0.01, 0.567)
Data Point: (0.035938, 0.567)
Data Point: (0.12915, 0.567)
Data Point: (0.46416, 0.567)
Data Point: (1.1111, 0.567)
Data Point: (1.6681, 0.567)
Data Point: (5.9948, 0.567)
Data Point: (21.544, 0.567)
Data Point: (77.426, 0.567)
Data Point: (105.93, 0.5402376)
Data Point: (210.74, 0.3387258)
Data Point: (278.26, 0.2567376)
Data Point: (315.56, 0.2232846)
Data Point: (420.37, 0.1406916)
Data Point: (525.19, 0.0779121)
Data Point: (630, 0.03843882)
Data Point: (734.81, 0.01673406)
Data Point: (839.63, 0.005422788)
Data Point: (944.44, 0.000745983)
Data Point: (1,000, 7.14735e-005)
Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function

Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Upper Glacial Till

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 36 %
K-Saturation: 0.0057
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (0.005, 0.0057)
Data Point: (0.01, 0.0057)
Data Point: (0.046416, 0.0057)
Data Point: (0.21544, 0.0057)
Data Point: (1, 0.0057)
Data Point: (4.6416, 0.0057)
Data Point: (11.111, 0.0057)
Data Point: (21.544, 0.0057)
Data Point: (100, 0.0057)
Data Point: (464.16, 0.0016245)
Data Point: (1,059.3, 0.0002427972)
Data Point: (2,107.4, 1.492716e-005)
Data Point: (2,154.4, 1.369596e-005)
Data Point: (3,155.6, 4.086672e-006)
Data Point: (4,203.7, 1.82115e-006)
Data Point: (5,251.9, 9.03222e-007)
Data Point: (6,300, 4.30521e-007)
Data Point: (7,348.1, 2.028516e-007)
Data Point: (8,396.3, 7.73661e-008)
Data Point: (9,444.4, 2.691312e-008)
Data Point: (10,000, 2.691312e-008)
Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Upper Rock

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 36 %
K-Saturation: 0.567
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (0.005, 0.567)
Data Point: (0.01, 0.567)
Data Point: (10,000, 0.567)

Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Till

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 36 %
K-Saturation: 0.000567
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (0.005, 0.000567)
Data Point: (0.01, 0.000567)
Data Point: (10,000, 0.000567)
Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

GC 5.7 E-4 ft/day

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 100 %
K-Saturation: 0.00057
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (10, 0.00057)
Data Point: (1,000, 9e-006)
Data Point: (5,000, 5e-006)
Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Hydraulic K Modifier Functions

1D consol derived k function rmu2 clay

Model: Spline Data Point Function (Y Log)
Function: K-Modifier vs. Y-Effective Stress
Curve Fit to Data: 100 %
Segment Curvature: 75 %

Y-Intercept: 1.2
Data Points: Y-Effective Stress (psf), K-Modifier
Data Point: (1,000, 1.2)
Data Point: (2,000, 1)
Data Point: (4,000, 0.839)
Data Point: (8,000, 0.70417211)
Data Point: (12,000, 0.63551782)
Data Point: (16,000, 0.59090577)

Vol. Water Content Functions

Clay soils OC

Model: Vol WC Data Point Function
Function: Vol. Water Content vs. Pore-Water Pressure
Mv: 7e-005 /psf
Saturated Water Content: 0.31427274 ft^3/ft^3
Residual Water Content: 0.031427274 ft^3/ft^3
Curve Fit to Data: 100 %
Segment Curvature: 100 %
Porosity: 0.31427274
Data Points: Matric Suction (psf), Vol. Water Content (ft^3/ft^3)
Data Point: (0.01, 0.29999999)
Data Point: (0.018329807, 0.29999998)
Data Point: (0.033598183, 0.29999996)
Data Point: (0.061584821, 0.29999991)
Data Point: (0.11288379, 0.29999982)
Data Point: (0.20691381, 0.29999962)
Data Point: (0.37926902, 0.29999917)
Data Point: (0.6951928, 0.29999814)
Data Point: (1.274275, 0.29999578)
Data Point: (2.3357215, 0.29999026)
Data Point: (4.2813324, 0.2999772)
Data Point: (7.8475997, 0.29994599)
Data Point: (14.384499, 0.29987093)
Data Point: (26.366509, 0.29968944)
Data Point: (48.329302, 0.29924951)
Data Point: (88.586679, 0.29818464)
Data Point: (162.37767, 0.29563126)
Data Point: (297.63514, 0.28967022)
Data Point: (545.55948, 0.27661743)
Data Point: (1,000, 0.25163343)
Estimation Properties
Vol. WC Estimation Method: Sample functions
Saturated Water Content: 0.3 ft^3/ft^3
Sample Material: Clay
Liquid Limit: 0 %
Diameter at 10% passing: 0
Diameter at 60% passing: 0
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Clay soils

Model: Vol WC Data Point Function
Function: Vol. Water Content vs. Pore-Water Pressure
Mv: 0.0004 /psf
Saturated Water Content: 0.60995302 ft^3/ft^3
Residual Water Content: 0.060995302 ft^3/ft^3
Curve Fit to Data: 100 %
Segment Curvature: 100 %
Porosity: 0.60995302
Data Points: Matric Suction (psf), Vol. Water Content (ft^3/ft^3)
Data Point: (0.01, 0.43999998)
Data Point: (0.018329807, 0.43999997)
Data Point: (0.033598183, 0.43999994)
Data Point: (0.061584821, 0.43999987)
Data Point: (0.11288379, 0.43999974)
Data Point: (0.20691381, 0.43999944)
Data Point: (0.37926902, 0.43999878)
Data Point: (0.6951928, 0.43999728)
Data Point: (1.274275, 0.43999381)
Data Point: (2.3357215, 0.43998571)
Data Point: (4.2813324, 0.43996655)
Data Point: (7.8475997, 0.43992079)
Data Point: (14.384499, 0.4398107)
Data Point: (26.366509, 0.43954452)
Data Point: (48.329302, 0.43889927)
Data Point: (88.586679, 0.43733747)
Data Point: (162.37767, 0.43359251)
Data Point: (297.63514, 0.42484965)
Data Point: (545.55948, 0.40570556)
Data Point: (1,000, 0.36906236)
Estimation Properties
Vol. WC Estimation Method: Sample functions
Saturated Water Content: 0.44 ft^3/ft^3
Sample Material: Clay
Liquid Limit: 0 %
Diameter at 10% passing: 0
Diameter at 60% passing: 0
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Till

Model: Vol WC Data Point Function
Function: Vol. Water Content vs. Pore-Water Pressure
Mv: 5e-006 /psf
Saturated Water Content: 0.20000173 ft^3/ft^3
Residual Water Content: 0.020000173 ft^3/ft^3
Curve Fit to Data: 100 %
Segment Curvature: 100 %
Porosity: 0.20000173
Data Points: Matric Suction (psf), Vol. Water Content (ft^3/ft^3)
Data Point: (0.01, 0.19999999)

Data Point: (0.018329807, 0.19999999)
Data Point: (0.033598183, 0.19999997)
Data Point: (0.061584821, 0.19999993)
Data Point: (0.11288379, 0.19999985)
Data Point: (0.20691381, 0.19999967)
Data Point: (0.37926902, 0.19999922)
Data Point: (0.6951928, 0.19999811)
Data Point: (1.274275, 0.19999535)
Data Point: (2.3357215, 0.19998838)
Data Point: (4.2813324, 0.19997056)
Data Point: (7.8475997, 0.19992471)
Data Point: (14.384499, 0.19980625)
Data Point: (26.366509, 0.19949952)
Data Point: (48.329302, 0.19870702)
Data Point: (88.586679, 0.19668084)
Data Point: (162.37767, 0.19165467)
Data Point: (297.63514, 0.18009116)
Data Point: (545.55948, 0.15752337)
Data Point: (1,000, 0.12453739)

Estimation Properties
Vol. WC Estimation Method: Sample functions
Saturated Water Content: 0.2 ft^3/ft^3
Sample Material: Silty Clay
Liquid Limit: 0 %
Diameter at 10% passing: 0
Diameter at 60% passing: 0
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

silty sand

Model: Vol WC Data Point Function
Function: Vol. Water Content vs. Pore-Water Pressure
Mv: 1e-005 /psf
Saturated Water Content: 0.30000011 ft^3/ft^3
Residual Water Content: 0.030000011 ft^3/ft^3
Curve Fit to Data: 100 %
Segment Curvature: 100 %
Porosity: 0.30000011
Data Points: Matric Suction (psf), Vol. Water Content (ft^3/ft^3)
Data Point: (0.01, 0.29999996)
Data Point: (0.018329807, 0.29999991)
Data Point: (0.033598183, 0.29999977)
Data Point: (0.061584821, 0.29999942)
Data Point: (0.11288379, 0.29999854)
Data Point: (0.20691381, 0.29999626)
Data Point: (0.37926902, 0.29999039)
Data Point: (0.6951928, 0.29997521)
Data Point: (1.274275, 0.29993588)
Data Point: (2.3357215, 0.29983385)
Data Point: (4.2813324, 0.29956912)
Data Point: (7.8475997, 0.29888334)

Data Point: (14.384499, 0.29711648)
Data Point: (26.366509, 0.29263189)
Data Point: (48.329302, 0.28167657)
Data Point: (88.586679, 0.25725429)
Data Point: (162.37767, 0.21239326)
Data Point: (297.63514, 0.15298031)
Data Point: (545.55948, 0.099847233)
Data Point: (1,000, 0.064649441)

Estimation Properties

Vol. WC Estimation Method: Sample functions
Saturated Water Content: 0.3 ft^3/ft^3
Sample Material: Silty Sand
Liquid Limit: 0 %
Diameter at 10% passing: 0
Diameter at 60% passing: 0
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Points

	X (ft)	Y (ft)
Point 1	0	268.91519
Point 2	207.4978	271.24238
Point 3	209.0232	271.26867
Point 4	215.074	271.32735
Point 5	225.5606	271.44496
Point 6	230.6621	271.56993
Point 7	234.0537	271.62591
Point 8	237.8751	271.70733
Point 9	243.6233	271.78388
Point 10	403.7734	274.99581
Point 11	406.1879	275.04891
Point 12	510.242	277.40528
Point 13	519.1809	277.52295
Point 14	522.2501	277.56833
Point 15	581.5843	278.21948
Point 16	706.5316	275.03632
Point 17	784.4915	272.77004
Point 18	796.8946	272.40949
Point 19	796.8946	278.66207
Point 20	771.752	277.8332
Point 21	583.2389	281.6042
Point 22	512.9202	278.57945

Point 23	404.2686	277.81745
Point 24	248.1947	278.63737
Point 25	83.6675	274.48464
Point 26	78.5956	274.41664
Point 27	69.7373	274.12229
Point 28	0	273.8562
Point 29	0	286.98783
Point 30	69.7373	288.07912
Point 31	78.6615	288.22649
Point 32	83.6675	288.57952
Point 33	248.1947	297.19282
Point 34	404.2686	294.81745
Point 35	512.9202	289.28565
Point 36	583.2389	288.00106
Point 37	796.8946	289.48765
Point 38	0	305.26334
Point 39	63.5351	305.72185
Point 40	69.7373	305.70863
Point 41	77.6371	305.65972
Point 42	78.5956	305.57155
Point 43	83.6675	305.7
Point 44	248.1947	307.61838
Point 45	299.7903	306.27673
Point 46	299.6238	303.28004
Point 47	404.2544	300.5593
Point 48	512.9971	302.35411
Point 49	583.3451	304.79977
Point 50	592.8421	305.14193
Point 51	650.1895	305.15472
Point 52	796.8602	303.47517
Point 53	796.8946	303.47517
Point 54	404.2686	303.55995
Point 55	512.9202	305.35325
Point 56	583.2389	307.79789
Point 57	592.7878	308.14191
Point 58	650.2064	308.15472
Point 59	796.8946	306.47498
Point 60	0	327.67711
Point 61	22.4921	326.28273

Point 62	49.2488	323.27595
Point 63	74.3201	319.27807
Point 64	77.7249	318.65421
Point 65	112.0147	318.69361
Point 66	124.2402	315.77486
Point 67	126.7076	315.31519
Point 68	136.2125	313.12968
Point 69	142.0351	312.45981
Point 70	357.6126	310.47901
Point 71	586.0206	317.13
Point 72	588.0287	317.67977
Point 73	603.6052	322
Point 74	693.0775	322
Point 75	695.4173	323.10644
Point 76	697.3194	324
Point 77	714.7524	332
Point 78	726.8078	332.79458
Point 79	736.4313	333.45251
Point 80	740.2913	333.71166
Point 81	742.8239	333.89241
Point 82	743.6092	331.27888
Point 83	746.0108	331.28559
Point 84	751.3746	333.5338
Point 85	751.5561	333.52887
Point 86	751.6873	333.53898
Point 87	751.9654	333.539
Point 88	755.4965	333.65881
Point 89	757.088	333.70415
Point 90	766.5218	333.52383
Point 91	769.5239	331.03222
Point 92	781.3859	336.00827
Point 93	796.8946	335.53695
Point 94	0	330.67136
Point 95	0.1856	330.67136
Point 96	22.7526	329.27234
Point 97	49.6527	326.24944
Point 98	74.8268	322.23518
Point 99	77.9958	321.65452
Point 100	112.3661	321.69402

Point 101	124.8636	318.71033
Point 102	127.3188	318.25295
Point 103	136.7217	316.09089
Point 104	142.2209	315.45823
Point 105	357.5827	313.47942
Point 106	585.5746	320.11828
Point 107	587.2318	320.57198
Point 108	684.7881	347.62982
Point 109	704.816	348.13028
Point 110	707.7847	347.0118
Point 111	709.4494	346.32322
Point 112	709.6367	345.87345
Point 113	708.0438	345.21
Point 114	685.2332	344.64
Point 115	131.5335	329.79618
Point 116	158.1735	318.33502
Point 117	165.2063	318.28065
Point 118	203.3044	317.9221
Point 119	243.6199	317.55888
Point 120	248.3589	317.51329
Point 121	357.6595	316.4965
Point 122	589.0312	323.16552
Point 123	591.6482	323.89085
Point 124	610.0073	329
Point 125	631.5677	335
Point 126	653.128	341
Point 127	674.6884	347
Point 128	684.1005	349.61929
Point 129	699.8223	350.01168
Point 130	0	332.91188
Point 131	22.4396	331.51733
Point 132	49.1519	328.50799
Point 133	68.0785	325.48185
Point 134	73.6566	324.58998
Point 135	90.5756	324.62675
Point 136	109.5111	324.68581
Point 137	124.0229	330.52741
Point 138	127.0249	330.53586
Point 139	129.8149	330.45078

Point 140	130.027	330.44431
Point 141	274.9823	329
Point 142	252.0124	321.5
Point 143	213.855	321.5
Point 144	177.1587	331.5
Point 145	171.0426	331.5
Point 146	152.2075	323.79526
Point 147	298.6003	335
Point 148	282.6389	331.5
Point 149	287.7433	331.5
Point 150	289.3308	331.95874
Point 151	290.9318	332.5
Point 152	317.0046	341
Point 153	355.3453	347
Point 154	666.3598	347
Point 155	669.6785	345.61929
Point 156	674.6567	347
Point 157	326.7765	344.18573
Point 158	336.1465	343.24706
Point 159	342.0216	342.65356
Point 160	373.7378	353
Point 161	651.9377	353
Point 162	392.1303	359
Point 163	637.5157	359
Point 164	410.5229	365
Point 165	623.0936	365
Point 166	608.6716	371
Point 167	428.9409	371
Point 168	415.8066	366.72364
Point 169	447.0228	377
Point 170	594.2496	377
Point 171	435.4903	373.13237
Point 172	450.0526	378.01608
Point 173	459.9195	378.51574
Point 174	479.4258	379.45192
Point 175	482.5508	379.55699
Point 176	491.9324	380
Point 177	507.2813	380.61621
Point 178	541.8899	382.28139

Point 179	574.2808	382.67429
Point 180	581.1072	381.37657
Point 181	581.6822	381.26488
Point 182	582.2411	381.14975
Point 183	582.7845	381.03125
Point 184	583.313	380.90951
Point 185	583.8273	380.78465
Point 186	584.3278	380.6568
Point 187	584.8152	380.52606
Point 188	585.29	380.39256
Point 189	592.2253	377.82435
Point 190	593.0101	377.51567
Point 191	78.5551	329.67009
Point 192	110.5776	331.89761
Point 193	113.2091	332.06836
Point 194	115.8406	332.21663
Point 195	118.4721	332.34247
Point 196	121.1036	332.44595
Point 197	123.7351	332.5271
Point 198	125.1298	332.55831
Point 199	126.3665	332.19565
Point 200	128.6722	331.5
Point 201	128.9196	331.46994
Point 202	710.0851	346.06023
Point 203	718.4637	349.55
Point 204	736.491	350
Point 205	738.1976	349.29
Point 206	796.8946	253.91519
Point 207	0	253.91519

Lines

	Start Point	End Point	Stress/Strain Boundary
Line 1	1	2	
Line 2	2	3	
Line 3	3	4	
Line 4	4	5	
Line 5	5	6	
Line 6	6	7	

Line 7	7	8	
Line 8	8	9	
Line 9	9	10	
Line 10	10	11	
Line 11	11	12	
Line 12	12	13	
Line 13	13	14	
Line 14	14	15	
Line 15	15	16	
Line 16	16	17	
Line 17	17	18	
Line 18	18	19	Fixed X
Line 19	19	20	
Line 20	20	21	
Line 21	21	22	
Line 22	22	23	
Line 23	23	24	
Line 24	24	25	
Line 25	25	26	
Line 26	26	27	
Line 27	27	28	
Line 28	28	1	Fixed X
Line 29	29	30	
Line 30	30	31	
Line 31	31	32	
Line 32	32	33	
Line 33	33	34	
Line 34	34	35	
Line 35	35	36	
Line 36	36	37	
Line 37	37	19	Fixed X
Line 38	28	29	Fixed X
Line 39	38	39	
Line 40	39	40	
Line 41	40	41	
Line 42	41	42	
Line 43	42	43	
Line 44	43	44	
Line 45	44	45	

Line 46	45	46	
Line 47	46	47	
Line 48	47	48	
Line 49	48	49	
Line 50	49	50	
Line 51	50	51	
Line 52	51	52	
Line 53	52	53	
Line 54	53	37	Fixed X
Line 55	29	38	Fixed X
Line 56	45	54	
Line 57	54	55	
Line 58	55	56	
Line 59	56	57	
Line 60	57	58	
Line 61	58	59	
Line 62	59	53	Fixed X
Line 63	60	61	
Line 64	61	62	
Line 65	62	63	
Line 66	63	64	
Line 67	64	65	
Line 68	65	66	
Line 69	66	67	
Line 70	67	68	
Line 71	68	69	
Line 72	69	70	
Line 73	70	71	
Line 74	71	72	
Line 75	72	73	
Line 76	73	74	
Line 77	74	75	
Line 78	75	76	
Line 79	76	77	
Line 80	77	78	
Line 81	78	79	
Line 82	79	80	
Line 83	80	81	
Line 84	81	82	

Line 85	82	83	
Line 86	83	84	
Line 87	84	85	
Line 88	85	86	
Line 89	86	87	
Line 90	87	88	
Line 91	88	89	
Line 92	89	90	
Line 93	90	91	
Line 94	91	92	
Line 95	92	93	
Line 96	93	59	Fixed X
Line 97	38	60	Fixed X
Line 98	94	95	
Line 99	95	96	
Line 100	96	97	
Line 101	97	98	
Line 102	98	99	
Line 103	99	100	
Line 104	100	101	
Line 105	101	102	
Line 106	102	103	
Line 107	103	104	
Line 108	104	105	
Line 109	105	106	
Line 110	106	107	
Line 111	107	108	
Line 112	108	109	
Line 113	109	110	
Line 114	110	111	
Line 115	111	112	
Line 116	112	113	
Line 117	113	114	
Line 118	114	73	
Line 119	60	94	Fixed X
Line 120	115	116	
Line 121	116	117	
Line 122	117	118	
Line 123	118	119	

Line 124	119	120	
Line 125	120	121	
Line 126	121	122	
Line 127	122	123	
Line 128	123	124	
Line 129	124	125	
Line 130	125	126	
Line 131	126	127	
Line 132	127	128	
Line 133	128	129	
Line 134	129	109	
Line 135	94	130	Fixed X
Line 136	130	131	
Line 137	131	132	
Line 138	132	133	
Line 139	133	134	
Line 140	134	135	
Line 141	135	136	
Line 142	136	137	
Line 143	137	138	
Line 144	138	139	
Line 145	139	140	
Line 146	140	115	
Line 147	124	141	
Line 148	141	142	
Line 149	142	143	
Line 150	143	144	
Line 151	144	145	
Line 152	145	146	
Line 153	146	115	
Line 154	147	125	
Line 155	141	148	
Line 156	148	149	
Line 157	149	150	
Line 158	150	151	
Line 159	151	147	
Line 160	126	152	
Line 161	152	147	
Line 162	153	154	

Line 163	154	155	
Line 164	155	156	
Line 165	156	127	
Line 166	152	157	
Line 167	157	158	
Line 168	158	159	
Line 169	159	153	
Line 170	160	161	
Line 171	161	154	
Line 172	153	160	
Line 173	162	163	
Line 174	163	161	
Line 175	160	162	
Line 176	164	165	
Line 177	165	163	
Line 178	162	164	
Line 179	165	166	
Line 180	166	167	
Line 181	167	168	
Line 182	168	164	
Line 183	169	170	
Line 184	170	166	
Line 185	167	171	
Line 186	171	169	
Line 187	169	172	
Line 188	172	173	
Line 189	173	174	
Line 190	174	175	
Line 191	175	176	
Line 192	176	177	
Line 193	177	178	
Line 194	178	179	
Line 195	179	180	
Line 196	180	181	
Line 197	181	182	
Line 198	182	183	
Line 199	183	184	
Line 200	184	185	
Line 201	185	186	

Line 202	186	187	
Line 203	187	188	
Line 204	188	189	
Line 205	189	190	
Line 206	190	170	
Line 207	133	191	
Line 208	191	192	
Line 209	192	193	
Line 210	193	194	
Line 211	194	195	
Line 212	195	196	
Line 213	196	197	
Line 214	197	198	
Line 215	198	199	
Line 216	199	200	
Line 217	200	201	
Line 218	201	139	
Line 219	112	202	
Line 220	202	203	
Line 221	203	204	
Line 222	204	205	
Line 223	205	81	
Line 224	18	206	Fixed X
Line 225	206	207	Fixed X/Y
Line 226	207	1	Fixed X

Regions

	Material	Points	Area (ft²)
Region 1	Lower Till	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28	3,346.1
Region 2	Sand/Silt	29,30,31,32,33,34,35,36,37,19,20,21,22,23,24,25,26,27,28	10,671
Region 3	GC-Drained	38,39,40,41,42,43,44,45,46,47,48,49,50,51,52,53,37,36,35,34,33,32,31,30,29	10,397
Region 4	GC OverConsolidated	45,54,55,56,57,58,59,53,52,51,50,49,48,47,46	1,491.9
Region 5	Upper Till	60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78,79,80,81,82,83,84,85,86,87,88,89,90,91,92,93,59,58,57,56,55,54,45,44,43,42,41,40,39,38	9,253.4

Region 6	NOT ACTIVE	94,95,96,97,98,99,100,101,102,103,104,105,106,107,108,109,110,111,112,113,114,73,72,71,70,69,68,67,66,65,64,63,62,61,60	2,139
Region 7	NOT ACTIVE	115,116,117,118,119,120,121,122,123,124,125,126,127,128,129,109,108,107,106,105,104,103,102,101,100,99,98,97,96,95,94,130,131,132,133,134,135,136,137,138,139,140	2,215.1
Region 8	NOT ACTIVE	115,116,117,118,119,120,121,122,123,124,141,142,143,144,145,146	4,104.1
Region 9	NOT ACTIVE	147,125,124,141,148,149,150,151	2,001.4
Region 10	NOT ACTIVE	147,125,126,152	2,007.3
Region 11	NOT ACTIVE	153,154,155,156,127,126,152,157,158,159	1,949.1
Region 12	NOT ACTIVE	160,161,154,153	1,767.6
Region 13	NOT ACTIVE	162,163,161,160	1,570.8
Region 14	NOT ACTIVE	164,165,163,162	1,373.9
Region 15	NOT ACTIVE	164,165,166,167,168	1,176.9
Region 16	NOT ACTIVE	169,170,166,167,171	980.5
Region 17	NOT ACTIVE	169,172,173,174,175,176,177,178,179,180,181,182,183,184,185,186,187,188,189,190,170	534.96
Region 18	NOT ACTIVE	133,191,192,193,194,195,196,197,198,199,200,201,139,138,137,136,135,134	293.23
Region 19	NOT ACTIVE	73,114,113,112,202,203,204,205,81,80,79,78,77,76,75,74	1,934.1
Region 20	UPPER SHALE	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,206,207	15,814

Figure 19 - Coupled Consolidation for Section OP-2 for Liner Construction

OP Step 1 - Liner Placement

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File Information

Title: Model City - RMU-2 CP-20 Section OP-2
Comments: Operation Conditions for CP-20 Section 2 Based on Maximum Fill Rate of 50,000 Cu Yds per Quarter
Created By: Peter J. Carey
Revision Number: 498
File Version: 8.0
Tool Version: 8.0.10.6504
Date: 2/25/2013
Time: 7:29:13 AM
File Name: C20OP-2r1.gsz
Directory: N:\Model_City\154.002_rmu2\154.005_revsions\geoslope\operational\

Project Settings

Length(L) Units: feet
Time(t) Units: Days
Force(F) Units: lbf
Pressure(p) Units: psf
Strength Units: psf
Stiffness Units: psf
Unit Weight of Water: 62.4 pcf
Air Pressure: 101.33 psf
View: 2D

Analysis Settings

OP Step 1 - Liner Placement

Kind: SIGMA/W
Parent: Insitu
Method: Coupled Stress/PWP
Settings
    Initial Stress: Parent Analysis
    Initial PWP: Parent Analysis
    Exclude cumulative values: Yes
Control
    Apply Body Force in All Steps: No
    Saturated Zone Only: No
Convergence
    Maximum Number of Iterations: 50
    Minimum Pressure Head Difference: 0.001
    Minimum Displacement Difference: 0.001
    Significant Digits: 3
    Hydraulic Under-Relaxation Criteria

Under-Relaxation Initial Rate: 1
Under-Relaxation Min. Rate: 0.1
Under-Relaxation Reduction Rate: 0.65
Under-Relaxation Iterations: 10
Equation Solver: Parallel Direct
Time
Starting Time: 0 days
Duration: 120 days
# of Steps: 15
Step Generation Method: Linear
Save Steps Every: 5

Materials

Bottom Liner

Model: Linear Elastic (Total)
Stress Strain
Young's Modulus (E): 400,000 psf
Unit Weight: 120 pcf
Poisson's Ratio: 0.45

CCL

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 1,000,000 psf
Unit Weight: 120 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Clay soils OC
K-Function: GC 5.7 E-4 ft/day
Ky'/Kx' Ratio: 0.1
Rotation: 0 °
Load Response Ratio: 1

Upper Till

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 300,000 psf
Unit Weight: 125 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Till
K-Function: Upper Glacial Till
Ky'/Kx' Ratio: 1
Rotation: 0 °
Load Response Ratio: 1

GC-Drained

Model: Soft Clay (MCC w/ PWP Change)
Stress Strain
O.C. Ratio: 4

Poisson's Ratio: 0.334
Lambda: 0.14
Kappa: 0.013
Initial Void Ratio: 1
Unit Weight: 118 pcf
Phi': 27 °

Hydraulic

Vol. WC. Function: Clay soils
K-Function: GC 5.7 E-4 ft/day
Ky'/Kx' Ratio: 1
Rotation: 0 °
K-Modifier Function: 1D consol derived k function rmu2 clay
Load Response Ratio: 1

GC OverConsolidated

Model: Soft Clay (MCC w/ PWP Change)

Stress Strain

O.C. Ratio: 8
Poisson's Ratio: 0.334
Lambda: 0.06
Kappa: 0.01
Initial Void Ratio: 0.5
Unit Weight: 125 pcf
Phi': 30 °

Hydraulic

Vol. WC. Function: Clay soils OC
K-Function: GC 5.7 E-4 ft/day
Ky'/Kx' Ratio: 1
Rotation: 0 °
K-Modifier Function: 1D consol derived k function rmu2 clay
Load Response Ratio: 1

Sand/Silt

Model: Linear Elastic (w/ PWP Change)

Stress Strain

Effective Young's Modulus (E'): 300,000 psf
Unit Weight: 135 pcf
Poisson's Ratio: 0.334

Hydraulic

Vol. WC. Function: silty sand
K-Function: Silty Sand, k = 0.567 ft/day 2 E-4cm/sec
Ky'/Kx' Ratio: 0.1
Rotation: 0 °
Load Response Ratio: 1

Lower Till

Model: Linear Elastic (w/ PWP Change)

Stress Strain

Effective Young's Modulus (E'): 600,000 psf
Unit Weight: 145 pcf
Poisson's Ratio: 0.334

Hydraulic

Vol. WC. Function: Till
K-Function: Till
Ky'/Kx' Ratio: 1
Rotation: 0 °
Load Response Ratio: 1

Structural Fill

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 100,000 psf
Unit Weight: 135 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Till
K-Function: Till
Ky'/Kx' Ratio: 1
Rotation: 0 °
Load Response Ratio: 1

UPPER SHALE

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 1,000,000 psf
Unit Weight: 145 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Till
K-Function: Upper Rock
Ky'/Kx' Ratio: 1
Rotation: 0 °
Load Response Ratio: 1

Boundary Conditions

Fixed X

X: X-Displacement 0

Fixed X/Y

X: X-Displacement 0
Y: Y-Displacement 0

no flow

Type: Total Flux (Q) 0
Review: No

noflowzeropress

Type: Total Flux (Q) 0
Review: Yes

drainage 313

Type: Head (H) 313

Review: No

Initial Water Tables

Initial Water Table 1

Max. negative head: 5
Coordinates
Coordinate 1: (0, 315) ft
Coordinate 2: (850, 315) ft

K Functions

Silty Sand, k = 0.567 ft/day 2 E-4cm/sec

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 36 %
K-Saturation: 0.567
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (0.005, 0.567)
Data Point: (0.01, 0.567)
Data Point: (0.035938, 0.567)
Data Point: (0.12915, 0.567)
Data Point: (0.46416, 0.567)
Data Point: (1.1111, 0.567)
Data Point: (1.6681, 0.567)
Data Point: (5.9948, 0.567)
Data Point: (21.544, 0.567)
Data Point: (77.426, 0.567)
Data Point: (105.93, 0.5402376)
Data Point: (210.74, 0.3387258)
Data Point: (278.26, 0.2567376)
Data Point: (315.56, 0.2232846)
Data Point: (420.37, 0.1406916)
Data Point: (525.19, 0.0779121)
Data Point: (630, 0.03843882)
Data Point: (734.81, 0.01673406)
Data Point: (839.63, 0.005422788)
Data Point: (944.44, 0.000745983)
Data Point: (1,000, 7.14735e-005)
Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Upper Glacial Till

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 36 %
K-Saturation: 0.0057
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (0.005, 0.0057)
Data Point: (0.01, 0.0057)
Data Point: (0.046416, 0.0057)
Data Point: (0.21544, 0.0057)
Data Point: (1, 0.0057)
Data Point: (4.6416, 0.0057)
Data Point: (11.111, 0.0057)
Data Point: (21.544, 0.0057)
Data Point: (100, 0.0057)
Data Point: (464.16, 0.0016245)
Data Point: (1,059.3, 0.0002427972)
Data Point: (2,107.4, 1.492716e-005)
Data Point: (2,154.4, 1.369596e-005)
Data Point: (3,155.6, 4.086672e-006)
Data Point: (4,203.7, 1.82115e-006)
Data Point: (5,251.9, 9.03222e-007)
Data Point: (6,300, 4.30521e-007)
Data Point: (7,348.1, 2.028516e-007)
Data Point: (8,396.3, 7.73661e-008)
Data Point: (9,444.4, 2.691312e-008)
Data Point: (10,000, 2.691312e-008)
Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Upper Rock

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 36 %
K-Saturation: 0.567
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (0.005, 0.567)
Data Point: (0.01, 0.567)
Data Point: (10,000, 0.567)
Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01

Num. Points: 20

Till

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 36 %
K-Saturation: 0.000567
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (0.005, 0.000567)
Data Point: (0.01, 0.000567)
Data Point: (10,000, 0.000567)
Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

GC 5.7 E-4 ft/day

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 100 %
K-Saturation: 0.00057
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (10, 0.00057)
Data Point: (1,000, 9e-006)
Data Point: (5,000, 5e-006)
Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Hydraulic K Modifier Functions

1D consol derived k function rmu2 clay

Model: Spline Data Point Function (Y Log)
Function: K-Modifier vs. Y-Effective Stress
Curve Fit to Data: 100 %
Segment Curvature: 75 %
Y-Intercept: 1.2
Data Points: Y-Effective Stress (psf), K-Modifier
Data Point: (1,000, 1.2)
Data Point: (2,000, 1)
Data Point: (4,000, 0.839)
Data Point: (8,000, 0.70417211)

Data Point: (12,000, 0.63551782)
Data Point: (16,000, 0.59090577)

Vol. Water Content Functions

Clay soils OC

Model: Vol WC Data Point Function
Function: Vol. Water Content vs. Pore-Water Pressure
Mv: 7e-005 /psf
Saturated Water Content: 0.31427274 ft^3/ft^3
Residual Water Content: 0.031427274 ft^3/ft^3
Curve Fit to Data: 100 %
Segment Curvature: 100 %
Porosity: 0.31427274
Data Points: Matric Suction (psf), Vol. Water Content (ft^3/ft^3)
Data Point: (0.01, 0.29999999)
Data Point: (0.018329807, 0.29999998)
Data Point: (0.033598183, 0.29999996)
Data Point: (0.061584821, 0.29999991)
Data Point: (0.11288379, 0.29999982)
Data Point: (0.20691381, 0.29999962)
Data Point: (0.37926902, 0.29999917)
Data Point: (0.6951928, 0.29999814)
Data Point: (1.274275, 0.29999578)
Data Point: (2.3357215, 0.29999026)
Data Point: (4.2813324, 0.2999772)
Data Point: (7.8475997, 0.29994599)
Data Point: (14.384499, 0.29987093)
Data Point: (26.366509, 0.29968944)
Data Point: (48.329302, 0.29924951)
Data Point: (88.586679, 0.29818464)
Data Point: (162.37767, 0.29563126)
Data Point: (297.63514, 0.28967022)
Data Point: (545.55948, 0.27661743)
Data Point: (1,000, 0.25163343)
Estimation Properties
Vol. WC Estimation Method: Sample functions
Saturated Water Content: 0.3 ft^3/ft^3
Sample Material: Clay
Liquid Limit: 0 %
Diameter at 10% passing: 0
Diameter at 60% passing: 0
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Clay soils

Model: Vol WC Data Point Function
Function: Vol. Water Content vs. Pore-Water Pressure
Mv: 0.0004 /psf
Saturated Water Content: 0.60995302 ft^3/ft^3

Residual Water Content: 0.060995302 ft^3/ft^3
Curve Fit to Data: 100 %
Segment Curvature: 100 %
Porosity: 0.60995302
Data Points: Matric Suction (psf), Vol. Water Content (ft^3/ft^3)
Data Point: (0.01, 0.43999998)
Data Point: (0.018329807, 0.43999997)
Data Point: (0.033598183, 0.43999994)
Data Point: (0.061584821, 0.43999987)
Data Point: (0.11288379, 0.43999974)
Data Point: (0.20691381, 0.43999944)
Data Point: (0.37926902, 0.43999878)
Data Point: (0.6951928, 0.43999728)
Data Point: (1.274275, 0.43999381)
Data Point: (2.3357215, 0.43998571)
Data Point: (4.2813324, 0.43996655)
Data Point: (7.8475997, 0.43992079)
Data Point: (14.384499, 0.4398107)
Data Point: (26.366509, 0.43954452)
Data Point: (48.329302, 0.43889927)
Data Point: (88.586679, 0.43733747)
Data Point: (162.37767, 0.43359251)
Data Point: (297.63514, 0.42484965)
Data Point: (545.55948, 0.40570556)
Data Point: (1,000, 0.36906236)
Estimation Properties
Vol. WC Estimation Method: Sample functions
Saturated Water Content: 0.44 ft^3/ft^3
Sample Material: Clay
Liquid Limit: 0 %
Diameter at 10% passing: 0
Diameter at 60% passing: 0
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Till

Model: Vol WC Data Point Function
Function: Vol. Water Content vs. Pore-Water Pressure
Mv: 5e-006 /psf
Saturated Water Content: 0.20000173 ft^3/ft^3
Residual Water Content: 0.020000173 ft^3/ft^3
Curve Fit to Data: 100 %
Segment Curvature: 100 %
Porosity: 0.20000173
Data Points: Matric Suction (psf), Vol. Water Content (ft^3/ft^3)
Data Point: (0.01, 0.19999999)
Data Point: (0.018329807, 0.19999999)
Data Point: (0.033598183, 0.19999997)
Data Point: (0.061584821, 0.19999993)
Data Point: (0.11288379, 0.19999985)
Data Point: (0.20691381, 0.19999967)

Data Point: (0.37926902, 0.19999922)
Data Point: (0.6951928, 0.19999811)
Data Point: (1.274275, 0.19999535)
Data Point: (2.3357215, 0.19998838)
Data Point: (4.2813324, 0.19997056)
Data Point: (7.8475997, 0.19992471)
Data Point: (14.384499, 0.19980625)
Data Point: (26.366509, 0.19949952)
Data Point: (48.329302, 0.19870702)
Data Point: (88.586679, 0.19668084)
Data Point: (162.37767, 0.19165467)
Data Point: (297.63514, 0.18009116)
Data Point: (545.55948, 0.15752337)
Data Point: (1,000, 0.12453739)

Estimation Properties
Vol. WC Estimation Method: Sample functions
Saturated Water Content: 0.2 ft^3/ft^3
Sample Material: Silty Clay
Liquid Limit: 0 %
Diameter at 10% passing: 0
Diameter at 60% passing: 0
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

silty sand

Model: Vol WC Data Point Function
Function: Vol. Water Content vs. Pore-Water Pressure
Mv: 1e-005 /psf
Saturated Water Content: 0.30000011 ft^3/ft^3
Residual Water Content: 0.030000011 ft^3/ft^3
Curve Fit to Data: 100 %
Segment Curvature: 100 %
Porosity: 0.30000011
Data Points: Matric Suction (psf), Vol. Water Content (ft^3/ft^3)
Data Point: (0.01, 0.29999996)
Data Point: (0.018329807, 0.29999991)
Data Point: (0.033598183, 0.29999977)
Data Point: (0.061584821, 0.29999942)
Data Point: (0.11288379, 0.29999854)
Data Point: (0.20691381, 0.29999626)
Data Point: (0.37926902, 0.29999039)
Data Point: (0.6951928, 0.29997521)
Data Point: (1.274275, 0.29993588)
Data Point: (2.3357215, 0.29983385)
Data Point: (4.2813324, 0.29956912)
Data Point: (7.8475997, 0.29888334)
Data Point: (14.384499, 0.29711648)
Data Point: (26.366509, 0.29263189)
Data Point: (48.329302, 0.28167657)
Data Point: (88.586679, 0.25725429)
Data Point: (162.37767, 0.21239326)

Data Point: (297.63514, 0.15298031)
Data Point: (545.55948, 0.099847233)
Data Point: (1,000, 0.064649441)

Estimation Properties

Vol. WC Estimation Method: Sample functions
Saturated Water Content: 0.3 ft^3/ft^3
Sample Material: Silty Sand
Liquid Limit: 0 %
Diameter at 10% passing: 0
Diameter at 60% passing: 0
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Points

	X (ft)	Y (ft)
Point 1	0	268.91519
Point 2	207.4978	271.24238
Point 3	209.0232	271.26867
Point 4	215.074	271.32735
Point 5	225.5606	271.44496
Point 6	230.6621	271.56993
Point 7	234.0537	271.62591
Point 8	237.8751	271.70733
Point 9	243.6233	271.78388
Point 10	403.7734	274.99581
Point 11	406.1879	275.04891
Point 12	510.242	277.40528
Point 13	519.1809	277.52295
Point 14	522.2501	277.56833
Point 15	581.5843	278.21948
Point 16	706.5316	275.03632
Point 17	784.4915	272.77004
Point 18	796.8946	272.40949
Point 19	796.8946	278.66207
Point 20	771.752	277.8332
Point 21	583.2389	281.6042
Point 22	512.9202	278.57945
Point 23	404.2686	277.81745
Point 24	248.1947	278.63737
Point 25	83.6675	274.48464
Point 26	78.5956	274.41664

Point 27	69.7373	274.12229
Point 28	0	273.8562
Point 29	0	286.98783
Point 30	69.7373	288.07912
Point 31	78.6615	288.22649
Point 32	83.6675	288.57952
Point 33	248.1947	297.19282
Point 34	404.2686	294.81745
Point 35	512.9202	289.28565
Point 36	583.2389	288.00106
Point 37	796.8946	289.48765
Point 38	0	305.26334
Point 39	63.5351	305.72185
Point 40	69.7373	305.70863
Point 41	77.6371	305.65972
Point 42	78.5956	305.57155
Point 43	83.6675	305.7
Point 44	248.1947	307.61838
Point 45	299.7903	306.27673
Point 46	299.6238	303.28004
Point 47	404.2544	300.5593
Point 48	512.9971	302.35411
Point 49	583.3451	304.79977
Point 50	592.8421	305.14193
Point 51	650.1895	305.15472
Point 52	796.8602	303.47517
Point 53	796.8946	303.47517
Point 54	404.2686	303.55995
Point 55	512.9202	305.35325
Point 56	583.2389	307.79789
Point 57	592.7878	308.14191
Point 58	650.2064	308.15472
Point 59	796.8946	306.47498
Point 60	0	327.67711
Point 61	22.4921	326.28273
Point 62	49.2488	323.27595
Point 63	74.3201	319.27807
Point 64	77.7249	318.65421
Point 65	112.0147	318.69361

Point 66	124.2402	315.77486
Point 67	126.7076	315.31519
Point 68	136.2125	313.12968
Point 69	142.0351	312.45981
Point 70	357.6126	310.47901
Point 71	586.0206	317.13
Point 72	588.0287	317.67977
Point 73	603.6052	322
Point 74	693.0775	322
Point 75	695.4173	323.10644
Point 76	697.3194	324
Point 77	714.7524	332
Point 78	726.8078	332.79458
Point 79	736.4313	333.45251
Point 80	740.2913	333.71166
Point 81	742.8239	333.89241
Point 82	743.6092	331.27888
Point 83	746.0108	331.28559
Point 84	751.3746	333.5338
Point 85	751.5561	333.52887
Point 86	751.6873	333.53898
Point 87	751.9654	333.539
Point 88	755.4965	333.65881
Point 89	757.088	333.70415
Point 90	766.5218	333.52383
Point 91	769.5239	331.03222
Point 92	781.3859	336.00827
Point 93	796.8946	335.53695
Point 94	0	330.67136
Point 95	0.1856	330.67136
Point 96	22.7526	329.27234
Point 97	49.6527	326.24944
Point 98	74.8268	322.23518
Point 99	77.9958	321.65452
Point 100	112.3661	321.69402
Point 101	124.8636	318.71033
Point 102	127.3188	318.25295
Point 103	136.7217	316.09089
Point 104	142.2209	315.45823

Point 105	357.5827	313.47942
Point 106	585.5746	320.11828
Point 107	587.2318	320.57198
Point 108	684.7881	347.62982
Point 109	704.816	348.13028
Point 110	707.7847	347.0118
Point 111	709.4494	346.32322
Point 112	709.6367	345.87345
Point 113	708.0438	345.21
Point 114	685.2332	344.64
Point 115	131.5335	329.79618
Point 116	158.1735	318.33502
Point 117	165.2063	318.28065
Point 118	203.3044	317.9221
Point 119	243.6199	317.55888
Point 120	248.3589	317.51329
Point 121	357.6595	316.4965
Point 122	589.0312	323.16552
Point 123	591.6482	323.89085
Point 124	610.0073	329
Point 125	631.5677	335
Point 126	653.128	341
Point 127	674.6884	347
Point 128	684.1005	349.61929
Point 129	699.8223	350.01168
Point 130	0	332.91188
Point 131	22.4396	331.51733
Point 132	49.1519	328.50799
Point 133	68.0785	325.48185
Point 134	73.6566	324.58998
Point 135	90.5756	324.62675
Point 136	109.5111	324.68581
Point 137	124.0229	330.52741
Point 138	127.0249	330.53586
Point 139	129.8149	330.45078
Point 140	130.027	330.44431
Point 141	274.9823	329
Point 142	252.0124	321.5
Point 143	213.855	321.5

Point 144	177.1587	331.5
Point 145	171.0426	331.5
Point 146	152.2075	323.79526
Point 147	298.6003	335
Point 148	282.6389	331.5
Point 149	287.7433	331.5
Point 150	289.3308	331.95874
Point 151	290.9318	332.5
Point 152	317.0046	341
Point 153	355.3453	347
Point 154	666.3598	347
Point 155	669.6785	345.61929
Point 156	674.6567	347
Point 157	326.7765	344.18573
Point 158	336.1465	343.24706
Point 159	342.0216	342.65356
Point 160	373.7378	353
Point 161	651.9377	353
Point 162	392.1303	359
Point 163	637.5157	359
Point 164	410.5229	365
Point 165	623.0936	365
Point 166	608.6716	371
Point 167	428.9409	371
Point 168	415.8066	366.72364
Point 169	447.0228	377
Point 170	594.2496	377
Point 171	435.4903	373.13237
Point 172	450.0526	378.01608
Point 173	459.9195	378.51574
Point 174	479.4258	379.45192
Point 175	482.5508	379.55699
Point 176	491.9324	380
Point 177	507.2813	380.61621
Point 178	541.8899	382.28139
Point 179	574.2808	382.67429
Point 180	581.1072	381.37657
Point 181	581.6822	381.26488
Point 182	582.2411	381.14975

Point 183	582.7845	381.03125
Point 184	583.313	380.90951
Point 185	583.8273	380.78465
Point 186	584.3278	380.6568
Point 187	584.8152	380.52606
Point 188	585.29	380.39256
Point 189	592.2253	377.82435
Point 190	593.0101	377.51567
Point 191	78.5551	329.67009
Point 192	110.5776	331.89761
Point 193	113.2091	332.06836
Point 194	115.8406	332.21663
Point 195	118.4721	332.34247
Point 196	121.1036	332.44595
Point 197	123.7351	332.5271
Point 198	125.1298	332.55831
Point 199	126.3665	332.19565
Point 200	128.6722	331.5
Point 201	128.9196	331.46994
Point 202	710.0851	346.06023
Point 203	718.4637	349.55
Point 204	736.491	350
Point 205	738.1976	349.29
Point 206	796.8946	253.91519
Point 207	0	253.91519

Lines

	Start Point	End Point	Hydraulic Boundary	Stress/Strain Boundary
Line 1	1	2		
Line 2	2	3		
Line 3	3	4		
Line 4	4	5		
Line 5	5	6		
Line 6	6	7		
Line 7	7	8		
Line 8	8	9		
Line 9	9	10		
Line 10	10	11		

Line 11	11	12		
Line 12	12	13		
Line 13	13	14		
Line 14	14	15		
Line 15	15	16		
Line 16	16	17		
Line 17	17	18		
Line 18	18	19	drainage 313	Fixed X
Line 19	19	20		
Line 20	20	21		
Line 21	21	22		
Line 22	22	23		
Line 23	23	24		
Line 24	24	25		
Line 25	25	26		
Line 26	26	27		
Line 27	27	28		
Line 28	28	1	drainage 313	Fixed X
Line 29	29	30		
Line 30	30	31		
Line 31	31	32		
Line 32	32	33		
Line 33	33	34		
Line 34	34	35		
Line 35	35	36		
Line 36	36	37		
Line 37	37	19	drainage 313	Fixed X
Line 38	28	29	drainage 313	Fixed X
Line 39	38	39		
Line 40	39	40		
Line 41	40	41		
Line 42	41	42		
Line 43	42	43		
Line 44	43	44		
Line 45	44	45		
Line 46	45	46		
Line 47	46	47		
Line 48	47	48		
Line 49	48	49		

Line 50	49	50		
Line 51	50	51		
Line 52	51	52		
Line 53	52	53		
Line 54	53	37	drainage 313	Fixed X
Line 55	29	38	drainage 313	Fixed X
Line 56	45	54		
Line 57	54	55		
Line 58	55	56		
Line 59	56	57		
Line 60	57	58		
Line 61	58	59		
Line 62	59	53	drainage 313	Fixed X
Line 63	60	61		
Line 64	61	62		
Line 65	62	63		
Line 66	63	64		
Line 67	64	65		
Line 68	65	66		
Line 69	66	67		
Line 70	67	68		
Line 71	68	69		
Line 72	69	70		
Line 73	70	71		
Line 74	71	72		
Line 75	72	73		
Line 76	73	74		
Line 77	74	75		
Line 78	75	76		
Line 79	76	77		
Line 80	77	78		
Line 81	78	79		
Line 82	79	80		
Line 83	80	81		
Line 84	81	82		
Line 85	82	83		
Line 86	83	84		
Line 87	84	85		
Line 88	85	86		

Line 89	86	87		
Line 90	87	88		
Line 91	88	89		
Line 92	89	90		
Line 93	90	91		
Line 94	91	92		
Line 95	92	93		
Line 96	93	59	noflowzeropress	Fixed X
Line 97	38	60	noflowzeropress	Fixed X
Line 98	94	95		
Line 99	95	96		
Line 100	96	97		
Line 101	97	98	no flow	
Line 102	98	99	no flow	
Line 103	99	100	no flow	
Line 104	100	101	no flow	
Line 105	101	102	no flow	
Line 106	102	103	no flow	
Line 107	103	104	no flow	
Line 108	104	105	no flow	
Line 109	105	106	no flow	
Line 110	106	107	no flow	
Line 111	107	108	no flow	
Line 112	108	109	no flow	
Line 113	109	110		
Line 114	110	111		
Line 115	111	112		
Line 116	112	113		
Line 117	113	114		
Line 118	114	73		
Line 119	60	94		Fixed X
Line 120	115	116		
Line 121	116	117		
Line 122	117	118		
Line 123	118	119		
Line 124	119	120		
Line 125	120	121		
Line 126	121	122		
Line 127	122	123		

Line 128	123	124		
Line 129	124	125		
Line 130	125	126		
Line 131	126	127		
Line 132	127	128		
Line 133	128	129		
Line 134	129	109		
Line 135	94	130		Fixed X
Line 136	130	131		
Line 137	131	132		
Line 138	132	133		
Line 139	133	134		
Line 140	134	135		
Line 141	135	136		
Line 142	136	137		
Line 143	137	138		
Line 144	138	139		
Line 145	139	140		
Line 146	140	115		
Line 147	124	141		
Line 148	141	142		
Line 149	142	143		
Line 150	143	144		
Line 151	144	145		
Line 152	145	146		
Line 153	146	115		
Line 154	147	125		
Line 155	141	148		
Line 156	148	149		
Line 157	149	150		
Line 158	150	151		
Line 159	151	147		
Line 160	126	152		
Line 161	152	147		
Line 162	153	154		
Line 163	154	155		
Line 164	155	156		
Line 165	156	127		
Line 166	152	157		

Line 167	157	158		
Line 168	158	159		
Line 169	159	153		
Line 170	160	161		
Line 171	161	154		
Line 172	153	160		
Line 173	162	163		
Line 174	163	161		
Line 175	160	162		
Line 176	164	165		
Line 177	165	163		
Line 178	162	164		
Line 179	165	166		
Line 180	166	167		
Line 181	167	168		
Line 182	168	164		
Line 183	169	170		
Line 184	170	166		
Line 185	167	171		
Line 186	171	169		
Line 187	169	172		
Line 188	172	173		
Line 189	173	174		
Line 190	174	175		
Line 191	175	176		
Line 192	176	177		
Line 193	177	178		
Line 194	178	179		
Line 195	179	180		
Line 196	180	181		
Line 197	181	182		
Line 198	182	183		
Line 199	183	184		
Line 200	184	185		
Line 201	185	186		
Line 202	186	187		
Line 203	187	188		
Line 204	188	189		
Line 205	189	190		

Line 206	190	170		
Line 207	133	191		
Line 208	191	192		
Line 209	192	193		
Line 210	193	194		
Line 211	194	195		
Line 212	195	196		
Line 213	196	197		
Line 214	197	198		
Line 215	198	199		
Line 216	199	200		
Line 217	200	201		
Line 218	201	139		
Line 219	112	202		
Line 220	202	203		
Line 221	203	204		
Line 222	204	205		
Line 223	205	81		
Line 224	18	206	drainage 313	Fixed X
Line 225	206	207	drainage 313	Fixed X/Y
Line 226	207	1	drainage 313	Fixed X

Regions

	Material	Points	Area (ft^2)
Region 1	Lower Till	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28	3,346.1
Region 2	Sand/Silt	29,30,31,32,33,34,35,36,37,19,20,21,22,23,24,25,26,27,28	10,671
Region 3	GC-Drained	38,39,40,41,42,43,44,45,46,47,48,49,50,51,52,53,37,36,35,34,33,32,31,30,29	10,397
Region 4	GC OverConsolidated	45,54,55,56,57,58,59,53,52,51,50,49,48,47,46	1,491.9
Region 5	Upper Till	60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78,79,80,81,82,83,84,85,86,87,88,89,90,91,92,93,59,58,57,56,55,54,45,44,43,42,41,40,39,38	9,253.4
Region 6	CCL	94,95,96,97,98,99,100,101,102,103,104,105,106,107,108,109,110,111,112,113,114,73,72,71,70,69,68,67,66,65,64,63,62,61,60	2,139
Region 7	Bottom Liner	115,116,117,118,119,120,121,122,123,124,125,126,127,128,129,109,108,107,106,105,104,103,102,101,100,99,98,97,96,95,94,1	2,215.1

		30,131,132,133,134,135,136,137,138,139,140	
Region 8		115,116,117,118,119,120,121,122,123,124,141,142,143,144,145,146	4,104.1
Region 9		147,125,124,141,148,149,150,151	2,001.4
Region 10		147,125,126,152	2,007.3
Region 11		153,154,155,156,127,126,152,157,158,159	1,949.1
Region 12		160,161,154,153	1,767.6
Region 13		162,163,161,160	1,570.8
Region 14		164,165,163,162	1,373.9
Region 15		164,165,166,167,168	1,176.9
Region 16		169,170,166,167,171	980.5
Region 17		169,172,173,174,175,176,177,178,179,180,181,182,183,184,185,186,187,188,189,190,170	534.96
Region 18	Structural Fill	133,191,192,193,194,195,196,197,198,199,200,201,139,138,137,136,135,134	293.23
Region 19	Structural Fill	73,114,113,112,202,203,204,205,81,80,79,78,77,76,75,74	1,934.1
Region 20	UPPER SHALE	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,206,207	15,814

Figure 20 - Coupled Consolidation for Section OP-2 for Waste Lift 1

Waste Lift 1 El. 329

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File Information

Title: Model City - RMU-2 CP-20 Section OP-2
Comments: Operation Conditions for CP-20 Section 2 Based on Maximum Fill Rate of 50,000 Cu Yds per Quarter
Created By: Peter J. Carey
Revision Number: 498
File Version: 8.0
Tool Version: 8.0.10.6504
Date: 2/25/2013
Time: 7:29:13 AM
File Name: C20OP-2r1.gsz
Directory: N:\Model_City\154.002_rmu2\154.005_revsions\geoslope\operational\

Project Settings

Length(L) Units: feet
Time(t) Units: Days
Force(F) Units: lbf
Pressure(p) Units: psf
Strength Units: psf
Stiffness Units: psf
Unit Weight of Water: 62.4 pcf
Air Pressure: 101.33 psf
View: 2D

Analysis Settings

Waste Lift 1 El. 329

Kind: SIGMA/W
Parent: OP Step 1 - Liner Placement
Method: Coupled Stress/PWP
Settings
    Initial Stress: Parent Analysis
    Initial PWP: Parent Analysis
    Exclude cumulative values: No
Control
    Apply Body Force in All Steps: No
    Saturated Zone Only: No
Convergence
    Maximum Number of Iterations: 50
    Minimum Pressure Head Difference: 0.001
    Minimum Displacement Difference: 0.001
    Significant Digits: 3
    Hydraulic Under-Relaxation Criteria

Under-Relaxation Initial Rate: 1
Under-Relaxation Min. Rate: 0.1
Under-Relaxation Reduction Rate: 0.65
Under-Relaxation Iterations: 10
Equation Solver: Parallel Direct
Time
Starting Time: 120 days
Duration: 88 days
# of Steps: 12
Step Generation Method: Linear
Save Steps Every: 4

Materials

Waste Material

Model: Linear Elastic (Total)
Stress Strain
Young's Modulus (E): 400,000 psf
Unit Weight: 111 pcf
Poisson's Ratio: 0.45

Bottom Liner

Model: Linear Elastic (Total)
Stress Strain
Young's Modulus (E): 400,000 psf
Unit Weight: 120 pcf
Poisson's Ratio: 0.45

CCL

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 1,000,000 psf
Unit Weight: 120 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Clay soils OC
K-Function: GC 5.7 E-4 ft/day
Ky'/Kx' Ratio: 0.1
Rotation: 0 °
Load Response Ratio: 1

Upper Till

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 300,000 psf
Unit Weight: 125 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Till
K-Function: Upper Glacial Till
Ky'/Kx' Ratio: 1

Rotation: 0 °
Load Response Ratio: 1

GC-Drained

Model: Soft Clay (MCC w/ PWP Change)
Stress Strain
O.C. Ratio: 4
Poisson's Ratio: 0.334
Lambda: 0.14
Kappa: 0.013
Initial Void Ratio: 1
Unit Weight: 118 pcf
Phi': 27 °
Hydraulic
Vol. WC. Function: Clay soils
K-Function: GC 5.7 E-4 ft/day
Ky'/Kx' Ratio: 1
Rotation: 0 °
K-Modifier Function: 1D consol derived k function rmu2 clay
Load Response Ratio: 1

GC OverConsolidated

Model: Soft Clay (MCC w/ PWP Change)
Stress Strain
O.C. Ratio: 8
Poisson's Ratio: 0.334
Lambda: 0.06
Kappa: 0.01
Initial Void Ratio: 0.5
Unit Weight: 125 pcf
Phi': 30 °
Hydraulic
Vol. WC. Function: Clay soils OC
K-Function: GC 5.7 E-4 ft/day
Ky'/Kx' Ratio: 1
Rotation: 0 °
K-Modifier Function: 1D consol derived k function rmu2 clay
Load Response Ratio: 1

Sand/Silt

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 300,000 psf
Unit Weight: 135 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: silty sand
K-Function: Silty Sand, k = 0.567 ft/day 2 E-4cm/sec
Ky'/Kx' Ratio: 0.1
Rotation: 0 °
Load Response Ratio: 1

Lower Till

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 600,000 psf
Unit Weight: 145 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Till
K-Function: Till
Ky'/Kx' Ratio: 1
Rotation: 0 °
Load Response Ratio: 1

Structural Fill

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 100,000 psf
Unit Weight: 135 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Till
K-Function: Till
Ky'/Kx' Ratio: 1
Rotation: 0 °
Load Response Ratio: 1

UPPER SHALE

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 1,000,000 psf
Unit Weight: 145 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Till
K-Function: Upper Rock
Ky'/Kx' Ratio: 1
Rotation: 0 °
Load Response Ratio: 1

Boundary Conditions

Fixed X

X: X-Displacement 0

Fixed X/Y

X: X-Displacement 0
Y: Y-Displacement 0

no flow

Type: Total Flux (Q) 0

Review: No

noflowzeropress

Type: Total Flux (Q) 0
Review: Yes

drainage 313

Type: Head (H) 313
Review: No

Initial Water Tables

Initial Water Table 1

Max. negative head: 5
Coordinates
Coordinate 1: (0, 315) ft
Coordinate 2: (850, 315) ft

K Functions

Silty Sand, k = 0.567 ft/day 2 E-4cm/sec

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 36 %
K-Saturation: 0.567
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (0.005, 0.567)
Data Point: (0.01, 0.567)
Data Point: (0.035938, 0.567)
Data Point: (0.12915, 0.567)
Data Point: (0.46416, 0.567)
Data Point: (1.1111, 0.567)
Data Point: (1.6681, 0.567)
Data Point: (5.9948, 0.567)
Data Point: (21.544, 0.567)
Data Point: (77.426, 0.567)
Data Point: (105.93, 0.5402376)
Data Point: (210.74, 0.3387258)
Data Point: (278.26, 0.2567376)
Data Point: (315.56, 0.2232846)
Data Point: (420.37, 0.1406916)
Data Point: (525.19, 0.0779121)
Data Point: (630, 0.03843882)
Data Point: (734.81, 0.01673406)
Data Point: (839.63, 0.005422788)
Data Point: (944.44, 0.000745983)
Data Point: (1,000, 7.14735e-005)
Estimation Properties

Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Upper Glacial Till

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 36 %
K-Saturation: 0.0057
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (0.005, 0.0057)
Data Point: (0.01, 0.0057)
Data Point: (0.046416, 0.0057)
Data Point: (0.21544, 0.0057)
Data Point: (1, 0.0057)
Data Point: (4.6416, 0.0057)
Data Point: (11.111, 0.0057)
Data Point: (21.544, 0.0057)
Data Point: (100, 0.0057)
Data Point: (464.16, 0.0016245)
Data Point: (1,059.3, 0.0002427972)
Data Point: (2,107.4, 1.492716e-005)
Data Point: (2,154.4, 1.369596e-005)
Data Point: (3,155.6, 4.086672e-006)
Data Point: (4,203.7, 1.82115e-006)
Data Point: (5,251.9, 9.03222e-007)
Data Point: (6,300, 4.30521e-007)
Data Point: (7,348.1, 2.028516e-007)
Data Point: (8,396.3, 7.73661e-008)
Data Point: (9,444.4, 2.691312e-008)
Data Point: (10,000, 2.691312e-008)
Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Upper Rock

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 36 %
K-Saturation: 0.567
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (0.005, 0.567)
Data Point: (0.01, 0.567)

Data Point: (10,000, 0.567)
Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Till

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 36 %
K-Saturation: 0.000567
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (0.005, 0.000567)
Data Point: (0.01, 0.000567)
Data Point: (10,000, 0.000567)
Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

GC 5.7 E-4 ft/day

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 100 %
K-Saturation: 0.00057
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (10, 0.00057)
Data Point: (1,000, 9e-006)
Data Point: (5,000, 5e-006)
Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Hydraulic K Modifier Functions

1D consol derived k function rmu2 clay

Model: Spline Data Point Function (Y Log)
Function: K-Modifier vs. Y-Effective Stress
Curve Fit to Data: 100 %

Segment Curvature: 75 %
Y-Intercept: 1.2
Data Points: Y-Effective Stress (psf), K-Modifier
Data Point: (1,000, 1.2)
Data Point: (2,000, 1)
Data Point: (4,000, 0.839)
Data Point: (8,000, 0.70417211)
Data Point: (12,000, 0.63551782)
Data Point: (16,000, 0.59090577)

Vol. Water Content Functions

Clay soils OC

Model: Vol WC Data Point Function
Function: Vol. Water Content vs. Pore-Water Pressure
Mv: 7e-005 /psf
Saturated Water Content: 0.31427274 ft^3/ft^3
Residual Water Content: 0.031427274 ft^3/ft^3
Curve Fit to Data: 100 %
Segment Curvature: 100 %
Porosity: 0.31427274
Data Points: Matric Suction (psf), Vol. Water Content (ft^3/ft^3)
Data Point: (0.01, 0.29999999)
Data Point: (0.018329807, 0.29999998)
Data Point: (0.033598183, 0.29999996)
Data Point: (0.061584821, 0.29999991)
Data Point: (0.11288379, 0.29999982)
Data Point: (0.20691381, 0.29999962)
Data Point: (0.37926902, 0.29999917)
Data Point: (0.6951928, 0.29999814)
Data Point: (1.274275, 0.29999578)
Data Point: (2.3357215, 0.29999026)
Data Point: (4.2813324, 0.2999772)
Data Point: (7.8475997, 0.29994599)
Data Point: (14.384499, 0.29987093)
Data Point: (26.366509, 0.29968944)
Data Point: (48.329302, 0.29924951)
Data Point: (88.586679, 0.29818464)
Data Point: (162.37767, 0.29563126)
Data Point: (297.63514, 0.28967022)
Data Point: (545.55948, 0.27661743)
Data Point: (1,000, 0.25163343)
Estimation Properties
Vol. WC Estimation Method: Sample functions
Saturated Water Content: 0.3 ft^3/ft^3
Sample Material: Clay
Liquid Limit: 0 %
Diameter at 10% passing: 0
Diameter at 60% passing: 0
Maximum: 1,000
Minimum: 0.01

Num. Points: 20

Clay soils

Model: Vol WC Data Point Function
Function: Vol. Water Content vs. Pore-Water Pressure
Mv: 0.0004 /psf
Saturated Water Content: 0.60995302 ft^3/ft^3
Residual Water Content: 0.060995302 ft^3/ft^3
Curve Fit to Data: 100 %
Segment Curvature: 100 %
Porosity: 0.60995302
Data Points: Matric Suction (psf), Vol. Water Content (ft^3/ft^3)
Data Point: (0.01, 0.43999998)
Data Point: (0.018329807, 0.43999997)
Data Point: (0.033598183, 0.43999994)
Data Point: (0.061584821, 0.43999987)
Data Point: (0.11288379, 0.43999974)
Data Point: (0.20691381, 0.43999944)
Data Point: (0.37926902, 0.43999878)
Data Point: (0.6951928, 0.43999728)
Data Point: (1.274275, 0.43999381)
Data Point: (2.3357215, 0.43998571)
Data Point: (4.2813324, 0.43996655)
Data Point: (7.8475997, 0.43992079)
Data Point: (14.384499, 0.4398107)
Data Point: (26.366509, 0.43954452)
Data Point: (48.329302, 0.43889927)
Data Point: (88.586679, 0.43733747)
Data Point: (162.37767, 0.43359251)
Data Point: (297.63514, 0.42484965)
Data Point: (545.55948, 0.40570556)
Data Point: (1,000, 0.36906236)
Estimation Properties
Vol. WC Estimation Method: Sample functions
Saturated Water Content: 0.44 ft^3/ft^3
Sample Material: Clay
Liquid Limit: 0 %
Diameter at 10% passing: 0
Diameter at 60% passing: 0
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Till

Model: Vol WC Data Point Function
Function: Vol. Water Content vs. Pore-Water Pressure
Mv: 5e-006 /psf
Saturated Water Content: 0.20000173 ft^3/ft^3
Residual Water Content: 0.020000173 ft^3/ft^3
Curve Fit to Data: 100 %
Segment Curvature: 100 %
Porosity: 0.20000173

Data Points: Matric Suction (psf), Vol. Water Content (ft^3/ft^3)
- Data Point: (0.01, 0.19999999)
- Data Point: (0.018329807, 0.19999999)
- Data Point: (0.033598183, 0.19999997)
- Data Point: (0.061584821, 0.19999993)
- Data Point: (0.11288379, 0.19999985)
- Data Point: (0.20691381, 0.19999967)
- Data Point: (0.37926902, 0.19999922)
- Data Point: (0.6951928, 0.19999811)
- Data Point: (1.274275, 0.19999535)
- Data Point: (2.3357215, 0.19998838)
- Data Point: (4.2813324, 0.19997056)
- Data Point: (7.8475997, 0.19992471)
- Data Point: (14.384499, 0.19980625)
- Data Point: (26.366509, 0.19949952)
- Data Point: (48.329302, 0.19870702)
- Data Point: (88.586679, 0.19668084)
- Data Point: (162.37767, 0.19165467)
- Data Point: (297.63514, 0.18009116)
- Data Point: (545.55948, 0.15752337)
- Data Point: (1,000, 0.12453739)

Estimation Properties
- Vol. WC Estimation Method: Sample functions
- Saturated Water Content: 0.2 ft^3/ft^3
- Sample Material: Silty Clay
- Liquid Limit: 0 %
- Diameter at 10% passing: 0
- Diameter at 60% passing: 0
- Maximum: 1,000
- Minimum: 0.01
- Num. Points: 20

silty sand

Model: Vol WC Data Point Function

Function: Vol. Water Content vs. Pore-Water Pressure
- Mv: 1e-005 /psf
- Saturated Water Content: 0.30000011 ft^3/ft^3
- Residual Water Content: 0.030000011 ft^3/ft^3
- Curve Fit to Data: 100 %
- Segment Curvature: 100 %

Porosity: 0.30000011

Data Points: Matric Suction (psf), Vol. Water Content (ft^3/ft^3)
- Data Point: (0.01, 0.29999996)
- Data Point: (0.018329807, 0.29999991)
- Data Point: (0.033598183, 0.29999977)
- Data Point: (0.061584821, 0.29999942)
- Data Point: (0.11288379, 0.29999854)
- Data Point: (0.20691381, 0.29999626)
- Data Point: (0.37926902, 0.29999039)
- Data Point: (0.6951928, 0.29997521)
- Data Point: (1.274275, 0.29993588)
- Data Point: (2.3357215, 0.29983385)

Data Point: (4.2813324, 0.29956912)
Data Point: (7.8475997, 0.29888334)
Data Point: (14.384499, 0.29711648)
Data Point: (26.366509, 0.29263189)
Data Point: (48.329302, 0.28167657)
Data Point: (88.586679, 0.25725429)
Data Point: (162.37767, 0.21239326)
Data Point: (297.63514, 0.15298031)
Data Point: (545.55948, 0.099847233)
Data Point: (1,000, 0.064649441)

Estimation Properties

Vol. WC Estimation Method: Sample functions
Saturated Water Content: 0.3 ft^3/ft^3
Sample Material: Silty Sand
Liquid Limit: 0 %
Diameter at 10% passing: 0
Diameter at 60% passing: 0
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Points

	X (ft)	Y (ft)
Point 1	0	268.91519
Point 2	207.4978	271.24238
Point 3	209.0232	271.26867
Point 4	215.074	271.32735
Point 5	225.5606	271.44496
Point 6	230.6621	271.56993
Point 7	234.0537	271.62591
Point 8	237.8751	271.70733
Point 9	243.6233	271.78388
Point 10	403.7734	274.99581
Point 11	406.1879	275.04891
Point 12	510.242	277.40528
Point 13	519.1809	277.52295
Point 14	522.2501	277.56833
Point 15	581.5843	278.21948
Point 16	706.5316	275.03632
Point 17	784.4915	272.77004
Point 18	796.8946	272.40949
Point 19	796.8946	278.66207
Point 20	771.752	277.8332

Point 21	583.2389	281.6042
Point 22	512.9202	278.57945
Point 23	404.2686	277.81745
Point 24	248.1947	278.63737
Point 25	83.6675	274.48464
Point 26	78.5956	274.41664
Point 27	69.7373	274.12229
Point 28	0	273.8562
Point 29	0	286.98783
Point 30	69.7373	288.07912
Point 31	78.6615	288.22649
Point 32	83.6675	288.57952
Point 33	248.1947	297.19282
Point 34	404.2686	294.81745
Point 35	512.9202	289.28565
Point 36	583.2389	288.00106
Point 37	796.8946	289.48765
Point 38	0	305.26334
Point 39	63.5351	305.72185
Point 40	69.7373	305.70863
Point 41	77.6371	305.65972
Point 42	78.5956	305.57155
Point 43	83.6675	305.7
Point 44	248.1947	307.61838
Point 45	299.7903	306.27673
Point 46	299.6238	303.28004
Point 47	404.2544	300.5593
Point 48	512.9971	302.35411
Point 49	583.3451	304.79977
Point 50	592.8421	305.14193
Point 51	650.1895	305.15472
Point 52	796.8602	303.47517
Point 53	796.8946	303.47517
Point 54	404.2686	303.55995
Point 55	512.9202	305.35325
Point 56	583.2389	307.79789
Point 57	592.7878	308.14191
Point 58	650.2064	308.15472
Point 59	796.8946	306.47498

Point 60	0	327.67711
Point 61	22.4921	326.28273
Point 62	49.2488	323.27595
Point 63	74.3201	319.27807
Point 64	77.7249	318.65421
Point 65	112.0147	318.69361
Point 66	124.2402	315.77486
Point 67	126.7076	315.31519
Point 68	136.2125	313.12968
Point 69	142.0351	312.45981
Point 70	357.6126	310.47901
Point 71	586.0206	317.13
Point 72	588.0287	317.67977
Point 73	603.6052	322
Point 74	693.0775	322
Point 75	695.4173	323.10644
Point 76	697.3194	324
Point 77	714.7524	332
Point 78	726.8078	332.79458
Point 79	736.4313	333.45251
Point 80	740.2913	333.71166
Point 81	742.8239	333.89241
Point 82	743.6092	331.27888
Point 83	746.0108	331.28559
Point 84	751.3746	333.5338
Point 85	751.5561	333.52887
Point 86	751.6873	333.53898
Point 87	751.9654	333.539
Point 88	755.4965	333.65881
Point 89	757.088	333.70415
Point 90	766.5218	333.52383
Point 91	769.5239	331.03222
Point 92	781.3859	336.00827
Point 93	796.8946	335.53695
Point 94	0	330.67136
Point 95	0.1856	330.67136
Point 96	22.7526	329.27234
Point 97	49.6527	326.24944
Point 98	74.8268	322.23518

Point 99	77.9958	321.65452
Point 100	112.3661	321.69402
Point 101	124.8636	318.71033
Point 102	127.3188	318.25295
Point 103	136.7217	316.09089
Point 104	142.2209	315.45823
Point 105	357.5827	313.47942
Point 106	585.5746	320.11828
Point 107	587.2318	320.57198
Point 108	684.7881	347.62982
Point 109	704.816	348.13028
Point 110	707.7847	347.0118
Point 111	709.4494	346.32322
Point 112	709.6367	345.87345
Point 113	708.0438	345.21
Point 114	685.2332	344.64
Point 115	131.5335	329.79618
Point 116	158.1735	318.33502
Point 117	165.2063	318.28065
Point 118	203.3044	317.9221
Point 119	243.6199	317.55888
Point 120	248.3589	317.51329
Point 121	357.6595	316.4965
Point 122	589.0312	323.16552
Point 123	591.6482	323.89085
Point 124	610.0073	329
Point 125	631.5677	335
Point 126	653.128	341
Point 127	674.6884	347
Point 128	684.1005	349.61929
Point 129	699.8223	350.01168
Point 130	0	332.91188
Point 131	22.4396	331.51733
Point 132	49.1519	328.50799
Point 133	68.0785	325.48185
Point 134	73.6566	324.58998
Point 135	90.5756	324.62675
Point 136	109.5111	324.68581
Point 137	124.0229	330.52741

Point 138	127.0249	330.53586
Point 139	129.8149	330.45078
Point 140	130.027	330.44431
Point 141	274.9823	329
Point 142	252.0124	321.5
Point 143	213.855	321.5
Point 144	177.1587	331.5
Point 145	171.0426	331.5
Point 146	152.2075	323.79526
Point 147	298.6003	335
Point 148	282.6389	331.5
Point 149	287.7433	331.5
Point 150	289.3308	331.95874
Point 151	290.9318	332.5
Point 152	317.0046	341
Point 153	355.3453	347
Point 154	666.3598	347
Point 155	669.6785	345.61929
Point 156	674.6567	347
Point 157	326.7765	344.18573
Point 158	336.1465	343.24706
Point 159	342.0216	342.65356
Point 160	373.7378	353
Point 161	651.9377	353
Point 162	392.1303	359
Point 163	637.5157	359
Point 164	410.5229	365
Point 165	623.0936	365
Point 166	608.6716	371
Point 167	428.9409	371
Point 168	415.8066	366.72364
Point 169	447.0228	377
Point 170	594.2496	377
Point 171	435.4903	373.13237
Point 172	450.0526	378.01608
Point 173	459.9195	378.51574
Point 174	479.4258	379.45192
Point 175	482.5508	379.55699
Point 176	491.9324	380

Point 177	507.2813	380.61621
Point 178	541.8899	382.28139
Point 179	574.2808	382.67429
Point 180	581.1072	381.37657
Point 181	581.6822	381.26488
Point 182	582.2411	381.14975
Point 183	582.7845	381.03125
Point 184	583.313	380.90951
Point 185	583.8273	380.78465
Point 186	584.3278	380.6568
Point 187	584.8152	380.52606
Point 188	585.29	380.39256
Point 189	592.2253	377.82435
Point 190	593.0101	377.51567
Point 191	78.5551	329.67009
Point 192	110.5776	331.89761
Point 193	113.2091	332.06836
Point 194	115.8406	332.21663
Point 195	118.4721	332.34247
Point 196	121.1036	332.44595
Point 197	123.7351	332.5271
Point 198	125.1298	332.55831
Point 199	126.3665	332.19565
Point 200	128.6722	331.5
Point 201	128.9196	331.46994
Point 202	710.0851	346.06023
Point 203	718.4637	349.55
Point 204	736.491	350
Point 205	738.1976	349.29
Point 206	796.8946	253.91519
Point 207	0	253.91519

Lines

	Start Point	End Point	Hydraulic Boundary	Stress/Strain Boundary
Line 1	1	2		
Line 2	2	3		
Line 3	3	4		
Line 4	4	5		

Line 5	5	6		
Line 6	6	7		
Line 7	7	8		
Line 8	8	9		
Line 9	9	10		
Line 10	10	11		
Line 11	11	12		
Line 12	12	13		
Line 13	13	14		
Line 14	14	15		
Line 15	15	16		
Line 16	16	17		
Line 17	17	18		
Line 18	18	19	drainage 313	Fixed X
Line 19	19	20		
Line 20	20	21		
Line 21	21	22		
Line 22	22	23		
Line 23	23	24		
Line 24	24	25		
Line 25	25	26		
Line 26	26	27		
Line 27	27	28		
Line 28	28	1	drainage 313	Fixed X
Line 29	29	30		
Line 30	30	31		
Line 31	31	32		
Line 32	32	33		
Line 33	33	34		
Line 34	34	35		
Line 35	35	36		
Line 36	36	37		
Line 37	37	19	drainage 313	Fixed X
Line 38	28	29	drainage 313	Fixed X
Line 39	38	39		
Line 40	39	40		
Line 41	40	41		
Line 42	41	42		
Line 43	42	43		

Line 44	43	44		
Line 45	44	45		
Line 46	45	46		
Line 47	46	47		
Line 48	47	48		
Line 49	48	49		
Line 50	49	50		
Line 51	50	51		
Line 52	51	52		
Line 53	52	53		
Line 54	53	37	drainage 313	Fixed X
Line 55	29	38	drainage 313	Fixed X
Line 56	45	54		
Line 57	54	55		
Line 58	55	56		
Line 59	56	57		
Line 60	57	58		
Line 61	58	59		
Line 62	59	53	drainage 313	Fixed X
Line 63	60	61		
Line 64	61	62		
Line 65	62	63		
Line 66	63	64		
Line 67	64	65		
Line 68	65	66		
Line 69	66	67		
Line 70	67	68		
Line 71	68	69		
Line 72	69	70		
Line 73	70	71		
Line 74	71	72		
Line 75	72	73		
Line 76	73	74		
Line 77	74	75		
Line 78	75	76		
Line 79	76	77		
Line 80	77	78		
Line 81	78	79		
Line 82	79	80		

Line 83	80	81		
Line 84	81	82		
Line 85	82	83		
Line 86	83	84		
Line 87	84	85		
Line 88	85	86		
Line 89	86	87		
Line 90	87	88		
Line 91	88	89		
Line 92	89	90		
Line 93	90	91		
Line 94	91	92		
Line 95	92	93		
Line 96	93	59	noflowzeropress	Fixed X
Line 97	38	60	noflowzeropress	Fixed X
Line 98	94	95		
Line 99	95	96		
Line 100	96	97		
Line 101	97	98	no flow	
Line 102	98	99	no flow	
Line 103	99	100	no flow	
Line 104	100	101	no flow	
Line 105	101	102	no flow	
Line 106	102	103	no flow	
Line 107	103	104	no flow	
Line 108	104	105	no flow	
Line 109	105	106	no flow	
Line 110	106	107	no flow	
Line 111	107	108	no flow	
Line 112	108	109	no flow	
Line 113	109	110		
Line 114	110	111		
Line 115	111	112		
Line 116	112	113		
Line 117	113	114		
Line 118	114	73		
Line 119	60	94		Fixed X
Line 120	115	116		
Line 121	116	117		

Line 122	117	118		
Line 123	118	119		
Line 124	119	120		
Line 125	120	121		
Line 126	121	122		
Line 127	122	123		
Line 128	123	124		
Line 129	124	125		
Line 130	125	126		
Line 131	126	127		
Line 132	127	128		
Line 133	128	129		
Line 134	129	109		
Line 135	94	130		Fixed X
Line 136	130	131		
Line 137	131	132		
Line 138	132	133		
Line 139	133	134		
Line 140	134	135		
Line 141	135	136		
Line 142	136	137		
Line 143	137	138		
Line 144	138	139		
Line 145	139	140		
Line 146	140	115		
Line 147	124	141		
Line 148	141	142		
Line 149	142	143		
Line 150	143	144		
Line 151	144	145		
Line 152	145	146		
Line 153	146	115		
Line 154	147	125		
Line 155	141	148		
Line 156	148	149		
Line 157	149	150		
Line 158	150	151		
Line 159	151	147		
Line 160	126	152		

Line 161	152	147		
Line 162	153	154		
Line 163	154	155		
Line 164	155	156		
Line 165	156	127		
Line 166	152	157		
Line 167	157	158		
Line 168	158	159		
Line 169	159	153		
Line 170	160	161		
Line 171	161	154		
Line 172	153	160		
Line 173	162	163		
Line 174	163	161		
Line 175	160	162		
Line 176	164	165		
Line 177	165	163		
Line 178	162	164		
Line 179	165	166		
Line 180	166	167		
Line 181	167	168		
Line 182	168	164		
Line 183	169	170		
Line 184	170	166		
Line 185	167	171		
Line 186	171	169		
Line 187	169	172		
Line 188	172	173		
Line 189	173	174		
Line 190	174	175		
Line 191	175	176		
Line 192	176	177		
Line 193	177	178		
Line 194	178	179		
Line 195	179	180		
Line 196	180	181		
Line 197	181	182		
Line 198	182	183		
Line 199	183	184		

Line 200	184	185		
Line 201	185	186		
Line 202	186	187		
Line 203	187	188		
Line 204	188	189		
Line 205	189	190		
Line 206	190	170		
Line 207	133	191		
Line 208	191	192		
Line 209	192	193		
Line 210	193	194		
Line 211	194	195		
Line 212	195	196		
Line 213	196	197		
Line 214	197	198		
Line 215	198	199		
Line 216	199	200		
Line 217	200	201		
Line 218	201	139		
Line 219	112	202		
Line 220	202	203		
Line 221	203	204		
Line 222	204	205		
Line 223	205	81		
Line 224	18	206	drainage 313	Fixed X
Line 225	206	207	drainage 313	Fixed X/Y
Line 226	207	1	drainage 313	Fixed X

Regions

	Material	Points	Area (ft²)
Region 1	Lower Till	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28	3,346.1
Region 2	Sand/Silt	29,30,31,32,33,34,35,36,37,19,20,21,22,23,24,25,26,27,28	10,671
Region 3	GC-Drained	38,39,40,41,42,43,44,45,46,47,48,49,50,51,52,53,37,36,35,34,33,32,31,30,29	10,397
Region 4	GC OverConsolidated	45,54,55,56,57,58,59,53,52,51,50,49,48,47,46	1,491.9
Region 5	Upper Till	60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78,79,80	9,253.4

		,81,82,83,84,85,86,87,88,89,90,91,92,93,59,58,57,56,55,54,45,44,43,42,41,40,39,38	
Region 6	CCL	94,95,96,97,98,99,100,101,102,103,104,105,106,107,108,109,110,111,112,113,114,73,72,71,70,69,68,67,66,65,64,63,62,61,60	2,139
Region 7	Bottom Liner	115,116,117,118,119,120,121,122,123,124,125,126,127,128,129,109,108,107,106,105,104,103,102,101,100,99,98,97,96,95,94,130,131,132,133,134,135,136,137,138,139,140	2,215.1
Region 8	Waste Material	115,116,117,118,119,120,121,122,123,124,141,142,143,144,145,146	4,104.1
Region 9		147,125,124,141,148,149,150,151	2,001.4
Region 10		147,125,126,152	2,007.3
Region 11		153,154,155,156,127,126,152,157,158,159	1,949.1
Region 12		160,161,154,153	1,767.6
Region 13		162,163,161,160	1,570.8
Region 14		164,165,163,162	1,373.9
Region 15		164,165,166,167,168	1,176.9
Region 16		169,170,166,167,171	980.5
Region 17		169,172,173,174,175,176,177,178,179,180,181,182,183,184,185,186,187,188,189,190,170	534.96
Region 18	Structural Fill	133,191,192,193,194,195,196,197,198,199,200,201,139,138,137,136,135,134	293.23
Region 19	Structural Fill	73,114,113,112,202,203,204,205,81,80,79,78,77,76,75,74	1,934.1
Region 20	UPPER SHALE	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,206,207	15,814

Figure 21 - Coupled Consolidation for Section OP-2 for Waste Lift 2

Waste Lift 2 El. 335

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File Information

Title: Model City - RMU-2 CP-20 Section OP-2
Comments: Operation Conditions for CP-20 Section 2 Based on Maximum Fill Rate of 50,000 Cu Yds per Quarter
Created By: Peter J. Carey
Revision Number: 498
File Version: 8.0
Tool Version: 8.0.10.6504
Date: 2/25/2013
Time: 7:29:13 AM
File Name: C20OP-2r1.gsz
Directory: N:\Model_City\154.002_rmu2\154.005_revsions\geoslope\operational\

Project Settings

Length(L) Units: feet
Time(t) Units: Days
Force(F) Units: lbf
Pressure(p) Units: psf
Strength Units: psf
Stiffness Units: psf
Unit Weight of Water: 62.4 pcf
Air Pressure: 101.33 psf
View: 2D

Analysis Settings

Waste Lift 2 El. 335

Kind: SIGMA/W
Parent: Waste Lift 1 El. 329
Method: Coupled Stress/PWP
Settings
- Initial Stress: Parent Analysis
- Initial PWP: Parent Analysis
- Exclude cumulative values: No

Control
- Apply Body Force in All Steps: No
- Saturated Zone Only: No

Convergence
- Maximum Number of Iterations: 50
- Minimum Pressure Head Difference: 0.001
- Minimum Displacement Difference: 0.001
- Significant Digits: 3
- Hydraulic Under-Relaxation Criteria

Under-Relaxation Initial Rate: 1
Under-Relaxation Min. Rate: 0.1
Under-Relaxation Reduction Rate: 0.65
Under-Relaxation Iterations: 10
Equation Solver: Parallel Direct
Time
Starting Time: 208 days
Duration: 74 days
# of Steps: 12
Step Generation Method: Linear
Save Steps Every: 4

Materials

Waste Material

Model: Linear Elastic (Total)
Stress Strain
Young's Modulus (E): 400,000 psf
Unit Weight: 111 pcf
Poisson's Ratio: 0.45

Bottom Liner

Model: Linear Elastic (Total)
Stress Strain
Young's Modulus (E): 400,000 psf
Unit Weight: 120 pcf
Poisson's Ratio: 0.45

CCL

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 1,000,000 psf
Unit Weight: 120 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Clay soils OC
K-Function: GC 5.7 E-4 ft/day
Ky'/Kx' Ratio: 0.1
Rotation: 0 °
Load Response Ratio: 1

Upper Till

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 300,000 psf
Unit Weight: 125 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Till
K-Function: Upper Glacial Till
Ky'/Kx' Ratio: 1

Rotation: 0 °
Load Response Ratio: 1

GC-Drained

Model: Soft Clay (MCC w/ PWP Change)
Stress Strain
O.C. Ratio: 4
Poisson's Ratio: 0.334
Lambda: 0.14
Kappa: 0.013
Initial Void Ratio: 1
Unit Weight: 118 pcf
Phi': 27 °
Hydraulic
Vol. WC. Function: Clay soils
K-Function: GC 5.7 E-4 ft/day
Ky'/Kx' Ratio: 1
Rotation: 0 °
K-Modifier Function: 1D consol derived k function rmu2 clay
Load Response Ratio: 1

GC OverConsolidated

Model: Soft Clay (MCC w/ PWP Change)
Stress Strain
O.C. Ratio: 8
Poisson's Ratio: 0.334
Lambda: 0.06
Kappa: 0.01
Initial Void Ratio: 0.5
Unit Weight: 125 pcf
Phi': 30 °
Hydraulic
Vol. WC. Function: Clay soils OC
K-Function: GC 5.7 E-4 ft/day
Ky'/Kx' Ratio: 1
Rotation: 0 °
K-Modifier Function: 1D consol derived k function rmu2 clay
Load Response Ratio: 1

Sand/Silt

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 300,000 psf
Unit Weight: 135 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: silty sand
K-Function: Silty Sand, k = 0.567 ft/day 2 E-4cm/sec
Ky'/Kx' Ratio: 0.1
Rotation: 0 °
Load Response Ratio: 1

Lower Till

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 600,000 psf
Unit Weight: 145 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Till
K-Function: Till
Ky'/Kx' Ratio: 1
Rotation: 0 °
Load Response Ratio: 1

Structural Fill

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 100,000 psf
Unit Weight: 135 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Till
K-Function: Till
Ky'/Kx' Ratio: 1
Rotation: 0 °
Load Response Ratio: 1

UPPER SHALE

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 1,000,000 psf
Unit Weight: 145 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Till
K-Function: Upper Rock
Ky'/Kx' Ratio: 1
Rotation: 0 °
Load Response Ratio: 1

Boundary Conditions

Fixed X

X: X-Displacement 0

Fixed X/Y

X: X-Displacement 0
Y: Y-Displacement 0

no flow

Type: Total Flux (Q) 0

Review: No

noflowzeropress

Type: Total Flux (Q) 0
Review: Yes

drainage 313

Type: Head (H) 313
Review: No

Initial Water Tables

Initial Water Table 1

Max. negative head: 5
Coordinates
Coordinate 1: (0, 315) ft
Coordinate 2: (850, 315) ft

K Functions

Silty Sand, k = 0.567 ft/day 2 E-4cm/sec

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 36 %
K-Saturation: 0.567
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (0.005, 0.567)
Data Point: (0.01, 0.567)
Data Point: (0.035938, 0.567)
Data Point: (0.12915, 0.567)
Data Point: (0.46416, 0.567)
Data Point: (1.1111, 0.567)
Data Point: (1.6681, 0.567)
Data Point: (5.9948, 0.567)
Data Point: (21.544, 0.567)
Data Point: (77.426, 0.567)
Data Point: (105.93, 0.5402376)
Data Point: (210.74, 0.3387258)
Data Point: (278.26, 0.2567376)
Data Point: (315.56, 0.2232846)
Data Point: (420.37, 0.1406916)
Data Point: (525.19, 0.0779121)
Data Point: (630, 0.03843882)
Data Point: (734.81, 0.01673406)
Data Point: (839.63, 0.005422788)
Data Point: (944.44, 0.000745983)
Data Point: (1,000, 7.14735e-005)
Estimation Properties

Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Upper Glacial Till

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 36 %
K-Saturation: 0.0057
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (0.005, 0.0057)
Data Point: (0.01, 0.0057)
Data Point: (0.046416, 0.0057)
Data Point: (0.21544, 0.0057)
Data Point: (1, 0.0057)
Data Point: (4.6416, 0.0057)
Data Point: (11.111, 0.0057)
Data Point: (21.544, 0.0057)
Data Point: (100, 0.0057)
Data Point: (464.16, 0.0016245)
Data Point: (1,059.3, 0.0002427972)
Data Point: (2,107.4, 1.492716e-005)
Data Point: (2,154.4, 1.369596e-005)
Data Point: (3,155.6, 4.086672e-006)
Data Point: (4,203.7, 1.82115e-006)
Data Point: (5,251.9, 9.03222e-007)
Data Point: (6,300, 4.30521e-007)
Data Point: (7,348.1, 2.028516e-007)
Data Point: (8,396.3, 7.73661e-008)
Data Point: (9,444.4, 2.691312e-008)
Data Point: (10,000, 2.691312e-008)
Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Upper Rock

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 36 %
K-Saturation: 0.567
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (0.005, 0.567)
Data Point: (0.01, 0.567)

Data Point: (10,000, 0.567)
Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Till

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 36 %
K-Saturation: 0.000567
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (0.005, 0.000567)
Data Point: (0.01, 0.000567)
Data Point: (10,000, 0.000567)
Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

GC 5.7 E-4 ft/day

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 100 %
K-Saturation: 0.00057
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (10, 0.00057)
Data Point: (1,000, 9e-006)
Data Point: (5,000, 5e-006)
Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Hydraulic K Modifier Functions

1D consol derived k function rmu2 clay

Model: Spline Data Point Function (Y Log)
Function: K-Modifier vs. Y-Effective Stress
Curve Fit to Data: 100 %

Segment Curvature: 75 %
Y-Intercept: 1.2
Data Points: Y-Effective Stress (psf), K-Modifier
Data Point: (1,000, 1.2)
Data Point: (2,000, 1)
Data Point: (4,000, 0.839)
Data Point: (8,000, 0.70417211)
Data Point: (12,000, 0.63551782)
Data Point: (16,000, 0.59090577)

Vol. Water Content Functions

Clay soils OC

Model: Vol WC Data Point Function
Function: Vol. Water Content vs. Pore-Water Pressure
Mv: 7e-005 /psf
Saturated Water Content: 0.31427274 ft^3/ft^3
Residual Water Content: 0.031427274 ft^3/ft^3
Curve Fit to Data: 100 %
Segment Curvature: 100 %
Porosity: 0.31427274
Data Points: Matric Suction (psf), Vol. Water Content (ft^3/ft^3)
Data Point: (0.01, 0.29999999)
Data Point: (0.018329807, 0.29999998)
Data Point: (0.033598183, 0.29999996)
Data Point: (0.061584821, 0.29999991)
Data Point: (0.11288379, 0.29999982)
Data Point: (0.20691381, 0.29999962)
Data Point: (0.37926902, 0.29999917)
Data Point: (0.6951928, 0.29999814)
Data Point: (1.274275, 0.29999578)
Data Point: (2.3357215, 0.29999026)
Data Point: (4.2813324, 0.2999772)
Data Point: (7.8475997, 0.29994599)
Data Point: (14.384499, 0.29987093)
Data Point: (26.366509, 0.29968944)
Data Point: (48.329302, 0.29924951)
Data Point: (88.586679, 0.29818464)
Data Point: (162.37767, 0.29563126)
Data Point: (297.63514, 0.28967022)
Data Point: (545.55948, 0.27661743)
Data Point: (1,000, 0.25163343)
Estimation Properties
Vol. WC Estimation Method: Sample functions
Saturated Water Content: 0.3 ft^3/ft^3
Sample Material: Clay
Liquid Limit: 0 %
Diameter at 10% passing: 0
Diameter at 60% passing: 0
Maximum: 1,000
Minimum: 0.01

Num. Points: 20

Clay soils

Model: Vol WC Data Point Function
Function: Vol. Water Content vs. Pore-Water Pressure
Mv: 0.0004 /psf
Saturated Water Content: 0.60995302 ft^3/ft^3
Residual Water Content: 0.060995302 ft^3/ft^3
Curve Fit to Data: 100 %
Segment Curvature: 100 %
Porosity: 0.60995302
Data Points: Matric Suction (psf), Vol. Water Content (ft^3/ft^3)
Data Point: (0.01, 0.43999998)
Data Point: (0.018329807, 0.43999997)
Data Point: (0.033598183, 0.43999994)
Data Point: (0.061584821, 0.43999987)
Data Point: (0.11288379, 0.43999974)
Data Point: (0.20691381, 0.43999944)
Data Point: (0.37926902, 0.43999878)
Data Point: (0.6951928, 0.43999728)
Data Point: (1.274275, 0.43999381)
Data Point: (2.3357215, 0.43998571)
Data Point: (4.2813324, 0.43996655)
Data Point: (7.8475997, 0.43992079)
Data Point: (14.384499, 0.4398107)
Data Point: (26.366509, 0.43954452)
Data Point: (48.329302, 0.43889927)
Data Point: (88.586679, 0.43733747)
Data Point: (162.37767, 0.43359251)
Data Point: (297.63514, 0.42484965)
Data Point: (545.55948, 0.40570556)
Data Point: (1,000, 0.36906236)
Estimation Properties
Vol. WC Estimation Method: Sample functions
Saturated Water Content: 0.44 ft^3/ft^3
Sample Material: Clay
Liquid Limit: 0 %
Diameter at 10% passing: 0
Diameter at 60% passing: 0
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Till

Model: Vol WC Data Point Function
Function: Vol. Water Content vs. Pore-Water Pressure
Mv: 5e-006 /psf
Saturated Water Content: 0.20000173 ft^3/ft^3
Residual Water Content: 0.020000173 ft^3/ft^3
Curve Fit to Data: 100 %
Segment Curvature: 100 %
Porosity: 0.20000173

Data Points: Matric Suction (psf), Vol. Water Content (ft^3/ft^3)
- Data Point: (0.01, 0.19999999)
- Data Point: (0.018329807, 0.19999999)
- Data Point: (0.033598183, 0.19999997)
- Data Point: (0.061584821, 0.19999993)
- Data Point: (0.11288379, 0.19999985)
- Data Point: (0.20691381, 0.19999967)
- Data Point: (0.37926902, 0.19999922)
- Data Point: (0.6951928, 0.19999811)
- Data Point: (1.274275, 0.19999535)
- Data Point: (2.3357215, 0.19998838)
- Data Point: (4.2813324, 0.19997056)
- Data Point: (7.8475997, 0.19992471)
- Data Point: (14.384499, 0.19980625)
- Data Point: (26.366509, 0.19949952)
- Data Point: (48.329302, 0.19870702)
- Data Point: (88.586679, 0.19668084)
- Data Point: (162.37767, 0.19165467)
- Data Point: (297.63514, 0.18009116)
- Data Point: (545.55948, 0.15752337)
- Data Point: (1,000, 0.12453739)

Estimation Properties
- Vol. WC Estimation Method: Sample functions
- Saturated Water Content: 0.2 ft^3/ft^3
- Sample Material: Silty Clay
- Liquid Limit: 0 %
- Diameter at 10% passing: 0
- Diameter at 60% passing: 0
- Maximum: 1,000
- Minimum: 0.01
- Num. Points: 20

silty sand

Model: Vol WC Data Point Function

Function: Vol. Water Content vs. Pore-Water Pressure
- Mv: 1e-005 /psf
- Saturated Water Content: 0.30000011 ft^3/ft^3
- Residual Water Content: 0.030000011 ft^3/ft^3
- Curve Fit to Data: 100 %
- Segment Curvature: 100 %

Porosity: 0.30000011

Data Points: Matric Suction (psf), Vol. Water Content (ft^3/ft^3)
- Data Point: (0.01, 0.29999996)
- Data Point: (0.018329807, 0.29999991)
- Data Point: (0.033598183, 0.29999977)
- Data Point: (0.061584821, 0.29999942)
- Data Point: (0.11288379, 0.29999854)
- Data Point: (0.20691381, 0.29999626)
- Data Point: (0.37926902, 0.29999039)
- Data Point: (0.6951928, 0.29997521)
- Data Point: (1.274275, 0.29993588)
- Data Point: (2.3357215, 0.29983385)

Data Point: (4.2813324, 0.29956912)
Data Point: (7.8475997, 0.29888334)
Data Point: (14.384499, 0.29711648)
Data Point: (26.366509, 0.29263189)
Data Point: (48.329302, 0.28167657)
Data Point: (88.586679, 0.25725429)
Data Point: (162.37767, 0.21239326)
Data Point: (297.63514, 0.15298031)
Data Point: (545.55948, 0.099847233)
Data Point: (1,000, 0.064649441)

Estimation Properties

Vol. WC Estimation Method: Sample functions
Saturated Water Content: 0.3 ft^3/ft^3
Sample Material: Silty Sand
Liquid Limit: 0 %
Diameter at 10% passing: 0
Diameter at 60% passing: 0
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Points

	X (ft)	Y (ft)
Point 1	0	268.91519
Point 2	207.4978	271.24238
Point 3	209.0232	271.26867
Point 4	215.074	271.32735
Point 5	225.5606	271.44496
Point 6	230.6621	271.56993
Point 7	234.0537	271.62591
Point 8	237.8751	271.70733
Point 9	243.6233	271.78388
Point 10	403.7734	274.99581
Point 11	406.1879	275.04891
Point 12	510.242	277.40528
Point 13	519.1809	277.52295
Point 14	522.2501	277.56833
Point 15	581.5843	278.21948
Point 16	706.5316	275.03632
Point 17	784.4915	272.77004
Point 18	796.8946	272.40949
Point 19	796.8946	278.66207
Point 20	771.752	277.8332

Point 21	583.2389	281.6042
Point 22	512.9202	278.57945
Point 23	404.2686	277.81745
Point 24	248.1947	278.63737
Point 25	83.6675	274.48464
Point 26	78.5956	274.41664
Point 27	69.7373	274.12229
Point 28	0	273.8562
Point 29	0	286.98783
Point 30	69.7373	288.07912
Point 31	78.6615	288.22649
Point 32	83.6675	288.57952
Point 33	248.1947	297.19282
Point 34	404.2686	294.81745
Point 35	512.9202	289.28565
Point 36	583.2389	288.00106
Point 37	796.8946	289.48765
Point 38	0	305.26334
Point 39	63.5351	305.72185
Point 40	69.7373	305.70863
Point 41	77.6371	305.65972
Point 42	78.5956	305.57155
Point 43	83.6675	305.7
Point 44	248.1947	307.61838
Point 45	299.7903	306.27673
Point 46	299.6238	303.28004
Point 47	404.2544	300.5593
Point 48	512.9971	302.35411
Point 49	583.3451	304.79977
Point 50	592.8421	305.14193
Point 51	650.1895	305.15472
Point 52	796.8602	303.47517
Point 53	796.8946	303.47517
Point 54	404.2686	303.55995
Point 55	512.9202	305.35325
Point 56	583.2389	307.79789
Point 57	592.7878	308.14191
Point 58	650.2064	308.15472
Point 59	796.8946	306.47498

Point 60	0	327.67711
Point 61	22.4921	326.28273
Point 62	49.2488	323.27595
Point 63	74.3201	319.27807
Point 64	77.7249	318.65421
Point 65	112.0147	318.69361
Point 66	124.2402	315.77486
Point 67	126.7076	315.31519
Point 68	136.2125	313.12968
Point 69	142.0351	312.45981
Point 70	357.6126	310.47901
Point 71	586.0206	317.13
Point 72	588.0287	317.67977
Point 73	603.6052	322
Point 74	693.0775	322
Point 75	695.4173	323.10644
Point 76	697.3194	324
Point 77	714.7524	332
Point 78	726.8078	332.79458
Point 79	736.4313	333.45251
Point 80	740.2913	333.71166
Point 81	742.8239	333.89241
Point 82	743.6092	331.27888
Point 83	746.0108	331.28559
Point 84	751.3746	333.5338
Point 85	751.5561	333.52887
Point 86	751.6873	333.53898
Point 87	751.9654	333.539
Point 88	755.4965	333.65881
Point 89	757.088	333.70415
Point 90	766.5218	333.52383
Point 91	769.5239	331.03222
Point 92	781.3859	336.00827
Point 93	796.8946	335.53695
Point 94	0	330.67136
Point 95	0.1856	330.67136
Point 96	22.7526	329.27234
Point 97	49.6527	326.24944
Point 98	74.8268	322.23518

Point 99	77.9958	321.65452
Point 100	112.3661	321.69402
Point 101	124.8636	318.71033
Point 102	127.3188	318.25295
Point 103	136.7217	316.09089
Point 104	142.2209	315.45823
Point 105	357.5827	313.47942
Point 106	585.5746	320.11828
Point 107	587.2318	320.57198
Point 108	684.7881	347.62982
Point 109	704.816	348.13028
Point 110	707.7847	347.0118
Point 111	709.4494	346.32322
Point 112	709.6367	345.87345
Point 113	708.0438	345.21
Point 114	685.2332	344.64
Point 115	131.5335	329.79618
Point 116	158.1735	318.33502
Point 117	165.2063	318.28065
Point 118	203.3044	317.9221
Point 119	243.6199	317.55888
Point 120	248.3589	317.51329
Point 121	357.6595	316.4965
Point 122	589.0312	323.16552
Point 123	591.6482	323.89085
Point 124	610.0073	329
Point 125	631.5677	335
Point 126	653.128	341
Point 127	674.6884	347
Point 128	684.1005	349.61929
Point 129	699.8223	350.01168
Point 130	0	332.91188
Point 131	22.4396	331.51733
Point 132	49.1519	328.50799
Point 133	68.0785	325.48185
Point 134	73.6566	324.58998
Point 135	90.5756	324.62675
Point 136	109.5111	324.68581
Point 137	124.0229	330.52741

Point 138	127.0249	330.53586
Point 139	129.8149	330.45078
Point 140	130.027	330.44431
Point 141	274.9823	329
Point 142	252.0124	321.5
Point 143	213.855	321.5
Point 144	177.1587	331.5
Point 145	171.0426	331.5
Point 146	152.2075	323.79526
Point 147	298.6003	335
Point 148	282.6389	331.5
Point 149	287.7433	331.5
Point 150	289.3308	331.95874
Point 151	290.9318	332.5
Point 152	317.0046	341
Point 153	355.3453	347
Point 154	666.3598	347
Point 155	669.6785	345.61929
Point 156	674.6567	347
Point 157	326.7765	344.18573
Point 158	336.1465	343.24706
Point 159	342.0216	342.65356
Point 160	373.7378	353
Point 161	651.9377	353
Point 162	392.1303	359
Point 163	637.5157	359
Point 164	410.5229	365
Point 165	623.0936	365
Point 166	608.6716	371
Point 167	428.9409	371
Point 168	415.8066	366.72364
Point 169	447.0228	377
Point 170	594.2496	377
Point 171	435.4903	373.13237
Point 172	450.0526	378.01608
Point 173	459.9195	378.51574
Point 174	479.4258	379.45192
Point 175	482.5508	379.55699
Point 176	491.9324	380

Point 177	507.2813	380.61621
Point 178	541.8899	382.28139
Point 179	574.2808	382.67429
Point 180	581.1072	381.37657
Point 181	581.6822	381.26488
Point 182	582.2411	381.14975
Point 183	582.7845	381.03125
Point 184	583.313	380.90951
Point 185	583.8273	380.78465
Point 186	584.3278	380.6568
Point 187	584.8152	380.52606
Point 188	585.29	380.39256
Point 189	592.2253	377.82435
Point 190	593.0101	377.51567
Point 191	78.5551	329.67009
Point 192	110.5776	331.89761
Point 193	113.2091	332.06836
Point 194	115.8406	332.21663
Point 195	118.4721	332.34247
Point 196	121.1036	332.44595
Point 197	123.7351	332.5271
Point 198	125.1298	332.55831
Point 199	126.3665	332.19565
Point 200	128.6722	331.5
Point 201	128.9196	331.46994
Point 202	710.0851	346.06023
Point 203	718.4637	349.55
Point 204	736.491	350
Point 205	738.1976	349.29
Point 206	796.8946	253.91519
Point 207	0	253.91519

Lines

	Start Point	End Point	Hydraulic Boundary	Stress/Strain Boundary
Line 1	1	2		
Line 2	2	3		
Line 3	3	4		
Line 4	4	5		

Line 5	5	6		
Line 6	6	7		
Line 7	7	8		
Line 8	8	9		
Line 9	9	10		
Line 10	10	11		
Line 11	11	12		
Line 12	12	13		
Line 13	13	14		
Line 14	14	15		
Line 15	15	16		
Line 16	16	17		
Line 17	17	18		
Line 18	18	19	drainage 313	Fixed X
Line 19	19	20		
Line 20	20	21		
Line 21	21	22		
Line 22	22	23		
Line 23	23	24		
Line 24	24	25		
Line 25	25	26		
Line 26	26	27		
Line 27	27	28		
Line 28	28	1	drainage 313	Fixed X
Line 29	29	30		
Line 30	30	31		
Line 31	31	32		
Line 32	32	33		
Line 33	33	34		
Line 34	34	35		
Line 35	35	36		
Line 36	36	37		
Line 37	37	19	drainage 313	Fixed X
Line 38	28	29	drainage 313	Fixed X
Line 39	38	39		
Line 40	39	40		
Line 41	40	41		
Line 42	41	42		
Line 43	42	43		

Line 44	43	44		
Line 45	44	45		
Line 46	45	46		
Line 47	46	47		
Line 48	47	48		
Line 49	48	49		
Line 50	49	50		
Line 51	50	51		
Line 52	51	52		
Line 53	52	53		
Line 54	53	37	drainage 313	Fixed X
Line 55	29	38	drainage 313	Fixed X
Line 56	45	54		
Line 57	54	55		
Line 58	55	56		
Line 59	56	57		
Line 60	57	58		
Line 61	58	59		
Line 62	59	53	drainage 313	Fixed X
Line 63	60	61		
Line 64	61	62		
Line 65	62	63		
Line 66	63	64		
Line 67	64	65		
Line 68	65	66		
Line 69	66	67		
Line 70	67	68		
Line 71	68	69		
Line 72	69	70		
Line 73	70	71		
Line 74	71	72		
Line 75	72	73		
Line 76	73	74		
Line 77	74	75		
Line 78	75	76		
Line 79	76	77		
Line 80	77	78		
Line 81	78	79		
Line 82	79	80		

Line 83	80	81		
Line 84	81	82		
Line 85	82	83		
Line 86	83	84		
Line 87	84	85		
Line 88	85	86		
Line 89	86	87		
Line 90	87	88		
Line 91	88	89		
Line 92	89	90		
Line 93	90	91		
Line 94	91	92		
Line 95	92	93		
Line 96	93	59	noflowzeropress	Fixed X
Line 97	38	60	noflowzeropress	Fixed X
Line 98	94	95		
Line 99	95	96		
Line 100	96	97		
Line 101	97	98	no flow	
Line 102	98	99	no flow	
Line 103	99	100	no flow	
Line 104	100	101	no flow	
Line 105	101	102	no flow	
Line 106	102	103	no flow	
Line 107	103	104	no flow	
Line 108	104	105	no flow	
Line 109	105	106	no flow	
Line 110	106	107	no flow	
Line 111	107	108	no flow	
Line 112	108	109	no flow	
Line 113	109	110		
Line 114	110	111		
Line 115	111	112		
Line 116	112	113		
Line 117	113	114		
Line 118	114	73		
Line 119	60	94		Fixed X
Line 120	115	116		
Line 121	116	117		

Line 122	117	118		
Line 123	118	119		
Line 124	119	120		
Line 125	120	121		
Line 126	121	122		
Line 127	122	123		
Line 128	123	124		
Line 129	124	125		
Line 130	125	126		
Line 131	126	127		
Line 132	127	128		
Line 133	128	129		
Line 134	129	109		
Line 135	94	130		Fixed X
Line 136	130	131		
Line 137	131	132		
Line 138	132	133		
Line 139	133	134		
Line 140	134	135		
Line 141	135	136		
Line 142	136	137		
Line 143	137	138		
Line 144	138	139		
Line 145	139	140		
Line 146	140	115		
Line 147	124	141		
Line 148	141	142		
Line 149	142	143		
Line 150	143	144		
Line 151	144	145		
Line 152	145	146		
Line 153	146	115		
Line 154	147	125		
Line 155	141	148		
Line 156	148	149		
Line 157	149	150		
Line 158	150	151		
Line 159	151	147		
Line 160	126	152		

Line 161	152	147		
Line 162	153	154		
Line 163	154	155		
Line 164	155	156		
Line 165	156	127		
Line 166	152	157		
Line 167	157	158		
Line 168	158	159		
Line 169	159	153		
Line 170	160	161		
Line 171	161	154		
Line 172	153	160		
Line 173	162	163		
Line 174	163	161		
Line 175	160	162		
Line 176	164	165		
Line 177	165	163		
Line 178	162	164		
Line 179	165	166		
Line 180	166	167		
Line 181	167	168		
Line 182	168	164		
Line 183	169	170		
Line 184	170	166		
Line 185	167	171		
Line 186	171	169		
Line 187	169	172		
Line 188	172	173		
Line 189	173	174		
Line 190	174	175		
Line 191	175	176		
Line 192	176	177		
Line 193	177	178		
Line 194	178	179		
Line 195	179	180		
Line 196	180	181		
Line 197	181	182		
Line 198	182	183		
Line 199	183	184		

Line 200	184	185		
Line 201	185	186		
Line 202	186	187		
Line 203	187	188		
Line 204	188	189		
Line 205	189	190		
Line 206	190	170		
Line 207	133	191		
Line 208	191	192		
Line 209	192	193		
Line 210	193	194		
Line 211	194	195		
Line 212	195	196		
Line 213	196	197		
Line 214	197	198		
Line 215	198	199		
Line 216	199	200		
Line 217	200	201		
Line 218	201	139		
Line 219	112	202		
Line 220	202	203		
Line 221	203	204		
Line 222	204	205		
Line 223	205	81		
Line 224	18	206	drainage 313	Fixed X
Line 225	206	207	drainage 313	Fixed X/Y
Line 226	207	1	drainage 313	Fixed X

Regions

	Material	Points	Area (ft^2)
Region 1	Lower Till	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28	3,346.1
Region 2	Sand/Silt	29,30,31,32,33,34,35,36,37,19,20,21,22,23,24,25,26,27,28	10,671
Region 3	GC-Drained	38,39,40,41,42,43,44,45,46,47,48,49,50,51,52,53,37,36,35,34,33,32,31,30,29	10,397
Region 4	GC OverConsolidated	45,54,55,56,57,58,59,53,52,51,50,49,48,47,46	1,491.9
Region 5	Upper Till	60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78,79,80	9,253.4

