Appendix E

PLAXIS-Generated Report for Model TrenchTrans2

This page is intentionally left blank.

Appendix E

PLAXIS-Generated Report for Model TrenchTrans2

REPORT

October 25, 2004

User: Bechtel BWXT Idaho, LLC

Title: TrenchTrans2

Table of Contents

1. General Information 3

2. Geometry 4

3. Loads and Boundary Conditions 8

4. Mesh Data 10

5. Material Data 11

6. Calculation Phases 14

7. Results for Phase 2 17

8. Results for Phase 8 22

9. Results for Phase 12 27

1. General Information

Table 1. Units.

Type	Unit
Length	ft
Force	lb
Time	hr

Table 2. Model dimensions.

	min.	max.
X	0.000	100.000
Y	0.000	34.000

Table 3. Model.

Model	Plane strain
Element	15-Noded

2. Geometry

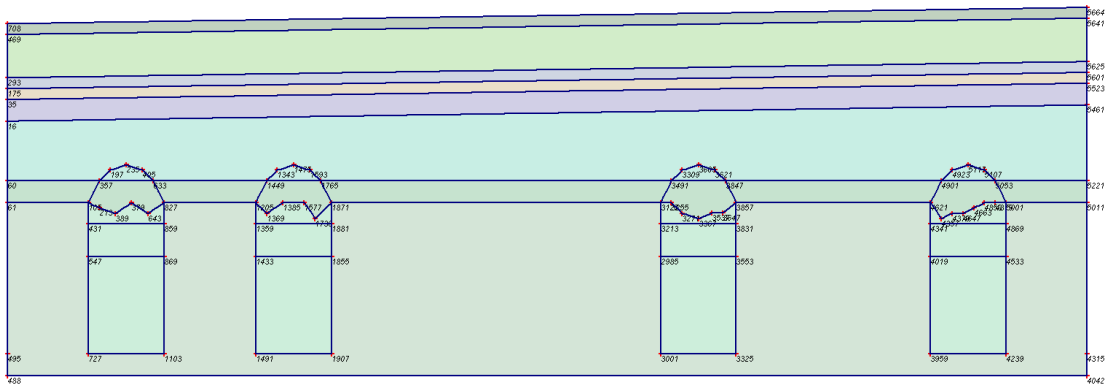


Figure 1. Plot of geometry model with significant nodes.

Table 4. Table of significant nodes.

Node no.	x-coord.	y-coord.	Node no.	x-coord.	y-coord.
488	0.000	0.000	1359	23.000	14.000
4042	100.000	0.000	1881	30.000	14.000
4315	100.000	2.000	3213	60.500	14.000
495	0.000	2.000	3831	67.500	14.000
5011	100.000	16.000	4341	85.500	14.000
61	0.000	16.000	4869	92.500	14.000
5221	100.000	18.000	1449	24.000	18.000
60	0.000	18.000	1765	29.000	18.000
5461	100.000	25.000	3847	66.500	18.000
16	0.000	23.500	3491	61.500	18.000
5523	100.000	27.000	4901	86.500	18.000
35	0.000	25.500	5053	91.500	18.000
5601	100.000	28.000	4923	87.500	19.000
175	0.000	26.500	5107	90.500	19.000
5625	100.000	29.000	5117	89.000	19.500
293	0.000	27.500	3309	62.500	19.000
5641	100.000	33.000	3605	64.000	19.500
469	0.000	31.500	3621	65.500	19.000
5664	100.000	34.000	1343	25.000	19.000
708	0.000	32.500	1475	26.500	19.500
105	7.500	16.000	1593	28.000	19.000
727	7.500	2.000	357	8.500	18.000
827	14.500	16.000	197	9.500	19.000
1103	14.500	2.000	235	11.000	19.500
1205	23.000	16.000	405	12.500	19.000
1491	23.000	2.000	633	13.500	18.000
1871	30.000	16.000	213	8.500	15.500
1907	30.000	2.000	389	10.000	15.000
3127	60.500	16.000	379	11.500	16.000

Table 4. (continued).

Node no.	x-coord.	y-coord.	Node no.	x-coord.	y-coord.
3001	60.500	2.000	643	13.000	15.000
3857	67.500	16.000	1369	24.000	15.000
3325	67.500	2.000	1385	25.500	16.000
5001	92.500	16.000	1577	27.500	16.000
4239	92.500	2.000	1736	28.500	14.500
4621	85.500	16.000	3255	61.500	16.000
3959	85.500	2.000	3271	62.500	15.000
547	7.500	11.000	3367	64.000	14.500
869	14.500	11.000	3537	65.273	15.041
1433	23.000	11.000	3647	66.273	15.041
1855	30.000	11.000	4357	86.500	14.500
2985	60.500	11.000	4379	87.500	15.000
3553	67.500	11.000	4647	88.500	15.000
4019	85.500	11.000	4663	89.500	15.500
4533	92.500	11.000	4853	90.500	16.000
431	7.500	14.000	4879	91.500	16.000
859	14.500	14.000			

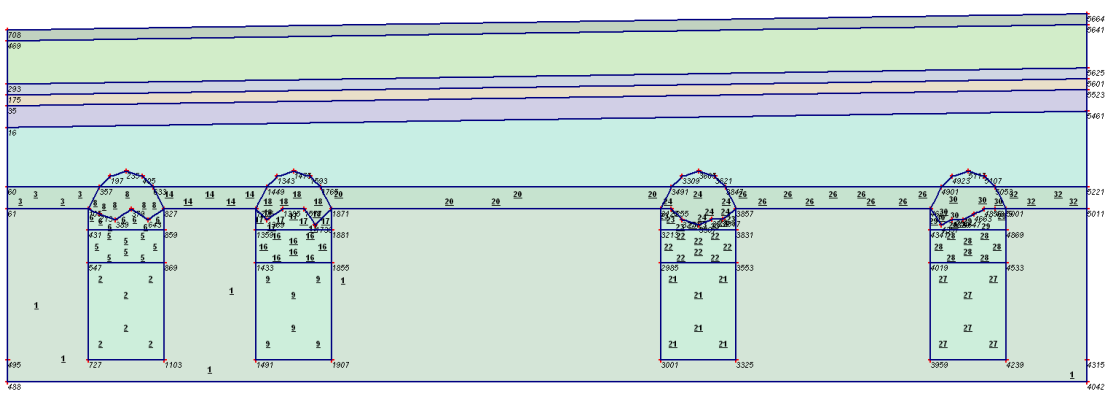


Figure 2. Plot of geometry model with cluster numbers.

Table 5. Table of clusters.

Cluster no.	Nodes
1	488, 4042, 4315, 495, 5011, 61, 105, 727, 827, 1103, 1205, 1491, 1871, 1907, 3127, 3001, 3857, 3325, 5001, 4239, 4621, 3959, 547, 869, 1433, 1855, 2985, 3553, 4019, 4533, 431, 859, 1359, 1881, 3213, 3831, 4341, 4869.
2	727, 1103, 547, 869.
3	61, 60, 105, 357.
4	5221, 60, 5461, 16, 1449, 1765, 3847, 3491, 4901, 5053, 4923, 5107, 5117, 3309, 3605, 3621, 1343, 1475, 1593, 357, 197, 235, 405, 633.
5	547, 869, 431, 859.
6	105, 827, 431, 859, 213, 389, 379, 643.
7	5461, 16, 5523, 35.
8	105, 827, 357, 633, 213, 389, 379, 643.
9	1491, 1907, 1433, 1855.
10	5523, 35, 5601, 175.
11	5601, 175, 5625, 293.
12	357, 197, 235, 405, 633.
13	5625, 293, 5641, 469.
14	827, 1205, 1449, 633.
15	5641, 469, 5664, 708.
16	1433, 1855, 1359, 1881.
17	1205, 1871, 1359, 1881, 1369, 1385, 1577, 1736.
18	1205, 1871, 1449, 1765, 1369, 1385, 1577, 1736.
19	1449, 1765, 1343, 1475, 1593.
20	1871, 3127, 1765, 3491.
21	3001, 3325, 2985, 3553.
22	2985, 3553, 3213, 3831.
23	3127, 3857, 3213, 3831, 3255, 3271, 3367, 3537, 3647.
24	3127, 3857, 3847, 3491, 3255, 3271, 3367, 3537, 3647.
25	3847, 3491, 3309, 3605, 3621.
26	3857, 4621, 3847, 4901.
27	4239, 3959, 4019, 4533.
28	4019, 4533, 4341, 4869.
29	5001, 4621, 4341, 4869, 4357, 4379, 4647, 4663, 4853, 4879.
30	5001, 4621, 4901, 5053, 4357, 4379, 4647, 4663, 4853, 4879.
31	4901, 5053, 4923, 5107, 5117.
32	5011, 5221, 5001, 5053.

3. Loads and Boundary Conditions

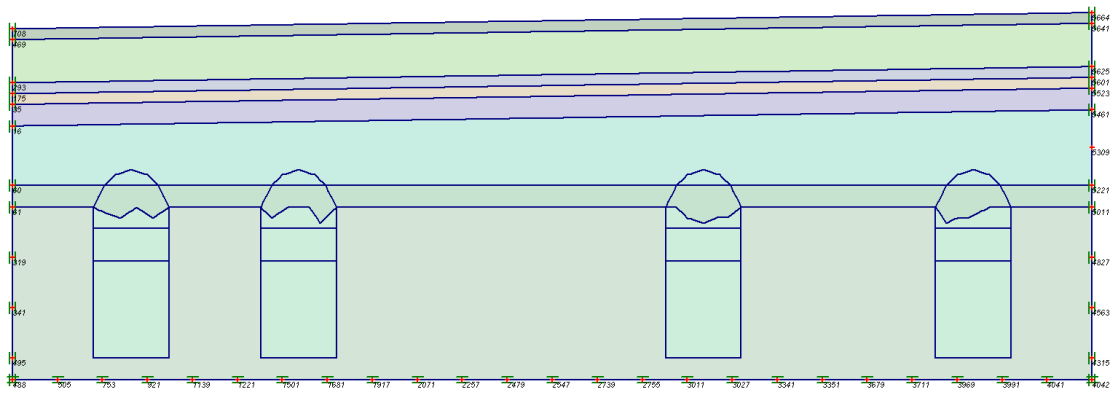


Figure 3. Plot of geometry with loads & boundary conditions.

Table 6. Node fixities.

Node no.	Sign	Horizontal	Vertical	Node no.	Sign	Horizontal	Vertical
488	#	Fixed	Fixed	5309	||	Fixed	Free
4042	#	Fixed	Fixed				
4315	||	Fixed	Free				
495	||	Fixed	Free				
5011	||	Fixed	Free				
61	||	Fixed	Free				
5221	||	Fixed	Free				
60	||	Fixed	Free				
5461	||	Fixed	Free				
16	||	Fixed	Free				
5523	||	Fixed	Free				
35	||	Fixed	Free				
5601	||	Fixed	Free				
175	||	Fixed	Free				
5625	||	Fixed	Free				
293	||	Fixed	Free				
5641	||	Fixed	Free				
469	||	Fixed	Free				
5664	||	Fixed	Free				
708	||	Fixed	Free				
4563	||	Fixed	Free				
4827	||	Fixed	Free				
319	||	Fixed	Free				
341	||	Fixed	Free				

Table 7. Distributed loads A.

Loads no.	First node	qx [lb/ft/ft]	qy [lb/ft/ft]	Last node	qx [lb/ft/ft]	qy [lb/ft/ft]
1	5664			708		

4. Mesh Data

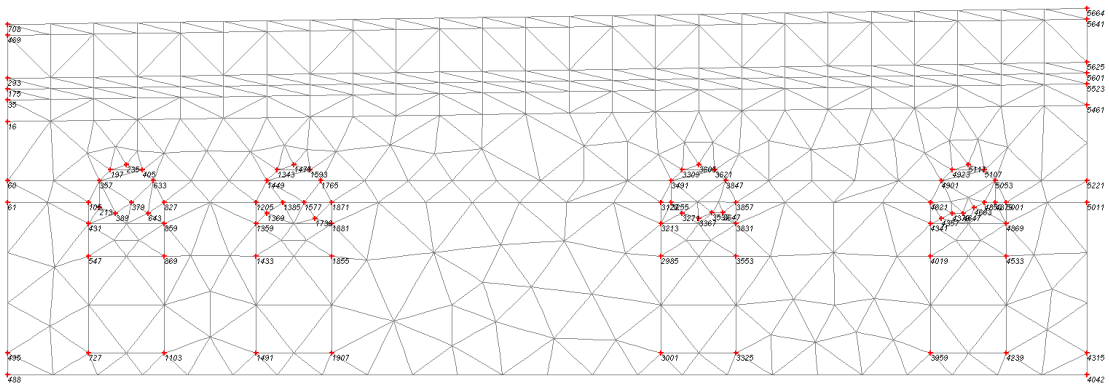


Figure 4. Plot of the mesh with significant nodes.

Table 8. Numbers, type of elements, integrations.

Type	Type of element	Type of integration	Total no.
Soil	15-noded	12-point Gauss	690

5. Material Data

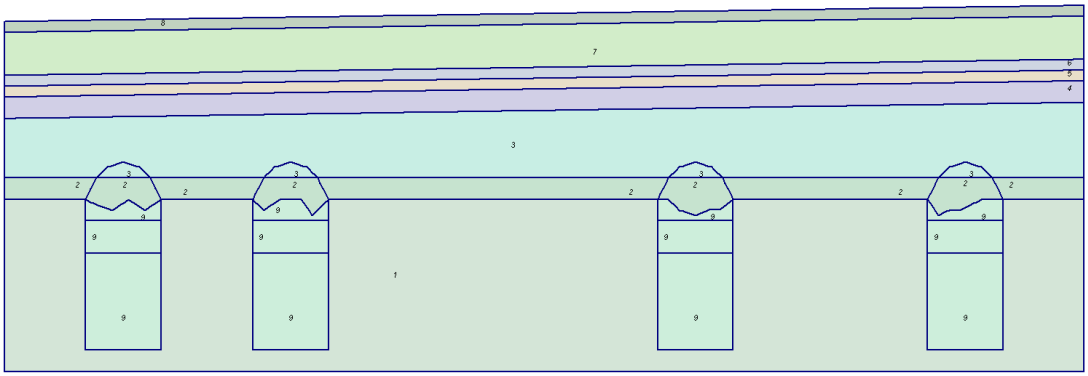


Figure 5. Plot of geometry with material data sets.

Table 9. Soil data sets parameters.

Mohr-Coulomb		1 Underburden/Native	2 Existing Overburden	3 Grading Fill	4 Biointrusion Barrier/Gas Venting
Type		Drained	Drained	Drained	Drained
γ_{unsat}	[lb/ft³]	115.00	103.00	115.00	136.00
γ_{sat}	[lb/ft³]	129.00	129.00	139.00	149.00
k_x	[ft/hr]	0.000	0.000	0.000	0.000
k_y	[ft/hr]	0.000	0.000	0.000	0.000
e_{init}	[-]	0.500	0.500	0.500	0.500
c_k	[-]	1E15	1E15	1E15	1E15
E_{ref}	[lb/ft²]	216000.000	432000.000	432000.000	4320000.000
ν	[-]	0.350	0.300	0.300	0.200
G_{ref}	[lb/ft²]	80000.000	166153.846	166153.846	1800000.000
E_{oed}	[lb/ft²]	346666.667	581538.462	581538.462	4800000.000
c_{ref}	[lb/ft²]	1540.00	1540.00	1540.00	0.20
φ	[°]	26.30	26.30	33.50	50.00
ψ	[°]	0.00	0.00	3.50	20.00
E_{inc}	[lb/ft²/ft]	0.00	0.00	0.00	0.00
y_{ref}	[ft]	0.000	0.000	0.000	0.000
$c_{increment}$	[lb/ft²/ft]	0.00	0.00	0.00	0.00
$T_{str.}$	[lb/ft²]	0.00	0.00	0.00	0.00
$R_{inter.}$	[-]	1.00	1.00	1.00	1.00
Interface permeability		Neutral	Neutral	Neutral	Neutral

Table 9. (continued).

Mohr-Coulomb		5 Crushed Gravel	6 Sand	7 Water Storage	8 Topsoil
Type		Drained	Drained	Drained	Drained
γ_{unsat}	[lb/ft³]	136.00	121.00	115.00	115.00
γ_{sat}	[lb/ft³]	149.00	138.00	139.00	139.00
k_x	[ft/hr]	0.000	0.000	0.000	0.000
k_y	[ft/hr]	0.000	0.000	0.000	0.000
e_{init}	[-]	0.500	0.500	0.500	0.500
c_k	[-]	1E15	1E15	1E15	1E15
E_{ref}	[lb/ft²]	2016000.000	100800.000	288000.000	216000.000
ν	[-]	0.300	0.300	0.340	0.300
G_{ref}	[lb/ft²]	775384.615	38769.231	107462.687	83076.923
E_{oed}	[lb/ft²]	2713846.154	135692.308	443283.582	290769.231
c_{ref}	[lb/ft²]	0.20	20.00	1540.00	500.00
φ	[°]	50.00	33.50	33.50	30.00
ψ	[°]	20.00	3.50	3.50	0.00
E_{inc}	[lb/ft²/ft]	0.00	0.00	0.00	0.00
y_{ref}	[ft]	0.000	0.000	0.000	0.000
$c_{increment}$	[lb/ft²/ft]	0.00	0.00	0.00	0.00
$T_{str.}$	[lb/ft²]	0.00	0.00	0.00	0.00
$R_{inter.}$	[-]	1.00	1.00	1.00	1.00
Interface permeability		Neutral	Neutral	Neutral	Neutral

Mohr-Coulomb		**9** **Trench Waste**
Type		Drained
γ_{unsat}	[lb/ft³]	100.00
γ_{sat}	[lb/ft³]	120.00
k_x	[ft/hr]	0.000
k_y	[ft/hr]	0.000
e_{init}	[-]	0.500
c_k	[-]	1E15
E_{ref}	[lb/ft²]	100000.000
ν	[-]	0.300
G_{ref}	[lb/ft²]	38461.538
E_{oed}	[lb/ft²]	134615.385
c_{ref}	[lb/ft²]	100.00
φ	[°]	20.00
ψ	[°]	0.00
E_{inc}	[lb/ft²/ft]	0.00
y_{ref}	[ft]	0.000
$c_{increment}$	[lb/ft²/ft]	0.00
$T_{str.}$	[lb/ft²]	0.00
$R_{inter.}$	[-]	1.00
Interface permeability		Neutral

6. Calculation Phases

Table 10. List of phases.

Phase	Ph-No.	Start phase	Calculation type	Load input	First step	Last step
Initial phase	0	0		-	0	0
Stage 1	1	0	Plastic	Staged construction	1	2
Stage 2	2	1	Plastic	Staged construction	3	7
Stage 3	3	2	Plastic	Total multipliers	8	39
Stage 4	4	3	Plastic	Total multipliers	40	67
Stage 5	5	4	Plastic	Total multipliers	68	115
Stage 6	6	5	Plastic	Total multipliers	116	139
Stage 7	7	6	Plastic	Staged construction	140	149
Stage 8	8	7	Plastic	Staged construction	150	158
Stage 9	9	8	Plastic	Total multipliers	159	223
Stage 10	10	9	Plastic	Total multipliers	224	244
Stage 11	11	10	Plastic	Total multipliers	245	261
Stage 12	12	11	Plastic	Total multipliers	262	265

Table 11. Staged construction info.

Ph-No.	Active clusters	Inactive clusters	Active beams	Active geotextiles	Active anchors
0	1, 2, 3, 5, 6, 8, 9, 14, 16, 17, 18, 20, 21, 22, 23, 24, 26, 27, 28, 29, 30, 32.	4, 7, 10, 11, 12, 13, 15, 19, 25, 31.			
1	1, 2, 3, 4, 5, 6, 8, 9, 12, 14, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32.	7, 10, 11, 13, 15.			
2	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, 29, 30, 31, 32.				
7	1, 2, 3, 4, 5, 7, 9, 10, 11, 13, 14, 15, 16, 20, 21, 22, 26, 27, 28, 32.	6, 8, 12, 17, 18, 19, 23, 24, 25, 29, 30, 31.			
8	1, 2, 3, 4, 7, 9, 10, 11, 13, 14, 15, 20, 21, 26, 27, 32.	5, 6, 8, 12, 16, 17, 18, 19, 22, 23, 24, 25, 28, 29, 30, 31.			

Table 12. Control parameters 1.

Ph-No.	Additional steps	Reset displacements to zero	Ignore undrained behavior	Delete intermediate steps
1	250	No	No	Yes
2	250	No	No	Yes
3	250	No	No	Yes
4	250	No	No	Yes
5	250	No	No	Yes
6	250	No	No	Yes
7	250	No	No	Yes
8	250	No	No	Yes
9	250	No	No	Yes
10	250	No	No	Yes
11	250	No	No	Yes
12	250	No	No	Yes

Table 13. Control parameters 2.

Ph-No.	Iterative procedure	Tolerated error	Over relaxation	Max. iterations	Desired min.	Desired max.	Arc-Length control
1	Standard	0.010	1.200	60	6	15	Yes
2	Standard	0.010	1.200	60	6	15	Yes
3	Standard	0.010	1.200	60	6	15	Yes
4	Standard	0.010	1.200	60	6	15	Yes
5	Standard	0.010	1.200	60	6	15	Yes
6	Standard	0.010	1.200	60	6	15	Yes
7	Standard	0.010	1.200	60	6	15	Yes
8	Standard	0.010	1.200	60	6	15	Yes
9	Standard	0.010	1.200	60	6	15	Yes
10	Standard	0.010	1.200	60	6	15	Yes
11	Standard	0.010	1.200	60	6	15	Yes
12	Standard	0.010	1.200	60	6	15	Yes

Table 14. Incremental multipliers (input values).

Ph-No.	Displ.	Load A	Load B	Weight	Accel	Time	s-f
0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
1	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
6	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
7	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
8	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
9	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
10	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
11	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
12	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Table 15. Total multipliers - input values.

Ph-No.	Displ.	Load A	Load B	Weight	Accel	Time	s-f
0	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	1.0000
1	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	1.0000
2	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	1.0000
3	1.0000	1.0000	1.0000	1.0400	0.7100	0.0000	1.0000
4	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	1.0000
5	1.0000	1.0000	1.0000	1.0400	-0.7100	0.0000	1.0000
6	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	1.0000
7	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	1.0000
8	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	1.0000
9	1.0000	1.0000	1.0000	1.0400	0.7100	0.0000	1.0000
10	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	1.0000
11	1.0000	1.0000	1.0000	1.0400	-0.1700	0.0000	1.0000
12	1.0000	1.0000	1.0000	1.0000	-0.1700	0.0000	1.0000

Table 16. Total multipliers - reached values.

Ph-No.	Displ.	Load A	Load B	Weight	Accel	Time	s-f
0	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	1.0000
1	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	1.0000
2	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	1.0000
3	1.0000	1.0000	1.0000	1.0400	0.7106	0.0000	1.0000
4	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	1.0000
5	1.0000	1.0000	1.0000	1.0400	-0.7100	0.0000	1.0000
6	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	1.0000
7	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	1.0000
8	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	1.0000
9	1.0000	1.0000	1.0000	1.0400	0.7103	0.0000	1.0000
10	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	1.0000
11	1.0000	1.0000	1.0000	1.0400	-0.1700	0.0000	1.0000
12	1.0000	1.0000	1.0000	1.0000	-0.1700	0.0000	1.0000

7. Results for Phase 2

Table 17. Step info phase no: 2.

Step no:	7
Calculation type	PLASTIC
Extrapolation factor	1.170
Relative stiffness	1.000

Table 18. Reached multipliers phase no: 2.

Multipliers	Incremental value	Total value
Prescribed displacements	0.0000	1.0000
Load system A	0.0000	1.0000
Load system B	0.0000	1.0000
Soil weight	0.0000	1.0000
Acceleration	0.0000	0.0000
Strength reduction factor	0.0000	1.0000
Time	0.0000	0.0000

Table 19. Staged construction info phase no: 2.

Staged construction	Incremental value	Total value
Active proportion of total area	0.000	1.000
Active proportion of stage	0.384	1.000

Table [20] Iteration info phase no: 2

Iter. no.	Global error	Plastic points	Plastic Cap + Hard. points	Inacc. Pl. pts.	Plastic Intf. pts.	Inacc. Intf. pts.	Apex & Tension	Inacc. Apx. pts.
1	0.000	191	0	54	0	0	57	0
2	0.000	191	0	0	0	0	57	0

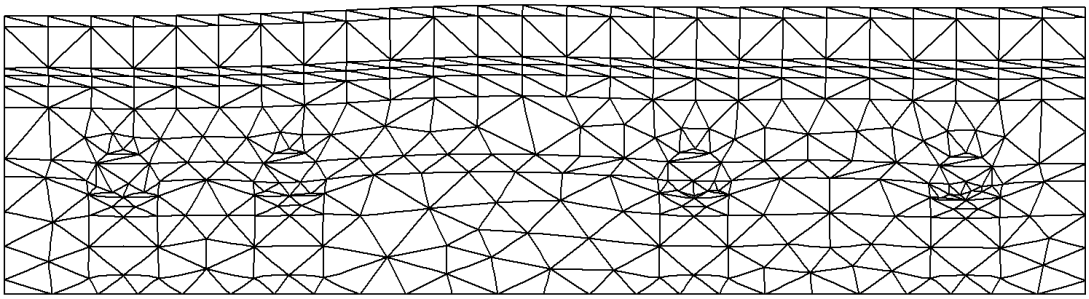


Figure 6. Plot of deformed mesh - step no: 7 - (phase: 2).

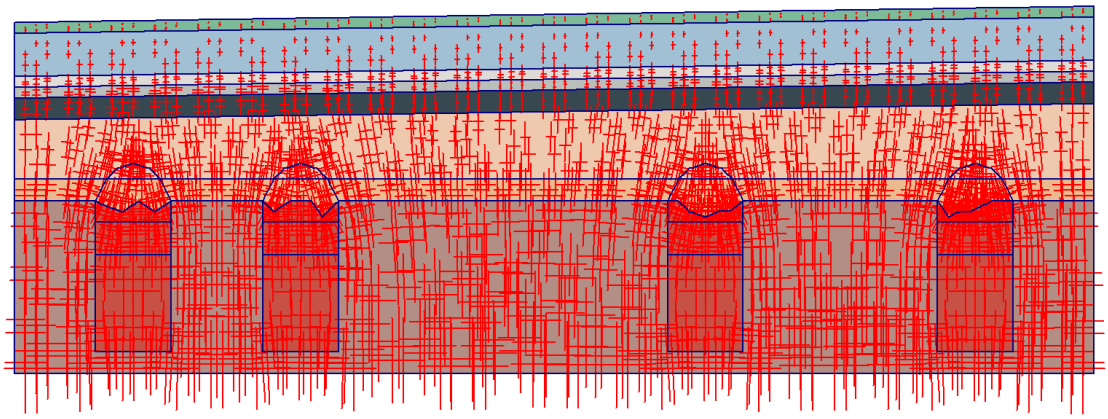


Figure 7. Plot of effective stresses (principal directions) - step no: 7 - (phase: 2).

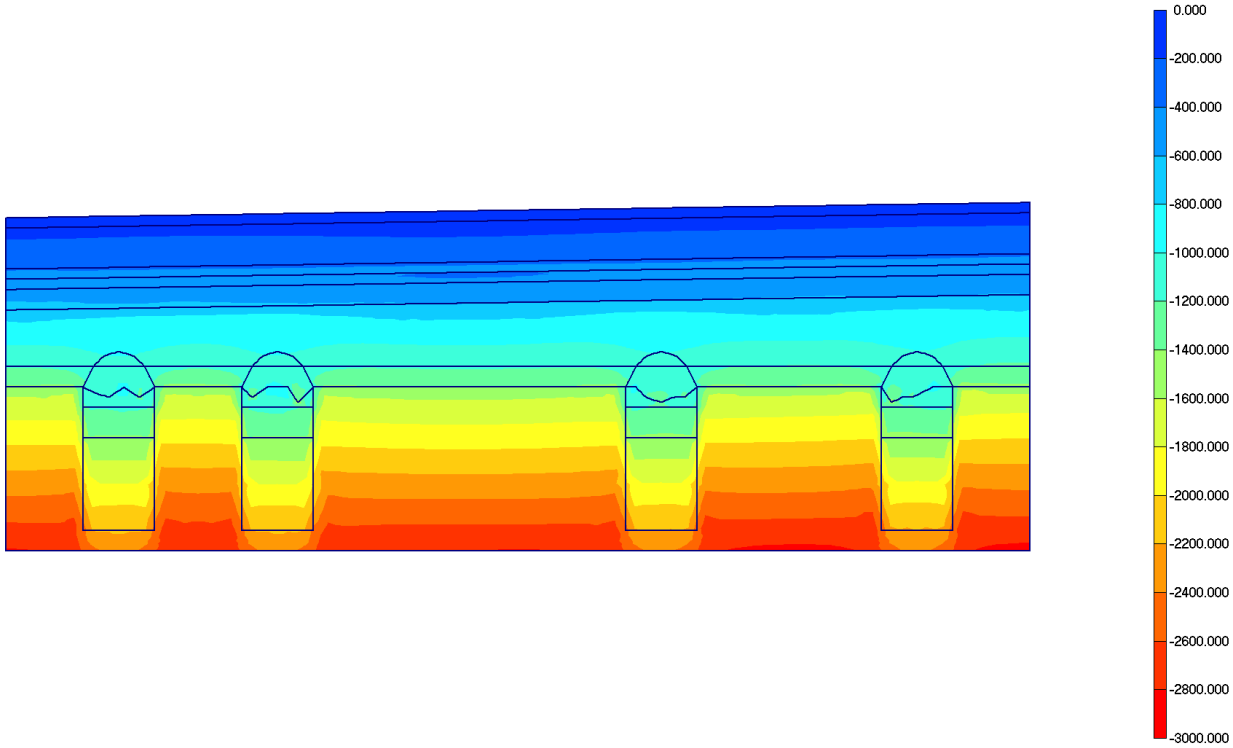


Figure 8. Plot of effective stresses (mean shadings) - step no: 7 - (phase: 2).

