RESOURCE INTERNATIONAL, INC.
281 ENTERPRISE DRIVE
WESTERVILLE, OHIO 43081
(614) 885-1959

REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-29
Sheet: 1 of 2
Completion Depth: 10.0 m

Date Started: 2/3/98
Date Finished: 2/3/98
Drilled By: J.T.

DRILLING AND SAMPLING INFORMATION

Northing: 141886.522
Easting: 634782.376
Elevation: 267.7 m

Boring Method: 8.2 cm HSA
Hammer Weight: 63.5 kg
Hammer Drop: 76 cm

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
SS-1	2 2 3	33		15 cm - Concrete 0.1			
SS-2	5 17 19	33		Brown fine SANDY SILT, some fine gravel, little clay, little coarse sand. Medium stiff to very stiff. Moist. -SS-1: qh = 120 kPa -SS-2: ODOT A-4a (1); qh = 168 kPa	17	26	16
SS-3	3 2 2	44	1.0		26		
SS-4	28 11 7	33	2.0		12		
SS-5	6 9 7	33	2.6 3.0	Reddish-brown SILTY CLAY, little coarse to fine sand, trace fine gravel, trace organics, brick fragments, metal wire. Very stiff to hard. Moist.	10		
SS-6	50/3cm	100	4.0		21		

NOTES:

SAMPLE TYPE
SS - 5.1cm OD Split Spoon
GS - Geoprobe Sample
ST - Shelby Tube
RC - Rock Core
AS - Auger Sample

GROUND WATER READING
At Completion: 4.0 m
After 24 Hrs: ▼ N/A m

BORING METHOD
HSA - Hollow Stem Augers
SFA - Solid Flight Augers
MD - Mud Drilling
WD - Wash Drilling
RC - Rock Coring

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139
Boring Number: B-29
Sheet: 2 of 2
Completion Depth: 10.0 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
			5.0				
			6.2	Mottled gray and reddish-brown CLAY (INDURATED CLAY/MUDSTONE), some silt, trace coarse to fine sand. Hard soil/very soft bedrock. Moist. -groundwater initially encountered @ 5.6 m -SS-7: ODOT A-7-6 (20); qh = 335 kPa			
SS-7	8 18 20	94	6.0		18	58	23
			7.0				
SS-8	26 50/8cm	89			13		
			8.0				
SS-9	26 50/3cm	86	9.0		17		
SS-10	50/13cm	100			16		
			10.0	Bottom of Boring = 10.0 meters			

NOTES:

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281 ENTERPRISE DRIVE
WESTERVILLE, OHIO 43081
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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-30
Sheet: 1 of 3
Completion Depth: 11.9 m

Date Started: 2/3/98
Date Finished: 2/3/98
Drilled By: M.F.

DRILLING AND SAMPLING INFORMATION

Northing: 141753.782
Easting: 634887.038
Elevation: 249.7 m

Boring Method: 9.5 cm HSA
Hammer Weight: 63.5 kg
Hammer Drop: 76 cm

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
SS-1	2 2 2	72		Brown coarse to fine SANDY SILT, little clay, little organics (Topsoil). Moist. 0.2	16		
ST-2		100		Brown to reddish-brown CLAYEY SILT, some coarse to fine sand, trace fine gravel. Soft to medium stiff. Moist. -ST-2: ODOT A-6a (10)	27	34	19
			1.0				
SS-3	1 1 1	56		-groundwater initially encountered @ 1.1 m -SS-3: qh = 215 kPa	22		
SS-4	4 5 7	44	2.0	-SS-4: qh = 120 kPa	20		
				2.6			
ST-5		100		Reddish-brown CLAY, some silt, little to trace coarse to fine sand, trace fine gravel. Hard. Moist. -ST-5: ODOT A-7-6 (12); uw = 19.75 KN/m3	22	44	25
			3.0				
			4.0				
SS-6	14 15 17	44		-SS-6: qh = 431+ kPa	24		

NOTES:

SAMPLE TYPE
SS - 5.1cm OD Split Spoon
GS - Geoprobe Sample
ST - Shelby Tube
RC - Rock Core
AS - Auger Sample

GROUND WATER READING
At Completion ▽ Seepage m
After 24 Hrs ▼ N/A m

BORING METHOD
HSA - Hollow Stem Augers
SFA - Solid Flight Augers
MD - Mud Drilling
WD - Wash Drilling
RC - Rock Coring

RESOURCE INTERNATIONAL, INC.
281 ENTERPRISE DRIVE
WESTERVILLE, OHIO 43081
(614) 885-1959

REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139
Boring Number: B-30
Sheet: 2 of 3
Completion Depth: 11.9 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
			5.0		6.0		
				Reddish-brown INDURATED CLAY/WEATHERED MUDSTONE. Hard soil/very soft bedrock.			
SS-7	14 24 37	56	6.0		14		
SS-8	25 37 49	89	7.0		13		
			8.0				
SS-9	20 31 50/13cm	44	9.0	-SS-9: ODOT A-7-6 (14); qh = 431+ kPa	14	43	20
			10.0				
SS-10	30 44 50/10cm	44			12		
			11.0				

NOTES:

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281 ENTERPRISE DRIVE
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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Boring Number: B-30
Project: ATH/MEG-33-30.980/0.000
Sheet: 3 of 3
Project Number: W-7139
Completion Depth: 11.9 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
SS-11	50/8cm	100	11.9	Bottom of Boring = 11.9 meters	10		

NOTES:

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-31
Sheet: 1 of 2
Completion Depth: 10.0 m

Date Started: 2/4/98
Date Finished: 2/4/98
Drilled By: M.F.

DRILLING AND SAMPLING INFORMATION

Northing: 141679.145
Easting: 635044.161
Elevation: 285.6 m

Boring Method: 9.5 cm HSA/RC
Hammer Weight: 63.5 kg
Hammer Drop: 76 cm

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
SS-1	3 4 5	67		Brown SILTY CLAY, little organics, trace fine sand (Topsoil). Moist. 0.2	30		
SS-2	5 12 16	72		Brown to red CLAY, some silt, trace coarse to fine sand, trace fine gravel. Stiff to hard. Damp to moist.	14		
			1.0				
SS-3	10 11 24	44			15		
SS-4	12 50/3cm	67	2.0		16		
SS-5	2 7 12	44	3.0	-SS-5: ODOT A-7-6 (19)	33	55	22
			4.0				
SS-6	14 17 21	56			11		

NOTES:

SAMPLE TYPE
SS - 5.1cm OD Split Spoon
GS - Geoprobe Sample
ST - Shelby Tube
RC - Rock Core
AS - Auger Sample

GROUND WATER READING
At Completion N/A * m
After 24 Hrs ▼ N/A m

BORING METHOD
HSA - Hollow Stem Augers
SFA - Solid Flight Augers
MD - Mud Drilling
WD - Wash Drilling
RC - Rock Coring

RESOURCE INTERNATIONAL, INC.
281 ENTERPRISE DRIVE
WESTERVILLE, OHIO 43081
(614) 885-1959

REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Boring Number: B-31
Project: ATH/MEG-33-30.980/0.000
Sheet: 2 of 2
Project Number: W-7139
Completion Depth: 10.0 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
			5.0				
SS-7	17 20 27	44	6.0		13		
			7.0				
SS-8 RC-1	50/5cm	0		SANDSTONE; brown, moderately hard, fine grained, slightly weathered.			
			7.1				
			8.0	-RC-1: Recovery = 100% -No Core Loss -RQD = 31%			
			8.2	SHALE; gray, very soft to soft, highly weathered.			
			9.0				
RC-2							
			9.5	MUDSTONE; gray, very soft, slightly weathered. -RC-2: Recovery = 93% -Core Loss = 6 centimeters -RQD = 0%			
			10.0				
			10.0	Bottom of Boring = 10.0 meters			

NOTES:

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-32
Sheet: 1 of 2
Completion Depth: 5.8 m

Date Started: 2/4/98
Date Finished: 2/4/98
Drilled By: M.F.

DRILLING AND SAMPLING INFORMATION

Northing: 141549.554
Easting: 635146.172
Elevation: 269.7 m

Boring Method: 9.5 cm HSA
Hammer Weight: 63.5 kg
Hammer Drop: 76 cm

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
SS-1	1, 2, 2	89		Brown SILT, some fine sand, little organics, trace clay (Topsoil). Moist.	29		
				0.1			
SS-2	3, 4, 6	83		Brown CLAY, some silt, trace coarse to fine sand, trace fine gravel. Soft to very stiff. Moist. -SS-2: ODOT A-7-6 (15)	27	44	19
			1.0				
SS-3	7, 9, 14	89			16		
				1.8			
SS-4	7, 14, 21	56	2.0	Brown fine SANDY CLAY, some fine gravel (sandstone fragments), little silt. Hard. Moist.	15		
				2.4			
SS-5	11, 25, 50/13cm	56	3.0	Reddish brown INDURATED CLAY/CLAY-SHALE. Hard soil/very soft bedrock.	15		
			4.0				
				4.1			
SS-6	41, 34, 37	89		Black to gray carbonaceous SHALE. Hard soil/very soft bedrock.	18		

NOTES:

SAMPLE TYPE:
SS - 5.1cm OD Split Spoon
GS - Geoprobe Sample
ST - Shelby Tube
RC - Rock Core
AS - Auger Sample

GROUND WATER READING
At Completion: Dry m
After 24 Hrs: ▼ N/A m

BORING METHOD
HSA - Hollow Stem Augers
SFA - Solid Flight Augers
MD - Mud Drilling
WD - Wash Drilling
RC - Rock Coring

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281 ENTERPRISE DRIVE
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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139
Boring Number: B-32
Sheet: 2 of 2
Completion Depth: 5.8 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
			5.0				
SS-7	50/5cm	50	5.8	Bottom of Boring = 5.8 meters	6		

NOTES:

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-33
Sheet: 1 of 3
Completion Depth: 16.2 m

Date Started: 1/31/98
Date Finished: 2/2/98
Drilled By: J.T.

DRILLING AND SAMPLING INFORMATION

Northing: 141458.855
Easting: 635334.090
Elevation: 300.8 m

Boring Method: 8.3 cm HSA/RC
Hammer Weight: 63.5 kg
Hammer Drop: 76 cm

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
SS-1	3 3 4	89		Red to brown SILTY CLAY, little organics, trace coarse to fine sand (Topsoil). Moist. 0.1	29		
SS-2	3 3 4	44	1.0	Red to brown SILTY CLAY, trace coarse to fine sand, trace to some coarse to fine gravel. Medium stiff to hard. Moist.	31		
SS-3	6 11 12	28			22		
SS-4	17 24 40	33	2.0	2.6	14		
SS-5	50/10cm	100	3.0	Gray to light brown weathered SANDSTONE. Very soft bedrock.			
			4.0	-shale inclusions from 4.0 to 5.7 m			
SS-6	50/10cm	100					

NOTES:

SAMPLE TYPE
SS - 6.1cm OD Split Spoon
GS - Geoprobe Sample
ST - Shelby Tube
RC - Rock Core
AS - Auger Sample

GROUND WATER READING
At Completion: N/A* m
After 24 Hrs: ▼ N/A m
* Wash water used during the coring process.

BORING METHOD
HSA - Hollow Stem Augers
SFA - Solid Flight Augers
MD - Mud Drilling
WD - Wash Drilling
RC - Rock Coring

RESOURCE INTERNATIONAL, INC.
281 ENTERPRISE DRIVE
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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Boring Number: B-33
Project: ATH/MEG-33-30.980/0.000
Sheet: 2 of 3
Project Number: W-7139
Completion Depth: 16.2 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
			5.0				
					5.7		
SS-7	50/8cm	100		SHALE; gray, medium to moderately hard, highly broken, arenaceous, micaceous, slightly jointed, slightly fissile.			
			6.0				
RC-1							
					6.5		
				SANDSTONE; brown to gray, medium to moderately hard, medium to fine grained, massive.			
			7.0	-RC-1: Recovery = 100%			
				-No Core Loss			
				-RQD = 48%			
				-qr (@ 7.3 m) = 17.84 MPa			
RC-2							
			8.0				
				-RC-2: Recovery = 87%			
				-Core Loss = 20 centimeters			
				-RQD = 81%			
			9.0				
RC-3							
				-RC-3: Recovery = 95%			
				-Core Loss = 8 centimeters			
				-RQD = 82%			
					9.9		
			10.0	SHALE; gray, medium hard, massive, slightly arenaceous, slickensides.			
RC-4							
			11.0				

NOTES:

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139
Boring Number: B-33
Sheet: 3 of 3
Completion Depth: 16.2 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
				-RC-4: Recovery = 90% -Core Loss = 15 centimeters -RQD = 55%			
			12.0	12.1			
RC-5				CLAY-SHALE; gray, soft, slightly broken. -qr (@ 12.8 m) = 2.90 MPa			
			13.0	12.9 MUDSTONE; gray, soft, slightly broken. -RC-5: Recovery = 94% -Core Loss = 9 centimeters -RQD = 48%			
RC-6			14.0				
				14.3 SHALE; gray, soft to medium hard, massive, arenaceous. -RC-6: Recovery = 94% -Core Loss = 9 centimeters -RQD = 63%			
RC-7			15.0	-RC-7: Recovery = 100% -No Core Loss -RQD = 79%			
			16.0	16.2 Bottom of Boring = 16.2 meters			

NOTES:

RESOURCE INTERNATIONAL, INC.
281 ENTERPRISE DRIVE
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(614) 885-1959

REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-34
Sheet: 1 of 2
Completion Depth: 4.9 m

Date Started: 2/3/98
Date Finished: 2/3/98
Drilled By: J.T.

DRILLING AND SAMPLING INFORMATION

Northing: 141408.457
Easting: 635314.818
Elevation: 297.9 m

Boring Method: 8.3 cm HSA
Hammer Weight: 63.5 kg
Hammer Drop: 76 cm

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
				Brown SILTY CLAY, little fine sand, little organics, trace fine gravel (Topsoil). Moist.			
					0.1		
SS-1	8 9 8	67		Red to brown SILTY CLAY, little coarse to fine sand, trace fine gravel. Very stiff to hard. Moist to damp.	16		
			1.0				
SS-2	18 40 44	100			9		
					1.8		
SS-3	50/5cm	100	2.0	Brown SANDSTONE. Soft bedrock.			
SS-4	50/8cm	100	3.0				
			4.0				
SS-5	50/13cm	100					

NOTES:

SAMPLE TYPE
SS - 5.1cm OD Split Spoon
GS - Geoprobe Sample
ST - Shelby Tube
RC - Rock Core
AS - Auger Sample

GROUND WATER READING
At Completion - Dry m
After 24 Hrs ▼ N/A m

BORING METHOD
HSA - Hollow Stem Augers
SFA - Solid Flight Augers
MD - Mud Drilling
WD - Wash Drilling
RC - Rock Coring

RESOURCE INTERNATIONAL, INC.
281 ENTERPRISE DRIVE
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REPORT OF SOIL EXPLORATION

Client Sverdrup Associates, Inc.
Boring Number B-34
Project ATH/MEG-33-30.980/0.000
Sheet 2 of 2
Project Number W-7139
Completion Depth 4.9 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
			4.9	Bottom of Boring = 4.9 meters			

NOTES:

RESOURCE INTERNATIONAL, INC.
281 ENTERPRISE DRIVE
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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-35
Sheet: 1 of 1
Completion Depth: 2.8 m

Date Started: 2/13/98
Date Finished: 2/13/98
Drilled By: M.F.

DRILLING AND SAMPLING INFORMATION

Northing: 141276.457
Easting: 635436.888
Elevation: 282.2 m**

Boring Method: 9.5 cm HSA
Hammer Weight: 63.5 kg
Hammer Drop: 76 cm

SAMPLE NO	BLOWS PER 16cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION		MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
SS-1	2 3 5	72		Brown fine SANDY SILT, little organics, trace clay (Topsoil). Moist.	0.0	25	45	21
SS-2A	6	67		Brown SILT and CLAY, little coarse sand, trace fine sand. Stiff to hard. Moist.	0.6	18		
SS-2B	26 40			-SS-1: ODOT A-7-6 (14)		14		
			1.0	Brown SILTY CLAY, little fine gravel, trace coarse to fine sand. Hard. Moist.				
SS-3	20 31 41	83		-SS-3: ODOT A-6a (10)		10	37	23
					1.8			
SS-4	7 9 12	89	2.0	Mottled red and brown SILTY CLAY, trace coarse to fine sand. Very stiff. Moist.		26		
					2.5			
SS-5	46 50/3cm	86		Red MUDSTONE. Hard soil/very soft bedrock.	2.8			
				Bottom of Boring = 2.8 meters				

NOTES: ** Elevation is approximate.

SAMPLE TYPE
SS - 5.1cm OD Split Spoon
GS - Geoprobe Sample
ST - Shelby Tube
RC - Rock Core
AS - Auger Sample

GROUND WATER READING
At Completion: Dry m
After 24 Hrs: ▼ N/A m

BORING METHOD
HSA - Hollow Stem Augers
SFA - Solid Flight Augers
MD - Mud Drilling
WD - Wash Drilling
RC - Rock Coring

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281 ENTERPRISE DRIVE
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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-36
Sheet: 1 of 1
Completion Depth: 2.7 m

Date Started: 2/13/98
Date Finished: 2/13/98
Drilled By: M.F.

DRILLING AND SAMPLING INFORMATION

Northing: 141165.616
Easting: 635528.606
Elevation: 273.0 m**

Boring Method: 9.5 cm HSA
Hammer Weight: 63.5 kg
Hammer Drop: 76 cm

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
SS-1	2 2 4	61		Brown SILT, some fine sand, little organics, little clay (Topsoil). Moist. 0.1	32		
ST-2		88		Brown CLAYEY SILT, little fine sand, trace coarse sand, trace fine gravel. Medium stiff. Moist. -ST-2: ODOT A-6a (9); qu = 64.40 kPa	25	29	17
SS-3	3 2 3	89	1.0		26		
				1.6 Brown fine GRAVEL and SILT, trace coarse to fine sand, trace clay. Hard. Moist.	21		
SS-4a	6 21	89	2.0	-SS-4a: Visual ODOT A-4a 2.1			
SS-4b	50/10cm	89		Brown weathered SANDSTONE. Very soft bedrock. 2.7			
SS-5	50/5cm	100		Bottom of Boring = 2.7 meters			

NOTES: ** Elevation is approximate.

SAMPLE TYPE
SS - 5.1cm OD Split Spoon
GS - Geoprobe Sample
ST - Shelby Tube
RC - Rock Core
AS - Auger Sample

GROUND WATER READING
At Completion – Dry ... m
After 24 Hrs ▼ N/A ... m

BORING METHOD
HSA - Hollow Stem Augers
SFA - Solid Flight Augers
MD - Mud Drilling
WD - Wash Drilling
RC - Rock Coring

RESOURCE INTERNATIONAL, INC.
281 ENTERPRISE DRIVE
WESTERVILLE, OHIO 43081
(614) 885-1959

REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-37
Sheet: 1 of 1
Completion Depth: 2.7 m

Date Started: 2/11/98
Date Finished: 2/11/98
Drilled By: S.B.

DRILLING AND SAMPLING INFORMATION

Northing: 141035.576
Easting: 635614.683
Elevation: 285.5 m

Boring Method: Geoprobe
Hammer Weight: N/A
Hammer Drop: N/A

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
GS-1		100		Brown SILTY CLAY, little fine to coarse sand, trace organics, trace fine gravel (Topsoil). Moist. 0.1			
GS-2		100		Brown CLAY, some silt, trace coarse to fine sand. Moist. -GS-2: ODOT A-7-6 (19)	29	54	23
			1.0				
GS-3		100			17		
			2.0				
GS-4		100		Red to brown MUDSTONE. Hard soil/very soft bedrock. 2.2			
				Refusal @ 2.7 meters 2.7			
				Bottom of Boring = 2.7 meters			

NOTES:

SAMPLE TYPE
SS - 5.1cm OD Split Spoon
GS - Geoprobe Sample
ST - Shelby Tube
RC - Rock Core
AS - Auger Sample

GROUND WATER READING
At Completion: Dry m
After 24 Hrs: ▼ N/A m

BORING METHOD
HSA - Hollow Stem Augers
SFA - Solid Flight Augers
MD - Mud Drilling
WD - Wash Drilling
RC - Rock Coring

RESOURCE INTERNATIONAL, INC.
281 ENTERPRISE DRIVE
WESTERVILLE, OHIO 43081
(614) 885-1959

REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-38
Sheet: 1 of 3
Completion Depth: 17.0 m

Date Started: 2/12/98
Date Finished: 2/12/98
Drilled By: M.F.

DRILLING AND SAMPLING INFORMATION

Northing: 141000.558
Easting: 635675.267
Elevation: 297.0 m

Boring Method: 9.5 cm HSA
Hammer Weight: 63.5 kg
Hammer Drop: 76 cm

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
SS-1	3 2 2	44		Brown SILTY fine SAND, some clay, little organics (Topsoil). Moist. 0.1	25		
SS-2	3 5 8	78		Brown CLAYEY SILT, trace fine sand. Soft. Moist. 0.4	19		
			1.0	Brown SILTY fine SAND, little clay, trace coarse sand. Medium dense to dense. Moist. -SS-2: Visual ODOT A-4a			
SS-3	9 26 50/10cm	100		1.2 Brown to red weathered SANDSTONE. Very soft to medium hard bedrock.	17		
SS-4	50/13cm	80	2.0		9		
SS-5	48 50/4cm	100	3.0		9		
			4.0				
SS-6	50/13cm	100			10		

NOTES:

SAMPLE TYPE
SS - 5.1cm OD Split Spoon
GS - Geoprobe Sample
ST - Shelby Tube
RC - Rock Core
AS - Auger Sample

GROUND WATER READING
At Completion - N/A* m
After 24 Hrs ▼ N/A m
*Wash water used during the coring process.

BORING METHOD
HSA - Hollow Stem Augers
SFA - Solid Flight Augers
MD - Mud Drilling
WD - Wash Drilling
RC - Rock Coring

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Boring Number: B-38
Project: ATH/MEG-33-30.980/0.000
Sheet: 2 of 3
Project Number: W-7139
Completion Depth: 17.0 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
			5.0				
SS-7	52/10cm	100	6.0		10		
			7.0				
SS-8	50/13cm	100			10		
			8.0				
SS-9	21 50/13cm	91					
RC-1			9.0	CLAY-SHALE; gray, soft, weathered, highly broken.			
				8.7			
				SHALE; gray, soft, weathered, highly broken.			
			10.0	-RC-1: Recovery = 84% -Core Loss = 22 centimeters -RQD = 13%			
				10.2			
RC-2				CLAY-SHALE; gray, very soft, weathered, highly broken.			
RC-3				-RC-2: Recovery = 100% -No Core Loss -RQD = 0%			
				10.7			
			11.0	SHALE; gray, soft to medium hard, highly broken, fissile, slightly arenaceous.			

NOTES:

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139
Boring Number: B-38
Sheet: 3 of 3
Completion Depth: 17.0 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
			12.0	-RC-3: Recovery = 100% -No Core Loss -RQD = 36%			
RC-4			13.0	-RC-4: Recovery = 92% -Core Loss = 12 centimeters -RQD = 7%			
			13.7				
RC-5			14.0	MUDSTONE; red to gray, medium to moderately hard, calcareous, highly broken.			
				-RC-5: Recovery = 78% -Core Loss = 33 centimeters -RQD = 25%			
			15.0				
RC-6			16.0				
				SHALE; gray, medium hard, calcareous, slightly weathered.			
				-RC-6: Recovery = 98% -Core Loss = 4 centimeters -RQD = 31%			
			17.0				
				Bottom of Boring = 17.0 meters			

NOTES:

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-39
Sheet: 1 of 1
Completion Depth: 3.0 m

Date Started: 2/11/98
Date Finished: 2/11/98
Drilled By: S.B.

DRILLING AND SAMPLING INFORMATION

Northing: 140876.768
Easting: 635699.261
Elevation: 278.2 m

Boring Method: Geoprobe
Hammer Weight: N/A
Hammer Drop: N/A

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
GS-1		100		Brown SILTY CLAY, some fine to coarse sand, trace organics, trace fine gravel (Topsoil). Moist.			
GS-2		95	0.1	Red to brown CLAY, little silt, little fine gravel, trace fine sand. Moist.	30	73	24
			1.0	-GS-2: ODOT A-7-6 (20)			
GS-3		95			21		
			2.0				
			3.0	Bottom of Boring = 3.0 meters			

NOTES:

SAMPLE TYPE
SS - 5.1cm OD Split Spoon
GS - Geoprobe Sample
ST - Shelby Tube
RC - Rock Core
AS - Auger Sample

GROUND WATER READING
At Completion - Dry m
After 24 Hrs ▼ N/A m

BORING METHOD
HSA - Hollow Stem Augers
SFA - Solid Flight Augers
MD - Mud Drilling
WD - Wash Drilling
RC - Rock Coring

RESOURCE INTERNATIONAL

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CONSOLIDATION TEST

ASTM D 2435

PROJECT ATH/MEG-33-30.980/0.000
LOCATION
JOB No. W-7139 BORING N. B - 14
SAMPLE No. ST - 2
SAMPLE DEPTH 0.75 to 0.90 meters
SOIL DESCRIPTION SILT & CLAY, some sand
DATE OF TESTING 2/2/98
TESTED BY Straub / Hostetter

CONSOLIDOMETER TYPE	Fixed Ring	RING No.	2
MULT. RATIO OF LOAD DEVICE	9		
RING DIM.: DIAMETER:	63.5 mm	AREA:	31.67 cm^2 HEIGHT: 20 mm
INITIAL HT. OF SOIL, Hi:	20 mm		
SPECIFIC GRAVITY OF SOIL:	2.67		
M. RING + SPECIMEN AT BEGINNING OF TEST:	192 g	***WATER CONTENT DETERMINATION***	
M. OF RING:	64.3 g	M. OF CAN + WET SOIL:	335.67 g
M. OF WET SOIL, Mt:	127.7 g	M. OF CAN + DRY SOIL:	282.66 g
COMPUTED DRY WEIGHT OF SOIL, M's:	g	M. OF CAN:	28.77 g
		M. OF WATER:	53.01 g
OVEN DRY M. OF SOIL, Ms:[a]	104.92 g	M. OF DRY SOIL:	253.89 g
COMPUTED HT. OF SOLIDS, Hs:[b]	1.184 cm	INITIAL WATER CONTENT:	20.88%
INITIAL HT. OF VOIDS, Hv:	0.816 cm		
INITIAL VOID RATIO, ei:	0.690		

FINAL TEST DATA		***FINAL WATER CONTENT DETERMINATION***	
(Obtained at end of load testing)			
INITIAL DIAL READING:	0.0386 in	FINAL WET M. + RING:[c]	189.22 g
FINAL DIAL READING:	0.1121 in	FINAL DRY M. + RING:	169.22 g
EQUIP. DEF. @ FINAL LOAD:	7.00E-04 in	OVEN DRY M. OF SOIL, Ms.	104.92 g
CHANGE IN SAMPLE HT.:	0.184912 cm	FINAL M. OF WATER:	20 g
FINAL HT. OF VOIDS, H_{Vf}:	0.632 cm	FINAL WATER CONTENT, wf:	19.06%
FINAL VOID RATIO, ef:	0.534	FINAL DEGREE OF SAT. S:	100% (assumed)

NOTES: (a) Obtained from Final Water-Content data

(b) Use either Gs of final water-content data for S-100%

(c) Be sure to include any soil extruded from ring which is in consolidometer

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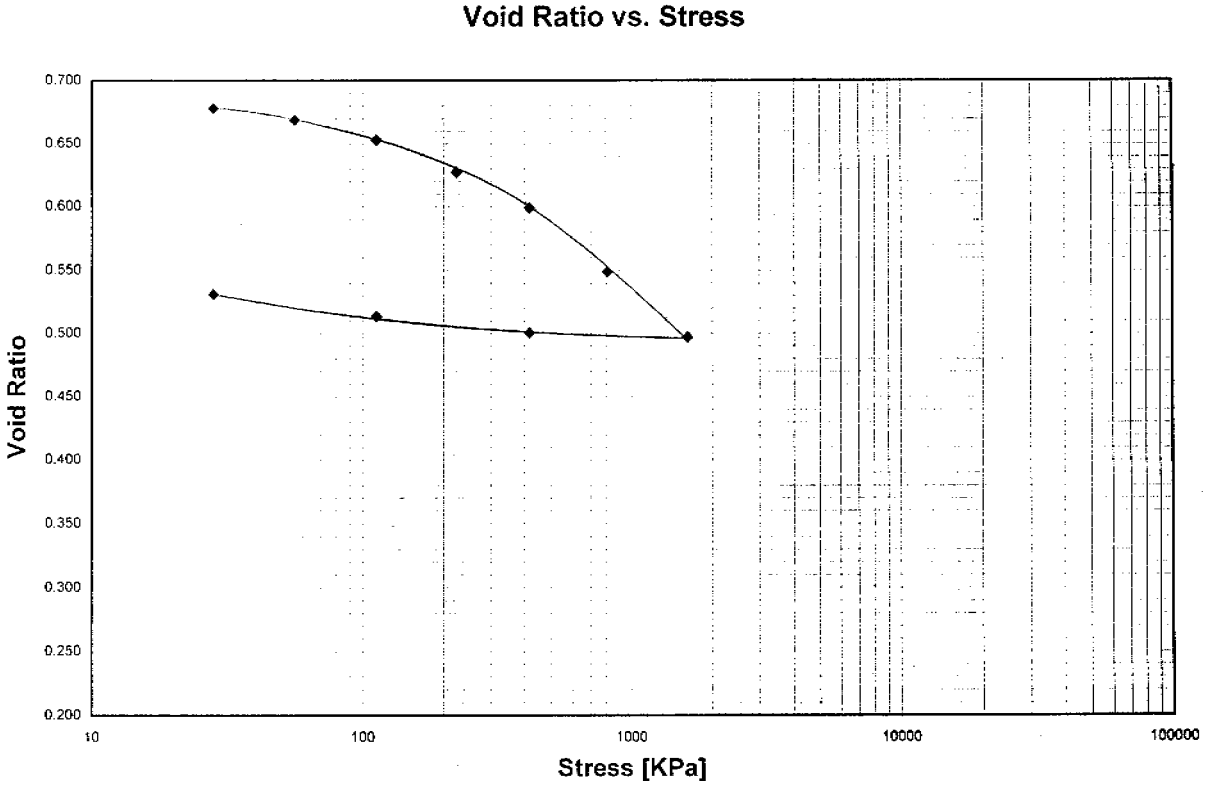
CONSOLIDATION TEST RESULTS

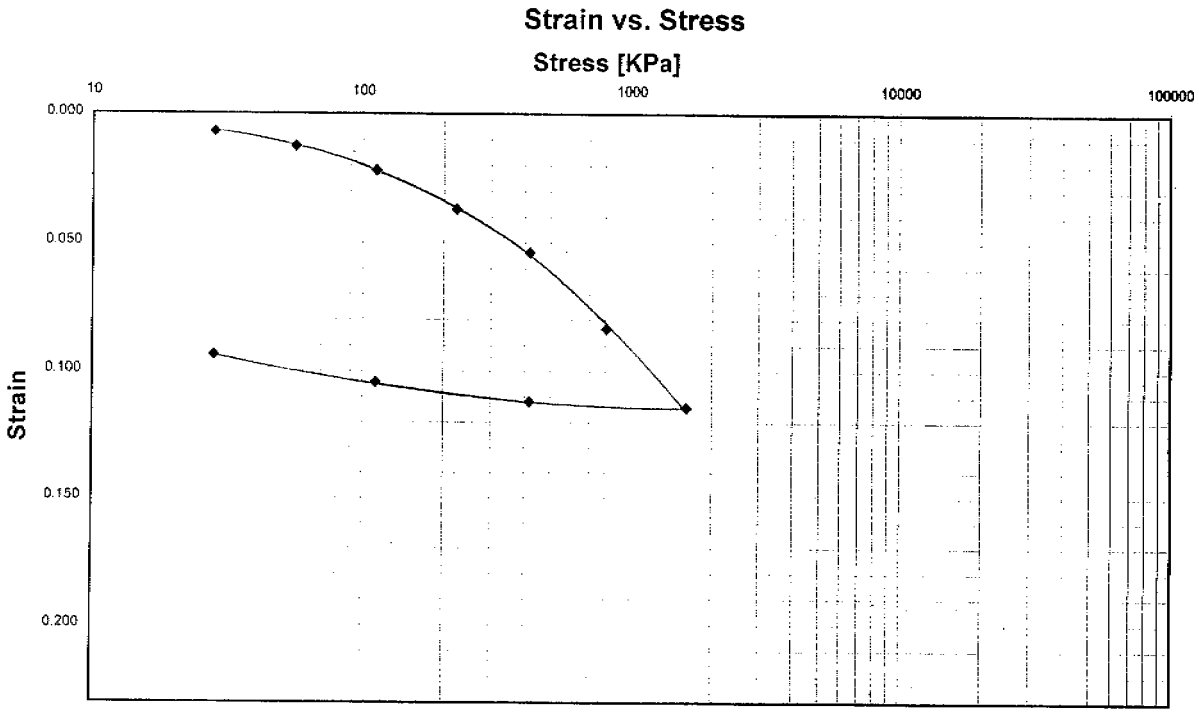
ASTM D 2435

PROJECT	ATH/MEG-33-30.980/0.000
LOCATION	
JOB No.	W-7139 BORING B - 14
SAMPLE No.	ST - 2
SAMPLE DEPTH	0.75 to 0.90 meters
SOIL DESCRIPTION	SILT & CLAY, some sand
DATE OF TESTING	2/2/98
TESTED BY	Straub / Hostetter

INITIAL SAMPLE VOL., Vi	63.338 cm^3	DRY WT. OF SOIL SOLIDS, Ms	104.92 g
SPECIFIC GRAVITY, Gs	2.67	HT. OF SOLIDS, Hs	1.1836 cm
INITIAL HT. OF VOIDS, Hv	0.8164 cm	INITIAL VOID RATIO, ei	0.6898
Hi	20 mm		