		,81,82,83,84,85,86,87,88,89,90,91,92,93,59,58,57,56,55,54,45,44,43,42,41,40,39,38	
Region 6	CCL	94,95,96,97,98,99,100,101,102,103,104,105,106,107,108,109,110,111,112,113,114,73,72,71,70,69,68,67,66,65,64,63,62,61,60	2,139
Region 7	Bottom Liner	115,116,117,118,119,120,121,122,123,124,125,126,127,128,129,109,108,107,106,105,104,103,102,101,100,99,98,97,96,95,94,130,131,132,133,134,135,136,137,138,139,140	2,215.1
Region 8	Waste Material	115,116,117,118,119,120,121,122,123,124,141,142,143,144,145,146	4,104.1
Region 9	Waste Material	147,125,124,141,148,149,150,151	2,001.4
Region 10		147,125,126,152	2,007.3
Region 11		153,154,155,156,127,126,152,157,158,159	1,949.1
Region 12		160,161,154,153	1,767.6
Region 13		162,163,161,160	1,570.8
Region 14		164,165,163,162	1,373.9
Region 15		164,165,166,167,168	1,176.9
Region 16		169,170,166,167,171	980.5
Region 17		169,172,173,174,175,176,177,178,179,180,181,182,183,184,185,186,187,188,189,190,170	534.96
Region 18	Structural Fill	133,191,192,193,194,195,196,197,198,199,200,201,139,138,137,136,135,134	293.23
Region 19	Structural Fill	73,114,113,112,202,203,204,205,81,80,79,78,77,76,75,74	1,934.1
Region 20	UPPER SHALE	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,206,207	15,814

Figure 22 - Coupled Consolidation for Section OP-2 for Waste Lift 3

Waste Lift 3 El. 341

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File Information

Title: Model City - RMU-2 CP-20 Section OP-2
Comments: Operation Conditions for CP-20 Section 2 Based on Maximum Fill Rate of 50,000 Cu Yds per Quarter
Created By: Peter J. Carey
Revision Number: 498
File Version: 8.0
Tool Version: 8.0.10.6504
Date: 2/25/2013
Time: 7:29:13 AM
File Name: C20OP-2r1.gsz
Directory: N:\Model_City\154.002_rmu2\154.005_revsions\geoslope\operational\

Project Settings

Length(L) Units: feet
Time(t) Units: Days
Force(F) Units: lbf
Pressure(p) Units: psf
Strength Units: psf
Stiffness Units: psf
Unit Weight of Water: 62.4 pcf
Air Pressure: 101.33 psf
View: 2D

Analysis Settings

Waste Lift 3 El. 341

Kind: SIGMA/W
Parent: Waste Lift 2 El. 335
Method: Coupled Stress/PWP
Settings
- Initial Stress: Parent Analysis
- Initial PWP: Parent Analysis
- Exclude cumulative values: No

Control
- Apply Body Force in All Steps: No
- Saturated Zone Only: No

Convergence
- Maximum Number of Iterations: 50
- Minimum Pressure Head Difference: 0.001
- Minimum Displacement Difference: 0.001
- Significant Digits: 3
- Hydraulic Under-Relaxation Criteria

Under-Relaxation Initial Rate: 1
Under-Relaxation Min. Rate: 0.1
Under-Relaxation Reduction Rate: 0.65
Under-Relaxation Iterations: 10
Equation Solver: Parallel Direct
Time
Starting Time: 282 days
Duration: 79 days
# of Steps: 12
Step Generation Method: Linear
Save Steps Every: 4

Materials

Waste Material

Model: Linear Elastic (Total)
Stress Strain
Young's Modulus (E): 400,000 psf
Unit Weight: 111 pcf
Poisson's Ratio: 0.45

Bottom Liner

Model: Linear Elastic (Total)
Stress Strain
Young's Modulus (E): 400,000 psf
Unit Weight: 120 pcf
Poisson's Ratio: 0.45

CCL

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 1,000,000 psf
Unit Weight: 120 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Clay soils OC
K-Function: GC 5.7 E-4 ft/day
Ky'/Kx' Ratio: 0.1
Rotation: 0 °
Load Response Ratio: 1

Upper Till

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 300,000 psf
Unit Weight: 125 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Till
K-Function: Upper Glacial Till
Ky'/Kx' Ratio: 1

Rotation: 0 °
Load Response Ratio: 1

GC-Drained

Model: Soft Clay (MCC w/ PWP Change)
Stress Strain
O.C. Ratio: 4
Poisson's Ratio: 0.334
Lambda: 0.14
Kappa: 0.013
Initial Void Ratio: 1
Unit Weight: 118 pcf
Phi': 27 °
Hydraulic
Vol. WC. Function: Clay soils
K-Function: GC 5.7 E-4 ft/day
Ky'/Kx' Ratio: 1
Rotation: 0 °
K-Modifier Function: 1D consol derived k function rmu2 clay
Load Response Ratio: 1

GC OverConsolidated

Model: Soft Clay (MCC w/ PWP Change)
Stress Strain
O.C. Ratio: 8
Poisson's Ratio: 0.334
Lambda: 0.06
Kappa: 0.01
Initial Void Ratio: 0.5
Unit Weight: 125 pcf
Phi': 30 °
Hydraulic
Vol. WC. Function: Clay soils OC
K-Function: GC 5.7 E-4 ft/day
Ky'/Kx' Ratio: 1
Rotation: 0 °
K-Modifier Function: 1D consol derived k function rmu2 clay
Load Response Ratio: 1

Sand/Silt

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 300,000 psf
Unit Weight: 135 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: silty sand
K-Function: Silty Sand, k = 0.567 ft/day 2 E-4cm/sec
Ky'/Kx' Ratio: 0.1
Rotation: 0 °
Load Response Ratio: 1

Lower Till

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 600,000 psf
Unit Weight: 145 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Till
K-Function: Till
Ky'/Kx' Ratio: 1
Rotation: 0 °
Load Response Ratio: 1

Structural Fill

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 100,000 psf
Unit Weight: 135 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Till
K-Function: Till
Ky'/Kx' Ratio: 1
Rotation: 0 °
Load Response Ratio: 1

UPPER SHALE

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 1,000,000 psf
Unit Weight: 145 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Till
K-Function: Upper Rock
Ky'/Kx' Ratio: 1
Rotation: 0 °
Load Response Ratio: 1

Boundary Conditions

Fixed X

X: X-Displacement 0

Fixed X/Y

X: X-Displacement 0
Y: Y-Displacement 0

no flow

Type: Total Flux (Q) 0

Review: No

noflowzeropress

Type: Total Flux (Q) 0
Review: Yes

drainage 313

Type: Head (H) 313
Review: No

Initial Water Tables

Initial Water Table 1

Max. negative head: 5
Coordinates
Coordinate 1: (0, 315) ft
Coordinate 2: (850, 315) ft

K Functions

Silty Sand, k = 0.567 ft/day 2 E-4cm/sec

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 36 %
K-Saturation: 0.567
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (0.005, 0.567)
Data Point: (0.01, 0.567)
Data Point: (0.035938, 0.567)
Data Point: (0.12915, 0.567)
Data Point: (0.46416, 0.567)
Data Point: (1.1111, 0.567)
Data Point: (1.6681, 0.567)
Data Point: (5.9948, 0.567)
Data Point: (21.544, 0.567)
Data Point: (77.426, 0.567)
Data Point: (105.93, 0.5402376)
Data Point: (210.74, 0.3387258)
Data Point: (278.26, 0.2567376)
Data Point: (315.56, 0.2232846)
Data Point: (420.37, 0.1406916)
Data Point: (525.19, 0.0779121)
Data Point: (630, 0.03843882)
Data Point: (734.81, 0.01673406)
Data Point: (839.63, 0.005422788)
Data Point: (944.44, 0.000745983)
Data Point: (1,000, 7.14735e-005)
Estimation Properties

Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Upper Glacial Till

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 36 %
K-Saturation: 0.0057
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (0.005, 0.0057)
Data Point: (0.01, 0.0057)
Data Point: (0.046416, 0.0057)
Data Point: (0.21544, 0.0057)
Data Point: (1, 0.0057)
Data Point: (4.6416, 0.0057)
Data Point: (11.111, 0.0057)
Data Point: (21.544, 0.0057)
Data Point: (100, 0.0057)
Data Point: (464.16, 0.0016245)
Data Point: (1,059.3, 0.0002427972)
Data Point: (2,107.4, 1.492716e-005)
Data Point: (2,154.4, 1.369596e-005)
Data Point: (3,155.6, 4.086672e-006)
Data Point: (4,203.7, 1.82115e-006)
Data Point: (5,251.9, 9.03222e-007)
Data Point: (6,300, 4.30521e-007)
Data Point: (7,348.1, 2.028516e-007)
Data Point: (8,396.3, 7.73661e-008)
Data Point: (9,444.4, 2.691312e-008)
Data Point: (10,000, 2.691312e-008)
Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Upper Rock

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 36 %
K-Saturation: 0.567
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (0.005, 0.567)
Data Point: (0.01, 0.567)

Data Point: (10,000, 0.567)
Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Till

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 36 %
K-Saturation: 0.000567
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (0.005, 0.000567)
Data Point: (0.01, 0.000567)
Data Point: (10,000, 0.000567)
Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

GC 5.7 E-4 ft/day

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 100 %
K-Saturation: 0.00057
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (10, 0.00057)
Data Point: (1,000, 9e-006)
Data Point: (5,000, 5e-006)
Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Hydraulic K Modifier Functions

1D consol derived k function rmu2 clay

Model: Spline Data Point Function (Y Log)
Function: K-Modifier vs. Y-Effective Stress
Curve Fit to Data: 100 %

Segment Curvature: 75 %
Y-Intercept: 1.2
Data Points: Y-Effective Stress (psf), K-Modifier
Data Point: (1,000, 1.2)
Data Point: (2,000, 1)
Data Point: (4,000, 0.839)
Data Point: (8,000, 0.70417211)
Data Point: (12,000, 0.63551782)
Data Point: (16,000, 0.59090577)

Vol. Water Content Functions

Clay soils OC

Model: Vol WC Data Point Function
Function: Vol. Water Content vs. Pore-Water Pressure
Mv: 7e-005 /psf
Saturated Water Content: 0.31427274 ft^3/ft^3
Residual Water Content: 0.031427274 ft^3/ft^3
Curve Fit to Data: 100 %
Segment Curvature: 100 %
Porosity: 0.31427274
Data Points: Matric Suction (psf), Vol. Water Content (ft^3/ft^3)
Data Point: (0.01, 0.29999999)
Data Point: (0.018329807, 0.29999998)
Data Point: (0.033598183, 0.29999996)
Data Point: (0.061584821, 0.29999991)
Data Point: (0.11288379, 0.29999982)
Data Point: (0.20691381, 0.29999962)
Data Point: (0.37926902, 0.29999917)
Data Point: (0.6951928, 0.29999814)
Data Point: (1.274275, 0.29999578)
Data Point: (2.3357215, 0.29999026)
Data Point: (4.2813324, 0.2999772)
Data Point: (7.8475997, 0.29994599)
Data Point: (14.384499, 0.29987093)
Data Point: (26.366509, 0.29968944)
Data Point: (48.329302, 0.29924951)
Data Point: (88.586679, 0.29818464)
Data Point: (162.37767, 0.29563126)
Data Point: (297.63514, 0.28967022)
Data Point: (545.55948, 0.27661743)
Data Point: (1,000, 0.25163343)
Estimation Properties
Vol. WC Estimation Method: Sample functions
Saturated Water Content: 0.3 ft^3/ft^3
Sample Material: Clay
Liquid Limit: 0 %
Diameter at 10% passing: 0
Diameter at 60% passing: 0
Maximum: 1,000
Minimum: 0.01

Num. Points: 20

Clay soils

Model: Vol WC Data Point Function
Function: Vol. Water Content vs. Pore-Water Pressure
Mv: 0.0004 /psf
Saturated Water Content: 0.60995302 ft^3/ft^3
Residual Water Content: 0.060995302 ft^3/ft^3
Curve Fit to Data: 100 %
Segment Curvature: 100 %
Porosity: 0.60995302
Data Points: Matric Suction (psf), Vol. Water Content (ft^3/ft^3)
Data Point: (0.01, 0.43999998)
Data Point: (0.018329807, 0.43999997)
Data Point: (0.033598183, 0.43999994)
Data Point: (0.061584821, 0.43999987)
Data Point: (0.11288379, 0.43999974)
Data Point: (0.20691381, 0.43999944)
Data Point: (0.37926902, 0.43999878)
Data Point: (0.6951928, 0.43999728)
Data Point: (1.274275, 0.43999381)
Data Point: (2.3357215, 0.43998571)
Data Point: (4.2813324, 0.43996655)
Data Point: (7.8475997, 0.43992079)
Data Point: (14.384499, 0.4398107)
Data Point: (26.366509, 0.43954452)
Data Point: (48.329302, 0.43889927)
Data Point: (88.586679, 0.43733747)
Data Point: (162.37767, 0.43359251)
Data Point: (297.63514, 0.42484965)
Data Point: (545.55948, 0.40570556)
Data Point: (1,000, 0.36906236)
Estimation Properties
Vol. WC Estimation Method: Sample functions
Saturated Water Content: 0.44 ft^3/ft^3
Sample Material: Clay
Liquid Limit: 0 %
Diameter at 10% passing: 0
Diameter at 60% passing: 0
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Till

Model: Vol WC Data Point Function
Function: Vol. Water Content vs. Pore-Water Pressure
Mv: 5e-006 /psf
Saturated Water Content: 0.20000173 ft^3/ft^3
Residual Water Content: 0.020000173 ft^3/ft^3
Curve Fit to Data: 100 %
Segment Curvature: 100 %
Porosity: 0.20000173

Data Points: Matric Suction (psf), Vol. Water Content (ft^3/ft^3)
- Data Point: (0.01, 0.19999999)
- Data Point: (0.018329807, 0.19999999)
- Data Point: (0.033598183, 0.19999997)
- Data Point: (0.061584821, 0.19999993)
- Data Point: (0.11288379, 0.19999985)
- Data Point: (0.20691381, 0.19999967)
- Data Point: (0.37926902, 0.19999922)
- Data Point: (0.6951928, 0.19999811)
- Data Point: (1.274275, 0.19999535)
- Data Point: (2.3357215, 0.19998838)
- Data Point: (4.2813324, 0.19997056)
- Data Point: (7.8475997, 0.19992471)
- Data Point: (14.384499, 0.19980625)
- Data Point: (26.366509, 0.19949952)
- Data Point: (48.329302, 0.19870702)
- Data Point: (88.586679, 0.19668084)
- Data Point: (162.37767, 0.19165467)
- Data Point: (297.63514, 0.18009116)
- Data Point: (545.55948, 0.15752337)
- Data Point: (1,000, 0.12453739)

Estimation Properties
- Vol. WC Estimation Method: Sample functions
- Saturated Water Content: 0.2 ft^3/ft^3
- Sample Material: Silty Clay
- Liquid Limit: 0 %
- Diameter at 10% passing: 0
- Diameter at 60% passing: 0
- Maximum: 1,000
- Minimum: 0.01
- Num. Points: 20

silty sand

Model: Vol WC Data Point Function

Function: Vol. Water Content vs. Pore-Water Pressure
- Mv: 1e-005 /psf
- Saturated Water Content: 0.30000011 ft^3/ft^3
- Residual Water Content: 0.030000011 ft^3/ft^3
- Curve Fit to Data: 100 %
- Segment Curvature: 100 %

Porosity: 0.30000011

Data Points: Matric Suction (psf), Vol. Water Content (ft^3/ft^3)
- Data Point: (0.01, 0.29999996)
- Data Point: (0.018329807, 0.29999991)
- Data Point: (0.033598183, 0.29999977)
- Data Point: (0.061584821, 0.29999942)
- Data Point: (0.11288379, 0.29999854)
- Data Point: (0.20691381, 0.29999626)
- Data Point: (0.37926902, 0.29999039)
- Data Point: (0.6951928, 0.29997521)
- Data Point: (1.274275, 0.29993588)
- Data Point: (2.3357215, 0.29983385)

Data Point: (4.2813324, 0.29956912)
Data Point: (7.8475997, 0.29888334)
Data Point: (14.384499, 0.29711648)
Data Point: (26.366509, 0.29263189)
Data Point: (48.329302, 0.28167657)
Data Point: (88.586679, 0.25725429)
Data Point: (162.37767, 0.21239326)
Data Point: (297.63514, 0.15298031)
Data Point: (545.55948, 0.099847233)
Data Point: (1,000, 0.064649441)

Estimation Properties

Vol. WC Estimation Method: Sample functions
Saturated Water Content: 0.3 ft^3/ft^3
Sample Material: Silty Sand
Liquid Limit: 0 %
Diameter at 10% passing: 0
Diameter at 60% passing: 0
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Points

	X (ft)	Y (ft)
Point 1	0	268.91519
Point 2	207.4978	271.24238
Point 3	209.0232	271.26867
Point 4	215.074	271.32735
Point 5	225.5606	271.44496
Point 6	230.6621	271.56993
Point 7	234.0537	271.62591
Point 8	237.8751	271.70733
Point 9	243.6233	271.78388
Point 10	403.7734	274.99581
Point 11	406.1879	275.04891
Point 12	510.242	277.40528
Point 13	519.1809	277.52295
Point 14	522.2501	277.56833
Point 15	581.5843	278.21948
Point 16	706.5316	275.03632
Point 17	784.4915	272.77004
Point 18	796.8946	272.40949
Point 19	796.8946	278.66207
Point 20	771.752	277.8332

Point 21	583.2389	281.6042
Point 22	512.9202	278.57945
Point 23	404.2686	277.81745
Point 24	248.1947	278.63737
Point 25	83.6675	274.48464
Point 26	78.5956	274.41664
Point 27	69.7373	274.12229
Point 28	0	273.8562
Point 29	0	286.98783
Point 30	69.7373	288.07912
Point 31	78.6615	288.22649
Point 32	83.6675	288.57952
Point 33	248.1947	297.19282
Point 34	404.2686	294.81745
Point 35	512.9202	289.28565
Point 36	583.2389	288.00106
Point 37	796.8946	289.48765
Point 38	0	305.26334
Point 39	63.5351	305.72185
Point 40	69.7373	305.70863
Point 41	77.6371	305.65972
Point 42	78.5956	305.57155
Point 43	83.6675	305.7
Point 44	248.1947	307.61838
Point 45	299.7903	306.27673
Point 46	299.6238	303.28004
Point 47	404.2544	300.5593
Point 48	512.9971	302.35411
Point 49	583.3451	304.79977
Point 50	592.8421	305.14193
Point 51	650.1895	305.15472
Point 52	796.8602	303.47517
Point 53	796.8946	303.47517
Point 54	404.2686	303.55995
Point 55	512.9202	305.35325
Point 56	583.2389	307.79789
Point 57	592.7878	308.14191
Point 58	650.2064	308.15472
Point 59	796.8946	306.47498

Point 60	0	327.67711
Point 61	22.4921	326.28273
Point 62	49.2488	323.27595
Point 63	74.3201	319.27807
Point 64	77.7249	318.65421
Point 65	112.0147	318.69361
Point 66	124.2402	315.77486
Point 67	126.7076	315.31519
Point 68	136.2125	313.12968
Point 69	142.0351	312.45981
Point 70	357.6126	310.47901
Point 71	586.0206	317.13
Point 72	588.0287	317.67977
Point 73	603.6052	322
Point 74	693.0775	322
Point 75	695.4173	323.10644
Point 76	697.3194	324
Point 77	714.7524	332
Point 78	726.8078	332.79458
Point 79	736.4313	333.45251
Point 80	740.2913	333.71166
Point 81	742.8239	333.89241
Point 82	743.6092	331.27888
Point 83	746.0108	331.28559
Point 84	751.3746	333.5338
Point 85	751.5561	333.52887
Point 86	751.6873	333.53898
Point 87	751.9654	333.539
Point 88	755.4965	333.65881
Point 89	757.088	333.70415
Point 90	766.5218	333.52383
Point 91	769.5239	331.03222
Point 92	781.3859	336.00827
Point 93	796.8946	335.53695
Point 94	0	330.67136
Point 95	0.1856	330.67136
Point 96	22.7526	329.27234
Point 97	49.6527	326.24944
Point 98	74.8268	322.23518

Point 99	77.9958	321.65452
Point 100	112.3661	321.69402
Point 101	124.8636	318.71033
Point 102	127.3188	318.25295
Point 103	136.7217	316.09089
Point 104	142.2209	315.45823
Point 105	357.5827	313.47942
Point 106	585.5746	320.11828
Point 107	587.2318	320.57198
Point 108	684.7881	347.62982
Point 109	704.816	348.13028
Point 110	707.7847	347.0118
Point 111	709.4494	346.32322
Point 112	709.6367	345.87345
Point 113	708.0438	345.21
Point 114	685.2332	344.64
Point 115	131.5335	329.79618
Point 116	158.1735	318.33502
Point 117	165.2063	318.28065
Point 118	203.3044	317.9221
Point 119	243.6199	317.55888
Point 120	248.3589	317.51329
Point 121	357.6595	316.4965
Point 122	589.0312	323.16552
Point 123	591.6482	323.89085
Point 124	610.0073	329
Point 125	631.5677	335
Point 126	653.128	341
Point 127	674.6884	347
Point 128	684.1005	349.61929
Point 129	699.8223	350.01168
Point 130	0	332.91188
Point 131	22.4396	331.51733
Point 132	49.1519	328.50799
Point 133	68.0785	325.48185
Point 134	73.6566	324.58998
Point 135	90.5756	324.62675
Point 136	109.5111	324.68581
Point 137	124.0229	330.52741

Point 138	127.0249	330.53586
Point 139	129.8149	330.45078
Point 140	130.027	330.44431
Point 141	274.9823	329
Point 142	252.0124	321.5
Point 143	213.855	321.5
Point 144	177.1587	331.5
Point 145	171.0426	331.5
Point 146	152.2075	323.79526
Point 147	298.6003	335
Point 148	282.6389	331.5
Point 149	287.7433	331.5
Point 150	289.3308	331.95874
Point 151	290.9318	332.5
Point 152	317.0046	341
Point 153	355.3453	347
Point 154	666.3598	347
Point 155	669.6785	345.61929
Point 156	674.6567	347
Point 157	326.7765	344.18573
Point 158	336.1465	343.24706
Point 159	342.0216	342.65356
Point 160	373.7378	353
Point 161	651.9377	353
Point 162	392.1303	359
Point 163	637.5157	359
Point 164	410.5229	365
Point 165	623.0936	365
Point 166	608.6716	371
Point 167	428.9409	371
Point 168	415.8066	366.72364
Point 169	447.0228	377
Point 170	594.2496	377
Point 171	435.4903	373.13237
Point 172	450.0526	378.01608
Point 173	459.9195	378.51574
Point 174	479.4258	379.45192
Point 175	482.5508	379.55699
Point 176	491.9324	380

Point 177	507.2813	380.61621
Point 178	541.8899	382.28139
Point 179	574.2808	382.67429
Point 180	581.1072	381.37657
Point 181	581.6822	381.26488
Point 182	582.2411	381.14975
Point 183	582.7845	381.03125
Point 184	583.313	380.90951
Point 185	583.8273	380.78465
Point 186	584.3278	380.6568
Point 187	584.8152	380.52606
Point 188	585.29	380.39256
Point 189	592.2253	377.82435
Point 190	593.0101	377.51567
Point 191	78.5551	329.67009
Point 192	110.5776	331.89761
Point 193	113.2091	332.06836
Point 194	115.8406	332.21663
Point 195	118.4721	332.34247
Point 196	121.1036	332.44595
Point 197	123.7351	332.5271
Point 198	125.1298	332.55831
Point 199	126.3665	332.19565
Point 200	128.6722	331.5
Point 201	128.9196	331.46994
Point 202	710.0851	346.06023
Point 203	718.4637	349.55
Point 204	736.491	350
Point 205	738.1976	349.29
Point 206	796.8946	253.91519
Point 207	0	253.91519

Lines

	Start Point	End Point	Hydraulic Boundary	Stress/Strain Boundary
Line 1	1	2		
Line 2	2	3		
Line 3	3	4		
Line 4	4	5		

Line 5	5	6		
Line 6	6	7		
Line 7	7	8		
Line 8	8	9		
Line 9	9	10		
Line 10	10	11		
Line 11	11	12		
Line 12	12	13		
Line 13	13	14		
Line 14	14	15		
Line 15	15	16		
Line 16	16	17		
Line 17	17	18		
Line 18	18	19	drainage 313	Fixed X
Line 19	19	20		
Line 20	20	21		
Line 21	21	22		
Line 22	22	23		
Line 23	23	24		
Line 24	24	25		
Line 25	25	26		
Line 26	26	27		
Line 27	27	28		
Line 28	28	1	drainage 313	Fixed X
Line 29	29	30		
Line 30	30	31		
Line 31	31	32		
Line 32	32	33		
Line 33	33	34		
Line 34	34	35		
Line 35	35	36		
Line 36	36	37		
Line 37	37	19	drainage 313	Fixed X
Line 38	28	29	drainage 313	Fixed X
Line 39	38	39		
Line 40	39	40		
Line 41	40	41		
Line 42	41	42		
Line 43	42	43		

Line 44	43	44		
Line 45	44	45		
Line 46	45	46		
Line 47	46	47		
Line 48	47	48		
Line 49	48	49		
Line 50	49	50		
Line 51	50	51		
Line 52	51	52		
Line 53	52	53		
Line 54	53	37	drainage 313	Fixed X
Line 55	29	38	drainage 313	Fixed X
Line 56	45	54		
Line 57	54	55		
Line 58	55	56		
Line 59	56	57		
Line 60	57	58		
Line 61	58	59		
Line 62	59	53	drainage 313	Fixed X
Line 63	60	61		
Line 64	61	62		
Line 65	62	63		
Line 66	63	64		
Line 67	64	65		
Line 68	65	66		
Line 69	66	67		
Line 70	67	68		
Line 71	68	69		
Line 72	69	70		
Line 73	70	71		
Line 74	71	72		
Line 75	72	73		
Line 76	73	74		
Line 77	74	75		
Line 78	75	76		
Line 79	76	77		
Line 80	77	78		
Line 81	78	79		
Line 82	79	80		

Line 83	80	81		
Line 84	81	82		
Line 85	82	83		
Line 86	83	84		
Line 87	84	85		
Line 88	85	86		
Line 89	86	87		
Line 90	87	88		
Line 91	88	89		
Line 92	89	90		
Line 93	90	91		
Line 94	91	92		
Line 95	92	93		
Line 96	93	59	noflowzeropress	Fixed X
Line 97	38	60	noflowzeropress	Fixed X
Line 98	94	95		
Line 99	95	96		
Line 100	96	97		
Line 101	97	98	no flow	
Line 102	98	99	no flow	
Line 103	99	100	no flow	
Line 104	100	101	no flow	
Line 105	101	102	no flow	
Line 106	102	103	no flow	
Line 107	103	104	no flow	
Line 108	104	105	no flow	
Line 109	105	106	no flow	
Line 110	106	107	no flow	
Line 111	107	108	no flow	
Line 112	108	109	no flow	
Line 113	109	110		
Line 114	110	111		
Line 115	111	112		
Line 116	112	113		
Line 117	113	114		
Line 118	114	73		
Line 119	60	94		Fixed X
Line 120	115	116		
Line 121	116	117		

Line 122	117	118		
Line 123	118	119		
Line 124	119	120		
Line 125	120	121		
Line 126	121	122		
Line 127	122	123		
Line 128	123	124		
Line 129	124	125		
Line 130	125	126		
Line 131	126	127		
Line 132	127	128		
Line 133	128	129		
Line 134	129	109		
Line 135	94	130		Fixed X
Line 136	130	131		
Line 137	131	132		
Line 138	132	133		
Line 139	133	134		
Line 140	134	135		
Line 141	135	136		
Line 142	136	137		
Line 143	137	138		
Line 144	138	139		
Line 145	139	140		
Line 146	140	115		
Line 147	124	141		
Line 148	141	142		
Line 149	142	143		
Line 150	143	144		
Line 151	144	145		
Line 152	145	146		
Line 153	146	115		
Line 154	147	125		
Line 155	141	148		
Line 156	148	149		
Line 157	149	150		
Line 158	150	151		
Line 159	151	147		
Line 160	126	152		

Line 161	152	147		
Line 162	153	154		
Line 163	154	155		
Line 164	155	156		
Line 165	156	127		
Line 166	152	157		
Line 167	157	158		
Line 168	158	159		
Line 169	159	153		
Line 170	160	161		
Line 171	161	154		
Line 172	153	160		
Line 173	162	163		
Line 174	163	161		
Line 175	160	162		
Line 176	164	165		
Line 177	165	163		
Line 178	162	164		
Line 179	165	166		
Line 180	166	167		
Line 181	167	168		
Line 182	168	164		
Line 183	169	170		
Line 184	170	166		
Line 185	167	171		
Line 186	171	169		
Line 187	169	172		
Line 188	172	173		
Line 189	173	174		
Line 190	174	175		
Line 191	175	176		
Line 192	176	177		
Line 193	177	178		
Line 194	178	179		
Line 195	179	180		
Line 196	180	181		
Line 197	181	182		
Line 198	182	183		
Line 199	183	184		

Line 200	184	185		
Line 201	185	186		
Line 202	186	187		
Line 203	187	188		
Line 204	188	189		
Line 205	189	190		
Line 206	190	170		
Line 207	133	191		
Line 208	191	192		
Line 209	192	193		
Line 210	193	194		
Line 211	194	195		
Line 212	195	196		
Line 213	196	197		
Line 214	197	198		
Line 215	198	199		
Line 216	199	200		
Line 217	200	201		
Line 218	201	139		
Line 219	112	202		
Line 220	202	203		
Line 221	203	204		
Line 222	204	205		
Line 223	205	81		
Line 224	18	206	drainage 313	Fixed X
Line 225	206	207	drainage 313	Fixed X/Y
Line 226	207	1	drainage 313	Fixed X

Regions

	Material	Points	Area (ft^2)
Region 1	Lower Till	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28	3,346.1
Region 2	Sand/Silt	29,30,31,32,33,34,35,36,37,19,20,21,22,23,24,25,26,27,28	10,671
Region 3	GC-Drained	38,39,40,41,42,43,44,45,46,47,48,49,50,51,52,53,37,36,35,34,33,32,31,30,29	10,397
Region 4	GC OverConsolidated	45,54,55,56,57,58,59,53,52,51,50,49,48,47,46	1,491.9
Region 5	Upper Till	60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78,79,80,	9,253.4

		81,82,83,84,85,86,87,88,89,90,91,92,93,59,58,57,56,55,54,45,44,43,42,41,40,39,38	
Region 6	CCL	94,95,96,97,98,99,100,101,102,103,104,105,106,107,108,109,110,111,112,113,114,73,72,71,70,69,68,67,66,65,64,63,62,61,60	2,139
Region 7	Bottom Liner	115,116,117,118,119,120,121,122,123,124,125,126,127,128,129,109,108,107,106,105,104,103,102,101,100,99,98,97,96,95,94,130,131,132,133,134,135,136,137,138,139,140	2,215.1
Region 8	Waste Material	115,116,117,118,119,120,121,122,123,124,141,142,143,144,145,146	4,104.1
Region 9	Waste Material	147,125,124,141,148,149,150,151	2,001.4
Region 10	Waste Material	147,125,126,152	2,007.3
Region 11		153,154,155,156,127,126,152,157,158,159	1,949.1
Region 12		160,161,154,153	1,767.6
Region 13		162,163,161,160	1,570.8
Region 14		164,165,163,162	1,373.9
Region 15		164,165,166,167,168	1,176.9
Region 16		169,170,166,167,171	980.5
Region 17		169,172,173,174,175,176,177,178,179,180,181,182,183,184,185,186,187,188,189,190,170	534.96
Region 18	Structural Fill	133,191,192,193,194,195,196,197,198,199,200,201,139,138,137,136,135,134	293.23
Region 19	Structural Fill	73,114,113,112,202,203,204,205,81,80,79,78,77,76,75,74	1,934.1
Region 20	UPPER SHALE	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,206,207	15,814

Figure 23 - Coupled Consolidation for Section OP-2 for Waste Lift 4

Waste Lift 4 El. 347

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File Information

Title: Model City - RMU-2 CP-20 Section OP-2
Comments: Operation Conditions for CP-20 Section 2 Based on Maximum Fill Rate of 50,000 Cu Yds per Quarter
Created By: Peter J. Carey
Revision Number: 498
File Version: 8.0
Tool Version: 8.0.10.6504
Date: 2/25/2013
Time: 7:29:13 AM
File Name: C20OP-2r1.gsz
Directory: N:\Model_City\154.002_rmu2\154.005_revsions\geoslope\operational\

Project Settings

Length(L) Units: feet
Time(t) Units: Days
Force(F) Units: lbf
Pressure(p) Units: psf
Strength Units: psf
Stiffness Units: psf
Unit Weight of Water: 62.4 pcf
Air Pressure: 101.33 psf
View: 2D

Analysis Settings

Waste Lift 4 El. 347

Kind: SIGMA/W
Parent: Waste Lift 3 El. 341
Method: Coupled Stress/PWP
Settings
- Initial Stress: Parent Analysis
- Initial PWP: Parent Analysis
- Exclude cumulative values: No

Control
- Apply Body Force in All Steps: No
- Saturated Zone Only: No

Convergence
- Maximum Number of Iterations: 50
- Minimum Pressure Head Difference: 0.001
- Minimum Displacement Difference: 0.001
- Significant Digits: 3
- Hydraulic Under-Relaxation Criteria

Under-Relaxation Initial Rate: 1
Under-Relaxation Min. Rate: 0.1
Under-Relaxation Reduction Rate: 0.65
Under-Relaxation Iterations: 10
Equation Solver: Parallel Direct
Time
Starting Time: 361 days
Duration: 76 days
# of Steps: 12
Step Generation Method: Linear
Save Steps Every: 4

Materials

Waste Material

Model: Linear Elastic (Total)
Stress Strain
Young's Modulus (E): 400,000 psf
Unit Weight: 111 pcf
Poisson's Ratio: 0.45

Bottom Liner

Model: Linear Elastic (Total)
Stress Strain
Young's Modulus (E): 400,000 psf
Unit Weight: 120 pcf
Poisson's Ratio: 0.45

CCL

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 1,000,000 psf
Unit Weight: 120 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Clay soils OC
K-Function: GC 5.7 E-4 ft/day
Ky'/Kx' Ratio: 0.1
Rotation: 0 °
Load Response Ratio: 1

Upper Till

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 300,000 psf
Unit Weight: 125 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Till
K-Function: Upper Glacial Till
Ky'/Kx' Ratio: 1

Rotation: 0 °
Load Response Ratio: 1

GC-Drained

Model: Soft Clay (MCC w/ PWP Change)
Stress Strain
O.C. Ratio: 4
Poisson's Ratio: 0.334
Lambda: 0.14
Kappa: 0.013
Initial Void Ratio: 1
Unit Weight: 118 pcf
Phi': 27 °
Hydraulic
Vol. WC. Function: Clay soils
K-Function: GC 5.7 E-4 ft/day
Ky'/Kx' Ratio: 1
Rotation: 0 °
K-Modifier Function: 1D consol derived k function rmu2 clay
Load Response Ratio: 1

GC OverConsolidated

Model: Soft Clay (MCC w/ PWP Change)
Stress Strain
O.C. Ratio: 8
Poisson's Ratio: 0.334
Lambda: 0.06
Kappa: 0.01
Initial Void Ratio: 0.5
Unit Weight: 125 pcf
Phi': 30 °
Hydraulic
Vol. WC. Function: Clay soils OC
K-Function: GC 5.7 E-4 ft/day
Ky'/Kx' Ratio: 1
Rotation: 0 °
K-Modifier Function: 1D consol derived k function rmu2 clay
Load Response Ratio: 1

Sand/Silt

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 300,000 psf
Unit Weight: 135 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: silty sand
K-Function: Silty Sand, k = 0.567 ft/day 2 E-4cm/sec
Ky'/Kx' Ratio: 0.1
Rotation: 0 °
Load Response Ratio: 1

Lower Till

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 600,000 psf
Unit Weight: 145 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Till
K-Function: Till
Ky'/Kx' Ratio: 1
Rotation: 0 °
Load Response Ratio: 1

Structural Fill

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 100,000 psf
Unit Weight: 135 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Till
K-Function: Till
Ky'/Kx' Ratio: 1
Rotation: 0 °
Load Response Ratio: 1

UPPER SHALE

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 1,000,000 psf
Unit Weight: 145 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Till
K-Function: Upper Rock
Ky'/Kx' Ratio: 1
Rotation: 0 °
Load Response Ratio: 1

Boundary Conditions

Fixed X

X: X-Displacement 0

Fixed X/Y

X: X-Displacement 0
Y: Y-Displacement 0

no flow

Type: Total Flux (Q) 0

Review: No

noflowzeropress

Type: Total Flux (Q) 0
Review: Yes

drainage 313

Type: Head (H) 313
Review: No

Initial Water Tables

Initial Water Table 1

Max. negative head: 5
Coordinates
Coordinate 1: (0, 315) ft
Coordinate 2: (850, 315) ft

K Functions

Silty Sand, k = 0.567 ft/day 2 E-4cm/sec

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 36 %
K-Saturation: 0.567
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (0.005, 0.567)
Data Point: (0.01, 0.567)
Data Point: (0.035938, 0.567)
Data Point: (0.12915, 0.567)
Data Point: (0.46416, 0.567)
Data Point: (1.1111, 0.567)
Data Point: (1.6681, 0.567)
Data Point: (5.9948, 0.567)
Data Point: (21.544, 0.567)
Data Point: (77.426, 0.567)
Data Point: (105.93, 0.5402376)
Data Point: (210.74, 0.3387258)
Data Point: (278.26, 0.2567376)
Data Point: (315.56, 0.2232846)
Data Point: (420.37, 0.1406916)
Data Point: (525.19, 0.0779121)
Data Point: (630, 0.03843882)
Data Point: (734.81, 0.01673406)
Data Point: (839.63, 0.005422788)
Data Point: (944.44, 0.000745983)
Data Point: (1,000, 7.14735e-005)
Estimation Properties

Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Upper Glacial Till

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 36 %
K-Saturation: 0.0057
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (0.005, 0.0057)
Data Point: (0.01, 0.0057)
Data Point: (0.046416, 0.0057)
Data Point: (0.21544, 0.0057)
Data Point: (1, 0.0057)
Data Point: (4.6416, 0.0057)
Data Point: (11.111, 0.0057)
Data Point: (21.544, 0.0057)
Data Point: (100, 0.0057)
Data Point: (464.16, 0.0016245)
Data Point: (1,059.3, 0.0002427972)
Data Point: (2,107.4, 1.492716e-005)
Data Point: (2,154.4, 1.369596e-005)
Data Point: (3,155.6, 4.086672e-006)
Data Point: (4,203.7, 1.82115e-006)
Data Point: (5,251.9, 9.03222e-007)
Data Point: (6,300, 4.30521e-007)
Data Point: (7,348.1, 2.028516e-007)
Data Point: (8,396.3, 7.73661e-008)
Data Point: (9,444.4, 2.691312e-008)
Data Point: (10,000, 2.691312e-008)
Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Upper Rock

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 36 %
K-Saturation: 0.567
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (0.005, 0.567)
Data Point: (0.01, 0.567)

Data Point: (10,000, 0.567)
Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Till

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 36 %
K-Saturation: 0.000567
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (0.005, 0.000567)
Data Point: (0.01, 0.000567)
Data Point: (10,000, 0.000567)
Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

GC 5.7 E-4 ft/day

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 100 %
K-Saturation: 0.00057
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (10, 0.00057)
Data Point: (1,000, 9e-006)
Data Point: (5,000, 5e-006)
Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Hydraulic K Modifier Functions

1D consol derived k function rmu2 clay

Model: Spline Data Point Function (Y Log)
Function: K-Modifier vs. Y-Effective Stress
Curve Fit to Data: 100 %

Segment Curvature: 75 %
Y-Intercept: 1.2
Data Points: Y-Effective Stress (psf), K-Modifier
Data Point: (1,000, 1.2)
Data Point: (2,000, 1)
Data Point: (4,000, 0.839)
Data Point: (8,000, 0.70417211)
Data Point: (12,000, 0.63551782)
Data Point: (16,000, 0.59090577)

Vol. Water Content Functions

Clay soils OC

Model: Vol WC Data Point Function
Function: Vol. Water Content vs. Pore-Water Pressure
Mv: 7e-005 /psf
Saturated Water Content: 0.31427274 ft^3/ft^3
Residual Water Content: 0.031427274 ft^3/ft^3
Curve Fit to Data: 100 %
Segment Curvature: 100 %
Porosity: 0.31427274
Data Points: Matric Suction (psf), Vol. Water Content (ft^3/ft^3)
Data Point: (0.01, 0.29999999)
Data Point: (0.018329807, 0.29999998)
Data Point: (0.033598183, 0.29999996)
Data Point: (0.061584821, 0.29999991)
Data Point: (0.11288379, 0.29999982)
Data Point: (0.20691381, 0.29999962)
Data Point: (0.37926902, 0.29999917)
Data Point: (0.6951928, 0.29999814)
Data Point: (1.274275, 0.29999578)
Data Point: (2.3357215, 0.29999026)
Data Point: (4.2813324, 0.2999772)
Data Point: (7.8475997, 0.29994599)
Data Point: (14.384499, 0.29987093)
Data Point: (26.366509, 0.29968944)
Data Point: (48.329302, 0.29924951)
Data Point: (88.586679, 0.29818464)
Data Point: (162.37767, 0.29563126)
Data Point: (297.63514, 0.28967022)
Data Point: (545.55948, 0.27661743)
Data Point: (1,000, 0.25163343)
Estimation Properties
Vol. WC Estimation Method: Sample functions
Saturated Water Content: 0.3 ft^3/ft^3
Sample Material: Clay
Liquid Limit: 0 %
Diameter at 10% passing: 0
Diameter at 60% passing: 0
Maximum: 1,000
Minimum: 0.01

Num. Points: 20

Clay soils

Model: Vol WC Data Point Function
Function: Vol. Water Content vs. Pore-Water Pressure
Mv: 0.0004 /psf
Saturated Water Content: 0.60995302 ft^3/ft^3
Residual Water Content: 0.060995302 ft^3/ft^3
Curve Fit to Data: 100 %
Segment Curvature: 100 %
Porosity: 0.60995302
Data Points: Matric Suction (psf), Vol. Water Content (ft^3/ft^3)
Data Point: (0.01, 0.43999998)
Data Point: (0.018329807, 0.43999997)
Data Point: (0.033598183, 0.43999994)
Data Point: (0.061584821, 0.43999987)
Data Point: (0.11288379, 0.43999974)
Data Point: (0.20691381, 0.43999944)
Data Point: (0.37926902, 0.43999878)
Data Point: (0.6951928, 0.43999728)
Data Point: (1.274275, 0.43999381)
Data Point: (2.3357215, 0.43998571)
Data Point: (4.2813324, 0.43996655)
Data Point: (7.8475997, 0.43992079)
Data Point: (14.384499, 0.4398107)
Data Point: (26.366509, 0.43954452)
Data Point: (48.329302, 0.43889927)
Data Point: (88.586679, 0.43733747)
Data Point: (162.37767, 0.43359251)
Data Point: (297.63514, 0.42484965)
Data Point: (545.55948, 0.40570556)
Data Point: (1,000, 0.36906236)
Estimation Properties
Vol. WC Estimation Method: Sample functions
Saturated Water Content: 0.44 ft^3/ft^3
Sample Material: Clay
Liquid Limit: 0 %
Diameter at 10% passing: 0
Diameter at 60% passing: 0
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Till

Model: Vol WC Data Point Function
Function: Vol. Water Content vs. Pore-Water Pressure
Mv: 5e-006 /psf
Saturated Water Content: 0.20000173 ft^3/ft^3
Residual Water Content: 0.020000173 ft^3/ft^3
Curve Fit to Data: 100 %
Segment Curvature: 100 %
Porosity: 0.20000173

Data Points: Matric Suction (psf), Vol. Water Content (ft^3/ft^3)
- Data Point: (0.01, 0.19999999)
- Data Point: (0.018329807, 0.19999999)
- Data Point: (0.033598183, 0.19999997)
- Data Point: (0.061584821, 0.19999993)
- Data Point: (0.11288379, 0.19999985)
- Data Point: (0.20691381, 0.19999967)
- Data Point: (0.37926902, 0.19999922)
- Data Point: (0.6951928, 0.19999811)
- Data Point: (1.274275, 0.19999535)
- Data Point: (2.3357215, 0.19998838)
- Data Point: (4.2813324, 0.19997056)
- Data Point: (7.8475997, 0.19992471)
- Data Point: (14.384499, 0.19980625)
- Data Point: (26.366509, 0.19949952)
- Data Point: (48.329302, 0.19870702)
- Data Point: (88.586679, 0.19668084)
- Data Point: (162.37767, 0.19165467)
- Data Point: (297.63514, 0.18009116)
- Data Point: (545.55948, 0.15752337)
- Data Point: (1,000, 0.12453739)

Estimation Properties
- Vol. WC Estimation Method: Sample functions
- Saturated Water Content: 0.2 ft^3/ft^3
- Sample Material: Silty Clay
- Liquid Limit: 0 %
- Diameter at 10% passing: 0
- Diameter at 60% passing: 0
- Maximum: 1,000
- Minimum: 0.01
- Num. Points: 20

silty sand

Model: Vol WC Data Point Function

Function: Vol. Water Content vs. Pore-Water Pressure
- Mv: 1e-005 /psf
- Saturated Water Content: 0.30000011 ft^3/ft^3
- Residual Water Content: 0.030000011 ft^3/ft^3
- Curve Fit to Data: 100 %
- Segment Curvature: 100 %

Porosity: 0.30000011

Data Points: Matric Suction (psf), Vol. Water Content (ft^3/ft^3)
- Data Point: (0.01, 0.29999996)
- Data Point: (0.018329807, 0.29999991)
- Data Point: (0.033598183, 0.29999977)
- Data Point: (0.061584821, 0.29999942)
- Data Point: (0.11288379, 0.29999854)
- Data Point: (0.20691381, 0.29999626)
- Data Point: (0.37926902, 0.29999039)
- Data Point: (0.6951928, 0.29997521)
- Data Point: (1.274275, 0.29993588)
- Data Point: (2.3357215, 0.29983385)

Data Point: (4.2813324, 0.29956912)
Data Point: (7.8475997, 0.29888334)
Data Point: (14.384499, 0.29711648)
Data Point: (26.366509, 0.29263189)
Data Point: (48.329302, 0.28167657)
Data Point: (88.586679, 0.25725429)
Data Point: (162.37767, 0.21239326)
Data Point: (297.63514, 0.15298031)
Data Point: (545.55948, 0.099847233)
Data Point: (1,000, 0.064649441)

Estimation Properties

Vol. WC Estimation Method: Sample functions
Saturated Water Content: 0.3 ft^3/ft^3
Sample Material: Silty Sand
Liquid Limit: 0 %
Diameter at 10% passing: 0
Diameter at 60% passing: 0
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Points

	X (ft)	Y (ft)
Point 1	0	268.91519
Point 2	207.4978	271.24238
Point 3	209.0232	271.26867
Point 4	215.074	271.32735
Point 5	225.5606	271.44496
Point 6	230.6621	271.56993
Point 7	234.0537	271.62591
Point 8	237.8751	271.70733
Point 9	243.6233	271.78388
Point 10	403.7734	274.99581
Point 11	406.1879	275.04891
Point 12	510.242	277.40528
Point 13	519.1809	277.52295
Point 14	522.2501	277.56833
Point 15	581.5843	278.21948
Point 16	706.5316	275.03632
Point 17	784.4915	272.77004
Point 18	796.8946	272.40949
Point 19	796.8946	278.66207
Point 20	771.752	277.8332

Point 21	583.2389	281.6042
Point 22	512.9202	278.57945
Point 23	404.2686	277.81745
Point 24	248.1947	278.63737
Point 25	83.6675	274.48464
Point 26	78.5956	274.41664
Point 27	69.7373	274.12229
Point 28	0	273.8562
Point 29	0	286.98783
Point 30	69.7373	288.07912
Point 31	78.6615	288.22649
Point 32	83.6675	288.57952
Point 33	248.1947	297.19282
Point 34	404.2686	294.81745
Point 35	512.9202	289.28565
Point 36	583.2389	288.00106
Point 37	796.8946	289.48765
Point 38	0	305.26334
Point 39	63.5351	305.72185
Point 40	69.7373	305.70863
Point 41	77.6371	305.65972
Point 42	78.5956	305.57155
Point 43	83.6675	305.7
Point 44	248.1947	307.61838
Point 45	299.7903	306.27673
Point 46	299.6238	303.28004
Point 47	404.2544	300.5593
Point 48	512.9971	302.35411
Point 49	583.3451	304.79977
Point 50	592.8421	305.14193
Point 51	650.1895	305.15472
Point 52	796.8602	303.47517
Point 53	796.8946	303.47517
Point 54	404.2686	303.55995
Point 55	512.9202	305.35325
Point 56	583.2389	307.79789
Point 57	592.7878	308.14191
Point 58	650.2064	308.15472
Point 59	796.8946	306.47498

Point 60	0	327.67711
Point 61	22.4921	326.28273
Point 62	49.2488	323.27595
Point 63	74.3201	319.27807
Point 64	77.7249	318.65421
Point 65	112.0147	318.69361
Point 66	124.2402	315.77486
Point 67	126.7076	315.31519
Point 68	136.2125	313.12968
Point 69	142.0351	312.45981
Point 70	357.6126	310.47901
Point 71	586.0206	317.13
Point 72	588.0287	317.67977
Point 73	603.6052	322
Point 74	693.0775	322
Point 75	695.4173	323.10644
Point 76	697.3194	324
Point 77	714.7524	332
Point 78	726.8078	332.79458
Point 79	736.4313	333.45251
Point 80	740.2913	333.71166
Point 81	742.8239	333.89241
Point 82	743.6092	331.27888
Point 83	746.0108	331.28559
Point 84	751.3746	333.5338
Point 85	751.5561	333.52887
Point 86	751.6873	333.53898
Point 87	751.9654	333.539
Point 88	755.4965	333.65881
Point 89	757.088	333.70415
Point 90	766.5218	333.52383
Point 91	769.5239	331.03222
Point 92	781.3859	336.00827
Point 93	796.8946	335.53695
Point 94	0	330.67136
Point 95	0.1856	330.67136
Point 96	22.7526	329.27234
Point 97	49.6527	326.24944
Point 98	74.8268	322.23518

Point 99	77.9958	321.65452
Point 100	112.3661	321.69402
Point 101	124.8636	318.71033
Point 102	127.3188	318.25295
Point 103	136.7217	316.09089
Point 104	142.2209	315.45823
Point 105	357.5827	313.47942
Point 106	585.5746	320.11828
Point 107	587.2318	320.57198
Point 108	684.7881	347.62982
Point 109	704.816	348.13028
Point 110	707.7847	347.0118
Point 111	709.4494	346.32322
Point 112	709.6367	345.87345
Point 113	708.0438	345.21
Point 114	685.2332	344.64
Point 115	131.5335	329.79618
Point 116	158.1735	318.33502
Point 117	165.2063	318.28065
Point 118	203.3044	317.9221
Point 119	243.6199	317.55888
Point 120	248.3589	317.51329
Point 121	357.6595	316.4965
Point 122	589.0312	323.16552
Point 123	591.6482	323.89085
Point 124	610.0073	329
Point 125	631.5677	335
Point 126	653.128	341
Point 127	674.6884	347
Point 128	684.1005	349.61929
Point 129	699.8223	350.01168
Point 130	0	332.91188
Point 131	22.4396	331.51733
Point 132	49.1519	328.50799
Point 133	68.0785	325.48185
Point 134	73.6566	324.58998
Point 135	90.5756	324.62675
Point 136	109.5111	324.68581
Point 137	124.0229	330.52741

Point 138	127.0249	330.53586
Point 139	129.8149	330.45078
Point 140	130.027	330.44431
Point 141	274.9823	329
Point 142	252.0124	321.5
Point 143	213.855	321.5
Point 144	177.1587	331.5
Point 145	171.0426	331.5
Point 146	152.2075	323.79526
Point 147	298.6003	335
Point 148	282.6389	331.5
Point 149	287.7433	331.5
Point 150	289.3308	331.95874
Point 151	290.9318	332.5
Point 152	317.0046	341
Point 153	355.3453	347
Point 154	666.3598	347
Point 155	669.6785	345.61929
Point 156	674.6567	347
Point 157	326.7765	344.18573
Point 158	336.1465	343.24706
Point 159	342.0216	342.65356
Point 160	373.7378	353
Point 161	651.9377	353
Point 162	392.1303	359
Point 163	637.5157	359
Point 164	410.5229	365
Point 165	623.0936	365
Point 166	608.6716	371
Point 167	428.9409	371
Point 168	415.8066	366.72364
Point 169	447.0228	377
Point 170	594.2496	377
Point 171	435.4903	373.13237
Point 172	450.0526	378.01608
Point 173	459.9195	378.51574
Point 174	479.4258	379.45192
Point 175	482.5508	379.55699
Point 176	491.9324	380

Point 177	507.2813	380.61621
Point 178	541.8899	382.28139
Point 179	574.2808	382.67429
Point 180	581.1072	381.37657
Point 181	581.6822	381.26488
Point 182	582.2411	381.14975
Point 183	582.7845	381.03125
Point 184	583.313	380.90951
Point 185	583.8273	380.78465
Point 186	584.3278	380.6568
Point 187	584.8152	380.52606
Point 188	585.29	380.39256
Point 189	592.2253	377.82435
Point 190	593.0101	377.51567
Point 191	78.5551	329.67009
Point 192	110.5776	331.89761
Point 193	113.2091	332.06836
Point 194	115.8406	332.21663
Point 195	118.4721	332.34247
Point 196	121.1036	332.44595
Point 197	123.7351	332.5271
Point 198	125.1298	332.55831
Point 199	126.3665	332.19565
Point 200	128.6722	331.5
Point 201	128.9196	331.46994
Point 202	710.0851	346.06023
Point 203	718.4637	349.55
Point 204	736.491	350
Point 205	738.1976	349.29
Point 206	796.8946	253.91519
Point 207	0	253.91519

Lines

	Start Point	End Point	Hydraulic Boundary	Stress/Strain Boundary
Line 1	1	2		
Line 2	2	3		
Line 3	3	4		
Line 4	4	5		

Line 5	5	6		
Line 6	6	7		
Line 7	7	8		
Line 8	8	9		
Line 9	9	10		
Line 10	10	11		
Line 11	11	12		
Line 12	12	13		
Line 13	13	14		
Line 14	14	15		
Line 15	15	16		
Line 16	16	17		
Line 17	17	18		
Line 18	18	19	drainage 313	Fixed X
Line 19	19	20		
Line 20	20	21		
Line 21	21	22		
Line 22	22	23		
Line 23	23	24		
Line 24	24	25		
Line 25	25	26		
Line 26	26	27		
Line 27	27	28		
Line 28	28	1	drainage 313	Fixed X
Line 29	29	30		
Line 30	30	31		
Line 31	31	32		
Line 32	32	33		
Line 33	33	34		
Line 34	34	35		
Line 35	35	36		
Line 36	36	37		
Line 37	37	19	drainage 313	Fixed X
Line 38	28	29	drainage 313	Fixed X
Line 39	38	39		
Line 40	39	40		
Line 41	40	41		
Line 42	41	42		
Line 43	42	43		

Line 44	43	44		
Line 45	44	45		
Line 46	45	46		
Line 47	46	47		
Line 48	47	48		
Line 49	48	49		
Line 50	49	50		
Line 51	50	51		
Line 52	51	52		
Line 53	52	53		
Line 54	53	37	drainage 313	Fixed X
Line 55	29	38	drainage 313	Fixed X
Line 56	45	54		
Line 57	54	55		
Line 58	55	56		
Line 59	56	57		
Line 60	57	58		
Line 61	58	59		
Line 62	59	53	drainage 313	Fixed X
Line 63	60	61		
Line 64	61	62		
Line 65	62	63		
Line 66	63	64		
Line 67	64	65		
Line 68	65	66		
Line 69	66	67		
Line 70	67	68		
Line 71	68	69		
Line 72	69	70		
Line 73	70	71		
Line 74	71	72		
Line 75	72	73		
Line 76	73	74		
Line 77	74	75		
Line 78	75	76		
Line 79	76	77		
Line 80	77	78		
Line 81	78	79		
Line 82	79	80		

Line 83	80	81		
Line 84	81	82		
Line 85	82	83		
Line 86	83	84		
Line 87	84	85		
Line 88	85	86		
Line 89	86	87		
Line 90	87	88		
Line 91	88	89		
Line 92	89	90		
Line 93	90	91		
Line 94	91	92		
Line 95	92	93		
Line 96	93	59	noflowzeropress	Fixed X
Line 97	38	60	noflowzeropress	Fixed X
Line 98	94	95		
Line 99	95	96		
Line 100	96	97		
Line 101	97	98	no flow	
Line 102	98	99	no flow	
Line 103	99	100	no flow	
Line 104	100	101	no flow	
Line 105	101	102	no flow	
Line 106	102	103	no flow	
Line 107	103	104	no flow	
Line 108	104	105	no flow	
Line 109	105	106	no flow	
Line 110	106	107	no flow	
Line 111	107	108	no flow	
Line 112	108	109	no flow	
Line 113	109	110		
Line 114	110	111		
Line 115	111	112		
Line 116	112	113		
Line 117	113	114		
Line 118	114	73		
Line 119	60	94		Fixed X
Line 120	115	116		
Line 121	116	117		

Line 122	117	118		
Line 123	118	119		
Line 124	119	120		
Line 125	120	121		
Line 126	121	122		
Line 127	122	123		
Line 128	123	124		
Line 129	124	125		
Line 130	125	126		
Line 131	126	127		
Line 132	127	128		
Line 133	128	129		
Line 134	129	109		
Line 135	94	130		Fixed X
Line 136	130	131		
Line 137	131	132		
Line 138	132	133		
Line 139	133	134		
Line 140	134	135		
Line 141	135	136		
Line 142	136	137		
Line 143	137	138		
Line 144	138	139		
Line 145	139	140		
Line 146	140	115		
Line 147	124	141		
Line 148	141	142		
Line 149	142	143		
Line 150	143	144		
Line 151	144	145		
Line 152	145	146		
Line 153	146	115		
Line 154	147	125		
Line 155	141	148		
Line 156	148	149		
Line 157	149	150		
Line 158	150	151		
Line 159	151	147		
Line 160	126	152		

Line 161	152	147		
Line 162	153	154		
Line 163	154	155		
Line 164	155	156		
Line 165	156	127		
Line 166	152	157		
Line 167	157	158		
Line 168	158	159		
Line 169	159	153		
Line 170	160	161		
Line 171	161	154		
Line 172	153	160		
Line 173	162	163		
Line 174	163	161		
Line 175	160	162		
Line 176	164	165		
Line 177	165	163		
Line 178	162	164		
Line 179	165	166		
Line 180	166	167		
Line 181	167	168		
Line 182	168	164		
Line 183	169	170		
Line 184	170	166		
Line 185	167	171		
Line 186	171	169		
Line 187	169	172		
Line 188	172	173		
Line 189	173	174		
Line 190	174	175		
Line 191	175	176		
Line 192	176	177		
Line 193	177	178		
Line 194	178	179		
Line 195	179	180		
Line 196	180	181		
Line 197	181	182		
Line 198	182	183		
Line 199	183	184		

Line 200	184	185		
Line 201	185	186		
Line 202	186	187		
Line 203	187	188		
Line 204	188	189		
Line 205	189	190		
Line 206	190	170		
Line 207	133	191		
Line 208	191	192		
Line 209	192	193		
Line 210	193	194		
Line 211	194	195		
Line 212	195	196		
Line 213	196	197		
Line 214	197	198		
Line 215	198	199		
Line 216	199	200		
Line 217	200	201		
Line 218	201	139		
Line 219	112	202		
Line 220	202	203		
Line 221	203	204		
Line 222	204	205		
Line 223	205	81		
Line 224	18	206	drainage 313	Fixed X
Line 225	206	207	drainage 313	Fixed X/Y
Line 226	207	1	drainage 313	Fixed X

Regions

	Material	Points	Area (ft²)
Region 1	Lower Till	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28	3,346.1
Region 2	Sand/Silt	29,30,31,32,33,34,35,36,37,19,20,21,22,23,24,25,26,27,28	10,671
Region 3	GC-Drained	38,39,40,41,42,43,44,45,46,47,48,49,50,51,52,53,37,36,35,34,33,32,31,30,29	10,397
Region 4	GC OverConsolidated	45,54,55,56,57,58,59,53,52,51,50,49,48,47,46	1,491.9
Region 5	Upper Till	60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78,7	9,253.4

		9,80,81,82,83,84,85,86,87,88,89,90,91,92,93,59,58,57,56,55,54,45,44,43,42,41,40,39,38	
Region 6	CCL	94,95,96,97,98,99,100,101,102,103,104,105,106,107,108,109,110,111,112,113,114,73,72,71,70,69,68,67,66,65,64,63,62,61,60	2,139
Region 7	Bottom Liner	115,116,117,118,119,120,121,122,123,124,125,126,127,128,129,109,108,107,106,105,104,103,102,101,100,99,98,97,96,95,94,130,131,132,133,134,135,136,137,138,139,140	2,215.1
Region 8	Waste Material	115,116,117,118,119,120,121,122,123,124,141,142,143,144,145,146	4,104.1
Region 9	Waste Material	147,125,124,141,148,149,150,151	2,001.4
Region 10	Waste Material	147,125,126,152	2,007.3
Region 11	Waste Material	153,154,155,156,127,126,152,157,158,159	1,949.1
Region 12		160,161,154,153	1,767.6
Region 13		162,163,161,160	1,570.8
Region 14		164,165,163,162	1,373.9
Region 15		164,165,166,167,168	1,176.9
Region 16		169,170,166,167,171	980.5
Region 17		169,172,173,174,175,176,177,178,179,180,181,182,183,184,185,186,187,188,189,190,170	534.96
Region 18	Structural Fill	133,191,192,193,194,195,196,197,198,199,200,201,139,138,137,136,135,134	293.23
Region 19	Structural Fill	73,114,113,112,202,203,204,205,81,80,79,78,77,76,75,74	1,934.1
Region 20	UPPER SHALE	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,206,207	15,814

Figure 24 - Coupled Consolidation for Section OP-2 for Waste Lift 5

Waste Lift 5 El. 353

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File Information

Title: Model City - RMU-2 CP-20 Section OP-2
Comments: Operation Conditions for CP-20 Section 2 Based on Maximum Fill Rate of 50,000 Cu Yds per Quarter
Created By: Peter J. Carey
Revision Number: 498
File Version: 8.0
Tool Version: 8.0.10.6504
Date: 2/25/2013
Time: 7:29:13 AM
File Name: C20OP-2r1.gsz
Directory: N:\Model_City\154.002_rmu2\154.005_revsions\geoslope\operational\

Project Settings

Length(L) Units: feet
Time(t) Units: Days
Force(F) Units: lbf
Pressure(p) Units: psf
Strength Units: psf
Stiffness Units: psf
Unit Weight of Water: 62.4 pcf
Air Pressure: 101.33 psf
View: 2D

Analysis Settings

Waste Lift 5 El. 353

Kind: SIGMA/W
Parent: Waste Lift 4 El. 347
Method: Coupled Stress/PWP
Settings
- Initial Stress: Parent Analysis
- Initial PWP: Parent Analysis
- Exclude cumulative values: No

Control
- Apply Body Force in All Steps: No
- Saturated Zone Only: No

Convergence
- Maximum Number of Iterations: 50
- Minimum Pressure Head Difference: 0.001
- Minimum Displacement Difference: 0.001
- Significant Digits: 3
- Hydraulic Under-Relaxation Criteria

Under-Relaxation Initial Rate: 1
Under-Relaxation Min. Rate: 0.1
Under-Relaxation Reduction Rate: 0.65
Under-Relaxation Iterations: 10
Equation Solver: Parallel Direct
Time
Starting Time: 437 days
Duration: 65 days
# of Steps: 12
Step Generation Method: Linear
Save Steps Every: 4

Materials

Waste Material

Model: Linear Elastic (Total)
Stress Strain
Young's Modulus (E): 400,000 psf
Unit Weight: 111 pcf
Poisson's Ratio: 0.45

Bottom Liner

Model: Linear Elastic (Total)
Stress Strain
Young's Modulus (E): 400,000 psf
Unit Weight: 120 pcf
Poisson's Ratio: 0.45

CCL

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 1,000,000 psf
Unit Weight: 120 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Clay soils OC
K-Function: GC 5.7 E-4 ft/day
Ky'/Kx' Ratio: 0.1
Rotation: 0 °
Load Response Ratio: 1

Upper Till

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 300,000 psf
Unit Weight: 125 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Till
K-Function: Upper Glacial Till
Ky'/Kx' Ratio: 1

Rotation: 0 °
Load Response Ratio: 1

GC-Drained

Model: Soft Clay (MCC w/ PWP Change)
Stress Strain
O.C. Ratio: 4
Poisson's Ratio: 0.334
Lambda: 0.14
Kappa: 0.013
Initial Void Ratio: 1
Unit Weight: 118 pcf
Phi': 27 °
Hydraulic
Vol. WC. Function: Clay soils
K-Function: GC 5.7 E-4 ft/day
Ky'/Kx' Ratio: 1
Rotation: 0 °
K-Modifier Function: 1D consol derived k function rmu2 clay
Load Response Ratio: 1

GC OverConsolidated

Model: Soft Clay (MCC w/ PWP Change)
Stress Strain
O.C. Ratio: 8
Poisson's Ratio: 0.334
Lambda: 0.06
Kappa: 0.01
Initial Void Ratio: 0.5
Unit Weight: 125 pcf
Phi': 30 °
Hydraulic
Vol. WC. Function: Clay soils OC
K-Function: GC 5.7 E-4 ft/day
Ky'/Kx' Ratio: 1
Rotation: 0 °
K-Modifier Function: 1D consol derived k function rmu2 clay
Load Response Ratio: 1

Sand/Silt

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 300,000 psf
Unit Weight: 135 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: silty sand
K-Function: Silty Sand, k = 0.567 ft/day 2 E-4cm/sec
Ky'/Kx' Ratio: 0.1
Rotation: 0 °
Load Response Ratio: 1

Lower Till

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 600,000 psf
Unit Weight: 145 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Till
K-Function: Till
Ky'/Kx' Ratio: 1
Rotation: 0 °
Load Response Ratio: 1

Structural Fill

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 100,000 psf
Unit Weight: 135 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Till
K-Function: Till
Ky'/Kx' Ratio: 1
Rotation: 0 °
Load Response Ratio: 1

UPPER SHALE

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 1,000,000 psf
Unit Weight: 145 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Till
K-Function: Upper Rock
Ky'/Kx' Ratio: 1
Rotation: 0 °
Load Response Ratio: 1

Boundary Conditions

Fixed X

X: X-Displacement 0

Fixed X/Y

X: X-Displacement 0
Y: Y-Displacement 0

no flow

Type: Total Flux (Q) 0

Review: No

noflowzeropress

Type: Total Flux (Q) 0
Review: Yes

drainage 313

Type: Head (H) 313
Review: No

Initial Water Tables

Initial Water Table 1

Max. negative head: 5
Coordinates
Coordinate 1: (0, 315) ft
Coordinate 2: (850, 315) ft

K Functions

Silty Sand, k = 0.567 ft/day 2 E-4cm/sec

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 36 %
K-Saturation: 0.567
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (0.005, 0.567)
Data Point: (0.01, 0.567)
Data Point: (0.035938, 0.567)
Data Point: (0.12915, 0.567)
Data Point: (0.46416, 0.567)
Data Point: (1.1111, 0.567)
Data Point: (1.6681, 0.567)
Data Point: (5.9948, 0.567)
Data Point: (21.544, 0.567)
Data Point: (77.426, 0.567)
Data Point: (105.93, 0.5402376)
Data Point: (210.74, 0.3387258)
Data Point: (278.26, 0.2567376)
Data Point: (315.56, 0.2232846)
Data Point: (420.37, 0.1406916)
Data Point: (525.19, 0.0779121)
Data Point: (630, 0.03843882)
Data Point: (734.81, 0.01673406)
Data Point: (839.63, 0.005422788)
Data Point: (944.44, 0.000745983)
Data Point: (1,000, 7.14735e-005)
Estimation Properties

Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Upper Glacial Till

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 36 %
K-Saturation: 0.0057
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (0.005, 0.0057)
Data Point: (0.01, 0.0057)
Data Point: (0.046416, 0.0057)
Data Point: (0.21544, 0.0057)
Data Point: (1, 0.0057)
Data Point: (4.6416, 0.0057)
Data Point: (11.111, 0.0057)
Data Point: (21.544, 0.0057)
Data Point: (100, 0.0057)
Data Point: (464.16, 0.0016245)
Data Point: (1,059.3, 0.0002427972)
Data Point: (2,107.4, 1.492716e-005)
Data Point: (2,154.4, 1.369596e-005)
Data Point: (3,155.6, 4.086672e-006)
Data Point: (4,203.7, 1.82115e-006)
Data Point: (5,251.9, 9.03222e-007)
Data Point: (6,300, 4.30521e-007)
Data Point: (7,348.1, 2.028516e-007)
Data Point: (8,396.3, 7.73661e-008)
Data Point: (9,444.4, 2.691312e-008)
Data Point: (10,000, 2.691312e-008)
Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Upper Rock

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 36 %
K-Saturation: 0.567
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (0.005, 0.567)
Data Point: (0.01, 0.567)

Data Point: (10,000, 0.567)
Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Till

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 36 %
K-Saturation: 0.000567
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (0.005, 0.000567)
Data Point: (0.01, 0.000567)
Data Point: (10,000, 0.000567)
Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

GC 5.7 E-4 ft/day

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 100 %
K-Saturation: 0.00057
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (10, 0.00057)
Data Point: (1,000, 9e-006)
Data Point: (5,000, 5e-006)
Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Hydraulic K Modifier Functions

1D consol derived k function rmu2 clay

Model: Spline Data Point Function (Y Log)
Function: K-Modifier vs. Y-Effective Stress
Curve Fit to Data: 100 %

Segment Curvature: 75 %
Y-Intercept: 1.2
Data Points: Y-Effective Stress (psf), K-Modifier
Data Point: (1,000, 1.2)
Data Point: (2,000, 1)
Data Point: (4,000, 0.839)
Data Point: (8,000, 0.70417211)
Data Point: (12,000, 0.63551782)
Data Point: (16,000, 0.59090577)

Vol. Water Content Functions

Clay soils OC

Model: Vol WC Data Point Function
Function: Vol. Water Content vs. Pore-Water Pressure
Mv: 7e-005 /psf
Saturated Water Content: 0.31427274 ft^3/ft^3
Residual Water Content: 0.031427274 ft^3/ft^3
Curve Fit to Data: 100 %
Segment Curvature: 100 %
Porosity: 0.31427274
Data Points: Matric Suction (psf), Vol. Water Content (ft^3/ft^3)
Data Point: (0.01, 0.29999999)
Data Point: (0.018329807, 0.29999998)
Data Point: (0.033598183, 0.29999996)
Data Point: (0.061584821, 0.29999991)
Data Point: (0.11288379, 0.29999982)
Data Point: (0.20691381, 0.29999962)
Data Point: (0.37926902, 0.29999917)
Data Point: (0.6951928, 0.29999814)
Data Point: (1.274275, 0.29999578)
Data Point: (2.3357215, 0.29999026)
Data Point: (4.2813324, 0.2999772)
Data Point: (7.8475997, 0.29994599)
Data Point: (14.384499, 0.29987093)
Data Point: (26.366509, 0.29968944)
Data Point: (48.329302, 0.29924951)
Data Point: (88.586679, 0.29818464)
Data Point: (162.37767, 0.29563126)
Data Point: (297.63514, 0.28967022)
Data Point: (545.55948, 0.27661743)
Data Point: (1,000, 0.25163343)
Estimation Properties
Vol. WC Estimation Method: Sample functions
Saturated Water Content: 0.3 ft^3/ft^3
Sample Material: Clay
Liquid Limit: 0 %
Diameter at 10% passing: 0
Diameter at 60% passing: 0
Maximum: 1,000
Minimum: 0.01

Num. Points: 20

Clay soils

Model: Vol WC Data Point Function
Function: Vol. Water Content vs. Pore-Water Pressure
Mv: 0.0004 /psf
Saturated Water Content: 0.60995302 ft^3/ft^3
Residual Water Content: 0.060995302 ft^3/ft^3
Curve Fit to Data: 100 %
Segment Curvature: 100 %
Porosity: 0.60995302
Data Points: Matric Suction (psf), Vol. Water Content (ft^3/ft^3)
Data Point: (0.01, 0.43999998)
Data Point: (0.018329807, 0.43999997)
Data Point: (0.033598183, 0.43999994)
Data Point: (0.061584821, 0.43999987)
Data Point: (0.11288379, 0.43999974)
Data Point: (0.20691381, 0.43999944)
Data Point: (0.37926902, 0.43999878)
Data Point: (0.6951928, 0.43999728)
Data Point: (1.274275, 0.43999381)
Data Point: (2.3357215, 0.43998571)
Data Point: (4.2813324, 0.43996655)
Data Point: (7.8475997, 0.43992079)
Data Point: (14.384499, 0.4398107)
Data Point: (26.366509, 0.43954452)
Data Point: (48.329302, 0.43889927)
Data Point: (88.586679, 0.43733747)
Data Point: (162.37767, 0.43359251)
Data Point: (297.63514, 0.42484965)
Data Point: (545.55948, 0.40570556)
Data Point: (1,000, 0.36906236)
Estimation Properties
Vol. WC Estimation Method: Sample functions
Saturated Water Content: 0.44 ft^3/ft^3
Sample Material: Clay
Liquid Limit: 0 %
Diameter at 10% passing: 0
Diameter at 60% passing: 0
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Till

Model: Vol WC Data Point Function
Function: Vol. Water Content vs. Pore-Water Pressure
Mv: 5e-006 /psf
Saturated Water Content: 0.20000173 ft^3/ft^3
Residual Water Content: 0.020000173 ft^3/ft^3
Curve Fit to Data: 100 %
Segment Curvature: 100 %
Porosity: 0.20000173

Data Points: Matric Suction (psf), Vol. Water Content (ft^3/ft^3)
- Data Point: (0.01, 0.19999999)
- Data Point: (0.018329807, 0.19999999)
- Data Point: (0.033598183, 0.19999997)
- Data Point: (0.061584821, 0.19999993)
- Data Point: (0.11288379, 0.19999985)
- Data Point: (0.20691381, 0.19999967)
- Data Point: (0.37926902, 0.19999922)
- Data Point: (0.6951928, 0.19999811)
- Data Point: (1.274275, 0.19999535)
- Data Point: (2.3357215, 0.19998838)
- Data Point: (4.2813324, 0.19997056)
- Data Point: (7.8475997, 0.19992471)
- Data Point: (14.384499, 0.19980625)
- Data Point: (26.366509, 0.19949952)
- Data Point: (48.329302, 0.19870702)
- Data Point: (88.586679, 0.19668084)
- Data Point: (162.37767, 0.19165467)
- Data Point: (297.63514, 0.18009116)
- Data Point: (545.55948, 0.15752337)
- Data Point: (1,000, 0.12453739)

Estimation Properties
- Vol. WC Estimation Method: Sample functions
- Saturated Water Content: 0.2 ft^3/ft^3
- Sample Material: Silty Clay
- Liquid Limit: 0 %
- Diameter at 10% passing: 0
- Diameter at 60% passing: 0
- Maximum: 1,000
- Minimum: 0.01
- Num. Points: 20

silty sand

Model: Vol WC Data Point Function

Function: Vol. Water Content vs. Pore-Water Pressure
- Mv: 1e-005 /psf
- Saturated Water Content: 0.30000011 ft^3/ft^3
- Residual Water Content: 0.030000011 ft^3/ft^3
- Curve Fit to Data: 100 %
- Segment Curvature: 100 %

Porosity: 0.30000011

Data Points: Matric Suction (psf), Vol. Water Content (ft^3/ft^3)
- Data Point: (0.01, 0.29999996)
- Data Point: (0.018329807, 0.29999991)
- Data Point: (0.033598183, 0.29999977)
- Data Point: (0.061584821, 0.29999942)
- Data Point: (0.11288379, 0.29999854)
- Data Point: (0.20691381, 0.29999626)
- Data Point: (0.37926902, 0.29999039)
- Data Point: (0.6951928, 0.29997521)
- Data Point: (1.274275, 0.29993588)
- Data Point: (2.3357215, 0.29983385)

Data Point: (4.2813324, 0.29956912)
Data Point: (7.8475997, 0.29888334)
Data Point: (14.384499, 0.29711648)
Data Point: (26.366509, 0.29263189)
Data Point: (48.329302, 0.28167657)
Data Point: (88.586679, 0.25725429)
Data Point: (162.37767, 0.21239326)
Data Point: (297.63514, 0.15298031)
Data Point: (545.55948, 0.099847233)
Data Point: (1,000, 0.064649441)

Estimation Properties

Vol. WC Estimation Method: Sample functions
Saturated Water Content: 0.3 ft^3/ft^3
Sample Material: Silty Sand
Liquid Limit: 0 %
Diameter at 10% passing: 0
Diameter at 60% passing: 0
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Points

	X (ft)	Y (ft)
Point 1	0	268.91519
Point 2	207.4978	271.24238
Point 3	209.0232	271.26867
Point 4	215.074	271.32735
Point 5	225.5606	271.44496
Point 6	230.6621	271.56993
Point 7	234.0537	271.62591
Point 8	237.8751	271.70733
Point 9	243.6233	271.78388
Point 10	403.7734	274.99581
Point 11	406.1879	275.04891
Point 12	510.242	277.40528
Point 13	519.1809	277.52295
Point 14	522.2501	277.56833
Point 15	581.5843	278.21948
Point 16	706.5316	275.03632
Point 17	784.4915	272.77004
Point 18	796.8946	272.40949
Point 19	796.8946	278.66207
Point 20	771.752	277.8332

Point 21	583.2389	281.6042
Point 22	512.9202	278.57945
Point 23	404.2686	277.81745
Point 24	248.1947	278.63737
Point 25	83.6675	274.48464
Point 26	78.5956	274.41664
Point 27	69.7373	274.12229
Point 28	0	273.8562
Point 29	0	286.98783
Point 30	69.7373	288.07912
Point 31	78.6615	288.22649
Point 32	83.6675	288.57952
Point 33	248.1947	297.19282
Point 34	404.2686	294.81745
Point 35	512.9202	289.28565
Point 36	583.2389	288.00106
Point 37	796.8946	289.48765
Point 38	0	305.26334
Point 39	63.5351	305.72185
Point 40	69.7373	305.70863
Point 41	77.6371	305.65972
Point 42	78.5956	305.57155
Point 43	83.6675	305.7
Point 44	248.1947	307.61838
Point 45	299.7903	306.27673
Point 46	299.6238	303.28004
Point 47	404.2544	300.5593
Point 48	512.9971	302.35411
Point 49	583.3451	304.79977
Point 50	592.8421	305.14193
Point 51	650.1895	305.15472
Point 52	796.8602	303.47517
Point 53	796.8946	303.47517
Point 54	404.2686	303.55995
Point 55	512.9202	305.35325
Point 56	583.2389	307.79789
Point 57	592.7878	308.14191
Point 58	650.2064	308.15472
Point 59	796.8946	306.47498

Point 60	0	327.67711
Point 61	22.4921	326.28273
Point 62	49.2488	323.27595
Point 63	74.3201	319.27807
Point 64	77.7249	318.65421
Point 65	112.0147	318.69361
Point 66	124.2402	315.77486
Point 67	126.7076	315.31519
Point 68	136.2125	313.12968
Point 69	142.0351	312.45981
Point 70	357.6126	310.47901
Point 71	586.0206	317.13
Point 72	588.0287	317.67977
Point 73	603.6052	322
Point 74	693.0775	322
Point 75	695.4173	323.10644
Point 76	697.3194	324
Point 77	714.7524	332
Point 78	726.8078	332.79458
Point 79	736.4313	333.45251
Point 80	740.2913	333.71166
Point 81	742.8239	333.89241
Point 82	743.6092	331.27888
Point 83	746.0108	331.28559
Point 84	751.3746	333.5338
Point 85	751.5561	333.52887
Point 86	751.6873	333.53898
Point 87	751.9654	333.539
Point 88	755.4965	333.65881
Point 89	757.088	333.70415
Point 90	766.5218	333.52383
Point 91	769.5239	331.03222
Point 92	781.3859	336.00827
Point 93	796.8946	335.53695
Point 94	0	330.67136
Point 95	0.1856	330.67136
Point 96	22.7526	329.27234
Point 97	49.6527	326.24944
Point 98	74.8268	322.23518

Point 99	77.9958	321.65452
Point 100	112.3661	321.69402
Point 101	124.8636	318.71033
Point 102	127.3188	318.25295
Point 103	136.7217	316.09089
Point 104	142.2209	315.45823
Point 105	357.5827	313.47942
Point 106	585.5746	320.11828
Point 107	587.2318	320.57198
Point 108	684.7881	347.62982
Point 109	704.816	348.13028
Point 110	707.7847	347.0118
Point 111	709.4494	346.32322
Point 112	709.6367	345.87345
Point 113	708.0438	345.21
Point 114	685.2332	344.64
Point 115	131.5335	329.79618
Point 116	158.1735	318.33502
Point 117	165.2063	318.28065
Point 118	203.3044	317.9221
Point 119	243.6199	317.55888
Point 120	248.3589	317.51329
Point 121	357.6595	316.4965
Point 122	589.0312	323.16552
Point 123	591.6482	323.89085
Point 124	610.0073	329
Point 125	631.5677	335
Point 126	653.128	341
Point 127	674.6884	347
Point 128	684.1005	349.61929
Point 129	699.8223	350.01168
Point 130	0	332.91188
Point 131	22.4396	331.51733
Point 132	49.1519	328.50799
Point 133	68.0785	325.48185
Point 134	73.6566	324.58998
Point 135	90.5756	324.62675
Point 136	109.5111	324.68581
Point 137	124.0229	330.52741

Point 138	127.0249	330.53586
Point 139	129.8149	330.45078
Point 140	130.027	330.44431
Point 141	274.9823	329
Point 142	252.0124	321.5
Point 143	213.855	321.5
Point 144	177.1587	331.5
Point 145	171.0426	331.5
Point 146	152.2075	323.79526
Point 147	298.6003	335
Point 148	282.6389	331.5
Point 149	287.7433	331.5
Point 150	289.3308	331.95874
Point 151	290.9318	332.5
Point 152	317.0046	341
Point 153	355.3453	347
Point 154	666.3598	347
Point 155	669.6785	345.61929
Point 156	674.6567	347
Point 157	326.7765	344.18573
Point 158	336.1465	343.24706
Point 159	342.0216	342.65356
Point 160	373.7378	353
Point 161	651.9377	353
Point 162	392.1303	359
Point 163	637.5157	359
Point 164	410.5229	365
Point 165	623.0936	365
Point 166	608.6716	371
Point 167	428.9409	371
Point 168	415.8066	366.72364
Point 169	447.0228	377
Point 170	594.2496	377
Point 171	435.4903	373.13237
Point 172	450.0526	378.01608
Point 173	459.9195	378.51574
Point 174	479.4258	379.45192
Point 175	482.5508	379.55699
Point 176	491.9324	380

Point 177	507.2813	380.61621
Point 178	541.8899	382.28139
Point 179	574.2808	382.67429
Point 180	581.1072	381.37657
Point 181	581.6822	381.26488
Point 182	582.2411	381.14975
Point 183	582.7845	381.03125
Point 184	583.313	380.90951
Point 185	583.8273	380.78465
Point 186	584.3278	380.6568
Point 187	584.8152	380.52606
Point 188	585.29	380.39256
Point 189	592.2253	377.82435
Point 190	593.0101	377.51567
Point 191	78.5551	329.67009
Point 192	110.5776	331.89761
Point 193	113.2091	332.06836
Point 194	115.8406	332.21663
Point 195	118.4721	332.34247
Point 196	121.1036	332.44595
Point 197	123.7351	332.5271
Point 198	125.1298	332.55831
Point 199	126.3665	332.19565
Point 200	128.6722	331.5
Point 201	128.9196	331.46994
Point 202	710.0851	346.06023
Point 203	718.4637	349.55
Point 204	736.491	350
Point 205	738.1976	349.29
Point 206	796.8946	253.91519
Point 207	0	253.91519

Lines

	Start Point	End Point	Hydraulic Boundary	Stress/Strain Boundary
Line 1	1	2		
Line 2	2	3		
Line 3	3	4		
Line 4	4	5		

Line 5	5	6		
Line 6	6	7		
Line 7	7	8		
Line 8	8	9		
Line 9	9	10		
Line 10	10	11		
Line 11	11	12		
Line 12	12	13		
Line 13	13	14		
Line 14	14	15		
Line 15	15	16		
Line 16	16	17		
Line 17	17	18		
Line 18	18	19	drainage 313	Fixed X
Line 19	19	20		
Line 20	20	21		
Line 21	21	22		
Line 22	22	23		
Line 23	23	24		
Line 24	24	25		
Line 25	25	26		
Line 26	26	27		
Line 27	27	28		
Line 28	28	1	drainage 313	Fixed X
Line 29	29	30		
Line 30	30	31		
Line 31	31	32		
Line 32	32	33		
Line 33	33	34		
Line 34	34	35		
Line 35	35	36		
Line 36	36	37		
Line 37	37	19	drainage 313	Fixed X
Line 38	28	29	drainage 313	Fixed X
Line 39	38	39		
Line 40	39	40		
Line 41	40	41		
Line 42	41	42		
Line 43	42	43		

Line 44	43	44		
Line 45	44	45		
Line 46	45	46		
Line 47	46	47		
Line 48	47	48		
Line 49	48	49		
Line 50	49	50		
Line 51	50	51		
Line 52	51	52		
Line 53	52	53		
Line 54	53	37	drainage 313	Fixed X
Line 55	29	38	drainage 313	Fixed X
Line 56	45	54		
Line 57	54	55		
Line 58	55	56		
Line 59	56	57		
Line 60	57	58		
Line 61	58	59		
Line 62	59	53	drainage 313	Fixed X
Line 63	60	61		
Line 64	61	62		
Line 65	62	63		
Line 66	63	64		
Line 67	64	65		
Line 68	65	66		
Line 69	66	67		
Line 70	67	68		
Line 71	68	69		
Line 72	69	70		
Line 73	70	71		
Line 74	71	72		
Line 75	72	73		
Line 76	73	74		
Line 77	74	75		
Line 78	75	76		
Line 79	76	77		
Line 80	77	78		
Line 81	78	79		
Line 82	79	80		

Line 83	80	81		
Line 84	81	82		
Line 85	82	83		
Line 86	83	84		
Line 87	84	85		
Line 88	85	86		
Line 89	86	87		
Line 90	87	88		
Line 91	88	89		
Line 92	89	90		
Line 93	90	91		
Line 94	91	92		
Line 95	92	93		
Line 96	93	59	noflowzeropress	Fixed X
Line 97	38	60	noflowzeropress	Fixed X
Line 98	94	95		
Line 99	95	96		
Line 100	96	97		
Line 101	97	98	no flow	
Line 102	98	99	no flow	
Line 103	99	100	no flow	
Line 104	100	101	no flow	
Line 105	101	102	no flow	
Line 106	102	103	no flow	
Line 107	103	104	no flow	
Line 108	104	105	no flow	
Line 109	105	106	no flow	
Line 110	106	107	no flow	
Line 111	107	108	no flow	
Line 112	108	109	no flow	
Line 113	109	110		
Line 114	110	111		
Line 115	111	112		
Line 116	112	113		
Line 117	113	114		
Line 118	114	73		
Line 119	60	94		Fixed X
Line 120	115	116		
Line 121	116	117		

Line 122	117	118		
Line 123	118	119		
Line 124	119	120		
Line 125	120	121		
Line 126	121	122		
Line 127	122	123		
Line 128	123	124		
Line 129	124	125		
Line 130	125	126		
Line 131	126	127		
Line 132	127	128		
Line 133	128	129		
Line 134	129	109		
Line 135	94	130		Fixed X
Line 136	130	131		
Line 137	131	132		
Line 138	132	133		
Line 139	133	134		
Line 140	134	135		
Line 141	135	136		
Line 142	136	137		
Line 143	137	138		
Line 144	138	139		
Line 145	139	140		
Line 146	140	115		
Line 147	124	141		
Line 148	141	142		
Line 149	142	143		
Line 150	143	144		
Line 151	144	145		
Line 152	145	146		
Line 153	146	115		
Line 154	147	125		
Line 155	141	148		
Line 156	148	149		
Line 157	149	150		
Line 158	150	151		
Line 159	151	147		
Line 160	126	152		

Line 161	152	147		
Line 162	153	154		
Line 163	154	155		
Line 164	155	156		
Line 165	156	127		
Line 166	152	157		
Line 167	157	158		
Line 168	158	159		
Line 169	159	153		
Line 170	160	161		
Line 171	161	154		
Line 172	153	160		
Line 173	162	163		
Line 174	163	161		
Line 175	160	162		
Line 176	164	165		
Line 177	165	163		
Line 178	162	164		
Line 179	165	166		
Line 180	166	167		
Line 181	167	168		
Line 182	168	164		
Line 183	169	170		
Line 184	170	166		
Line 185	167	171		
Line 186	171	169		
Line 187	169	172		
Line 188	172	173		
Line 189	173	174		
Line 190	174	175		
Line 191	175	176		
Line 192	176	177		
Line 193	177	178		
Line 194	178	179		
Line 195	179	180		
Line 196	180	181		
Line 197	181	182		
Line 198	182	183		
Line 199	183	184		

Line 200	184	185		
Line 201	185	186		
Line 202	186	187		
Line 203	187	188		
Line 204	188	189		
Line 205	189	190		
Line 206	190	170		
Line 207	133	191		
Line 208	191	192		
Line 209	192	193		
Line 210	193	194		
Line 211	194	195		
Line 212	195	196		
Line 213	196	197		
Line 214	197	198		
Line 215	198	199		
Line 216	199	200		
Line 217	200	201		
Line 218	201	139		
Line 219	112	202		
Line 220	202	203		
Line 221	203	204		
Line 222	204	205		
Line 223	205	81		
Line 224	18	206	drainage 313	Fixed X
Line 225	206	207	drainage 313	Fixed X/Y
Line 226	207	1	drainage 313	Fixed X

Regions

	Material	Points	Area (ft^2)
Region 1	Lower Till	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28	3,346.1
Region 2	Sand/Silt	29,30,31,32,33,34,35,36,37,19,20,21,22,23,24,25,26,27,28	10,671
Region 3	GC-Drained	38,39,40,41,42,43,44,45,46,47,48,49,50,51,52,53,37,36,35,34,33,32,31,30,29	10,397
Region 4	GC OverConsolidated	45,54,55,56,57,58,59,53,52,51,50,49,48,47,46	1,491.9
Region 5	Upper Till	60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78,79,80,	9,253.4

		81,82,83,84,85,86,87,88,89,90,91,92,93,59,58,57,56,55,54,45,44,43,42,41,40,39,38	
Region 6	CCL	94,95,96,97,98,99,100,101,102,103,104,105,106,107,108,109,110,111,112,113,114,73,72,71,70,69,68,67,66,65,64,63,62,61,60	2,139
Region 7	Bottom Liner	115,116,117,118,119,120,121,122,123,124,125,126,127,128,129,109,108,107,106,105,104,103,102,101,100,99,98,97,96,95,94,130,131,132,133,134,135,136,137,138,139,140	2,215.1
Region 8	Waste Material	115,116,117,118,119,120,121,122,123,124,141,142,143,144,145,146	4,104.1
Region 9	Waste Material	147,125,124,141,148,149,150,151	2,001.4
Region 10	Waste Material	147,125,126,152	2,007.3
Region 11	Waste Material	153,154,155,156,127,126,152,157,158,159	1,949.1
Region 12	Waste Material	160,161,154,153	1,767.6
Region 13		162,163,161,160	1,570.8
Region 14		164,165,163,162	1,373.9
Region 15		164,165,166,167,168	1,176.9
Region 16		169,170,166,167,171	980.5
Region 17		169,172,173,174,175,176,177,178,179,180,181,182,183,184,185,186,187,188,189,190,170	534.96
Region 18	Structural Fill	133,191,192,193,194,195,196,197,198,199,200,201,139,138,137,136,135,134	293.23
Region 19	Structural Fill	73,114,113,112,202,203,204,205,81,80,79,78,77,76,75,74	1,934.1
Region 20	UPPER SHALE	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,206,207	15,814

Figure 25 - Coupled Consolidation for Section OP-2 for Waste Lift 6

Waste Lift 6 El. 359

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File Information

Title: Model City - RMU-2 CP-20 Section OP-2
Comments: Operation Conditions for CP-20 Section 2 Based on Maximum Fill Rate of 50,000 Cu Yds per Quarter
Created By: Peter J. Carey
Revision Number: 498
File Version: 8.0
Tool Version: 8.0.10.6504
Date: 2/25/2013
Time: 7:29:13 AM
File Name: C20OP-2r1.gsz
Directory: N:\Model_City\154.002_rmu2\154.005_revsions\geoslope\operational\

Project Settings

Length(L) Units: feet
Time(t) Units: Days
Force(F) Units: lbf
Pressure(p) Units: psf
Strength Units: psf
Stiffness Units: psf
Unit Weight of Water: 62.4 pcf
Air Pressure: 101.33 psf
View: 2D

Analysis Settings

Waste Lift 6 El. 359

Kind: SIGMA/W
Parent: Waste Lift 5 El. 353
Method: Coupled Stress/PWP
Settings
    Initial Stress: Parent Analysis
    Initial PWP: Parent Analysis
    Exclude cumulative values: No
Control
    Apply Body Force in All Steps: No
    Saturated Zone Only: No
Convergence
    Maximum Number of Iterations: 50
    Minimum Pressure Head Difference: 0.001
    Minimum Displacement Difference: 0.001
    Significant Digits: 3
    Hydraulic Under-Relaxation Criteria

Under-Relaxation Initial Rate: 1
Under-Relaxation Min. Rate: 0.1
Under-Relaxation Reduction Rate: 0.65
Under-Relaxation Iterations: 10
Equation Solver: Parallel Direct
Time
Starting Time: 502 days
Duration: 56 days
# of Steps: 12
Step Generation Method: Linear
Save Steps Every: 4

Materials

Waste Material

Model: Linear Elastic (Total)
Stress Strain
Young's Modulus (E): 400,000 psf
Unit Weight: 111 pcf
Poisson's Ratio: 0.45

Bottom Liner

Model: Linear Elastic (Total)
Stress Strain
Young's Modulus (E): 400,000 psf
Unit Weight: 120 pcf
Poisson's Ratio: 0.45

CCL

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 1,000,000 psf
Unit Weight: 120 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Clay soils OC
K-Function: GC 5.7 E-4 ft/day
Ky'/Kx' Ratio: 0.1
Rotation: 0 °
Load Response Ratio: 1

Upper Till

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 300,000 psf
Unit Weight: 125 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Till
K-Function: Upper Glacial Till
Ky'/Kx' Ratio: 1

Rotation: 0 °
Load Response Ratio: 1

GC-Drained

Model: Soft Clay (MCC w/ PWP Change)
Stress Strain
O.C. Ratio: 4
Poisson's Ratio: 0.334
Lambda: 0.14
Kappa: 0.013
Initial Void Ratio: 1
Unit Weight: 118 pcf
Phi': 27 °
Hydraulic
Vol. WC. Function: Clay soils
K-Function: GC 5.7 E-4 ft/day
Ky'/Kx' Ratio: 1
Rotation: 0 °
K-Modifier Function: 1D consol derived k function rmu2 clay
Load Response Ratio: 1

GC OverConsolidated

Model: Soft Clay (MCC w/ PWP Change)
Stress Strain
O.C. Ratio: 8
Poisson's Ratio: 0.334
Lambda: 0.06
Kappa: 0.01
Initial Void Ratio: 0.5
Unit Weight: 125 pcf
Phi': 30 °
Hydraulic
Vol. WC. Function: Clay soils OC
K-Function: GC 5.7 E-4 ft/day
Ky'/Kx' Ratio: 1
Rotation: 0 °
K-Modifier Function: 1D consol derived k function rmu2 clay
Load Response Ratio: 1

Sand/Silt

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 300,000 psf
Unit Weight: 135 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: silty sand
K-Function: Silty Sand, k = 0.567 ft/day 2 E-4cm/sec
Ky'/Kx' Ratio: 0.1
Rotation: 0 °
Load Response Ratio: 1

Lower Till

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 600,000 psf
Unit Weight: 145 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Till
K-Function: Till
Ky'/Kx' Ratio: 1
Rotation: 0 °
Load Response Ratio: 1

Structural Fill

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 100,000 psf
Unit Weight: 135 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Till
K-Function: Till
Ky'/Kx' Ratio: 1
Rotation: 0 °
Load Response Ratio: 1

UPPER SHALE

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 1,000,000 psf
Unit Weight: 145 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Till
K-Function: Upper Rock
Ky'/Kx' Ratio: 1
Rotation: 0 °
Load Response Ratio: 1

Boundary Conditions

Fixed X

X: X-Displacement 0

Fixed X/Y

X: X-Displacement 0
Y: Y-Displacement 0

no flow

Type: Total Flux (Q) 0

Review: No

noflowzeropress

Type: Total Flux (Q) 0
Review: Yes

drainage 313

Type: Head (H) 313
Review: No

Initial Water Tables

Initial Water Table 1

Max. negative head: 5
Coordinates
Coordinate 1: (0, 315) ft
Coordinate 2: (850, 315) ft

K Functions

Silty Sand, k = 0.567 ft/day 2 E-4cm/sec

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 36 %
K-Saturation: 0.567
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (0.005, 0.567)
Data Point: (0.01, 0.567)
Data Point: (0.035938, 0.567)
Data Point: (0.12915, 0.567)
Data Point: (0.46416, 0.567)
Data Point: (1.1111, 0.567)
Data Point: (1.6681, 0.567)
Data Point: (5.9948, 0.567)
Data Point: (21.544, 0.567)
Data Point: (77.426, 0.567)
Data Point: (105.93, 0.5402376)
Data Point: (210.74, 0.3387258)
Data Point: (278.26, 0.2567376)
Data Point: (315.56, 0.2232846)
Data Point: (420.37, 0.1406916)
Data Point: (525.19, 0.0779121)
Data Point: (630, 0.03843882)
Data Point: (734.81, 0.01673406)
Data Point: (839.63, 0.005422788)
Data Point: (944.44, 0.000745983)
Data Point: (1,000, 7.14735e-005)
Estimation Properties

Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Upper Glacial Till

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 36 %
K-Saturation: 0.0057
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (0.005, 0.0057)
Data Point: (0.01, 0.0057)
Data Point: (0.046416, 0.0057)
Data Point: (0.21544, 0.0057)
Data Point: (1, 0.0057)
Data Point: (4.6416, 0.0057)
Data Point: (11.111, 0.0057)
Data Point: (21.544, 0.0057)
Data Point: (100, 0.0057)
Data Point: (464.16, 0.0016245)
Data Point: (1,059.3, 0.0002427972)
Data Point: (2,107.4, 1.492716e-005)
Data Point: (2,154.4, 1.369596e-005)
Data Point: (3,155.6, 4.086672e-006)
Data Point: (4,203.7, 1.82115e-006)
Data Point: (5,251.9, 9.03222e-007)
Data Point: (6,300, 4.30521e-007)
Data Point: (7,348.1, 2.028516e-007)
Data Point: (8,396.3, 7.73661e-008)
Data Point: (9,444.4, 2.691312e-008)
Data Point: (10,000, 2.691312e-008)
Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Upper Rock

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 36 %
K-Saturation: 0.567
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (0.005, 0.567)
Data Point: (0.01, 0.567)

Data Point: (10,000, 0.567)
Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Till

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 36 %
K-Saturation: 0.000567
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (0.005, 0.000567)
Data Point: (0.01, 0.000567)
Data Point: (10,000, 0.000567)
Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

GC 5.7 E-4 ft/day

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 100 %
K-Saturation: 0.00057
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (10, 0.00057)
Data Point: (1,000, 9e-006)
Data Point: (5,000, 5e-006)
Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Hydraulic K Modifier Functions

1D consol derived k function rmu2 clay

Model: Spline Data Point Function (Y Log)
Function: K-Modifier vs. Y-Effective Stress
Curve Fit to Data: 100 %

Segment Curvature: 75 %
Y-Intercept: 1.2
Data Points: Y-Effective Stress (psf), K-Modifier
Data Point: (1,000, 1.2)
Data Point: (2,000, 1)
Data Point: (4,000, 0.839)
Data Point: (8,000, 0.70417211)
Data Point: (12,000, 0.63551782)
Data Point: (16,000, 0.59090577)

Vol. Water Content Functions

Clay soils OC

Model: Vol WC Data Point Function
Function: Vol. Water Content vs. Pore-Water Pressure
Mv: 7e-005 /psf
Saturated Water Content: 0.31427274 ft^3/ft^3
Residual Water Content: 0.031427274 ft^3/ft^3
Curve Fit to Data: 100 %
Segment Curvature: 100 %
Porosity: 0.31427274
Data Points: Matric Suction (psf), Vol. Water Content (ft^3/ft^3)
Data Point: (0.01, 0.29999999)
Data Point: (0.018329807, 0.29999998)
Data Point: (0.033598183, 0.29999996)
Data Point: (0.061584821, 0.29999991)
Data Point: (0.11288379, 0.29999982)
Data Point: (0.20691381, 0.29999962)
Data Point: (0.37926902, 0.29999917)
Data Point: (0.6951928, 0.29999814)
Data Point: (1.274275, 0.29999578)
Data Point: (2.3357215, 0.29999026)
Data Point: (4.2813324, 0.2999772)
Data Point: (7.8475997, 0.29994599)
Data Point: (14.384499, 0.29987093)
Data Point: (26.366509, 0.29968944)
Data Point: (48.329302, 0.29924951)
Data Point: (88.586679, 0.29818464)
Data Point: (162.37767, 0.29563126)
Data Point: (297.63514, 0.28967022)
Data Point: (545.55948, 0.27661743)
Data Point: (1,000, 0.25163343)
Estimation Properties
Vol. WC Estimation Method: Sample functions
Saturated Water Content: 0.3 ft^3/ft^3
Sample Material: Clay
Liquid Limit: 0 %
Diameter at 10% passing: 0
Diameter at 60% passing: 0
Maximum: 1,000
Minimum: 0.01

Num. Points: 20

Clay soils

Model: Vol WC Data Point Function
Function: Vol. Water Content vs. Pore-Water Pressure
Mv: 0.0004 /psf
Saturated Water Content: 0.60995302 ft^3/ft^3
Residual Water Content: 0.060995302 ft^3/ft^3
Curve Fit to Data: 100 %
Segment Curvature: 100 %
Porosity: 0.60995302
Data Points: Matric Suction (psf), Vol. Water Content (ft^3/ft^3)
Data Point: (0.01, 0.43999998)
Data Point: (0.018329807, 0.43999997)
Data Point: (0.033598183, 0.43999994)
Data Point: (0.061584821, 0.43999987)
Data Point: (0.11288379, 0.43999974)
Data Point: (0.20691381, 0.43999944)
Data Point: (0.37926902, 0.43999878)
Data Point: (0.6951928, 0.43999728)
Data Point: (1.274275, 0.43999381)
Data Point: (2.3357215, 0.43998571)
Data Point: (4.2813324, 0.43996655)
Data Point: (7.8475997, 0.43992079)
Data Point: (14.384499, 0.4398107)
Data Point: (26.366509, 0.43954452)
Data Point: (48.329302, 0.43889927)
Data Point: (88.586679, 0.43733747)
Data Point: (162.37767, 0.43359251)
Data Point: (297.63514, 0.42484965)
Data Point: (545.55948, 0.40570556)
Data Point: (1,000, 0.36906236)
Estimation Properties
Vol. WC Estimation Method: Sample functions
Saturated Water Content: 0.44 ft^3/ft^3
Sample Material: Clay
Liquid Limit: 0 %
Diameter at 10% passing: 0
Diameter at 60% passing: 0
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Till

Model: Vol WC Data Point Function
Function: Vol. Water Content vs. Pore-Water Pressure
Mv: 5e-006 /psf
Saturated Water Content: 0.20000173 ft^3/ft^3
Residual Water Content: 0.020000173 ft^3/ft^3
Curve Fit to Data: 100 %
Segment Curvature: 100 %
Porosity: 0.20000173

Data Points: Matric Suction (psf), Vol. Water Content (ft^3/ft^3)
- Data Point: (0.01, 0.19999999)
- Data Point: (0.018329807, 0.19999999)
- Data Point: (0.033598183, 0.19999997)
- Data Point: (0.061584821, 0.19999993)
- Data Point: (0.11288379, 0.19999985)
- Data Point: (0.20691381, 0.19999967)
- Data Point: (0.37926902, 0.19999922)
- Data Point: (0.6951928, 0.19999811)
- Data Point: (1.274275, 0.19999535)
- Data Point: (2.3357215, 0.19998838)
- Data Point: (4.2813324, 0.19997056)
- Data Point: (7.8475997, 0.19992471)
- Data Point: (14.384499, 0.19980625)
- Data Point: (26.366509, 0.19949952)
- Data Point: (48.329302, 0.19870702)
- Data Point: (88.586679, 0.19668084)
- Data Point: (162.37767, 0.19165467)
- Data Point: (297.63514, 0.18009116)
- Data Point: (545.55948, 0.15752337)
- Data Point: (1,000, 0.12453739)

Estimation Properties
- Vol. WC Estimation Method: Sample functions
- Saturated Water Content: 0.2 ft^3/ft^3
- Sample Material: Silty Clay
- Liquid Limit: 0 %
- Diameter at 10% passing: 0
- Diameter at 60% passing: 0
- Maximum: 1,000
- Minimum: 0.01
- Num. Points: 20

silty sand

Model: Vol WC Data Point Function

Function: Vol. Water Content vs. Pore-Water Pressure
- Mv: 1e-005 /psf
- Saturated Water Content: 0.30000011 ft^3/ft^3
- Residual Water Content: 0.030000011 ft^3/ft^3
- Curve Fit to Data: 100 %
- Segment Curvature: 100 %

Porosity: 0.30000011

Data Points: Matric Suction (psf), Vol. Water Content (ft^3/ft^3)
- Data Point: (0.01, 0.29999996)
- Data Point: (0.018329807, 0.29999991)
- Data Point: (0.033598183, 0.29999977)
- Data Point: (0.061584821, 0.29999942)
- Data Point: (0.11288379, 0.29999854)
- Data Point: (0.20691381, 0.29999626)
- Data Point: (0.37926902, 0.29999039)
- Data Point: (0.6951928, 0.29997521)
- Data Point: (1.274275, 0.29993588)
- Data Point: (2.3357215, 0.29983385)

Data Point: (4.2813324, 0.29956912)
Data Point: (7.8475997, 0.29888334)
Data Point: (14.384499, 0.29711648)
Data Point: (26.366509, 0.29263189)
Data Point: (48.329302, 0.28167657)
Data Point: (88.586679, 0.25725429)
Data Point: (162.37767, 0.21239326)
Data Point: (297.63514, 0.15298031)
Data Point: (545.55948, 0.099847233)
Data Point: (1,000, 0.064649441)

Estimation Properties

Vol. WC Estimation Method: Sample functions
Saturated Water Content: 0.3 ft^3/ft^3
Sample Material: Silty Sand
Liquid Limit: 0 %
Diameter at 10% passing: 0
Diameter at 60% passing: 0
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Points

	X (ft)	Y (ft)
Point 1	0	268.91519
Point 2	207.4978	271.24238
Point 3	209.0232	271.26867
Point 4	215.074	271.32735
Point 5	225.5606	271.44496
Point 6	230.6621	271.56993
Point 7	234.0537	271.62591
Point 8	237.8751	271.70733
Point 9	243.6233	271.78388
Point 10	403.7734	274.99581
Point 11	406.1879	275.04891
Point 12	510.242	277.40528
Point 13	519.1809	277.52295
Point 14	522.2501	277.56833
Point 15	581.5843	278.21948
Point 16	706.5316	275.03632
Point 17	784.4915	272.77004
Point 18	796.8946	272.40949
Point 19	796.8946	278.66207
Point 20	771.752	277.8332

Point 21	583.2389	281.6042
Point 22	512.9202	278.57945
Point 23	404.2686	277.81745
Point 24	248.1947	278.63737
Point 25	83.6675	274.48464
Point 26	78.5956	274.41664
Point 27	69.7373	274.12229
Point 28	0	273.8562
Point 29	0	286.98783
Point 30	69.7373	288.07912
Point 31	78.6615	288.22649
Point 32	83.6675	288.57952
Point 33	248.1947	297.19282
Point 34	404.2686	294.81745
Point 35	512.9202	289.28565
Point 36	583.2389	288.00106
Point 37	796.8946	289.48765
Point 38	0	305.26334
Point 39	63.5351	305.72185
Point 40	69.7373	305.70863
Point 41	77.6371	305.65972
Point 42	78.5956	305.57155
Point 43	83.6675	305.7
Point 44	248.1947	307.61838
Point 45	299.7903	306.27673
Point 46	299.6238	303.28004
Point 47	404.2544	300.5593
Point 48	512.9971	302.35411
Point 49	583.3451	304.79977
Point 50	592.8421	305.14193
Point 51	650.1895	305.15472
Point 52	796.8602	303.47517
Point 53	796.8946	303.47517
Point 54	404.2686	303.55995
Point 55	512.9202	305.35325
Point 56	583.2389	307.79789
Point 57	592.7878	308.14191
Point 58	650.2064	308.15472
Point 59	796.8946	306.47498

Point 60	0	327.67711
Point 61	22.4921	326.28273
Point 62	49.2488	323.27595
Point 63	74.3201	319.27807
Point 64	77.7249	318.65421
Point 65	112.0147	318.69361
Point 66	124.2402	315.77486
Point 67	126.7076	315.31519
Point 68	136.2125	313.12968
Point 69	142.0351	312.45981
Point 70	357.6126	310.47901
Point 71	586.0206	317.13
Point 72	588.0287	317.67977
Point 73	603.6052	322
Point 74	693.0775	322
Point 75	695.4173	323.10644
Point 76	697.3194	324
Point 77	714.7524	332
Point 78	726.8078	332.79458
Point 79	736.4313	333.45251
Point 80	740.2913	333.71166
Point 81	742.8239	333.89241
Point 82	743.6092	331.27888
Point 83	746.0108	331.28559
Point 84	751.3746	333.5338
Point 85	751.5561	333.52887
Point 86	751.6873	333.53898
Point 87	751.9654	333.539
Point 88	755.4965	333.65881
Point 89	757.088	333.70415
Point 90	766.5218	333.52383
Point 91	769.5239	331.03222
Point 92	781.3859	336.00827
Point 93	796.8946	335.53695
Point 94	0	330.67136
Point 95	0.1856	330.67136
Point 96	22.7526	329.27234
Point 97	49.6527	326.24944
Point 98	74.8268	322.23518

Point 99	77.9958	321.65452
Point 100	112.3661	321.69402
Point 101	124.8636	318.71033
Point 102	127.3188	318.25295
Point 103	136.7217	316.09089
Point 104	142.2209	315.45823
Point 105	357.5827	313.47942
Point 106	585.5746	320.11828
Point 107	587.2318	320.57198
Point 108	684.7881	347.62982
Point 109	704.816	348.13028
Point 110	707.7847	347.0118
Point 111	709.4494	346.32322
Point 112	709.6367	345.87345
Point 113	708.0438	345.21
Point 114	685.2332	344.64
Point 115	131.5335	329.79618
Point 116	158.1735	318.33502
Point 117	165.2063	318.28065
Point 118	203.3044	317.9221
Point 119	243.6199	317.55888
Point 120	248.3589	317.51329
Point 121	357.6595	316.4965
Point 122	589.0312	323.16552
Point 123	591.6482	323.89085
Point 124	610.0073	329
Point 125	631.5677	335
Point 126	653.128	341
Point 127	674.6884	347
Point 128	684.1005	349.61929
Point 129	699.8223	350.01168
Point 130	0	332.91188
Point 131	22.4396	331.51733
Point 132	49.1519	328.50799
Point 133	68.0785	325.48185
Point 134	73.6566	324.58998
Point 135	90.5756	324.62675
Point 136	109.5111	324.68581
Point 137	124.0229	330.52741

Point 138	127.0249	330.53586
Point 139	129.8149	330.45078
Point 140	130.027	330.44431
Point 141	274.9823	329
Point 142	252.0124	321.5
Point 143	213.855	321.5
Point 144	177.1587	331.5
Point 145	171.0426	331.5
Point 146	152.2075	323.79526
Point 147	298.6003	335
Point 148	282.6389	331.5
Point 149	287.7433	331.5
Point 150	289.3308	331.95874
Point 151	290.9318	332.5
Point 152	317.0046	341
Point 153	355.3453	347
Point 154	666.3598	347
Point 155	669.6785	345.61929
Point 156	674.6567	347
Point 157	326.7765	344.18573
Point 158	336.1465	343.24706
Point 159	342.0216	342.65356
Point 160	373.7378	353
Point 161	651.9377	353
Point 162	392.1303	359
Point 163	637.5157	359
Point 164	410.5229	365
Point 165	623.0936	365
Point 166	608.6716	371
Point 167	428.9409	371
Point 168	415.8066	366.72364
Point 169	447.0228	377
Point 170	594.2496	377
Point 171	435.4903	373.13237
Point 172	450.0526	378.01608
Point 173	459.9195	378.51574
Point 174	479.4258	379.45192
Point 175	482.5508	379.55699
Point 176	491.9324	380

Point 177	507.2813	380.61621
Point 178	541.8899	382.28139
Point 179	574.2808	382.67429
Point 180	581.1072	381.37657
Point 181	581.6822	381.26488
Point 182	582.2411	381.14975
Point 183	582.7845	381.03125
Point 184	583.313	380.90951
Point 185	583.8273	380.78465
Point 186	584.3278	380.6568
Point 187	584.8152	380.52606
Point 188	585.29	380.39256
Point 189	592.2253	377.82435
Point 190	593.0101	377.51567
Point 191	78.5551	329.67009
Point 192	110.5776	331.89761
Point 193	113.2091	332.06836
Point 194	115.8406	332.21663
Point 195	118.4721	332.34247
Point 196	121.1036	332.44595
Point 197	123.7351	332.5271
Point 198	125.1298	332.55831
Point 199	126.3665	332.19565
Point 200	128.6722	331.5
Point 201	128.9196	331.46994
Point 202	710.0851	346.06023
Point 203	718.4637	349.55
Point 204	736.491	350
Point 205	738.1976	349.29
Point 206	796.8946	253.91519
Point 207	0	253.91519

Lines

	Start Point	End Point	Hydraulic Boundary	Stress/Strain Boundary
Line 1	1	2		
Line 2	2	3		
Line 3	3	4		
Line 4	4	5		