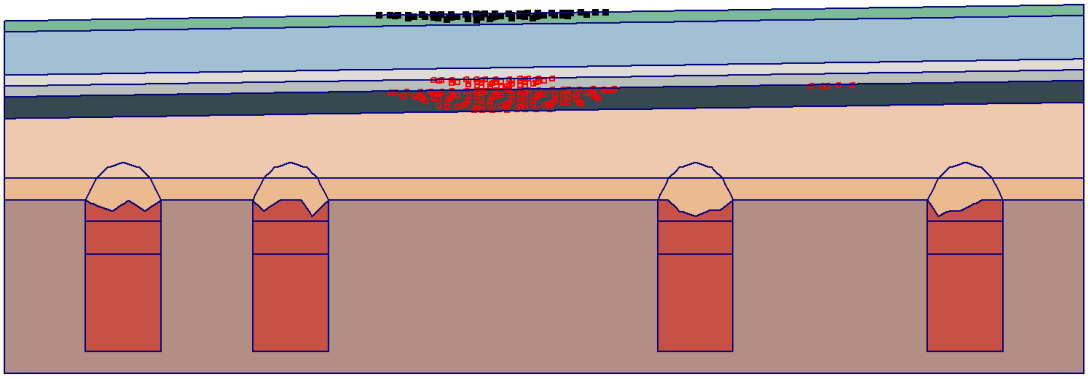


Figure 9. Plot of plastic points - step no: 7 - (phase: 2).

8. Results for Phase 8

Table 21. Step info phase no: 8.

Step no:	158
Calculation type	PLASTIC
Extrapolation factor	0.439
Relative stiffness	0.085

Table 22. Reached multipliers phase no: 8.

Multipliers	Incremental value	Total value
Prescribed displacements	0.0000	1.0000
Load system A	0.0000	1.0000
Load system B	0.0000	1.0000
Soil weight	0.0000	1.0000
Acceleration	0.0000	0.0000
Strength reduction factor	0.0000	1.0000
Time	0.0000	0.0000

Table 23. Staged construction info phase no: 8.

Staged construction	Incremental value	Total value
Active proportion of total area	0.000	0.938
Active proportion of stage	0.034	1.000

Table 24. Iteration info phase no: 8.

Iter. no.	Global error	Plastic points	Plastic Cap + Hard. points	Inacc. Pl. pts.	Plastic Intf. pts.	Inacc. Intf. pts.	Apex & Tension	Inacc. Apx. pts.
1	0.008	298	0	136	0	0	46	5
2	0.006	295	0	15	0	0	46	3

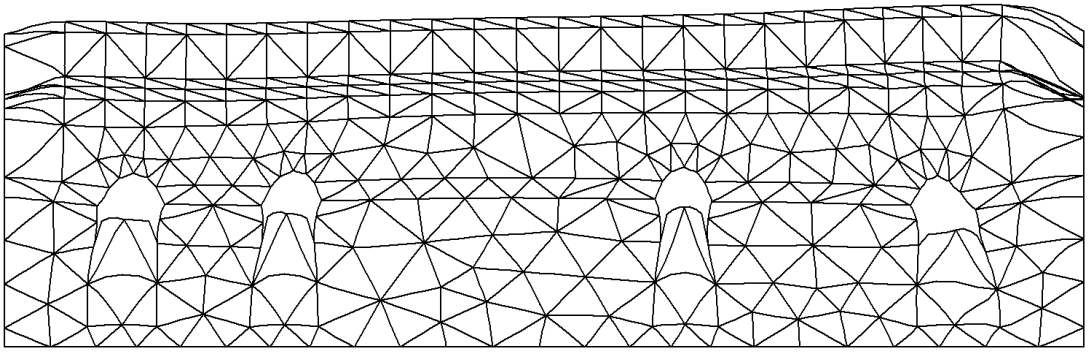


Figure 10. Plot of deformed mesh - step no: 158 - (phase: 8).

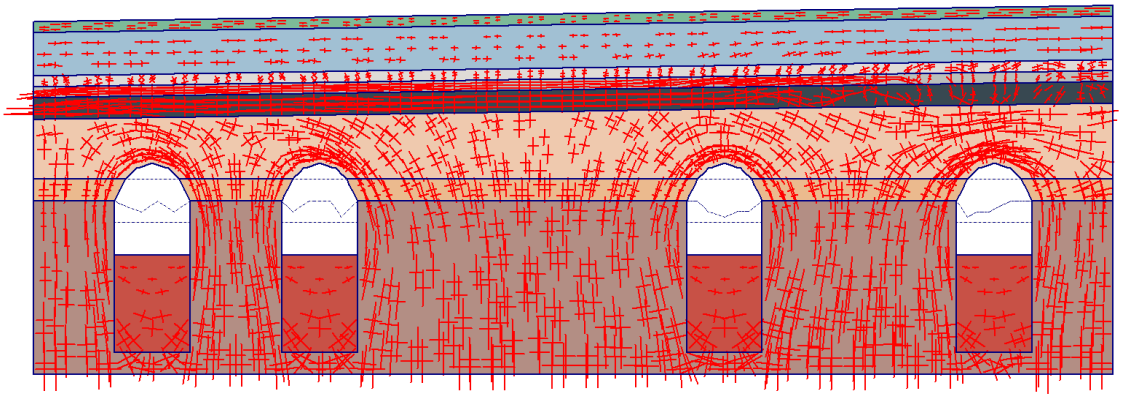


Figure 11. Plot of effective stresses (principal directions) - step no: 158 - (phase: 8).

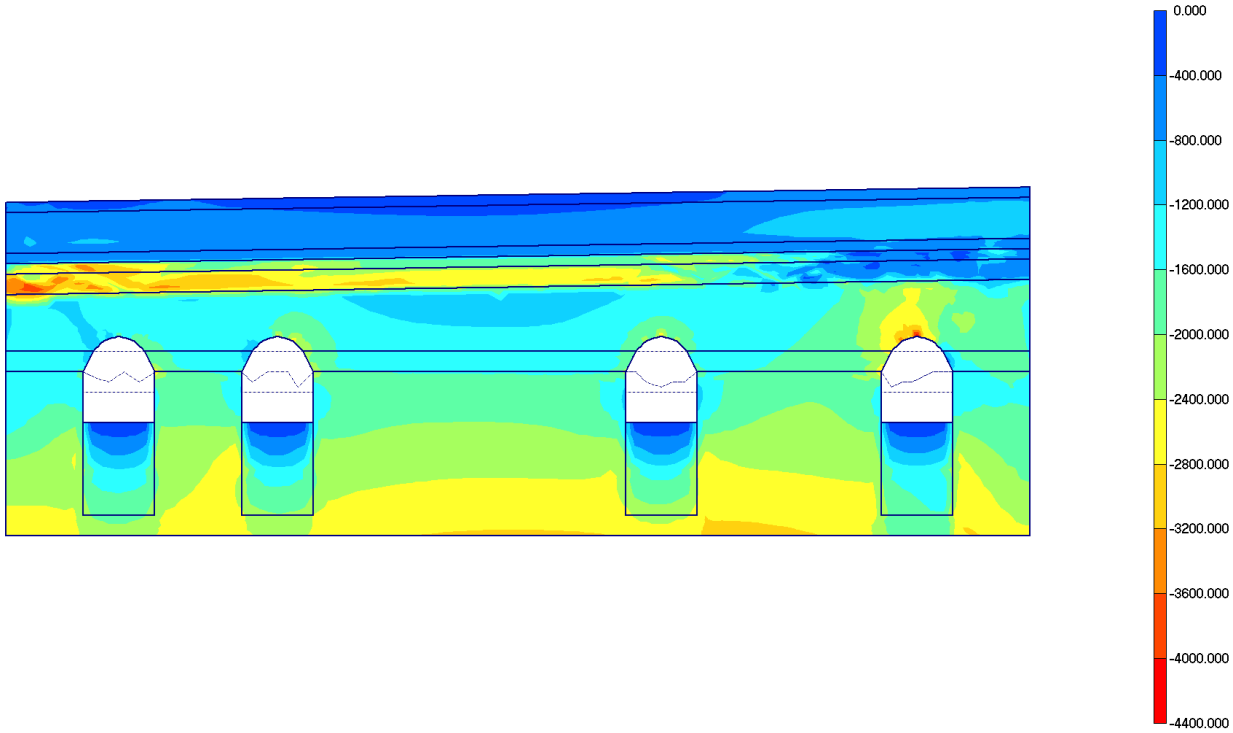


Figure 12. Plot of effective stresses (mean shadings) - step no: 158 - (phase: 8).

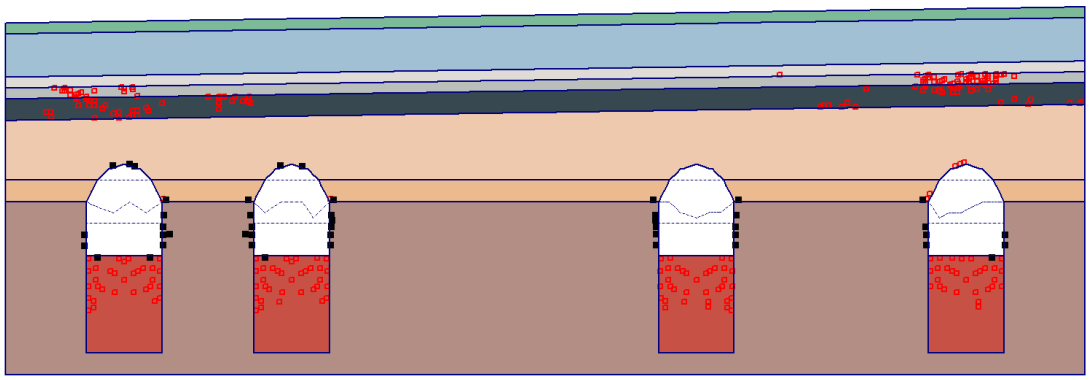


Figure 13. Plot of plastic points - step no: 158 - (phase: 8).

9. Results for Phase 12

Table 25. Step info phase no: 12.

Step no:	265
Calculation type	PLASTIC
Extrapolation factor	0.545
Relative stiffness	0.879

Table 26. Reached multipliers phase no: 12.

Multipliers	Incremental value	Total value
Prescribed displacements	0.0000	1.0000
Load system A	0.0000	1.0000
Load system B	0.0000	1.0000
Soil weight	-0.0107	1.0000
Acceleration	0.0000	-0.1700
Strength reduction factor	0.0000	1.0000
Time	0.0000	0.0000

Table 27. Staged construction info phase no: 12.

Staged construction	Incremental value	Total value
Active proportion of total area	0.000	0.938
Active proportion of stage	0.000	0.000

Table 28. Iteration info phase no: 12.

Iter. no.	Global error	Plastic points	Plastic Cap + Hard. points	Inacc. Pl. pts.	Plastic Intf. pts.	Inacc. Intf. pts.	Apex & Tension	Inacc. Apx. pts.
1	0.009	529	0	60	0	0	57	22
2	0.009	534	0	36	0	0	56	12

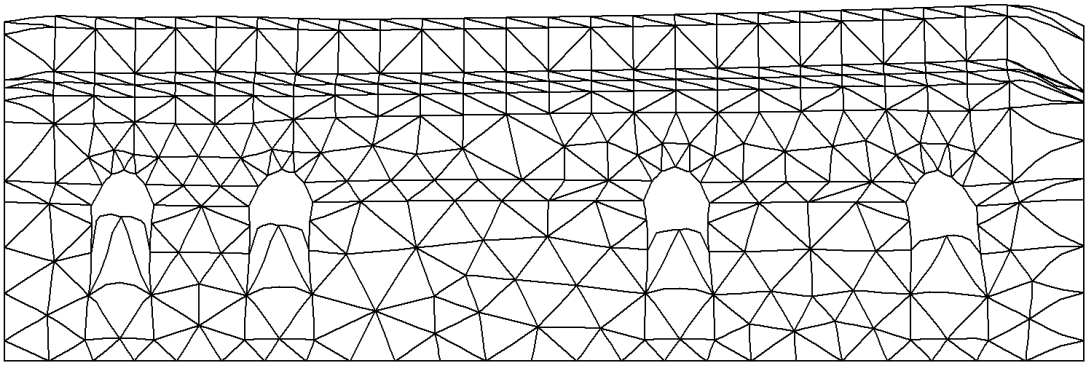


Figure 14. Plot of deformed mesh - step no: 265 - (phase: 12).

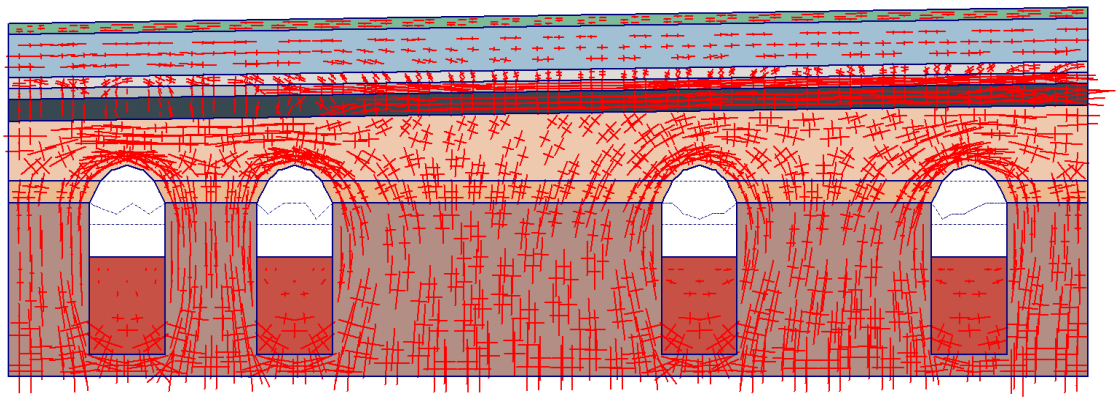


Figure 15. Plot of effective stresses (principal directions) - step no: 265 - (phase: 12).

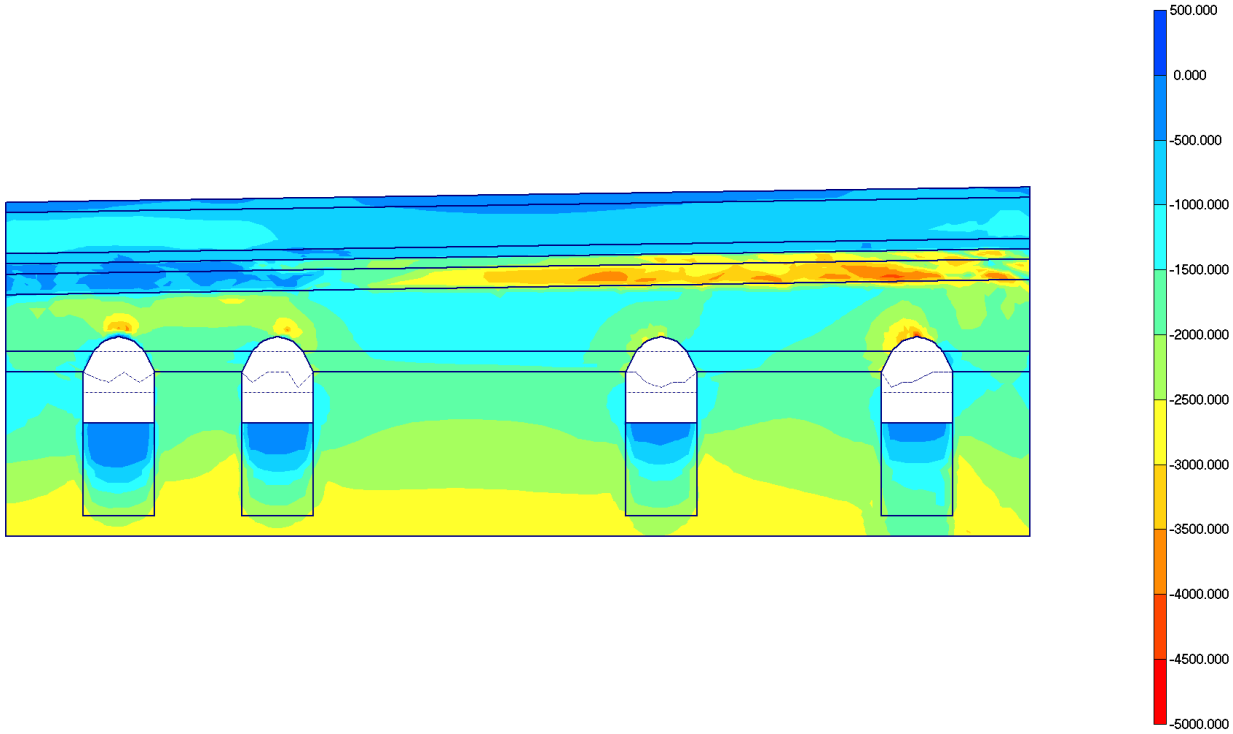


Figure 16. Plot of effective stresses (mean shadings) - step no: 265 - (phase: 12).

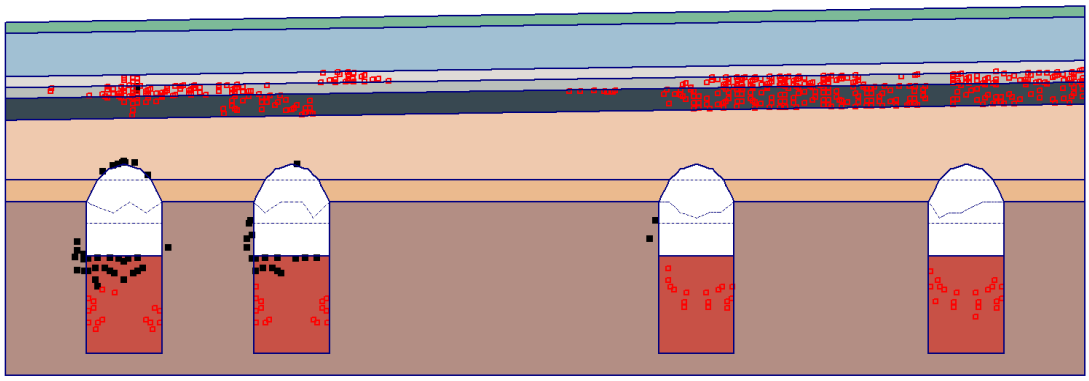


Figure 17. Plot of plastic points - step no: 265 - (phase: 12).

Appendix F

PLAXIS-Generated Report for Model General Pit1

This page is intentionally left blank.

Appendix F

PLAXIS-Generated Report for Model General Pit1

REPORT

October 25, 2004

User: Bechtel BWXT Idaho, LLC

Title: General Pit1

Table of Contents

1. General Information 3

2. Geometry 4

3. Structures 8

4. Loads and Boundary Conditions 9

5. Mesh Data 11

6. Material Data 12

7. Calculation Phases 15

8. Results for Phase 2 18

9. Results for Phase 12 23

10. Results for Phase 11 28

1. General Information

Table 1. Units.

Type	Unit
Length	ft
Force	lb
Time	hr

Table 2. Model dimensions.

	min.	max.
X	0.000	46.000
Y	1.997	30.500

Table 3. Model.

Model	Plane strain
Element	15-Noded

2. Geometry

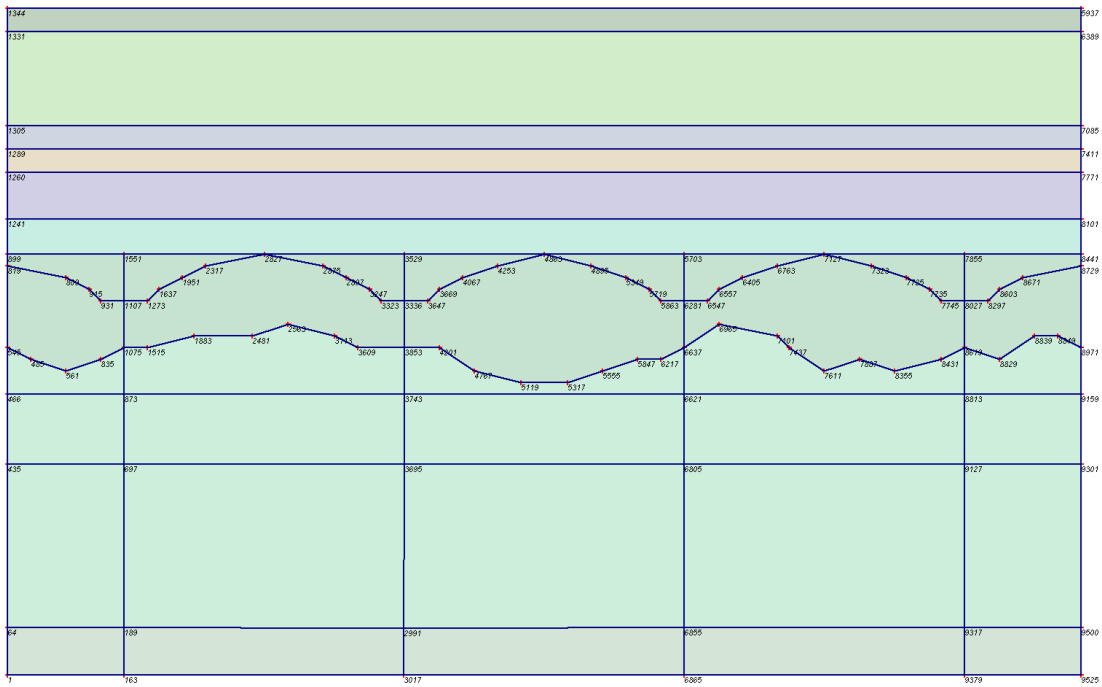


Figure 1. Plot of geometry model with significant nodes.

Table 4. Table of significant nodes.

Node no.	x-coord.	y-coord.	Node no.	x-coord.	y-coord.
1	0.000	2.000	7127	35.000	20.000
64	0.000	4.000	8027	41.000	18.000
545	0.000	16.000	9379	41.000	2.000
899	0.000	20.000	8619	41.000	16.000
1241	0.000	21.500	9317	41.000	4.000
1260	0.000	23.500	7323	37.000	19.500
1289	0.000	24.500	7725	38.500	19.000
1305	0.000	25.500	7735	39.500	18.500
1331	0.000	29.500	7745	40.000	18.000
1344	0.000	30.500	8297	42.000	18.000
9525	46.000	2.000	8603	42.500	18.500
9500	46.000	4.000	8671	43.500	19.000
8971	46.000	16.000	8729	46.000	19.500
5863	28.000	18.000	466	0.000	14.000
6547	30.000	18.000	819	0.000	19.500
6281	29.000	18.000	9159	46.000	14.000
6865	29.000	2.000	873	5.000	14.000
6855	29.000	4.000	3743	17.000	14.000
6637	29.000	16.000	8813	41.000	14.000
3323	16.000	18.000	6621	29.000	14.000
3647	18.000	18.000	435	0.000	11.000

Table 4. (continued).

Node no.	x-coord.	y-coord.	Node no.	x-coord.	y-coord.
3336	17.000	18.000	9301	46.000	11.000
3017	16.986	1.997	697	5.000	11.000
3853	17.000	16.000	3695	17.000	11.000
2991	16.986	3.997	9127	41.000	11.000
931	4.000	18.000	6805	29.000	11.000
1273	6.000	18.000	1551	5.000	20.000
1107	5.000	18.000	3529	17.000	20.000
163	5.000	2.000	5703	29.000	20.000
1075	5.000	16.000	7855	41.000	20.000
189	5.000	4.000	485	1.000	15.500
5937	46.000	30.500	561	2.500	15.000
8441	46.000	20.000	835	4.000	15.500
8101	46.000	21.500	1515	6.000	16.000
7771	46.000	23.500	1883	8.000	16.500
7411	46.000	24.500	2481	10.500	16.500
7085	46.000	25.500	2563	12.000	17.000
6389	46.000	29.500	3113	14.000	16.500
1637	6.500	18.500	3609	15.000	16.000
1951	7.500	19.000	4201	18.500	16.000
2317	8.500	19.500	4767	20.000	15.000
2827	11.000	20.000	5119	22.000	14.500
2875	13.500	19.500	5317	24.000	14.500
2897	14.500	19.000	5555	25.500	15.000
3247	15.500	18.500	5847	27.000	15.500
915	3.500	18.500	6217	28.000	15.500
809	2.500	19.000	6965	30.500	17.000
3669	18.500	18.500	7101	33.000	16.500
4067	19.500	19.000	7437	33.500	16.000
4253	21.000	19.500	7611	35.000	15.000
4863	23.000	20.000	7887	36.500	15.500
4895	25.000	19.500	8355	38.000	15.000
5349	26.500	19.000	8431	40.000	15.500
5719	27.500	18.500	8829	42.500	15.500
6557	30.500	18.500	8839	44.000	16.500
6405	31.500	19.000	8849	45.000	16.500
6763	33.000	19.500			

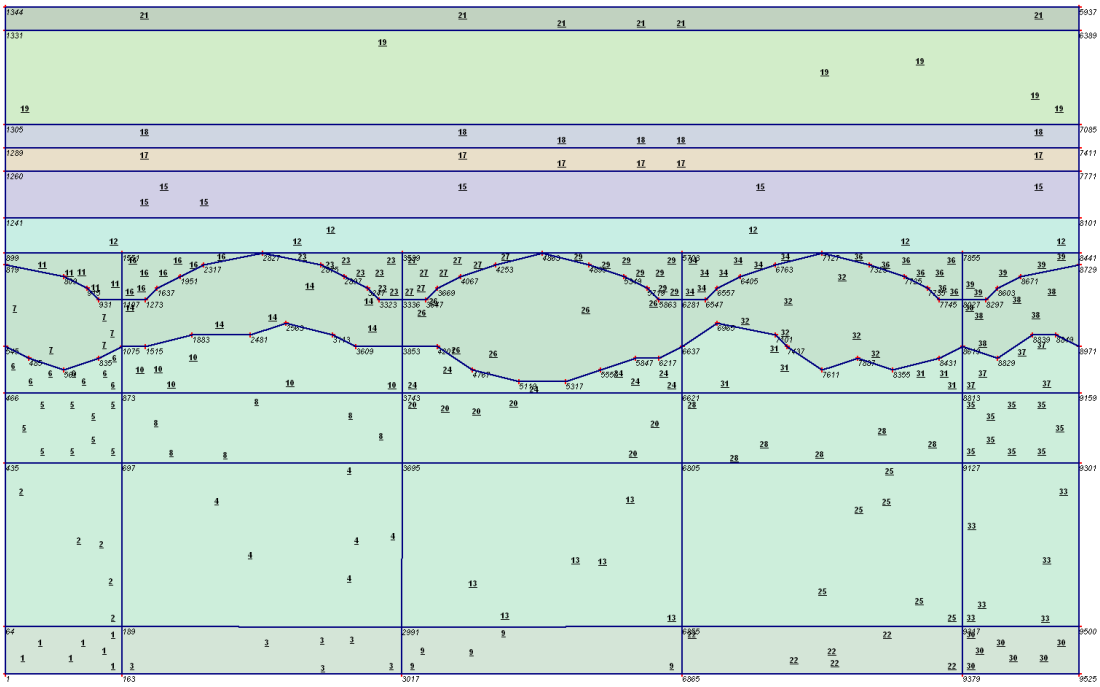


Figure 2. Plot of geometry model with cluster numbers.

Table 5. Table of clusters.

Cluster no.	Nodes
1	1, 64, 163, 189.
2	64, 189, 435, 697.
3	3017, 2991, 163, 189.
4	2991, 189, 697, 3695.
5	466, 873, 435, 697.
6	545, 1075, 466, 873, 485, 561, 835.
7	545, 931, 1107, 1075, 915, 809, 819, 485, 561, 835.
8	873, 3743, 697, 3695.
9	6865, 6855, 3017, 2991.
10	3853, 1075, 873, 3743, 1515, 1883, 2481, 2563, 3113, 3609.
11	899, 931, 1107, 915, 809, 819, 1551.
12	899, 1241, 8441, 8101, 2827, 4863, 7127, 1551, 3529, 5703, 7855.
13	6855, 2991, 3695, 6805.
14	3323, 3336, 3853, 1273, 1107, 1075, 1637, 1951, 2317, 2827, 2875, 2897, 3247, 1515, 1883, 2481, 2563, 3113, 3609.
15	1241, 1260, 8101, 7771.
16	1273, 1107, 1637, 1951, 2317, 2827, 1551.
17	1260, 1289, 7771, 7411.
18	1289, 1305, 7411, 7085.
19	1305, 1331, 7085, 6389.
20	3743, 6621, 3695, 6805.
21	1331, 1344, 5937, 6389.
22	6865, 6855, 9379, 9317.
23	3323, 3336, 2827, 2875, 2897, 3247, 3529.
24	6637, 3853, 3743, 6621, 4201, 4767, 5119, 5317, 5555, 5847, 6217.
25	6855, 9317, 9127, 6805.
26	5863, 6281, 6637, 3647, 3336, 3853, 3669, 4067, 4253, 4863, 4895, 5349, 5719, 4201, 4767, 5119, 5317, 5555, 5847, 6217.
27	3647, 3336, 3669, 4067, 4253, 4863, 3529.
28	8813, 6621, 9127, 6805.
29	5863, 6281, 4863, 4895, 5349, 5719, 5703.
30	9525, 9500, 9379, 9317.
31	6637, 8619, 8813, 6621, 6965, 7101, 7437, 7611, 7887, 8355, 8431.
32	6547, 6281, 6637, 6557, 6405, 6763, 7127, 8027, 8619, 7323, 7725, 7735, 7745, 6965, 7101, 7437, 7611, 7887, 8355, 8431.
33	9500, 9317, 9301, 9127.
34	6547, 6281, 6557, 6405, 6763, 7127, 5703.
35	9159, 8813, 9301, 9127.
36	7127, 8027, 7323, 7725, 7735, 7745, 7855.
37	8971, 8619, 9159, 8813, 8829, 8839, 8849.
38	8971, 8027, 8619, 8297, 8603, 8671, 8729, 8829, 8839, 8849.
39	8441, 8027, 8297, 8603, 8671, 8729, 7855.