Load Increment (kPa)	Def. dial reading at end of load (x.0001")	D_{50} (x.0001")	D_{100} (x.0001")	Equip. Def. ΔHe (x.0001")	Change in sample Ht., ΔH (x.0001")	ε = ΔH / Hi	e = e_0 - ΔH / Hs	Average Sample ht. H (in)	Length longest. drainage path H (cm)	Time for 50% consol, t_{50} (min)	Coeff. of consol., c_v, (cm^2/min)
0	386	0	0	0	0	0	0	0	0	0	0.00E+00
28	453	439	448	7	55	0.0070	0.6780	0.783	0.9942	3	6.49E-02
56	500	483	496	11	99	0.0126	0.6686	0.779	0.9891	3.5	5.51E-02
112	586	555	575	17	172	0.0218	0.6529	0.772	0.9807	1.8	1.05E-01
223	715	672	703	25	292	0.0371	0.6272	0.761	0.9669	1.8	1.02E-01
418	856	801	842	32	424	0.0538	0.5988	0.749	0.9514	2.1	8.49E-02
809	1103	1010	1085	42	657	0.0834	0.5488	0.729	0.9261	2.5	6.76E-02
1617	1362	1247	1342	57	899	0.1142	0.4969	0.707	0.8979	2.7	5.88E-02
418	1298		1300	32	882	0.1120	0.5005				
112	1215		1225	17	822	0.1044	0.5134				
28	1121		1133	7	740	0.0940	0.5310				
112				17							
1617				57							


Void Ratio vs. Stress
Void Ratio
0.700
0.650
0.600
0.550
0.500
0.450
0.400
0.350
0.300
0.250
0.200
10
100
1000
10000
100000
Stress [KPa]


Strain vs. Stress
Stress [KPa]
10
100
1000
10000
100000
Strain
0.000
0.050
0.100
0.150
0.200

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CONSOLIDATION TEST

ASTM D 2435

PROJECT ATH/MEG-33-30.980/0.000
LOCATION
JOB No. W-7139 BORING N. B-26
SAMPLE No. ST-2
SAMPLE DEPTH 0.75 to 0.85 meters
SOIL DESCRIPTION SILTY CLAY, some fine sand
DATE OF TESTING
TESTED BY Straub/Hostetter

CONSOLIDOMETER TYPE	Fixed Ring	RING No.	2
MULT. RATIO OF LOAD DEVICE	9		
RING DIM.: DIAMETER:	63.5 mm	AREA:	31.67 cm^2 HEIGHT: 20 mm
INITIAL HT. OF SOIL, Hi:	20 mm		
SPECIFIC GRAVITY OF SOIL:	2.67		
M. RING + SPECIMEN AT		***WATER CONTENT DETERMINATION***	
BEGINNING OF TEST:	186.72 g		
M. OF RING:	64.29 g	M. OF CAN + WET SOIL:	318.06 g
M. OF WET SOIL, Mt:	122.43 g	M. OF CAN + DRY SOIL:	263.07 g
COMPUTED DRY WEIGHT		M. OF CAN:	28.28 g
OF SOIL, M's:	g	M. OF WATER:	54.99 g
OVEN DRY M. OF SOIL, Ms:[a]	99.23 g	M. OF DRY SOIL:	234.79 g
COMPUTED HT. OF SOLIDS, Hs:[b]	1.149 cm	INITIAL WATER CONTENT:	23.42%
INITIAL HT. OF VOIDS, Hv:	0.851 cm		
INITIAL VOID RATIO, ei:	0.740		

FINAL TEST DATA		***FINAL WATER CONTENT DETERMINATION***	
(Obtained at end of load testing)			
INITIAL DIAL READING:	0.0585 in	FINAL WET M. + RING:[c]	182.59 g
FINAL DIAL READING:	0.1564 in	FINAL DRY M. + RING:	163.52 g
EQUIP. DEF. @ FINAL LOAD:	7.00E-05 in	OVEN DRY M. OF SOIL, Ms:	99.23 g
CHANGE IN SAMPLE HT.:	0.2484882 cm	FINAL M. OF WATER:	19.07 g
FINAL HT. OF VOIDS, H_{vf}:	0.602 cm	FINAL WATER CONTENT, wf:	19.22%
FINAL VOID RATIO, ef:	0.524	FINAL DEGREE OF SAT. S:	100% (assumed)

NOTES: (a) Obtained from Final Water-Content data

(b) Use either Gs of final water-content data for S-100%

(c) Be sure to include any soil extruded from ring which is in consolidometer

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CONSOLIDATION TEST RESULTS

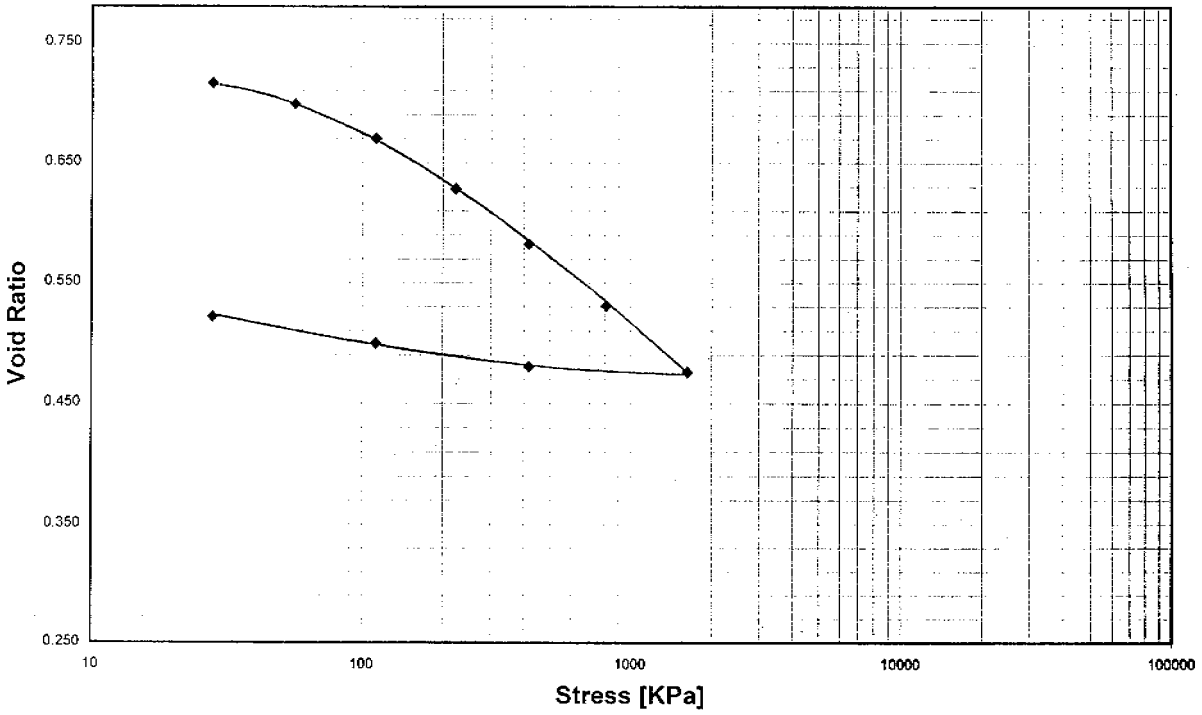
ASTM D 2435

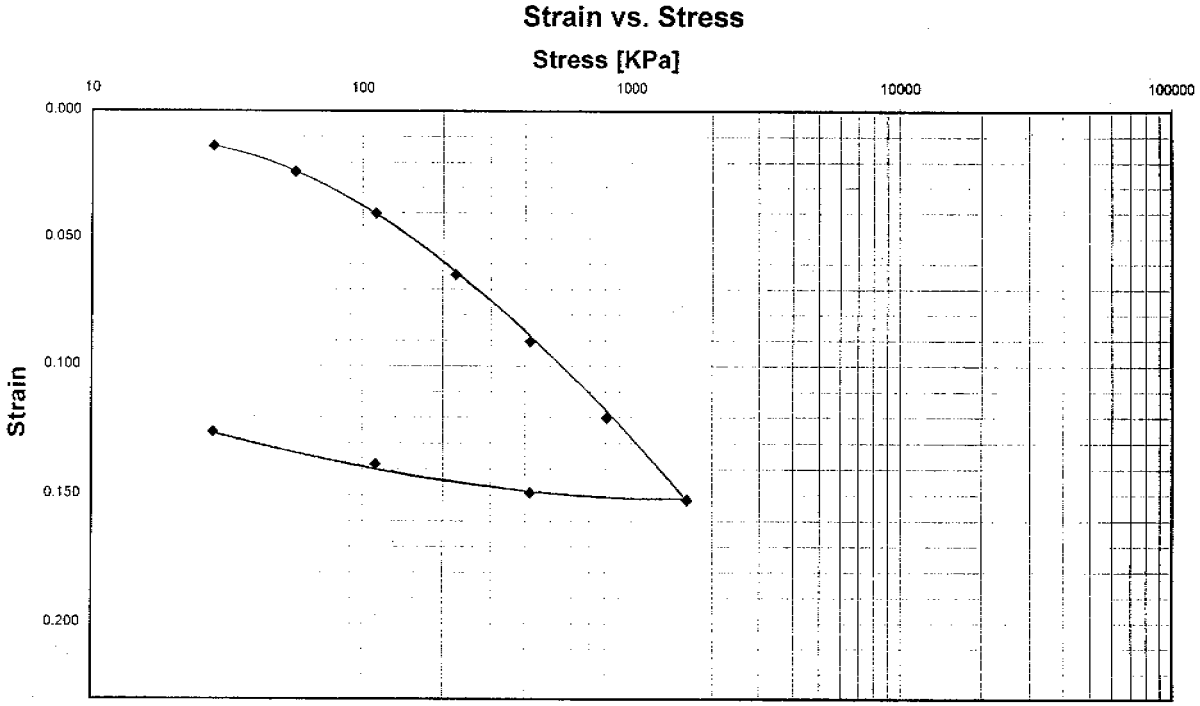
PROJECT	ATH/MEG-33-30.980/0.000
LOCATION	
JOB No.	W-7139 BORING B-26
SAMPLE No.	ST-2
SAMPLE DEPTH	0.75 to 0.85 meters
SOIL DESCRIPTION	SILTY CLAY, some fine sand
DATE OF TESTING	
TESTED BY	Straub/Hostetter

INITIAL SAMPLE VOL., Vi	63.338 cm^3	DRY WT. OF SOIL SOLIDS, Ms	99.23 g
SPECIFIC GRAVITY, Gs	2.67	HT. OF SOLIDS, Hs	1.1493 cm
INITIAL HT. OF VOIDS, Hv	0.8507 cm	INITIAL VOID RATIO, ei	0.7401
Hi	20 mm		

Load increment (kPa)	Def. dial reading at end of load (x.0001")	D_{50} (x.0001")	D_{100} (x.0001")	Equip. Def. ΔHe (x.0001")	Change in sample Ht., ΔH (x.0001")	ε = ΔH / Hi	e = e0 - ΔH / Hs	Average Sample ht. H (in)	Length longest. drainage path H (cm)	Time for 50% consol. t_{50} (min)	Coeff. of consol., c_v, (cm^2/min)
0	585	0	0	0	0	0	0	0	0	0	0.00E+00
28	719	682	701	7	109	0.0138	0.7160	0.778	0.9886	1.8	1.07E-01
56	802	761	784	11	188	0.0239	0.6986	0.771	0.9790	3.5	5.40E-02
112	935	880	919	17	317	0.0403	0.6701	0.760	0.9647	2.5	7.33E-02
223	1142	1058	1117	25	507	0.0644	0.6281	0.743	0.9431	2.8	6.26E-02
418	1353	1258	1330	32	713	0.0906	0.5825	0.723	0.9186	4	4.16E-02
809	1597	1488	1574	42	947	0.1203	0.5308	0.701	0.8907	5.2	3.01E-02
1617	1865	1735	1838	57	1196	0.1519	0.4758	0.678	0.8612	5.3	2.76E-02
418	1790		1792	32	1175	0.1492	0.4804				
112	1676		1690	17	1088	0.1382	0.4997				
28	1564		1582	7	990	0.1257	0.5213				
112				17							
1617				57							

Void Ratio vs. Stress




Strain vs. Stress
Stress [KPa]
10
100
1000
10000
100000
Strain
0.000
0.050
0.100
0.150
0.200

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CONSOLIDATION TEST

ASTM D 2435

PROJECT	ATH/MEG-33-30.980/0.000
LOCATION	
JOB No.	W-7139 BORING N. B-30
SAMPLE No.	ST-2
SAMPLE DEPTH	0.70 to 0.80 meter
SOIL DESCRIPTION	CLAYEY SILT, some fine sand
DATE OF TESTING	
TESTED BY	Straub/Hostetter

CONSOLIDOMETER TYPE	Fixed Ring	RING No.	2
MULT. RATIO OF LOAD DEVICE	9		
RING DIM.: DIAMETER:	63.5 mm	AREA:	31.67 cm^2 HEIGHT: 20 mm
INITIAL HT. OF SOIL, Hi:	20 mm		
SPECIFIC GRAVITY OF SOIL:	2.67		
M. RING + SPECIMEN AT BEGINNING OF TEST:	185.88 g	***WATER CONTENT DETERMINATION***	
M. OF RING:	64.78 g	M. OF CAN + WET SOIL:	344.99 g
M. OF WET SOIL, Mt:	121.1 g	M. OF CAN + DRY SOIL:	278.53 g
COMPUTED DRY WEIGHT OF SOIL, M's:	g	M. OF CAN:	28.29 g
		M. OF WATER:	66.46 g
OVEN DRY M. OF SOIL, Ms:[a]	95.9 g	M. OF DRY SOIL:	250.24 g
COMPUTED HT. OF SOLIDS, Hs:[b]	1.090 cm	INITIAL WATER CONTENT:	26.56%
INITIAL HT. OF VOIDS, Hv:	0.910 cm		
INITIAL VOID RATIO, e_i:	0.835		

FINAL TEST DATA (Obtained at end of load testing)		***FINAL WATER CONTENT DETERMINATION***	
INITIAL DIAL READING:	0.0467 in	FINAL WET M. + RING:[c]	180.42 g
FINAL DIAL READING:	0.1604 in	FINAL DRY M. + RING:	160.68 g
EQUIP. DEF. @ FINAL LOAD:	7.00E-04 in	OVEN DRY M. OF SOIL, Ms:	95.9 g
CHANGE IN SAMPLE HT.:	0.28702 cm	FINAL M. OF WATER:	19.74 g
FINAL HT. OF VOIDS, H_{Vf}:	0.623 cm	FINAL WATER CONTENT, wf:	20.58%
FINAL VOID RATIO, e_f:	0.572	FINAL DEGREE OF SAT. S:	100% (assumed)

NOTES: (a) Obtained from Final Water-Content data

(b) Use either Gs of final water-content data for S=100%

(c) Be sure to include any soil extruded from ring which is in consolidometer

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CONSOLIDATION TEST RESULTS

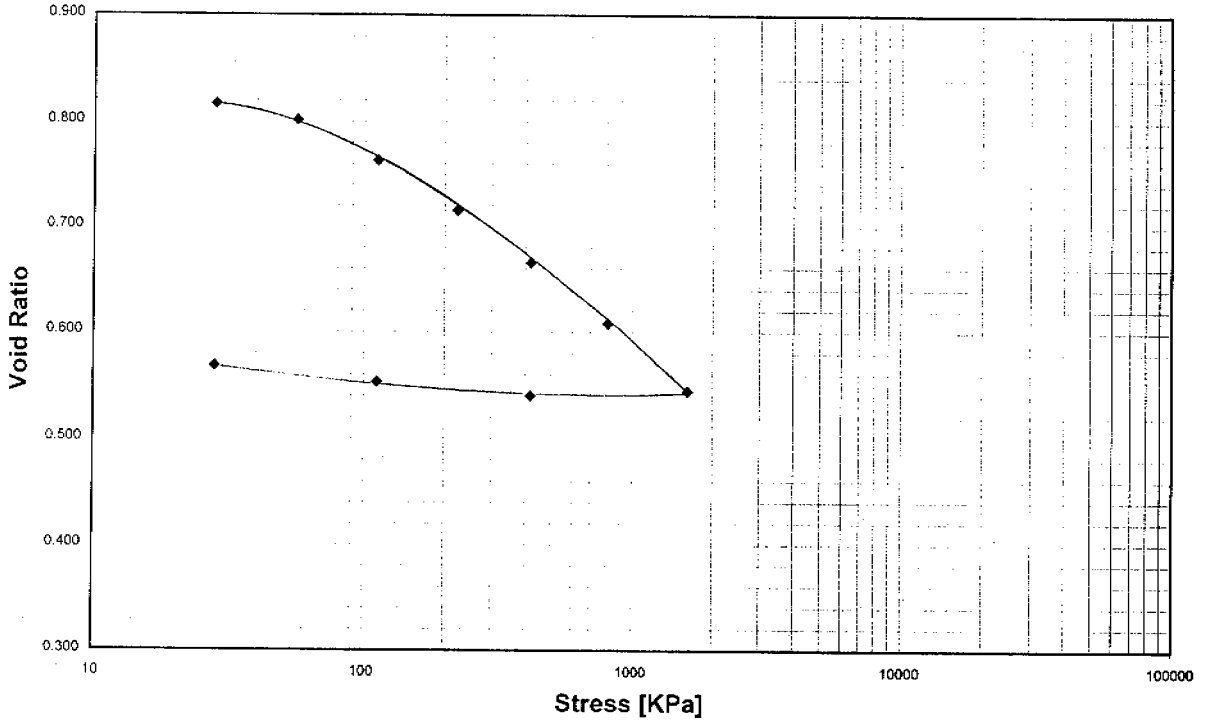
ASTM D 2435

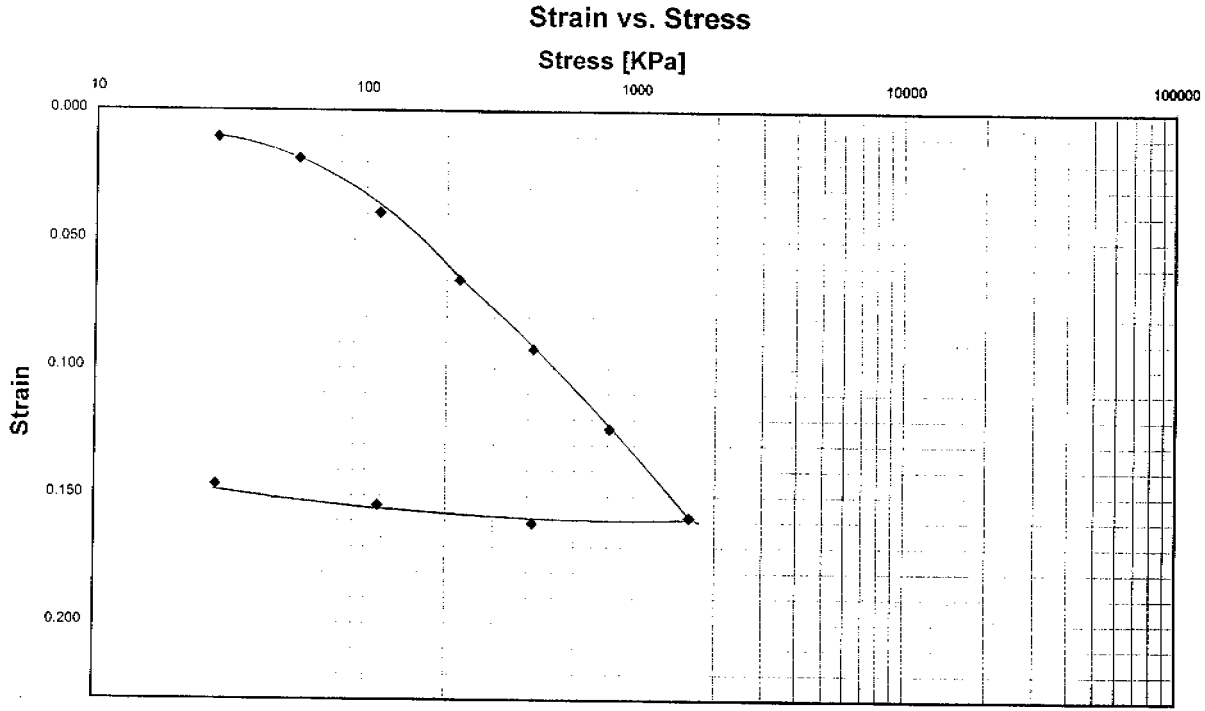
PROJECT	ATH/MEG-33-30.980/0.000
LOCATION	
JOB No.	W-7139 BORING B-30
SAMPLE No.	ST-2
SAMPLE DEPTH	0.70 to 0.80 meter
SOIL DESCRIPTION	CLAYEY SILT, some fine sand
DATE OF TESTING	
TESTED BY	Straub/Hostetter

INITIAL SAMPLE VOL., Vi	63.338 cm^3	DRY WT. OF SOIL SOLIDS, Ms	95.9 g
SPECIFIC GRAVITY, Gs	2.67	HT. OF SOLIDS, Hs	1.0897 cm
INITIAL HT. OF VOIDS, Hv	0.9103 cm	INITIAL VOID RATIO, ei	0.8354
Hi	20 mm		

Load Increment (kPa)	Def. dial reading at end of load (x.0001")	D_{50} (x.0001")	D_{100} (x.0001")	Equip. Def. ΔHe (x.0001")	Change in sample Ht., ΔH (x.0001")	ε = ΔH / Hi	e = e_0 - ΔH / Hs	Average Sample ht. H (in)	Length longest. drainage path H (cm)	Time for 50% consol, t_{50} (min)	Coeff. of consol., c_v, (cm^2/min)
0	467	0	0	0	0	0	0	0	0	0	0.00E+00
28	579	547	557	7	83	0.0105	0.8161	0.780	0.9907	1	1.93E-01
56	654	612.5	625	11	147	0.0187	0.8012	0.774	0.9829	1	1.90E-01
112	853	744	796	17	312	0.0396	0.7627	0.761	0.9670	0.23	8.01E-01
223	1066	957	1008	25	516	0.0655	0.7152	0.741	0.9409	0.9	1.94E-01
418	1278	1163	1228	32	729	0.0926	0.6655	0.721	0.9157	1.2	1.38E-01
809	1534	1397	1484	42	975	0.1238	0.6082	0.699	0.8872	0.95	1.63E-01
1617	1820	1666	1772	57	1248	0.1585	0.5445	0.673	0.8550	0.9	1.60E-01
418	1762		1766	32	1267	0.1609	0.5401				
112	1683		1696	17	1212	0.1539	0.5529				
28	1604		1623	7	1149	0.1459	0.5676				
112				17							
1617				57							

Void Ratio vs. Stress




Strain vs. Stress
Stress [KPa]
10
100
1000
10000
100000
Strain
0.000
0.050
0.100
0.150
0.200

RESOURCE
INTERNATIONAL
ENGINEERING CONSULTANTS

PRELIMINARY SUBSURFACE INVESTIGATION REPORT

ARE-MEC-033-30.980/0.000
North-Central Section - From Station 37+138 to 39+600
Athens County, Ohio

Prepared For:

Syverdrup Associates, Inc.
50 West Broad Street, Suite 1700
Columbus, Ohio 43214

Prepared By:

Resource International, Inc.
281 Enterprise Drive
Westerville, Ohio 43081

RI# W-7139

June, 1998

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Construction Management
System Design and
Software Development

June 11, 1998

Mr. Terry Winebrenner, P.E.
Sverdrup Associates, Inc.
50 West Broad Street, Suite 1700
Columbus, Ohio 43214

Re: Preliminary Subsurface Investigation
ATH/MEG-033-30.980/0.000
PID 17974
North-Central Section, from Station 34+134 to 39+600
RI #W-7139

Dear Mr. Winebrenner:

We are pleased to submit this preliminary subsurface investigation report for the north-central section of the referenced project, ATH/MEG-033-30.980/0.000. In order to expedite the delivery of the subsurface investigation report for this project, the report has been divided into four (4) parts, north, south, north-central, and south-central. Engineering logs have been prepared and are attached to this report along with results of laboratory testing. Full size plan and profile sheets are being prepared, and will be submitted as a single submission for the entire project. For reference purposes, half-size plan and profile sheets for this section are being included in this submittal.

If you have any questions concerning the subsurface investigation or this report, please call.

Sincerely,

RESOURCE INTERNATIONAL, INC.

Christopher Merklin, P.E.
Director - Geotechnical Engineering

G. Philip Hall, P.E.
Vice President

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1.0 INTRODUCTION

This report is a presentation of the subsurface investigation performed for ATH/MEG-033-30.980/0.000 - north-central section. The north-central section limits, for the purpose of this report, are between Stations 34+134 and 39+600.

The subject project is the design of a "super two" lane highway system linking the four-lane existing portion of USR 33 at Athens with the existing four-lane portion of USR 33 at Darwin. The total project length is 19.858 kilometers. The northern two-thirds of the alignment is within Athens County, traversing Athens, Alexander and Lodi Townships. The southern one-third (of the alignment) is within Bedford Township in Meigs County.

1.1 EXISTING LAND USAGE

The land usage along the entire alignment is generally described as alternating forest and pasture with very few cultivated fields. Typically, the valleys and steeply sloping hills are tree covered, and the flatter sidehills and hilltops are pasture. The field observations along Corridor A, as presented in the Geologic Study performed for Feasible Corridors A and B, are indicative of the land usage along the alignment in this north-central section. Because of the relief, the area is well drained with creeks at the bottom of every valley and drainage paths down the sides of most of the hills. Drainage paths are easily identifiable by the erosion of the easily erodible surficial red clays and/or mudstone/shale. The alignment is traversed several times, typically along ridge tops, by county and township roads, with rural residences and farms scattered throughout.

The steep slopes and flatter hilltops show evidence of movement which is very common for this area. Many of the pastures exhibit hummocky terrain. Many signs of predominantly small surficial slumps have been observed on the steep slopes and near the valley bottoms, along creek beds. Much of the exposed red soils and rock (red beds) in the valleys and on the slopes show evidence of severe decomposition from erosion.

Coal mines are common in southeast Ohio. It was determined in the Geologic Study that there are one abandoned underground mine and three reclaimed strip mines within the Feasible Study Corridors. Strip mine #1 (SM1) is located just west of the north-central section, between stations 35+000 to 37+000, outside of the expected right-of-way.

1.2 SITE GEOLOGY

Both Athens County and Meigs County lie entirely within the unglaciated section of the Allegheny Plateau. The area is maturely dissected, well-drained and is

characterized by steep-sides, "V" shaped valleys and narrowly rounded hilltops. Elevations along the alignment range from approximately 200 meters at the southern most portion, at Darwin, to approximately 300 meters in the northern portion.

The uplands are covered with a thin layer of residual soils; soils formed in place by the disintegration and decomposition of rocks and the consequent weathering of the mineral materials. Soils consist predominantly of sands and clays, very similar to the shales, mudstones, and sandstones on which they lie. The transition to bedrock is very subtle, and in most cases, not clearly identifiable, unless the parent rock is sandstone, siltstone, or limestone.

Soils in the valleys are generally described as colluvial (consisting of alluvial in part) soils overlying residual soils. Colluvial soils (colluvium) are loose and incoherent deposits typically found at the foot of a slope or cliff, brought there chiefly by gravity. Alluvial soils (Alluvium) are (intermixed) water-laid deposits. Typically, soils in the valley run deeper than on the slopes and hilltops, however, the soils are similar to those on the hills, consisting predominantly of sand and clay, and the transition to bedrock is equally difficult to identify.

Both Athens and Meigs Counties, along the alignment, are comprised of bedrock of Pennsylvania Age. The rock strata in this area of southeastern Ohio dips gently to the east-southeast at a rate of approximately 6 meters per kilometer. The top of the Conemaugh formation is estimated to be between elevations 260 and 270 meters at the north end of the alignment. It slopes downward to the east-southeast until it is entirely below any influence on the subject alignment at approximately Station 40+250.

The bedrock was deposited under regular succession of varying environmental conditions that were repeated many times. As a result, the rocks show a definite succession of strata representing one sequence of changing sedimentary conditions. A sequence of strata matching one depositional cycle is termed a cyclothem. Cyclothems are typically associated with unstable shelf or interior basin conditions in which alternate marine transgressions and regressions occur. The non-marine sediments occur in the lower half of the cyclothem and the marine sediments in the upper half. In Ohio, each cyclothem is usually defined as the series between a coal-to-coal interval. The lithology of the rocks that comprise the Pennsylvania System in Ohio consist of alternating clay, coal, shale, limestone and sandstone beds. These beds lack a real persistence and vary greatly in thickness over a short distance.

1.2.1 CONEMAUGH FORMATION

The literature defines the upper boundary of the Conemaugh Formation as the top

of the Upper Freeport No. 7 coal and the lower boundary being the base of the No. 8 Pittsburgh coal. The lithology of the Conemaugh consists of sandstone, sandy shale, shale, limestone, coal, under-clay and varicolored claystones (clay-shales, mudstones, etc.) referred to as "Red beds". Bedded marine shales and some thin marine limestone are present in the lower part of the series, whereas the upper part contains only non-marine strata, including abundant red calcareous claystones. Coal seams of minable thickness occur throughout the study area. The Conemaugh Formation has a reported thickness of approximately 108 meters.

1.2.2 MONONGAHELA FORMATION

The Monongahela Formation overlies the Conemaugh Formation. Its lower boundary is defined as the base of the No. 8 Pittsburgh coal and the upper limit is the top of the No. 1 Waynesburg coal bed. The lithology of the Monongahela Formation is similar to the upper portion of the Conemaugh Formation. The most significant difference is the occurrence of minable coal beds in the Monongahela in contrast to the thin coal beds of the Conemaugh only available by strip mining.

The Monongahela Formation is approximately 76 meters thick. A full thickness above drainage is displayed in Lodi and Bedford Townships. Athens and Alexander Townships show only parts of the Monongahela Series above drainage.

1.3 CUT/FILL SECTIONS

The entire alignment will be constructed on alternating, massive cuts (hilltops) and fills (valleys). The cut and fill sections projected for the north-central section are presented in Table 1 (based on centerline profiles).

Table 1: Cut/Fill Sections

Begin Station	End Station	Earth-work	Maximum Depth (Cut or Fill)
34+237	34+534	Fill	22 meters
34+534	34+603	Cut	8 meters
34+603	34+779	Fill	13 meters
34+779	35+518	Cut	16 meters
35+518	35+597	Fill	3 meters
35+597	35+815	Cut	3 meters

35+815	36+075	Fill	22 meters
36+075	36+148	Cut	5 meters
36+148	36+185	Fill	4 meters
36+185	36+615	Cut	15 meters
36+615	37+062	Fill	32 meters
37+062	37+470	Cut	15 meters
37+470	37+605	Fill	7 meters
37+605	38+197	Cut	23 meters
38+197	38+280	Fill	3 meters
38+280	38+807	Cut	21 meters
38+807	38+830	Fill	2 meters
38+830	38+964	Cut	9 meters
38+964	39+014	Fill	8 meters
39+014	39+635	Cut	27 meters

2.0 SUBSURFACE INVESTIGATION

Forty (40) engineering test borings, designated B-41 through B-80, were planned for the north section. B-41, not drilled at the time of the report for the north section, has since been drilled and is included in this report. Rock outcrops in the stream bed adjacent to B-77 were observed and mapped in place of drilling B-77.

The boring locations were specified (station and offset) by representatives of Resource International, Inc. (RI), based on the horizontal and vertical alignment current in December, 1997. It is noted that both the horizontal and vertical alignments have changed since the development and execution of this boring plan, thus, many of the borings extend to awkward depths and/or are located well off the alignment. The boring locations were converted to Project Coordinates and field located by representatives of Sverdrup Associates (Sverdrup), Canter Surveying, with the use of Global Positioning Satellite (GPS). Borings in cut sections were drilled along the alignment and left and/or right of centerline (within the proposed backslopes) to identify the soil and rock conditions in the cut sections and at the proposed subgrade. Borings in fill sections were drilled to a depth equivalent to the height of the proposed embankment or split-spoon refusal

in bedrock, whichever was shallower. Split-spoon refusal is defined as exceeding 50 blows with less than 15 centimeters of penetration.

All but three (3) of the borings in the north section were drilled with either a truck-mounted or ATV-mounted rotary drilling rig, utilizing hollow-stem continuous flight augers to advance the holes in soil. The remaining three (3) borings were advanced with a Geoprobe Model 4220, a vehicle-mounted, hydraulically-powered machine that utilizes static force and percussion to advanced a 122-centimeter long by 5.1-centimeter diameter soil sampler.

Where borings extended into the bedrock (after encountering split-spoon sample refusal), a double tube diamond bit core barrel (either wireline or conventional equipment) was used to core (the bedrock). Coring produced NX-sized (5.3-centimeter diameter) cores, from which the type of rock and its geological characteristics were determined.

For the borings advanced using a truck mounted rig, Standard Penetration testing was performed at 0.46 to 1.52-meter intervals. The Standard Penetration Test (ASTM D 1586) is conducted by using a 63.5-kilogram hammer falling 76.0 centimeters to drive a 5.1-centimeter O.D. split-barrel sampler 45.0 centimeters. Driving resistance is recorded on the boring logs in terms of blows per 15-centimeter interval of the driving distance. The second and third intervals are added to obtain the number of blows per 30 centimeters. Standard Penetration blow counts aid in determining soil properties applicable in embankment and roadway design.

A nominal 7.6-centimeter diameter Shelby tube, or thin-walled sampler, was employed (ASTM D-1587) to obtain undisturbed samples from borings B-53, B-55, B-60, B-63, B-69, and B-72. The Shelby tube is hydraulically pressed into the subsurface soils to obtain an undisturbed sample.

Soil samples obtained from the drilling operation were preserved in jars (drill rig boreholes) or sealed tubes (geoprobe boreholes), tested for natural moisture content (ASTM 2216), and visually classified in the laboratory. Representative soil samples were tested in the laboratory to determine the following properties:

-	Liquid Limit, Plastic Limit	(AASHTO T89, T90)
-	Gradation	(AASHTO T 88)
-	(Wet) Unit Weight	(EM 1110-2-1906)
-	One-Dimensional Consolidation Properties	(AASHTO T 216)

The tests performed are necessary to classify existing soils according to the Ohio Department of Transportation (ODOT) Classification System and to infer engineering properties of importance in determining pavement, embankment, and

backslope design and construction recommendations. Results of the laboratory testing are presented in Appendices C and D.