Line 5	5	6		
Line 6	6	7		
Line 7	7	8		
Line 8	8	9		
Line 9	9	10		
Line 10	10	11		
Line 11	11	12		
Line 12	12	13		
Line 13	13	14		
Line 14	14	15		
Line 15	15	16		
Line 16	16	17		
Line 17	17	18		
Line 18	18	19	drainage 313	Fixed X
Line 19	19	20		
Line 20	20	21		
Line 21	21	22		
Line 22	22	23		
Line 23	23	24		
Line 24	24	25		
Line 25	25	26		
Line 26	26	27		
Line 27	27	28		
Line 28	28	1	drainage 313	Fixed X
Line 29	29	30		
Line 30	30	31		
Line 31	31	32		
Line 32	32	33		
Line 33	33	34		
Line 34	34	35		
Line 35	35	36		
Line 36	36	37		
Line 37	37	19	drainage 313	Fixed X
Line 38	28	29	drainage 313	Fixed X
Line 39	38	39		
Line 40	39	40		
Line 41	40	41		
Line 42	41	42		
Line 43	42	43		

Line 44	43	44		
Line 45	44	45		
Line 46	45	46		
Line 47	46	47		
Line 48	47	48		
Line 49	48	49		
Line 50	49	50		
Line 51	50	51		
Line 52	51	52		
Line 53	52	53		
Line 54	53	37	drainage 313	Fixed X
Line 55	29	38	drainage 313	Fixed X
Line 56	45	54		
Line 57	54	55		
Line 58	55	56		
Line 59	56	57		
Line 60	57	58		
Line 61	58	59		
Line 62	59	53	drainage 313	Fixed X
Line 63	60	61		
Line 64	61	62		
Line 65	62	63		
Line 66	63	64		
Line 67	64	65		
Line 68	65	66		
Line 69	66	67		
Line 70	67	68		
Line 71	68	69		
Line 72	69	70		
Line 73	70	71		
Line 74	71	72		
Line 75	72	73		
Line 76	73	74		
Line 77	74	75		
Line 78	75	76		
Line 79	76	77		
Line 80	77	78		
Line 81	78	79		
Line 82	79	80		

Line 83	80	81		
Line 84	81	82		
Line 85	82	83		
Line 86	83	84		
Line 87	84	85		
Line 88	85	86		
Line 89	86	87		
Line 90	87	88		
Line 91	88	89		
Line 92	89	90		
Line 93	90	91		
Line 94	91	92		
Line 95	92	93		
Line 96	93	59	noflowzeropress	Fixed X
Line 97	38	60	noflowzeropress	Fixed X
Line 98	94	95		
Line 99	95	96		
Line 100	96	97		
Line 101	97	98	no flow	
Line 102	98	99	no flow	
Line 103	99	100	no flow	
Line 104	100	101	no flow	
Line 105	101	102	no flow	
Line 106	102	103	no flow	
Line 107	103	104	no flow	
Line 108	104	105	no flow	
Line 109	105	106	no flow	
Line 110	106	107	no flow	
Line 111	107	108	no flow	
Line 112	108	109	no flow	
Line 113	109	110		
Line 114	110	111		
Line 115	111	112		
Line 116	112	113		
Line 117	113	114		
Line 118	114	73		
Line 119	60	94		Fixed X
Line 120	115	116		
Line 121	116	117		

Line 122	117	118		
Line 123	118	119		
Line 124	119	120		
Line 125	120	121		
Line 126	121	122		
Line 127	122	123		
Line 128	123	124		
Line 129	124	125		
Line 130	125	126		
Line 131	126	127		
Line 132	127	128		
Line 133	128	129		
Line 134	129	109		
Line 135	94	130		Fixed X
Line 136	130	131		
Line 137	131	132		
Line 138	132	133		
Line 139	133	134		
Line 140	134	135		
Line 141	135	136		
Line 142	136	137		
Line 143	137	138		
Line 144	138	139		
Line 145	139	140		
Line 146	140	115		
Line 147	124	141		
Line 148	141	142		
Line 149	142	143		
Line 150	143	144		
Line 151	144	145		
Line 152	145	146		
Line 153	146	115		
Line 154	147	125		
Line 155	141	148		
Line 156	148	149		
Line 157	149	150		
Line 158	150	151		
Line 159	151	147		
Line 160	126	152		

Line 161	152	147		
Line 162	153	154		
Line 163	154	155		
Line 164	155	156		
Line 165	156	127		
Line 166	152	157		
Line 167	157	158		
Line 168	158	159		
Line 169	159	153		
Line 170	160	161		
Line 171	161	154		
Line 172	153	160		
Line 173	162	163		
Line 174	163	161		
Line 175	160	162		
Line 176	164	165		
Line 177	165	163		
Line 178	162	164		
Line 179	165	166		
Line 180	166	167		
Line 181	167	168		
Line 182	168	164		
Line 183	169	170		
Line 184	170	166		
Line 185	167	171		
Line 186	171	169		
Line 187	169	172		
Line 188	172	173		
Line 189	173	174		
Line 190	174	175		
Line 191	175	176		
Line 192	176	177		
Line 193	177	178		
Line 194	178	179		
Line 195	179	180		
Line 196	180	181		
Line 197	181	182		
Line 198	182	183		
Line 199	183	184		

Line 200	184	185		
Line 201	185	186		
Line 202	186	187		
Line 203	187	188		
Line 204	188	189		
Line 205	189	190		
Line 206	190	170		
Line 207	133	191		
Line 208	191	192		
Line 209	192	193		
Line 210	193	194		
Line 211	194	195		
Line 212	195	196		
Line 213	196	197		
Line 214	197	198		
Line 215	198	199		
Line 216	199	200		
Line 217	200	201		
Line 218	201	139		
Line 219	112	202		
Line 220	202	203		
Line 221	203	204		
Line 222	204	205		
Line 223	205	81		
Line 224	18	206	drainage 313	Fixed X
Line 225	206	207	drainage 313	Fixed X/Y
Line 226	207	1	drainage 313	Fixed X

Regions

	Material	Points	Area (ft²)
Region 1	Lower Till	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28	3,346.1
Region 2	Sand/Silt	29,30,31,32,33,34,35,36,37,19,20,21,22,23,24,25,26,27,28	10,671
Region 3	GC-Drained	38,39,40,41,42,43,44,45,46,47,48,49,50,51,52,53,37,36,35,34,33,32,31,30,29	10,397
Region 4	GC OverConsolidated	45,54,55,56,57,58,59,53,52,51,50,49,48,47,46	1,491.9
Region 5	Upper Till	60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78,79,80,8	9,253.4

		1,82,83,84,85,86,87,88,89,90,91,92,93,59,58,57,56,55,54,45,44,43,42,41,40,39,38	
Region 6	CCL	94,95,96,97,98,99,100,101,102,103,104,105,106,107,108,109,110,111,112,113,114,73,72,71,70,69,68,67,66,65,64,63,62,61,60	2,139
Region 7	Bottom Liner	115,116,117,118,119,120,121,122,123,124,125,126,127,128,129,109,108,107,106,105,104,103,102,101,100,99,98,97,96,95,94,130,131,132,133,134,135,136,137,138,139,140	2,215.1
Region 8	Waste Material	115,116,117,118,119,120,121,122,123,124,141,142,143,144,145,146	4,104.1
Region 9	Waste Material	147,125,124,141,148,149,150,151	2,001.4
Region 10	Waste Material	147,125,126,152	2,007.3
Region 11	Waste Material	153,154,155,156,127,126,152,157,158,159	1,949.1
Region 12	Waste Material	160,161,154,153	1,767.6
Region 13	Waste Material	162,163,161,160	1,570.8
Region 14		164,165,163,162	1,373.9
Region 15		164,165,166,167,168	1,176.9
Region 16		169,170,166,167,171	980.5
Region 17		169,172,173,174,175,176,177,178,179,180,181,182,183,184,185,186,187,188,189,190,170	534.96
Region 18	Structural Fill	133,191,192,193,194,195,196,197,198,199,200,201,139,138,137,136,135,134	293.23
Region 19	Structural Fill	73,114,113,112,202,203,204,205,81,80,79,78,77,76,75,74	1,934.1
Region 20	UPPER SHALE	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,206,207	15,814

Figure 26 - Coupled Consolidation for Section OP-2 for Waste Lift 7

Waste Lift 7 El. 365

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File Information

Title: Model City - RMU-2 CP-20 Section OP-2
Comments: Operation Conditions for CP-20 Section 2 Based on Maximum Fill Rate of 50,000 Cu Yds per Quarter
Created By: Peter J. Carey
Revision Number: 498
File Version: 8.0
Tool Version: 8.0.10.6504
Date: 2/25/2013
Time: 7:29:13 AM
File Name: C20OP-2r1.gsz
Directory: N:\Model_City\154.002_rmu2\154.005_revsions\geoslope\operational\

Project Settings

Length(L) Units: feet
Time(t) Units: Days
Force(F) Units: lbf
Pressure(p) Units: psf
Strength Units: psf
Stiffness Units: psf
Unit Weight of Water: 62.4 pcf
Air Pressure: 101.33 psf
View: 2D

Analysis Settings

Waste Lift 7 El. 365

Kind: SIGMA/W
Parent: Waste Lift 6 El. 359
Method: Coupled Stress/PWP
Settings
    Initial Stress: Parent Analysis
    Initial PWP: Parent Analysis
    Exclude cumulative values: No
Control
    Apply Body Force in All Steps: No
    Saturated Zone Only: No
Convergence
    Maximum Number of Iterations: 50
    Minimum Pressure Head Difference: 0.001
    Minimum Displacement Difference: 0.001
    Significant Digits: 3
    Hydraulic Under-Relaxation Criteria

Under-Relaxation Initial Rate: 1
Under-Relaxation Min. Rate: 0.1
Under-Relaxation Reduction Rate: 0.65
Under-Relaxation Iterations: 10
Equation Solver: Parallel Direct
Time
Starting Time: 558 days
Duration: 47 days
# of Steps: 12
Step Generation Method: Linear
Save Steps Every: 4

Materials

Waste Material

Model: Linear Elastic (Total)
Stress Strain
Young's Modulus (E): 400,000 psf
Unit Weight: 111 pcf
Poisson's Ratio: 0.45

Bottom Liner

Model: Linear Elastic (Total)
Stress Strain
Young's Modulus (E): 400,000 psf
Unit Weight: 120 pcf
Poisson's Ratio: 0.45

CCL

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 1,000,000 psf
Unit Weight: 120 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Clay soils OC
K-Function: GC 5.7 E-4 ft/day
Ky'/Kx' Ratio: 0.1
Rotation: 0 °
Load Response Ratio: 1

Upper Till

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 300,000 psf
Unit Weight: 125 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Till
K-Function: Upper Glacial Till
Ky'/Kx' Ratio: 1

Rotation: 0 °
Load Response Ratio: 1

GC-Drained

Model: Soft Clay (MCC w/ PWP Change)
Stress Strain
O.C. Ratio: 4
Poisson's Ratio: 0.334
Lambda: 0.14
Kappa: 0.013
Initial Void Ratio: 1
Unit Weight: 118 pcf
Phi': 27 °
Hydraulic
Vol. WC. Function: Clay soils
K-Function: GC 5.7 E-4 ft/day
Ky'/Kx' Ratio: 1
Rotation: 0 °
K-Modifier Function: 1D consol derived k function rmu2 clay
Load Response Ratio: 1

GC OverConsolidated

Model: Soft Clay (MCC w/ PWP Change)
Stress Strain
O.C. Ratio: 8
Poisson's Ratio: 0.334
Lambda: 0.06
Kappa: 0.01
Initial Void Ratio: 0.5
Unit Weight: 125 pcf
Phi': 30 °
Hydraulic
Vol. WC. Function: Clay soils OC
K-Function: GC 5.7 E-4 ft/day
Ky'/Kx' Ratio: 1
Rotation: 0 °
K-Modifier Function: 1D consol derived k function rmu2 clay
Load Response Ratio: 1

Sand/Silt

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 300,000 psf
Unit Weight: 135 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: silty sand
K-Function: Silty Sand, k = 0.567 ft/day 2 E-4cm/sec
Ky'/Kx' Ratio: 0.1
Rotation: 0 °
Load Response Ratio: 1

Lower Till

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 600,000 psf
Unit Weight: 145 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Till
K-Function: Till
Ky'/Kx' Ratio: 1
Rotation: 0 °
Load Response Ratio: 1

Structural Fill

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 100,000 psf
Unit Weight: 135 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Till
K-Function: Till
Ky'/Kx' Ratio: 1
Rotation: 0 °
Load Response Ratio: 1

UPPER SHALE

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 1,000,000 psf
Unit Weight: 145 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Till
K-Function: Upper Rock
Ky'/Kx' Ratio: 1
Rotation: 0 °
Load Response Ratio: 1

Boundary Conditions

Fixed X

X: X-Displacement 0

Fixed X/Y

X: X-Displacement 0
Y: Y-Displacement 0

no flow

Type: Total Flux (Q) 0

Review: No

noflowzeropress

Type: Total Flux (Q) 0
Review: Yes

drainage 313

Type: Head (H) 313
Review: No

Initial Water Tables

Initial Water Table 1

Max. negative head: 5
Coordinates
Coordinate 1: (0, 315) ft
Coordinate 2: (850, 315) ft

K Functions

Silty Sand, k = 0.567 ft/day 2 E-4cm/sec

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 36 %
K-Saturation: 0.567
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (0.005, 0.567)
Data Point: (0.01, 0.567)
Data Point: (0.035938, 0.567)
Data Point: (0.12915, 0.567)
Data Point: (0.46416, 0.567)
Data Point: (1.1111, 0.567)
Data Point: (1.6681, 0.567)
Data Point: (5.9948, 0.567)
Data Point: (21.544, 0.567)
Data Point: (77.426, 0.567)
Data Point: (105.93, 0.5402376)
Data Point: (210.74, 0.3387258)
Data Point: (278.26, 0.2567376)
Data Point: (315.56, 0.2232846)
Data Point: (420.37, 0.1406916)
Data Point: (525.19, 0.0779121)
Data Point: (630, 0.03843882)
Data Point: (734.81, 0.01673406)
Data Point: (839.63, 0.005422788)
Data Point: (944.44, 0.000745983)
Data Point: (1,000, 7.14735e-005)
Estimation Properties

Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Upper Glacial Till

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 36 %
K-Saturation: 0.0057
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (0.005, 0.0057)
Data Point: (0.01, 0.0057)
Data Point: (0.046416, 0.0057)
Data Point: (0.21544, 0.0057)
Data Point: (1, 0.0057)
Data Point: (4.6416, 0.0057)
Data Point: (11.111, 0.0057)
Data Point: (21.544, 0.0057)
Data Point: (100, 0.0057)
Data Point: (464.16, 0.0016245)
Data Point: (1,059.3, 0.0002427972)
Data Point: (2,107.4, 1.492716e-005)
Data Point: (2,154.4, 1.369596e-005)
Data Point: (3,155.6, 4.086672e-006)
Data Point: (4,203.7, 1.82115e-006)
Data Point: (5,251.9, 9.03222e-007)
Data Point: (6,300, 4.30521e-007)
Data Point: (7,348.1, 2.028516e-007)
Data Point: (8,396.3, 7.73661e-008)
Data Point: (9,444.4, 2.691312e-008)
Data Point: (10,000, 2.691312e-008)
Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Upper Rock

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 36 %
K-Saturation: 0.567
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (0.005, 0.567)
Data Point: (0.01, 0.567)

Data Point: (10,000, 0.567)
Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Till

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 36 %
K-Saturation: 0.000567
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (0.005, 0.000567)
Data Point: (0.01, 0.000567)
Data Point: (10,000, 0.000567)
Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

GC 5.7 E-4 ft/day

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 100 %
K-Saturation: 0.00057
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (10, 0.00057)
Data Point: (1,000, 9e-006)
Data Point: (5,000, 5e-006)
Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Hydraulic K Modifier Functions

1D consol derived k function rmu2 clay

Model: Spline Data Point Function (Y Log)
Function: K-Modifier vs. Y-Effective Stress
Curve Fit to Data: 100 %

Segment Curvature: 75 %
Y-Intercept: 1.2
Data Points: Y-Effective Stress (psf), K-Modifier
Data Point: (1,000, 1.2)
Data Point: (2,000, 1)
Data Point: (4,000, 0.839)
Data Point: (8,000, 0.70417211)
Data Point: (12,000, 0.63551782)
Data Point: (16,000, 0.59090577)

Vol. Water Content Functions

Clay soils OC

Model: Vol WC Data Point Function
Function: Vol. Water Content vs. Pore-Water Pressure
Mv: 7e-005 /psf
Saturated Water Content: 0.31427274 ft^3/ft^3
Residual Water Content: 0.031427274 ft^3/ft^3
Curve Fit to Data: 100 %
Segment Curvature: 100 %
Porosity: 0.31427274
Data Points: Matric Suction (psf), Vol. Water Content (ft^3/ft^3)
Data Point: (0.01, 0.29999999)
Data Point: (0.018329807, 0.29999998)
Data Point: (0.033598183, 0.29999996)
Data Point: (0.061584821, 0.29999991)
Data Point: (0.11288379, 0.29999982)
Data Point: (0.20691381, 0.29999962)
Data Point: (0.37926902, 0.29999917)
Data Point: (0.6951928, 0.29999814)
Data Point: (1.274275, 0.29999578)
Data Point: (2.3357215, 0.29999026)
Data Point: (4.2813324, 0.2999772)
Data Point: (7.8475997, 0.29994599)
Data Point: (14.384499, 0.29987093)
Data Point: (26.366509, 0.29968944)
Data Point: (48.329302, 0.29924951)
Data Point: (88.586679, 0.29818464)
Data Point: (162.37767, 0.29563126)
Data Point: (297.63514, 0.28967022)
Data Point: (545.55948, 0.27661743)
Data Point: (1,000, 0.25163343)
Estimation Properties
Vol. WC Estimation Method: Sample functions
Saturated Water Content: 0.3 ft^3/ft^3
Sample Material: Clay
Liquid Limit: 0 %
Diameter at 10% passing: 0
Diameter at 60% passing: 0
Maximum: 1,000
Minimum: 0.01

Num. Points: 20

Clay soils

Model: Vol WC Data Point Function
Function: Vol. Water Content vs. Pore-Water Pressure
Mv: 0.0004 /psf
Saturated Water Content: 0.60995302 ft^3/ft^3
Residual Water Content: 0.060995302 ft^3/ft^3
Curve Fit to Data: 100 %
Segment Curvature: 100 %
Porosity: 0.60995302
Data Points: Matric Suction (psf), Vol. Water Content (ft^3/ft^3)
Data Point: (0.01, 0.43999998)
Data Point: (0.018329807, 0.43999997)
Data Point: (0.033598183, 0.43999994)
Data Point: (0.061584821, 0.43999987)
Data Point: (0.11288379, 0.43999974)
Data Point: (0.20691381, 0.43999944)
Data Point: (0.37926902, 0.43999878)
Data Point: (0.6951928, 0.43999728)
Data Point: (1.274275, 0.43999381)
Data Point: (2.3357215, 0.43998571)
Data Point: (4.2813324, 0.43996655)
Data Point: (7.8475997, 0.43992079)
Data Point: (14.384499, 0.4398107)
Data Point: (26.366509, 0.43954452)
Data Point: (48.329302, 0.43889927)
Data Point: (88.586679, 0.43733747)
Data Point: (162.37767, 0.43359251)
Data Point: (297.63514, 0.42484965)
Data Point: (545.55948, 0.40570556)
Data Point: (1,000, 0.36906236)
Estimation Properties
Vol. WC Estimation Method: Sample functions
Saturated Water Content: 0.44 ft^3/ft^3
Sample Material: Clay
Liquid Limit: 0 %
Diameter at 10% passing: 0
Diameter at 60% passing: 0
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Till

Model: Vol WC Data Point Function
Function: Vol. Water Content vs. Pore-Water Pressure
Mv: 5e-006 /psf
Saturated Water Content: 0.20000173 ft^3/ft^3
Residual Water Content: 0.020000173 ft^3/ft^3
Curve Fit to Data: 100 %
Segment Curvature: 100 %
Porosity: 0.20000173

Data Points: Matric Suction (psf), Vol. Water Content (ft^3/ft^3)
- Data Point: (0.01, 0.19999999)
- Data Point: (0.018329807, 0.19999999)
- Data Point: (0.033598183, 0.19999997)
- Data Point: (0.061584821, 0.19999993)
- Data Point: (0.11288379, 0.19999985)
- Data Point: (0.20691381, 0.19999967)
- Data Point: (0.37926902, 0.19999922)
- Data Point: (0.6951928, 0.19999811)
- Data Point: (1.274275, 0.19999535)
- Data Point: (2.3357215, 0.19998838)
- Data Point: (4.2813324, 0.19997056)
- Data Point: (7.8475997, 0.19992471)
- Data Point: (14.384499, 0.19980625)
- Data Point: (26.366509, 0.19949952)
- Data Point: (48.329302, 0.19870702)
- Data Point: (88.586679, 0.19668084)
- Data Point: (162.37767, 0.19165467)
- Data Point: (297.63514, 0.18009116)
- Data Point: (545.55948, 0.15752337)
- Data Point: (1,000, 0.12453739)

Estimation Properties
- Vol. WC Estimation Method: Sample functions
- Saturated Water Content: 0.2 ft^3/ft^3
- Sample Material: Silty Clay
- Liquid Limit: 0 %
- Diameter at 10% passing: 0
- Diameter at 60% passing: 0
- Maximum: 1,000
- Minimum: 0.01
- Num. Points: 20

silty sand

Model: Vol WC Data Point Function

Function: Vol. Water Content vs. Pore-Water Pressure
- Mv: 1e-005 /psf
- Saturated Water Content: 0.30000011 ft^3/ft^3
- Residual Water Content: 0.030000011 ft^3/ft^3
- Curve Fit to Data: 100 %
- Segment Curvature: 100 %

Porosity: 0.30000011

Data Points: Matric Suction (psf), Vol. Water Content (ft^3/ft^3)
- Data Point: (0.01, 0.29999996)
- Data Point: (0.018329807, 0.29999991)
- Data Point: (0.033598183, 0.29999977)
- Data Point: (0.061584821, 0.29999942)
- Data Point: (0.11288379, 0.29999854)
- Data Point: (0.20691381, 0.29999626)
- Data Point: (0.37926902, 0.29999039)
- Data Point: (0.6951928, 0.29997521)
- Data Point: (1.274275, 0.29993588)
- Data Point: (2.3357215, 0.29983385)

Data Point: (4.2813324, 0.29956912)
Data Point: (7.8475997, 0.29888334)
Data Point: (14.384499, 0.29711648)
Data Point: (26.366509, 0.29263189)
Data Point: (48.329302, 0.28167657)
Data Point: (88.586679, 0.25725429)
Data Point: (162.37767, 0.21239326)
Data Point: (297.63514, 0.15298031)
Data Point: (545.55948, 0.099847233)
Data Point: (1,000, 0.064649441)

Estimation Properties

Vol. WC Estimation Method: Sample functions
Saturated Water Content: 0.3 ft^3/ft^3
Sample Material: Silty Sand
Liquid Limit: 0 %
Diameter at 10% passing: 0
Diameter at 60% passing: 0
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Points

	X (ft)	Y (ft)
Point 1	0	268.91519
Point 2	207.4978	271.24238
Point 3	209.0232	271.26867
Point 4	215.074	271.32735
Point 5	225.5606	271.44496
Point 6	230.6621	271.56993
Point 7	234.0537	271.62591
Point 8	237.8751	271.70733
Point 9	243.6233	271.78388
Point 10	403.7734	274.99581
Point 11	406.1879	275.04891
Point 12	510.242	277.40528
Point 13	519.1809	277.52295
Point 14	522.2501	277.56833
Point 15	581.5843	278.21948
Point 16	706.5316	275.03632
Point 17	784.4915	272.77004
Point 18	796.8946	272.40949
Point 19	796.8946	278.66207
Point 20	771.752	277.8332

Point 21	583.2389	281.6042
Point 22	512.9202	278.57945
Point 23	404.2686	277.81745
Point 24	248.1947	278.63737
Point 25	83.6675	274.48464
Point 26	78.5956	274.41664
Point 27	69.7373	274.12229
Point 28	0	273.8562
Point 29	0	286.98783
Point 30	69.7373	288.07912
Point 31	78.6615	288.22649
Point 32	83.6675	288.57952
Point 33	248.1947	297.19282
Point 34	404.2686	294.81745
Point 35	512.9202	289.28565
Point 36	583.2389	288.00106
Point 37	796.8946	289.48765
Point 38	0	305.26334
Point 39	63.5351	305.72185
Point 40	69.7373	305.70863
Point 41	77.6371	305.65972
Point 42	78.5956	305.57155
Point 43	83.6675	305.7
Point 44	248.1947	307.61838
Point 45	299.7903	306.27673
Point 46	299.6238	303.28004
Point 47	404.2544	300.5593
Point 48	512.9971	302.35411
Point 49	583.3451	304.79977
Point 50	592.8421	305.14193
Point 51	650.1895	305.15472
Point 52	796.8602	303.47517
Point 53	796.8946	303.47517
Point 54	404.2686	303.55995
Point 55	512.9202	305.35325
Point 56	583.2389	307.79789
Point 57	592.7878	308.14191
Point 58	650.2064	308.15472
Point 59	796.8946	306.47498

Point 60	0	327.67711
Point 61	22.4921	326.28273
Point 62	49.2488	323.27595
Point 63	74.3201	319.27807
Point 64	77.7249	318.65421
Point 65	112.0147	318.69361
Point 66	124.2402	315.77486
Point 67	126.7076	315.31519
Point 68	136.2125	313.12968
Point 69	142.0351	312.45981
Point 70	357.6126	310.47901
Point 71	586.0206	317.13
Point 72	588.0287	317.67977
Point 73	603.6052	322
Point 74	693.0775	322
Point 75	695.4173	323.10644
Point 76	697.3194	324
Point 77	714.7524	332
Point 78	726.8078	332.79458
Point 79	736.4313	333.45251
Point 80	740.2913	333.71166
Point 81	742.8239	333.89241
Point 82	743.6092	331.27888
Point 83	746.0108	331.28559
Point 84	751.3746	333.5338
Point 85	751.5561	333.52887
Point 86	751.6873	333.53898
Point 87	751.9654	333.539
Point 88	755.4965	333.65881
Point 89	757.088	333.70415
Point 90	766.5218	333.52383
Point 91	769.5239	331.03222
Point 92	781.3859	336.00827
Point 93	796.8946	335.53695
Point 94	0	330.67136
Point 95	0.1856	330.67136
Point 96	22.7526	329.27234
Point 97	49.6527	326.24944
Point 98	74.8268	322.23518

Point 99	77.9958	321.65452
Point 100	112.3661	321.69402
Point 101	124.8636	318.71033
Point 102	127.3188	318.25295
Point 103	136.7217	316.09089
Point 104	142.2209	315.45823
Point 105	357.5827	313.47942
Point 106	585.5746	320.11828
Point 107	587.2318	320.57198
Point 108	684.7881	347.62982
Point 109	704.816	348.13028
Point 110	707.7847	347.0118
Point 111	709.4494	346.32322
Point 112	709.6367	345.87345
Point 113	708.0438	345.21
Point 114	685.2332	344.64
Point 115	131.5335	329.79618
Point 116	158.1735	318.33502
Point 117	165.2063	318.28065
Point 118	203.3044	317.9221
Point 119	243.6199	317.55888
Point 120	248.3589	317.51329
Point 121	357.6595	316.4965
Point 122	589.0312	323.16552
Point 123	591.6482	323.89085
Point 124	610.0073	329
Point 125	631.5677	335
Point 126	653.128	341
Point 127	674.6884	347
Point 128	684.1005	349.61929
Point 129	699.8223	350.01168
Point 130	0	332.91188
Point 131	22.4396	331.51733
Point 132	49.1519	328.50799
Point 133	68.0785	325.48185
Point 134	73.6566	324.58998
Point 135	90.5756	324.62675
Point 136	109.5111	324.68581
Point 137	124.0229	330.52741

Point 138	127.0249	330.53586
Point 139	129.8149	330.45078
Point 140	130.027	330.44431
Point 141	274.9823	329
Point 142	252.0124	321.5
Point 143	213.855	321.5
Point 144	177.1587	331.5
Point 145	171.0426	331.5
Point 146	152.2075	323.79526
Point 147	298.6003	335
Point 148	282.6389	331.5
Point 149	287.7433	331.5
Point 150	289.3308	331.95874
Point 151	290.9318	332.5
Point 152	317.0046	341
Point 153	355.3453	347
Point 154	666.3598	347
Point 155	669.6785	345.61929
Point 156	674.6567	347
Point 157	326.7765	344.18573
Point 158	336.1465	343.24706
Point 159	342.0216	342.65356
Point 160	373.7378	353
Point 161	651.9377	353
Point 162	392.1303	359
Point 163	637.5157	359
Point 164	410.5229	365
Point 165	623.0936	365
Point 166	608.6716	371
Point 167	428.9409	371
Point 168	415.8066	366.72364
Point 169	447.0228	377
Point 170	594.2496	377
Point 171	435.4903	373.13237
Point 172	450.0526	378.01608
Point 173	459.9195	378.51574
Point 174	479.4258	379.45192
Point 175	482.5508	379.55699
Point 176	491.9324	380

Point 177	507.2813	380.61621
Point 178	541.8899	382.28139
Point 179	574.2808	382.67429
Point 180	581.1072	381.37657
Point 181	581.6822	381.26488
Point 182	582.2411	381.14975
Point 183	582.7845	381.03125
Point 184	583.313	380.90951
Point 185	583.8273	380.78465
Point 186	584.3278	380.6568
Point 187	584.8152	380.52606
Point 188	585.29	380.39256
Point 189	592.2253	377.82435
Point 190	593.0101	377.51567
Point 191	78.5551	329.67009
Point 192	110.5776	331.89761
Point 193	113.2091	332.06836
Point 194	115.8406	332.21663
Point 195	118.4721	332.34247
Point 196	121.1036	332.44595
Point 197	123.7351	332.5271
Point 198	125.1298	332.55831
Point 199	126.3665	332.19565
Point 200	128.6722	331.5
Point 201	128.9196	331.46994
Point 202	710.0851	346.06023
Point 203	718.4637	349.55
Point 204	736.491	350
Point 205	738.1976	349.29
Point 206	796.8946	253.91519
Point 207	0	253.91519

Lines

	Start Point	End Point	Hydraulic Boundary	Stress/Strain Boundary
Line 1	1	2		
Line 2	2	3		
Line 3	3	4		
Line 4	4	5		

Line 5	5	6		
Line 6	6	7		
Line 7	7	8		
Line 8	8	9		
Line 9	9	10		
Line 10	10	11		
Line 11	11	12		
Line 12	12	13		
Line 13	13	14		
Line 14	14	15		
Line 15	15	16		
Line 16	16	17		
Line 17	17	18		
Line 18	18	19	drainage 313	Fixed X
Line 19	19	20		
Line 20	20	21		
Line 21	21	22		
Line 22	22	23		
Line 23	23	24		
Line 24	24	25		
Line 25	25	26		
Line 26	26	27		
Line 27	27	28		
Line 28	28	1	drainage 313	Fixed X
Line 29	29	30		
Line 30	30	31		
Line 31	31	32		
Line 32	32	33		
Line 33	33	34		
Line 34	34	35		
Line 35	35	36		
Line 36	36	37		
Line 37	37	19	drainage 313	Fixed X
Line 38	28	29	drainage 313	Fixed X
Line 39	38	39		
Line 40	39	40		
Line 41	40	41		
Line 42	41	42		
Line 43	42	43		

Line 44	43	44		
Line 45	44	45		
Line 46	45	46		
Line 47	46	47		
Line 48	47	48		
Line 49	48	49		
Line 50	49	50		
Line 51	50	51		
Line 52	51	52		
Line 53	52	53		
Line 54	53	37	drainage 313	Fixed X
Line 55	29	38	drainage 313	Fixed X
Line 56	45	54		
Line 57	54	55		
Line 58	55	56		
Line 59	56	57		
Line 60	57	58		
Line 61	58	59		
Line 62	59	53	drainage 313	Fixed X
Line 63	60	61		
Line 64	61	62		
Line 65	62	63		
Line 66	63	64		
Line 67	64	65		
Line 68	65	66		
Line 69	66	67		
Line 70	67	68		
Line 71	68	69		
Line 72	69	70		
Line 73	70	71		
Line 74	71	72		
Line 75	72	73		
Line 76	73	74		
Line 77	74	75		
Line 78	75	76		
Line 79	76	77		
Line 80	77	78		
Line 81	78	79		
Line 82	79	80		

Line 83	80	81		
Line 84	81	82		
Line 85	82	83		
Line 86	83	84		
Line 87	84	85		
Line 88	85	86		
Line 89	86	87		
Line 90	87	88		
Line 91	88	89		
Line 92	89	90		
Line 93	90	91		
Line 94	91	92		
Line 95	92	93		
Line 96	93	59	noflowzeropress	Fixed X
Line 97	38	60	noflowzeropress	Fixed X
Line 98	94	95		
Line 99	95	96		
Line 100	96	97		
Line 101	97	98	no flow	
Line 102	98	99	no flow	
Line 103	99	100	no flow	
Line 104	100	101	no flow	
Line 105	101	102	no flow	
Line 106	102	103	no flow	
Line 107	103	104	no flow	
Line 108	104	105	no flow	
Line 109	105	106	no flow	
Line 110	106	107	no flow	
Line 111	107	108	no flow	
Line 112	108	109	no flow	
Line 113	109	110		
Line 114	110	111		
Line 115	111	112		
Line 116	112	113		
Line 117	113	114		
Line 118	114	73		
Line 119	60	94		Fixed X
Line 120	115	116		
Line 121	116	117		

Line 122	117	118		
Line 123	118	119		
Line 124	119	120		
Line 125	120	121		
Line 126	121	122		
Line 127	122	123		
Line 128	123	124		
Line 129	124	125		
Line 130	125	126		
Line 131	126	127		
Line 132	127	128		
Line 133	128	129		
Line 134	129	109		
Line 135	94	130		Fixed X
Line 136	130	131		
Line 137	131	132		
Line 138	132	133		
Line 139	133	134		
Line 140	134	135		
Line 141	135	136		
Line 142	136	137		
Line 143	137	138		
Line 144	138	139		
Line 145	139	140		
Line 146	140	115		
Line 147	124	141		
Line 148	141	142		
Line 149	142	143		
Line 150	143	144		
Line 151	144	145		
Line 152	145	146		
Line 153	146	115		
Line 154	147	125		
Line 155	141	148		
Line 156	148	149		
Line 157	149	150		
Line 158	150	151		
Line 159	151	147		
Line 160	126	152		

Line 161	152	147		
Line 162	153	154		
Line 163	154	155		
Line 164	155	156		
Line 165	156	127		
Line 166	152	157		
Line 167	157	158		
Line 168	158	159		
Line 169	159	153		
Line 170	160	161		
Line 171	161	154		
Line 172	153	160		
Line 173	162	163		
Line 174	163	161		
Line 175	160	162		
Line 176	164	165		
Line 177	165	163		
Line 178	162	164		
Line 179	165	166		
Line 180	166	167		
Line 181	167	168		
Line 182	168	164		
Line 183	169	170		
Line 184	170	166		
Line 185	167	171		
Line 186	171	169		
Line 187	169	172		
Line 188	172	173		
Line 189	173	174		
Line 190	174	175		
Line 191	175	176		
Line 192	176	177		
Line 193	177	178		
Line 194	178	179		
Line 195	179	180		
Line 196	180	181		
Line 197	181	182		
Line 198	182	183		
Line 199	183	184		

Line 200	184	185		
Line 201	185	186		
Line 202	186	187		
Line 203	187	188		
Line 204	188	189		
Line 205	189	190		
Line 206	190	170		
Line 207	133	191		
Line 208	191	192		
Line 209	192	193		
Line 210	193	194		
Line 211	194	195		
Line 212	195	196		
Line 213	196	197		
Line 214	197	198		
Line 215	198	199		
Line 216	199	200		
Line 217	200	201		
Line 218	201	139		
Line 219	112	202		
Line 220	202	203		
Line 221	203	204		
Line 222	204	205		
Line 223	205	81		
Line 224	18	206	drainage 313	Fixed X
Line 225	206	207	drainage 313	Fixed X/Y
Line 226	207	1	drainage 313	Fixed X

Regions

	Material	Points	Area (ft^2)
Region 1	Lower Till	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28	3,346.1
Region 2	Sand/Silt	29,30,31,32,33,34,35,36,37,19,20,21,22,23,24,25,26,27,28	10,671
Region 3	GC-Drained	38,39,40,41,42,43,44,45,46,47,48,49,50,51,52,53,37,36,35,34,33,32,31,30,29	10,397
Region 4	GC OverConsolidated	45,54,55,56,57,58,59,53,52,51,50,49,48,47,46	1,491.9
Region 5	Upper Till	60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78,79,8	9,253.4

		0,81,82,83,84,85,86,87,88,89,90,91,92,93,59,58,57,56,55,54,45,44,43,42,41,40,39,38	
Region 6	CCL	94,95,96,97,98,99,100,101,102,103,104,105,106,107,108,109,110,111,112,113,114,73,72,71,70,69,68,67,66,65,64,63,62,61,60	2,139
Region 7	Bottom Liner	115,116,117,118,119,120,121,122,123,124,125,126,127,128,129,109,108,107,106,105,104,103,102,101,100,99,98,97,96,95,94,130,131,132,133,134,135,136,137,138,139,140	2,215.1
Region 8	Waste Material	115,116,117,118,119,120,121,122,123,124,141,142,143,144,145,146	4,104.1
Region 9	Waste Material	147,125,124,141,148,149,150,151	2,001.4
Region 10	Waste Material	147,125,126,152	2,007.3
Region 11	Waste Material	153,154,155,156,127,126,152,157,158,159	1,949.1
Region 12	Waste Material	160,161,154,153	1,767.6
Region 13	Waste Material	162,163,161,160	1,570.8
Region 14	Waste Material	164,165,163,162	1,373.9
Region 15		164,165,166,167,168	1,176.9
Region 16		169,170,166,167,171	980.5
Region 17		169,172,173,174,175,176,177,178,179,180,181,182,183,184,185,186,187,188,189,190,170	534.96
Region 18	Structural Fill	133,191,192,193,194,195,196,197,198,199,200,201,139,138,137,136,135,134	293.23
Region 19	Structural Fill	73,114,113,112,202,203,204,205,81,80,79,78,77,76,75,74	1,934.1
Region 20	UPPER SHALE	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,206,207	15,814

Figure 27 - Coupled Consolidation for Section OP-2 for Waste Lift 8

Waste Lift 8 El. 371

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File Information

Title: Model City - RMU-2 CP-20 Section OP-2
Comments: Operation Conditions for CP-20 Section 2 Based on Maximum Fill Rate of 50,000 Cu Yds per Quarter
Created By: Peter J. Carey
Revision Number: 498
File Version: 8.0
Tool Version: 8.0.10.6504
Date: 2/25/2013
Time: 7:29:13 AM
File Name: C20OP-2r1.gsz
Directory: N:\Model_City\154.002_rmu2\154.005_revsions\geoslope\operational\

Project Settings

Length(L) Units: feet
Time(t) Units: Days
Force(F) Units: lbf
Pressure(p) Units: psf
Strength Units: psf
Stiffness Units: psf
Unit Weight of Water: 62.4 pcf
Air Pressure: 101.33 psf
View: 2D

Analysis Settings

Waste Lift 8 El. 371

Kind: SIGMA/W
Parent: Waste Lift 7 El. 365
Method: Coupled Stress/PWP
Settings
    Initial Stress: Parent Analysis
    Initial PWP: Parent Analysis
    Exclude cumulative values: No
Control
    Apply Body Force in All Steps: No
    Saturated Zone Only: No
Convergence
    Maximum Number of Iterations: 50
    Minimum Pressure Head Difference: 0.001
    Minimum Displacement Difference: 0.001
    Significant Digits: 3
    Hydraulic Under-Relaxation Criteria

Under-Relaxation Initial Rate: 1
Under-Relaxation Min. Rate: 0.1
Under-Relaxation Reduction Rate: 0.65
Under-Relaxation Iterations: 10
Equation Solver: Parallel Direct
Time
Starting Time: 605 days
Duration: 40 days
# of Steps: 12
Step Generation Method: Linear
Save Steps Every: 4

Materials

Waste Material

Model: Linear Elastic (Total)
Stress Strain
Young's Modulus (E): 400,000 psf
Unit Weight: 111 pcf
Poisson's Ratio: 0.45

Bottom Liner

Model: Linear Elastic (Total)
Stress Strain
Young's Modulus (E): 400,000 psf
Unit Weight: 120 pcf
Poisson's Ratio: 0.45

CCL

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 1,000,000 psf
Unit Weight: 120 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Clay soils OC
K-Function: GC 5.7 E-4 ft/day
Ky'/Kx' Ratio: 0.1
Rotation: 0 °
Load Response Ratio: 1

Upper Till

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 300,000 psf
Unit Weight: 125 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Till
K-Function: Upper Glacial Till
Ky'/Kx' Ratio: 1

Rotation: 0 °
Load Response Ratio: 1

GC-Drained

Model: Soft Clay (MCC w/ PWP Change)
Stress Strain
O.C. Ratio: 4
Poisson's Ratio: 0.334
Lambda: 0.14
Kappa: 0.013
Initial Void Ratio: 1
Unit Weight: 118 pcf
Phi': 27 °
Hydraulic
Vol. WC. Function: Clay soils
K-Function: GC 5.7 E-4 ft/day
Ky'/Kx' Ratio: 1
Rotation: 0 °
K-Modifier Function: 1D consol derived k function rmu2 clay
Load Response Ratio: 1

GC OverConsolidated

Model: Soft Clay (MCC w/ PWP Change)
Stress Strain
O.C. Ratio: 8
Poisson's Ratio: 0.334
Lambda: 0.06
Kappa: 0.01
Initial Void Ratio: 0.5
Unit Weight: 125 pcf
Phi': 30 °
Hydraulic
Vol. WC. Function: Clay soils OC
K-Function: GC 5.7 E-4 ft/day
Ky'/Kx' Ratio: 1
Rotation: 0 °
K-Modifier Function: 1D consol derived k function rmu2 clay
Load Response Ratio: 1

Sand/Silt

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 300,000 psf
Unit Weight: 135 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: silty sand
K-Function: Silty Sand, k = 0.567 ft/day 2 E-4cm/sec
Ky'/Kx' Ratio: 0.1
Rotation: 0 °
Load Response Ratio: 1

Lower Till

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 600,000 psf
Unit Weight: 145 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Till
K-Function: Till
Ky'/Kx' Ratio: 1
Rotation: 0 °
Load Response Ratio: 1

Structural Fill

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 100,000 psf
Unit Weight: 135 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Till
K-Function: Till
Ky'/Kx' Ratio: 1
Rotation: 0 °
Load Response Ratio: 1

UPPER SHALE

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 1,000,000 psf
Unit Weight: 145 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Till
K-Function: Upper Rock
Ky'/Kx' Ratio: 1
Rotation: 0 °
Load Response Ratio: 1

Boundary Conditions

Fixed X

X: X-Displacement 0

Fixed X/Y

X: X-Displacement 0
Y: Y-Displacement 0

no flow

Type: Total Flux (Q) 0

Review: No

noflowzeropress

Type: Total Flux (Q) 0
Review: Yes

drainage 313

Type: Head (H) 313
Review: No

Initial Water Tables

Initial Water Table 1

Max. negative head: 5
Coordinates
Coordinate 1: (0, 315) ft
Coordinate 2: (850, 315) ft

K Functions

Silty Sand, k = 0.567 ft/day 2 E-4cm/sec

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 36 %
K-Saturation: 0.567
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (0.005, 0.567)
Data Point: (0.01, 0.567)
Data Point: (0.035938, 0.567)
Data Point: (0.12915, 0.567)
Data Point: (0.46416, 0.567)
Data Point: (1.1111, 0.567)
Data Point: (1.6681, 0.567)
Data Point: (5.9948, 0.567)
Data Point: (21.544, 0.567)
Data Point: (77.426, 0.567)
Data Point: (105.93, 0.5402376)
Data Point: (210.74, 0.3387258)
Data Point: (278.26, 0.2567376)
Data Point: (315.56, 0.2232846)
Data Point: (420.37, 0.1406916)
Data Point: (525.19, 0.0779121)
Data Point: (630, 0.03843882)
Data Point: (734.81, 0.01673406)
Data Point: (839.63, 0.005422788)
Data Point: (944.44, 0.000745983)
Data Point: (1,000, 7.14735e-005)
Estimation Properties

Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Upper Glacial Till

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 36 %
K-Saturation: 0.0057
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (0.005, 0.0057)
Data Point: (0.01, 0.0057)
Data Point: (0.046416, 0.0057)
Data Point: (0.21544, 0.0057)
Data Point: (1, 0.0057)
Data Point: (4.6416, 0.0057)
Data Point: (11.111, 0.0057)
Data Point: (21.544, 0.0057)
Data Point: (100, 0.0057)
Data Point: (464.16, 0.0016245)
Data Point: (1,059.3, 0.0002427972)
Data Point: (2,107.4, 1.492716e-005)
Data Point: (2,154.4, 1.369596e-005)
Data Point: (3,155.6, 4.086672e-006)
Data Point: (4,203.7, 1.82115e-006)
Data Point: (5,251.9, 9.03222e-007)
Data Point: (6,300, 4.30521e-007)
Data Point: (7,348.1, 2.028516e-007)
Data Point: (8,396.3, 7.73661e-008)
Data Point: (9,444.4, 2.691312e-008)
Data Point: (10,000, 2.691312e-008)
Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Upper Rock

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 36 %
K-Saturation: 0.567
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (0.005, 0.567)
Data Point: (0.01, 0.567)

Data Point: (10,000, 0.567)
Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Till

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 36 %
K-Saturation: 0.000567
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (0.005, 0.000567)
Data Point: (0.01, 0.000567)
Data Point: (10,000, 0.000567)
Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

GC 5.7 E-4 ft/day

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 100 %
K-Saturation: 0.00057
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (10, 0.00057)
Data Point: (1,000, 9e-006)
Data Point: (5,000, 5e-006)
Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Hydraulic K Modifier Functions

1D consol derived k function rmu2 clay

Model: Spline Data Point Function (Y Log)
Function: K-Modifier vs. Y-Effective Stress
Curve Fit to Data: 100 %

Segment Curvature: 75 %
Y-Intercept: 1.2
Data Points: Y-Effective Stress (psf), K-Modifier
Data Point: (1,000, 1.2)
Data Point: (2,000, 1)
Data Point: (4,000, 0.839)
Data Point: (8,000, 0.70417211)
Data Point: (12,000, 0.63551782)
Data Point: (16,000, 0.59090577)

Vol. Water Content Functions

Clay soils OC

Model: Vol WC Data Point Function
Function: Vol. Water Content vs. Pore-Water Pressure
Mv: 7e-005 /psf
Saturated Water Content: 0.31427274 ft^3/ft^3
Residual Water Content: 0.031427274 ft^3/ft^3
Curve Fit to Data: 100 %
Segment Curvature: 100 %
Porosity: 0.31427274
Data Points: Matric Suction (psf), Vol. Water Content (ft^3/ft^3)
Data Point: (0.01, 0.29999999)
Data Point: (0.018329807, 0.29999998)
Data Point: (0.033598183, 0.29999996)
Data Point: (0.061584821, 0.29999991)
Data Point: (0.11288379, 0.29999982)
Data Point: (0.20691381, 0.29999962)
Data Point: (0.37926902, 0.29999917)
Data Point: (0.6951928, 0.29999814)
Data Point: (1.274275, 0.29999578)
Data Point: (2.3357215, 0.29999026)
Data Point: (4.2813324, 0.2999772)
Data Point: (7.8475997, 0.29994599)
Data Point: (14.384499, 0.29987093)
Data Point: (26.366509, 0.29968944)
Data Point: (48.329302, 0.29924951)
Data Point: (88.586679, 0.29818464)
Data Point: (162.37767, 0.29563126)
Data Point: (297.63514, 0.28967022)
Data Point: (545.55948, 0.27661743)
Data Point: (1,000, 0.25163343)
Estimation Properties
Vol. WC Estimation Method: Sample functions
Saturated Water Content: 0.3 ft^3/ft^3
Sample Material: Clay
Liquid Limit: 0 %
Diameter at 10% passing: 0
Diameter at 60% passing: 0
Maximum: 1,000
Minimum: 0.01

Num. Points: 20

Clay soils

Model: Vol WC Data Point Function
Function: Vol. Water Content vs. Pore-Water Pressure
Mv: 0.0004 /psf
Saturated Water Content: 0.60995302 ft^3/ft^3
Residual Water Content: 0.060995302 ft^3/ft^3
Curve Fit to Data: 100 %
Segment Curvature: 100 %
Porosity: 0.60995302
Data Points: Matric Suction (psf), Vol. Water Content (ft^3/ft^3)
Data Point: (0.01, 0.43999998)
Data Point: (0.018329807, 0.43999997)
Data Point: (0.033598183, 0.43999994)
Data Point: (0.061584821, 0.43999987)
Data Point: (0.11288379, 0.43999974)
Data Point: (0.20691381, 0.43999944)
Data Point: (0.37926902, 0.43999878)
Data Point: (0.6951928, 0.43999728)
Data Point: (1.274275, 0.43999381)
Data Point: (2.3357215, 0.43998571)
Data Point: (4.2813324, 0.43996655)
Data Point: (7.8475997, 0.43992079)
Data Point: (14.384499, 0.4398107)
Data Point: (26.366509, 0.43954452)
Data Point: (48.329302, 0.43889927)
Data Point: (88.586679, 0.43733747)
Data Point: (162.37767, 0.43359251)
Data Point: (297.63514, 0.42484965)
Data Point: (545.55948, 0.40570556)
Data Point: (1,000, 0.36906236)
Estimation Properties
Vol. WC Estimation Method: Sample functions
Saturated Water Content: 0.44 ft^3/ft^3
Sample Material: Clay
Liquid Limit: 0 %
Diameter at 10% passing: 0
Diameter at 60% passing: 0
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Till

Model: Vol WC Data Point Function
Function: Vol. Water Content vs. Pore-Water Pressure
Mv: 5e-006 /psf
Saturated Water Content: 0.20000173 ft^3/ft^3
Residual Water Content: 0.020000173 ft^3/ft^3
Curve Fit to Data: 100 %
Segment Curvature: 100 %
Porosity: 0.20000173

Data Points: Matric Suction (psf), Vol. Water Content (ft^3/ft^3)
- Data Point: (0.01, 0.19999999)
- Data Point: (0.018329807, 0.19999999)
- Data Point: (0.033598183, 0.19999997)
- Data Point: (0.061584821, 0.19999993)
- Data Point: (0.11288379, 0.19999985)
- Data Point: (0.20691381, 0.19999967)
- Data Point: (0.37926902, 0.19999922)
- Data Point: (0.6951928, 0.19999811)
- Data Point: (1.274275, 0.19999535)
- Data Point: (2.3357215, 0.19998838)
- Data Point: (4.2813324, 0.19997056)
- Data Point: (7.8475997, 0.19992471)
- Data Point: (14.384499, 0.19980625)
- Data Point: (26.366509, 0.19949952)
- Data Point: (48.329302, 0.19870702)
- Data Point: (88.586679, 0.19668084)
- Data Point: (162.37767, 0.19165467)
- Data Point: (297.63514, 0.18009116)
- Data Point: (545.55948, 0.15752337)
- Data Point: (1,000, 0.12453739)

Estimation Properties
- Vol. WC Estimation Method: Sample functions
- Saturated Water Content: 0.2 ft^3/ft^3
- Sample Material: Silty Clay
- Liquid Limit: 0 %
- Diameter at 10% passing: 0
- Diameter at 60% passing: 0
- Maximum: 1,000
- Minimum: 0.01
- Num. Points: 20

silty sand

Model: Vol WC Data Point Function

Function: Vol. Water Content vs. Pore-Water Pressure
- Mv: 1e-005 /psf
- Saturated Water Content: 0.30000011 ft^3/ft^3
- Residual Water Content: 0.030000011 ft^3/ft^3
- Curve Fit to Data: 100 %
- Segment Curvature: 100 %

Porosity: 0.30000011

Data Points: Matric Suction (psf), Vol. Water Content (ft^3/ft^3)
- Data Point: (0.01, 0.29999996)
- Data Point: (0.018329807, 0.29999991)
- Data Point: (0.033598183, 0.29999977)
- Data Point: (0.061584821, 0.29999942)
- Data Point: (0.11288379, 0.29999854)
- Data Point: (0.20691381, 0.29999626)
- Data Point: (0.37926902, 0.29999039)
- Data Point: (0.6951928, 0.29997521)
- Data Point: (1.274275, 0.29993588)
- Data Point: (2.3357215, 0.29983385)

Data Point: (4.2813324, 0.29956912)
Data Point: (7.8475997, 0.29888334)
Data Point: (14.384499, 0.29711648)
Data Point: (26.366509, 0.29263189)
Data Point: (48.329302, 0.28167657)
Data Point: (88.586679, 0.25725429)
Data Point: (162.37767, 0.21239326)
Data Point: (297.63514, 0.15298031)
Data Point: (545.55948, 0.099847233)
Data Point: (1,000, 0.064649441)

Estimation Properties

Vol. WC Estimation Method: Sample functions
Saturated Water Content: 0.3 ft^3/ft^3
Sample Material: Silty Sand
Liquid Limit: 0 %
Diameter at 10% passing: 0
Diameter at 60% passing: 0
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Points

	X (ft)	Y (ft)
Point 1	0	268.91519
Point 2	207.4978	271.24238
Point 3	209.0232	271.26867
Point 4	215.074	271.32735
Point 5	225.5606	271.44496
Point 6	230.6621	271.56993
Point 7	234.0537	271.62591
Point 8	237.8751	271.70733
Point 9	243.6233	271.78388
Point 10	403.7734	274.99581
Point 11	406.1879	275.04891
Point 12	510.242	277.40528
Point 13	519.1809	277.52295
Point 14	522.2501	277.56833
Point 15	581.5843	278.21948
Point 16	706.5316	275.03632
Point 17	784.4915	272.77004
Point 18	796.8946	272.40949
Point 19	796.8946	278.66207
Point 20	771.752	277.8332

Point 21	583.2389	281.6042
Point 22	512.9202	278.57945
Point 23	404.2686	277.81745
Point 24	248.1947	278.63737
Point 25	83.6675	274.48464
Point 26	78.5956	274.41664
Point 27	69.7373	274.12229
Point 28	0	273.8562
Point 29	0	286.98783
Point 30	69.7373	288.07912
Point 31	78.6615	288.22649
Point 32	83.6675	288.57952
Point 33	248.1947	297.19282
Point 34	404.2686	294.81745
Point 35	512.9202	289.28565
Point 36	583.2389	288.00106
Point 37	796.8946	289.48765
Point 38	0	305.26334
Point 39	63.5351	305.72185
Point 40	69.7373	305.70863
Point 41	77.6371	305.65972
Point 42	78.5956	305.57155
Point 43	83.6675	305.7
Point 44	248.1947	307.61838
Point 45	299.7903	306.27673
Point 46	299.6238	303.28004
Point 47	404.2544	300.5593
Point 48	512.9971	302.35411
Point 49	583.3451	304.79977
Point 50	592.8421	305.14193
Point 51	650.1895	305.15472
Point 52	796.8602	303.47517
Point 53	796.8946	303.47517
Point 54	404.2686	303.55995
Point 55	512.9202	305.35325
Point 56	583.2389	307.79789
Point 57	592.7878	308.14191
Point 58	650.2064	308.15472
Point 59	796.8946	306.47498

Point 60	0	327.67711
Point 61	22.4921	326.28273
Point 62	49.2488	323.27595
Point 63	74.3201	319.27807
Point 64	77.7249	318.65421
Point 65	112.0147	318.69361
Point 66	124.2402	315.77486
Point 67	126.7076	315.31519
Point 68	136.2125	313.12968
Point 69	142.0351	312.45981
Point 70	357.6126	310.47901
Point 71	586.0206	317.13
Point 72	588.0287	317.67977
Point 73	603.6052	322
Point 74	693.0775	322
Point 75	695.4173	323.10644
Point 76	697.3194	324
Point 77	714.7524	332
Point 78	726.8078	332.79458
Point 79	736.4313	333.45251
Point 80	740.2913	333.71166
Point 81	742.8239	333.89241
Point 82	743.6092	331.27888
Point 83	746.0108	331.28559
Point 84	751.3746	333.5338
Point 85	751.5561	333.52887
Point 86	751.6873	333.53898
Point 87	751.9654	333.539
Point 88	755.4965	333.65881
Point 89	757.088	333.70415
Point 90	766.5218	333.52383
Point 91	769.5239	331.03222
Point 92	781.3859	336.00827
Point 93	796.8946	335.53695
Point 94	0	330.67136
Point 95	0.1856	330.67136
Point 96	22.7526	329.27234
Point 97	49.6527	326.24944
Point 98	74.8268	322.23518

Point 99	77.9958	321.65452
Point 100	112.3661	321.69402
Point 101	124.8636	318.71033
Point 102	127.3188	318.25295
Point 103	136.7217	316.09089
Point 104	142.2209	315.45823
Point 105	357.5827	313.47942
Point 106	585.5746	320.11828
Point 107	587.2318	320.57198
Point 108	684.7881	347.62982
Point 109	704.816	348.13028
Point 110	707.7847	347.0118
Point 111	709.4494	346.32322
Point 112	709.6367	345.87345
Point 113	708.0438	345.21
Point 114	685.2332	344.64
Point 115	131.5335	329.79618
Point 116	158.1735	318.33502
Point 117	165.2063	318.28065
Point 118	203.3044	317.9221
Point 119	243.6199	317.55888
Point 120	248.3589	317.51329
Point 121	357.6595	316.4965
Point 122	589.0312	323.16552
Point 123	591.6482	323.89085
Point 124	610.0073	329
Point 125	631.5677	335
Point 126	653.128	341
Point 127	674.6884	347
Point 128	684.1005	349.61929
Point 129	699.8223	350.01168
Point 130	0	332.91188
Point 131	22.4396	331.51733
Point 132	49.1519	328.50799
Point 133	68.0785	325.48185
Point 134	73.6566	324.58998
Point 135	90.5756	324.62675
Point 136	109.5111	324.68581
Point 137	124.0229	330.52741

Point 138	127.0249	330.53586
Point 139	129.8149	330.45078
Point 140	130.027	330.44431
Point 141	274.9823	329
Point 142	252.0124	321.5
Point 143	213.855	321.5
Point 144	177.1587	331.5
Point 145	171.0426	331.5
Point 146	152.2075	323.79526
Point 147	298.6003	335
Point 148	282.6389	331.5
Point 149	287.7433	331.5
Point 150	289.3308	331.95874
Point 151	290.9318	332.5
Point 152	317.0046	341
Point 153	355.3453	347
Point 154	666.3598	347
Point 155	669.6785	345.61929
Point 156	674.6567	347
Point 157	326.7765	344.18573
Point 158	336.1465	343.24706
Point 159	342.0216	342.65356
Point 160	373.7378	353
Point 161	651.9377	353
Point 162	392.1303	359
Point 163	637.5157	359
Point 164	410.5229	365
Point 165	623.0936	365
Point 166	608.6716	371
Point 167	428.9409	371
Point 168	415.8066	366.72364
Point 169	447.0228	377
Point 170	594.2496	377
Point 171	435.4903	373.13237
Point 172	450.0526	378.01608
Point 173	459.9195	378.51574
Point 174	479.4258	379.45192
Point 175	482.5508	379.55699
Point 176	491.9324	380

Point 177	507.2813	380.61621
Point 178	541.8899	382.28139
Point 179	574.2808	382.67429
Point 180	581.1072	381.37657
Point 181	581.6822	381.26488
Point 182	582.2411	381.14975
Point 183	582.7845	381.03125
Point 184	583.313	380.90951
Point 185	583.8273	380.78465
Point 186	584.3278	380.6568
Point 187	584.8152	380.52606
Point 188	585.29	380.39256
Point 189	592.2253	377.82435
Point 190	593.0101	377.51567
Point 191	78.5551	329.67009
Point 192	110.5776	331.89761
Point 193	113.2091	332.06836
Point 194	115.8406	332.21663
Point 195	118.4721	332.34247
Point 196	121.1036	332.44595
Point 197	123.7351	332.5271
Point 198	125.1298	332.55831
Point 199	126.3665	332.19565
Point 200	128.6722	331.5
Point 201	128.9196	331.46994
Point 202	710.0851	346.06023
Point 203	718.4637	349.55
Point 204	736.491	350
Point 205	738.1976	349.29
Point 206	796.8946	253.91519
Point 207	0	253.91519

Lines

	Start Point	End Point	Hydraulic Boundary	Stress/Strain Boundary
Line 1	1	2		
Line 2	2	3		
Line 3	3	4		
Line 4	4	5		

Line 5	5	6		
Line 6	6	7		
Line 7	7	8		
Line 8	8	9		
Line 9	9	10		
Line 10	10	11		
Line 11	11	12		
Line 12	12	13		
Line 13	13	14		
Line 14	14	15		
Line 15	15	16		
Line 16	16	17		
Line 17	17	18		
Line 18	18	19	drainage 313	Fixed X
Line 19	19	20		
Line 20	20	21		
Line 21	21	22		
Line 22	22	23		
Line 23	23	24		
Line 24	24	25		
Line 25	25	26		
Line 26	26	27		
Line 27	27	28		
Line 28	28	1	drainage 313	Fixed X
Line 29	29	30		
Line 30	30	31		
Line 31	31	32		
Line 32	32	33		
Line 33	33	34		
Line 34	34	35		
Line 35	35	36		
Line 36	36	37		
Line 37	37	19	drainage 313	Fixed X
Line 38	28	29	drainage 313	Fixed X
Line 39	38	39		
Line 40	39	40		
Line 41	40	41		
Line 42	41	42		
Line 43	42	43		

Line 44	43	44		
Line 45	44	45		
Line 46	45	46		
Line 47	46	47		
Line 48	47	48		
Line 49	48	49		
Line 50	49	50		
Line 51	50	51		
Line 52	51	52		
Line 53	52	53		
Line 54	53	37	drainage 313	Fixed X
Line 55	29	38	drainage 313	Fixed X
Line 56	45	54		
Line 57	54	55		
Line 58	55	56		
Line 59	56	57		
Line 60	57	58		
Line 61	58	59		
Line 62	59	53	drainage 313	Fixed X
Line 63	60	61		
Line 64	61	62		
Line 65	62	63		
Line 66	63	64		
Line 67	64	65		
Line 68	65	66		
Line 69	66	67		
Line 70	67	68		
Line 71	68	69		
Line 72	69	70		
Line 73	70	71		
Line 74	71	72		
Line 75	72	73		
Line 76	73	74		
Line 77	74	75		
Line 78	75	76		
Line 79	76	77		
Line 80	77	78		
Line 81	78	79		
Line 82	79	80		

Line 83	80	81		
Line 84	81	82		
Line 85	82	83		
Line 86	83	84		
Line 87	84	85		
Line 88	85	86		
Line 89	86	87		
Line 90	87	88		
Line 91	88	89		
Line 92	89	90		
Line 93	90	91		
Line 94	91	92		
Line 95	92	93		
Line 96	93	59	noflowzeropress	Fixed X
Line 97	38	60	noflowzeropress	Fixed X
Line 98	94	95		
Line 99	95	96		
Line 100	96	97		
Line 101	97	98	no flow	
Line 102	98	99	no flow	
Line 103	99	100	no flow	
Line 104	100	101	no flow	
Line 105	101	102	no flow	
Line 106	102	103	no flow	
Line 107	103	104	no flow	
Line 108	104	105	no flow	
Line 109	105	106	no flow	
Line 110	106	107	no flow	
Line 111	107	108	no flow	
Line 112	108	109	no flow	
Line 113	109	110		
Line 114	110	111		
Line 115	111	112		
Line 116	112	113		
Line 117	113	114		
Line 118	114	73		
Line 119	60	94		Fixed X
Line 120	115	116		
Line 121	116	117		

Line 122	117	118		
Line 123	118	119		
Line 124	119	120		
Line 125	120	121		
Line 126	121	122		
Line 127	122	123		
Line 128	123	124		
Line 129	124	125		
Line 130	125	126		
Line 131	126	127		
Line 132	127	128		
Line 133	128	129		
Line 134	129	109		
Line 135	94	130		Fixed X
Line 136	130	131		
Line 137	131	132		
Line 138	132	133		
Line 139	133	134		
Line 140	134	135		
Line 141	135	136		
Line 142	136	137		
Line 143	137	138		
Line 144	138	139		
Line 145	139	140		
Line 146	140	115		
Line 147	124	141		
Line 148	141	142		
Line 149	142	143		
Line 150	143	144		
Line 151	144	145		
Line 152	145	146		
Line 153	146	115		
Line 154	147	125		
Line 155	141	148		
Line 156	148	149		
Line 157	149	150		
Line 158	150	151		
Line 159	151	147		
Line 160	126	152		

Line 161	152	147		
Line 162	153	154		
Line 163	154	155		
Line 164	155	156		
Line 165	156	127		
Line 166	152	157		
Line 167	157	158		
Line 168	158	159		
Line 169	159	153		
Line 170	160	161		
Line 171	161	154		
Line 172	153	160		
Line 173	162	163		
Line 174	163	161		
Line 175	160	162		
Line 176	164	165		
Line 177	165	163		
Line 178	162	164		
Line 179	165	166		
Line 180	166	167		
Line 181	167	168		
Line 182	168	164		
Line 183	169	170		
Line 184	170	166		
Line 185	167	171		
Line 186	171	169		
Line 187	169	172		
Line 188	172	173		
Line 189	173	174		
Line 190	174	175		
Line 191	175	176		
Line 192	176	177		
Line 193	177	178		
Line 194	178	179		
Line 195	179	180		
Line 196	180	181		
Line 197	181	182		
Line 198	182	183		
Line 199	183	184		

Line 200	184	185		
Line 201	185	186		
Line 202	186	187		
Line 203	187	188		
Line 204	188	189		
Line 205	189	190		
Line 206	190	170		
Line 207	133	191		
Line 208	191	192		
Line 209	192	193		
Line 210	193	194		
Line 211	194	195		
Line 212	195	196		
Line 213	196	197		
Line 214	197	198		
Line 215	198	199		
Line 216	199	200		
Line 217	200	201		
Line 218	201	139		
Line 219	112	202		
Line 220	202	203		
Line 221	203	204		
Line 222	204	205		
Line 223	205	81		
Line 224	18	206	drainage 313	Fixed X
Line 225	206	207	drainage 313	Fixed X/Y
Line 226	207	1	drainage 313	Fixed X

Regions

	Material	Points	Area (ft^2)
Region 1	Lower Till	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28	3,346.1
Region 2	Sand/Silt	29,30,31,32,33,34,35,36,37,19,20,21,22,23,24,25,26,27,28	10,671
Region 3	GC-Drained	38,39,40,41,42,43,44,45,46,47,48,49,50,51,52,53,37,36,35,34,33,32,31,30,29	10,397
Region 4	GC OverConsolidated	45,54,55,56,57,58,59,53,52,51,50,49,48,47,46	1,491.9

Region 5	Upper Till	60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78,79,80,81,82,83,84,85,86,87,88,89,90,91,92,93,59,58,57,56,55,54,45,44,43,42,41,40,39,38	9,253.4
Region 6	CCL	94,95,96,97,98,99,100,101,102,103,104,105,106,107,108,109,110,111,112,113,114,73,72,71,70,69,68,67,66,65,64,63,62,61,60	2,139
Region 7	Bottom Liner	115,116,117,118,119,120,121,122,123,124,125,126,127,128,129,109,108,107,106,105,104,103,102,101,100,99,98,97,96,95,94,130,131,132,133,134,135,136,137,138,139,140	2,215.1
Region 8	Waste Material	115,116,117,118,119,120,121,122,123,124,141,142,143,144,145,146	4,104.1
Region 9	Waste Material	147,125,124,141,148,149,150,151	2,001.4
Region 10	Waste Material	147,125,126,152	2,007.3
Region 11	Waste Material	153,154,155,156,127,126,152,157,158,159	1,949.1
Region 12	Waste Material	160,161,154,153	1,767.6
Region 13	Waste Material	162,163,161,160	1,570.8
Region 14	Waste Material	164,165,163,162	1,373.9
Region 15	Waste Material	164,165,166,167,168	1,176.9
Region 16		169,170,166,167,171	980.5
Region 17		169,172,173,174,175,176,177,178,179,180,181,182,183,184,185,186,187,188,189,190,170	534.96
Region 18	Structural Fill	133,191,192,193,194,195,196,197,198,199,200,201,139,138,137,136,135,134	293.23
Region 19	Structural Fill	73,114,113,112,202,203,204,205,81,80,79,78,77,76,75,74	1,934.1
Region 20	UPPER SHALE	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,206,207	15,814

Figure 28 - Coupled Consolidation for Section OP-2 for Waste Lift 9

Waste Lift 9 El. 377

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File Information

Title: Model City - RMU-2 CP-20 Section OP-2
Comments: Operation Conditions for CP-20 Section 2 Based on Maximum Fill Rate of 50,000 Cu Yds per Quarter
Created By: Peter J. Carey
Revision Number: 498
File Version: 8.0
Tool Version: 8.0.10.6504
Date: 2/25/2013
Time: 7:29:13 AM
File Name: C20OP-2r1.gsz
Directory: N:\Model_City\154.002_rmu2\154.005_revsions\geoslope\operational\

Project Settings

Length(L) Units: feet
Time(t) Units: Days
Force(F) Units: lbf
Pressure(p) Units: psf
Strength Units: psf
Stiffness Units: psf
Unit Weight of Water: 62.4 pcf
Air Pressure: 101.33 psf
View: 2D

Analysis Settings

Waste Lift 9 El. 377

Kind: SIGMA/W
Parent: Waste Lift 8 El. 371
Method: Coupled Stress/PWP
Settings
- Initial Stress: Parent Analysis
- Initial PWP: Parent Analysis
- Exclude cumulative values: No

Control
- Apply Body Force in All Steps: No
- Saturated Zone Only: No

Convergence
- Maximum Number of Iterations: 50
- Minimum Pressure Head Difference: 0.001
- Minimum Displacement Difference: 0.001
- Significant Digits: 3
- Hydraulic Under-Relaxation Criteria

Under-Relaxation Initial Rate: 1
Under-Relaxation Min. Rate: 0.1
Under-Relaxation Reduction Rate: 0.65
Under-Relaxation Iterations: 10
Equation Solver: Parallel Direct
Time
Starting Time: 645 days
Duration: 30 days
# of Steps: 12
Step Generation Method: Linear
Save Steps Every: 4

Materials

Waste Material

Model: Linear Elastic (Total)
Stress Strain
Young's Modulus (E): 400,000 psf
Unit Weight: 111 pcf
Poisson's Ratio: 0.45

Bottom Liner

Model: Linear Elastic (Total)
Stress Strain
Young's Modulus (E): 400,000 psf
Unit Weight: 120 pcf
Poisson's Ratio: 0.45

CCL

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 1,000,000 psf
Unit Weight: 120 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Clay soils OC
K-Function: GC 5.7 E-4 ft/day
Ky'/Kx' Ratio: 0.1
Rotation: 0 °
Load Response Ratio: 1

Upper Till

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 300,000 psf
Unit Weight: 125 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Till
K-Function: Upper Glacial Till
Ky'/Kx' Ratio: 1

Rotation: 0 °
Load Response Ratio: 1

GC-Drained

Model: Soft Clay (MCC w/ PWP Change)
Stress Strain
O.C. Ratio: 4
Poisson's Ratio: 0.334
Lambda: 0.14
Kappa: 0.013
Initial Void Ratio: 1
Unit Weight: 118 pcf
Phi': 27 °
Hydraulic
Vol. WC. Function: Clay soils
K-Function: GC 5.7 E-4 ft/day
Ky'/Kx' Ratio: 1
Rotation: 0 °
K-Modifier Function: 1D consol derived k function rmu2 clay
Load Response Ratio: 1

GC OverConsolidated

Model: Soft Clay (MCC w/ PWP Change)
Stress Strain
O.C. Ratio: 8
Poisson's Ratio: 0.334
Lambda: 0.06
Kappa: 0.01
Initial Void Ratio: 0.5
Unit Weight: 125 pcf
Phi': 30 °
Hydraulic
Vol. WC. Function: Clay soils OC
K-Function: GC 5.7 E-4 ft/day
Ky'/Kx' Ratio: 1
Rotation: 0 °
K-Modifier Function: 1D consol derived k function rmu2 clay
Load Response Ratio: 1

Sand/Silt

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 300,000 psf
Unit Weight: 135 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: silty sand
K-Function: Silty Sand, k = 0.567 ft/day 2 E-4cm/sec
Ky'/Kx' Ratio: 0.1
Rotation: 0 °
Load Response Ratio: 1

Lower Till

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 600,000 psf
Unit Weight: 145 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Till
K-Function: Till
Ky'/Kx' Ratio: 1
Rotation: 0 °
Load Response Ratio: 1

Structural Fill

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 100,000 psf
Unit Weight: 135 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Till
K-Function: Till
Ky'/Kx' Ratio: 1
Rotation: 0 °
Load Response Ratio: 1

UPPER SHALE

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 1,000,000 psf
Unit Weight: 145 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Till
K-Function: Upper Rock
Ky'/Kx' Ratio: 1
Rotation: 0 °
Load Response Ratio: 1

Boundary Conditions

Fixed X

X: X-Displacement 0

Fixed X/Y

X: X-Displacement 0
Y: Y-Displacement 0

no flow

Type: Total Flux (Q) 0

Review: No

noflowzeropress

Type: Total Flux (Q) 0
Review: Yes

drainage 313

Type: Head (H) 313
Review: No

Initial Water Tables

Initial Water Table 1

Max. negative head: 5
Coordinates
Coordinate 1: (0, 315) ft
Coordinate 2: (850, 315) ft

K Functions

Silty Sand, k = 0.567 ft/day 2 E-4cm/sec

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 36 %
K-Saturation: 0.567
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (0.005, 0.567)
Data Point: (0.01, 0.567)
Data Point: (0.035938, 0.567)
Data Point: (0.12915, 0.567)
Data Point: (0.46416, 0.567)
Data Point: (1.1111, 0.567)
Data Point: (1.6681, 0.567)
Data Point: (5.9948, 0.567)
Data Point: (21.544, 0.567)
Data Point: (77.426, 0.567)
Data Point: (105.93, 0.5402376)
Data Point: (210.74, 0.3387258)
Data Point: (278.26, 0.2567376)
Data Point: (315.56, 0.2232846)
Data Point: (420.37, 0.1406916)
Data Point: (525.19, 0.0779121)
Data Point: (630, 0.03843882)
Data Point: (734.81, 0.01673406)
Data Point: (839.63, 0.005422788)
Data Point: (944.44, 0.000745983)
Data Point: (1,000, 7.14735e-005)
Estimation Properties

Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Upper Glacial Till

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 36 %
K-Saturation: 0.0057
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (0.005, 0.0057)
Data Point: (0.01, 0.0057)
Data Point: (0.046416, 0.0057)
Data Point: (0.21544, 0.0057)
Data Point: (1, 0.0057)
Data Point: (4.6416, 0.0057)
Data Point: (11.111, 0.0057)
Data Point: (21.544, 0.0057)
Data Point: (100, 0.0057)
Data Point: (464.16, 0.0016245)
Data Point: (1,059.3, 0.0002427972)
Data Point: (2,107.4, 1.492716e-005)
Data Point: (2,154.4, 1.369596e-005)
Data Point: (3,155.6, 4.086672e-006)
Data Point: (4,203.7, 1.82115e-006)
Data Point: (5,251.9, 9.03222e-007)
Data Point: (6,300, 4.30521e-007)
Data Point: (7,348.1, 2.028516e-007)
Data Point: (8,396.3, 7.73661e-008)
Data Point: (9,444.4, 2.691312e-008)
Data Point: (10,000, 2.691312e-008)
Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Upper Rock

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 36 %
K-Saturation: 0.567
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (0.005, 0.567)
Data Point: (0.01, 0.567)

Data Point: (10,000, 0.567)
Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Till

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 36 %
K-Saturation: 0.000567
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (0.005, 0.000567)
Data Point: (0.01, 0.000567)
Data Point: (10,000, 0.000567)
Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

GC 5.7 E-4 ft/day

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 100 %
K-Saturation: 0.00057
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (10, 0.00057)
Data Point: (1,000, 9e-006)
Data Point: (5,000, 5e-006)
Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Hydraulic K Modifier Functions

1D consol derived k function rmu2 clay

Model: Spline Data Point Function (Y Log)
Function: K-Modifier vs. Y-Effective Stress
Curve Fit to Data: 100 %

Segment Curvature: 75 %
Y-Intercept: 1.2
Data Points: Y-Effective Stress (psf), K-Modifier
Data Point: (1,000, 1.2)
Data Point: (2,000, 1)
Data Point: (4,000, 0.839)
Data Point: (8,000, 0.70417211)
Data Point: (12,000, 0.63551782)
Data Point: (16,000, 0.59090577)

Vol. Water Content Functions

Clay soils OC

Model: Vol WC Data Point Function
Function: Vol. Water Content vs. Pore-Water Pressure
Mv: 7e-005 /psf
Saturated Water Content: 0.31427274 ft^3/ft^3
Residual Water Content: 0.031427274 ft^3/ft^3
Curve Fit to Data: 100 %
Segment Curvature: 100 %
Porosity: 0.31427274
Data Points: Matric Suction (psf), Vol. Water Content (ft^3/ft^3)
Data Point: (0.01, 0.29999999)
Data Point: (0.018329807, 0.29999998)
Data Point: (0.033598183, 0.29999996)
Data Point: (0.061584821, 0.29999991)
Data Point: (0.11288379, 0.29999982)
Data Point: (0.20691381, 0.29999962)
Data Point: (0.37926902, 0.29999917)
Data Point: (0.6951928, 0.29999814)
Data Point: (1.274275, 0.29999578)
Data Point: (2.3357215, 0.29999026)
Data Point: (4.2813324, 0.2999772)
Data Point: (7.8475997, 0.29994599)
Data Point: (14.384499, 0.29987093)
Data Point: (26.366509, 0.29968944)
Data Point: (48.329302, 0.29924951)
Data Point: (88.586679, 0.29818464)
Data Point: (162.37767, 0.29563126)
Data Point: (297.63514, 0.28967022)
Data Point: (545.55948, 0.27661743)
Data Point: (1,000, 0.25163343)
Estimation Properties
Vol. WC Estimation Method: Sample functions
Saturated Water Content: 0.3 ft^3/ft^3
Sample Material: Clay
Liquid Limit: 0 %
Diameter at 10% passing: 0
Diameter at 60% passing: 0
Maximum: 1,000
Minimum: 0.01

Num. Points: 20

Clay soils

Model: Vol WC Data Point Function
Function: Vol. Water Content vs. Pore-Water Pressure
Mv: 0.0004 /psf
Saturated Water Content: 0.60995302 ft^3/ft^3
Residual Water Content: 0.060995302 ft^3/ft^3
Curve Fit to Data: 100 %
Segment Curvature: 100 %
Porosity: 0.60995302
Data Points: Matric Suction (psf), Vol. Water Content (ft^3/ft^3)
Data Point: (0.01, 0.43999998)
Data Point: (0.018329807, 0.43999997)
Data Point: (0.033598183, 0.43999994)
Data Point: (0.061584821, 0.43999987)
Data Point: (0.11288379, 0.43999974)
Data Point: (0.20691381, 0.43999944)
Data Point: (0.37926902, 0.43999878)
Data Point: (0.6951928, 0.43999728)
Data Point: (1.274275, 0.43999381)
Data Point: (2.3357215, 0.43998571)
Data Point: (4.2813324, 0.43996655)
Data Point: (7.8475997, 0.43992079)
Data Point: (14.384499, 0.4398107)
Data Point: (26.366509, 0.43954452)
Data Point: (48.329302, 0.43889927)
Data Point: (88.586679, 0.43733747)
Data Point: (162.37767, 0.43359251)
Data Point: (297.63514, 0.42484965)
Data Point: (545.55948, 0.40570556)
Data Point: (1,000, 0.36906236)
Estimation Properties
Vol. WC Estimation Method: Sample functions
Saturated Water Content: 0.44 ft^3/ft^3
Sample Material: Clay
Liquid Limit: 0 %
Diameter at 10% passing: 0
Diameter at 60% passing: 0
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Till

Model: Vol WC Data Point Function
Function: Vol. Water Content vs. Pore-Water Pressure
Mv: 5e-006 /psf
Saturated Water Content: 0.20000173 ft^3/ft^3
Residual Water Content: 0.020000173 ft^3/ft^3
Curve Fit to Data: 100 %
Segment Curvature: 100 %
Porosity: 0.20000173

Data Points: Matric Suction (psf), Vol. Water Content (ft^3/ft^3)
- Data Point: (0.01, 0.19999999)
- Data Point: (0.018329807, 0.19999999)
- Data Point: (0.033598183, 0.19999997)
- Data Point: (0.061584821, 0.19999993)
- Data Point: (0.11288379, 0.19999985)
- Data Point: (0.20691381, 0.19999967)
- Data Point: (0.37926902, 0.19999922)
- Data Point: (0.6951928, 0.19999811)
- Data Point: (1.274275, 0.19999535)
- Data Point: (2.3357215, 0.19998838)
- Data Point: (4.2813324, 0.19997056)
- Data Point: (7.8475997, 0.19992471)
- Data Point: (14.384499, 0.19980625)
- Data Point: (26.366509, 0.19949952)
- Data Point: (48.329302, 0.19870702)
- Data Point: (88.586679, 0.19668084)
- Data Point: (162.37767, 0.19165467)
- Data Point: (297.63514, 0.18009116)
- Data Point: (545.55948, 0.15752337)
- Data Point: (1,000, 0.12453739)

Estimation Properties
- Vol. WC Estimation Method: Sample functions
- Saturated Water Content: 0.2 ft^3/ft^3
- Sample Material: Silty Clay
- Liquid Limit: 0 %
- Diameter at 10% passing: 0
- Diameter at 60% passing: 0
- Maximum: 1,000
- Minimum: 0.01
- Num. Points: 20

silty sand

Model: Vol WC Data Point Function

Function: Vol. Water Content vs. Pore-Water Pressure
- Mv: 1e-005 /psf
- Saturated Water Content: 0.30000011 ft^3/ft^3
- Residual Water Content: 0.030000011 ft^3/ft^3
- Curve Fit to Data: 100 %
- Segment Curvature: 100 %

Porosity: 0.30000011

Data Points: Matric Suction (psf), Vol. Water Content (ft^3/ft^3)
- Data Point: (0.01, 0.29999996)
- Data Point: (0.018329807, 0.29999991)
- Data Point: (0.033598183, 0.29999977)
- Data Point: (0.061584821, 0.29999942)
- Data Point: (0.11288379, 0.29999854)
- Data Point: (0.20691381, 0.29999626)
- Data Point: (0.37926902, 0.29999039)
- Data Point: (0.6951928, 0.29997521)
- Data Point: (1.274275, 0.29993588)
- Data Point: (2.3357215, 0.29983385)

Data Point: (4.2813324, 0.29956912)
Data Point: (7.8475997, 0.29888334)
Data Point: (14.384499, 0.29711648)
Data Point: (26.366509, 0.29263189)
Data Point: (48.329302, 0.28167657)
Data Point: (88.586679, 0.25725429)
Data Point: (162.37767, 0.21239326)
Data Point: (297.63514, 0.15298031)
Data Point: (545.55948, 0.099847233)
Data Point: (1,000, 0.064649441)

Estimation Properties

Vol. WC Estimation Method: Sample functions
Saturated Water Content: 0.3 ft^3/ft^3
Sample Material: Silty Sand
Liquid Limit: 0 %
Diameter at 10% passing: 0
Diameter at 60% passing: 0
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Points

	X (ft)	Y (ft)
Point 1	0	268.91519
Point 2	207.4978	271.24238
Point 3	209.0232	271.26867
Point 4	215.074	271.32735
Point 5	225.5606	271.44496
Point 6	230.6621	271.56993
Point 7	234.0537	271.62591
Point 8	237.8751	271.70733
Point 9	243.6233	271.78388
Point 10	403.7734	274.99581
Point 11	406.1879	275.04891
Point 12	510.242	277.40528
Point 13	519.1809	277.52295
Point 14	522.2501	277.56833
Point 15	581.5843	278.21948
Point 16	706.5316	275.03632
Point 17	784.4915	272.77004
Point 18	796.8946	272.40949
Point 19	796.8946	278.66207
Point 20	771.752	277.8332

Point 21	583.2389	281.6042
Point 22	512.9202	278.57945
Point 23	404.2686	277.81745
Point 24	248.1947	278.63737
Point 25	83.6675	274.48464
Point 26	78.5956	274.41664
Point 27	69.7373	274.12229
Point 28	0	273.8562
Point 29	0	286.98783
Point 30	69.7373	288.07912
Point 31	78.6615	288.22649
Point 32	83.6675	288.57952
Point 33	248.1947	297.19282
Point 34	404.2686	294.81745
Point 35	512.9202	289.28565
Point 36	583.2389	288.00106
Point 37	796.8946	289.48765
Point 38	0	305.26334
Point 39	63.5351	305.72185
Point 40	69.7373	305.70863
Point 41	77.6371	305.65972
Point 42	78.5956	305.57155
Point 43	83.6675	305.7
Point 44	248.1947	307.61838
Point 45	299.7903	306.27673
Point 46	299.6238	303.28004
Point 47	404.2544	300.5593
Point 48	512.9971	302.35411
Point 49	583.3451	304.79977
Point 50	592.8421	305.14193
Point 51	650.1895	305.15472
Point 52	796.8602	303.47517
Point 53	796.8946	303.47517
Point 54	404.2686	303.55995
Point 55	512.9202	305.35325
Point 56	583.2389	307.79789
Point 57	592.7878	308.14191
Point 58	650.2064	308.15472
Point 59	796.8946	306.47498

Point 60	0	327.67711
Point 61	22.4921	326.28273
Point 62	49.2488	323.27595
Point 63	74.3201	319.27807
Point 64	77.7249	318.65421
Point 65	112.0147	318.69361
Point 66	124.2402	315.77486
Point 67	126.7076	315.31519
Point 68	136.2125	313.12968
Point 69	142.0351	312.45981
Point 70	357.6126	310.47901
Point 71	586.0206	317.13
Point 72	588.0287	317.67977
Point 73	603.6052	322
Point 74	693.0775	322
Point 75	695.4173	323.10644
Point 76	697.3194	324
Point 77	714.7524	332
Point 78	726.8078	332.79458
Point 79	736.4313	333.45251
Point 80	740.2913	333.71166
Point 81	742.8239	333.89241
Point 82	743.6092	331.27888
Point 83	746.0108	331.28559
Point 84	751.3746	333.5338
Point 85	751.5561	333.52887
Point 86	751.6873	333.53898
Point 87	751.9654	333.539
Point 88	755.4965	333.65881
Point 89	757.088	333.70415
Point 90	766.5218	333.52383
Point 91	769.5239	331.03222
Point 92	781.3859	336.00827
Point 93	796.8946	335.53695
Point 94	0	330.67136
Point 95	0.1856	330.67136
Point 96	22.7526	329.27234
Point 97	49.6527	326.24944
Point 98	74.8268	322.23518

Point 99	77.9958	321.65452
Point 100	112.3661	321.69402
Point 101	124.8636	318.71033
Point 102	127.3188	318.25295
Point 103	136.7217	316.09089
Point 104	142.2209	315.45823
Point 105	357.5827	313.47942
Point 106	585.5746	320.11828
Point 107	587.2318	320.57198
Point 108	684.7881	347.62982
Point 109	704.816	348.13028
Point 110	707.7847	347.0118
Point 111	709.4494	346.32322
Point 112	709.6367	345.87345
Point 113	708.0438	345.21
Point 114	685.2332	344.64
Point 115	131.5335	329.79618
Point 116	158.1735	318.33502
Point 117	165.2063	318.28065
Point 118	203.3044	317.9221
Point 119	243.6199	317.55888
Point 120	248.3589	317.51329
Point 121	357.6595	316.4965
Point 122	589.0312	323.16552
Point 123	591.6482	323.89085
Point 124	610.0073	329
Point 125	631.5677	335
Point 126	653.128	341
Point 127	674.6884	347
Point 128	684.1005	349.61929
Point 129	699.8223	350.01168
Point 130	0	332.91188
Point 131	22.4396	331.51733
Point 132	49.1519	328.50799
Point 133	68.0785	325.48185
Point 134	73.6566	324.58998
Point 135	90.5756	324.62675
Point 136	109.5111	324.68581
Point 137	124.0229	330.52741

Point 138	127.0249	330.53586
Point 139	129.8149	330.45078
Point 140	130.027	330.44431
Point 141	274.9823	329
Point 142	252.0124	321.5
Point 143	213.855	321.5
Point 144	177.1587	331.5
Point 145	171.0426	331.5
Point 146	152.2075	323.79526
Point 147	298.6003	335
Point 148	282.6389	331.5
Point 149	287.7433	331.5
Point 150	289.3308	331.95874
Point 151	290.9318	332.5
Point 152	317.0046	341
Point 153	355.3453	347
Point 154	666.3598	347
Point 155	669.6785	345.61929
Point 156	674.6567	347
Point 157	326.7765	344.18573
Point 158	336.1465	343.24706
Point 159	342.0216	342.65356
Point 160	373.7378	353
Point 161	651.9377	353
Point 162	392.1303	359
Point 163	637.5157	359
Point 164	410.5229	365
Point 165	623.0936	365
Point 166	608.6716	371
Point 167	428.9409	371
Point 168	415.8066	366.72364
Point 169	447.0228	377
Point 170	594.2496	377
Point 171	435.4903	373.13237
Point 172	450.0526	378.01608
Point 173	459.9195	378.51574
Point 174	479.4258	379.45192
Point 175	482.5508	379.55699
Point 176	491.9324	380

Point 177	507.2813	380.61621
Point 178	541.8899	382.28139
Point 179	574.2808	382.67429
Point 180	581.1072	381.37657
Point 181	581.6822	381.26488
Point 182	582.2411	381.14975
Point 183	582.7845	381.03125
Point 184	583.313	380.90951
Point 185	583.8273	380.78465
Point 186	584.3278	380.6568
Point 187	584.8152	380.52606
Point 188	585.29	380.39256
Point 189	592.2253	377.82435
Point 190	593.0101	377.51567
Point 191	78.5551	329.67009
Point 192	110.5776	331.89761
Point 193	113.2091	332.06836
Point 194	115.8406	332.21663
Point 195	118.4721	332.34247
Point 196	121.1036	332.44595
Point 197	123.7351	332.5271
Point 198	125.1298	332.55831
Point 199	126.3665	332.19565
Point 200	128.6722	331.5
Point 201	128.9196	331.46994
Point 202	710.0851	346.06023
Point 203	718.4637	349.55
Point 204	736.491	350
Point 205	738.1976	349.29
Point 206	796.8946	253.91519
Point 207	0	253.91519

Lines

	Start Point	End Point	Hydraulic Boundary	Stress/Strain Boundary
Line 1	1	2		
Line 2	2	3		
Line 3	3	4		
Line 4	4	5		

Line 5	5	6		
Line 6	6	7		
Line 7	7	8		
Line 8	8	9		
Line 9	9	10		
Line 10	10	11		
Line 11	11	12		
Line 12	12	13		
Line 13	13	14		
Line 14	14	15		
Line 15	15	16		
Line 16	16	17		
Line 17	17	18		
Line 18	18	19	drainage 313	Fixed X
Line 19	19	20		
Line 20	20	21		
Line 21	21	22		
Line 22	22	23		
Line 23	23	24		
Line 24	24	25		
Line 25	25	26		
Line 26	26	27		
Line 27	27	28		
Line 28	28	1	drainage 313	Fixed X
Line 29	29	30		
Line 30	30	31		
Line 31	31	32		
Line 32	32	33		
Line 33	33	34		
Line 34	34	35		
Line 35	35	36		
Line 36	36	37		
Line 37	37	19	drainage 313	Fixed X
Line 38	28	29	drainage 313	Fixed X
Line 39	38	39		
Line 40	39	40		
Line 41	40	41		
Line 42	41	42		
Line 43	42	43		

Line 44	43	44		
Line 45	44	45		
Line 46	45	46		
Line 47	46	47		
Line 48	47	48		
Line 49	48	49		
Line 50	49	50		
Line 51	50	51		
Line 52	51	52		
Line 53	52	53		
Line 54	53	37	drainage 313	Fixed X
Line 55	29	38	drainage 313	Fixed X
Line 56	45	54		
Line 57	54	55		
Line 58	55	56		
Line 59	56	57		
Line 60	57	58		
Line 61	58	59		
Line 62	59	53	drainage 313	Fixed X
Line 63	60	61		
Line 64	61	62		
Line 65	62	63		
Line 66	63	64		
Line 67	64	65		
Line 68	65	66		
Line 69	66	67		
Line 70	67	68		
Line 71	68	69		
Line 72	69	70		
Line 73	70	71		
Line 74	71	72		
Line 75	72	73		
Line 76	73	74		
Line 77	74	75		
Line 78	75	76		
Line 79	76	77		
Line 80	77	78		
Line 81	78	79		
Line 82	79	80		

Line 83	80	81		
Line 84	81	82		
Line 85	82	83		
Line 86	83	84		
Line 87	84	85		
Line 88	85	86		
Line 89	86	87		
Line 90	87	88		
Line 91	88	89		
Line 92	89	90		
Line 93	90	91		
Line 94	91	92		
Line 95	92	93		
Line 96	93	59	noflowzeropress	Fixed X
Line 97	38	60	noflowzeropress	Fixed X
Line 98	94	95		
Line 99	95	96		
Line 100	96	97		
Line 101	97	98	no flow	
Line 102	98	99	no flow	
Line 103	99	100	no flow	
Line 104	100	101	no flow	
Line 105	101	102	no flow	
Line 106	102	103	no flow	
Line 107	103	104	no flow	
Line 108	104	105	no flow	
Line 109	105	106	no flow	
Line 110	106	107	no flow	
Line 111	107	108	no flow	
Line 112	108	109	no flow	
Line 113	109	110		
Line 114	110	111		
Line 115	111	112		
Line 116	112	113		
Line 117	113	114		
Line 118	114	73		
Line 119	60	94		Fixed X
Line 120	115	116		
Line 121	116	117		

Line 122	117	118		
Line 123	118	119		
Line 124	119	120		
Line 125	120	121		
Line 126	121	122		
Line 127	122	123		
Line 128	123	124		
Line 129	124	125		
Line 130	125	126		
Line 131	126	127		
Line 132	127	128		
Line 133	128	129		
Line 134	129	109		
Line 135	94	130		Fixed X
Line 136	130	131		
Line 137	131	132		
Line 138	132	133		
Line 139	133	134		
Line 140	134	135		
Line 141	135	136		
Line 142	136	137		
Line 143	137	138		
Line 144	138	139		
Line 145	139	140		
Line 146	140	115		
Line 147	124	141		
Line 148	141	142		
Line 149	142	143		
Line 150	143	144		
Line 151	144	145		
Line 152	145	146		
Line 153	146	115		
Line 154	147	125		
Line 155	141	148		
Line 156	148	149		
Line 157	149	150		
Line 158	150	151		
Line 159	151	147		
Line 160	126	152		

Line 161	152	147		
Line 162	153	154		
Line 163	154	155		
Line 164	155	156		
Line 165	156	127		
Line 166	152	157		
Line 167	157	158		
Line 168	158	159		
Line 169	159	153		
Line 170	160	161		
Line 171	161	154		
Line 172	153	160		
Line 173	162	163		
Line 174	163	161		
Line 175	160	162		
Line 176	164	165		
Line 177	165	163		
Line 178	162	164		
Line 179	165	166		
Line 180	166	167		
Line 181	167	168		
Line 182	168	164		
Line 183	169	170		
Line 184	170	166		
Line 185	167	171		
Line 186	171	169		
Line 187	169	172		
Line 188	172	173		
Line 189	173	174		
Line 190	174	175		
Line 191	175	176		
Line 192	176	177		
Line 193	177	178		
Line 194	178	179		
Line 195	179	180		
Line 196	180	181		
Line 197	181	182		
Line 198	182	183		
Line 199	183	184		

Line 200	184	185		
Line 201	185	186		
Line 202	186	187		
Line 203	187	188		
Line 204	188	189		
Line 205	189	190		
Line 206	190	170		
Line 207	133	191		
Line 208	191	192		
Line 209	192	193		
Line 210	193	194		
Line 211	194	195		
Line 212	195	196		
Line 213	196	197		
Line 214	197	198		
Line 215	198	199		
Line 216	199	200		
Line 217	200	201		
Line 218	201	139		
Line 219	112	202		
Line 220	202	203		
Line 221	203	204		
Line 222	204	205		
Line 223	205	81		
Line 224	18	206	drainage 313	Fixed X
Line 225	206	207	drainage 313	Fixed X/Y
Line 226	207	1	drainage 313	Fixed X

Regions

	Material	Points	Area (ft^2)
Region 1	Lower Till	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28	3,346.1
Region 2	Sand/Silt	29,30,31,32,33,34,35,36,37,19,20,21,22,23,24,25,26,27,28	10,671
Region 3	GC-Drained	38,39,40,41,42,43,44,45,46,47,48,49,50,51,52,53,37,36,35,34,33,32,31,30,29	10,397
Region 4	GC OverConsolidated	45,54,55,56,57,58,59,53,52,51,50,49,48,47,46	1,491.9
Region 5	Upper Till	60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78,	9,253.4

		79,80,81,82,83,84,85,86,87,88,89,90,91,92,93,59,58,57,56,55,54,45,44,43,42,41,40,39,38	
Region 6	CCL	94,95,96,97,98,99,100,101,102,103,104,105,106,107,108,109,110,111,112,113,114,73,72,71,70,69,68,67,66,65,64,63,62,61,60	2,139
Region 7	Bottom Liner	115,116,117,118,119,120,121,122,123,124,125,126,127,128,129,109,108,107,106,105,104,103,102,101,100,99,98,97,96,95,94,130,131,132,133,134,135,136,137,138,139,140	2,215.1
Region 8	Waste Material	115,116,117,118,119,120,121,122,123,124,141,142,143,144,145,146	4,104.1
Region 9	Waste Material	147,125,124,141,148,149,150,151	2,001.4
Region 10	Waste Material	147,125,126,152	2,007.3
Region 11	Waste Material	153,154,155,156,127,126,152,157,158,159	1,949.1
Region 12	Waste Material	160,161,154,153	1,767.6
Region 13	Waste Material	162,163,161,160	1,570.8
Region 14	Waste Material	164,165,163,162	1,373.9
Region 15	Waste Material	164,165,166,167,168	1,176.9
Region 16	Waste Material	169,170,166,167,171	980.5
Region 17		169,172,173,174,175,176,177,178,179,180,181,182,183,184,185,186,187,188,189,190,170	534.96
Region 18	Structural Fill	133,191,192,193,194,195,196,197,198,199,200,201,139,138,137,136,135,134	293.23
Region 19	Structural Fill	73,114,113,112,202,203,204,205,81,80,79,78,77,76,75,74	1,934.1
Region 20	UPPER SHALE	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,206,207	15,814

Figure 29 - Coupled Consolidation for Section OP-2 for Waste Lift 10

Waste Lift10 El. 383

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File Information

Title: Model City - RMU-2 CP-20 Section OP-2
Comments: Operation Conditions for CP-20 Section 2 Based on Maximum Fill Rate of 50,000 Cu Yds per Quarter
Created By: Peter J. Carey
Revision Number: 498
File Version: 8.0
Tool Version: 8.0.10.6504
Date: 2/25/2013
Time: 7:29:13 AM
File Name: C20OP-2r1.gsz
Directory: N:\Model_City\154.002_rmu2\154.005_revsions\geoslope\operational\

Project Settings

Length(L) Units: feet
Time(t) Units: Days
Force(F) Units: lbf
Pressure(p) Units: psf
Strength Units: psf
Stiffness Units: psf
Unit Weight of Water: 62.4 pcf
Air Pressure: 101.33 psf
View: 2D

Analysis Settings

Waste Lift10 El. 383

Kind: SIGMA/W
Parent: Waste Lift 9 El. 377
Method: Coupled Stress/PWP
Settings
- Initial Stress: Parent Analysis
- Initial PWP: Parent Analysis
- Exclude cumulative values: No

Control
- Apply Body Force in All Steps: No
- Saturated Zone Only: No

Convergence
- Maximum Number of Iterations: 50
- Minimum Pressure Head Difference: 0.001
- Minimum Displacement Difference: 0.001
- Significant Digits: 3
- Hydraulic Under-Relaxation Criteria

Under-Relaxation Initial Rate: 1
Under-Relaxation Min. Rate: 0.1
Under-Relaxation Reduction Rate: 0.65
Under-Relaxation Iterations: 10
Equation Solver: Parallel Direct
Time
Starting Time: 675 days
Duration: 18 days
# of Steps: 12
Step Generation Method: Linear
Save Steps Every: 4

Materials

Waste Material

Model: Linear Elastic (Total)
Stress Strain
Young's Modulus (E): 400,000 psf
Unit Weight: 111 pcf
Poisson's Ratio: 0.45

Bottom Liner

Model: Linear Elastic (Total)
Stress Strain
Young's Modulus (E): 400,000 psf
Unit Weight: 120 pcf
Poisson's Ratio: 0.45

CCL

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 1,000,000 psf
Unit Weight: 120 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Clay soils OC
K-Function: GC 5.7 E-4 ft/day
Ky'/Kx' Ratio: 0.1
Rotation: 0 °
Load Response Ratio: 1

Upper Till

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 300,000 psf
Unit Weight: 125 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Till
K-Function: Upper Glacial Till
Ky'/Kx' Ratio: 1

Rotation: 0 °
Load Response Ratio: 1

GC-Drained

Model: Soft Clay (MCC w/ PWP Change)
Stress Strain
O.C. Ratio: 4
Poisson's Ratio: 0.334
Lambda: 0.14
Kappa: 0.013
Initial Void Ratio: 1
Unit Weight: 118 pcf
Phi': 27 °
Hydraulic
Vol. WC. Function: Clay soils
K-Function: GC 5.7 E-4 ft/day
Ky'/Kx' Ratio: 1
Rotation: 0 °
K-Modifier Function: 1D consol derived k function rmu2 clay
Load Response Ratio: 1

GC OverConsolidated

Model: Soft Clay (MCC w/ PWP Change)
Stress Strain
O.C. Ratio: 8
Poisson's Ratio: 0.334
Lambda: 0.06
Kappa: 0.01
Initial Void Ratio: 0.5
Unit Weight: 125 pcf
Phi': 30 °
Hydraulic
Vol. WC. Function: Clay soils OC
K-Function: GC 5.7 E-4 ft/day
Ky'/Kx' Ratio: 1
Rotation: 0 °
K-Modifier Function: 1D consol derived k function rmu2 clay
Load Response Ratio: 1

Sand/Silt

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 300,000 psf
Unit Weight: 135 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: silty sand
K-Function: Silty Sand, k = 0.567 ft/day 2 E-4cm/sec
Ky'/Kx' Ratio: 0.1
Rotation: 0 °
Load Response Ratio: 1

Lower Till

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 600,000 psf
Unit Weight: 145 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Till
K-Function: Till
Ky'/Kx' Ratio: 1
Rotation: 0 °
Load Response Ratio: 1

Structural Fill

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 100,000 psf
Unit Weight: 135 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Till
K-Function: Till
Ky'/Kx' Ratio: 1
Rotation: 0 °
Load Response Ratio: 1

UPPER SHALE

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 1,000,000 psf
Unit Weight: 145 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Till
K-Function: Upper Rock
Ky'/Kx' Ratio: 1
Rotation: 0 °
Load Response Ratio: 1

Boundary Conditions

Fixed X

X: X-Displacement 0

Fixed X/Y

X: X-Displacement 0
Y: Y-Displacement 0

no flow

Type: Total Flux (Q) 0

Review: No

noflowzeropress

Type: Total Flux (Q) 0
Review: Yes

drainage 313

Type: Head (H) 313
Review: No

Initial Water Tables

Initial Water Table 1

Max. negative head: 5
Coordinates
Coordinate 1: (0, 315) ft
Coordinate 2: (850, 315) ft

K Functions

Silty Sand, k = 0.567 ft/day 2 E-4cm/sec

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 36 %
K-Saturation: 0.567
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (0.005, 0.567)
Data Point: (0.01, 0.567)
Data Point: (0.035938, 0.567)
Data Point: (0.12915, 0.567)
Data Point: (0.46416, 0.567)
Data Point: (1.1111, 0.567)
Data Point: (1.6681, 0.567)
Data Point: (5.9948, 0.567)
Data Point: (21.544, 0.567)
Data Point: (77.426, 0.567)
Data Point: (105.93, 0.5402376)
Data Point: (210.74, 0.3387258)
Data Point: (278.26, 0.2567376)
Data Point: (315.56, 0.2232846)
Data Point: (420.37, 0.1406916)
Data Point: (525.19, 0.0779121)
Data Point: (630, 0.03843882)
Data Point: (734.81, 0.01673406)
Data Point: (839.63, 0.005422788)
Data Point: (944.44, 0.000745983)
Data Point: (1,000, 7.14735e-005)
Estimation Properties

Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Upper Glacial Till

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 36 %
K-Saturation: 0.0057
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (0.005, 0.0057)
Data Point: (0.01, 0.0057)
Data Point: (0.046416, 0.0057)
Data Point: (0.21544, 0.0057)
Data Point: (1, 0.0057)
Data Point: (4.6416, 0.0057)
Data Point: (11.111, 0.0057)
Data Point: (21.544, 0.0057)
Data Point: (100, 0.0057)
Data Point: (464.16, 0.0016245)
Data Point: (1,059.3, 0.0002427972)
Data Point: (2,107.4, 1.492716e-005)
Data Point: (2,154.4, 1.369596e-005)
Data Point: (3,155.6, 4.086672e-006)
Data Point: (4,203.7, 1.82115e-006)
Data Point: (5,251.9, 9.03222e-007)
Data Point: (6,300, 4.30521e-007)
Data Point: (7,348.1, 2.028516e-007)
Data Point: (8,396.3, 7.73661e-008)
Data Point: (9,444.4, 2.691312e-008)
Data Point: (10,000, 2.691312e-008)
Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Upper Rock

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 36 %
K-Saturation: 0.567
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (0.005, 0.567)
Data Point: (0.01, 0.567)

Data Point: (10,000, 0.567)
Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Till

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 36 %
K-Saturation: 0.000567
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (0.005, 0.000567)
Data Point: (0.01, 0.000567)
Data Point: (10,000, 0.000567)
Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

GC 5.7 E-4 ft/day

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 100 %
K-Saturation: 0.00057
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (10, 0.00057)
Data Point: (1,000, 9e-006)
Data Point: (5,000, 5e-006)
Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Hydraulic K Modifier Functions

1D consol derived k function rmu2 clay

Model: Spline Data Point Function (Y Log)
Function: K-Modifier vs. Y-Effective Stress
Curve Fit to Data: 100 %

Segment Curvature: 75 %
Y-Intercept: 1.2
Data Points: Y-Effective Stress (psf), K-Modifier
Data Point: (1,000, 1.2)
Data Point: (2,000, 1)
Data Point: (4,000, 0.839)
Data Point: (8,000, 0.70417211)
Data Point: (12,000, 0.63551782)
Data Point: (16,000, 0.59090577)

Vol. Water Content Functions

Clay soils OC

Model: Vol WC Data Point Function
Function: Vol. Water Content vs. Pore-Water Pressure
Mv: 7e-005 /psf
Saturated Water Content: 0.31427274 ft^3/ft^3
Residual Water Content: 0.031427274 ft^3/ft^3
Curve Fit to Data: 100 %
Segment Curvature: 100 %
Porosity: 0.31427274
Data Points: Matric Suction (psf), Vol. Water Content (ft^3/ft^3)
Data Point: (0.01, 0.29999999)
Data Point: (0.018329807, 0.29999998)
Data Point: (0.033598183, 0.29999996)
Data Point: (0.061584821, 0.29999991)
Data Point: (0.11288379, 0.29999982)
Data Point: (0.20691381, 0.29999962)
Data Point: (0.37926902, 0.29999917)
Data Point: (0.6951928, 0.29999814)
Data Point: (1.274275, 0.29999578)
Data Point: (2.3357215, 0.29999026)
Data Point: (4.2813324, 0.2999772)
Data Point: (7.8475997, 0.29994599)
Data Point: (14.384499, 0.29987093)
Data Point: (26.366509, 0.29968944)
Data Point: (48.329302, 0.29924951)
Data Point: (88.586679, 0.29818464)
Data Point: (162.37767, 0.29563126)
Data Point: (297.63514, 0.28967022)
Data Point: (545.55948, 0.27661743)
Data Point: (1,000, 0.25163343)
Estimation Properties
Vol. WC Estimation Method: Sample functions
Saturated Water Content: 0.3 ft^3/ft^3
Sample Material: Clay
Liquid Limit: 0 %
Diameter at 10% passing: 0
Diameter at 60% passing: 0
Maximum: 1,000
Minimum: 0.01

Num. Points: 20

Clay soils

Model: Vol WC Data Point Function
Function: Vol. Water Content vs. Pore-Water Pressure
Mv: 0.0004 /psf
Saturated Water Content: 0.60995302 ft^3/ft^3
Residual Water Content: 0.060995302 ft^3/ft^3
Curve Fit to Data: 100 %
Segment Curvature: 100 %
Porosity: 0.60995302
Data Points: Matric Suction (psf), Vol. Water Content (ft^3/ft^3)
Data Point: (0.01, 0.43999998)
Data Point: (0.018329807, 0.43999997)
Data Point: (0.033598183, 0.43999994)
Data Point: (0.061584821, 0.43999987)
Data Point: (0.11288379, 0.43999974)
Data Point: (0.20691381, 0.43999944)
Data Point: (0.37926902, 0.43999878)
Data Point: (0.6951928, 0.43999728)
Data Point: (1.274275, 0.43999381)
Data Point: (2.3357215, 0.43998571)
Data Point: (4.2813324, 0.43996655)
Data Point: (7.8475997, 0.43992079)
Data Point: (14.384499, 0.4398107)
Data Point: (26.366509, 0.43954452)
Data Point: (48.329302, 0.43889927)
Data Point: (88.586679, 0.43733747)
Data Point: (162.37767, 0.43359251)
Data Point: (297.63514, 0.42484965)
Data Point: (545.55948, 0.40570556)
Data Point: (1,000, 0.36906236)
Estimation Properties
Vol. WC Estimation Method: Sample functions
Saturated Water Content: 0.44 ft^3/ft^3
Sample Material: Clay
Liquid Limit: 0 %
Diameter at 10% passing: 0
Diameter at 60% passing: 0
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Till

Model: Vol WC Data Point Function
Function: Vol. Water Content vs. Pore-Water Pressure
Mv: 5e-006 /psf
Saturated Water Content: 0.20000173 ft^3/ft^3
Residual Water Content: 0.020000173 ft^3/ft^3
Curve Fit to Data: 100 %
Segment Curvature: 100 %
Porosity: 0.20000173

Data Points: Matric Suction (psf), Vol. Water Content (ft^3/ft^3)
- Data Point: (0.01, 0.19999999)
- Data Point: (0.018329807, 0.19999999)
- Data Point: (0.033598183, 0.19999997)
- Data Point: (0.061584821, 0.19999993)
- Data Point: (0.11288379, 0.19999985)
- Data Point: (0.20691381, 0.19999967)
- Data Point: (0.37926902, 0.19999922)
- Data Point: (0.6951928, 0.19999811)
- Data Point: (1.274275, 0.19999535)
- Data Point: (2.3357215, 0.19998838)
- Data Point: (4.2813324, 0.19997056)
- Data Point: (7.8475997, 0.19992471)
- Data Point: (14.384499, 0.19980625)
- Data Point: (26.366509, 0.19949952)
- Data Point: (48.329302, 0.19870702)
- Data Point: (88.586679, 0.19668084)
- Data Point: (162.37767, 0.19165467)
- Data Point: (297.63514, 0.18009116)
- Data Point: (545.55948, 0.15752337)
- Data Point: (1,000, 0.12453739)

Estimation Properties
- Vol. WC Estimation Method: Sample functions
- Saturated Water Content: 0.2 ft^3/ft^3
- Sample Material: Silty Clay
- Liquid Limit: 0 %
- Diameter at 10% passing: 0
- Diameter at 60% passing: 0
- Maximum: 1,000
- Minimum: 0.01
- Num. Points: 20

silty sand

Model: Vol WC Data Point Function

Function: Vol. Water Content vs. Pore-Water Pressure
- Mv: 1e-005 /psf
- Saturated Water Content: 0.30000011 ft^3/ft^3
- Residual Water Content: 0.030000011 ft^3/ft^3
- Curve Fit to Data: 100 %
- Segment Curvature: 100 %

Porosity: 0.30000011

Data Points: Matric Suction (psf), Vol. Water Content (ft^3/ft^3)
- Data Point: (0.01, 0.29999996)
- Data Point: (0.018329807, 0.29999991)
- Data Point: (0.033598183, 0.29999977)
- Data Point: (0.061584821, 0.29999942)
- Data Point: (0.11288379, 0.29999854)
- Data Point: (0.20691381, 0.29999626)
- Data Point: (0.37926902, 0.29999039)
- Data Point: (0.6951928, 0.29997521)
- Data Point: (1.274275, 0.29993588)
- Data Point: (2.3357215, 0.29983385)

Data Point: (4.2813324, 0.29956912)
Data Point: (7.8475997, 0.29888334)
Data Point: (14.384499, 0.29711648)
Data Point: (26.366509, 0.29263189)
Data Point: (48.329302, 0.28167657)
Data Point: (88.586679, 0.25725429)
Data Point: (162.37767, 0.21239326)
Data Point: (297.63514, 0.15298031)
Data Point: (545.55948, 0.099847233)
Data Point: (1,000, 0.064649441)

Estimation Properties

Vol. WC Estimation Method: Sample functions
Saturated Water Content: 0.3 ft^3/ft^3
Sample Material: Silty Sand
Liquid Limit: 0 %
Diameter at 10% passing: 0
Diameter at 60% passing: 0
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Points