3. Structures

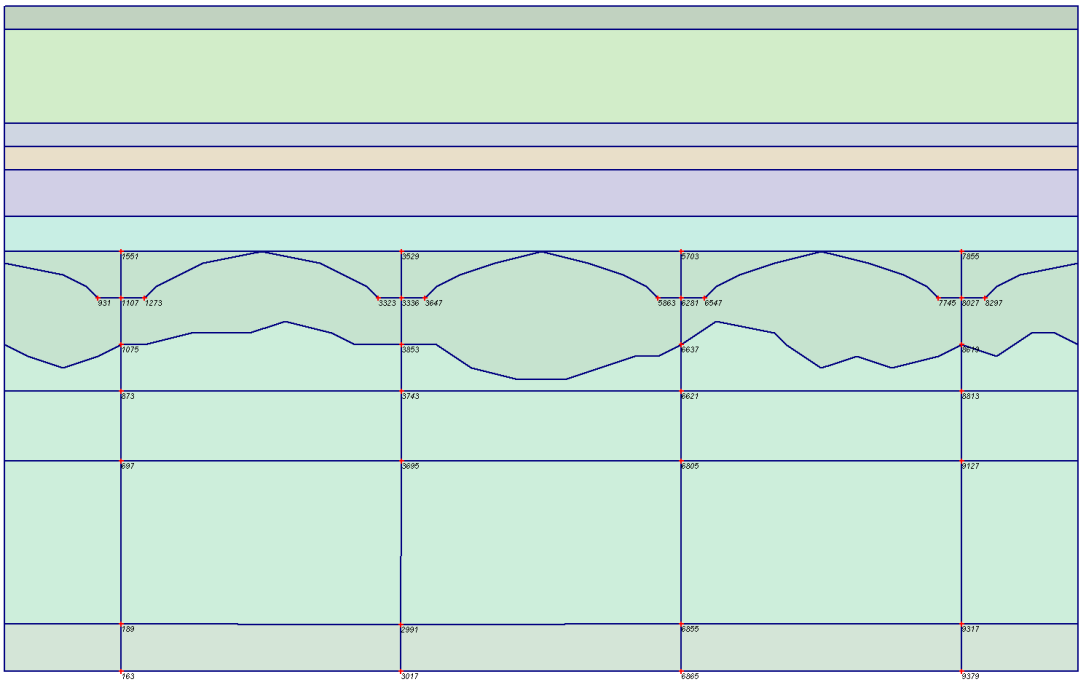


Figure 3. Plot of geometry model with structures.

Table 6. Beams.

Plate no.	Data set	Length [ft]	Nodes
1	2 ft dia. grout column	16.000	1107, 1075, 873, 697, 189, 163.
2	2 ft dia. grout column	2.000	931, 1107, 1273.
3	2 ft dia. grout column	4.000	3336, 2991, 3017.
4	2 ft dia. grout column	2.000	3323, 3336, 3647.
5	2 ft dia. grout column	16.000	8027, 8619, 8813, 9127, 9317, 9379.
6	2 ft dia. grout column	2.000	7745, 8027, 8297.
7	2 ft dia. grout column	16.000	6281, 6637, 6621, 6805, 6855, 6865.
8	2 ft dia. grout column	2.000	6281, 5863, 6281.
9	2 ft dia. grout column	12.003	3853, 3743, 3695, 2991.
10	0.34 ft dia. grout column	2.000	1551, 1107.
11	0.34 ft dia. grout column	2.000	3529, 3336.
12	0.34 ft dia. grout column	2.000	5703, 6281.
13	0.34 ft dia. grout column	2.000	7855,

4. Loads and Boundary Conditions

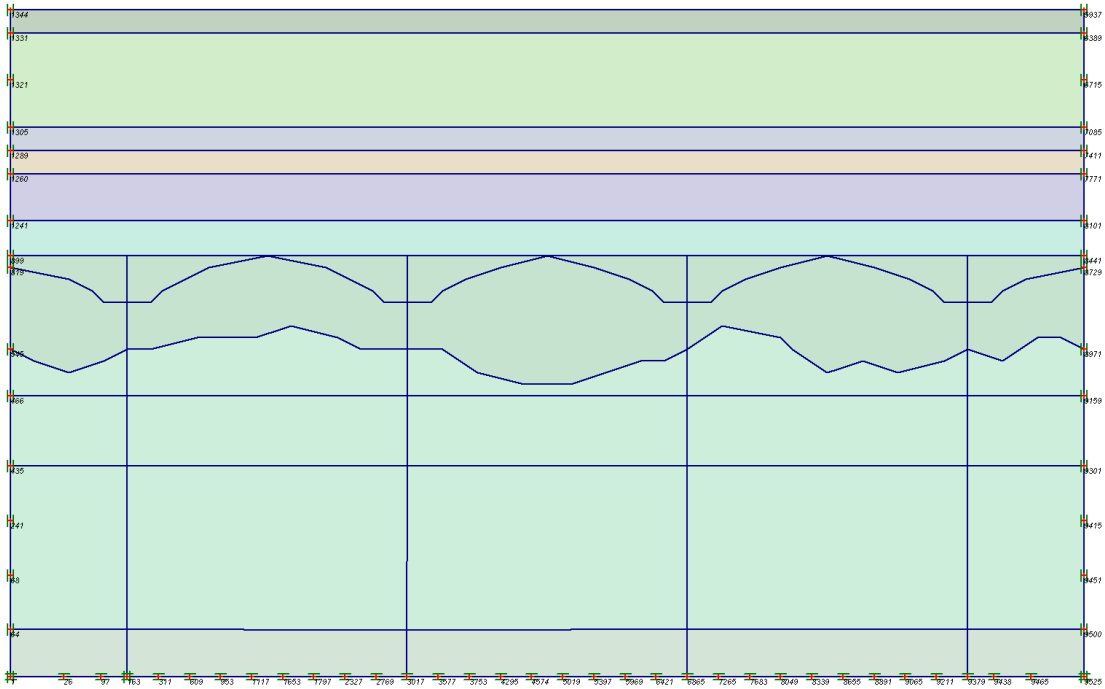


Figure 4. Plot of geometry with loads & boundary conditions.

Table 7. Node fixities.

Node no.	Sign	Horizontal	Vertical	Node no.	Sign	Horizontal	Vertical
1	#	Fixed	Fixed	6715	||	Fixed	Free
9525	#	Fixed	Fixed				
163	#	Fixed	Fixed				
64	||	Fixed	Free				
545	||	Fixed	Free				
899	||	Fixed	Free				
1241	||	Fixed	Free				
1260	||	Fixed	Free				
1289	||	Fixed	Free				
1305	||	Fixed	Free				
1331	||	Fixed	Free				
1344	||	Fixed	Free				
9500	||	Fixed	Free				
8971	||	Fixed	Free				
5937	||	Fixed	Free				
8441	||	Fixed	Free				
8101	||	Fixed	Free				
7771	||	Fixed	Free				
7411	||	Fixed	Free				
7085	||	Fixed	Free				
6389	||	Fixed	Free				
466	||	Fixed	Free				
8729	||	Fixed	Free				
819	||	Fixed	Free				
435	||	Fixed	Free				
9159	||	Fixed	Free				
9301	||	Fixed	Free				
241	||	Fixed	Free				
68	||	Fixed	Free				
9415	||	Fixed	Free				
9451	||	Fixed	Free				
1321	||	Fixed	Free				

Table 8. Distributed loads A.

Loads no.	First node	qx [lb/ft/ft]	qy [lb/ft/ft]	Last node	qx [lb/ft/ft]	qy [lb/ft/ft]
1	1344	0.000	0.000	5937	0.000	0.000

5. Mesh Data

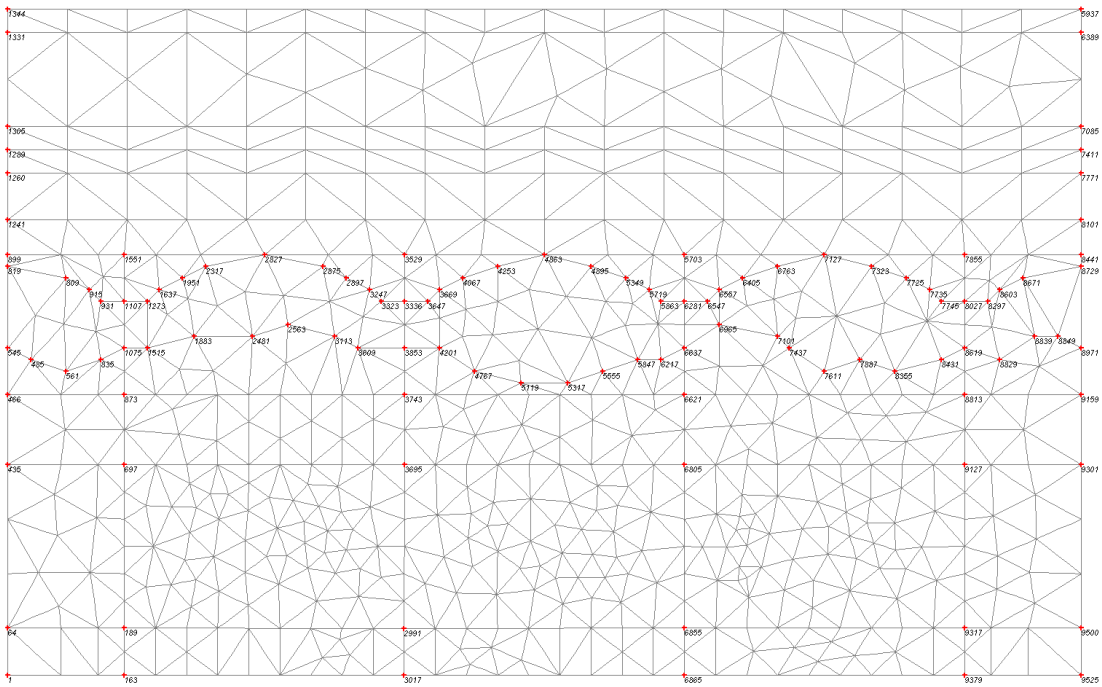


Figure 5. Plot of the mesh with significant nodes.

Table 9. Numbers, type of elements, integrations.

Type	Type of element	Type of integration	Total no.
Soil	15-noded	12-point Gauss	1171
Plate	5-node line	4-point Gauss	72

6. Material Data

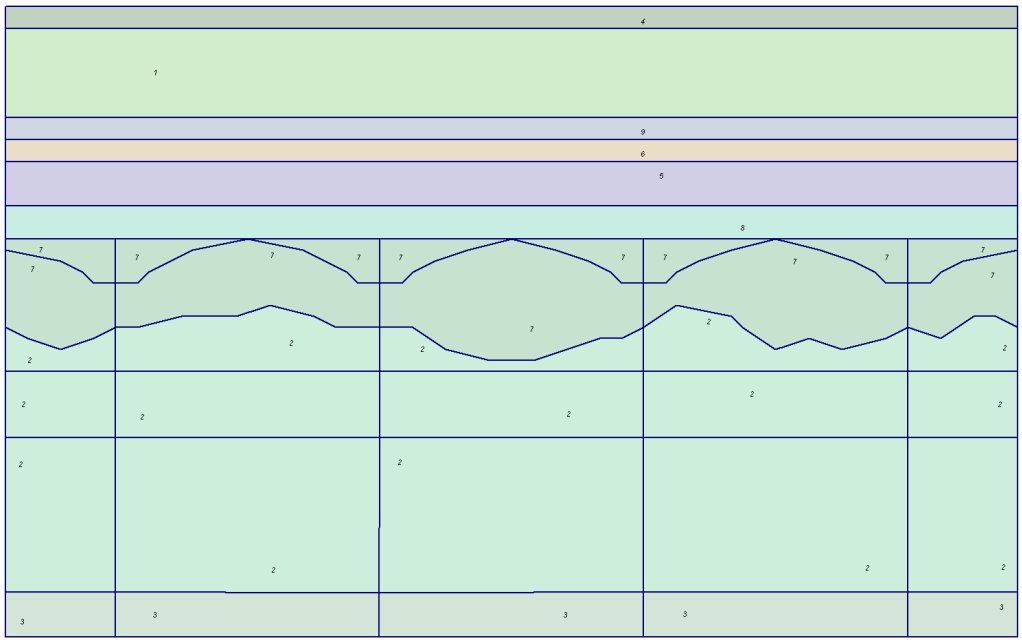


Figure 6. Plot of geometry with material data sets.

Table 10. Soil data sets parameters.

Mohr-Coulomb		1 Water Storage	2 Waste	3 Underburden/Native	4 Topsoil
Type		Drained	Undrained	Undrained	Undrained
γ_{unsat}	[lb/ft³]	115.00	100.00	115.00	115.00
γ_{sat}	[lb/ft³]	139.00	120.00	129.00	139.00
k_x	[ft/hr]	0.000	0.000	0.000	0.000
k_y	[ft/hr]	0.000	0.000	0.000	0.000
e_{init}	[-]	0.500	0.500	0.500	0.500
c_k	[-]	1E15	1E15	1E15	1E15
E_{ref}	[lb/ft²]	288000.000	10000.000	216000.000	216000.000
ν	[-]	0.340	0.350	0.350	0.300
G_{ref}	[lb/ft²]	107462.687	3703.704	80000.000	83076.923
E_{oed}	[lb/ft²]	443283.582	16049.383	346666.667	290769.231
c_{ref}	[lb/ft²]	1540.00	20.00	1540.00	500.00
φ	[°]	33.50	15.00	26.30	30.00
ψ	[°]	0.00	0.00	0.00	0.00
E_{inc}	[lb/ft²/ft]	0.00	0.00	0.00	0.00
y_{ref}	[ft]	0.000	0.000	0.000	0.000
$c_{increment}$	[lb/ft²/ft]	0.00	0.00	0.00	0.00
$T_{str.}$	[lb/ft²]	0.00	0.00	0.00	0.00
$R_{inter.}$	[-]	1.00	1.00	1.00	1.00
Interface permeability		Neutral	Neutral	Neutral	Neutral

Table 10. (continued).

Mohr-Coulomb		5 Biointrusion Barrier/Gas Venting	6 Crushed Gravel	7 Existing Overburden	8 Grading Fill
Type		Drained	Drained	Drained	Drained
γ_{unsat}	[lb/ft³]	136.00	136.00	103.00	115.00
γ_{sat}	[lb/ft³]	149.00	149.00	129.00	139.00
k_x	[ft/hr]	0.000	0.000	0.000	0.000
k_y	[ft/hr]	0.000	0.000	0.000	0.000
e_{init}	[-]	0.500	0.500	0.500	0.500
c_k	[-]	1E15	1E15	1E15	1E15
E_{ref}	[lb/ft²]	4320000.000	2016000.000	432000.000	432000.000
ν	[-]	0.200	0.300	0.300	0.300
G_{ref}	[lb/ft²]	1800000.000	775384.615	166153.846	166153.846
E_{oed}	[lb/ft²]	4800000.000	2713846.154	581538.462	581538.462
c_{ref}	[lb/ft²]	0.20	0.20	1540.00	1540.00
φ	[°]	50.00	50.00	26.30	33.50
ψ	[°]	20.00	20.00	0.00	0.00
E_{inc}	[lb/ft²/ft]	0.00	0.00	0.00	0.00
y_{ref}	[ft]	0.000	0.000	0.000	0.000
$c_{increment}$	[lb/ft²/ft]	0.00	0.00	0.00	0.00
$T_{str.}$	[lb/ft²]	0.00	0.00	0.00	0.00
$R_{inter.}$	[-]	1.00	1.00	1.00	1.00
Interface permeability		Neutral	Neutral	Neutral	Neutral

Mohr-Coulomb		9 Sand
Type		Drained
γ_{unsat}	[lb/ft³]	121.00
γ_{sat}	[lb/ft³]	138.00
k_x	[ft/hr]	0.000
k_y	[ft/hr]	0.000
e_{init}	[-]	0.500
c_k	[-]	1E15
E_{ref}	[lb/ft²]	100800.000
ν	[-]	0.300
G_{ref}	[lb/ft²]	38769.231
E_{oed}	[lb/ft²]	135692.308
c_{ref}	[lb/ft²]	20.00
φ	[°]	33.50
ψ	[°]	10.00
E_{inc}	[lb/ft²/ft]	0.00
y_{ref}	[ft]	0.000
$c_{increment}$	[lb/ft²/ft]	0.00
$T_{str.}$	[lb/ft²]	0.00
$R_{inter.}$	[-]	1.00
Interface permeability		Neutral

Table 11. Beam data sets parameters.

No.	Identification	EA	EI	w	ν	Mp	Np
		[lb/ft]	[lbft²/ft]	[lb/ft/ft]	[-]	[lbft/ft]	[lb/ft]
1	2 ft dia. grout column	8.9281E8	2.2332E8	150.00	0.15	1E15	1E15
2	1 ft. dia. grout return	2.2331E8	1.3961E7	0.00	0.00	1E15	1E15
3	0.34 ft dia. grout column	2.5815E7	1.8651E5	130.00	0.15	1E15	1E15

7. Calculation Phases

Table 12. List of phases.

Phase	Ph-No.	Start phase	Calculation type	Load input	First step	Last step
Initial phase	0	0		-	0	0
Stage 1	1	0	Plastic	Staged construction	1	2
Stage 2	2	1	Plastic	Staged construction	3	4
Stage 3	3	2	Plastic	Total multipliers	5	21
Stage 4	4	3	Plastic	Total multipliers	22	24
Stage 5	5	4	Plastic	Total multipliers	25	39
Stage 6	6	5	Plastic	Total multipliers	40	40
Stage 7	7	6	Plastic	Staged construction	41	68
Stage 8	12	7	Plastic	Staged construction	69	70
Stage 9	8	7	Plastic	Total multipliers	71	119
Stage 10	9	8	Plastic	Total multipliers	120	129
Stage 11	10	9	Plastic	Total multipliers	130	161
Stage 12	11	10	Plastic	Total multipliers	162	166

Table 13. Staged construction info.

Ph-No.	Active clusters	Inactive clusters	Active beams	Active geotextiles	Active anchors
0	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, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39.				
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, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39.		1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13.		
2	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, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39.		1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13.		
7	1, 2, 3, 4, 5, 8, 9, 11, 12, 13, 15, 16, 17, 18, 19, 20, 21, 22, 23, 25, 27, 28, 29, 30, 33, 34, 35, 36, 39.	6, 7, 10, 14, 24, 26, 31, 32, 37, 38.	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13.		
12	1, 2, 3, 4, 9, 11, 12, 13, 15, 16, 17, 18, 19, 21, 22, 23, 25, 27, 29, 30, 33, 34, 36, 39.	5, 6, 7, 8, 10, 14, 20, 24, 26, 28, 31, 32, 35, 37, 38.	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13.		

Table 14. Control parameters 1.

Ph-No.	Additional steps	Reset displacements to zero	Ignore undrained behavior	Delete intermediate steps
1	250	No	No	Yes
2	250	No	No	Yes
3	250	No	No	Yes
4	250	No	No	Yes
5	250	No	No	Yes
6	250	No	No	Yes
7	250	No	No	Yes
12	250	No	No	Yes
8	250	No	No	Yes
9	250	No	No	Yes
10	250	No	No	Yes
11	250	No	No	Yes

Table 15. Control parameters 2.

Ph-No.	Iterative procedure	Tolerated error	Over relaxation	Max. iterations	Desired min.	Desired max.	Arc-Length control
1	Standard	0.010	1.200	60	6	15	Yes
2	Standard	0.010	1.200	60	6	15	Yes
3	Standard	0.010	1.200	60	6	15	Yes
4	Standard	0.010	1.200	60	6	15	Yes
5	Standard	0.010	1.200	60	6	15	Yes
6	Standard	0.010	1.200	60	6	15	Yes
7	Standard	0.010	1.200	60	6	15	Yes
12	Standard	0.010	1.200	60	6	15	Yes
8	Standard	0.010	1.200	60	6	15	Yes
9	Standard	0.010	1.200	60	6	15	Yes
10	Standard	0.010	1.200	60	6	15	Yes
11	Standard	0.010	1.200	60	6	15	Yes

Table 16. Incremental multipliers (input values).

Ph-No.	Displ.	Load A	Load B	Weight	Accel	Time	s-f
0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
1	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
6	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
7	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
12	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
8	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
9	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
10	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
11	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Table 17. Total multipliers - input values.

Ph-No.	Displ.	Load A	Load B	Weight	Accel	Time	s-f
0	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	1.0000
1	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	1.0000
2	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	1.0000
3	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	1.0000
4	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	1.0000
5	1.0000	1.0000	1.0000	1.0000	-1.0000	0.0000	1.0000
6	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	1.0000
7	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	1.0000
12	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	1.0000
8	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	1.0000
9	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	1.0000
10	1.0000	1.0000	1.0000	1.0000	-1.0000	0.0000	1.0000
11	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	1.0000

Table 18. Total multipliers - reached values.

Ph-No.	Displ.	Load A	Load B	Weight	Accel	Time	s-f
0	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	1.0000
1	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	1.0000
2	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	1.0000
3	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	1.0000
4	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	1.0000
5	1.0000	1.0000	1.0000	1.0000	-1.0000	0.0000	1.0000
6	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	1.0000
7	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	1.0000
12	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	1.0000
8	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	1.0000
9	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	1.0000
10	1.0000	1.0000	1.0000	1.0000	-1.0000	0.0000	1.0000
11	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	1.0000

8. Results for Phase 2

Table 19. Step info phase no: 2.

Step no:	4
Calculation type	PLASTIC
Extrapolation factor	1.000
Relative stiffness	1.000

Table 20. Reached multipliers phase no: 2.

Multipliers	Incremental value	Total value
Prescribed displacements	0.0000	1.0000
Load system A	0.0000	1.0000
Load system B	0.0000	1.0000
Soil weight	0.0000	1.0000
Acceleration	0.0000	0.0000
Strength reduction factor	0.0000	1.0000
Time	0.0000	0.0000

Table 21. Staged construction info phase no: 2.

Staged construction	Incremental value	Total value
Active proportion of total area	0.000	1.000
Active proportion of stage	0.500	1.000

Table 22. Iteration info phase no: 2.

Iter. no.	Global error	Plastic points	Plastic Cap + Hard. points	Inacc. Pl. pts.	Plastic Intf. pts.	Inacc. Intf. pts.	Apex & Tension	Inacc. Apx. pts.
1	0.000	4	0	0	0	0	0	0
2	0.000	4	0	0	0	0	0	0

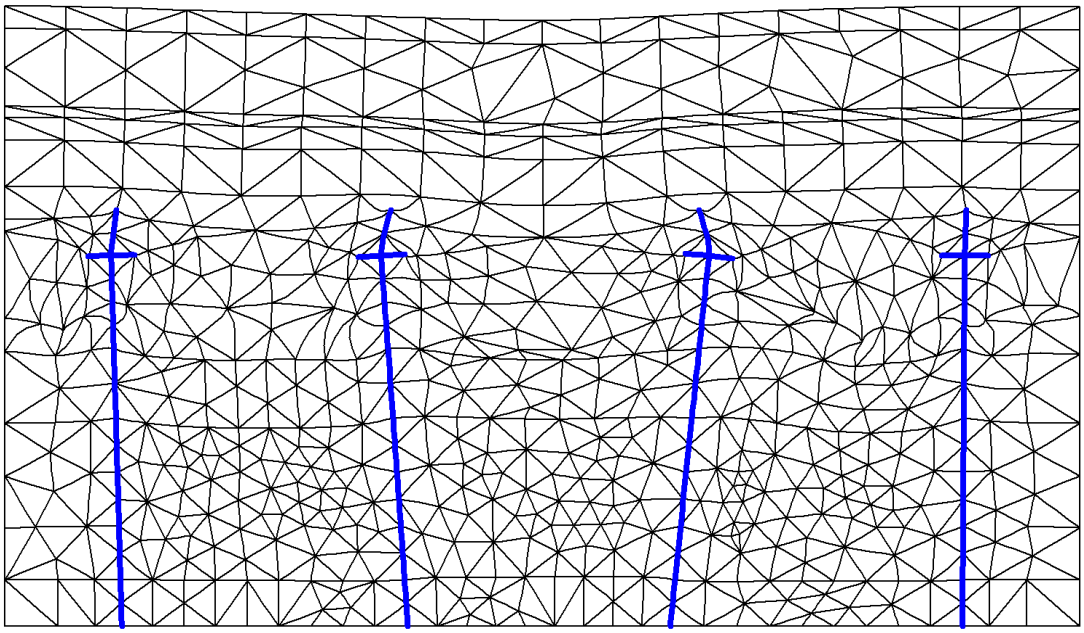


Figure 7. Plot of deformed mesh - step no: 4 - (phase: 2).

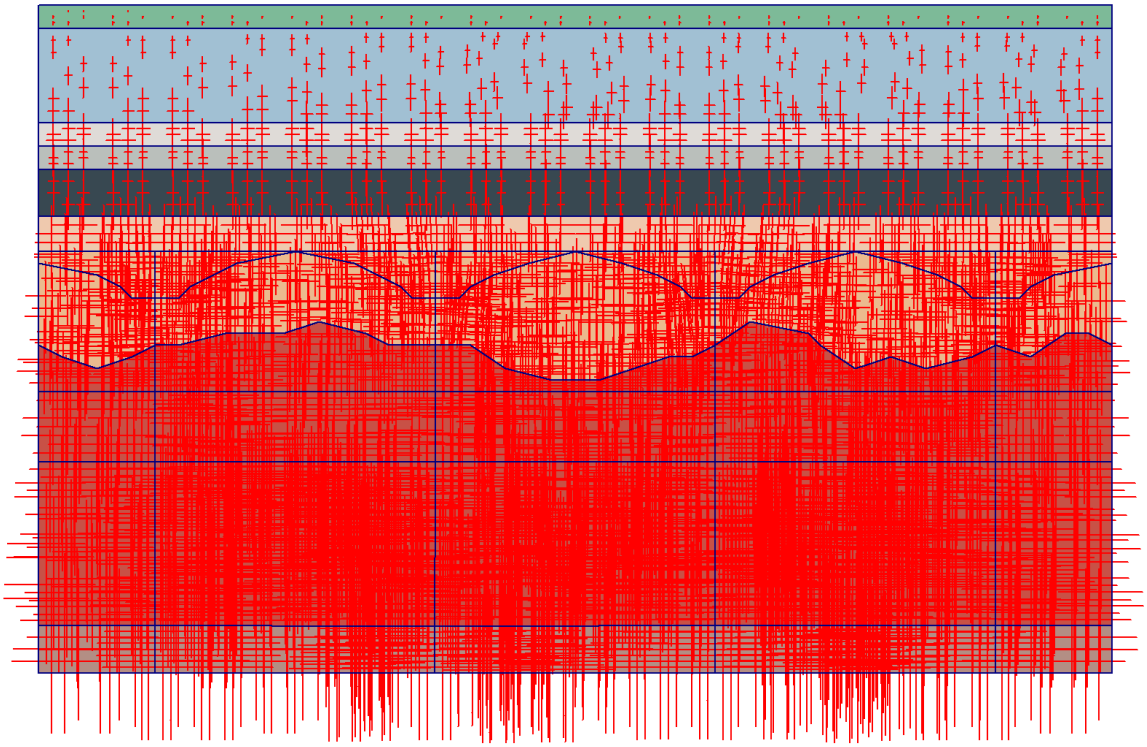


Figure 8. Plot of effective stresses (principal directions) - step no: 4 - (phase: 2).