Rock cores were logged in the field and visually classified in the laboratory. They were analyzed to identify the type of rock, color, minerals, bedding planes and other geological and mechanical features of interest in this project. The Rock Quality Designation (RQD) for each type of rock was calculated according to the equation:

$$RQD = \frac{\Sigma \text{segments equal or longer than 10.2 centimeters}}{\text{Core Run Length}} \times 100$$

The RQD aids in estimating the general quality of the rock and is used in conjunction with other parameters to designate the quality of the rock mass. Unconfined compressive strength testing of intact rock cores segments (ASTM D 2938) was performed on representative samples to identify their strength and hardness.

3.0 SUBSURFACE PROFILE

Interpreted engineering logs have been prepared from field geologist's logs, visual examination of samples, and laboratory testing. Classification follows the current ODOT Specifications for Subsurface Investigation. The following is a generalization of what was found in the test borings.

Soil drilled along the alignment is generally between 1.0 and 5.0 meters thick, averaging approximately 3.0 meters thick. However, there were several locations where residual soils were as great as 9.0 meters deep on the uplands (e.g. B-52). The transition to bedrock is not easily discernable where the surface rock is shale, clay-shale, or mudstone, which accounts for a good portion of this section, similar to the north section. Where sandstone, limestone, or siltstone is the surface rock, transition (to rock) was easily discernable. The soils are predominantly cohesive, described as reddish brown clay (silty clay, sandy clay) of medium to high plasticity. The soils are predominantly classified as ODOT A-7-6 as well as A-6a, A-6b, A-4a, and very little A-3a.

Many soil properties, including soil consistency and shear strength (of cohesive samples), are primarily derived from Standard Penetration blow counts. The Standard Penetration blow counts recorded during the drilling process ranged from 2 blows per 30 centimeters to refusal, increasing with depth. Generally speaking, soils encountered from the ground surface to 1.5 meters± are described as soft to stiff, below 1.5 meters±, soils are very stiff to hard. Split-spoon refusal, defined as obtaining in excess of 50 blows with less than 15 centimeters of

penetration, was encountered in virtually every boring in the transitional material (hard indurated clay/very soft bedrock).

Laboratory testing indicates that the natural moisture contents of the soil encountered to a depth of 1.5 meters± are typically at to well above their corresponding plastic limits. However, because of the highly plastic nature of the clays encountered, the moisture contents do not approach the soils' corresponding liquid limits. Below the surficial 1.5 meters±, moisture contents typically decrease, down to typically less than 10% in the transitional material.

3.1 Bedrock

Bedrock was cored when encountered in any proposed cut section above the proposed completion depth of the test boring. If bedrock was encountered above the completion depth in any boring drilled in a proposed fill section, the boring was terminated on the top of bedrock (defined as split-spoon refusal). The majority of the bedrock encountered in this section consisted of shale, clay-shale, or mudstone, predominantly in poor condition. Interbeds of sandstone, limestone, and siltstone were encountered throughout. The mudstone and some of the shale was frequently slickensided and deteriorated when exposed to water. As mentioned above, where these bedrocks were encountered, the rock condition was typically so poor that it was difficult to identify the transition from soil to rock.

In the cut sections between stations 34+534 and 35+815, bedrock was encountered in all borings above the proposed grades (two grades are proposed). Most of the bedrock consists of poor quality (soft and broken) shale and mudstone. Limestone, sandstone, and siltstone interbeds were encountered above the proposed grade, the most prominent being (sandstone) between stations 34+960 and 35+240 (B-46, B-47, B-50).

In the cut section between stations 36+075 and 36+615, friable, weathered sandstone bedrock overlying alternating layers of mudstone and shale (with sandstone interbeds) was encountered. Again, the predominant rock is mudstone, and all rock encountered above grade is of poor quality.

In the cut section between 37+062 and 37+470, clay-shale, shale, and mudstone, all of poor (very little fair) quality, was predominantly encountered, below a relatively thick layer of soil (5± meters). Thin to thick (2± meters) interbeds of poor to fair quality sandstone and siltstone were encountered, scattered throughout the boring depths.

In the cut section between 37+605 and 38+197, B-66 exhibited 5 meters of friable (weathered) sandstone, overlying two (1 meter thick) limestone layers with a mudstone interbed, overlying mudstone. The other borings in this section, B-67

and B-68, encountered sandstone and mudstone, respectively, however, no rock was cored.

In the cut section between 38+280 and 38+807, thick soil (6.0 to 8.0 meters+) overlying poor quality mudstone was encountered in all the borings. B-73 exhibited good quality sandstone and siltstone below elevation 272 meters, however, the boring was terminated above the current proposed grade.

In the cut sections between stations 38+830 and 39+635, the borings exhibited poor quality mudstone and shale with relatively thick interbeds (up to 4.0 meters) of fair quality sandstone and siltstone.

3.2 Groundwater

With the exception of the Hocking River Valley, groundwater in Athens and Meigs Counties is scarce at best. Few perched lenses of groundwater (B-69) were encountered during the drilling process in the north-central section within the soil. It was impossible to identify groundwater in the rock sections since water was being used during the coring process. Groundwater for the area can be found in alternating layers of shale and thin sandstone with yields of less than 1.0 gallon per minute.

4.0 CONCLUSIONS AND RECOMMENDATIONS

Data obtained from the drilling and testing program have been used to develop preliminary pavement, embankment, and backslope recommendations for the soils and bedrock encountered along the alignment. These parameters have been used to provide guidelines for the design of the pavement systems for the subject roadway which are discussed in the following paragraphs. It is noted that these recommendations are preliminary. Additional subsurface investigations will be performed to verify these recommendations along a finalized alignment.

4.1 Pavement Design

Because of the extensive earthwork necessary for this project, very little soil will remain in-place, in its current condition, as a pavement subgrade soil. Subgrades in most of the cut sections will be bedrock. The soils are almost exclusively cohesive, described as reddish brown clay (silty clay, sandy clay) of medium to high plasticity. The shales and mudstone deteriorate to a highly plastic clay when exposed to weathering (water) as well. Therefore, it is recommended that pavement designs be based on a Group Index value of 16. The corresponding design California Bearing Ratio (CBR) is approximately 4, and the equivalent Subgrade Resilient Modulus, M_R, is 4800 psi (this value is left in English units

Subgrade Resilient Modulus, M_R, is 4800 psi (this value is left in English units since the current L&D manual presents it that way for use in a correlation chart).

Where bedrock is encountered in the subgrade, the rock shall be cut an additional 0.5 to 0.6 meters below the surface of the subgrade, depending on the pavement type, for the cross section width of the roadway between points 0.3 meters beyond the shoulders.

4.2 Embankment Design

Massive embankment fills are proposed at the locations presented in Table 1. The largest fill section is 32 meters, between stations 36+615 and 37+062. To estimate the settlement of the "in-situ" soils (and rock) due to the weight of the embankment, one-dimensional consolidation tests were performed on undisturbed samples procured from B-60 (station 36+877) and B-69 (station 38+267). The results of these tests (See Appendix D) were employed to verify the compressibility parameters of the soils along the alignment in the valleys. A worst case settlement, within the foundation soils alone, was determined beneath the centerline of the proposed highway at the maximum fill section at station 36+900. In this analysis, the top 2.0 meters was modeled as a normally consolidated clay, and the underlying sandstone was modeled as a pre-consolidated (clay). The total settlement caused by the consolidation of the "in-situ" subsoils is estimated to be 0.3 meters. Additional settlements can be expected within the embankment itself, on the order of 0.3 to 0.5 meters.

Total settlement on the order of 1.0 meter± for such an embankment is not considered out of the ordinary. The foundation soils and the fill soils will be predominantly clayey, therefore, the time-rate of settlement will be slow. However, the construction process for such an embankment will be slow as well, and the embankment will likely sit idle for a period of time before paving. In any case, the use of settlement plates is recommended to monitor the settlement of the soils in the larger embankments. Because of the notorious instability of the soils and rock in this area, the use of inclinometers is recommended to monitor the stability of these larger embankments as well. In the final design stage, it is recommended that further analysis be performed on the embankment slope-stability.

The earthwork design of all fill sections (and cut sections) shall follow ODOT's *Location and Design Manual* (1995, or latest, edition). The maximum (steepest) recommended unreinforced slope for the embankments is 2:1 (horizontal:vertical).

4.3 Backslope Design

The study area is considered to be highly susceptible to slope movements due to the lithology, topography and amount of rainfall. Problems of instability typically

of the bedrock encountered consisted of (red) shale, clay-shale, or mudstone, predominantly in poor condition. The mudstone and some of the shale was frequently slickensided and deteriorated when exposed to water. As mentioned above, where these bedrocks were encountered, the rock condition was typically so poor that it was difficult to identify the transition from soil to rock.

Many small slumps and rock falls were observed during field reconnaissance and geological study, however, no "large" slumps were identified. The terrain is typically hummocked, indicating movement. The most common forms of landslides in southeastern Ohio are rock falls, where the soft shale bedrock is weathered out from underneath blocky sandstone or limestone, and rotational slumps.

Based on the soil and rock encountered in the proposed cut sections, backslope recommendations are presented below in Table 2, applying to both left and right backslopes as applicable. It is noted that the grade changes made in this section since the development of the boring plan are quite substantial. Backslope recommendations cannot be accurately assessed at this time for many of the cut sections as a result of these changes.

Table 2: Backslope Recommendations

Cut Section	Maximum Cut	Recommended Backslope
34+534 to 34+603	8 meters	2:1 to daylight
34+779 to 35+518	16 meters	2:1 to daylight (possible to cut at 1:1 in sandstone with underlying benches, however, proposed grade here is uncertain)
36+075 to 36+615	15 meters	2:1 to daylight. Note: 1:1 is possible in sandstone as identified in the upper part of B-57 (elevation 282 to 286 meters), however, the extent of the sandstone would need to be confirmed with additional borings.
37+062 to 37+470	15 meters	2:1 to daylight
37+605 to 38+197	23 meters	2:1 to daylight for the rock encountered, however, none of the borings extend below the proposed grade.

38+280 to 38+964	21 meters	2:1 to daylight for the rock encountered, however, none of the borings extend below the proposed grade.
39+014 to 39+635	27 meters	2:1 to daylight

The top 5.0 (vertical) meters of all backslopes should be considered soil and laid back at a 2:1 slope. Any cuts not addressed in this table should be laid back at a 2:1 slope.

Due to the lithologic character of the rock formations in this area, most of the cut slopes will be mixed-faced, consisting of various rock types. Differential weathering of the various rock types must be considered in the design of the cut slope. This is especially true where sandstone is overlying a less resistant shale. Because the shale weathers at a faster rate than the overlying sandstone, the sandstone may be left unsupported and subject to rock falls. Rock falls occur routinely in this area. Consequently, it is recommended that at least a 3-meter wide bench be constructed behind the roadway ditch to allow temporary accumulation of talus and rock fall material.

It is expected that blasting will be required for cuts in the limestone, siltstone, and sandstone bedrock. It is expected that the shales (and mudstone), even in an unweathered condition can be removed using standard ripping methods. We expect that even the upper, weathered sandstone can also be removed by ripping, due to the friable nature of the weathered sandstone.

It is recommended that sidehill benches be cut in the rock slopes which are greater than 15 meters high. Past experience has shown that these benches act to collect rock falls as well as minimize erosion of the exposed surface. The benches interrupt the velocity of runoff water washing down the slope and thus minimizes the erosion. Typically, these benches do not significantly increase hillside stability.

4.4 Construction Considerations

All site work shall conform to the latest ODOT Construction and Materials Specifications (January, 1997), including that all excavation and embankment preparation and construction should follow ODOT Item 200 (Earthwork).

Where existing structures will be razed, all foundations, floor slabs, basements, wells, and/or cistern walls shall be removed to a minimum of 0.3 meters below the grade of the surrounding area. All basements or cavities left by structure removal shall be filled to the level of the surrounding ground. For those areas within the

vicinity of construction, the fill shall be compacted in accordance with the specifications provided in ODOT's Specifications.

Prior to beginning excavation, grading, and/or embankment operations across the site, all necessary clearing and grubbing shall be completed. Topsoil, organic deposits, unsuitable fill materials (as determined by a soils engineer or an experienced soils technician), and/or existing pavement sections should be stripped away from proposed pavement areas prior to excavation. In constructing the embankments, if topsoil is encountered at the ground surface of the existing subgrade within 1.22 meters of the proposed subgrade elevation, the topsoil (and any other unsuitable material, as determined by the site soils engineer) should be stripped off and stockpiled. In areas where greater than 1.22 meters of fill is to be placed, the excavation is dependent on the soil conditions at the time of construction. In particular, if dry conditions exist, the topsoil will provide adequate stability, and can remain in place. If wet conditions exist, and excessive moisture contents are present, this topsoil will not provide adequate stability, and will require removal. Where a new pavement is to be constructed on an embankment which is less than 0.9 meters over an existing pavement, the existing pavement must be removed.

The proposed subgrade surfaces should be proofrolled prior to placing engineered fill. A soils engineer or an experienced soils technician should be present during proofrolling to determine if soft soils exist. When employing proofrolling to determine the soils that will require stabilization, the proposed profile of the roadway must be considered. A greater amount of subgrade deformation is acceptable at the base of an embankment than along sections of the subgrade where the roadway will be constructed at the existing grade.

The highway construction will cut through the Monongahela and some of the Conemaugh Formations. Therefore, we expect the predominant rock fill to consist of weathered shale and sandstone. It is our opinion that colluvium and residual soil, sandstone and most of the shale will be suitable for embankment fill material. It is recommended that the cut material available for fill be classified. The sandstone and limestone are best suited for fill. This is followed by the green and gray shale, colluvium and residual soils. The "Red Bed" shales and claystones (i.e., mudstone) are the least suitable for fill soil due to their rapid slaking and deterioration into a plastic unstable clay soil. This "Red Bed" shale and mudstone should be wasted whenever possible. Alternatively, special precautions and flatter slopes must be used if this red shale is used as fill.

Special design and construction techniques are recommended even when the gray and green, more stable shale is used for embankment fill. This shale requires the addition of water and special handling in order to construct a stable embankment fill. Even with special precautions, however, the stability of subgrades in shale

deteriorates with time. Shallow sloughing is common in 2:1 embankment slopes formed in shale, therefore, it is recommended that limitations be placed on the use of shale in embankment construction. It is recommended that shale not be allowed within the upper 0.6 meter of embankment fill. A 0.6 meter cap of soil will minimize weathering and deterioration of the underlying shale. Further limitations are recommended if the "Red Bed" shale must be used in embankment fill. The shale should be broken into pieces no larger than 150 millimeters of the initial pass of the compactor and should be broken into pieces smaller than 50 millimeters following compaction. The shale should be compacted at a range of moisture varying from optimum to 3% wetter than optimum. Past experience has shown "Red Bed" fill will perform better when compacted wetter than optimum, due to swelling. It has been found that less swelling occurs in the fill when it is compacted at a moisture content wetter than optimum.

When employed as embankment fill, excavated bedrock shall be placed in lifts not to exceed 0.9 meters. When rock and other embankment material are excavated at the same time, the rock shall be incorporated into the outer portions of the embankment as rock fill and the other material shall be incorporated into the inner portion as rolled embankment. The top 0.6 meters of all embankments shall be constructed of material other than excavated bedrock.

Due to the steeply sloping topography, sidehill fills are expected. It is critical that benches be cut into the hillside where the toe of the new slope starts on an existing slope. This bench should cut into the hillside wide enough to accommodate construction equipment. Wherever possible, benching should "key" into the underlying bedrock. Drains intercepting seepage would be installed in the back of the benches as dictated by site conditions. Landslide activity is common in areas of sidehill cut and fill operations. Consequently, landslides can be expected to occur if sidehill fills are improperly constructed. Individual stability analyses should be performed in the final investigation for the sidehill fill areas.

Groundwater does not occur in large quantities over the length of the alignment. A static water table is not expected within the depths of cuts for the proposed roadway. However, perched groundwater is expected in the more permeable sandstone beds of the Conemaugh and Monongahela Formations. This is especially true where the more permeable sandstone is directly underlain by a relatively impervious shale. Also, groundwater should be expected along the soil/bedrock interface during wet weather. Horizontal drains may be needed on intermediate benches and along the roadway ditch line to lower the perched water table and minimize seepage emerging on the cut slopes. The need for horizontal drains will largely be controlled by the dip of the bedrock at the individual cut. As previously indicated, the regional dip of the rock is approximately 6 meters per kilometer to the east-southeast. Drains are used to dewater cut slopes when the rock is dipping toward the cut. Horizontal drains are usually not necessary when

the rock dips away from the highway cut.

5.0 LIMITATIONS OF STUDY

Our recommendations for this project were developed utilizing soil and bedrock information obtained from the test borings that were made at the proposed site. At this time we would like to point out that soil borings only depict the soil and bedrock conditions at the specific locations and time at which they were made. The conditions at other locations on the site may differ from those occurring at the boring locations.

The conclusions and recommendations herein have been based upon the available soil and bedrock information and the preliminary design details furnished by a representative of the owner of the proposed project. Any revision in the plans for the proposed construction from those anticipated in this report should be brought to the attention of the soils engineer to determine whether any changes in the foundation or earthwork recommendations are necessary. If deviations from the noted subsurface conditions are encountered during construction, they should also be brought to the attention of the soils engineer.

The scope of our services does not include any environmental assessment or investigation for the presence or absence of hazardous or toxic materials in the soil, groundwater, or surface water within or beyond the site studied. Any statements in this report or on the test boring logs regarding odors, staining of soils, or other unusual conditions observed are strictly for the information of our client.

Our professional services have been performed, our findings obtained, and our recommendations prepared in accordance with generally accepted Geotechnical engineering principles and practices. Resource International is not responsible for the conclusions, opinions, or recommendations made by others based upon the data included herein.

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-40
Sheet: 1 of 3
Completion Depth: 14.9 m

Date Started: 6/9/98
Date Finished: 6/10/98
Drilled By: M.F.

DRILLING AND SAMPLING INFORMATION

Northing: 140716.7
Easting: 635896.0
Elevation: 285.2 m

Boring Method: 8.3 cm HSA/RC
Hammer Weight: 63.5 kg
Hammer Drop: 76 cm

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
SS-1	4 5 6	6		Brown SANDY SILT, little organics, trace fine gravel (Topsoil). Moist. 0.1	34		
SS-2	4 50/13cm	100		Brown SILTY CLAY, some fine sand, little coarse sand. Stiff. Moist. 0.6 Brown weathered SILTSTONE. Hard soil/very soft bedrock.	24		
SS-3	40 50/13cm	55	1.0		8		
SS-4	50/13cm	80	2.0		10		
SS-5	42 50/5cm	88	3.0				
			4.0	4.1			
SS-6	19 44 50/5cm	93		Reddish-brown INDURATED CLAY/WEATHERED MUDSTONE. Hard soil/very soft bedrock.			

NOTES:

SAMPLE TYPE
SS - 5.1cm OD Split Spoon
GS - Geoprobe Sample
ST - Shelby Tube
RC - Rock Core
AS - Auger Sample

GROUND WATER READING
At Completion ▽ Dry m
After 24 Hrs ▼ N/A m

BORING METHOD
HSA - Hollow Stem Augers
SFA - Solid Flight Augers
MD - Mud Drilling
WD - Wash Drilling
RC - Rock Coring

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281 ENTERPRISE DRIVE
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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139
Boring Number: B-40
Sheet: 2 of 3
Completion Depth: 14.9 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
			5.0				
SS-7	50/10cm	100	6.0				
				6.6			
				Gray weathered SANDSTONE. Very soft bedrock.			
			7.0				
SS-8	50/13cm	60					
			8.0				
			9.0				
				9.1			
RC-1				LIMESTONE; gray, medium to moderately hard, highly broken, highly jointed, fine crystalline.			
				-gray, soft mudstone lens from 9.3 to 9.4 m			
			10.0	-RC-1: Recovery = 74%			
				-Core Loss = 40 cm			
				-RQD = 13%			
RC-2			11.0				
				11.1			
				MUDSTONE; red and gray, soft to medium, highly broken, highly jointed, calcareous,			

NOTES:

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Boring Number: B-40
Project: ATH/MEG-33-30.980/0.000
Sheet: 3 of 3
Project Number: W-7139
Completion Depth: 14.9 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
				slightly fissile. -RC-2: Recovery = 82% -Core Loss = 27 cm -RQD = 11% 11.9			
			12.0	LIMESTONE; gray, moderately hard, highly broken, highly jointed, fine crystalline.			
RC-3				-RC-3: Recovery = 100% -No Core Loss -RQD = 16% 12.8			
			13.0	SILTSTONE; gray to reddish-gray, medium to moderately hard, highly broken, highly jointed, calcareous, slightly fissile, slightly weathered, rare slickensides.			
RC-4				13.4			
				LIMESTONE; gray, hard, slightly broken, highly jointed, fine crystalline.			
			14.0	14.0			
				MUDSTONE; gray to red, soft, highly broken, highly jointed, calcareous, highly weathered.			
				-RC-4: Recovery = 50% -Core Loss = 91 cm -RQD = 7% 14.9			
				Bottom of Boring = 14.9 meters			

NOTES:

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-41
Sheet: 1 of 1
Completion Depth: 2.7 m

Date Started: 6/10/98
Date Finished: 6/10/98
Drilled By: M.F.

DRILLING AND SAMPLING INFORMATION

Northing: 140626.9
Easting: 635930.8
Elevation: 275.0 m**

Boring Method: 8.3 cm HSA
Hammer Weight: 63.5 kg
Hammer Drop: 76 cm

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
SS-1	3 6 7	50		Brown fine SANDY SILT, little organics, trace coarse sand, trace fine gravel (Topsoil). Moist. 0.1	28		
SS-2	4 4 5	44	1.0	Brown and gray SILTY CLAY, little coarse to fine sand. Stiff. Moist.	27		
SS-3	5 50/8cm	67		1.2 Brown INDURATED CLAY/WEATHERED MUDSTONE. Hard soil/very soft bedrock.	22		
SS-4	24 35 50/13cm	100	2.0				
SS-5	50/10cm	100		2.7 Bottom of Boring = 2.7 meters			

NOTES: ** Elevation is approximate.

SAMPLE TYPE
SS - 5.1cm OD Split Spoon
GS - Geoprobe Sample
ST - Shelby Tube
RC - Rock Core
AS Auger Sample

GROUND WATER READING
At Completion ▽ Dry ____ m
After 24 Hrs ▼ N/A ____ m

BORING METHOD
HSA - Hollow Stem Augers
SFA - Solid Flight Augers
MD - Mud Drilling
WD - Wash Drilling
RC - Rock Coring

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-42
Sheet: 1 of 4
Completion Depth: 23.2 m

Date Started: 4/7/98
Date Finished: 4/7/98
Drilled By: M.F.

DRILLING AND SAMPLING INFORMATION

Northing: 140382.5
Easting: 635860.8
Elevation: 291.6 m

Boring Method: 8.3 cm HSA/RC
Hammer Weight: 63.5 kg
Hammer Drop: 76 cm

SAMPLE NO	BLOWS PER 16cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
SS-1	2 2 3	78		Brown fine SANDY SILT, little organics, trace clay (Topsoil). Moist. 0.1	23		
SS-2	5 9 11	89		Brown CLAYEY SILT, little fine sand, trace organics. Medium stiff. Moist. 0.5	16		
			1.0	Brown SILTY fine SAND, little clay, trace coarse sand. Very stiff to hard. Moist to damp. -SS-2: Visual ODOT A-4a			
SS-3	8 10 11	56			12		
SS-4	8 10 11	44	2.0		13		
				2.6			
SS-5	33 50/13cm	73	3.0	Brown to gray weathered SILTSTONE. Very soft bedrock.			
			4.0				
SS-6	38 50/5cm	75					

NOTES:

SAMPLE TYPE
SS - 5.1cm OD Split Spoon
GS - Geoprobe Sample
ST - Shelby Tube
RC - Rock Core
AS - Auger Sample

GROUND WATER READING
At Completion = N/A* m
After 24 Hrs ▼ N/A m
* Wash water used during the coring process.

BORING METHOD
HSA - Hollow Stem Augers
SFA - Solid Flight Augers
MD - Mud Drilling
WD - Wash Drilling
RC - Rock Coring

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139
Boring Number: B-42
Sheet: 2 of 4
Completion Depth: 23.2 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
			5.0				
SS-7	28 49 50/5cm	86	6.0				
			7.0				
SS-8	27 50/10cm	90	8.0				
				Auger refusal @ 8.7 m — 8.8			
RC-1			9.0	SILTSTONE; brown, medium to moderately hard, highly broken, weathered, micaceous, slightly jointed. -RC-1: Recovery = 98% -Core Loss = 4 cm -RQD = 6%			
			10.0	10.1 — SHALE; gray, medium, highly broken, micaceous, fissile.			
RC-2			11.0	-RC-2: Recovery = 80% -Core Loss = 30 cm -RQD = 0%			
				11.4			

NOTES:

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139
Boring Number: B-42
Sheet: 3 of 4
Completion Depth: 23.2 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
			12.0	MUDSTONE; gray, soft to medium, highly broken, non-bedded, calcareous.			
				12.2			
RC-3				SILTSTONE; gray, medium, massive, slightly jointed, micaceous.			
			13.0	-RC-3: Recovery = 99% -Core Loss = 3 cm -RQD = 36%			
				-qr (@ 13.3 m) = 55.47 MPa			
				13.4			
				SHALE; gray, soft to medium, slightly broken, micaceous, slickensided, fissile.			
			14.0				
			15.0				
RC-4				-RC-4: Recovery = 95% -Core Loss = 8 cm -RQD = 0%			
			16.0	-gray clay seam from 16.1 to 16.3 m			
				16.3			
				LIMESTONE; gray, moderately hard, highly broken, fine crystalline.			
RC-5			17.0				
				-qr (@ 17.2 m) = 31.73 MPa			
				17.3			
				SHALE (60%); variegated red, gray, and green, soft, highly broken, micaceous, calcareous, silty, fissile, with interbedded LIMESTONE (40%); gray, medium to moderatley hard, massive, fine crystalline.			
			18.0	-RC-5: Recovery = 100%			

NOTES:

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139
Boring Number: B-42
Sheet: 4 of 4
Completion Depth: 23.2 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
RC-6				-No Core Loss -RQD = 7%			
			19.0	-RC-6: Recovery = 95% -Core Loss = 8 cm -RQD = 35%			
				19.8			
RC-7			20.0	SHALE; red to gray, medium, highly broken, fissile, slightly micaceous.			
			21.0	21.0			
				MUDSTONE; red, very soft, highly broken, silty, non-bedded. -RC-7: Recovery = 95% -Core Loss = 15 cm -RQD = 12%			
				21.9			
			22.0	SHALE; gray, medium, highly broken, fissile, slightly micaceous.			
RC-8			23.0	-RC-8: Recovery = 80% -Core Loss = 6 cm -RQD = 0%			
				23.2			
				Bottom of Boring = 23.2 meters			

NOTES:

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-43
Sheet: 1 of 2
Completion Depth: 7.9 m

Date Started: 4/3/98
Date Finished: 4/3/98
Drilled By: M.F.

DRILLING AND SAMPLING INFORMATION

Northing: 140386.7
Easting: 635982.4
Elevation: 284.7 m

Boring Method: 8.3 cm HSA/RC
Hammer Weight: 63.5 kg
Hammer Drop: 76 cm

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
SS-1	2 3 3	44		Brown SILT, some fine sand, little organics, trace clay (Topsoil). Moist. 0.0	29		
SS-2	3 5 9	83		Brown CLAYEY SILT, little fine sand, trace coarse sand. Medium stiff. Moist. 0.5	24	48	26
			1.0	Brown CLAY, some silt, trace fine to coarse sand. Stiff to hard. Moist to damp. -SS-2: ODOT A-7-6 (15)			
SS-3	4 9 15	56			20		
SS-4	24 26 33	89	2.0		17		
SS-5	50/13cm	80		2.6 Brown INDURATED CLAY/WEATHERED CLAY-SHALE. Hard soil/very soft bedrock.			
			3.0				
			4.0				
				4.6			

NOTES:

SAMPLE TYPE
SS 5.1cm OD Split Spoon
GS - Geoprobe Sample
ST - Shelby Tube
RC - Rock Core
AS - Auger Sample

GROUND WATER READING
At Completion: N/A * m
After 24 Hrs: ▼ N/A m
* Wash water used during the coring process.

BORING METHOD
HSA - Hollow Stem Augers
SFA - Solid Flight Augers
MD - Mud Drilling
WD - Wash Drilling
RC - Rock Coring

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139
Boring Number: B-43
Sheet: 2 of 2
Completion Depth: 7.9 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
RC-1				CLAY-SHALE; brown, soft, highly broken, fissile, slightly weathered, with nodular limestone.			
			5.0	-RC-1: Recovery = 89% -Core Loss = 15 cm -RQD = 0%			
RC-2			6.0	-RC-2: Recovery = 79% -Core Loss = 15 cm -RQD = 0%			
				6.7			
RC-3			7.0	SILTSTONE; brown, medium, massive, argillaceous, with interbedded brown limestone lenses up to 8 cm thick.			
				-RC-3: Recovery = 97% -Core Loss = 4 cm -RQD = 42% -qr (@ 7.8 m) = 39.09 MPa			
				7.9			
				Bottom of Boring = 7.9 meters			

NOTES:

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-44
Sheet: 1 of 2
Completion Depth: 7.9 m

Date Started: 4/3/98
Date Finished: 4/3/98
Drilled By: M.F.

DRILLING AND SAMPLING INFORMATION

Northing: 140253.4
Easting: 635932.4
Elevation: 280.2 m

Boring Method: 8.3 cm HSA/RC
Hammer Weight: 63.5 kg
Hammer Drop: 76 cm

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
SS-1	2 4 6	56		Brown fine SANDY SILT, little organics, trace clay (Topsoil). Moist. 0.1	22		
SS-2	3 5 6	67	1.0	Brown SILTY CLAY, little fine sand. Stiff. Moist. 1.1	24		
SS-3	4 7 9	61		Brown CLAYEY SILT, little to trace fine to coarse sand, trace fine gravel. Stiff to hard.	17		
SS-4	3 6 7	72	2.0		21		
SS-5	3 27 25	72	3.0		9		
			4.0				
SS-6	9 18 31	89		-SS-6: ODOT A-6a (10) 4.6	13	37	23

NOTES:

SAMPLE TYPE
SS - 5.1cm OD Split Spoon
GS - Geoprobe Sample
ST - Shelby Tube
RC - Rock Core
AS - Auger Sample

GROUND WATER READING
At Completion: N/A * m
After 24 Hrs: ▼ N/A m
* Wash water used during the coring process.

BORING METHOD
HSA - Hollow Stem Augers
SFA - Solid Flight Augers
MD - Mud Drilling
WD - Wash Drilling
RC - Rock Coring

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139
Boring Number: B-44
Sheet: 2 of 2
Completion Depth: 7.9 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
				Brown INDURATED CLAY/WEATHERED MUDSTONE. Hard soil/very soft bedrock.			
			5.0				
SS-7	15 25 49	89	6.0				
				6.6			
				LIMESTONE; brownish-gray, moderately hard, highly broken, highly jointed, fine crystalline, slightly weathered, with calcareous clay seams up to 3 cm thick.			
			7.0				
RC-1							
				7.9			
				Bottom of Boring = 7.9 meters			

NOTES:

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-45
Sheet: 1 of 3
Completion Depth: 15.2 m

Date Started: 4/1/98
Date Finished: 4/2/98
Drilled By: M.F.

DRILLING AND SAMPLING INFORMATION

Northing: 140119.8
Easting: 636008.0
Elevation: 288.2 m

Boring Method: 8.3 cm HSA/RC
Hammer Weight: 63.5 kg
Hammer Drop: 76 cm

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
SS-1	1 1 2	67		Brown SILT, some fine sand, little organics, trace clay (Topsoil). Moist. (0.1)	24		
SS-2	3 5 13	67		Brown SILT, trace fine sand, trace clay. Soft. Moist. (0.5) Brown CLAYEY SILT, little fine sand. Very stiff. Moist.	25		
SS-3	17 21 50/13cm	89	1.0	(1.4)	14		
SS-4	41 50/5cm	80	2.0	Brown weathered SANDSTONE. Very soft bedrock.	11		
SS-5	50/13cm	100	3.0		11		
SS-6	21 50/8cm	100	4.0	(4.1) Brownish gray SHALE. Very soft bedrock.			

NOTES:

SAMPLE TYPE
SS - 5.1cm OD Split Spoon
GS - Geoprobe Sample
ST - Shelby Tube
RC - Rock Core
AS - Auger Sample

GROUND WATER READING
At Completion ▽ N/A * m
After 24 Hrs ▼ N/A m
* Wash water used during the coring process.

BORING METHOD
HSA - Hollow Stem Augers
SFA - Solid Flight Augers
MD - Mud Drilling
WD - Wash Drilling
RC - Rock Coring

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139
Boring Number: B-45
Sheet: 2 of 3
Completion Depth: 15.2 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
			5.0				
SS-7	20 31 50/13cm	100	6.0				
			7.0				
SS-8	50/8cm	0		SILTSTONE; gray, medium, massive, arenaceous, micaceous.			
RC-1			8.0				
				SHALE; gray, soft to medium, highly broken, fissile, slightly micaceous.			
			9.0	SILTSTONE; gray, medium, massive, arenaceous, micaceous. -RC-1: Recovery = 92% -Core Loss = 24 cm -RQD = 19%			
				SHALE; gray, soft to medium, highly broken, fissile, slightly micaceous.			
			10.0				
RC-2				MUDSTONE; red to gray, very soft to soft, highly broken, non-bedded, silty, calcareous.			
			11.0				

NOTES:

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Boring Number: B-45
Project: ATH/MEG-33-30.980/0.000
Sheet: 3 of 3
Project Number: W-7139
Completion Depth: 15.2 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
			12.0				
				12.2			
				SHALE; gray, medium, slightly broken, fissile, slightly micaceous.			
				-qr (@ 12.7 m) = 26.52 MPa			
			13.0	-RC-2: Recovery = 99% -Core Loss = 3 cm -RQD = 63%			
RC-3				-slightly jointed from 13.7 to 15.2 m			
			14.0				
				-RC-3: Recovery = 100% -No Core Loss -RQD = 8%			
			15.0				
				15.2			
				Bottom of Boring = 15.2 meters			

NOTES:

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-46
Sheet: 1 of 3
Completion Depth: 16.2 m

Date Started: 4/2/98
Date Finished: 4/2/98
Drilled By: M.F.