	X (ft)	Y (ft)
Point 1	0	268.91519
Point 2	207.4978	271.24238
Point 3	209.0232	271.26867
Point 4	215.074	271.32735
Point 5	225.5606	271.44496
Point 6	230.6621	271.56993
Point 7	234.0537	271.62591
Point 8	237.8751	271.70733
Point 9	243.6233	271.78388
Point 10	403.7734	274.99581
Point 11	406.1879	275.04891
Point 12	510.242	277.40528
Point 13	519.1809	277.52295
Point 14	522.2501	277.56833
Point 15	581.5843	278.21948
Point 16	706.5316	275.03632
Point 17	784.4915	272.77004
Point 18	796.8946	272.40949
Point 19	796.8946	278.66207
Point 20	771.752	277.8332

Point 21	583.2389	281.6042
Point 22	512.9202	278.57945
Point 23	404.2686	277.81745
Point 24	248.1947	278.63737
Point 25	83.6675	274.48464
Point 26	78.5956	274.41664
Point 27	69.7373	274.12229
Point 28	0	273.8562
Point 29	0	286.98783
Point 30	69.7373	288.07912
Point 31	78.6615	288.22649
Point 32	83.6675	288.57952
Point 33	248.1947	297.19282
Point 34	404.2686	294.81745
Point 35	512.9202	289.28565
Point 36	583.2389	288.00106
Point 37	796.8946	289.48765
Point 38	0	305.26334
Point 39	63.5351	305.72185
Point 40	69.7373	305.70863
Point 41	77.6371	305.65972
Point 42	78.5956	305.57155
Point 43	83.6675	305.7
Point 44	248.1947	307.61838
Point 45	299.7903	306.27673
Point 46	299.6238	303.28004
Point 47	404.2544	300.5593
Point 48	512.9971	302.35411
Point 49	583.3451	304.79977
Point 50	592.8421	305.14193
Point 51	650.1895	305.15472
Point 52	796.8602	303.47517
Point 53	796.8946	303.47517
Point 54	404.2686	303.55995
Point 55	512.9202	305.35325
Point 56	583.2389	307.79789
Point 57	592.7878	308.14191
Point 58	650.2064	308.15472
Point 59	796.8946	306.47498

Point 60	0	327.67711
Point 61	22.4921	326.28273
Point 62	49.2488	323.27595
Point 63	74.3201	319.27807
Point 64	77.7249	318.65421
Point 65	112.0147	318.69361
Point 66	124.2402	315.77486
Point 67	126.7076	315.31519
Point 68	136.2125	313.12968
Point 69	142.0351	312.45981
Point 70	357.6126	310.47901
Point 71	586.0206	317.13
Point 72	588.0287	317.67977
Point 73	603.6052	322
Point 74	693.0775	322
Point 75	695.4173	323.10644
Point 76	697.3194	324
Point 77	714.7524	332
Point 78	726.8078	332.79458
Point 79	736.4313	333.45251
Point 80	740.2913	333.71166
Point 81	742.8239	333.89241
Point 82	743.6092	331.27888
Point 83	746.0108	331.28559
Point 84	751.3746	333.5338
Point 85	751.5561	333.52887
Point 86	751.6873	333.53898
Point 87	751.9654	333.539
Point 88	755.4965	333.65881
Point 89	757.088	333.70415
Point 90	766.5218	333.52383
Point 91	769.5239	331.03222
Point 92	781.3859	336.00827
Point 93	796.8946	335.53695
Point 94	0	330.67136
Point 95	0.1856	330.67136
Point 96	22.7526	329.27234
Point 97	49.6527	326.24944
Point 98	74.8268	322.23518

Point 99	77.9958	321.65452
Point 100	112.3661	321.69402
Point 101	124.8636	318.71033
Point 102	127.3188	318.25295
Point 103	136.7217	316.09089
Point 104	142.2209	315.45823
Point 105	357.5827	313.47942
Point 106	585.5746	320.11828
Point 107	587.2318	320.57198
Point 108	684.7881	347.62982
Point 109	704.816	348.13028
Point 110	707.7847	347.0118
Point 111	709.4494	346.32322
Point 112	709.6367	345.87345
Point 113	708.0438	345.21
Point 114	685.2332	344.64
Point 115	131.5335	329.79618
Point 116	158.1735	318.33502
Point 117	165.2063	318.28065
Point 118	203.3044	317.9221
Point 119	243.6199	317.55888
Point 120	248.3589	317.51329
Point 121	357.6595	316.4965
Point 122	589.0312	323.16552
Point 123	591.6482	323.89085
Point 124	610.0073	329
Point 125	631.5677	335
Point 126	653.128	341
Point 127	674.6884	347
Point 128	684.1005	349.61929
Point 129	699.8223	350.01168
Point 130	0	332.91188
Point 131	22.4396	331.51733
Point 132	49.1519	328.50799
Point 133	68.0785	325.48185
Point 134	73.6566	324.58998
Point 135	90.5756	324.62675
Point 136	109.5111	324.68581
Point 137	124.0229	330.52741

Point 138	127.0249	330.53586
Point 139	129.8149	330.45078
Point 140	130.027	330.44431
Point 141	274.9823	329
Point 142	252.0124	321.5
Point 143	213.855	321.5
Point 144	177.1587	331.5
Point 145	171.0426	331.5
Point 146	152.2075	323.79526
Point 147	298.6003	335
Point 148	282.6389	331.5
Point 149	287.7433	331.5
Point 150	289.3308	331.95874
Point 151	290.9318	332.5
Point 152	317.0046	341
Point 153	355.3453	347
Point 154	666.3598	347
Point 155	669.6785	345.61929
Point 156	674.6567	347
Point 157	326.7765	344.18573
Point 158	336.1465	343.24706
Point 159	342.0216	342.65356
Point 160	373.7378	353
Point 161	651.9377	353
Point 162	392.1303	359
Point 163	637.5157	359
Point 164	410.5229	365
Point 165	623.0936	365
Point 166	608.6716	371
Point 167	428.9409	371
Point 168	415.8066	366.72364
Point 169	447.0228	377
Point 170	594.2496	377
Point 171	435.4903	373.13237
Point 172	450.0526	378.01608
Point 173	459.9195	378.51574
Point 174	479.4258	379.45192
Point 175	482.5508	379.55699
Point 176	491.9324	380

Point 177	507.2813	380.61621
Point 178	541.8899	382.28139
Point 179	574.2808	382.67429
Point 180	581.1072	381.37657
Point 181	581.6822	381.26488
Point 182	582.2411	381.14975
Point 183	582.7845	381.03125
Point 184	583.313	380.90951
Point 185	583.8273	380.78465
Point 186	584.3278	380.6568
Point 187	584.8152	380.52606
Point 188	585.29	380.39256
Point 189	592.2253	377.82435
Point 190	593.0101	377.51567
Point 191	78.5551	329.67009
Point 192	110.5776	331.89761
Point 193	113.2091	332.06836
Point 194	115.8406	332.21663
Point 195	118.4721	332.34247
Point 196	121.1036	332.44595
Point 197	123.7351	332.5271
Point 198	125.1298	332.55831
Point 199	126.3665	332.19565
Point 200	128.6722	331.5
Point 201	128.9196	331.46994
Point 202	710.0851	346.06023
Point 203	718.4637	349.55
Point 204	736.491	350
Point 205	738.1976	349.29
Point 206	796.8946	253.91519
Point 207	0	253.91519

Lines

	Start Point	End Point	Hydraulic Boundary	Stress/Strain Boundary
Line 1	1	2		
Line 2	2	3		
Line 3	3	4		
Line 4	4	5		

Line 5	5	6		
Line 6	6	7		
Line 7	7	8		
Line 8	8	9		
Line 9	9	10		
Line 10	10	11		
Line 11	11	12		
Line 12	12	13		
Line 13	13	14		
Line 14	14	15		
Line 15	15	16		
Line 16	16	17		
Line 17	17	18		
Line 18	18	19	drainage 313	Fixed X
Line 19	19	20		
Line 20	20	21		
Line 21	21	22		
Line 22	22	23		
Line 23	23	24		
Line 24	24	25		
Line 25	25	26		
Line 26	26	27		
Line 27	27	28		
Line 28	28	1	drainage 313	Fixed X
Line 29	29	30		
Line 30	30	31		
Line 31	31	32		
Line 32	32	33		
Line 33	33	34		
Line 34	34	35		
Line 35	35	36		
Line 36	36	37		
Line 37	37	19	drainage 313	Fixed X
Line 38	28	29	drainage 313	Fixed X
Line 39	38	39		
Line 40	39	40		
Line 41	40	41		
Line 42	41	42		
Line 43	42	43		

Line 44	43	44		
Line 45	44	45		
Line 46	45	46		
Line 47	46	47		
Line 48	47	48		
Line 49	48	49		
Line 50	49	50		
Line 51	50	51		
Line 52	51	52		
Line 53	52	53		
Line 54	53	37	drainage 313	Fixed X
Line 55	29	38	drainage 313	Fixed X
Line 56	45	54		
Line 57	54	55		
Line 58	55	56		
Line 59	56	57		
Line 60	57	58		
Line 61	58	59		
Line 62	59	53	drainage 313	Fixed X
Line 63	60	61		
Line 64	61	62		
Line 65	62	63		
Line 66	63	64		
Line 67	64	65		
Line 68	65	66		
Line 69	66	67		
Line 70	67	68		
Line 71	68	69		
Line 72	69	70		
Line 73	70	71		
Line 74	71	72		
Line 75	72	73		
Line 76	73	74		
Line 77	74	75		
Line 78	75	76		
Line 79	76	77		
Line 80	77	78		
Line 81	78	79		
Line 82	79	80		

Line 83	80	81		
Line 84	81	82		
Line 85	82	83		
Line 86	83	84		
Line 87	84	85		
Line 88	85	86		
Line 89	86	87		
Line 90	87	88		
Line 91	88	89		
Line 92	89	90		
Line 93	90	91		
Line 94	91	92		
Line 95	92	93		
Line 96	93	59	noflowzeropress	Fixed X
Line 97	38	60	noflowzeropress	Fixed X
Line 98	94	95		
Line 99	95	96		
Line 100	96	97		
Line 101	97	98	no flow	
Line 102	98	99	no flow	
Line 103	99	100	no flow	
Line 104	100	101	no flow	
Line 105	101	102	no flow	
Line 106	102	103	no flow	
Line 107	103	104	no flow	
Line 108	104	105	no flow	
Line 109	105	106	no flow	
Line 110	106	107	no flow	
Line 111	107	108	no flow	
Line 112	108	109	no flow	
Line 113	109	110		
Line 114	110	111		
Line 115	111	112		
Line 116	112	113		
Line 117	113	114		
Line 118	114	73		
Line 119	60	94		Fixed X
Line 120	115	116		
Line 121	116	117		

Line 122	117	118		
Line 123	118	119		
Line 124	119	120		
Line 125	120	121		
Line 126	121	122		
Line 127	122	123		
Line 128	123	124		
Line 129	124	125		
Line 130	125	126		
Line 131	126	127		
Line 132	127	128		
Line 133	128	129		
Line 134	129	109		
Line 135	94	130		Fixed X
Line 136	130	131		
Line 137	131	132		
Line 138	132	133		
Line 139	133	134		
Line 140	134	135		
Line 141	135	136		
Line 142	136	137		
Line 143	137	138		
Line 144	138	139		
Line 145	139	140		
Line 146	140	115		
Line 147	124	141		
Line 148	141	142		
Line 149	142	143		
Line 150	143	144		
Line 151	144	145		
Line 152	145	146		
Line 153	146	115		
Line 154	147	125		
Line 155	141	148		
Line 156	148	149		
Line 157	149	150		
Line 158	150	151		
Line 159	151	147		
Line 160	126	152		

Line 161	152	147		
Line 162	153	154		
Line 163	154	155		
Line 164	155	156		
Line 165	156	127		
Line 166	152	157		
Line 167	157	158		
Line 168	158	159		
Line 169	159	153		
Line 170	160	161		
Line 171	161	154		
Line 172	153	160		
Line 173	162	163		
Line 174	163	161		
Line 175	160	162		
Line 176	164	165		
Line 177	165	163		
Line 178	162	164		
Line 179	165	166		
Line 180	166	167		
Line 181	167	168		
Line 182	168	164		
Line 183	169	170		
Line 184	170	166		
Line 185	167	171		
Line 186	171	169		
Line 187	169	172		
Line 188	172	173		
Line 189	173	174		
Line 190	174	175		
Line 191	175	176		
Line 192	176	177		
Line 193	177	178		
Line 194	178	179		
Line 195	179	180		
Line 196	180	181		
Line 197	181	182		
Line 198	182	183		
Line 199	183	184		

Line 200	184	185		
Line 201	185	186		
Line 202	186	187		
Line 203	187	188		
Line 204	188	189		
Line 205	189	190		
Line 206	190	170		
Line 207	133	191		
Line 208	191	192		
Line 209	192	193		
Line 210	193	194		
Line 211	194	195		
Line 212	195	196		
Line 213	196	197		
Line 214	197	198		
Line 215	198	199		
Line 216	199	200		
Line 217	200	201		
Line 218	201	139		
Line 219	112	202		
Line 220	202	203		
Line 221	203	204		
Line 222	204	205		
Line 223	205	81		
Line 224	18	206	drainage 313	Fixed X
Line 225	206	207	drainage 313	Fixed X/Y
Line 226	207	1	drainage 313	Fixed X

Regions

	Material	Points	Area (ft^2)
Region 1	Lower Till	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28	3,346.1
Region 2	Sand/Silt	29,30,31,32,33,34,35,36,37,19,20,21,22,23,24,25,26,27,28	10,671
Region 3	GC-Drained	38,39,40,41,42,43,44,45,46,47,48,49,50,51,52,53,37,36,35,34,33,32,31,30,29	10,397
Region 4	GC OverConsolidated	45,54,55,56,57,58,59,53,52,51,50,49,48,47,46	1,491.9

Region 5	Upper Till	60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78,79,80,81,82,83,84,85,86,87,88,89,90,91,92,93,59,58,57,56,55,54,45,44,43,42,41,40,39,38	9,253.4
Region 6	CCL	94,95,96,97,98,99,100,101,102,103,104,105,106,107,108,109,110,111,112,113,114,73,72,71,70,69,68,67,66,65,64,63,62,61,60	2,139
Region 7	Bottom Liner	115,116,117,118,119,120,121,122,123,124,125,126,127,128,129,109,108,107,106,105,104,103,102,101,100,99,98,97,96,95,94,130,131,132,133,134,135,136,137,138,139,140	2,215.1
Region 8	Waste Material	115,116,117,118,119,120,121,122,123,124,141,142,143,144,145,146	4,104.1
Region 9	Waste Material	147,125,124,141,148,149,150,151	2,001.4
Region 10	Waste Material	147,125,126,152	2,007.3
Region 11	Waste Material	153,154,155,156,127,126,152,157,158,159	1,949.1
Region 12	Waste Material	160,161,154,153	1,767.6
Region 13	Waste Material	162,163,161,160	1,570.8
Region 14	Waste Material	164,165,163,162	1,373.9
Region 15	Waste Material	164,165,166,167,168	1,176.9
Region 16	Waste Material	169,170,166,167,171	980.5
Region 17	Waste Material	169,172,173,174,175,176,177,178,179,180,181,182,183,184,185,186,187,188,189,190,170	534.96
Region 18	Structural Fill	133,191,192,193,194,195,196,197,198,199,200,201,139,138,137,136,135,134	293.23
Region 19	Structural Fill	73,114,113,112,202,203,204,205,81,80,79,78,77,76,75,74	1,934.1
Region 20	UPPER SHALE	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,206,207	15,814

Figure 30 - Coupled Consolidation for Section OP-2 for Waste Lift 10 - 1 Year After Placement

Waste Lift10 El. 383 Consolidation

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File Information

Title: Model City - RMU-2 CP-20 Section OP-2
Comments: Operation Conditions for CP-20 Section 2 Based on Maximum Fill Rate of 50,000 Cu Yds per Quarter
Created By: Peter J. Carey
Revision Number: 498
File Version: 8.0
Tool Version: 8.0.10.6504
Date: 2/25/2013
Time: 7:29:13 AM
File Name: C20OP-2r1.gsz
Directory: N:\Model_City\154.002_rmu2\154.005_revsions\geoslope\operational\

Project Settings

Length(L) Units: feet
Time(t) Units: Days
Force(F) Units: lbf
Pressure(p) Units: psf
Strength Units: psf
Stiffness Units: psf
Unit Weight of Water: 62.4 pcf
Air Pressure: 101.33 psf
View: 2D

Analysis Settings

Waste Lift10 El. 383 Consolidation

Kind: SIGMA/W
Parent: Waste Lift10 El. 383
Method: Coupled Stress/PWP
Settings
- Initial Stress: Parent Analysis
- Initial PWP: Parent Analysis
- Exclude cumulative values: No

Control
- Apply Body Force in All Steps: No
- Saturated Zone Only: No

Convergence
- Maximum Number of Iterations: 50
- Minimum Pressure Head Difference: 0.001
- Minimum Displacement Difference: 0.001
- Significant Digits: 3
- Hydraulic Under-Relaxation Criteria

Under-Relaxation Initial Rate: 1
Under-Relaxation Min. Rate: 0.1
Under-Relaxation Reduction Rate: 0.65
Under-Relaxation Iterations: 10
Equation Solver: Parallel Direct
Time
Starting Time: 693 days
Duration: 365 days
# of Steps: 12
Step Generation Method: Linear
Save Steps Every: 12

Materials

Waste Material

Model: Linear Elastic (Total)
Stress Strain
Young's Modulus (E): 400,000 psf
Unit Weight: 111 pcf
Poisson's Ratio: 0.45

Bottom Liner

Model: Linear Elastic (Total)
Stress Strain
Young's Modulus (E): 400,000 psf
Unit Weight: 120 pcf
Poisson's Ratio: 0.45

CCL

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 1,000,000 psf
Unit Weight: 120 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Clay soils OC
K-Function: GC 5.7 E-4 ft/day
Ky'/Kx' Ratio: 0.1
Rotation: 0 °
Load Response Ratio: 1

Upper Till

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 300,000 psf
Unit Weight: 125 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Till
K-Function: Upper Glacial Till
Ky'/Kx' Ratio: 1

Rotation: 0 °
Load Response Ratio: 1

GC-Drained

Model: Soft Clay (MCC w/ PWP Change)
Stress Strain
O.C. Ratio: 4
Poisson's Ratio: 0.334
Lambda: 0.14
Kappa: 0.013
Initial Void Ratio: 1
Unit Weight: 118 pcf
Phi': 27 °
Hydraulic
Vol. WC. Function: Clay soils
K-Function: GC 5.7 E-4 ft/day
Ky'/Kx' Ratio: 1
Rotation: 0 °
K-Modifier Function: 1D consol derived k function rmu2 clay
Load Response Ratio: 1

GC OverConsolidated

Model: Soft Clay (MCC w/ PWP Change)
Stress Strain
O.C. Ratio: 8
Poisson's Ratio: 0.334
Lambda: 0.06
Kappa: 0.01
Initial Void Ratio: 0.5
Unit Weight: 125 pcf
Phi': 30 °
Hydraulic
Vol. WC. Function: Clay soils OC
K-Function: GC 5.7 E-4 ft/day
Ky'/Kx' Ratio: 1
Rotation: 0 °
K-Modifier Function: 1D consol derived k function rmu2 clay
Load Response Ratio: 1

Sand/Silt

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 300,000 psf
Unit Weight: 135 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: silty sand
K-Function: Silty Sand, k = 0.567 ft/day 2 E-4cm/sec
Ky'/Kx' Ratio: 0.1
Rotation: 0 °
Load Response Ratio: 1

Lower Till

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 600,000 psf
Unit Weight: 145 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Till
K-Function: Till
Ky'/Kx' Ratio: 1
Rotation: 0 °
Load Response Ratio: 1

Structural Fill

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 100,000 psf
Unit Weight: 135 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Till
K-Function: Till
Ky'/Kx' Ratio: 1
Rotation: 0 °
Load Response Ratio: 1

UPPER SHALE

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 1,000,000 psf
Unit Weight: 145 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Till
K-Function: Upper Rock
Ky'/Kx' Ratio: 1
Rotation: 0 °
Load Response Ratio: 1

Boundary Conditions

Fixed X

X: X-Displacement 0

Fixed X/Y

X: X-Displacement 0
Y: Y-Displacement 0

no flow

Type: Total Flux (Q) 0

Review: No

noflowzeropress

Type: Total Flux (Q) 0
Review: Yes

drainage 313

Type: Head (H) 313
Review: No

Initial Water Tables

Initial Water Table 1

Max. negative head: 5
Coordinates
Coordinate 1: (0, 315) ft
Coordinate 2: (850, 315) ft

K Functions

Silty Sand, k = 0.567 ft/day 2 E-4cm/sec

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 36 %
K-Saturation: 0.567
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (0.005, 0.567)
Data Point: (0.01, 0.567)
Data Point: (0.035938, 0.567)
Data Point: (0.12915, 0.567)
Data Point: (0.46416, 0.567)
Data Point: (1.1111, 0.567)
Data Point: (1.6681, 0.567)
Data Point: (5.9948, 0.567)
Data Point: (21.544, 0.567)
Data Point: (77.426, 0.567)
Data Point: (105.93, 0.5402376)
Data Point: (210.74, 0.3387258)
Data Point: (278.26, 0.2567376)
Data Point: (315.56, 0.2232846)
Data Point: (420.37, 0.1406916)
Data Point: (525.19, 0.0779121)
Data Point: (630, 0.03843882)
Data Point: (734.81, 0.01673406)
Data Point: (839.63, 0.005422788)
Data Point: (944.44, 0.000745983)
Data Point: (1,000, 7.14735e-005)
Estimation Properties

Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Upper Glacial Till

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 36 %
K-Saturation: 0.0057
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (0.005, 0.0057)
Data Point: (0.01, 0.0057)
Data Point: (0.046416, 0.0057)
Data Point: (0.21544, 0.0057)
Data Point: (1, 0.0057)
Data Point: (4.6416, 0.0057)
Data Point: (11.111, 0.0057)
Data Point: (21.544, 0.0057)
Data Point: (100, 0.0057)
Data Point: (464.16, 0.0016245)
Data Point: (1,059.3, 0.0002427972)
Data Point: (2,107.4, 1.492716e-005)
Data Point: (2,154.4, 1.369596e-005)
Data Point: (3,155.6, 4.086672e-006)
Data Point: (4,203.7, 1.82115e-006)
Data Point: (5,251.9, 9.03222e-007)
Data Point: (6,300, 4.30521e-007)
Data Point: (7,348.1, 2.028516e-007)
Data Point: (8,396.3, 7.73661e-008)
Data Point: (9,444.4, 2.691312e-008)
Data Point: (10,000, 2.691312e-008)
Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Upper Rock

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 36 %
K-Saturation: 0.567
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (0.005, 0.567)
Data Point: (0.01, 0.567)

Data Point: (10,000, 0.567)
Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Till

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 36 %
K-Saturation: 0.000567
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (0.005, 0.000567)
Data Point: (0.01, 0.000567)
Data Point: (10,000, 0.000567)
Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

GC 5.7 E-4 ft/day

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 100 %
K-Saturation: 0.00057
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (10, 0.00057)
Data Point: (1,000, 9e-006)
Data Point: (5,000, 5e-006)
Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Hydraulic K Modifier Functions

1D consol derived k function rmu2 clay

Model: Spline Data Point Function (Y Log)
Function: K-Modifier vs. Y-Effective Stress
Curve Fit to Data: 100 %

Segment Curvature: 75 %
Y-Intercept: 1.2
Data Points: Y-Effective Stress (psf), K-Modifier
Data Point: (1,000, 1.2)
Data Point: (2,000, 1)
Data Point: (4,000, 0.839)
Data Point: (8,000, 0.70417211)
Data Point: (12,000, 0.63551782)
Data Point: (16,000, 0.59090577)

Vol. Water Content Functions

Clay soils OC

Model: Vol WC Data Point Function
Function: Vol. Water Content vs. Pore-Water Pressure
Mv: 7e-005 /psf
Saturated Water Content: 0.31427274 ft^3/ft^3
Residual Water Content: 0.031427274 ft^3/ft^3
Curve Fit to Data: 100 %
Segment Curvature: 100 %
Porosity: 0.31427274
Data Points: Matric Suction (psf), Vol. Water Content (ft^3/ft^3)
Data Point: (0.01, 0.29999999)
Data Point: (0.018329807, 0.29999998)
Data Point: (0.033598183, 0.29999996)
Data Point: (0.061584821, 0.29999991)
Data Point: (0.11288379, 0.29999982)
Data Point: (0.20691381, 0.29999962)
Data Point: (0.37926902, 0.29999917)
Data Point: (0.6951928, 0.29999814)
Data Point: (1.274275, 0.29999578)
Data Point: (2.3357215, 0.29999026)
Data Point: (4.2813324, 0.2999772)
Data Point: (7.8475997, 0.29994599)
Data Point: (14.384499, 0.29987093)
Data Point: (26.366509, 0.29968944)
Data Point: (48.329302, 0.29924951)
Data Point: (88.586679, 0.29818464)
Data Point: (162.37767, 0.29563126)
Data Point: (297.63514, 0.28967022)
Data Point: (545.55948, 0.27661743)
Data Point: (1,000, 0.25163343)
Estimation Properties
Vol. WC Estimation Method: Sample functions
Saturated Water Content: 0.3 ft^3/ft^3
Sample Material: Clay
Liquid Limit: 0 %
Diameter at 10% passing: 0
Diameter at 60% passing: 0
Maximum: 1,000
Minimum: 0.01

Num. Points: 20

Clay soils

Model: Vol WC Data Point Function
Function: Vol. Water Content vs. Pore-Water Pressure
Mv: 0.0004 /psf
Saturated Water Content: 0.60995302 ft^3/ft^3
Residual Water Content: 0.060995302 ft^3/ft^3
Curve Fit to Data: 100 %
Segment Curvature: 100 %
Porosity: 0.60995302
Data Points: Matric Suction (psf), Vol. Water Content (ft^3/ft^3)
Data Point: (0.01, 0.43999998)
Data Point: (0.018329807, 0.43999997)
Data Point: (0.033598183, 0.43999994)
Data Point: (0.061584821, 0.43999987)
Data Point: (0.11288379, 0.43999974)
Data Point: (0.20691381, 0.43999944)
Data Point: (0.37926902, 0.43999878)
Data Point: (0.6951928, 0.43999728)
Data Point: (1.274275, 0.43999381)
Data Point: (2.3357215, 0.43998571)
Data Point: (4.2813324, 0.43996655)
Data Point: (7.8475997, 0.43992079)
Data Point: (14.384499, 0.4398107)
Data Point: (26.366509, 0.43954452)
Data Point: (48.329302, 0.43889927)
Data Point: (88.586679, 0.43733747)
Data Point: (162.37767, 0.43359251)
Data Point: (297.63514, 0.42484965)
Data Point: (545.55948, 0.40570556)
Data Point: (1,000, 0.36906236)
Estimation Properties
Vol. WC Estimation Method: Sample functions
Saturated Water Content: 0.44 ft^3/ft^3
Sample Material: Clay
Liquid Limit: 0 %
Diameter at 10% passing: 0
Diameter at 60% passing: 0
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Till

Model: Vol WC Data Point Function
Function: Vol. Water Content vs. Pore-Water Pressure
Mv: 5e-006 /psf
Saturated Water Content: 0.20000173 ft^3/ft^3
Residual Water Content: 0.020000173 ft^3/ft^3
Curve Fit to Data: 100 %
Segment Curvature: 100 %
Porosity: 0.20000173

Data Points: Matric Suction (psf), Vol. Water Content (ft^3/ft^3)
- Data Point: (0.01, 0.19999999)
- Data Point: (0.018329807, 0.19999999)
- Data Point: (0.033598183, 0.19999997)
- Data Point: (0.061584821, 0.19999993)
- Data Point: (0.11288379, 0.19999985)
- Data Point: (0.20691381, 0.19999967)
- Data Point: (0.37926902, 0.19999922)
- Data Point: (0.6951928, 0.19999811)
- Data Point: (1.274275, 0.19999535)
- Data Point: (2.3357215, 0.19998838)
- Data Point: (4.2813324, 0.19997056)
- Data Point: (7.8475997, 0.19992471)
- Data Point: (14.384499, 0.19980625)
- Data Point: (26.366509, 0.19949952)
- Data Point: (48.329302, 0.19870702)
- Data Point: (88.586679, 0.19668084)
- Data Point: (162.37767, 0.19165467)
- Data Point: (297.63514, 0.18009116)
- Data Point: (545.55948, 0.15752337)
- Data Point: (1,000, 0.12453739)

Estimation Properties
- Vol. WC Estimation Method: Sample functions
- Saturated Water Content: 0.2 ft^3/ft^3
- Sample Material: Silty Clay
- Liquid Limit: 0 %
- Diameter at 10% passing: 0
- Diameter at 60% passing: 0
- Maximum: 1,000
- Minimum: 0.01
- Num. Points: 20

silty sand

Model: Vol WC Data Point Function

Function: Vol. Water Content vs. Pore-Water Pressure
- Mv: 1e-005 /psf
- Saturated Water Content: 0.30000011 ft^3/ft^3
- Residual Water Content: 0.030000011 ft^3/ft^3
- Curve Fit to Data: 100 %
- Segment Curvature: 100 %

Porosity: 0.30000011

Data Points: Matric Suction (psf), Vol. Water Content (ft^3/ft^3)
- Data Point: (0.01, 0.29999996)
- Data Point: (0.018329807, 0.29999991)
- Data Point: (0.033598183, 0.29999977)
- Data Point: (0.061584821, 0.29999942)
- Data Point: (0.11288379, 0.29999854)
- Data Point: (0.20691381, 0.29999626)
- Data Point: (0.37926902, 0.29999039)
- Data Point: (0.6951928, 0.29997521)
- Data Point: (1.274275, 0.29993588)
- Data Point: (2.3357215, 0.29983385)

Data Point: (4.2813324, 0.29956912)
Data Point: (7.8475997, 0.29888334)
Data Point: (14.384499, 0.29711648)
Data Point: (26.366509, 0.29263189)
Data Point: (48.329302, 0.28167657)
Data Point: (88.586679, 0.25725429)
Data Point: (162.37767, 0.21239326)
Data Point: (297.63514, 0.15298031)
Data Point: (545.55948, 0.099847233)
Data Point: (1,000, 0.064649441)

Estimation Properties

Vol. WC Estimation Method: Sample functions
Saturated Water Content: 0.3 ft^3/ft^3
Sample Material: Silty Sand
Liquid Limit: 0 %
Diameter at 10% passing: 0
Diameter at 60% passing: 0
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Points

	X (ft)	Y (ft)
Point 1	0	268.91519
Point 2	207.4978	271.24238
Point 3	209.0232	271.26867
Point 4	215.074	271.32735
Point 5	225.5606	271.44496
Point 6	230.6621	271.56993
Point 7	234.0537	271.62591
Point 8	237.8751	271.70733
Point 9	243.6233	271.78388
Point 10	403.7734	274.99581
Point 11	406.1879	275.04891
Point 12	510.242	277.40528
Point 13	519.1809	277.52295
Point 14	522.2501	277.56833
Point 15	581.5843	278.21948
Point 16	706.5316	275.03632
Point 17	784.4915	272.77004
Point 18	796.8946	272.40949
Point 19	796.8946	278.66207
Point 20	771.752	277.8332

Point 21	583.2389	281.6042
Point 22	512.9202	278.57945
Point 23	404.2686	277.81745
Point 24	248.1947	278.63737
Point 25	83.6675	274.48464
Point 26	78.5956	274.41664
Point 27	69.7373	274.12229
Point 28	0	273.8562
Point 29	0	286.98783
Point 30	69.7373	288.07912
Point 31	78.6615	288.22649
Point 32	83.6675	288.57952
Point 33	248.1947	297.19282
Point 34	404.2686	294.81745
Point 35	512.9202	289.28565
Point 36	583.2389	288.00106
Point 37	796.8946	289.48765
Point 38	0	305.26334
Point 39	63.5351	305.72185
Point 40	69.7373	305.70863
Point 41	77.6371	305.65972
Point 42	78.5956	305.57155
Point 43	83.6675	305.7
Point 44	248.1947	307.61838
Point 45	299.7903	306.27673
Point 46	299.6238	303.28004
Point 47	404.2544	300.5593
Point 48	512.9971	302.35411
Point 49	583.3451	304.79977
Point 50	592.8421	305.14193
Point 51	650.1895	305.15472
Point 52	796.8602	303.47517
Point 53	796.8946	303.47517
Point 54	404.2686	303.55995
Point 55	512.9202	305.35325
Point 56	583.2389	307.79789
Point 57	592.7878	308.14191
Point 58	650.2064	308.15472
Point 59	796.8946	306.47498

Point 60	0	327.67711
Point 61	22.4921	326.28273
Point 62	49.2488	323.27595
Point 63	74.3201	319.27807
Point 64	77.7249	318.65421
Point 65	112.0147	318.69361
Point 66	124.2402	315.77486
Point 67	126.7076	315.31519
Point 68	136.2125	313.12968
Point 69	142.0351	312.45981
Point 70	357.6126	310.47901
Point 71	586.0206	317.13
Point 72	588.0287	317.67977
Point 73	603.6052	322
Point 74	693.0775	322
Point 75	695.4173	323.10644
Point 76	697.3194	324
Point 77	714.7524	332
Point 78	726.8078	332.79458
Point 79	736.4313	333.45251
Point 80	740.2913	333.71166
Point 81	742.8239	333.89241
Point 82	743.6092	331.27888
Point 83	746.0108	331.28559
Point 84	751.3746	333.5338
Point 85	751.5561	333.52887
Point 86	751.6873	333.53898
Point 87	751.9654	333.539
Point 88	755.4965	333.65881
Point 89	757.088	333.70415
Point 90	766.5218	333.52383
Point 91	769.5239	331.03222
Point 92	781.3859	336.00827
Point 93	796.8946	335.53695
Point 94	0	330.67136
Point 95	0.1856	330.67136
Point 96	22.7526	329.27234
Point 97	49.6527	326.24944
Point 98	74.8268	322.23518

Point 99	77.9958	321.65452
Point 100	112.3661	321.69402
Point 101	124.8636	318.71033
Point 102	127.3188	318.25295
Point 103	136.7217	316.09089
Point 104	142.2209	315.45823
Point 105	357.5827	313.47942
Point 106	585.5746	320.11828
Point 107	587.2318	320.57198
Point 108	684.7881	347.62982
Point 109	704.816	348.13028
Point 110	707.7847	347.0118
Point 111	709.4494	346.32322
Point 112	709.6367	345.87345
Point 113	708.0438	345.21
Point 114	685.2332	344.64
Point 115	131.5335	329.79618
Point 116	158.1735	318.33502
Point 117	165.2063	318.28065
Point 118	203.3044	317.9221
Point 119	243.6199	317.55888
Point 120	248.3589	317.51329
Point 121	357.6595	316.4965
Point 122	589.0312	323.16552
Point 123	591.6482	323.89085
Point 124	610.0073	329
Point 125	631.5677	335
Point 126	653.128	341
Point 127	674.6884	347
Point 128	684.1005	349.61929
Point 129	699.8223	350.01168
Point 130	0	332.91188
Point 131	22.4396	331.51733
Point 132	49.1519	328.50799
Point 133	68.0785	325.48185
Point 134	73.6566	324.58998
Point 135	90.5756	324.62675
Point 136	109.5111	324.68581
Point 137	124.0229	330.52741

Point 138	127.0249	330.53586
Point 139	129.8149	330.45078
Point 140	130.027	330.44431
Point 141	274.9823	329
Point 142	252.0124	321.5
Point 143	213.855	321.5
Point 144	177.1587	331.5
Point 145	171.0426	331.5
Point 146	152.2075	323.79526
Point 147	298.6003	335
Point 148	282.6389	331.5
Point 149	287.7433	331.5
Point 150	289.3308	331.95874
Point 151	290.9318	332.5
Point 152	317.0046	341
Point 153	355.3453	347
Point 154	666.3598	347
Point 155	669.6785	345.61929
Point 156	674.6567	347
Point 157	326.7765	344.18573
Point 158	336.1465	343.24706
Point 159	342.0216	342.65356
Point 160	373.7378	353
Point 161	651.9377	353
Point 162	392.1303	359
Point 163	637.5157	359
Point 164	410.5229	365
Point 165	623.0936	365
Point 166	608.6716	371
Point 167	428.9409	371
Point 168	415.8066	366.72364
Point 169	447.0228	377
Point 170	594.2496	377
Point 171	435.4903	373.13237
Point 172	450.0526	378.01608
Point 173	459.9195	378.51574
Point 174	479.4258	379.45192
Point 175	482.5508	379.55699
Point 176	491.9324	380

Point 177	507.2813	380.61621
Point 178	541.8899	382.28139
Point 179	574.2808	382.67429
Point 180	581.1072	381.37657
Point 181	581.6822	381.26488
Point 182	582.2411	381.14975
Point 183	582.7845	381.03125
Point 184	583.313	380.90951
Point 185	583.8273	380.78465
Point 186	584.3278	380.6568
Point 187	584.8152	380.52606
Point 188	585.29	380.39256
Point 189	592.2253	377.82435
Point 190	593.0101	377.51567
Point 191	78.5551	329.67009
Point 192	110.5776	331.89761
Point 193	113.2091	332.06836
Point 194	115.8406	332.21663
Point 195	118.4721	332.34247
Point 196	121.1036	332.44595
Point 197	123.7351	332.5271
Point 198	125.1298	332.55831
Point 199	126.3665	332.19565
Point 200	128.6722	331.5
Point 201	128.9196	331.46994
Point 202	710.0851	346.06023
Point 203	718.4637	349.55
Point 204	736.491	350
Point 205	738.1976	349.29
Point 206	796.8946	253.91519
Point 207	0	253.91519

Lines

	Start Point	End Point	Hydraulic Boundary	Stress/Strain Boundary
Line 1	1	2		
Line 2	2	3		
Line 3	3	4		
Line 4	4	5		

Line 5	5	6		
Line 6	6	7		
Line 7	7	8		
Line 8	8	9		
Line 9	9	10		
Line 10	10	11		
Line 11	11	12		
Line 12	12	13		
Line 13	13	14		
Line 14	14	15		
Line 15	15	16		
Line 16	16	17		
Line 17	17	18		
Line 18	18	19	drainage 313	Fixed X
Line 19	19	20		
Line 20	20	21		
Line 21	21	22		
Line 22	22	23		
Line 23	23	24		
Line 24	24	25		
Line 25	25	26		
Line 26	26	27		
Line 27	27	28		
Line 28	28	1	drainage 313	Fixed X
Line 29	29	30		
Line 30	30	31		
Line 31	31	32		
Line 32	32	33		
Line 33	33	34		
Line 34	34	35		
Line 35	35	36		
Line 36	36	37		
Line 37	37	19	drainage 313	Fixed X
Line 38	28	29	drainage 313	Fixed X
Line 39	38	39		
Line 40	39	40		
Line 41	40	41		
Line 42	41	42		
Line 43	42	43		

Line 44	43	44		
Line 45	44	45		
Line 46	45	46		
Line 47	46	47		
Line 48	47	48		
Line 49	48	49		
Line 50	49	50		
Line 51	50	51		
Line 52	51	52		
Line 53	52	53		
Line 54	53	37	drainage 313	Fixed X
Line 55	29	38	drainage 313	Fixed X
Line 56	45	54		
Line 57	54	55		
Line 58	55	56		
Line 59	56	57		
Line 60	57	58		
Line 61	58	59		
Line 62	59	53	drainage 313	Fixed X
Line 63	60	61		
Line 64	61	62		
Line 65	62	63		
Line 66	63	64		
Line 67	64	65		
Line 68	65	66		
Line 69	66	67		
Line 70	67	68		
Line 71	68	69		
Line 72	69	70		
Line 73	70	71		
Line 74	71	72		
Line 75	72	73		
Line 76	73	74		
Line 77	74	75		
Line 78	75	76		
Line 79	76	77		
Line 80	77	78		
Line 81	78	79		
Line 82	79	80		

Line 83	80	81		
Line 84	81	82		
Line 85	82	83		
Line 86	83	84		
Line 87	84	85		
Line 88	85	86		
Line 89	86	87		
Line 90	87	88		
Line 91	88	89		
Line 92	89	90		
Line 93	90	91		
Line 94	91	92		
Line 95	92	93		
Line 96	93	59	noflowzeropress	Fixed X
Line 97	38	60	noflowzeropress	Fixed X
Line 98	94	95		
Line 99	95	96		
Line 100	96	97		
Line 101	97	98	no flow	
Line 102	98	99	no flow	
Line 103	99	100	no flow	
Line 104	100	101	no flow	
Line 105	101	102	no flow	
Line 106	102	103	no flow	
Line 107	103	104	no flow	
Line 108	104	105	no flow	
Line 109	105	106	no flow	
Line 110	106	107	no flow	
Line 111	107	108	no flow	
Line 112	108	109	no flow	
Line 113	109	110		
Line 114	110	111		
Line 115	111	112		
Line 116	112	113		
Line 117	113	114		
Line 118	114	73		
Line 119	60	94		Fixed X
Line 120	115	116		
Line 121	116	117		

Line 122	117	118		
Line 123	118	119		
Line 124	119	120		
Line 125	120	121		
Line 126	121	122		
Line 127	122	123		
Line 128	123	124		
Line 129	124	125		
Line 130	125	126		
Line 131	126	127		
Line 132	127	128		
Line 133	128	129		
Line 134	129	109		
Line 135	94	130		Fixed X
Line 136	130	131		
Line 137	131	132		
Line 138	132	133		
Line 139	133	134		
Line 140	134	135		
Line 141	135	136		
Line 142	136	137		
Line 143	137	138		
Line 144	138	139		
Line 145	139	140		
Line 146	140	115		
Line 147	124	141		
Line 148	141	142		
Line 149	142	143		
Line 150	143	144		
Line 151	144	145		
Line 152	145	146		
Line 153	146	115		
Line 154	147	125		
Line 155	141	148		
Line 156	148	149		
Line 157	149	150		
Line 158	150	151		
Line 159	151	147		
Line 160	126	152		

Line 161	152	147		
Line 162	153	154		
Line 163	154	155		
Line 164	155	156		
Line 165	156	127		
Line 166	152	157		
Line 167	157	158		
Line 168	158	159		
Line 169	159	153		
Line 170	160	161		
Line 171	161	154		
Line 172	153	160		
Line 173	162	163		
Line 174	163	161		
Line 175	160	162		
Line 176	164	165		
Line 177	165	163		
Line 178	162	164		
Line 179	165	166		
Line 180	166	167		
Line 181	167	168		
Line 182	168	164		
Line 183	169	170		
Line 184	170	166		
Line 185	167	171		
Line 186	171	169		
Line 187	169	172		
Line 188	172	173		
Line 189	173	174		
Line 190	174	175		
Line 191	175	176		
Line 192	176	177		
Line 193	177	178		
Line 194	178	179		
Line 195	179	180		
Line 196	180	181		
Line 197	181	182		
Line 198	182	183		
Line 199	183	184		

Line 200	184	185		
Line 201	185	186		
Line 202	186	187		
Line 203	187	188		
Line 204	188	189		
Line 205	189	190		
Line 206	190	170		
Line 207	133	191		
Line 208	191	192		
Line 209	192	193		
Line 210	193	194		
Line 211	194	195		
Line 212	195	196		
Line 213	196	197		
Line 214	197	198		
Line 215	198	199		
Line 216	199	200		
Line 217	200	201		
Line 218	201	139		
Line 219	112	202		
Line 220	202	203		
Line 221	203	204		
Line 222	204	205		
Line 223	205	81		
Line 224	18	206	drainage 313	Fixed X
Line 225	206	207	drainage 313	Fixed X/Y
Line 226	207	1	drainage 313	Fixed X

Regions

	Material	Points	Area (ft²)
Region 1	Lower Till	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28	3,346.1
Region 2	Sand/Silt	29,30,31,32,33,34,35,36,37,19,20,21,22,23,24,25,26,27,28	10,671
Region 3	GC-Drained	38,39,40,41,42,43,44,45,46,47,48,49,50,51,52,53,37,36,35,34,33,32,31,30,29	10,397
Region 4	GC OverConsolidated	45,54,55,56,57,58,59,53,52,51,50,49,48,47,46	1,491.9
Region 5	Upper Till	60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78,79,	9,253.4

		80,81,82,83,84,85,86,87,88,89,90,91,92,93,59,58,57,56,55,54,45,44,43,42,41,40,39,38	
Region 6	CCL	94,95,96,97,98,99,100,101,102,103,104,105,106,107,108,109,110,111,112,113,114,73,72,71,70,69,68,67,66,65,64,63,62,61,60	2,139
Region 7	Bottom Liner	115,116,117,118,119,120,121,122,123,124,125,126,127,128,129,109,108,107,106,105,104,103,102,101,100,99,98,97,96,95,94,130,131,132,133,134,135,136,137,138,139,140	2,215.1
Region 8	Waste Material	115,116,117,118,119,120,121,122,123,124,141,142,143,144,145,146	4,104.1
Region 9	Waste Material	147,125,124,141,148,149,150,151	2,001.4
Region 10	Waste Material	147,125,126,152	2,007.3
Region 11	Waste Material	153,154,155,156,127,126,152,157,158,159	1,949.1
Region 12	Waste Material	160,161,154,153	1,767.6
Region 13	Waste Material	162,163,161,160	1,570.8
Region 14	Waste Material	164,165,163,162	1,373.9
Region 15	Waste Material	164,165,166,167,168	1,176.9
Region 16	Waste Material	169,170,166,167,171	980.5
Region 17	Waste Material	169,172,173,174,175,176,177,178,179,180,181,182,183,184,185,186,187,188,189,190,170	534.96
Region 18	Structural Fill	133,191,192,193,194,195,196,197,198,199,200,201,139,138,137,136,135,134	293.23
Region 19	Structural Fill	73,114,113,112,202,203,204,205,81,80,79,78,77,76,75,74	1,934.1
Region 20	UPPER SHALE	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,206,207	15,814

Figure 31 - Coupled Consolidation for Section OP-2 for Waste Lift 10 with GSS Varied K

Waste Lift10 El. 383

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File Information

Title: Model City - RMU-2 CP-20 Section OP-2
Comments: Operation Conditions for CP-20 Section 2 Based on Maximum Fill Rate of 50,000 Cu Yds per Quarter
Created By: Peter J. Carey
Revision Number: 497
File Version: 8.0
Tool Version: 8.0.10.6504
Date: 2/24/2013
Time: 3:09:25 PM
File Name: C20OP-2r1_gssk.gsz
Directory: N:\Model_City\154.002_rmu2\154.005_revsions\geoslope\operational\

Project Settings

Length(L) Units: feet
Time(t) Units: Days
Force(F) Units: lbf
Pressure(p) Units: psf
Strength Units: psf
Stiffness Units: psf
Unit Weight of Water: 62.4 pcf
Air Pressure: 101.33 psf
View: 2D

Analysis Settings

Waste Lift10 El. 383

Kind: SIGMA/W
Parent: Waste Lift 9 El. 377
Method: Coupled Stress/PWP
Settings
    Initial Stress: Parent Analysis
    Initial PWP: Parent Analysis
    Exclude cumulative values: No
Control
    Apply Body Force in All Steps: No
    Saturated Zone Only: No
Convergence
    Maximum Number of Iterations: 50
    Minimum Pressure Head Difference: 0.001
    Minimum Displacement Difference: 0.001
    Significant Digits: 3
    Hydraulic Under-Relaxation Criteria

Under-Relaxation Initial Rate: 1
Under-Relaxation Min. Rate: 0.1
Under-Relaxation Reduction Rate: 0.65
Under-Relaxation Iterations: 10
Equation Solver: Parallel Direct
Time
Starting Time: 675 days
Duration: 18 days
# of Steps: 12
Step Generation Method: Linear
Save Steps Every: 4

Materials

Waste Material

Model: Linear Elastic (Total)
Stress Strain
Young's Modulus (E): 400,000 psf
Unit Weight: 111 pcf
Poisson's Ratio: 0.45

Bottom Liner

Model: Linear Elastic (Total)
Stress Strain
Young's Modulus (E): 400,000 psf
Unit Weight: 120 pcf
Poisson's Ratio: 0.45

CCL

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 1,000,000 psf
Unit Weight: 120 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Clay soils OC
K-Function: GC 5.7 E-4 ft/day
Ky'/Kx' Ratio: 0.1
Rotation: 0 °
Load Response Ratio: 1

Upper Till

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 300,000 psf
Unit Weight: 125 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Till
K-Function: Upper Glacial Till
Ky'/Kx' Ratio: 1

Rotation: 0 °
Load Response Ratio: 1

GC-Drained

Model: Soft Clay (MCC w/ PWP Change)
Stress Strain
O.C. Ratio: 4
Poisson's Ratio: 0.334
Lambda: 0.14
Kappa: 0.013
Initial Void Ratio: 1
Unit Weight: 118 pcf
Phi': 27 °
Hydraulic
Vol. WC. Function: Clay soils
K-Function: GC 5.7 E-4 ft/day
Ky'/Kx' Ratio: 1
Rotation: 0 °
K-Modifier Function: 1D consol derived k function rmu2 clay
Load Response Ratio: 1

GC OverConsolidated

Model: Soft Clay (MCC w/ PWP Change)
Stress Strain
O.C. Ratio: 8
Poisson's Ratio: 0.334
Lambda: 0.06
Kappa: 0.01
Initial Void Ratio: 0.5
Unit Weight: 125 pcf
Phi': 30 °
Hydraulic
Vol. WC. Function: Clay soils OC
K-Function: GC 5.7 E-4 ft/day
Ky'/Kx' Ratio: 1
Rotation: 0 °
K-Modifier Function: 1D consol derived k function rmu2 clay
Load Response Ratio: 1

Sand/Silt

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 300,000 psf
Unit Weight: 135 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: silty sand
K-Function: Silty Sand, k = 0.0567 ft/day 2 E-5cm/sec (2)
Ky'/Kx' Ratio: 0.1
Rotation: 0 °
Load Response Ratio: 1

Lower Till

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 600,000 psf
Unit Weight: 145 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Till
K-Function: Till
Ky'/Kx' Ratio: 1
Rotation: 0 °
Load Response Ratio: 1

Structural Fill

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 100,000 psf
Unit Weight: 135 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Till
K-Function: Till
Ky'/Kx' Ratio: 1
Rotation: 0 °
Load Response Ratio: 1

UPPER SHALE

Model: Linear Elastic (w/ PWP Change)
Stress Strain
Effective Young's Modulus (E'): 1,000,000 psf
Unit Weight: 145 pcf
Poisson's Ratio: 0.334
Hydraulic
Vol. WC. Function: Till
K-Function: Upper Rock
Ky'/Kx' Ratio: 1
Rotation: 0 °
Load Response Ratio: 1

Boundary Conditions

Fixed X

X: X-Displacement 0

Fixed X/Y

X: X-Displacement 0
Y: Y-Displacement 0

no flow

Type: Total Flux (Q) 0

Review: No

noflowzeropress

Type: Total Flux (Q) 0
Review: Yes

drainage 313

Type: Head (H) 313
Review: No

Initial Water Tables

Initial Water Table 1

Max. negative head: 5
Coordinates
Coordinate 1: (0, 315) ft
Coordinate 2: (850, 315) ft

K Functions

Upper Glacial Till

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 36 %
K-Saturation: 0.0057
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (0.005, 0.0057)
Data Point: (0.01, 0.0057)
Data Point: (0.046416, 0.0057)
Data Point: (0.21544, 0.0057)
Data Point: (1, 0.0057)
Data Point: (4.6416, 0.0057)
Data Point: (11.111, 0.0057)
Data Point: (21.544, 0.0057)
Data Point: (100, 0.0057)
Data Point: (464.16, 0.0016245)
Data Point: (1,059.3, 0.0002427972)
Data Point: (2,107.4, 1.492716e-005)
Data Point: (2,154.4, 1.369596e-005)
Data Point: (3,155.6, 4.086672e-006)
Data Point: (4,203.7, 1.82115e-006)
Data Point: (5,251.9, 9.03222e-007)
Data Point: (6,300, 4.30521e-007)
Data Point: (7,348.1, 2.028516e-007)
Data Point: (8,396.3, 7.73661e-008)
Data Point: (9,444.4, 2.691312e-008)
Data Point: (10,000, 2.691312e-008)
Estimation Properties

Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Upper Rock

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 36 %
K-Saturation: 0.567
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (0.005, 0.567)
Data Point: (0.01, 0.567)
Data Point: (10,000, 0.567)
Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Till

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 36 %
K-Saturation: 0.000567
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (0.005, 0.000567)
Data Point: (0.01, 0.000567)
Data Point: (10,000, 0.000567)
Estimation Properties
Hyd. K-Function Estimation Method: Van Genuchten Function
Hydraulic K Sat: 0 ft/days
Residual Water Content: 0 ft^3/ft^3
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

GC 5.7 E-4 ft/day

Model: Hyd K Data Point Function
Function: X-Conductivity vs. Pore-Water Pressure
Curve Fit to Data: 100 %
Segment Curvature: 100 %
K-Saturation: 0.00057
Data Points: Matric Suction (psf), X-Conductivity (ft/days)
Data Point: (10, 0.00057)
Data Point: (1,000, 9e-006)

Data Point: (5,000, 5e-006)

Estimation Properties

Hyd. K-Function Estimation Method: Van Genuchten Function

Hydraulic K Sat: 0 ft/days

Residual Water Content: 0 ft^3/ft^3

Maximum: 1,000

Minimum: 0.01

Num. Points: 20

Silty Sand, k = 0.0567 ft/day 2 E-5cm/sec (2)

Model: Hyd K Data Point Function

Function: X-Conductivity vs. Pore-Water Pressure

Curve Fit to Data: 100 %

Segment Curvature: 36 %

K-Saturation: 0.0567

Data Points: Matric Suction (psf), X-Conductivity (ft/days)

Data Point: (0.005, 0.0567)

Data Point: (0.01, 0.0567)

Data Point: (0.035938, 0.0567)

Data Point: (0.12915, 0.0567)

Data Point: (0.46416, 0.0567)

Data Point: (1.1111, 0.0567)

Data Point: (1.6681, 0.0567)

Data Point: (5.9948, 0.0567)

Data Point: (21.544, 0.0567)

Data Point: (77.426, 0.0567)

Data Point: (105.93, 0.05402376)

Data Point: (210.74, 0.03387258)

Data Point: (278.26, 0.02567376)

Data Point: (315.56, 0.02232846)

Data Point: (420.37, 0.01406916)

Data Point: (525.19, 0.00779121)

Data Point: (630, 0.003843882)

Data Point: (734.81, 0.001673406)

Data Point: (839.63, 0.0005422788)

Data Point: (944.44, 7.45983e-005)

Data Point: (1,000, 7.14735e-006)

Estimation Properties

Hyd. K-Function Estimation Method: Van Genuchten Function

Hydraulic K Sat: 0 ft/days

Residual Water Content: 0 ft^3/ft^3

Maximum: 1,000

Minimum: 0.01

Num. Points: 20

Hydraulic K Modifier Functions

1D consol derived k function rmu2 clay

Model: Spline Data Point Function (Y Log)

Function: K-Modifier vs. Y-Effective Stress

Curve Fit to Data: 100 %

Segment Curvature: 75 %
Y-Intercept: 1.2
Data Points: Y-Effective Stress (psf), K-Modifier
Data Point: (1,000, 1.2)
Data Point: (2,000, 1)
Data Point: (4,000, 0.839)
Data Point: (8,000, 0.70417211)
Data Point: (12,000, 0.63551782)
Data Point: (16,000, 0.59090577)

Vol. Water Content Functions

Clay soils OC

Model: Vol WC Data Point Function
Function: Vol. Water Content vs. Pore-Water Pressure
Mv: 7e-005 /psf
Saturated Water Content: 0.31427274 ft^3/ft^3
Residual Water Content: 0.031427274 ft^3/ft^3
Curve Fit to Data: 100 %
Segment Curvature: 100 %
Porosity: 0.31427274
Data Points: Matric Suction (psf), Vol. Water Content (ft^3/ft^3)
Data Point: (0.01, 0.29999999)
Data Point: (0.018329807, 0.29999998)
Data Point: (0.033598183, 0.29999996)
Data Point: (0.061584821, 0.29999991)
Data Point: (0.11288379, 0.29999982)
Data Point: (0.20691381, 0.29999962)
Data Point: (0.37926902, 0.29999917)
Data Point: (0.6951928, 0.29999814)
Data Point: (1.274275, 0.29999578)
Data Point: (2.3357215, 0.29999026)
Data Point: (4.2813324, 0.2999772)
Data Point: (7.8475997, 0.29994599)
Data Point: (14.384499, 0.29987093)
Data Point: (26.366509, 0.29968944)
Data Point: (48.329302, 0.29924951)
Data Point: (88.586679, 0.29818464)
Data Point: (162.37767, 0.29563126)
Data Point: (297.63514, 0.28967022)
Data Point: (545.55948, 0.27661743)
Data Point: (1,000, 0.25163343)
Estimation Properties
Vol. WC Estimation Method: Sample functions
Saturated Water Content: 0.3 ft^3/ft^3
Sample Material: Clay
Liquid Limit: 0 %
Diameter at 10% passing: 0
Diameter at 60% passing: 0
Maximum: 1,000
Minimum: 0.01

Num. Points: 20

Clay soils

Model: Vol WC Data Point Function
Function: Vol. Water Content vs. Pore-Water Pressure
Mv: 0.0004 /psf
Saturated Water Content: 0.60995302 ft^3/ft^3
Residual Water Content: 0.060995302 ft^3/ft^3
Curve Fit to Data: 100 %
Segment Curvature: 100 %
Porosity: 0.60995302
Data Points: Matric Suction (psf), Vol. Water Content (ft^3/ft^3)
Data Point: (0.01, 0.43999998)
Data Point: (0.018329807, 0.43999997)
Data Point: (0.033598183, 0.43999994)
Data Point: (0.061584821, 0.43999987)
Data Point: (0.11288379, 0.43999974)
Data Point: (0.20691381, 0.43999944)
Data Point: (0.37926902, 0.43999878)
Data Point: (0.6951928, 0.43999728)
Data Point: (1.274275, 0.43999381)
Data Point: (2.3357215, 0.43998571)
Data Point: (4.2813324, 0.43996655)
Data Point: (7.8475997, 0.43992079)
Data Point: (14.384499, 0.4398107)
Data Point: (26.366509, 0.43954452)
Data Point: (48.329302, 0.43889927)
Data Point: (88.586679, 0.43733747)
Data Point: (162.37767, 0.43359251)
Data Point: (297.63514, 0.42484965)
Data Point: (545.55948, 0.40570556)
Data Point: (1,000, 0.36906236)
Estimation Properties
Vol. WC Estimation Method: Sample functions
Saturated Water Content: 0.44 ft^3/ft^3
Sample Material: Clay
Liquid Limit: 0 %
Diameter at 10% passing: 0
Diameter at 60% passing: 0
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Till

Model: Vol WC Data Point Function
Function: Vol. Water Content vs. Pore-Water Pressure
Mv: 5e-006 /psf
Saturated Water Content: 0.20000173 ft^3/ft^3
Residual Water Content: 0.020000173 ft^3/ft^3
Curve Fit to Data: 100 %
Segment Curvature: 100 %
Porosity: 0.20000173

Data Points: Matric Suction (psf), Vol. Water Content (ft^3/ft^3)
- Data Point: (0.01, 0.19999999)
- Data Point: (0.018329807, 0.19999999)
- Data Point: (0.033598183, 0.19999997)
- Data Point: (0.061584821, 0.19999993)
- Data Point: (0.11288379, 0.19999985)
- Data Point: (0.20691381, 0.19999967)
- Data Point: (0.37926902, 0.19999922)
- Data Point: (0.6951928, 0.19999811)
- Data Point: (1.274275, 0.19999535)
- Data Point: (2.3357215, 0.19998838)
- Data Point: (4.2813324, 0.19997056)
- Data Point: (7.8475997, 0.19992471)
- Data Point: (14.384499, 0.19980625)
- Data Point: (26.366509, 0.19949952)
- Data Point: (48.329302, 0.19870702)
- Data Point: (88.586679, 0.19668084)
- Data Point: (162.37767, 0.19165467)
- Data Point: (297.63514, 0.18009116)
- Data Point: (545.55948, 0.15752337)
- Data Point: (1,000, 0.12453739)

Estimation Properties
- Vol. WC Estimation Method: Sample functions
- Saturated Water Content: 0.2 ft^3/ft^3
- Sample Material: Silty Clay
- Liquid Limit: 0 %
- Diameter at 10% passing: 0
- Diameter at 60% passing: 0
- Maximum: 1,000
- Minimum: 0.01
- Num. Points: 20

silty sand

Model: Vol WC Data Point Function

Function: Vol. Water Content vs. Pore-Water Pressure
- Mv: 1e-005 /psf
- Saturated Water Content: 0.30000011 ft^3/ft^3
- Residual Water Content: 0.030000011 ft^3/ft^3
- Curve Fit to Data: 100 %
- Segment Curvature: 100 %

Porosity: 0.30000011

Data Points: Matric Suction (psf), Vol. Water Content (ft^3/ft^3)
- Data Point: (0.01, 0.29999996)
- Data Point: (0.018329807, 0.29999991)
- Data Point: (0.033598183, 0.29999977)
- Data Point: (0.061584821, 0.29999942)
- Data Point: (0.11288379, 0.29999854)
- Data Point: (0.20691381, 0.29999626)
- Data Point: (0.37926902, 0.29999039)
- Data Point: (0.6951928, 0.29997521)
- Data Point: (1.274275, 0.29993588)
- Data Point: (2.3357215, 0.29983385)

Data Point: (4.2813324, 0.29956912)
Data Point: (7.8475997, 0.29888334)
Data Point: (14.384499, 0.29711648)
Data Point: (26.366509, 0.29263189)
Data Point: (48.329302, 0.28167657)
Data Point: (88.586679, 0.25725429)
Data Point: (162.37767, 0.21239326)
Data Point: (297.63514, 0.15298031)
Data Point: (545.55948, 0.099847233)
Data Point: (1,000, 0.064649441)

Estimation Properties

Vol. WC Estimation Method: Sample functions
Saturated Water Content: 0.3 ft^3/ft^3
Sample Material: Silty Sand
Liquid Limit: 0 %
Diameter at 10% passing: 0
Diameter at 60% passing: 0
Maximum: 1,000
Minimum: 0.01
Num. Points: 20

Points

	X (ft)	Y (ft)
Point 1	0	268.91519
Point 2	207.4978	271.24238
Point 3	209.0232	271.26867
Point 4	215.074	271.32735
Point 5	225.5606	271.44496
Point 6	230.6621	271.56993
Point 7	234.0537	271.62591
Point 8	237.8751	271.70733
Point 9	243.6233	271.78388
Point 10	403.7734	274.99581
Point 11	406.1879	275.04891
Point 12	510.242	277.40528
Point 13	519.1809	277.52295
Point 14	522.2501	277.56833
Point 15	581.5843	278.21948
Point 16	706.5316	275.03632
Point 17	784.4915	272.77004
Point 18	796.8946	272.40949
Point 19	796.8946	278.66207
Point 20	771.752	277.8332

Point 21	583.2389	281.6042
Point 22	512.9202	278.57945
Point 23	404.2686	277.81745
Point 24	248.1947	278.63737
Point 25	83.6675	274.48464
Point 26	78.5956	274.41664
Point 27	69.7373	274.12229
Point 28	0	273.8562
Point 29	0	286.98783
Point 30	69.7373	288.07912
Point 31	78.6615	288.22649
Point 32	83.6675	288.57952
Point 33	248.1947	297.19282
Point 34	404.2686	294.81745
Point 35	512.9202	289.28565
Point 36	583.2389	288.00106
Point 37	796.8946	289.48765
Point 38	0	305.26334
Point 39	63.5351	305.72185
Point 40	69.7373	305.70863
Point 41	77.6371	305.65972
Point 42	78.5956	305.57155
Point 43	83.6675	305.7
Point 44	248.1947	307.61838
Point 45	299.7903	306.27673
Point 46	299.6238	303.28004
Point 47	404.2544	300.5593
Point 48	512.9971	302.35411
Point 49	583.3451	304.79977
Point 50	592.8421	305.14193
Point 51	650.1895	305.15472
Point 52	796.8602	303.47517
Point 53	796.8946	303.47517
Point 54	404.2686	303.55995
Point 55	512.9202	305.35325
Point 56	583.2389	307.79789
Point 57	592.7878	308.14191
Point 58	650.2064	308.15472
Point 59	796.8946	306.47498

Point 60	0	327.67711
Point 61	22.4921	326.28273
Point 62	49.2488	323.27595
Point 63	74.3201	319.27807
Point 64	77.7249	318.65421
Point 65	112.0147	318.69361
Point 66	124.2402	315.77486
Point 67	126.7076	315.31519
Point 68	136.2125	313.12968
Point 69	142.0351	312.45981
Point 70	357.6126	310.47901
Point 71	586.0206	317.13
Point 72	588.0287	317.67977
Point 73	603.6052	322
Point 74	693.0775	322
Point 75	695.4173	323.10644
Point 76	697.3194	324
Point 77	714.7524	332
Point 78	726.8078	332.79458
Point 79	736.4313	333.45251
Point 80	740.2913	333.71166
Point 81	742.8239	333.89241
Point 82	743.6092	331.27888
Point 83	746.0108	331.28559
Point 84	751.3746	333.5338
Point 85	751.5561	333.52887
Point 86	751.6873	333.53898
Point 87	751.9654	333.539
Point 88	755.4965	333.65881
Point 89	757.088	333.70415
Point 90	766.5218	333.52383
Point 91	769.5239	331.03222
Point 92	781.3859	336.00827
Point 93	796.8946	335.53695
Point 94	0	330.67136
Point 95	0.1856	330.67136
Point 96	22.7526	329.27234
Point 97	49.6527	326.24944
Point 98	74.8268	322.23518

Point 99	77.9958	321.65452
Point 100	112.3661	321.69402
Point 101	124.8636	318.71033
Point 102	127.3188	318.25295
Point 103	136.7217	316.09089
Point 104	142.2209	315.45823
Point 105	357.5827	313.47942
Point 106	585.5746	320.11828
Point 107	587.2318	320.57198
Point 108	684.7881	347.62982
Point 109	704.816	348.13028
Point 110	707.7847	347.0118
Point 111	709.4494	346.32322
Point 112	709.6367	345.87345
Point 113	708.0438	345.21
Point 114	685.2332	344.64
Point 115	131.5335	329.79618
Point 116	158.1735	318.33502
Point 117	165.2063	318.28065
Point 118	203.3044	317.9221
Point 119	243.6199	317.55888
Point 120	248.3589	317.51329
Point 121	357.6595	316.4965
Point 122	589.0312	323.16552
Point 123	591.6482	323.89085
Point 124	610.0073	329
Point 125	631.5677	335
Point 126	653.128	341
Point 127	674.6884	347
Point 128	684.1005	349.61929
Point 129	699.8223	350.01168
Point 130	0	332.91188
Point 131	22.4396	331.51733
Point 132	49.1519	328.50799
Point 133	68.0785	325.48185
Point 134	73.6566	324.58998
Point 135	90.5756	324.62675
Point 136	109.5111	324.68581
Point 137	124.0229	330.52741

Point 138	127.0249	330.53586
Point 139	129.8149	330.45078
Point 140	130.027	330.44431
Point 141	274.9823	329
Point 142	252.0124	321.5
Point 143	213.855	321.5
Point 144	177.1587	331.5
Point 145	171.0426	331.5
Point 146	152.2075	323.79526
Point 147	298.6003	335
Point 148	282.6389	331.5
Point 149	287.7433	331.5
Point 150	289.3308	331.95874
Point 151	290.9318	332.5
Point 152	317.0046	341
Point 153	355.3453	347
Point 154	666.3598	347
Point 155	669.6785	345.61929
Point 156	674.6567	347
Point 157	326.7765	344.18573
Point 158	336.1465	343.24706
Point 159	342.0216	342.65356
Point 160	373.7378	353
Point 161	651.9377	353
Point 162	392.1303	359
Point 163	637.5157	359
Point 164	410.5229	365
Point 165	623.0936	365
Point 166	608.6716	371
Point 167	428.9409	371
Point 168	415.8066	366.72364
Point 169	447.0228	377
Point 170	594.2496	377
Point 171	435.4903	373.13237
Point 172	450.0526	378.01608
Point 173	459.9195	378.51574
Point 174	479.4258	379.45192
Point 175	482.5508	379.55699
Point 176	491.9324	380

Point 177	507.2813	380.61621
Point 178	541.8899	382.28139
Point 179	574.2808	382.67429
Point 180	581.1072	381.37657
Point 181	581.6822	381.26488
Point 182	582.2411	381.14975
Point 183	582.7845	381.03125
Point 184	583.313	380.90951
Point 185	583.8273	380.78465
Point 186	584.3278	380.6568
Point 187	584.8152	380.52606
Point 188	585.29	380.39256
Point 189	592.2253	377.82435
Point 190	593.0101	377.51567
Point 191	78.5551	329.67009
Point 192	110.5776	331.89761
Point 193	113.2091	332.06836
Point 194	115.8406	332.21663
Point 195	118.4721	332.34247
Point 196	121.1036	332.44595
Point 197	123.7351	332.5271
Point 198	125.1298	332.55831
Point 199	126.3665	332.19565
Point 200	128.6722	331.5
Point 201	128.9196	331.46994
Point 202	710.0851	346.06023
Point 203	718.4637	349.55
Point 204	736.491	350
Point 205	738.1976	349.29
Point 206	796.8946	253.91519
Point 207	0	253.91519

Lines

	Start Point	End Point	Hydraulic Boundary	Stress/Strain Boundary
Line 1	1	2		
Line 2	2	3		
Line 3	3	4		
Line 4	4	5		

Line 5	5	6		
Line 6	6	7		
Line 7	7	8		
Line 8	8	9		
Line 9	9	10		
Line 10	10	11		
Line 11	11	12		
Line 12	12	13		
Line 13	13	14		
Line 14	14	15		
Line 15	15	16		
Line 16	16	17		
Line 17	17	18		
Line 18	18	19	drainage 313	Fixed X
Line 19	19	20		
Line 20	20	21		
Line 21	21	22		
Line 22	22	23		
Line 23	23	24		
Line 24	24	25		
Line 25	25	26		
Line 26	26	27		
Line 27	27	28		
Line 28	28	1	drainage 313	Fixed X
Line 29	29	30		
Line 30	30	31		
Line 31	31	32		
Line 32	32	33		
Line 33	33	34		
Line 34	34	35		
Line 35	35	36		
Line 36	36	37		
Line 37	37	19	drainage 313	Fixed X
Line 38	28	29	drainage 313	Fixed X
Line 39	38	39		
Line 40	39	40		
Line 41	40	41		
Line 42	41	42		
Line 43	42	43		

Line 44	43	44		
Line 45	44	45		
Line 46	45	46		
Line 47	46	47		
Line 48	47	48		
Line 49	48	49		
Line 50	49	50		
Line 51	50	51		
Line 52	51	52		
Line 53	52	53		
Line 54	53	37	drainage 313	Fixed X
Line 55	29	38	drainage 313	Fixed X
Line 56	45	54		
Line 57	54	55		
Line 58	55	56		
Line 59	56	57		
Line 60	57	58		
Line 61	58	59		
Line 62	59	53	drainage 313	Fixed X
Line 63	60	61		
Line 64	61	62		
Line 65	62	63		
Line 66	63	64		
Line 67	64	65		
Line 68	65	66		
Line 69	66	67		
Line 70	67	68		
Line 71	68	69		
Line 72	69	70		
Line 73	70	71		
Line 74	71	72		
Line 75	72	73		
Line 76	73	74		
Line 77	74	75		
Line 78	75	76		
Line 79	76	77		
Line 80	77	78		
Line 81	78	79		
Line 82	79	80		

Line 83	80	81		
Line 84	81	82		
Line 85	82	83		
Line 86	83	84		
Line 87	84	85		
Line 88	85	86		
Line 89	86	87		
Line 90	87	88		
Line 91	88	89		
Line 92	89	90		
Line 93	90	91		
Line 94	91	92		
Line 95	92	93		
Line 96	93	59	noflowzeropress	Fixed X
Line 97	38	60	noflowzeropress	Fixed X
Line 98	94	95		
Line 99	95	96		
Line 100	96	97		
Line 101	97	98	no flow	
Line 102	98	99	no flow	
Line 103	99	100	no flow	
Line 104	100	101	no flow	
Line 105	101	102	no flow	
Line 106	102	103	no flow	
Line 107	103	104	no flow	
Line 108	104	105	no flow	
Line 109	105	106	no flow	
Line 110	106	107	no flow	
Line 111	107	108	no flow	
Line 112	108	109	no flow	
Line 113	109	110		
Line 114	110	111		
Line 115	111	112		
Line 116	112	113		
Line 117	113	114		
Line 118	114	73		
Line 119	60	94		Fixed X
Line 120	115	116		
Line 121	116	117		

Line 122	117	118		
Line 123	118	119		
Line 124	119	120		
Line 125	120	121		
Line 126	121	122		
Line 127	122	123		
Line 128	123	124		
Line 129	124	125		
Line 130	125	126		
Line 131	126	127		
Line 132	127	128		
Line 133	128	129		
Line 134	129	109		
Line 135	94	130		Fixed X
Line 136	130	131		
Line 137	131	132		
Line 138	132	133		
Line 139	133	134		
Line 140	134	135		
Line 141	135	136		
Line 142	136	137		
Line 143	137	138		
Line 144	138	139		
Line 145	139	140		
Line 146	140	115		
Line 147	124	141		
Line 148	141	142		
Line 149	142	143		
Line 150	143	144		
Line 151	144	145		
Line 152	145	146		
Line 153	146	115		
Line 154	147	125		
Line 155	141	148		
Line 156	148	149		
Line 157	149	150		
Line 158	150	151		
Line 159	151	147		
Line 160	126	152		

Line 161	152	147		
Line 162	153	154		
Line 163	154	155		
Line 164	155	156		
Line 165	156	127		
Line 166	152	157		
Line 167	157	158		
Line 168	158	159		
Line 169	159	153		
Line 170	160	161		
Line 171	161	154		
Line 172	153	160		
Line 173	162	163		
Line 174	163	161		
Line 175	160	162		
Line 176	164	165		
Line 177	165	163		
Line 178	162	164		
Line 179	165	166		
Line 180	166	167		
Line 181	167	168		
Line 182	168	164		
Line 183	169	170		
Line 184	170	166		
Line 185	167	171		
Line 186	171	169		
Line 187	169	172		
Line 188	172	173		
Line 189	173	174		
Line 190	174	175		
Line 191	175	176		
Line 192	176	177		
Line 193	177	178		
Line 194	178	179		
Line 195	179	180		
Line 196	180	181		
Line 197	181	182		
Line 198	182	183		
Line 199	183	184		

Line 200	184	185		
Line 201	185	186		
Line 202	186	187		
Line 203	187	188		
Line 204	188	189		
Line 205	189	190		
Line 206	190	170		
Line 207	133	191		
Line 208	191	192		
Line 209	192	193		
Line 210	193	194		
Line 211	194	195		
Line 212	195	196		
Line 213	196	197		
Line 214	197	198		
Line 215	198	199		
Line 216	199	200		
Line 217	200	201		
Line 218	201	139		
Line 219	112	202		
Line 220	202	203		
Line 221	203	204		
Line 222	204	205		
Line 223	205	81		
Line 224	18	206	drainage 313	Fixed X
Line 225	206	207	drainage 313	Fixed X/Y
Line 226	207	1	drainage 313	Fixed X

Regions

	Material	Points	Area (ft²)
Region 1	Lower Till	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28	3,346.1
Region 2	Sand/Silt	29,30,31,32,33,34,35,36,37,19,20,21,22,23,24,25,26,27,28	10,671
Region 3	GC-Drained	38,39,40,41,42,43,44,45,46,47,48,49,50,51,52,53,37,36,35,34,33,32,31,30,29	10,397
Region 4	GC OverConsolidated	45,54,55,56,57,58,59,53,52,51,50,49,48,47,46	1,491.9

Region 5	Upper Till	60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78,79,80,81,82,83,84,85,86,87,88,89,90,91,92,93,59,58,57,56,55,54,45,44,43,42,41,40,39,38	9,253.4
Region 6	CCL	94,95,96,97,98,99,100,101,102,103,104,105,106,107,108,109,110,111,112,113,114,73,72,71,70,69,68,67,66,65,64,63,62,61,60	2,139
Region 7	Bottom Liner	115,116,117,118,119,120,121,122,123,124,125,126,127,128,129,109,108,107,106,105,104,103,102,101,100,99,98,97,96,95,94,130,131,132,133,134,135,136,137,138,139,140	2,215.1
Region 8	Waste Material	115,116,117,118,119,120,121,122,123,124,141,142,143,144,145,146	4,104.1
Region 9	Waste Material	147,125,124,141,148,149,150,151	2,001.4
Region 10	Waste Material	147,125,126,152	2,007.3
Region 11	Waste Material	153,154,155,156,127,126,152,157,158,159	1,949.1
Region 12	Waste Material	160,161,154,153	1,767.6
Region 13	Waste Material	162,163,161,160	1,570.8
Region 14	Waste Material	164,165,163,162	1,373.9
Region 15	Waste Material	164,165,166,167,168	1,176.9
Region 16	Waste Material	169,170,166,167,171	980.5
Region 17	Waste Material	169,172,173,174,175,176,177,178,179,180,181,182,183,184,185,186,187,188,189,190,170	534.96
Region 18	Structural Fill	133,191,192,193,194,195,196,197,198,199,200,201,139,138,137,136,135,134	293.23
Region 19	Structural Fill	73,114,113,112,202,203,204,205,81,80,79,78,77,76,75,74	1,934.1
Region 20	UPPER SHALE	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,206,207	15,814

Figure 33 Stability for Section OP-1, Unbuttressed Long Term Drained Conditions

Waste Lift10 - consolidated ESA

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File Information

Title: Model City - RMU-2 CP-20 Section OP-1
Comments: Operation Conditions for CP-20 Section 1 Based on Maximum Fill Rate of 50,000 Cu Yds per Quarter
Created By: Peter J. Carey
Last Edited By: Peter J. Carey
Revision Number: 511
File Version: 8.0
Tool Version: 8.0.10.6504
Date: 2/24/2013
Time: 3:48:00 PM
File Name: C20OP-1r1.gsz
Directory: N:\Model_City\154.002_rmu2\154.005_revsions\geoslope\operational\
Last Solved Date: 2/24/2013
Last Solved Time: 4:06:56 PM

Project Settings

Length(L) Units: feet
Time(t) Units: Days
Force(F) Units: lbf
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D

Analysis Settings

Waste Lift10 - consolidated ESA

Description: Drained based on consolidation after 1yr
Kind: SLOPE/W
Parent: WASTE LIFT 10 EL. 383 - consol
Method: Morgenstern-Price
Settings
- Side Function
  - Interslice force function option: Half-Sine
- Lambda
  - Lambda 1: -1
  - Lambda 2: -0.8
  - Lambda 3: -0.6
  - Lambda 4: -0.4
  - Lambda 5: -0.2
  - Lambda 6: 0
  - Lambda 7: 0.2

Lambda 8: 0.4
Lambda 9: 0.6
Lambda 10: 0.8
Lambda 11: 1
PWP Conditions Source: Parent Analysis
Slip Surface
Direction of movement: Right to Left
Use Passive Mode: No
Slip Surface Option: Entry and Exit
Critical slip surfaces saved: 1
Optimize Critical Slip Surface Location: Yes
Tension Crack
Tension Crack Option: (none)
F of S Distribution
F of S Calculation Option: Constant
Advanced
Number of Slices: 30
F of S Tolerance: 0.001
Minimum Slip Surface Depth: 15 ft
Optimization Maximum Iterations: 2,000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

Waste Material

Model: Mohr-Coulomb
Unit Weight: 111 pcf
Cohesion': 0 psf
Phi': 30 °
Phi-B: 0 °

Bottom Liner

Model: Shear/Normal Fn.
Unit Weight: 120 pcf
Strength Function: Baseliner
Phi-B: 0 °

CCL

Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 1,000 psf
Phi': 10 °
Phi-B: 0 °

Upper Till

Model: Mohr-Coulomb

Unit Weight: 125 pcf
Cohesion': 150 psf
Phi': 31 °
Phi-B: 0 °

GC-Drained

Model: Shear/Normal Fn.
Unit Weight: 118 pcf
Strength Function: normalized N^m
Phi-B: 0 °
Anisotropic Strength Fn: clay ellipse staticshear

GC OverConsolidated

Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 100 psf
Phi': 30 °
Phi-B: 0 °

Deflection surface

Model: Bedrock (Impenetrable)

Structural Fill

Model: Mohr-Coulomb
Unit Weight: 135 pcf
Cohesion': 1,000 psf
Phi': 45 °
Phi-B: 0 °

NOT ACTIVE

Model: (None)

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (76.8668, 319.45558) ft
Left-Zone Right Coordinate: (171.8639, 324.99999) ft
Left-Zone Increment: 10
Right Projection: Range
Right-Zone Left Coordinate: (290, 363.58286) ft
Right-Zone Right Coordinate: (399.9028, 380.82588) ft
Right-Zone Increment: 10
Radius Increments: 8

Slip Surface Limits

Left Coordinate: (63.808718, 319.21096) ft
Right Coordinate: (446.87317, 382.21462) ft

Anisotropic Strength Functions

clay ellipse staticshear

Model: Spline Data Point Function
Function: Modifier Factor vs. Inclination
Curve Fit to Data: 100 %
Segment Curvature: 50 %
Y-Intercept: 0.706
Data Points: Inclination (°), Modifier Factor
Data Point: (-60, 0.92608827)
Data Point: (-30, 0.92608827)
Data Point: (-17.838428, 0.83077031)
Data Point: (-3, 0.70608827)
Data Point: (3, 0.70608827)
Data Point: (23.685228, 0.82618324)
Data Point: (39.261389, 0.92608827)
Data Point: (59.397364, 0.92608827)

Shear/Normal Strength Functions

Baseliner

Model: Shear/Normal Spline Data Point Function
Function: Shear Stress vs. Normal Stress
Curve Fit to Data: 100 %
Segment Curvature: 100 %
Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
Data Point: (0, 0)
Data Point: (500, 235)
Data Point: (1,000, 463)
Data Point: (2,000, 899)
Data Point: (5,000, 2,057)
Data Point: (10,000, 3,515)
Data Point: (15,000, 4,430)
Estimation Properties
Intact Rock Param.: 10
Geological Strength: 100
Disturbance Factor: 0
SigmaC: 600,000 psf
SigmaC: 300,000 psf
Num. Points: 20

normalized N^m

Model: Add-In Function
Function: Shear Stress vs. Normal Stress
Assembly: GeoStudio AddIns1
Function: Mesri1
Field
tan_Phi_100kPa: .548982
power: .147

pa: 2089
Y-Intercept: -1.#IND

Points

	X (ft)	Y (ft)
Point 1	561.5172	329
Point 2	184.2753	329
Point 3	174.1934	323.83525
Point 4	351.3603	319.67886
Point 5	546.7523	324.07989
Point 6	139.5241	323.62981
Point 7	0	321.01609
Point 8	0	318.01563
Point 9	133.22	320.51124
Point 10	196.3072	335
Point 11	579.5227	335
Point 12	597.5282	341
Point 13	208.339	341
Point 14	608.5585	347
Point 15	240.1424	347
Point 16	234.9596	345.27685
Point 17	219.929	346.77965
Point 18	611.3486	345.60539
Point 19	596.5548	353
Point 20	258.1852	353
Point 21	250.6076	350.4794
Point 22	276.2227	359
Point 23	584.5511	359
Point 24	294.2603	365
Point 25	572.5474	365
Point 26	312.2978	371
Point 27	560.5437	371
Point 28	548.5399	377
Point 29	330.1036	377
Point 30	325.5389	375.4045
Point 31	337.8201	379.69712
Point 32	364.4177	380
Point 33	381.0855	380.33726
Point 34	395.5929	380.71635

Point 35	416.8543	381.25666
Point 36	438.0487	382
Point 37	479.1653	383
Point 38	511.5499	383
Point 39	512.0826	382.82242
Point 40	513.8708	383
Point 41	531.0491	383
Point 42	533.1096	382.31347
Point 43	533.1107	382.31305
Point 44	536.5271	381.01628
Point 45	537.9265	380.70839
Point 46	547.5083	377.51565
Point 47	346.883	383
Point 48	493.5541	389
Point 49	363.3465	389
Point 50	371.2953	391.89686
Point 51	372.0119	391.98713
Point 52	372.2345	391.99514
Point 53	372.3208	392
Point 54	374.2156	392.05341
Point 55	419.4544	394.02388
Point 56	423.1399	394.1518
Point 57	476.0285	394.84323
Point 58	0	275.56112
Point 59	82.561	276.49127
Point 60	84.7322	276.34451
Point 61	123.7177	276.54438
Point 62	191.6961	277.65321
Point 63	430.1918	279.01879
Point 64	487.7086	279.639
Point 65	509.7138	279.55021
Point 66	721.9937	279.02461
Point 67	839	278.53365
Point 68	839	283.95091
Point 69	694.2381	280.02879
Point 70	505.5772	282.211
Point 71	487.7086	281.69555
Point 72	430.1918	282.66537
Point 73	247.1163	283.77931

Point 74	191.6961	282.79673
Point 75	123.7177	280.19493
Point 76	93.9325	281.10076
Point 77	61.0988	279.7585
Point 78	0	281.01485
Point 79	839	292.1407
Point 80	505.5772	286.98428
Point 81	487.7086	287.07159
Point 82	430.1918	289.73652
Point 83	247.1163	297.70175
Point 84	123.7177	292.05467
Point 85	94.7708	289.80875
Point 86	84.7322	289.65003
Point 87	82.561	289.66397
Point 88	38.9609	289.4325
Point 89	0	289.19587
Point 90	0	300.53803
Point 91	17.729	300.30563
Point 92	61.8788	299.93669
Point 93	191.626	301.3549
Point 94	247.1555	301.9218
Point 95	430.2162	304.83853
Point 96	487.7442	304.85433
Point 97	505.6491	305.27434
Point 98	509.7473	305.37466
Point 99	564.3735	305.25518
Point 100	839	303.47923
Point 101	839	306.47929
Point 102	564.3865	308.25516
Point 103	509.7138	308.37474
Point 104	505.5772	308.27348
Point 105	487.7086	307.85432
Point 106	430.1918	307.83852
Point 107	247.1163	304.92156
Point 108	191.6961	304.35577
Point 109	123.7177	308.23059
Point 110	93.9325	306.13974
Point 111	81.2213	307.4429
Point 112	61.5521	302.93952

Point 113	17.7611	303.30547
Point 114	0	303.53785
Point 115	839	315.0402
Point 116	797.6335	315.91598
Point 117	788.4831	316.10833
Point 118	751.3873	316.84226
Point 119	746.5947	316.94222
Point 120	742.0308	317.02756
Point 121	740.5664	317.15339
Point 122	740.3716	317.22293
Point 123	737.8797	317.29393
Point 124	718.0152	324.01292
Point 125	711.8056	325.93525
Point 126	706.0898	327.46147
Point 127	700.0454	333.50592
Point 128	694.499	330.73293
Point 129	691.9982	333.23326
Point 130	680.0323	333.54954
Point 131	679.8975	333.54516
Point 132	674.9116	331.05465
Point 133	672.911	331.05491
Point 134	672.1929	333.92615
Point 135	648.0416	332
Point 136	642.1238	328.67972
Point 137	637.4622	326.05461
Point 138	633.8287	324
Point 139	632.6094	323.29395
Point 140	630.3447	322
Point 141	556.3265	322
Point 142	544.3989	318.02536
Point 143	351.3575	313.67727
Point 144	171.7713	317.89042
Point 145	158.9451	319.66188
Point 146	146.7629	317.7643
Point 147	0	315.01616
Point 148	126.916	317.39267
Point 149	624.2673	344.64
Point 150	642.7896	345.19608
Point 151	639.8757	348.10995

Point 152	623.7369	347.62543
Point 153	543.8794	321.01441
Point 154	351.3589	316.67806
Point 155	172.0125	320.88559
Point 156	158.9189	322.69398
Point 157	146.5027	320.75996
Point 158	161.8204	329.91734
Point 159	162.0292	329.91734
Point 160	169.8774	325.99323
Point 161	172.2537	323.88076
Point 162	158.8927	325.72607
Point 163	146.2426	323.75561
Point 164	144.6459	323.72571
Point 165	157.0292	329.91734
Point 166	643.2531	345.21
Point 167	651.9258	349.55
Point 168	666.9304	350
Point 169	668.3508	349.29
Point 170	707.4035	333.53244
Point 171	710.6052	333.51008
Point 172	711.3189	333.31046
Point 173	713.7443	332.66283
Point 174	720.1721	330.67297
Point 175	739.1283	324.2612
Point 176	741.6802	324.18848
Point 177	742.0676	324.05019
Point 178	742.3962	324.02195
Point 179	746.7331	323.94086
Point 180	751.5295	323.84082
Point 181	788.6259	323.10687
Point 182	797.7821	322.91441
Point 183	839	322.03859
Point 184	704.3877	335.67695
Point 185	758.6353	353.74048
Point 186	806.6964	369.75012
Point 187	818.5728	368.55874
Point 188	839	375.2318
Point 189	623.3833	349.61571
Point 190	636.5766	350.01181

Point 191	637.9727	350.01292
Point 192	0	260
Point 193	839	260

Regions

	Material	Points	Area (ft²)
Region 1	Waste Material	1,2,3,4,5	2,684.8
Region 2	NOT ACTIVE	6,7,8,9	409.18
Region 3	Waste Material	10,11,1,2	2,281.4
Region 4	Waste Material	10,11,12,13	2,317.2
Region 5	Waste Material	14,15,16,17,13,12,18	2,329.2
Region 6	Waste Material	19,20,21,15,14	2,120.4
Region 7	Waste Material	19,20,22,23	1,940.1
Region 8	Waste Material	23,22,24,25	1,759.8
Region 9	Waste Material	26,27,25,24	1,579.6
Region 10	Waste Material	28,29,30,26,27	1,399.5
Region 11	Waste Material	29,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,28	963.75
Region 12	NOT ACTIVE	47,31,32,33,34,35,36,37,38,48,49	1,129
Region 13	NOT ACTIVE	49,50,51,52,53,54,55,56,57,48	563.69
Region 14	Deflection surface	58,59,60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78	3,000.7
Region 15	Deflection surface	78,77,76,75,74,73,72,71,70,69,68,79,80,81,82,83,84,85,86,87,88,89	7,768.6
Region 16	GC-Drained	90,91,92,93,94,95,96,97,98,99,100,79,80,81,82,83,84,85,86,87,88,89	10,108
Region 17	GC OverConsolidated	90,91,92,93,94,95,96,97,98,99,100,101,102,103,104,105,106,107,108,109,110,111,112,113,114	2,873.1
Region 18	Upper Till	114,113,112,111,110,109,108,107,106,105,104,103,102,101,115,116,117,118,119,120,121,122,123,124,125,126,127,128,129,130,131,132,133,134,135,136,137,138,139,140,141,142,143,144,145,146,147	9,788.5
Region 19	Structural Fill	8,147,148,9	390.2
Region 20	CCL	148,146,145,144,143,142,141,149,150,151,152,153,154,155,156,157,9	1,547.9
Region 21	Structural Fill	158,159,160,3,161,162,163,164,165	80.098
Region 22	Structural Fill	150,166,167,168,169,134,135,136,137,138,139,140,141,149	1,602.2
Region 23	NOT ACTIVE	127,170,171,172,173,174,175,176,177,178,179,180,181,182,183,115,116,117,118,119,120,121,122,123,124,125,126	957.6
Region 24	NOT ACTIVE	184,185,186,187,188,183,182,181,180,179,178,177,176,175,174,173,172,171,170,127	4,345.4

Region 25	Bottom Liner	157,9,6,164,163,162,161,3,4,5,1,11,12,18,189,190,191,151,152,153,154,155,156	1,423.6
Region 26	Deflection surface	58,192,193,67,66,65,64,63,62,61,60,59	15,370

Current Slip Surface

Slip Surface: 1,090
F of S: 1.903
Volume: 9,451.645 ft³
Weight: 1,105,087.2 lbs
Resisting Moment: 85,488,584 lbs-ft
Activating Moment: 44,860,453 lbs-ft
Resisting Force: 372,618.69 lbs
Activating Force: 190,951.07 lbs
F of S Rank: 1
Exit: (95.975516, 319.81354) ft
Entry: (354.91733, 379.89181) ft
Radius: 126.86964 ft
Center: (195.09379, 494.79532) ft

Slip Slices

	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
Slice 1	98.361317	318.3581	-717.76353	803.08149	803.08149	1,000
Slice 2	106.65005	313.30161	146.97269	1,211.2373	639.47469	150
Slice 3	114.44561	308.70657	436.38111	1,929.576	897.20201	150
Slice 4	120.02797	305.77475	619.1695	2,421.504	1,040.5783	100
Slice 5	125.31685	302.99706	790.23206	2,939.2584	1,240.7409	100
Slice 6	128.3239	301.41778	886.84779	3,230.9945	1,353.3937	100
Slice 7	129.87315	300.60412	936.41237	3,248.1468	982.38289	169.29693
Slice 8	131.61726	300.19853	961.22572	2,922.6086	703.54905	121.24464
Slice 9	136.37205	299.21553	1,021.1995	3,273.0942	791.52043	136.40511
Slice 10	142.085	298.03444	1,092.9052	3,673.1905	888.97824	153.20044
Slice 11	145.44425	297.33995	1,134.9519	3,849.9859	928.42978	159.99875
Slice 12	146.37265	297.14801	1,146.5576	3,949.7659	954.08863	164.42081
Slice 13	146.6328	297.09423	1,149.8084	3,977.2507	961.11976	165.63264
Slice 14	149.07082	296.5902	1,180.2456	4,237.3551	1,027.3278	177.04211
Slice 15	154.20397	296.13216	1,208.1392	4,341.6817	976.02685	168.20163
Slice 16	157.98715	296.15774	1,206.9665	4,531.0269	1,026.4244	176.88678
Slice 17	160.38275	296.17394	1,206.2005	4,530.6652	1,026.5309	176.90514
Slice 18	161.9248	296.18436	1,205.6936	4,531.9528	1,027.0036	176.98651
Slice 19	165.14343	296.20612	1,204.5964	4,316.365	970.23882	167.20411
Slice 20	169.06752	296.16359	1,207.2767	4,186.6232	937.62979	161.58442

Slice 21	170.82435	296.02564	1,215.4921	4,080.3641	906.81122	156.27348
Slice 22	171.8919	295.94182	1,220.473	4,015.5389	887.92967	153.01953
Slice 23	172.1331	295.92288	1,221.5973	4,000.9778	883.67737	152.28688
Slice 24	173.22355	295.83726	1,226.676	3,933.1428	863.86462	148.87224
Slice 25	178.5682	295.4176	1,251.4846	4,180.3256	924.05469	159.24502
Slice 26	183.60915	295.05861	1,272.6196	4,425.3921	981.15831	169.08579
Slice 27	185.849	295.00656	1,275.6492	4,558.6312	1,015.6201	175.02476
Slice 28	189.5594	295.06778	1,271.9607	4,622.6261	1,033.5241	178.11011
Slice 29	194.00165	295.27107	1,259.8751	4,834.189	1,092.0865	188.20279
Slice 30	198.13972	295.46044	1,248.6149	5,030.3281	1,145.9138	197.47922
Slice 31	204.15562	295.73574	1,232.2422	5,313.4443	1,222.886	210.74371
Slice 32	214.134	296.19238	1,205.0795	5,777.6835	1,347.4207	232.20536
Slice 33	223.68665	296.62954	1,179.0623	5,959.9218	1,399.5949	241.19641
Slice 34	231.20195	296.97346	1,158.5749	5,788.0508	1,361.7029	234.66644
Slice 35	237.551	297.26401	1,141.2431	5,767.2992	1,360.8447	234.51874
Slice 36	243.62935	297.54313	1,124.5536	5,920.8142	1,403.4413	241.85956
Slice 37	247.78824	297.74677	1,112.7722	5,976.2874	1,420.6903	244.83278
Slice 38	249.5339	297.88747	1,105.6167	5,944.4899	1,418.0719	244.38076
Slice 39	253.95054	298.28885	1,085.2437	6,030.7545	1,444.6865	248.96696
Slice 40	257.73933	298.64859	1,067.2531	6,016.6213	1,455.2167	250.78177
Slice 41	261.60231	299.1332	1,042.7601	6,077.2973	1,476.5497	254.4587
Slice 42	268.43655	299.99055	1,000.446	6,184.9969	1,513.9984	260.91141
Slice 43	274.03818	300.88492	956.1716	6,047.9836	1,536.8484	264.85023
Slice 44	278.843	301.90919	904.6795	6,084.2488	1,559.4151	268.73776
Slice 45	283.52933	304.00121	794.27249	4,814.3192	2,320.975	100
Slice 46	289.92783	308.75028	520.2763	4,509.3822	2,396.8967	150
Slice 47	296.25258	313.44461	240.82509	4,235.917	2,400.4934	150
Slice 48	300.20445	316.37775	68.348762	4,285.3716	743.57489	1,000
Slice 49	304.12364	319.28663	0	4,138.8604	1,533.0453	213.44782
Slice 50	306.52777	321.07101	0	3,911.3338	2,258.2096	0
Slice 51	309.63505	323.86096	0	3,556.2722	2,053.2147	0
Slice 52	313.7477	327.66049	0	3,395.0441	1,960.1296	0
Slice 53	317.72829	331.338	0	3,238.1399	1,869.5409	0
Slice 54	320.8838	334.338	0	2,980.9039	1,721.0257	0
Slice 55	323.52376	337.13501	0	2,855.2922	1,648.5037	0
Slice 56	326.35532	340.13501	0	2,720.5771	1,570.7259	0
Slice 57	328.63767	342.55314	0	2,613.0073	1,508.6205	0
Slice 58	331.46922	345.55314	0	2,478.2226	1,430.8025	0
Slice 59	333.26543	347.45621	0	2,391.9165	1,380.9736	0

Slice 60	335.58976	350.45621	0	2,078.1056	1,199.7948	0
Slice 61	337.6518	353.22607	0	1,944.3014	1,122.543	0
Slice 62	339.88516	356.22607	0	1,743.3841	1,006.5433	0
Slice 63	344.18359	362	0	1,339.8081	773.53854	0
Slice 64	346.64998	365.31301	0	1,103.0136	636.82521	0
Slice 65	348.88334	368.31301	0	883.67608	510.19062	0
Slice 66	351.2609	371.50671	0	647.00828	373.55041	0
Slice 67	352.6759	374.50671	0	339.00728	195.72595	0
Slice 68	354.31551	378.44591	0	91.97227	53.100215	0

Figure 34 Stability for Section OP-2, Unbutrussed Long Term Drained Conditions

Slope Stability Waste Lift 10 ESA

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File Information

Title: Model City - RMU-2 CP-20 Section OP-2
Comments: Operation Conditions for CP-20 Section 2 Based on Maximum Fill Rate of 50,000 Cu Yds per Quarter
Created By: Peter J. Carey
Revision Number: 497
File Version: 8.0
Tool Version: 8.0.10.6504
Date: 2/24/2013
Time: 9:11:42 PM
File Name: C20OP-2r1.gsz
Directory: N:\Model_City\154.002_rmu2\154.005_revsions\geoslope\operational\
Last Solved Date: 2/25/2013
Last Solved Time: 1:30:46 AM

Project Settings

Length(L) Units: feet
Time(t) Units: Days
Force(F) Units: lbf
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D

Analysis Settings

Slope Stability Waste Lift 10 ESA

Description: after 1 year consolidation following lift
Kind: SLOPE/W
Parent: Waste Lift10 El. 383 Consolidation
Method: Morgenstern-Price
Settings
- Side Function
  - Interslice force function option: Half-Sine
- Lambda
  - Lambda 1: -1
  - Lambda 2: -0.8
  - Lambda 3: -0.6
  - Lambda 4: -0.4
  - Lambda 5: -0.2
  - Lambda 6: 0
  - Lambda 7: 0.2
  - Lambda 8: 0.4

Lambda 9: 0.6
Lambda 10: 0.8
Lambda 11: 1
PWP Conditions Source: Parent Analysis
Slip Surface
Direction of movement: Right to Left
Use Passive Mode: No
Slip Surface Option: Entry and Exit
Critical slip surfaces saved: 3
Optimize Critical Slip Surface Location: Yes
Tension Crack
Tension Crack Option: (none)
F of S Distribution
F of S Calculation Option: Constant
Advanced
Number of Slices: 30
F of S Tolerance: 0.001
Minimum Slip Surface Depth: 10 ft
Optimization Maximum Iterations: 2,000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

Waste Material

Model: Mohr-Coulomb
Unit Weight: 111 pcf
Cohesion': 0 psf
Phi': 30 °
Phi-B: 0 °

Bottom Liner

Model: Shear/Normal Fn.
Unit Weight: 120 pcf
Strength Function: Baseliner
Phi-B: 0 °

CCL

Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 1,000 psf
Phi': 10 °
Phi-B: 0 °

Upper Till

Model: Mohr-Coulomb
Unit Weight: 125 pcf

Cohesion': 150 psf
Phi': 31 °
Phi-B: 0 °

GC-Drained

Model: Shear/Normal Fn.
Unit Weight: 118 pcf
Strength Function: normalized N^m
Phi-B: 0 °
Anisotropic Strength Fn: clay ellipse staticshear

GC OverConsolidated

Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 100 psf
Phi': 30 °
Phi-B: 0 °

Deflection surface

Model: Bedrock (Impenetrable)

Structural Fill

Model: Mohr-Coulomb
Unit Weight: 135 pcf
Cohesion': 1,000 psf
Phi': 45 °
Phi-B: 0 °

NOT ACTIVE

Model: (None)

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (79.8044, 329.75699) ft
Left-Zone Right Coordinate: (252, 321.5) ft
Left-Zone Increment: 10
Right Projection: Range
Right-Zone Left Coordinate: (430.9718, 371.66122) ft
Right-Zone Right Coordinate: (524, 381.42062) ft
Right-Zone Increment: 10
Radius Increments: 10

Slip Surface Limits

Left Coordinate: (22.828036, 331.47357) ft
Right Coordinate: (611.93811, 369.64103) ft

Anisotropic Strength Functions

clay ellipse staticshear

Model: Spline Data Point Function
Function: Modifier Factor vs. Inclination
Curve Fit to Data: 100 %
Segment Curvature: 50 %
Y-Intercept: 0.706
Data Points: Inclination (°), Modifier Factor
Data Point: (-60, 0.92608827)
Data Point: (-30, 0.92608827)
Data Point: (-17.838428, 0.83077031)
Data Point: (-3, 0.70608827)
Data Point: (3, 0.70608827)
Data Point: (23.685228, 0.82618324)
Data Point: (39.261389, 0.92608827)
Data Point: (59.397364, 0.92608827)

Shear/Normal Strength Functions

Baseliner

Model: Shear/Normal Spline Data Point Function
Function: Shear Stress vs. Normal Stress
Curve Fit to Data: 100 %
Segment Curvature: 100 %
Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
Data Point: (0, 0)
Data Point: (500, 235)
Data Point: (1,000, 463)
Data Point: (2,000, 899)
Data Point: (5,000, 2,057)
Data Point: (10,000, 3,515)
Data Point: (15,000, 4,430)
Estimation Properties
Intact Rock Param.: 10
Geological Strength: 100
Disturbance Factor: 0
SigmaC: 600,000 psf
SigmaC: 300,000 psf
Num. Points: 20

normalized N^m

Model: Add-In Function
Function: Shear Stress vs. Normal Stress
Assembly: GeoStudio AddIns1
Function: Mesri1
Field
tan_Phi_100kPa: .548982
power: .147

pa: 2089
Y-Intercept: -1.#IND

Points

	X (ft)	Y (ft)
Point 1	0	268.91519
Point 2	207.4978	271.24238
Point 3	209.0232	271.26867
Point 4	215.074	271.32735
Point 5	225.5606	271.44496
Point 6	230.6621	271.56993
Point 7	234.0537	271.62591
Point 8	237.8751	271.70733
Point 9	243.6233	271.78388
Point 10	403.7734	274.99581
Point 11	406.1879	275.04891
Point 12	510.242	277.40528
Point 13	519.1809	277.52295
Point 14	522.2501	277.56833
Point 15	581.5843	278.21948
Point 16	706.5316	275.03632
Point 17	784.4915	272.77004
Point 18	796.8946	272.40949
Point 19	796.8946	278.66207
Point 20	771.752	277.8332
Point 21	583.2389	281.6042
Point 22	512.9202	278.57945
Point 23	404.2686	277.81745
Point 24	248.1947	278.63737
Point 25	83.6675	274.48464
Point 26	78.5956	274.41664
Point 27	69.7373	274.12229
Point 28	0	273.8562
Point 29	0	286.98783
Point 30	69.7373	288.07912
Point 31	78.6615	288.22649
Point 32	83.6675	288.57952
Point 33	248.1947	297.19282
Point 34	404.2686	294.81745

Point 35	512.9202	289.28565
Point 36	583.2389	288.00106
Point 37	796.8946	289.48765
Point 38	0	305.26334
Point 39	63.5351	305.72185
Point 40	69.7373	305.70863
Point 41	77.6371	305.65972
Point 42	78.5956	305.57155
Point 43	83.6675	305.7
Point 44	248.1947	307.61838
Point 45	299.7903	306.27673
Point 46	299.6238	303.28004
Point 47	404.2544	300.5593
Point 48	512.9971	302.35411
Point 49	583.3451	304.79977
Point 50	592.8421	305.14193
Point 51	650.1895	305.15472
Point 52	796.8602	303.47517
Point 53	796.8946	303.47517
Point 54	404.2686	303.55995
Point 55	512.9202	305.35325
Point 56	583.2389	307.79789
Point 57	592.7878	308.14191
Point 58	650.2064	308.15472
Point 59	796.8946	306.47498
Point 60	0	327.67711
Point 61	22.4921	326.28273
Point 62	49.2488	323.27595
Point 63	74.3201	319.27807
Point 64	77.7249	318.65421
Point 65	112.0147	318.69361
Point 66	124.2402	315.77486
Point 67	126.7076	315.31519
Point 68	136.2125	313.12968
Point 69	142.0351	312.45981
Point 70	357.6126	310.47901
Point 71	586.0206	317.13
Point 72	588.0287	317.67977
Point 73	603.6052	322

Point 74	693.0775	322
Point 75	695.4173	323.10644
Point 76	697.3194	324
Point 77	714.7524	332
Point 78	726.8078	332.79458
Point 79	736.4313	333.45251
Point 80	740.2913	333.71166
Point 81	742.8239	333.89241
Point 82	743.6092	331.27888
Point 83	746.0108	331.28559
Point 84	751.3746	333.5338
Point 85	751.5561	333.52887
Point 86	751.6873	333.53898
Point 87	751.9654	333.539
Point 88	755.4965	333.65881
Point 89	757.088	333.70415
Point 90	766.5218	333.52383
Point 91	769.5239	331.03222
Point 92	781.3859	336.00827
Point 93	796.8946	335.53695
Point 94	0	330.67136
Point 95	0.1856	330.67136
Point 96	22.7526	329.27234
Point 97	49.6527	326.24944
Point 98	74.8268	322.23518
Point 99	77.9958	321.65452
Point 100	112.3661	321.69402
Point 101	124.8636	318.71033
Point 102	127.3188	318.25295
Point 103	136.7217	316.09089
Point 104	142.2209	315.45823
Point 105	357.5827	313.47942
Point 106	585.5746	320.11828
Point 107	587.2318	320.57198
Point 108	684.7881	347.62982
Point 109	704.816	348.13028
Point 110	707.7847	347.0118
Point 111	709.4494	346.32322
Point 112	709.6367	345.87345

Point 113	708.0438	345.21
Point 114	685.2332	344.64
Point 115	131.5335	329.79618
Point 116	158.1735	318.33502
Point 117	165.2063	318.28065
Point 118	203.3044	317.9221
Point 119	243.6199	317.55888
Point 120	248.3589	317.51329
Point 121	357.6595	316.4965
Point 122	589.0312	323.16552
Point 123	591.6482	323.89085
Point 124	610.0073	329
Point 125	631.5677	335
Point 126	653.128	341
Point 127	674.6884	347
Point 128	684.1005	349.61929
Point 129	699.8223	350.01168
Point 130	0	332.91188
Point 131	22.4396	331.51733
Point 132	49.1519	328.50799
Point 133	68.0785	325.48185
Point 134	73.6566	324.58998
Point 135	90.5756	324.62675
Point 136	109.5111	324.68581
Point 137	124.0229	330.52741
Point 138	127.0249	330.53586
Point 139	129.8149	330.45078
Point 140	130.027	330.44431
Point 141	274.9823	329
Point 142	252.0124	321.5
Point 143	213.855	321.5
Point 144	177.1587	331.5
Point 145	171.0426	331.5
Point 146	152.2075	323.79526
Point 147	298.6003	335
Point 148	282.6389	331.5
Point 149	287.7433	331.5
Point 150	289.3308	331.95874
Point 151	290.9318	332.5

Point 152	317.0046	341
Point 153	355.3453	347
Point 154	666.3598	347
Point 155	669.6785	345.61929
Point 156	674.6567	347
Point 157	326.7765	344.18573
Point 158	336.1465	343.24706
Point 159	342.0216	342.65356
Point 160	373.7378	353
Point 161	651.9377	353
Point 162	392.1303	359
Point 163	637.5157	359
Point 164	410.5229	365
Point 165	623.0936	365
Point 166	608.6716	371
Point 167	428.9409	371
Point 168	415.8066	366.72364
Point 169	447.0228	377
Point 170	594.2496	377
Point 171	435.4903	373.13237
Point 172	450.0526	378.01608
Point 173	459.9195	378.51574
Point 174	479.4258	379.45192
Point 175	482.5508	379.55699
Point 176	491.9324	380
Point 177	507.2813	380.61621
Point 178	541.8899	382.28139
Point 179	574.2808	382.67429
Point 180	581.1072	381.37657
Point 181	581.6822	381.26488
Point 182	582.2411	381.14975
Point 183	582.7845	381.03125
Point 184	583.313	380.90951
Point 185	583.8273	380.78465
Point 186	584.3278	380.6568
Point 187	584.8152	380.52606
Point 188	585.29	380.39256
Point 189	592.2253	377.82435
Point 190	593.0101	377.51567

Point 191	78.5551	329.67009
Point 192	110.5776	331.89761
Point 193	113.2091	332.06836
Point 194	115.8406	332.21663
Point 195	118.4721	332.34247
Point 196	121.1036	332.44595
Point 197	123.7351	332.5271
Point 198	125.1298	332.55831
Point 199	126.3665	332.19565
Point 200	128.6722	331.5
Point 201	128.9196	331.46994
Point 202	710.0851	346.06023
Point 203	718.4637	349.55
Point 204	736.491	350
Point 205	738.1976	349.29
Point 206	796.8946	253.91519
Point 207	0	253.91519

Regions

	Material	Points	Area (ft²)
Region 1	NOT ACTIVE	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28	3,346.1
Region 2	Deflection surface	29,30,31,32,33,34,35,36,37,19,20,21,22,23,24,25,26,27,28	10,671
Region 3	GC-Drained	38,39,40,41,42,43,44,45,46,47,48,49,50,51,52,53,37,36,35,34,33,32,31,30,29	10,397
Region 4	GC OverConsolidated	45,54,55,56,57,58,59,53,52,51,50,49,48,47,46	1,491.9
Region 5	Upper Till	60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78,79,80,81,82,83,84,85,86,87,88,89,90,91,92,93,59,58,57,56,55,54,45,44,43,42,41,40,39,38	9,253.4
Region 6	CCL	94,95,96,97,98,99,100,101,102,103,104,105,106,107,108,109,110,111,112,113,114,73,72,71,70,69,68,67,66,65,64,63,62,61,60	2,139
Region 7	Bottom Liner	115,116,117,118,119,120,121,122,123,124,125,126,127,128,129,109,108,107,106,105,104,103,102,101,100,99,98,97,96,95,94,130,131,132,133,134,135,136,137,138,139,140	2,215.1
Region 8	Waste Material	115,116,117,118,119,120,121,122,123,124,141,142,143,144,145,146	4,104.1
Region 9	Waste Material	147,125,124,141,148,149,150,151	2,001.4
Region 10	Waste Material	147,125,126,152	2,007.3

Region 11	Waste Material	153,154,155,156,127,126,152,157,158,159	1,949.1
Region 12	Waste Material	160,161,154,153	1,767.6
Region 13	Waste Material	162,163,161,160	1,570.8
Region 14	Waste Material	164,165,163,162	1,373.9
Region 15	Waste Material	164,165,166,167,168	1,176.9
Region 16	Waste Material	169,170,166,167,171	980.5
Region 17	Waste Material	169,172,173,174,175,176,177,178,179,180,181,182,183,184,185,186,187,188,189,190,170	534.96
Region 18	Structural Fill	133,191,192,193,194,195,196,197,198,199,200,201,139,138,137,136,135,134	293.23
Region 19	Structural Fill	73,114,113,112,202,203,204,205,81,80,79,78,77,76,75,74	1,934.1
Region 20	NOT ACTIVE	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,206,207	15,814

Current Slip Surface

Slip Surface: 1,332
F of S: 1.931
Volume: 9,899.9029 ft³
Weight: 1,132,970.8 lbs
Resisting Moment: 72,366,127 lbs-ft
Activating Moment: 37,467,123 lbs-ft
Resisting Force: 381,040.09 lbs
Activating Force: 197,502.23 lbs
F of S Rank: 1
Exit: (225.25394, 321.5) ft
Entry: (480.92747, 379.50241) ft
Radius: 125.25229 ft
Center: (323.11002, 457.11684) ft

Slip Slices

	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
Slice 1	227.50937	319.59185	0	289.50017	167.143	0
Slice 2	231.5751	316.15214	0	794.93248	361.24538	9.1572755
Slice 3	235.07852	313.18818	138.31555	1,595.6441	256.96633	1,000
Slice 4	240.19576	309.71932	353.25816	1,829.1874	886.82772	150
Slice 5	245.9073	306.32249	562.03	2,264.2259	760.8772	131.12423
Slice 6	250.10355	303.82684	697.58662	2,659.4576	858.83834	148.00594
Slice 7	252.17351	302.59577	758.58454	2,866.4776	913.07483	157.35264
Slice 8	258.65686	300.81182	843.49675	3,087.2032	827.551	142.61413
Slice 9	269.98071	298.60575	949.97901	3,691.3926	879.70785	151.60277
Slice 10	278.8106	297.69138	994.78915	4,174.3281	998.30422	172.04051
Slice 11	284.95393	297.05522	1,027.0241	4,421.0264	1,055.4647	181.89119