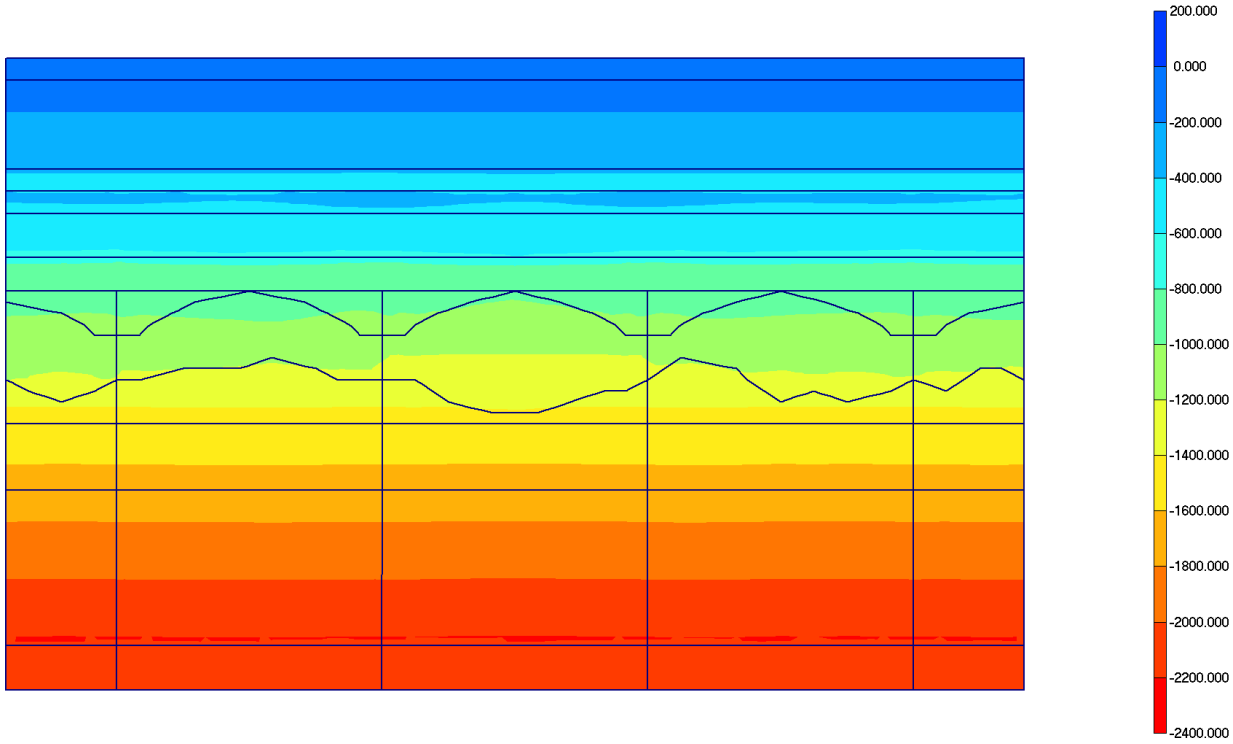


Figure 9. Plot of effective stresses (mean shadings) - step no: 4 - (phase: 2).

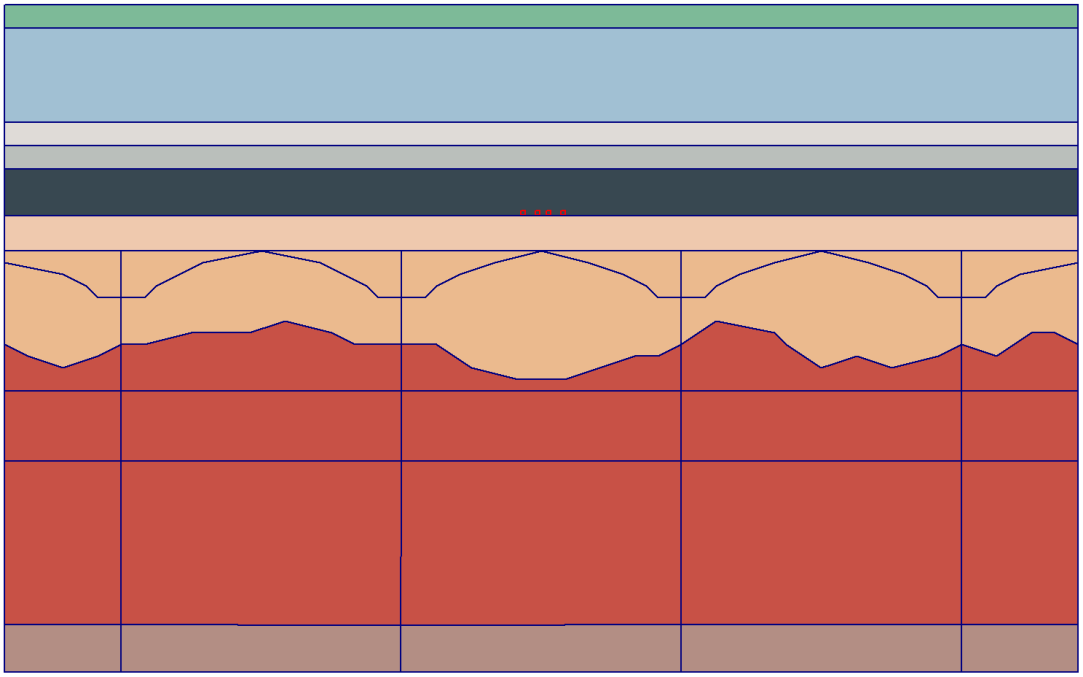


Figure 10. Plot of plastic points - step no: 4 - (phase: 2).

9. Results for Phase 12

Table 23. Step info phase no: 12.

Step no:	70
Calculation type	PLASTIC
Extrapolation factor	1.000
Relative stiffness	1.000

Table 24. Reached multipliers phase no: 12.

Multipliers	Incremental value	Total value
Prescribed displacements	0.0000	1.0000
Load system A	0.0000	1.0000
Load system B	0.0000	1.0000
Soil weight	0.0000	1.0000
Acceleration	0.0000	0.0000
Strength reduction factor	0.0000	1.0000
Time	0.0000	0.0000

Table 25. Staged construction info phase no: 12.

Staged construction	Incremental value	Total value
Active proportion of total area	0.000	0.719
Active proportion of stage	0.500	1.000

Table 26. Iteration info phase no: 12.

Iter. no.	Global error	Plastic points	Plastic Cap + Hard. points	Inacc. Pl. pts.	Plastic Intf. pts.	Inacc. Intf. pts.	Apex & Tension	Inacc. Apx. pts.
1	0.002	322	0	0	0	0	281	0
2	0.002	328	0	0	0	0	281	0

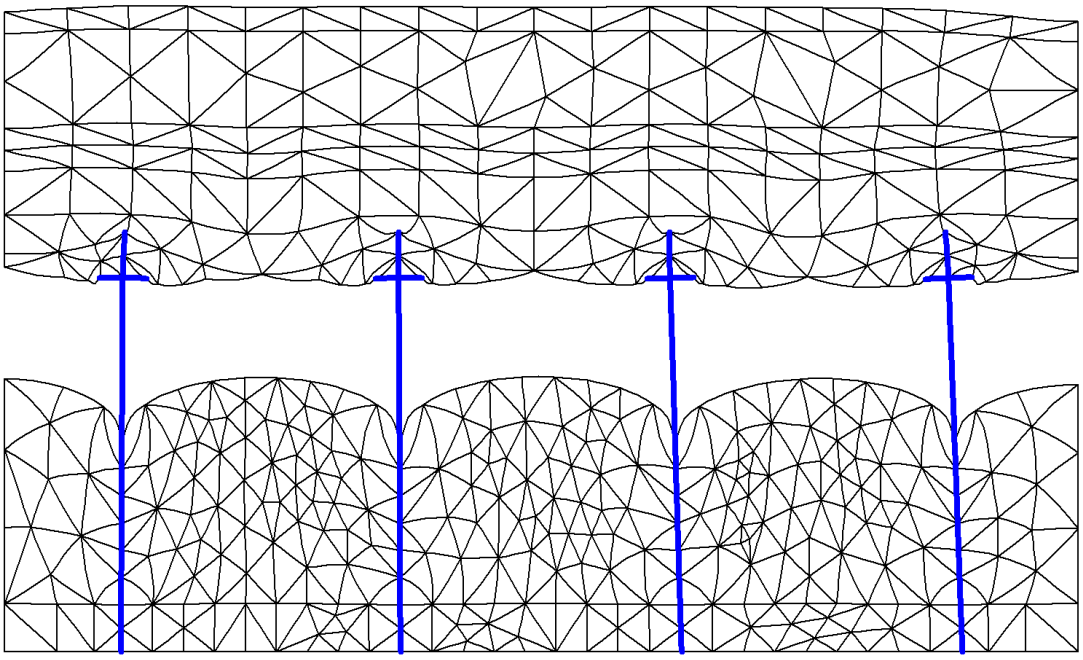


Figure 11. Plot of deformed mesh - step no: 70 - (phase: 12).

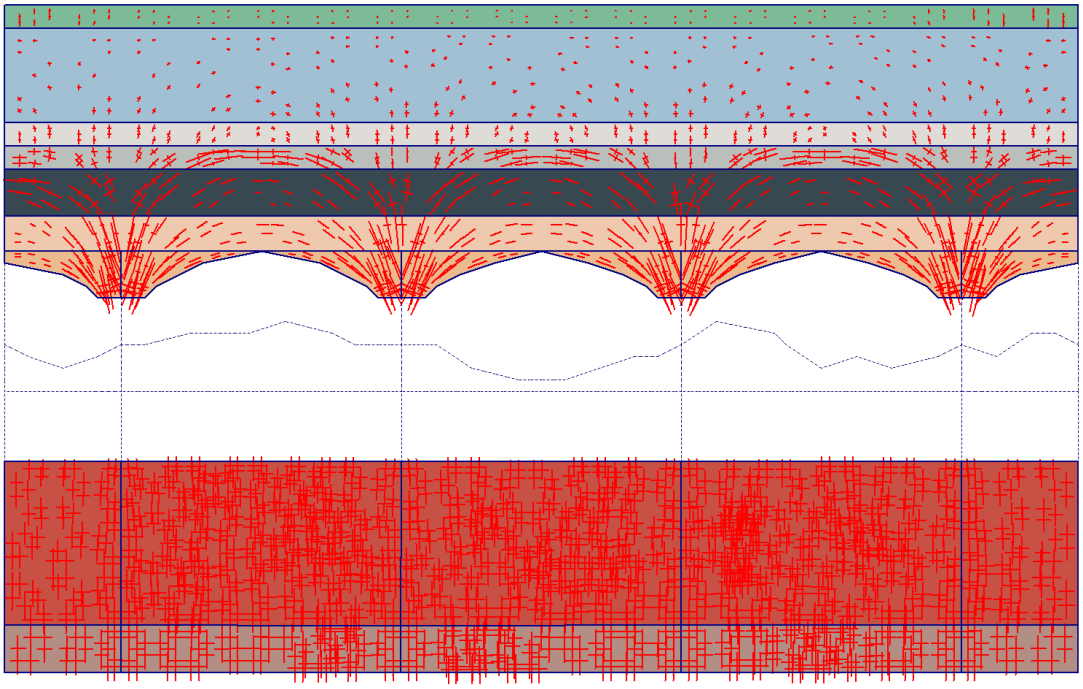


Figure 12. Plot of effective stresses (principal directions) - step no: 70 - (phase: 12)

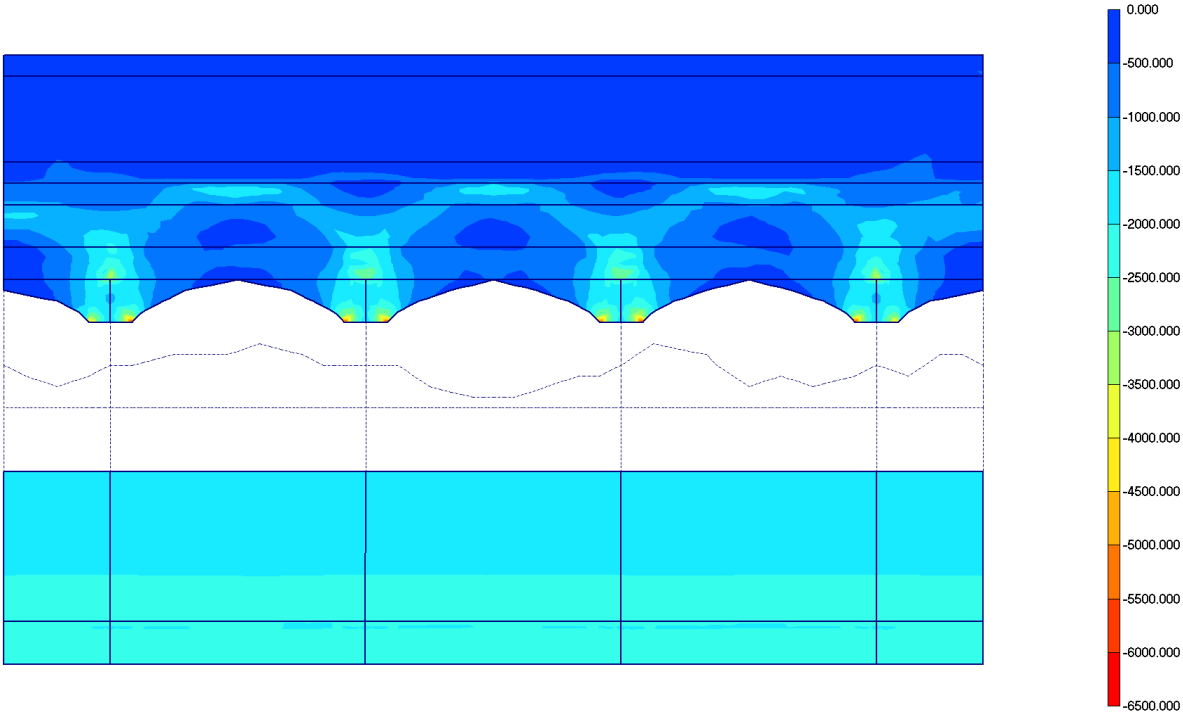


Fig. 13 Plot of effective stresses (mean shadings) - step no: 70 - (phase: 12).

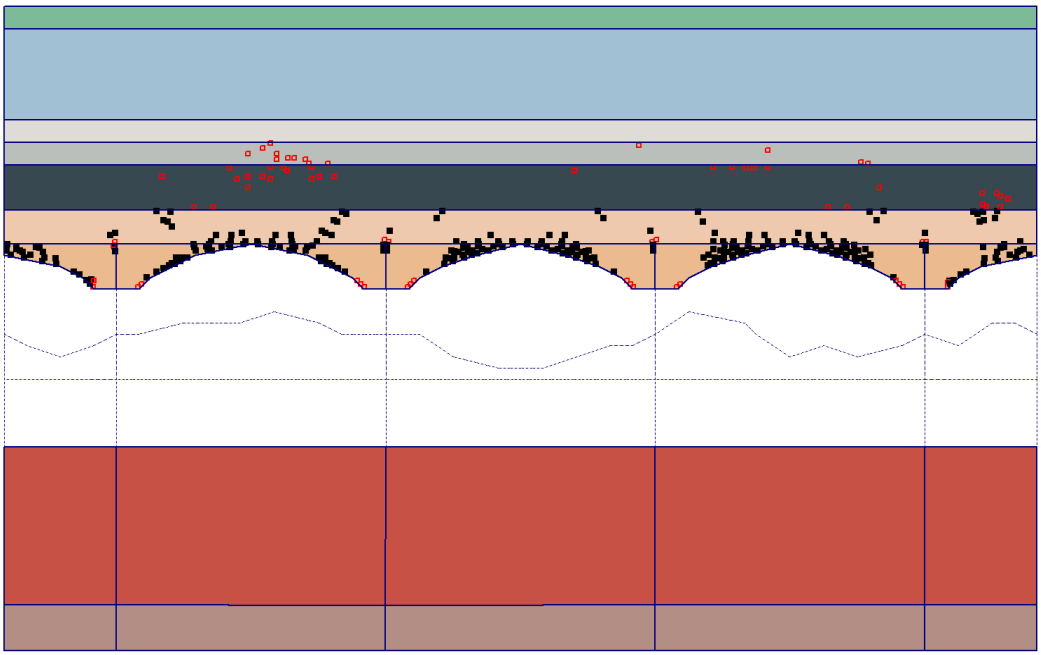


Figure 14. Plot of plastic points - step no: 70 - (phase: 12).

10. Results for Phase 11

Table 27. Step info phase no: 11.

Step no:	166
Calculation type	PLASTIC
Extrapolation factor	0.658
Relative stiffness	0.870

Table 28. Reached multipliers phase no: 11.

Multipliers	Incremental value	Total value
Prescribed displacements	0.0000	1.0000
Load system A	0.0000	1.0000
Load system B	0.0000	1.0000
Soil weight	0.0000	1.0000
Acceleration	0.2084	0.0000
Strength reduction factor	0.0000	1.0000
Time	0.0000	0.0000

Table 29. Staged construction info phase no: 11.

Staged construction	Incremental value	Total value
Active proportion of total area	0.000	0.825
Active proportion of stage	0.000	0.000

Table 30. Iteration info phase no: 11.

Iter. no.	Global error	Plastic points	Plastic Cap + Hard. points	Inacc. Pl. pts.	Plastic Intf. pts.	Inacc. Intf. pts.	Apex & Tension	Inacc. Apx. pts.
1	0.004	257	0	82	0	0	116	5
2	0.003	256	0	22	0	0	115	0

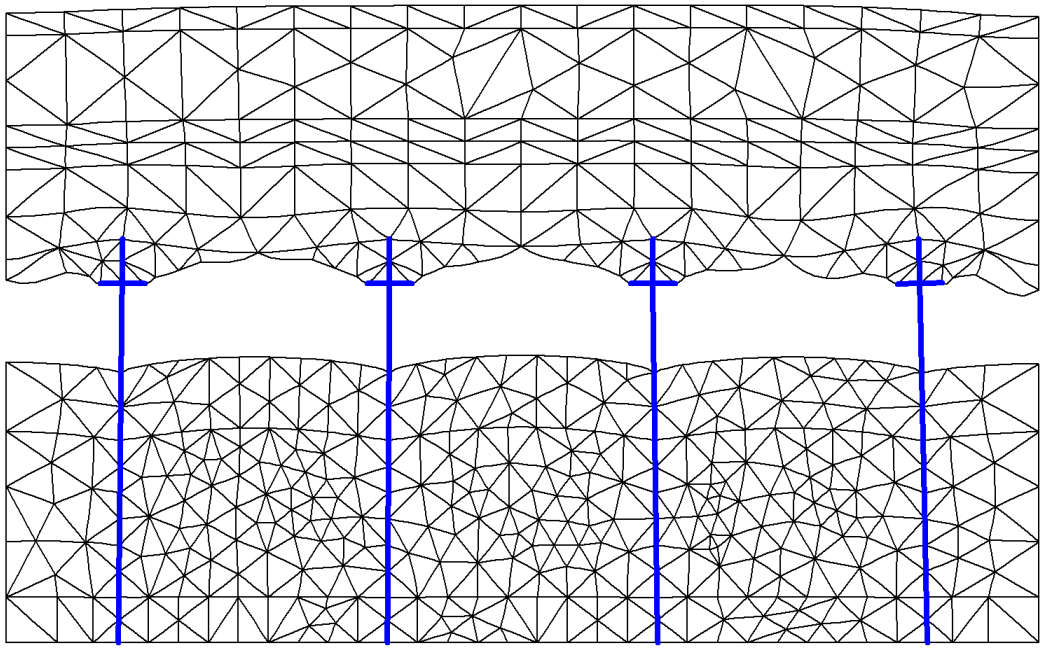


Figure 15. Plot of deformed mesh - step no: 166 - (phase: 11).

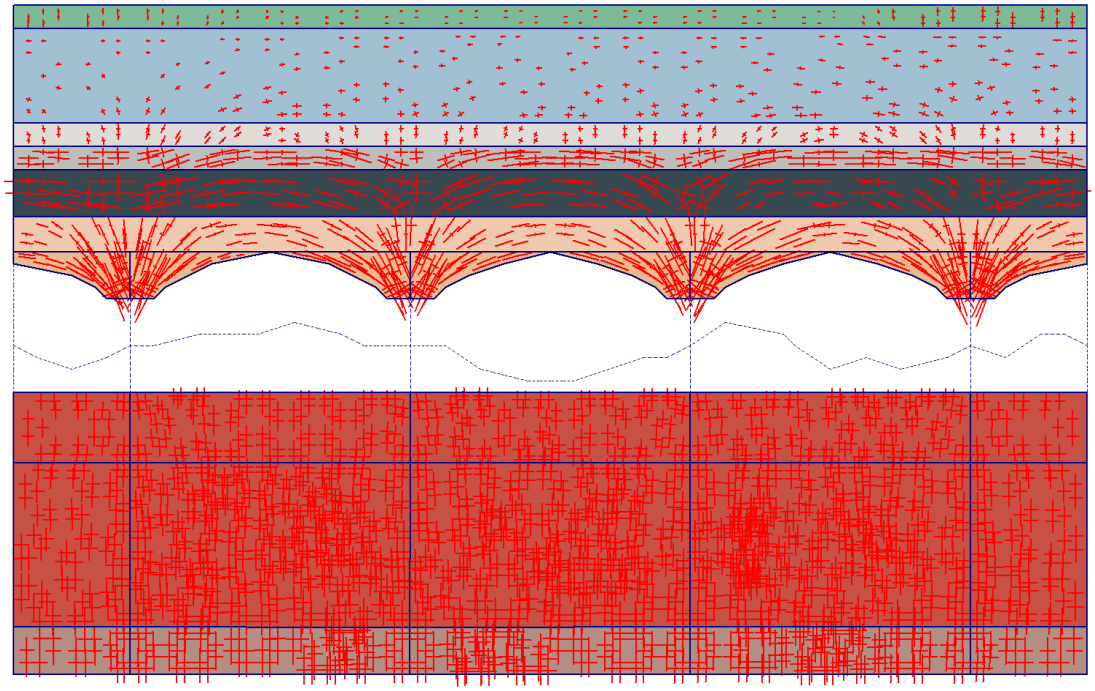


Figure 16. Plot of effective stresses (principal directions) - step no: 166 - (phase: 11).

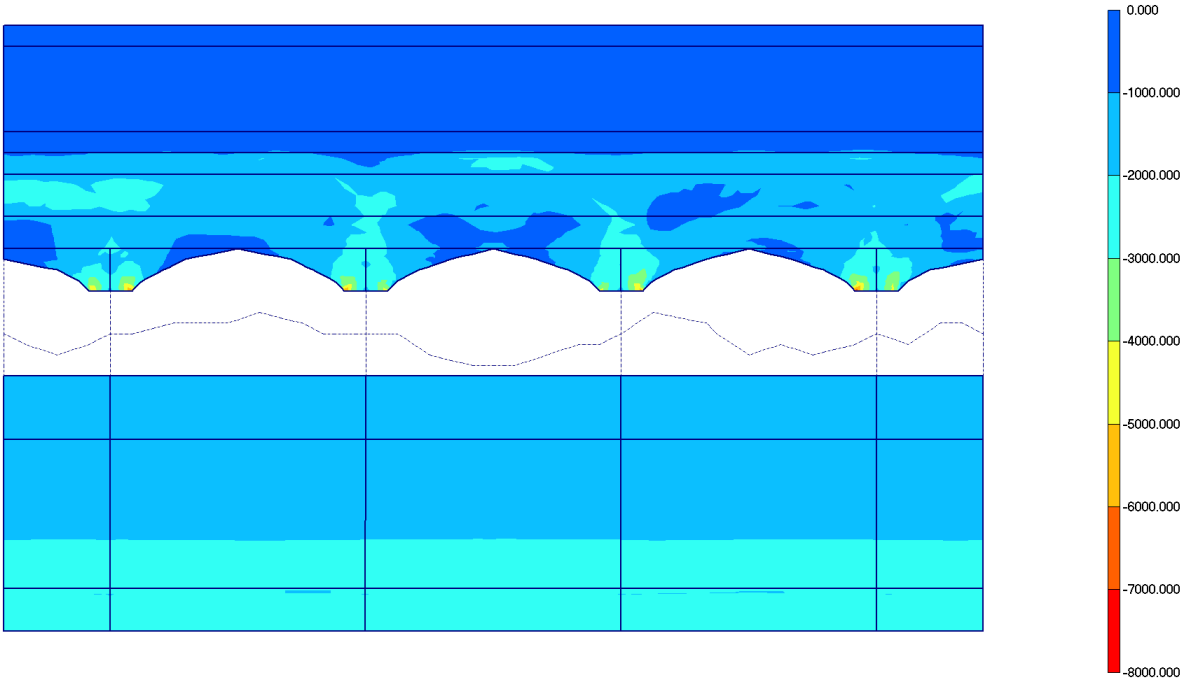


Figure 17. Plot of effective stresses (mean shadings) - step no: 166 - (phase: 11).

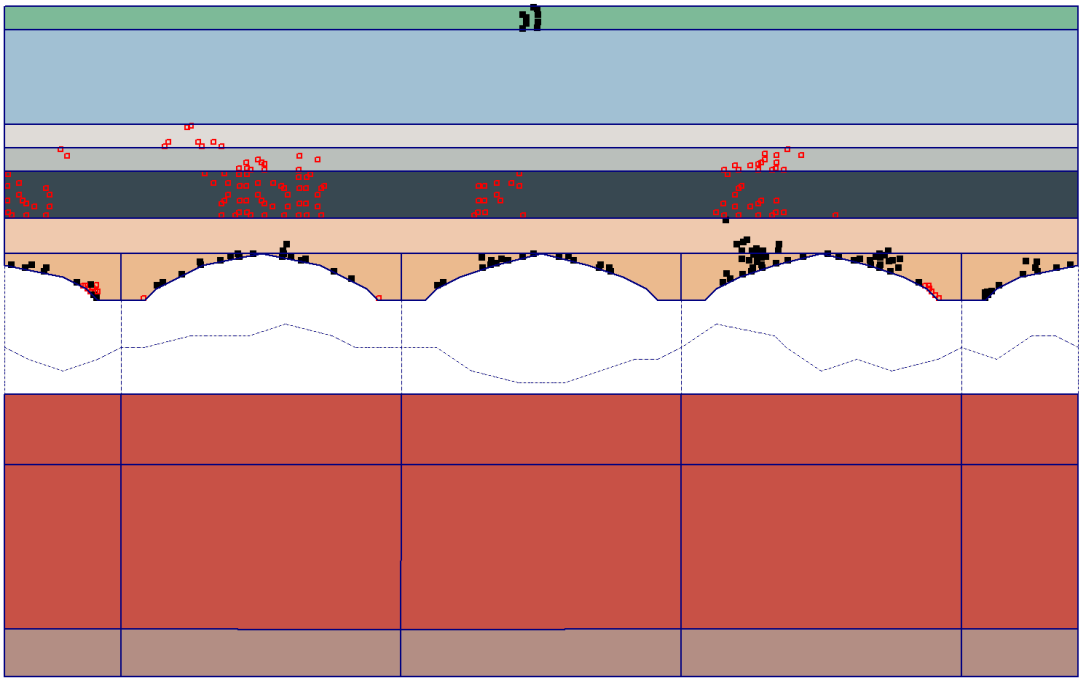


Figure 18. Plot of plastic points - step no: 166 - (phase: 11).

Appendix G

PLAXIS-Generated Report for Model General Pit2

This page is intentionally left blank.

Appendix G

PLAXIS-Generated Report for Model General Pit2

REPORT

October 25, 2004

User: Bechtel BWXT Idaho, LLC

Title: General Pit2

Table of Contents

1. General Information 3

2. Geometry 4

3. Structures 8

4. Loads and Boundary Conditions 9

5. Mesh Data 11

6. Material Data 12

7. Calculation Phases 15

8. Results for Phase 2 18

9. Results for Phase 12 23

10. Results for Phase 13 28

1. General Information

Table 1. Units.

Type	Unit
Length	ft
Force	lb
Time	hr

Table 2. Model dimensions.

	min.	max.
X	0.000	46.000
Y	-1.000	39.000

Table 3. Model.

Model	Plane strain
Element	15-Noded

2. Geometry

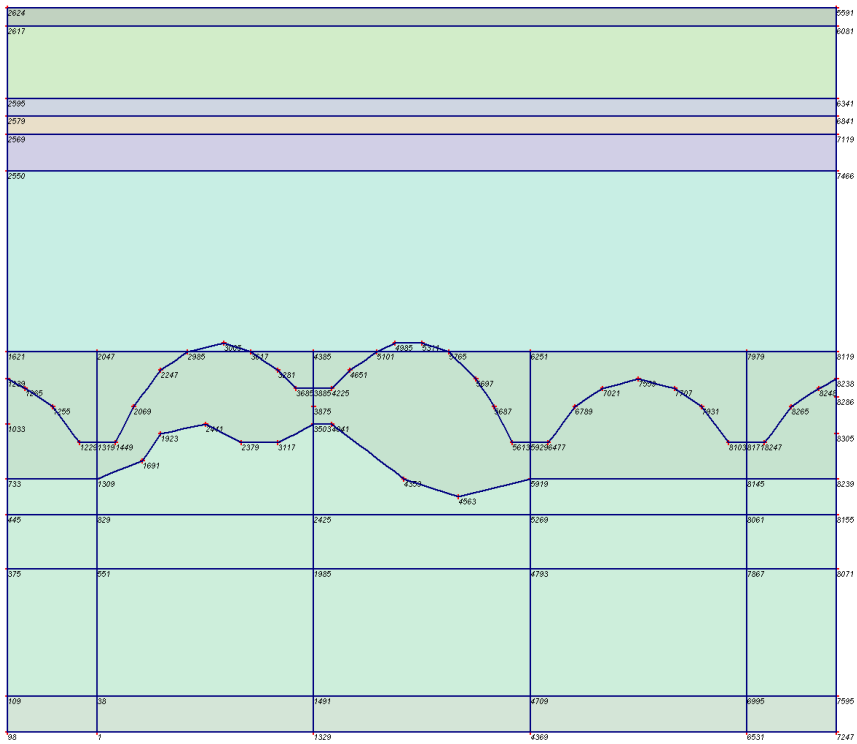


Figure 1. Plot of geometry model with significant nodes.