DRILLING AND SAMPLING INFORMATION

Northing: 139981.5
Easting: 636085.0
Elevation: 292.3 m

Boring Method: 8.3 cm HSA/RC
Hammer Weight: 63.5 kg
Hammer Drop: 76 cm

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
SS-1	2 2 2	78		Brown fine SANDY SILT, little clay, trace organics (Topsoil). Moist. 0.1	26		
SS-2	2 2 4	72	1.0	Reddish-brown SILTY CLAY, trace fine sand. Soft to very stiff. Moist.	36		
SS-3	3 7 17	61			14		
SS-4	13 31 50/13cm	82	2.0	1.8 Brown INDURATED CLAY/WEATHERED MUDSTONE. Hard soil/very soft bedrock.			
SS-5	10 31 50/8cm	100	3.0				
			4.0	3.8 SANDSTONE; variegated brown, gray, and green, medium, slightly broken, very fine grained, micaceous, cross-bedded.			

NOTES:

SAMPLE TYPE
SS - 5.1cm OD Split Spoon
GS - Geoprobe Sample
ST - Shelby Tube
RC - Rock Core
AS - Auger Sample

GROUND WATER READING
At Completion: N/A * m
After 24 Hrs: ▼ N/A m
* Wash water used during the coring process.

BORING METHOD
HSA - Hollow Stem Augers
SFA - Solid Flight Augers
MD - Mud Drilling
WD - Wash Drilling
RC - Rock Coring

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139
Boring Number: B-46
Sheet: 2 of 3
Completion Depth: 16.2 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
RC-1			5.0				
			6.0	-RC-1: Recovery = 94% -Core Loss = 18 cm -RQD = 23%			
			7.0				
RC-2			8.0				
			9.0	-RC-2: Recovery = 94% -Core Loss = 18 cm -RQD = 18%			
				9.4 SHALE; gray to dark gray, soft to medium, highly broken, fissile, carbonaceous, slickensided, slightly jointed, with interbedded gray clay seams up to 3 cm thick.			
			10.0				
RC-3			11.0				
				11.3			

NOTES:

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(614) 885-1959

REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139
Boring Number: B-46
Sheet: 3 of 3
Completion Depth: 16.2 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
			12.0	MUDSTONE; gray, soft, highly broken, non-bedded, slickensided. -RC-3: Recovery = 85% -Core Loss = 37 cm -RQD = 17%			
				12.5			
			13.0	SANDSTONE; gray, medium, massive, very fine grained, micaceous, cross-bedded.			
				13.2			
RC-4			14.0	SHALE; gray, medium, highly broken, micaceous, fissile, silty. -RC-4: Recovery = 97% -Core Loss = 6 cm -RQD = 9%			
			15.0				
				15.2			
RC-5			16.0	MUDSTONE; gray to red, medium, massive, slickensides, slightly calcareous. -RC-5: Recovery = 100% -No Core Loss -RQD = 50%			
				16.2			
				Bottom of Boring = 16.2 meters			

NOTES:

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-47
Sheet: 1 of 2
Completion Depth: 9.1 m

Date Started: 4/1/98
Date Finished: 4/1/98
Drilled By: M.F.

DRILLING AND SAMPLING INFORMATION

Northing: 139979.0
Easting: 636038.7
Elevation: 295.0 m**

Boring Method: 8.3 cm HSA/RC
Hammer Weight: 63.5 kg
Hammer Drop: 76 cm

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
SS-1	2 3 4	67		Brown SILT, little fine sand, little organics, trace clay (Topsoil). Moist. 0.1	25		
SS-2	3 3 4	50	1.0	Reddish-brown to brown and gray CLAY, some silt, trace coarse to fine sand. Medium stiff to hard. Moist to damp. -SS-2: ODOT A-7-6 (20)	41	75	28
SS-3	4 4 8	72			32		
SS-4	6 9 12	83	2.0		22		
SS-5	8 14 21	89	3.0		23		
			4.0				
SS-6	10 14 33	94			13		

NOTES: ** Elevation is approximate.

SAMPLE TYPE
SS 5.1cm OD Split Spoon
GS - Geoprobe Sample
ST - Shelby Tube
RC - Rock Core
AS Auger Sample

GROUND WATER READING
At Completion — N/A* m
After 24 Hrs ▼ N/A m
* Wash water used during the coring process.

BORING METHOD
HSA - Hollow Stem Augers
SFA - Solid Flight Augers
MD - Mud Drilling
WD - Wash Drilling
RC - Rock Coring

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139
Boring Number: B-47
Sheet: 2 of 2
Completion Depth: 9.1 m

SAMPLE NO	BLOWS PER 16cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
			5.0				
				5.5			
SS-7	25 31 30	67	6.0	Gray INDURATED CLAY/WEATHERED MUDSTONE. Hard soil/very soft bedrock.			
				6.7			
			7.0	SANDSTONE; gray, medium, highly broken, micaceous, fine grained, cross-bedded, silty.			
SS-8	50/10cm	75					
RC-1			8.0	-RC-1: Recovery = 95% -Core Loss = 8 cm -RQD = 13%			
				8.8			
			9.0	SILTSTONE; gray, medium, highly broken, micaceous, argillaceous, cross-bedded.			
				9.1			
				Bottom of Boring = 9.1 meters			

NOTES: ** Elevation is approximate.

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-48
Sheet: 1 of 3
Completion Depth: 12.2 m

Date Started: 4/1/98
Date Finished: 4/1/98
Drilled By: M.F.

DRILLING AND SAMPLING INFORMATION

Northing: 139958.7
Easting: 635962.1
Elevation: 301.9 m

Boring Method: 8.3 cm HSA/RC
Hammer Weight: 63.5 kg
Hammer Drop: 76 cm

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
SS-1	3 3 3	89		Brown fine SANDY SILT, some organics, little clay, trace fine gravel (Topsoil). Moist. 0.1	27		
SS-2	2 3 3	56	1.0	Brown and gray CLAY, some fine sand, little silt, trace coarse sand. Medium stiff to very stiff. Moist to damp. -SS-2: ODOT A-7-6 (17)	36	67	26
SS-3	3 5 3	67			19		
SS-4	8 11 9	56	2.0		14		
SS-5	9 12 10	22	3.0		11		
SS-6	9 22 50/13cm	100	4.0	Red INDURATED CLAY/WEATHERED MUDSTONE. Hard soil/very soft bedrock. 4.1			

NOTES:

SAMPLE TYPE
SS - 5.1cm OD Split Spoon
GS - Geoprobe Sample
ST - Shelby Tube
RC - Rock Core
AS - Auger Sample

GROUND WATER READING
At Completion: N/A * m
After 24 Hrs: ▼ N/A m
* Wash water used during the coring process.

BORING METHOD
HSA - Hollow Stem Augers
SFA - Solid Flight Augers
MD - Mud Drilling
WD - Wash Drilling
RC - Rock Coring

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139
Boring Number: B-48
Sheet: 2 of 3
Completion Depth: 12.2 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
			5.0				
SS-7	41 50/8cm	70	6.0				
			7.0				
SS-8	21 50/10cm	90	8.0				
SS-9	50/10cm	50	9.0				
				9.1			
RC-1				MUDSTONE; red to brown, very soft to soft, highly broken, non-bedded, calcareous, silty.			
			10.0	-RC-1: Recovery = 82% -Core Loss = 25 cm -RQD = 0%			
RC-2							
				10.8			
			11.0	SHALE; gray, medium, massive, silty, slightly micaceous, with calcite-filled fractures.			
				-qr (@ 11.3 m) = 27.30 MPa			

NOTES:

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139
Boring Number: B-48
Sheet: 3 of 3
Completion Depth: 12.2 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
			12.0	-RC-2: Recovery = 100% -No Core Loss -RQD = 45%			
			12.2	Bottom of Boring = 12.2 meters			

NOTES:

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-49
Sheet: 1 of 2
Completion Depth: 10.1 m

Date Started: 4/6/98
Date Finished: 4/6/98
Drilled By: M.F.

DRILLING AND SAMPLING INFORMATION

Northing: 139824.9
Easting: 636063.2
Elevation: 287.4 m

Boring Method: 8.3 cm HSA/RC
Hammer Weight: N/A kg
Hammer Drop: N/A cm

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
SS-1	3 2 2	78		Brown SILTY fine SAND, little organics, trace clay, trace fine gravel (Topsoil). Moist. 0.1	23		
SS-2	3 3 10	89		Brown CLAYEY SILT, little fine sand. Soft to medium stiff. Moist. 0.8	15		
			1.0	Brown SILTY CLAY, little coarse to fine sand and gravel (shale fragments). Stiff. Moist. 1.1			
SS-3	9 13 23	72		Brown SILTY fine SAND, little clay, little fine gravel, trace coarse sand. Hard. Moist. -SS-3: Visual ODOT A-4a	13		
SS-4	9 33 50/8cm	100	2.0	2.1	15		
RC-1				Brown weathered SANDSTONE. Very soft bedrock. 2.4 Auger refusal @ 2.4 m SANDSTONE; brown, hard, slightly broken, fine grained, micaceous, cross-bedded. -qr (@ 2.6 m) = 70.51 MPa			
			3.0				
			4.0	-RC-1: Recovery = 95% -Core Loss = 15 cm -RQD = 29%			

NOTES:

SAMPLE TYPE
SS - 5.1cm OD Split Spoon
GS - Geoprobe Sample
ST - Shelby Tube
RC - Rock Core
AS - Auger Sample

GROUND WATER READING
At Completion: N/A * m
After 24 Hrs: ▼ N/A m
* Wash water used during the coring process.

BORING METHOD
HSA - Hollow Stem Augers
SFA - Solid Flight Augers
MD - Mud Drilling
WD - Wash Drilling
RC - Rock Coring

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139
Boring Number: B-49
Sheet: 2 of 2
Completion Depth: 10.1 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
			4.9				
			5.0	CLAY-SHALE; gray, soft, highly broken, fissile, slickensides, slightly weathered.			
			5.5				
RC-2				MUDSTONE; gray, very soft to soft, highly broken, non-bedded, silty.			
			6.0				
				-RC-2: Recovery = 70% -Core Loss = 73 cm -RQD = 0% -slightly calcareous from 7.0 to 10.1 m			
			7.0				
RC-3			8.0				
			9.0				
			10.0				
			10.1	Bottom of Boring = 10.1 meters			

NOTES:

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-50
Sheet: 1 of 3
Completion Depth: 14.0 m

Date Started: 4/8/98
Date Finished: 4/8/98
Drilled By: M.F.

DRILLING AND SAMPLING INFORMATION

Northing: 139726.6
Easting: 636081.5
Elevation: 296.7 m

Boring Method: 9.5 cm HSA/RC
Hammer Weight: 63.5 kg
Hammer Drop: 76 cm

SAMPLE NO	BLOWS PER 16cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
SS-1	2 2 2	56		Brown SILTY CLAY, trace coarse to fine sand, trace organics (Topsoil). Moist. 0.1	29		
SS-2	2 5 7	100	1.0	Brown to red SILTY CLAY, some fine gravel, trace coarse to fine sand. Soft to hard. Moist to damp.	26		
SS-3	6 8 11	94		-SS-3: ODOT A-7-6 (17)	32	68	24
SS-4	9 12 19	100	2.0		23		
SS-5	13 20 23	100	3.0		17		
SS-6	10 21 27	100	4.0		18		

NOTES:

SAMPLE TYPE
SS - 5.1cm OD Split Spoon
GS - Geoprobe Sample
ST - Shelby Tube
RC - Rock Core
AS - Auger Sample

GROUND WATER READING
At Completion ▽ N/A * m
After 24 Hrs ▼ N/A m
* Wash water used during the coring process.

BORING METHOD
HSA - Hollow Stem Augers
SFA - Solid Flight Augers
MD - Mud Drilling
WD - Wash Drilling
RC - Rock Coring

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281 ENTERPRISE DRIVE
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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-50
Sheet: 2 of 3
Completion Depth: 14.0 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
			5.0				
SS-7	12 21 32	100	6.0		18		
				6.1 Brownish-gray INDURATED CLAY/WEATHERED MUDSTONE. Hard soil/very soft bedrock.			
			7.0				
SS-8	19 27 46	83					
			8.0				
				Auger refusal @ 8.8 m			
RC-1			9.0	8.8 SILTSTONE; gray, medium, highly broken, micaceous, argillaceous.			
				9.4 SANDSTONE; gray, medium, massive, fine grained, micaceous, silty, cross-bedded.			
			10.0	-RC-1: Recovery = 100% -No Core Loss -RQD = 61%			
				-qr (@ 10.5 m) = 55.84 MPa			
RC-2			11.0				

NOTES:

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Boring Number: B-50
Project: ATH/MEG-33-30.980/0.000
Sheet: 3 of 3
Project Number: W-7139
Completion Depth: 14.0 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
			12.0	-RC-2: Recovery = 98% -Core Loss = 6 cm -RQD = 68%			
			13.0				
				13.4 SILTSTONE; gray, medium, massive, argillaceous, micaceous.			
RC-3				-RC-3: Recovery = 100% -No Core Loss			
			14.0	14.0 -RQD = 100% Bottom of Boring = 14.0 meters			

NOTES:

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-51
Sheet: 1 of 1
Completion Depth: 1.2 m

Date Started: 3/31/98
Date Finished: 3/31/98
Drilled By: M.F.

DRILLING AND SAMPLING INFORMATION

Northing: 139608.7
Easting: 636103.7
Elevation: 288.9 m

Boring Method: 8.3 cm HSA
Hammer Weight: 63.5 kg
Hammer Drop: 76 cm

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
				Gray fine to coarse GRAVEL. Damp. 0.1			
SS-1	50/13cm	60		Brown weathered SANDSTONE. Very soft bedrock.			
			1.0				
SS-2	50/8cm	33		1.2			
				Bottom of Boring = 1.2 meters			

NOTES:

SAMPLE TYPE
SS - 5.1cm OD Split Spoon
GS - Geoprobe Sample
ST - Shelby Tube
RC - Rock Core
AS - Auger Sample

GROUND WATER READING
At Completion = Dry m
After 24 Hrs ▼ N/A m

BORING METHOD
HSA - Hollow Stem Augers
SFA - Solid Flight Augers
MD - Mud Drilling
WD - Wash Drilling
RC - Rock Coring

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-52
Sheet: 1 of 3
Completion Depth: 12.2 m

Date Started: 3/31/98
Date Finished: 3/31/98
Drilled By: M.F.

DRILLING AND SAMPLING INFORMATION

Northing: 139539.2
Easting: 636159.4
Elevation: 296.6 m

Boring Method: 8.3 cm HSA/RC
Hammer Weight: 63.5 kg
Hammer Drop: 76 cm

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
SS-1	1, 2, 3	89		Brown fine SANDY SILT, little organics, trace clay (Topsoil). Moist. 0.0	24		
SS-2	2, 2, 2	67	1.0	Brown CLAYEY SILT, some fine sand, trace organics. Medium stiff to soft. Moist. 1.1	26		
SS-3	2, 5, 9	72		Reddish-brown CLAY, little silt, trace fine sand. Medium stiff to hard. Moist to damp.	30		
SS-4	3, 3, 5	94	2.0		38		
SS-5	6, 9, 8	39	3.0		26		
			4.0				
SS-6	9, 15, 20	78			19		

NOTES:

SAMPLE TYPE
SS - 5.1cm OD Split Spoon
GS - Geoprobe Sample
ST - Shelby Tube
RC - Rock Core
AS - Auger Sample

GROUND WATER READING
At Completion ▽ N/A * ..... m
After 24 Hrs ▼ N/A ..... m
* Wash water used during the curing process.

BORING METHOD
HSA - Hollow Stem Augers
SFA - Solid Flight Augers
MD - Mud Drilling
WD - Wash Drilling
RC - Rock Coring

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139
Boring Number: B-52
Sheet: 2 of 3
Completion Depth: 12.2 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
			5.0				
SS-7	6 6 8	89	6.0		26		
			7.0				
SS-8	5 9 20	83		7.2 Light brownish-gray CLAY, some silt, some fine gravel, trace coarse to fine sand. Very stiff. Damp. -SS-8: ODOT A-7-6 (11)	17	42	22
			8.0				
SS-9	50/3cm	0		8.8			
RC-1			9.0	SANDSTONE; brownish gray, medium, massive, medium to fine grained, micaceous, silty. -cross-bedded from 8.8 to 10.7 m			
			10.0	-RC-1: Recovery = 100% -No Core Loss -RQD = 64%			
RC-2			11.0	-qr (@ 10.8 m) = 27.99 MPa			

NOTES:

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REPORT OF SOIL EXPLORATION

Client Sverdrup Associates, Inc.
Boring Number B-52
Project ATH/MEG-33-30.980/0.000
Sheet 3 of 3
Project Number W-7139
Completion Depth 12.2 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
				-RC-2: Recovery = 100% -No Core Loss -RQD = 87%			
			12.0				
			12.2	Bottom of Boring = 12.2 meters			

NOTES:

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-53
Sheet: 1 of 1
Completion Depth: 3.0 m

Date Started: 3/31/98
Date Finished: 3/31/98
Drilled By: M.F.

DRILLING AND SAMPLING INFORMATION

Northing: 139413.8
Easting: 636148.7
Elevation: 284.1 m

Boring Method: 8.3 cm HSA
Hammer Weight: 63.5 kg
Hammer Drop: 76 cm

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
SS-1	1 1 2	100		Brown fine SANDY SILT, little organics (Topsoil). Moist. 0.0	24		
ST-2		100	1.0	Brown CLAYEY SILT, some fine sand, trace coarse sand, trace fine gravel. Soft. Moist. -ST-2: ODOT A-6a (9) 1.1	22	29	16
SS-3	4 6 9	94		Brown SILTY fine SAND, some clay, trace coarse sand, trace fine gravel. Stiff to very stiff. Moist. -SS-3: ODOT A-4a	16		
SS-4	4 8 11	72	2.0	2.6	21		
SS-5	4 7 10	83	3.0	Brownish-gray fine SANDY CLAY, little silt. Very stiff. Moist. 3.0	18		
				Bottom of Boring = 3.0 meters			

NOTES:

SAMPLE TYPE
SS - 5.1cm OD Split Spoon
GS - Geoprobe Sample
ST - Shelby Tube
RC - Rock Core
AS - Auger Sample

GROUND WATER READING
At Completion: Dry m
After 24 Hrs: ▼ N/A m

BORING METHOD
HSA - Hollow Stem Augers
SFA - Solid Flight Augers
MD - Mud Drilling
WD - Wash Drilling
RC - Rock Coring

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-54
Sheet: 1 of 1
Completion Depth: 2.0 m

Date Started: 3/31/98
Date Finished: 3/31/98
Drilled By: M.F.

DRILLING AND SAMPLING INFORMATION

Northing: 139260.0
Easting: 636192.6
Elevation: 288.9 m

Boring Method: 8.3 cm HSA
Hammer Weight: 63.5 kg
Hammer Drop: 76 cm

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
SS-1	2 3 2	78		Brown fine SANDY SILT, little organics, trace clay (Topsoil). Moist. 0.1	24		
SS-2	3 4 6	78		Brown fine SANDY SILT, little clay, trace coarse sand. Medium stiff to stiff. Moist.	19		
			1.0				
SS-3	10 13 49	61		-SS-3: ODOT A-6a (6) 1.4	12	33	21
				Brown weathered SANDSTONE. Very soft bedrock.			
SS-4	49 50/5cm	100	2.0	2.0	8		
				Bottom of Boring = 2.0 meters			

NOTES:

SAMPLE TYPE
SS - 5.1cm OD Split Spoon
GS - Geoprobe Sample
ST - Shelby Tube
RC - Rock Core
AS - Auger Sample

GROUND WATER READING
At Completion: Dry ... m
After 24 Hrs: ▼ N/A ... m

BORING METHOD
HSA - Hollow Stem Augers
SFA - Solid Flight Augers
MD - Mud Drilling
WD - Wash Drilling
RC - Rock Coring

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-55
Sheet: 1 of 1
Completion Depth: 2.0 m

Date Started: 3/31/98
Date Finished: 3/31/98
Drilled By: M.F.

DRILLING AND SAMPLING INFORMATION

Northing: 139015.1
Easting: 636291.9
Elevation: 259.8 m**

Boring Method: 8.3 cm HSA
Hammer Weight: 63.5 kg
Hammer Drop: 76 cm

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
SS-1	2 1 3	78		Brown fine SANDY SILT, little organics, trace fine gravel (Topsoil). Moist. 0.1	24		
ST-2		100		Brown SILTY CLAY, some rock fragments, little coarse to fine sand. Medium stiff to stiff. Moist.	17		
			1.0	-groundwater initially encountered @ 1.0 m			
SS-3	2 50/8m	100		-SS-3: ODOT A-6b (2)	20	37	20
				Brown weathered SANDSTONE. Very soft bedrock. 1.4			
			2.0	2.0			
				Bottom of Boring = 2.0 meters			

NOTES: ** Elevation is approximate.

SAMPLE TYPE
SS - 5.1cm OD Split Spoon
GS - Geoprobe Sample
ST - Shelby Tube
RC - Rock Core
AS - Auger Sample

GROUND WATER READING
At Completion: 1.0 m
After 24 Hrs: N/A m

BORING METHOD
HSA - Hollow Stem Augers
SFA - Solid Flight Augers
MD - Mud Drilling
WD - Wash Drilling
RC - Rock Coring

RESOURCE INTERNATIONAL, INC.
281 ENTERPRISE DRIVE
WESTERVILLE, OHIO 43081
(614) 885-1959

REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-56
Sheet: 1 of 3
Completion Depth: 13.1 m

Date Started: 4/14/98
Date Finished: 4/14/98
Drilled By: M.F.

DRILLING AND SAMPLING INFORMATION

Northing: 138895.0
Easting: 636360.4
Elevation: 290.7 m

Boring Method: 8.3 cm HSA/RC
Hammer Weight: 63.5 kg
Hammer Drop: 76 cm

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
SS-1	2 2 2	56		Brown SILT, little clay, trace organics (Topsoil). Moist. 0.1	27		
SS-2	3 4 21	78		Brown SILTY CLAY, trace fine sand. Soft to very stiff. Moist. 0.7	16		
			1.0	Brown weathered SANDSTONE. Very soft bedrock.			
SS-3	20 50/13cm	73					
SS-4	45 50/5cm	100	2.0				
SS-5	48 50/3cm	100	3.0				
			4.0				
SS-6	50/13cm	100					

NOTES:

SAMPLE TYPE
SS - 5.1cm OD Split Spoon
GS - Geoprobe Sample
ST - Shelby Tube
RC - Rock Core
AS - Auger Sample

GROUND WATER READING
At Completion: N/A* m
After 24 Hrs: N/A m
* Wash water used during the coring process.

BORING METHOD
HSA - Hollow Stem Augers
SFA - Solid Flight Augers
MD - Mud Drilling
WD - Wash Drilling
RC - Rock Coring

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139
Boring Number: B-56
Sheet: 2 of 3
Completion Depth: 13.1 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
			5.0				
				5.6			
SS-7	35 50/10cm	100		Brown INDURATED CLAY/WEATHERED MUDSTONE. Hard soil/very soft bedrock.			
			6.0				
			7.0				
SS-8	21 50/13cm	82					
			8.0	-groundwater initially encountered @ 8.0 m			
SS-9	49 50/5cm	75					
			9.0				
			10.0				
SS-10	50/10cm	100					
				10.7			
RC-1				SHALE; gray, medium, highly broken, fissile, silty, slightly weathered, slightly jointed.			
			11.0				

NOTES:

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REPORT OF SOIL EXPLORATION

Client Sverdrup Associates, Inc.
Boring Number B-56
Project ATH/MEG-33-30.980/0.000
Sheet 3 of 3
Project Number W-7139
Completion Depth 13.1 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
			12.0	-RC-1: Recovery = 97% -Core Loss = 5 cm -RQD = 12%			
				12.2			
RC-2				MUDSTONE; gray, very soft to soft, highly broken, non-bedded.			
			13.0	-RC-2: Recovery = 50% -Core Loss = 30 cm -RQD = 0%			
				13.1			
				Bottom of Boring = 13.1 meters			

NOTES:

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-57
Sheet: 1 of 4
Completion Depth: 20.1 m

Date Started: 4/15/98
Date Finished: 4/22/98
Drilled By: M.F.

DRILLING AND SAMPLING INFORMATION

Northing: 138687.4
Easting: 636433.2
Elevation: 288.9 m

Boring Method: 8.3 cm HSA/RC
Hammer Weight: 63.5 kg
Hammer Drop: 76 cm

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
SS-1	2 2 3	78		Brown fine SANDY SILT, little organics, trace clay (Topsoil). Moist. 0.1	28		
SS-2	2 3 7	72	1.0	Brown SILT and CLAY, trace fine sand. Medium stiff to hard. Moist. 1.8	23		
SS-3	10 17 34	83			14		
SS-4	25 50/8cm	78	2.0	Brown weathered SANDSTONE. Very soft bedrock. 3.0			
SS-5	50/13cm	80					
RC-1			3.0	SANDSTONE; brown, very soft to medium, highly broken, fine grained, micaceous, silty.			
			4.0				

NOTES:

SAMPLE TYPE
SS - 5.1cm OD Split Spoon
GS - Geoprobe Sample
ST - Shelby Tube
RC - Rock Core
AS - Auger Sample

GROUND WATER READING
At Completion: N/A * m
After 24 Hrs: ▼ N/A m
* Wash water used during the coring process.

BORING METHOD
HSA - Hollow Stem Augers
SFA - Solid Flight Augers
MD - Mud Drilling
WD - Wash Drilling
RC - Rock Coring

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Boring Number: B-57
Project: ATH/MEG-33-30.980/0.000
Sheet: 2 of 4
Project Number: W-7139
Completion Depth: 20.1 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
			5.0	-RC-1: Recovery = 100% -No Core Loss -RQD = 0%			
			6.0				
RC-2				-RC-2: Recovery = 98% -Core Loss = 3 cm -RQD = 17%			
			7.0				
				SHALE; brown, soft to medium, highly broken, fissile, silty.			
				7.6			
RC-3				SANDSTONE; brown, medium, highly broken, very fine grained, micaceous, silty. 7.9			
			8.0	SHALE; gray, medium, highly broken, carbonaceous, fissile.			
				-RC-3: Recovery = 83% -Core Loss = 31 cm -RQD = 6%			
			9.0				
				9.4			
RC-4				MUDSTONE (90%); gray, very soft to soft, highly broken, non-bedded, silty, with interbedded SHALE (10%); gray, medium, highly broken, micaceous, silty.			
			10.0				
			11.0	-RC-4: Recovery = 60% -Core Loss = 110 cm -RQD = 11%			

NOTES:

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139
Boring Number: B-57
Sheet: 3 of 4
Completion Depth: 20.1 m

SAMPLE NO	BLOWS PER 16cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
				11.9			
			12.0	SHALE; gray, medium, highly broken, micaceous, fissile, silty.			
RC-5							
			13.0	-RC-5: Recovery = 100% -No Core Loss -RQD = 0%			
				13.4			
				MUDSTONE; gray, very soft to soft, highly broken, non-bedded, silty. -calcareous from 13.7 to 15.4 m			
RC-6			14.0				
				-RC-6: Recovery = 81% -Core Loss = 29 cm -RQD = 7%			
			15.0				
RC-7				15.4			
				SANDSTONE; gray, moderately hard, massive, fine grained, micaceous, silty.			
			16.0				
				-qr (@ 16.2 m) = 46.62 MPa			
				-RC-7: Recovery = 98% -Core Loss = 6 cm -RQD = 78%			
			17.0				
			18.0				

NOTES:

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Boring Number: B-57
Project: ATH/MEG-33-30.980/0.000
Sheet: 4 of 4
Project Number: W-7139
Completion Depth: 20.1 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION		MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
RC-8				SHALE; gray, medium, highly broken, fissile, silty, slightly carbonaceous.	18.3			
			19.0	-RC-8: Recovery = 83% -Core Loss = 31 cm -RQD = 22%				
			20.0	-qr (@ 20.0 m) = 51.04 MPa	20.1			
				Bottom of Boring = 20.1 meters				

NOTES:

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-58
Sheet: 1 of 4
Completion Depth: 25.0 m

Date Started: 4/23/98
Date Finished: 4/23/98
Drilled By: M.F.

DRILLING AND SAMPLING INFORMATION

Northing: 138462.6
Easting: 636420.8
Elevation: 284.1 m**

Boring Method: 8.3 cm HSA/RC
Hammer Weight: 63.5 kg
Hammer Drop: 76 cm

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
SS-1	2 1 1	83		Brown SILTY fine SAND, little organics, trace fine gravel (Topsoil). Moist. 0.1	25		
SS-2	2 5 8	83		Brown fine SAND, some silt, trace coarse sand, trace clay. Very loose to dense. Moist. -SS-2: ODOT A-3a	18		
			1.0				
SS-3	10 17 28	67			12		
				1.8			
SS-4	26 50/10cm	100	2.0	Brown weathered SANDSTONE. Very soft bedrock.	12		
				2.6			
SS-5	23 48 44	94	3.0	Brown to grey INDURATED CLAY/WEATHERED MUDSTONE. Hard soil/very soft bedrock.			
			4.0				
SS-6	13 26 50/13cm	100					

NOTES: ** Elevation is approximate.

SAMPLE TYPE
SS - 5.1cm OD Split Spoon
GS - Geoprobe Sample
ST - Shelby Tube
RC - Rock Core
AS - Auger Sample

GROUND WATER READING
At Completion: N/A* m
After 24 Hrs: N/A m
* Wash water used during the coring process.

BORING METHOD
HSA - Hollow Stem Augers
SFA - Solid Flight Augers
MD - Mud Drilling
WD - Wash Drilling
RC - Rock Coring

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281 ENTERPRISE DRIVE
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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-58
Sheet: 2 of 4
Completion Depth: 25.0 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL / PL
			5.0			
SS-7	17 33 50/13cm	71	6.0			
			7.0			
SS-8	50/13cm	80	8.0			
SS-9	50/8cm	100	9.0			
RC-1				MUDSTONE; gray, soft, highly broken, calcareous, non-bedded. 9.1		
			10.0	-RC-1: Recovery = 60% -Core Loss = 61 cm -RQD = 0%		
RC-2			11.0			

NOTES: * * Elevation is approximate.

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139
Boring Number: B-58
Sheet: 3 of 4
Completion Depth: 25.0 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
			12.0	-RC-2: Recovery = 39% -Core Loss = 93 cm -RQD = 0%			
RC-3				12.2 SANDSTONE; brown, medium to moderately hard, massive, fine grained, micaceous, cross-bedded, slightly weathered, slightly jointed.			
			13.0	-qr (@ 13.5 m) = 29.50 MPa			
			14.0	-RC-3: Recovery = 100% -No Core Loss -RQD = 40%			
				14.3 MUDSTONE; gray, very soft to soft, highly broken, non-bedded, slightly jointed.			
			15.0	15.2			
RC-4				SILTSTONE; brown to gray, medium, slightly broken, argillaceous, micaceous, cross-bedded, slightly weathered.			
			16.0	-RC-4: Recovery = 98% -Core Loss = 6 cm -RQD = 17%			
				16.8 SHALE; gray, medium, highly broken, fissile, rare slickensides, slightly jointed.			
			17.0				
			18.0	18.0 LIMESTONE; gray, moderately hard to hard, massive, fine crystalline, argillaceous.			

NOTES: ** Elevation is approximate.

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139
Boring Number: B-58
Sheet: 4 of 4
Completion Depth: 25.0 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
RC-5			19.0	-qr (@ 18.4 m) = 26.84 MPa -RC-5: Recovery = 97% -Core Loss = 6 cm -RQD = 31%			
			20.0				
				MUDSTONE; red and gray, soft to moderately hard, highly broken, calcareous, non-bedded, with nodular limestone. (20.1)			
RC-6				-RC-6: Recovery = 57% -Core Loss = 46 cm -RQD = 0%			
			21.0				
				SHALE; gray to red, soft to medium, highly broken, fissile, calcareous, with gray limestone lenses up to 8 cm thick. (21.3)			
RC-7			22.0	-RC-7: Recovery = 100% -No Core Loss -RQD = 30%			
				LIMESTONE; gray, hard, massive, fine crystalline, argillaceous. (22.6)			
RC-8			23.0				
				MUDSTONE; red to gray, medium, slightly broken, non-bedded, rare slickensides. (23.2)			
				-RC-8: Recovery = 45% -Core Loss = 67 cm -RQD = 27%			
			24.0				
RC-9				SHALE; gray, medium, slightly broken, carbonaceous, fissile. (24.1)			
				-RC-9: Recovery = 75% -Core Loss = 23 cm -RQD = 29%			
			25.0	Bottom of Boring = 25.0 meters (25.0)			

NOTES: * Elevation is approximate.

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-59
Sheet: 1 of 1
Completion Depth: 1.9 m

Date Started: 4/22/98
Date Finished: 4/22/98
Drilled By: J.S.

DRILLING AND SAMPLING INFORMATION

Northing: 138296.6
Easting: 636527.6
Elevation: 253.4 m

Boring Method: Geoprobe
Hammer Weight: N/A
Hammer Drop: N/A

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
GS-1		100		Brown SILTY CLAY, trace coarse to fine sand, trace fine gravel. Damp.	11	43	19
				-GS-1: ODOT A-7-6 (14)			
			1.0				
				1.2			
GS-2		100		Brown INDURATED CLAY/WEATHERED MUDSTONE. Hard soil/very soft bedrock.			
				Geoprobe refusal @ 1.9 m			
				1.9			
				Bottom of Boring = 1.9 meters			

NOTES:

SAMPLE TYPE
SS - 5.1cm OD Split Spoon
GS - Geoprobe Sample
ST - Shelby Tube
RC - Rock Core
AS - Auger Sample

GROUND WATER READING
At Completion: Dry m
After 24 Hrs: N/A m

BORING METHOD
HSA - Hollow Stem Augers
SFA - Solid Flight Augers
MD - Mud Drilling
WD - Wash Drilling
RC - Rock Coring

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-60
Sheet: 1 of 1
Completion Depth: 1.7 m

Date Started: 4/10/98
Date Finished: 4/10/98
Drilled By: M.F.