Slice 12	287.50613	296.80201	1,040.2048	4,390.3616	1,033.5238	178.11043
Slice 13	288.53705	296.74344	1,043.3465	4,426.1024	1,042.0963	179.58761
Slice 14	290.1313	296.65286	1,048.2382	4,498.189	1,059.7281	182.62592
Slice 15	291.71309	296.56299	1,053.1301	4,573.0109	1,078.0238	185.77902
Slice 16	295.54734	296.47214	1,058.4718	4,667.3848	1,101.0068	189.73979
Slice 17	299.11205	296.41788	1,061.8697	4,809.2183	1,136.9326	195.93061
Slice 18	305.46325	296.32122	1,067.924	5,081.3951	1,205.4543	207.73907
Slice 19	314.15365	296.18896	1,076.2151	5,420.1869	1,289.6312	222.24597
Slice 20	321.89055	296.0712	1,083.6035	5,716.0008	1,362.3234	234.77347
Slice 21	329.19448	295.96004	1,090.5856	5,871.2016	1,399.419	241.16559
Slice 22	333.87948	295.88874	1,095.0683	5,812.7401	1,383.6866	238.45459
Slice 23	339.08405	295.80953	1,100.0524	5,744.2915	1,365.2933	235.28544
Slice 24	346.42932	295.69774	1,107.0936	5,860.3072	1,392.5734	239.98641
Slice 25	353.09117	295.67416	1,109.084	5,999.6558	1,426.833	245.89073
Slice 26	356.5024	295.74	1,105.705	6,101.2185	1,452.9083	250.38455
Slice 27	357.7761	295.76458	1,104.4488	6,138.9585	1,462.5778	252.05025
Slice 28	361.77019	295.98845	1,092.2408	6,148.3681	1,468.1881	253.01787
Slice 29	369.69273	296.59595	1,059.0414	6,234.6686	1,502.8173	258.98469
Slice 30	377.52546	297.34318	1,018.574	6,390.8823	1,551.3966	267.35726
Slice 31	386.7217	298.5788	952.17887	6,378.1442	1,590.4782	274.09242
Slice 32	395.90013	300.06247	873.44255	6,495.277	1,639.3252	282.5091
Slice 33	401.74677	302.12169	761.02538	5,197.1685	2,561.2084	100
Slice 34	407.17323	305.90997	538.4285	4,940.9374	2,645.2942	150
Slice 35	413.16475	310.09272	285.30727	4,691.9316	2,647.767	150
Slice 36	415.98338	312.06044	166.3966	4,574.9757	2,648.9416	150
Slice 37	418.4033	313.74981	66.401547	4,724.039	821.26716	1,000
Slice 38	422.71815	316.76206	0	4,550.4967	1,642.5667	254.44739
Slice 39	424.91849	318.32361	0	4,218.9513	1,554.8896	221.19512
Slice 40	426.994	320.18355	0	3,948.9193	2,279.9096	0
Slice 41	432.2156	324.8628	0	3,740.2015	2,159.4063	0
Slice 42	436.16131	328.39869	0	3,582.9664	2,068.6266	0
Slice 43	440.18002	332	0	3,425.0713	1,977.4659	0
Slice 44	443.80336	335.247	0	3,282.3134	1,895.0445	0
Slice 45	445.5509	337.09063	0	3,019.4037	1,743.2535	0
Slice 46	448.08884	339.84363	0	2,890.4811	1,668.82	0
Slice 47	449.60374	341.4869	0	2,813.0755	1,624.1299	0
Slice 48	452.36938	344.4869	0	2,617.7177	1,511.34	0
Slice 49	456.64058	349.12003	0	2,296.3843	1,325.8181	0
Slice 50	459.25725	352.0081	0	2,052.3465	1,184.9228	0

Slice 51	462.6028	355.88807	0	1,779.0498	1,027.1349	0
Slice 52	466.56309	360.48097	0	1,450.3292	837.34796	0
Slice 53	468.97346	363.48097	0	1,178.9054	680.64135	0
Slice 54	472.34523	368	0	855.59414	493.97751	0
Slice 55	476.82198	374	0	415.88322	240.11029	0
Slice 56	479.24308	377.24489	0	173.22152	100.00949	0
Slice 57	480.17664	378.4961	0	77.484654	44.735786	0

Figure 35 Stability for Section OP-1, Partially Drained Conditions, Waste Lift 6

Waste Lift 6 - 4th step pp

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File Information

Title: Model City - RMU-2 CP-20 Section OP-1
Comments: Operation Conditions for CP-20 Section 1 Based on Maximum Fill Rate of 50,000 Cu Yds per Quarter
Created By: Peter J. Carey
Last Edited By: Peter J. Carey
Revision Number: 509
File Version: 8.0
Tool Version: 8.0.10.6504
Date: 2/24/2013
Time: 12:44:51 PM
File Name: C20OP-1r1.gsz
Directory: N:\Model_City\154.002_rmu2\154.005_revsions\geoslope\operational\
Last Solved Date: 2/24/2013
Last Solved Time: 1:14:08 PM

Project Settings

Length(L) Units: feet
Time(t) Units: Days
Force(F) Units: lbf
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D

Analysis Settings

Waste Lift 6 - 4th step pp

Description: Undrained Strength based on 25% of fill time
Kind: SLOPE/W
Parent: WASTE LIFT6 EL. 359
Method: Morgenstern-Price
Settings
- Side Function
  - Interslice force function option: Half-Sine
- Lambda
  - Lambda 1: -1
  - Lambda 2: -0.8
  - Lambda 3: -0.6
  - Lambda 4: -0.4
  - Lambda 5: -0.2
  - Lambda 6: 0
  - Lambda 7: 0.2

Lambda 8: 0.4
Lambda 9: 0.6
Lambda 10: 0.8
Lambda 11: 1
PWP Conditions Source: Parent Analysis
Slip Surface
Direction of movement: Right to Left
Use Passive Mode: No
Slip Surface Option: Entry and Exit
Critical slip surfaces saved: 1
Optimize Critical Slip Surface Location: Yes
Tension Crack
Tension Crack Option: (none)
F of S Distribution
F of S Calculation Option: Constant
Advanced
Number of Slices: 30
F of S Tolerance: 0.001
Minimum Slip Surface Depth: 15 ft
Optimization Maximum Iterations: 2,000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

Waste Material

Model: Mohr-Coulomb
Unit Weight: 111 pcf
Cohesion': 0 psf
Phi': 30 °
Phi-B: 0 °

Bottom Liner

Model: Shear/Normal Fn.
Unit Weight: 120 pcf
Strength Function: Baseliner
Phi-B: 0 °

CCL

Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 1,000 psf
Phi': 10 °
Phi-B: 0 °

Upper Till

Model: Mohr-Coulomb

Unit Weight: 125 pcf
Cohesion': 150 psf
Phi': 31 °
Phi-B: 0 °

Deflection surface

Model: Bedrock (Impenetrable)

Structural Fill

Model: Mohr-Coulomb
Unit Weight: 135 pcf
Cohesion': 1,000 psf
Phi': 45 °
Phi-B: 0 °

NOT ACTIVE

Model: (None)

GC UNDRAINED

Model: Shear/Normal Fn.
Unit Weight: 120 pcf
Strength Function: SHANSEP CONSOLIDATED UNDRAINED STATIC
Phi-B: 0 °
Anisotropic Strength Fn: clay ellipse staticshear

GC-Overconsolidated-UNDRAINED

Model: Shear/Normal Fn.
Unit Weight: 125 pcf
Strength Function: SHANSEP Over CONSOLIDATED UNDRAINED STATIC
Phi-B: 0 °
Anisotropic Strength Fn: clay ellipse staticshear

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (76.8668, 319.45558) ft
Left-Zone Right Coordinate: (171.8639, 324.99999) ft
Left-Zone Increment: 10
Right Projection: Range
Right-Zone Left Coordinate: (247.4206, 349.41981) ft
Right-Zone Right Coordinate: (362, 359) ft
Right-Zone Increment: 10
Radius Increments: 8

Slip Surface Limits

Left Coordinate: (63.808718, 319.21096) ft
Right Coordinate: (447, 359) ft

Anisotropic Strength Functions

clay ellipse staticshear

Model: Spline Data Point Function
Function: Modifier Factor vs. Inclination
Curve Fit to Data: 100 %
Segment Curvature: 50 %
Y-Intercept: 0.706
Data Points: Inclination (°), Modifier Factor
Data Point: (-60, 0.92608827)
Data Point: (-30, 0.92608827)
Data Point: (-17.838428, 0.83077031)
Data Point: (-3, 0.70608827)
Data Point: (3, 0.70608827)
Data Point: (23.685228, 0.82618324)
Data Point: (39.261389, 0.92608827)
Data Point: (59.397364, 0.92608827)

Shear/Normal Strength Functions

Baseliner

Model: Shear/Normal Spline Data Point Function
Function: Shear Stress vs. Normal Stress
Curve Fit to Data: 100 %
Segment Curvature: 100 %
Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
Data Point: (0, 0)
Data Point: (500, 235)
Data Point: (1,000, 463)
Data Point: (2,000, 899)
Data Point: (5,000, 2,057)
Data Point: (10,000, 3,515)
Data Point: (15,000, 4,430)
Estimation Properties
Intact Rock Param.: 10
Geological Strength: 100
Disturbance Factor: 0
SigmaC: 600,000 psf
SigmaC: 300,000 psf
Num. Points: 20

SHANSEP CONSOLIDATED UNDRAINED STATIC

Model: Add-In Function
Function: Shear Stress vs. Normal Stress
Assembly: GeoStudio AddIns1
Function: SHANSEPP
Field
MPP: 5000
m: 0.7

S: .34
Y-Intercept: -1.#IND

SHANSEP Over CONSOLIDATED UNDRAINED STATIC

Model: Add-In Function
Function: Shear Stress vs. Normal Stress
Assembly: GeoStudio AddIns1
Function: SHANSEPP
Field
MPP: 8000
m: 0.7
S: .34
Y-Intercept: -1.#IND

Points

	X (ft)	Y (ft)
Point 1	561.5172	329
Point 2	184.2753	329
Point 3	174.1934	323.83525
Point 4	351.3603	319.67886
Point 5	546.7523	324.07989
Point 6	139.5241	323.62981
Point 7	0	321.01609
Point 8	0	318.01563
Point 9	133.22	320.51124
Point 10	196.3072	335
Point 11	579.5227	335
Point 12	597.5282	341
Point 13	208.339	341
Point 14	608.5585	347
Point 15	240.1424	347
Point 16	234.9596	345.27685
Point 17	219.929	346.77965
Point 18	611.3486	345.60539
Point 19	596.5548	353
Point 20	258.1852	353
Point 21	250.6076	350.4794
Point 22	276.2227	359
Point 23	584.5511	359
Point 24	294.2603	365
Point 25	572.5474	365
Point 26	312.2978	371

Point 27	560.5437	371
Point 28	548.5399	377
Point 29	330.1036	377
Point 30	325.5389	375.4045
Point 31	337.8201	379.69712
Point 32	364.4177	380
Point 33	381.0855	380.33726
Point 34	395.5929	380.71635
Point 35	416.8543	381.25666
Point 36	438.0487	382
Point 37	479.1653	383
Point 38	511.5499	383
Point 39	512.0826	382.82242
Point 40	513.8708	383
Point 41	531.0491	383
Point 42	533.1096	382.31347
Point 43	533.1107	382.31305
Point 44	536.5271	381.01628
Point 45	537.9265	380.70839
Point 46	547.5083	377.51565
Point 47	346.883	383
Point 48	493.5541	389
Point 49	363.3465	389
Point 50	371.2953	391.89686
Point 51	372.0119	391.98713
Point 52	372.2345	391.99514
Point 53	372.3208	392
Point 54	374.2156	392.05341
Point 55	419.4544	394.02388
Point 56	423.1399	394.1518
Point 57	476.0285	394.84323
Point 58	0	275.56112
Point 59	82.561	276.49127
Point 60	84.7322	276.34451
Point 61	123.7177	276.54438
Point 62	191.6961	277.65321
Point 63	430.1918	279.01879
Point 64	487.7086	279.639
Point 65	509.7138	279.55021

Point 66	721.9937	279.02461
Point 67	839	278.53365
Point 68	839	283.95091
Point 69	694.2381	280.02879
Point 70	505.5772	282.211
Point 71	487.7086	281.69555
Point 72	430.1918	282.66537
Point 73	247.1163	283.77931
Point 74	191.6961	282.79673
Point 75	123.7177	280.19493
Point 76	93.9325	281.10076
Point 77	61.0988	279.7585
Point 78	0	281.01485
Point 79	839	292.1407
Point 80	505.5772	286.98428
Point 81	487.7086	287.07159
Point 82	430.1918	289.73652
Point 83	247.1163	297.70175
Point 84	123.7177	292.05467
Point 85	94.7708	289.80875
Point 86	84.7322	289.65003
Point 87	82.561	289.66397
Point 88	38.9609	289.4325
Point 89	0	289.19587
Point 90	0	300.53803
Point 91	17.729	300.30563
Point 92	61.8788	299.93669
Point 93	191.626	301.3549
Point 94	247.1555	301.9218
Point 95	430.2162	304.83853
Point 96	487.7442	304.85433
Point 97	505.6491	305.27434
Point 98	509.7473	305.37466
Point 99	564.3735	305.25518
Point 100	839	303.47923
Point 101	839	306.47929
Point 102	564.3865	308.25516
Point 103	509.7138	308.37474
Point 104	505.5772	308.27348

Point 105	487.7086	307.85432
Point 106	430.1918	307.83852
Point 107	247.1163	304.92156
Point 108	191.6961	304.35577
Point 109	123.7177	308.23059
Point 110	93.9325	306.13974
Point 111	81.2213	307.4429
Point 112	61.5521	302.93952
Point 113	17.7611	303.30547
Point 114	0	303.53785
Point 115	839	315.0402
Point 116	797.6335	315.91598
Point 117	788.4831	316.10833
Point 118	751.3873	316.84226
Point 119	746.5947	316.94222
Point 120	742.0308	317.02756
Point 121	740.5664	317.15339
Point 122	740.3716	317.22293
Point 123	737.8797	317.29393
Point 124	718.0152	324.01292
Point 125	711.8056	325.93525
Point 126	706.0898	327.46147
Point 127	700.0454	333.50592
Point 128	694.499	330.73293
Point 129	691.9982	333.23326
Point 130	680.0323	333.54954
Point 131	679.8975	333.54516
Point 132	674.9116	331.05465
Point 133	672.911	331.05491
Point 134	672.1929	333.92615
Point 135	648.0416	332
Point 136	642.1238	328.67972
Point 137	637.4622	326.05461
Point 138	633.8287	324
Point 139	632.6094	323.29395
Point 140	630.3447	322
Point 141	556.3265	322
Point 142	544.3989	318.02536
Point 143	351.3575	313.67727

Point 144	171.7713	317.89042
Point 145	158.9451	319.66188
Point 146	146.7629	317.7643
Point 147	0	315.01616
Point 148	126.916	317.39267
Point 149	624.2673	344.64
Point 150	642.7896	345.19608
Point 151	639.8757	348.10995
Point 152	623.7369	347.62543
Point 153	543.8794	321.01441
Point 154	351.3589	316.67806
Point 155	172.0125	320.88559
Point 156	158.9189	322.69398
Point 157	146.5027	320.75996
Point 158	161.8204	329.91734
Point 159	162.0292	329.91734
Point 160	169.8774	325.99323
Point 161	172.2537	323.88076
Point 162	158.8927	325.72607
Point 163	146.2426	323.75561
Point 164	144.6459	323.72571
Point 165	157.0292	329.91734
Point 166	643.2531	345.21
Point 167	651.9258	349.55
Point 168	666.9304	350
Point 169	668.3508	349.29
Point 170	707.4035	333.53244
Point 171	710.6052	333.51008
Point 172	711.3189	333.31046
Point 173	713.7443	332.66283
Point 174	720.1721	330.67297
Point 175	739.1283	324.2612
Point 176	741.6802	324.18848
Point 177	742.0676	324.05019
Point 178	742.3962	324.02195
Point 179	746.7331	323.94086
Point 180	751.5295	323.84082
Point 181	788.6259	323.10687
Point 182	797.7821	322.91441

Point 183	839	322.03859
Point 184	704.3877	335.67695
Point 185	758.6353	353.74048
Point 186	806.6964	369.75012
Point 187	818.5728	368.55874
Point 188	839	375.2318
Point 189	623.3833	349.61571
Point 190	636.5766	350.01181
Point 191	637.9727	350.01292
Point 192	0	260
Point 193	839	260

Regions

	Material	Points	Area (ft²)
Region 1	Waste Material	1,2,3,4,5	2,684.8
Region 2	NOT ACTIVE	6,7,8,9	409.18
Region 3	Waste Material	10,11,1,2	2,281.4
Region 4	Waste Material	10,11,12,13	2,317.2
Region 5	Waste Material	14,15,16,17,13,12,18	2,329.2
Region 6	Waste Material	19,20,21,15,14	2,120.4
Region 7	Waste Material	19,20,22,23	1,940.1
Region 8	NOT ACTIVE	23,22,24,25	1,759.8
Region 9	NOT ACTIVE	26,27,25,24	1,579.6
Region 10	NOT ACTIVE	28,29,30,26,27	1,399.5
Region 11	NOT ACTIVE	29,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,28	963.75
Region 12	NOT ACTIVE	47,31,32,33,34,35,36,37,38,48,49	1,129
Region 13	NOT ACTIVE	49,50,51,52,53,54,55,56,57,48	563.69
Region 14	Deflection surface	58,59,60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78	3,000.7
Region 15	Deflection surface	78,77,76,75,74,73,72,71,70,69,68,79,80,81,82,83,84,85,86,87,88,89	7,768.6
Region 16	GC UNDRAINED	90,91,92,93,94,95,96,97,98,99,100,79,80,81,82,83,84,85,86,87,88,89	10,108
Region 17	GC-Overconsolidated-UNDRAINED	90,91,92,93,94,95,96,97,98,99,100,101,102,103,104,105,106,107,108,109,110,111,112,113,114	2,873.1
Region 18	Upper Till	114,113,112,111,110,109,108,107,106,105,104,103,102,101,115,116,117,118,119,120,121,122,123,124,125,126,127,128,129,130,131,132,133,134,135,136,137,138,139,140,141,1	9,788.5

		42,143,144,145,146,147	
Region 19	Structural Fill	8,147,148,9	390.2
Region 20	CCL	148,146,145,144,143,142,141,149,150,151,152,153,154,155,156,157,9	1,547.9
Region 21	Structural Fill	158,159,160,3,161,162,163,164,165	80.098
Region 22	Structural Fill	150,166,167,168,169,134,135,136,137,138,139,140,141,149	1,602.2
Region 23	NOT ACTIVE	127,170,171,172,173,174,175,176,177,178,179,180,181,182,183,115,116,117,118,119,120,121,122,123,124,125,126	957.6
Region 24	NOT ACTIVE	184,185,186,187,188,183,182,181,180,179,178,177,176,175,174,173,172,171,170,127	4,345.4
Region 25	Bottom Liner	157,9,6,164,163,162,161,3,4,5,1,11,12,18,189,190,191,151,152,153,154,155,156	1,423.6
Region 26	Deflection surface	58,192,193,67,66,65,64,63,62,61,60,59	15,370

Current Slip Surface

Slip Surface: 1,090
F of S: 2.057
Volume: 6,966.5963 ft³
Weight: 822,811.13 lbs
Resisting Moment: 34,868,653 lbs-ft
Activating Moment: 16,955,716 lbs-ft
Resisting Force: 241,231.12 lbs
Activating Force: 117,506.05 lbs
F of S Rank: 1
Exit: (104.76294, 319.97815) ft
Entry: (314.40081, 359) ft
Radius: 98.389652 ft
Center: (196.76331, 415.6571) ft

Slip Slices

	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
Slice 1	107.01938	318.52026	-354.1896	774.36303	774.36303	1,000
Slice 2	114.512	313.67922	219.01515	1,105.1296	532.43126	150
Slice 3	121.34921	309.2364	507.47208	1,822.7402	790.29278	150
Slice 4	123.33396	307.92273	592.74108	2,233.003	470.09646	1,096.8916
Slice 5	125.31685	306.61029	677.31286	2,439.8027	480.34264	1,120.7989
Slice 6	130.068	303.46558	879.06628	2,914.7087	501.56074	1,170.308
Slice 7	133.71259	301.05329	1,032.6606	3,308.7018	518.64137	1,210.1627
Slice 8	134.29072	300.67064	1,056.8681	3,214.6289	367.30759	857.05129
Slice 9	136.95018	300.05606	1,098.0328	3,060.9242	294.64291	687.50023
Slice 10	142.085	298.94296	1,171.8578	3,383.1554	305.36653	712.52164

Slice 11	145.44425	298.21475	1,219.4008	3,547.7346	310.12771	723.6317
Slice 12	146.37265	298.0135	1,232.4486	3,640.7386	313.28488	730.99892
Slice 13	146.6328	297.95711	1,236.0982	3,666.3234	314.13828	732.98995
Slice 14	147.50677	297.76765	1,248.3381	3,752.8102	316.98746	739.63726
Slice 15	152.63992	297.30062	1,281.6599	4,024.5388	301.12546	702.62563
Slice 16	157.98715	296.92811	1,309.426	4,367.1607	311.10362	725.90885
Slice 17	160.38275	296.76123	1,321.7615	4,389.4423	311.40709	726.61619
Slice 18	161.9248	296.6538	1,329.6512	4,405.2799	311.64858	727.18077
Slice 19	164.3054	296.48796	1,341.7269	4,272.6647	307.17594	716.74405
Slice 20	168.2295	296.18918	1,362.7021	4,060.0892	300.5234	701.22122
Slice 21	170.82435	295.96839	1,377.5362	3,910.4923	294.90611	688.11384
Slice 22	171.8919	295.87756	1,383.5515	3,848.7359	292.51641	682.53801
Slice 23	172.1331	295.85703	1,384.9031	3,834.8811	291.97396	681.27217
Slice 24	173.22355	295.76425	1,390.9699	3,770.4099	289.42616	675.32755
Slice 25	179.23435	295.25385	1,423.0793	4,050.8925	298.16156	695.70983
Slice 26	187.0598	294.95339	1,442.8732	4,369.336	306.63912	715.49175
Slice 27	190.7702	295.12319	1,435.8649	4,541.9752	312.16915	728.39452
Slice 28	194.00165	295.27107	1,429.7542	4,691.7092	316.78788	739.17096
Slice 29	199.07254	295.50313	1,420.1492	4,925.801	323.7094	755.32237
Slice 30	204.60321	295.75623	1,409.646	5,179.922	330.85413	771.99357
Slice 31	207.85378	295.90498	1,403.4576	5,328.7761	334.87857	781.38325
Slice 32	211.2365	296.05979	1,397.004	5,483.2072	338.93852	790.85632
Slice 33	217.0315	296.32498	1,385.9112	5,747.0223	345.62414	806.45615
Slice 34	221.92847	296.54908	1,376.4969	5,836.807	347.96367	811.91648
Slice 35	225.15304	296.69665	1,370.2753	5,769.2341	346.52106	808.54964
Slice 36	227.62945	296.80997	1,365.483	5,717.2069	345.40065	805.93512
Slice 37	231.92018	297.17279	1,353.0877	5,533.1242	342.72663	799.69512
Slice 38	237.551	297.73886	1,338.3644	5,504.873	342.39341	798.91791
Slice 39	242.66065	298.25253	1,330.1557	5,610.6474	345.17721	805.41264
Slice 40	246.1672	298.70756	1,328.401	5,538.4315	354.52237	827.21948
Slice 41	248.88155	299.26198	1,335.833	5,565.2103	355.01031	828.3581
Slice 42	254.3964	300.38842	1,360.8657	5,621.7257	355.80156	830.20262
Slice 43	259.43566	301.41772	1,379.6581	5,675.3648	356.67151	832.23425
Slice 44	261.23821	301.91405	1,380.2234	5,394.3885	394.01453	919.36657
Slice 45	264.29273	303.24703	1,357.8697	5,275.214	543.52016	1,268.2108
Slice 46	267.25566	304.79443	1,321.9126	4,460.4284	571.10755	1,332.5842
Slice 47	271.96943	309.45556	1,088.4271	4,105.7906	1,813.0149	150
Slice 48	277.10121	314.53004	821.3332	3,737.0208	1,751.9219	150
Slice 49	279.46191	316.86438	703.93327	3,651.7775	519.78446	1,000

Slice 50	281.84953	319.22533	0	3,428.3926	1,327.5626	149.83489
Slice 51	283.23988	320.69313	0	3,161.3105	1,244.6842	128.42656
Slice 52	287.00056	325.1328	0	2,655.3377	1,533.0599	0
Slice 53	292.2683	331.35166	0	2,190.8779	1,264.9039	0
Slice 54	294.80948	334.35166	0	1,963.7152	1,133.7515	0
Slice 55	296.41024	336.24144	0	1,819.2973	1,050.3718	0
Slice 56	298.86931	339.24144	0	1,562.9451	902.36675	0
Slice 57	302.67791	344	0	1,196.9047	691.03325	0
Slice 58	305.90773	348.03543	0	882.00841	509.22779	0
Slice 59	308.25292	351.03543	0	637.88484	368.28298	0
Slice 60	311.03359	354.63778	0	351.84107	203.13554	0
Slice 61	313.34931	357.63778	0	110.47669	63.783747	0

Figure 36 Stability for Section OP-1, Partially Drained Conditions, Waste Lift 9

Waste Lift 9 - 4th step pp

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File Information

Title: Model City - RMU-2 CP-20 Section OP-1
Comments: Operation Conditions for CP-20 Section 1 Based on Maximum Fill Rate of 50,000 Cu Yds per Quarter
Created By: Peter J. Carey
Last Edited By: Peter J. Carey
Revision Number: 509
File Version: 8.0
Tool Version: 8.0.10.6504
Date: 2/24/2013
Time: 12:44:51 PM
File Name: C20OP-1r1.gsz
Directory: N:\Model_City\154.002_rmu2\154.005_revsions\geoslope\operational\
Last Solved Date: 2/24/2013
Last Solved Time: 1:41:52 PM

Project Settings

Length(L) Units: feet
Time(t) Units: Days
Force(F) Units: lbf
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D

Analysis Settings

Waste Lift 9 - 4th step pp

Description: Undrained Strength based on 25% of fill time
Kind: SLOPE/W
Parent: WASTE LIFT 9 EL. 377
Method: Morgenstern-Price
Settings
- Side Function
  - Interslice force function option: Half-Sine
- Lambda
  - Lambda 1: -1
  - Lambda 2: -0.8
  - Lambda 3: -0.6
  - Lambda 4: -0.4
  - Lambda 5: -0.2
  - Lambda 6: 0
  - Lambda 7: 0.2

Lambda 8: 0.4
Lambda 9: 0.6
Lambda 10: 0.8
Lambda 11: 1
PWP Conditions Source: Parent Analysis
Slip Surface
Direction of movement: Right to Left
Use Passive Mode: No
Slip Surface Option: Entry and Exit
Critical slip surfaces saved: 1
Optimize Critical Slip Surface Location: Yes
Tension Crack
Tension Crack Option: (none)
F of S Distribution
F of S Calculation Option: Constant
Advanced
Number of Slices: 30
F of S Tolerance: 0.001
Minimum Slip Surface Depth: 15 ft
Optimization Maximum Iterations: 2,000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

Waste Material

Model: Mohr-Coulomb
Unit Weight: 111 pcf
Cohesion': 0 psf
Phi': 30 °
Phi-B: 0 °

Bottom Liner

Model: Shear/Normal Fn.
Unit Weight: 120 pcf
Strength Function: Baseliner
Phi-B: 0 °

CCL

Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 1,000 psf
Phi': 10 °
Phi-B: 0 °

Upper Till

Model: Mohr-Coulomb

Unit Weight: 125 pcf
Cohesion': 150 psf
Phi': 31 °
Phi-B: 0 °

Deflection surface

Model: Bedrock (Impenetrable)

Structural Fill

Model: Mohr-Coulomb
Unit Weight: 135 pcf
Cohesion': 1,000 psf
Phi': 45 °
Phi-B: 0 °

NOT ACTIVE

Model: (None)

GC UNDRAINED

Model: Shear/Normal Fn.
Unit Weight: 120 pcf
Strength Function: SHANSEP CONSOLIDATED UNDRAINED STATIC
Phi-B: 0 °
Anisotropic Strength Fn: clay ellipse staticshear

GC-Overconsolidated-UNDRAINED

Model: Shear/Normal Fn.
Unit Weight: 125 pcf
Strength Function: SHANSEP Over CONSOLIDATED UNDRAINED STATIC
Phi-B: 0 °
Anisotropic Strength Fn: clay ellipse staticshear

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (76.8668, 319.45558) ft
Left-Zone Right Coordinate: (171.8639, 324.99999) ft
Left-Zone Increment: 10
Right Projection: Range
Right-Zone Left Coordinate: (290, 363.58286) ft
Right-Zone Right Coordinate: (400, 377) ft
Right-Zone Increment: 10
Radius Increments: 8

Slip Surface Limits

Left Coordinate: (63.808718, 319.21096) ft
Right Coordinate: (447, 377) ft

Anisotropic Strength Functions

clay ellipse staticshear

Model: Spline Data Point Function
Function: Modifier Factor vs. Inclination
Curve Fit to Data: 100 %
Segment Curvature: 50 %
Y-Intercept: 0.706
Data Points: Inclination (°), Modifier Factor
Data Point: (-60, 0.92608827)
Data Point: (-30, 0.92608827)
Data Point: (-17.838428, 0.83077031)
Data Point: (-3, 0.70608827)
Data Point: (3, 0.70608827)
Data Point: (23.685228, 0.82618324)
Data Point: (39.261389, 0.92608827)
Data Point: (59.397364, 0.92608827)

Shear/Normal Strength Functions

Baseliner

Model: Shear/Normal Spline Data Point Function
Function: Shear Stress vs. Normal Stress
Curve Fit to Data: 100 %
Segment Curvature: 100 %
Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
Data Point: (0, 0)
Data Point: (500, 235)
Data Point: (1,000, 463)
Data Point: (2,000, 899)
Data Point: (5,000, 2,057)
Data Point: (10,000, 3,515)
Data Point: (15,000, 4,430)
Estimation Properties
Intact Rock Param.: 10
Geological Strength: 100
Disturbance Factor: 0
SigmaC: 600,000 psf
SigmaC: 300,000 psf
Num. Points: 20

SHANSEP CONSOLIDATED UNDRAINED STATIC

Model: Add-In Function
Function: Shear Stress vs. Normal Stress
Assembly: GeoStudio AddIns1
Function: SHANSEPP
Field
MPP: 5000
m: 0.7

S: .34

Y-Intercept: -1.#IND

SHANSEP Over CONSOLIDATED UNDRAINED STATIC

Model: Add-In Function

Function: Shear Stress vs. Normal Stress

Assembly: GeoStudio AddIns1

Function: SHANSEPP

Field

MPP: 8000

m: 0.7

S: .34

Y-Intercept: -1.#IND

Points

	X (ft)	Y (ft)
Point 1	561.5172	329
Point 2	184.2753	329
Point 3	174.1934	323.83525
Point 4	351.3603	319.67886
Point 5	546.7523	324.07989
Point 6	139.5241	323.62981
Point 7	0	321.01609
Point 8	0	318.01563
Point 9	133.22	320.51124
Point 10	196.3072	335
Point 11	579.5227	335
Point 12	597.5282	341
Point 13	208.339	341
Point 14	608.5585	347
Point 15	240.1424	347
Point 16	234.9596	345.27685
Point 17	219.929	346.77965
Point 18	611.3486	345.60539
Point 19	596.5548	353
Point 20	258.1852	353
Point 21	250.6076	350.4794
Point 22	276.2227	359
Point 23	584.5511	359
Point 24	294.2603	365
Point 25	572.5474	365
Point 26	312.2978	371

Point 27	560.5437	371
Point 28	548.5399	377
Point 29	330.1036	377
Point 30	325.5389	375.4045
Point 31	337.8201	379.69712
Point 32	364.4177	380
Point 33	381.0855	380.33726
Point 34	395.5929	380.71635
Point 35	416.8543	381.25666
Point 36	438.0487	382
Point 37	479.1653	383
Point 38	511.5499	383
Point 39	512.0826	382.82242
Point 40	513.8708	383
Point 41	531.0491	383
Point 42	533.1096	382.31347
Point 43	533.1107	382.31305
Point 44	536.5271	381.01628
Point 45	537.9265	380.70839
Point 46	547.5083	377.51565
Point 47	346.883	383
Point 48	493.5541	389
Point 49	363.3465	389
Point 50	371.2953	391.89686
Point 51	372.0119	391.98713
Point 52	372.2345	391.99514
Point 53	372.3208	392
Point 54	374.2156	392.05341
Point 55	419.4544	394.02388
Point 56	423.1399	394.1518
Point 57	476.0285	394.84323
Point 58	0	275.56112
Point 59	82.561	276.49127
Point 60	84.7322	276.34451
Point 61	123.7177	276.54438
Point 62	191.6961	277.65321
Point 63	430.1918	279.01879
Point 64	487.7086	279.639
Point 65	509.7138	279.55021

Point 66	721.9937	279.02461
Point 67	839	278.53365
Point 68	839	283.95091
Point 69	694.2381	280.02879
Point 70	505.5772	282.211
Point 71	487.7086	281.69555
Point 72	430.1918	282.66537
Point 73	247.1163	283.77931
Point 74	191.6961	282.79673
Point 75	123.7177	280.19493
Point 76	93.9325	281.10076
Point 77	61.0988	279.7585
Point 78	0	281.01485
Point 79	839	292.1407
Point 80	505.5772	286.98428
Point 81	487.7086	287.07159
Point 82	430.1918	289.73652
Point 83	247.1163	297.70175
Point 84	123.7177	292.05467
Point 85	94.7708	289.80875
Point 86	84.7322	289.65003
Point 87	82.561	289.66397
Point 88	38.9609	289.4325
Point 89	0	289.19587
Point 90	0	300.53803
Point 91	17.729	300.30563
Point 92	61.8788	299.93669
Point 93	191.626	301.3549
Point 94	247.1555	301.9218
Point 95	430.2162	304.83853
Point 96	487.7442	304.85433
Point 97	505.6491	305.27434
Point 98	509.7473	305.37466
Point 99	564.3735	305.25518
Point 100	839	303.47923
Point 101	839	306.47929
Point 102	564.3865	308.25516
Point 103	509.7138	308.37474
Point 104	505.5772	308.27348

Point 105	487.7086	307.85432
Point 106	430.1918	307.83852
Point 107	247.1163	304.92156
Point 108	191.6961	304.35577
Point 109	123.7177	308.23059
Point 110	93.9325	306.13974
Point 111	81.2213	307.4429
Point 112	61.5521	302.93952
Point 113	17.7611	303.30547
Point 114	0	303.53785
Point 115	839	315.0402
Point 116	797.6335	315.91598
Point 117	788.4831	316.10833
Point 118	751.3873	316.84226
Point 119	746.5947	316.94222
Point 120	742.0308	317.02756
Point 121	740.5664	317.15339
Point 122	740.3716	317.22293
Point 123	737.8797	317.29393
Point 124	718.0152	324.01292
Point 125	711.8056	325.93525
Point 126	706.0898	327.46147
Point 127	700.0454	333.50592
Point 128	694.499	330.73293
Point 129	691.9982	333.23326
Point 130	680.0323	333.54954
Point 131	679.8975	333.54516
Point 132	674.9116	331.05465
Point 133	672.911	331.05491
Point 134	672.1929	333.92615
Point 135	648.0416	332
Point 136	642.1238	328.67972
Point 137	637.4622	326.05461
Point 138	633.8287	324
Point 139	632.6094	323.29395
Point 140	630.3447	322
Point 141	556.3265	322
Point 142	544.3989	318.02536
Point 143	351.3575	313.67727

Point 144	171.7713	317.89042
Point 145	158.9451	319.66188
Point 146	146.7629	317.7643
Point 147	0	315.01616
Point 148	126.916	317.39267
Point 149	624.2673	344.64
Point 150	642.7896	345.19608
Point 151	639.8757	348.10995
Point 152	623.7369	347.62543
Point 153	543.8794	321.01441
Point 154	351.3589	316.67806
Point 155	172.0125	320.88559
Point 156	158.9189	322.69398
Point 157	146.5027	320.75996
Point 158	161.8204	329.91734
Point 159	162.0292	329.91734
Point 160	169.8774	325.99323
Point 161	172.2537	323.88076
Point 162	158.8927	325.72607
Point 163	146.2426	323.75561
Point 164	144.6459	323.72571
Point 165	157.0292	329.91734
Point 166	643.2531	345.21
Point 167	651.9258	349.55
Point 168	666.9304	350
Point 169	668.3508	349.29
Point 170	707.4035	333.53244
Point 171	710.6052	333.51008
Point 172	711.3189	333.31046
Point 173	713.7443	332.66283
Point 174	720.1721	330.67297
Point 175	739.1283	324.2612
Point 176	741.6802	324.18848
Point 177	742.0676	324.05019
Point 178	742.3962	324.02195
Point 179	746.7331	323.94086
Point 180	751.5295	323.84082
Point 181	788.6259	323.10687
Point 182	797.7821	322.91441

Point 183	839	322.03859
Point 184	704.3877	335.67695
Point 185	758.6353	353.74048
Point 186	806.6964	369.75012
Point 187	818.5728	368.55874
Point 188	839	375.2318
Point 189	623.3833	349.61571
Point 190	636.5766	350.01181
Point 191	637.9727	350.01292
Point 192	0	260
Point 193	839	260

Regions

	Material	Points	Area (ft²)
Region 1	Waste Material	1,2,3,4,5	2,684.8
Region 2	NOT ACTIVE	6,7,8,9	409.18
Region 3	Waste Material	10,11,1,2	2,281.4
Region 4	Waste Material	10,11,12,13	2,317.2
Region 5	Waste Material	14,15,16,17,13,12,18	2,329.2
Region 6	Waste Material	19,20,21,15,14	2,120.4
Region 7	Waste Material	19,20,22,23	1,940.1
Region 8	Waste Material	23,22,24,25	1,759.8
Region 9	Waste Material	26,27,25,24	1,579.6
Region 10	Waste Material	28,29,30,26,27	1,399.5
Region 11	NOT ACTIVE	29,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,28	963.75
Region 12	NOT ACTIVE	47,31,32,33,34,35,36,37,38,48,49	1,129
Region 13	NOT ACTIVE	49,50,51,52,53,54,55,56,57,48	563.69
Region 14	Deflection surface	58,59,60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78	3,000.7
Region 15	Deflection surface	78,77,76,75,74,73,72,71,70,69,68,79,80,81,82,83,84,85,86,87,88,89	7,768.6
Region 16	GC UNDRAINED	90,91,92,93,94,95,96,97,98,99,100,79,80,81,82,83,84,85,86,87,88,89	10,108
Region 17	GC-Overconsolidated-UNDRAINED	90,91,92,93,94,95,96,97,98,99,100,101,102,103,104,105,106,107,108,109,110,111,112,113,114	2,873.1
Region 18	Upper Till	114,113,112,111,110,109,108,107,106,105,104,103,102,101,115,116,117,118,119,120,121,122,123,124,125,126,127,128,129,130,131,132,133,134,135,136,137,138,139,140,141,142,143,144,145,146,147	9,788.5

Region 19	Structural Fill	8,147,148,9	390.2
Region 20	CCL	148,146,145,144,143,142,141,149,150,151,152,153,154,155,156,157,9	1,547.9
Region 21	Structural Fill	158,159,160,3,161,162,163,164,165	80.098
Region 22	Structural Fill	150,166,167,168,169,134,135,136,137,138,139,140,141,149	1,602.2
Region 23	NOT ACTIVE	127,170,171,172,173,174,175,176,177,178,179,180,181,182,183,115,116,117,118,119,120,121,122,123,124,125,126	957.6
Region 24	NOT ACTIVE	184,185,186,187,188,183,182,181,180,179,178,177,176,175,174,173,172,171,170,127	4,345.4
Region 25	Bottom Liner	157,9,6,164,163,162,161,3,4,5,1,11,12,18,189,190,191,151,152,153,154,155,156	1,423.6
Region 26	Deflection surface	58,192,193,67,66,65,64,63,62,61,60,59	15,370

Current Slip Surface

Slip Surface: 1,090
F of S: 1.630
Volume: 9,956.1167 ft³
Weight: 1,160,752.2 lbs
Resisting Moment: 57,113,850 lbs-ft
Activating Moment: 35,049,082 lbs-ft
Resisting Force: 305,389.76 lbs
Activating Force: 187,421.03 lbs
F of S Rank: 1
Exit: (114.01107, 320.1514) ft
Entry: (362.14967, 377) ft
Radius: 121.41489 ft
Center: (214.4641, 448.37097) ft

Slip Slices

	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
Slice 1	116.47044	318.69726	-410.25041	920.59876	920.59876	1,000
Slice 2	122.9229	314.88215	203.89344	986.73479	470.37854	150
Slice 3	127.92354	311.92544	400.28567	1,458.6339	635.91974	150
Slice 4	131.07554	310.02432	526.38889	1,763.2435	743.17719	150
Slice 5	134.15339	308.15073	650.4862	2,139.9284	894.94713	150
Slice 6	137.30544	306.23197	774.69779	2,890.65	507.21764	1,183.5078
Slice 7	142.085	303.3225	959.11311	3,524.6607	537.39823	1,253.9307
Slice 8	145.37966	301.31694	1,084.7917	3,920.3883	553.77809	1,292.1495
Slice 9	146.16408	300.8644	1,113.0954	3,262.7623	394.33619	920.11815
Slice 10	146.22867	300.85691	1,113.6608	3,223.3703	282.18772	658.43824
Slice 11	146.37265	300.84022	1,114.9206	3,235.5907	282.62686	659.4625

Slice 12	151.76595	300.2148	1,161.8108	3,695.9783	298.1413	695.66275
Slice 13	157.98715	299.49338	1,215.4317	4,161.3851	311.91692	727.80673
Slice 14	160.38275	299.21558	1,235.9532	4,204.2692	312.62553	729.45962
Slice 15	161.9248	299.03676	1,249.1163	4,233.4323	313.13008	730.63702
Slice 16	163.39448	298.86633	1,261.6197	4,166.1154	310.59342	724.71891
Slice 17	167.31858	298.3681	1,297.2472	3,991.7194	306.17222	714.40147
Slice 18	170.82435	297.9024	1,329.8751	3,817.9775	298.93976	697.5268
Slice 19	171.8919	297.76059	1,339.7259	3,764.6723	296.64317	692.16693
Slice 20	172.1331	297.72855	1,341.9466	3,752.7213	296.12177	690.95115
Slice 21	173.22355	297.5837	1,351.9642	3,696.7954	293.66804	685.22609
Slice 22	179.23435	296.78523	1,406.2994	4,034.6371	303.89781	709.09555
Slice 23	187.95065	295.63898	1,480.8679	4,689.7568	322.12048	751.61393
Slice 24	193.9666	295.26946	1,506.6772	4,810.1711	317.99273	741.98235
Slice 25	197.44812	295.42879	1,501.7273	4,975.1721	322.81442	753.23376
Slice 26	203.46401	295.70409	1,493.1706	5,258.2671	330.7179	771.67507
Slice 27	211.16712	296.05661	1,482.1956	5,618.035	340.16836	793.72628
Slice 28	216.96212	296.32181	1,473.9193	5,886.2984	346.83845	809.28829
Slice 29	223.1185	296.60354	1,465.088	5,957.701	348.71772	813.67613
Slice 30	229.4975	296.89546	1,455.8275	5,825.7517	345.83345	806.9448
Slice 31	233.8233	297.09342	1,449.4337	5,735.2258	343.82244	802.25228
Slice 32	235.43143	297.16702	1,447.0217	5,723.9507	343.60899	801.75417
Slice 33	238.02283	297.28561	1,443.0797	5,793.2597	345.36369	805.84953
Slice 34	243.62935	297.54218	1,434.1984	5,942.2612	349.07754	814.51409
Slice 35	248.86195	297.6258	1,434.6253	6,273.0053	356.55919	831.97205
Slice 36	253.35755	297.43021	1,452.0205	6,439.6157	359.8227	839.58814
Slice 37	257.14635	297.34861	1,468.3068	6,408.4441	358.78215	837.15985
Slice 38	259.97877	297.45236	1,484.0966	6,484.4619	1,200.3588	0.00012353894
Slice 39	265.38492	297.8244	1,521.826	6,515.2815	360.69116	841.61272
Slice 40	272.61011	298.43708	1,585.0543	6,669.5307	1,223.0977	-8.9667354e-005
Slice 41	276.38621	298.75729	1,623.4328	6,750.2713	1,233.2881	-4.6945955e-005
Slice 42	280.97736	299.42935	1,678.5321	6,698.0661	1,224.132	0.00016913141
Slice 43	289.83265	300.74574	1,789.8651	6,831.3421	1,229.4835	-4.6801132e-005
Slice 44	298.72836	302.06815	1,901.3116	6,970.2546	1,236.1817	-3.4856372e-006
Slice 45	304.89789	304.30083	1,930.2586	5,451.8202	591.08782	1,379.2039
Slice 46	309.44858	308.49583	1,787.4035	5,101.7723	1,991.4737	150
Slice 47	314.13387	312.81491	1,600.7204	4,836.8242	1,944.4473	150
Slice 48	317.55718	315.97065	1,465.8057	4,861.1794	598.69599	1,000
Slice 49	320.73166	318.897	0	4,546.5232	1,641.5415	254.03804
Slice 50	322.61408	320.6323	0	4,195.3331	2,422.1767	0

Slice 51	324.22409	322.58318	0	3,672.916	2,120.5591	0
Slice 52	327.39432	326.63098	0	3,487.0133	2,013.2281	0
Slice 53	329.67667	329.54512	0	3,353.5894	1,936.1957	0
Slice 54	331.01819	331.25799	0	3,251.3997	1,877.1965	0
Slice 55	332.88757	333.71287	0	3,027.8515	1,748.1309	0
Slice 56	335.83124	337.6811	0	2,767.4884	1,597.8102	0
Slice 57	338.05667	340.6811	0	2,569.0578	1,483.2462	0
Slice 58	340.51866	344	0	2,346.9031	1,354.9851	0
Slice 59	344.81354	349.78975	0	1,954.3573	1,128.3487	0
Slice 60	347.03897	352.78975	0	1,748.2959	1,009.3791	0
Slice 61	348.64432	354.95385	0	1,597.9831	922.596	0
Slice 62	350.79119	357.95385	0	1,336.327	771.52875	0
Slice 63	353.48885	362	0	1,059.8443	611.90142	0
Slice 64	357.37383	367.82699	0	655.01583	378.17356	0
Slice 65	359.33747	370.82699	0	381.26959	220.1261	0
Slice 66	360.78298	374	0	186.00281	107.38877	0

Figure 37 Stability for Section OP-1, Partially Drained Conditions, Waste Lift 10

Waste Lift10 - 4th step pp

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File Information

Title: Model City - RMU-2 CP-20 Section OP-1
Comments: Operation Conditions for CP-20 Section 1 Based on Maximum Fill Rate of 50,000 Cu Yds per Quarter
Created By: Peter J. Carey
Last Edited By: Peter J. Carey
Revision Number: 509
File Version: 8.0
Tool Version: 8.0.10.6504
Date: 2/24/2013
Time: 12:44:51 PM
File Name: C20OP-1r1.gsz
Directory: N:\Model_City\154.002_rmu2\154.005_revsions\geoslope\operational\
Last Solved Date: 2/24/2013
Last Solved Time: 1:44:22 PM

Project Settings

Length(L) Units: feet
Time(t) Units: Days
Force(F) Units: lbf
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D

Analysis Settings

Waste Lift10 - 4th step pp

Description: Undrained Strength based on 25% of fill time
Kind: SLOPE/W
Parent: WASTE LIFT 10 EL. 383
Method: Morgenstern-Price
Settings
- Side Function
  - Interslice force function option: Half-Sine
- Lambda
  - Lambda 1: -1
  - Lambda 2: -0.8
  - Lambda 3: -0.6
  - Lambda 4: -0.4
  - Lambda 5: -0.2
  - Lambda 6: 0
  - Lambda 7: 0.2

Lambda 8: 0.4
Lambda 9: 0.6
Lambda 10: 0.8
Lambda 11: 1
PWP Conditions Source: Parent Analysis
Slip Surface
Direction of movement: Right to Left
Use Passive Mode: No
Slip Surface Option: Entry and Exit
Critical slip surfaces saved: 1
Optimize Critical Slip Surface Location: Yes
Tension Crack
Tension Crack Option: (none)
F of S Distribution
F of S Calculation Option: Constant
Advanced
Number of Slices: 30
F of S Tolerance: 0.001
Minimum Slip Surface Depth: 15 ft
Optimization Maximum Iterations: 2,000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

Waste Material

Model: Mohr-Coulomb
Unit Weight: 111 pcf
Cohesion': 0 psf
Phi': 30 °
Phi-B: 0 °

Bottom Liner

Model: Shear/Normal Fn.
Unit Weight: 120 pcf
Strength Function: Baseliner
Phi-B: 0 °

CCL

Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 1,000 psf
Phi': 10 °
Phi-B: 0 °

Upper Till

Model: Mohr-Coulomb

Unit Weight: 125 pcf
Cohesion': 150 psf
Phi': 31 °
Phi-B: 0 °

Deflection surface

Model: Bedrock (Impenetrable)

Structural Fill

Model: Mohr-Coulomb
Unit Weight: 135 pcf
Cohesion': 1,000 psf
Phi': 45 °
Phi-B: 0 °

NOT ACTIVE

Model: (None)

GC UNDRAINED

Model: Shear/Normal Fn.
Unit Weight: 120 pcf
Strength Function: SHANSEP CONSOLIDATED UNDRAINED STATIC
Phi-B: 0 °
Anisotropic Strength Fn: clay ellipse staticshear

GC-Overconsolidated-UNDRAINED

Model: Shear/Normal Fn.
Unit Weight: 125 pcf
Strength Function: SHANSEP Over CONSOLIDATED UNDRAINED STATIC
Phi-B: 0 °
Anisotropic Strength Fn: clay ellipse staticshear

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (76.8668, 319.45558) ft
Left-Zone Right Coordinate: (171.8639, 324.99999) ft
Left-Zone Increment: 10
Right Projection: Range
Right-Zone Left Coordinate: (290, 363.58286) ft
Right-Zone Right Coordinate: (399.9028, 380.82588) ft
Right-Zone Increment: 10
Radius Increments: 8

Slip Surface Limits

Left Coordinate: (63.808718, 319.21096) ft
Right Coordinate: (446.87317, 382.21462) ft

Anisotropic Strength Functions

clay ellipse staticshear

Model: Spline Data Point Function
Function: Modifier Factor vs. Inclination
Curve Fit to Data: 100 %
Segment Curvature: 50 %
Y-Intercept: 0.706
Data Points: Inclination (°), Modifier Factor
Data Point: (-60, 0.92608827)
Data Point: (-30, 0.92608827)
Data Point: (-17.838428, 0.83077031)
Data Point: (-3, 0.70608827)
Data Point: (3, 0.70608827)
Data Point: (23.685228, 0.82618324)
Data Point: (39.261389, 0.92608827)
Data Point: (59.397364, 0.92608827)

Shear/Normal Strength Functions

Baseliner

Model: Shear/Normal Spline Data Point Function
Function: Shear Stress vs. Normal Stress
Curve Fit to Data: 100 %
Segment Curvature: 100 %
Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
Data Point: (0, 0)
Data Point: (500, 235)
Data Point: (1,000, 463)
Data Point: (2,000, 899)
Data Point: (5,000, 2,057)
Data Point: (10,000, 3,515)
Data Point: (15,000, 4,430)
Estimation Properties
Intact Rock Param.: 10
Geological Strength: 100
Disturbance Factor: 0
SigmaC: 600,000 psf
SigmaC: 300,000 psf
Num. Points: 20

SHANSEP CONSOLIDATED UNDRAINED STATIC

Model: Add-In Function
Function: Shear Stress vs. Normal Stress
Assembly: GeoStudio AddIns1
Function: SHANSEPP
Field
MPP: 5000
m: 0.7

S: .34
Y-Intercept: -1.#IND

SHANSEP Over CONSOLIDATED UNDRAINED STATIC

Model: Add-In Function
Function: Shear Stress vs. Normal Stress
Assembly: GeoStudio AddIns1
Function: SHANSEPP
Field
MPP: 8000
m: 0.7
S: .34
Y-Intercept: -1.#IND

Points

	X (ft)	Y (ft)
Point 1	561.5172	329
Point 2	184.2753	329
Point 3	174.1934	323.83525
Point 4	351.3603	319.67886
Point 5	546.7523	324.07989
Point 6	139.5241	323.62981
Point 7	0	321.01609
Point 8	0	318.01563
Point 9	133.22	320.51124
Point 10	196.3072	335
Point 11	579.5227	335
Point 12	597.5282	341
Point 13	208.339	341
Point 14	608.5585	347
Point 15	240.1424	347
Point 16	234.9596	345.27685
Point 17	219.929	346.77965
Point 18	611.3486	345.60539
Point 19	596.5548	353
Point 20	258.1852	353
Point 21	250.6076	350.4794
Point 22	276.2227	359
Point 23	584.5511	359
Point 24	294.2603	365
Point 25	572.5474	365
Point 26	312.2978	371

Point 27	560.5437	371
Point 28	548.5399	377
Point 29	330.1036	377
Point 30	325.5389	375.4045
Point 31	337.8201	379.69712
Point 32	364.4177	380
Point 33	381.0855	380.33726
Point 34	395.5929	380.71635
Point 35	416.8543	381.25666
Point 36	438.0487	382
Point 37	479.1653	383
Point 38	511.5499	383
Point 39	512.0826	382.82242
Point 40	513.8708	383
Point 41	531.0491	383
Point 42	533.1096	382.31347
Point 43	533.1107	382.31305
Point 44	536.5271	381.01628
Point 45	537.9265	380.70839
Point 46	547.5083	377.51565
Point 47	346.883	383
Point 48	493.5541	389
Point 49	363.3465	389
Point 50	371.2953	391.89686
Point 51	372.0119	391.98713
Point 52	372.2345	391.99514
Point 53	372.3208	392
Point 54	374.2156	392.05341
Point 55	419.4544	394.02388
Point 56	423.1399	394.1518
Point 57	476.0285	394.84323
Point 58	0	275.56112
Point 59	82.561	276.49127
Point 60	84.7322	276.34451
Point 61	123.7177	276.54438
Point 62	191.6961	277.65321
Point 63	430.1918	279.01879
Point 64	487.7086	279.639
Point 65	509.7138	279.55021

Point 66	721.9937	279.02461
Point 67	839	278.53365
Point 68	839	283.95091
Point 69	694.2381	280.02879
Point 70	505.5772	282.211
Point 71	487.7086	281.69555
Point 72	430.1918	282.66537
Point 73	247.1163	283.77931
Point 74	191.6961	282.79673
Point 75	123.7177	280.19493
Point 76	93.9325	281.10076
Point 77	61.0988	279.7585
Point 78	0	281.01485
Point 79	839	292.1407
Point 80	505.5772	286.98428
Point 81	487.7086	287.07159
Point 82	430.1918	289.73652
Point 83	247.1163	297.70175
Point 84	123.7177	292.05467
Point 85	94.7708	289.80875
Point 86	84.7322	289.65003
Point 87	82.561	289.66397
Point 88	38.9609	289.4325
Point 89	0	289.19587
Point 90	0	300.53803
Point 91	17.729	300.30563
Point 92	61.8788	299.93669
Point 93	191.626	301.3549
Point 94	247.1555	301.9218
Point 95	430.2162	304.83853
Point 96	487.7442	304.85433
Point 97	505.6491	305.27434
Point 98	509.7473	305.37466
Point 99	564.3735	305.25518
Point 100	839	303.47923
Point 101	839	306.47929
Point 102	564.3865	308.25516
Point 103	509.7138	308.37474
Point 104	505.5772	308.27348

Point 105	487.7086	307.85432
Point 106	430.1918	307.83852
Point 107	247.1163	304.92156
Point 108	191.6961	304.35577
Point 109	123.7177	308.23059
Point 110	93.9325	306.13974
Point 111	81.2213	307.4429
Point 112	61.5521	302.93952
Point 113	17.7611	303.30547
Point 114	0	303.53785
Point 115	839	315.0402
Point 116	797.6335	315.91598
Point 117	788.4831	316.10833
Point 118	751.3873	316.84226
Point 119	746.5947	316.94222
Point 120	742.0308	317.02756
Point 121	740.5664	317.15339
Point 122	740.3716	317.22293
Point 123	737.8797	317.29393
Point 124	718.0152	324.01292
Point 125	711.8056	325.93525
Point 126	706.0898	327.46147
Point 127	700.0454	333.50592
Point 128	694.499	330.73293
Point 129	691.9982	333.23326
Point 130	680.0323	333.54954
Point 131	679.8975	333.54516
Point 132	674.9116	331.05465
Point 133	672.911	331.05491
Point 134	672.1929	333.92615
Point 135	648.0416	332
Point 136	642.1238	328.67972
Point 137	637.4622	326.05461
Point 138	633.8287	324
Point 139	632.6094	323.29395
Point 140	630.3447	322
Point 141	556.3265	322
Point 142	544.3989	318.02536
Point 143	351.3575	313.67727

Point 144	171.7713	317.89042
Point 145	158.9451	319.66188
Point 146	146.7629	317.7643
Point 147	0	315.01616
Point 148	126.916	317.39267
Point 149	624.2673	344.64
Point 150	642.7896	345.19608
Point 151	639.8757	348.10995
Point 152	623.7369	347.62543
Point 153	543.8794	321.01441
Point 154	351.3589	316.67806
Point 155	172.0125	320.88559
Point 156	158.9189	322.69398
Point 157	146.5027	320.75996
Point 158	161.8204	329.91734
Point 159	162.0292	329.91734
Point 160	169.8774	325.99323
Point 161	172.2537	323.88076
Point 162	158.8927	325.72607
Point 163	146.2426	323.75561
Point 164	144.6459	323.72571
Point 165	157.0292	329.91734
Point 166	643.2531	345.21
Point 167	651.9258	349.55
Point 168	666.9304	350
Point 169	668.3508	349.29
Point 170	707.4035	333.53244
Point 171	710.6052	333.51008
Point 172	711.3189	333.31046
Point 173	713.7443	332.66283
Point 174	720.1721	330.67297
Point 175	739.1283	324.2612
Point 176	741.6802	324.18848
Point 177	742.0676	324.05019
Point 178	742.3962	324.02195
Point 179	746.7331	323.94086
Point 180	751.5295	323.84082
Point 181	788.6259	323.10687
Point 182	797.7821	322.91441

Point 183	839	322.03859
Point 184	704.3877	335.67695
Point 185	758.6353	353.74048
Point 186	806.6964	369.75012
Point 187	818.5728	368.55874
Point 188	839	375.2318
Point 189	623.3833	349.61571
Point 190	636.5766	350.01181
Point 191	637.9727	350.01292
Point 192	0	260
Point 193	839	260

Regions

	Material	Points	Area (ft²)
Region 1	Waste Material	1,2,3,4,5	2,684.8
Region 2	NOT ACTIVE	6,7,8,9	409.18
Region 3	Waste Material	10,11,1,2	2,281.4
Region 4	Waste Material	10,11,12,13	2,317.2
Region 5	Waste Material	14,15,16,17,13,12,18	2,329.2
Region 6	Waste Material	19,20,21,15,14	2,120.4
Region 7	Waste Material	19,20,22,23	1,940.1
Region 8	Waste Material	23,22,24,25	1,759.8
Region 9	Waste Material	26,27,25,24	1,579.6
Region 10	Waste Material	28,29,30,26,27	1,399.5
Region 11	Waste Material	29,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,28	963.75
Region 12	NOT ACTIVE	47,31,32,33,34,35,36,37,38,48,49	1,129
Region 13	NOT ACTIVE	49,50,51,52,53,54,55,56,57,48	563.69
Region 14	Deflection surface	58,59,60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78	3,000.7
Region 15	Deflection surface	78,77,76,75,74,73,72,71,70,69,68,79,80,81,82,83,84,85,86,87,88,89	7,768.6
Region 16	GC UNDRAINED	90,91,92,93,94,95,96,97,98,99,100,79,80,81,82,83,84,85,86,87,88,89	10,108
Region 17	GC-Overconsolidated-UNDRAINED	90,91,92,93,94,95,96,97,98,99,100,101,102,103,104,105,106,107,108,109,110,111,112,113,114	2,873.1
Region 18	Upper Till	114,113,112,111,110,109,108,107,106,105,104,103,102,101,115,116,117,118,119,120,121,122,123,124,125,126,127,128,129,130,131,132,133,134,135,136,137,138,139,140,141,142,143,144,145,146,147	9,788.5

Region 19	Structural Fill	8,147,148,9	390.2
Region 20	CCL	148,146,145,144,143,142,141,149,150,151,152,153,154,155,156,157,9	1,547.9
Region 21	Structural Fill	158,159,160,3,161,162,163,164,165	80.098
Region 22	Structural Fill	150,166,167,168,169,134,135,136,137,138,139,140,141,149	1,602.2
Region 23	NOT ACTIVE	127,170,171,172,173,174,175,176,177,178,179,180,181,182,183,115,116,117,118,119,120,121,122,123,124,125,126	957.6
Region 24	NOT ACTIVE	184,185,186,187,188,183,182,181,180,179,178,177,176,175,174,173,172,171,170,127	4,345.4
Region 25	Bottom Liner	157,9,6,164,163,162,161,3,4,5,1,11,12,18,189,190,191,151,152,153,154,155,156	1,423.6
Region 26	Deflection surface	58,192,193,67,66,65,64,63,62,61,60,59	15,370

Current Slip Surface

Slip Surface: 1,090
F of S: 1.583
Volume: 10,599.983 ft³
Weight: 1,233,620.1 lbs
Resisting Moment: 62,693,095 lbs-ft
Activating Moment: 39,623,559 lbs-ft
Resisting Force: 322,793.94 lbs
Activating Force: 203,625.33 lbs
F of S Rank: 1
Exit: (114.59609, 320.16236) ft
Entry: (372.09297, 380.1553) ft
Radius: 126.30436 ft
Center: (218.6228, 454.76588) ft

Slip Slices

	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
Slice 1	117.0248	318.70764	-422.26843	970.64413	970.64413	1,000
Slice 2	123.18476	315.01804	206.23282	977.18542	463.23505	150
Slice 3	128.61325	311.76656	422.6533	1,495.2742	644.49566	150
Slice 4	131.76525	309.84804	550.17514	1,809.4694	756.66033	150
Slice 5	134.3365	308.25389	655.90607	2,163.6556	905.94732	150
Slice 6	137.48855	306.29965	782.16922	2,931.2289	509.63329	1,189.1439
Slice 7	142.085	303.44989	960.32486	3,546.5689	538.74609	1,257.0736
Slice 8	145.27343	301.4731	1,081.2165	3,931.6871	554.69993	1,294.2998
Slice 9	146.07178	301.0533	1,106.8584	3,317.4514	412.83973	963.29257
Slice 10	146.37265	300.99917	1,110.5115	3,347.2378	414.29786	966.69492

Slice 11	146.6328	300.95236	1,113.6671	3,372.679	415.53187	969.57445
Slice 12	150.55482	300.24666	1,160.9622	3,682.4152	309.05802	721.13553
Slice 13	155.68797	299.39923	1,218.0745	4,095.5144	310.74496	725.07153
Slice 14	157.98715	299.11613	1,238.095	4,228.756	314.36352	733.51539
Slice 15	160.38275	298.82117	1,258.8831	4,274.8012	315.15769	735.36831
Slice 16	161.9248	298.6313	1,272.2091	4,306.0138	315.71695	736.67429
Slice 17	165.9533	298.13528	1,306.7215	4,112.709	308.40963	719.62243
Slice 18	170.82435	297.53552	1,347.7517	3,867.3576	298.60834	696.75289
Slice 19	171.8919	297.40407	1,356.6303	3,813.0424	296.3417	691.4635
Slice 20	172.1331	297.37437	1,358.6316	3,800.8644	295.82746	690.26368
Slice 21	173.22355	297.24011	1,367.6573	3,743.9215	293.40728	684.61637
Slice 22	176.45496	296.84223	1,394.1871	3,864.5678	296.84607	692.64097
Slice 23	181.49591	296.26371	1,432.6491	4,219.38	305.73631	713.38508
Slice 24	186.16443	295.75969	1,465.8181	4,557.5862	315.41378	735.96566
Slice 25	189.83978	295.46447	1,485.8716	4,719.3167	315.96245	737.24514
Slice 26	192.7145	295.31759	1,496.7186	4,898.3112	320.80439	748.54352
Slice 27	195.0551	295.31928	1,499.0079	4,878.7049	320.17557	747.07631
Slice 28	199.6932	295.53153	1,492.6109	5,099.2493	326.47896	761.78533
Slice 29	205.70909	295.80684	1,484.3416	5,383.5584	334.2088	779.82101
Slice 30	214.134	296.19238	1,472.7938	5,777.7997	344.28418	803.32952
Slice 31	223.57922	296.62462	1,459.8106	5,973.2356	349.20187	814.8048
Slice 32	230.87965	296.95871	1,449.6168	5,823.7368	345.93303	807.17715
Slice 33	234.74473	297.13559	1,444.1041	5,743.6065	344.15236	803.02101
Slice 34	237.551	297.26401	1,440.0238	5,809.075	345.81301	806.89614
Slice 35	243.62935	297.54218	1,430.7845	5,972.0239	349.84654	816.30749
Slice 36	248.86195	297.6258	1,431.5129	6,311.7553	357.48182	834.12513
Slice 37	252.55736	297.46502	1,446.0524	6,450.5169	1,201.3768	-4.5731229e-005
Slice 38	256.34616	297.46391	1,461.6384	6,385.472	358.43967	836.35746
Slice 39	260.67978	297.6612	1,481.7137	6,498.2493	1,204.2813	0.00029372712
Slice 40	266.43644	298.07015	1,512.5518	6,538.1301	1,209.8141	8.1870947e-005
Slice 41	272.96062	298.66091	1,556.3933	6,673.337	1,231.8089	-0.00013372232
Slice 42	278.89348	299.19813	1,623.4789	6,796.0828	1,245.2079	-3.5110881e-006
Slice 43	287.91228	300.32962	1,737.3611	6,851.0937	1,244.0114	0.00012803159
Slice 44	299.33941	301.93108	1,881.8736	7,033.6859	1,253.2754	-0.00026857148
Slice 45	304.70989	302.74318	1,951.0372	6,746.5964	395.34277	922.46696
Slice 46	308.64953	304.09915	1,979.65	6,667.6463	545.63503	1,273.1489
Slice 47	312.8648	305.55	2,005.0925	6,646.9361	544.01807	1,269.3755
Slice 48	318.22345	310.04367	1,836.7038	5,203.7818	2,023.1446	150
Slice 49	324.27701	315.47422	1,618.393	5,107.2309	615.17626	1,000

Slice 50	325.90692	316.93639	1,567.05	5,024.6925	609.67566	1,000
Slice 51	327.90487	318.72872	0	4,756.4399	1,694.8467	276.02693
Slice 52	329.80419	320.43256	0	4,396.4993	2,538.32	0
Slice 53	330.08859	320.69374	0	3,860.7225	2,228.9892	0
Slice 54	333.29067	324.85663	0	3,674.0855	2,121.2343	0
Slice 55	337.14892	329.87258	0	3,447.9286	1,990.6625	0
Slice 56	339.45651	332.87258	0	3,271.6927	1,888.9126	0
Slice 57	342.43578	336.7458	0	3,021.2898	1,744.3425	0
Slice 58	344.68043	339.7458	0	2,755.0116	1,590.6067	0
Slice 59	346.23261	341.90455	0	2,616.6523	1,510.7249	0
Slice 60	348.38967	344.90455	0	2,422.7798	1,398.7926	0
Slice 61	352.0534	350	0	2,089.4568	1,206.3484	0
Slice 62	356.36752	356	0	1,690.1545	975.81114	0
Slice 63	360.68164	362	0	1,282.7713	740.60835	0
Slice 64	363.0926	365.35312	0	1,051.7575	607.23248	0
Slice 65	363.8821	366.45115	0	975.37858	563.13508	0
Slice 66	365.78526	369.09803	0	790.82331	456.58205	0
Slice 67	367.93566	372.08877	0	580.80531	335.3281	0
Slice 68	369.64278	375.08877	0	314.4524	181.54918	0
Slice 69	370.93118	377.75293	0	149.84338	86.512117	0
Slice 70	371.6536	379.24676	0	56.805653	32.796759	0
Slice 71	372.05244	380.07148	0	5.2501682	3.031186	0

Figure 38 Stability for Section OP-1, Partially Drained Conditions, Waste Lift 10 - 1 Year After Placement

Waste Lift10 - consolidated

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File Information

Title: Model City - RMU-2 CP-20 Section OP-1
Comments: Operation Conditions for CP-20 Section 1 Based on Maximum Fill Rate of 50,000 Cu Yds per Quarter
Created By: Peter J. Carey
Last Edited By: Peter J. Carey
Revision Number: 509
File Version: 8.0
Tool Version: 8.0.10.6504
Date: 2/24/2013
Time: 12:44:51 PM
File Name: C20OP-1r1.gsz
Directory: N:\Model_City\154.002_rmu2\154.005_revsions\geoslope\operational\
Last Solved Date: 2/24/2013
Last Solved Time: 2:10:14 PM

Project Settings

Length(L) Units: feet
Time(t) Units: Days
Force(F) Units: lbf
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D

Analysis Settings

Waste Lift10 - consolidated

Description: Undrained Strength based on consolidation after 1yr
Kind: SLOPE/W
Parent: WASTE LIFT 10 EL. 383 - consol
Method: Morgenstern-Price
Settings
- Side Function
  - Interslice force function option: Half-Sine
- Lambda
  - Lambda 1: -1
  - Lambda 2: -0.8
  - Lambda 3: -0.6
  - Lambda 4: -0.4
  - Lambda 5: -0.2
  - Lambda 6: 0
  - Lambda 7: 0.2

Lambda 8: 0.4
Lambda 9: 0.6
Lambda 10: 0.8
Lambda 11: 1
PWP Conditions Source: Parent Analysis
Slip Surface
Direction of movement: Right to Left
Use Passive Mode: No
Slip Surface Option: Entry and Exit
Critical slip surfaces saved: 1
Optimize Critical Slip Surface Location: Yes
Tension Crack
Tension Crack Option: (none)
F of S Distribution
F of S Calculation Option: Constant
Advanced
Number of Slices: 30
F of S Tolerance: 0.001
Minimum Slip Surface Depth: 15 ft
Optimization Maximum Iterations: 2,000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

Waste Material

Model: Mohr-Coulomb
Unit Weight: 111 pcf
Cohesion': 0 psf
Phi': 30 °
Phi-B: 0 °

Bottom Liner

Model: Shear/Normal Fn.
Unit Weight: 120 pcf
Strength Function: Baseliner
Phi-B: 0 °

CCL

Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 1,000 psf
Phi': 10 °
Phi-B: 0 °

Upper Till

Model: Mohr-Coulomb

Unit Weight: 125 pcf
Cohesion': 150 psf
Phi': 31 °
Phi-B: 0 °

Deflection surface

Model: Bedrock (Impenetrable)

Structural Fill

Model: Mohr-Coulomb
Unit Weight: 135 pcf
Cohesion': 1,000 psf
Phi': 45 °
Phi-B: 0 °

NOT ACTIVE

Model: (None)

GC UNDRAINED

Model: Shear/Normal Fn.
Unit Weight: 120 pcf
Strength Function: SHANSEP CONSOLIDATED UNDRAINED STATIC
Phi-B: 0 °
Anisotropic Strength Fn: clay ellipse staticshear

GC-Overconsolidated-UNDRAINED

Model: Shear/Normal Fn.
Unit Weight: 125 pcf
Strength Function: SHANSEP Over CONSOLIDATED UNDRAINED STATIC
Phi-B: 0 °
Anisotropic Strength Fn: clay ellipse staticshear

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (76.8668, 319.45558) ft
Left-Zone Right Coordinate: (171.8639, 324.99999) ft
Left-Zone Increment: 10
Right Projection: Range
Right-Zone Left Coordinate: (290, 363.58286) ft
Right-Zone Right Coordinate: (399.9028, 380.82588) ft
Right-Zone Increment: 10
Radius Increments: 8

Slip Surface Limits

Left Coordinate: (63.808718, 319.21096) ft
Right Coordinate: (446.87317, 382.21462) ft

Anisotropic Strength Functions

clay ellipse staticshear

Model: Spline Data Point Function
Function: Modifier Factor vs. Inclination
Curve Fit to Data: 100 %
Segment Curvature: 50 %
Y-Intercept: 0.706
Data Points: Inclination (°), Modifier Factor
Data Point: (-60, 0.92608827)
Data Point: (-30, 0.92608827)
Data Point: (-17.838428, 0.83077031)
Data Point: (-3, 0.70608827)
Data Point: (3, 0.70608827)
Data Point: (23.685228, 0.82618324)
Data Point: (39.261389, 0.92608827)
Data Point: (59.397364, 0.92608827)

Shear/Normal Strength Functions

Baseliner

Model: Shear/Normal Spline Data Point Function
Function: Shear Stress vs. Normal Stress
Curve Fit to Data: 100 %
Segment Curvature: 100 %
Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
Data Point: (0, 0)
Data Point: (500, 235)
Data Point: (1,000, 463)
Data Point: (2,000, 899)
Data Point: (5,000, 2,057)
Data Point: (10,000, 3,515)
Data Point: (15,000, 4,430)
Estimation Properties
Intact Rock Param.: 10
Geological Strength: 100
Disturbance Factor: 0
SigmaC: 600,000 psf
SigmaC: 300,000 psf
Num. Points: 20

SHANSEP CONSOLIDATED UNDRAINED STATIC

Model: Add-In Function
Function: Shear Stress vs. Normal Stress
Assembly: GeoStudio AddIns1
Function: SHANSEPP
Field
MPP: 5000
m: 0.7

S: .34
Y-Intercept: -1.#IND

SHANSEP Over CONSOLIDATED UNDRAINED STATIC

Model: Add-In Function
Function: Shear Stress vs. Normal Stress
Assembly: GeoStudio AddIns1
Function: SHANSEPP
Field
MPP: 8000
m: 0.7
S: .34
Y-Intercept: -1.#IND

Points

	X (ft)	Y (ft)
Point 1	561.5172	329
Point 2	184.2753	329
Point 3	174.1934	323.83525
Point 4	351.3603	319.67886
Point 5	546.7523	324.07989
Point 6	139.5241	323.62981
Point 7	0	321.01609
Point 8	0	318.01563
Point 9	133.22	320.51124
Point 10	196.3072	335
Point 11	579.5227	335
Point 12	597.5282	341
Point 13	208.339	341
Point 14	608.5585	347
Point 15	240.1424	347
Point 16	234.9596	345.27685
Point 17	219.929	346.77965
Point 18	611.3486	345.60539
Point 19	596.5548	353
Point 20	258.1852	353
Point 21	250.6076	350.4794
Point 22	276.2227	359
Point 23	584.5511	359
Point 24	294.2603	365
Point 25	572.5474	365
Point 26	312.2978	371

Point 27	560.5437	371
Point 28	548.5399	377
Point 29	330.1036	377
Point 30	325.5389	375.4045
Point 31	337.8201	379.69712
Point 32	364.4177	380
Point 33	381.0855	380.33726
Point 34	395.5929	380.71635
Point 35	416.8543	381.25666
Point 36	438.0487	382
Point 37	479.1653	383
Point 38	511.5499	383
Point 39	512.0826	382.82242
Point 40	513.8708	383
Point 41	531.0491	383
Point 42	533.1096	382.31347
Point 43	533.1107	382.31305
Point 44	536.5271	381.01628
Point 45	537.9265	380.70839
Point 46	547.5083	377.51565
Point 47	346.883	383
Point 48	493.5541	389
Point 49	363.3465	389
Point 50	371.2953	391.89686
Point 51	372.0119	391.98713
Point 52	372.2345	391.99514
Point 53	372.3208	392
Point 54	374.2156	392.05341
Point 55	419.4544	394.02388
Point 56	423.1399	394.1518
Point 57	476.0285	394.84323
Point 58	0	275.56112
Point 59	82.561	276.49127
Point 60	84.7322	276.34451
Point 61	123.7177	276.54438
Point 62	191.6961	277.65321
Point 63	430.1918	279.01879
Point 64	487.7086	279.639
Point 65	509.7138	279.55021

Point 66	721.9937	279.02461
Point 67	839	278.53365
Point 68	839	283.95091
Point 69	694.2381	280.02879
Point 70	505.5772	282.211
Point 71	487.7086	281.69555
Point 72	430.1918	282.66537
Point 73	247.1163	283.77931
Point 74	191.6961	282.79673
Point 75	123.7177	280.19493
Point 76	93.9325	281.10076
Point 77	61.0988	279.7585
Point 78	0	281.01485
Point 79	839	292.1407
Point 80	505.5772	286.98428
Point 81	487.7086	287.07159
Point 82	430.1918	289.73652
Point 83	247.1163	297.70175
Point 84	123.7177	292.05467
Point 85	94.7708	289.80875
Point 86	84.7322	289.65003
Point 87	82.561	289.66397
Point 88	38.9609	289.4325
Point 89	0	289.19587
Point 90	0	300.53803
Point 91	17.729	300.30563
Point 92	61.8788	299.93669
Point 93	191.626	301.3549
Point 94	247.1555	301.9218
Point 95	430.2162	304.83853
Point 96	487.7442	304.85433
Point 97	505.6491	305.27434
Point 98	509.7473	305.37466
Point 99	564.3735	305.25518
Point 100	839	303.47923
Point 101	839	306.47929
Point 102	564.3865	308.25516
Point 103	509.7138	308.37474
Point 104	505.5772	308.27348

Point 105	487.7086	307.85432
Point 106	430.1918	307.83852
Point 107	247.1163	304.92156
Point 108	191.6961	304.35577
Point 109	123.7177	308.23059
Point 110	93.9325	306.13974
Point 111	81.2213	307.4429
Point 112	61.5521	302.93952
Point 113	17.7611	303.30547
Point 114	0	303.53785
Point 115	839	315.0402
Point 116	797.6335	315.91598
Point 117	788.4831	316.10833
Point 118	751.3873	316.84226
Point 119	746.5947	316.94222
Point 120	742.0308	317.02756
Point 121	740.5664	317.15339
Point 122	740.3716	317.22293
Point 123	737.8797	317.29393
Point 124	718.0152	324.01292
Point 125	711.8056	325.93525
Point 126	706.0898	327.46147
Point 127	700.0454	333.50592
Point 128	694.499	330.73293
Point 129	691.9982	333.23326
Point 130	680.0323	333.54954
Point 131	679.8975	333.54516
Point 132	674.9116	331.05465
Point 133	672.911	331.05491
Point 134	672.1929	333.92615
Point 135	648.0416	332
Point 136	642.1238	328.67972
Point 137	637.4622	326.05461
Point 138	633.8287	324
Point 139	632.6094	323.29395
Point 140	630.3447	322
Point 141	556.3265	322
Point 142	544.3989	318.02536
Point 143	351.3575	313.67727

Point 144	171.7713	317.89042
Point 145	158.9451	319.66188
Point 146	146.7629	317.7643
Point 147	0	315.01616
Point 148	126.916	317.39267
Point 149	624.2673	344.64
Point 150	642.7896	345.19608
Point 151	639.8757	348.10995
Point 152	623.7369	347.62543
Point 153	543.8794	321.01441
Point 154	351.3589	316.67806
Point 155	172.0125	320.88559
Point 156	158.9189	322.69398
Point 157	146.5027	320.75996
Point 158	161.8204	329.91734
Point 159	162.0292	329.91734
Point 160	169.8774	325.99323
Point 161	172.2537	323.88076
Point 162	158.8927	325.72607
Point 163	146.2426	323.75561
Point 164	144.6459	323.72571
Point 165	157.0292	329.91734
Point 166	643.2531	345.21
Point 167	651.9258	349.55
Point 168	666.9304	350
Point 169	668.3508	349.29
Point 170	707.4035	333.53244
Point 171	710.6052	333.51008
Point 172	711.3189	333.31046
Point 173	713.7443	332.66283
Point 174	720.1721	330.67297
Point 175	739.1283	324.2612
Point 176	741.6802	324.18848
Point 177	742.0676	324.05019
Point 178	742.3962	324.02195
Point 179	746.7331	323.94086
Point 180	751.5295	323.84082
Point 181	788.6259	323.10687
Point 182	797.7821	322.91441

Point 183	839	322.03859
Point 184	704.3877	335.67695
Point 185	758.6353	353.74048
Point 186	806.6964	369.75012
Point 187	818.5728	368.55874
Point 188	839	375.2318
Point 189	623.3833	349.61571
Point 190	636.5766	350.01181
Point 191	637.9727	350.01292
Point 192	0	260
Point 193	839	260

Regions

	Material	Points	Area (ft²)
Region 1	Waste Material	1,2,3,4,5	2,684.8
Region 2	NOT ACTIVE	6,7,8,9	409.18
Region 3	Waste Material	10,11,1,2	2,281.4
Region 4	Waste Material	10,11,12,13	2,317.2
Region 5	Waste Material	14,15,16,17,13,12,18	2,329.2
Region 6	Waste Material	19,20,21,15,14	2,120.4
Region 7	Waste Material	19,20,22,23	1,940.1
Region 8	Waste Material	23,22,24,25	1,759.8
Region 9	Waste Material	26,27,25,24	1,579.6
Region 10	Waste Material	28,29,30,26,27	1,399.5
Region 11	Waste Material	29,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,28	963.75
Region 12	NOT ACTIVE	47,31,32,33,34,35,36,37,38,48,49	1,129
Region 13	NOT ACTIVE	49,50,51,52,53,54,55,56,57,48	563.69
Region 14	Deflection surface	58,59,60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78	3,000.7
Region 15	Deflection surface	78,77,76,75,74,73,72,71,70,69,68,79,80,81,82,83,84,85,86,87,88,89	7,768.6
Region 16	GC UNDRAINED	90,91,92,93,94,95,96,97,98,99,100,79,80,81,82,83,84,85,86,87,88,89	10,108
Region 17	GC-Overconsolidated-UNDRAINED	90,91,92,93,94,95,96,97,98,99,100,101,102,103,104,105,106,107,108,109,110,111,112,113,114	2,873.1
Region 18	Upper Till	114,113,112,111,110,109,108,107,106,105,104,103,102,101,115,116,117,118,119,120,121,122,123,124,125,126,127,128,129,130,131,132,133,134,135,136,137,138,139,140,141,142,143	9,788.5

		,144,145,146,147	
Region 19	Structural Fill	8,147,148,9	390.2
Region 20	CCL	148,146,145,144,143,142,141,149,150,151,152,153,154,155,156,157,9	1,547.9
Region 21	Structural Fill	158,159,160,3,161,162,163,164,165	80.098
Region 22	Structural Fill	150,166,167,168,169,134,135,136,137,138,139,140,141,149	1,602.2
Region 23	NOT ACTIVE	127,170,171,172,173,174,175,176,177,178,179,180,181,182,183,115,116,117,118,119,120,121,122,123,124,125,126	957.6
Region 24	NOT ACTIVE	184,185,186,187,188,183,182,181,180,179,178,177,176,175,174,173,172,171,170,127	4,345.4
Region 25	Bottom Liner	157,9,6,164,163,162,161,3,4,5,1,11,12,18,189,190,191,151,152,153,154,155,156	1,423.6
Region 26	Deflection surface	58,192,193,67,66,65,64,63,62,61,60,59	15,370

Current Slip Surface

Slip Surface: 1,090
F of S: 1.688
Volume: 10,163.882 ft³
Weight: 1,184,061.9 lbs
Resisting Moment: 64,315,337 lbs-ft
Activating Moment: 38,266,207 lbs-ft
Resisting Force: 337,392.06 lbs
Activating Force: 196,968.26 lbs
F of S Rank: 1
Exit: (112.83704, 320.12941) ft
Entry: (363.99144, 379.99515) ft
Radius: 124.35942 ft
Center: (212.7594, 451.71232) ft

Slip Slices

	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
Slice 1	115.23621	318.67415	-473.28918	919.96306	919.96306	1,000
Slice 2	122.27569	314.40422	84.637616	1,119.3402	621.71204	150
Slice 3	127.58166	311.18579	287.23249	1,659.6684	824.6427	150
Slice 4	130.72915	309.23574	409.88225	1,993.4196	951.48526	150
Slice 5	133.21549	307.68666	507.26528	2,441.7406	493.81305	1,152.2307
Slice 6	136.37205	305.72	628.12823	2,990.395	524.31495	1,223.402
Slice 7	141.39215	302.59229	818.62571	3,747.771	559.26261	1,304.9468
Slice 8	143.95305	301.22879	901.26791	3,401.2245	465.93615	1,087.1855
Slice 9	144.95984	300.9387	918.91771	3,474.562	469.02623	1,094.3945
Slice 10	145.75819	300.70867	932.90291	3,462.2829	336.48611	785.13446
Slice 11	146.37265	300.53162	943.65652	3,533.6304	338.88455	790.73021

Slice 12	146.6328	300.45667	948.20663	3,563.4127	339.87144	793.03362
Slice 13	147.76043	300.13176	967.91284	3,693.4011	344.10918	802.92151
Slice 14	152.89358	299.34179	1,016.1918	3,963.863	312.7619	729.7782
Slice 15	157.98715	298.72283	1,054.0706	4,342.6681	323.20145	754.13729
Slice 16	160.38275	298.43173	1,071.7799	4,389.5774	324.05963	756.14001
Slice 17	161.9248	298.24434	1,083.1393	4,421.2947	324.65541	757.52838
Slice 18	165.9533	297.75481	1,112.6597	4,227.9518	317.99487	741.98763
Slice 19	170.82435	297.16289	1,148.076	3,981.9933	309.091	721.21258
Slice 20	171.8919	297.03317	1,155.8032	3,927.4263	307.03675	716.41958
Slice 21	172.1331	297.00386	1,157.5476	3,915.1854	306.57142	715.33288
Slice 22	173.22355	296.87135	1,165.4279	3,857.9235	304.38054	710.22111
Slice 23	176.17058	296.51323	1,186.6802	3,956.8634	306.98933	716.30745
Slice 24	181.21153	296.01406	1,216.212	4,266.2614	311.76328	727.44727
Slice 25	187.95065	295.45875	1,248.9345	4,719.3134	323.78403	755.49702
Slice 26	193.9666	295.26946	1,259.9704	4,862.2241	326.36023	761.50698
Slice 27	198.03615	295.4557	1,248.8967	5,052.7341	331.73467	774.04903
Slice 28	204.05205	295.731	1,232.5241	5,331.943	339.26671	791.6231
Slice 29	211.31981	296.0636	1,212.7414	5,666.1538	347.80286	811.53888
Slice 30	217.1148	296.32879	1,196.963	5,929.9675	354.21375	826.50015
Slice 31	223.36362	296.61476	1,179.9423	5,984.3207	355.80806	830.21945
Slice 32	230.23285	296.92911	1,161.2182	5,836.4081	352.91018	823.4583
Slice 33	234.31354	297.11586	1,150.085	5,747.3915	351.13703	819.31774
Slice 34	237.551	297.26401	1,141.2431	5,800.112	352.54064	822.59432
Slice 35	242.09831	297.47211	1,128.8042	5,916.8317	355.44421	829.37093
Slice 36	245.60486	297.63083	1,119.2897	6,008.8423	357.68713	834.60387
Slice 37	248.88155	297.62495	1,119.9717	6,315.1754	1,247.1658	-4.7474221e-005
Slice 38	254.3964	297.79597	1,112.8066	6,214.277	1,225.1352	-8.9816725e-005
Slice 39	261.41963	298.26711	1,090.404	6,364.1291	1,266.842	4.1079032e-005
Slice 40	267.88848	298.71714	1,069.8779	6,508.9125	1,306.5524	-4.973481e-005
Slice 41	273.6728	299.30662	1,042.2433	6,454.2372	1,317.6146	0.00013560671
Slice 42	280.7321	300.31564	994.20756	6,556.5582	1,354.2209	-3.8184699e-006
Slice 43	289.7509	301.60475	934.2007	6,690.4553	1,401.4291	-3.9515821e-006
Slice 44	294.94754	302.34753	902.72311	6,769.2155	1,428.2675	0.00029801715
Slice 45	296.03509	302.57637	892.54769	6,410.7496	1,458.4771	-5.551793e-005
Slice 46	301.22878	304.27091	811.2686	6,356.5453	568.28056	1,325.9899
Slice 47	309.15997	308.47344	579.61661	4,892.7227	2,591.5756	150
Slice 48	314.31176	312.80559	323.54063	4,623.4742	2,583.6608	150
Slice 49	318.06157	315.95882	138.96672	4,780.1226	818.361	1,000
Slice 50	321.53329	318.8782	0	4,585.3486	1,651.5295	258.05111

Slice 51	323.62612	320.63806	0	4,272.2532	2,466.5865	0
Slice 52	324.76099	321.83751	0	3,804.5376	2,196.5508	0
Slice 53	327.82125	325.37523	0	3,651.4016	2,108.1377	0
Slice 54	330.53021	328.50683	0	3,516.0523	2,029.9937	0
Slice 55	333.54468	331.99163	0	3,364.1086	1,942.269	0
Slice 56	336.97632	336.08605	0	3,046.904	1,759.1308	0
Slice 57	339.2781	339.09442	0	2,875.325	1,660.0697	0
Slice 58	343.03146	344	0	2,557.1641	1,476.3794	0
Slice 59	346.10491	348.01695	0	2,292.6318	1,323.6516	0
Slice 60	348.40028	351.01695	0	2,091.8355	1,207.7218	0
Slice 61	352.21292	356	0	1,752.5707	1,011.8472	0
Slice 62	354.8145	359.40022	0	1,517.406	876.07479	0
Slice 63	356.2627	362.40022	0	1,048.8142	605.53318	0
Slice 64	358.72246	368	0	723.57095	417.75388	0
Slice 65	361.35801	374	0	366.23939	211.44841	0
Slice 66	363.01115	377.76345	0	137.60178	79.444427	0
Slice 67	363.66897	379.26103	0	45.400015	26.211711	0

Figure 39 Stability for Section OP-2, Partially Drained Conditions, Waste Lift 9

Slope Stability Waste Lift 9 -Consolidated Undrained

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File Information

Title: Model City - RMU-2 CP-20 Section OP-2
Comments: Operation Conditions for CP-20 Section 2 Based on Maximum Fill Rate of 50,000 Cu Yds per Quarter
Created By: Peter J. Carey
Revision Number: 494
File Version: 8.0
Tool Version: 8.0.10.6504
Date: 2/24/2013
Time: 7:16:44 PM
File Name: C20OP-2r1.gsz
Directory: N:\Model_City\154.002_rmu2\154.005_revsions\geoslope\operational\
Last Solved Date: 2/24/2013
Last Solved Time: 7:39:24 PM

Project Settings

Length(L) Units: feet
Time(t) Units: Days
Force(F) Units: lbf
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D

Analysis Settings

Slope Stability Waste Lift 9 -Consolidated Undrained

Kind: SLOPE/W
Parent: Waste Lift 9 El. 377
Method: Morgenstern-Price
Settings
- Side Function
  - Interslice force function option: Half-Sine
- Lambda
  - Lambda 1: -1
  - Lambda 2: -0.8
  - Lambda 3: -0.6
  - Lambda 4: -0.4
  - Lambda 5: -0.2
  - Lambda 6: 0

Lambda 7: 0.2
Lambda 8: 0.4
Lambda 9: 0.6
Lambda 10: 0.8
Lambda 11: 1
PWP Conditions Source: Parent Analysis
Slip Surface
Direction of movement: Right to Left
Use Passive Mode: No
Slip Surface Option: Entry and Exit
Critical slip surfaces saved: 3
Optimize Critical Slip Surface Location: Yes
Tension Crack
Tension Crack Option: (none)
F of S Distribution
F of S Calculation Option: Constant
Advanced
Number of Slices: 30
F of S Tolerance: 0.001
Minimum Slip Surface Depth: 10 ft
Optimization Maximum Iterations: 2,000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

Waste Material

Model: Mohr-Coulomb
Unit Weight: 111 pcf
Cohesion': 0 psf
Phi': 30 °
Phi-B: 0 °

Bottom Liner

Model: Shear/Normal Fn.
Unit Weight: 120 pcf
Strength Function: Baseliner
Phi-B: 0 °

CCL

Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 1,000 psf
Phi': 10 °
Phi-B: 0 °

Upper Till

Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 150 psf
Phi': 31 °
Phi-B: 0 °

Deflection surface

Model: Bedrock (Impenetrable)

Structural Fill

Model: Mohr-Coulomb
Unit Weight: 135 pcf
Cohesion': 1,000 psf
Phi': 45 °
Phi-B: 0 °

NOT ACTIVE

Model: (None)

GC UNDRAINED

Model: Shear/Normal Fn.
Unit Weight: 120 pcf
Strength Function: SHANSEP CONSOLIDATED UNDRAINED STATIC
Phi-B: 0 °
Anisotropic Strength Fn: clay ellipse staticshear

GC-Overconsolidated-UNDRAINED

Model: Shear/Normal Fn.
Unit Weight: 125 pcf
Strength Function: SHANSEP Over CONSOLIDATED UNDRAINED STATIC
Phi-B: 0 °
Anisotropic Strength Fn: clay ellipse staticshear

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (45.7472, 328.89155) ft
Left-Zone Right Coordinate: (246, 321.5) ft
Left-Zone Increment: 10
Right Projection: Range
Right-Zone Left Coordinate: (406.2261, 363.59831) ft
Right-Zone Right Coordinate: (514, 377) ft
Right-Zone Increment: 10
Radius Increments: 10

Slip Surface Limits

Left Coordinate: (42.341149, 329.27527) ft
Right Coordinate: (608.6716, 371) ft

Anisotropic Strength Functions

clay ellipse staticshear

Model: Spline Data Point Function
Function: Modifier Factor vs. Inclination
Curve Fit to Data: 100 %
Segment Curvature: 50 %
Y-Intercept: 0.706
Data Points: Inclination (°), Modifier Factor
Data Point: (-60, 0.92608827)
Data Point: (-30, 0.92608827)
Data Point: (-17.838428, 0.83077031)
Data Point: (-3, 0.70608827)
Data Point: (3, 0.70608827)
Data Point: (23.685228, 0.82618324)
Data Point: (39.261389, 0.92608827)
Data Point: (59.397364, 0.92608827)

Shear/Normal Strength Functions

Baseliner

Model: Shear/Normal Spline Data Point Function
Function: Shear Stress vs. Normal Stress
Curve Fit to Data: 100 %
Segment Curvature: 100 %
Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
Data Point: (0, 0)
Data Point: (500, 235)
Data Point: (1,000, 463)
Data Point: (2,000, 899)
Data Point: (5,000, 2,057)
Data Point: (10,000, 3,515)
Data Point: (15,000, 4,430)
Estimation Properties
Intact Rock Param.: 10
Geological Strength: 100
Disturbance Factor: 0
SigmaC: 600,000 psf
SigmaC: 300,000 psf
Num. Points: 20

SHANSEP CONSOLIDATED UNDRAINED STATIC

Model: Add-In Function
Function: Shear Stress vs. Normal Stress
Assembly: GeoStudio AddIns1
Function: SHANSEPP
Field
MPP: 5000
m: 0.7

S: .34
Y-Intercept: -1.#IND

SHANSEP Over CONSOLIDATED UNDRAINED STATIC

Model: Add-In Function
Function: Shear Stress vs. Normal Stress
Assembly: GeoStudio AddIns1
Function: SHANSEPP
Field
MPP: 8000
m: 0.7
S: .34
Y-Intercept: -1.#IND

Points

	X (ft)	Y (ft)
Point 1	0	268.91519
Point 2	207.4978	271.24238
Point 3	209.0232	271.26867
Point 4	215.074	271.32735
Point 5	225.5606	271.44496
Point 6	230.6621	271.56993
Point 7	234.0537	271.62591
Point 8	237.8751	271.70733
Point 9	243.6233	271.78388
Point 10	403.7734	274.99581
Point 11	406.1879	275.04891
Point 12	510.242	277.40528
Point 13	519.1809	277.52295
Point 14	522.2501	277.56833
Point 15	581.5843	278.21948
Point 16	706.5316	275.03632
Point 17	784.4915	272.77004
Point 18	796.8946	272.40949
Point 19	796.8946	278.66207
Point 20	771.752	277.8332
Point 21	583.2389	281.6042
Point 22	512.9202	278.57945
Point 23	404.2686	277.81745
Point 24	248.1947	278.63737
Point 25	83.6675	274.48464
Point 26	78.5956	274.41664

Point 27	69.7373	274.12229
Point 28	0	273.8562
Point 29	0	286.98783
Point 30	69.7373	288.07912
Point 31	78.6615	288.22649
Point 32	83.6675	288.57952
Point 33	248.1947	297.19282
Point 34	404.2686	294.81745
Point 35	512.9202	289.28565
Point 36	583.2389	288.00106
Point 37	796.8946	289.48765
Point 38	0	305.26334
Point 39	63.5351	305.72185
Point 40	69.7373	305.70863
Point 41	77.6371	305.65972
Point 42	78.5956	305.57155
Point 43	83.6675	305.7
Point 44	248.1947	307.61838
Point 45	299.7903	306.27673
Point 46	299.6238	303.28004
Point 47	404.2544	300.5593
Point 48	512.9971	302.35411
Point 49	583.3451	304.79977
Point 50	592.8421	305.14193
Point 51	650.1895	305.15472
Point 52	796.8602	303.47517
Point 53	796.8946	303.47517
Point 54	404.2686	303.55995
Point 55	512.9202	305.35325
Point 56	583.2389	307.79789
Point 57	592.7878	308.14191
Point 58	650.2064	308.15472
Point 59	796.8946	306.47498
Point 60	0	327.67711
Point 61	22.4921	326.28273
Point 62	49.2488	323.27595
Point 63	74.3201	319.27807
Point 64	77.7249	318.65421
Point 65	112.0147	318.69361

Point 66	124.2402	315.77486
Point 67	126.7076	315.31519
Point 68	136.2125	313.12968
Point 69	142.0351	312.45981
Point 70	357.6126	310.47901
Point 71	586.0206	317.13
Point 72	588.0287	317.67977
Point 73	603.6052	322
Point 74	693.0775	322
Point 75	695.4173	323.10644
Point 76	697.3194	324
Point 77	714.7524	332
Point 78	726.8078	332.79458
Point 79	736.4313	333.45251
Point 80	740.2913	333.71166
Point 81	742.8239	333.89241
Point 82	743.6092	331.27888
Point 83	746.0108	331.28559
Point 84	751.3746	333.5338
Point 85	751.5561	333.52887
Point 86	751.6873	333.53898
Point 87	751.9654	333.539
Point 88	755.4965	333.65881
Point 89	757.088	333.70415
Point 90	766.5218	333.52383
Point 91	769.5239	331.03222
Point 92	781.3859	336.00827
Point 93	796.8946	335.53695
Point 94	0	330.67136
Point 95	0.1856	330.67136
Point 96	22.7526	329.27234
Point 97	49.6527	326.24944
Point 98	74.8268	322.23518
Point 99	77.9958	321.65452
Point 100	112.3661	321.69402
Point 101	124.8636	318.71033
Point 102	127.3188	318.25295
Point 103	136.7217	316.09089
Point 104	142.2209	315.45823

Point 105	357.5827	313.47942
Point 106	585.5746	320.11828
Point 107	587.2318	320.57198
Point 108	684.7881	347.62982
Point 109	704.816	348.13028
Point 110	707.7847	347.0118
Point 111	709.4494	346.32322
Point 112	709.6367	345.87345
Point 113	708.0438	345.21
Point 114	685.2332	344.64
Point 115	131.5335	329.79618
Point 116	158.1735	318.33502
Point 117	165.2063	318.28065
Point 118	203.3044	317.9221
Point 119	243.6199	317.55888
Point 120	248.3589	317.51329
Point 121	357.6595	316.4965
Point 122	589.0312	323.16552
Point 123	591.6482	323.89085
Point 124	610.0073	329
Point 125	631.5677	335
Point 126	653.128	341
Point 127	674.6884	347
Point 128	684.1005	349.61929
Point 129	699.8223	350.01168
Point 130	0	332.91188
Point 131	22.4396	331.51733
Point 132	49.1519	328.50799
Point 133	68.0785	325.48185
Point 134	73.6566	324.58998
Point 135	90.5756	324.62675
Point 136	109.5111	324.68581
Point 137	124.0229	330.52741
Point 138	127.0249	330.53586
Point 139	129.8149	330.45078
Point 140	130.027	330.44431
Point 141	274.9823	329
Point 142	252.0124	321.5
Point 143	213.855	321.5

Point 144	177.1587	331.5
Point 145	171.0426	331.5
Point 146	152.2075	323.79526
Point 147	298.6003	335
Point 148	282.6389	331.5
Point 149	287.7433	331.5
Point 150	289.3308	331.95874
Point 151	290.9318	332.5
Point 152	317.0046	341
Point 153	355.3453	347
Point 154	666.3598	347
Point 155	669.6785	345.61929
Point 156	674.6567	347
Point 157	326.7765	344.18573
Point 158	336.1465	343.24706
Point 159	342.0216	342.65356
Point 160	373.7378	353
Point 161	651.9377	353
Point 162	392.1303	359
Point 163	637.5157	359
Point 164	410.5229	365
Point 165	623.0936	365
Point 166	608.6716	371
Point 167	428.9409	371
Point 168	415.8066	366.72364
Point 169	447.0228	377
Point 170	594.2496	377
Point 171	435.4903	373.13237
Point 172	450.0526	378.01608
Point 173	459.9195	378.51574
Point 174	479.4258	379.45192
Point 175	482.5508	379.55699
Point 176	491.9324	380
Point 177	507.2813	380.61621
Point 178	541.8899	382.28139
Point 179	574.2808	382.67429
Point 180	581.1072	381.37657
Point 181	581.6822	381.26488
Point 182	582.2411	381.14975

Point 183	582.7845	381.03125
Point 184	583.313	380.90951
Point 185	583.8273	380.78465
Point 186	584.3278	380.6568
Point 187	584.8152	380.52606
Point 188	585.29	380.39256
Point 189	592.2253	377.82435
Point 190	593.0101	377.51567
Point 191	78.5551	329.67009
Point 192	110.5776	331.89761
Point 193	113.2091	332.06836
Point 194	115.8406	332.21663
Point 195	118.4721	332.34247
Point 196	121.1036	332.44595
Point 197	123.7351	332.5271
Point 198	125.1298	332.55831
Point 199	126.3665	332.19565
Point 200	128.6722	331.5
Point 201	128.9196	331.46994
Point 202	710.0851	346.06023
Point 203	718.4637	349.55
Point 204	736.491	350
Point 205	738.1976	349.29
Point 206	796.8946	253.91519
Point 207	0	253.91519

Regions

	Material	Points	Area (ft²)
Region 1	NOT ACTIVE	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28	3,346.1
Region 2	Deflection surface	29,30,31,32,33,34,35,36,37,19,20,21,22,23,24,25,26,27,28	10,671
Region 3	GC UNDRAINED	38,39,40,41,42,43,44,45,46,47,48,49,50,51,52,53,37,36,35,34,33,32,31,30,29	10,397
Region 4	GC-Overconsolidated-UNDRAINED	45,54,55,56,57,58,59,53,52,51,50,49,48,47,46	1,491.9

Region 5	Upper Till	60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78,79,80,81,82,83,84,85,86,87,88,89,90,91,92,93,59,58,57,56,55,54,45,44,43,42,41,40,39,38	9,253.4
Region 6	CCL	94,95,96,97,98,99,100,101,102,103,104,105,106,107,108,109,110,111,112,113,114,73,72,71,70,69,68,67,66,65,64,63,62,61,60	2,139
Region 7	Bottom Liner	115,116,117,118,119,120,121,122,123,124,125,126,127,128,129,109,108,107,106,105,104,103,102,101,100,99,98,97,96,95,94,130,131,132,133,134,135,136,137,138,139,140	2,215.1
Region 8	Waste Material	115,116,117,118,119,120,121,122,123,124,141,142,143,144,145,146	4,104.1
Region 9	Waste Material	147,125,124,141,148,149,150,151	2,001.4
Region 10	Waste Material	147,125,126,152	2,007.3
Region 11	Waste Material	153,154,155,156,127,126,152,157,158,159	1,949.1
Region 12	Waste Material	160,161,154,153	1,767.6
Region 13	Waste Material	162,163,161,160	1,570.8
Region 14	Waste Material	164,165,163,162	1,373.9
Region 15	Waste Material	164,165,166,167,168	1,176.9
Region 16	Waste Material	169,170,166,167,171	980.5
Region 17	NOT ACTIVE	169,172,173,174,175,176,177,178,179,180,181,182,183,184,185,186,187,188,189,190,170	534.96
Region 18	Structural Fill	133,191,192,193,194,195,196,197,198,199,200,201,139,138,137,136,135,134	293.23
Region 19	Structural Fill	73,114,113,112,202,203,204,205,81,80,79,78,77,76,75,74	1,934.1
Region 20	NOT ACTIVE	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,206,207	15,814

Current Slip Surface

Slip Surface: 1,332
F of S: 1.584
Volume: 10,006.423 ft³
Weight: 1,147,846.9 lbs
Resisting Moment: 55,933,084 lbs-ft
Activating Moment: 35,311,122 lbs-ft
Resisting Force: 292,672.11 lbs
Activating Force: 184,841.79 lbs
F of S Rank: 1

Exit: (232.36792, 321.5) ft
Entry: (476.79377, 377) ft
Radius: 120.37306 ft
Center: (330.64701, 453.20565) ft

Slip Slices

	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
Slice 1	234.82405	319.558	0	309.64653	178.77451	0
Slice 2	239.21957	316.08258	0	836.0068	378.90949	10.134071
Slice 3	242.38943	313.57625	677.83348	1,568.6105	157.06803	1,000
Slice 4	243.80213	312.45926	751.59245	1,729.8427	172.4919	1,000
Slice 5	244.61382	311.91334	787.22866	1,674.459	156.44264	1,000
Slice 6	246.80109	310.51702	879.1096	1,626.6236	449.15174	150
Slice 7	249.9171	308.5278	1,006.5811	1,964.9402	575.84024	150
Slice 8	251.74385	307.36163	1,083.4375	2,265.942	306.62021	715.44757
Slice 9	254.89962	305.34703	1,174.3734	2,702.4045	331.13103	772.6388
Slice 10	263.68626	301.85709	1,242.0131	3,194.9637	309.1538	721.35918
Slice 11	272.28399	299.81413	1,248.4516	3,679.7023	299.20175	698.1371
Slice 12	278.8106	298.85587	1,247.936	4,074.8698	313.04742	730.4431
Slice 13	285.1911	297.91906	1,251.5677	4,363.68	322.20459	751.81053
Slice 14	288.53705	297.42779	1,254.6713	4,464.9013	325.21892	758.84443
Slice 15	289.3518	297.30816	1,255.4667	4,510.2664	326.56702	761.98978
Slice 16	290.1523	297.24391	1,256.3479	4,452.7188	315.7481	736.74496
Slice 17	294.76605	296.88184	1,262.7472	4,678.9202	322.11097	751.59173
Slice 18	299.11205	296.54078	1,268.5946	4,889.8071	327.7931	764.8499
Slice 19	299.70705	296.49409	1,269.4294	4,926.2427	328.75614	767.09844
Slice 20	300.42263	296.43793	1,270.4442	4,968.4526	329.86294	769.68065
Slice 21	304.11075	296.3418	1,275.7636	5,018.1734	330.09177	770.21345
Slice 22	310.22232	296.24879	1,284.6086	5,251.062	335.90011	783.76586
Slice 23	315.14135	296.17392	1,291.7394	5,436.2231	340.35404	794.15746
Slice 24	321.89055	296.0712	1,301.5358	5,686.2286	346.15498	807.69546
Slice 25	329.10161	295.96146	1,312.0162	5,837.6291	349.45616	815.39649
Slice 26	333.78661	295.89015	1,318.8387	5,780.7248	347.9721	811.93529
Slice 27	337.98226	295.8263	1,324.9591	5,727.7183	346.58181	808.69286
Slice 28	340.91981	295.78159	1,329.2487	5,689.4035	345.5726	806.33686
Slice 29	345.35253	295.71412	1,335.728	5,790.0981	347.7962	811.52469
Slice 30	352.01437	295.61273	1,345.4709	6,017.8464	352.81766	823.24129
Slice 31	356.5024	295.54443	1,352.0444	6,169.082	356.06004	830.80621
Slice 32	360.29705	295.48668	1,357.5956	6,296.7411	358.74477	837.06836

Slice 33	368.3362	295.73039	1,376.9108	6,376.0861	360.08726	840.20429
Slice 34	373.92838	296.02425	1,399.1706	6,516.3206	1,228.4754	-0.00026325696
Slice 35	377.56394	296.40799	1,420.6993	6,466.0075	1,218.1587	0.00021124135
Slice 36	384.4539	297.15542	1,468.2956	6,592.5869	1,237.2287	0.00017094091
Slice 37	390.01459	297.84959	1,515.0164	6,598.086	1,240.6934	0.00025887861
Slice 38	398.19235	299.08826	1,595.3345	6,714.4359	1,249.4886	-0.00022372053
Slice 39	406.30248	300.31669	1,681.7934	6,832.7766	1,257.2702	8.5082406e-005
Slice 40	408.63017	300.66926	1,707.2865	6,870.8343	513.6968	1,198.6272
Slice 41	409.71634	301.01047	1,717.7374	6,394.214	553.12853	1,290.6358
Slice 42	413.16475	302.28822	1,741.9422	6,365.7689	551.25298	1,286.2593
Slice 43	416.52286	303.53251	1,754.2969	6,338.937	549.84763	1,282.9788
Slice 44	422.12961	308.149	1,557.2042	4,943.6923	2,034.8073	150
Slice 45	427.9805	313.35455	1,326.333	4,854.3591	622.08619	1,000
Slice 46	429.72425	314.90596	1,269.963	4,766.2157	616.48368	1,000
Slice 47	432.19691	317.10589	0	4,517.6299	1,634.0692	251.06893
Slice 48	434.68826	319.59105	0	3,710.3837	2,142.191	0
Slice 49	438.93096	324.78661	0	3,474.6326	2,006.08	0
Slice 50	444.09135	331.10597	0	3,186.1861	1,839.5454	0
Slice 51	446.41694	334.02571	0	2,947.1038	1,701.5112	0
Slice 52	448.5377	336.8743	0	2,778.3303	1,604.0697	0
Slice 53	450.83094	339.95455	0	2,578.7837	1,488.8615	0
Slice 54	453.84277	344	0	2,313.3702	1,335.6249	0
Slice 55	457.99788	349.5811	0	1,941.8022	1,121.1001	0
Slice 56	460.23137	352.5811	0	1,739.2982	1,004.1843	0
Slice 57	462.77673	356	0	1,505.154	869.00109	0
Slice 58	467.24371	362	0	1,087.5785	627.91375	0
Slice 59	470.63208	366.55122	0	764.6322	441.46061	0
Slice 60	472.60221	369.55122	0	494.35496	285.41597	0
Slice 61	475.10562	374	0	200.50502	115.76163	0

Figure 40 Stability for Section OP-2, Partially Drained Conditions, Waste Lift 10

Slope Stability

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File Information

Title: Model City - RMU-2 CP-20 Section OP-2
Comments: Operation Conditions for CP-20 Section 2 Based on Maximum Fill Rate of 50,000 Cu Yds per Quarter
Created By: Peter J. Carey
Revision Number: 497
File Version: 8.0
Tool Version: 8.0.10.6504
Date: 2/24/2013
Time: 9:11:42 PM
File Name: C20OP-2r1.gsz
Directory: N:\Model_City\154.002_rmu2\154.005_revsions\geoslope\operational\
Last Solved Date: 2/25/2013
Last Solved Time: 12:22:36 AM

Project Settings

Length(L) Units: feet
Time(t) Units: Days
Force(F) Units: lbf
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D

Analysis Settings

Slope Stability

Description: TSA End Construction block
Kind: SLOPE/W
Parent: Waste Lift10 El. 383
Method: Morgenstern-Price
Settings
- Side Function
  - Interslice force function option: Half-Sine
- Lambda
  - Lambda 1: -1
  - Lambda 2: -0.8
  - Lambda 3: -0.6
  - Lambda 4: -0.4
  - Lambda 5: -0.2
  - Lambda 6: 0
  - Lambda 7: 0.2
  - Lambda 8: 0.4

Lambda 9: 0.6
Lambda 10: 0.8
Lambda 11: 1
PWP Conditions Source: Parent Analysis
Slip Surface
Direction of movement: Right to Left
Use Passive Mode: No
Slip Surface Option: Block
Critical slip surfaces saved: 3
Restrict Block Crossing: No
Optimize Critical Slip Surface Location: Yes
Tension Crack
Tension Crack Option: (none)
F of S Distribution
F of S Calculation Option: Constant
Advanced
Number of Slices: 30
F of S Tolerance: 0.001
Minimum Slip Surface Depth: 10 ft
Optimization Maximum Iterations: 2,000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

Waste Material

Model: Mohr-Coulomb
Unit Weight: 111 pcf
Cohesion': 0 psf
Phi': 30 °
Phi-B: 0 °

Bottom Liner

Model: Shear/Normal Fn.
Unit Weight: 120 pcf
Strength Function: Baseliner
Phi-B: 0 °

CCL

Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 1,000 psf
Phi': 10 °
Phi-B: 0 °

Upper Till

Model: Mohr-Coulomb

Unit Weight: 125 pcf
Cohesion': 150 psf
Phi': 31 °
Phi-B: 0 °

Deflection surface

Model: Bedrock (Impenetrable)

Structural Fill

Model: Mohr-Coulomb
Unit Weight: 135 pcf
Cohesion': 1,000 psf
Phi': 45 °
Phi-B: 0 °

NOT ACTIVE

Model: (None)

GC UNDRAINED

Model: Shear/Normal Fn.
Unit Weight: 120 pcf
Strength Function: SHANSEP CONSOLIDATED UNDRAINED STATIC
Phi-B: 0 °
Anisotropic Strength Fn: clay ellipse staticshear