Table 4. Table of significant nodes.

Node no.	x-coord.	y-coord.	Node no.	x-coord.	y-coord.
98	0.000	-1.000	3281	15.000	19.000
109	0.000	1.000	1255	2.500	17.000
733	0.000	13.000	1265	1.000	18.000
1621	0.000	20.000	1239	0.000	18.500
2550	0.000	30.000	4651	19.000	19.000
2569	0.000	32.000	5697	26.000	18.500
2579	0.000	33.000	5687	27.000	17.000
2595	0.000	34.000	6789	31.500	17.000
2617	0.000	38.000	8171	41.000	15.000
2624	0.000	39.000	6531	41.000	-1.000
7247	46.000	-1.000	8145	41.000	13.000
7595	46.000	1.000	6995	41.000	1.000
8239	46.000	13.000	7707	37.000	18.000
1033	0.000	16.000	7931	38.500	17.000
375	0.000	8.000	8103	40.000	15.000
8305	46.000	15.500	8247	42.000	15.000
5613	28.000	15.000	8265	43.500	17.000
6477	30.000	15.000	8248	45.000	18.000
5929	29.000	15.000	8286	46.000	17.500
4369	29.000	-1.000	8238	46.000	18.500

Table 4. (continued).

Node no.	x-coord.	y-coord.	Node no.	x-coord.	y-coord.
4709	29.000	1.000	445	0.000	11.000
5919	29.000	13.000	8155	46.000	11.000
4793	29.000	8.000	829	5.000	11.000
3685	16.000	18.000	2425	17.000	11.000
4225	18.000	18.000	5269	29.000	11.000
3885	17.000	18.000	8061	41.000	11.000
1329	17.000	-1.000	8071	46.000	8.000
3503	17.000	16.000	7867	41.000	8.000
1985	17.000	8.000	2047	5.000	20.000
1491	17.000	1.000	4385	17.000	20.000
1229	4.000	15.000	6251	29.000	20.000
1449	6.000	15.000	7979	41.000	20.000
1319	5.000	15.000	3875	17.000	17.000
1	5.000	-1.000	7021	33.000	18.000
551	5.000	8.000	7559	35.000	18.500
1309	5.000	13.000	1691	7.500	14.000
38	5.000	1.000	2441	11.000	16.000
5591	46.000	39.000	3117	15.000	15.000
8119	46.000	20.000	1923	8.500	15.500
7466	46.000	30.000	2379	13.000	15.000
7119	46.000	32.000	4041	18.000	16.000
6841	46.000	33.000	4563	25.000	12.000
6341	46.000	34.000	4359	22.000	13.000
6081	46.000	38.000	2985	10.000	20.000
2069	7.000	17.000	4985	21.500	20.500
2247	8.500	19.000	5311	23.000	20.500
3005	12.000	20.500	5101	20.500	20.000
3617	13.500	20.000	5765	24.500	20.000

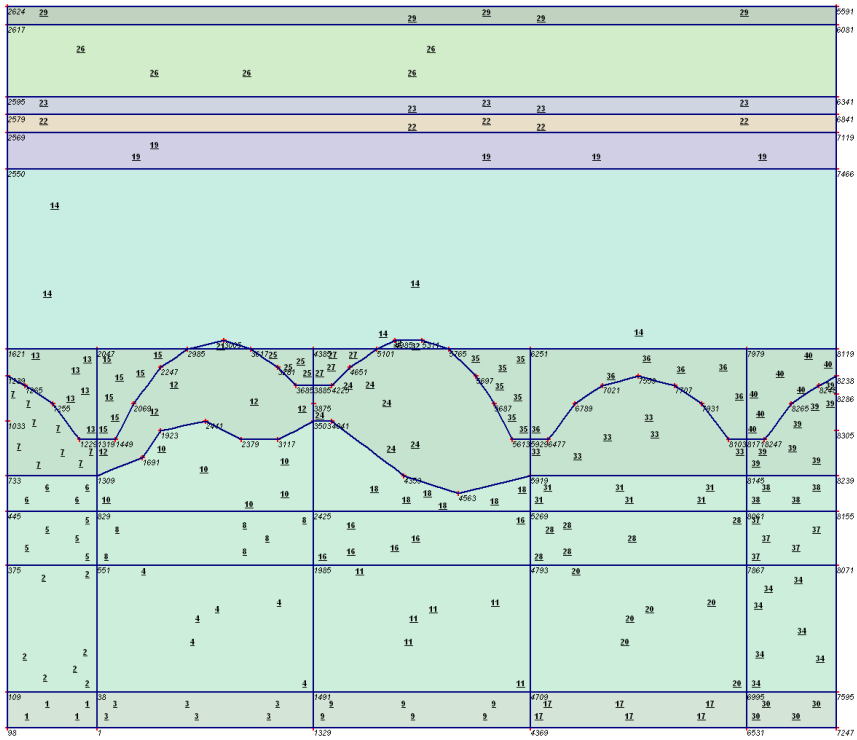


Figure 2. Plot of geometry model with cluster numbers.

Table 5. Table of clusters.

Cluster no.	Nodes
1	98, 109, 1, 38.
2	109, 375, 551, 38.
3	1329, 1491, 1, 38.
4	1985, 1491, 551, 38.
5	375, 551, 445, 829.
6	733, 1309, 445, 829.
7	733, 1033, 1229, 1319, 1309, 1255, 1265, 1239.
8	1985, 551, 829, 2425.
9	4369, 4709, 1329, 1491.
10	3503, 1309, 829, 2425, 1691, 2441, 3117, 1923, 2379.
11	4709, 4793, 1985, 1491.
12	3685, 3885, 3503, 1449, 1319, 1309, 2069, 2247, 3617, 3281, 3875, 1691, 2441, 3117, 1923, 2379, 2985.
13	1621, 1229, 1319, 1255, 1265, 1239, 2047.
14	1621, 2550, 8119, 7466, 3005, 3617, 2047, 4385, 6251, 7979, 2985, 4985, 5311, 5101, 5765.
15	1449, 1319, 2069, 2247, 2047, 2985.
16	4793, 1985, 2425, 5269.
17	4369, 4709, 6531, 6995.
18	5919, 3503, 2425, 5269, 4041, 4563, 4359.
19	2550, 2569, 7466, 7119.
20	4709, 4793, 6995, 7867.
21	3005, 3617, 2985.
22	2569, 2579, 7119, 6841.
23	2579, 2595, 6841, 6341.

Table 5. (continued).

Cluster no.	Nodes
24	5613, 5929, 5919, 4225, 3885, 3503, 4651, 5697, 5687, 3875, 4041, 4563, 4359, 5101, 5765.
25	3685, 3885, 3617, 3281, 4385.
26	2595, 2617, 6341, 6081.
27	4225, 3885, 4651, 4385, 5101.
28	4793, 5269, 8061, 7867.
29	2617, 2624, 5591, 6081.
30	7247, 7595, 6531, 6995.
31	5919, 8145, 5269, 8061.
32	4985, 5311, 5101, 5765.
33	6477, 5929, 5919, 6789, 8171, 8145, 7707, 7931, 8103, 7021, 7559.
34	7595, 6995, 8071, 7867.
35	5613, 5929, 5697, 5687, 6251, 5765.
36	6477, 5929, 6789, 8171, 7707, 7931, 8103, 6251, 7979, 7021, 7559.
37	8155, 8061, 8071, 7867.
38	8239, 8145, 8155, 8061.
39	8239, 8305, 8171, 8145, 8247, 8265, 8248, 8286, 8238.
40	8119, 8171, 8247, 8265, 8248, 8238, 7979.

3. Structures

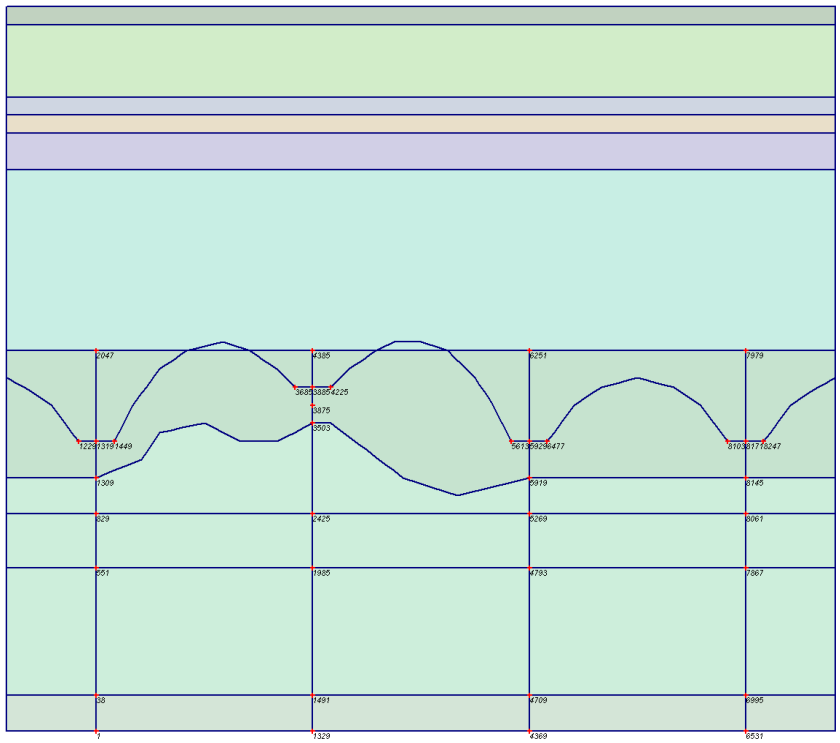


Figure 3. Plot of geometry model with structures.

Table 6. Beams.

Plate no.	Data set	Length [ft]	Nodes
1	2 ft dia. grout column	16.000	38, 1309, 551, 829, 1319, 1309.
2	2 ft dia. grout column	16.000	4709, 5919, 4793, 5269, 5929, 5919.
3	2 ft dia. grout column	16.000	6995, 8145, 8061, 7867, 8171, 8145.
4	2 ft dia. grout column	19.000	1491, 1985, 2425, 3503, 3875, 3885, 3875.
5	2 ft dia. grout column	2.000	1229, 1319, 1449.
6	2 ft dia. grout column	2.000	5613, 5929, 6477.
7	2 ft dia. grout column	2.000	8103, 8171, 8247.
8	0.34 ft dia. grout column	5.000	2047, 1319.
9	0.34 ft dia. grout column	5.000	6251, 5929.
10	0.34 ft dia. grout column	5.000	7979, 8171.
11	0.34 ft dia. grout column	2.000	4385, 3885.
12	2 ft dia. grout column	2.000	3685, 3885, 4225.

4. Loads and Boundary Conditions

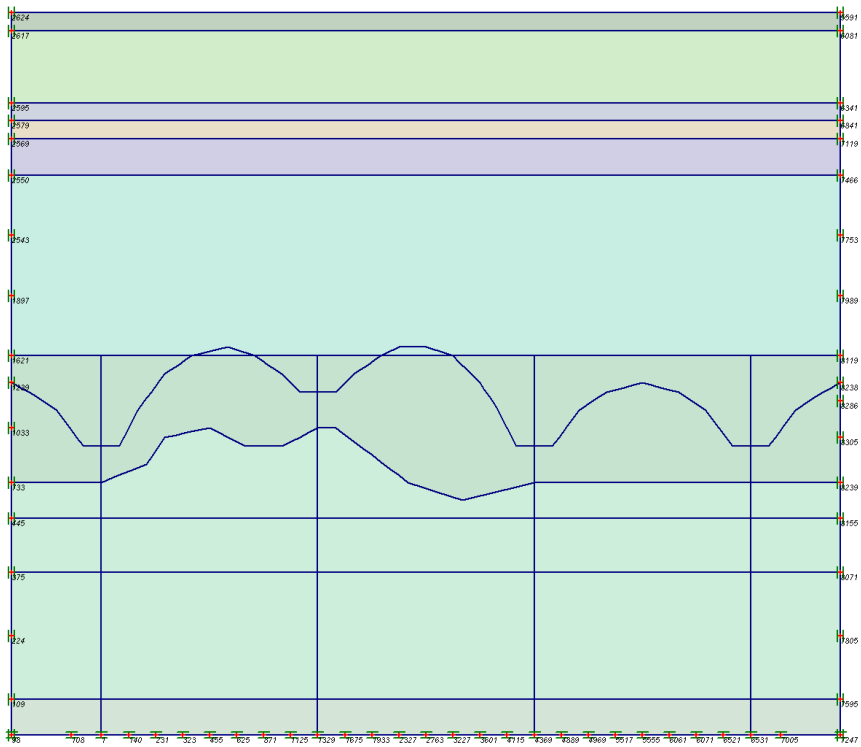


Figure 4. Plot of geometry with loads & boundary conditions.

Table 7. Node fixities.

Node no.	Sign	Horizontal	Vertical	Node no.	Sign	Horizontal	Vertical
98	#	Fixed	Fixed	8155	||	Fixed	Free
7247	#	Fixed	Fixed	224	||	Fixed	Free
109	||	Fixed	Free	8071	||	Fixed	Free
733	||	Fixed	Free	7805	||	Fixed	Free
1621	||	Fixed	Free				
2550	||	Fixed	Free				
2569	||	Fixed	Free				
2579	||	Fixed	Free				
2595	||	Fixed	Free				
2617	||	Fixed	Free				
2624	||	Fixed	Free				
7595	||	Fixed	Free				
8239	||	Fixed	Free				
1033	||	Fixed	Free				
375	||	Fixed	Free				
8305	||	Fixed	Free				
5591	||	Fixed	Free				
8119	||	Fixed	Free				
7466	||	Fixed	Free				
7119	||	Fixed	Free				
6841	||	Fixed	Free				
6341	||	Fixed	Free				
6081	||	Fixed	Free				
1239	||	Fixed	Free				
2543	||	Fixed	Free				
1897	||	Fixed	Free				
8286	||	Fixed	Free				
8238	||	Fixed	Free				
7753	||	Fixed	Free				
7989	||	Fixed	Free				
445	||	Fixed	Free				

Table 8. Distributed loads A.

Loads no.	First node	qx [lb/ft/ft]	qy [lb/ft/ft]	Last node	qx [lb/ft/ft]	qy [lb/ft/ft]
1	2624	0.000	0.000	5591	0.000	0.000

5. Mesh Data

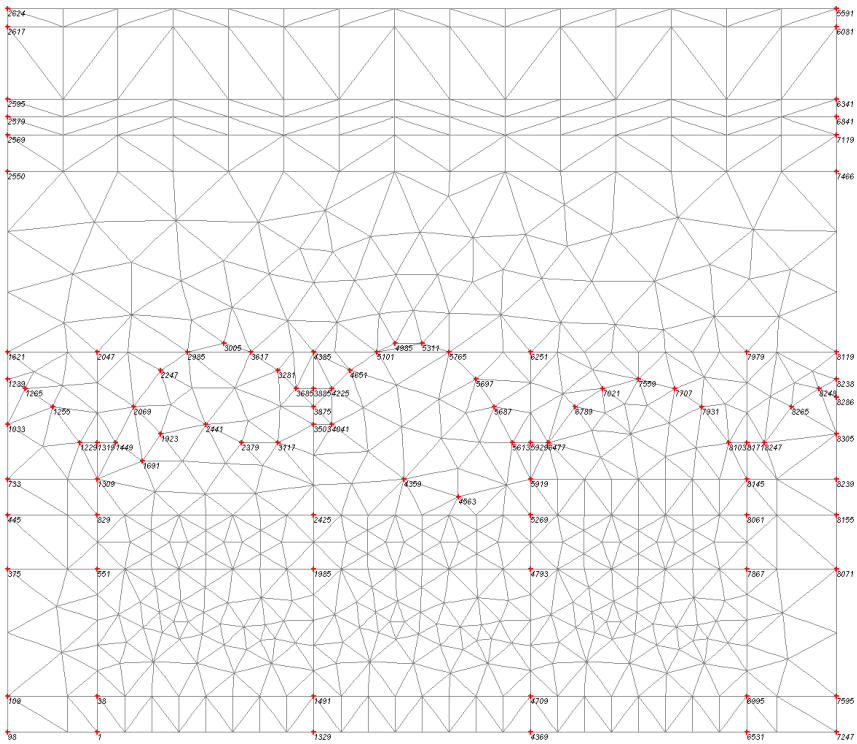


Figure 5. Plot of the mesh with significant nodes.

Table 9. Numbers, type of elements, integrations.

Type	Type of element	Type of integration	Total no.
Soil	15-noded	12-point Gauss	1022
Plate	5-node line	4-point Gauss	61

6. Material Data

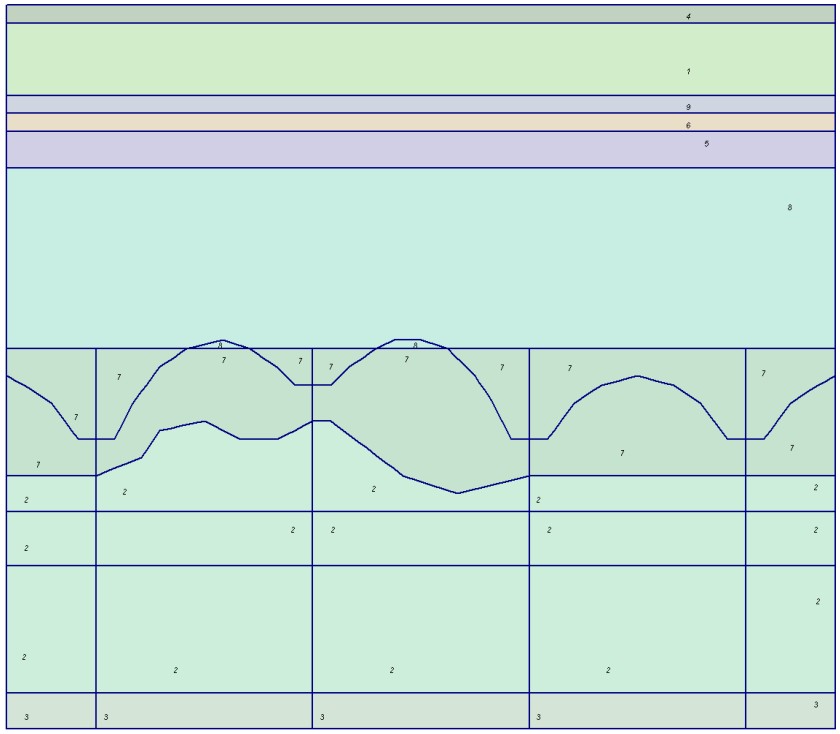


Figure 6. Plot of geometry with material data sets.

Table 10. Soil data sets parameters.

Mohr-Coulomb		1 Water Storage	2 Waste	3 Underburden/Native	4 Topsoil
Type		Drained	Undrained	Undrained	Undrained
γ_{unsat}	[lb/ft³]	115.00	100.00	115.00	115.00
γ_{sat}	[lb/ft³]	139.00	120.00	129.00	139.00
k_x	[ft/hr]	0.000	0.000	0.000	0.000
k_y	[ft/hr]	0.000	0.000	0.000	0.000
e_{init}	[-]	0.500	0.500	0.500	0.500
c_k	[-]	1E15	1E15	1E15	1E15
E_{ref}	[lb/ft²]	288000.000	10000.000	216000.000	216000.000
ν	[-]	0.340	0.350	0.350	0.300
G_{ref}	[lb/ft²]	107462.687	3703.704	80000.000	83076.923
E_{oed}	[lb/ft²]	443283.582	16049.383	346666.667	290769.231
c_{ref}	[lb/ft²]	1540.00	20.00	1540.00	500.00
φ	[°]	33.50	15.00	26.30	30.00
ψ	[°]	0.00	0.00	0.00	0.00
E_{inc}	[lb/ft²/ft]	0.00	0.00	0.00	0.00
y_{ref}	[ft]	0.000	0.000	0.000	0.000
$c_{increment}$	[lb/ft²/ft]	0.00	0.00	0.00	0.00

Table 10. (continued).

Mohr-Coulomb		1 Water Storage	2 Waste	3 Underburden/Native	4 Topsoil
$T_{str.}$	[lb/ft²]	0.00	0.00	0.00	0.00
$R_{inter.}$	[-]	1.00	1.00	1.00	1.00
Interface permeability		Neutral	Neutral	Neutral	Neutral

Mohr-Coulomb		5 Biointrusion Barrier/Gas Venting	6 Crushed Gravel	7 Existing Overburden	8 Grading Fill
Type		Drained	Drained	Drained	Drained
γ_{unsat}	[lb/ft³]	136.00	136.00	103.00	115.00
γ_{sat}	[lb/ft³]	149.00	149.00	129.00	139.00
k_x	[ft/hr]	0.000	0.000	0.000	0.000
k_y	[ft/hr]	0.000	0.000	0.000	0.000
e_{init}	[-]	0.500	0.500	0.500	0.500
c_k	[-]	1E15	1E15	1E15	1E15
E_{ref}	[lb/ft²]	4320000.000	2016000.000	432000.000	432000.000
ν	[-]	0.200	0.300	0.300	0.300
G_{ref}	[lb/ft²]	1800000.000	775384.615	166153.846	166153.846
E_{oed}	[lb/ft²]	4800000.000	2713846.154	581538.462	581538.462
c_{ref}	[lb/ft²]	0.20	0.20	1540.00	1540.00
φ	[°]	50.00	50.00	26.30	33.50
ψ	[°]	20.00	20.00	0.00	0.00
E_{inc}	[lb/ft²/ft]	0.00	0.00	0.00	0.00
y_{ref}	[ft]	0.000	0.000	0.000	0.000
$c_{increment}$	[lb/ft²/ft]	0.00	0.00	0.00	0.00
$T_{str.}$	[lb/ft²]	0.00	0.00	0.00	0.00
$R_{inter.}$	[-]	1.00	1.00	1.00	1.00
Interface permeability		Neutral	Neutral	Neutral	Neutral

Mohr-Coulomb		9 Sand
Type		Drained
γ_{unsat}	[lb/ft³]	121.00
γ_{sat}	[lb/ft³]	138.00
k_x	[ft/hr]	0.000
k_y	[ft/hr]	0.000
e_{init}	[-]	0.500
c_k	[-]	1E15
E_{ref}	[lb/ft²]	100800.000
ν	[-]	0.300
G_{ref}	[lb/ft²]	38769.231
E_{oed}	[lb/ft²]	135692.308
c_{ref}	[lb/ft²]	20.00
φ	[°]	33.50
ψ	[°]	10.00
E_{inc}	[lb/ft²/ft]	0.00
y_{ref}	[ft]	0.000
$c_{increment}$	[lb/ft²/ft]	0.00

Table 10. (continued).

Mohr-Coulomb		9 Sand
$T_{str.}$	[lb/ft²]	0.00
$R_{inter.}$	[-]	1.00
Interface permeability		Neutral

Table 11. Beam data sets parameters.

No.	Identification	EA [lb/ft]	EI [lbft²/ft]	w [lb/ft/ft]	ν [-]	Mp [lbft/ft]	Np [lb/ft]
1	2 ft dia. grout column	8.9326E8	2.2331E8	130.00	0.15	1E15	1E15
2	1.5 ft dia. grout column	5.0246E8	7.0658E7	130.00	0.15	1E15	1E15
3	0.34 ft dia. grout column	2.5815E7	1.8651E5	130.00	0.15	1E15	1E15

7. Calculation Phases

Table 12. List of phases.

Phase	Ph-No.	Start phase	Calculation type	Load input	First step	Last step
Initial phase	0	0		-	0	0
Stage 1	1	0	Plastic	Staged construction	1	2
Stage 2	2	1	Plastic	Staged construction	3	4
Stage 3	3	2	Plastic	Total multipliers	5	15
Stage 4	4	3	Plastic	Total multipliers	16	16
Stage 5	5	4	Plastic	Total multipliers	17	30
Stage 6	6	5	Plastic	Total multipliers	31	31
Stage 7	7	6	Plastic	Staged construction	32	35
Stage 8	12	7	Plastic	Staged construction	36	37
Stage 9	8	12	Plastic	Total multipliers	38	44
Stage 10	9	8	Plastic	Total multipliers	45	45
Stage 11	10	9	Plastic	Total multipliers	46	48
Stage 12	13	10	Plastic	Total multipliers	49	49

Table 13. Staged construction info.

Ph-No.	Active clusters	Inactive clusters	Active beams	Active geotextiles	Active anchors
0	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, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40.				
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, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40.		1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12.		
2	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, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40.		1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12.		
7	1, 2, 3, 4, 5, 8, 9, 11, 13, 14, 15, 16, 17, 19, 20, 22, 23, 25, 26, 27, 28, 29, 30, 34, 35, 36, 37, 40.	6, 7, 10, 12, 18, 21, 24, 31, 32, 33, 38, 39.	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12.		
12	1, 2, 3, 4, 9, 11, 13, 14, 15, 17, 19, 20, 22, 23, 25, 26, 27, 29, 30, 34, 35, 36, 40.	5, 6, 7, 8, 10, 12, 16, 18, 21, 24, 28, 31, 32, 33, 37, 38, 39.	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12.		

Table 14. Control parameters 1.

Ph-No.	Additional steps	Reset displacements to zero	Ignore undrained behavior	Delete intermediate steps
1	250	No	No	Yes
2	250	No	No	Yes
3	250	No	No	Yes
4	250	No	No	Yes
5	250	No	No	Yes
6	250	No	No	Yes
7	250	No	No	Yes
12	250	No	No	Yes
8	250	No	No	Yes
9	250	No	No	Yes
10	250	No	No	Yes
13	250	No	No	Yes

Table 15. Control parameters 2.

Ph-No.	Iterative procedure	Tolerated error	Over relaxation	Max. iterations	Desired min.	Desired max.	Arc-Length control
1	Standard	0.010	1.200	60	6	15	Yes
2	Standard	0.010	1.200	60	6	15	Yes
3	Standard	0.010	1.200	60	6	15	Yes
4	Standard	0.010	1.200	60	6	15	Yes
5	Standard	0.010	1.200	60	6	15	Yes
6	Standard	0.010	1.200	60	6	15	Yes
7	Standard	0.010	1.200	60	6	15	Yes
12	Standard	0.010	1.200	60	6	15	Yes
8	Standard	0.010	1.200	60	6	15	Yes
9	Standard	0.010	1.200	60	6	15	Yes
10	Standard	0.010	1.200	60	6	15	Yes
13	Standard	0.010	1.200	60	6	15	Yes

Table 16. Incremental multipliers (input values).

Ph-No.	Displ.	Load A	Load B	Weight	Accel	Time	s-f
0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
1	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
6	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
7	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
12	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
8	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
9	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
10	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
13	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Table 17. Total multipliers - input values.

Ph-No.	Displ.	Load A	Load B	Weight	Accel	Time	s-f
0	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	1.0000
1	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	1.0000
2	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	1.0000
3	1.0000	1.0000	1.0000	1.0400	0.7100	0.0000	1.0000
4	1.0000	1.0000	1.0000	1.0400	0.0000	0.0000	1.0000
5	1.0000	1.0000	1.0000	1.0400	-0.7100	0.0000	1.0000
6	1.0000	1.0000	1.0000	1.0400	0.0000	0.0000	1.0000
7	1.0000	1.0000	1.0000	1.0400	0.0000	0.0000	1.0000
12	1.0000	1.0000	1.0000	1.0400	0.0000	0.0000	1.0000
8	1.0000	1.0000	1.0000	1.0400	0.7100	0.0000	1.0000
9	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	1.0000
10	1.0000	1.0000	1.0000	1.0400	-0.7100	0.0000	1.0000
13	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	1.0000

Table 18. Total multipliers - reached values.

Ph-No.	Displ.	Load A	Load B	Weight	Accel	Time	s-f
0	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	1.0000
1	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	1.0000
2	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	1.0000
3	1.0000	1.0000	1.0000	1.0400	0.7100	0.0000	1.0000
4	1.0000	1.0000	1.0000	1.0400	0.0000	0.0000	1.0000
5	1.0000	1.0000	1.0000	1.0400	-0.7100	0.0000	1.0000
6	1.0000	1.0000	1.0000	1.0400	0.0000	0.0000	1.0000
7	1.0000	1.0000	1.0000	1.0400	0.0000	0.0000	1.0000
12	1.0000	1.0000	1.0000	1.0400	0.0000	0.0000	1.0000
8	1.0000	1.0000	1.0000	1.0400	0.7100	0.0000	1.0000
9	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	1.0000
10	1.0000	1.0000	1.0000	1.0400	-0.7100	0.0000	1.0000
13	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	1.0000

8. Results for Phase 2

Table 19. Step info phase no: 2.

Step no:	4
Calculation type	PLASTIC
Extrapolation factor	1.000
Relative stiffness	1.000

Table 20. Reached multipliers phase no: 2.

Multipliers	Incremental value	Total value
Prescribed displacements	0.0000	1.0000
Load system A	0.0000	1.0000
Load system B	0.0000	1.0000
Soil weight	0.0000	1.0000
Acceleration	0.0000	0.0000
Strength reduction factor	0.0000	1.0000
Time	0.0000	0.0000

Table 21 Staged construction info phase no: 2.

Staged construction	Incremental value	Total value
Active proportion of total area	0.000	1.000
Active proportion of stage	0.500	1.000

Table 22. Iteration info phase no: 2.