DRILLING AND SAMPLING INFORMATION

Northing: 138155.1
Easting: 636577.2
Elevation: 237.7 m

Boring Method: 9.5 cm HSA
Hammer Weight: 63.5 kg
Hammer Drop: 76 cm

SAMPLE NO	BLOWS PER 16cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
SS-1	2 3 6	94		Brown fine to coarse SAND, some clayey silt, trace organics (Topsoil). Moist. 0.1	20		
SS-2	4 10 50/10cm	89		Brown SILTY fine to coarse SAND, some clay. Stiff to hard. Moist.	18		
			1.0				
ST-3		100		-ST-3: ODOT A-4a (2)	18	32	22
				Auger refusal @ 1.7 m 1.7			
				Bottom of Boring = 1.7 meters			

NOTES:

SAMPLE TYPE
SS - 5.1cm OD Split Spoon
GS - Geoprobe Sample
ST - Shelby Tube
RC - Rock Core
AS - Auger Sample

GROUND WATER READING
At Completion ▽ Dry m
After 24 Hrs ▼ N/A m

BORING METHOD
HSA - Hollow Stem Augers
SFA - Solid Flight Augers
MD - Mud Drilling
WD - Wash Drilling
RC Rock Coring

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-61
Sheet: 1 of 1
Completion Depth: 1.6 m

Date Started: 6/4/98
Date Finished: 6/4/98
Drilled By: S.B.

DRILLING AND SAMPLING INFORMATION

Northing: 138013.5
Easting: 636626.8
Elevation: 259.0 m

Boring Method: Geoprobe
Hammer Weight: N/A
Hammer Drop: N/A

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
GS-1		100	1.0	Reddish-brown SILTY CLAY, some sandstone fragments. Moist. 1.2	20		
GS-2		100		Light brown INDURATED CLAY/WEATHERED MUDSTONE. Hard soil/very soft bedrock. Geoprobe refusal @ 1.6 m 1.6	17		
				Bottom of Boring = 1.6 meters			

NOTES:

SAMPLE TYPE
SS - 5.1cm OD Split Spoon
GS - Geoprobe Sample
ST - Shelby Tube
RC - Rock Core
AS - Auger Sample

GROUND WATER READING
At Completion: Dry m
After 24 Hrs: N/A m

BORING METHOD
HSA - Hollow Stem Augers
SFA - Solid Flight Augers
MD - Mud Drilling
WD - Wash Drilling
RC - Rock Coring

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-62'
Sheet: 1 of 5
Completion Depth: 29.0 m

Date Started: 4/15/98
Date Finished: 4/15/98
Drilled By: M.F.

DRILLING AND SAMPLING INFORMATION

Northing: 137883.7
Easting: 636619.3
Elevation: 288.8 m

Boring Method: 8.3 cm HSA/RC
Hammer Weight: 63.5 kg
Hammer Drop: 76 cm

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
SS-1	2 1 3	56		Brown SILT, some clay, little organics, trace fine sand (Topsoil). Moist. 0.1	27		
SS-2	2 3 5	78	1.0	Brown to red CLAY, some silt, trace coarse to fine sand. Soft to very stiff. Moist.	33		
SS-3	3 6 9	61		-SS-3: ODOT A-7-6	26		
SS-4	6 8 10	83	2.0		28		
SS-5	5 7 8	100	3.0		29		
			4.0				
SS-6	4 8 8	56			19		

NOTES:

SAMPLE TYPE
SS - 5.1cm OD Split Spoon
GS - Geoprobe Sample
ST - Shelby Tube
RC - Rock Core
AS - Auger Sample

GROUND WATER READING
At Completion — N/A* m
After 24 Hrs ▼ N/A m
* Wash water used during the coring process.

BORING METHOD
HSA - Hollow Stem Augers
SFA - Solid Flight Augers
MD - Mud Drilling
WD - Wash Drilling
RC - Rock Coring

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Boring Number: B-62
Project: ATH/MEG-33-30.980/0.000
Sheet: 2 of 5
Project Number: W-7139
Completion Depth: 29.0 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL : PL
			5.0			
				5.1 Brown weathered SHALE. Very soft bedrock.		
			6.0			
RC-1				6.1 CLAY-SHALE (55%); brownish-gray, soft to medium, highly broken, slickensided, slightly weathered, slightly fissile, with interbedded SILTSTONE (45%); brownish-gray, medium, argillaceous, micaceous.		
			7.0			
				-RC-1: Recovery = 94% -Core Loss = 18 cm -RQD = 21%		
			8.0			
				-qr (@ 8.6 m) = 38.90 MPa		
			9.0			
RC-2				9.4 SANDSTONE; brown, medium, highly broken, very fine grained, micaceous, silty.		
			10.0			
				10.1 SHALE; dark gray, soft, highly broken, carbonaceous.		
				-RC-2: Recovery = 95% -Core Loss = 15 cm -RQD = 13%		
			11.0			

NOTES:

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281 ENTERPRISE DRIVE
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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Boring Number: B-62
Project: ATH/MEG-33-30.980/0.000
Sheet: 3 of 5
Project Number: W-7139
Completion Depth: 29.0 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
				11.6			
				SILTSTONE; gray, medium, massive, arenaceous, micaceous.			
			12.0				
				12.2			
RC-3				SHALE; dark gray and brown, soft to medium, highly broken, carbonaceous, fissile, slightly weathered.			
			13.0	-RC-3: Recovery = 80% -Core Loss = 30 cm -RQD = 0%			
RC-4							
			14.0				
				14.4			
				MUDSTONE; gray, soft to medium, slightly broken, non-bedded, silty, with nodular limestone.			
			15.0	-RC-4: Recovery = 95% -Core Loss = 8 cm -RQD = 8%			
				15.2			
RC-5				SILTSTONE (60%); gray, medium, slightly broken, argillaceous, micaceous, cross-bedded, with nodular limestone, with interbedded SHALE (40%); gray, soft to medium, highly broken, slickensided, silty, slightly micaceous, with nodular limestone.			
			16.0				
			17.0	-RC-5: Recovery = 95% -Core Loss = 8 cm -RQD = 27%			
				17.9			
			18.0	MUDSTONE; variegated brown, red, and gray, soft, highly broken, non-bedded,			

NOTES:

RESOURCE INTERNATIONAL, INC.
281 ENTERPRISE DRIVE
WESTERVILLE, OHIO 43081
(614) 885-1959

REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139
Boring Number: B-62
Sheet: 4 of 5
Completion Depth: 29.0 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
RC-6				slickensided, calacareous, silty.			
				-RC-6: Recovery = 90% -Core Loss = 8 cm -RQD = 0%			
			19.0				
RC-7				-RC-7: Recovery = 72% -Core Loss = 72% -RQD = 0%			
RC-8			20.0				
				20.3 SILTSTONE; gray, medium, massive, argillaceous, micaceous.			
			21.0	-RC-8: Recovery = 94% -Core Loss = 18 cm -RQD = 43%			
			22.0	22.1 MUDSTONE; gray, soft, highly broken, non-bedded, silty, with nodular limestone.			
				22.9			
RC-9			23.0	SILTSTONE; gray, medium, highly broken, micaceous, argillaceous.			
			24.0	-RC-9: Recovery = 100% -No Core Loss -RQD = 14%			
				24.7 SHALE; gray to red, medium to moderately hard, highly broken, fissile.			
			25.0				

NOTES:

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139
Boring Number: B-62
Sheet: 5 of 5
Completion Depth: 29.0 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
RC-10			26.0				
				26.8			
			27.0	LIMESTONE; gray, medium to moderately hard, highly broken, highly jointed, fine crystalline, argillaceous. -RC-10: Recovery = 80% -Core Loss = 53 cm -RQD = 8%			
			28.0				
				28.5			
RC-11				SHALE; dark gray, medium, highly broken, carbonaceous, fissile. -RC-11: Recovery = 77% -Core Loss = 9 cm -RQD = 0%			
			29.0	29.0			
				Bottom of Boring = 29.0 meters			

NOTES:

RESOURCE INTERNATIONAL, INC.
281 ENTERPRISE DRIVE
WESTERVILLE, OHIO 43081
(614) 885-1959

REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-63
Sheet: 1 of 3
Completion Depth: 15.2 m

Date Started: 4/8/98
Date Finished: 4/8/98
Drilled By: M.F.

DRILLING AND SAMPLING INFORMATION

Northing: 137692.8
Easting: 636739.7
Elevation: 286.0 m

Boring Method: 9.5 cm HSA/RC
Hammer Weight: 63.5 kg
Hammer Drop: 76 cm

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
SS-1	1 2 3	67		Reddish-brown SILTY CLAY, little coarse to fine sand, trace organics (Topsoil). Moist. 0.1	28		
SS-2	2 3 4	83	1.0	Red CLAY, some silt, some fine sand, trace coarse sand, trace fine gravel. Medium stiff to very stiff. Moist to damp.	32		
SS-3	2 6 9	89			30		
SS-4	2 8 11	100	2.0	-SS-4: ODOT A-7-6 (17)	28	53	24
SS-5	6 8 11	94	3.0		23		
			4.0				
SS-6	8 12 15	89			14		

NOTES:

SAMPLE TYPE
SS - 5.1cm OD Split Spoon
GS - Geoprobe Sample
ST - Shelby Tube
RC - Rock Core
AS - Auger Sample

GROUND WATER READING
At Completion: N/A * m
After 24 Hrs: ▼ N/A m
* Wash water used during the coring process.

BORING METHOD
HSA - Hollow Stem Augers
SFA - Solid Flight Augers
MD - Mud Drilling
WD - Wash Drilling
RC - Rock Coring

RESOURCE INTERNATIONAL, INC.
281 ENTERPRISE DRIVE
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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Boring Number: B-63
Project: ATH/MEG-33-30.980/0.000
Sheet: 2 of 3
Project Number: W-7139
Completion Depth: 15.2 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
				Red to gray INDURATED CLAY/WEATHERED MUDSTONE. Hard soil/very soft bedrock.			
			4.6				
			5.0				
SS-7	50/8cm	100		Auger refusal @ 5.8 m			
			5.8				
RC-1			6.0	MUDSTONE; brown, soft, highly broken, non-bedded.			
				-RC-1: Recovery = 78% -Core Loss = 27 cm -RQD = 10%			
RC-2			7.0				
			7.3	SHALE; gray to brown, soft, massive, fissile, silty.			
			8.0	-RC-2: Recovery = 96% -Core Loss = 9 cm -RQD = 40%			
				-qr (@ 8.4 m) = 18.55 MPa			
			8.5	SILTSTONE; brown, medium, massive, micaceous, argillaceous, cross-bedded.			
			9.0				
			9.1	SHALE (55%); brown, medium, slightly broken, micaceous, with interbedded SILTSTONE (45%); brown, medium, slightly broken, micaceous, cross-bedded.			
RC-3			10.0	-RC-3: Recovery = 79% -Core Loss = 32 cm -RQD = 30%			
RC-4				-gray, soft, carbonaceous shale from 10.8 to 11.3 m			
			11.0				
			11.3				

NOTES:

RESOURCE INTERNATIONAL, INC.
281 ENTERPRISE DRIVE
WESTERVILLE, OHIO 43081
(614) 885-1959

REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Boring Number: B-63
Project: ATH/MEG-33-30.980/0.000
Sheet: 3 of 3
Project Number: W-7139
Completion Depth: 15.2 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
			12.0	SANDSTONE; brown, medium to moderately hard, highly broken, highly jointed, fine grained, silty, slightly weathered. -RC-4: Recovery = 100% -No Core Loss -RQD = 26%			
RC-5			13.0	12.2 SHALE; brown to gray, very soft to medium, highly broken, carbonaceous, fissile. -RC-5: Recovery = 82% -Core Loss = 27 cm -RQD = 0%			
RC-6			14.0	-RC-6: Recovery = 98% -Core Loss = 1 cm -RQD = 25%			
RC-7			15.0	14.3 MUDSTONE; brown to gray, very soft to soft, highly broken, non-bedded, calcareous. -RC-7: Recovery = 98% -Core Loss = 2 cm -RQD = 14%			
				15.2 Bottom of Boring = 15.2 meters			

NOTES:

RESOURCE INTERNATIONAL, INC.
281 ENTERPRISE DRIVE
WESTERVILLE, OHIO 43081
(614) 885-1959

REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-64
Sheet: 1 of 1
Completion Depth: 2.3 m

Date Started: 4/17/98
Date Finished: 4/17/98
Drilled By: M.F.

DRILLING AND SAMPLING INFORMATION

Northing: 137540.1
Easting: 636799.9
Elevation: 267.8 m**

Boring Method: 8.3 cm HSA
Hammer Weight: 63.5 kg
Hammer Drop: 76 cm

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
SS-1	1 2 2	39		Brown fine SANDY SILT, little organics, trace clay (Topsoil). Moist. 0.1	26		
ST-2		92	1.0	Reddish-brown SILTY CLAY, some fine sand (sand seams), trace coarse sand. Medium stiff to stiff. Moist. -ST-2: ODOT A-7-6 (19) 1.1	25	76	18
SS-3	3 5 7	78		Brown CLAYEY SILT, little fine sand, little fine gravel, trace coarse sand. Stiff to very stiff. Moist. -SS-3: Visual ODOT A-6a	21		
SS-4	3 21 50/3cm	85	2.0	2.1	19		
				Brown weathered SANDSTONE. Very soft bedrock. 2.3 Auger refusal @ 2.3 m Bottom of Boring = 2.3 meters			

NOTES: ** Elevation is approximate.

SAMPLE TYPE
SS - 5.1cm OD Split Spoon
GS - Geoprobe Sample
ST - Shelby Tube
RC - Rock Core
AS - Auger Sample

GROUND WATER READING
At Completion ∓ Dry m
After 24 Hrs ▼ N/A m

BORING METHOD
HSA - Hollow Stem Augers
SFA - Solid Flight Augers
MD - Mud Drilling
WD - Wash Drilling
RC - Rock Coring

RESOURCE INTERNATIONAL, INC.
281 ENTERPRISE DRIVE
WESTERVILLE, OHIO 43081
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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-65
Sheet: 1 of 1
Completion Depth: 3.0 m

Date Started: 4/17/98
Date Finished: 4/17/98
Drilled By: M.F.

DRILLING AND SAMPLING INFORMATION

Northing: 137423.9
Easting: 636858.5
Elevation: 282.1 m**

Boring Method: 8.3 cm HSA
Hammer Weight: 63.5 kg
Hammer Drop: 76 cm

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
SS-1	2 2 3	22		Brown fine SANDY SILT, trace organics (Topsoil). Moist. 0.1	31		
SS-2	2 2 4	78	1.0	Reddish-brown CLAY, some silt, trace coarse to fine sand. Medium stiff to very stiff. Moist. -SS-2: ODOT A-7-6	35		
SS-3	3 4 6	56			32		
SS-4	5 8 9	89	2.0	2.3	27		
SS-5	14 18 19	89	3.0	Red INDURATED CLAY/WEATHERED MUDSTONE. Hard soil/very soft bedrock. 3.0			
				Bottom of Boring = 3.0 meters			

NOTES: ** Elevation is approximate.

SAMPLE TYPE
SS - 5.1cm OD Split Spoon
GS - Geoprobe Sample
ST - Shelby Tube
RC - Rock Core
AS - Auger Sample

GROUND WATER READING
At Completion — Dry m
After 24 Hrs ▼ N/A m

BORING METHOD
HSA - Hollow Stem Augers
SFA - Solid Flight Augers
MD - Mud Drilling
WD - Wash Drilling
RC - Rock Coring

RESOURCE INTERNATIONAL, INC.
281 ENTERPRISE DRIVE
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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-66
Sheet: 1 of 3
Completion Depth: 17.1 m

Date Started: 4/17/98
Date Finished: 4/17/98
Drilled By: M.F.

DRILLING AND SAMPLING INFORMATION

Northing: 137334.2
Easting: 636934.5
Elevation: 297.2 m

Boring Method: 8.3 cm HSA/RC
Hammer Weight: 63.5 kg
Hammer Drop: 76 cm

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
SS-1	2 2 3	67		Brown SILTY fine SAND, little organics, trace clay (Topsoil). Moist. 0.1	24		
SS-2	3 5 10	78	1.0	Brown SILT and CLAY, little fine sand. Medium stiff to very stiff. Moist. 1.1	23		
SS-3	5 12 21	78		Brownish-gray SILTY fine SAND, some clay, trace coarse sand. Hard. Moist. -SS-3: ODOT A-4a 2.0	16		
SS-4	16 38 50/8cm	83	2.0	Brown weathered SANDSTONE. Very soft bedrock.	10		
SS-5	24 50/8cm	100	3.0				
			4.0				
SS-6	36 50/8cm	89					

NOTES:

SAMPLE TYPE
SS - 5.1cm OD Split Spoon
GS - Geoprobe Sample
ST - Shelby Tube
RC - Rock Core
AS - Auger Sample

GROUND WATER READING
At Completion: N/A * m
After 24 Hrs: ▼ N/A m
* Wash water used during the coring process.

BORING METHOD
HSA - Hollow Stem Augers
SFA - Solid Flight Augers
MD - Mud Drilling
WD - Wash Drilling
RC - Rock Coring

RESOURCE INTERNATIONAL, INC.
281 ENTERPRISE DRIVE
WESTERVILLE, OHIO 43081
(614) 885-1959

REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139
Boring Number: B-66
Sheet: 2 of 3
Completion Depth: 17.1 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
			5.0				
SS-7	34 21 12	83	6.0				
AS-8							
			7.0				
SS-9	50/3cm	0					
					7.3		
RC-1				LIMESTONE; gray, moderately hard, highly broken, fine crystalline, slightly weathered, slightly jointed. -RC-1: Recovery = 16% -Core Loss = 64 cm -RQD = 0%			
RC-2			8.0	-RC-2: Recovery = 25% -Core Loss = 46 cm -RQD = 0%			
					8.7		
RC-3				MUDSTONE; gray, very soft to soft, highly broken, non-bedded, silty.	9.0		
			9.0	LIMESTONE; gray, moderately hard to hard, slightly broken, fine crystalline, argillaceous, with chert nodules. -RC-3: Recovery = 94% -Core Loss = 9 cm -RQD = 22% -qr (@ 9.7 m) = 32.12 MPa			
			10.0				
					10.2		
RC-4				MUDSTONE; gray to red, very soft to medium, highly broken, non-bedded, calcareous, rare slickensides. -RC-4: Recovery = 48% -Core Loss = 63 cm -RQD = 0%			
			11.0				

NOTES:

RESOURCE INTERNATIONAL, INC.
281 ENTERPRISE DRIVE
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(614) 885-1959

REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Boring Number: B-66
Project: ATH/MEG-33-30.980/0.000
Sheet: 3 of 3
Project Number: W-7139
Completion Depth: 17.1 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
RC-5							
			12.0	-RC-5: Recovery = 75% -Core Loss = 15 cm -RQD = 0% -arenaceous from 12.0 to 13.5 m			
RC-6							
			13.0	-RC-6: Recovery = 95% -Core Loss = 8 cm -RQD = 0%			
RC-7							
			14.0				
				-RC-7: Recovery = 80% -Core Loss = 30 cm -RQD = 23%			
			15.0				
RC-8							
			16.0				
				-RC-8: Recovery = 93% -Core Loss = 14 cm -RQD = 5%			
			17.0				
				17.1 Bottom of Boring = 17.1 meters			

NOTES:

RESOURCE INTERNATIONAL, INC.
281 ENTERPRISE DRIVE
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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-67
Sheet: 1 of 1
Completion Depth: 2.7 m

Date Started: 4/17/98
Date Finished: 4/17/98
Drilled By: M.F.

DRILLING AND SAMPLING INFORMATION

Northing: 137203.2
Easting: 636997.5
Elevation: 278.5 m**

Boring Method: 8.3 cm HSA
Hammer Weight: 63.5 kg
Hammer Drop: 76 cm

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
SS-1	1 2 2	56		Brown SILTY fine SAND, little clay, trace organics (Topsoil). Moist. 0.1	27		
SS-2	4 4 5	72	1.0	Brown and red CLAY, little silt, trace coarse to fine sand. Soft to very stiff. Moist to damp. -SS-2: ODOT A-7-6 (20)	27	68	24
SS-3	5 10 14	67			14		
SS-4	8 10 16	89	2.0	2.5	22		
SS-5	50/13cm	80		Brown weathered SANDSTONE. Very soft bedrock. 2.7 Auger refusal @ 2.7 m Bottom of Boring = 2.7 meters			

NOTES: ** Elevation is approximate.

SAMPLE TYPE
SS - 5.1cm OD Split Spoon
GS - Geoprobe Sample
ST - Shelby Tube
RC - Rock Core
AS - Auger Sample

GROUND WATER READING
At Completion: Dry m
After 24 Hrs: ▼ N/A m

BORING METHOD
HSA - Hollow Stem Augers
SFA - Solid Flight Augers
MD - Mud Drilling
WD - Wash Drilling
RC - Rock Coring

RESOURCE INTERNATIONAL, INC.
281 ENTERPRISE DRIVE
WESTERVILLE, OHIO 43081
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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-68
Sheet: 1 of 1
Completion Depth: 4.5 m

Date Started: 4/17/98
Date Finished: 4/17/98
Drilled By: M.F.

DRILLING AND SAMPLING INFORMATION

Northing: 137028.0
Easting: 637122.2
Elevation: 277.2 m**

Boring Method: 8.3 cm HSA
Hammer Weight: 63.5 kg
Hammer Drop: 76 cm

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
SS-1	W 1 1	56		Brown SILTY fine SAND, little clay, trace organics (Topsoil). Moist. 0.1	18		
SS-2	5 8 9	61	1.0	Brown SILTY CLAY, trace coarse to fine sand. Soft to very stiff. Moist. -SS-1: Visual ODOT A-6b	29		
SS-3	9 20 50/15cm	67		1.4			
SS-4	39 50/5cm	100	2.0	Brown INDURATED CLAY/WEATHERED MUDSTONE. Hard soil/very soft bedrock.			
SS-5	45 50/3cm	86	3.0				
			4.0				
SS-6	50/13cm	80		4.5 Bottom of Boring = 4.5 meters			

NOTES: ** Elevation is approximate; W = weight of hammer

SAMPLE TYPE
SS - 5.1cm OD Split Spoon
GS - Geoprobe Sample
ST - Shelby Tube
RC - Rock Core
AS - Auger Sample

GROUND WATER READING
At Completion ▽ Dry m
After 24 Hrs ▼ N/A m

BORING METHOD
HSA - Hollow Stem Augers
SFA - Solid Flight Augers
MD - Mud Drilling
WD - Wash Drilling
RC - Rock Coring

RESOURCE INTERNATIONAL, INC.
281 ENTERPRISE DRIVE
WESTERVILLE, OHIO 43081
(614) 885-1959

REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-69
Sheet: 1 of 2
Completion Depth: 6.6 m

Date Started: 4/20/98
Date Finished: 4/20/98
Drilled By: M.F.

DRILLING AND SAMPLING INFORMATION

Northing: 136918.2
Easting: 637192.0
Elevation: 268.6 m

Boring Method: 8.3 cm HSA
Hammer Weight: 63.5 kg
Hammer Drop: 76 cm

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
SS-1	2 2 3	83		Brown fine SANDY SILT, little organics (Topsoil). Moist. 0.1	35		
ST-2		100		Brown CLAYEY SILT, some fine sand, trace coarse sand, trace fine gravel. Medium stiff. Moist. -ST-2: ODOT A-6a (5)	24	29	16
			1.0	-groundwater initially encountered @ 1.1 m 1.1			
SS-3	3 2 3	33		Brown SILTY coarse to fine SAND, trace clay. Medium stiff. Moist. -SS-3: ODOT A-3a	23		
				1.8			
SS-4	4 15 22	44	2.0	Red to gray INDURATED CLAY/WEATHERED MUDSTONE. Hard soil/very soft bedrock.			
SS-5	33 50/13cm	82	3.0				
			4.0				
SS-6	26 50/10cm	67					

NOTES:

SAMPLE TYPE
SS - 5.1cm OD Split Spoon
GS - Geoprobe Sample
ST - Shelby Tube
RC - Rock Core
AS - Auger Sample

GROUND WATER READING
At Completion ▽ 5.9 m
After 24 Hrs ▼ N/A m

BORING METHOD
HSA - Hollow Stem Augers
SFA - Solid Flight Augers
MD - Mud Drilling
WD - Wash Drilling
RC - Rock Coring

RESOURCE INTERNATIONAL, INC.
281 ENTERPRISE DRIVE
WESTERVILLE, OHIO 43081
(614) 885-1959

REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Boring Number: B-69
Project: ATH/MEG-33-30.980/0.000
Sheet: 2 of 2
Project Number: W-7139
Completion Depth: 6.6 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
			5.0				
SS-7	16 50/5cm	88	6.0 ▽				
				Auger refusal @ 6.6 m 6.6 Bottom of Boring = 6.6 meters			

NOTES:

RESOURCE INTERNATIONAL, INC.
281 ENTERPRISE DRIVE
WESTERVILLE, OHIO 43081
(614) 885-1959

REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-70
Sheet: 1 of 3
Completion Depth: 15.2 m

Date Started: 4/21/98
Date Finished: 4/21/98
Drilled By: M.F.

DRILLING AND SAMPLING INFORMATION

Northing: 136798.3
Easting: 637304.0
Elevation: 293.6 m

Boring Method: 8.3 cm HSA/RC
Hammer Weight: 63.5 kg
Hammer Drop: 76 cm

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
SS-1	2 3 5	44		Brown SILTY fine SAND, little organics, trace clay (Topsoil). Moist. 0.1	23		
SS-2	2 3 3	89		Brown fine SAND, some clay, little silt, trace coarse sand. Loose. Moist. -SS-2: ODOT A-4a	19		
SS-3	3 4 5	67	1.0		16		
SS-4	4 5 8	67	1.8 / 2.0	Brownish-gray SILTY CLAY, trace to some fine sand, trace fine gravel. Stiff to very stiff. Damp to moist.	18		
SS-5	6 6 11	72	3.0		25		
SS-6	3 5 8	78	4.0		13		

NOTES:

SAMPLE TYPE
SS - 5.1cm OD Split Spoon
GS - Geoprobe Sample
ST - Shelby Tube
RC - Rock Core
AS - Auger Sample

GROUND WATER READING
At Completion ▽ N/A * m
After 24 Hrs ▼ N/A m
* Wash water used during the coring process.

BORING METHOD
HSA - Hollow Stem Augers
SFA - Solid Flight Augers
MD - Mud Drilling
WD - Wash Drilling
RC - Rock Coring

RESOURCE INTERNATIONAL, INC.
281 ENTERPRISE DRIVE
WESTERVILLE, OHIO 43081
(614) 885-1959

REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Boring Number: B-70
Project: ATH/MEG-33-30.980/0.000
Sheet: 2 of 3
Project Number: W-7139
Completion Depth: 15.2 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
			6.0				
				5.6			
SS-7	9 39 50/8cm	93	6.0	Brownish-gray INDURATED CLAY/WEATHERED MUDSTONE. Hard soil/very soft bedrock.			
			7.0				
SS-8	19 50/10cm	70					
			8.0				
SS-9	50/10cm	50					
			9.0	Auger refusal @ 9.1 m			
				9.1			
RC-1				MUDSTONE; red, very soft to soft, slightly broken, non-bedded, calcareous.			
			10.0	-RC-1: Recovery = 76% -Core Loss = 36 cm -RQD = 26%			
RC-2							
			11.0				

NOTES:

RESOURCE INTERNATIONAL, INC.
281 ENTERPRISE DRIVE
WESTERVILLE, OHIO 43081
(614) 885-1959

REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Boring Number: B-70
Project: ATH/MEG-33-30.980/0.000
Sheet: 3 of 3
Project Number: W-7139
Completion Depth: 15.2 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
			12.0	-RC-2: Recovery = 80% -Core Loss = 30 cm -RQD = 27%			
RC-3			13.0	-RC-3: Recovery = 76% -Core Loss = 36 cm -RQD = 27%			
RC-4			14.0	-RC-4: Recovery = 40% -Core Loss = 91 cm -RQD = 0%			
			15.0				
			15.2	Bottom of Boring = 15.2 meters			

NOTES:

RESOURCE INTERNATIONAL, INC.
281 ENTERPRISE DRIVE
WESTERVILLE, OHIO 43081
(614) 885-1959

REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-71
Sheet: 1 of 2
Completion Depth: 7.9 m

Date Started: 4/20/98
Date Finished: 4/20/98
Drilled By: M.F.

DRILLING AND SAMPLING INFORMATION

Northing: 136770.9
Easting: 637256.3
Elevation: 284.4 m

Boring Method: 8.3 cm HSA
Hammer Weight: 63.5 kg
Hammer Drop: 76 cm

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
SS-1	2 1 3	83		Brown fine SANDY SILT, little organics, trace clay (Topsoil). Moist. 0.1	25		
SS-2	2 3 3	67	1.0	Brown to reddish-brown CLAY, some silt, trace fine sand. Soft to medium stiff. Moist. 1.1	35		
SS-3	3 3 6	44		Reddish-brown CLAYEY SILT, some fine sand, trace coarse sand. Stiff to hard. Damp to moist.	31		
SS-4	4 6 10	89	2.0		32		
SS-5	3 5 7	100	3.0		33		
SS-6	10 22 39	100	4.0	-SS-6: ODOT A-6a (9)	17	36	21

NOTES:

SAMPLE TYPE
SS - 5.1cm OD Split Spoon
GS - Geoprobe Sample
ST - Shelby Tube
RC - Rock Core
AS - Auger Sample

GROUND WATER READING
At Completion ▽ Dry ... m
After 24 Hrs ▼ N/A ... m

BORING METHOD
HSA - Hollow Stem Augers
SFA - Solid Flight Augers
MD - Mud Drilling
WD - Wash Drilling
RC - Rock Coring

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REPORT OF SOIL EXPLORATION

Client Sverdrup Associates, Inc.
Boring Number B-71
Project ATH/MEG-33-30.980/0.000
Sheet 2 of 2
Project Number W-7139
Completion Depth 7.9 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
			5.0				
SS-7	3 5 9	83	6.0		28		
			7.0				
SS-8	15 25 34	100			17		
				7.9 Bottom of Boring = 7.9 meters			

NOTES:

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-72
Sheet: 1 of 2
Completion Depth: 4.9 m

Date Started: 4/20/98
Date Finished: 4/20/98
Drilled By: M.F.

DRILLING AND SAMPLING INFORMATION

Northing: 136650.2
Easting: 637347.1
Elevation: 267.8 m

Boring Method: 8.3 cm HSA
Hammer Weight: 63.5 kg
Hammer Drop: 76 cm

SAMPLE NO	BLOWS PER 16cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
SS-1	1 2 2	83		Brown fine SANDY SILT, little organics, trace coarse sand (Topsoil). Moist. 0.1	31		
ST-2		88		Brown to brownish-gray SILTY CLAY, trace to little fine sand, trace coarse sand. Soft to medium stiff. Moist. -ST-2: ODOT A-7-6 (20)	27	58	25
			1.0				
SS-3	4 7 10	67			19		
SS-4	4 7 9	56	2.0	-SS-4: ODOT A-7-6 (15)	22	46	21
SS-5	3 6 8	67			21		
			3.0				
			4.0				
				Red INDURATED CLAY/WEATHERED 4.4			

NOTES:

SAMPLE TYPE
SS - 5.1cm OD Split Spoon
GS - Geoprobe Sample
ST - Shelby Tube
RC - Rock Core
AS - Auger Sample

GROUND WATER READING
At Completion: Dry m
After 24 Hrs: ▼ N/A m

BORING METHOD
HSA - Hollow Stem Augers
SFA - Solid Flight Augers
MD - Mud Drilling
WD - Wash Drilling
RC - Rock Coring

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REPORT OF SOIL EXPLORATION

Client Sverdrup Associates, Inc.
Project ATH/MEG-33-30.980/0.000
Project Number W-7139

Boring Number B-72
Sheet 2 of 2
Completion Depth 4.9 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
SS-6	12 29 50/10cm	100		MUDSTONE. Hard soil/very soft bedrock.			
			4.9	Bottom of Boring = 4.9 meters			

NOTES:

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-73
Sheet: 1 of 3
Completion Depth: 13.1 m

Date Started: 4/21/98
Date Finished: 4/21/98
Drilled By: M.F.

DRILLING AND SAMPLING INFORMATION

Northing: 136573.2
Easting: 637423.8
Elevation: 282.8 m

Boring Method: 8.3 cm HSA/RC
Hammer Weight: 63.5 kg
Hammer Drop: 76 cm

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
SS-1	4 2 3	50		Brown fine SANDY SILT, little organics, trace clay (Topsoil). Moist. 0.1	28		
SS-2	2 4 6	67		Mottled red, brown, and gray SILTY CLAY, little fine sand, trace coarse sand. Medium stiff to hard. Moist to damp.	32		
			1.0				
SS-3	6 8 12	78		-SS-3: Visual ODOT A-6b	21		
SS-4	8 9 13	67	2.0		19		
SS-5	10 13 12	50	3.0		18		
			4.0				
SS-6	6 10 19	61			19		

NOTES:

SAMPLE TYPE
SS - 5.1cm OD Split Spoon
GS - Geoprobe Sample
ST - Shelby Tube
RC - Rock Core
AS - Auger Sample

GROUND WATER READING
At Completion ▽ N/A* m
After 24 Hrs ▼ N/A m
* Wash water used during the coring process.

BORING METHOD
HSA - Hollow Stem Augers
SFA - Solid Flight Augers
MD - Mud Drilling
WD - Wash Drilling
RC - Rock Coring

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139
Boring Number: B-73
Sheet: 2 of 3
Completion Depth: 13.1 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
			5.0				
SS-7	13 27 36	100	6.0		18		
				6.1 Brown INDURATED CLAY/WEATHERED MUDSTONE. Hard soil/very soft bedrock.			
			7.0				
SS-8	50/8cm	67					
				7.6 MUDSTONE; gray, soft to medium, highly broken, non-bedded, calcareous, silty.			
RC-1			8.0				
			9.0	-RC-1: Recovery = 66% -Core Loss = 104 cm -RQD = 11%			
			10.0				
				10.7			
RC-2				SILTSTONE; gray, medium, massive, argillaceous, micaceous.			
			11.0				

NOTES:

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Boring Number: B-73
Project: ATH/MEG-33-30.980/0.000
Sheet: 3 of 3
Project Number: W-7139
Completion Depth: 13.1 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
				11.6			
			12.0	SANDSTONE; gray, medium, massive, fine grained, micaceous, silty. -RC-2: Recovery = 100% -No Core Loss -RQD = 78%			
			13.0	13.1			
				Bottom of Boring = 13.1 meters			

NOTES:

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-74
Sheet: 1 of 2
Completion Depth: 6.1 m

Date Started: 4/20/98
Date Finished: 4/20/98
Drilled By: M.F.