GC-Overconsolidated-UNDRAINED

Model: Shear/Normal Fn.
Unit Weight: 125 pcf
Strength Function: SHANSEP Over CONSOLIDATED UNDRAINED STATIC
Phi-B: 0 °
Anisotropic Strength Fn: clay ellipse staticshear

Slip Surface Limits

Left Coordinate: (25.66545, 331.15391) ft
Right Coordinate: (594.2496, 377) ft

Slip Surface Block

Left Grid
- Upper Left: (151, 306) ft
- Lower Left: (152, 288) ft
- Lower Right: (207, 288) ft
- X Increments: 5
- Y Increments: 5
- Starting Angle: 135 °
- Ending Angle: 180 °
- Angle Increments: 2

Right Grid
- Upper Left: (254, 306) ft
- Lower Left: (254, 289) ft

Lower Right: (450, 292) ft
X Increments: 10
Y Increments: 4
Starting Angle: 45 °
Ending Angle: 65 °
Angle Increments: 2

Anisotropic Strength Functions

clay ellipse staticshear

Model: Spline Data Point Function
Function: Modifier Factor vs. Inclination
Curve Fit to Data: 100 %
Segment Curvature: 50 %
Y-Intercept: 0.706
Data Points: Inclination (°), Modifier Factor
Data Point: (-60, 0.92608827)
Data Point: (-30, 0.92608827)
Data Point: (-17.838428, 0.83077031)
Data Point: (-3, 0.70608827)
Data Point: (3, 0.70608827)
Data Point: (23.685228, 0.82618324)
Data Point: (39.261389, 0.92608827)
Data Point: (59.397364, 0.92608827)

Shear/Normal Strength Functions

Baseliner

Model: Shear/Normal Spline Data Point Function
Function: Shear Stress vs. Normal Stress
Curve Fit to Data: 100 %
Segment Curvature: 100 %
Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
Data Point: (0, 0)
Data Point: (500, 235)
Data Point: (1,000, 463)
Data Point: (2,000, 899)
Data Point: (5,000, 2,057)
Data Point: (10,000, 3,515)
Data Point: (15,000, 4,430)
Estimation Properties
Intact Rock Param.: 10
Geological Strength: 100
Disturbance Factor: 0
SigmaC: 600,000 psf
SigmaC: 300,000 psf
Num. Points: 20

SHANSEP CONSOLIDATED UNDRAINED STATIC

Model: Add-In Function
Function: Shear Stress vs. Normal Stress
Assembly: GeoStudio AddIns1
Function: SHANSEPP
Field
MPP: 5000
m: 0.7
S: .34
Y-Intercept: -1.#IND

SHANSEP Over CONSOLIDATED UNDRAINED STATIC

Model: Add-In Function
Function: Shear Stress vs. Normal Stress
Assembly: GeoStudio AddIns1
Function: SHANSEPP
Field
MPP: 8000
m: 0.7
S: .34
Y-Intercept: -1.#IND

Points

	X (ft)	Y (ft)
Point 1	0	268.91519
Point 2	207.4978	271.24238
Point 3	209.0232	271.26867
Point 4	215.074	271.32735
Point 5	225.5606	271.44496
Point 6	230.6621	271.56993
Point 7	234.0537	271.62591
Point 8	237.8751	271.70733
Point 9	243.6233	271.78388
Point 10	403.7734	274.99581
Point 11	406.1879	275.04891
Point 12	510.242	277.40528
Point 13	519.1809	277.52295
Point 14	522.2501	277.56833
Point 15	581.5843	278.21948
Point 16	706.5316	275.03632
Point 17	784.4915	272.77004
Point 18	796.8946	272.40949
Point 19	796.8946	278.66207

Point 20	771.752	277.8332
Point 21	583.2389	281.6042
Point 22	512.9202	278.57945
Point 23	404.2686	277.81745
Point 24	248.1947	278.63737
Point 25	83.6675	274.48464
Point 26	78.5956	274.41664
Point 27	69.7373	274.12229
Point 28	0	273.8562
Point 29	0	286.98783
Point 30	69.7373	288.07912
Point 31	78.6615	288.22649
Point 32	83.6675	288.57952
Point 33	248.1947	297.19282
Point 34	404.2686	294.81745
Point 35	512.9202	289.28565
Point 36	583.2389	288.00106
Point 37	796.8946	289.48765
Point 38	0	305.26334
Point 39	63.5351	305.72185
Point 40	69.7373	305.70863
Point 41	77.6371	305.65972
Point 42	78.5956	305.57155
Point 43	83.6675	305.7
Point 44	248.1947	307.61838
Point 45	299.7903	306.27673
Point 46	299.6238	303.28004
Point 47	404.2544	300.5593
Point 48	512.9971	302.35411
Point 49	583.3451	304.79977
Point 50	592.8421	305.14193
Point 51	650.1895	305.15472
Point 52	796.8602	303.47517
Point 53	796.8946	303.47517
Point 54	404.2686	303.55995
Point 55	512.9202	305.35325
Point 56	583.2389	307.79789
Point 57	592.7878	308.14191
Point 58	650.2064	308.15472

Point 59	796.8946	306.47498
Point 60	0	327.67711
Point 61	22.4921	326.28273
Point 62	49.2488	323.27595
Point 63	74.3201	319.27807
Point 64	77.7249	318.65421
Point 65	112.0147	318.69361
Point 66	124.2402	315.77486
Point 67	126.7076	315.31519
Point 68	136.2125	313.12968
Point 69	142.0351	312.45981
Point 70	357.6126	310.47901
Point 71	586.0206	317.13
Point 72	588.0287	317.67977
Point 73	603.6052	322
Point 74	693.0775	322
Point 75	695.4173	323.10644
Point 76	697.3194	324
Point 77	714.7524	332
Point 78	726.8078	332.79458
Point 79	736.4313	333.45251
Point 80	740.2913	333.71166
Point 81	742.8239	333.89241
Point 82	743.6092	331.27888
Point 83	746.0108	331.28559
Point 84	751.3746	333.5338
Point 85	751.5561	333.52887
Point 86	751.6873	333.53898
Point 87	751.9654	333.539
Point 88	755.4965	333.65881
Point 89	757.088	333.70415
Point 90	766.5218	333.52383
Point 91	769.5239	331.03222
Point 92	781.3859	336.00827
Point 93	796.8946	335.53695
Point 94	0	330.67136
Point 95	0.1856	330.67136
Point 96	22.7526	329.27234
Point 97	49.6527	326.24944

Point 98	74.8268	322.23518
Point 99	77.9958	321.65452
Point 100	112.3661	321.69402
Point 101	124.8636	318.71033
Point 102	127.3188	318.25295
Point 103	136.7217	316.09089
Point 104	142.2209	315.45823
Point 105	357.5827	313.47942
Point 106	585.5746	320.11828
Point 107	587.2318	320.57198
Point 108	684.7881	347.62982
Point 109	704.816	348.13028
Point 110	707.7847	347.0118
Point 111	709.4494	346.32322
Point 112	709.6367	345.87345
Point 113	708.0438	345.21
Point 114	685.2332	344.64
Point 115	131.5335	329.79618
Point 116	158.1735	318.33502
Point 117	165.2063	318.28065
Point 118	203.3044	317.9221
Point 119	243.6199	317.55888
Point 120	248.3589	317.51329
Point 121	357.6595	316.4965
Point 122	589.0312	323.16552
Point 123	591.6482	323.89085
Point 124	610.0073	329
Point 125	631.5677	335
Point 126	653.128	341
Point 127	674.6884	347
Point 128	684.1005	349.61929
Point 129	699.8223	350.01168
Point 130	0	332.91188
Point 131	22.4396	331.51733
Point 132	49.1519	328.50799
Point 133	68.0785	325.48185
Point 134	73.6566	324.58998
Point 135	90.5756	324.62675
Point 136	109.5111	324.68581

Point 137	124.0229	330.52741
Point 138	127.0249	330.53586
Point 139	129.8149	330.45078
Point 140	130.027	330.44431
Point 141	274.9823	329
Point 142	252.0124	321.5
Point 143	213.855	321.5
Point 144	177.1587	331.5
Point 145	171.0426	331.5
Point 146	152.2075	323.79526
Point 147	298.6003	335
Point 148	282.6389	331.5
Point 149	287.7433	331.5
Point 150	289.3308	331.95874
Point 151	290.9318	332.5
Point 152	317.0046	341
Point 153	355.3453	347
Point 154	666.3598	347
Point 155	669.6785	345.61929
Point 156	674.6567	347
Point 157	326.7765	344.18573
Point 158	336.1465	343.24706
Point 159	342.0216	342.65356
Point 160	373.7378	353
Point 161	651.9377	353
Point 162	392.1303	359
Point 163	637.5157	359
Point 164	410.5229	365
Point 165	623.0936	365
Point 166	608.6716	371
Point 167	428.9409	371
Point 168	415.8066	366.72364
Point 169	447.0228	377
Point 170	594.2496	377
Point 171	435.4903	373.13237
Point 172	450.0526	378.01608
Point 173	459.9195	378.51574
Point 174	479.4258	379.45192
Point 175	482.5508	379.55699

Point 176	491.9324	380
Point 177	507.2813	380.61621
Point 178	541.8899	382.28139
Point 179	574.2808	382.67429
Point 180	581.1072	381.37657
Point 181	581.6822	381.26488
Point 182	582.2411	381.14975
Point 183	582.7845	381.03125
Point 184	583.313	380.90951
Point 185	583.8273	380.78465
Point 186	584.3278	380.6568
Point 187	584.8152	380.52606
Point 188	585.29	380.39256
Point 189	592.2253	377.82435
Point 190	593.0101	377.51567
Point 191	78.5551	329.67009
Point 192	110.5776	331.89761
Point 193	113.2091	332.06836
Point 194	115.8406	332.21663
Point 195	118.4721	332.34247
Point 196	121.1036	332.44595
Point 197	123.7351	332.5271
Point 198	125.1298	332.55831
Point 199	126.3665	332.19565
Point 200	128.6722	331.5
Point 201	128.9196	331.46994
Point 202	710.0851	346.06023
Point 203	718.4637	349.55
Point 204	736.491	350
Point 205	738.1976	349.29
Point 206	796.8946	253.91519
Point 207	0	253.91519

Regions

	Material	Points	Area (ft²)
Region 1	NOT ACTIVE	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28	3,346.1

Region 2	Deflection surface	29,30,31,32,33,34,35,36,37,19,20,21,22,23,24,25,26,27,28	10,671
Region 3	GC UNDRAINED	38,39,40,41,42,43,44,45,46,47,48,49,50,51,52,53,37,36,35,34,33,32,31,30,29	10,397
Region 4	GC-Overconsolidated-UNDRAINED	45,54,55,56,57,58,59,53,52,51,50,49,48,47,46	1,491.9
Region 5	Upper Till	60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78,79,80,81,82,83,84,85,86,87,88,89,90,91,92,93,59,58,57,56,55,54,45,44,43,42,41,40,39,38	9,253.4
Region 6	CCL	94,95,96,97,98,99,100,101,102,103,104,105,106,107,108,109,110,111,112,113,114,73,72,71,70,69,68,67,66,65,64,63,62,61,60	2,139
Region 7	Bottom Liner	115,116,117,118,119,120,121,122,123,124,125,126,127,128,129,109,108,107,106,105,104,103,102,101,100,99,98,97,96,95,94,130,131,132,133,134,135,136,137,138,139,140	2,215.1
Region 8	Waste Material	115,116,117,118,119,120,121,122,123,124,141,142,143,144,145,146	4,104.1
Region 9	Waste Material	147,125,124,141,148,149,150,151	2,001.4
Region 10	Waste Material	147,125,126,152	2,007.3
Region 11	Waste Material	153,154,155,156,127,126,152,157,158,159	1,949.1
Region 12	Waste Material	160,161,154,153	1,767.6
Region 13	Waste Material	162,163,161,160	1,570.8
Region 14	Waste Material	164,165,163,162	1,373.9
Region 15	Waste Material	164,165,166,167,168	1,176.9
Region 16	Waste Material	169,170,166,167,171	980.5
Region 17	Waste Material	169,172,173,174,175,176,177,178,179,180,181,182,183,184,185,186,187,188,189,190,170	534.96
Region 18	Structural Fill	133,191,192,193,194,195,196,197,198,199,200,201,139,138,137,136,135,134	293.23
Region 19	Structural Fill	73,114,113,112,202,203,204,205,81,80,79,78,77,76,75,74	1,934.1
Region 20	NOT ACTIVE	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,206,207	15,814

Current Slip Surface

Slip Surface: 17,821
F of S: 1.573
Volume: 10,556.776 ft³
Weight: 1,210,367.1 lbs
Resisting Moment: 83,855,159 lbs-ft
Activating Moment: 53,303,206 lbs-ft
Resisting Force: 308,888.67 lbs
Activating Force: 196,444.42 lbs
F of S Rank: 1
Exit: (232.66749, 321.5) ft
Entry: (485.25096, 379.68449) ft

Radius: 124.60787 ft
Center: (169, 482) ft

Slip Slices

	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
Slice 1	235.1136	319.55674	0	311.27465	179.71451	0
Slice 2	239.48985	316.08012	0	838.80311	380.10946	10.201379
Slice 3	242.51994	313.67292	612.67811	1,566.993	168.27147	1,000
Slice 4	244.16404	312.36681	696.37397	1,755.6355	186.77639	1,000
Slice 5	245.05487	311.72229	737.2936	1,685.0045	167.10701	1,000
Slice 6	246.88024	310.60484	810.38954	1,617.2598	484.81658	150
Slice 7	250.18565	308.58135	940.29891	1,958.1322	611.57595	150
Slice 8	255.58267	305.27743	1,118.836	2,723.9211	335.98561	783.96643
Slice 9	262.37489	302.22214	1,190.8255	3,075.8261	303.64319	708.50065
Slice 10	268.81878	300.48283	1,211.0084	3,592.5176	325.70596	759.98062
Slice 11	273.51151	299.4241	1,213.8744	3,759.3397	300.3257	700.75987
Slice 12	278.8106	298.74289	1,216.1959	4,065.0313	310.64384	724.83506
Slice 13	285.1911	297.92266	1,221.2919	4,336.2553	319.07913	744.51744
Slice 14	287.97171	297.5652	1,224.8116	4,398.7274	320.87854	748.7172
Slice 15	288.76546	297.47394	1,225.9286	4,412.0421	318.4664	743.08817
Slice 16	290.1313	297.32438	1,227.9625	4,484.5123	320.56225	747.97895
Slice 17	294.76605	296.8312	1,235.7738	4,727.2895	326.853	762.65657
Slice 18	299.11205	296.41788	1,243.6618	4,812.6144	325.42509	759.32578
Slice 19	303.39781	296.35266	1,249.6784	4,994.1117	330.14476	770.3389
Slice 20	312.08821	296.22039	1,261.9551	5,327.1794	338.38739	789.57111
Slice 21	321.89055	296.0712	1,275.9185	5,695.455	346.97796	809.61565
Slice 22	329.01115	295.96283	1,286.1331	5,850.7058	350.3556	817.4964
Slice 23	333.69615	295.89153	1,292.8875	5,795.8041	348.92905	814.16798
Slice 24	339.08405	295.80953	1,300.6788	5,729.6854	347.20052	810.13603
Slice 25	345.21252	295.71626	1,309.5571	5,804.4278	348.74165	813.73151
Slice 26	351.59436	295.61913	1,318.8117	6,025.8202	353.60012	825.06727
Slice 27	355.06529	295.5663	1,323.8534	6,144.8178	356.14644	831.00999
Slice 28	355.75163	295.55586	1,324.8516	6,168.1878	356.64134	832.16513
Slice 29	356.90873	295.53824	1,326.5346	6,207.4875	357.47008	834.09881
Slice 30	360.9544	295.47667	1,332.4161	6,345.9541	1,203.4638	0.0001662758
Slice 31	368.99355	295.67321	1,347.5429	6,433.4987	1,220.9831	-8.9512327e-005
Slice 32	374.31606	295.94995	1,361.6104	6,569.076	1,250.1536	0.0002167896
Slice 33	379.20331	296.46119	1,377.8644	6,532.1158	1,245.2443	-9.129096e-005
Slice 34	387.8213	297.42352	1,416.688	6,688.7106	1,273.697	0.00026576502

Slice 35	398.19235	298.5816	1,501.749	6,878.4199	1,298.9801	-0.0002783658
Slice 36	407.38865	299.60851	1,601.1186	7,047.8864	1,315.9152	-0.00028199492
Slice 37	411.48735	300.06619	1,648.7349	7,123.7457	1,322.7387	-0.00042332086
Slice 38	413.35161	300.4491	1,671.0446	6,760.3422	1,330.4852	0.00013693133
Slice 39	415.02901	300.96212	1,689.3875	6,717.824	545.84096	1,273.63
Slice 40	418.88637	302.14188	1,724.6953	6,710.2373	544.43973	1,270.361
Slice 41	422.429	303.47557	1,743.0045	5,555.6629	605.14526	1,412.0061
Slice 42	425.91639	306.42718	1,625.7108	5,247.9834	2,176.4809	150
Slice 43	431.12444	310.8351	1,428.8348	4,984.0732	2,136.2027	150
Slice 44	434.39914	313.6067	1,317.0826	5,069.7955	661.70453	1,000
Slice 45	436.23535	315.1608	1,268.4399	4,985.0376	655.33645	1,000
Slice 46	437.20648	315.98273	0	4,800.9564	1,705.932	280.78196
Slice 47	438.58051	317.51806	0	4,286.3498	1,573.0703	227.80172
Slice 48	443.37563	323.13201	0	3,732.2968	2,154.8426	0
Slice 49	447.70527	328.20099	0	3,503.4175	2,022.699	0
Slice 50	448.91991	329.62304	0	3,438.8333	1,985.4114	0
Slice 51	449.75234	330.63624	0	3,263.3712	1,884.1083	0
Slice 52	451.58158	333.01321	0	3,123.2003	1,803.1806	0
Slice 53	455.41926	338	0	2,813.5047	1,624.3777	0
Slice 54	458.82374	342.42386	0	2,535.4696	1,463.854	0
Slice 55	461.13245	345.42386	0	2,344.4255	1,353.5547	0
Slice 56	464.65411	350	0	2,048.9468	1,182.96	0
Slice 57	469.27153	356	0	1,654.8878	955.44992	0
Slice 58	473.88895	362	0	1,252.365	723.0533	0
Slice 59	476.54283	365.44853	0	1,017.3322	587.35702	0
Slice 60	478.1569	367.989	0	770.50943	444.85383	0
Slice 61	479.70453	370.54047	0	605.94054	349.83994	0
Slice 62	481.26703	373.11646	0	436.52151	252.02581	0
Slice 63	483.08672	376.11646	0	237.94369	137.37685	0
Slice 64	484.4368	378.34225	0	89.835993	51.866834	0

Figure 41 Stability for Section OP-2, Partially Drained Conditions, Waste Lift 10 - 1 Year After Placement

Lift 10 Consolidated Undrained - Static, Crit surface

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File Information

Title: Model City - RMU-2 CP-20 Section OP-2
Comments: Operation Conditions for CP-20 Section 2 Based on Maximum Fill Rate of 50,000 Cu Yds per Quarter
Created By: Peter J. Carey
Revision Number: 497
File Version: 8.0
Tool Version: 8.0.10.6504
Date: 2/24/2013
Time: 9:11:42 PM
File Name: C20OP-2r1.gsz
Directory: N:\Model_City\154.002_rmu2\154.005_revsions\geoslope\operational\
Last Solved Date: 2/25/2013
Last Solved Time: 4:18:22 AM

Project Settings

Length(L) Units: feet
Time(t) Units: Days
Force(F) Units: lbf
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D

Analysis Settings

Lift 10 Consolidated Undrained - Static, Crit surface

Description: TSA after 1 year consolidation for Yield Acc critical surface determination ET 1058 days
Kind: SLOPE/W
Parent: Waste Lift10 El. 383 Consolidation
Method: Morgenstern-Price
Settings
- Side Function
  - Interslice force function option: Half-Sine
- Lambda
  - Lambda 1: -1
  - Lambda 2: -0.8
  - Lambda 3: -0.6
  - Lambda 4: -0.4
  - Lambda 5: -0.2

Lambda 6: 0
Lambda 7: 0.2
Lambda 8: 0.4
Lambda 9: 0.6
Lambda 10: 0.8
Lambda 11: 1
PWP Conditions Source: Parent Analysis
Slip Surface
Direction of movement: Right to Left
Use Passive Mode: No
Slip Surface Option: Block
Critical slip surfaces saved: 3
Restrict Block Crossing: No
Optimize Critical Slip Surface Location: Yes
Tension Crack
Tension Crack Option: (none)
F of S Distribution
F of S Calculation Option: Constant
Advanced
Number of Slices: 30
F of S Tolerance: 0.001
Minimum Slip Surface Depth: 10 ft
Optimization Maximum Iterations: 2,000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

Waste Material

Model: Mohr-Coulomb
Unit Weight: 111 pcf
Cohesion': 0 psf
Phi': 30 °
Phi-B: 0 °

Bottom Liner

Model: Shear/Normal Fn.
Unit Weight: 120 pcf
Strength Function: Baseliner
Phi-B: 0 °

CCL

Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 1,000 psf
Phi': 10 °
Phi-B: 0 °

Upper Till

Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 150 psf
Phi': 31 °
Phi-B: 0 °

Deflection surface

Model: Bedrock (Impenetrable)

Structural Fill

Model: Mohr-Coulomb
Unit Weight: 135 pcf
Cohesion': 1,000 psf
Phi': 45 °
Phi-B: 0 °

NOT ACTIVE

Model: (None)

GC UNDRAINED

Model: Shear/Normal Fn.
Unit Weight: 120 pcf
Strength Function: SHANSEP CONSOLIDATED UNDRAINED STATIC
Phi-B: 0 °
Anisotropic Strength Fn: clay ellipse staticshear

GC-Overconsolidated-UNDRAINED

Model: Shear/Normal Fn.
Unit Weight: 125 pcf
Strength Function: SHANSEP Over CONSOLIDATED UNDRAINED STATIC
Phi-B: 0 °
Anisotropic Strength Fn: clay ellipse staticshear

Slip Surface Limits

Left Coordinate: (25.66545, 331.15391) ft
Right Coordinate: (594.2496, 377) ft

Slip Surface Block

Left Grid
- Upper Left: (151, 306) ft
- Lower Left: (152, 288) ft
- Lower Right: (207, 288) ft
- X Increments: 5
- Y Increments: 5
- Starting Angle: 135 °
- Ending Angle: 180 °
- Angle Increments: 2

Right Grid

Upper Left: (254, 306) ft
Lower Left: (254, 289) ft
Lower Right: (450, 292) ft
X Increments: 10
Y Increments: 4
Starting Angle: 45 °
Ending Angle: 65 °
Angle Increments: 2

Anisotropic Strength Functions

clay ellipse staticshear

Model: Spline Data Point Function
Function: Modifier Factor vs. Inclination
Curve Fit to Data: 100 %
Segment Curvature: 50 %
Y-Intercept: 0.706
Data Points: Inclination (°), Modifier Factor
Data Point: (-60, 0.92608827)
Data Point: (-30, 0.92608827)
Data Point: (-17.838428, 0.83077031)
Data Point: (-3, 0.70608827)
Data Point: (3, 0.70608827)
Data Point: (23.685228, 0.82618324)
Data Point: (39.261389, 0.92608827)
Data Point: (59.397364, 0.92608827)

Shear/Normal Strength Functions

Baseliner

Model: Shear/Normal Spline Data Point Function
Function: Shear Stress vs. Normal Stress
Curve Fit to Data: 100 %
Segment Curvature: 100 %
Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
Data Point: (0, 0)
Data Point: (500, 235)
Data Point: (1,000, 463)
Data Point: (2,000, 899)
Data Point: (5,000, 2,057)
Data Point: (10,000, 3,515)
Data Point: (15,000, 4,430)
Estimation Properties
Intact Rock Param.: 10
Geological Strength: 100
Disturbance Factor: 0
SigmaC: 600,000 psf
SigmaC: 300,000 psf

Num. Points: 20

SHANSEP CONSOLIDATED UNDRAINED STATIC

Model: Add-In Function
Function: Shear Stress vs. Normal Stress
Assembly: GeoStudio AddIns1
Function: SHANSEPP
Field
MPP: 5000
m: 0.7
S: .34
Y-Intercept: -1.#IND

SHANSEP Over CONSOLIDATED UNDRAINED STATIC

Model: Add-In Function
Function: Shear Stress vs. Normal Stress
Assembly: GeoStudio AddIns1
Function: SHANSEPP
Field
MPP: 8000
m: 0.7
S: .34
Y-Intercept: -1.#IND

Points

	X (ft)	Y (ft)
Point 1	0	268.91519
Point 2	207.4978	271.24238
Point 3	209.0232	271.26867
Point 4	215.074	271.32735
Point 5	225.5606	271.44496
Point 6	230.6621	271.56993
Point 7	234.0537	271.62591
Point 8	237.8751	271.70733
Point 9	243.6233	271.78388
Point 10	403.7734	274.99581
Point 11	406.1879	275.04891
Point 12	510.242	277.40528
Point 13	519.1809	277.52295
Point 14	522.2501	277.56833
Point 15	581.5843	278.21948
Point 16	706.5316	275.03632
Point 17	784.4915	272.77004
Point 18	796.8946	272.40949

Point 19	796.8946	278.66207
Point 20	771.752	277.8332
Point 21	583.2389	281.6042
Point 22	512.9202	278.57945
Point 23	404.2686	277.81745
Point 24	248.1947	278.63737
Point 25	83.6675	274.48464
Point 26	78.5956	274.41664
Point 27	69.7373	274.12229
Point 28	0	273.8562
Point 29	0	286.98783
Point 30	69.7373	288.07912
Point 31	78.6615	288.22649
Point 32	83.6675	288.57952
Point 33	248.1947	297.19282
Point 34	404.2686	294.81745
Point 35	512.9202	289.28565
Point 36	583.2389	288.00106
Point 37	796.8946	289.48765
Point 38	0	305.26334
Point 39	63.5351	305.72185
Point 40	69.7373	305.70863
Point 41	77.6371	305.65972
Point 42	78.5956	305.57155
Point 43	83.6675	305.7
Point 44	248.1947	307.61838
Point 45	299.7903	306.27673
Point 46	299.6238	303.28004
Point 47	404.2544	300.5593
Point 48	512.9971	302.35411
Point 49	583.3451	304.79977
Point 50	592.8421	305.14193
Point 51	650.1895	305.15472
Point 52	796.8602	303.47517
Point 53	796.8946	303.47517
Point 54	404.2686	303.55995
Point 55	512.9202	305.35325
Point 56	583.2389	307.79789
Point 57	592.7878	308.14191

Point 58	650.2064	308.15472
Point 59	796.8946	306.47498
Point 60	0	327.67711
Point 61	22.4921	326.28273
Point 62	49.2488	323.27595
Point 63	74.3201	319.27807
Point 64	77.7249	318.65421
Point 65	112.0147	318.69361
Point 66	124.2402	315.77486
Point 67	126.7076	315.31519
Point 68	136.2125	313.12968
Point 69	142.0351	312.45981
Point 70	357.6126	310.47901
Point 71	586.0206	317.13
Point 72	588.0287	317.67977
Point 73	603.6052	322
Point 74	693.0775	322
Point 75	695.4173	323.10644
Point 76	697.3194	324
Point 77	714.7524	332
Point 78	726.8078	332.79458
Point 79	736.4313	333.45251
Point 80	740.2913	333.71166
Point 81	742.8239	333.89241
Point 82	743.6092	331.27888
Point 83	746.0108	331.28559
Point 84	751.3746	333.5338
Point 85	751.5561	333.52887
Point 86	751.6873	333.53898
Point 87	751.9654	333.539
Point 88	755.4965	333.65881
Point 89	757.088	333.70415
Point 90	766.5218	333.52383
Point 91	769.5239	331.03222
Point 92	781.3859	336.00827
Point 93	796.8946	335.53695
Point 94	0	330.67136
Point 95	0.1856	330.67136
Point 96	22.7526	329.27234

Point 97	49.6527	326.24944
Point 98	74.8268	322.23518
Point 99	77.9958	321.65452
Point 100	112.3661	321.69402
Point 101	124.8636	318.71033
Point 102	127.3188	318.25295
Point 103	136.7217	316.09089
Point 104	142.2209	315.45823
Point 105	357.5827	313.47942
Point 106	585.5746	320.11828
Point 107	587.2318	320.57198
Point 108	684.7881	347.62982
Point 109	704.816	348.13028
Point 110	707.7847	347.0118
Point 111	709.4494	346.32322
Point 112	709.6367	345.87345
Point 113	708.0438	345.21
Point 114	685.2332	344.64
Point 115	131.5335	329.79618
Point 116	158.1735	318.33502
Point 117	165.2063	318.28065
Point 118	203.3044	317.9221
Point 119	243.6199	317.55888
Point 120	248.3589	317.51329
Point 121	357.6595	316.4965
Point 122	589.0312	323.16552
Point 123	591.6482	323.89085
Point 124	610.0073	329
Point 125	631.5677	335
Point 126	653.128	341
Point 127	674.6884	347
Point 128	684.1005	349.61929
Point 129	699.8223	350.01168
Point 130	0	332.91188
Point 131	22.4396	331.51733
Point 132	49.1519	328.50799
Point 133	68.0785	325.48185
Point 134	73.6566	324.58998
Point 135	90.5756	324.62675

Point 136	109.5111	324.68581
Point 137	124.0229	330.52741
Point 138	127.0249	330.53586
Point 139	129.8149	330.45078
Point 140	130.027	330.44431
Point 141	274.9823	329
Point 142	252.0124	321.5
Point 143	213.855	321.5
Point 144	177.1587	331.5
Point 145	171.0426	331.5
Point 146	152.2075	323.79526
Point 147	298.6003	335
Point 148	282.6389	331.5
Point 149	287.7433	331.5
Point 150	289.3308	331.95874
Point 151	290.9318	332.5
Point 152	317.0046	341
Point 153	355.3453	347
Point 154	666.3598	347
Point 155	669.6785	345.61929
Point 156	674.6567	347
Point 157	326.7765	344.18573
Point 158	336.1465	343.24706
Point 159	342.0216	342.65356
Point 160	373.7378	353
Point 161	651.9377	353
Point 162	392.1303	359
Point 163	637.5157	359
Point 164	410.5229	365
Point 165	623.0936	365
Point 166	608.6716	371
Point 167	428.9409	371
Point 168	415.8066	366.72364
Point 169	447.0228	377
Point 170	594.2496	377
Point 171	435.4903	373.13237
Point 172	450.0526	378.01608
Point 173	459.9195	378.51574
Point 174	479.4258	379.45192

Point 175	482.5508	379.55699
Point 176	491.9324	380
Point 177	507.2813	380.61621
Point 178	541.8899	382.28139
Point 179	574.2808	382.67429
Point 180	581.1072	381.37657
Point 181	581.6822	381.26488
Point 182	582.2411	381.14975
Point 183	582.7845	381.03125
Point 184	583.313	380.90951
Point 185	583.8273	380.78465
Point 186	584.3278	380.6568
Point 187	584.8152	380.52606
Point 188	585.29	380.39256
Point 189	592.2253	377.82435
Point 190	593.0101	377.51567
Point 191	78.5551	329.67009
Point 192	110.5776	331.89761
Point 193	113.2091	332.06836
Point 194	115.8406	332.21663
Point 195	118.4721	332.34247
Point 196	121.1036	332.44595
Point 197	123.7351	332.5271
Point 198	125.1298	332.55831
Point 199	126.3665	332.19565
Point 200	128.6722	331.5
Point 201	128.9196	331.46994
Point 202	710.0851	346.06023
Point 203	718.4637	349.55
Point 204	736.491	350
Point 205	738.1976	349.29
Point 206	796.8946	253.91519
Point 207	0	253.91519

Regions

	Material	Points	Area (ft^2)
Region 1	NOT ACTIVE	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,	3,346.1

		26,27,28	
Region 2	Deflection surface	29,30,31,32,33,34,35,36,37,19,20,21,22,23,24,25,26,27,28	10,671
Region 3	GC UNDRAINED	38,39,40,41,42,43,44,45,46,47,48,49,50,51,52,53,37,36,35,34,33,32,31,30,29	10,397
Region 4	GC-Overconsolidated-UNDRAINED	45,54,55,56,57,58,59,53,52,51,50,49,48,47,46	1,491.9
Region 5	Upper Till	60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78,79,80,81,82,83,84,85,86,87,88,89,90,91,92,93,59,58,57,56,55,54,45,44,43,42,41,40,39,38	9,253.4
Region 6	CCL	94,95,96,97,98,99,100,101,102,103,104,105,106,107,108,109,110,111,112,113,114,73,72,71,70,69,68,67,66,65,64,63,62,61,60	2,139
Region 7	Bottom Liner	115,116,117,118,119,120,121,122,123,124,125,126,127,128,129,109,108,107,106,105,104,103,102,101,100,99,98,97,96,95,94,130,131,132,133,134,135,136,137,138,139,140	2,215.1
Region 8	Waste Material	115,116,117,118,119,120,121,122,123,124,141,142,143,144,145,146	4,104.1
Region 9	Waste Material	147,125,124,141,148,149,150,151	2,001.4
Region 10	Waste Material	147,125,126,152	2,007.3
Region 11	Waste Material	153,154,155,156,127,126,152,157,158,159	1,949.1
Region 12	Waste Material	160,161,154,153	1,767.6
Region 13	Waste Material	162,163,161,160	1,570.8
Region 14	Waste Material	164,165,163,162	1,373.9
Region 15	Waste Material	164,165,166,167,168	1,176.9
Region 16	Waste Material	169,170,166,167,171	980.5
Region 17	Waste Material	169,172,173,174,175,176,177,178,179,180,181,182,183,184,185,186,187,188,189,190,170	534.96
Region 18	Structural Fill	133,191,192,193,194,195,196,197,198,199,200,201,139,138,137,136,135,134	293.23
Region 19	Structural Fill	73,114,113,112,202,203,204,205,81,80,79,78,77,76,75,74	1,934.1
Region 20	NOT ACTIVE	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,206,207	15,814

Current Slip Surface

Slip Surface: 17,821
F of S: 1.674
Volume: 10,520.145 ft³
Weight: 1,206,320.8 lbs
Resisting Moment: 89,462,306 lbs-ft
Activating Moment: 53,430,958 lbs-ft
Resisting Force: 331,391.77 lbs
Activating Force: 197,997.23 lbs
F of S Rank: 1

Exit: (229.96114, 321.5) ft
Entry: (485.22929, 379.68347) ft
Radius: 125.69818 ft
Center: (169, 482) ft

Slip Slices

	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
Slice 1	232.46902	319.56837	0	298.14445	172.13378	0
Slice 2	236.96812	316.10306	0	811.9272	368.56255	9.5588569
Slice 3	240.93044	313.05119	145.13528	1,644.6724	264.40885	1,000
Slice 4	243.26071	311.25636	255.89765	1,801.1179	928.462	150
Slice 5	243.67954	310.93377	275.83546	1,858.3491	950.87012	150
Slice 6	246.04904	309.44069	367.52137	1,971.8204	963.96007	150
Slice 7	248.67483	307.79561	468.23695	2,257.2257	1,074.9328	150
Slice 8	250.50158	306.65114	537.75519	2,398.8577	351.27935	819.65166
Slice 9	254.65216	304.05078	681.4969	2,902.4338	370.40974	864.28922
Slice 10	260.9955	301.43668	812.20438	3,127.3727	320.21745	747.17374
Slice 11	268.40265	299.51615	905.57139	3,703.4673	338.93735	790.85416
Slice 12	273.54427	298.4173	959.11899	3,865.274	308.31875	719.41126
Slice 13	278.8106	297.9098	983.93511	4,140.862	316.07064	737.49783
Slice 14	285.1911	297.29493	1,014.8844	4,378.2913	322.13547	751.64928
Slice 15	288.53705	296.97249	1,031.5941	4,453.1728	323.79691	755.52593
Slice 16	290.1313	296.81886	1,039.6764	4,533.1297	325.82261	760.25258
Slice 17	292.16001	296.62336	1,050.0682	4,638.6086	328.45817	766.40226
Slice 18	295.99426	296.46533	1,058.8978	4,688.6888	327.07972	763.18574
Slice 19	299.11205	296.41788	1,061.8697	4,809.8098	330.23783	770.55494
Slice 20	305.01596	296.32803	1,067.4973	5,051.9996	336.35745	784.83457
Slice 21	313.70635	296.19576	1,075.7881	5,382.0536	344.28568	803.33407
Slice 22	321.89055	296.0712	1,083.6035	5,686.8794	351.2439	819.57001
Slice 23	328.94722	295.96381	1,090.3492	5,841.475	354.59102	827.37973
Slice 24	333.63222	295.8925	1,094.8316	5,785.9112	353.2411	824.22825
Slice 25	339.08405	295.80953	1,100.0524	5,718.3889	351.58773	820.37404
Slice 26	343.21405	295.74667	1,104.0107	5,722.7298	351.59688	820.39401
Slice 27	349.8759	295.64528	1,110.4008	5,953.8789	356.64519	832.17172
Slice 28	356.47895	295.54479	1,116.7427	6,181.5637	1,215.7743	-0.00021768398
Slice 29	358.47402	295.51442	1,118.66	6,251.1371	1,232.0143	0.00012679687
Slice 30	361.71074	295.46516	1,121.773	6,364.2095	1,258.4091	0.00030692901
Slice 31	365.71023	295.40429	1,125.6218	6,502.8127	1,290.7562	4.185448e-005
Slice 32	370.53611	295.62793	1,113.6157	6,424.8729	1,276.6746	0.00017639093

Slice 33	377.44418	296.1638	1,084.6484	6,579.5554	1,320.8187	0.00022904367
Slice 34	384.85694	296.73881	1,054.1953	6,744.6837	1,367.8316	-0.0004377521
Slice 35	390.34681	297.32024	1,023.6605	6,661.0073	1,381.9615	9.3520559e-005
Slice 36	398.19235	298.61318	955.64508	6,760.9836	1,423.1435	0.00024678784
Slice 37	407.38865	300.12873	877.76716	6,880.7362	1,471.5916	-4.149418e-006
Slice 38	410.57503	300.65385	851.1092	6,922.7588	1,488.4283	-4.1968918e-006
Slice 39	413.21688	301.5125	805.67464	6,549.8821	574.93358	1,341.5163
Slice 40	417.97825	303.07539	723.45336	6,528.8735	576.76548	1,345.7884
Slice 41	424.54539	307.67704	451.36711	4,863.7685	2,651.2382	150
Slice 42	429.51952	312.07779	185.43571	4,576.0444	2,638.1438	150
Slice 43	431.85203	314.14142	62.950076	4,827.1528	840.05748	1,000
Slice 44	434.54811	316.52671	0	4,648.7731	1,667.7198	264.65933
Slice 45	436.29623	318.07332	0	4,569.0742	1,647.3504	256.36557
Slice 46	437.66382	319.28326	0	4,270.2604	2,465.436	0
Slice 47	442.25855	324.39009	0	3,696.702	2,134.2919	0
Slice 48	446.65721	329.41788	0	3,467.281	2,001.8356	0
Slice 49	448.5377	331.56734	0	3,368.487	1,944.7969	0
Slice 50	450.79671	334.14946	0	3,233.2995	1,866.7464	0
Slice 51	453.51424	337.25567	0	3,029.9408	1,749.3372	0
Slice 52	456.07394	340.25567	0	2,731.4303	1,576.992	0
Slice 53	458.28986	343.06894	0	2,550.0257	1,472.258	0
Slice 54	460.65286	346.06894	0	2,354.9089	1,359.6073	0
Slice 55	463.74923	350	0	2,095.4078	1,209.7843	0
Slice 56	468.47523	356	0	1,692.8696	977.37874	0
Slice 57	473.20123	362	0	1,281.3513	739.78849	0
Slice 58	477.3285	367.23987	0	914.29455	527.8682	0
Slice 59	479.25928	369.75661	0	669.70314	386.65329	0
Slice 60	479.71643	370.51674	0	619.31946	357.56426	0
Slice 61	481.27893	373.11485	0	445.2019	257.03744	0
Slice 62	483.08313	376.11485	0	242.76202	140.15872	0
Slice 63	484.42237	378.34174	0	91.619417	52.896495	0

Figure 42 Stability for Section OP-2, Partially Drained Conditions, Waste Lift 10 with GSS Varied K

Slope Stability

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File Information

Title: Model City - RMU-2 CP-20 Section OP-2
Comments: Operation Conditions for CP-20 Section 2 Based on Maximum Fill Rate of 50,000 Cu Yds per Quarter
Created By: Peter J. Carey
Revision Number: 494
File Version: 8.0
Tool Version: 8.0.10.6504
Date: 2/23/2013
Time: 3:03:00 PM
File Name: C20OP-2r1_gssk.gsz
Directory: N:\Model_City\154.002_rmu2\154.005_revsions\geoslope\operational\
Last Solved Date: 2/23/2013
Last Solved Time: 5:56:48 PM

Project Settings

Length(L) Units: feet
Time(t) Units: Days
Force(F) Units: lbf
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D

Analysis Settings

Slope Stability

Description: TSA End Construction block
Kind: SLOPE/W
Parent: Waste Lift10 El. 383
Method: Morgenstern-Price
Settings
- Side Function
  - Interslice force function option: Half-Sine
- Lambda
  - Lambda 1: -1
  - Lambda 2: -0.8
  - Lambda 3: -0.6
  - Lambda 4: -0.4
  - Lambda 5: -0.2
  - Lambda 6: 0
  - Lambda 7: 0.2
  - Lambda 8: 0.4

Lambda 9: 0.6
Lambda 10: 0.8
Lambda 11: 1
PWP Conditions Source: Parent Analysis
Slip Surface
Direction of movement: Right to Left
Use Passive Mode: No
Slip Surface Option: Block
Critical slip surfaces saved: 3
Restrict Block Crossing: No
Optimize Critical Slip Surface Location: Yes
Tension Crack
Tension Crack Option: (none)
F of S Distribution
F of S Calculation Option: Constant
Advanced
Number of Slices: 30
F of S Tolerance: 0.001
Minimum Slip Surface Depth: 10 ft
Optimization Maximum Iterations: 2,000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

Waste Material

Model: Mohr-Coulomb
Unit Weight: 111 pcf
Cohesion': 0 psf
Phi': 30 °
Phi-B: 0 °

Bottom Liner

Model: Shear/Normal Fn.
Unit Weight: 120 pcf
Strength Function: Baseliner
Phi-B: 0 °

CCL

Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 1,000 psf
Phi': 10 °
Phi-B: 0 °

Upper Till

Model: Mohr-Coulomb

Unit Weight: 125 pcf
Cohesion': 150 psf
Phi': 31 °
Phi-B: 0 °

Deflection surface

Model: Bedrock (Impenetrable)

Structural Fill

Model: Mohr-Coulomb
Unit Weight: 135 pcf
Cohesion': 1,000 psf
Phi': 45 °
Phi-B: 0 °

NOT ACTIVE

Model: (None)

GC UNDRAINED

Model: Shear/Normal Fn.
Unit Weight: 120 pcf
Strength Function: SHANSEP CONSOLIDATED UNDRAINED STATIC
Phi-B: 0 °
Anisotropic Strength Fn: clay ellipse staticshear

GC-Overconsolidated-UNDRAINED

Model: Shear/Normal Fn.
Unit Weight: 125 pcf
Strength Function: SHANSEP Over CONSOLIDATED UNDRAINED STATIC
Phi-B: 0 °
Anisotropic Strength Fn: clay ellipse staticshear

Slip Surface Limits

Left Coordinate: (25.66545, 331.15391) ft
Right Coordinate: (594.2496, 377) ft

Slip Surface Block

Left Grid
- Upper Left: (151, 306) ft
- Lower Left: (152, 288) ft
- Lower Right: (207, 288) ft
- X Increments: 5
- Y Increments: 5
- Starting Angle: 135 °
- Ending Angle: 180 °
- Angle Increments: 2

Right Grid
- Upper Left: (254, 306) ft
- Lower Left: (254, 289) ft

Lower Right: (450, 292) ft
X Increments: 10
Y Increments: 4
Starting Angle: 45 °
Ending Angle: 65 °
Angle Increments: 2

Anisotropic Strength Functions

clay ellipse staticshear

Model: Spline Data Point Function
Function: Modifier Factor vs. Inclination
Curve Fit to Data: 100 %
Segment Curvature: 50 %
Y-Intercept: 0.706
Data Points: Inclination (°), Modifier Factor
Data Point: (-60, 0.92608827)
Data Point: (-30, 0.92608827)
Data Point: (-17.838428, 0.83077031)
Data Point: (-3, 0.70608827)
Data Point: (3, 0.70608827)
Data Point: (23.685228, 0.82618324)
Data Point: (39.261389, 0.92608827)
Data Point: (59.397364, 0.92608827)

Shear/Normal Strength Functions

Baseliner

Model: Shear/Normal Spline Data Point Function
Function: Shear Stress vs. Normal Stress
Curve Fit to Data: 100 %
Segment Curvature: 100 %
Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
Data Point: (0, 0)
Data Point: (500, 235)
Data Point: (1,000, 463)
Data Point: (2,000, 899)
Data Point: (5,000, 2,057)
Data Point: (10,000, 3,515)
Data Point: (15,000, 4,430)
Estimation Properties
Intact Rock Param.: 10
Geological Strength: 100
Disturbance Factor: 0
SigmaC: 600,000 psf
SigmaC: 300,000 psf
Num. Points: 20

SHANSEP CONSOLIDATED UNDRAINED STATIC

Model: Add-In Function
Function: Shear Stress vs. Normal Stress
Assembly: GeoStudio AddIns1
Function: SHANSEPP
Field
MPP: 5000
m: 0.7
S: .34
Y-Intercept: -1.#IND

SHANSEP Over CONSOLIDATED UNDRAINED STATIC

Model: Add-In Function
Function: Shear Stress vs. Normal Stress
Assembly: GeoStudio AddIns1
Function: SHANSEPP
Field
MPP: 8000
m: 0.7
S: .34
Y-Intercept: -1.#IND

Points

	X (ft)	Y (ft)
Point 1	0	268.91519
Point 2	207.4978	271.24238
Point 3	209.0232	271.26867
Point 4	215.074	271.32735
Point 5	225.5606	271.44496
Point 6	230.6621	271.56993
Point 7	234.0537	271.62591
Point 8	237.8751	271.70733
Point 9	243.6233	271.78388
Point 10	403.7734	274.99581
Point 11	406.1879	275.04891
Point 12	510.242	277.40528
Point 13	519.1809	277.52295
Point 14	522.2501	277.56833
Point 15	581.5843	278.21948
Point 16	706.5316	275.03632
Point 17	784.4915	272.77004
Point 18	796.8946	272.40949
Point 19	796.8946	278.66207

Point 20	771.752	277.8332
Point 21	583.2389	281.6042
Point 22	512.9202	278.57945
Point 23	404.2686	277.81745
Point 24	248.1947	278.63737
Point 25	83.6675	274.48464
Point 26	78.5956	274.41664
Point 27	69.7373	274.12229
Point 28	0	273.8562
Point 29	0	286.98783
Point 30	69.7373	288.07912
Point 31	78.6615	288.22649
Point 32	83.6675	288.57952
Point 33	248.1947	297.19282
Point 34	404.2686	294.81745
Point 35	512.9202	289.28565
Point 36	583.2389	288.00106
Point 37	796.8946	289.48765
Point 38	0	305.26334
Point 39	63.5351	305.72185
Point 40	69.7373	305.70863
Point 41	77.6371	305.65972
Point 42	78.5956	305.57155
Point 43	83.6675	305.7
Point 44	248.1947	307.61838
Point 45	299.7903	306.27673
Point 46	299.6238	303.28004
Point 47	404.2544	300.5593
Point 48	512.9971	302.35411
Point 49	583.3451	304.79977
Point 50	592.8421	305.14193
Point 51	650.1895	305.15472
Point 52	796.8602	303.47517
Point 53	796.8946	303.47517
Point 54	404.2686	303.55995
Point 55	512.9202	305.35325
Point 56	583.2389	307.79789
Point 57	592.7878	308.14191
Point 58	650.2064	308.15472

Point 59	796.8946	306.47498
Point 60	0	327.67711
Point 61	22.4921	326.28273
Point 62	49.2488	323.27595
Point 63	74.3201	319.27807
Point 64	77.7249	318.65421
Point 65	112.0147	318.69361
Point 66	124.2402	315.77486
Point 67	126.7076	315.31519
Point 68	136.2125	313.12968
Point 69	142.0351	312.45981
Point 70	357.6126	310.47901
Point 71	586.0206	317.13
Point 72	588.0287	317.67977
Point 73	603.6052	322
Point 74	693.0775	322
Point 75	695.4173	323.10644
Point 76	697.3194	324
Point 77	714.7524	332
Point 78	726.8078	332.79458
Point 79	736.4313	333.45251
Point 80	740.2913	333.71166
Point 81	742.8239	333.89241
Point 82	743.6092	331.27888
Point 83	746.0108	331.28559
Point 84	751.3746	333.5338
Point 85	751.5561	333.52887
Point 86	751.6873	333.53898
Point 87	751.9654	333.539
Point 88	755.4965	333.65881
Point 89	757.088	333.70415
Point 90	766.5218	333.52383
Point 91	769.5239	331.03222
Point 92	781.3859	336.00827
Point 93	796.8946	335.53695
Point 94	0	330.67136
Point 95	0.1856	330.67136
Point 96	22.7526	329.27234
Point 97	49.6527	326.24944

Point 98	74.8268	322.23518
Point 99	77.9958	321.65452
Point 100	112.3661	321.69402
Point 101	124.8636	318.71033
Point 102	127.3188	318.25295
Point 103	136.7217	316.09089
Point 104	142.2209	315.45823
Point 105	357.5827	313.47942
Point 106	585.5746	320.11828
Point 107	587.2318	320.57198
Point 108	684.7881	347.62982
Point 109	704.816	348.13028
Point 110	707.7847	347.0118
Point 111	709.4494	346.32322
Point 112	709.6367	345.87345
Point 113	708.0438	345.21
Point 114	685.2332	344.64
Point 115	131.5335	329.79618
Point 116	158.1735	318.33502
Point 117	165.2063	318.28065
Point 118	203.3044	317.9221
Point 119	243.6199	317.55888
Point 120	248.3589	317.51329
Point 121	357.6595	316.4965
Point 122	589.0312	323.16552
Point 123	591.6482	323.89085
Point 124	610.0073	329
Point 125	631.5677	335
Point 126	653.128	341
Point 127	674.6884	347
Point 128	684.1005	349.61929
Point 129	699.8223	350.01168
Point 130	0	332.91188
Point 131	22.4396	331.51733
Point 132	49.1519	328.50799
Point 133	68.0785	325.48185
Point 134	73.6566	324.58998
Point 135	90.5756	324.62675
Point 136	109.5111	324.68581

Point 137	124.0229	330.52741
Point 138	127.0249	330.53586
Point 139	129.8149	330.45078
Point 140	130.027	330.44431
Point 141	274.9823	329
Point 142	252.0124	321.5
Point 143	213.855	321.5
Point 144	177.1587	331.5
Point 145	171.0426	331.5
Point 146	152.2075	323.79526
Point 147	298.6003	335
Point 148	282.6389	331.5
Point 149	287.7433	331.5
Point 150	289.3308	331.95874
Point 151	290.9318	332.5
Point 152	317.0046	341
Point 153	355.3453	347
Point 154	666.3598	347
Point 155	669.6785	345.61929
Point 156	674.6567	347
Point 157	326.7765	344.18573
Point 158	336.1465	343.24706
Point 159	342.0216	342.65356
Point 160	373.7378	353
Point 161	651.9377	353
Point 162	392.1303	359
Point 163	637.5157	359
Point 164	410.5229	365
Point 165	623.0936	365
Point 166	608.6716	371
Point 167	428.9409	371
Point 168	415.8066	366.72364
Point 169	447.0228	377
Point 170	594.2496	377
Point 171	435.4903	373.13237
Point 172	450.0526	378.01608
Point 173	459.9195	378.51574
Point 174	479.4258	379.45192
Point 175	482.5508	379.55699

Point 176	491.9324	380
Point 177	507.2813	380.61621
Point 178	541.8899	382.28139
Point 179	574.2808	382.67429
Point 180	581.1072	381.37657
Point 181	581.6822	381.26488
Point 182	582.2411	381.14975
Point 183	582.7845	381.03125
Point 184	583.313	380.90951
Point 185	583.8273	380.78465
Point 186	584.3278	380.6568
Point 187	584.8152	380.52606
Point 188	585.29	380.39256
Point 189	592.2253	377.82435
Point 190	593.0101	377.51567
Point 191	78.5551	329.67009
Point 192	110.5776	331.89761
Point 193	113.2091	332.06836
Point 194	115.8406	332.21663
Point 195	118.4721	332.34247
Point 196	121.1036	332.44595
Point 197	123.7351	332.5271
Point 198	125.1298	332.55831
Point 199	126.3665	332.19565
Point 200	128.6722	331.5
Point 201	128.9196	331.46994
Point 202	710.0851	346.06023
Point 203	718.4637	349.55
Point 204	736.491	350
Point 205	738.1976	349.29
Point 206	796.8946	253.91519
Point 207	0	253.91519

Regions

	Material	Points	Area (ft^2)
Region 1	NOT ACTIVE	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28	3,346.1

Region 2	Deflection surface	29,30,31,32,33,34,35,36,37,19,20,21,22,23,24,25,26,27,28	10,671
Region 3	GC UNDRAINED	38,39,40,41,42,43,44,45,46,47,48,49,50,51,52,53,37,36,35,34,33,32,31,30,29	10,397
Region 4	GC-Overconsolidated-UNDRAINED	45,54,55,56,57,58,59,53,52,51,50,49,48,47,46	1,491.9
Region 5	Upper Till	60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78,79,80,81,82,83,84,85,86,87,88,89,90,91,92,93,59,58,57,56,55,54,45,44,43,42,41,40,39,38	9,253.4
Region 6	CCL	94,95,96,97,98,99,100,101,102,103,104,105,106,107,108,109,110,111,112,113,114,73,72,71,70,69,68,67,66,65,64,63,62,61,60	2,139
Region 7	Bottom Liner	115,116,117,118,119,120,121,122,123,124,125,126,127,128,129,109,108,107,106,105,104,103,102,101,100,99,98,97,96,95,94,130,131,132,133,134,135,136,137,138,139,140	2,215.1
Region 8	Waste Material	115,116,117,118,119,120,121,122,123,124,141,142,143,144,145,146	4,104.1
Region 9	Waste Material	147,125,124,141,148,149,150,151	2,001.4
Region 10	Waste Material	147,125,126,152	2,007.3
Region 11	Waste Material	153,154,155,156,127,126,152,157,158,159	1,949.1
Region 12	Waste Material	160,161,154,153	1,767.6
Region 13	Waste Material	162,163,161,160	1,570.8
Region 14	Waste Material	164,165,163,162	1,373.9
Region 15	Waste Material	164,165,166,167,168	1,176.9
Region 16	Waste Material	169,170,166,167,171	980.5
Region 17	Waste Material	169,172,173,174,175,176,177,178,179,180,181,182,183,184,185,186,187,188,189,190,170	534.96
Region 18	Structural Fill	133,191,192,193,194,195,196,197,198,199,200,201,139,138,137,136,135,134	293.23
Region 19	Structural Fill	73,114,113,112,202,203,204,205,81,80,79,78,77,76,75,74	1,934.1
Region 20	NOT ACTIVE	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,206,207	15,814

Current Slip Surface

Slip Surface: 17,821
F of S: 1.506
Volume: 10,370.417 ft³
Weight: 1,189,647.4 lbs
Resisting Moment: 79,473,311 lbs-ft
Activating Moment: 52,766,638 lbs-ft
Resisting Force: 290,524.38 lbs
Activating Force: 193,000.57 lbs
F of S Rank: 1
Exit: (229.21704, 321.5) ft
Entry: (482.17646, 379.5444) ft
Radius: 124.82202 ft

Center: (169, 482) ft

Slip Slices

	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
Slice 1	231.69566	319.57199	0	311.95672	180.1083	0
Slice 2	236.14564	316.11054	0	841.03653	381.06786	10.254996
Slice 3	239.01118	313.88156	1,131.714	1,498.0996	64.603675	1,000
Slice 4	241.10339	312.36227	1,257.8996	1,637.126	66.86784	1,000
Slice 5	242.96066	311.08525	1,362.6849	1,359.882	-1.68416	150
Slice 6	245.9073	309.05918	1,518.6724	1,692.5277	104.46279	150
Slice 7	250.10355	306.17391	1,682.593	2,420.0064	266.19924	621.13199
Slice 8	252.91075	304.24373	1,668.6763	2,793.5032	302.14785	705.01146
Slice 9	257.49184	302.73989	1,657.8744	2,757.7464	252.34097	588.79528
Slice 10	264.85732	300.9676	1,641.6255	3,318.1046	286.35491	668.16096
Slice 11	271.76118	299.6895	1,624.6981	3,642.3904	279.16502	651.38475
Slice 12	278.8106	298.8317	1,602.542	4,043.0441	295.56184	689.64378
Slice 13	285.1911	298.0553	1,583.6082	4,308.217	305.48903	712.80775
Slice 14	288.53705	297.64815	1,573.9616	4,397.203	308.76526	720.45311
Slice 15	290.1313	297.45415	1,569.5193	4,484.3344	311.73672	727.38501
Slice 16	294.41929	296.93237	1,558.2063	4,724.9713	319.58705	745.70301
Slice 17	298.25354	296.49368	1,549.1737	4,805.4552	316.61709	738.77431
Slice 18	299.11205	296.45824	1,548.9674	4,842.3059	317.69423	741.28607
Slice 19	299.70705	296.43368	1,548.8458	4,875.4747	318.65388	743.52651
Slice 20	300.2254	296.41228	1,548.7541	4,905.331	319.51198	745.5281
Slice 21	304.74652	296.33213	1,551.0841	5,041.0844	323.24867	754.24669
Slice 22	312.91857	296.20775	1,556.5298	5,353.4841	331.52806	773.5638
Slice 23	320.01369	296.09977	1,561.4807	5,620.2121	338.22518	789.19257
Slice 24	324.89963	296.02541	1,565.4171	5,801.2618	342.58668	799.3704
Slice 25	329.23824	295.95938	1,569.274	5,841.8127	343.47442	801.44145
Slice 26	333.92324	295.88807	1,573.822	5,786.2294	342.01711	798.04072
Slice 27	337.77238	295.82949	1,578.0498	5,738.7873	340.75331	795.09116
Slice 28	340.70993	295.78478	1,581.6627	5,701.422	339.74272	792.7341
Slice 29	345.35253	295.71412	1,587.5162	5,801.0493	342.0447	798.10453
Slice 30	352.01437	295.61273	1,596.2362	6,031.405	347.34603	810.47336
Slice 31	356.5024	295.54443	1,602.4193	6,184.4215	350.75646	818.43156
Slice 32	360.51625	295.48334	1,608.2201	6,321.041	353.73181	825.37203
Slice 33	368.5554	295.3841	1,621.2354	6,578.625	359.13943	837.99037
Slice 34	379.02105	295.75698	1,654.007	6,657.1173	1,203.032	-8.8196305e-005
Slice 35	388.2173	296.78742	1,719.0884	6,668.5141	365.27501	852.30971

Slice 36	398.19235	298.32152	1,829.499	6,806.611	365.88758	853.73646
Slice 37	407.38865	299.73585	1,932.1731	6,938.0319	1,222.735	-4.6544245e-005
Slice 38	410.89328	300.27484	1,972.04	6,989.0829	1,225.4669	-4.6648234e-005
Slice 39	411.76304	300.51164	1,981.5482	6,593.2752	394.1439	919.66878
Slice 40	414.03451	301.32963	2,001.9234	6,516.9348	544.22337	1,269.8549
Slice 41	417.10769	302.43634	2,020.8734	6,494.8914	542.73619	1,266.3851
Slice 42	418.92668	303.35766	2,021.9946	5,398.4824	583.56819	1,361.6585
Slice 43	424.19274	307.96146	1,823.7196	5,044.9674	1,935.521	150
Slice 44	429.2033	312.34189	1,618.6853	4,779.7057	1,899.3327	150
Slice 45	431.24136	314.12364	1,556.113	4,879.2628	585.96098	1,000
Slice 46	434.25365	316.75711	0	4,580.3748	1,650.2537	257.5352
Slice 47	435.88518	318.18345	0	4,507.3268	1,631.397	250.01309
Slice 48	440.54122	323.76434	0	3,516.2889	2,030.1303	0
Slice 49	445.91259	330.36411	0	3,218.2848	1,858.0776	0
Slice 50	448.3542	333.36411	0	3,081.478	1,779.0922	0
Slice 51	449.8691	335.22546	0	2,996.2146	1,729.8653	0
Slice 52	451.13903	336.78582	0	2,902.0807	1,675.5171	0
Slice 53	453.31432	339.56036	0	2,652.2238	1,531.2621	0
Slice 54	456.67218	344	0	2,376.1298	1,371.8592	0
Slice 55	459.43034	347.64674	0	2,147.0229	1,239.5842	0
Slice 56	461.69935	350.64674	0	1,955.8177	1,129.1919	0
Slice 57	465.74821	356	0	1,609.8934	929.47238	0
Slice 58	469.27565	360.66385	0	1,303.6264	752.64906	0
Slice 59	471.43762	363.66385	0	1,058.6426	611.20757	0
Slice 60	474.36984	368	0	776.27799	448.18431	0
Slice 61	477.91216	373.23837	0	429.51269	247.97926	0
Slice 62	479.94083	376.23837	0	227.36575	131.26967	0
Slice 63	481.31616	378.2722	0	87.773954	50.676316	0

Figure 43 Baseliner Stability for Section OP-1, Partially Drained Conditions, Waste Lift 10

Waste Lift10 - 4th step pp

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File Information

Title: Model City - RMU-2 CP-20 Section OP-1
Comments: Operation Conditions for CP-20 Section 1 Based on Maximum Fill Rate of 50,000 Cu Yds per Quarter
Created By: Peter J. Carey
Last Edited By: Peter J. Carey
Revision Number: 509
File Version: 8.0
Tool Version: 8.0.10.6504
Date: 2/24/2013
Time: 12:44:51 PM
File Name: C20OP-1r1.gsz
Directory: N:\Model_City\154.002_rmu2\154.005_revsions\geoslope\operational\
Last Solved Date: 2/24/2013
Last Solved Time: 1:44:22 PM

Project Settings

Length(L) Units: feet
Time(t) Units: Days
Force(F) Units: lbf
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D

Analysis Settings

Waste Lift10 - 4th step pp

Description: Undrained Strength based on 25% of fill time
Kind: SLOPE/W
Parent: WASTE LIFT 10 EL. 383
Method: Morgenstern-Price
Settings
- Side Function
  - Interslice force function option: Half-Sine
- Lambda
  - Lambda 1: -1
  - Lambda 2: -0.8
  - Lambda 3: -0.6
  - Lambda 4: -0.4
  - Lambda 5: -0.2
  - Lambda 6: 0
  - Lambda 7: 0.2

Lambda 8: 0.4
Lambda 9: 0.6
Lambda 10: 0.8
Lambda 11: 1
PWP Conditions Source: Parent Analysis
Slip Surface
Direction of movement: Right to Left
Use Passive Mode: No
Slip Surface Option: Entry and Exit
Critical slip surfaces saved: 1
Optimize Critical Slip Surface Location: Yes
Tension Crack
Tension Crack Option: (none)
F of S Distribution
F of S Calculation Option: Constant
Advanced
Number of Slices: 30
F of S Tolerance: 0.001
Minimum Slip Surface Depth: 15 ft
Optimization Maximum Iterations: 2,000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

Waste Material

Model: Mohr-Coulomb
Unit Weight: 111 pcf
Cohesion': 0 psf
Phi': 30 °
Phi-B: 0 °

Bottom Liner

Model: Shear/Normal Fn.
Unit Weight: 120 pcf
Strength Function: Baseliner
Phi-B: 0 °

CCL

Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 1,000 psf
Phi': 10 °
Phi-B: 0 °

Upper Till

Model: Mohr-Coulomb

Unit Weight: 125 pcf
Cohesion': 150 psf
Phi': 31 °
Phi-B: 0 °

Deflection surface

Model: Bedrock (Impenetrable)

Structural Fill

Model: Mohr-Coulomb
Unit Weight: 135 pcf
Cohesion': 1,000 psf
Phi': 45 °
Phi-B: 0 °

NOT ACTIVE

Model: (None)

GC UNDRAINED

Model: Shear/Normal Fn.
Unit Weight: 120 pcf
Strength Function: SHANSEP CONSOLIDATED UNDRAINED STATIC
Phi-B: 0 °
Anisotropic Strength Fn: clay ellipse staticshear

GC-Overconsolidated-UNDRAINED

Model: Shear/Normal Fn.
Unit Weight: 125 pcf
Strength Function: SHANSEP Over CONSOLIDATED UNDRAINED STATIC
Phi-B: 0 °
Anisotropic Strength Fn: clay ellipse staticshear

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (76.8668, 319.45558) ft
Left-Zone Right Coordinate: (171.8639, 324.99999) ft
Left-Zone Increment: 10
Right Projection: Range
Right-Zone Left Coordinate: (290, 363.58286) ft
Right-Zone Right Coordinate: (399.9028, 380.82588) ft
Right-Zone Increment: 10
Radius Increments: 8

Slip Surface Limits

Left Coordinate: (63.808718, 319.21096) ft
Right Coordinate: (446.87317, 382.21462) ft

Anisotropic Strength Functions

clay ellipse staticshear

Model: Spline Data Point Function
Function: Modifier Factor vs. Inclination
Curve Fit to Data: 100 %
Segment Curvature: 50 %
Y-Intercept: 0.706
Data Points: Inclination (°), Modifier Factor
Data Point: (-60, 0.92608827)
Data Point: (-30, 0.92608827)
Data Point: (-17.838428, 0.83077031)
Data Point: (-3, 0.70608827)
Data Point: (3, 0.70608827)
Data Point: (23.685228, 0.82618324)
Data Point: (39.261389, 0.92608827)
Data Point: (59.397364, 0.92608827)

Shear/Normal Strength Functions

Baseliner

Model: Shear/Normal Spline Data Point Function
Function: Shear Stress vs. Normal Stress
Curve Fit to Data: 100 %
Segment Curvature: 100 %
Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
Data Point: (0, 0)
Data Point: (500, 235)
Data Point: (1,000, 463)
Data Point: (2,000, 899)
Data Point: (5,000, 2,057)
Data Point: (10,000, 3,515)
Data Point: (15,000, 4,430)
Estimation Properties
Intact Rock Param.: 10
Geological Strength: 100
Disturbance Factor: 0
SigmaC: 600,000 psf
SigmaC: 300,000 psf
Num. Points: 20

SHANSEP CONSOLIDATED UNDRAINED STATIC

Model: Add-In Function
Function: Shear Stress vs. Normal Stress
Assembly: GeoStudio AddIns1
Function: SHANSEPP
Field
MPP: 5000
m: 0.7

S: .34
Y-Intercept: -1.#IND

SHANSEP Over CONSOLIDATED UNDRAINED STATIC

Model: Add-In Function
Function: Shear Stress vs. Normal Stress
Assembly: GeoStudio AddIns1
Function: SHANSEPP
Field
MPP: 8000
m: 0.7
S: .34
Y-Intercept: -1.#IND

Points

	X (ft)	Y (ft)
Point 1	561.5172	329
Point 2	184.2753	329
Point 3	174.1934	323.83525
Point 4	351.3603	319.67886
Point 5	546.7523	324.07989
Point 6	139.5241	323.62981
Point 7	0	321.01609
Point 8	0	318.01563
Point 9	133.22	320.51124
Point 10	196.3072	335
Point 11	579.5227	335
Point 12	597.5282	341
Point 13	208.339	341
Point 14	608.5585	347
Point 15	240.1424	347
Point 16	234.9596	345.27685
Point 17	219.929	346.77965
Point 18	611.3486	345.60539
Point 19	596.5548	353
Point 20	258.1852	353
Point 21	250.6076	350.4794
Point 22	276.2227	359
Point 23	584.5511	359
Point 24	294.2603	365
Point 25	572.5474	365
Point 26	312.2978	371

Point 27	560.5437	371
Point 28	548.5399	377
Point 29	330.1036	377
Point 30	325.5389	375.4045
Point 31	337.8201	379.69712
Point 32	364.4177	380
Point 33	381.0855	380.33726
Point 34	395.5929	380.71635
Point 35	416.8543	381.25666
Point 36	438.0487	382
Point 37	479.1653	383
Point 38	511.5499	383
Point 39	512.0826	382.82242
Point 40	513.8708	383
Point 41	531.0491	383
Point 42	533.1096	382.31347
Point 43	533.1107	382.31305
Point 44	536.5271	381.01628
Point 45	537.9265	380.70839
Point 46	547.5083	377.51565
Point 47	346.883	383
Point 48	493.5541	389
Point 49	363.3465	389
Point 50	371.2953	391.89686
Point 51	372.0119	391.98713
Point 52	372.2345	391.99514
Point 53	372.3208	392
Point 54	374.2156	392.05341
Point 55	419.4544	394.02388
Point 56	423.1399	394.1518
Point 57	476.0285	394.84323
Point 58	0	275.56112
Point 59	82.561	276.49127
Point 60	84.7322	276.34451
Point 61	123.7177	276.54438
Point 62	191.6961	277.65321
Point 63	430.1918	279.01879
Point 64	487.7086	279.639
Point 65	509.7138	279.55021

Point 66	721.9937	279.02461
Point 67	839	278.53365
Point 68	839	283.95091
Point 69	694.2381	280.02879
Point 70	505.5772	282.211
Point 71	487.7086	281.69555
Point 72	430.1918	282.66537
Point 73	247.1163	283.77931
Point 74	191.6961	282.79673
Point 75	123.7177	280.19493
Point 76	93.9325	281.10076
Point 77	61.0988	279.7585
Point 78	0	281.01485
Point 79	839	292.1407
Point 80	505.5772	286.98428
Point 81	487.7086	287.07159
Point 82	430.1918	289.73652
Point 83	247.1163	297.70175
Point 84	123.7177	292.05467
Point 85	94.7708	289.80875
Point 86	84.7322	289.65003
Point 87	82.561	289.66397
Point 88	38.9609	289.4325
Point 89	0	289.19587
Point 90	0	300.53803
Point 91	17.729	300.30563
Point 92	61.8788	299.93669
Point 93	191.626	301.3549
Point 94	247.1555	301.9218
Point 95	430.2162	304.83853
Point 96	487.7442	304.85433
Point 97	505.6491	305.27434
Point 98	509.7473	305.37466
Point 99	564.3735	305.25518
Point 100	839	303.47923
Point 101	839	306.47929
Point 102	564.3865	308.25516
Point 103	509.7138	308.37474
Point 104	505.5772	308.27348

Point 105	487.7086	307.85432
Point 106	430.1918	307.83852
Point 107	247.1163	304.92156
Point 108	191.6961	304.35577
Point 109	123.7177	308.23059
Point 110	93.9325	306.13974
Point 111	81.2213	307.4429
Point 112	61.5521	302.93952
Point 113	17.7611	303.30547
Point 114	0	303.53785
Point 115	839	315.0402
Point 116	797.6335	315.91598
Point 117	788.4831	316.10833
Point 118	751.3873	316.84226
Point 119	746.5947	316.94222
Point 120	742.0308	317.02756
Point 121	740.5664	317.15339
Point 122	740.3716	317.22293
Point 123	737.8797	317.29393
Point 124	718.0152	324.01292
Point 125	711.8056	325.93525
Point 126	706.0898	327.46147
Point 127	700.0454	333.50592
Point 128	694.499	330.73293
Point 129	691.9982	333.23326
Point 130	680.0323	333.54954
Point 131	679.8975	333.54516
Point 132	674.9116	331.05465
Point 133	672.911	331.05491
Point 134	672.1929	333.92615
Point 135	648.0416	332
Point 136	642.1238	328.67972
Point 137	637.4622	326.05461
Point 138	633.8287	324
Point 139	632.6094	323.29395
Point 140	630.3447	322
Point 141	556.3265	322
Point 142	544.3989	318.02536
Point 143	351.3575	313.67727

Point 144	171.7713	317.89042
Point 145	158.9451	319.66188
Point 146	146.7629	317.7643
Point 147	0	315.01616
Point 148	126.916	317.39267
Point 149	624.2673	344.64
Point 150	642.7896	345.19608
Point 151	639.8757	348.10995
Point 152	623.7369	347.62543
Point 153	543.8794	321.01441
Point 154	351.3589	316.67806
Point 155	172.0125	320.88559
Point 156	158.9189	322.69398
Point 157	146.5027	320.75996
Point 158	161.8204	329.91734
Point 159	162.0292	329.91734
Point 160	169.8774	325.99323
Point 161	172.2537	323.88076
Point 162	158.8927	325.72607
Point 163	146.2426	323.75561
Point 164	144.6459	323.72571
Point 165	157.0292	329.91734
Point 166	643.2531	345.21
Point 167	651.9258	349.55
Point 168	666.9304	350
Point 169	668.3508	349.29
Point 170	707.4035	333.53244
Point 171	710.6052	333.51008
Point 172	711.3189	333.31046
Point 173	713.7443	332.66283
Point 174	720.1721	330.67297
Point 175	739.1283	324.2612
Point 176	741.6802	324.18848
Point 177	742.0676	324.05019
Point 178	742.3962	324.02195
Point 179	746.7331	323.94086
Point 180	751.5295	323.84082
Point 181	788.6259	323.10687
Point 182	797.7821	322.91441

Point 183	839	322.03859
Point 184	704.3877	335.67695
Point 185	758.6353	353.74048
Point 186	806.6964	369.75012
Point 187	818.5728	368.55874
Point 188	839	375.2318
Point 189	623.3833	349.61571
Point 190	636.5766	350.01181
Point 191	637.9727	350.01292
Point 192	0	260
Point 193	839	260

Regions

	Material	Points	Area (ft²)
Region 1	Waste Material	1,2,3,4,5	2,684.8
Region 2	NOT ACTIVE	6,7,8,9	409.18
Region 3	Waste Material	10,11,1,2	2,281.4
Region 4	Waste Material	10,11,12,13	2,317.2
Region 5	Waste Material	14,15,16,17,13,12,18	2,329.2
Region 6	Waste Material	19,20,21,15,14	2,120.4
Region 7	Waste Material	19,20,22,23	1,940.1
Region 8	Waste Material	23,22,24,25	1,759.8
Region 9	Waste Material	26,27,25,24	1,579.6
Region 10	Waste Material	28,29,30,26,27	1,399.5
Region 11	Waste Material	29,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,28	963.75
Region 12	NOT ACTIVE	47,31,32,33,34,35,36,37,38,48,49	1,129
Region 13	NOT ACTIVE	49,50,51,52,53,54,55,56,57,48	563.69
Region 14	Deflection surface	58,59,60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78	3,000.7
Region 15	Deflection surface	78,77,76,75,74,73,72,71,70,69,68,79,80,81,82,83,84,85,86,87,88,89	7,768.6
Region 16	GC UNDRAINED	90,91,92,93,94,95,96,97,98,99,100,79,80,81,82,83,84,85,86,87,88,89	10,108
Region 17	GC-Overconsolidated-UNDRAINED	90,91,92,93,94,95,96,97,98,99,100,101,102,103,104,105,106,107,108,109,110,111,112,113,114	2,873.1
Region 18	Upper Till	114,113,112,111,110,109,108,107,106,105,104,103,102,101,115,116,117,118,119,120,121,122,123,124,125,126,127,128,129,130,131,132,133,134,135,136,137,138,139,140,141,142,143,144,145,146,147	9,788.5

Region 19	Structural Fill	8,147,148,9	390.2
Region 20	CCL	148,146,145,144,143,142,141,149,150,151,152,153,154,155,156,157,9	1,547.9
Region 21	Structural Fill	158,159,160,3,161,162,163,164,165	80.098
Region 22	Structural Fill	150,166,167,168,169,134,135,136,137,138,139,140,141,149	1,602.2
Region 23	NOT ACTIVE	127,170,171,172,173,174,175,176,177,178,179,180,181,182,183,115,116,117,118,119,120,121,122,123,124,125,126	957.6
Region 24	NOT ACTIVE	184,185,186,187,188,183,182,181,180,179,178,177,176,175,174,173,172,171,170,127	4,345.4
Region 25	Bottom Liner	157,9,6,164,163,162,161,3,4,5,1,11,12,18,189,190,191,151,152,153,154,155,156	1,423.6
Region 26	Deflection surface	58,192,193,67,66,65,64,63,62,61,60,59	15,370

Current Slip Surface

Slip Surface: 1,090
F of S: 1.583
Volume: 10,599.983 ft³
Weight: 1,233,620.1 lbs
Resisting Moment: 62,693,095 lbs-ft
Activating Moment: 39,623,559 lbs-ft
Resisting Force: 322,793.94 lbs
Activating Force: 203,625.33 lbs
F of S Rank: 1
Exit: (114.59609, 320.16236) ft
Entry: (372.09297, 380.1553) ft
Radius: 126.30436 ft
Center: (218.6228, 454.76588) ft

Slip Slices

	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
Slice 1	117.0248	318.70764	-422.26843	970.64413	970.64413	1,000
Slice 2	123.18476	315.01804	206.23282	977.18542	463.23505	150
Slice 3	128.61325	311.76656	422.6533	1,495.2742	644.49566	150
Slice 4	131.76525	309.84804	550.17514	1,809.4694	756.66033	150
Slice 5	134.3365	308.25389	655.90607	2,163.6556	905.94732	150
Slice 6	137.48855	306.29965	782.16922	2,931.2289	509.63329	1,189.1439
Slice 7	142.085	303.44989	960.32486	3,546.5689	538.74609	1,257.0736
Slice 8	145.27343	301.4731	1,081.2165	3,931.6871	554.69993	1,294.2998
Slice 9	146.07178	301.0533	1,106.8584	3,317.4514	412.83973	963.29257
Slice 10	146.37265	300.99917	1,110.5115	3,347.2378	414.29786	966.69492
Slice 11	146.6328	300.95236	1,113.6671	3,372.679	415.53187	969.57445
Slice 12	150.55482	300.24666	1,160.9622	3,682.4152	309.05802	721.13553

Slice 13	155.68797	299.39923	1,218.0745	4,095.5144	310.74496	725.07153
Slice 14	157.98715	299.11613	1,238.095	4,228.756	314.36352	733.51539
Slice 15	160.38275	298.82117	1,258.8831	4,274.8012	315.15769	735.36831
Slice 16	161.9248	298.6313	1,272.2091	4,306.0138	315.71695	736.67429
Slice 17	165.9533	298.13528	1,306.7215	4,112.709	308.40963	719.62243
Slice 18	170.82435	297.53552	1,347.7517	3,867.3576	298.60834	696.75289
Slice 19	171.8919	297.40407	1,356.6303	3,813.0424	296.3417	691.4635
Slice 20	172.1331	297.37437	1,358.6316	3,800.8644	295.82746	690.26368
Slice 21	173.22355	297.24011	1,367.6573	3,743.9215	293.40728	684.61637
Slice 22	176.45496	296.84223	1,394.1871	3,864.5678	296.84607	692.64097
Slice 23	181.49591	296.26371	1,432.6491	4,219.38	305.73631	713.38508
Slice 24	186.16443	295.75969	1,465.8181	4,557.5862	315.41378	735.96566
Slice 25	189.83978	295.46447	1,485.8716	4,719.3167	315.96245	737.24514
Slice 26	192.7145	295.31759	1,496.7186	4,898.3112	320.80439	748.54352
Slice 27	195.0551	295.31928	1,499.0079	4,878.7049	320.17557	747.07631
Slice 28	199.6932	295.53153	1,492.6109	5,099.2493	326.47896	761.78533
Slice 29	205.70909	295.80684	1,484.3416	5,383.5584	334.2088	779.82101
Slice 30	214.134	296.19238	1,472.7938	5,777.7997	344.28418	803.32952
Slice 31	223.57922	296.62462	1,459.8106	5,973.2356	349.20187	814.8048
Slice 32	230.87965	296.95871	1,449.6168	5,823.7368	345.93303	807.17715
Slice 33	234.74473	297.13559	1,444.1041	5,743.6065	344.15236	803.02101
Slice 34	237.551	297.26401	1,440.0238	5,809.075	345.81301	806.89614
Slice 35	243.62935	297.54218	1,430.7845	5,972.0239	349.84654	816.30749
Slice 36	248.86195	297.6258	1,431.5129	6,311.7553	357.48182	834.12513
Slice 37	252.55736	297.46502	1,446.0524	6,450.5169	1,201.3768	-4.5731229e-005
Slice 38	256.34616	297.46391	1,461.6384	6,385.472	358.43967	836.35746
Slice 39	260.67978	297.6612	1,481.7137	6,498.2493	1,204.2813	0.00029372712
Slice 40	266.43644	298.07015	1,512.5518	6,538.1301	1,209.8141	8.1870947e-005
Slice 41	272.96062	298.66091	1,556.3933	6,673.337	1,231.8089	-0.00013372232
Slice 42	278.89348	299.19813	1,623.4789	6,796.0828	1,245.2079	-3.5110881e-006
Slice 43	287.91228	300.32962	1,737.3611	6,851.0937	1,244.0114	0.00012803159
Slice 44	299.33941	301.93108	1,881.8736	7,033.6859	1,253.2754	-0.00026857148
Slice 45	304.70989	302.74318	1,951.0372	6,746.5964	395.34277	922.46696
Slice 46	308.64953	304.09915	1,979.65	6,667.6463	545.63503	1,273.1489
Slice 47	312.8648	305.55	2,005.0925	6,646.9361	544.01807	1,269.3755
Slice 48	318.22345	310.04367	1,836.7038	5,203.7818	2,023.1446	150
Slice 49	324.27701	315.47422	1,618.393	5,107.2309	615.17626	1,000
Slice 50	325.90692	316.93639	1,567.05	5,024.6925	609.67566	1,000
Slice 51	327.90487	318.72872	0	4,756.4399	1,694.8467	276.02693

Slice 52	329.80419	320.43256	0	4,396.4993	2,538.32	0
Slice 53	330.08859	320.69374	0	3,860.7225	2,228.9892	0
Slice 54	333.29067	324.85663	0	3,674.0855	2,121.2343	0
Slice 55	337.14892	329.87258	0	3,447.9286	1,990.6625	0
Slice 56	339.45651	332.87258	0	3,271.6927	1,888.9126	0
Slice 57	342.43578	336.7458	0	3,021.2898	1,744.3425	0
Slice 58	344.68043	339.7458	0	2,755.0116	1,590.6067	0
Slice 59	346.23261	341.90455	0	2,616.6523	1,510.7249	0
Slice 60	348.38967	344.90455	0	2,422.7798	1,398.7926	0
Slice 61	352.0534	350	0	2,089.4568	1,206.3484	0
Slice 62	356.36752	356	0	1,690.1545	975.81114	0
Slice 63	360.68164	362	0	1,282.7713	740.60835	0
Slice 64	363.0926	365.35312	0	1,051.7575	607.23248	0
Slice 65	363.8821	366.45115	0	975.37858	563.13508	0
Slice 66	365.78526	369.09803	0	790.82331	456.58205	0
Slice 67	367.93566	372.08877	0	580.80531	335.3281	0
Slice 68	369.64278	375.08877	0	314.4524	181.54918	0
Slice 69	370.93118	377.75293	0	149.84338	86.512117	0
Slice 70	371.6536	379.24676	0	56.805653	32.796759	0
Slice 71	372.05244	380.07148	0	5.2501682	3.031186	0

Figure 44 Baseliner Stability for Section OP-2, Partially Drained Conditions, Waste Lift 10

Slope Stability Waste Lift 10 @Baseliner

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File Information

Title: Model City - RMU-2 CP-20 Section OP-2
Comments: Operation Conditions for CP-20 Section 2 Based on Maximum Fill Rate of 50,000 Cu Yds per Quarter
Created By: Peter J. Carey
Revision Number: 497
File Version: 8.0
Tool Version: 8.0.10.6504
Date: 2/24/2013
Time: 9:11:42 PM
File Name: C20OP-2r1.gsz
Directory: N:\Model_City\154.002_rmu2\154.005_revsions\geoslope\operational\
Last Solved Date: 2/25/2013
Last Solved Time: 12:01:44 AM

Project Settings

Length(L) Units: feet
Time(t) Units: Days
Force(F) Units: lbf
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D

Analysis Settings

Slope Stability Waste Lift 10 @Baseliner

Description: Lift 10 Entry Exit Search Limited to baseliner
Kind: SLOPE/W
Parent: Waste Lift10 El. 383
Method: Morgenstern-Price
Settings
- Side Function
  - Interslice force function option: Half-Sine
- Lambda
  - Lambda 1: -1
  - Lambda 2: -0.8
  - Lambda 3: -0.6
  - Lambda 4: -0.4
  - Lambda 5: -0.2
  - Lambda 6: 0
  - Lambda 7: 0.2
  - Lambda 8: 0.4

Lambda 9: 0.6
Lambda 10: 0.8
Lambda 11: 1
PWP Conditions Source: Parent Analysis
Slip Surface
Direction of movement: Right to Left
Use Passive Mode: No
Slip Surface Option: Block
Critical slip surfaces saved: 3
Restrict Block Crossing: No
Optimize Critical Slip Surface Location: Yes
Tension Crack
Tension Crack Option: (none)
F of S Distribution
F of S Calculation Option: Constant
Advanced
Number of Slices: 30
F of S Tolerance: 0.001
Minimum Slip Surface Depth: 10 ft
Optimization Maximum Iterations: 2,000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

Waste Material

Model: Mohr-Coulomb
Unit Weight: 111 pcf
Cohesion': 0 psf
Phi': 30 °
Phi-B: 0 °

Bottom Liner

Model: Shear/Normal Fn.
Unit Weight: 120 pcf
Strength Function: Baseliner
Phi-B: 0 °

CCL

Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 1,000 psf
Phi': 10 °
Phi-B: 0 °

Upper Till

Model: Mohr-Coulomb

Unit Weight: 125 pcf
Cohesion': 150 psf
Phi': 31 °
Phi-B: 0 °

Structural Fill

Model: Mohr-Coulomb
Unit Weight: 135 pcf
Cohesion': 1,000 psf
Phi': 45 °
Phi-B: 0 °

Slip Surface Limits

Left Coordinate: (225, 321.5) ft
Right Coordinate: (594.2496, 377) ft

Slip Surface Block

Left Grid
- Upper Left: (246, 316) ft
- Lower Left: (245, 310) ft
- Lower Right: (285, 310) ft
- X Increments: 3
- Y Increments: 3
- Starting Angle: 135 °
- Ending Angle: 180 °
- Angle Increments: 2

Right Grid
- Upper Left: (349, 318) ft
- Lower Left: (349, 309) ft
- Lower Right: (426, 310) ft
- X Increments: 5
- Y Increments: 3
- Starting Angle: 45 °
- Ending Angle: 65 °
- Angle Increments: 2

Shear/Normal Strength Functions

Baseliner

Model: Shear/Normal Spline Data Point Function
Function: Shear Stress vs. Normal Stress
- Curve Fit to Data: 100 %
- Segment Curvature: 100 %

Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
- Data Point: (0, 0)
- Data Point: (500, 235)
- Data Point: (1,000, 463)

Data Point: (2,000, 899)
Data Point: (5,000, 2,057)
Data Point: (10,000, 3,515)
Data Point: (15,000, 4,430)

Estimation Properties

Intact Rock Param.: 10
Geological Strength: 100
Disturbance Factor: 0
SigmaC: 600,000 psf
SigmaC: 300,000 psf
Num. Points: 20

Points

	X (ft)	Y (ft)
Point 1	0	268.91519
Point 2	207.4978	271.24238
Point 3	209.0232	271.26867
Point 4	215.074	271.32735
Point 5	225.5606	271.44496
Point 6	230.6621	271.56993
Point 7	234.0537	271.62591
Point 8	237.8751	271.70733
Point 9	243.6233	271.78388
Point 10	403.7734	274.99581
Point 11	406.1879	275.04891
Point 12	510.242	277.40528
Point 13	519.1809	277.52295
Point 14	522.2501	277.56833
Point 15	581.5843	278.21948
Point 16	706.5316	275.03632
Point 17	784.4915	272.77004
Point 18	796.8946	272.40949
Point 19	796.8946	278.66207
Point 20	771.752	277.8332
Point 21	583.2389	281.6042
Point 22	512.9202	278.57945
Point 23	404.2686	277.81745
Point 24	248.1947	278.63737
Point 25	83.6675	274.48464
Point 26	78.5956	274.41664
Point 27	69.7373	274.12229

Point 28	0	273.8562
Point 29	0	286.98783
Point 30	69.7373	288.07912
Point 31	78.6615	288.22649
Point 32	83.6675	288.57952
Point 33	248.1947	297.19282
Point 34	404.2686	294.81745
Point 35	512.9202	289.28565
Point 36	583.2389	288.00106
Point 37	796.8946	289.48765
Point 38	0	305.26334
Point 39	63.5351	305.72185
Point 40	69.7373	305.70863
Point 41	77.6371	305.65972
Point 42	78.5956	305.57155
Point 43	83.6675	305.7
Point 44	248.1947	307.61838
Point 45	299.7903	306.27673
Point 46	299.6238	303.28004
Point 47	404.2544	300.5593
Point 48	512.9971	302.35411
Point 49	583.3451	304.79977
Point 50	592.8421	305.14193
Point 51	650.1895	305.15472
Point 52	796.8602	303.47517
Point 53	796.8946	303.47517
Point 54	404.2686	303.55995
Point 55	512.9202	305.35325
Point 56	583.2389	307.79789
Point 57	592.7878	308.14191
Point 58	650.2064	308.15472
Point 59	796.8946	306.47498
Point 60	0	327.67711
Point 61	22.4921	326.28273
Point 62	49.2488	323.27595
Point 63	74.3201	319.27807
Point 64	77.7249	318.65421
Point 65	112.0147	318.69361
Point 66	124.2402	315.77486

Point 67	126.7076	315.31519
Point 68	136.2125	313.12968
Point 69	142.0351	312.45981
Point 70	357.6126	310.47901
Point 71	586.0206	317.13
Point 72	588.0287	317.67977
Point 73	603.6052	322
Point 74	693.0775	322
Point 75	695.4173	323.10644
Point 76	697.3194	324
Point 77	714.7524	332
Point 78	726.8078	332.79458
Point 79	736.4313	333.45251
Point 80	740.2913	333.71166
Point 81	742.8239	333.89241
Point 82	743.6092	331.27888
Point 83	746.0108	331.28559
Point 84	751.3746	333.5338
Point 85	751.5561	333.52887
Point 86	751.6873	333.53898
Point 87	751.9654	333.539
Point 88	755.4965	333.65881
Point 89	757.088	333.70415
Point 90	766.5218	333.52383
Point 91	769.5239	331.03222
Point 92	781.3859	336.00827
Point 93	796.8946	335.53695
Point 94	0	330.67136
Point 95	0.1856	330.67136
Point 96	22.7526	329.27234
Point 97	49.6527	326.24944
Point 98	74.8268	322.23518
Point 99	77.9958	321.65452
Point 100	112.3661	321.69402
Point 101	124.8636	318.71033
Point 102	127.3188	318.25295
Point 103	136.7217	316.09089
Point 104	142.2209	315.45823
Point 105	357.5827	313.47942

Point 106	585.5746	320.11828
Point 107	587.2318	320.57198
Point 108	684.7881	347.62982
Point 109	704.816	348.13028
Point 110	707.7847	347.0118
Point 111	709.4494	346.32322
Point 112	709.6367	345.87345
Point 113	708.0438	345.21
Point 114	685.2332	344.64
Point 115	131.5335	329.79618
Point 116	158.1735	318.33502
Point 117	165.2063	318.28065
Point 118	203.3044	317.9221
Point 119	243.6199	317.55888
Point 120	248.3589	317.51329
Point 121	357.6595	316.4965
Point 122	589.0312	323.16552
Point 123	591.6482	323.89085
Point 124	610.0073	329
Point 125	631.5677	335
Point 126	653.128	341
Point 127	674.6884	347
Point 128	684.1005	349.61929
Point 129	699.8223	350.01168
Point 130	0	332.91188
Point 131	22.4396	331.51733
Point 132	49.1519	328.50799
Point 133	68.0785	325.48185
Point 134	73.6566	324.58998
Point 135	90.5756	324.62675
Point 136	109.5111	324.68581
Point 137	124.0229	330.52741
Point 138	127.0249	330.53586
Point 139	129.8149	330.45078
Point 140	130.027	330.44431
Point 141	274.9823	329
Point 142	252.0124	321.5
Point 143	213.855	321.5
Point 144	177.1587	331.5

Point 145	171.0426	331.5
Point 146	152.2075	323.79526
Point 147	298.6003	335
Point 148	282.6389	331.5
Point 149	287.7433	331.5
Point 150	289.3308	331.95874
Point 151	290.9318	332.5
Point 152	317.0046	341
Point 153	355.3453	347
Point 154	666.3598	347
Point 155	669.6785	345.61929
Point 156	674.6567	347
Point 157	326.7765	344.18573
Point 158	336.1465	343.24706
Point 159	342.0216	342.65356
Point 160	373.7378	353
Point 161	651.9377	353
Point 162	392.1303	359
Point 163	637.5157	359
Point 164	410.5229	365
Point 165	623.0936	365
Point 166	608.6716	371
Point 167	428.9409	371
Point 168	415.8066	366.72364
Point 169	447.0228	377
Point 170	594.2496	377
Point 171	435.4903	373.13237
Point 172	450.0526	378.01608
Point 173	459.9195	378.51574
Point 174	479.4258	379.45192
Point 175	482.5508	379.55699
Point 176	491.9324	380
Point 177	507.2813	380.61621
Point 178	541.8899	382.28139
Point 179	574.2808	382.67429
Point 180	581.1072	381.37657
Point 181	581.6822	381.26488
Point 182	582.2411	381.14975
Point 183	582.7845	381.03125

Point 184	583.313	380.90951
Point 185	583.8273	380.78465
Point 186	584.3278	380.6568
Point 187	584.8152	380.52606
Point 188	585.29	380.39256
Point 189	592.2253	377.82435
Point 190	593.0101	377.51567
Point 191	78.5551	329.67009
Point 192	110.5776	331.89761
Point 193	113.2091	332.06836
Point 194	115.8406	332.21663
Point 195	118.4721	332.34247
Point 196	121.1036	332.44595
Point 197	123.7351	332.5271
Point 198	125.1298	332.55831
Point 199	126.3665	332.19565
Point 200	128.6722	331.5
Point 201	128.9196	331.46994
Point 202	710.0851	346.06023
Point 203	718.4637	349.55
Point 204	736.491	350
Point 205	738.1976	349.29
Point 206	796.8946	253.91519
Point 207	0	253.91519

Regions

	Points	Area (ft^2)	Material
Region 1	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28	3,346.1	
Region 2	29,30,31,32,33,34,35,36,37,19,20,21,22,23,24,25,26,27,28	10,671	
Region 3	38,39,40,41,42,43,44,45,46,47,48,49,50,51,52,53,37,36,35,34,33,32,31,30,29	10,397	
Region 4	45,54,55,56,57,58,59,53,52,51,50,49,48,47,46	1,491.9	
Region 5	60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78,79, 80,81,82,83,84,85,86,87,88,89,90,91,92,93,59,58,57,56,55,54,45, 44,43,42,41,40,39,38	9,253.4	Upper Till
Region 6	94,95,96,97,98,99,100,101,102,103,104,105,106,107,108,109,110,111,112, 113,114,73,72,71,70,69,68,67,66,65,64,63,62,61,60	2,139	CCL
Region 7	115,116,117,118,119,120,121,122,123,124,125,126,127,128,129,109,108, 107,106,105,104,103,102,101,100,99,98,97,96,95,94,130,131,132,133,	2,215.1	Bottom Liner

	134,135,136,137,138,139,140		
Region 8	115,116,117,118,119,120,121,122,123,124,141,142,143,144,145,146	4,104.1	Waste Material
Region 9	147,125,124,141,148,149,150,151	2,001.4	Waste Material
Region 10	147,125,126,152	2,007.3	Waste Material
Region 11	153,154,155,156,127,126,152,157,158,159	1,949.1	Waste Material
Region 12	160,161,154,153	1,767.6	Waste Material
Region 13	162,163,161,160	1,570.8	Waste Material
Region 14	164,165,163,162	1,373.9	Waste Material
Region 15	164,165,166,167,168	1,176.9	Waste Material
Region 16	169,170,166,167,171	980.5	Waste Material
Region 17	169,172,173,174,175,176,177,178,179,180,181,182,183,184,185,186,187, 188,189,190,170	534.96	Waste Material
Region 18	133,191,192,193,194,195,196,197,198,199,200,201,139,138,137,136,135,134	293.23	Structural Fill
Region 19	73,114,113,112,202,203,204,205,81,80,79,78,77,76,75,74	1,934.1	Structural Fill
Region 20	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,206,207	15,814	

Current Slip Surface

Slip Surface: 3,457
F of S: 2.073
Volume: 7,126.3985 ft³
Weight: 797,827.27 lbs
Resisting Moment: 76,702,073 lbs-ft
Activating Moment: 36,998,485 lbs-ft
Resisting Force: 323,900.59 lbs
Activating Force: 156,265.86 lbs
F of S Rank: 1
Exit: (236.47709, 321.5) ft
Entry: (479.68238, 379.46055) ft
Radius: 116.48889 ft
Center: (169, 482) ft

Slip Slices

	X (ft)	Y (ft)	PWP (psf)	Base Normal	Frictional	Cohesive

				Stress (psf)	Strength (psf)	Strength (psf)
Slice 1	240.36091	320.90559	0	69.767855	40.28049	0
Slice 2	248.12857	319.71676	0	212.7459	122.8289	0
Slice 3	257.72748	318.24766	0	622.55851	359.43432	0
Slice 4	269.21243	316.4899	0	1,306.8687	576.30563	23.219139
Slice 5	278.64033	315.04698	0	1,898.757	808.33941	47.692719
Slice 6	282.46862	314.45851	0	2,156.2572	903.53661	61.256275
Slice 7	283.46315	314.29139	0	2,189.8063	915.69767	63.138778
Slice 8	286.01535	313.86252	540.0592	2,309.0261	311.9166	1,000
Slice 9	288.53705	313.43877	556.77645	2,402.9128	325.52364	1,000
Slice 10	290.1313	313.17088	567.42114	2,504.0289	341.4762	1,000
Slice 11	294.76605	312.39205	598.58291	2,806.2057	389.26347	1,000
Slice 12	300.03371	311.50688	634.61322	3,148.388	443.24632	1,000
Slice 13	306.78931	311.08224	643.92374	3,288.2795	466.27127	1,000
Slice 14	314.55806	310.8807	646.54046	3,572.5732	515.93852	1,000
Slice 15	320.86698	310.83487	647.81956	3,815.9238	558.62224	1,000
Slice 16	325.75293	310.79805	652.26844	4,004.6486	591.11508	1,000
Slice 17	331.4615	310.74915	661.35072	3,992.2817	587.33301	1,000
Slice 18	339.08405	310.68385	679.59247	3,903.8394	568.52172	1,000
Slice 19	347.70078	310.61004	709.25754	4,070.5707	592.69021	1,000
Slice 20	354.36263	310.57719	737.68375	4,253.3133	619.90034	1,000
Slice 21	356.5024	310.6116	745.80028	4,320.2797	630.27715	1,000
Slice 22	362.43743	310.70705	769.58051	4,504.9488	658.64622	1,000
Slice 23	370.47659	310.87588	805.56626	4,720.4826	690.30537	1,000
Slice 24	378.31269	311.09693	845.65813	4,942.0927	722.31195	1,000
Slice 25	385.91246	311.34264	890.78006	5,126.5101	746.87349	1,000
Slice 26	390.53382	311.60839	915.85394	5,120.8674	741.45734	1,000
Slice 27	394.91253	312.01729	934.6651	5,207.3227	753.38481	1,000
Slice 28	400.90179	312.84134	951.73307	5,131.6411	737.03057	1,000
Slice 29	407.31586	313.96981	964.35195	5,204.3054	747.61819	1,000
Slice 30	411.93068	314.78173	977.20881	5,257.7532	754.77547	1,000
Slice 31	413.42263	315.06864	980.97816	4,773.8767	668.79035	1,000
Slice 32	414.6567	315.64374	0	4,721.13	1,685.9993	272.27859
Slice 33	418.18113	317.28619	0	4,669.4183	1,672.9558	266.82481
Slice 34	424.74828	321.7146	0	3,883.8321	2,242.3315	0
Slice 35	431.44218	327.01822	0	3,661.1907	2,113.7894	0
Slice 36	434.71688	329.61278	0	3,552.8759	2,051.2538	0
Slice 37	436.29055	330.8596	0	3,501.5776	2,021.6368	0
Slice 38	438.86105	333.24682	0	3,188.1619	1,840.6861	0

Slice 39	443.66054	338	0	2,975.9541	1,718.1679	0
Slice 40	446.85628	341.16491	0	2,833.6089	1,635.9848	0
Slice 41	448.5377	342.8301	0	2,758.0796	1,592.378	0
Slice 42	451.40041	345.66519	0	2,596.9219	1,499.3335	0
Slice 43	453.73851	347.98073	0	2,434.7778	1,405.7196	0
Slice 44	456.49044	350.98073	0	2,130.6596	1,230.1369	0
Slice 45	459.08579	353.95563	0	1,924.43	1,111.0702	0
Slice 46	461.70305	356.95563	0	1,712.5876	988.76288	0
Slice 47	466.10386	362	0	1,348.522	778.56952	0
Slice 48	471.33837	368	0	902.53406	521.07828	0
Slice 49	474.71261	371.86768	0	607.46318	350.71903	0
Slice 50	476.80532	374.86768	0	337.57405	194.89847	0
Slice 51	478.78342	378.02547	0	106.68769	61.596167	0
Slice 52	479.55409	379.25575	0	15.390492	8.8857049	0

Figure 45 Baseliner Stability for Section OP-2, Partially Drained Conditions, Waste Lift 10 with GSS Varied K

Slope Stability Waste Lift 10 @Baseliner

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File Information

Title: Model City - RMU-2 CP-20 Section OP-2
Comments: Operation Conditions for CP-20 Section 2 Based on Maximum Fill Rate of 50,000 Cu Yds per Quarter
Created By: Peter J. Carey
Revision Number: 496
File Version: 8.0
Tool Version: 8.0.10.6504
Date: 2/23/2013
Time: 9:11:13 PM
File Name: C20OP-2r1_gssk.gsz
Directory: N:\Model_City\154.002_rmu2\154.005_revsions\geoslope\operational\
Last Solved Date: 2/23/2013
Last Solved Time: 9:11:58 PM

Project Settings

Length(L) Units: feet
Time(t) Units: Days
Force(F) Units: lbf
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D

Analysis Settings

Slope Stability Waste Lift 10 @Baseliner

Description: Lift 10 Entry Exit Search Limited to baseliner
Kind: SLOPE/W
Parent: Waste Lift10 El. 383
Method: Morgenstern-Price
Settings
- Side Function
  - Interslice force function option: Half-Sine
- Lambda
  - Lambda 1: -1
  - Lambda 2: -0.8
  - Lambda 3: -0.6
  - Lambda 4: -0.4
  - Lambda 5: -0.2
  - Lambda 6: 0
  - Lambda 7: 0.2
  - Lambda 8: 0.4

Lambda 9: 0.6
Lambda 10: 0.8
Lambda 11: 1
PWP Conditions Source: Parent Analysis
Slip Surface
Direction of movement: Right to Left
Use Passive Mode: No
Slip Surface Option: Block
Critical slip surfaces saved: 3
Restrict Block Crossing: No
Optimize Critical Slip Surface Location: Yes
Tension Crack
Tension Crack Option: (none)
F of S Distribution
F of S Calculation Option: Constant
Advanced
Number of Slices: 30
F of S Tolerance: 0.001
Minimum Slip Surface Depth: 10 ft
Optimization Maximum Iterations: 2,000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

Waste Material

Model: Mohr-Coulomb
Unit Weight: 111 pcf
Cohesion': 0 psf
Phi': 30 °
Phi-B: 0 °

Bottom Liner

Model: Shear/Normal Fn.
Unit Weight: 120 pcf
Strength Function: Baseliner
Phi-B: 0 °

CCL

Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 1,000 psf
Phi': 10 °
Phi-B: 0 °

Upper Till

Model: Mohr-Coulomb

Unit Weight: 125 pcf
Cohesion': 150 psf
Phi': 31 °
Phi-B: 0 °

Structural Fill

Model: Mohr-Coulomb
Unit Weight: 135 pcf
Cohesion': 1,000 psf
Phi': 45 °
Phi-B: 0 °

Slip Surface Limits

Left Coordinate: (225, 321.5) ft
Right Coordinate: (594.2496, 377) ft

Slip Surface Block

Left Grid
- Upper Left: (246, 316) ft
- Lower Left: (245, 310) ft
- Lower Right: (285, 310) ft
- X Increments: 3
- Y Increments: 3
- Starting Angle: 135 °
- Ending Angle: 180 °
- Angle Increments: 2

Right Grid
- Upper Left: (349, 318) ft
- Lower Left: (349, 309) ft
- Lower Right: (426, 310) ft
- X Increments: 5
- Y Increments: 3
- Starting Angle: 45 °
- Ending Angle: 65 °
- Angle Increments: 2

Shear/Normal Strength Functions

Baseliner

Model: Shear/Normal Spline Data Point Function
Function: Shear Stress vs. Normal Stress
- Curve Fit to Data: 100 %
- Segment Curvature: 100 %

Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
- Data Point: (0, 0)
- Data Point: (500, 235)
- Data Point: (1,000, 463)

Data Point: (2,000, 899)
Data Point: (5,000, 2,057)
Data Point: (10,000, 3,515)
Data Point: (15,000, 4,430)

Estimation Properties

Intact Rock Param.: 10
Geological Strength: 100
Disturbance Factor: 0
SigmaC: 600,000 psf
SigmaC: 300,000 psf
Num. Points: 20

Points

	X (ft)	Y (ft)
Point 1	0	268.91519
Point 2	207.4978	271.24238
Point 3	209.0232	271.26867
Point 4	215.074	271.32735
Point 5	225.5606	271.44496
Point 6	230.6621	271.56993
Point 7	234.0537	271.62591
Point 8	237.8751	271.70733
Point 9	243.6233	271.78388
Point 10	403.7734	274.99581
Point 11	406.1879	275.04891
Point 12	510.242	277.40528
Point 13	519.1809	277.52295
Point 14	522.2501	277.56833
Point 15	581.5843	278.21948
Point 16	706.5316	275.03632
Point 17	784.4915	272.77004
Point 18	796.8946	272.40949
Point 19	796.8946	278.66207
Point 20	771.752	277.8332
Point 21	583.2389	281.6042
Point 22	512.9202	278.57945
Point 23	404.2686	277.81745
Point 24	248.1947	278.63737
Point 25	83.6675	274.48464
Point 26	78.5956	274.41664
Point 27	69.7373	274.12229

Point 28	0	273.8562
Point 29	0	286.98783
Point 30	69.7373	288.07912
Point 31	78.6615	288.22649
Point 32	83.6675	288.57952
Point 33	248.1947	297.19282
Point 34	404.2686	294.81745
Point 35	512.9202	289.28565
Point 36	583.2389	288.00106
Point 37	796.8946	289.48765
Point 38	0	305.26334
Point 39	63.5351	305.72185
Point 40	69.7373	305.70863
Point 41	77.6371	305.65972
Point 42	78.5956	305.57155
Point 43	83.6675	305.7
Point 44	248.1947	307.61838
Point 45	299.7903	306.27673
Point 46	299.6238	303.28004
Point 47	404.2544	300.5593
Point 48	512.9971	302.35411
Point 49	583.3451	304.79977
Point 50	592.8421	305.14193
Point 51	650.1895	305.15472
Point 52	796.8602	303.47517
Point 53	796.8946	303.47517
Point 54	404.2686	303.55995
Point 55	512.9202	305.35325
Point 56	583.2389	307.79789
Point 57	592.7878	308.14191
Point 58	650.2064	308.15472
Point 59	796.8946	306.47498
Point 60	0	327.67711
Point 61	22.4921	326.28273
Point 62	49.2488	323.27595
Point 63	74.3201	319.27807
Point 64	77.7249	318.65421
Point 65	112.0147	318.69361
Point 66	124.2402	315.77486

Point 67	126.7076	315.31519
Point 68	136.2125	313.12968
Point 69	142.0351	312.45981
Point 70	357.6126	310.47901
Point 71	586.0206	317.13
Point 72	588.0287	317.67977
Point 73	603.6052	322
Point 74	693.0775	322
Point 75	695.4173	323.10644
Point 76	697.3194	324
Point 77	714.7524	332
Point 78	726.8078	332.79458
Point 79	736.4313	333.45251
Point 80	740.2913	333.71166
Point 81	742.8239	333.89241
Point 82	743.6092	331.27888
Point 83	746.0108	331.28559
Point 84	751.3746	333.5338
Point 85	751.5561	333.52887
Point 86	751.6873	333.53898
Point 87	751.9654	333.539
Point 88	755.4965	333.65881
Point 89	757.088	333.70415
Point 90	766.5218	333.52383
Point 91	769.5239	331.03222
Point 92	781.3859	336.00827
Point 93	796.8946	335.53695
Point 94	0	330.67136
Point 95	0.1856	330.67136
Point 96	22.7526	329.27234
Point 97	49.6527	326.24944
Point 98	74.8268	322.23518
Point 99	77.9958	321.65452
Point 100	112.3661	321.69402
Point 101	124.8636	318.71033
Point 102	127.3188	318.25295
Point 103	136.7217	316.09089
Point 104	142.2209	315.45823
Point 105	357.5827	313.47942

Point 106	585.5746	320.11828
Point 107	587.2318	320.57198
Point 108	684.7881	347.62982
Point 109	704.816	348.13028
Point 110	707.7847	347.0118
Point 111	709.4494	346.32322
Point 112	709.6367	345.87345
Point 113	708.0438	345.21
Point 114	685.2332	344.64
Point 115	131.5335	329.79618
Point 116	158.1735	318.33502
Point 117	165.2063	318.28065
Point 118	203.3044	317.9221
Point 119	243.6199	317.55888
Point 120	248.3589	317.51329
Point 121	357.6595	316.4965
Point 122	589.0312	323.16552
Point 123	591.6482	323.89085
Point 124	610.0073	329
Point 125	631.5677	335
Point 126	653.128	341
Point 127	674.6884	347
Point 128	684.1005	349.61929
Point 129	699.8223	350.01168
Point 130	0	332.91188
Point 131	22.4396	331.51733
Point 132	49.1519	328.50799
Point 133	68.0785	325.48185
Point 134	73.6566	324.58998
Point 135	90.5756	324.62675
Point 136	109.5111	324.68581
Point 137	124.0229	330.52741
Point 138	127.0249	330.53586
Point 139	129.8149	330.45078
Point 140	130.027	330.44431
Point 141	274.9823	329
Point 142	252.0124	321.5
Point 143	213.855	321.5
Point 144	177.1587	331.5

Point 145	171.0426	331.5
Point 146	152.2075	323.79526
Point 147	298.6003	335
Point 148	282.6389	331.5
Point 149	287.7433	331.5
Point 150	289.3308	331.95874
Point 151	290.9318	332.5
Point 152	317.0046	341
Point 153	355.3453	347
Point 154	666.3598	347
Point 155	669.6785	345.61929
Point 156	674.6567	347
Point 157	326.7765	344.18573
Point 158	336.1465	343.24706
Point 159	342.0216	342.65356
Point 160	373.7378	353
Point 161	651.9377	353
Point 162	392.1303	359
Point 163	637.5157	359
Point 164	410.5229	365
Point 165	623.0936	365
Point 166	608.6716	371
Point 167	428.9409	371
Point 168	415.8066	366.72364
Point 169	447.0228	377
Point 170	594.2496	377
Point 171	435.4903	373.13237
Point 172	450.0526	378.01608
Point 173	459.9195	378.51574
Point 174	479.4258	379.45192
Point 175	482.5508	379.55699
Point 176	491.9324	380
Point 177	507.2813	380.61621
Point 178	541.8899	382.28139
Point 179	574.2808	382.67429
Point 180	581.1072	381.37657
Point 181	581.6822	381.26488
Point 182	582.2411	381.14975
Point 183	582.7845	381.03125

Point 184	583.313	380.90951
Point 185	583.8273	380.78465
Point 186	584.3278	380.6568
Point 187	584.8152	380.52606
Point 188	585.29	380.39256
Point 189	592.2253	377.82435
Point 190	593.0101	377.51567
Point 191	78.5551	329.67009
Point 192	110.5776	331.89761
Point 193	113.2091	332.06836
Point 194	115.8406	332.21663
Point 195	118.4721	332.34247
Point 196	121.1036	332.44595
Point 197	123.7351	332.5271
Point 198	125.1298	332.55831
Point 199	126.3665	332.19565
Point 200	128.6722	331.5
Point 201	128.9196	331.46994
Point 202	710.0851	346.06023
Point 203	718.4637	349.55
Point 204	736.491	350
Point 205	738.1976	349.29
Point 206	796.8946	253.91519
Point 207	0	253.91519

Regions

	Points	Area (ft^2)	Material
Region 1	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28	3,346.1	
Region 2	29,30,31,32,33,34,35,36,37,19,20,21,22,23,24,25,26,27,28	10,671	
Region 3	38,39,40,41,42,43,44,45,46,47,48,49,50,51,52,53,37,36,35,34,33,32,31,30,29	10,397	
Region 4	45,54,55,56,57,58,59,53,52,51,50,49,48,47,46	1,491.9	
Region 5	60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78,79,80,81,82,83,84, 85,86,87,88,89,90,91,92,93,59,58,57,56,55,54,45,44,43,42,41,40,39,38	9,253.4	Upper Till
Region	94,95,96,97,98,99,100,101,102,103,104,105,106,107,108,109,110,111,112,113,	2,139	CCL