Iter. no.	Global error	Plastic points	Plastic Cap + Hard. points	Inacc. Pl. pts.	Plastic Intf. pts.	Inacc. Intf. pts.	Apex & Tension	Inacc. Apx. pts.
1	0.000	0	0	0	0	0	0	0
2	0.000	0	0	0	0	0	0	0

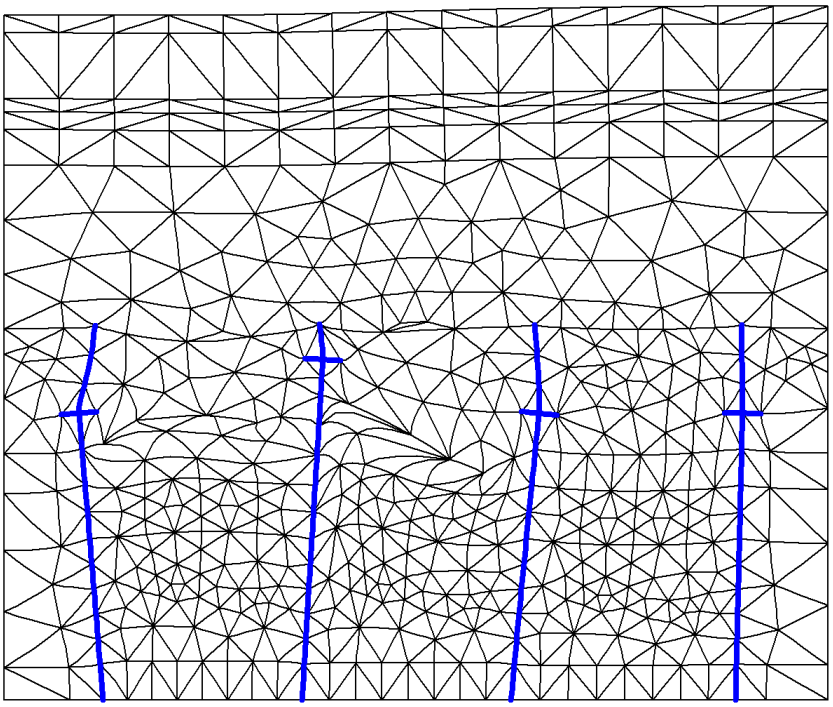


Figure 7. Plot of deformed mesh - step no: 4 - (phase: 2).

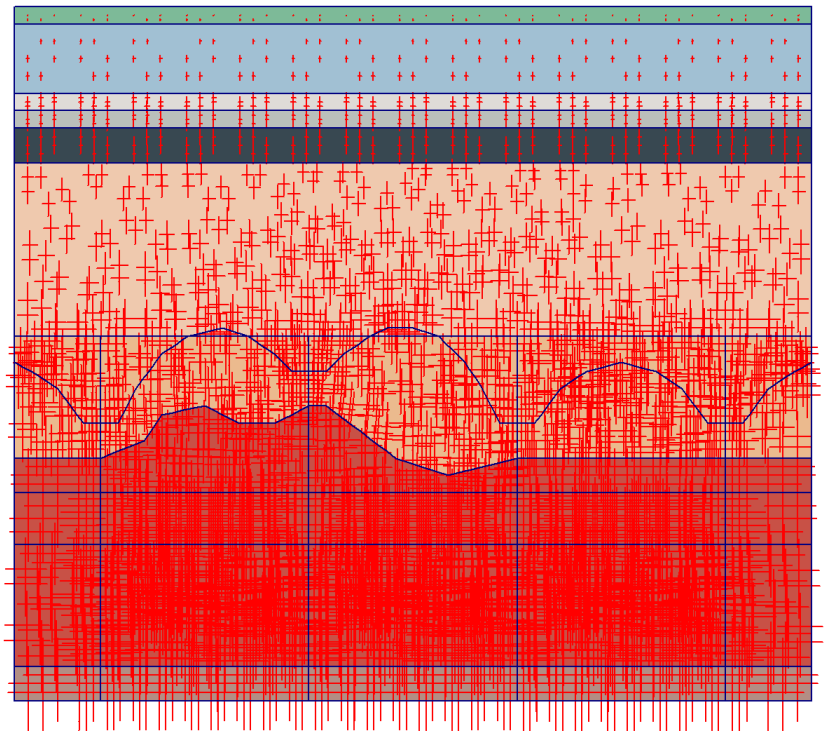


Figure 8. Plot of effective stresses (principal directions) - step no: 4 - (phase: 2).

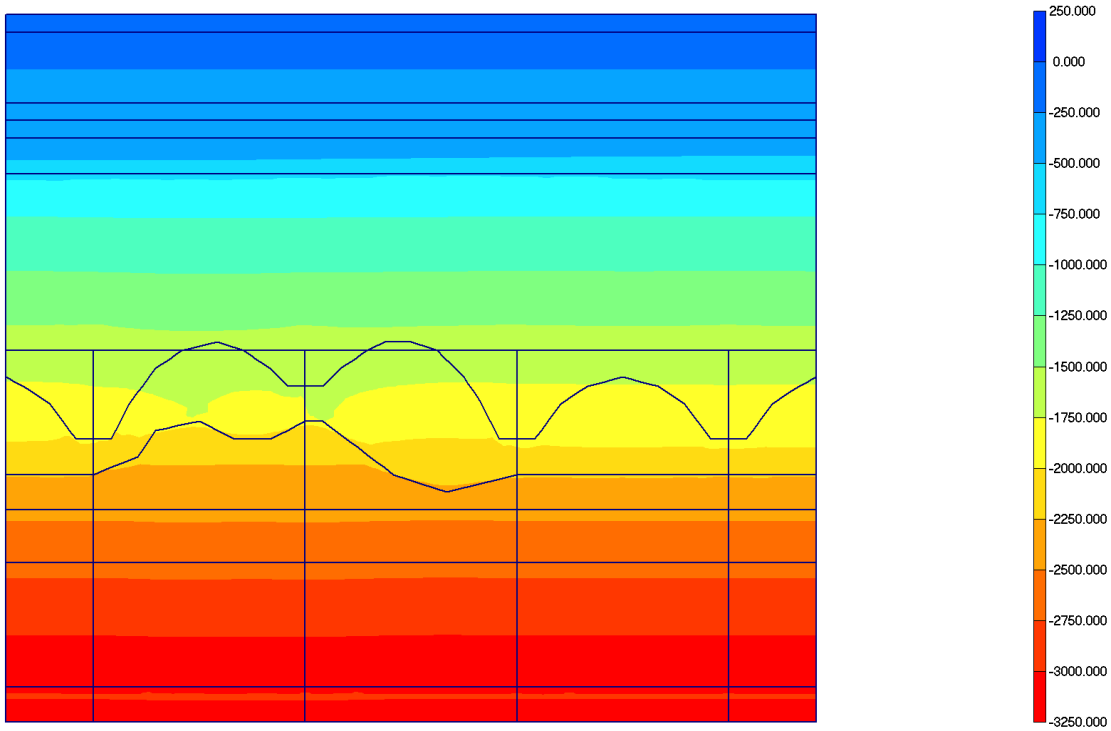


Figure 9. Plot of effective stresses (mean shadings) - step no: 4 - (phase: 2).

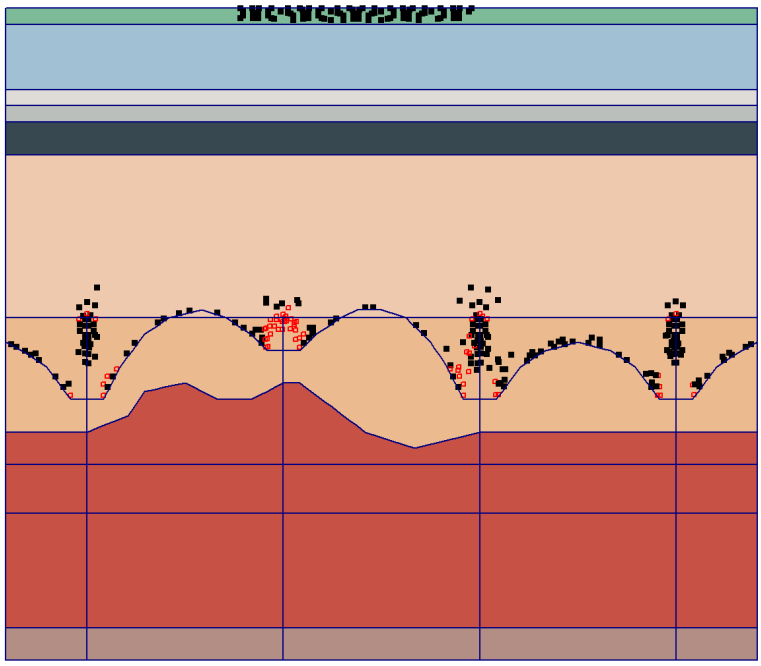


Figure 10 Plot of plastic points - step no: 4 - (phase: 2).

9. Results for Phase 12

Table 23. Step info phase no: 12.

Step no:	37
Calculation type	PLASTIC
Extrapolation factor	1.000
Relative stiffness	0.982

Table 24. Reached multipliers phase no: 12.

Multipliers	Incremental value	Total value
Prescribed displacements	0.0000	1.0000
Load system A	0.0000	1.0000
Load system B	0.0000	1.0000
Soil weight	0.0000	1.0400
Acceleration	0.0000	0.0000
Strength reduction factor	0.0000	1.0000
Time	0.0000	0.0000

Table 25. Staged construction info phase no: 12.

Staged construction	Incremental value	Total value
Active proportion of total area	0.000	0.755
Active proportion of stage	0.500	1.000

Table 26. Iteration info phase no: 12.

Iter. no.	Global error	Plastic points	Plastic Cap + Hard. points	Inacc. Pl. pts.	Plastic Intf. pts.	Inacc. Intf. pts.	Apex & Tension	Inacc. Apx. pts.
1	0.006	278	0	15	0	0	274	14
2	0.006	322	0	12	0	0	276	11

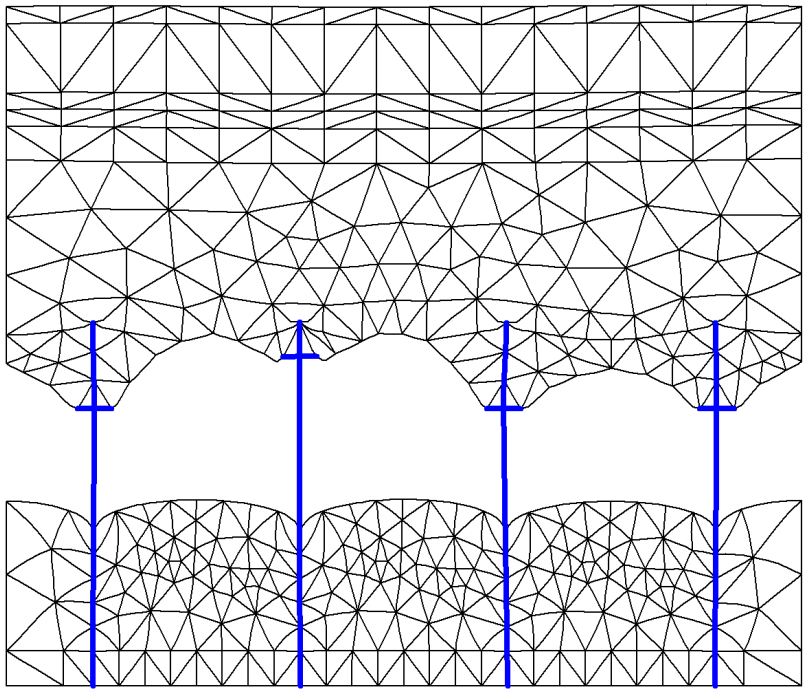


Figure 11. Plot of deformed mesh - step no: 37 - (phase: 12).

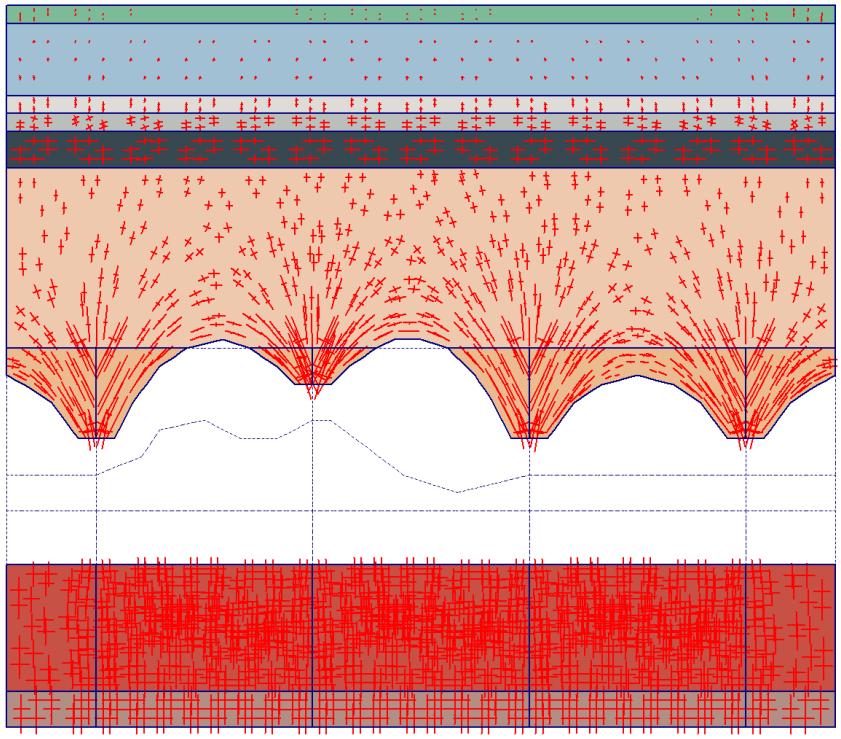


Figure 12. Plot of effective stresses (principal directions) - step no: 37 - (phase: 12).

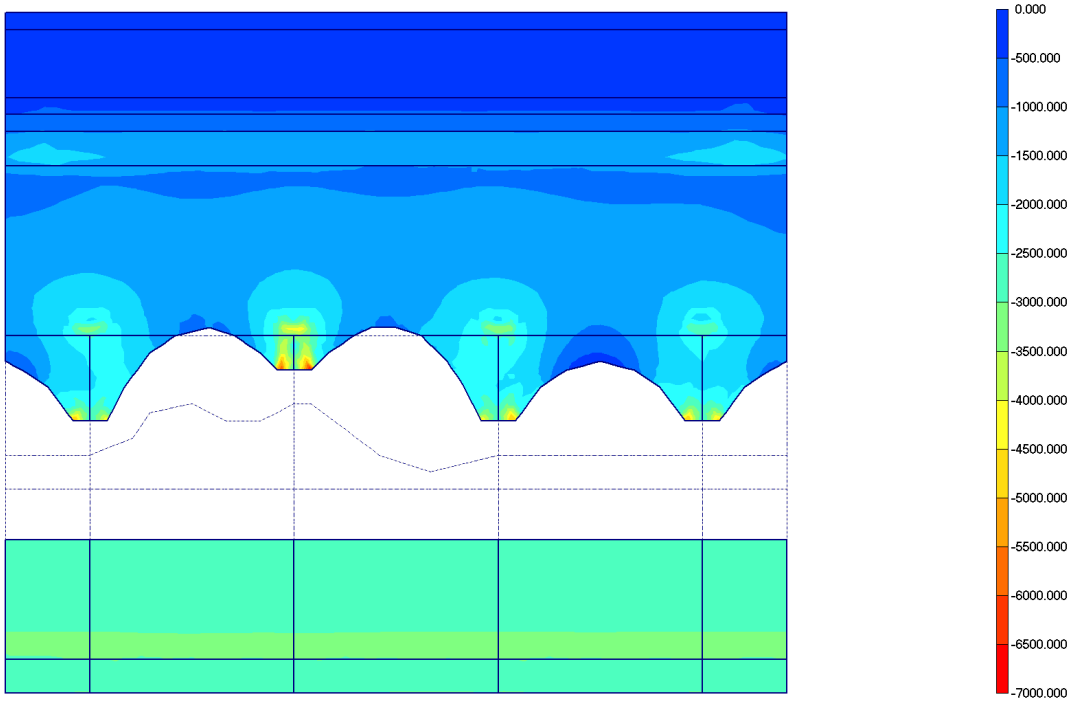


Figure 13. Plot of effective stresses (mean shadings) - step no: 37 - (phase: 12).

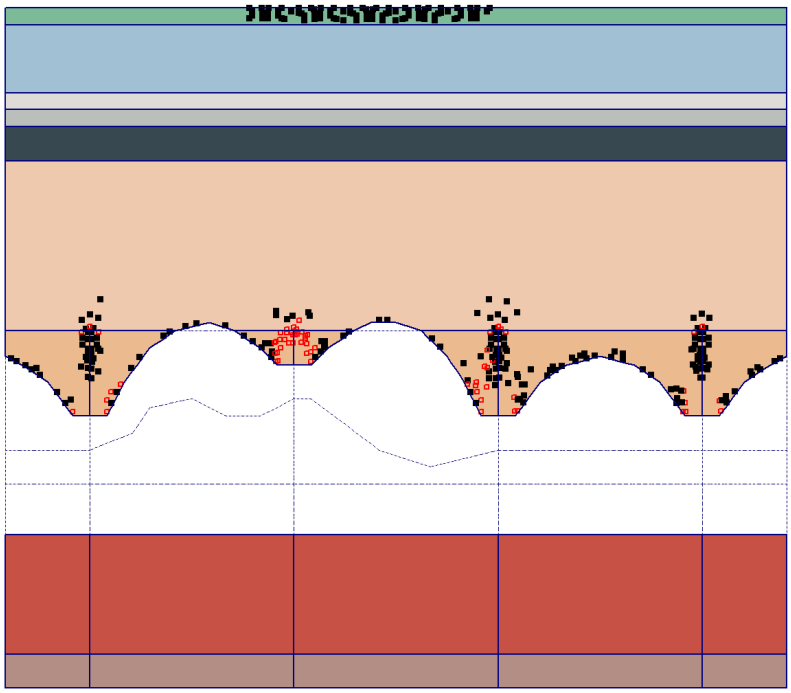


Figure 14. Plot of plastic points - step no: 37 - (phase: 12).

10. Results for Phase 13

Table 27. Step info phase no: 13.

Step no:	49
Calculation type	PLASTIC
Extrapolation factor	0.000
Relative stiffness	1.000

Table 28. Reached multipliers phase no: 13.

Multipliers	Incremental value	Total value
Prescribed displacements	0.0000	1.0000
Load system A	0.0000	1.0000
Load system B	0.0000	1.0000
Soil weight	-0.0400	1.0000
Acceleration	0.7100	0.0000
Strength reduction factor	0.0000	1.0000
Time	0.0000	0.0000

Table 29. Staged construction info phase no: 13.

Staged construction	Incremental value	Total value
Active proportion of total area	0.000	0.755
Active proportion of stage	0.000	0.000

Table 30. Iteration info phase no: 13.

Iter. no.	Global error	Plastic points	Plastic Cap + Hard. points	Inacc. Pl. pts.	Plastic Intf. pts.	Inacc. Intf. pts.	Apex & Tension	Inacc. Apx. pts.
1	0.001	45	0	1	0	0	46	1
2	0.001	47	0	1	0	0	49	1
3	0.008	59	0	10	0	0	59	10
4	0.001	58	0	1	0	0	59	1

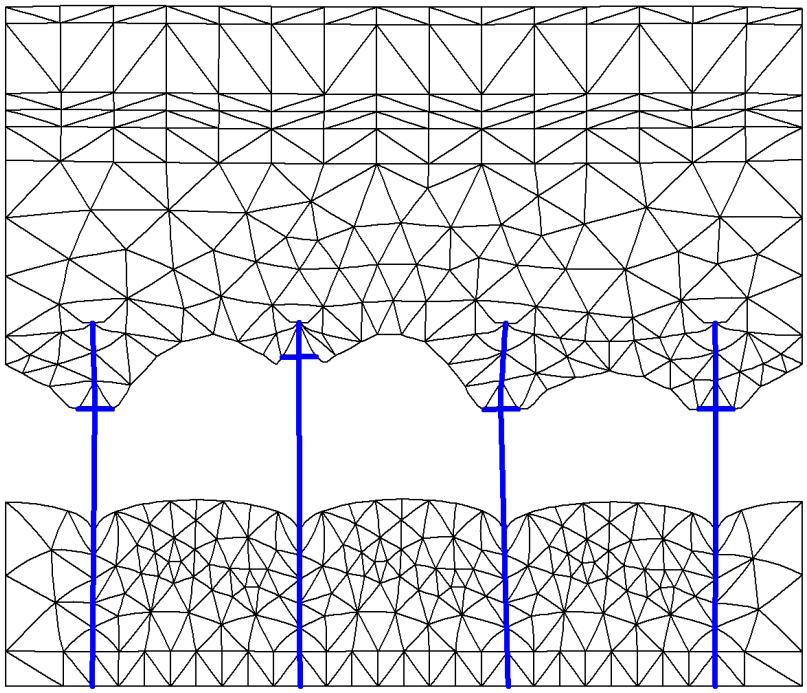


Figure 15. Plot of deformed mesh - step no: 49 - (phase: 13).

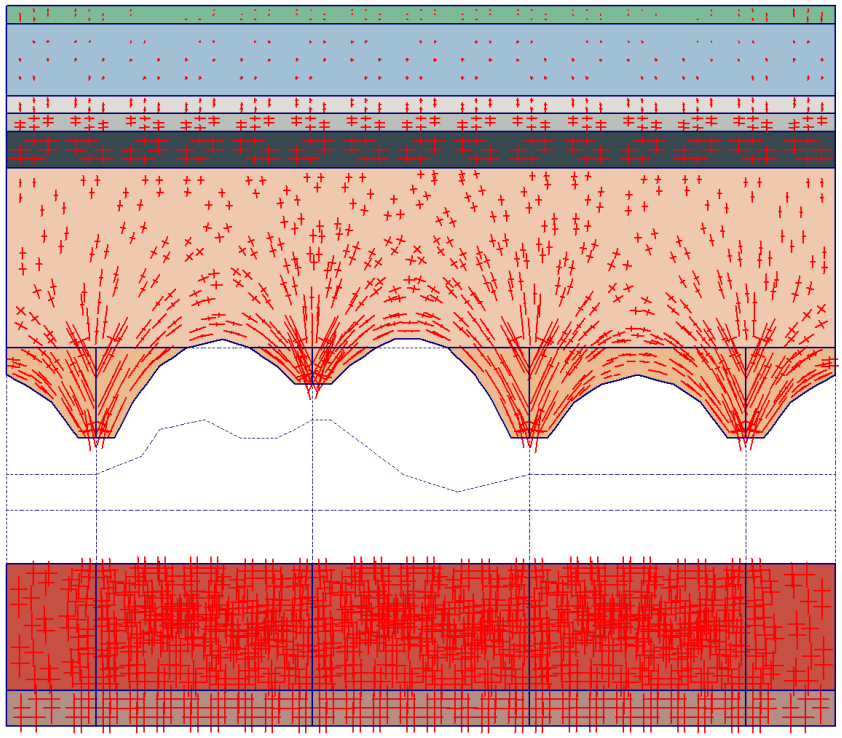


Figure 16. Plot of effective stresses (principal directions) - step no: 49 - (phase: 13)

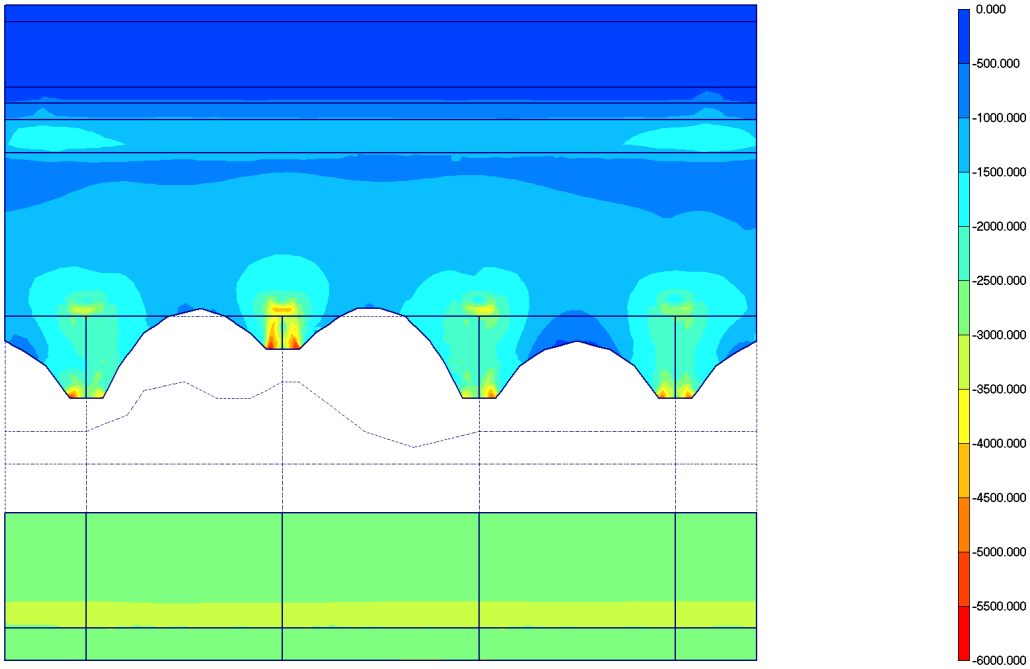


Figure 17. Plot of effective stresses (mean shadings) - step no: 49 - (phase: 13).

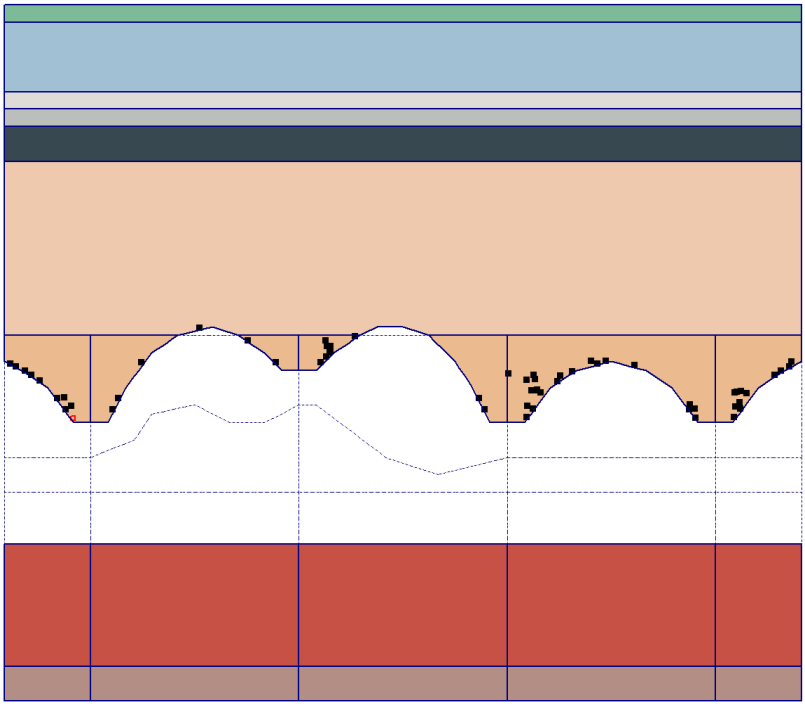


Figure 18. Plot of plastic points - step no: 49 - (phase: 13).

Appendix H

PLAXIS-Generated Report for Model General Pit3

This page is intentionally left blank.

Appendix H

PLAXIS-Generated Report for Model General Pit3

REPORT

October 25, 2004

User: Bechtel BWXT Idaho, LLC

Title: General Pit3

Table of Contents

1. General Information 3

2. Geometry 4

3. Structures 8

4. Loads and Boundary Conditions 9

5. Mesh Data 11

6. Material Data 12

7. Calculation Phases 15

8. Results for Phase 2 18

9. Results for Phase 12 23

10. Results for Phase 13 28

1. General Information

Table 1. Units.

Type	Unit
Length	ft
Force	lb
Time	hr

Table 2. Model dimensions.

	min.	max.
X	0.000	46.000
Y	-9.000	35.000

Table 3. Model.

Model	Plane strain
Element	15-Noded

2. Geometry

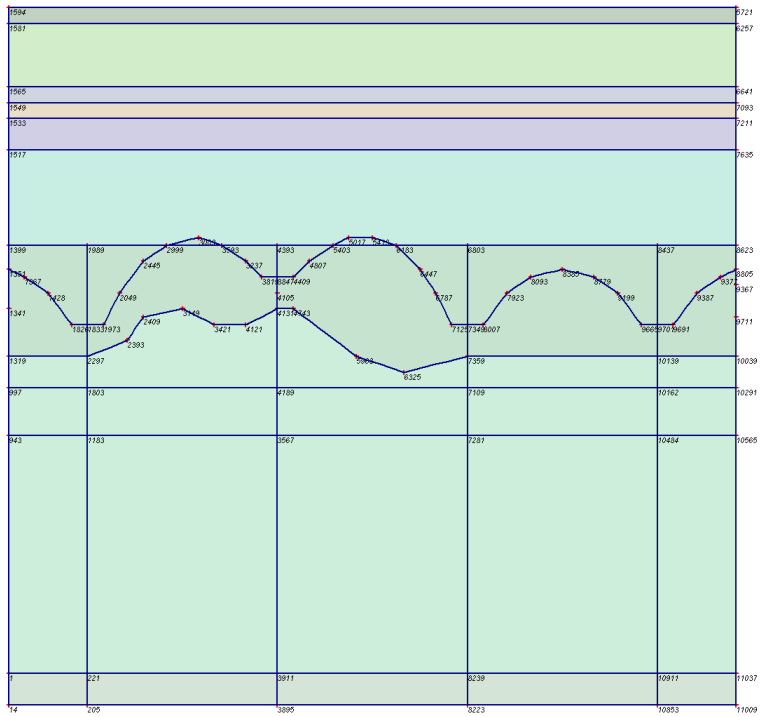


Figure 1. Plot of geometry model with significant nodes.