DRILLING AND SAMPLING INFORMATION

Northing: 136375.3
Easting: 637474.0
Elevation: 274.0 m

Boring Method: 8.3 cm HSA/RC
Hammer Weight: 63.5 kg
Hammer Drop: 76 cm

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
SS-1	2 1 3	83		Brown SILT, some fine sand, little organics, trace clay (Topsoil). Moist. 0.1	30		
SS-2	2 3 7	44		Brown SILT, some clay, trace organics. Soft. Moist. 0.5	26		
			1.0	Brown SILTY CLAY, trace fine sand. Stiff. Moist. 1.1			
SS-3	30 50/8cm	78		Brown weathered SANDSTONE. Very soft bedrock.			
SS-4	50/10cm	75	2.0				
				Auger refusal @ 2.7 m 2.7			
RC-1			3.0	SANDSTONE; brown, medium to moderately hard, slightly broken, fine grained, micaceous, silty, with brown clay seams up to 5 cm thick.			
				-RC-1: Recovery = 91% -Core Loss = 16 cm			
			4.0	-RQD = 26%			

NOTES:

SAMPLE TYPE
SS - 5.1cm OD Split Spoon
GS - Geoprobe Sample
ST - Shelby Tube
RC - Rock Core
AS - Auger Sample

GROUND WATER READING
At Completion: N/A* m
After 24 Hrs: N/A m
* Wash water used during the coring process.

BORING METHOD
HSA - Hollow Stem Augers
SFA - Solid Flight Augers
MD - Mud Drilling
WD - Wash Drilling
RC - Rock Coring

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Boring Number: B-74
Project: ATH/MEG-33-30.980/0.000
Sheet: 2 of 2
Project Number: W-7139
Completion Depth: 6.1 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
RC-2							
				4.9			
			5.0	SHALE; brown to gray, soft to medium, highly broken, silty, micaceous, fissile.			
				-RC-2: Recovery = 99% -Core Loss = 2 cm -RQD = 0%			
			6.0				
				6.1			
				Bottom of Boring = 6.1 meters			

NOTES:

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-75
Sheet: 1 of 1
Completion Depth: 1.2 m

Date Started: 6/2/98
Date Finished: 6/2/98
Drilled By: S.B.

DRILLING AND SAMPLING INFORMATION

Northing: 136222.5
Easting: 637482.9
Elevation: 264.3 m

Boring Method: Geoprobe
Hammer Weight: N/A
Hammer Drop: N/A

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
~~GS-1~~		100		Brown CLAYEY SILT, some fine sand, little coarse sand, trace organics (Topsoil). Moist. 0.1			
GS-2		100		Light brown SILTY CLAY, little coarse to fine sand. Moist.	15		
				0.9			
GS-3		100	1.0	Reddish-brown to gray INDURATED CLAY/WEATHERED MUDSTONE. Hard soil/very soft bedrock. 1.2	15		
GS-4		100		Geoprobe refusal @ 1.2 m	10		
				Bottom of Boring = 1.2 meters			

NOTES:

SAMPLE TYPE
SS - 5.1cm OD Split Spoon
GS - Geoprobe Sample
ST - Shelby Tube
RC - Rock Core
AS - Auger Sample

GROUND WATER READING
At Completion ∓ Dry m
After 24 Hrs ▼ N/A m

BORING METHOD
HSA - Hollow Stem Augers
SFA - Solid Flight Augers
MD - Mud Drilling
WD - Wash Drilling
RC - Rock Coring

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-76
Sheet: 1 of 5
Completion Depth: 28.2 m

Date Started: 5/1/98
Date Finished: 5/1/98
Drilled By: M.F.

DRILLING AND SAMPLING INFORMATION

Northing: 136130.6
Easting: 637539.2
Elevation: 287.4 m

Boring Method: 8.3 cm HSA/RC
Hammer Weight: 63.5 kg
Hammer Drop: 76 cm

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
SS-1	2 2 4	67		Brown fine SANDY SILT, little coarse sand, trace organics (Topsoil). Moist. 0.1	25		
SS-2	5 10 12	89	1.0	Brown to brownish-gray SILTY CLAY, little fine sand, trace coarse sand, trace fine gravel. Medium stiff to very stiff. Damp to moist.	17		
SS-3	5 7 8	61			15		
SS-4	5 8 10	61	2.0		19		
SS-5	3 2 5	56	3.0		28		
			4.0	4.1			
SS-6	24 50/13cm	91		Brown INDURATED CLAY/WEATHERED MUDSTONE. Hard soil/very soft bedrock.			

NOTES:

SAMPLE TYPE
SS - 5.1cm OD Split Spoon
GS - Geoprobe Sample
ST - Shelby Tube
RC - Rock Core
AS - Auger Sample

GROUND WATER READING
At Completion ▽ N/A * m
After 24 Hrs ▼ N/A m
* Wash water used during the coring process.

BORING METHOD
HSA - Hollow Stem Augers
SFA - Solid Flight Augers
MD - Mud Drilling
WD - Wash Drilling
RC - Rock Coring

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REPORT OF SOIL EXPLORATION

Client Sverdrup Associates, Inc.
Project ATH/MEG-33-30.980/0.000
Project Number W-7139

Boring Number B-76
Sheet 2 of 5
Completion Depth 28.2 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
			5.0				
SS-7	22 50/3cm	86	6.0				
			7.0				
SS-8	50/10cm	75	8.0				
SS-9	50/10cm	75	9.0				
			10.0				
SS-10	50/10cm	100	11.0				

NOTES:

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139
Boring Number: B-76
Sheet: 3 of 5
Completion Depth: 28.2 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL / PL
				11.8		
~~SS-11~~ RC-1	50/5cm	0	12.0	MUDSTONE; red to gray, very soft to soft, highly broken, highly jointed, arenaceous, non-bedded.		
			13.0	-RC-1: Recovery = 39% -Core Loss = 119 cm -RQD = 0%		
RC-2			14.0			
			15.0	-RC-2: Recovery = 63% -Core Loss = 56 cm -RQD = 0%		
RC-3			16.0	-gray, moderately hard siltstone lens from 15.7 to 15.9 m -RC-3: Recovery = 97% -Core Loss = 4 cm -RQD = 31%		
				16.5		
RC-4			17.0	SILTSTONE (55%) with interbedded SHALE (45%); gray, very soft to moderately hard, slightly broken, slightly jointed, micaceous, arenaceous, fissile. -qr on siltstone (@ 16.7 m) = 42.70 MPa		
			18.0	-RC-4: Recovery = 98% -Core Loss = 6 cm -RQD = 40%		

NOTES:

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139
Boring Number: B-76
Sheet: 4 of 5
Completion Depth: 28.2 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
				SANDSTONE; gray, moderately hard, slightly broken, slightly jointed, fine grained, micaceous, cross-bedded. 18.3 – 18.9			
			19.0	SILTSTONE; gray, moderately hard, slightly broken, arenaceous, micaceous.			
RC-5			20.0	20.7			
			21.0	MUDSTONE; gray, very soft to medium, highly broken, highly jointed, fissile, micaceous, arenaceous, slickensided. -RC-5: Recovery = 97% -Core Loss = 9 cm -RQD = 30%			
			22.0	-gray, soft shale lens from 22.6 to 22.9 m			
RC-6			23.0	23.5			
				SILTSTONE; red to gray, soft to moderately hard, highly broken, highly jointed, fissile, calcareous. -RC-6: Recovery = 98% -Core Loss = 3 cm -RQD = 16%			
RC-7			24.0	-gray, moderately hard shale lens from 24.1 to 24.3 m			
			25.0				

NOTES:

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REPORT OF SOIL EXPLORATION

Client Sverdrup Associates, Inc.
Project ATH/MEG-33-30.980/0.000
Project Number W-7139

Boring Number B-76
Sheet 5 of 5
Completion Depth 28.2 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
				-RC-7: Recovery = 83% -Core Loss = 52 cm -RQD = 36%			
				25.9			
			26.0	MUDSTONE; varigated gray, red, and brown, very soft, highly broken, highly jointed, fissile, calcareous, arenaceous.			
			27.0				
RC-8							
				-RC-8: Recovery = 80% -Core Loss = 15 cm -RQD = 53%			
			28.0				
				28.2			
				Bottom of Boring = 28.2 meters			

NOTES:

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-78
Sheet: 1 of 3
Completion Depth: 13.1 m

Date Started: 4/29/98
Date Finished: 4/29/98
Drilled By: M.F.

DRILLING AND SAMPLING INFORMATION

Northing: 135838.2
Easting: 637609.2
Elevation: 280.2 m

Boring Method: 8.3 cm HSA/RC
Hammer Weight: N/A kg
Hammer Drop: N/A cm

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
SS-1	2 3 4	33		Brown fine SANDY SILT, little organics, trace clay (Topsoil). Moist. 0.1	28		
SS-2	2 3 3	44	1.0	Brown to red CLAY, some silt, trace fine gravel, trace coarse to fine sand. Medium stiff to hard. Moist to damp. -SS-2: Visual ODOT A-7-6	28		
SS-3	3 4 4	67			28		
SS-4	5 6 8	39	2.0		21		
SS-5	6 12 19	89	3.0		17		
			4.0	4.1			
SS-6	20 50/8cm	100		Brown weathered SILTSTONE. Very soft bedrock.			

NOTES:

SAMPLE TYPE
SS - 5.1cm OD Split Spoon
GS - Geoprobe Sample
ST - Shelby Tube
RC - Rock Core
AS - Auger Sample

GROUND WATER READING
At Completion: N/A * m
After 24 Hrs: ▼ N/A m
* Wash water used during the coring process.

BORING METHOD
HSA - Hollow Stem Augers
SFA - Solid Flight Augers
MD - Mud Drilling
WD - Wash Drilling
RC - Rock Coring

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281 ENTERPRISE DRIVE
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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139
Boring Number: B-78
Sheet: 2 of 3
Completion Depth: 13.1 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
			5.0				
			6.0	6.1			
RC-1				SILTSTONE; brown, medium, slightly broken, argillaceous.			
				-RC-1: Recovery = 93% -Core Loss = 17 cm -RQD = 16%			
			7.0	7.3			
				SHALE; brown, soft to medium, highly broken, fissile, slightly jointed.			
				7.9			
			8.0	SILTSTONE; brown, medium, slightly broken, argillaceous.			
				8.5			
RC-2				SANDSTONE; gray, medium, massive, fine grained, micaceous. -qr (@ 8.6 m) = 44.88 MPa			
			9.0	9.4			
				SHALE; gray to dark gray, soft to medium, highly broken, fissile, carbonaceous.			
			10.0	-RC-2: Recovery = 91% -Core Loss = 19 cm -RQD = 31%			
RC-3							
			11.0				

NOTES:

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REPORT OF SOIL EXPLORATION

Client Sverdrup Associates, Inc.
Project ATH/MEG-33-30.980/0.000
Project Number W-7139

Boring Number B-78
Sheet 3 of 3
Completion Depth 13.1 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
				-RC-3: Recovery = 100% -No Core Loss -RQD = 0%			
			12.0				
RC-4				-RC-4: Recovery = 100% -No Core Loss -RQD = 0%			
				12.7			
			13.0	MUDSTONE; gray to red, very soft to soft, highly broken, non-bedded, silty.			
				13.1			
				Bottom of Boring = 13.1 meters			

NOTES:

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281 ENTERPRISE DRIVE
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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-79
Sheet: 1 of 4
Completion Depth: 22.3 m

Date Started: 4/30/98
Date Finished: 4/30/98
Drilled By: M.F.

DRILLING AND SAMPLING INFORMATION

Northing: 135828.2
Easting: 637550.0
Elevation: 275.3 m

Boring Method: 8.3 cm HSA/RC
Hammer Weight: 63.5 kg
Hammer Drop: 76 cm

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
SS-1	2 2 3	89		Brown fine SANDY SILT, little organics, trace clay (Topsoil). Moist. 0.1	33		
SS-2	3 5 8	72		Brown CLAYEY SILT, little fine sand, trace organics. Medium stiff. Moist. 0.6	21		
			1.0	Brown SILTY CLAY, some fine sand, little fine gravel, trace coarse sand. Stiff. Moist. 1.2			
SS-3	6 39 50/3cm	77		Brown INDURATED CLAY/WEATHERED SHALE. Hard soil/very soft bedrock.	15		
SS-4	50/13cm	80	2.0				
			3.0	3.0			
RC-1				SHALE; brown to gray, soft to medium, highly broken, fissile, carbonaceous, silty.			
			4.0				

NOTES:

SAMPLE TYPE
SS - 5.1cm OD Split Spoon
GS - Geoprobe Sample
ST - Shelby Tube
RC - Rock Core
AS - Auger Sample

GROUND WATER READING
At Completion ▽ N/A* m
After 24 Hrs ▼ N/A m
* Wash water used during the coring process.

BORING METHOD
HSA - Hollow Stem Augers
SFA - Solid Flight Augers
MD - Mud Drilling
WD - Wash Drilling
RC - Rock Coring

RESOURCE INTERNATIONAL, INC.
281 ENTERPRISE DRIVE
WESTERVILLE, OHIO 43081
(614) 885-1959

REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Boring Number: B-79
Project: ATH/MEG-33-30.980/0.000
Sheet: 2 of 4
Project Number: W-7139
Completion Depth: 22.3 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
			5.0	-RC-1: Recovery = 92% -Core Loss = 24 cm -RQD = 24%			
			6.0				
RC-2			7.0	-RC-2: Recovery = 80% -Core Loss = 30 cm -RQD = 0%			
RC-3			8.0	-RC-3: Recovery = 99% -Core Loss = 2 cm -RQD = 13%			
			9.0	8.8 MUDSTONE; gray, very soft to soft, highly broken, non-bedded, silty.			
RC-4				9.4 SHALE; gray, medium, highly broken, slightly jointed, fissile, micaceous, rare slickensides.			
			10.0	-RC-4: Recovery = 88% -Core Loss = 26 cm -RQD = 0%			
			11.0				

NOTES:

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139
Boring Number: B-79
Sheet: 3 of 4
Completion Depth: 22.3 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
				11.9			
RC-5			12.0	MUDSTONE; red, very soft to soft, highly broken, non-bedded, silty, slightly calcareous.			
				-RC-5: Recovery = 65% -Core Loss = 64 cm -RQD = 0%			
			13.0				
				13.7			
RC-6			14.0	SANDSTONE; gray, moderately hard, massive, very fine grained, argillaceous, micaceous, cross-bedded.			
				-qr (@ 14.2 m) = 65.61 MPa			
				-gray, medium siltstone lens from 14.6 to 14.7 m			
			15.0				
				-RC-6: Recovery = 100% -No Core Loss -RQD = 50%			
				15.8			
			16.0	MUDSTONE; gray, medium, highly broken, non-bedded, slickensides, with ferruginous nodules.			
				16.2			
				SILTSTONE; brown, medium, slightly broken, micaceous, argillaceous, cross-bedded, slightly calcareous, with shale partings and ferruginous nodules.			
				16.8			
RC-7			17.0	SANDSTONE; gray, moderately hard, massive, fine grained, micaceous, silty, with rare nodular limestone.			
				-RC-7: Recovery = 96% -Core Loss = 6 cm -RQD = 47%			
			18.0				
				18.0			
				MUDSTONE; red to gray, very soft to soft, highly broken, non-bedded, slickensided,			

NOTES:

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Boring Number: B-79
Project: ATH/MEG-33-30.980/0.000
Sheet: 4 of 4
Project Number: W-7139
Completion Depth: 22.3 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
RC-8				slightly calcareous, with rare nodular limestone.			
			19.0	-RC-8: Recovery = 100% -No Core Loss -RQD = 0%			
				19.8			
RC-9			20.0	SANDSTONE; gray, moderately hard, massive, very fine grained, argillaceous, micaceous.			
				20.4			
				MUDSTONE; gray, very soft to soft, highly broken, non-bedded, slightly jointed.			
			21.0	21.0			
				SILTSTONE; gray, medium, massive, arenaceous, micaceous, cross-bedded.			
				-RC-9: Recovery = 100% -No Core Loss -RQD = 40%			
			22.0	-qr (@ 21.5 m) = 48.04 MPa			
				22.3			
				Bottom of Boring = 22.3 meters			

NOTES:

RESOURCE INTERNATIONAL, INC.
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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139

Boring Number: B-80
Sheet: 1 of 4
Completion Depth: 23.2 m

Date Started: 4/27/98
Date Finished: 4/27/98
Drilled By: M.F.

DRILLING AND SAMPLING INFORMATION

Northing: 135684.5
Easting: 637599.8
Elevation: 273.4 m

Boring Method: 8.3 cm HSA/RC
Hammer Weight: 63.5 kg
Hammer Drop: 76 cm

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
SS-1	1 2 1	89		Brown fine SANDY SILT, little organics, trace clay (Topsoil). Moist. 0.1	27		
SS-2	3 5 11	100		Brown CLAYEY SILT, little to some fine sand, trace organics. Soft to very stiff. Moist. 0.6	16		
			1.0	Brown SANDY SILT, trace clay. Very stiff. Moist.			
SS-3	7 8 12	78		1.8	14		
SS-4	30 50/8cm	67	2.0	Brown INDURATED CLAY/WEATHERED SHALE. Hard soil/very soft bedrock.			
SS-5	50/10cm	100	3.0				
			4.0				

NOTES:

SAMPLE TYPE
SS - 5.1cm OD Split Spoon
GS - Geoprobe Sample
ST - Shelby Tube
RC - Rock Core
AS - Auger Sample

GROUND WATER READING
At Completion: N/A * m
After 24 Hrs: N/A m
* Wash water used during the coring process.

BORING METHOD
HSA - Hollow Stem Augers
SFA - Solid Flight Augers
MD - Mud Drilling
WD - Wash Drilling
RC - Rock Coring

RESOURCE INTERNATIONAL, INC.
281 ENTERPRISE DRIVE
WESTERVILLE, OHIO 43081
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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Boring Number: B-80
Project: ATH/MEG-33-30.980/0.000
Sheet: 2 of 4
Project Number: W-7139
Completion Depth: 23.2 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
RC-1			5.0	MUDSTONE; gray, very soft to medium, highly broken, non-bedded.			
			6.0	-RC-1: Recovery = 81% -Core Loss = 46 cm -RQD = 0%			
			7.0	4.6			
RC-2			8.0	SHALE; brown to gray, medium, highly broken, micaceous, fissile, silty.			
			9.0	-RC-2: Recovery = 68% -Core Loss = 68 cm -RQD = 0%			
				9.1			
RC-3			10.0	MUDSTONE; red to gray, very soft, highly broken, non-bedded, silty.			
				-RC-3: Recovery = 96% -Core Loss = 6 cm -RQD = 13%			
				10.7			
RC-4			11.0	SANDSTONE; gray, moderately hard, massive, fine grained, silty, micaceous.			

NOTES:

RESOURCE INTERNATIONAL, INC.
281 ENTERPRISE DRIVE
WESTERVILLE, OHIO 43081
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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139
Boring Number: B-80
Sheet: 3 of 4
Completion Depth: 23.2 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
			12.0	-RC-4: Recovery = 100% -No Core Loss -RQD = 43%			
				12.8			
			13.0	SHALE; gray, medium, highly broken, micaceous, silty, fissile.			
				13.7			
RC-5			14.0	SANDSTONE; gray, moderately hard, massive, fine grained, silty, micaceous.			
				14.3			
				MUDSTONE; gray, soft to medium, highly broken, non-bedded, calcareous.			
				-RC-5: Recovery = 99% -Core Loss = 3 cm -RQD = 33%			
			15.0	15.2			
				SANDSTONE; brown, moderately hard, slightly broken, medium to coarse grained, cross-bedded, micaceous, slightly jointed.			
			16.0				
RC-6			17.0				
				-qr (@ 17.2 m) = 23.31 MPa			
				-RC-6: Recovery = 82% -Core Loss = 55 cm -RQD = 35%			
			18.0				

NOTES:

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REPORT OF SOIL EXPLORATION

Client: Sverdrup Associates, Inc.
Project: ATH/MEG-33-30.980/0.000
Project Number: W-7139
Boring Number: B-80
Sheet: 4 of 4
Completion Depth: 23.2 m

SAMPLE NO	BLOWS PER 15cm	PERCENT RECOVERY	DEPTH	SOIL DESCRIPTION	MOISTURE CONTENT	ATTERBERG LL	ATTERBERG PL
				-calcareous from 18.3 to 18.5 m			
				-loss of water circulation @ 18.6 m			
			19.0				
RC-7			20.0				
			21.0	-RC-7: Recovery = 95% -Core Loss = 15 cm -RQD = 19%			
			22.0				
RC-8			23.0	-RC-8: Recovery = 100% -No Core Loss -RQD = 33%			
				23.2 Bottom of Boring = 23.2 meters			

NOTES:

RESOURCE INTERNATIONAL

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Telephone: (614) 885-1959
Fax Number: (614) 885-3341

CONSOLIDATION TEST

ASTM D 2435

PROJECT: Ath / Meg 33-33.980/0.00
LOCATION:
JOB No.: W-7139 BORING N.: B-60
SAMPLE No.: ST-3
SAMPLE DEPTH: (3.5-5.5') 4.42'-4.67'
SOIL DESCRIPTION: Br SiCl; Sm C-F Sa and C-F Gr; Tr Organics
DATE OF TESTING: 5/11/98
TESTED BY: Straub / Hostetter

CONSOLIDOMETER TYPE	Fixed Ring	RING No.	2
MULT. RATIO OF LOAD DEVICE	9		
RING DIM.: DIAMETER:	63.5 mm	AREA:	31.67 cm^2 HEIGHT: 22.7 mm
INITIAL HT. OF SOIL, Hi:	22.7 mm		
SPECIFIC GRAVITY OF SOIL:	2.67		
M. RING + SPECIMEN AT BEGINNING OF TEST:	195.51 g	***WATER CONTENT DETERMINATION***	
M. OF RING:	64.64 g	M. OF CAN + WET SOIL:	230.71 g
M. OF WET SOIL, Mt:	130.87 g	M. OF CAN + DRY SOIL:	199.56 g
COMPUTED DRY WEIGHT OF SOIL, M's:	g	M. OF CAN:	28.32 g
		M. OF WATER:	31.15 g
OVEN DRY M. OF SOIL, Ms:[a]	109.29 g	M. OF DRY SOIL:	171.24 g
COMPUTED HT. OF SOLIDS, Hs:[b]	1.504 cm	INITIAL WATER CONTENT:	18.19%
INITIAL HT. OF VOIDS, Hv:	0.766 cm		
INITIAL VOID RATIO, e_i:	0.509		

FINAL TEST DATA		***FINAL WATER CONTENT DETERMINATION***	
(Obtained at end of load testing)			
INITIAL DIAL READING:	0.0369 in	FINAL WET M. + RING:[c]	192.33 g
FINAL DIAL READING:	0.1105 in	FINAL DRY M. + RING:	173.93 g
EQUIP. DEF. @ FINAL LOAD:	7.00E-04 in	OVEN DRY M. OF SOIL, Ms:	109.29 g
CHANGE IN SAMPLE HT.:	0.185166 cm	FINAL M. OF WATER:	18.4 g
FINAL HT. OF VOIDS, H_{vf}:	0.581 cm	FINAL WATER CONTENT, wf:	16.84%
FINAL VOID RATIO, ef:	0.386	FINAL DEGREE OF SAT. S:	100% (assumed)

NOTES: (a) Obtained from Final Water-Content data

(b) Use either Gs of final water-content data for S-100%

(c) Be sure to include any soil extruded from ring which is in consolidometer

RESOURCE INTERNATIONAL

281 Enterprise Drive
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Telephone: (614) 885-1959
Fax Number: (614) 885-3341

CONSOLIDATION TEST RESULTS

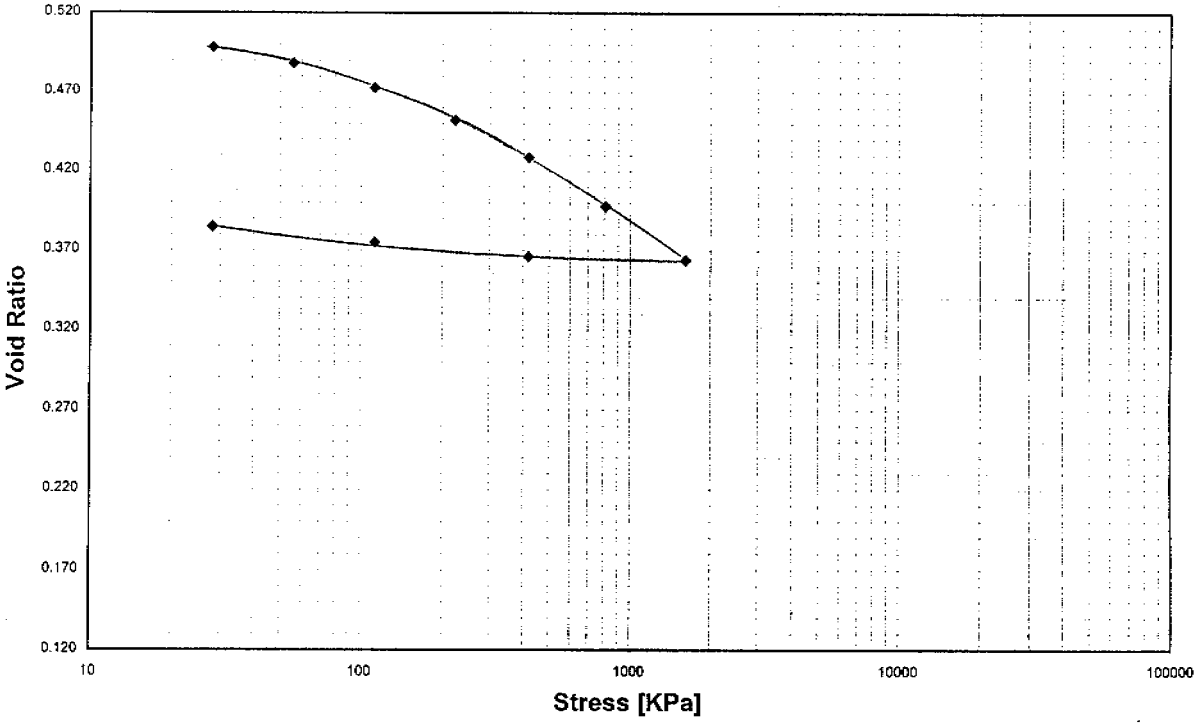
ASTM D 2435

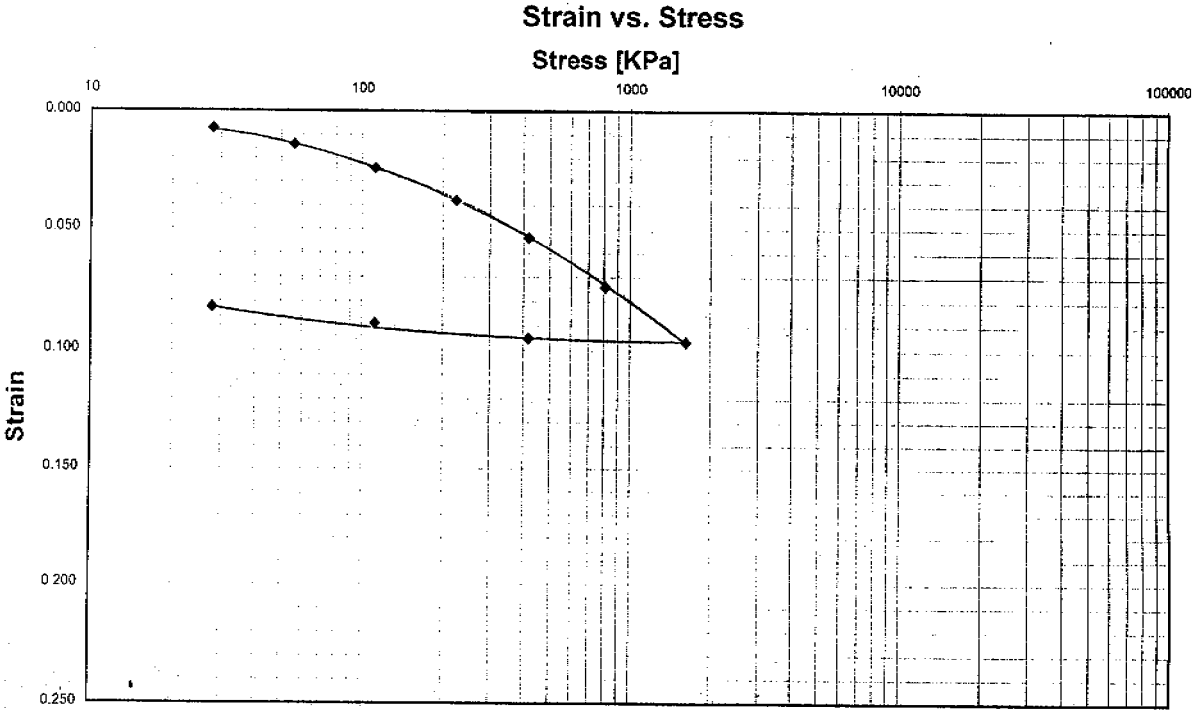
PROJECT	Ath / Meg 33-33.980/0.00
LOCATION	
JOB No.	W-7139 BORING B-60
SAMPLE No.	ST-3
SAMPLE DEPTH	(3.5-5.5') 4.42'-4.67'
SOIL DESCRIPTION	Br SiCl; Sm C-F Sa and C-F Gr, Tr Organics
DATE OF TESTING	5/11/98
TESTED BY	Straub / Hostetter

INITIAL SAMPLE VOL., Vi	71.889 cm^3	DRY WT. OF SOIL SOLIDS, Ms	109.29 g
SPECIFIC GRAVITY, Gs	2.67	HT. OF SOLIDS, Hs	1.5038 cm
INITIAL HT. OF VOIDS, Hv	0.7662 cm	INITIAL VOID RATIO, ei	0.5095
Hi	22.7 mm		

Load Increment (kPa)	Def. dial reading at end of load (x.0001")	D_{50} (x.0001")	D_{100} (x.0001")	Equip. Def. ΔHe (x.0001")	Change in sample Ht., ΔH (x.0001")	ε = ΔH / Hi	e = eo - ΔH / Hs	Average Sample ht. H (in)	Length longest. drainage path H (cm)	Time for 50% consol, t_{50} (min)	Coeff. of consol., c_v, (cm^2/min)
0	369	0	0	0	0	0	0	0	0	0	0.00E+00
28	449	425.45	442.9	7	66.9	0.0075	0.4982	0.889	1.1287	2.2	1.14E-01
56	513	482.75	507	11	127	0.0142	0.4880	0.883	1.1220	4.75	5.22E-02
112	614	567.1	604	17	218	0.0244	0.4727	0.876	1.1120	2.2	1.11E-01
223	751	685.75	734	25	340	0.0380	0.4521	0.865	1.0979	1.8	1.32E-01
418	893	825.5	880	32	479	0.0536	0.4286	0.851	1.0811	1.8	1.28E-01
809	1087	999	1073	42	662	0.0741	0.3977	0.835	1.0603	2.6	8.52E-02
1617	1302	1201.5	1288	57	862	0.0965	0.3639	0.816	1.0365	2.1	1.01E-01
418	1247		1249.9	32	848.9	0.0950	0.3661				
112	1175		1182.5	17	796.5	0.0891	0.3750				
28	1105		1114.5	7	738.5	0.0826	0.3847				
112				17							
1617				57							

Void Ratio vs. Stress




Strain vs. Stress
Stress [KPa]
10
100
1000
10000
100000
Strain
0.000
0.050
0.100
0.150
0.200
0.250

RESOURCE INTERNATIONAL

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CONSOLIDATION TEST

ASTM D 2435

PROJECT Ath/Meg - 33
LOCATION
JOB No. W-7139 BORING N. B-69
SAMPLE No. ST-2
SAMPLE DEPTH 1.5 - 3.5' (Sample @ 2'9" - 3'1")
SOIL DESCRIPTION Brn; c-f sa clay; sm si; li f. gr.
DATE OF TESTING 4/2/98
TESTED BY Straub

CONSOLIDOMETER TYPE	Fixed Ring	RING No.	1
MULT. RATIO OF LOAD DEVICE	9		
RING DIM.: DIAMETER:	63.5 mm	AREA:	31.67 cm^2 HEIGHT: 20.37 mm
INITIAL HT. OF SOIL, Hi:	20.37 mm		
SPECIFIC GRAVITY OF SOIL:	2.67		
M. RING + SPECIMEN AT BEGINNING OF TEST:	192.59 g	***WATER CONTENT DETERMINATION***	
M. OF RING:	66.47 g	M. OF CAN + WET SOIL:	213.57 g
M. OF WET SOIL, Mt:	126.12 g	M. OF CAN + DRY SOIL:	178.05 g
COMPUTED DRY WEIGHT OF SOIL, M's:	g	M. OF CAN:	30.05 g
		M. OF WATER:	35.52 g
OVEN DRY M. OF SOIL, Ms:[a]	101.55 g	M. OF DRY SOIL:	148 g
COMPUTED HT. OF SOLIDS, Hs:[b]	1.159 cm	INITIAL WATER CONTENT:	24.00%
INITIAL HT. OF VOIDS, Hv:	0.878 cm		
INITIAL VOID RATIO, ei:	0.758		