6	114,73,72,71,70,69,68,67,66,65,64,63,62,61,60		
Region 7	115,116,117,118,119,120,121,122,123,124,125,126,127,128,129,109,108,107, 106,105,104,103,102,101,100,99,98,97,96,95,94,130,131,132,133,134,135, 136,137,138,139,140	2,215.1	Bottom Liner
Region 8	115,116,117,118,119,120,121,122,123,124,141,142,143,144,145,146	4,104.1	Waste Material
Region 9	147,125,124,141,148,149,150,151	2,001.4	Waste Material
Region 10	147,125,126,152	2,007.3	Waste Material
Region 11	153,154,155,156,127,126,152,157,158,159	1,949.1	Waste Material
Region 12	160,161,154,153	1,767.6	Waste Material
Region 13	162,163,161,160	1,570.8	Waste Material
Region 14	164,165,163,162	1,373.9	Waste Material
Region 15	164,165,166,167,168	1,176.9	Waste Material
Region 16	169,170,166,167,171	980.5	Waste Material
Region 17	169,172,173,174,175,176,177,178,179,180,181,182,183,184,185,186,187, 188,189,190,170	534.96	Waste Material
Region 18	133,191,192,193,194,195,196,197,198,199,200,201,139,138,137,136,135,134	293.23	Structural Fill
Region 19	73,114,113,112,202,203,204,205,81,80,79,78,77,76,75,74	1,934.1	Structural Fill
Region 20	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,206,207	15,814	

Current Slip Surface

Slip Surface: 3,457
F of S: 1.914
Volume: 7,053.2426 ft³
Weight: 793,680.21 lbs
Resisting Moment: 71,773,804 lbs-ft
Activating Moment: 37,499,304 lbs-ft
Resisting Force: 300,313.71 lbs
Activating Force: 157,060.8 lbs
F of S Rank: 1
Exit: (234.0847, 321.5) ft
Entry: (473.64487, 379.17447) ft

Radius: 115.23633 ft
Center: (169, 482) ft

Slip Slices

	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
Slice 1	236.87491	319.54726	0	282.32975	163.00316	0
Slice 2	241.64252	316.21063	0	760.98092	346.59023	8.3664513
Slice 3	243.83723	314.67465	0	1,006.0683	451.36848	14.354491
Slice 4	246.20673	313.01634	1,260.7412	1,463.9645	35.833747	1,000
Slice 5	250.18565	310.23168	1,465.8106	1,504.5545	23.279654	150
Slice 6	253.07652	308.20849	1,601.5471	1,904.3564	181.94621	150
Slice 7	255.53173	307.42759	1,645.9069	1,889.5144	146.37417	150
Slice 8	262.62991	307.24302	1,654.6243	2,191.7074	322.71209	150
Slice 9	270.94263	307.02686	1,611.4755	2,555.4225	567.18056	150
Slice 10	274.26528	307.03143	1,587.4901	2,587.6118	600.93375	150
Slice 11	278.8106	307.48988	1,526.995	2,697.0729	703.05376	150
Slice 12	285.1911	308.13344	1,439.6448	2,759.3094	792.93451	150
Slice 13	288.53705	308.47092	1,394.3428	2,744.6043	811.31894	150
Slice 14	290.1313	308.63172	1,372.8023	2,781.3965	846.36877	150
Slice 15	292.9556	308.91659	1,334.5724	2,851.8692	911.68388	150
Slice 16	296.78985	309.34935	1,279.6517	2,909.2968	979.18957	150
Slice 17	303.79104	310.2335	1,176.6447	3,055.1824	1,128.7393	150
Slice 18	309.32439	310.90429	1,105.0982	3,303.1432	1,320.7187	150
Slice 19	310.28061	310.94689	1,098.3706	3,325.6031	392.72118	1,000
Slice 20	313.94941	310.9378	1,084.1571	3,558.2238	436.24471	1,000
Slice 21	321.89055	310.8431	1,066.9234	3,873.5068	494.87638	1,000
Slice 22	330.24933	310.74342	1,062.3882	4,028.6976	523.04039	1,000
Slice 23	334.93433	310.69071	1,065.1089	3,972.6146	512.67171	1,000
Slice 24	339.08405	310.65201	1,069.8792	3,923.2156	503.1202	1,000
Slice 25	345.35253	310.59356	1,082.3833	4,006.9588	515.68156	1,000
Slice 26	352.01437	310.53144	1,102.9587	4,242.8681	553.65075	1,000
Slice 27	355.82141	310.49594	1,117.9587	4,375.2132	574.34186	1,000
Slice 28	356.94011	310.5069	1,121.6016	4,339.5744	567.41544	1,000
Slice 29	362.05048	310.6294	1,135.4982	4,492.0092	591.84344	1,000
Slice 30	370.12803	310.94278	1,158.4833	4,641.2892	614.11264	1,000
Slice 31	376.77629	311.32271	1,178.1101	4,804.3107	639.397	1,000
Slice 32	382.85327	311.66999	1,200.4543	4,950.5217	661.23806	1,000
Slice 33	389.01103	312.39884	1,208.7848	4,799.2537	633.09653	1,000
Slice 34	397.23682	313.86299	1,204.0805	4,888.0434	649.58206	1,000

Slice 35	405.82681	316.26002	0	4,424.3031	1,609.7109	241.57094
Slice 36	409.47702	317.87149	0	3,903.7991	1,467.4166	191.36517
Slice 37	410.08333	318.32018	0	3,760.6219	2,171.196	0
Slice 38	413.16475	320.60052	0	3,666.1822	2,116.6713	0
Slice 39	420.16076	325.77779	0	3,453.9061	1,994.1136	0
Slice 40	425.05063	329.39644	0	3,306.7432	1,909.1491	0
Slice 41	427.26362	331.18396	0	3,127.9448	1,805.9198	0
Slice 42	430.40283	333.78752	0	3,017.0153	1,741.8746	0
Slice 43	433.67753	336.50346	0	2,901.1067	1,674.9547	0
Slice 44	437.29474	339.50346	0	2,774.1496	1,601.656	0
Slice 45	441.54298	343.02682	0	2,625.9585	1,516.0978	0
Slice 46	444.89962	346.02682	0	2,319.4657	1,339.1441	0
Slice 47	446.41763	347.64517	0	2,244.4024	1,295.8063	0
Slice 48	448.5377	349.90539	0	2,138.6495	1,234.7499	0
Slice 49	450.74651	352.26022	0	2,011.6913	1,161.4505	0
Slice 50	454.2544	356	0	1,751.0991	1,010.9976	0
Slice 51	457.69846	359.67172	0	1,491.3245	861.01658	0
Slice 52	459.12401	361.32148	0	1,315.6653	759.59973	0
Slice 53	461.01773	363.64975	0	1,151.9774	665.09445	0
Slice 54	464.55604	368	0	839.42366	484.64147	0
Slice 55	469.43618	374	0	395.4805	228.33077	0
Slice 56	472.76056	378.08724	0	84.207625	48.617295	0

Figure 46 Baseliner Stability for Section OP-2, Partially Drained Conditions, Waste Lift 10

Yield Acceleration - C-20

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File Information

Title: Model City - RMU-2 CP-20 Section OP-1
Comments: Operation Conditions for CP-20 Section 1 Based on Maximum Fill Rate of 50,000 Cu Yds per Quarter
Created By: Peter J. Carey
Last Edited By: Peter J. Carey
Revision Number: 509
File Version: 8.0
Tool Version: 8.0.10.6504
Date: 2/24/2013
Time: 12:44:51 PM
File Name: C20OP-1r1.gsz
Directory: N:\Model_City\154.002_rmu2\154.005_revsions\geoslope\operational\
Last Solved Date: 2/24/2013
Last Solved Time: 1:47:14 PM

Project Settings

Length(L) Units: feet
Time(t) Units: Days
Force(F) Units: lbf
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D

Analysis Settings

Yield Acceleration - C-20

Description: Undrained Strength based on Minimum Static Failure Surface
Kind: SLOPE/W
Parent: WASTE LIFT 10 EL. 383 - consol
Method: Morgenstern-Price
Settings
- Side Function
  - Interslice force function option: Half-Sine
- Lambda
  - Lambda 1: -1
  - Lambda 2: -0.8
  - Lambda 3: -0.6
  - Lambda 4: -0.4
  - Lambda 5: -0.2
  - Lambda 6: 0
  - Lambda 7: 0.2

Lambda 8: 0.4
Lambda 9: 0.6
Lambda 10: 0.8
Lambda 11: 1
PWP Conditions Source: Parent Analysis
Slip Surface
Direction of movement: Right to Left
Use Passive Mode: No
Slip Surface Option: Fully-Specified
Critical slip surfaces saved: 1
Optimize Critical Slip Surface Location: No
Tension Crack
Tension Crack Option: (none)
F of S Distribution
F of S Calculation Option: Constant
Advanced
Number of Slices: 30
F of S Tolerance: 0.0005
Minimum Slip Surface Depth: 15 ft
Optimization Maximum Iterations: 2,000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

Waste Material

Model: Mohr-Coulomb
Unit Weight: 111 pcf
Cohesion': 0 psf
Phi': 30 °
Phi-B: 0 °

Bottom Liner

Model: Shear/Normal Fn.
Unit Weight: 120 pcf
Strength Function: Baseliner
Phi-B: 0 °

CCL

Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 1,000 psf
Phi': 10 °
Phi-B: 0 °

Upper Till

Model: Mohr-Coulomb

Unit Weight: 125 pcf
Cohesion': 150 psf
Phi': 31 °
Phi-B: 0 °

Deflection surface

Model: Bedrock (Impenetrable)

Structural Fill

Model: Mohr-Coulomb
Unit Weight: 135 pcf
Cohesion': 1,000 psf
Phi': 45 °
Phi-B: 0 °

NOT ACTIVE

Model: (None)

GC UNDRAINED

Model: Shear/Normal Fn.
Unit Weight: 120 pcf
Strength Function: SHANSEP CONSOLIDATED UNDRAINED STATIC
Phi-B: 0 °
Anisotropic Strength Fn: clay ellipse staticshear

GC-Overconsolidated-UNDRAINED

Model: Shear/Normal Fn.
Unit Weight: 125 pcf
Strength Function: SHANSEP Over CONSOLIDATED UNDRAINED STATIC
Phi-B: 0 °
Anisotropic Strength Fn: clay ellipse staticshear

Slip Surface Limits

Left Coordinate: (63.808718, 319.21096) ft
Right Coordinate: (446.87317, 382.21462) ft

Fully Specified Slip Surfaces

Fully Specified Slip Surface 1

	X (ft)	Y (ft)
	107	323.02053
	115.1899	318.67328
	122.2568	314.40239
	127.5817	311.18431
	130.7291	309.23574
	133.2155	307.68665

	136.3721	305.72
	141.3921	302.59229
	143.953	301.20953
	144.8742	300.91851
	145.4086	300.7497
	145.9786	300.61994
	146.3726	300.57056
	151.766	299.89477
	157.9872	299.11524
	160.3827	298.81506
	161.9248	298.62184
	165.9533	298.11706
	170.8244	297.5067
	171.8919	297.37293
	172.1331	297.34271
	173.2235	297.20607
	175.0878	296.97248
	180.1287	296.41116
	187.3507	295.62871
	191.0261	295.2947
	193.0219	295.292
	195.3625	295.33334
	202.3231	295.65188
	211.501	296.07189
	217.296	296.33709
	223.4832	296.62023
	230.5917	296.94553
	234.5528	297.12681
	237.551	297.26401
	243.7174	297.53835
	248.95	297.62197
	250.8074	297.54116
	254.5961	297.77297
	261.7022	298.24915
	268.7363	298.7205
	274.238	299.25238
	280.7321	300.22159
	289.7509	301.56761
	294.9475	302.34319

	296.0351	302.57637
	301.2288	304.27091
	309.16	308.6812
	313.9452	313.02195
	317.2049	315.97891
	320.4296	318.90409
	323.0126	321.24717
	324.7611	323.0041
	327.8213	326.45219
	332.7556	332.01192
	335.7701	335.40857
	336.9764	336.90315
	338.9896	339.49458
	342.4898	344
	345.8517	348.3275
	348.1823	351.3275
	351.8123	356
	355.6875	360.98815
	357.9235	363.98815
	360.665	368
	363.0308	371.46204
	363.8821	372.70786
	365.6164	375.24582
	367.8714	378.54563
	371	384

Seismic Coefficients

Horz Seismic Coef.: 0.1445
Ignore seismic load in strength: Yes
Points Fixed During Optimization
- Slip Point
  - Coordinate: (115.1899, 318.67328) ft
  - Is Fixed: Yes
- Slip Point
  - Coordinate: (122.2568, 314.40239) ft
  - Is Fixed: Yes
- Slip Point
  - Coordinate: (127.5817, 311.18431) ft
  - Is Fixed: Yes
- Slip Point
  - Coordinate: (130.7291, 309.23574) ft
  - Is Fixed: Yes

Slip Point
Coordinate: (133.2155, 307.68665) ft
Is Fixed: Yes
Slip Point
Coordinate: (136.3721, 305.72) ft
Is Fixed: Yes
Slip Point
Coordinate: (141.3921, 302.59229) ft
Is Fixed: Yes
Slip Point
Coordinate: (143.953, 301.20953) ft
Is Fixed: Yes
Slip Point
Coordinate: (144.8742, 300.91851) ft
Is Fixed: Yes
Slip Point
Coordinate: (145.4086, 300.7497) ft
Is Fixed: Yes
Slip Point
Coordinate: (145.9786, 300.61994) ft
Is Fixed: Yes
Slip Point
Coordinate: (146.3726, 300.57056) ft
Is Fixed: Yes
Slip Point
Coordinate: (151.766, 299.89477) ft
Is Fixed: Yes
Slip Point
Coordinate: (157.9872, 299.11524) ft
Is Fixed: Yes
Slip Point
Coordinate: (160.3827, 298.81506) ft
Is Fixed: Yes
Slip Point
Coordinate: (161.9248, 298.62184) ft
Is Fixed: Yes
Slip Point
Coordinate: (165.9533, 298.11706) ft
Is Fixed: Yes
Slip Point
Coordinate: (170.8244, 297.5067) ft
Is Fixed: Yes
Slip Point
Coordinate: (171.8919, 297.37293) ft
Is Fixed: Yes
Slip Point
Coordinate: (172.1331, 297.34271) ft
Is Fixed: Yes
Slip Point
Coordinate: (173.2235, 297.20607) ft
Is Fixed: Yes
Slip Point

Coordinate: (175.0878, 296.97248) ft
Is Fixed: Yes
Slip Point
Coordinate: (180.1287, 296.41116) ft
Is Fixed: Yes
Slip Point
Coordinate: (187.3507, 295.62871) ft
Is Fixed: Yes
Slip Point
Coordinate: (191.0261, 295.2947) ft
Is Fixed: Yes
Slip Point
Coordinate: (193.0219, 295.292) ft
Is Fixed: Yes
Slip Point
Coordinate: (195.3625, 295.33334) ft
Is Fixed: Yes
Slip Point
Coordinate: (202.3231, 295.65188) ft
Is Fixed: Yes
Slip Point
Coordinate: (211.501, 296.07189) ft
Is Fixed: Yes
Slip Point
Coordinate: (217.296, 296.33709) ft
Is Fixed: Yes
Slip Point
Coordinate: (223.4832, 296.62023) ft
Is Fixed: Yes
Slip Point
Coordinate: (230.5917, 296.94553) ft
Is Fixed: Yes
Slip Point
Coordinate: (234.5528, 297.12681) ft
Is Fixed: Yes
Slip Point
Coordinate: (237.551, 297.26401) ft
Is Fixed: Yes
Slip Point
Coordinate: (243.7174, 297.53835) ft
Is Fixed: Yes
Slip Point
Coordinate: (248.95, 297.62197) ft
Is Fixed: Yes
Slip Point
Coordinate: (250.8074, 297.54116) ft
Is Fixed: Yes
Slip Point
Coordinate: (254.5961, 297.77297) ft
Is Fixed: Yes
Slip Point
Coordinate: (261.7022, 298.24915) ft

Is Fixed: Yes
Slip Point
Coordinate: (268.7363, 298.7205) ft
Is Fixed: Yes
Slip Point
Coordinate: (274.238, 299.25238) ft
Is Fixed: Yes
Slip Point
Coordinate: (280.7321, 300.22159) ft
Is Fixed: Yes
Slip Point
Coordinate: (289.7509, 301.56761) ft
Is Fixed: Yes
Slip Point
Coordinate: (294.9475, 302.34319) ft
Is Fixed: Yes
Slip Point
Coordinate: (296.0351, 302.57637) ft
Is Fixed: Yes
Slip Point
Coordinate: (301.2288, 304.27091) ft
Is Fixed: Yes
Slip Point
Coordinate: (309.16, 308.6812) ft
Is Fixed: Yes
Slip Point
Coordinate: (313.9452, 313.02195) ft
Is Fixed: Yes
Slip Point
Coordinate: (317.2049, 315.97891) ft
Is Fixed: Yes
Slip Point
Coordinate: (320.4296, 318.90409) ft
Is Fixed: Yes
Slip Point
Coordinate: (323.0126, 321.24717) ft
Is Fixed: Yes
Slip Point
Coordinate: (324.7611, 323.0041) ft
Is Fixed: Yes
Slip Point
Coordinate: (327.8213, 326.45219) ft
Is Fixed: Yes
Slip Point
Coordinate: (332.7556, 332.01192) ft
Is Fixed: Yes
Slip Point
Coordinate: (335.7701, 335.40857) ft
Is Fixed: Yes
Slip Point
Coordinate: (336.9764, 336.90315) ft
Is Fixed: Yes

Slip Point
Coordinate: (338.9896, 339.49458) ft
Is Fixed: Yes
Slip Point
Coordinate: (342.4898, 344) ft
Is Fixed: Yes
Slip Point
Coordinate: (345.8517, 348.3275) ft
Is Fixed: Yes
Slip Point
Coordinate: (348.1823, 351.3275) ft
Is Fixed: Yes
Slip Point
Coordinate: (351.8123, 356) ft
Is Fixed: Yes
Slip Point
Coordinate: (355.6875, 360.98815) ft
Is Fixed: Yes
Slip Point
Coordinate: (357.9235, 363.98815) ft
Is Fixed: Yes
Slip Point
Coordinate: (360.665, 368) ft
Is Fixed: Yes
Slip Point
Coordinate: (363.0308, 371.46204) ft
Is Fixed: Yes
Slip Point
Coordinate: (363.8821, 372.70786) ft
Is Fixed: Yes
Slip Point
Coordinate: (365.6164, 375.24582) ft
Is Fixed: Yes
Slip Point
Coordinate: (367.8714, 378.54563) ft
Is Fixed: Yes

Anisotropic Strength Functions

clay ellipse staticshear

Model: Spline Data Point Function
Function: Modifier Factor vs. Inclination
Curve Fit to Data: 100 %
Segment Curvature: 50 %
Y-Intercept: 0.706
Data Points: Inclination (°), Modifier Factor
Data Point: (-60, 0.92608827)
Data Point: (-30, 0.92608827)
Data Point: (-17.838428, 0.83077031)
Data Point: (-3, 0.70608827)
Data Point: (3, 0.70608827)

Data Point: (23.685228, 0.82618324)
Data Point: (39.261389, 0.92608827)
Data Point: (59.397364, 0.92608827)

Shear/Normal Strength Functions

Baseliner

Model: Shear/Normal Spline Data Point Function
Function: Shear Stress vs. Normal Stress
Curve Fit to Data: 100 %
Segment Curvature: 100 %
Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
Data Point: (0, 0)
Data Point: (500, 235)
Data Point: (1,000, 463)
Data Point: (2,000, 899)
Data Point: (5,000, 2,057)
Data Point: (10,000, 3,515)
Data Point: (15,000, 4,430)
Estimation Properties
Intact Rock Param.: 10
Geological Strength: 100
Disturbance Factor: 0
SigmaC: 600,000 psf
SigmaC: 300,000 psf
Num. Points: 20

SHANSEP CONSOLIDATED UNDRAINED STATIC

Model: Add-In Function
Function: Shear Stress vs. Normal Stress
Assembly: GeoStudio AddIns1
Function: SHANSEPP
Field
MPP: 5000
m: 0.7
S: .34
Y-Intercept: -1.#IND

SHANSEP Over CONSOLIDATED UNDRAINED STATIC

Model: Add-In Function
Function: Shear Stress vs. Normal Stress
Assembly: GeoStudio AddIns1
Function: SHANSEPP
Field
MPP: 8000
m: 0.7
S: .34
Y-Intercept: -1.#IND

Points

	X (ft)	Y (ft)
Point 1	561.5172	329
Point 2	184.2753	329
Point 3	174.1934	323.83525
Point 4	351.3603	319.67886
Point 5	546.7523	324.07989
Point 6	139.5241	323.62981
Point 7	0	321.01609
Point 8	0	318.01563
Point 9	133.22	320.51124
Point 10	196.3072	335
Point 11	579.5227	335
Point 12	597.5282	341
Point 13	208.339	341
Point 14	608.5585	347
Point 15	240.1424	347
Point 16	234.9596	345.27685
Point 17	219.929	346.77965
Point 18	611.3486	345.60539
Point 19	596.5548	353
Point 20	258.1852	353
Point 21	250.6076	350.4794
Point 22	276.2227	359
Point 23	584.5511	359
Point 24	294.2603	365
Point 25	572.5474	365
Point 26	312.2978	371
Point 27	560.5437	371
Point 28	548.5399	377
Point 29	330.1036	377
Point 30	325.5389	375.4045
Point 31	337.8201	379.69712
Point 32	364.4177	380
Point 33	381.0855	380.33726
Point 34	395.5929	380.71635
Point 35	416.8543	381.25666
Point 36	438.0487	382
Point 37	479.1653	383

Point 38	511.5499	383
Point 39	512.0826	382.82242
Point 40	513.8708	383
Point 41	531.0491	383
Point 42	533.1096	382.31347
Point 43	533.1107	382.31305
Point 44	536.5271	381.01628
Point 45	537.9265	380.70839
Point 46	547.5083	377.51565
Point 47	346.883	383
Point 48	493.5541	389
Point 49	363.3465	389
Point 50	371.2953	391.89686
Point 51	372.0119	391.98713
Point 52	372.2345	391.99514
Point 53	372.3208	392
Point 54	374.2156	392.05341
Point 55	419.4544	394.02388
Point 56	423.1399	394.1518
Point 57	476.0285	394.84323
Point 58	0	275.56112
Point 59	82.561	276.49127
Point 60	84.7322	276.34451
Point 61	123.7177	276.54438
Point 62	191.6961	277.65321
Point 63	430.1918	279.01879
Point 64	487.7086	279.639
Point 65	509.7138	279.55021
Point 66	721.9937	279.02461
Point 67	839	278.53365
Point 68	839	283.95091
Point 69	694.2381	280.02879
Point 70	505.5772	282.211
Point 71	487.7086	281.69555
Point 72	430.1918	282.66537
Point 73	247.1163	283.77931
Point 74	191.6961	282.79673
Point 75	123.7177	280.19493
Point 76	93.9325	281.10076

Point 77	61.0988	279.7585
Point 78	0	281.01485
Point 79	839	292.1407
Point 80	505.5772	286.98428
Point 81	487.7086	287.07159
Point 82	430.1918	289.73652
Point 83	247.1163	297.70175
Point 84	123.7177	292.05467
Point 85	94.7708	289.80875
Point 86	84.7322	289.65003
Point 87	82.561	289.66397
Point 88	38.9609	289.4325
Point 89	0	289.19587
Point 90	0	300.53803
Point 91	17.729	300.30563
Point 92	61.8788	299.93669
Point 93	191.626	301.3549
Point 94	247.1555	301.9218
Point 95	430.2162	304.83853
Point 96	487.7442	304.85433
Point 97	505.6491	305.27434
Point 98	509.7473	305.37466
Point 99	564.3735	305.25518
Point 100	839	303.47923
Point 101	839	306.47929
Point 102	564.3865	308.25516
Point 103	509.7138	308.37474
Point 104	505.5772	308.27348
Point 105	487.7086	307.85432
Point 106	430.1918	307.83852
Point 107	247.1163	304.92156
Point 108	191.6961	304.35577
Point 109	123.7177	308.23059
Point 110	93.9325	306.13974
Point 111	81.2213	307.4429
Point 112	61.5521	302.93952
Point 113	17.7611	303.30547
Point 114	0	303.53785
Point 115	839	315.0402

Point 116	797.6335	315.91598
Point 117	788.4831	316.10833
Point 118	751.3873	316.84226
Point 119	746.5947	316.94222
Point 120	742.0308	317.02756
Point 121	740.5664	317.15339
Point 122	740.3716	317.22293
Point 123	737.8797	317.29393
Point 124	718.0152	324.01292
Point 125	711.8056	325.93525
Point 126	706.0898	327.46147
Point 127	700.0454	333.50592
Point 128	694.499	330.73293
Point 129	691.9982	333.23326
Point 130	680.0323	333.54954
Point 131	679.8975	333.54516
Point 132	674.9116	331.05465
Point 133	672.911	331.05491
Point 134	672.1929	333.92615
Point 135	648.0416	332
Point 136	642.1238	328.67972
Point 137	637.4622	326.05461
Point 138	633.8287	324
Point 139	632.6094	323.29395
Point 140	630.3447	322
Point 141	556.3265	322
Point 142	544.3989	318.02536
Point 143	351.3575	313.67727
Point 144	171.7713	317.89042
Point 145	158.9451	319.66188
Point 146	146.7629	317.7643
Point 147	0	315.01616
Point 148	126.916	317.39267
Point 149	624.2673	344.64
Point 150	642.7896	345.19608
Point 151	639.8757	348.10995
Point 152	623.7369	347.62543
Point 153	543.8794	321.01441
Point 154	351.3589	316.67806

Point 155	172.0125	320.88559
Point 156	158.9189	322.69398
Point 157	146.5027	320.75996
Point 158	161.8204	329.91734
Point 159	162.0292	329.91734
Point 160	169.8774	325.99323
Point 161	172.2537	323.88076
Point 162	158.8927	325.72607
Point 163	146.2426	323.75561
Point 164	144.6459	323.72571
Point 165	157.0292	329.91734
Point 166	643.2531	345.21
Point 167	651.9258	349.55
Point 168	666.9304	350
Point 169	668.3508	349.29
Point 170	707.4035	333.53244
Point 171	710.6052	333.51008
Point 172	711.3189	333.31046
Point 173	713.7443	332.66283
Point 174	720.1721	330.67297
Point 175	739.1283	324.2612
Point 176	741.6802	324.18848
Point 177	742.0676	324.05019
Point 178	742.3962	324.02195
Point 179	746.7331	323.94086
Point 180	751.5295	323.84082
Point 181	788.6259	323.10687
Point 182	797.7821	322.91441
Point 183	839	322.03859
Point 184	704.3877	335.67695
Point 185	758.6353	353.74048
Point 186	806.6964	369.75012
Point 187	818.5728	368.55874
Point 188	839	375.2318
Point 189	623.3833	349.61571
Point 190	636.5766	350.01181
Point 191	637.9727	350.01292
Point 192	0	260
Point 193	839	260

Regions

	Material	Points	Area (ft²)
Region 1	Waste Material	1,2,3,4,5	2,684.8
Region 2	NOT ACTIVE	6,7,8,9	409.18
Region 3	Waste Material	10,11,1,2	2,281.4
Region 4	Waste Material	10,11,12,13	2,317.2
Region 5	Waste Material	14,15,16,17,13,12,18	2,329.2
Region 6	Waste Material	19,20,21,15,14	2,120.4
Region 7	Waste Material	19,20,22,23	1,940.1
Region 8	Waste Material	23,22,24,25	1,759.8
Region 9	Waste Material	26,27,25,24	1,579.6
Region 10	Waste Material	28,29,30,26,27	1,399.5
Region 11	Waste Material	29,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,28	963.75
Region 12	NOT ACTIVE	47,31,32,33,34,35,36,37,38,48,49	1,129
Region 13	NOT ACTIVE	49,50,51,52,53,54,55,56,57,48	563.69
Region 14	Deflection surface	58,59,60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78	3,000.7
Region 15	Deflection surface	78,77,76,75,74,73,72,71,70,69,68,79,80,81,82,83,84,85,86,87,88,89	7,768.6
Region 16	GC UNDRAINED	90,91,92,93,94,95,96,97,98,99,100,79,80,81,82,83,84,85,86,87,88,89	10,108
Region 17	GC-Overconsolidated-UNDRAINED	90,91,92,93,94,95,96,97,98,99,100,101,102,103,104,105,106,107,108,109,110,111,112,113,114	2,873.1
Region 18	Upper Till	114,113,112,111,110,109,108,107,106,105,104,103,102,101,115,116,117,118,119,120,121,122,123,124,125,126,127,128,129,130,131,132,133,134,135,136,137,138,139,140,141,142,143,144,145,146,147	9,788.5
Region 19	Structural Fill	8,147,148,9	390.2
Region 20	CCL	148,146,145,144,143,142,141,149,150,151,152,153,154,155,156,157,9	1,547.9

Region 21	Structural Fill	158,159,160,3,161,162,163,164,165	80.098
Region 22	Structural Fill	150,166,167,168,169,134,135,136,137,138,139,140,141,149	1,602.2
Region 23	NOT ACTIVE	127,170,171,172,173,174,175,176,177,178,179,180,181,182,183,115,116,117,118,119,120,121,122,123,124,125,126	957.6
Region 24	NOT ACTIVE	184,185,186,187,188,183,182,181,180,179,178,177,176,175,174,173,172,171,170,127	4,345.4
Region 25	Bottom Liner	157,9,6,164,163,162,161,3,4,5,1,11,12,18,189,190,191,151,152,153,154,155,156	1,423.6
Region 26	Deflection surface	58,192,193,67,66,65,64,63,62,61,60,59	15,370

Current Slip Surface

Slip Surface: 1
F of S: 1.003
Volume: 10,160.686 ft³
Weight: 1,183,448 lbs
Resisting Moment: 54,616,408 lbs-ft
Activating Moment: 54,518,046 lbs-ft
Resisting Force: 333,214.81 lbs
Activating Force: 332,383.9 lbs
F of S Rank: 1
Exit: (112.45997, 320.12234) ft
Entry: (368.75597, 380.08778) ft
Radius: 125.73379 ft
Center: (205, 428) ft

Slip Slices

	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
Slice 1	113.82494	319.39781	-521.21435	802.93929	802.93929	1,000
Slice 2	116.39375	317.94573	-430.28763	1,499.5168	1,499.5168	1,000
Slice 3	119.9272	315.81028	-3.9306499	1,125.691	676.38342	150
Slice 4	124.5864	312.99451	173.38599	1,763.7585	955.59218	150
Slice 5	127.24885	311.38547	274.6661	2,162.69	1,134.4392	150
Slice 6	129.1554	310.21002	348.61189	2,490.3484	1,286.8851	150
Slice 7	131.97004	308.4626	458.4897	2,981.4677	1,515.9581	150
Slice 8	133.21324	307.68806	507.17887	3,296.4812	551.11521	1,285.9351
Slice 9	133.21775	307.68525	507.35224	3,297.1858	551.14697	1,286.0084
Slice 10	134.79605	306.70192	567.90342	3,676.6166	569.33493	1,328.4482
Slice 11	137.9481	304.73807	688.13401	4,456.7379	603.18126	1,407.4231
Slice 12	140.4581	303.17422	783.31179	5,033.371	625.33409	1,459.1134
Slice 13	142.67255	301.90091	860.55501	5,145.8101	624.81415	1,457.8964
Slice 14	144.29945	301.10008	909.07962	4,566.164	533.64426	1,245.1697

Slice 15	144.76005	300.95457	917.92275	4,616.7941	535.46613	1,249.4212
Slice 16	144.98838	300.88244	922.30527	4,654.6294	536.90386	1,252.7742
Slice 17	145.25558	300.79804	927.43232	4,428.2326	379.02553	884.39324
Slice 18	145.6936	300.68482	934.32273	4,249.3735	347.74887	811.41433
Slice 19	146.1106	300.6034	939.29569	4,055.9158	318.61841	743.44204
Slice 20	146.3076	300.57871	940.81687	4,075.4547	319.16975	744.72898
Slice 21	146.43765	300.56241	941.82076	4,088.0992	319.52002	745.54649
Slice 22	146.6328	300.53796	943.32669	4,107.1702	320.05422	746.79264
Slice 23	149.26445	300.20821	963.61724	4,365.8423	327.10508	763.24636
Slice 24	154.3976	299.56502	1,003.1328	4,868.5686	339.87467	793.04133
Slice 25	157.5082	299.17526	1,026.993	5,138.0225	346.21432	807.83229
Slice 26	158.46615	299.05522	1,034.3165	5,163.8569	346.68214	808.92532
Slice 27	159.6639	298.90513	1,043.4574	5,198.1086	347.31318	810.39791
Slice 28	161.10155	298.72499	1,054.4026	5,240.1942	348.09024	812.20972
Slice 29	161.8726	298.62838	1,060.2608	5,262.5742	348.50157	813.17045
Slice 30	161.977	298.6153	1,061.0533	5,265.607	348.55842	813.30252
Slice 31	163.99125	298.36291	1,076.3143	5,184.6771	346.14662	807.67538
Slice 32	167.91535	297.87121	1,105.8821	5,014.9041	341.02016	795.71326
Slice 33	170.3509	297.56603	1,124.1361	4,905.9814	337.65328	787.85662
Slice 34	171.29785	297.44737	1,131.2155	4,862.7242	336.29979	784.69988
Slice 35	171.8316	297.38049	1,135.2021	4,838.1693	335.52637	782.89409
Slice 36	171.9522	297.36537	1,136.1024	4,832.5832	335.34634	782.47439
Slice 37	172.0728	297.35026	1,137.0025	4,827.0661	335.1714	782.06681
Slice 38	172.1934	297.33515	1,137.9026	4,821.62	335.00199	781.67125
Slice 39	172.7386	297.26683	1,141.9703	4,795.6489	334.18	779.75365
Slice 40	173.70845	297.14531	1,149.1993	4,748.8283	332.68696	776.26888
Slice 41	174.6406	297.02851	1,156.1405	4,761.9345	332.85745	776.66784
Slice 42	177.60825	296.69182	1,176.1169	4,943.1885	335.13268	781.97563
Slice 43	182.202	296.18653	1,206.0129	5,281.4427	342.71772	799.67443
Slice 44	185.813	295.79531	1,229.0996	5,547.5801	348.72568	813.69271
Slice 45	189.1884	295.4617	1,248.7397	5,700.1076	349.80137	816.20259
Slice 46	191.32605	295.29429	1,258.5686	5,442.4111	341.316	796.40379
Slice 47	191.66105	295.29384	1,258.5878	5,457.6844	341.68896	797.27366
Slice 48	192.359	295.2929	1,258.6276	5,489.3616	342.45884	799.07141
Slice 49	194.1922	295.31267	1,257.4192	5,488.0003	342.45957	799.07264
Slice 50	195.83485	295.35496	1,254.887	5,434.7454	341.24981	796.25191
Slice 51	199.31515	295.51423	1,245.4165	5,555.141	344.39706	803.59386
Slice 52	205.33105	295.78953	1,229.0433	5,757.4269	349.54857	815.61411
Slice 53	209.92	295.99954	1,216.5517	5,906.9696	353.25431	824.26236

Slice 54	214.3985	296.20449	1,204.3592	6,048.9785	356.69971	832.29932
Slice 55	218.6125	296.39734	1,192.884	6,194.1222	1,200.6107	-0.00017265223
Slice 56	221.7061	296.53891	1,184.4578	6,181.8847	360.0381	840.08981
Slice 57	227.03745	296.78288	1,169.9307	6,004.5755	356.47922	831.78487
Slice 58	232.00901	297.0104	1,156.3733	5,851.8038	353.36826	824.52578
Slice 59	233.98956	297.10103	1,150.9691	5,790.5527	352.10257	821.57095
Slice 60	234.7562	297.13612	1,148.8764	5,766.8146	351.60887	820.41925
Slice 61	236.2553	297.20472	1,144.783	5,777.1869	351.93855	821.18977
Slice 62	238.8467	297.32331	1,137.7022	5,810.3232	352.85219	823.32234
Slice 63	241.9299	297.46441	1,129.2656	5,849.4625	353.9263	825.82818
Slice 64	245.41685	297.62398	1,119.6978	5,893.4932	355.12749	828.63
Slice 65	248.03315	297.66186	1,117.5859	6,501.0934	1,292.3701	4.1906815e-005
Slice 66	249.7788	297.58591	1,122.4992	6,546.2254	1,302.025	8.8111073e-005
Slice 67	250.7075	297.54551	1,125.1191	6,569.908	1,307.0815	-9.582435e-005
Slice 68	252.70175	297.65706	1,119.7575	5,938.669	356.20655	831.15006
Slice 69	256.39065	297.89322	1,108.362	5,952.3802	356.86075	832.67398
Slice 70	259.9437	298.13131	1,097.0515	5,997.4147	358.10065	835.56824
Slice 71	265.21925	298.48483	1,080.7778	6,066.4025	359.95797	839.9039
Slice 72	271.48715	298.98644	1,057.8719	5,984.4991	359.82165	839.58357
Slice 73	275.23035	299.40048	1,038.4835	5,764.5219	359.74251	839.39939
Slice 74	278.4774	299.88509	1,015.237	5,795.6229	360.97862	842.28363
Slice 75	285.2415	300.8946	967.65429	5,870.3422	363.72463	848.69191
Slice 76	292.0056	301.90412	921.40473	5,956.0092	1,228.0275	0.00012638656
Slice 77	294.6039	302.29191	905.05867	5,991.6038	1,240.6967	0.00012769045
Slice 78	295.4913	302.45978	897.74895	5,734.8377	371.20704	866.15004
Slice 79	296.23526	302.64168	889.43289	5,350.5612	383.12104	893.94841
Slice 80	298.83211	303.48895	848.82871	5,505.2463	539.26556	1,258.2831
Slice 81	302.62922	305.04964	771.44452	4,744.0499	578.4789	1,349.7861
Slice 82	306.59482	307.25478	648.91004	4,770.1735	2,476.3049	150
Slice 83	310.7289	310.10438	482.29955	3,704.4087	1,936.0385	150
Slice 84	313.1215	312.27476	353.47474	3,619.406	1,962.3695	150
Slice 85	314.76889	313.76914	264.68736	3,559.4729	1,979.7068	150
Slice 86	316.39874	315.24762	177.82703	3,542.103	593.21263	1,000
Slice 87	318.01107	316.7102	92.884372	3,501.294	600.99458	1,000
Slice 88	319.62342	318.17279	0	3,497.1992	1,348.4058	155.57831
Slice 89	321.23577	319.63538	0	3,459.7209	1,337.078	152.43884
Slice 90	322.52727	320.80692	0	3,361.2989	1,940.6469	0
Slice 91	323.88685	322.12563	0	3,157.4291	1,822.9426	0
Slice 92	325.15	323.44229	0	2,937.6584	1,696.0579	0

Slice 93	326.6801	325.16634	0	2,893.857	1,670.7691	0
Slice 94	328.96245	327.73798	0	2,828.6203	1,633.1047	0
Slice 95	331.4296	330.51785	0	2,757.1829	1,591.8603	0
Slice 96	334.08155	333.50596	0	2,679.119	1,546.7901	0
Slice 97	335.5888	335.20429	0	2,634.1588	1,520.8323	0
Slice 98	336.37325	336.15586	0	2,483.8043	1,434.0251	0
Slice 99	337.39825	337.44616	0	2,399.7617	1,385.5031	0
Slice 100	338.40485	338.74188	0	2,351.6593	1,357.7311	0
Slice 101	339.57437	340.24729	0	2,284.6322	1,319.033	0
Slice 102	341.32447	342.5	0	2,182.199	1,259.8932	0
Slice 103	343.6551	345.5	0	2,042.0827	1,178.997	0
Slice 104	345.33605	347.66375	0	1,938.3085	1,119.083	0
Slice 105	346.36735	348.99126	0	1,873.2774	1,081.5372	0
Slice 106	347.53265	350.49126	0	1,798.5729	1,038.4065	0
Slice 107	348.83197	352.16375	0	1,713.7717	989.44653	0
Slice 108	350.64697	354.5	0	1,592.2701	919.29757	0
Slice 109	352.97762	357.5	0	1,431.3277	826.37746	0
Slice 110	354.91522	359.99408	0	1,293.0622	746.5498	0
Slice 111	356.8055	362.48815	0	1,129.7811	652.27943	0
Slice 112	358.26922	364.49408	0	976.55051	563.8117	0
Slice 113	359.63997	366.5	0	861.52518	497.4018	0
Slice 114	361.69003	369.5	0	684.07389	394.95024	0
Slice 115	362.87293	371.23102	0	578.70176	334.11361	0
Slice 116	363.18865	371.69304	0	550.06976	317.58292	0
Slice 117	363.6143	372.31595	0	511.18313	295.13172	0
Slice 118	364.1499	373.09976	0	461.80721	266.62452	0
Slice 119	365.01705	374.36874	0	381.00974	219.97608	0
Slice 120	366.21578	376.12291	0	267.34765	154.35324	0
Slice 121	367.34328	377.77281	0	157.94071	91.18711	0
Slice 122	368.31369	379.31671	0	49.591107	28.631439	0

Figure 47 Yield Acceleration for Section OP-2, Partially Drained Conditions, Waste Lift 10 - 1 Year After Placement

Lift 10 Consolidated Yied Acceleration

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File Information

Title: Model City - RMU-2 CP-20 Section OP-2
Comments: Operation Conditions for CP-20 Section 2 Based on Maximum Fill Rate of 50,000 Cu Yds per Quarter
Created By: Peter J. Carey
Revision Number: 497
File Version: 8.0
Tool Version: 8.0.10.6504
Date: 2/24/2013
Time: 9:11:42 PM
File Name: C20OP-2r1.gsz
Directory: N:\Model_City\154.002_rmu2\154.005_revsions\geoslope\operational\
Last Solved Date: 2/25/2013
Last Solved Time: 12:52:08 AM

Project Settings

Length(L) Units: feet
Time(t) Units: Days
Force(F) Units: lbf
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D

Analysis Settings

Lift 10 Consolidated Yied Acceleration

Description: Yield acc for ET 1058 days
Kind: SLOPE/W
Parent: Waste Lift10 El. 383 Consolidation
Method: Morgenstern-Price
Settings
- Side Function
  - Interslice force function option: Half-Sine
- Lambda
  - Lambda 1: -1
  - Lambda 2: -0.8
  - Lambda 3: -0.6
  - Lambda 4: -0.4
  - Lambda 5: -0.2
  - Lambda 6: 0
  - Lambda 7: 0.2

Lambda 8: 0.4
Lambda 9: 0.6
Lambda 10: 0.8
Lambda 11: 1
PWP Conditions Source: Parent Analysis
Slip Surface
Direction of movement: Right to Left
Use Passive Mode: No
Slip Surface Option: Fully-Specified
Critical slip surfaces saved: 1
Optimize Critical Slip Surface Location: No
Tension Crack
Tension Crack Option: (none)
F of S Distribution
F of S Calculation Option: Constant
Advanced
Number of Slices: 30
F of S Tolerance: 0.001
Minimum Slip Surface Depth: 10 ft
Optimization Maximum Iterations: 2,000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

Waste Material

Model: Mohr-Coulomb
Unit Weight: 111 pcf
Cohesion': 0 psf
Phi': 30 °
Phi-B: 0 °

Bottom Liner

Model: Shear/Normal Fn.
Unit Weight: 120 pcf
Strength Function: Baseliner
Phi-B: 0 °

CCL

Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 1,000 psf
Phi': 10 °
Phi-B: 0 °

Upper Till

Model: Mohr-Coulomb

Unit Weight: 125 pcf
Cohesion': 150 psf
Phi': 31 °
Phi-B: 0 °

Deflection surface

Model: Bedrock (Impenetrable)

Structural Fill

Model: Mohr-Coulomb
Unit Weight: 135 pcf
Cohesion': 1,000 psf
Phi': 45 °
Phi-B: 0 °

NOT ACTIVE

Model: (None)

GC UNDRAINED

Model: Shear/Normal Fn.
Unit Weight: 120 pcf
Strength Function: SHANSEP CONSOLIDATED UNDRAINED STATIC
Phi-B: 0 °
Anisotropic Strength Fn: clay ellipse staticshear

GC-Overconsolidated-UNDRAINED

Model: Shear/Normal Fn.
Unit Weight: 125 pcf
Strength Function: SHANSEP Over CONSOLIDATED UNDRAINED STATIC
Phi-B: 0 °
Anisotropic Strength Fn: clay ellipse staticshear

Slip Surface Limits

Left Coordinate: (25.66545, 331.15391) ft
Right Coordinate: (594.2496, 377) ft

Fully Specified Slip Surfaces

Fully Specified Slip Surface 1

	X (ft)	Y (ft)
	227	324
	232.4691	319.56837
	236.9682	316.10306
	240.9305	313.05119
	243.2608	311.2564
	243.6796	310.93381

	246.0491	309.44072
	248.6749	307.79564
	250.5016	306.65117
	254.6522	304.05081
	260.9955	301.43668
	268.4026	299.51615
	273.5442	298.4173
	278.8106	297.9098
	285.1911	297.29493
	288.5371	296.97249
	290.1313	296.81886
	292.16	296.62336
	295.9943	296.46533
	299.1121	296.41788
	305.016	296.32803
	313.7064	296.19576
	321.8906	296.0712
	328.9473	295.9638
	333.6323	295.8925
	339.084	295.80953
	343.2141	295.74667
	349.8759	295.64528
	356.479	295.54479
	358.474	295.51442
	361.7108	295.46516
	365.7103	295.40429
	370.5361	295.62793
	377.4442	296.16379
	384.8569	296.73881
	390.3468	297.32024
	398.1923	298.61319
	407.3886	300.12874
	410.575	300.65385
	413.2169	301.5125
	417.9783	303.07539
	424.5454	307.67703
	429.5195	312.07778
	431.8521	314.14142
	434.5481	316.5267

	436.2962	318.07331
	437.6638	319.28326
	442.2586	324.39009
	446.6572	329.41787
	448.5377	331.5673
	450.7967	334.14944
	453.5143	337.25567
	456.074	340.25567
	458.2899	343.06893
	460.6529	346.06893
	463.7492	350
	468.4752	356
	473.2012	362
	477.3284	367.23987
	479.2593	369.75667
	479.7164	370.5168
	481.2789	373.11488
	483.0831	376.11488
	484.4223	378.34174
	488	391

Seismic Coefficients

Horz Seismic Coef.: 0.15
Ignore seismic load in strength: Yes

Anisotropic Strength Functions

clay ellipse staticshear

Model: Spline Data Point Function
Function: Modifier Factor vs. Inclination
    Curve Fit to Data: 100 %
    Segment Curvature: 50 %
Y-Intercept: 0.706
Data Points: Inclination (°), Modifier Factor
    Data Point: (-60, 0.92608827)
    Data Point: (-30, 0.92608827)
    Data Point: (-17.838428, 0.83077031)
    Data Point: (-3, 0.70608827)
    Data Point: (3, 0.70608827)
    Data Point: (23.685228, 0.82618324)
    Data Point: (39.261389, 0.92608827)
    Data Point: (59.397364, 0.92608827)

Shear/Normal Strength Functions

Baseliner

Model: Shear/Normal Spline Data Point Function
Function: Shear Stress vs. Normal Stress
Curve Fit to Data: 100 %
Segment Curvature: 100 %
Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
Data Point: (0, 0)
Data Point: (500, 235)
Data Point: (1,000, 463)
Data Point: (2,000, 899)
Data Point: (5,000, 2,057)
Data Point: (10,000, 3,515)
Data Point: (15,000, 4,430)
Estimation Properties
Intact Rock Param.: 10
Geological Strength: 100
Disturbance Factor: 0
SigmaC: 600,000 psf
SigmaC: 300,000 psf
Num. Points: 20

SHANSEP CONSOLIDATED UNDRAINED STATIC

Model: Add-In Function
Function: Shear Stress vs. Normal Stress
Assembly: GeoStudio AddIns1
Function: SHANSEPP
Field
MPP: 5000
m: 0.7
S: .34
Y-Intercept: -1.#IND

SHANSEP Over CONSOLIDATED UNDRAINED STATIC

Model: Add-In Function
Function: Shear Stress vs. Normal Stress
Assembly: GeoStudio AddIns1
Function: SHANSEPP
Field
MPP: 8000
m: 0.7
S: .34
Y-Intercept: -1.#IND

Points

	X (ft)	Y (ft)
Point 1	0	268.91519

Point 2	207.4978	271.24238
Point 3	209.0232	271.26867
Point 4	215.074	271.32735
Point 5	225.5606	271.44496
Point 6	230.6621	271.56993
Point 7	234.0537	271.62591
Point 8	237.8751	271.70733
Point 9	243.6233	271.78388
Point 10	403.7734	274.99581
Point 11	406.1879	275.04891
Point 12	510.242	277.40528
Point 13	519.1809	277.52295
Point 14	522.2501	277.56833
Point 15	581.5843	278.21948
Point 16	706.5316	275.03632
Point 17	784.4915	272.77004
Point 18	796.8946	272.40949
Point 19	796.8946	278.66207
Point 20	771.752	277.8332
Point 21	583.2389	281.6042
Point 22	512.9202	278.57945
Point 23	404.2686	277.81745
Point 24	248.1947	278.63737
Point 25	83.6675	274.48464
Point 26	78.5956	274.41664
Point 27	69.7373	274.12229
Point 28	0	273.8562
Point 29	0	286.98783
Point 30	69.7373	288.07912
Point 31	78.6615	288.22649
Point 32	83.6675	288.57952
Point 33	248.1947	297.19282
Point 34	404.2686	294.81745
Point 35	512.9202	289.28565
Point 36	583.2389	288.00106
Point 37	796.8946	289.48765
Point 38	0	305.26334
Point 39	63.5351	305.72185
Point 40	69.7373	305.70863

Point 41	77.6371	305.65972
Point 42	78.5956	305.57155
Point 43	83.6675	305.7
Point 44	248.1947	307.61838
Point 45	299.7903	306.27673
Point 46	299.6238	303.28004
Point 47	404.2544	300.5593
Point 48	512.9971	302.35411
Point 49	583.3451	304.79977
Point 50	592.8421	305.14193
Point 51	650.1895	305.15472
Point 52	796.8602	303.47517
Point 53	796.8946	303.47517
Point 54	404.2686	303.55995
Point 55	512.9202	305.35325
Point 56	583.2389	307.79789
Point 57	592.7878	308.14191
Point 58	650.2064	308.15472
Point 59	796.8946	306.47498
Point 60	0	327.67711
Point 61	22.4921	326.28273
Point 62	49.2488	323.27595
Point 63	74.3201	319.27807
Point 64	77.7249	318.65421
Point 65	112.0147	318.69361
Point 66	124.2402	315.77486
Point 67	126.7076	315.31519
Point 68	136.2125	313.12968
Point 69	142.0351	312.45981
Point 70	357.6126	310.47901
Point 71	586.0206	317.13
Point 72	588.0287	317.67977
Point 73	603.6052	322
Point 74	693.0775	322
Point 75	695.4173	323.10644
Point 76	697.3194	324
Point 77	714.7524	332
Point 78	726.8078	332.79458
Point 79	736.4313	333.45251

Point 80	740.2913	333.71166
Point 81	742.8239	333.89241
Point 82	743.6092	331.27888
Point 83	746.0108	331.28559
Point 84	751.3746	333.5338
Point 85	751.5561	333.52887
Point 86	751.6873	333.53898
Point 87	751.9654	333.539
Point 88	755.4965	333.65881
Point 89	757.088	333.70415
Point 90	766.5218	333.52383
Point 91	769.5239	331.03222
Point 92	781.3859	336.00827
Point 93	796.8946	335.53695
Point 94	0	330.67136
Point 95	0.1856	330.67136
Point 96	22.7526	329.27234
Point 97	49.6527	326.24944
Point 98	74.8268	322.23518
Point 99	77.9958	321.65452
Point 100	112.3661	321.69402
Point 101	124.8636	318.71033
Point 102	127.3188	318.25295
Point 103	136.7217	316.09089
Point 104	142.2209	315.45823
Point 105	357.5827	313.47942
Point 106	585.5746	320.11828
Point 107	587.2318	320.57198
Point 108	684.7881	347.62982
Point 109	704.816	348.13028
Point 110	707.7847	347.0118
Point 111	709.4494	346.32322
Point 112	709.6367	345.87345
Point 113	708.0438	345.21
Point 114	685.2332	344.64
Point 115	131.5335	329.79618
Point 116	158.1735	318.33502
Point 117	165.2063	318.28065
Point 118	203.3044	317.9221

Point 119	243.6199	317.55888
Point 120	248.3589	317.51329
Point 121	357.6595	316.4965
Point 122	589.0312	323.16552
Point 123	591.6482	323.89085
Point 124	610.0073	329
Point 125	631.5677	335
Point 126	653.128	341
Point 127	674.6884	347
Point 128	684.1005	349.61929
Point 129	699.8223	350.01168
Point 130	0	332.91188
Point 131	22.4396	331.51733
Point 132	49.1519	328.50799
Point 133	68.0785	325.48185
Point 134	73.6566	324.58998
Point 135	90.5756	324.62675
Point 136	109.5111	324.68581
Point 137	124.0229	330.52741
Point 138	127.0249	330.53586
Point 139	129.8149	330.45078
Point 140	130.027	330.44431
Point 141	274.9823	329
Point 142	252.0124	321.5
Point 143	213.855	321.5
Point 144	177.1587	331.5
Point 145	171.0426	331.5
Point 146	152.2075	323.79526
Point 147	298.6003	335
Point 148	282.6389	331.5
Point 149	287.7433	331.5
Point 150	289.3308	331.95874
Point 151	290.9318	332.5
Point 152	317.0046	341
Point 153	355.3453	347
Point 154	666.3598	347
Point 155	669.6785	345.61929
Point 156	674.6567	347
Point 157	326.7765	344.18573

Point 158	336.1465	343.24706
Point 159	342.0216	342.65356
Point 160	373.7378	353
Point 161	651.9377	353
Point 162	392.1303	359
Point 163	637.5157	359
Point 164	410.5229	365
Point 165	623.0936	365
Point 166	608.6716	371
Point 167	428.9409	371
Point 168	415.8066	366.72364
Point 169	447.0228	377
Point 170	594.2496	377
Point 171	435.4903	373.13237
Point 172	450.0526	378.01608
Point 173	459.9195	378.51574
Point 174	479.4258	379.45192
Point 175	482.5508	379.55699
Point 176	491.9324	380
Point 177	507.2813	380.61621
Point 178	541.8899	382.28139
Point 179	574.2808	382.67429
Point 180	581.1072	381.37657
Point 181	581.6822	381.26488
Point 182	582.2411	381.14975
Point 183	582.7845	381.03125
Point 184	583.313	380.90951
Point 185	583.8273	380.78465
Point 186	584.3278	380.6568
Point 187	584.8152	380.52606
Point 188	585.29	380.39256
Point 189	592.2253	377.82435
Point 190	593.0101	377.51567
Point 191	78.5551	329.67009
Point 192	110.5776	331.89761
Point 193	113.2091	332.06836
Point 194	115.8406	332.21663
Point 195	118.4721	332.34247
Point 196	121.1036	332.44595

Point 197	123.7351	332.5271
Point 198	125.1298	332.55831
Point 199	126.3665	332.19565
Point 200	128.6722	331.5
Point 201	128.9196	331.46994
Point 202	710.0851	346.06023
Point 203	718.4637	349.55
Point 204	736.491	350
Point 205	738.1976	349.29
Point 206	796.8946	253.91519
Point 207	0	253.91519

Regions

	Material	Points	Area (ft²)
Region 1	NOT ACTIVE	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28	3,346.1
Region 2	Deflection surface	29,30,31,32,33,34,35,36,37,19,20,21,22,23,24,25,26,27,28	10,671
Region 3	GC UNDRAINED	38,39,40,41,42,43,44,45,46,47,48,49,50,51,52,53,37,36,35,34,33,32,31,30,29	10,397
Region 4	GC-Overconsolidated-UNDRAINED	45,54,55,56,57,58,59,53,52,51,50,49,48,47,46	1,491.9
Region 5	Upper Till	60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78,79,80,81,82,83,84,85,86,87,88,89,90,91,92,93,59,58,57,56,55,54,45,44,43,42,41,40,39,38	9,253.4
Region 6	CCL	94,95,96,97,98,99,100,101,102,103,104,105,106,107,108,109,110,111,112,113,114,73,72,71,70,69,68,67,66,65,64,63,62,61,60	2,139
Region 7	Bottom Liner	115,116,117,118,119,120,121,122,123,124,125,126,127,128,129,109,108,107,106,105,104,103,102,101,100,99,98,97,96,95,94,130,131,132,133,134,135,136,137,138,139,140	2,215.1
Region 8	Waste Material	115,116,117,118,119,120,121,122,123,124,141,142,143,144,145,146	4,104.1
Region 9	Waste Material	147,125,124,141,148,149,150,151	2,001.4
Region 10	Waste Material	147,125,126,152	2,007.3
Region 11	Waste	153,154,155,156,127,126,152,157,158,159	1,949.1

	Material		
Region 12	Waste Material	160,161,154,153	1,767.6
Region 13	Waste Material	162,163,161,160	1,570.8
Region 14	Waste Material	164,165,163,162	1,373.9
Region 15	Waste Material	164,165,166,167,168	1,176.9
Region 16	Waste Material	169,170,166,167,171	980.5
Region 17	Waste Material	169,172,173,174,175,176,177,178,179,180,181,182,183,184,185, 186,187,188,189,190,170	534.96
Region 18	Structural Fill	133,191,192,193,194,195,196,197,198,199,200,201,139,138,137, 136,135,134	293.23
Region 19	Structural Fill	73,114,113,112,202,203,204,205,81,80,79,78,77,76,75,74	1,934.1
Region 20	NOT ACTIVE	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,206,207	15,814

Current Slip Surface

Slip Surface: 1
F of S: 1.004
Volume: 10,513.752 ft³
Weight: 1,205,547.6 lbs
Resisting Moment: 79,311,207 lbs-ft
Activating Moment: 78,994,769 lbs-ft
Resisting Force: 320,557.97 lbs
Activating Force: 319,330.48 lbs
F of S Rank: 1
Exit: (230.08526, 321.5) ft
Entry: (484.79574, 379.663) ft
Radius: 125.11443 ft
Center: (169, 482) ft

Slip Slices

	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
Slice 1	231.27718	320.53418	0	161.11536	93.019995	0
Slice 2	233.72304	318.60256	0	503.54602	290.72243	0
Slice 3	235.97259	316.8699	0	792.31462	360.11724	9.0956746
Slice 4	237.96381	315.33621	0	1,123.7199	500.79227	17.538813
Slice 5	239.94496	313.81028	98.177544	1,922.4708	321.67213	1,000
Slice 6	241.91608	312.2921	191.96701	2,278.723	367.95138	1,000

Slice 7	243.08123	311.39471	247.34619	2,552.211	1,384.9025	150
Slice 8	243.44035	311.1181	264.44312	2,647.9293	1,432.143	150
Slice 9	243.64975	310.9568	274.41172	2,704.5202	1,460.1565	150
Slice 10	244.86435	310.18727	321.70097	2,646.495	1,396.8772	150
Slice 11	247.204	308.71717	411.87384	3,157.8492	1,649.9485	150
Slice 12	248.5169	307.89463	462.18937	3,473.1804	1,809.1859	150
Slice 13	248.83289	307.69666	474.28046	3,552.8752	1,849.8063	150
Slice 14	249.74624	307.12442	509.29126	3,320.6368	397.55335	927.62565
Slice 15	251.257	306.17791	565.58392	3,588.9362	406.31973	948.07992
Slice 16	253.3323	304.87773	637.7756	4,037.7199	420.88462	982.06394
Slice 17	257.82385	302.74374	747.77789	4,309.9091	406.35501	948.16086
Slice 18	264.69905	300.47641	858.73805	4,762.6224	374.55834	873.96988
Slice 19	270.9734	298.96673	932.33769	5,288.0723	373.35227	871.15556
Slice 20	274.26325	298.34801	962.4847	5,110.4661	343.04876	800.44617
Slice 21	276.89645	298.09426	974.85702	5,281.2727	346.92755	809.49883
Slice 22	280.72475	297.72534	993.09948	5,525.7988	352.29895	822.03192
Slice 23	283.915	297.4179	1,008.6005	5,678.0507	355.45455	829.39478
Slice 24	286.4672	297.17196	1,021.2163	5,739.6136	356.56815	831.99314
Slice 25	288.1402	297.01074	1,029.5938	5,791.6284	357.55463	834.2937
Slice 26	288.93395	296.93425	1,033.5989	5,835.8443	358.45782	836.40172
Slice 27	289.73105	296.85743	1,037.6399	5,882.2013	359.40267	838.6058
Slice 28	290.53155	296.78029	1,041.7171	5,930.7013	360.38808	840.90508
Slice 29	291.5459	296.68254	1,046.91	5,990.8779	361.59968	843.73071
Slice 30	294.07715	296.54435	1,054.468	5,816.977	354.86942	828.02941
Slice 31	297.2973	296.4455	1,060.1404	5,805.2812	354.45725	827.06663
Slice 32	298.8562	296.42177	1,061.6259	5,857.1392	355.58114	829.69162
Slice 33	299.36795	296.41399	1,062.1134	5,873.9006	355.94321	830.53481
Slice 34	302.3199	296.36906	1,064.9268	5,982.2727	358.26797	835.95934
Slice 35	309.3612	296.26189	1,071.642	6,201.5858	1,231.4063	-3.4721722e-006
Slice 36	315.3555	296.17066	1,077.3628	6,398.5235	1,277.3068	-0.00022870136
Slice 37	319.4476	296.10838	1,081.2701	6,524.9296	1,306.7117	-0.00014185359
Slice 38	324.33355	296.03402	1,085.9381	6,667.8727	1,339.9032	0.00027957937
Slice 39	327.8619	295.98032	1,089.3115	6,707.6815	1,348.6492	0.00028140429
Slice 40	331.2898	295.92815	1,092.5902	6,613.5122	1,325.2582	-0.00033070711
Slice 41	334.8894	295.87337	1,096.0355	6,509.1087	1,299.3694	8.7931361e-005
Slice 42	337.61525	295.83188	1,098.6452	6,425.5084	1,278.6755	-9.3741855e-005
Slice 43	340.5528	295.78717	1,101.4595	6,331.5358	1,255.4424	4.0709383e-005
Slice 44	342.61785	295.75574	1,103.439	6,295.4578	1,246.3068	0.00017219518
Slice 45	346.545	295.69597	1,107.2046	6,371.9423	1,263.7625	8.5521761e-005

Slice 46	350.33686	295.63826	1,110.8436	6,441.7837	1,279.6538	0.00022190524
Slice 47	353.07156	295.59665	1,113.4689	6,488.2549	1,290.1787	0.00022373037
Slice 48	355.91215	295.55342	1,116.1975	6,534.3796	1,300.5958	4.2173543e-005
Slice 49	357.06925	295.5358	1,117.31	6,552.3209	1,304.6355	-4.9661844e-005
Slice 50	357.80141	295.52466	1,118.0139	6,563.5352	1,307.1588	-0.00037226267
Slice 51	358.20866	295.51846	1,118.4051	6,569.8791	1,308.5873	8.8555155e-005
Slice 52	360.0924	295.48979	1,120.2165	6,598.3673	1,314.9908	0.00013533667
Slice 53	363.71055	295.43473	1,123.6972	6,650.2726	1,326.6147	0.00023004875
Slice 54	368.1232	295.51611	1,119.6035	6,142.5216	1,205.8179	0.00012410079
Slice 55	372.13695	295.75211	1,106.862	5,914.7152	356.34343	831.46735
Slice 56	375.591	296.02004	1,092.3712	5,930.2869	357.00998	833.02407
Slice 57	381.15055	296.4513	1,069.318	5,960.4234	358.18338	835.76103
Slice 58	387.60185	297.02952	1,038.8966	5,795.0959	356.60229	832.07136
Slice 59	391.23855	297.4672	1,015.854	5,465.3877	355.07132	828.50096
Slice 60	395.1613	298.11368	981.78806	5,481.8064	356.276	831.30905
Slice 61	401.22335	299.11271	929.72768	5,519.9836	358.40406	836.27509
Slice 62	405.8215	299.87048	890.8767	5,560.7282	360.25681	840.59976
Slice 63	408.95575	300.387	864.65145	5,599.3539	361.75016	844.08411
Slice 64	410.54895	300.64956	851.32704	5,620.5244	362.53846	845.92467
Slice 65	411.89595	301.08317	828.3397	5,197.8125	528.71443	1,233.6655
Slice 66	414.51175	301.93752	783.29288	5,184.3881	530.78366	1,238.4944
Slice 67	416.89245	302.71897	742.18472	5,185.7742	532.31566	1,242.0701
Slice 68	418.49776	303.43938	703.58545	3,947.0026	569.5838	1,329.0274
Slice 69	421.78131	305.7402	567.50508	3,987.8631	2,055.1584	150
Slice 70	426.74315	309.62145	333.9014	3,381.457	1,831.1561	150
Slice 71	429.2302	311.82183	200.9059	3,322.3264	1,875.5387	150
Slice 72	429.80883	312.33374	169.96791	3,308.1038	1,885.5823	150
Slice 73	430.97513	313.36556	108.72576	3,214.4273	547.61896	1,000
Slice 74	432.72902	314.91727	17.194111	3,189.6737	559.39375	1,000
Slice 75	434.07702	316.10991	0	3,193.8903	1,254.9636	130.96165
Slice 76	435.0192	316.9435	0	3,181.2701	1,250.9873	129.97718
Slice 77	435.89325	317.7168	0	3,169.8788	1,247.3922	129.09115
Slice 78	436.69917	318.42983	0	3,159.7418	1,244.1877	128.30536
Slice 79	437.38297	319.0348	0	3,163.4599	1,826.4244	0
Slice 80	439.9612	321.83668	0	2,706.4663	1,562.5791	0
Slice 81	444.27511	326.69504	0	2,572.1985	1,485.0595	0
Slice 82	446.47441	329.20894	0	2,525.3441	1,458.0081	0
Slice 83	446.84	329.62681	0	2,517.4856	1,453.471	0
Slice 84	447.78025	330.70153	0	2,497.0173	1,441.6536	0

Slice 85	449.29515	332.4331	0	2,463.5954	1,422.3575	0
Slice 86	450.42465	333.72417	0	2,431.7498	1,403.9714	0
Slice 87	451.16877	334.57472	0	2,401.6447	1,386.5902	0
Slice 88	452.52757	336.12784	0	2,345.6309	1,354.2506	0
Slice 89	454.79415	338.75567	0	2,217.2415	1,280.125	0
Slice 90	456.36714	340.62784	0	2,054.1628	1,185.9715	0
Slice 91	457.47509	342.03447	0	2,002.0434	1,155.8803	0
Slice 92	459.1047	344.10338	0	1,923.4319	1,110.4939	0
Slice 93	460.2862	345.60338	0	1,864.8377	1,076.6645	0
Slice 94	461.01958	346.53447	0	1,827.5894	1,055.1592	0
Slice 95	462.56773	348.5	0	1,746.8953	1,008.5705	0
Slice 96	464.9307	351.5	0	1,618.9142	934.68053	0
Slice 97	467.2937	354.5	0	1,484.2183	856.91385	0
Slice 98	469.6567	357.5	0	1,342.3075	774.9816	0
Slice 99	472.0197	360.5	0	1,192.6321	688.56648	0
Slice 100	474.38268	363.5	0	1,034.6033	597.32848	0
Slice 101	476.44628	366.11994	0	889.46953	513.53547	0
Slice 102	478.29385	368.49827	0	743.38439	429.19318	0
Slice 103	479.34255	369.89511	0	597.20773	344.79804	0
Slice 104	479.5711	370.27517	0	576.0761	332.59769	0
Slice 105	479.8617	370.7584	0	548.91765	316.91775	0
Slice 106	480.64295	372.05744	0	474.36071	273.87228	0
Slice 107	481.91485	374.17233	0	349.18005	201.5992	0
Slice 108	482.81695	375.67233	0	257.6171	148.7353	0
Slice 109	483.34925	376.55744	0	202.5308	116.93121	0
Slice 110	484.01885	377.67087	0	131.79115	76.089656	0
Slice 111	484.60902	379.00237	0	30.916054	17.849392	0

Figure 48 Stability for Section OP-1, Partially Drained Conditions, Waste Lift 9 2:1 slope

Waste Lift 9 - 4th step pp

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File Information

Title: Model City - RMU-2 CP-20 Section OP-1
Comments: Operation Conditions for CP-20 Section 1 Based on Maximum Fill Rate of 50,000 Cu Yds per Quarter
Created By: Peter J. Carey
Last Edited By: Peter J. Carey
Revision Number: 513
File Version: 8.0
Tool Version: 8.0.10.6504
Date: 2/26/2013
Time: 5:16:38 PM
File Name: C20OP-1r1_variant.gsz
Directory: N:\Model_City\154.002_rmu2\154.005_revsions\geoslope\operational\
Last Solved Date: 2/26/2013
Last Solved Time: 6:21:32 PM

Project Settings

Length(L) Units: feet
Time(t) Units: Days
Force(F) Units: lbf
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D

Analysis Settings

Waste Lift 9 - 4th step pp

Description: Undrained Strength based on 25% of fill time
Kind: SLOPE/W
Parent: WASTE LIFT 9 EL. 377
Method: Morgenstern-Price
Settings
- Side Function
  - Interslice force function option: Half-Sine
- Lambda
  - Lambda 1: -1
  - Lambda 2: -0.8
  - Lambda 3: -0.6
  - Lambda 4: -0.4
  - Lambda 5: -0.2
  - Lambda 6: 0
  - Lambda 7: 0.2

Lambda 8: 0.4
Lambda 9: 0.6
Lambda 10: 0.8
Lambda 11: 1
PWP Conditions Source: Parent Analysis
Slip Surface
Direction of movement: Right to Left
Use Passive Mode: No
Slip Surface Option: Entry and Exit
Critical slip surfaces saved: 1
Optimize Critical Slip Surface Location: Yes
Tension Crack
Tension Crack Option: (none)
F of S Distribution
F of S Calculation Option: Constant
Advanced
Number of Slices: 30
F of S Tolerance: 0.001
Minimum Slip Surface Depth: 15 ft
Optimization Maximum Iterations: 2,000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

Waste Material

Model: Mohr-Coulomb
Unit Weight: 111 pcf
Cohesion': 0 psf
Phi': 30 °
Phi-B: 0 °

Bottom Liner

Model: Shear/Normal Fn.
Unit Weight: 120 pcf
Strength Function: Baseliner
Phi-B: 0 °

CCL

Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 1,000 psf
Phi': 10 °
Phi-B: 0 °

Upper Till

Model: Mohr-Coulomb

Unit Weight: 125 pcf
Cohesion': 150 psf
Phi': 31 °
Phi-B: 0 °

Deflection surface

Model: Bedrock (Impenetrable)

Structural Fill

Model: Mohr-Coulomb
Unit Weight: 135 pcf
Cohesion': 1,000 psf
Phi': 45 °
Phi-B: 0 °

NOT ACTIVE

Model: (None)

GC UNDRAINED

Model: Shear/Normal Fn.
Unit Weight: 120 pcf
Strength Function: SHANSEP CONSOLIDATED UNDRAINED STATIC
Phi-B: 0 °
Anisotropic Strength Fn: clay ellipse staticshear

GC-Overconsolidated-UNDRAINED

Model: Shear/Normal Fn.
Unit Weight: 125 pcf
Strength Function: SHANSEP Over CONSOLIDATED UNDRAINED STATIC
Phi-B: 0 °
Anisotropic Strength Fn: clay ellipse staticshear

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (76.8668, 319.45558) ft
Left-Zone Right Coordinate: (171.8639, 324.99999) ft
Left-Zone Increment: 10
Right Projection: Range
Right-Zone Left Coordinate: (293.05266, 357.51679) ft
Right-Zone Right Coordinate: (400, 377) ft
Right-Zone Increment: 10
Radius Increments: 8

Slip Surface Limits

Left Coordinate: (63.808718, 319.21096) ft
Right Coordinate: (447, 377) ft

Anisotropic Strength Functions

clay ellipse staticshear

Model: Spline Data Point Function
Function: Modifier Factor vs. Inclination
Curve Fit to Data: 100 %
Segment Curvature: 50 %
Y-Intercept: 0.706
Data Points: Inclination (°), Modifier Factor
Data Point: (-60, 0.92608827)
Data Point: (-30, 0.92608827)
Data Point: (-17.838428, 0.83077031)
Data Point: (-3, 0.70608827)
Data Point: (3, 0.70608827)
Data Point: (23.685228, 0.82618324)
Data Point: (39.261389, 0.92608827)
Data Point: (59.397364, 0.92608827)

Shear/Normal Strength Functions

Baseliner

Model: Shear/Normal Spline Data Point Function
Function: Shear Stress vs. Normal Stress
Curve Fit to Data: 100 %
Segment Curvature: 100 %
Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
Data Point: (0, 0)
Data Point: (500, 235)
Data Point: (1,000, 463)
Data Point: (2,000, 899)
Data Point: (5,000, 2,057)
Data Point: (10,000, 3,515)
Data Point: (15,000, 4,430)
Estimation Properties
Intact Rock Param.: 10
Geological Strength: 100
Disturbance Factor: 0
SigmaC: 600,000 psf
SigmaC: 300,000 psf
Num. Points: 20

SHANSEP CONSOLIDATED UNDRAINED STATIC

Model: Add-In Function
Function: Shear Stress vs. Normal Stress
Assembly: GeoStudio AddIns1
Function: SHANSEPP
Field
MPP: 5000
m: 0.7

S: .34

Y-Intercept: -1.#IND

SHANSEP Over CONSOLIDATED UNDRAINED STATIC

Model: Add-In Function

Function: Shear Stress vs. Normal Stress

Assembly: GeoStudio AddIns1

Function: SHANSEPP

Field

MPP: 8000

m: 0.7

S: .34

Y-Intercept: -1.#IND

Points

	X (ft)	Y (ft)
Point 1	561.5172	329
Point 2	184.2753	329
Point 3	174.1934	323.83525
Point 4	351.3603	319.67886
Point 5	546.7523	324.07989
Point 6	139.5241	323.62981
Point 7	0	321.01609
Point 8	0	318.01563
Point 9	133.22	320.51124
Point 10	196.3072	335
Point 11	579.5227	335
Point 12	597.5282	341
Point 13	208.339	341
Point 14	608.5585	347
Point 15	240.1424	347
Point 16	234.9596	345.27685
Point 17	219.929	346.77965
Point 18	611.3486	345.60539
Point 19	596.5548	353
Point 20	258.1852	353
Point 21	250.6076	350.4794
Point 22	276.2227	359
Point 23	584.5511	359
Point 24	294.2603	365
Point 25	572.5474	365
Point 26	312.2978	371

Point 27	560.5437	371
Point 28	548.5399	377
Point 29	330.1036	377
Point 30	325.5389	375.4045
Point 31	337.8201	379.69712
Point 32	364.4177	380
Point 33	381.0855	380.33726
Point 34	395.5929	380.71635
Point 35	416.8543	381.25666
Point 36	438.0487	382
Point 37	479.1653	383
Point 38	511.5499	383
Point 39	512.0826	382.82242
Point 40	513.8708	383
Point 41	531.0491	383
Point 42	533.1096	382.31347
Point 43	533.1107	382.31305
Point 44	536.5271	381.01628
Point 45	537.9265	380.70839
Point 46	547.5083	377.51565
Point 47	346.883	383
Point 48	493.5541	389
Point 49	363.3465	389
Point 50	371.2953	391.89686
Point 51	372.0119	391.98713
Point 52	372.2345	391.99514
Point 53	372.3208	392
Point 54	374.2156	392.05341
Point 55	419.4544	394.02388
Point 56	423.1399	394.1518
Point 57	476.0285	394.84323
Point 58	0	275.56112
Point 59	82.561	276.49127
Point 60	84.7322	276.34451
Point 61	123.7177	276.54438
Point 62	191.6961	277.65321
Point 63	430.1918	279.01879
Point 64	487.7086	279.639
Point 65	509.7138	279.55021

Point 66	721.9937	279.02461
Point 67	839	278.53365
Point 68	839	283.95091
Point 69	694.2381	280.02879
Point 70	505.5772	282.211
Point 71	487.7086	281.69555
Point 72	430.1918	282.66537
Point 73	247.1163	283.77931
Point 74	191.6961	282.79673
Point 75	123.7177	280.19493
Point 76	93.9325	281.10076
Point 77	61.0988	279.7585
Point 78	0	281.01485
Point 79	839	292.1407
Point 80	505.5772	286.98428
Point 81	487.7086	287.07159
Point 82	430.1918	289.73652
Point 83	247.1163	297.70175
Point 84	123.7177	292.05467
Point 85	94.7708	289.80875
Point 86	84.7322	289.65003
Point 87	82.561	289.66397
Point 88	38.9609	289.4325
Point 89	0	289.19587
Point 90	0	300.53803
Point 91	17.729	300.30563
Point 92	61.8788	299.93669
Point 93	191.626	301.3549
Point 94	247.1555	301.9218
Point 95	430.2162	304.83853
Point 96	487.7442	304.85433
Point 97	505.6491	305.27434
Point 98	509.7473	305.37466
Point 99	564.3735	305.25518
Point 100	839	303.47923
Point 101	839	306.47929
Point 102	564.3865	308.25516
Point 103	509.7138	308.37474
Point 104	505.5772	308.27348

Point 105	487.7086	307.85432
Point 106	430.1918	307.83852
Point 107	247.1163	304.92156
Point 108	191.6961	304.35577
Point 109	123.7177	308.23059
Point 110	93.9325	306.13974
Point 111	81.2213	307.4429
Point 112	61.5521	302.93952
Point 113	17.7611	303.30547
Point 114	0	303.53785
Point 115	839	315.0402
Point 116	797.6335	315.91598
Point 117	788.4831	316.10833
Point 118	751.3873	316.84226
Point 119	746.5947	316.94222
Point 120	742.0308	317.02756
Point 121	740.5664	317.15339
Point 122	740.3716	317.22293
Point 123	737.8797	317.29393
Point 124	718.0152	324.01292
Point 125	711.8056	325.93525
Point 126	706.0898	327.46147
Point 127	700.0454	333.50592
Point 128	694.499	330.73293
Point 129	691.9982	333.23326
Point 130	680.0323	333.54954
Point 131	679.8975	333.54516
Point 132	674.9116	331.05465
Point 133	672.911	331.05491
Point 134	672.1929	333.92615
Point 135	648.0416	332
Point 136	642.1238	328.67972
Point 137	637.4622	326.05461
Point 138	633.8287	324
Point 139	632.6094	323.29395
Point 140	630.3447	322
Point 141	556.3265	322
Point 142	544.3989	318.02536
Point 143	351.3575	313.67727

Point 144	171.7713	317.89042
Point 145	158.9451	319.66188
Point 146	146.7629	317.7643
Point 147	0	315.01616
Point 148	126.916	317.39267
Point 149	624.2673	344.64
Point 150	642.7896	345.19608
Point 151	639.8757	348.10995
Point 152	623.7369	347.62543
Point 153	543.8794	321.01441
Point 154	351.3589	316.67806
Point 155	172.0125	320.88559
Point 156	158.9189	322.69398
Point 157	146.5027	320.75996
Point 158	161.8204	329.91734
Point 159	162.0292	329.91734
Point 160	169.8774	325.99323
Point 161	172.2537	323.88076
Point 162	158.8927	325.72607
Point 163	146.2426	323.75561
Point 164	144.6459	323.72571
Point 165	157.0292	329.91734
Point 166	643.2531	345.21
Point 167	651.9258	349.55
Point 168	666.9304	350
Point 169	668.3508	349.29
Point 170	707.4035	333.53244
Point 171	710.6052	333.51008
Point 172	711.3189	333.31046
Point 173	713.7443	332.66283
Point 174	720.1721	330.67297
Point 175	739.1283	324.2612
Point 176	741.6802	324.18848
Point 177	742.0676	324.05019
Point 178	742.3962	324.02195
Point 179	746.7331	323.94086
Point 180	751.5295	323.84082
Point 181	788.6259	323.10687
Point 182	797.7821	322.91441

Point 183	839	322.03859
Point 184	704.3877	335.67695
Point 185	758.6353	353.74048
Point 186	806.6964	369.75012
Point 187	818.5728	368.55874
Point 188	839	375.2318
Point 189	623.3833	349.61571
Point 190	636.5766	350.01181
Point 191	637.9727	350.01292
Point 192	0	260
Point 193	839	260
Point 194	272	347
Point 195	284	352.96118
Point 196	296	359
Point 197	308.23444	365
Point 198	320	371
Point 199	332.39073	377

Regions

	Material	Points	Area (ft²)
Region 1	Waste Material	1,2,3,4,5	2,684.8
Region 2	NOT ACTIVE	6,7,8,9	409.18
Region 3	Waste Material	10,11,1,2	2,281.4
Region 4	Waste Material	10,11,12,13	2,317.2
Region 5	Waste Material	14,194,15,16,17,13,12,18	2,329.2
Region 6	Waste Material	19,195,194,14	1,941
Region 7	Waste Material	19,195,196,23	1,809.2
Region 8	Waste Material	23,196,197,25	1,658.6
Region 9	Waste Material	198,27,25,197	1,514.6
Region 10	Waste Material	28,199,198,27	1,370.1
Region 11	NOT ACTIVE	31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,28,199	960.66
Region 12	NOT ACTIVE	47,31,32,33,34,35,36,37,38,48,49	1,129
Region 13	NOT ACTIVE	49,50,51,52,53,54,55,56,57,48	563.69
Region 14	Deflection surface	58,59,60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76, 77,78	3,000.7
Region 15	Deflection surface	78,77,76,75,74,73,72,71,70,69,68,79,80,81,82,83,84,85,86, 87,88,89	7,768.6
Region 16	GC UNDRAINED	90,91,92,93,94,95,96,97,98,99,100,79,80,81,82,83,84,85,86 ,87,88,89	10,108

Region 17	GC-Overconsolidated-UNDRAINED	90,91,92,93,94,95,96,97,98,99,100,101,102,103,104,105,106,107,108,109,110,111,112,113,114	2,873.1
Region 18	Upper Till	114,113,112,111,110,109,108,107,106,105,104,103,102,101,115,116,117,118,119,120,121,122,123,124,125,126,127,128,129,130,131,132,133,134,135,136,137,138,139,140,141,142,143,144,145,146,147	9,788.5
Region 19	Structural Fill	8,147,148,9	390.2
Region 20	CCL	148,146,145,144,143,142,141,149,150,151,152,153,154,155,156,157,9	1,547.9
Region 21	Structural Fill	158,159,160,3,161,162,163,164,165	80.098
Region 22	Structural Fill	150,166,167,168,169,134,135,136,137,138,139,140,141,149	1,602.2
Region 23	NOT ACTIVE	127,170,171,172,173,174,175,176,177,178,179,180,181,182,183,115,116,117,118,119,120,121,122,123,124,125,126	957.6
Region 24	NOT ACTIVE	184,185,186,187,188,183,182,181,180,179,178,177,176,175,174,173,172,171,170,127	4,345.4
Region 25	Bottom Liner	157,9,6,164,163,162,161,3,4,5,1,11,12,18,189,190,191,151,152,153,154,155,156	1,423.6
Region 26	Deflection surface	58,192,193,67,66,65,64,63,62,61,60,59	15,370

Current Slip Surface

Slip Surface: 1,090
F of S: 1.651
Volume: 10,304.135 ft³
Weight: 1,202,866.8 lbs
Resisting Moment: 59,989,949 lbs-ft
Activating Moment: 36,339,175 lbs-ft
Resisting Force: 312,394.52 lbs
Activating Force: 189,284.39 lbs
F of S Rank: 1
Exit: (115.35447, 320.17657) ft
Entry: (371.6932, 377) ft
Radius: 124.66239 ft
Center: (220.46239, 451.20216) ft

Slip Slices

	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
Slice 1	117.64747	318.71931	-429.71335	987.07068	987.07068	1,000
Slice 2	123.42823	315.04549	172.49156	981.90685	486.34577	150
Slice 3	130.068	310.82575	449.67352	1,645.6338	718.60546	150

Slice 4	134.19975	308.19991	622.00713	2,140.5247	912.41741	150
Slice 5	137.3518	306.19671	751.42263	2,899.3318	509.61212	1,189.0952
Slice 6	141.70685	303.42896	927.84731	3,498.6138	537.84123	1,254.9618
Slice 7	144.26775	301.9363	1,022.8308	3,184.3044	442.78593	1,033.1667
Slice 8	145.44425	301.60817	1,044.7282	3,294.3237	448.12607	1,045.6269
Slice 9	146.37265	301.34924	1,061.9746	3,401.5622	453.43025	1,058.0039
Slice 10	146.6328	301.27668	1,066.8022	3,431.1436	454.864	1,061.35
Slice 11	147.31536	301.08631	1,079.4583	3,509.2005	458.60277	1,070.0734
Slice 12	152.44851	300.32944	1,133.5932	3,723.3027	302.35382	705.49278
Slice 13	157.98715	299.60059	1,186.4467	4,142.4978	314.59654	734.05863
Slice 14	160.38275	299.28535	1,209.2605	4,190.5567	315.40009	735.93378
Slice 15	161.9248	299.08242	1,223.9272	4,223.083	315.96578	737.25357
Slice 16	165.9533	298.5523	1,262.1273	4,033.5673	308.56885	719.99384
Slice 17	170.82435	297.9113	1,307.9859	3,792.9787	298.63317	696.81043
Slice 18	171.8919	297.77082	1,317.9733	3,739.7461	296.33355	691.44397
Slice 19	172.1331	297.73908	1,320.2269	3,727.8146	295.81149	690.22674
Slice 20	173.22355	297.59558	1,330.4037	3,671.9979	293.35537	684.49545
Slice 21	179.23435	296.8046	1,385.9395	4,008.9047	303.51347	708.19847
Slice 22	184.76325	296.07703	1,435.9434	4,431.3509	315.84727	736.97702
Slice 23	188.43861	295.78331	1,457.4683	4,595.6041	313.64424	731.8369
Slice 24	193.288	295.43414	1,482.7587	4,912.4799	322.11677	751.60641
Slice 25	195.6286	295.34552	1,490.1477	4,882.7563	320.54203	747.9314
Slice 26	202.3231	295.65188	1,480.2364	5,201.2032	329.55028	768.95042
Slice 27	209.90929	295.99905	1,468.9937	5,559.7979	339.05316	791.12318
Slice 28	215.70429	296.26424	1,460.3801	5,831.3377	345.85791	807.00211
Slice 29	223.18788	296.60672	1,449.1965	5,963.5716	349.22446	814.85571
Slice 30	229.70566	296.90499	1,439.3717	5,832.5064	346.3837	808.22801
Slice 31	233.96207	297.09977	1,432.8749	5,745.9556	344.47749	803.78155
Slice 32	237.551	297.26401	1,427.3025	5,796.4613	345.81528	806.90239
Slice 33	242.696	297.49946	1,419.0455	5,842.4732	347.09873	809.89573
Slice 34	246.20255	297.65818	1,413.1316	5,811.755	346.51066	808.52474
Slice 35	248.20535	297.65437	1,415.3449	5,963.9024	350.01318	816.69627
Slice 36	253.046	297.44376	1,433.9137	5,965.4786	349.62037	815.77978
Slice 37	260.6276	297.1139	1,463.9406	5,964.5991	348.90245	814.1075
Slice 38	268.2092	296.78404	1,494.4672	5,959.6467	348.07559	812.1763
Slice 39	275.58515	296.46313	1,524.4224	6,152.6049	351.83993	820.95952
Slice 40	281.58515	296.42469	1,559.8722	6,287.036	354.08735	826.20447
Slice 41	285.33698	296.60732	1,595.4753	6,451.2628	356.95021	832.8858
Slice 42	291.33698	297.23919	1,678.0637	6,551.1901	360.37962	840.88602

Slice 43	296.9761	297.92463	1,767.8995	6,755.1059	362.88969	846.74422
Slice 44	303.09332	299.45262	1,891.747	6,631.3761	379.58264	885.69237
Slice 45	312.08846	301.91847	2,031.5159	6,824.724	380.8645	888.68461
Slice 46	317.44398	304.5205	2,031.0675	5,428.343	584.87443	1,364.7077
Slice 47	319.47274	306.60873	1,968.854	5,239.4662	1,965.1821	150
Slice 48	323.44874	310.70128	1,787.0501	5,027.8208	1,947.2515	150
Slice 49	328.23353	315.62631	1,565.0691	5,017.8042	608.81035	1,000
Slice 50	329.64514	317.09361	1,497.8555	4,726.0159	569.21178	1,000
Slice 51	330.9287	318.65778	0	4,458.0799	1,618.5659	244.99208
Slice 52	332.26371	320.28465	0	4,067.6562	2,348.4624	0
Slice 53	333.92349	322.30729	0	3,937.3915	2,273.254	0
Slice 54	336.63817	325.78672	0	3,555.9764	2,053.0439	0
Slice 55	338.40744	328.19915	0	3,400.064	1,963.0278	0
Slice 56	341.19496	332	0	3,152.31	1,819.987	0
Slice 57	345.13907	337.37789	0	2,798.0749	1,615.4693	0
Slice 58	347.33925	340.37789	0	2,598.3468	1,500.1562	0
Slice 59	349.36424	343.13901	0	2,412.7346	1,392.993	0
Slice 60	351.53121	346.13901	0	2,166.8741	1,251.0454	0
Slice 61	354.20354	349.98508	0	1,908.402	1,101.8164	0
Slice 62	358.37246	355.98508	0	1,499.2944	865.61803	0
Slice 63	361.90689	361.07192	0	1,146.3062	661.82018	0
Slice 64	363.8821	363.91468	0	946.44427	546.42986	0
Slice 65	364.52695	364.84276	0	880.75007	508.50129	0
Slice 66	366.1314	367.15193	0	716.13775	413.46232	0
Slice 67	368.07472	370.15193	0	452.05728	260.99539	0
Slice 68	369.90907	373.62348	0	223.96777	129.30785	0
Slice 69	371.49425	376.62348	0	25.127102	14.507139	0

Figure 49 Stability for Section OP-1, Partially Drained Conditions, Waste Lift 10 2:1 slope

Waste Lift10 - 4th step pp

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File Information

Title: Model City - RMU-2 CP-20 Section OP-1
Comments: Operation Conditions for CP-20 Section 1 Based on Maximum Fill Rate of 50,000 Cu Yds per Quarter
Created By: Peter J. Carey
Last Edited By: Peter J. Carey
Revision Number: 513
File Version: 8.0
Tool Version: 8.0.10.6504
Date: 2/26/2013
Time: 5:16:38 PM
File Name: C20OP-1r1_variant.gsz
Directory: N:\Model_City\154.002_rmu2\154.005_revsions\geoslope\operational\
Last Solved Date: 2/26/2013
Last Solved Time: 6:24:18 PM

Project Settings

Length(L) Units: feet
Time(t) Units: Days
Force(F) Units: lbf
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D

Analysis Settings

Waste Lift10 - 4th step pp

Description: Undrained Strength based on 25% of fill time
Kind: SLOPE/W
Parent: WASTE LIFT 10 EL. 383
Method: Morgenstern-Price
Settings
- Side Function
  - Interslice force function option: Half-Sine
- Lambda
  - Lambda 1: -1
  - Lambda 2: -0.8
  - Lambda 3: -0.6
  - Lambda 4: -0.4
  - Lambda 5: -0.2
  - Lambda 6: 0
  - Lambda 7: 0.2

Lambda 8: 0.4
Lambda 9: 0.6
Lambda 10: 0.8
Lambda 11: 1
PWP Conditions Source: Parent Analysis
Slip Surface
Direction of movement: Right to Left
Use Passive Mode: No
Slip Surface Option: Entry and Exit
Critical slip surfaces saved: 1
Optimize Critical Slip Surface Location: Yes
Tension Crack
Tension Crack Option: (none)
F of S Distribution
F of S Calculation Option: Constant
Advanced
Number of Slices: 30
F of S Tolerance: 0.001
Minimum Slip Surface Depth: 15 ft
Optimization Maximum Iterations: 2,000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

Waste Material

Model: Mohr-Coulomb
Unit Weight: 111 pcf
Cohesion': 0 psf
Phi': 30 °
Phi-B: 0 °

Bottom Liner

Model: Shear/Normal Fn.
Unit Weight: 120 pcf
Strength Function: Baseliner
Phi-B: 0 °

CCL

Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 1,000 psf
Phi': 10 °
Phi-B: 0 °

Upper Till

Model: Mohr-Coulomb

Unit Weight: 125 pcf
Cohesion': 150 psf
Phi': 31 °
Phi-B: 0 °

Deflection surface

Model: Bedrock (Impenetrable)

Structural Fill

Model: Mohr-Coulomb
Unit Weight: 135 pcf
Cohesion': 1,000 psf
Phi': 45 °
Phi-B: 0 °

NOT ACTIVE

Model: (None)

GC UNDRAINED

Model: Shear/Normal Fn.
Unit Weight: 120 pcf
Strength Function: SHANSEP CONSOLIDATED UNDRAINED STATIC
Phi-B: 0 °
Anisotropic Strength Fn: clay ellipse staticshear

GC-Overconsolidated-UNDRAINED

Model: Shear/Normal Fn.
Unit Weight: 125 pcf
Strength Function: SHANSEP Over CONSOLIDATED UNDRAINED STATIC
Phi-B: 0 °
Anisotropic Strength Fn: clay ellipse staticshear

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (76.8668, 319.45558) ft
Left-Zone Right Coordinate: (171.8639, 324.99999) ft
Left-Zone Increment: 10
Right Projection: Range
Right-Zone Left Coordinate: (293.05266, 357.51679) ft
Right-Zone Right Coordinate: (399.9028, 380.82588) ft
Right-Zone Increment: 10
Radius Increments: 8

Slip Surface Limits

Left Coordinate: (63.808718, 319.21096) ft
Right Coordinate: (446.87317, 382.21462) ft

Anisotropic Strength Functions

clay ellipse staticshear

Model: Spline Data Point Function
Function: Modifier Factor vs. Inclination
Curve Fit to Data: 100 %
Segment Curvature: 50 %
Y-Intercept: 0.706
Data Points: Inclination (°), Modifier Factor
Data Point: (-60, 0.92608827)
Data Point: (-30, 0.92608827)
Data Point: (-17.838428, 0.83077031)
Data Point: (-3, 0.70608827)
Data Point: (3, 0.70608827)
Data Point: (23.685228, 0.82618324)
Data Point: (39.261389, 0.92608827)
Data Point: (59.397364, 0.92608827)

Shear/Normal Strength Functions

Baseliner

Model: Shear/Normal Spline Data Point Function
Function: Shear Stress vs. Normal Stress
Curve Fit to Data: 100 %
Segment Curvature: 100 %
Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
Data Point: (0, 0)
Data Point: (500, 235)
Data Point: (1,000, 463)
Data Point: (2,000, 899)
Data Point: (5,000, 2,057)
Data Point: (10,000, 3,515)
Data Point: (15,000, 4,430)
Estimation Properties
Intact Rock Param.: 10
Geological Strength: 100
Disturbance Factor: 0
SigmaC: 600,000 psf
SigmaC: 300,000 psf
Num. Points: 20

SHANSEP CONSOLIDATED UNDRAINED STATIC

Model: Add-In Function
Function: Shear Stress vs. Normal Stress
Assembly: GeoStudio AddIns1
Function: SHANSEPP
Field
MPP: 5000
m: 0.7

S: .34

Y-Intercept: -1.#IND

SHANSEP Over CONSOLIDATED UNDRAINED STATIC

Model: Add-In Function

Function: Shear Stress vs. Normal Stress

Assembly: GeoStudio AddIns1

Function: SHANSEPP

Field

MPP: 8000

m: 0.7

S: .34

Y-Intercept: -1.#IND

Points

	X (ft)	Y (ft)
Point 1	561.5172	329
Point 2	184.2753	329
Point 3	174.1934	323.83525
Point 4	351.3603	319.67886
Point 5	546.7523	324.07989
Point 6	139.5241	323.62981
Point 7	0	321.01609
Point 8	0	318.01563
Point 9	133.22	320.51124
Point 10	196.3072	335
Point 11	579.5227	335
Point 12	597.5282	341
Point 13	208.339	341
Point 14	608.5585	347
Point 15	240.1424	347
Point 16	234.9596	345.27685
Point 17	219.929	346.77965
Point 18	611.3486	345.60539
Point 19	596.5548	353
Point 20	258.1852	353
Point 21	250.6076	350.4794
Point 22	276.2227	359
Point 23	584.5511	359
Point 24	294.2603	365
Point 25	572.5474	365
Point 26	312.2978	371

Point 27	560.5437	371
Point 28	548.5399	377
Point 29	330.1036	377
Point 30	325.5389	375.4045
Point 31	337.8201	379.69712
Point 32	364.4177	380
Point 33	381.0855	380.33726
Point 34	395.5929	380.71635
Point 35	416.8543	381.25666
Point 36	438.0487	382
Point 37	479.1653	383
Point 38	511.5499	383
Point 39	512.0826	382.82242
Point 40	513.8708	383
Point 41	531.0491	383
Point 42	533.1096	382.31347
Point 43	533.1107	382.31305
Point 44	536.5271	381.01628
Point 45	537.9265	380.70839
Point 46	547.5083	377.51565
Point 47	346.883	383
Point 48	493.5541	389
Point 49	363.3465	389
Point 50	371.2953	391.89686
Point 51	372.0119	391.98713
Point 52	372.2345	391.99514
Point 53	372.3208	392
Point 54	374.2156	392.05341
Point 55	419.4544	394.02388
Point 56	423.1399	394.1518
Point 57	476.0285	394.84323
Point 58	0	275.56112
Point 59	82.561	276.49127
Point 60	84.7322	276.34451
Point 61	123.7177	276.54438
Point 62	191.6961	277.65321
Point 63	430.1918	279.01879
Point 64	487.7086	279.639
Point 65	509.7138	279.55021

Point 66	721.9937	279.02461
Point 67	839	278.53365
Point 68	839	283.95091
Point 69	694.2381	280.02879
Point 70	505.5772	282.211
Point 71	487.7086	281.69555
Point 72	430.1918	282.66537
Point 73	247.1163	283.77931
Point 74	191.6961	282.79673
Point 75	123.7177	280.19493
Point 76	93.9325	281.10076
Point 77	61.0988	279.7585
Point 78	0	281.01485
Point 79	839	292.1407
Point 80	505.5772	286.98428
Point 81	487.7086	287.07159
Point 82	430.1918	289.73652
Point 83	247.1163	297.70175
Point 84	123.7177	292.05467
Point 85	94.7708	289.80875
Point 86	84.7322	289.65003
Point 87	82.561	289.66397
Point 88	38.9609	289.4325
Point 89	0	289.19587
Point 90	0	300.53803
Point 91	17.729	300.30563
Point 92	61.8788	299.93669
Point 93	191.626	301.3549
Point 94	247.1555	301.9218
Point 95	430.2162	304.83853
Point 96	487.7442	304.85433
Point 97	505.6491	305.27434
Point 98	509.7473	305.37466
Point 99	564.3735	305.25518
Point 100	839	303.47923
Point 101	839	306.47929
Point 102	564.3865	308.25516
Point 103	509.7138	308.37474
Point 104	505.5772	308.27348

Point 105	487.7086	307.85432
Point 106	430.1918	307.83852
Point 107	247.1163	304.92156
Point 108	191.6961	304.35577
Point 109	123.7177	308.23059
Point 110	93.9325	306.13974
Point 111	81.2213	307.4429
Point 112	61.5521	302.93952
Point 113	17.7611	303.30547
Point 114	0	303.53785
Point 115	839	315.0402
Point 116	797.6335	315.91598
Point 117	788.4831	316.10833
Point 118	751.3873	316.84226
Point 119	746.5947	316.94222
Point 120	742.0308	317.02756
Point 121	740.5664	317.15339
Point 122	740.3716	317.22293
Point 123	737.8797	317.29393
Point 124	718.0152	324.01292
Point 125	711.8056	325.93525
Point 126	706.0898	327.46147
Point 127	700.0454	333.50592
Point 128	694.499	330.73293
Point 129	691.9982	333.23326
Point 130	680.0323	333.54954
Point 131	679.8975	333.54516
Point 132	674.9116	331.05465
Point 133	672.911	331.05491
Point 134	672.1929	333.92615
Point 135	648.0416	332
Point 136	642.1238	328.67972
Point 137	637.4622	326.05461
Point 138	633.8287	324
Point 139	632.6094	323.29395
Point 140	630.3447	322
Point 141	556.3265	322
Point 142	544.3989	318.02536
Point 143	351.3575	313.67727

Point 144	171.7713	317.89042
Point 145	158.9451	319.66188
Point 146	146.7629	317.7643
Point 147	0	315.01616
Point 148	126.916	317.39267
Point 149	624.2673	344.64
Point 150	642.7896	345.19608
Point 151	639.8757	348.10995
Point 152	623.7369	347.62543
Point 153	543.8794	321.01441
Point 154	351.3589	316.67806
Point 155	172.0125	320.88559
Point 156	158.9189	322.69398
Point 157	146.5027	320.75996
Point 158	161.8204	329.91734
Point 159	162.0292	329.91734
Point 160	169.8774	325.99323
Point 161	172.2537	323.88076
Point 162	158.8927	325.72607
Point 163	146.2426	323.75561
Point 164	144.6459	323.72571
Point 165	157.0292	329.91734
Point 166	643.2531	345.21
Point 167	651.9258	349.55
Point 168	666.9304	350
Point 169	668.3508	349.29
Point 170	707.4035	333.53244
Point 171	710.6052	333.51008
Point 172	711.3189	333.31046
Point 173	713.7443	332.66283
Point 174	720.1721	330.67297
Point 175	739.1283	324.2612
Point 176	741.6802	324.18848
Point 177	742.0676	324.05019
Point 178	742.3962	324.02195
Point 179	746.7331	323.94086
Point 180	751.5295	323.84082
Point 181	788.6259	323.10687
Point 182	797.7821	322.91441

Point 183	839	322.03859
Point 184	704.3877	335.67695
Point 185	758.6353	353.74048
Point 186	806.6964	369.75012
Point 187	818.5728	368.55874
Point 188	839	375.2318
Point 189	623.3833	349.61571
Point 190	636.5766	350.01181
Point 191	637.9727	350.01292
Point 192	0	260
Point 193	839	260
Point 194	272	347
Point 195	284	352.96118
Point 196	296	359
Point 197	308.23444	365
Point 198	320	371
Point 199	332.39073	377

Regions

	Material	Points	Area (ft²)
Region 1	Waste Material	1,2,3,4,5	2,684.8
Region 2	NOT ACTIVE	6,7,8,9	409.18
Region 3	Waste Material	10,11,1,2	2,281.4
Region 4	Waste Material	10,11,12,13	2,317.2
Region 5	Waste Material	14,194,15,16,17,13,12,18	2,329.2
Region 6	Waste Material	19,195,194,14	1,941
Region 7	Waste Material	19,195,196,23	1,809.2
Region 8	Waste Material	23,196,197,25	1,658.6
Region 9	Waste Material	198,27,25,197	1,514.6
Region 10	Waste Material	28,199,198,27	1,370.1
Region 11	Waste Material	31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,28,199	960.66
Region 12	NOT ACTIVE	47,31,32,33,34,35,36,37,38,48,49	1,129
Region 13	NOT ACTIVE	49,50,51,52,53,54,55,56,57,48	563.69
Region 14	Deflection surface	58,59,60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78	3,000.7
Region 15	Deflection surface	78,77,76,75,74,73,72,71,70,69,68,79,80,81,82,83,84,85,86,87,88,89	7,768.6
Region 16	GC UNDRAINED	90,91,92,93,94,95,96,97,98,99,100,79,80,81,82,83,84,85,86,87,88,89	10,108

Region 17	GC-Overconsolidated-UNDRAINED	90,91,92,93,94,95,96,97,98,99,100,101,102,103,104,105,106,107,108,109,110,111,112,113,114	2,873.1
Region 18	Upper Till	114,113,112,111,110,109,108,107,106,105,104,103,102,101,115,116,117,118,119,120,121,122,123,124,125,126,127,128,129,130,131,132,133,134,135,136,137,138,139,140,141,142,143,144,145,146,147	9,788.5
Region 19	Structural Fill	8,147,148,9	390.2
Region 20	CCL	148,146,145,144,143,142,141,149,150,151,152,153,154,155,156,157,9	1,547.9
Region 21	Structural Fill	158,159,160,3,161,162,163,164,165	80.098
Region 22	Structural Fill	150,166,167,168,169,134,135,136,137,138,139,140,141,149	1,602.2
Region 23	NOT ACTIVE	127,170,171,172,173,174,175,176,177,178,179,180,181,182,183,115,116,117,118,119,120,121,122,123,124,125,126	957.6
Region 24	NOT ACTIVE	184,185,186,187,188,183,182,181,180,179,178,177,176,175,174,173,172,171,170,127	4,345.4
Region 25	Bottom Liner	157,9,6,164,163,162,161,3,4,5,1,11,12,18,189,190,191,151,152,153,154,155,156	1,423.6
Region 26	Deflection surface	58,192,193,67,66,65,64,63,62,61,60,59	15,370

Current Slip Surface

Slip Surface: 1,090
F of S: 1.587
Volume: 11,115.196 ft³
Weight: 1,294,996.8 lbs
Resisting Moment: 66,445,302 lbs-ft
Activating Moment: 41,866,337 lbs-ft
Resisting Force: 331,280.61 lbs
Activating Force: 208,776.6 lbs
F of S Rank: 1
Exit: (114.71527, 320.16459) ft
Entry: (382.65113, 380.37817) ft
Radius: 130.13495 ft
Center: (224.46396, 457.88737) ft

Slip Slices

	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
Slice 1	117.06957	318.70848	-423.73888	1,003.0302	1,003.0302	1,000
Slice 2	123.16993	314.93547	191.30251	998.62577	485.08875	150
Slice 3	130.068	310.66909	473.19015	1,671.206	719.84053	150
Slice 4	134.1378	308.15197	639.37078	2,143.2737	903.63601	150
Slice 5	137.28985	306.20246	765.24168	2,899.0154	508.5367	1,186.5859

Slice 6	142.085	303.23671	952.25208	3,535.1125	538.52791	1,256.5649
Slice 7	145.29049	301.25415	1,075.0892	3,914.4389	554.04346	1,292.7668
Slice 8	145.95291	300.84445	1,100.2868	3,779.9576	391.84877	914.31328
Slice 9	146.10667	300.81595	1,102.2125	3,214.1202	283.95606	662.5639
Slice 10	146.37265	300.78178	1,104.6537	3,237.3622	284.79217	664.51495
Slice 11	151.76595	300.08879	1,153.86	3,706.8007	300.58041	701.35451
Slice 12	157.98715	299.28943	1,210.4032	4,182.956	314.62082	734.11515
Slice 13	160.38275	298.98162	1,232.1332	4,230.1285	315.42601	735.99482
Slice 14	161.9248	298.78348	1,246.0927	4,262.0978	315.99324	737.31847
Slice 15	165.9533	298.26586	1,282.3761	4,071.3487	308.66087	720.20928
Slice 16	170.82435	297.63998	1,325.792	3,829.4104	298.82646	697.2616
Slice 17	171.8919	297.50281	1,335.2341	3,775.9122	296.55262	691.95596
Slice 18	172.1331	297.47182	1,337.3643	3,763.9222	296.03693	690.7525
Slice 19	173.22355	297.33171	1,346.9833	3,707.8494	293.60964	685.08835
Slice 20	178.1168	296.70298	1,389.9024	3,957.7946	301.10756	702.58412
Slice 21	183.15775	296.10859	1,430.6924	4,271.6301	304.9254	711.49245
Slice 22	187.95065	295.72144	1,458.9226	4,595.6137	314.12086	732.94812
Slice 23	192.66211	295.34087	1,486.0613	4,911.2996	322.52391	752.55665
Slice 24	195.00271	295.31688	1,490.0785	4,860.389	319.90821	746.45358
Slice 25	198.22632	295.4644	1,485.5291	5,015.2646	324.37525	756.87507
Slice 26	204.24221	295.73971	1,477.0672	5,302.8001	332.30687	775.38252
Slice 27	210.52892	296.0274	1,468.2522	5,601.5041	340.10435	793.57742
Slice 28	214.71142	296.21881	1,462.3944	5,799.0547	345.04143	805.09728
Slice 29	218.31651	296.38379	1,457.3439	5,968.6286	349.15247	814.68858
Slice 30	223.68665	296.62954	1,449.8052	5,970.6757	349.37486	815.20753
Slice 31	231.20195	296.97346	1,439.1586	5,821.7191	346.13326	807.644
Slice 32	237.551	297.26401	1,429.9489	5,818.1834	346.26745	807.95774
Slice 33	243.81527	297.53409	1,421.4035	5,865.7368	347.58306	811.02788
Slice 34	251.57344	297.50783	1,432.0367	5,996.1389	350.37154	817.53265
Slice 35	259.74406	297.15234	1,465.1355	5,999.8073	349.69182	815.94797
Slice 36	267.91469	296.79686	1,499.0493	5,998.588	348.8767	814.04642
Slice 37	274.37536	296.51577	1,526.1981	6,128.0704	351.23882	819.55651
Slice 38	279.0853	296.31085	1,546.1516	6,387.9066	356.63363	832.14627
Slice 39	282.70995	296.23422	1,564.3972	6,456.2332	357.71156	834.65809
Slice 40	285.40746	296.28638	1,582.9757	6,584.3179	1,200.5407	3.8929125e-005
Slice 41	291.40746	296.80447	1,653.0319	6,660.2999	1,208.6077	0.00020958512
Slice 42	298.34312	297.54579	1,755.2992	6,920.3082	1,246.682	-3.5152446e-006
Slice 43	304.46033	298.6861	1,872.7908	6,858.5457	378.22976	882.53375
Slice 44	314.11722	300.96299	2,061.6158	7,101.7678	1,271.976	0.00017574175

Slice 45	321.66627	302.7429	2,177.5191	7,298.7787	1,292.445	0.00017856984
Slice 46	324.88434	304.66057	2,172.0268	5,782.8169	595.63017	1,389.8032
Slice 47	329.41343	309.11087	2,017.9331	5,442.8895	2,057.9214	150
Slice 48	333.42738	313.05498	1,848.9948	5,245.9668	2,041.1067	150
Slice 49	335.95541	315.53902	1,747.3198	5,403.6586	644.71119	1,000
Slice 50	337.63344	317.18786	0	5,101.6691	1,778.7869	313.77621
Slice 51	337.96609	317.51471	0	5,082.6745	1,774.302	311.63431
Slice 52	339.06441	318.80157	0	4,694.1613	1,679.2108	269.4279
Slice 53	342.61496	323.0645	0	4,057.7559	2,342.7465	0
Slice 54	346.04809	327.30223	0	3,628.7719	2,095.0724	0
Slice 55	347.09936	328.71022	0	3,538.8514	2,043.1568	0
Slice 56	349.55567	332	0	3,327.3952	1,921.0725	0
Slice 57	354.03556	338	0	2,937.933	1,696.2164	0
Slice 58	358.51544	344	0	2,542.5651	1,467.9506	0
Slice 59	361.57691	348.10028	0	2,268.9325	1,309.9688	0
Slice 60	362.87247	349.88263	0	2,093.2559	1,208.5419	0
Slice 61	363.8821	351.33534	0	1,997.4456	1,153.2258	0
Slice 62	364.71837	352.53862	0	1,917.9821	1,107.3475	0
Slice 63	367.11403	355.98562	0	1,689.3922	975.37103	0
Slice 64	370.25216	360.50094	0	1,386.9336	800.7465	0
Slice 65	371.6536	362.51741	0	1,250.452	721.94879	0
Slice 66	372.1232	363.1931	0	1,204.5106	695.42453	0
Slice 67	372.27765	363.41533	0	1,189.3771	686.68722	0
Slice 68	372.84989	364.23871	0	1,133.1902	654.24769	0
Slice 69	373.79729	365.60188	0	1,039.8863	600.37866	0
Slice 70	375.88228	368.60188	0	832.88865	480.86849	0
Slice 71	378.32015	372.10962	0	588.70124	339.88682	0
Slice 72	380.03133	375.10962	0	330.84361	191.01265	0
Slice 73	381.02841	377.11481	0	205.42764	118.6037	0
Slice 74	381.86831	378.80389	0	99.273947	57.31584	0

Appendix C-10

Fac Pond 5 Stability

NYSDEC OHMS Document No. 201469232-00007

APPENDIX C-10

RMU-2 FAC POND 5 STABILITY

PREPARED FOR

CWM

PREPARED BY

P.J. Carey & Associates, PC

September 14, 2009

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1 INTRODUCTION

1.1 SCOPE OF APPENDIX C-10

This appendix addresses the stability of the perimeter berm for FAC Pond 5. Subsurface conditions upon which the stability evaluation is based were developed as described in Appendix C-5. The FAC pond is to be lined and will contain liquid. Analyses were performed to demonstrate the stability of the proposed pond under a set of conservative assumptions

2 STABILITY ANALYSIS

2.1 GENERAL

The analysis performed in this appendix address the possibility of failures

- outward when the pond is full under both static and seismic conditions,
- inward when the pond is empty under static and seismic conditions, and
- rapid filling of pond prior to any consolidation .

2.2 SELECTION OF CROSS SECTIONS FOR ANALYSIS

2.2.1 SURFACE AND SUBSURFACE GEOMETRY

The manner in which the surface and subsurface geometry at RMU-2 was depicted is presented in Appendix C-5. The critical failure section for Fac Pond 5 was chosen to be along the south boundary of the basin where the piezometric surface is the highest in the GSS and the GC was assumed to be thick. No overconsolidated GC crust was assumed, which is a conservative assumption.

2.3 METHOD OF ANALYSIS

The analysis of all sections reported in this appendix was performed using Slope/W as part of the GEOStudio 2007 software package Version 7.14 under license from GEO-SLOPE International Ltd. This software allows flexibility in the description of shear strength under both drained and undrained conditions and a significant number of analytical methods to be used. Addins were utilized to allow the use of the normalized φ' and SHANSEP models for which parameters are described in Appendix A-1. The software also allows the use of anisotropic modifiers, which were applied to soils as described in Appendix A-1

All analyses presented in this report utilized Spencer's method with optimization to place the slide mass in both force and moment equilibrium.

2.3.1 STATIC CONDITIONS

The search for minimum factors of safety is dependent on the shape of the failure surface. At Fac Pond 5 the perimeter berm and liquid levels within the lined pond result in potential failure surfaces that do not extend to the base of the GC layer. Therefore, the GSS was modeled as a deflection surface, as described in Appendixes C-5, C-8 and C-9. The assignment of the deflection surface forces all potential failure surfaces generated that would normally have proceeded to pass into the GSS or LGT, which are much stronger materials, to deflect and remain in the GC layer or until they would normally move into the overlying strata. This greatly increased the number of failure surfaces analyzed that have lower factors of safety.