Table 4. Table of significant nodes.

Node no.	x-coord.	y-coord.	Node no.	x-coord.	y-coord.
14	0.000	-9.000	3237	15.000	19.000
1	0.000	-7.000	1428	2.500	17.000
1319	0.000	13.000	1367	1.000	18.000
1399	0.000	20.000	1351	0.000	18.500
1517	0.000	26.000	4807	19.000	19.000
1533	0.000	28.000	6447	26.000	18.500
1549	0.000	29.000	6787	27.000	17.000
1565	0.000	30.000	7923	31.500	17.000
1581	0.000	34.000	9701	41.000	15.000
1594	0.000	35.000	10853	41.000	-9.000
11009	46.000	-9.000	10139	41.000	13.000
11037	46.000	-7.000	10911	41.000	-7.000
10039	46.000	13.000	8779	37.000	18.000
1341	0.000	16.000	9199	38.500	17.000
943	0.000	8.000	9665	40.000	15.000
9711	46.000	15.500	9691	42.000	15.000
7125	28.000	15.000	9387	43.500	17.000
8007	30.000	15.000	9377	45.000	18.000
7349	29.000	15.000	9367	46.000	17.500
8223	29.000	-9.000	8805	46.000	18.500

Table 4. (continued).

Node no.	x-coord.	y-coord.	Node no.	x-coord.	y-coord.
8239	29.000	-7.000	997	0.000	11.000
7359	29.000	13.000	10291	46.000	11.000
7281	29.000	8.000	1803	5.000	11.000
3819	16.000	18.000	4189	17.000	11.000
4409	18.000	18.000	7109	29.000	11.000
3847	17.000	18.000	10162	41.000	11.000
3895	17.000	-9.000	10565	46.000	8.000
4131	17.000	16.000	10484	41.000	8.000
3567	17.000	8.000	1989	5.000	20.000
3911	17.000	-7.000	4393	17.000	20.000
1826	4.000	15.000	6803	29.000	20.000
1973	6.000	15.000	8437	41.000	20.000
1833	5.000	15.000	4105	17.000	17.000
205	5.000	-9.000	8093	33.000	18.000
1183	5.000	8.000	8385	35.000	18.500
2297	5.000	13.000	2393	7.500	14.000
221	5.000	-7.000	3149	11.000	16.000
5721	46.000	35.000	4121	15.000	15.000
8623	46.000	20.000	2409	8.500	15.500
7635	46.000	26.000	3421	13.000	15.000
7211	46.000	28.000	4743	18.000	16.000
7093	46.000	29.000	6325	25.000	12.000
6641	46.000	30.000	5963	22.000	13.000
6257	46.000	34.000	2999	10.000	20.000
2049	7.000	17.000	5017	21.500	20.500
2445	8.500	19.000	5413	23.000	20.500
3009	12.000	20.500	5403	20.500	20.000
3593	13.500	20.000	6183	24.500	20.000

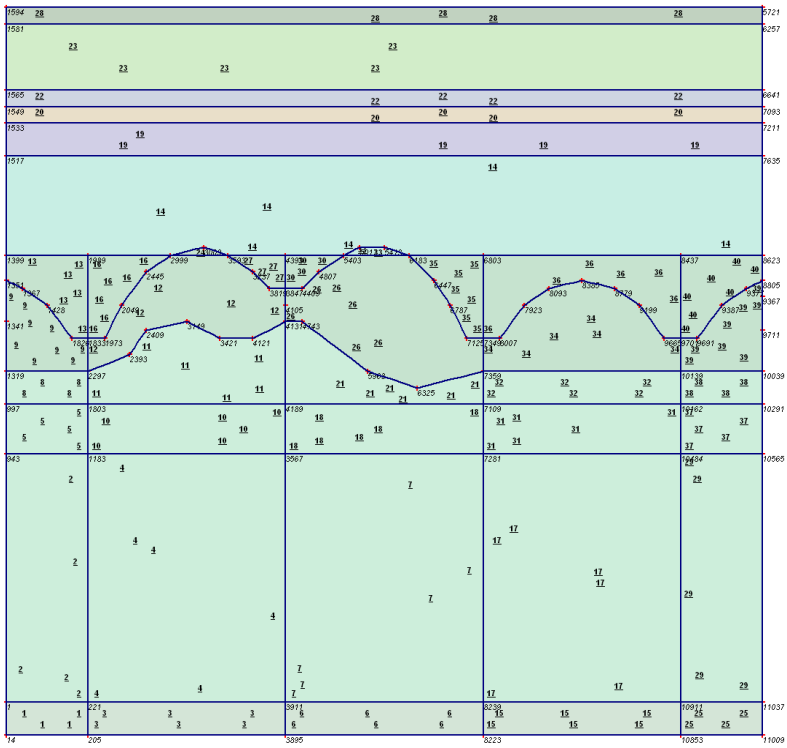


Figure 2. Plot of geometry model with cluster numbers.

Table 5. Table of clusters.

Cluster no.	Nodes
1	14, 1, 205, 221.
2	1, 943, 1183, 221.
3	3895, 3911, 205, 221.
4	3567, 3911, 1183, 221.
5	943, 1183, 997, 1803.
6	8223, 8239, 3895, 3911.
7	8239, 7281, 3567, 3911.
8	1319, 2297, 997, 1803.
9	1319, 1341, 1826, 1833, 2297, 1428, 1367, 1351.
10	3567, 1183, 1803, 4189.
11	4131, 2297, 1803, 4189, 2393, 3149, 4121, 2409, 3421.
12	3819, 3847, 4131, 1973, 1833, 2297, 2049, 2445, 3593, 3237, 4105, 2393, 3149, 4121, 2409, 3421, 2999.
13	1399, 1826, 1833, 1428, 1367, 1351, 1989.
14	1399, 1517, 8623, 7635, 3009, 3593, 1989, 4393, 6803, 8437, 2999, 5017, 5413, 5403, 6183.
15	8223, 8239, 10853, 10911.
16	1973, 1833, 2049, 2445, 1989, 2999.
17	8239, 7281, 10911, 10484.
18	7281, 3567, 4189, 7109.
19	1517, 1533, 7635, 7211.
20	1533, 1549, 7211, 7093.
21	7359, 4131, 4189, 7109, 4743, 6325, 5963.
22	1549, 1565, 7093, 6641.
23	1565, 1581, 6641, 6257.
24	3009, 3593, 2999.
25	11009, 11037, 10853, 10911.
26	7125, 7349, 7359, 4409, 3847, 4131, 4807, 6447, 6787, 4105, 4743, 6325, 5963, 5403, 6183.
27	3819, 3847, 3593, 3237, 4393.
28	1581, 1594, 5721, 6257.
29	11037, 10911, 10565, 10484.
30	4409, 3847, 4807, 4393, 5403.
31	7281, 7109, 10162, 10484.
32	7359, 10139, 7109, 10162.
33	5017, 5413, 5403, 6183.
34	8007, 7349, 7359, 7923, 9701, 10139, 8779, 9199, 9665, 8093, 8385.
35	7125, 7349, 6447, 6787, 6803, 6183.
36	8007, 7349, 7923, 9701, 8779, 9199, 9665, 6803, 8437, 8093, 8385.
37	10291, 10162, 10565, 10484.
38	10039, 10139, 10291, 10162.
39	10039, 9711, 9701, 10139, 9691, 9387, 9377, 9367, 8805.
40	8623, 9701, 9691, 9387, 9377, 8805, 8437.

3. Structures

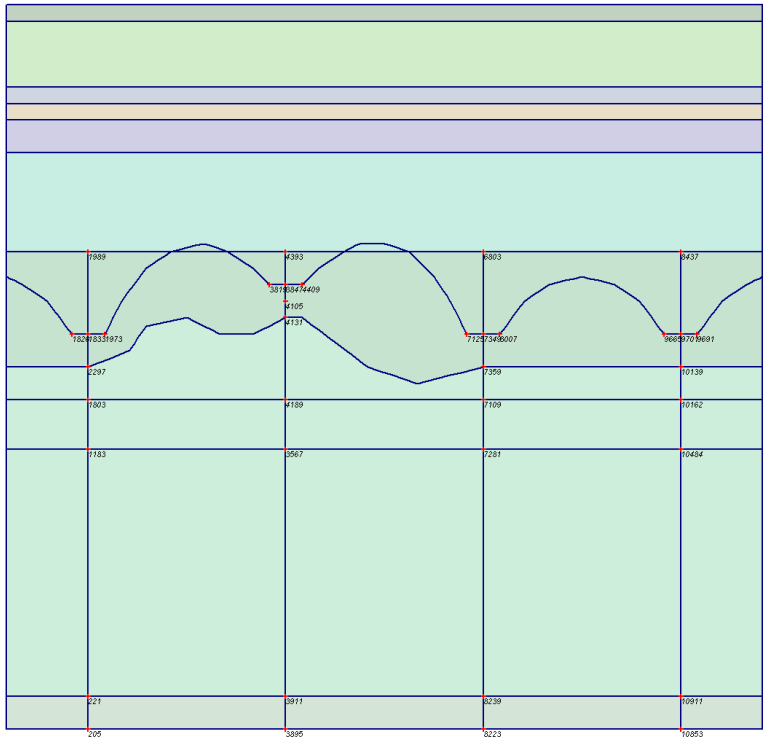


Figure 3. Plot of geometry model with structures.

Table 6. Beams.

Plate no.	Data set	Length [ft]	Nodes
1	2 ft dia. grout column	24.000	1833, 2297, 1803, 1183, 221, 205.
2	2 ft dia. grout column	24.000	7349, 7359, 7109, 7281, 8239, 8223.
3	2 ft dia. grout column	24.000	9701, 10139, 10162, 10484, 10911, 10853.
4	2 ft dia. grout column	27.000	3847, 4105, 4131, 4189, 3567, 3911, 3895.
5	2 ft dia. grout column	2.000	1826, 1833, 1973.
6	2 ft dia. grout column	2.000	7125, 7349, 8007.
7	2 ft dia. grout column	2.000	9665, 9701, 9691.
8	0.34 ft dia. grout column	5.000	1989, 1833.
9	0.34 ft dia. grout column	5.000	6803, 7349.
10	0.34 ft dia. grout column	5.000	8437, 9701.
11	0.34 ft dia. grout column	2.000	4393, 3847.
12	2 ft dia. grout column	2.000	3819, 3847, 4409.

4. Loads and Boundary Conditions

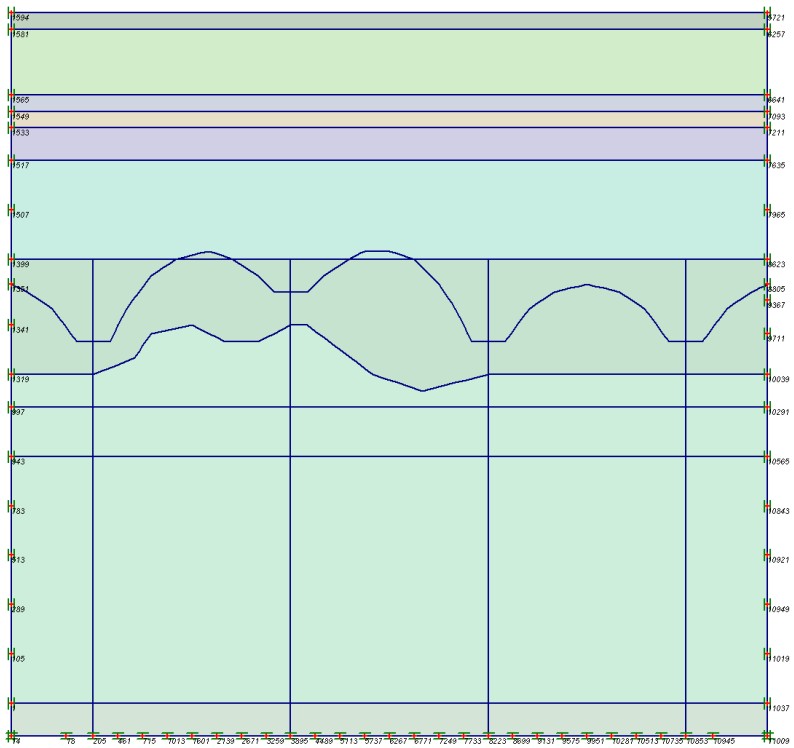


Figure 4. Plot of geometry with loads and boundary conditions.

Table 7. Node fixities.

Node no.	Sign	Horizontal	Vertical	Node no.	Sign	Horizontal	Vertical
14	#	Fixed	Fixed	10843	||	Fixed	Free
11009	#	Fixed	Fixed	10921	||	Fixed	Free
1	||	Fixed	Free	10949	||	Fixed	Free
1319	||	Fixed	Free	11019	||	Fixed	Free
1399	||	Fixed	Free	1507	||	Fixed	Free
1517	||	Fixed	Free	7965	||	Fixed	Free
1533	||	Fixed	Free				
1549	||	Fixed	Free				
1565	||	Fixed	Free				
1581	||	Fixed	Free				
1594	||	Fixed	Free				
11037	||	Fixed	Free				
10039	||	Fixed	Free				
1341	||	Fixed	Free				
943	||	Fixed	Free				
9711	||	Fixed	Free				
5721	||	Fixed	Free				
8623	||	Fixed	Free				
7635	||	Fixed	Free				
7211	||	Fixed	Free				
7093	||	Fixed	Free				
6641	||	Fixed	Free				
6257	||	Fixed	Free				
1351	||	Fixed	Free				
9367	||	Fixed	Free				
8805	||	Fixed	Free				
997	||	Fixed	Free				
10291	||	Fixed	Free				
10565	||	Fixed	Free				
783	||	Fixed	Free				
513	||	Fixed	Free				
289	||	Fixed	Free				
105	||	Fixed	Free				

Table 8. Distributed loads A.

Loads no.	First node	qx [lb/ft/ft]	qy [lb/ft/ft]	Last node	qx [lb/ft/ft]	qy [lb/ft/ft]
1	1594	0.000	0.000	5721	0.000	0.000

5. Mesh Data

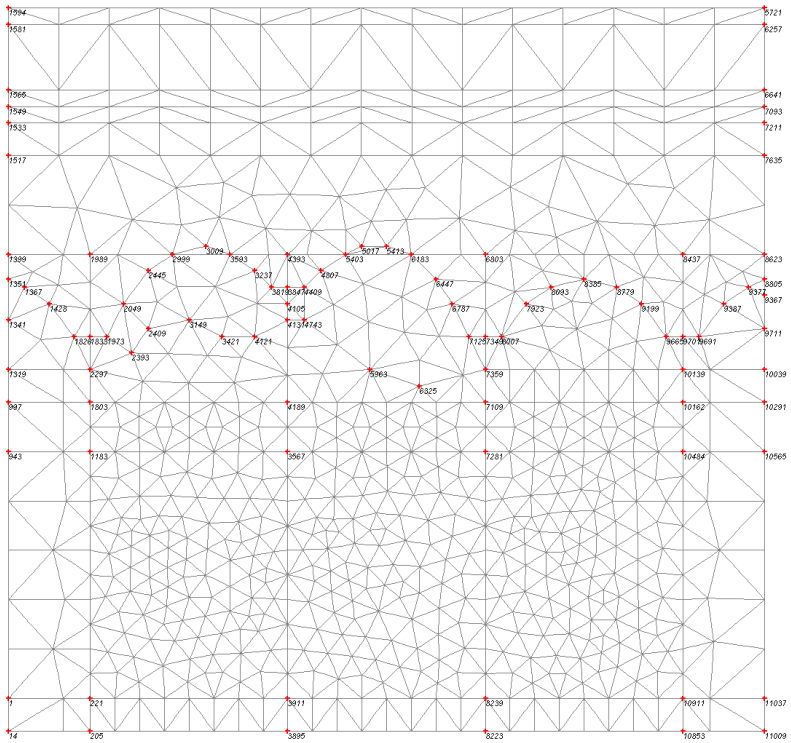


Figure 5. Plot of the mesh with significant nodes.

Table 9. Numbers, type of elements, integrations.

Type	Type of element	Type of integration	Total no.
Soil	15-noded	12-point Gauss	1360
Plate	5-node line	4-point Gauss	81

6. Material Data

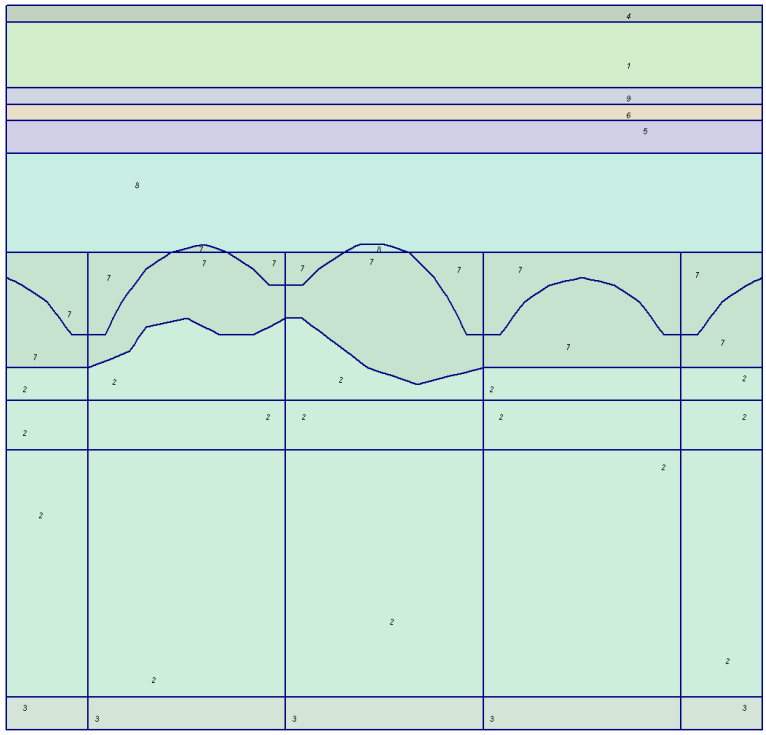


Figure 6. Plot of geometry with material data sets.

Table 10. Soil data sets parameters.

Mohr-Coulomb		1 Water Storage	2 Waste	3 Underburden/Native	4 Topsoil
Type		Drained	Undrained	Undrained	Undrained
γ_{unsat}	[lb/ft³]	115.00	100.00	115.00	115.00
γ_{sat}	[lb/ft³]	139.00	120.00	129.00	139.00
k_x	[ft/hr]	0.000	0.000	0.000	0.000
k_y	[ft/hr]	0.000	0.000	0.000	0.000
e_{init}	[-]	0.500	0.500	0.500	0.500
c_k	[-]	1E15	1E15	1E15	1E15
E_{ref}	[lb/ft²]	288000.000	10000.000	216000.000	216000.000
ν	[-]	0.340	0.350	0.350	0.300
G_{ref}	[lb/ft²]	107462.687	3703.704	80000.000	83076.923
E_{oed}	[lb/ft²]	443283.582	16049.383	346666.667	290769.231
c_{ref}	[lb/ft²]	1540.00	20.00	1540.00	500.00
φ	[°]	33.50	15.00	26.30	30.00
ψ	[°]	0.00	0.00	0.00	0.00
E_{inc}	[lb/ft²/ft]	0.00	0.00	0.00	0.00
y_{ref}	[ft]	0.000	0.000	0.000	0.000
$c_{increment}$	[lb/ft²/ft]	0.00	0.00	0.00	0.00
$T_{str.}$	[lb/ft²]	0.00	0.00	0.00	0.00

Table 10. (continued).

Mohr-Coulomb		1 Water Storage	2 Waste	3 Underburden/Native	4 Topsoil
$R_{inter.}$	[-]	1.00	1.00	1.00	1.00
Interface permeability		Neutral	Neutral	Neutral	Neutral

Mohr-Coulomb		5 Biointrusion Barrier/Gas Venting	6 Crushed Gravel	7 Existing Overburden	8 Grading Fill
Type		Drained	Drained	Drained	Drained
γ_{unsat}	[lb/ft³]	136.00	136.00	103.00	115.00
γ_{sat}	[lb/ft³]	149.00	149.00	129.00	139.00
k_x	[ft/hr]	0.000	0.000	0.000	0.000
k_y	[ft/hr]	0.000	0.000	0.000	0.000
e_{init}	[-]	0.500	0.500	0.500	0.500
c_k	[-]	1E15	1E15	1E15	1E15
E_{ref}	[lb/ft²]	4320000.000	2016000.000	432000.000	432000.000
ν	[-]	0.200	0.300	0.300	0.300
G_{ref}	[lb/ft²]	1800000.000	775384.615	166153.846	166153.846
E_{oed}	[lb/ft²]	4800000.000	2713846.154	581538.462	581538.462
c_{ref}	[lb/ft²]	0.20	0.20	1540.00	1540.00
φ	[°]	50.00	50.00	26.30	33.50
ψ	[°]	20.00	20.00	0.00	0.00
E_{inc}	[lb/ft²/ft]	0.00	0.00	0.00	0.00
y_{ref}	[ft]	0.000	0.000	0.000	0.000
$c_{increment}$	[lb/ft²/ft]	0.00	0.00	0.00	0.00
$T_{str.}$	[lb/ft²]	0.00	0.00	0.00	0.00
$R_{inter.}$	[-]	1.00	1.00	1.00	1.00
Interface permeability		Neutral	Neutral	Neutral	Neutral

Mohr-Coulomb		9 Sand
Type		Drained
γ_{unsat}	[lb/ft³]	121.00
γ_{sat}	[lb/ft³]	138.00
k_x	[ft/hr]	0.000
k_y	[ft/hr]	0.000
e_{init}	[-]	0.500
c_k	[-]	1E15
E_{ref}	[lb/ft²]	100800.000
ν	[-]	0.300
G_{ref}	[lb/ft²]	38769.231
E_{oed}	[lb/ft²]	135692.308
c_{ref}	[lb/ft²]	20.00
φ	[°]	33.50
ψ	[°]	10.00
E_{inc}	[lb/ft²/ft]	0.00
y_{ref}	[ft]	0.000
$c_{increment}$	[lb/ft²/ft]	0.00
$T_{str.}$	[lb/ft²]	0.00

Table 10. (continued).

Mohr-Coulomb		9 Sand
$\mathbf{R_{inter.}}$	[-]	1.00
Interface permeability		Neutral

Table 11. Beam data sets parameters.

No.	Identification	EA	EI	w	ν	Mp	Np
		[lb/ft]	[lbft²/ft]	[lb/ft/ft]	[-]	[lbft/ft]	[lb/ft]
1	2 ft dia. grout column	8.9326E8	2.2331E8	130.00	0.15	1E15	1E15
2	0.34 ft dia. grout column	2.5815E7	1.8651E5	130.00	0.15	1E15	1E15
3	1.0 ft dia. grout column	2.2331E8	1.3957E7	130.00	0.15	1E15	1E15

7. Calculation Phases

Table 12. List of phases.

Phase	Ph-No.	Start phase	Calculation type	Load input	First step	Last step
Initial phase	0	0		-	0	0
Stage 1	1	0	Plastic	Staged construction	1	2
Stage 2	2	1	Plastic	Staged construction	3	4
Stage 3	3	2	Plastic	Total multipliers	5	16
Stage 4	4	3	Plastic	Total multipliers	17	17
Stage 5	5	4	Plastic	Total multipliers	18	30
Stage 6	6	5	Plastic	Total multipliers	31	31
Stage 7	7	6	Plastic	Staged construction	32	35
Stage 8	12	7	Plastic	Staged construction	36	37
Stage 9	8	7	Plastic	Total multipliers	38	46
Stage 10	9	8	Plastic	Total multipliers	47	47
Stage 11	10	9	Plastic	Total multipliers	48	50
Stage 12	13	10	Plastic	Total multipliers	51	51

Table 13. Staged construction info.

Ph-No.	Active clusters	Inactive clusters	Active beams	Active geotextiles	Active anchors
0	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, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40.				
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, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40.		1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12.		
2	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, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40.		1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12.		
7	1, 2, 3, 4, 5, 6, 7, 10, 13, 14, 15, 16, 17, 18, 19, 20, 22, 23, 25, 27, 28, 29, 30, 31, 35, 36, 37, 40.	8, 9, 11, 12, 21, 24, 26, 32, 33, 34, 38, 39.	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12.		
12	1, 2, 3, 4, 6, 7, 13, 14, 15, 16, 17, 19, 20, 22, 23, 25, 27, 28, 29, 30, 35, 36, 40.	5, 8, 9, 10, 11, 12, 18, 21, 24, 26, 31, 32, 33, 34, 37, 38, 39.	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12.		

Table 14. Control parameters 1.

Ph-No.	Additional steps	Reset displacements to zero	Ignore undrained behavior	Delete intermediate steps
1	250	No	No	Yes
2	250	No	No	Yes
3	250	No	No	Yes
4	250	No	No	Yes
5	250	No	No	Yes
6	250	No	No	Yes
7	250	No	No	Yes
12	250	No	No	Yes
8	250	No	No	Yes
9	250	No	No	Yes
10	250	No	No	Yes
13	250	No	No	Yes

Table 15. Control parameters 2.

Ph-No.	Iterative procedure	Tolerated error	Over relaxation	Max. iterations	Desired min.	Desired max.	Arc-Length control
1	Standard	0.010	1.200	60	6	15	Yes
2	Standard	0.010	1.200	60	6	15	Yes
3	Standard	0.010	1.200	60	6	15	Yes
4	Standard	0.010	1.200	60	6	15	Yes
5	Standard	0.010	1.200	60	6	15	Yes
6	Standard	0.010	1.200	60	6	15	Yes
7	Standard	0.010	1.200	60	6	15	Yes
12	Standard	0.010	1.200	60	6	15	Yes
8	Standard	0.010	1.200	60	6	15	Yes
9	Standard	0.010	1.200	60	6	15	Yes
10	Standard	0.010	1.200	60	6	15	Yes
13	Standard	0.010	1.200	60	6	15	Yes

Table 16. Incremental multipliers (input values).

Ph-No.	Displ.	Load A	Load B	Weight	Accel	Time	s-f
0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
1	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
6	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
7	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
12	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
8	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
9	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
10	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
13	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Table 17. Total multipliers - input values.

Ph-No.	Displ.	Load A	Load B	Weight	Accel	Time	s-f
0	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	1.0000
1	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	1.0000
2	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	1.0000
3	1.0000	1.0000	1.0000	1.0400	0.7100	0.0000	1.0000
4	1.0000	1.0000	1.0000	1.0400	0.0000	0.0000	1.0000
5	1.0000	1.0000	1.0000	1.0400	-0.7100	0.0000	1.0000
6	1.0000	1.0000	1.0000	1.0400	0.0000	0.0000	1.0000
7	1.0000	1.0000	1.0000	1.0400	0.0000	0.0000	1.0000
12	1.0000	1.0000	1.0000	1.0400	0.0000	0.0000	1.0000
8	1.0000	1.0000	1.0000	1.0400	0.7100	0.0000	1.0000
9	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	1.0000
10	1.0000	1.0000	1.0000	1.0400	-0.7100	0.0000	1.0000
13	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	1.0000

Table 18. Total multipliers - reached values.

Ph-No.	Displ.	Load A	Load B	Weight	Accel	Time	s-f
0	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	1.0000
1	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	1.0000
2	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	1.0000
3	1.0000	1.0000	1.0000	1.0400	0.7100	0.0000	1.0000
4	1.0000	1.0000	1.0000	1.0400	0.0000	0.0000	1.0000
5	1.0000	1.0000	1.0000	1.0400	-0.7100	0.0000	1.0000
6	1.0000	1.0000	1.0000	1.0400	0.0000	0.0000	1.0000
7	1.0000	1.0000	1.0000	1.0400	0.0000	0.0000	1.0000
12	1.0000	1.0000	1.0000	1.0400	0.0000	0.0000	1.0000
8	1.0000	1.0000	1.0000	1.0400	0.7100	0.0000	1.0000
9	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	1.0000
10	1.0000	1.0000	1.0000	1.0400	-0.7100	0.0000	1.0000
13	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	1.0000

8. Results for Phase 2

Table 19. Step info phase no: 2.

Step no:	4
Calculation type	PLASTIC
Extrapolation factor	1.000
Relative stiffness	1.000

Table 20. Reached multipliers phase no: 2.

Multipliers	Incremental value	Total value
Prescribed displacements	0.0000	1.0000
Load system A	0.0000	1.0000
Load system B	0.0000	1.0000
Soil weight	0.0000	1.0000
Acceleration	0.0000	0.0000
Strength reduction factor	0.0000	1.0000
Time	0.0000	0.0000

Table 21. Staged construction info phase no: 2.

Staged construction	Incremental value	Total value
Active proportion of total area	0.000	1.000
Active proportion of stage	0.500	1.000

Table 22. Iteration info phase no: 2.