FINAL TEST DATA (Obtained at end of load testing)		***FINAL WATER CONTENT DETERMINATION***	
INITIAL DIAL READING:	0.0213 in	FINAL WET M. + RING:[c]	188.63 g
FINAL DIAL READING:	0.1116 in	FINAL DRY M. + RING:	188.02 g
EQUIP. DEF. @ FINAL LOAD:	7.00E-04 in	OVEN DRY M. OF SOIL, Ms:	101.55 g
CHANGE IN SAMPLE HT.:	0.227584 cm	FINAL M. OF WATER:	20.61 g
FINAL HT. OF VOIDS, H_{vf}:	0.651 cm	FINAL WATER CONTENT, wf:	20.30%
FINAL VOID RATIO, ef:	0.562	FINAL DEGREE OF SAT. S:	100% (assumed)

NOTES: (a) Obtained from Final Water-Content data

(b) Use either Gs of final water-content data for S-100%

(c) Be sure to include any soil extruded from ring which is in consolidometer

RESOURCE INTERNATIONAL

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Westerville, Ohio 43081
Telephone: (614) 885-1959
Fax Number: (614) 885-3341

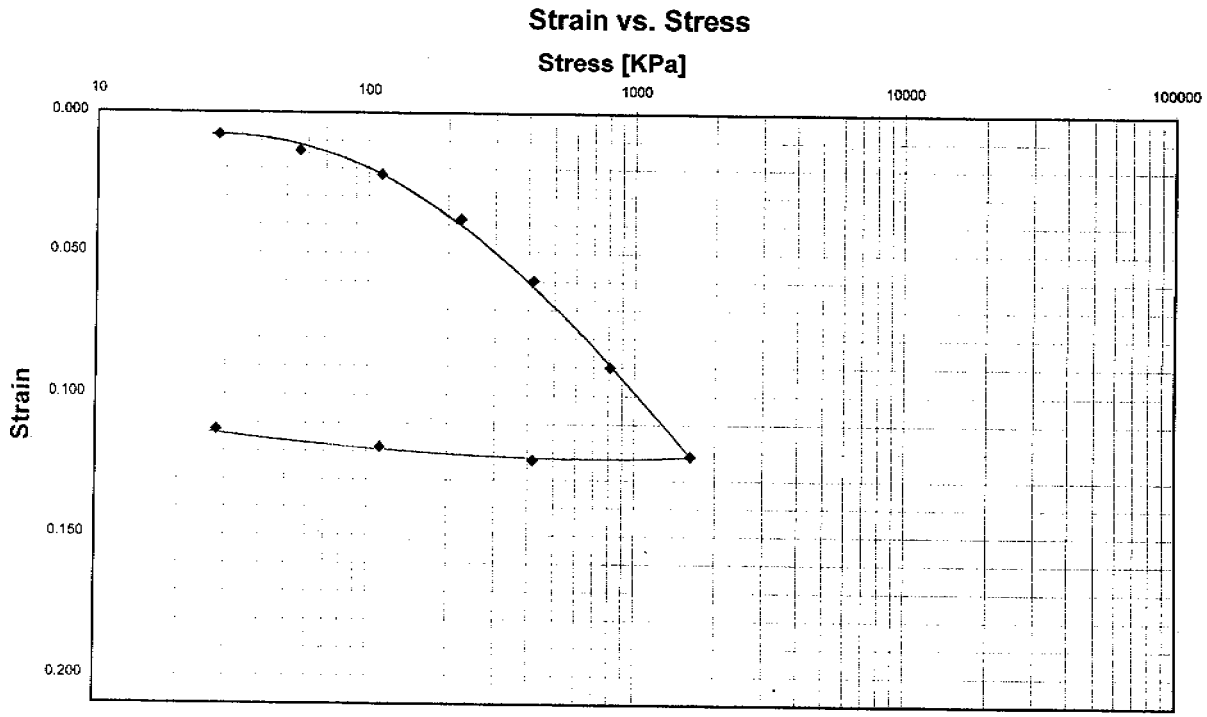
CONSOLIDATION TEST RESULTS

ASTM D 2435

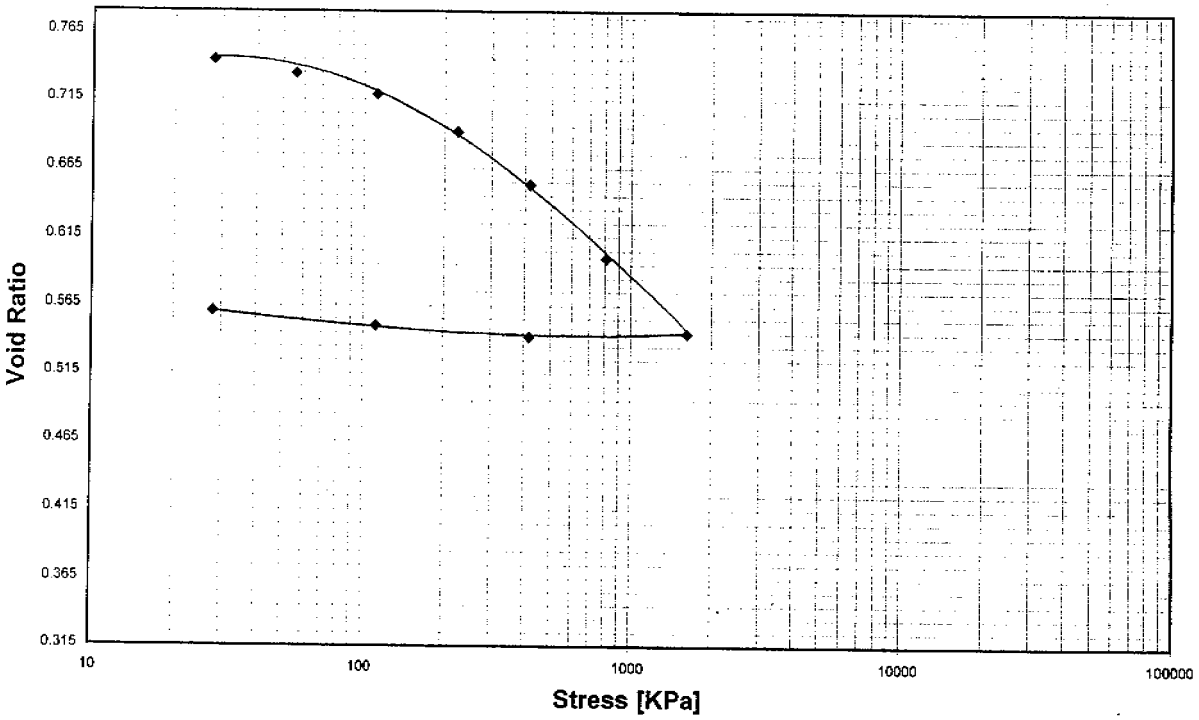
PROJECT	Ath/Meg - 33
LOCATION	
JOB No.	W-7139 BORING B-69
SAMPLE No.	ST-2
SAMPLE DEPTH	1.5 - 3.5' (Sample @ 2'9" - 3'1")
SOIL DESCRIPTION	Brn; c-f sa clay; sm si; li f. gr.
DATE OF TESTING	4/2/98
TESTED BY	Straub

INITIAL SAMPLE VOL., Vi	64.51 cm^3	DRY WT. OF SOIL SOLIDS, Ms	101.55 g
SPECIFIC GRAVITY, Gs	2.67	HT. OF SOLIDS, Hs	1.1586 cm
INITIAL HT. OF VOIDS, Hv	0.8784 cm	INITIAL VOID RATIO, ei	0.7581
Hi	20.37 mm		

Load increment (kPa)	Def. dial reading at end of load (x.0001")	D_{50} (x.0001")	D_{100} (x.0001")	Equip. Def. ΔHe (x.0001")	Change in sample Ht., ΔH (x.0001")	$\varepsilon \approx \Delta H / Hi$	$e = e_0 - \Delta H / Hs$	Average Sample ht. H (in)	Length longest. drainage path H (cm)	Time for 50% consol, t_{50} (min)	Coeff. of consol., c_v, (cm^2/min)
0	213	0	0	0	0	0	0	0	0	0	0.00E+00
28	288	272.8	283.6	7	63.6	0.0079	0.7442	0.797	1.0118	0.77	2.62E-01
56	338	328.8	333.4	11	109.4	0.0136	0.7341	0.791	1.0052	0.77	2.59E-01
112	421	391.45	409.3	17	179.3	0.0224	0.7188	0.786	0.9980	0.36	5.45E-01
223	559	510	543	25	305	0.0380	0.6913	0.775	0.9840	0.28	6.81E-01
418	745	674.75	723.5	32	478.5	0.0597	0.6532	0.759	0.9639	0.3	6.10E-01
809	997	907.75	977.5	42	722.5	0.0901	0.5997	0.737	0.9356	0.54	3.19E-01
1617	1271	1151.5	1243	57	973	0.1213	0.5448	0.714	0.9065	0.42	3.85E-01
418	1228		1231	32	986	0.1229	0.5420				
112	1172		1179.5	17	949.5	0.1184	0.5500				
28	1116		1121.25	7	901.25	0.1124	0.5605				
112				17							
1617				57							


Strain vs. Stress
Stress [KPa]
10
100
1000
10000
100000
Strain
0.000
0.050
0.100
0.150
0.200

Void Ratio vs. Stress



Wayne # 11

Monongahela

		S	1	2	3	4
P Hs 8						
Upper P Hs		910	488	850	830	818
		277	271	259	253	249
Conemaugh	Ames LS	740	713	690	668	659
		226	217	210	204	201
Lower Mahoning						
Upper Freeport # 7		565	565	561	548	542
		172	172	171	167	165

Allegheny

Brookville #4

Homewood

Pottsville

Sharon

OHIO DEPARTMENT OF TRANSPORTATION

1980 West Broad Street
P. O. Box 899
Columbus, Ohio 43216-0899

Reply to:
Office of Materials Management
1600 West Broad Street, Columbus, Ohio 43223-1298

February 20, 2001

Gannett Fleming Engineers And Architects, P.C.
Suite 350
4151 Executive Parkway
Westerville, Ohio 43081

Attention: Joseph Rikk, Jr., P. E.
Project Manager

Re: ATH-33-30.980
Stage 2 Geotechnical Compliance Comments

Gentlemen:

We have finished our review of your January 29, 2001 correspondence responding to our Stage 2 compliance comments. We believe the responses are acceptable and have no further comments. The Stage 2 Geotechnical Review is complete.

Please feel free to contact us should you have any questions.

Respectfully,

Eugene C. Geiger, PE

Eugene C. Geiger, P.E.
Geotechnical Engineering Coordinator

~~Encl.~~

ECG/SAS

cc: S. Eldabaja- D. Morgan- J. Townley - S. Sommers - Reading File - File

Gannett Fleming

GANNETT FLEMING ENGINEERS
AND ARCHITECTS, P.C.
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Office: (614) 794-9424
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www.gannettfleming.com

January 29, 2001

Mr. Eugene C. Geiger, P.E.
Ohio Department of Transportation
Office of Materials Management
1600 West Broad Street
Columbus, Ohio 43223-1298

Re: ATH-33-30.981
Stage 2 Compliance Comments

Dear Mr. Geiger:

In response to the Stage 2 Geotechnical Compliance Submittal comments, dated November 6, 2000, we would like to offer the following responses:

- *We did not receive any plan and profiles or cross-sections for Albany Road. We do not know if these sections require a geotechnical review.*
  The improvements on Albany Road will include the replacement of the concrete pavement and storm sewer improvements, based on the existing profile. Therefore, only minimal slope work is involved.

- *We also did not receive plans regarding any retaining walls. We assume that all walls on this project are connected to bridges, and therefore are submitted to the Office of Structural Engineering (OSE) for review.*
  The one retaining wall on the project, between the westbound lanes and Ramp B, will be an MSE wall and has been submitted to OSE for review.

- *At Sta 4+537 and 4+557 Ramp D, a 0.5:1 cut-slope is shown on the left. We are not confident that strong rock exists here, so if ROW permits, we recommend that a 2:1 slope be used from the top of the 10:1 bench to daylight. If this is a problem, perhaps foregoing the 10:1 bench at these two sections would be profitable.*
  We changed the slopes to 2:1 as requested. At Sta 4+537 we narrowed the 10:1 bench to a width of 2.5m.

- *At Sta 4+259.980 Ramp C, why is the 2:1 slope being used instead of the recommended 4:1?*
  The slope has been changed to 4:1.

- *As an example, the drainage layer at Sta 33+160 is shown with a sloped top. Our intent for placing granular material here was to provide a working platform and allow for compaction over possible wet soft soil. We would think the drainage layer would be constructed with a level top. The thickness of this layer should be a minimum of 1.5 meters, unless this would require a long sliver fill across a wide section of the embankment.*
  The appearance of a sloping granular drainage blanket at this station is a function of how the

cross section is cut. The section happens to coincide closely with the axis, or centerline, of the present drainage swale as opposed to cutting across the drainage swale at a right angle. As a result, this particular cross section follows the natural downhill gradient of the streambed. Since the drainage layer will be of constant thickness along the streambed, the top of the granular layer will, in reality, slope with the same gradient of the drainage swale. For this reason, the cross section shows a sloping granular surface to more accurately reflect how the layer will appear as it is placed in the field.

- *As examples, Sta 36+640 to 36+800, and 37+580 to 37+600 show rock fill instead of a drainage layer. It does not appear to us that in these cases there is a stability problem that warrants using the rock fill. There may be other cases like this as well.*
  We have reviewed the sections and have made the appropriate changes to the drainage layer.

- *At Sta 38+640 left, and 38+720 right (4-lane), please delete the lower bench to maintain consistency through these sections. Also, at Sta 38+880 right (4-lane), get rid of the 10:1 and use 4:1 from the top of the ditch 2:1, like the stations that follow.*
  The sections were revised as requested.

- *With regards to the special embankment notes, please see our comments on the enclosed copy of the notes.*
  The notes have been revised as suggested.

- *We saw no indication of the A-7-5 removal noted in our prior review comments.*
  We have added the areas that indicate the removal of the A-7-5 material.

Based on the geotechnical recommendations for the bridges on this project, we have revised the fill sections adjacent to the structures as using Item 203: Embankment using rock, as per plan (bridge approach). To separate the embankment being used for the bridge approaches from the stability blankets, we have added an additional plan note, which is attached for your review. This change affects the mainline sections at Stations 29+460 to 29+520, 29+560, and 29+580; TR 55 sections at Stations 48+220 and 48+300; and TR 64 sections at Stations 49+180 and 49+260.

If you have any questions or comments concerning these responses, please contact Malcolm Hargraves or Phil Schroeder at the above telephone number.

Very truly yours,

GANNETT FLEMING ENGINEERS & ARCHITECTS, P.C.

Joseph Rikk, Jr., P.E.
Project Manager

C: Doug Morgan, ODOT D-10
File 36151.130
G:\36151\100\geotech comment response.doc

FOSSILIZED WOOD

THE CONTRACTOR SHALL CONTACT DR. MICHAEL C. HANSEN AT THE OHIO DEPARTMENT OF NATURAL RESOURCES, DIVISION OF GEOLOGICAL SURVEY, 4383 FOUNTAIN SQUARE DRIVE, COLUMBUS, OHIO 43224-1362 TEL. (614)-265-6580 AS FOLLOWS:

1) PRIOR TO THE START OF ANY EARTHWORK ACTIVITY.

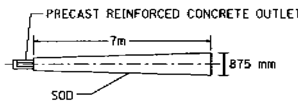
2) IF "SIGNIFICANT QUANITIES" OF FOSSILIZED PETRIFIED WOOD ARE ENCOUNTERED DURING CONSTRUCTION.

CONTINGENCY QUANTITIES

THE CONTRACTOR SHALL NOT ORDER MATERIALS OR PERFORM WORK FOR ITEMS DESIGNATED BY PLAN NOTE TO BE USED "AS DIRECTED BY THE ENGINEER" UNLESS AUTHORIZED BY THE ENGINEER. THE ACTUAL WORK LOCATIONS AND QUANTITIES USED FOR SUCH ITEMS SHALL BE INCORPORATED INTO THE FINAL CHANGE ORDER GOVERNING COMPLETION OF THIS PROJECT.

PRECAST REINFORCED CONCRETE OUTLET, AS PER PLAN

INSTALLATION OF THE PRECAST REINFORCED CONCRETE OUTLET, AS PER PLAN SHALL BE AS PER STANDARD DRAWING DM-1.1M EXCEPT THAT THE SOD PLACED ON THE SLOPE BELOW THE OUTLET SHALL BE MODIFIED IN LENGTH AND WIDTH AS PER THE FOLLOWING DETAIL. PAYMENT SHALL INCLUDE THE COST OF ALL THE SOD AND WIRE CLOTH.



EMBANKMENT USING ROCK, AS PER PLAN

GRANULAR STABILITY BLANKET MATERIALS SHALL BE PLACED IN ACCORDANCE WITH THE SPECIFICATIONS SET FORTH IN THE ODOT CMS FOR ROCK FILL (SEC.203.09d WITH THE FOLLOWING EXCEPTIONS:

1.) LIFT THICKNESSES ARE NOT TO EXCEED 50cm (0.5m) IN THICKNESS AND INDIVIDUAL ROCK FRAGMENTS ARE NOT TO EXCEED 25cm (.25m) IN ANY DIMENSION.

2.) THE ROCK FILL MATERIAL IS TO BE PLACED IN THE INTERIOR OF THE EMBANKMENTS AS INDICATED ON THE CROSS SECTION SHEETS.

3.) NO SHALE MATERIALS ARE TO BE PLACED IN THE GRANULAR BLANKETS.

4.) THE OUTER 2 METERS OF THE EMBANKMENTS IS TO CONSIST OF SUITABLE EMBANKMENT MATERIAL OTHER THAN ROCK FILL, SUCH AS SOIL OR SHALE MATERIAL THAT HAS BEEN BROKEN DOWN AND AND PLACED IN AS A SOIL.

SHALE, WHICH INCLUDES MATERIALS DESCRIBED AS CLAY-SHALE, MUDSTONE, CLAYSTONE, AND MUDROCK SHALL BE PLACED IN ACCORDANCE WITH THE ODOT CMS GUIDELINES FOR SOIL EMBANKMENTS. ANY SHALE FRAGMENTS LARGER THAN 15cm (.15m) IN THICKNESS MUST BE BROKEN DOWN BEFORE PLACEMENT AND SUBSEQUENT COMPACTION.

EMBANKMENT USING ROCK, AS PER PLAN (BRIDGE APPROACH)

GRANULAR MATERIALS SHALL BE PLACED IN ACCORDANCE WITH THE SPECIFICATIONS SET FORTH IN THE ODOT CMS FOR ROCK FILL (SEC. 203.09d WITH THE FOLLOWING EXCEPTIONS:

1.) INDIVIDUAL ROCK FRAGMENTS ARE NOT TO EXCEED 10cm (0.10m) IN ANY DIMENSION AND NO MORE THAN 20% OF THE BRIDGE APPROACH FILL CAN PASS #200 SIEVE.

2.) LIFT THICKNESSES ARE NOT TO EXCEED 30cm (0.3m)

3.) THE ROCK FILL BRIDGE APPROACH MATERIAL IS TO BE PLACED IN THE INTERIOR OF THE EMBANKMENTS AS INDICATED ON THE CROSS SECTION SHEETS.

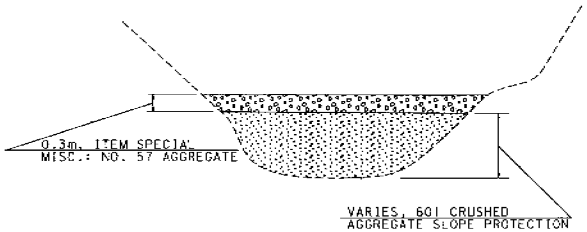
4.) NO SHALE MATERIALS ARE TO BE PLACED IN THE FILL.

SHALE, WHICH INCLUDES MATERIALS DESCRIBED AS CLAY-SHALE, MUDSTONE, CLAYSTONE, AND MUDROCK SHALL BE PLACED IN ACCORDANCE WITH THE ODOT CMS GUIDELINES FOR SOIL EMBANKMENTS. ANY SHALE FRAGMENTS LARGER THAN 15cm (.15m) IN THICKNESS MUST BE BROKEN DOWN BEFORE PLACEMENT AND SUBSEQUENT COMPACTION.

GRANULAR DRAINAGE LAYER (TYPICAL)

GRANULAR DRAINAGE LAYER SHALL CONSIST OF 30cm (0.3m) OF No. 57 AGGREGATE UNDERLAIN BY CRUSHED No. 1 AND No. 2 (MATERIAL TYPE 601.05, CRUSHED AGGREGATE SLOPE PROTECTION.)

IN AREAS WHERE GRANULAR FILL DRAINAGE MATERIAL PLACED ALONG PRE-EXISTING SWALES INTERSECTS CULVERT PIPES OR THE CULVERT OUTLET WING WALLS, THE CONTRACTOR SHALL GRADE THE DRAINAGE MATERIAL TO PROVIDE A CONTINUOUS SEEPAGE PATH INTO THE GRANULAR PIPE AND HEAD WALL BACKFILL (SEC. 603.02)



CLEARING AND GRADING - R/W FENCE

THE CONTRACTOR SHALL PERFORM SUCH CLEARING AND GRADING AS MAY BE NECESSARY TO CONSTRUCT THE FENCE TO THE REQUIRED ALIGNMENT AND SHALL PROVIDE A REASONABLY SMOOTH GROUND PROFILE AT THE FENCE LINE.

FENCE LENGTHS

THE LENGTHS OF FENCE SHOWN IN THE PLANS ARE HORIZONTAL DIMENSIONS. MEASUREMENTS OF THE FINAL QUANTITIES SHALL BE MADE IN ACCORDANCE WITH ITEM 607.

DUST CONTROL

THE CONTRACTOR SHALL FURNISH AND APPLY WATER AND CALCIUM CHLORIDE FOR DUST CONTROL AS DIRECTED BY THE ENGINEER. THE FOLLOWING QUANTITIES HAVE BEEN INCLUDED FOR DUST CONTROL PURPOSES:

616, WATER	231950	CU. METER
616, CALCIUM CHLORIDE	5799	METRIC TON

ITEM 604 - CATCH BASIN NO. 7, AS PER PLAN

THIS CATCH BASIN SHALL BE CONSTRUCTED IN CONFORMANCE WITH ITEM 604 EXCEPT THAT THE GRATE SHALL BE NEENAH R-4055-18 GRATE "B", EAST JORDAN IRON WORKS 6318, OR APPROVED EQUAL.

ELEVATION DATUM

ALL ELEVATIONS ARE BASED ON U.S.G.S. DATUM.

CROSSINGS AND CONNECTIONS TO EXISTING PIPES AND UTILITIES

WHERE PLANS PROVIDE FOR A PROPOSED CONDUIT TO BE CONNECTED TO, OR CROSS OVER OR UNDER AN EXISTING SEWER OR UNDERGROUND UTILITY, THE CONTRACTOR SHALL LOCATE THE EXISTING PIPES OR UTILITIES AS TO BOTH LINE AND GRADE BEFORE STARTING TO LAY THE PROPOSED CONDUIT.

IF IT IS DETERMINED THAT THE ELEVATION OF THE EXISTING CONDUIT, OR EXISTING APPURTENANCE TO BE CONNECTED, DIFFERS FROM THE PLAN ELEVATION OR RESULTS IN A CHANGE IN THE PLAN CONDUIT SLOPE, THE ENGINEER SHALL BE NOTIFIED BEFORE STARTING CONSTRUCTION OF ANY PORTION OF THE PROPOSED CONDUIT WHICH WILL BE AFFECTED BY THE VARIANCE IN THE EXISTING ELEVATIONS.

IF IT IS DETERMINED THAT THE PROPOSED CONDUIT WILL INTERSECT AN EXISTING SEWER OR UNDERGROUND UTILITY IF CONSTRUCTED AS SHOWN ON THE PLAN, THE ENGINEER SHALL BE NOTIFIED BEFORE STARTING CONSTRUCTION ON ANY PORTION OF THE PROPOSED CONDUIT WHICH WOULD BE AFFECTED BY THE INTERFERENCE WITH AN EXISTING FACILITY.

PAYMENT FOR ALL THE OPERATIONS DESCRIBED ABOVE SHALL BE INCLUDED IN THE CONTRACT PRICE FOR THE PERTINENT 603 AND 638 CONDUIT ITEMS.

WATER LINES

THIS WORK CONSISTS OF CONSTRUCTING WATER MAINS AND SERVICE BRANCHES, INCLUDING FIRE HYDRANTS, WATER METERS, SERVICE STOPS, VALVES, FITTINGS AND BOXES. THE CONTRACTOR SHALL PROVIDE ALL TOOLS AND EQUIPMENT REQUIRED FOR INSTALLING THESE ITEMS. THE WORK ALSO INCLUDES FURNISHING ALL MATERIALS, EXCAVATING, BEDDING, LAYING PIPE, JOINTING, BACKFILLING, HYDROSTATIC TESTING, DISINFECTION, RESTORATION OF DISTURBED FACILITIES AND SURFACES, DISPOSAL OF ALL SURPLUS EXCAVATION AND DISCARDED MATERIALS, AND OTHER WORK NECESSARY TO COMPLETE THE ITEMS.

CALCULATED PRS CHECKED AM

GENERAL NOTES

ATH-33-30.981

38A / 956

24 JAN 2001 11:05:32

OHIO DEPARTMENT OF TRANSPORTATION

1980 West Broad Street
P. O. Box 899
Columbus, Ohio 43216-0899

Reply to:
Office of Materials Management
1600 West Broad Street, Columbus, Ohio 43223-1298

November 6, 2000

Gannett Fleming Engineers And Architects, P.C.
Suite 350
4151 Executive Parkway
Westerville, Ohio 43081

Attention: Joseph Rikk, Jr., P. E.
Project Manager

Re: ATH-33-30.980
Stage 2 Geotechnical Compliance Submittal

Gentlemen:

We have completed our review of your October 10, 2000 resubmittal of the subject project. In general, the plans are acceptable, except for the following considerations:

- We did not receive any plan and profiles or cross-sections for Albany Rd. We do not know if these sections require a geotechnical review.
- We also did not receive plans regarding any retaining walls. We assume that all walls on this project are connected to bridges, and therefore should be submitted to the Office of Structural Engineering for review.
- At Stas. 4+537 and 4+557 Ramp D, a 0.5:1 cut-slope is shown on the left. We are not that confident that strong rock exists here, so if ROW permits, we recommend that a 2:1 slope be used from the top of the 10:1 bench to daylight. If this is a problem, perhaps foregoing the 10:1 bench at these two sections would be profitable.
- At Sta. 4+259.980 Ramp C, why is the 2:1 slope being used instead of the recommended 4:1?

- As an example, the drainage layer at Sta. 33+160 is shown with a sloped top. Our intent for placing granular material here was to provide a working platform and allow for compaction over possible wet soft soil. We would think the drainage layer would be constructed with a level top. The thickness of this layer should be a minimum of 1.5 meters, unless this would require a long sliver fill across a wide section of the embankment.

- As examples, Stas. 36+640 to 36+800, and 37+580 to 37+600 show rock fill instead of a drainage layer. It does not appear to us that in these cases there is a stability problem that warrants using the rock fill. There may be other cases like this as well.

- At Stas. 38+640 left, and 38+720 right (4-lane), please delete the lower 10:1 bench to maintain consistency through these sections. Also, at Sta. 38+880 right (4-lane), get rid of the 10:1 and use a 4:1 from the top of the ditch 2:1, like the stations that follow.

- With regards to the special embankment notes, please see our comments on the enclosed copy of the notes.

- We saw no indication of the A-7-5 removal noted in our prior review comments.

- We have no other comments on any of the other items listed in your current submittal letter or our initial review letter of March 23, 2000.

We do not require a plan re-submission. However, we would like a written response to our comments above to let us know what is going to happen concerning these issues, or to explain why certain things are being done the way they are.

Please feel free to contact us should you have any questions.

Respectfully,

Eugene C. Geiger

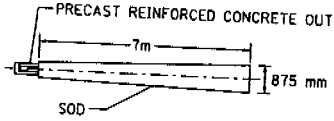
Eugene C. Geiger, P.E.
Geotechnical Engineering Coordinator

Encl.

ECG/SAS

cc: S. Eldabaja- D. Morgan- S. Sommers - Reading File - File

...THE SOD AND WIRE CLOTH.



EMBANKMENT USING ROCK, AS PER PLAN

GRANULAR STABILITY BLANKET MATERIALS SHALL BE PLACED IN ACCORDANCE WITH THE SPECIFICATIONS SET FORTH IN THE ODOT CMS FOR ROCK FILL (~~ODOT No~~ 203.02) WITH THE FOLLOWING EXCEPTIONS: Sec. 203.09d

1.) LIFT THICKNESSES ARE NOT TO EXCEED 50cm (0.5m) IN THICKNESS AND INDIVIDUAL ROCK FRAGMENTS ARE NOT TO EXCEED 25cm (.25m) IN ANY DIMENSION.

2.) THE ROCK FILL MATERIAL IS TO BE PLACED IN THE INTERIOR OF THE EMBANKMENTS AS INDICATED ON THE CROSS SECTION SHEETS.

3.) NO SHALE MATERIALS ARE TO BE PLACED IN THE GRANULAR BLANKETS

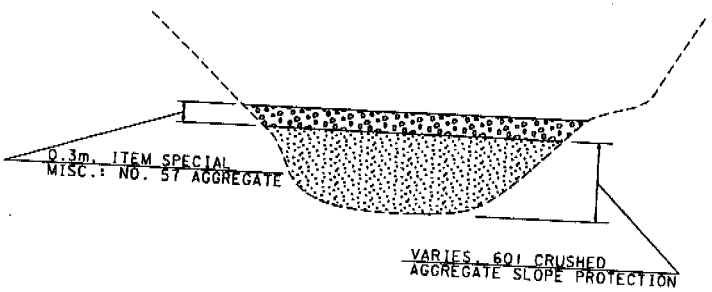
4.) THE OUTER 2 METERS OF THE EMBANKMENTS IS TO CONSIST OF SUITABLE EMBANKMENT MATERIAL OTHER THAN ROCK FILL, SUCH AS SOIL OR SHALE MATERIAL THAT HAS BEEN BROKEN DOWN AND AND PLACED IN AS A SOIL.

SHALE, WHICH INCLUDES MATERIALS DESCRIBED AS CLAY-SHALE, MUDSTONE, CLAYSTONE, AND MUDROCK SHALL BE PLACED IN ACCORDANCE WITH THE ODOT CMS GUIDLINES FOR SOIL EMBANKMENTS. ANY SHALE FRAGMENTS LARGER THAN 15cm (.15m) IN THICKNESS MUST BE BROKEN DOWN BEFORE PLACEMENT AND SUBSEQUENT COMPACTION.

GRANULAR DRAINAGE LAYER (TYPICAL)

GRANULAR DRAINAGE LAYER SHALL CONSIST OF 30cm (0.3m) OF ~~CRUSHED~~ ~~ODOT~~ No. 57 Aggregate (68) ~~MATERIAL TYPE 518, POROUS BACKFILL~~, UNDERLAIN BY CRUSHED ~~ODOT~~ No. 1 AND No. 2 (MATERIAL TYPE 601.05, CRUSHED AGGREGATE SLOPE PROTECTION.)

IN AREAS WHERE GRANULAR FILL DRAINAGE MATERIAL PLACED ALONG PRE-EXISTING SWALES INTERSECTS CULVERT PIPES OR THE CULVERT OUTLET WING WALLS, THE CONTRACTOR SHALL GRADE THE DRAINAGE MATERIAL TO PROVIDE A CONTINUOUS SEEPAGE PATH INTO THE GRANULAR PIPE AND HEAD WALL BACKFILL (~~ODOT No.~~ Sec. 603.02)



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Gannett Fleming

GANNETT FLEMING ENGINEERS
AND ARCHITECTS, P.C.
Suite 350
4151 Executive Parkway
Westerville, OH 43081
Office: (614) 794-9424
Fax: (614) 794-9442
www.gannettfleming.com

October 10, 2000

Mr. Eugene C. Geiger, P.E.
Ohio Department of Transportation
Office of Materials Management
1600 West Broad Street
Columbus, Ohio 43223-1298

Re: ATH-33-30.981
Slope Compliance Submittal

Dear Mr. Geiger:

We have enclosed one set of the following items for your review:

- One set of the Stage 3 roadway plans on 11"x17" sheets.
- One set of the subsurface investigation plans and profiles on 11"x17" sheets.
- The slope review comment set.

Several items on the cross sections have changed since our original submission in November 1999. We have modified the sections as requested in the slope submittal and Stage 2 submittal with few exceptions. We have completed the drainage design on the project and have added the drainage ditches to the sections. Granular fill areas have been added to select cross sections for additional slope stability in an effort to achieve a minimum factor of safety equal to 1.25. Also, please review the two special embankment notes, which have been added to the General Notes sheet 40.

Exceptions to the slope review comments occur where the granular drainage layer has been eliminated from Sta. 33+300 through Sta. 33+640 and Sta. 34+060 through Sta. 34+120 for the following reasons:

- Detailed mapping in these areas indicate that a dominant sheet flow (as opposed to a channelized flow) behavior occurs in these areas.
- The more subtle relief promoting sheet flow does not indicate the presence of rock outcrops where subsurface seepage along the bedrock-soil interface could be exposed, potentially saturating and softening the soils at the base of the highway embankment.
- The granular material indicated at the toe of these embankments would be exposed in the surface drainage ditches used to convey storm water and melt water runoff from the highway to the culverts and local drainage features.

In addition to the aforementioned exceptions, benching was specified at the slope toe between Sta. 35+620 and 35+700. Due to the relatively shallow fill (3 meters or less) that is to be placed on an existing slope, benching performed as outlined in Section 203.09 in the Ohio Department of Transportation Construction and Material Specifications manual should be employed and emphasized here instead of a special plan design.

If you have any questions concerning this submittal, please contact our Project Manager, Mr. Joseph Rikk, P. E.

Very truly yours,

GANNETT FLEMING ENGINEERS AND ARCHITECTS, P.C.

Joseph Rikk, Jr., P. E.
Project Manager

Enclosure

C: Doug Morgan – ODOT District 10
Mitchell Weber, P.G. – Geotechnical Manager
File 36151.
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OHIO DEPARTMENT OF TRANSPORTATION

1980 West Broad Street
P. O. Box 899
Columbus, Ohio 43216-0899

Reply to:
Office of Materials Management
1600 West Broad Street, Columbus, Ohio 43223-1298

March 23, 2000

Gannett Fleming Engineers And Architects, P.C.
Blendonview Office Park
5015 Pine Creek Drive
Columbus, Ohio 43081

Attention: John R. Kenny, P. E.
Vice President

Re: ATH-33-30.980
Slope Review Submittal

Gentlemen:

We have completed our review of your November 16, 1999 submittal of the subject project's soils information and plan set. There was also a site visit on January 6, 2000. Enclosed with this correspondence is the marked up plan set.