After the critical surface is found, a segmental technique in Slope/W called optimization is applied which segments the surface and methodically moves each point and probes for lower factors of safety. Then, the failure surface option that resulted in the lowest factors of safety, or most critical failure surface, was chosen. The deflection surface assignment also minimizes movement needed in the optimization portion of the analysis, increasing the probability that the failure surface with the minimum factor of safety is identified. Optimization was utilized for all static factor of safety analyses. The minimum factor of safety was found to result when the auto search, coupled with optimization was utilized.

Long term (drained) under filled conditions and short term rapid filling, assuming unconsolidated undrained shear strengths for the GC layer were evaluated

2.3.2 YIELD ACCELERATION DETERMINATION

The yield acceleration (k_y), defined as the horizontal acceleration that results in a factor of safety of unity for the potential failure surface having been found to have the lowest factor of safety under static conditions, was determined for each of cross sections analyzed for both failures passing through subgrade and those confined to the liner system and above. The surface having the minimum factor of safety was identified by performing a static analysis assigning consolidated undrained – seismic shear strengths to the GC materials. Once the failure surface was found, it was imported into a second analysis using the same strength parameters and a non-optimized sensitivity analysis against the horizontal acceleration was performed using the imported failure surface only. The results of the sensitivity to horizontal acceleration were examined and the acceleration resulting in a factor of safety of 1.00 was identified and reported as k_y.

2.4 PIEZOMETRIC HEAD ASSIGNMENTS

Piezometric heads were assigned based on a uniform head of elevation 315 in the GSS. This value was assigned to the GC layer and the UGT.

2.5 RESULTS

The results of the stability analyses are presented in Figures 2 through 6. Material assignments and soil strength parameters are provided on each figure. Given the large amount of information stored in the software, copies of reports depicting the geometry, material properties and critical failure surfaces that is generated for viewing by GeoStudio for the stability results are provided in electronic format on CD along with copies of the GeoStudio files. These files can be viewed directly by downloading a free viewer version of the software from the Geo-Slope Inc. website, www.geo-slope.com.

The results are summarized below in tabular form. As can be seen, all static factors of safety were quite high and yield accelerations (k_y) far exceed the peak ground acceleration (PGA) for the site. Given the high k_y values, no additional seismic analysis was warranted.

Failure Type	Factor of Safety	Figure
Full – Outward Drained	2.38	2
Empty- Inward Drained	2.12	3
Full Outward Yield Acceleration	0.5g	4
Empty - Inward Yield Acceleration	0.35g	5
Rapid Filling no Consolidation	1.98	6

3 CONCLUSIONS

Based on the evaluation of the stability under both static and seismic conditions for both empty and full pond levels it can be concluded that the proposed FAC Pond 5 geometry is stable.

NYSDEC OHMS Document No. 201469232-00007

FIGURES

CWM
MODEL CITY, NY

REVISION	DATE
1	
2	
3	
4	
5	

P. J. CAREY & ASSOCIATES, P.C.
5878 VALINE WAY, SUGAR HILL, GA. 30518

PROJ. NO.: 154.002
DATE: 10/31/2009
DESIGNED BY: PJC
DRAWN BY: PJC
CHECKED BY: PJC/KLH
APPROVED BY: PJC

FIGURE 1
FAC POND 5
STABILITY SECTION

RMU-2
GEOTECHICAL
EVALUATION

DRAWING

SHEET
OF 3

Project Desc.: Prototype Drawing for 24 x 36 Sheet Path: N:\Model_City\154.002_rmu2\drawings\prelim\rmu-2strata3.pro Plot Date/Time: Mon Aug 31,2009 / 18:27:22

Description: Model City - FAC Pond 5
Name: Long Term drained
Description: Drained Pond Full
File Name: N:\Model_City\154.002_rmu2\geoslope\FACPOND5.gsz
Last Saved Date: 8/31/2009
Analysis Method: Spencer
Optimization: Yes
Horizontal Acc (g) Value:
Ignore seismic load in strength: No
PWP Conditions Source: Piezometric Line

Region No.,Material No.
1, Liquid
2, Structural Fill
3, Upper Till
4, GC-Drained

Name: Upper Till Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion: 150 psf Phi: 31 °
Name: GC-Drained Model: Shear/Normal Fn. Unit Weight: 118 pcf Strength Function: normalized phi
Name: Structural Fill Model: Mohr-Coulomb Unit Weight: 128 pcf Cohesion: 195 psf Phi: 28.7 °
Name: Liquid Model: Undrained (Phi=0) Unit Weight: 63 pcf Cohesion: 0.0001 psf

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FIGURE2

Description: Model City - FAC Pond 5
Name: Long Term drained - Inward empty
Description: drained empty
File Name: N:\Model_City\154.002_rmu2\geoslope\FACPOND5.gsz
Last Saved Date: 8/31/2009
Analysis Method: Spencer
Optimization: Yes
Horizontal Acc (g) Value:
Ignore seismic load in strength: No
PWP Conditions Source: Piezometric Line

Region No.,Material No.
1, NOT ACTIVE
2, Structural Fill
3, Upper Till
4, GC-Drained

Name: Upper Till Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion: 150 psf Phi: 31 °
Name: GC-Drained Model: Shear/Normal Fn. Unit Weight: 118 pcf Strength Function: normalized phi
Name: Structural Fill Model: Mohr-Coulomb Unit Weight: 128 pcf Cohesion: 195 psf Phi: 28.7 °
Name: NOT ACTIVE Model: (None)

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FIGURE3

Description: Model City - FAC Pond 5
Name: CONSOLIDATED UNDRAINED-SEISMIC (2)
Description: CRITICAL SURFACE DETERMINATION
File Name: N:\Model_City\154.002_rmu2\geoslope\FACPOND5.gsz
Last Saved Date: 8/31/2009
Analysis Method: Spencer
Optimization: Yes
Horizontal Acc (g) Value: 0.01
Ignore seismic load in strength: Yes
PWP Conditions Source: Piezometric Line

Region No.,Material No.
1, Liquid
2, Structural Fill
3, Upper Till
4, GC Consolidated Undrained-Seismic

YIELD ACCELERATION

g	factor of safety
0.0500	2.1017197
0.1000	1.8773090
0.1500	1.6963433
0.2000	1.5481902
0.2500	1.4220333
0.3000	1.3164561
0.3500	1.2228316
0.4000	1.1424840
0.4500	1.0738557
0.5000	1.0109946
0.5500	0.9549824

Name: Upper Till Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion: 150 psf Phi: 31 °
Name: Structural Fill Model: Mohr-Coulomb Unit Weight: 128 pcf Cohesion: 195 psf Phi: 28.7 °
Name: GC Consolidated Undrained-Seismic Model: Shear/Normal Fn. Unit Weight: 120 pcf Strength Function: SHANSEPP-seismic
Name: Liquid Model: Undrained (Phi=0) Unit Weight: 63 pcf Cohesion: 0.0001 psf

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FIGURE4

Description: Model City - FAC Pond 5
Name: Consolidated Seismic - Inward empty (2)
Description: empty
File Name: N:\Model_City\154.002_rmu2\geoslope\FACPOND5.gsz
Last Saved Date: 8/31/2009
Analysis Method: Spencer
Optimization: Yes
Horizontal Acc (g) Value: 0.01
Ignore seismic load in strength: Yes
PWP Conditions Source: Piezometric Line

Region No.,Material No.
1, NOT ACTIVE
2, Structural Fill
3, Upper Till
4, GC Consolidated Undrained-Seismic

YIELD ACCELERATION

g	factor of safety
0.0500	1.9526233
0.1000	1.6971175
0.1500	1.5001978
0.2000	1.3438464
0.2500	1.2164822
0.3000	1.1111270
0.3500	1.0211061
0.4000	0.9458809
0.4500	0.8794991
0.5000	0.8225511
0.5500	0.7710369

Name: Upper Till Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion: 150 psf Phi: 31 °
Name: Structural Fill Model: Mohr-Coulomb Unit Weight: 128 pcf Cohesion: 195 psf Phi: 28.7 °
Name: NOT ACTIVE Model: (None)
Name: GC Consolidated Undrained-Seismic Model: Shear/Normal Fn. Unit Weight: 120 pcf Strength Function: SHANSEPP-seismic

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P.J. CAREY & ASSOCIATES, PC

FIGURE5

Description: Model City - FAC Pond 5
Name: Unconsolidated UNDRAINED-
Description: simulation of instantaneous filling
File Name: N:\Model_City\154.002_rmu2\geoslope\FACPOND5.gsz
Last Saved Date: 8/31/2009
Analysis Method: Spencer
Optimization: Yes
Horizontal Acc (g) Value:
Ignore seismic load in strength: No
PWP Conditions Source: Piezometric Line

Region No.,Material No.
1, Liquid
2, Structural Fill
3, Upper Till
4, Unconsolidate Undrained GC

Name: Upper Till Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion: 150 psf Phi: 31 °
Name: Unconsolidate Undrained GC Model: Undrained (Phi=0) Unit Weight: 118 pcf Cohesion: 600 psf
Name: Structural Fill Model: Mohr-Coulomb Unit Weight: 128 pcf Cohesion: 195 psf Phi: 28.7 °
Name: Liquid Model: Undrained (Phi=0) Unit Weight: 63 pcf Cohesion: 0.0001 psf

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FIGURE6

Appendix D

Geosynthetic Calculations

Appendix D-1

Geotextile Design

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Infrastructure, environment, buildings

Imagine the result

Calculation Sheet

Client: **CWM Chemical Services, LLC**

Project Location: **Model City, New York**

Project: **RMU-2 Design Calculations** **Project No.:** **B0023725.2009**

Subject: **Appendix D-1: Geotextile Design**

Prepared By: **BMS** **Date:** **August 2009**

Reviewed By: **BMS** **Date:** **August 2009**

Checked By: **PHB** **Date:** **August 2009**

OBJECTIVE:

Determine the required physical properties for geotextiles functioning as a separator underlying the operations layer, and as a cushion under the geosynthetic clay liner in the RMU-2 liner system.

REFERENCES:

1. *Designing with Geosynthetics*, Fourth Addition, Koerner, R.M., Prentice-Hall, Inc., 1998. (Applicable sections attached)

2. *Soil Mechanics*, Fifth Edition, Craig, R.F., Chapman & Hall, Inc., 1992.

3. RMU-2 Specification Section 02210, entitled "Earthworks."

4. "Geotextile Specification for Highway Applications," AASHTO Designation: M 288-05, AASHTO, January 2006.

ASSUMPTIONS:

1. Based on the gradation of the operations layer material provided in Reference 3 and previous materials testing performed on operations layer material during the construction of RMU-1, the following effective sizes are assumed:

   D_{10} = 0.31 mm
   D_{85} = 2.67 mm

2. Moderate survivability is required for the separator geotextile as defined in Reference 4.

CALCULATIONS:

1. Separator Geotextile Underlying the Operations Layer

A geotextile between the operations layer and the primary leachate collection system must provide for separation of the two layers without limiting the flow of leachate into the leachate collection system. The main properties to be determined for this geotextile are flow characteristics (permittivity), soil retention (apparent opening size), and survivability (strength).

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Imagine the result

Calculation Sheet

Flow Characteristics:

Estimate the hydraulic conductivity of the operations layer using equation 2.3 from Reference 2:

k (m/s) = $(1 \times 10^{-2})\ (D_{10})^2$, where D_{10} is the effective grain size in mm.

$k = (1 \times 10^{-2})\ (0.31)^2$
$k = 9.6 \times 10^{-4}$ m/s
$k = 9.6 \times 10^{-2}$ cm/s

Determine the vertical flowrate per unit area through the operations layer using Darcy's Law:

Q = kiA

where i = 1 for vertical flow and saturated conditions
A = 1 cm^2

$Q = (9.6 \times 10^{-2}$ cm/sec) (1) (1 cm^2)
$Q = 9.6 \times 10^{-2}$ cm^3/sec

Determine the required geotextile permittivity (Θ) based on the vertical flowrate through the operations layer material using equation 2.16 from Reference 1:

$\Theta_{req} = Q / (h)\ (A)$

where h = Allowable head loss over geotextile
≅ 10% of total head (assumed)
= 10% of 30 cm (1 ft)
= 3 cm
A = 1 cm^2

$\Theta_{req} = (9.6 \times 10^{-2}\ cm^3/s) / (3\ cm)\ (1\ cm^2)$
$\Theta_{req} = 3.2 \times 10^{-2}\ sec^{-1}$

Using a minimum factor of safety (F.S.) of 3, the minimum permittivity of the geotextile underlying the operations layer is:

F.S. = $\Theta_{min} / \Theta_{req}$
Θ_{min} = (F.S.) (Θ_{req})
$\Theta_{min} = (3)\ (3.2 \times 10^{-2}\ sec^{-1})$
$\Theta_{min} = 9.6 \times 10^{-2}\ sec^{-1}$

Soil Retention:

For a non-woven geotextile, the maximum apparent opening size (AOS) should be 2 or 3 times the D_{85} of the soil/granular layer having the potential to migrate into the geotextile (Reference 1, Equation 2.9). For the purposes of this calculation, the AOS is assumed to be $2D_{85}$, which is more conservative than $3D_{85}$. Therefore the maximum allowable AOS is as follows:

$AOS = 2\ D_{85}$

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Imagine the result

Calculation Sheet

AOS_{max} = (2) (2.67)
AOS_{max} = 5.34 mm

Reference 1 also presents another method, set forth by AASHTO, to determine AOS. For this second method, a maximum AOS of 0.60 mm is recommended for geotextiles used in conjunction with soil having less than or equal to 50 percent passing the No. 200 sieve. As indicated in Assumption 1, the operations layer material meets this criteria because the D_{10} size is equivalent to a No. 50 sieve.

As a third AOS design basis, Reference 4 indicates a maximum allowable AOS of 0.43 mm for geotextiles used in conjunction with soil having less than 15 percent passing the No. 200 sieve.

Considering these three methods, the maximum allowable AOS for the separator geotextile beneath the operations layer is 0.43 mm, based on the most stringent of the three design methods presented above.

Survivability:

The following properties are required for moderate survivability (Reference 4):

Grab Strength (minimum) = 157 lbs.
Tear Strength (minimum) = 56 lbs.
CBR Puncture Strength (minimum) = 309 lbs.

2. Cushion Geotextile Underlying the Geosynthetic Clay Liner

A cushion geotextile between the secondary drainage layer and the primary geosynthetic clay liner (GCL) protects the GCL from damage from the granular layer in the secondary leachate collection system. The required weight of the non-woven cushion geotextile is determined using a procedure presented in Reference 1 for designing cushion geotextile layers to protect geomembranes from puncture. The procedure has been recommended by leading GCL manufacturers for the design of cushion geotextile layers to protect GCLs from puncture as well. The equation from Reference 1 is as follows:

$$p_{all} = \left(50 + 0.00045\frac{M}{H^2}\right) \times \left(\frac{1}{MF_S \times MF_{PD} \times MF_A}\right) \times \left(\frac{1}{RF_{CR} \times RF_{CBD}}\right)$$

where, p_{all} = allowable pressure on GCL [kpa] = p_{act} x FS (see below)
M = cushion geotextile mass per unit area [g/m^2]
H = protrusion height [m] = max particle size = 0.5 inch = 0.0127 m (Reference 3)
MF_S = modification factor for protrusion shape = 0.5 (subangular and subrounded)
MF_{PD} = modification factor for packing density = 0.5
MF_A = modification factor for soil arching = 1.0 (soil arching neglected, conservative)
RF_{CR} = reduction factor for geotextile creep = 1.3 (assuming 16 oz geotextile and 0.5 inch protrusion height)
RF_{CBD} = reduction factor for chemical and biological degradation = 1.5 (harsh leachate)

The allowable pressure on the GCL is calculated as the worst-case actual pressure on the GCL (beneath the location of the greatest waste thickness) multiplied by a minimum factor of safety (FS) of 4.5 (based on 0.5 inch protrusion height). The pressure on the GCL is due to approximately 124 feet of waste (111 pcf unit weight) and 4.5 feet of liner and final cover system material (130 pcf unit weight):

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Calculation Sheet

P_{all} = (4.5)[(124 ft)(111 pcf)+(4.5 ft)(130 pcf)] = 64,571 psf = 3,092 kpa

Solving the preceding equation for M,

M = 522 g/m^2 = 15.4 oz/yd^2

Based on material availability, a 16 oz/yd^2 non-woven geotextile will be used as a cushion layer beneath the GCL.

SUMMARY*:*

A separator geotextile with the following physical properties is required under the operations layer:

Θ (minimum) = 9.6×10^{-2} sec^{-1}
AOS (maximum) = 0.43 mm
Grab Strength (minimum) = 157 lbs.
Tear Strength (minimum) = 56 lbs.
CBR Puncture Strength (minimum) = 309 lbs.

A cushion geotextile with a minimum unit weight of 16 oz/ yd^2 is required under the GCL.

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Attachment 1

References

BBL Library
BBL
BLASLAND, BOUCK & LEE, INC.
engineers, scientists, economists
00008857

DESIGNING WITH GEOSYNTHETICS

FIFTH EDITION

ROBERT M. KOERNER

Soil Retention. For the required flow of liquid to be allowed through the geotextile, the void spaces in it must be sufficiently large. There is, however, a limit—that being when the upstream soil particles start to pass through the geotextile voids along with the flowing liquid. This can lead to an unacceptable situation called *soil piping*, in which soil particles are carried through the geotextile, leaving unstable soil voids behind. The velocity of the liquid then increases, accelerating the process, until the upstream soil structure begins to collapse. This collapse often leads to small sinkhole-type patterns that grow larger with time.

This process is prevented by making the geotextile voids tight enough to retain the soil on the upstream side of the fabric. It is the coarser soil fraction that must be initially retained and that is the targeted soil size in the design process. These coarser-sized particles eventually block the finer-sized particles and build up a stable upstream soil structure. Fortunately, filtration concepts are well established in the design of soil filters, and those same ideas will be used to design an adequate geotextile filter.

There are many formulas that can be applied to soil-retention design, most of which use the soil particle size characteristics and compare them to the 95% opening size of the geotextile—i.e., defined as O_{95} of the geotextile. The test method used in the United States to determine this value is called the *apparent opening size* (AOS) and is obtained using a dry-sieving method. In Europe and Canada, the test method is called *filtration opening size* (FOS), and it is accomplished by wet or hydrodynamic sieving. Both of these latter methods are preferable to the dry-sieving method used in the United States.

The simplest of the design procedures examines the percentage of soil passing the No. 200 sieve, whose openings are 0.074 mm. According to AASHTO [4], the following is recommended:

- For soil with ≤50% passing the No. 200 sieve: $O_{95} < 0.60$ mm—i.e., AOS of the fabric ≥ No. 30 sieve.
- For soil >50% passing the No. 200 sieve: $O_{95} < 0.30$ mm—i.e., AOS of the fabric ≥ No. 50 sieve.

Beginning in 1972, a series of direct comparisons of geotextile-opening size (O_{95}, O_{50}, or O_{15}) was made in ratio form to some soil particle size to be retained (d_{90}, d_{85}, d_{50}, or d_{15}; see Christopher and Fischer [3]). The numeric value of the ratio depends upon the geotextile type, soil type, flow regime, etc. For example, Carroll [5] recommends the following:

$$O_{95} < (2 \text{ or } 3)\, d_{85} \tag{2.9}$$

where d_{85} is the soil particle size in mm, for which 85% of the total soil is finer.

In contrast to the simplified methods above, a more comprehensive approach toward soil retention criteria is given in Figure 2.4(a) and (b), for steady-state and dynamic flow conditions, respectively (Luettich et al. [6]). To utilize the figures, we must first characterize the upstream soil. A grain-size distribution, along with Atterberg limits and dispersivity characteristics for the fine fraction, are necessary. An example illustrates the use of each of the figures.

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Example 5.18

Obtain the required thickness of a smooth HDPE primary geomembrane beneath a 50 m high landfill containing solid waste of unit weight 12.5 kN/m^3. The localized subsoil settlement is estimated to result in a liner deformation angle of 20°. Drainage sand is above the geomembrane and a geonet is below it.

Solution: The necessary information for solving the design equation is

(a) For out-of-plane tension testing, the yield-stress of HDPE (from Table 5.5c) is conservatively estimated as 20,000 kPa.

(b) The mobilization distance for HDPE at 50 × 12.5 = 625 kPa (from Figure 5.10a) is approximately 80 mm.

(c) The friction angle (from Table 5.7) for smooth HDPE against Ottawa sand (δ_U) is 18°.

(d) The friction angle for HDPE against a geonet (separate test results) (δ_L) is 10°.

(e) These values give the required geomembrane thickness:

$$t = \frac{(625)(0.080)[\tan 18 + \tan 10]}{(20{,}000)[\cos 20 - (\sin 20)(\tan 10)]}$$

$$= \frac{25.1}{17600}$$

$$= 0.00143 \text{ m}$$

$$t = 1.43 \text{ mm}$$

Thus the regulated values of 1.5 mm in the United States or 2.0 mm in compliance with German regulations would control in this situation. Furthermore, the regulated values would be used since they also exceed the *very high* survivability value in Table 5.13 of 1.00 mm thickness.

5.6.7 Puncture Protection

There are many circumstances where geomembranes are placed on or beneath soils containing relatively large-sized stones — for example, poorly prepared clay soil subgrades with stones protruding from the surface or resting on the surface, soil subgrades over which geomembranes (particularly textured) have been dragged dislodging near-surface stones, and all cases where gravel drainage layers are placed above the geomembrane. All of these situations, particularly the last (which is unavoidable since it is a design situation), should use a protective geotextile to avoid puncturing of the geomembrane. Note that if the soil subgrade is a CCL, a geotextile cannot be used and the isolated stones must be physically removed. For the drainage layer case, which is common to all landfills, a nonwoven needle-punched geotextile can provide excellent puncture protection (recall Figure 5.8). However, the issue of required mass per unit area of the geotextile becomes critical.

In a series of papers, Wilson-Fahmy, Narejo and Koerner [76, 77, 78] have presented a design method that focuses on the protection of 1.5 mm thick HDPE geomembranes. The method uses the conventional factor of safety equation:

$$\text{FS} = \frac{p_{\text{allow}}}{p_{\text{reqd}}} \tag{5.32}$$

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where

FS = factor of safety (against geomembrane puncture),
p_{reqd} = required pressure due to the landfill contents (or surface impoundment), and
p_{allow} = allowable pressure using different types of geotextiles and site-specific conditions

Based on a large number of ASTM 5514 experiments, an empirical relationship for p_{allow} has been obtained, as shown in equation (5.33). It requires the use of modification factors and reduction factors as given in Table 5.18. Note that in Table 5.18 all MF values ≤1.0 and all RF values ≥1.0.

$$p_{allow} = \left(50 + 0.00045\frac{M}{H^2}\right)\left[\frac{1}{MF_S \times MF_{PD} \times MF_A}\right]\left[\frac{1}{RF_{CR} \times RF_{CBD}}\right] \tag{5.33}$$

where

p_{allow} = allowable pressure (kPa),
M = geotextile mass per unit area (g/m^2),
H = protrusion height (m),

TABLE 5.18 MODIFICATION FACTORS AND REDUCTION FACTORS FOR GEOMEMBRANE PROTECTION DESIGN USING NONWOVEN NEEDLE-PUNCHED GEOTEXTILES

Modification Factors (all ≤ 1.0)

MF_s		MF_{PD}		MF_A	
Angular	1.0	Isolated	1.0	Hydrostatic	1.0
Subrounded	0.5	Dense, 38 mm	0.83	Geostatic, shallow	0.75
Rounded	0.25	Dense, 25 mm	0.67	Geostatic, mod.	0.50
		Dense, 12 mm	0.50	Geostatic, deep	0.25

Reduction Factors (all ≥ 1.0)

RF_{CBD}		RF_{CR}			
		Mass per Unit Area (gm/m^2)	Protrusion Height (mm)		
			38	25	12
Mild leachate	1.1	Geomembrane alone	N/R	N/R	N/R
Moderate leachate	1.3	270	N/R	N/R	>1.5
Harsh leachate	1.5	550	N/R	1.5	1.3
		1100	1.3	1.2	1.1
		>1100	≅1.2	≅1.1	≅1.0

Abbreviations: N/R = not recommended

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MF_S = modification factor for protrusion shape,
MF_{PD} = modification factor for packing density,
MF_A = modification factor for arching in solids,
RF_{CR} = reduction factor for long-term creep, and
RF_{CBD} = reduction factor for long-term chemical/biological degradation.

The situation can be approached from a given mass per unit area geotextile to determine the unknown FS value, or from an unknown mass per unit area geotextile and a given FS value. Example 5.19 uses the latter approach.

Example 5.19

Given a coarse-gravel (subrounded with d_{50} = 38 mm) leachate collection layer to be placed on a 1.5 mm HDPE geomembrane under a 50 m high landfill, what geotextile mass per unit area is necessary for a FS value of 3.0? Assume that the solid waste weighs 12 kN/m^3.

Solution: Use H = 25 mm = 0.025 m, which is an estimate since the gravel particles are not isolated but are adjacent to one another, MF_S = 0.5 for shape, MF_{PD} = 0.83 for packing density, MF_A = 0.25 for arching RF_{CR} = 1.5 for creep and RF_{CBD} = 1.3 for long-term degradation Now calculate the value of P_{allow} using equation (5.32):

$$FS = p_{allow} p_{reqd}$$
$$3.0 = p_{allow}(50)(12)$$
$$p_{allow} = 1800 \text{ kN/m}^2$$

Calculate the required mass per unit area of the geotextile using equation (5.33):

$$p_{allow} = \left(50 + 0.00045\frac{M}{H^2}\right)\left[\frac{1}{MF_S \times MF_{PD} \times MF_A}\right]\left[\frac{1}{FS_{CR} \times FS_{CBD}}\right]$$
$$1800 = \left[50 + 0.00045\frac{M}{(0.025)^2}\right]\left[\frac{1}{0.5 \times 0.83 \times 0.25}\right]\left[\frac{1}{1.5 \times 1.3}\right]$$
$$M = 436 \text{ g/m}^2\text{; use } 500 \text{ g/m}^2$$

The isolated value of 50 kPa in the above equation represents the puncture resistance of the 1.5 mm HDPE geomembranes by itself. Other thicknesses of HDPE or other types of geomembranes will give proportionately different values.

5.6.8 Runout and Anchor Trenches

The terminus of geomembranes is a short horizontal runout at the top of the slope (recall Figure 5.27), and then (usually) a short drop into an anchor trench (recall Figure 5.28). The anchor trench is backfilled with soil and suitably compacted. Concrete anchor trenches with full fixity to the liner should generally not be used since geomembrane pullout is probably more desirable than geomembrane failure, although both should obviously be avoided.

The design method is explained and illustrated in Section 5.3.6 and will not be repeated here. Both analyses (runout alone and runout plus anchor trench) are applicable, with the latter being the most common. Alternatively, a V-trench configuration is also possible.

AASHTO M288-95
Effective Jan 2006

NYSDEC OHMS Document No. 201469232-00007

Standard Specification for

Geotextile Specification for Highway Applications

AASHTO Designation: M 288-05

1. SCOPE

1.1. This is a materials specification covering geotextile fabrics for use in subsurface drainage; separation; stabilization; erosion control; temporary silt fence; and paving fabrics. This is a material purchasing specification and design review of use is recommended.

1.2. This specification sets forth a set of physical, mechanical and endurance properties that must be met, or exceeded, by the geotextile being manufactured.

1.3. In tbe context of quality systems and management, this specification represents a manufacturing quality control (MQC) document. However, its general use is essentially as a recommended design document.

1.4. This specification is intended to assure both good quality and performance of geotextiles used as listed in Section 1.1, but is possibly not adequate for the complete specification in a specific situation. Additional tests, or more restrictive values for the tests indicated, may be necessary under conditions of a particular application.

1.5. This is not a construction or design specification. This specification is based on geotextile survivability from installation stresses. Refer to Appendix A of this specification for geotextile construction guidelines.

2. REFERENCED DOCUMENTS

2.1. *AASHTO Standards*:

- T 88, Particle Size Analysis of Soils
- T 90, Determining the Plastic Limit and Plasticity Index of Soils
- T 99, Moisture-Density Relations of Soils Using a 2.5-kg (5.5-lb) Rammer and a 305-mm (12-in.) Drop

2.2. *ASTM Standards*:[1]

- D 123, Standard Terminology Relating to Textiles
- D 276, Test Methods for Identification of Fibers in Textiles
- D 4354, Practice for Sampling of Geosynthetics for Testing
- D 4355, Test Method for Deterioration of Geotextiles from Exposure to Ultraviolet Light and Water (Xenon-Arc Type Apparatus)
- D 4439, Terminology for Geosynthetics
- D 4491, Test Methods for Water Permeability of Geotextiles by Permittivity

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8.3. *Separation Requirements*:

8.3.1. *Description*—This specification is applicable to the use of a geotextile to prevent mixing of a subgrade soil and an aggregate cover material (subbase, base, select embankment, etc.). This specification may also apply to situations other than beneath pavements where separation of two dissimilar materials is required, but where water seepage through the geotextile is not a critical function.

8.3.2. The separation application is appropriate for pavement structures constructed over soils with a California Bearing Ratio equal to or greater than 3 (CBR ≥ 3) (shear strength greater than approximately 90 kPa). It is appropriate for unsaturated subgrade soils. The primary function of a geotextile in this application is separation.

8.3.3. *Geotextile Requirements*—The geotextile shall meet the requirements of Table 3. All numeric values in Table 3 except AOS represent MARV in the weakest principal direction. Values for AOS represent maximum average roll values.

Table 3—Separation Geotextile Property Requirements

	Test Methods	Units	Requirements
Geotextile class			See Table 4
Permittivity	ASTM D 4491	sec^{-1}	0.02[a]
Apparent opening size	ASTM D 4751	mm	0.60 max avg roll value
Ultraviolet stability (retained strength)	ASTM D 4355	%	50% after 500 b of exposure

[a] Default value. Permittivity of the geotextile should be greater than that of the soil ($\Psi_g > \Psi_s$). The engineer may also require the permeability of the geotextile to be greater than that of the soil ($k_g > k_s$).

Table 4—Required Degree of Survivability as a Function of Subgrade Conditions, Construction Equipment and Lift Thickness (Class 1, 2, and 3 properties are given in Table 1; Class 1 + properties are higher than Class 1, but not defined at this time)[a]

	Low ground-pressure equipment ≤ 25 kPa (3.6 psi)	Medium ground-pressure equipment > 25 to ≤ 50 kPa (>3.6 to ≤ 7.3 psi)	High ground-pressure equipment > 50 kPa (> 7.3 psi)
Subgrade has been cleared of all obstacles except grass, weeds, leaves, and fine wood debris. Surface is smooth and level so that any shallow depressions and humps do not exceed 450 mm (18 in.) in depth or height. All larger depressions are filled. Alternatively, a smooth working table may be placed.	Low (Class 3)	Moderate (Class 2)	High (Class 1)
Subgrade has been cleared of obstacles larger than small to moderate-sized tree limbs and rocks. Tree trunks and stumps should be removed or covered with a partial working table. Depressions and bumps should not exceed 450 mm (18 in.) in depth or height. Larger depressions should be filled.	Moderate (Class 2)	High (Class 1)	Very High (Class 1+)
Minimal site preparation is required. Trees may be felled, delimbed, and left in place. Stumps should be cut to project not more than ±150 mm (±6 in.) above subgrade. Geotextile may be draped directly over the tree trunks, stumps, large depressions and humps, holes, stream channels, and large boulders. Items should be removed only if placing the geotextile and cover material over them will distort the finished road surface.	High (Class 1)	Very high (Class 1+)	Not recommended

[a] Recommendations are for 150 to 300 mm (6 to 12 in.) initial lift thickness. For other initial lift thicknesses:
300 to 450 mm (12 to 18 in.): reduce survivability requirement one level;
450 to 600 mm (18 to 24 in.): reduce survivability requirement two levels;
> 600 mm (24 in.): reduce survivability requirement three levels
For special construction techniques such as prerutting, increase the geotextile survivability requirement one level. Placement of excessive initial cover material thickness may cause bearing failure of the soft subgrade.

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Table 1—Geotextile Strength Property Requirements

			Geotextile Class[a,b]					
			Class 1		Class 2		Class 3	
	Test Methods	Units	Elongation <50%[c]	Elongation ≥50%[c]	Elongation <50%[c]	Elongation ≥50%[c]	Elongation <50%[c]	Elongation ≥50%[c]
Grab strength	ASTM D 4632	N	1400	900	1100	700	800	500
Sewn seam strength[d]	ASTM D 4632	N	1260	810	990	630	720	450
Tear strength	ASTM D 4533	N	500	350	400[e]	250	300	180
Puncture strength	ASTM D 6241	N	2750	1925	2200	1375	1650	990
Permittivity	ASTM D 4491	sec^{-1}	Minimum property values for permittivity, AOS, and UV stability are based on geotextile application. Refer to Table 2 for subsurface drainage, Table 3 and Table 4 for separation, Table 5 for stabilization, and Table 6 for permanent erosion control.					
Apparent opening size	ASTM D 4751	mm						
Ultraviolet stability (retained strength)	ASTM D 4355	%						

[a] Required geotextile class is designated in Tables 2, 3, 4, 5, or 6 for the indicated application. The severity of installation conditions for the application generally dictates the required geotextile class. Class 1 is specified for more severe or harsh installation conditions where there is a greater potential for geotextile damage, and Classes 2 and 3 are specified for less severe conditions.

[b] All numeric values represent MARV in the weaker principal direction. (See Section 8.1.2.)

[c] As measured in accordance with ASTM D 4632.

[d] When sewn seams are required. Refer to Appendix for overlap seam requirements.

[e] The required MARV tear strength for woven monofilament geotextiles is 250 N.

Table 2—Subsurface Drainage Geotextile Requirements

			Requirements, Percent *in Situ* Soil Passing 0.075 mm[a]		
	Test Methods	Units	<15	15 to 50	>50
Geotextile class			Class 2 from Table 1[b]		
Permittivity[c,d]	ASTM D 4491	sec^{-1}	0.5	0.2	0.1
Apparent opening size[c,d]	ASTM D 4751	mm	0.43 max avg roll value	0.25 max avg roll value	0.22[e] max avg roll value
Ultraviolet stability (retained strength)	ASTM D 4355	%	50% after 500 h of exposure		

[a] Based on grain size analysis of *in situ* soil in accordance with T 88.

[b] Default geotextile selection. The Engineer may specify a Class 3 geotextile from Table 1 for trench drain applications based on one or more of the following:

1. The engineer has found Class 3 geotextiles to have sufficient survivability based on field experience.
2. The engineer has found Class 3 geotextiles to have sufficient survivability based on laboratory testing and visual inspection of a geotextile sample removed from a field test section constructed under anticipated field conditions.
3. Subsurface drain depth is less than 2 m; drain aggregate diameter is less than 30 mm; and compaction requirement is less than 95 percent of T 99.

[c] These default filtration property values are based on the predominant particle sizes of *in situ* soil. In addition to the default permittivity value, the engineer may require geotextile permeability and/or performance testing based on engineering design for drainage systems in problematic soil environments.

[d] Site specific geotextile design should be performed especially if one or more of the following problematic soil environments are encountered: unstable or highly erodible soils such as non-cohesive silts; gap graded soils; alternating sand/silt laminated soils; dispersive clays; and/or rock flour.

[e] For cohesive soils with a plasticity index greater than seven, geotextile maximum average roll value for apparent opening size is 0.30 mm.

8.2.3. The property values in Table 2 represent default values that provide sufficient geotextile survivability under most construction conditions. Note b of Table 2 provides for a reduction in the minimum property requirements when sufficient survivability information is available. The engineer may also specify properties different from that listed in Table 2 based on engineering design experience.

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Appendix D-2

Sideslope Liner System Veneer Stability Analysis

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Infrastructure, environment, buildings

Imagine the result

Calculation Sheet

Client: CWM Chemical Services, LLC

Project Location: Model City, New York

Project: RMU-2 Design Calculations **Project No.: B0023725.2011**

Subject: Appendix D-2: Sideslope Liner System Veneer Stability Analysis

Prepared By: BMS **Date: February 2013**

Reviewed By: BMS **Date: February 2013**

Checked By: MG **Date: February 2013**

OBJECTIVE:

Calculate the factor of safety against rupture of the sideslope geosynthetics above the critical interface due to normal operating conditions. Evaluate the ability of the proposed anchor trench design to adequately anchor the geosynthetics above the weakest interface to resist pullout under normal operating conditions.

REFERENCES:

1. *RMU-2 Engineering Report,* ARCADIS, February 2013.

2. Koerner, Robert M. and T. Soong, "Analysis and Design of Veneer Cover Soils," *Sixth International Conference on Geosynthetics*, 1998 (excerpts attached).

3. RMU-2 Permit Drawing No. 5 entitled "Top of Operations Layer Grades," ARCADIS, February 2013.

4. RMU-2 Permit Drawing No. 15 entitled "Liner System Sections and Details," ARCADIS, August 2009.

5. *Operations & Maintenance Manual for Residuals Management Unit – 1* prepared for CWM Chemical Services, LLC.

ASSUMPTIONS:

1. Cross section of sideslope liner system consists of the following from top to bottom (Reference 4):

   - 2-ft operations layer
   - Geocomposite
   - 80-mil textured HDPE geomembrane
   - Geocomposite
   - 80-mil textured HDPE geomembrane
   - 3-ft compacted clay

2. Similar to RMU-1, waste will be placed in RMU-2 in approximately 6-foot-thick horizontal layers (Reference 5). Because of the limited height of new waste against the sideslope liner system and the existence of a large waste mass at the base of the sideslope (buttress effect), waste placement is not expected to produce the worst-case stresses in the sideslope liner system.

3. The 2-foot-thick operations layer with no waste in place and with construction equipment loads is

Calculation Sheet

anticipated to result in the worst-case sideslope liner veneer stability scenario. The longest (worst-case) 3H:1V sideslope liner slope length is 137 feet and is located at the Cell 16 sump (Reference 3). This worst-case scenario will only exist for a short period due to the placement of waste in newly constructed cells.

4. The stability of the sideslope liner system is assessed using a veneer stability model, inclusive of construction equipment loading, based on Reference 2. This method is based on balancing driving forces and resisting forces due to internal and interface shear strengths and avoiding the introduction of tension in the liner system geosynthetics.

5. Because of the short-term nature of the worst-case sideslope liner veneer stability scenario, a minimum factor of safety of 1.30 is used when determining minimum peak interface shear strength. A minimum factor of safety of 1.00 is used when determining minimum large-displacement interface shear strength.

6. The unit weight of the operations layer material, γ, is 115 pcf (Appendix A-1 to Reference 1).

7. The minimum shear strength of the operations layer material can be described by zero cohesion and an internal friction angle of 34 degrees. This assumed minimum shear strength will be confirmed by material testing required in the RMU-2 specifications.

8. Acceleration and deceleration forces due to bulldozer operation are not considered.

9. The operations layer material is assumed to have no pore pressure buildup due to the relatively thin layer of the material and the presence of a continuous geocomposite drain beneath the material.

CALCULATIONS:

The veneer stability analysis is performed by evaluating the gravitational forces acting on a finite length of the sideslope liner system. The gravitational forces include the self-weight of the operations layer material and also the assumed weight of a low-ground-pressure bulldozer. A force diagram and calculations for the worst-case slope length defined in Assumption 3 are provided in Attachments 1 and 2, respectively, to supplement the summary provided below:

$$W_e = qwI$$

$$q = \frac{W_b}{2wb}$$

$$W_{A1} = W_e + W_A$$

$$N_e = W_e \cos\beta$$

$$N_{A1} = N_e + N_A$$

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Calculation Sheet

$$W_A = \gamma h^2 (\frac{L}{h} - \frac{1}{\sin\beta} - \frac{\tan\beta}{2})$$

$$N_A = W_A \cos\beta$$

$$W_P = \frac{\gamma h^2}{\sin 2\beta}$$

$$E_A = \frac{(FS)(W_A - N_A \cos\beta) - (N_A \tan\delta + C_a)\sin\beta}{\sin\beta(FS)}$$

$$E_P = \frac{C + WP\tan\phi}{\cos\beta(FS) - \sin\beta\tan\phi}$$

where W_e is the equivalent equipment force per unit width at the geomembrane interface, N_e is the effective equipment force normal to the failure plane of the active wedge, I is the influence factor at the geomembrane interface (see Figure 7 from Reference 2 in Attachment 1), W_{A1} is the total weight of the active wedge (including equipment loading), W_A is the weight of the cover material in the active wedge, N_{A1} is the total effective force normal to the failure plane of the active wedge (including the contribution from the equipment loading), N_A is the effective force normal to the failure plane of the active wedge due to the weight of the cover material in the active wedge, W_P is the weight of the passive wedge, E_A is the interwedge force acting on the active wedge form the passive wedge, E_P is the interwedge force acting on the passive wedge from the active wedge, and FS is the factor of safety. By setting E_A=E_P, the equation can be rearranged in the form of the quadratic equation as follows:

$$a(FS)^2 + b(FS) + c = 0$$

$$a = (W_{A1} - N_{A1}\cos\beta)\cos\beta$$

$$b = -[(W_{A1} - N_{A1}\cos\beta)\sin\beta\tan\phi + (N_{A1}\tan\delta + C_a)\sin\beta\cos\beta + \sin\beta(C + W_P\tan\phi)]$$

$$c = (N_{A1}\tan\delta + C_a)\sin^2\beta\tan\phi$$

$$FS = \frac{-b + \sqrt{b^2 - 4ac}}{2a}$$

Using the above equations (as shown in Attachment 2), setting the minimum required factors of safety at 1.30 and 1.00, solving for the minimum acceptable peak and large-displacement friction angles results in 22.4 and 17.3 degrees respectively.

SUMMARY:

In order to achieve the minimum factors of safety for the sideslope liner system during cell construction and prior to waste placement, a minimum shear strength equivalent to a friction angle of 22.4 and 17.3 degrees must be achieved under peak and large displacement conditions over a normal load range of 0 to 1,000 psf. The upper end of the normal load range is based on the anticipated loading of the operations layer material (230 psf) plus that of a low ground pressure dozer (typically 5 psi or 720 psf). Higher friction angles would result in greater factors of safety. Achievement of these assumed minimum friction angles is required by the RMU-2 specifications.

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Attachment 1

Excerpts from Reference 2

Long-Term Stability

Figure 3 from "Analysis and Design of Veneer Cover Soils," in the Sixth International Conference on Geosynthetics '98, by Robert M. Koerner and Te-Yang Soong.

Equipment Loading

Figure 6a from "Analysis and Design of Veneer Cover Soils," in the Sixth International Conference on Geosynthetics '98, by Robert M. Koerner and Te-Yang Soong.

Pseudo-static Analysis Force Diagram

Figure 15 from "Analysis and Design of Veneer Cover Soils," in the Sixth International Conference on Geosynthetics '98, by Robert M. Koerner and Te-Yang Soong.

Influence Factor Values for Short-Term Analysis

Figure 7 from "Analysis and Design of Veneer Cover Soils," in the Sixth International Conference on Geosynthetics '98, by Robert M. Koerner and Te-Yang Soong.

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Attachment 2

Veneer Stability Calculations

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RMU-2
Appendix D-2: Sideslope Liner System Veneer Stability Analysis

Short-Term Peak Veneer Stability
Uniform Operations Layer Thickness with Equipment Loads

Thickness of cover soil, h	2	ft		
Soil slope angle beneath the geomembrane, beta	18.4	degrees	0.32	radians
Length of slope measured along the geomembrane, L	137	ft		
Unit weight of the cover soil, gamma	115	pcf		
Friction angle of the cover soil, theta	34	degrees	0.59	radians
Cohesion of the cover soil, c	0	psf		
Minimum interface friction angle in the cover system, delta	22.4	degrees	0.39	radians
Adhesion between cover soil and geomembrane, ca	0	psf		
Equipment weight, Wb	38,400	lb		
Equipment ground pressure (weight of equipment/(2wb)), q	640	psf		
Length of each equipment track, w	10	ft		
Width of each equipment track, b	3	ft		
Influence factor at geomembrane interface, I	0.95			
Acceleration/deceleration of the bulldozer, a	0	g		
b/h	1.5			
Equivalent equipment force per unit width at the geomembrane interface, We	6,080	lb		
Total weight of the active wedge, Wa	36,056	lb		
Total weight of the passive wedge, Wp	768	lb		
Effective force normal to the failure plane of the active wedge, Na	34,213	lb		
a=	3,409			
b=	-5,152			
c=	948			
Factor of Safety =	**1.30**			

Notes:

(1) The above calculations are based on reference 2 "Analysis and Design of Veneer Cover Soils" by R.M. Koerner and Te-Yang Soong, published in Sixth International Conference on Geosynthetics (1998).

(2) The above calculation does not account for acceleration/deceleration of the bulldozer.

(3) The Influence Factor, I, is estimated from Figure 7 of reference 2.

(4) The friction angle of the cover material, the minimum interface friction angle of the cover material, and equipment weight are assumed input parameters.

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Appendix D-2: Sideslope Liner System Veneer Stability Analysis

Short-Term Large-Displacement Veneer Stability
Uniform Operations Layer Thickness with Equipment Loads

Thickness of cover soil, h	2	ft		
Soil slope angle beneath the geomembrane, beta	18.4	degrees	0.32	radians
Length of slope measured along the geomembrane, L	137	ft		
Unit weight of the cover soil, gamma	115	pcf		
Friction angle of the cover soil, theta	34	degrees	0.59	radians
Cohesion of the cover soil, c	0	psf		
Minimum interface friction angle in the cover system, delta	17.3	degrees	0.30	radians
Adhesion between cover soil and geomembrane, ca	0	psf		
Equipment weight, Wb	38,400	lb		
Equipment ground pressure (weight of equipment/(2wb)), q	640	psf		
Length of each equipment track, w	10	ft		
Width of each equipment track, b	3	ft		
Influence factor at geomembrane interface, I	0.95			
Acceleration/deceleration of the bulldozer, a	0	g		
b/h	1.5			
Equivalent equipment force per unit width at the geomembrane interface, We	6,080	lb		
Total weight of the active wedge, Wa	36,056	lb		
Total weight of the passive wedge, Wp	768	lb		
Effective force normal to the failure plane of the active wedge, Na	34,213	lb		
a=	3,409			
b=	-4,120			
c=	716			
Factor of Safety =	**1.00**			

Notes:

(1) The above calculations are based on reference 2 "Analysis and Design of Veneer Cover Soils" by R.M. Koerner and Te-Yang Soong, published in Sixth International Conference on Geosynthetics (1998).

(2) The above calculation does not account for acceleration/deceleration of the bulldozer.

(3) The Influence Factor, I, is estimated from Figure 7 of reference 2.

(4) The friction angle of the cover material, the minimum interface friction angle of the cover material, and equipment weight are assumed input parameters.

Appendix E

Leachate Collection and
Conveyance Calculations

Appendix E-1

Liner System Geocomposite Design

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Imagine the result

Calculation Sheet

Client: CWM Chemical Services, LLC

Project Location: Model City, New York

Project: RMU-2 Design Calculations **Project No.: B0023725.2011**

Subject: Appendix E-1: Liner System Geocomposite Design

Prepared By: PTO **Date: February 2013**

Reviewed By: BMS **Date: February 2013**

Checked By: PHB **Date: February 2013**

OBJECTIVE:

Determine the minimum required transmissivities for the geocomposite on the cell floor and sideslopes of the RMU-2 liner system.

REFERENCES:

1. RMU-2 Permit Drawing No. 5 entitled "Top of Operations Layer Grades", ARCADIS, February 2013.
2. RMU-2 Permit Drawing No. 7 entitled "Top of Vegetative Cover Grades", ARCADIS, February 2013.
3. Advanced Geotech Systems website entitled "landfilldesign.com."
4. Visual HELP v3.07 (Windows-based implementation of HELP model v. 3.07), Waterloo Hydrogeologic, Inc.
5. Appendix C-1 to the RMU-2 Engineering Report entitled "Consolidation Settlement of Glaciolacustrine Clay," PJ Carey & Associates, PC., August 2009.
6. Memorandum from Dennis P. Gagne to OSRR entitled "Revised Alternative Cap Design Guidance Proposed for Unlined, Hazardous Waste Landfills in the EPA Region I," February 5, 2001.

ASSUMPTIONS:

1. All geocomposite transmissivity calculations ignore the transmissivity contribution of the overlying granular drainage and operations stone layers and are, therefore, conservative.
2. The minimum required transmissivity for the exposed cell sideslope is based on the longest maximum sideslope length of the RMU-2 cells (Cell 16 based on Reference 1). The minimum required transmissivity for the cell sideslope is based on Giroud's equation (presented in Reference 3) and the following parameters:
   - Slope = 130 feet at 33%
   - Maximum allowable head is limited to the thickness of the drainage layer (i.e., the thickness of the geonet core which is assumed to be 0.76 cm based on a 300-mil geonet core)
   - Impingement rate (i.e., rate at which leachate infiltrates to geocomposite layer) from Reference 4
   - Typical factors of safety from Reference 3 (see attached calculations for specific values)

Calculation Sheet

3. The impingement rate for the exposed cell sideslope is the peak daily infiltration value for the geocomposite layer calculated using Reference 4. The impingement rate for the exposed cell sideslope assumes a 2-foot layer of operations stone is placed above the geocomposite and the following parameters:

   - 25-year, 24-hour rainfall of 4.0 inches (the HELP model climatic data are modified to include the design storm)
   - Representative weather data is from Buffalo, New York
   - Runoff curve number of 90, which is representative of newly graded conditions;
   - Fraction of area allowing runoff = 0.0%
   - Maximum leaf area index = 0.0 (bare ground)
   - Evaporative zone depth = 6 inches (based on the guidance values for gravels as presented in the User's Guide for HELP Model v.3)
   - Permeability of materials are as follows:
     - Operations layer stone = 6.8×10^{-2} cm/s
     - Geocomposite drainage layer = 33 cm/s
     - High-density polyethylene (HDPE) Geomembrane = 2.0×10^{-13} cm/s

4. The minimum required transmissivity for the cell floor is evaluated for both active (10 ft of waste) and closed (i.e., capped) cell conditions. The minimum required transmissivity is based on the geometry of Cell 19 because it exhibits the longest drainage length and among the flattest post-consolidation cell floor slopes (based on Reference 5). This combination of parameters requires the largest geocomposite transmissivity of the RMU-2 cells. The minimum required transmissivity for the cell floor is based on Giroud's equation and the following parameters:

   - Slope of cell floor = 259 feet at 2.8% (pre-consolidation based on Reference 1) and 2.4% (post-consolidation based on Reference 5 – see below)
   - Slope of cover system = 259 feet at 4.9% (post-consolidation)
   - Maximum allowable head is limited to the thickness of the drainage layer (i.e., the thickness of the geocomposite core which is 0.76 cm)
   - Impingement rate (i.e., rate at which leachate infiltrates to geocomposite layer) from Reference 4
   - Typical factors of safety from Reference 3 (see attached calculations for specific values)

   The pre-consolidation cell floor slope of 2.8% is measured perpendicular to the cell floor contour lines as depicted on Reference 1. The post-consolidation cell floor slope of 2.4% is also measured perpendicular to the cell floor contour lines.

5. The impingement rate for the cell floor is the peak daily infiltration value to the geocomposite layer calculated using Reference 4. Separate impingement rates are determined for the active and closed cell conditions.

   The active cell impingement rate is based on an in-place waste thickness of approximately 10 feet (consistent with the RMU-1 geocomposite design condition) and the following parameters:

   - 25-year, 24-hour rainfall of 4.0 inches (the HELP model climatic data are modified to include the design storm)
   - Representative weather data is from Buffalo, New York
   - Runoff curve number of 90, which is representative of newly graded conditions
   - Fraction of area allowing runoff = 0.0%

Calculation Sheet

- Maximum leaf area index = 0.0 (bare ground)
- Evaporative zone depth = 6 inches (based on the guidance values for silty soils as presented in the User's Guide for HELP Model v.3)
- Permeability of materials are as follows:
  - Waste = 5.7 x 10^{-4} cm/s
  - Operations layer stone = 6.8 x 10^{-2} cm/s
  - Granular drainage material = 8.0 x 10^{-2} cm/s
  - Geocomposite drainage layer = 33 cm/s
  - High-density polyethylene (HDPE) Geomembrane = 2.0 x 10^{-13} cm/s

Under closed cell conditions, the maximum in-place waste thickness in RMU-2 will be approximately 124 feet (within Cell 16). However, because the waste thickness is not constant across the RMU-2 footprint (e.g., it decreases towards the northern, southern, and eastern edges), a smaller waste thickness is assumed for conservatism. Based on References 1 and 2, the average final in-place waste thickness at the inboard toe of slope of the perimeter berm is approximately 67 feet. The impingement rate for the closed cell floor condition is based on this waste thickness and the following parameters:

- 25-year, 24-hour rainfall of 4.0 inches (the HELP model climatic data are modified to include the design storm)
- Representative weather data is from Buffalo, New York
- Runoff curve number of 86, which is representative of newly established vegetation;
- Fraction of area allowing runoff = 100%
- Maximum leaf area index = 1.0 (poor stand of grass)
- Evaporative zone depth = 12 inches (based on the guidance values for silty soils as presented in the User's Guide for HELP Model v.3)
- Permeability of materials are as follows:
  - Topsoil = 7.5 x 10^{-4} cm/s
  - General soil fill = 5.0 x 10^{-5} cm/s
  - Geocomposite drainage layer = 33 cm/s
  - HDPE Geomembrane = 2.0 x 10^{-13} cm/s
  - GCL = 5 x 10^{-9} cm/s
  - Separation layer = 5 x 10^{-5} cm/s
  - Waste = 5.7 x 10^{-4} cm/s
  - Operations layer stone = 6.8 x 10^{-2} cm/s
  - Granular drainage material = 8.0 x 10^{-2} cm/s

6. When determining the impingement rates for each of the above cases, the initial moisture contents for the various layers are calculated by Reference 4 under nearly steady-state conditions (i.e., they are not user-specified).

7. Assumed unit weights:

- Waste material = 111 lb/ft^3 (Reference 5)
- Final cover and liner system = 130 lb/ft^3 (Reference 5)

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Calculation Sheet

CALCULATIONS:

1. Minimum Required Transmissivity for the Cell Sideslope

Leachate is conveyed down the cell sideslopes through a geocomposite layer and a 2-foot thick operations stone layer. Per Assumption 1, the transmissivity of the operations layer is not considered. The minimum required transmissivity for the geocomposite on the cell sideslope is based on Giroud's equation. Giroud's equation is as follows:

$$\Theta = \frac{TSF q_h L}{\sin\beta + \frac{t_{LCL}/L}{TSF}\cos^2\beta}$$

where,

Θ = minimum required transmissivity
TSF = total serviceability factor = 4.72 (see attached calculations for individual factors of safety)
q_h = impingement rate (calculated using Reference 4 based on Assumption 3) = 2.66 inches/day = 7.8×10^{-5} cm/s
L = maximum drainage length = 130 ft (Assumption 2)
β = slope angle of drainage layer = 18.4^o (33%) (Assumption 2)
t_{LCL} = thickness of geonet core of geocomposite = 0.76 cm (Assumption 2)

$\therefore$ $\Theta = 4.7 \times 10^{-4}$ m^2/s = 4.7 cm^2/s = Minimum Required Transmissivity for Cell Sideslope

2. Minimum Required Transmissivity for the Cell Floor (Active Condition – 10 feet of waste)

Leachate is conveyed along the cell floor through a geocomposite layer and a 1-foot thick granular drainage layer. Per Assumption 1, the transmissivity of the granular drainage layer is ignored; therefore the geocomposite transmissivity must be large enough to convey the peak leachate flow. The minimum required transmissivity for the active condition is:

$$\Theta = \frac{TSF q_h L}{\sin\beta + \frac{t_{LCL}/L}{TSF}\cos^2\beta}$$

where,

Θ = minimum required transmissivity
TSF = total serviceability factor = 4.72 (see attached calculations for individual factors of safety)
q_h = impingement rate (calculated using Reference 4 based on Assumption 5) = 0.49 inches/day = 1.4×10^{-5} cm/s
L = maximum drainage length = 259 ft (Assumption 4)
β = pre-consolidation slope angle of drainage layer in cell floor = 1.6^o (2.8%) (Assumption 4)
t_{LCL} = thickness of geonet core of geocomposite = 0.76 cm (Assumption 4)

$\therefore$ $\Theta = 1.86 \times 10^{-3}$ m^2/s = 18.6 cm^2/s = Minimum Required Transmissivity for Active Condition

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Calculation Sheet

3. Minimum Required Transmissivity for the Cell Floor (Closed Condition)

The minimum required transmissivity calculated above is also checked for the closed (i.e., capped) condition using a larger total serviceability factor that is more typical of leachate collection systems (as opposed to the reduced value used above for the active condition). The methodology is identical to that used above except a revised impingement rate that is reflective of the capped condition is calculated using Reference 4. The minimum required transmissivity for the closed condition is:

$$\Theta = \frac{TSF q_h L}{\sin\beta + \frac{t_{LCL}/L}{TSF}\cos^2\beta}$$

where,

Θ = minimum required transmissivity
TSF = total serviceability factor = 28.8 (see attached calculations for individual factors of safety)
q_h = impingement rate (calculated using Reference 4 based on Assumption 5) = 0.00 inches/day = 0.0 cm/s
L = maximum drainage length = 259 ft (Assumption 4)
β = slope angle of drainage layer in cell floor = 1.4^o (2.4%) (Assumption 4)
t_{LCL} = thickness of geonet core of geocomposite = 0.76 cm (Assumption 4)

$\therefore$ Θ = 0.0 m^2/s = 0.0 cm^2/s = Minimum Required Transmissivity for Closed Condition

Based on Reference 4, no measurable amount of liquid reaches the liner system geocomposite under the closed condition. This leads to a minimum required transmissivity of zero for the closed condition. Because the required transmissivity is zero for the closed condition, the required transmissivity for the active cell floor condition governs for all geocomposite installed on the cell floors.

4. Maximum Applied Load on the Geocomposite

Since the in-place transmissivity of the geocomposite is partly a function of the applied loading, it is necessary to estimate the maximum load that will be applied to the geocomposite. Two applied loadings are calculated- one for the active cell floor condition and one for the closed cell floor condition.

For the active cell floor condition, the geocomposite in the secondary leachate collection system will experience about 1,500 psf due to the presence of 10 feet of waste, 1 foot of operations layer stone, 1 foot of granular drainage layer in the primary leachate collection system, and 1 foot of granular drainage layer in the secondary leachate collection system (10 feet x 111 pcf + 3 feet x 130 pcf = 1,500 psf). The weight of construction equipment over the geocomposite during the active condition is not expected to significantly affect the applied load on the geocomposite due to the depth of liner system materials and waste over the geocomposite and the associated distribution of weight. Based on recommendations in Reference 6, a factor of safety of 2.0 is included because the geocomposite is relatively close to the active waste surface. Thus, a design loading of 3,000 psf will be used for the active cell floor condition.

For the closed cell floor condition, the geocomposite in the secondary leachate collection system will experience about 14,479 psf due to the presence of 124 feet of waste and 5.5 feet of final cover and liner system materials (124 feet x 111 pcf + 5.5 feet x 130 pcf = 14,479 psf). Thus, a design loading of 14,500 psf will be used for the closed cell condition. It is important to note that this load will only be experienced

Calculation Sheet

under the peak fill depth areas (i.e., near the spine of RMU-2) and any surface surcharges (e.g increase in pressure on the geocomposite due to vehicle loading) is negligible. For this reason, no factor of safety is applied to the design loading.

SUMMARY:

The liner system geocomposite must provide the following minimum transmissivities:

Θ = 18.6 cm^2/s with a hydraulic gradient = 0.1 and an applied loading of 14,500 psf; and
Θ = 4.7 cm^2/s with a hydraulic gradient = 0.33 and an applied loading of 3,000 psf.

For conservatism, the minimum required transmissivity from the active cell floor condition is combined with the maximum applied load from the closed cell floor condition even though these conditions are not expected to occur concurrently. The hydraulic gradient of 0.1 is approximately representative of the pre-consolidation cell floor slope of 2.4%. The hydraulic gradient of 0.33 is representative of the 33% sideslope. Although a geocomposite with a 300-mil thick geonet core is assumed for these calculations, any thickness of geonet core is acceptable for the RMU-2 liner system assuming it meets or exceeds the above transmissivities with the loading and gradients presented above.

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Attachment 1

HELP Model Output

```
******************************************************************************
******************************************************************************
**                                                                          **
**                                                                          **
**          HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE                   **
**           HELP MODEL VERSION 3.07 (1 November 1997)                      **
**            DEVELOPED BY ENVIRONMENTAL LABORATORY                         **
**             USAE WATERWAYS EXPERIMENT STATION                            **
**         FOR USEPA RISK REDUCTION ENGINEERING LABORATORY                  **
**                                                                          **
**                                                                          **
******************************************************************************
******************************************************************************

PRECIPITATION DATA FILE:    C:\WHI\UNSAT22\data\P848.VHP\_weather1.dat
TEMPERATURE DATA FILE:      C:\WHI\UNSAT22\data\P848.VHP\_weather2.dat
SOLAR RADIATION DATA FILE:  C:\WHI\UNSAT22\data\P848.VHP\_weather3.dat
EVAPOTRANSPIRATION DATA:    C:\WHI\UNSAT22\data\P848.VHP\_weather4.dat
SOIL AND DESIGN DATA FILE:  C:\WHI\UNSAT22\data\P848.VHP\I_386245.inp
OUTPUT DATA FILE:           C:\WHI\UNSAT22\data\P848.VHP\O_386245.prt

TIME:  16: 0     DATE:   7/23/2009

******************************************************************************

   TITLE:  Sideslope

******************************************************************************


   NOTE:  INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE
          COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.


                    LAYER  1
                    --------

          TYPE 1 - VERTICAL PERCOLATION LAYER
            MATERIAL TEXTURE NUMBER  33
      THICKNESS                =    60.96   CM
      POROSITY                 =    0.4170 VOL/VOL
      FIELD CAPACITY           =    0.0454 VOL/VOL
      WILTING POINT            =    0.0200 VOL/VOL
      INITIAL SOIL WATER CONTENT =    0.1933 VOL/VOL
      EFFECTIVE SAT. HYD. COND.  = 0.680000000000E-01 CM/SEC
```

LAYER 2

TYPE 2 - LATERAL DRAINAGE LAYER
MATERIAL TEXTURE NUMBER 1
THICKNESS = 0.60 CM
POROSITY = 0.8500 VOL/VOL
FIELD CAPACITY = 0.0100 VOL/VOL
WILTING POINT = 0.0050 VOL/VOL
INITIAL SOIL WATER CONTENT = 0.0100 VOL/VOL
EFFECTIVE SAT. HYD. COND. = 33.0000000000 CM/SEC
SLOPE = 33.00 PERCENT
DRAINAGE LENGTH = 39.6 METERS

LAYER 3

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 55
THICKNESS = 0.20 CM
POROSITY = 0.0000 VOL/VOL
FIELD CAPACITY = 0.0000 VOL/VOL
WILTING POINT = 0.0000 VOL/VOL
INITIAL SOIL WATER CONTENT = 0.0000 VOL/VOL
EFFECTIVE SAT. HYD. COND. = 0.200000000000E-12 CM/SEC
FML PINHOLE DENSITY = 2.47 HOLES/HECTARE
FML INSTALLATION DEFECTS = 9.88 HOLES/HECTARE
FML PLACEMENT QUALITY = 3 - GOOD

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS USER-SPECIFIED.

SCS RUNOFF CURVE NUMBER = 90.00
FRACTION OF AREA ALLOWING RUNOFF = 0.0 PERCENT
AREA PROJECTED ON HORIZONTAL PLANE = 0.4047 HECTARES
EVAPORATIVE ZONE DEPTH = 15.2 CM
INITIAL WATER IN EVAPORATIVE ZONE = 6.355 CM
UPPER LIMIT OF EVAPORATIVE STORAGE = 6.355 CM
LOWER LIMIT OF EVAPORATIVE STORAGE = 0.305 CM
INITIAL SNOW WATER = 0.000 CM
INITIAL WATER IN LAYER MATERIALS = 11.788 CM
TOTAL INITIAL WATER = 11.788 CM
TOTAL SUBSURFACE INFLOW = 0.00 MM/YR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
Buffalo NY

STATION LATITUDE = 42.89 DEGREES
MAXIMUM LEAF AREA INDEX = 0.00
START OF GROWING SEASON (JULIAN DATE) = 126
END OF GROWING SEASON (JULIAN DATE) = 285
EVAPORATIVE ZONE DEPTH = 6.0 INCHES
AVERAGE ANNUAL WIND SPEED = 12.10 MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY = 76.00 %
AVERAGE 2ND QUARTER RELATIVE HUMIDITY = 68.00 %
AVERAGE 3RD QUARTER RELATIVE HUMIDITY = 72.00 %
AVERAGE 4TH QUARTER RELATIVE HUMIDITY = 76.00 %

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR Buffalo NY

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
3.02	2.40	2.97	3.06	2.89	2.72
2.96	4.16	3.37	2.93	3.62	3.42

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR Buffalo NY

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
23.50	24.50	33.00	45.40	56.10	66.00
70.70	68.90	62.10	51.50	40.30	28.80

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR Buffalo NY
AND STATION LATITUDE = 42.90 DEGREES

****

PEAK DAILY VALUES FOR YEARS 1 THROUGH 5 and their dates (DDDYYYY)

	(INCHES)	(CU. FT.)	
PRECIPITATION	4.00	14519.68352	910001
RUNOFF	0.000	0.00000	0
DRAINAGE COLLECTED FROM LAYER 2	**2.65859**	**9650.48049**	**910001**
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.005708	20.72015	760002
AVERAGE HEAD ON TOP OF LAYER 3	0.009		
MAXIMUM HEAD ON TOP OF LAYER 3	0.012		
LOCATION OF MAXIMUM HEAD IN LAYER 2 (DISTANCE FROM DRAIN)	0.0 FEET		
SNOW WATER	7.65	27777.7330	640003

MAXIMUM VEG. SOIL WATER (VOL/VOL) 0.4170

MINIMUM VEG. SOIL WATER (VOL/VOL) 0.0200

*** Maximum heads are computed using McEnroe's equations. ***

Reference: Maximum Saturated Depth over Landfill Liner
by Bruce M. McEnroe, University of Kansas
ASCE Journal of Environmental Engineering
Vol. 119, No. 2, March 1993, pp. 262-270.

****
****

FINAL WATER STORAGE AT END OF YEAR 5

LAYER	(INCHES)	(VOL/VOL)
1	2.3810	0.0992
2	0.0026	0.0111
3	0.0000	0.0000

SNOW WATER 0.088

```
******************************************************************************
******************************************************************************
**                                                                          **
**                                                                          **
**          HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE                   **
**           HELP MODEL VERSION 3.07 (1 November 1997)                      **
**            DEVELOPED BY ENVIRONMENTAL LABORATORY                         **
**             USAE WATERWAYS EXPERIMENT STATION                            **
**         FOR USEPA RISK REDUCTION ENGINEERING LABORATORY                  **
**                                                                          **
**                                                                          **
******************************************************************************
******************************************************************************
```

PRECIPITATION DATA FILE: G:\TMProj\237\23725.2009\Calculations\E-1 Geocomposite Design\P954.VHP_weather1.dat
TEMPERATURE DATA FILE: G:\TMProj\237\23725.2009\Calculations\E-1 Geocomposite Design\P954.VHP_weather2.dat
SOLAR RADIATION DATA FILE: G:\TMProj\237\23725.2009\Calculations\E-1 Geocomposite Design\P954.VHP_weather3.dat
EVAPOTRANSPIRATION DATA: G:\TMProj\237\23725.2009\Calculations\E-1 Geocomposite Design\P954.VHP_weather4.dat
SOIL AND DESIGN DATA FILE: G:\TMProj\237\23725.2009\Calculations\E-1 Geocomposite Design\P954.VHP\I_386391.inp
OUTPUT DATA FILE: G:\TMProj\237\23725.2009\Calculations\E-1 Geocomposite Design\P954.VHP\O_386391.prt

TIME: 16:10 DATE: 7/23/2009

****

TITLE: Cell Floor (Active)

****

NOTE: INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.

```
                    LAYER  1
                    --------

          TYPE 1 - VERTICAL PERCOLATION LAYER
            MATERIAL TEXTURE NUMBER   9
     THICKNESS              =   304.82   CM
     POROSITY               =     0.5200 VOL/VOL
     FIELD CAPACITY         =     0.2942 VOL/VOL
     WILTING POINT          =     0.1400 VOL/VOL
     INITIAL SOIL WATER CONTENT  =     0.3385 VOL/VOL
     EFFECTIVE SAT. HYD. COND.   = 0.570000000000E-03 CM/SEC
```

LAYER 2

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 5
THICKNESS = 30.48 CM
POROSITY = 0.4170 VOL/VOL
FIELD CAPACITY = 0.0454 VOL/VOL
WILTING POINT = 0.0200 VOL/VOL
INITIAL SOIL WATER CONTENT = 0.1224 VOL/VOL
EFFECTIVE SAT. HYD. COND. = 0.680000000000E-01 CM/SEC

LAYER 3

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 4
THICKNESS = 30.48 CM
POROSITY = 0.4170 VOL/VOL
FIELD CAPACITY = 0.0454 VOL/VOL
WILTING POINT = 0.0200 VOL/VOL
INITIAL SOIL WATER CONTENT = 0.1329 VOL/VOL
EFFECTIVE SAT. HYD. COND. = 0.800000000000E-01 CM/SEC

LAYER 4

TYPE 2 - LATERAL DRAINAGE LAYER
MATERIAL TEXTURE NUMBER 1
THICKNESS = 0.60 CM
POROSITY = 0.8500 VOL/VOL
FIELD CAPACITY = 0.0100 VOL/VOL
WILTING POINT = 0.0050 VOL/VOL
INITIAL SOIL WATER CONTENT = 0.0377 VOL/VOL
EFFECTIVE SAT. HYD. COND. = 33.0000000000 CM/SEC
SLOPE = 2.80 PERCENT
DRAINAGE LENGTH = 78.9 METERS

LAYER 5

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 55
THICKNESS = 0.20 CM
POROSITY = 0.0000 VOL/VOL
FIELD CAPACITY = 0.0000 VOL/VOL
WILTING POINT = 0.0000 VOL/VOL
INITIAL SOIL WATER CONTENT = 0.0000 VOL/VOL
EFFECTIVE SAT. HYD. COND. = 0.200000000000E-12 CM/SEC
FML PINHOLE DENSITY = 2.47 HOLES/HECTARE
FML INSTALLATION DEFECTS = 9.88 HOLES/HECTARE
FML PLACEMENT QUALITY = 3 - GOOD

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS USER-SPECIFIED.

SCS RUNOFF CURVE NUMBER = 90.00
FRACTION OF AREA ALLOWING RUNOFF = 0.0 PERCENT
AREA PROJECTED ON HORIZONTAL PLANE = 0.4047 HECTARES
EVAPORATIVE ZONE DEPTH = 15.2 CM
INITIAL WATER IN EVAPORATIVE ZONE = 7.925 CM
UPPER LIMIT OF EVAPORATIVE STORAGE = 7.925 CM
LOWER LIMIT OF EVAPORATIVE STORAGE = 2.134 CM
INITIAL SNOW WATER = 0.000 CM
INITIAL WATER IN LAYER MATERIALS = 110.981 CM
TOTAL INITIAL WATER = 110.981 CM
TOTAL SUBSURFACE INFLOW = 0.00 MM/YR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
Buffalo NY

STATION LATITUDE = 42.89 DEGREES
MAXIMUM LEAF AREA INDEX = 0.00
START OF GROWING SEASON (JULIAN DATE) = 126
END OF GROWING SEASON (JULIAN DATE) = 285
EVAPORATIVE ZONE DEPTH = 6.0 INCHES
AVERAGE ANNUAL WIND SPEED = 12.10 MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY = 76.00 %
AVERAGE 2ND QUARTER RELATIVE HUMIDITY = 68.00 %
AVERAGE 3RD QUARTER RELATIVE HUMIDITY = 72.00 %
AVERAGE 4TH QUARTER RELATIVE HUMIDITY = 76.00 %

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR Buffalo NY

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
3.02	2.40	2.97	3.06	2.89	2.72
2.96	4.16	3.37	2.93	3.62	3.42

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR Buffalo NY

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
23.50	24.50	33.00	45.40	56.10	66.00
70.70	68.90	62.10	51.50	40.30	28.80

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR Buffalo NY
AND STATION LATITUDE = 42.90 DEGREES

****

PEAK DAILY VALUES FOR YEARS 1 THROUGH 5 and their dates (DDDYYYY)

	(INCHES)	(CU. FT.)	
PRECIPITATION	4.00	14519.68352	910001
RUNOFF	0.000	0.00000	0
DRAINAGE COLLECTED FROM LAYER 4	**0.48917**	**1775.66440**	**970001**
PERCOLATION/LEAKAGE THROUGH LAYER 5	0.022199	80.57957	970001
AVERAGE HEAD ON TOP OF LAYER 5	0.024		
MAXIMUM HEAD ON TOP OF LAYER 5	0.048		
LOCATION OF MAXIMUM HEAD IN LAYER 4 (DISTANCE FROM DRAIN)	0.7 FEET		
SNOW WATER	7.65	27777.7330	640003

MAXIMUM VEG. SOIL WATER (VOL/VOL) 0.5200

MINIMUM VEG. SOIL WATER (VOL/VOL) 0.1400

*** Maximum heads are computed using McEnroe's equations. ***

Reference: Maximum Saturated Depth over Landfill Liner
by Bruce M. McEnroe, University of Kansas
ASCE Journal of Environmental Engineering
Vol. 119, No. 2, March 1993, pp. 262-270.

****

****

FINAL WATER STORAGE AT END OF YEAR 5

LAYER	(INCHES)	(VOL/VOL)
1	35.8729	0.2989
2	1.2395	0.1033
3	1.2804	0.1067
4	0.0031	0.0130
5	0.0000	0.0000

SNOW WATER 0.088

****
****

```
******************************************************************************
******************************************************************************
**                                                                          **
**                                                                          **
**          HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE                   **
**           HELP MODEL VERSION 3.07 (1 November 1997)                      **
**            DEVELOPED BY ENVIRONMENTAL LABORATORY                         **
**             USAE WATERWAYS EXPERIMENT STATION                            **
**         FOR USEPA RISK REDUCTION ENGINEERING LABORATORY                  **
**                                                                          **
**                                                                          **
******************************************************************************
******************************************************************************
```

PRECIPITATION DATA FILE: G:\TMProj\237\23725.2009\Calculations\E-1 Geocomposite Design\P954.VHP_weather1.dat
TEMPERATURE DATA FILE: G:\TMProj\237\23725.2009\Calculations\E-1 Geocomposite Design\P954.VHP_weather2.dat
SOLAR RADIATION DATA FILE: G:\TMProj\237\23725.2009\Calculations\E-1 Geocomposite Design\P954.VHP_weather3.dat
EVAPOTRANSPIRATION DATA: G:\TMProj\237\23725.2009\Calculations\E-1 Geocomposite Design\P954.VHP_weather4.dat
SOIL AND DESIGN DATA FILE: G:\TMProj\237\23725.2009\Calculations\E-1 Geocomposite Design\P954.VHP\I_386391.inp
OUTPUT DATA FILE: G:\TMProj\237\23725.2009\Calculations\E-1 Geocomposite Design\P954.VHP\O_386391.prt

TIME: 14:44 DATE: 9/12/2012

****

TITLE: Cell Floor (Closed)

****

NOTE: INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.

LAYER 1

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 5
THICKNESS = 15.24 CM
POROSITY = 0.5010 VOL/VOL
FIELD CAPACITY = 0.2827 VOL/VOL
WILTING POINT = 0.1353 VOL/VOL
INITIAL SOIL WATER CONTENT = 0.4590 VOL/VOL
EFFECTIVE SAT. HYD. COND. = 0.750000000000E-04 CM/SEC
NOTE: SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY 1.80
FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.

LAYER 2

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 5
THICKNESS = 45.72 CM
POROSITY = 0.5010 VOL/VOL
FIELD CAPACITY = 0.2840 VOL/VOL
WILTING POINT = 0.1350 VOL/VOL
INITIAL SOIL WATER CONTENT = 0.3545 VOL/VOL
EFFECTIVE SAT. HYD. COND. = 0.500000000000E-04 CM/SEC

LAYER 3

TYPE 2 - LATERAL DRAINAGE LAYER
MATERIAL TEXTURE NUMBER 1
THICKNESS = 0.60 CM
POROSITY = 0.8500 VOL/VOL
FIELD CAPACITY = 0.0100 VOL/VOL
WILTING POINT = 0.0050 VOL/VOL
INITIAL SOIL WATER CONTENT = 0.0122 VOL/VOL
EFFECTIVE SAT. HYD. COND. = 33.0000000000 CM/SEC
SLOPE = 4.90 PERCENT
DRAINAGE LENGTH = 78.9 METERS

LAYER 4

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 35
THICKNESS = 0.10 CM
POROSITY = 0.0000 VOL/VOL
FIELD CAPACITY = 0.0000 VOL/VOL
WILTING POINT = 0.0000 VOL/VOL
INITIAL SOIL WATER CONTENT = 0.0000 VOL/VOL
EFFECTIVE SAT. HYD. COND. = 0.200000000000E-10 CM/SEC
FML PINHOLE DENSITY = 2.47 HOLES/HECTARE
FML INSTALLATION DEFECTS = 9.88 HOLES/HECTARE
FML PLACEMENT QUALITY = 3 - GOOD

LAYER 5

TYPE 3 - BARRIER SOIL LINER
MATERIAL TEXTURE NUMBER 10
THICKNESS = 0.51 CM
POROSITY = 0.3980 VOL/VOL
FIELD CAPACITY = 0.2440 VOL/VOL
WILTING POINT = 0.1360 VOL/VOL
INITIAL SOIL WATER CONTENT = 0.3980 VOL/VOL
EFFECTIVE SAT. HYD. COND. = 0.500000000000E-08 CM/SEC

LAYER 6

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 5
THICKNESS = 15.24 CM
POROSITY = 0.5010 VOL/VOL
FIELD CAPACITY = 0.2840 VOL/VOL
WILTING POINT = 0.1350 VOL/VOL
INITIAL SOIL WATER CONTENT = 0.2840 VOL/VOL
EFFECTIVE SAT. HYD. COND. = 0.500000000000E-04 CM/SEC

```
                LAYER  7
                --------

       TYPE 1 - VERTICAL PERCOLATION LAYER
          MATERIAL TEXTURE NUMBER   9
THICKNESS                =   2042.16   CM
POROSITY                 =     0.5200 VOL/VOL
FIELD CAPACITY           =     0.2942 VOL/VOL
WILTING POINT            =     0.1400 VOL/VOL
INITIAL SOIL WATER CONTENT  =     0.2942 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =  0.570000000000E-03 CM/SEC


                LAYER  8
                --------

       TYPE 1 - VERTICAL PERCOLATION LAYER
          MATERIAL TEXTURE NUMBER   5
THICKNESS                =     30.48   CM
POROSITY                 =     0.4170 VOL/VOL
FIELD CAPACITY           =     0.0454 VOL/VOL
WILTING POINT            =     0.0200 VOL/VOL
INITIAL SOIL WATER CONTENT  =     0.0454 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =  0.680000000000E-01 CM/SEC


                LAYER  9
                --------

       TYPE 1 - VERTICAL PERCOLATION LAYER
          MATERIAL TEXTURE NUMBER   4
THICKNESS                =     30.48   CM
POROSITY                 =     0.4170 VOL/VOL
FIELD CAPACITY           =     0.0454 VOL/VOL
WILTING POINT            =     0.0200 VOL/VOL
INITIAL SOIL WATER CONTENT  =     0.0454 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =  0.800000000000E-01 CM/SEC


                LAYER 10
                --------

        TYPE 2 - LATERAL DRAINAGE LAYER
          MATERIAL TEXTURE NUMBER   1
THICKNESS                =      0.60   CM
POROSITY                 =     0.8500 VOL/VOL
FIELD CAPACITY           =     0.0100 VOL/VOL
WILTING POINT            =     0.0050 VOL/VOL
INITIAL SOIL WATER CONTENT  =     0.0100 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =   33.0000000000     CM/SEC
SLOPE                    =      2.40   PERCENT
DRAINAGE LENGTH          =     78.9    METERS
```

LAYER 11

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 55

```
THICKNESS                    =     0.20   CM
POROSITY                     =     0.0000 VOL/VOL
FIELD CAPACITY               =     0.0000 VOL/VOL
WILTING POINT                =     0.0000 VOL/VOL
INITIAL SOIL WATER CONTENT   =     0.0000 VOL/VOL
EFFECTIVE SAT. HYD. COND.    = 0.200000000000E-12 CM/SEC
FML PINHOLE DENSITY          =     2.47   HOLES/HECTARE
FML INSTALLATION DEFECTS     =     9.88   HOLES/HECTARE
FML PLACEMENT QUALITY        = 3 - GOOD
```

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS USER-SPECIFIED.

```
SCS RUNOFF CURVE NUMBER                =     86.00
FRACTION OF AREA ALLOWING RUNOFF       =    100.0    PERCENT
AREA PROJECTED ON HORIZONTAL PLANE     =      0.4047 HECTARES
EVAPORATIVE ZONE DEPTH                 =     30.5    CM
INITIAL WATER IN EVAPORATIVE ZONE      =     13.137  CM
UPPER LIMIT OF EVAPORATIVE STORAGE     =     15.270  CM
LOWER LIMIT OF EVAPORATIVE STORAGE     =      4.119  CM
INITIAL SNOW WATER                     =      0.000  CM
INITIAL WATER IN LAYER MATERIALS       =    631.316  CM
TOTAL INITIAL WATER                    =    631.316  CM
TOTAL SUBSURFACE INFLOW                =      0.00   MM/YR
```

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
Buffalo NY

```
STATION LATITUDE                       = 42.89 DEGREES
MAXIMUM LEAF AREA INDEX                =  1.00
START OF GROWING SEASON (JULIAN DATE)  =    126
END OF GROWING SEASON (JULIAN DATE)    =    285
EVAPORATIVE ZONE DEPTH                 = 12.0  INCHES
AVERAGE ANNUAL WIND SPEED              = 12.10 MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY  = 76.00 %
AVERAGE 2ND QUARTER RELATIVE HUMIDITY  = 68.00 %
AVERAGE 3RD QUARTER RELATIVE HUMIDITY  = 72.00 %
AVERAGE 4TH QUARTER RELATIVE HUMIDITY  = 76.00 %
```

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR Buffalo NY

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
3.02	2.40	2.97	3.06	2.89	2.72
2.96	4.16	3.37	2.93	3.62	3.42

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR Buffalo NY

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
23.50	24.50	33.00	45.40	56.10	66.00
70.70	68.90	62.10	51.50	40.30	28.80

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR Buffalo NY
AND STATION LATITUDE = 42.90 DEGREES

****

PEAK DAILY VALUES FOR YEARS 1 THROUGH 5 and their dates (DDDYYYY)

	(INCHES)	(CU. FT.)	
PRECIPITATION	2.14	7768.03069	2440005
RUNOFF	2.762	10025.85399	760002
DRAINAGE COLLECTED FROM LAYER 3	0.31593	1146.79421	3350001
PERCOLATION/LEAKAGE THROUGH LAYER 5	0.000001	0.00248	3350001
AVERAGE HEAD ON TOP OF LAYER 4	0.009		
MAXIMUM HEAD ON TOP OF LAYER 4	0.018		
LOCATION OF MAXIMUM HEAD IN LAYER 3 (DISTANCE FROM DRAIN)	0.0 FEET		
DRAINAGE COLLECTED FROM LAYER 10	**0.00000**	**0.00013**	**3350001**
PERCOLATION/LEAKAGE THROUGH LAYER 11	0.000001	0.00236	3350001
AVERAGE HEAD ON TOP OF LAYER 11	0.000		
MAXIMUM HEAD ON TOP OF LAYER 11	0.000		
LOCATION OF MAXIMUM HEAD IN LAYER 10 (DISTANCE FROM DRAIN)	0.0 FEET		
SNOW WATER	7.57	27476.8976	680003

MAXIMUM VEG. SOIL WATER (VOL/VOL) 0.4794

MINIMUM VEG. SOIL WATER (VOL/VOL) 0.1352

*** Maximum heads are computed using McEnroe's equations. ***

Reference: Maximum Saturated Depth over Landfill Liner
by Bruce M. McEnroe, University of Kansas
ASCE Journal of Environmental Engineering
Vol. 119, No. 2, March 1993, pp. 262-270.

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FINAL WATER STORAGE AT END OF YEAR 5

LAYER	(INCHES)	(VOL/VOL)
1	2.1490	0.3582
2	6.1792	0.3433
3	0.0032	0.0136
4	0.0000	0.0000
5	0.0799	0.3980
6	1.7040	0.2840
7	236.5368	0.2942
8	0.5448	0.0454
9	0.5448	0.0454
10	0.0024	0.0100
11	0.0000	0.0000

SNOW WATER 0.088

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Attachment 2

Transmissivity Calculations

CWM Chemical Services, LLC
Model City, NY
RMU-2
Giroud's Equation for Minimum Required Geocomposite Transmissivity
Exposed Cell Sideslope

Input

Drainage Length [m]:	39.6
Drainage Layer Thickness [cm]:	0.76
Slope of Drainage Layer:	0.33
Impingement Rate, q_h, [cm/s][1]:	7.8E-05

		Typical Range for Factor of Safety		
Factor of Safety		Surface Water	Leachate Collection	Leachate Detection
Intrusion Reduction Factor, RF_{in}	1.1	1.0-1.2	1.0-1.2	1.0-1.2
Creep Reduction Factor, RF_{cr}:	1.2	1.1-1.4	1.4-2.0	1.4-2.0
Chemical Clogging Reduction Factor, RF_{cc}	1.1	1.0-1.2	1.5-2.0	1.5-2.0
Biological Clogging Reduction Factor, RF_{bc}	1.3	1.2-1.5	1.5-2.0	1.5-2.0
Overall FS for Drainage, FS_d:	2.5	2.0-3.0	2.0-3.0	2.0-3.0

Output

Total Serviceability Factor[2]	4.72
Required Transmissivity [cm^2/s]:	**4.66**

Note:

1. Impingement rate is equal to the peak daily value for lateral drainage collected by the geocomposite layer as calculated using Visual HELP. The amount of lateral drainage (in cm) is converted into a daily average infiltration rate to the geocomposite.

2. The total serviceability factor is based on typical factors of safety for surface water (i.e., cap drainage) applications because of the reduced likelihood of the 25-year, 24-hour storm occuring while the sideslopes are exposed. This serviceability factor is approximately the same as that used in the transmissivity calculations for RMU-1.

CWM Chemical Services, LLC
Model City, NY
RMU-2
Giroud's Equation for Minimum Required Geocomposite Transmissivity
Cell Floor (Active Condition)

Input

Drainage Length [m]:	78.9
Drainage Layer Thickness [cm]:	0.76
Slope of Drainage Layer:	0.028
Impingement Rate, q_h, [cm/s][1]:	1.4E-05

Factor of Safety		Typical Range for Factor of Safety		
		Surface Water	Leachate Collection	Leachate Detection
Intrusion Reduction Factor, RF_{in}	1.1	1.0-1.2	1.0-1.2	1.0-1.2
Creep Reduction Factor, RF_{cr}:	1.2	1.1-1.4	1.4-2.0	1.4-2.0
Chemical Clogging Reduction Factor, RF_{cc}	1.1	1.0-1.2	1.5-2.0	1.5-2.0
Biological Clogging Reduction Factor, RF_{bc}	1.3	1.2-1.5	1.5-2.0	1.5-2.0
Overall FS for Drainage, FS_d:	2.5	2.0-3.0	2.0-3.0	2.0-3.0

Output

Total Serviceability Factor[2]	4.72

Required Transmissivity [cm^2/s]:	**18.6**

Notes:

1. Impingement rate is equal to the peak daily value for lateral drainage collected by the geocomposite layer as calculated using Visual HELP. The amount of lateral drainage (in cm) is converted into a daily average infiltration rate to the geocomposite.

2. The total serviceability factor is based on typical factors of safety for surface water (i.e., cap drainage) applications because of the reduced likelihood of the 25-year, 24-hour storm occuring with only 10 feet of in-place waste. This serviceability factor is approximately the same as that used in the transmissivity calculations for RMU-1.

CWM Chemical Services, LLC
Model City, NY
RMU-2
Giroud's Equation for Minimum Required Transmissivity
Exposed Cell Sideslope

Input

Drainage Length [m]:	78.9
Drainage Layer Thickness [cm]:	0.76
Slope of Drainage Layer:	0.024
Impingement Rate, q_h, [cm/s][1]:	0.0E+00

		Typical Range for Factor of Safety		
Factor of Safety		Surface Water	Leachate Collection	Leachate Detection
Intrusion Reduction Factor, RF_{in}	1.2	1.0-1.2	1.0-1.2	1.0-1.2
Creep Reduction Factor, RF_{cr}:	2.0	1.1-1.4	1.4-2.0	1.4-2.0
Chemical Clogging Reduction Factor, RF_{cc}	2.0	1.0-1.2	1.5-2.0	1.5-2.0
Biological Clogging Reduction Factor, RF_{bc}	2.0	1.2-1.5	1.5-2.0	1.5-2.0
Overall FS for Drainage, FS_d:	3.0	2.0-3.0	2.0-3.0	2.0-3.0

Output

Total Serviceability Factor[2]	28.80

Required Transmissivity [cm^2/s]:	**0.00**

Note:

1. Impingement rate is equal to the peak daily value for lateral drainage collected by the geocomposite layer as calculated using Visual HELP. The amount of lateral drainage (in cm) is converted into a daily average infiltration rate to the geocomposite.

2. The total serviceability factor is based on typical factors of safety for surface water (i.e., cap drainage) applications because of the reduced likelihood of the 25-year, 24-hour storm occuring with only 10 feet of in-place waste. This serviceability factor is approximately the same as that used in the transmissivity calculations for RMU-1.

Appendix E-2

Leachate Collection Pipe Design

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Infrastructure, environment, buildings

Imagine the result

Calculation Sheet

Client: CWM Chemical Services, LLC

Project Location: Model City, New York

Project: RMU-2 Design Calculations **Project No.: B0023725.2011**

Subject: Appendix E-2: Leachate Collection Pipe Design

Prepared By: PTO **Date: May 2013**

Reviewed By: BMS **Date: May 2013**

Checked By: PHB **Date: May 2013**

OBJECTIVE:

Determine the required diameter and perforation pattern for the leachate collection pipe along the cell centerline in the primary and secondary leachate collection systems. Demonstrate that the leachate collection pipe is capable of withstanding the applied loading associated with final landfill buildout. Determine the minimum required cover for the leachate collection pipe to allow the operation of truck traffic across the pipe.

REFERENCES:

1. RMU-2 Permit Drawing No. 4 entitled "Subgrade Grades," ARCADIS, February 2013.

2. Appendix E-1 to the RMU-2 Engineering Report entitled "Liner System Geocomposite Design," ARCADIS, February 2013.

3. Appendix C-1 to the RMU-2 Engineering Report entitled "Consolidation Settlement of Glaciolacustrine Clay," PJ Carey & Associates, PC, August 2009.

4. *Engineer-in-Training Reference Manual*, 8th Edition, Lindeburg, Michael R., P.E., pp. A-38 and A-47, 1992 (attached).

5. Literature from Performance Pipe, Bulletin: pp 152-4710 (attached).

6. Goddard, J.B. "The Structural Performance of Polyethylene Pipe." *Geotechnical Fabrics Report.* September 1991.

7. CANDE-89. Culvert Analysis and Design Computer Program. U.S. Department of Transportation Federal Highway Administration. Publication No. FHWA-RD-89-169. March 1990.

8. Paruvakat, N. "Deflection Analysis of Polyethylene Leachate Collection Pipes." *Geosynthetics '93*. Vancouver, Canada.

9. Goddard, J. B., N.E. Kampbell, and D.P. Kozman. *Structural Performance of Corrugated PE Pipe Using the Burns and Richard Solution.* Technical Note 2.130 Advanced Drainage Systems, Inc.

10. RMU-2 Permit Drawing No. 7 entitled "Top of Vegetative Cover Grades," ARCADIS, February 2013.

11. *National Engineering Handbook*, U.S. Department of Agriculture, Natural Resources Conservation Service, Chapter 52 – Structural Design of Flexible Conduits, pp. 52-8, 52-10, 52-11, 52-12, and 52C-1 (attached).

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Imagine the result

Calculation Sheet

12. Principles of Geotechnical Engineering, 2nd Edition, Das, Braja M., pp 195-196, 1990 (attached).

ASSUMPTIONS:

1. The hydraulic capacity of the leachate collection pipe and its perforations must equal or exceed that of the geocomposite draining to it. The hydraulic capacity of the geocomposite is based on the design transmissivity value (from Reference 2), the post-consolidation slope of the cell floor perpendicular to the leachate collection pipe, and the length of the geocomposite that drains to the pipe (i.e., the length measured parallel to the leachate collection pipe). To be conservative, the longest length of geocomposite and the steepest post-consolidation slope of all the cells within RMU-2 are used to determine the hydraulic capacity of the geocomposite. Reference 1 indicates that Cell 17 has approximately 644 feet of geocomposite draining to the leachate collection pipe. Reference 3 indicates that Cell 18 has the steepest post-consolidation slope perpendicular to its centerline of all the cells within RMU-2 (post-consolidation slope of 3.2 %).

2. The hydraulic capacity of the leachate collection pipe is, among other parameters, a function of pipe slope. Since the leachate collection pipe will be installed directly on the geocomposite, the post-consolidation centerline slope for each cell should be used. To be conservative, the flattest post-consolidation centerline slope of all the cells within RMU-2 is used to determine the hydraulic capacity and size the leachate collection pipe. Reference 3 indicates that Cell 16 has the flattest post-consolidation centerline slope of all the cells within RMU-2 (post-consolidation slope of 1.2%).

3. The hydraulic capacity of the perforations in the leachate collection pipe is determined using the orifice equation, the perforation pattern (i.e., the location, diameter, and spacing of the holes), and assuming 1 foot of head above the geomembrane layer. An orifice coefficient of 0.3 is used (instead of a more typical value of 0.6) to account for the partial blockage of the perforation open area by the drainage stone surrounding the leachate collection pipe.

4. The maximum recommended vertical deflection of HDPE pipe is 5.0 percent (References 8 and 11).

5. Assumed unit weights:

   - Waste material = 111 lb/ft^3 (Reference 2)
   - Final cover and liner system = 130 lb/ft^3 (Reference 2)

6. Reference 7 is used to model the structural performance of the leachate collection pipe. The critical performance parameter for flexible pipe is typically ring deflection, which is the amount of vertical deflection of the pipe diameter due to applied external loads.

7. For the minimum cover depth requirement, vehicle traffic is assumed to consist of a semi-truck with a maximum single axle load of 40,000 pounds (lbs) (based on American Association of State Highway and Transportation Officials HS-25 loading). The tire inflation pressure is assumed to be 80 pounds per square inch (psi). The ground contact pressure beneath a pneumatic tire is approximately equal to the tire inflation pressure. The tire inflation pressure is multiplied by an impact factor of 2.5 to account for dynamic effects due to the truck traveling at speed over an uneven road surface.

8. In addition to ring deflection, pipe wall crushing potential is also evaluated. The maximum allowable long-term compressive stress of HDPE pipe (material designation PE3408) is 800 psi (Reference 11).

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Infrastructure, environment, buildings

Imagine the result

Calculation Sheet

CALCULATIONS:

1. Required Pipe Diameter

The required pipe diameter is determined using the Hazen-Williams equation and the maximum flowrate from the geocomposite that drains to the leachate collection pipe. The maximum flowrate from the geocomposite is determined using Darcy's law, the definition of transmissivity, and the design transmissivity value from Reference 2:

$$Q = kiA$$

$$k = \Phi/t$$

$$A = 2Lt$$

$$\therefore Q = 2L\Phi i$$

where,

- L = length of leachate collection pipe from Reference 1 (multiplied by 2 to account for inflow from both sides of pipe). To be conservative, the longest leachate collection pipe length from all the RMU-2 cells is used = 644 ft
- Φ = design transmissivity of geocomposite from Reference 2 = 18.6 cm^2/s = 0.0200 ft^2/s
- i = hydraulic gradient perpendicular to the leachate collection pipe (assumed to be equal to the post-consolidation slope from Cell 18 based on Assumption 1) = 3.2%

Thus,

Q = (2)(644 ft)(0.0200 ft^2/s)(0.032) = 0.82 cfs

The Hazen-Williams equation is:

$$Q = 1.318AC_hR^{0.63}S^{0.54}$$

where,

- Q = maximum flowrate from the geocomposite (from above)
- A = cross sectional area of pipe flowing full = $\pi D^2/4$
- C_h = Hazen-Williams friction coefficient for plastic pipe = 150 (Reference 5)
- R = hydraulic radius = A/P
- P = wetted perimeter of pipe flowing full = πD
- S = longitudinal slope of pipe (assumed to be equal to the post-consolidation centerline slope based on Assumption 2) = 1.2%

Thus,

$$0.82 = 1.318(\pi D^2/4)(150)(D/4)^{0.63}(0.012)^{0.54}$$

Solving for D,

D = 0.49 ft (5.9 inches)

To be conservative, an 8-inch-diameter pipe will be used for the leachate collection pipe. An 8-inch-

Calculation Sheet

diameter DR 7.3 pipe has an average inside diameter of 6.119 inches (0.510 feet). The pipe-full capacity for this pipe is determined using the Hazen-Williams equation:

$$Q = 1.318\left(\frac{\pi 0.510^2}{4}\right)(150)\left(\frac{0.510}{4}\right)^{0.63}(0.012)^{0.54} = 1.01\,\text{cfs}$$

Consequently, an 8-inch-diameter leachate collection pipe provides a factor of safety of approximately 1.2 (i.e., 1.01/ 0.82). Since the maximum flowrate from the geocomposite and the capacity of the leachate collection pipe are based on worst-case values (per Assumptions 1 and 2), this is the smallest anticipated factor of safety for any of the cells within RMU-2. Additionally, the required pipe diameter is based on the design transmissivity of the contributing geocomposite, which is significantly greater than the actual flowrate through the geocomposite to the leachate collection pipe (i.e., the design transmissivity also incorporates a factor of safety).

The actual flow depth in the leachate collection pipe for the design flowrate (0.82 cfs) can be calculated using the ratio of the design flowrate to the pipe-full flowrate:

Q/Q_o = 0.82 cfs/1.01 cfs = 0.81

Based on Reference 4, this flowrate ratio corresponds to a ratio of depth to pipe diameter of about 0.60. Therefore, the flow depth in the leachate collection pipe for the design flowrate is about 0.31 feet or 3.6 inches (0.60*0.510 feet = 0.31 feet).

2. Required Perforation Pattern

Similar to the required pipe diameter calculations above, the required perforation pattern is based on the maximum flowrate from the geocomposite (using the design transmissivity). Since the perforation pattern is specified as a number of perforations per foot, the maximum flowrate from the geocomposite is redefined as an inflow per foot of leachate collection pipe:

- Maximum Inflow to Each Foot of Pipe from Geocomposite = 0.82 cfs/644 ft = 0.00127 cfs/ft

This is the inflow to the pipe from both sides of the cell (the flow into each side of the pipe is one half of the above value).

Assuming 5/8-inch-diameter holes are used, the flowrate through each set of perforations is calculated using the orifice equation and the effective head (1 foot of head on the geomembrane minus either the height of the center of the holes above the geomembrane or the height of the water surface inside the pipe during the design flow depth above the geomembrane, whichever is greater). Four rows of holes will be installed in the pipe, with two rows offset from the bottom pipe centerline by 45° and the remaining two rows offset from the top pipe centerline by 45°. The centerline of each hole in the lower two rows will be approximately 1.3 inches above the outside bottom of the pipe (i.e., approximately 1.3 inches above the geomembrane). The centerline of each hole in the upper two rows will be approximately 7.3 inches above the outside bottom of the pipe. As calculated above, the design flow depth is 4.0 inches. This flow depth, combined with an average wall thickness of 1.182 inches, means that the design water surface inside the pipe is approximately 5.2 inches above the geomembrane. Thus, the effective head on each hole in the lower two rows is 6.8 inches (12 inches – 5.2 inches) and the effective head on each hole in the upper two rows is 4.7 (12 inches – 7.3 inches). The flowrate through each set of 4 holes is calculated as follows:

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$$Q = 2CA\sum\sqrt{2gH_{eff}}$$

where,

- Q = flowrate through each set of 4 holes (unknown)
- C = orifice coefficient = 0.3 (Assumption 3)
- A = cross sectional area of each hole = $\pi D^2/4$ = 0.00213 ft^2
- H_{eff} = effective head on each hole = 6.8 in = 0.57 ft for lower holes and 4.7 in = 0.39 ft for upper holes (see above)

The 2 in the above equation accounts for the fact that two holes in each set of 4 holes are at identical elevations and therefore have identical inflow capacities.

Thus,

$$Q = 2(0.3)(0.00213\ ft^2)\left[\sqrt{2(32.2\ ft/s^2)(0.57\ ft)} + \sqrt{2(32.2ft/s^2)(0.39ft)}\right] = 0.0141\,cfs$$

The required number of perforation sets per foot of pipe is:

n = (0.00127 cfs/ft)/(0.0141 cfs) = 0.09 (i.e., 1 perforation set per 11.3 feet of pipe)

To be conservative, the perforation sets will be spaced 6 inches apart on center, yielding a total of 2 perforation sets per foot of pipe. This provides an inflow capacity of 0.0282 cfs per foot of pipe (2x0.0141 cfs), and a factor of safety of approximately 22.2 (0.0282 cfs/0.00127 cfs). In terms of resistance to failure of the leachate collection pipe due to clogging of the perforations, this factor of safety allows for up to 95 percent clogging of the perforations before the inflow capacity of the leachate collection pipe is reduced to the point that it equals the maximum possible flowrate able to be conveyed through the geocomposite.

3. Structural Performance of Pipe Under Final Landfill Buildout

The leachate collection pipe is designed to withstand the applied loading associated with final buildout. A comparison of the top of secondary clay layer and the top of vegetative cover indicates that the maximum waste thickness in RMU-2 is approximately 124 feet. This condition is used to predict the maximum pipe deflection associated with final buildout. In estimating potential deflections for a HDPE pipe under such fill depths, special consideration must be given to two issues: (1) analytical method; and (2) soil modulus.

Although the Iowa Formula is a widely accepted method for estimating pipe deflections, it is considered to be overly conservative for fill heights greater than 50 ft because it does not consider soil-structure interaction, which includes soil arching. According to a study performed by Goddard (1991) In Reference 6, deflections in a pipe under a 100 ft embankment were significantly over predicted using the Iowa Formula (by a factor of approximately 1.8). In the study, it was established that finite element analysis programs such as CANDE (Reference 7) can better predict pipe deflections. Subsequent studies also provide other alternate methods of analysis including Paruvakat (Reference 8) and Goddard et al. (Reference 9). CANDE was originally designed to evaluate buried culverts, however, it applies to other soil-structure systems, such as a leachate collection pipe. CANDE is considered a well-established and well-accepted tool for this type of design. Based on the various models available, the CANDE model was selected for analysis. For comparison purposes, the solution of the Iowa Formula is also presented herein.

As mentioned previously, establishing a soil modulus is difficult for fills greater than 50 ft. For fills less than 50 feet, the soil modulus for crushed rock varies from 1,000 to 3,000 psi depending on the degree of compaction (based on Reference 6). Since the stone may be placed loose, an assumption of 1,000 psi

Calculation Sheet

was used in the analysis; however, it should be noted that this is a very conservative value and this value could actually exceed 6,000 psi.

The two analytical methods for vertical deflection are presented separately below, followed by an evaluation of pipe wall crushing.

CANDE-89

The following assumptions were used for the CANDE analysis:

Average pipe diameter	= 7.37 inches (Reference 5)
Young's Modulus of HDPE	= 110,000 psi (Reference 6)
Poisson's Ratio of HDPE	= 0.35 (Reference 6)
Yield Stress of Pipe	= 3,200 psi (Reference 6)
Minimum Thickness of Pipe Wall	= 1.182 inches (Reference 5)
Young's Modulus of Soil	= 1,000 psi
Poisson's Ratio of Soil	= 0.35
Fill Height above Springline	= 1.25 ft
User-Specified Pressure to account for Additional Overburden (Beyond 1.25 ft Above Springline)	= see below

Because CANDE-89 includes a limited amount of fill material above the pipe springline (in this case, 1.25 ft), the user-specified pressure acting on the pipe is reduced (to avoid including the pressure from the 1.25 ft of fill twice). The user-specified pressure is, therefore, calculated as:

User-Specified Pressure = 124 ft waste x 111 pcf
+ 5.5 ft liner/cover material x 130 pcf
- 1.25 ft liner material x 130 pcf
(14,317 psf = 99.4 psi) x 12/10.75 = 111.0 psi

In order to account for the presence of the perforations in the pipe (i.e., two sets of perforations per foot of pipe, as described in the previous calculation), the user-specified pressure is multiplied by a factor of 12/10.75. In essence, this removes 1.25 inches of every foot of pipe and transfers the load from that 1.25 inches to the remaining 10.75 inches of pipe.

A homogeneous finite element mesh with no frictional interface elements was assumed for simplicity. Furthermore, one construction step was assumed. Based on these assumptions, the CANDE model indicates a maximum deflection of 0.21 inches. This deflection is calculated based on the difference between the y-displacement at nodes 38 and 56 (i.e., the bottom and top of the pipe, respectively) as shown in the attached CANDE output. A deflection of 0.21 inches corresponds to 2.8% deflection as compared to the average pipe diameter. Since the recommended maximum deflection is 5.0% (Assumption 4), the above pipe design is acceptable.

Modified Iowa Formula

The deflection of the leachate collection pipe is also estimated using the Modified Iowa formula:

$$\Delta y = \frac{D\sigma k_b}{\frac{2}{3}E\left(\frac{1}{SDR-1}\right)^3 + 0.061E'}$$

Calculation Sheet

where,

Δy = vertical deflection of pipe
D = average pipe diameter = 7.37 in
σ = overburden pressure based on prism loading (see calculation below)
k_b = bedding factor = 0.1
E = modulus of elasticity for HDPE = 110,000 psi
SDR = standard diameter ratio of pipe (pipe OD/wall thickness) = 7.3
E' = soil modulus of pipe bedding = 1,000 psi (crushed rock, dumped)

The overburden pressure is calculated based on prism loading, which is the load that a flexible pipe would experience in an embankment situation (i.e., when the pipe is not in a traditional trench). As discussed above, the pipe is covered by 5.5 feet of liner and final cover material (at 130 pcf) and approximately 124 feet of waste material (at 111 pcf). This produces an overburden pressure of 14,479 psf or 100.5 psi. This value is then multiplied by a factor of 12/10.75 to account for perforations in the pipe. Therefore, the overburden pressure used in the Modified Iowa Formula is 112.2 psi. (This differs from the overburden pressure used in the CANDE-89 analysis because CANDE already included the pressure due to 1.25 feet of liner system material, as described above).

Using the Modified Iowa Formula, the vertical deflection of the pipe is 0.23 inches, which corresponds to a 3.1% deflection (as compared to the average diameter). Since a deflection of up to 5.0% is acceptable (Assumption 4), the calculated pipe deflection does not exceed the manufacturer's recommendations.

<u>Pipe Wall Crushing</u>

In addition to vertical deflection, the potential for pipe wall crushing is evaluated based on Reference 11 by dividing the normal load on the pipe by the wall cross section in a horizontal plane on a unit length basis as follows:

$$\sigma_{PW} = (P)(D_o)/(2t)$$

where,

σ_{PW} = pipe wall compressive stress (psi)
P = load applied to pipe = 112.2 psi (calculated previously)
D_o = pipe outside diameter = 8.625 in
t = pipe wall thickness = 1.182 in

σ_{PW} = 409 psi < 800 psi allowable

The calculated wall compressive stress is less than the maximum allowable compressive stress.

4. Minimum Cover to Allow Truck Operation Over the Pipe

In addition to final buildout, pipe performance is also evaluated under another scenario to determine the minimum required cover to allow operation of truck traffic over the pipe. Because the granular layers of the primary leachate collection system are 2-feet-thick, there will be approximately 15 inches of granular cover over the pipe (24 in – 8.625 in = 15.375 in) prior to any waste placement in the cell. As a first trial, this amount of cover is evaluated to determine if it is sufficient to protect the pipe from damage. As stated in Assumption 7, vehicle traffic over the top of the pipe is assumed to consist of loaded semi-trucks with a maximum axle load of 40,000 lbs. Using an assumed tire inflation pressure of 80 psi, the ground contact area is approximated as follows:

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Axle Load = 40,000 lbs
Load at Each End of Each Axle = 20,000 lbs
Ground Contact Area Beneath Set of Tires at Each End of Axle = (20,000 lbs)/(80 psi) = 250 in^2
Diameter of Assumed Circular Ground Contact Area = D = $((250\ in^2)(4)/\pi)^{1/2}$ = 17.8 in

The diameter of the ground contact area is used with Reference 12 to estimate the dissipation of the overburden pressure due to the cover depth over the top of the pipe. The estimated at-depth increase in pressure, Δp, due to traffic loads is as follows:

Ratio of cover depth, z, to radius of loaded area, R = 15.375 in/8.9 in = 1.7
Ratio of at-depth pressure increase, Δp, to ground surface pressure, q = 0.4
At-depth pressure increase (static load) = (80 psi)(0.4) = 32 psi
At-depth pressure increase (dynamic load) = (32 psi)(2.5) = 80 psi
At-depth pressure increase with adjustment for perforations = (80 psi)(12/10.75) = 89.3 psi

The two analytical methods for vertical deflection are presented separately below, followed by an evaluation of pipe wall crushing.

CANDE-89

The following assumptions are used for the CANDE analysis:

Average pipe diameter	= 7.37 inches (Reference 5)
Young's Modulus of HDPE	= 110,000 psi (Reference 6)
Poisson's Ratio of HDPE	= 0.35 (Reference 6)
Yield Stress of Pipe	= 3,200 psi (Reference 6)
Minimum Thickness of Pipe Wall	= 1.182 inches (Reference 5)
Young's Modulus of Soil	= 1,000 psi
Poisson's Ratio of Soil	= 0.35
Fill Height above Springline	= 1.25 ft
User-Specified Pressure to account for Additional Overburden (Beyond 1.25 ft Above Springline)	= see below

Because CANDE-89 includes a limited amount of fill material above the pipe springline (in this case, 1.25 ft), the user-specified soil pressure acting on the pipe is reduced (to avoid including the pressure from the 1.25 ft of fill twice). The user-specified soil pressure is, therefore, calculated as:

User-Specified Soil Pressure = 1.64 ft liner material x 130 pcf
- 1.25 ft liner material x 130 pcf
(51 psf = 0.4 psi) x 12/10.75 = 0.4 psi

In order to account for the presence of the perforations in the pipe (i.e., two sets of perforations per foot of pipe, as described in the previous calculation), the user-specified pressure is multiplied by a factor of 12/10.75. In essence, this removes 1.25 inches of every foot of pipe and transfers the load from that 1.25 inches to the remaining 10.75 inches of pipe. Including both truck and soil contributions, a total load of 89.7 psi is applied to the model.

The CANDE model indicates a maximum deflection of 0.17 inches. This deflection is calculated based on the difference between the y-displacement at nodes 38 and 56 (i.e., the bottom and top of the pipe, respectively) as shown in the attached CANDE output. A deflection of 0.17 inches corresponds to 2.3% deflection as compared to the average pipe diameter. Since a deflection of up to 5.0% is acceptable (Assumption 4), the calculated pipe deflection does not exceed the manufacturer's recommendations.

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Modified Iowa Formula

The vertical deflection of the pipe under minimal cover is also estimated using the Modified Iowa formula:

$$\Delta y = \frac{D\sigma k_b}{\frac{2}{3}E\left(\frac{1}{SDR-1}\right)^3 + 0.061E'}$$

where,

Δ y= vertical deflection of pipe
D = average pipe diameter = 7.37 in
σ = overburden pressure based on prism loading (see calculation below)
k_b = bedding factor = 0.1
E = modulus of elasticity for HDPE = 110,000 psi
SDR = standard diameter ratio of pipe (pipe OD/wall thickness) = 7.3
E' = soil modulus of pipe bedding = 1,000 psi (crushed rock, dumped)

The overburden pressure is calculated based on prism loading, which is the load that a flexible pipe would experience in an embankment situation (i.e., when the pipe is not in a traditional trench). As discussed above, the pipe is covered by approximately 15 inches of granular material (at 130 pcf). As calculated above, the truck traffic produces an at-depth pressure increase of 80 psi. Both loads are then multiplied by a factor of 12/10.75 to account for perforations in the pipe. Therefore, the overburden pressure used in the Modified Iowa Formula is 90.6 psi. (This differs from the overburden pressure used in the CANDE-89 analysis because CANDE already included the pressure due to 1.25 feet of liner system material above the pipe springline, as described above).

Using the Modified Iowa Formula, the vertical deflection of the pipe is 0.19 inches, which corresponds to a 2.6% deflection (as compared to the average diameter). Since a deflection of up to 5.0% is acceptable (Assumption 4), the calculated pipe deflection does not exceed the manufacturer's recommendations.

Pipe Wall Crushing

In addition to vertical deflection, the potential for pipe wall crushing is evaluated based on Reference 11 by dividing the normal load on the pipe by the wall cross section in a horizontal plane on a unit length basis as follows:

$\sigma_{PW} = (P)(D_o)/(2t)$

where,

σ_{PW} = pipe wall compressive stress (psi)
P = load applied to pipe = 90.6 psi (calculated previously)
D_o = pipe outside diameter = 8.625 in
t = pipe wall thickness = 1.182 in

σ_{PW} = 331 psi < 800 psi allowable

The calculated wall compressive stress is less than the maximum allowable compressive stress.

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SUMMARY:

Based on a hydraulic analysis of conditions anticipated for the cell primary and secondary leachate collection systems, an 8-inch-diameter DR 7.3 HDPE pipe with two sets of four 5/8-inch-diameter perforations per foot of pipe (eight holes total per foot of pipe) is sufficient for the leachate collection pipe. The pipe deflection analysis indicates that the selected pipe is adequate under a final buildout scenario based on an estimated deflection of less than 5.0%. A separate pipe deflection analysis demonstrates that completion of the primary leachate collection system layer (i.e., 1 foot of granular drainage layer plus 1 foot of operations layer) provides adequate cover to protect the pipe from excessive deflection under vehicle loading by a fully-loaded waste-hauling truck.