Iter. no.	Global error	Plastic points	Plastic Cap + Hard. points	Inacc. Pl. pts.	Plastic Intf. pts.	Inacc. Intf. pts.	Apex & Tension	Inacc. Apx. pts.
1	0.000	0	0	0	0	0	0	0
2	0.000	0	0	0	0	0	0	0

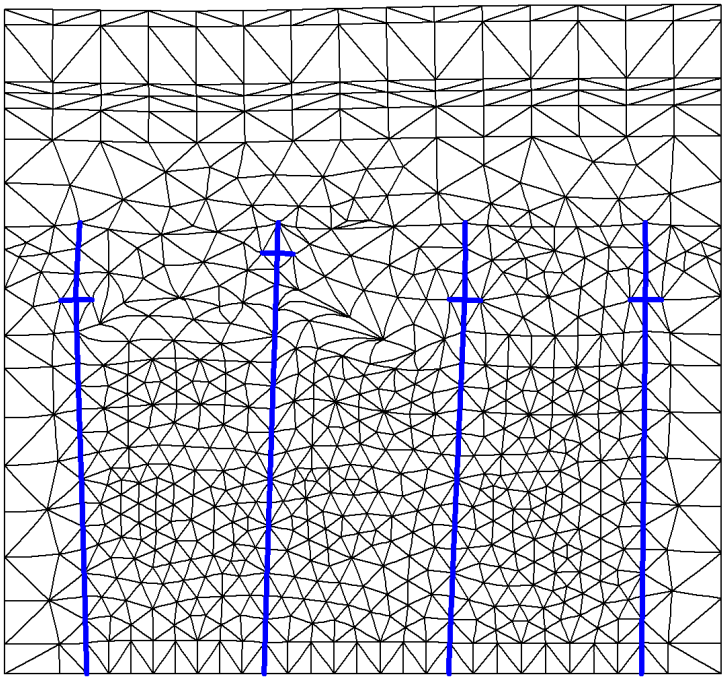


Figure 7. Plot of deformed mesh - step no: 4 - (phase: 2).

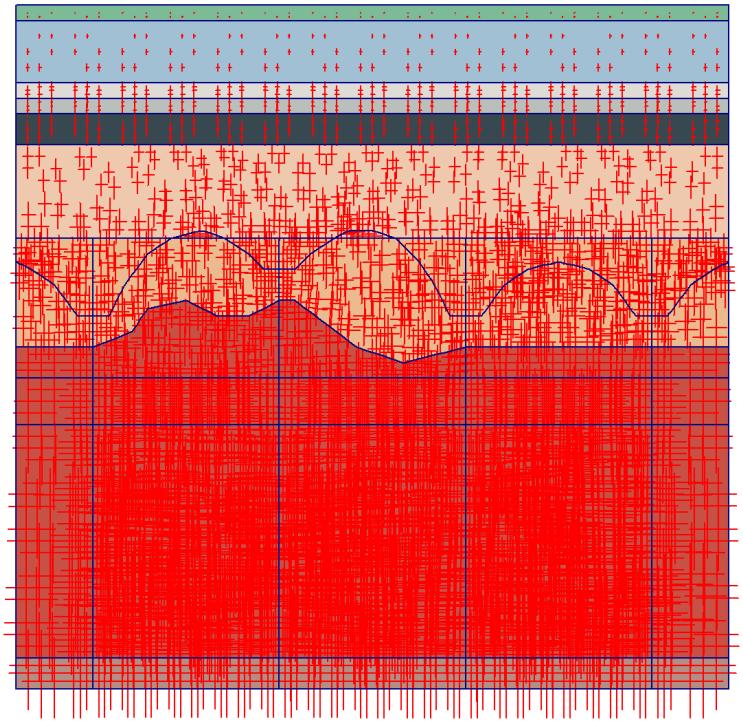


Fig. 8 Plot of effective stresses (principal directions) - step no: 4 - (phase: 2).

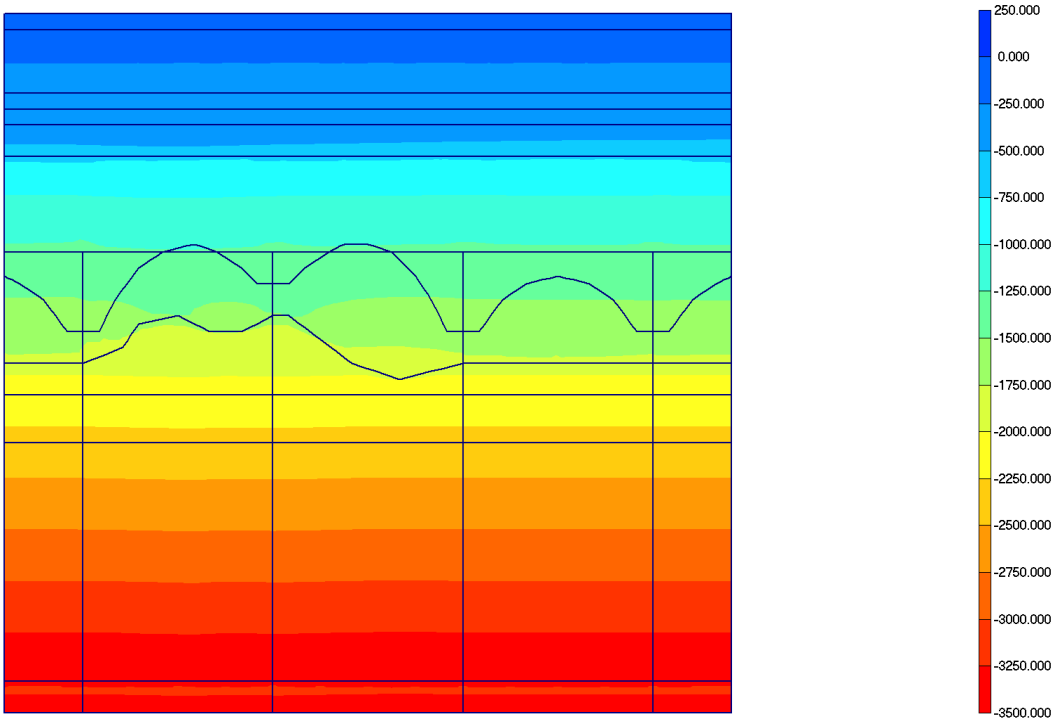


Figure 9. Plot of effective stresses (mean shadings) - step no: 4 - (phase: 2).

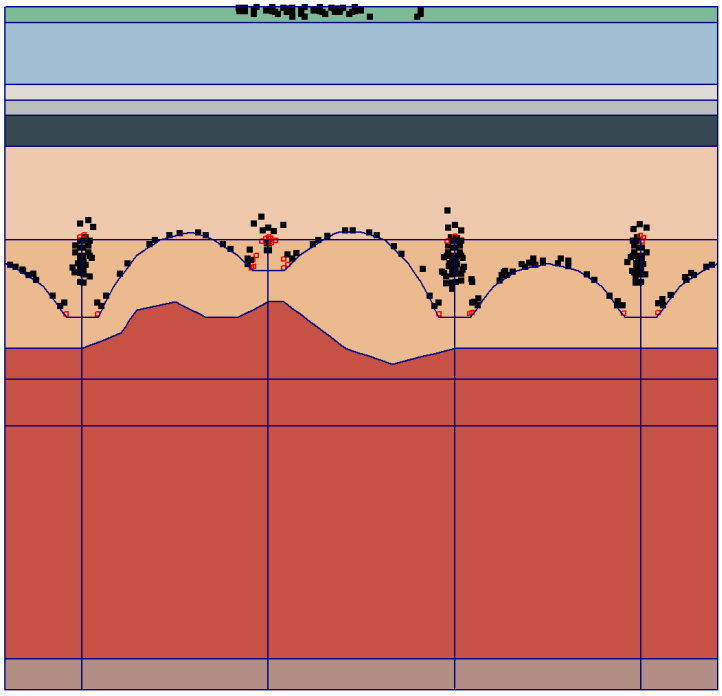


Figure 10. Plot of plastic points - step no: 4 - (phase: 2).

9. Results for Phase 12

Table 23. Step info phase no: 12.

Step no:	37
Calculation type	PLASTIC
Extrapolation factor	1.000
Relative stiffness	0.996

Table 24. Reached multipliers phase no: 12.

Multipliers	Incremental value	Total value
Prescribed displacements	0.0000	1.0000
Load system A	0.0000	1.0000
Load system B	0.0000	1.0000
Soil weight	0.0000	1.0400
Acceleration	0.0000	0.0000
Strength reduction factor	0.0000	1.0000
Time	0.0000	0.0000

Table 25. Staged construction info phase no: 12.

Staged construction	Incremental value	Total value
Active proportion of total area	0.000	0.777
Active proportion of stage	0.500	1.000

Table 26. Iteration info phase no: 12.

Iter. no.	Global error	Plastic points	Plastic Cap + Hard. points	Inacc. Pl. pts.	Plastic Intf. pts.	Inacc. Intf. pts.	Apex & Tension	Inacc. Apx. pts.
1	0.005	227	0	24	0	0	242	24
2	0.005	223	0	8	0	0	238	8

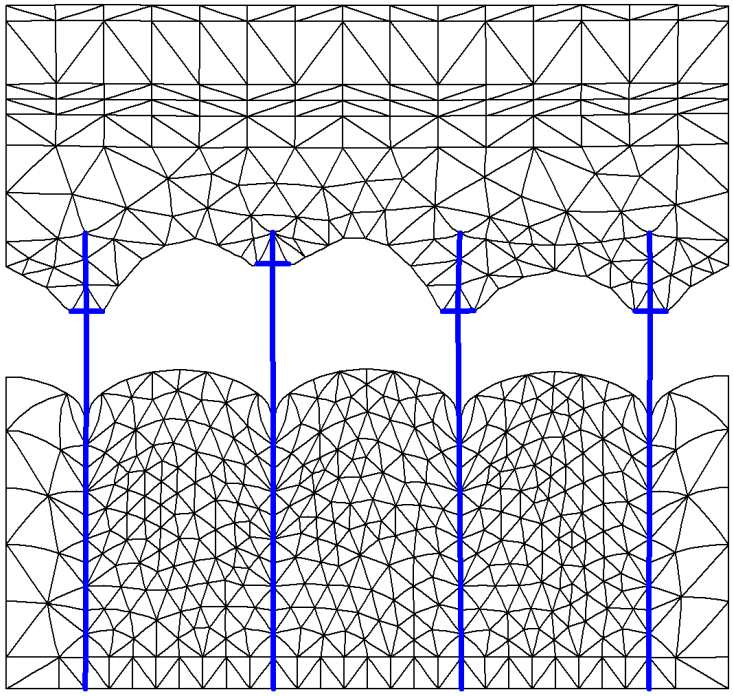


Figure 11. Plot of deformed mesh - step no: 37 - (phase: 12).

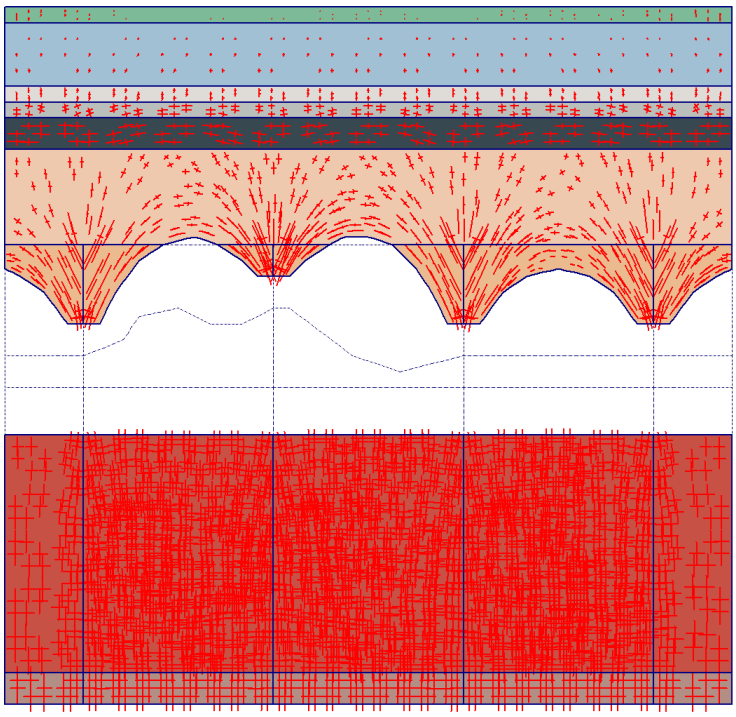


Figure 12. Plot of effective stresses (principal directions) - step no: 37 - (phase: 12).

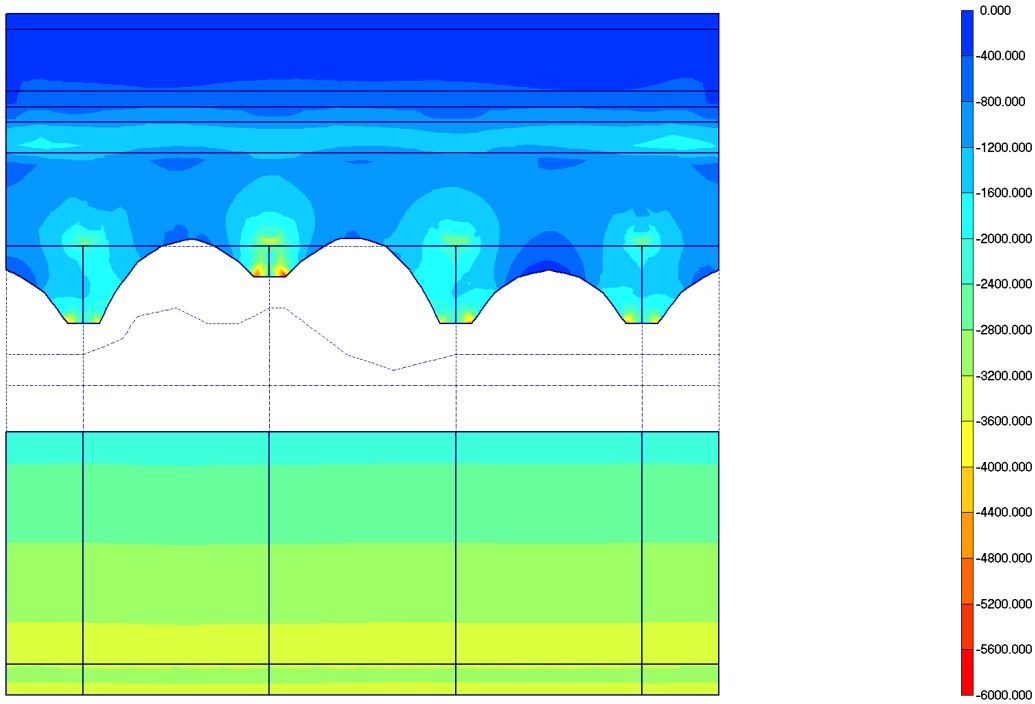


Figure 13. Plot of effective stresses (mean shadings) - step no: 37 - (phase: 12).

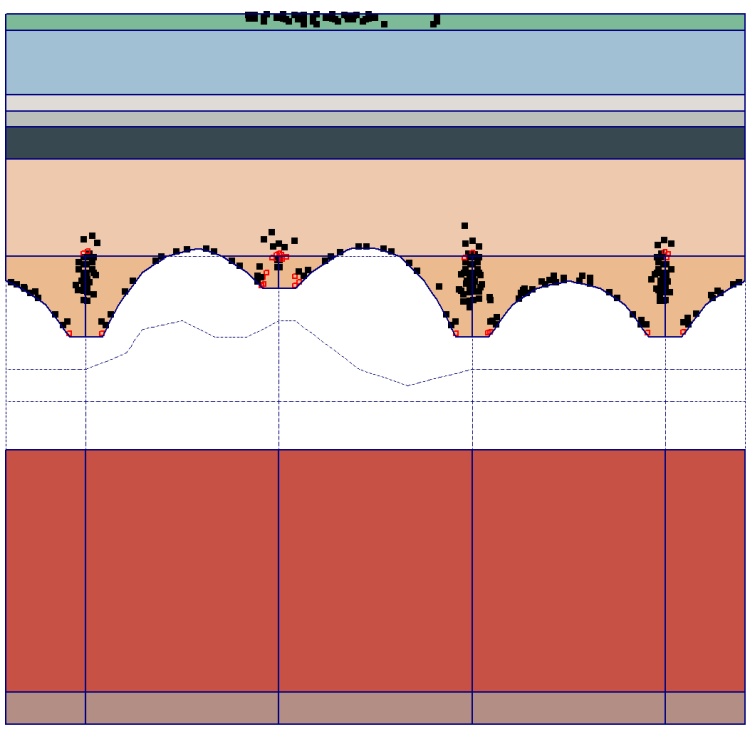


Figure 14. Plot of plastic points - step no: 37 - (phase: 12).

10. Results for Phase 13

Table 27. Step info phase no: 13.

Step no:	51
Calculation type	PLASTIC
Extrapolation factor	0.000
Relative stiffness	1.000

Table 28. Reached multipliers phase no: 13.

Multipliers	Incremental value	Total value
Prescribed displacements	0.0000	1.0000
Load system A	0.0000	1.0000
Load system B	0.0000	1.0000
Soil weight	-0.0400	1.0000
Acceleration	0.7100	0.0000
Strength reduction factor	0.0000	1.0000
Time	0.0000	0.0000

Table 29. Staged construction info phase no: 13.

Staged construction	Incremental value	Total value
Active proportion of total area	0.000	0.845
Active proportion of stage	0.000	0.000

Table 30. Iteration info phase no: 13.

Iter. no.	Global error	Plastic points	Plastic Cap + Hard. points	Inacc. Pl. pts.	Plastic Intf. pts.	Inacc. Intf. pts.	Apex & Tension	Inacc. Apx. pts.
1	0.001	37	0	3	0	0	38	3
2	0.001	43	0	2	0	0	43	2
3	0.009	51	0	11	0	0	52	11
4	0.001	48	0	1	0	0	47	1

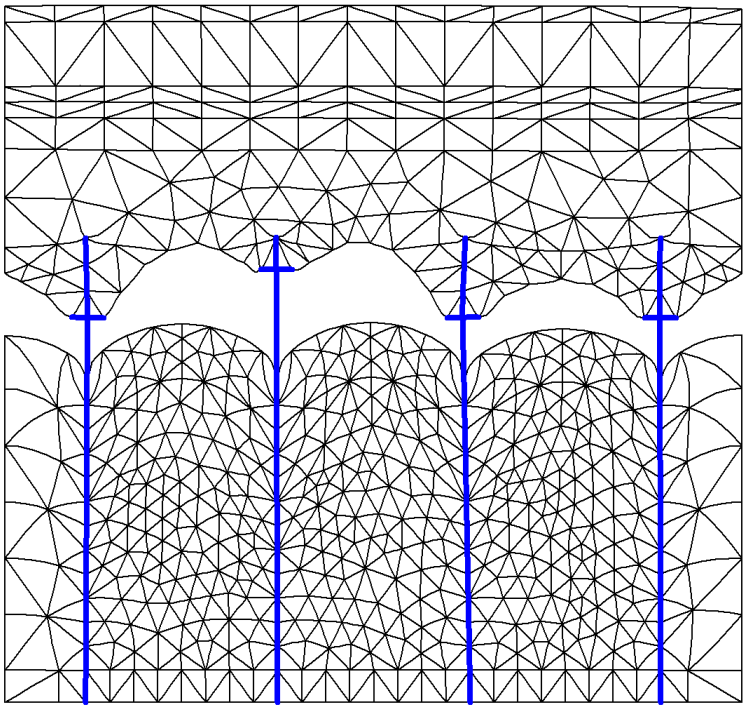


Figure 15. Plot of deformed mesh - step no: 51 - (phase: 13).

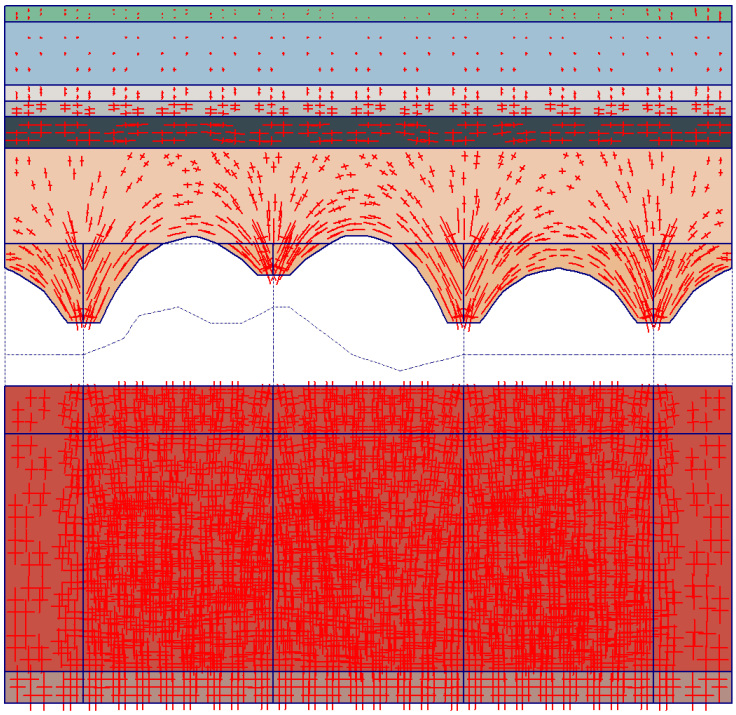


Figure 16. Plot of effective stresses (principal directions) - step no: 51 - (phase: 13).

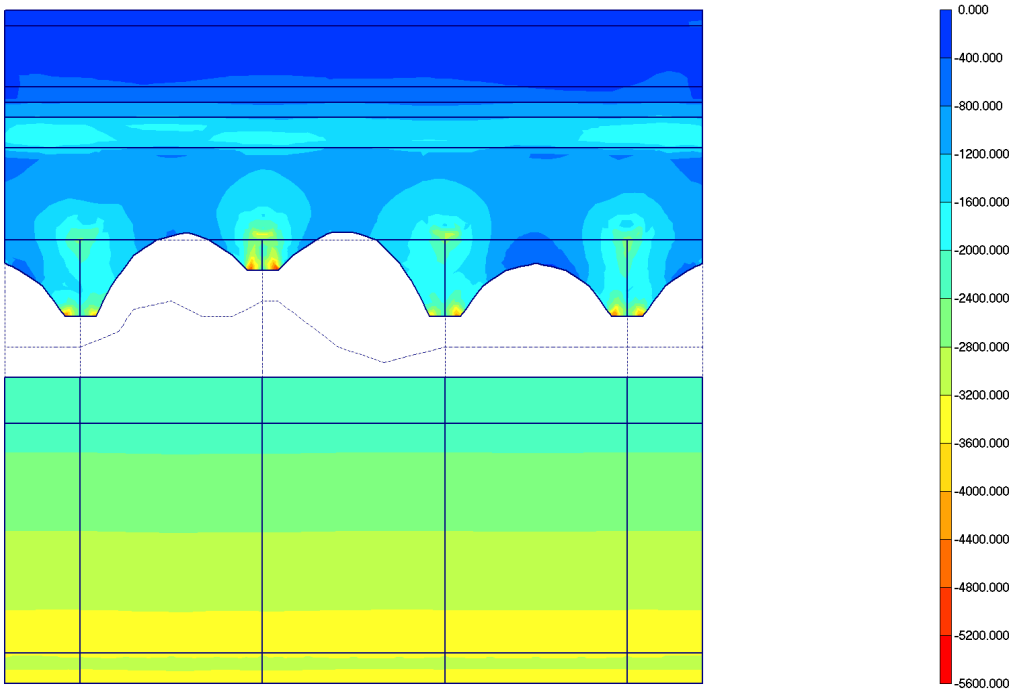


Figure 17. Plot of effective stresses (mean shadings) - step no: 51 - (phase: 13).

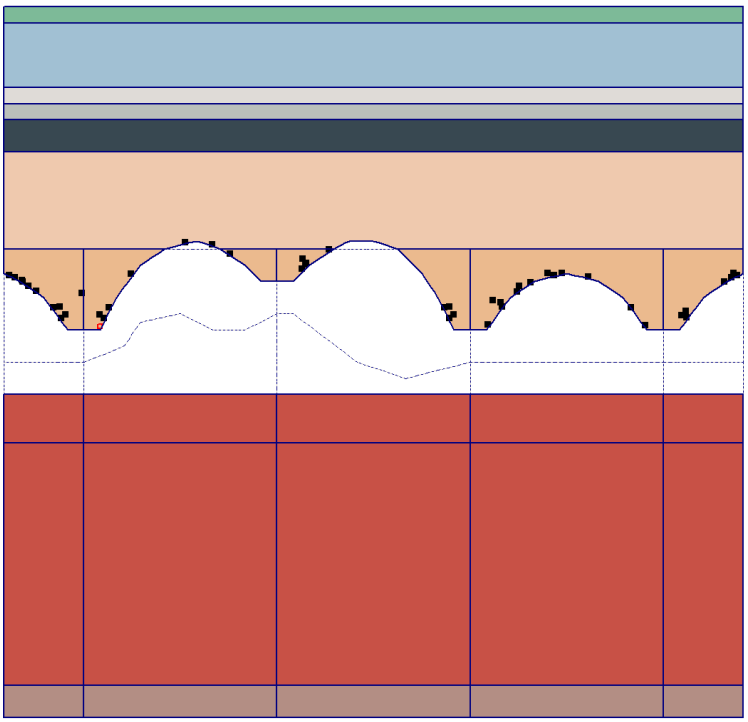
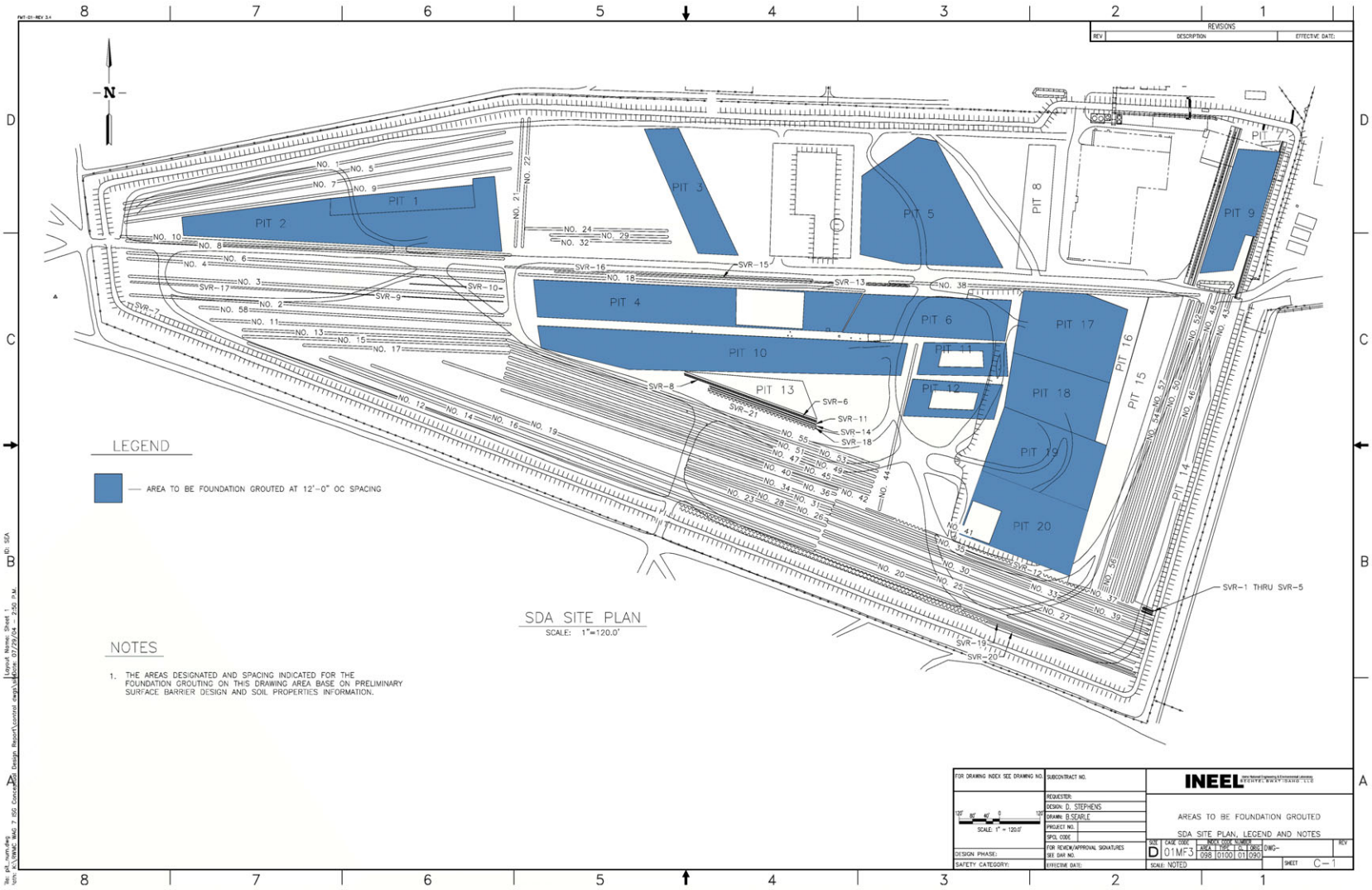


Figure 18. Plot of plastic points - step no: 51 - (phase: 13).

Appendix I

Plan of Subsurface Disposal Area Showing Areas to be Foundation Grouted

This page is intentionally left blank.

Appendix I

Plan of Subsurface Disposal Area Showing Areas to be Foundation Grouted