On the cross-sections we have shown our estimated rock and soil cut slopes for the 2-lane and the 4-lane layouts. Our main changes deal with the assumed thickness of the sandstone layers and the depth of overburden. We have also indicated areas where we feel granular material should be placed at the base of proposed fills. This is to allow compaction of the embankment material over wet, soft stream and ditch areas.

Special benches are indicated on some of the cross-sections. Please calculate he quantities of excavation and embankment required and include them in the plans. Also, please include Note R102 in the General Notes.

In two locations, A-7-5 material (elastic clay) was shown near proposed subgrade. This material should be removed to a depth of 0.9m below subgrade, to a width of 0.3m beyond the edge of pavement. The limiting stations for removal are :

US 33	30+180 to 30+220	
TR 64	49+280 to 49+460	Northbound (left side)

The excavated material should be replaced with 203 Embankment.

There were several options submitted pertaining to the possible cut-slope near Sta. 29+300, right of mainline. Based on seeing the rock samples during our January field trip, we feel that Option 2 is the most reasonable choice. This option allows for a 1/2:1 cut through sandstone, a 1-1/2:1 cut in the shale, and a 2:1 cut in the clay material. This option does not require any retaining wall. The slope of the shale cut could be made slightly steeper if necessary to avoid the necessity of a wall.

Also of concern was the TR 64 bridge over US 33. The issue was whether or not to cut the forward abutment fore-slope at a 4:1 and extend the bridge, or over-excavate to rock, replace with granular material at a 2:1 slope, and shorten the bridge. It was determined that a combination abutment/retaining wall to support the embankment was the best solution, so neither of the above options will be used.

The preliminary plans show a retaining wall located on the east side of US 33 at the beginning of the project. The borings obtained for this proposed wall are the RBW series. Based on the information provided by the borings, there should be no geotechnical difficulties in locating a wall here. Wall plans should be submitted for review as appropriate.

All of the bridge information should be submitted to the Office of Structural Engineering for review.

Please make the above recommended changes and resubmit the corrected plans. The revised plans should be quarter-size sheets, and the marked up set enclosed should be returned as well so we have the set to check off of. We understand that all the soils information available is now being plotted onto one Soil Profile. Please submit this updated Soil Profile as well, on quarter-size sheets.

Please feel free to contact us should you have any questions.

Respectfully,

Eugene C. Geiger

Eugene C. Geiger, P.E.
Geotechnical Engineering Coordinator

4/10/00
Phone conversation w/ Matt O'Donnell. They intend to over-excavate + use 2:1 granular embankment. OK w/ us. ECG.

Encl.

ECG/SAS

cc: S. Eldabaja- D. Briggs- S. Sommers - Reading File - File

Gannett Fleming

GANNETT FLEMING ENGINEERS
AND ARCHITECTS, P.C.
Blendonview Office Park
5015 Pine Creek Drive
Columbus, Ohio 43081
Office: (614) 794-9424
Fax: (614) 794-9442
www.gannettfleming.com

November 16, 1999

Mr. George Collins, District Deputy Director
Ohio Department of Transportation
338 Muskingum Drive
Marietta, Ohio 45750

Attn: Mr. Doug Briggs, P.E.

Dear Mr. Briggs:

Re: ATH-33-30.980
Slope Review Submittal

We have enclosed one set of the slope review plans for your review and comment. This set consists of the plan sheets and cross sections reflecting the preliminary slope recommendations described by Gene Geiger in his letter dated September 27, 1999.

The mainline cross sections show the ultimate 4-lane cross sections as dashed and the "Super 2" 2-lane cross sections as solid lines. On CR 21 and CR 16, the cross sections for the at-grade intersections have been adjusted to reflect the slope recommendations on both, left and right, sides. The CR 21 and CR 16 interchange crossroads have only been modified on the side opposite the at-grade intersection alignment. The infield areas for all ramps may not reflect a final grading.

If you have any questions concerning this submittal, please contact our Project Manager, Mr. Joseph A. Rossie, P. E.

Very truly yours.

GANNETT FLEMING CORDDRY & CARPENTER

John R. Kenny, P. E.
Vice President
Manager, Ohio Office

enclosure
c: Gene Geiger - ODOT Office of Materials Management w/enclosure
G:\36151\150\slope review submittal.doc

DRILLING LOG

Gannett Fleming
ENGINEERS AND PLANNERS

Date Started:	8/1/99
Date Finished:	8/1/99
Soil Sampling:	10.0'
Rock Sampling:	—
Total Depth of Hole:	10.0'
No. of Undist. Samples:	1
Total Number of Core Boxes:	—

Groundwater Observations

At —— Ft. After — Hrs.
At —— Ft. After — Hrs.
Elev. After Hrs.

Project:	US 33 ATHENS - DARWIN
Drilling Agency:	CENTRAL STAR DRILLING
Driller:	DAVID JACKSON
Bit Size and Type:	—
CME Sampler:	—
Casing Size:	—
Spoon Size:	2.0" O.D."
Hollow-Stem:	2.25"
Hammer Wt.:	140#
Drilling Fluid:	H_2O
Hammer Drop:	30"
Drill Rig:	CME 550 ATV

Hole No.	32+700
Sheet	of
Line & Station:	
Offset:	
N Coordinate:	
E Coordinate:	
Elev. Top of Hole:	

Direction of Hole
Vertical ☑ Inclined ☐
Degrees from Vertical

Inspector: HANGRAVER

Depth (Ft.)	Sample No.	Blows or RQD	Rec (Ft.)	Rec (%)	Legend	Description of Materials	Remarks
0						Topsoil 8"	
1.75 BF	1	3-5-5-10	0.9'			BROWN VERY SILTY CLAY W/ TRACES OF ROOT HAIRS AND FINE SAND (CL); MOIST, MEDIUM STIFF	
3.5 BF	2	11-11-11-16	1.0'	0.6	2.0'	BROWN TO MOTTLED BROWN W/ TRACE LIGHT BROWN SILTY CLAY W/ TRACES OF OXIDES, LITTLE TO SOME FINE SAND, AND TRACES OF SANDSTONE FRAGMENTS; (CL) MOIST, VERY STIFF TO HARD	
5 3.0 BF	3	4-8-11-14	1.4'				
1.75 BF	4	8-9-15-22	2.0'				
1.5 BF	5	10-17-22-22	1.4'	8.0	10.0'		
10						BOTTOM OF BORING @ 10.0'	
15							
20							
25							

Remarks: PUSHED SHELBY TUBE 6' to 8'
1.4' REC.

DRILLING LOG

Gannett Fleming
ENGINEERS AND PLANNERS

Date Started:	8/4/99
Date Finished:	8/4/99
Soil Sampling:	8.1
Rock Sampling:	—
Total Depth of Hole:	8.1
No. of Undist. Samples:	—
Total Number of Core Boxes:	—

Groundwater Observations

At — Ft. After — Hrs.

At — Ft. After — Hrs.

Elev. After Hrs.

Project:	US 33 ATHENS - DARWIN
Drilling Agency:	CENTRAL STAR DRILLING
Driller:	DAVID JARRISON
Bit Size and Type:	—
CME Sampler:	
Casing Size:	—
Spoon Size:	2.0" OD.
Hollow-Stem:	2.25"
Hammer Wt.:	140#
Drilling Fluid:	—
Hammer Drop:	30"
Drill Rig:	CME - 550 ATV

Hole No.	32+900
Sheet	of
Line & Station:	
Offset:	
N Coordinate:	
E Coordinate:	
Elev. Top of Hole:	

Direction of Hole

Vertical ☑ Inclined ☐

Degrees from Vertical

Inspector: HARGRAVES

Depth (Ft.)	Sample No.	Blows or RQD	Rec (Ft.)	Rec (%)	Legend	Description of Materials	Remarks
0						2" TOPSOIL	
–	1	8-14-24 -40	1.1'			LIGHT BROWN SILT / CLAYEY SILT W/ LITTLE TO SOME SILTSTONE / FINE GRAINED SANDSTONE FRAGMENTS (ML, CL-ML); SLIGHTLY MOIST, HARD	
–	2	30-50/.5'	0.7'				
4.5+ TOP	3	13-14-16 -19	0.8'	1.1	3.5'		
3.0+ TOP	4	10-50/.4'	0.6'			MOTTLED BROWN, GRAYISH BROWN, AND LIGHT BROWN SILTY CLAY W/ TRACES OF FINE SAND AND OXIDES (CL); SLIGHTLY MOIST, HARD	
	5	50/.1'	0.1'	2.3	7.5'		
10						LIGHT GRAY MEDIUM SANDSTONE/ SILTSTONE FRAGMENTS	
				2.5	8.1'	BOTTOM OF BORING @ 8.1'	
15							
20							
25							

Remarks:

DRILLING LOG

Gannett Fleming
ENGINEERS AND PLANNERS

Date Started:	8/10/99
Date Finished:	8/10/99
Soil Sampling:	13.8'
Rock Sampling:	—
Total Depth of Hole:	13.8'
No. of Undist. Samples:	—
Total Number of Core Boxes:	—

Groundwater Observations

At — Ft. After — Hrs.
At — Ft. After — Hrs.
Elev. After Hrs.

Project:	US 33 ATHENS - DARWIN
Drilling Agency:	CENTRAL STAR DRILLING
Driller:	MATT SAMISON
Bit Size and Type:	—
CME Sampler:	
Casing Size:	—
Spoon Size:	2.0" O.D.
Hollow-Stem:	3.25"
Hammer Wt.:	140#
Drilling Fluid:	—
Hammer Drop:	30"
Drill Rig:	CME 550 ATV

Hole No.	33+700
Sheet	of
Line & Station:	
Offset:	33+735, ≈ 15' RT
N Coordinate:	209.00
E Coordinate:	
Elev. Top of Hole:	

Direction of Hole
Vertical ☒ Inclined ☐
Degrees from Vertical

Inspector:

Depth (Ft.)	Sample No.	Blows or RQD	Rec (Ft.)	Rec (%)	Legend	Description of Materials	Remarks
0							
4.5+ TSF	1	5-11-16-10	0.7'			LIGHT BROWN TO MOTTLED BROWN VERY SILTY CLAY / CLAYEY SILT WITH TRACES OF FINE SAND AND OXIDES (CL, CL-ML); SLIGHTLY MOIST, VERY STIFF TO HARD	
4.25 TSF	2	6-14-16-20	1.3'				
4.5+ TSF	3	10-16-17-20	1.4'				
5							
4.5+ TSF	4	10-11-16-20	1.2'				
3.25 TSF	5	11-16-15-15	1.1'	2.6		8.5' ORANGE BROWN SANDY SILT TO SILT AND FINE SAND WITH TRACES OF OXIDES (ML, SM); MOIST, DENSE	
10							
				3.6		12.0' LIGHT BROWN FINE GRAINED SANDSTONE	
	6	50/3'	0.1'				
				4.1			
15						BOTTOM OF BORING @ 13.7' DUE TO AUGER REFUSAL	
20							
25							

Remarks:

Date Started: 8/4/99	**DRILLING LOG**		Hole No. 337800
Date Finished: 8/4/99	**Gannett Fleming** ENGINEERS AND PLANNERS		Sheet 1 of 1
Soil Sampling: 8.4'			Line & Station:
Rock Sampling: —	Project: US 33 ATHENS - DARWIN		Offset:
Total Depth of Hole: 8.4'	Drilling Agency: CENTRAL STAR DRILLING		N Coordinate:
No. of Undist. Samples: 1	Driller: DAVID JAMISON		E Coordinate:
Total Number of Core Boxes: —	Bit Size and Type: —	CME Sampler: —	Elev. Top of Hole:
Groundwater Observations	Casing Size: —	Spoon Size: 2.0" O.D.	Direction of Hole
At — Ft. After — Hrs.	Hollow-Stem: 2.25"	Hammer Wt.: 140#	Vertical ☑ Inclined ☐
At — Ft. After — Hrs.	Drilling Fluid: —	Hammer Drop: 30"	Degrees from Vertical
Elev. After Hrs.	Drill Rig: CME-550 ATV		Inspector: HARMANUS

Depth (Ft.)	Sample No.	Blows or RQD	Rec (Ft.)	Rec (%)	Legend	Description of Materials	Remarks
0						Topsoil 6"	
2.75 TOP	1	4-6-8-16	0.6'			LIGHT BROWN SILTY CLAY w/ TRACES OF ROOT HAIRS, OXIDES, AND FINE SAND (CL); MOIST, STIFF TO VERY STIFF	
4.5 TOP	2	9-10-14 -24	1.0'				
4.0 TOP 4.5' TOP	3	10-25-35 -60/4'	1.4'	1.5	5.0'		
4.5' TOP	4	41-40-50/5"	0.8'			LIGHT OLIVE BROWN / BEIGE SILTY CLAY w/ TRACES OF OXIDES (CL); MOIST, HARD	
—	5	50/4'	0.4'			-- LAMINATED STRUCTURE	
10						EXTREMELY WEATHERED SHALE	
				2.6	8.4'	BOTTOM OF BORING @ 8.4'	
15							
20							
25							

Remarks: PUSHED SHELBY TUBE

2' TO 4' REC. = 2.0'

DRILLING LOG

Gannett Fleming ENGINEERS AND PLANNERS

Date Started:	8/10/99
Date Finished:	8/10/99
Soil Sampling:	9.0'
Rock Sampling:	20.8
Total Depth of Hole:	29.8'
No. of Undist. Samples:	—
Total Number of Core Boxes:	3

Groundwater Observations

At Ft. After Hrs.

At Ft. After Hrs.

Elev. After Hrs.

Project:	US 33 ATHENS - DARWIN
Drilling Agency:	CENTRAL STAR DRILLING
Driller:	MATT JAMISON
Bit Size and Type:	NX - B
CME Sampler:	—
Casing Size:	3.0"
Spoon Size:	2.0" O.D.
Hollow-Stem:	3.25"
Hammer Wt.:	140#
Drilling Fluid:	H_2O
Hammer Drop:	30"
Drill Rig:	CME - 55 ATV

Hole No.	33+900
Sheet	1 of 2
Line & Station:	
Offset:	
N Coordinate:	
E Coordinate:	
Elev. Top of Hole:	

Direction of Hole

Vertical ☑ Inclined ☐

Degrees from Vertical

Inspector: HARGRAVES

Depth (Ft.)	Sample No.	Blows or RQD	Rec (Ft.)	Rec (%)	Legend	Description of Materials	Remarks
0						0.3' TOPSOIL	
	1	5-7-9-10	1.0'			LIGHT ORANGE - BROWN SILTY CLAY WITH TRACES OF ROOT HAIRS (CL) MOIST, VERY STIFF	
4.5' TSF	2	8-14-24-24	1.3'	0.9	3.0'	LIGHT BROWN SILT WITH TRACES OF FINE SAND (SM); SLIGHTLY MOIST; DENSE TO VERY DENSE	
4.5' TSF	3	42-50/3"	0.7'			[EXTREMELY WEATHERED FINE GRAINED SANDSTONE / SILTSTONE]	
—	4	50/3"	0.1'			— LAMINATED STRUCTURE	
9.0'				1.5"	5.4'		
10	5	(24"/60") 40%	3.8'	2.8	9.0'	LIGHT ORANGE - BROWN, FINE GRAINED WEATHERED SANDSTONE	START CORING @ 9.0'
14.8' 15	6	(58"/60") 97%	5.0'	4.6	15.0'	LIGHT BROWN, SOFT TO MEDIUM HARD, FINE TO MEDIUM GRAINED SANDSTONE, THICK BEDDING, POOR ROCK QUALITY	
19.8' 20	7	(60"/60") 100%	5.0'			LIGHT BROWN MEDIUM HARD FINE TO MEDIUM GRAINED SANDSTONE; [GOOD TO EXCELLENT ROCK QUALITY, MASSIVE BEDDING	
24.8' 25	8	(46"/60") 77%	48" 4.0'	8.6	28.3'	LIGHT BROWN MEDIUM HARD SHALE; GOOD ROCK QUALITY ONLY 7" OF SHALE NOTED IN CORE RUN 24.8 TO 29.8'	MUCH SLOWER CORING @ 28.3'
29.8'							

Remarks:

Agency: CENTRAL STAR DRILLING

Driller: MATT JAMISON

Inspector: HARGRAVES

DRILLING LOG

Gannett Fleming
ENGINEERS AND PLANNERS

Hole No. B3-1900

Sheet 2 of 2

Elev. Top of Hole:

Depth (Ft.)	Sample No.	Blows or ROD	Rec (Ft.)	Rec (%)	Legend	Description of Materials	Remarks
30	9	28" / 60"	(9.5")	10.8	30.7'	MOTTLED GRAY, VERY SOFT TO SOFT SHALE; POOR ROCK QUALITY	
35						BOTTOM OF BORING @ 34.8'	
40							
45							
50							
55							
60							
65							
70							

DRILLING LOG

Gannett Fleming
ENGINEERS AND PLANNERS

Date Started: 8/11/99	Hole No. 34+000
Date Finished: 8/11/99	Sheet of
Soil Sampling: 10.0'	Line & Station:
Rock Sampling: —	Project: US 33 ATHENS - DARWIN
Total Depth of Hole: 10.0'	Drilling Agency: CENTRAL STAR DRILLING
No. of Undist. Samples: 1	Driller:
Total Number of Core Boxes: —	Bit Size and Type: — CME Sampler: —
Groundwater Observations	Casing Size: — Spoon Size: 2.0" O.D.
At — Ft. After — Hrs.	Hollow-Stem: 2.25" Hammer Wt.: 140#
At — Ft. After — Hrs.	Drilling Fluid: — Hammer Drop: 30"
Elev. After Hrs.	Drill Rig: CME-550 ATV
Offset:	
N Coordinate:	
E Coordinate:	
Elev. Top of Hole:	
Direction of Hole: Vertical ☑ Inclined ☐ Degrees from Vertical	
Inspector: HARGRAVES	

Depth (Ft.)	Sample No.	Blows or RQD	Rec (Ft.)	Rec (%)	Legend	Description of Materials	Remarks
4.5" TSF	1	4-7-10-11	1.1'	0.76	2.5'	LIGHT OLIVE BROWN SILTY CLAY w/ TRACES OF ORIDES (CL); MOIST VERY STIFF	
4.5" TSF	2	11-14-17-23	0.7'			LIGHT ORANGE BROWN SILTY CLAY (CL); SLIGHTLY MOIST, VERY STIFF	
4.5" TSF	3	14-15-21-22	1.0'			-- SLIGHT LAMINATIONS PRESENT	
4.5" TSF	4	10-17-19-24	0.8'			-- TRACES OF LIMESTONE/CHERT NODULES IN SAMPLE #5	
4.5" TSF	5	8-15-30-37	1.5'	3.0	10.0	BOTTOM OF BORING @ 10.0'	

Remarks: PUSHED TUBE 6.0' - 8.0'

CHECK RECOVERY ON SAMPLE TUBE

Date Started: 8/11/99	**DRILLING LOG**	Hole No. 344130
Date Finished: 8/11/99	**Gannett Fleming** ENGINEERS AND PLANNERS	Sheet 1 of 1
Soil Sampling: 8.3		Line & Station:
Rock Sampling: —	Project: US 33 ATHENS - DARWIN	Offset:
Total Depth of Hole: 8.3'	Drilling Agency: CENTRAL STAR DRILLING	N Coordinate:
No. of Undist. Samples: 1	Driller: DAVID SAMISON	E Coordinate:
Total Number of Core Boxes: —	Bit Size and Type: — CME Sampler: —	Elev. Top of Hole:
Groundwater Observations	Casing Size: — Spoon Size: 2.0" O.D.	Direction of Hole
At — Ft. After — Hrs.	Hollow-Stem: 2.25" Hammer Wt.: 140#	Vertical ☑ Inclined ☐
At — Ft. After — Hrs.	Drilling Fluid: — Hammer Drop: 30"	Degrees from Vertical
Elev. After Hrs.	Drill Rig: CME-550 ATV	Inspector: HARGRAVES

Depth (Ft.)	Sample No.	Blows or RQD	Rec (Ft.)	Rec (%)	Legend	Description of Materials	Remarks
0							
4.5+ TSF	1	4-8-10-10	1.3'			BROWN W/ TRACE ORANGE VERY SILTY CLAY WITH TRACES OF OXIDES AND ROOT HAIRS (CL); MOIST, VERY STIFF	
4.5+ TSF	2	12-15-16-20	1.0'	61.6	2.0'		
5						MOTTLED LIGHT ORANGE-BROWN W/ TRACE GRAY AND MAROON SILTY CLAY WITH TRACES OF OXIDES (CL); SLIGHTLY MOIST, HARD	
4.5+ TSF	3	16-19-23-30	1.2'				
3.25 TSF	4	6-8-16-28	1.2'			-- SLIGHT LAMINATIONS PRESENT	
—	5	50/.3'	0.1'	11	3.5'	LIGHT OLIVE BROWN SILTY CLAY W/ TRACES OF OXIDES AND SHALE FRAGMENTS (CL); MOIST, VERY STIFF	
10							
				25	8.0'	-- LAMINATIONS PRESENT	
15						SOFT, LIGHT OLIVE BROWN, VERY WEATHERED SHALE	
				2.6	8.3'		
20						BOTTOM OF BORING @ 8.3'	
25							

Remarks:

PUSHED SHELBY TUBE 5' TO 6.4'

REC. 1.4'

DRILLING LOG

Gannett Fleming
ENGINEERS AND PLANNERS

Date Started: 8/4/99	Hole No. 34+650
Date Finished: 8/4/99	Sheet 1 of 1
Soil Sampling: 8.7'	Line & Station:
Rock Sampling: —	Offset:
Total Depth of Hole: 8.7'	N Coordinate:
No. of Undist. Samples: 1	E Coordinate:
Total Number of Core Boxes: —	Elev. Top of Hole:

Project: US 33 ATHENS - DARWIN
Drilling Agency: CENTRAL STAR DRILLING
Driller:
Bit Size and Type: —
CME Sampler:
Casing Size: —
Spoon Size: 2.0" O.D.
Hollow-Stem: 2.25
Hammer Wt.: 140#
Drilling Fluid: —
Hammer Drop: 30"
Drill Rig: CME 550 ATV

Direction of Hole: Vertical ☑ Inclined ☐ Degrees from Vertical

Inspector: HARGRAVES

Groundwater Observations
At — Ft. After — Hrs.
At — Ft. After — Hrs.
Elev. After Hrs.

Depth (Ft.)	Sample No.	Blows or RQD	Rec (Ft.)	Rec (%)	Legend	Description of Materials	Remarks
0							
2.75 TSF	1	2-4-6-8	0.9'			2" Topsoil	
						LIGHT ORANGE-BROWN SILTY CLAY	
4.5+ TSF	2	9-10-10-17	0.4'		1.5'	W/ TRACES OF ROOT HAIRS (CL), MOIST	
				0.1%		MEDIUM STIFF	
5							
3.75 TSF	3	8-9-11-19	0.8'			MOTTLED ORANGE-BROWN TO	
3.25 TSF	4	20-50/.4'	0.8'			BEIGE SILTY CLAY W/ TRACE	
						OXIDES AND FINE SAND (CL);	
—	5	30-50/.2'	0.3'	-2.0	6.5'	MOIST, VERY STIFF	
10							
						LIGHT OLIVE BROWN SILTY CLAY	
						/ EXTREMELY WEATHERED SHALE	
						(CL) SLIGHTLY MOIST, HARD	
						-- LAMINATED STRUCTURE	
15				2.1	8.7'		
						BOTTOM OF BORING @ 8.7'	
20							
25							

Remarks: PUSHED SHELBY TUBE 1 to 3'
2.0' REC.

DRILLING LOG

Gannett Fleming
ENGINEERS AND PLANNERS

Date Started: 8/4/99	Project: US 33 ATHENS - DARWIN	Hole No. 34+720	
Date Finished: 8/4/99	Drilling Agency: CENTRAL STAR DRILLING	Sheet of	
Soil Sampling: 8.3'	Driller: DAVID SAMUSON	Line & Station:	
Rock Sampling: —	Bit Size and Type: —	CME Sampler:	Offset:
Total Depth of Hole: 8.3'	Casing Size: —	Spoon Size: 2.0" O.D.	N Coordinate:
No. of Undist. Samples: 1	Hollow-Stem: 2.25"	Hammer Wt.: 140#	E Coordinate:
Total Number of Core Boxes:	Drilling Fluid: —	Hammer Drop: 30"	Elev. Top of Hole:
Groundwater Observations: At — Ft. After — Hrs. / At — Ft. After — Hrs. / Elev. After Hrs.	Drill Rig: CME 550 ATV		Direction of Hole: Vertical ☑ Inclined ☐ Degrees from Vertical
			Inspector: HARENAUGH

Depth (Ft.)	Sample No.	Blows or RQD	Rec (Ft.)	Rec (%)	Legend	Description of Materials	Remarks
2.75 TSF	1	3-4-4-5	1.0'			3" TOPSOIL	
2.25 TSF / 1.75 TSF	2	8-7-7-10	1.3'			BROWN / LIGHT BROWN SILTY CLAY W/ TRACES OF ROOT HAIRS (CL) MOIST, MEDIUM STIFF TO STIFF	
1.75 TSF	3	5-6-8-11	0.6'	0.92	3.0'	REDDISH BROWN TO RED SILTY CLAY W/ TRACES OF ORIDES (CL); MOIST	HARD DRILLING @ ≈ 6.5'
1.5 TSF	4	13-50/2'	0.6'			STIFF	
—	5	50/.3'	0.2'	2.0	6.5'	LIGHT OLIVE BROWN / BEIGE SOFT WEATHERED SHALE	
				1.6	8.3'	BOTTOM OF BORING @ 8.3'	

Remarks:

PUSHED SHELBY TUBE 4'-6'

1.2' REC.

DRILLING LOG

Gannett Fleming
ENGINEERS AND PLANNERS

Date Started: 7/23/99		Hole No. 35+000	
Date Finished: 7/23/99		Sheet 1 of 2	
Soil Sampling: 33.0'		Line & Station:	
Rock Sampling: 7.0'	Project: US 33 ATHENS - DARWIN	Offset:	
Total Depth of Hole: 40.0'	Drilling Agency: CENTRAL STAR DRILLING	N Coordinate:	
No. of Undist. Samples: 1	Driller: DAVID SAMPSON	E Coordinate:	
Total Number of Core Boxes: 1	Bit Size and Type: NX-B CME Sampler:	Elev. Top of Hole:	
Groundwater Observations	Casing Size: 3" Spoon Size: 2.0"	Direction of Hole	
At 10.3' Ft. After 0 Hrs.	Hollow-Stem: 3.25" Hammer Wt.: 140#	Vertical ☐ Inclined ☐	
At 23.8' Ft. After 72 Hrs.	Drilling Fluid: H_2O Hammer Drop: 30"	Degrees from Vertical	
Elev. After Hrs.	Drill Rig: D-120	Inspector:	

Depth (Ft.)	Sample No.	Blows or RQD	Rec (Ft.)	Rec (%)	Legend	Description of Materials	Remarks
0						6" TOPSOIL	
	1 1.75 TSF	3-6-12-12	1.0'			BROWN VERY SILTY CLAY / CLAYEY SILT w/ TRACES OF ROOT HAIRS (CL, CL-ML);	
	2 4.5+ TSF	11-12-20-19	1.3'			MOIST, VERY STIFF	
				0.0	2.0'	RED TO RED w/ GRAY SILTY CLAY (CL)	
5	3 4.5+ TSF	18-20-24-26	1.0'			MOIST, HARD	
	4 4.5+ TSF	20-50/4"	0.7'				
	5 3.0 TSF	15-21-23-26	1.3'				
10				3.6	12.0'	MOTTLED GRAY AND RED SILTY CLAY w/ OLIVE SHALE FRAGMENTS (CL) SLIGHTLY MOIST, HARD	
13.5'	6 2.25 TSF	13-18-28	1.2'			-- PREDOMINANTLY GRAY BELOW 17.0'	
15				5.5	18.0'	OLIVE BROWN w/ TRACE ORANGE - BROWN VERY SILTY CLAY w/ TRACES OF	
18.5'	7 3.25 TSF	25-50/4"	0.8'			WEATHERED SHALE FRAGMENTS (CL);	
20						SLIGHTLY MOIST, HARD	
				6.7	22.5'	OLIVE BROWN SILTY CLAY w/ TRACES OF	
23.5'	8	12-11-5	0.8'			OXIDES AND SHALE FRAGMENTS (CL);	
25						SLIGHTLY MOIST, VERY STIFF	
						-- LAMINATED STRUCTURE	
				8.3	27.0'		
28.5'	9	50/2"	0.2'			SOFT TO MEDIUM HARD GRAY / OLIVE GRAY ARGILLACEOUS SHALE	

Remarks:

SHELBY TUBE 2.0'-4.2' 2.2' REC.

Agency: CENTRAL STAR DRILLING
Driller: DAVID JAMISON
Inspector: HARDGROVE

DRILLING LOG

Gannett Fleming
ENGINEERS AND PLANNERS

Hole No. 35+000
Sheet 2 of 2
Elev. Top of Hole:

Depth (Ft.)	Sample No.	Blows or RQD	Rec (Ft.)	Rec (%)	Legend	Description of Materials	Remarks
30				9.5	31.0'		
33.0'						LIGHT BROWN, MODERATELY HARD FINE TO MEDIUM GRAINED SANDSTONE	AUGER REFUSAL @ 33.0'
	10	(10"/24") 67%	1.3'			FAIR TO POOR ROCK QUALITY	LOSS OF DRILL H_2O @ INTERVALS OF CORE RUN
35							
	11	(29"/60") 48%	4.6'				
40.0' 40				12		BOTTOM OF BORING 40.0'	
45							
50							
55							
60							
65							
70							

Date Started: 8/11/99	**DRILLING LOG**	Hole No. 36+560
Date Finished: 8/11/99	**Gannett Fleming** ENGINEERS AND PLANNERS	Sheet 1 of 2
Soil Sampling: 21.5		Line & Station:
Rock Sampling: 11.0	Project: US 33 ATHENS - DARWIN	Offset: ≈ 30M UP STATION
Total Depth of Hole: 32.5	Drilling Agency: CENTRAL STAR DRILLING	N Coordinate:
No. of Undist. Samples: —	Driller: DAVID SAMILSON	E Coordinate:
Total Number of Core Boxes: 2	Bit Size and Type: NX-B CME Sampler:	Elev. Top of Hole:
Groundwater Observations	Casing Size: 3.0" Spoon Size: 2.0" O.D.	Direction of Hole
At — Ft. After — Hrs.	Hollow-Stem: 3.25" Hammer Wt.: 140 #	Vertical ☑ Inclined ☐
At 11 Ft. After 24 Hrs.	Drilling Fluid: H_2O Hammer Drop: 30"	Degrees from Vertical
Elev. After Hrs.	Drill Rig: CME-550 ATV	Inspector: HARGRAVES

Depth (Ft.)	Sample No.	Blows or RQD	Rec (Ft.)	Rec (%)	Legend	Description of Materials	Remarks
0						3" TOPSOIL	
	1	4.5+ TSF	9-10-12-13	0.2'		LIGHT ORANGE-BROWN TO LIGHT BROWN SILTY CLAY w/ TRACES OF OXIDES (CL); SLIGHTLY MOIST, VERY STIFF TO HARD	
	2	4.5+ TSF	14-20-26-32	1.2'			
5	3	—	50/4"	0.2'	11	3.5'	
	4	—	33-33-50/1"	0.8'		LIGHT OLIVE BROWN / BEIGE SILTY CLAY WITH TRACES OF OXIDES (CL); SLIGHTLY MOIST, HARD [EXTREMELY WEATHERED SHALE] --LAMINATED STRUCTURE	HARD DRILLING @ ABOUT 5.0'
	5	—	22-44-50/4"	0.4'			
10					3.6	12.0'	
13.5'	6		50/3"	0.0'		VERY SOFT LIGHT BROWN FINE GRAINED SANDSTONE / SILT STONE	AUGERS ADVANCE QUICKER @ ABOUT 17.0'
15					5.2	17.0'	
	7		60/4"	0.4'		OLIVE GRAY TO GRAY SOFT SHALE	
20					6.5	21.5'	AUGER REFUSAL @ 21.5'
21.5'	8		(35"/60") 97%	3.0'		HARD WHITE LIMESTONE AND MODERATELY HARD TO HARD LIGHT BROWN SANDSTONE; EXCELLENT ROCK QUALITY -- LIMESTONE FROM 21.5' TO 22.5'	
24.5' 25	9		(34"/60") 57%	(59%) 4.9	8.0	26.1' MODERATELY HARD TO HARD, GRAY, FINE GRAINED SANDSTONE WITH LIMESTONE NODULES AND SOFT TO MEDIUM HARD SHALE; FAIR ROCK QUALITY	
29.5'							

Remarks:

Agency: CENTRAL STAR DRILLING
Driller: DAVID JAMISON
Inspector: HARDGRAVES

DRILLING LOG

Gannett Fleming
ENGINEERS AND PLANNERS

Hole No. 36+560
Sheet 2 of 2
Elev. Top of Hole:

Depth (Ft.)	Sample No.	Blows or RQD	Rec (Ft.)	Rec (%)	Legend	Description of Materials	Remarks
30			(34")				
	10	(18"/36") 50%	2.8'	8.7	28.5'	SOFT TO MEDIUM HARD GRAY SHALE, FAIR ROCK QUALITY	
32.5'				9.5	30.6'		
35						MEDIUM TO MODERATELY HARD, OLIVE BROWN, FINE GRAINED SANDSTONE / SILTSTONE; FAIR ROCK QUALITY	
						--LIGHT GRAY; FINE GRAINED SANDSTONE/ SILTSTONE W/ SHALE PARTINGS @ BOTTOM 6"	
40				10		BOTTOM OF BORING @ 32.5'	
45							
50							
55							
60							
65							
70							

DRILLING LOG

Gannett Fleming ENGINEERS AND PLANNERS

Date Started: 8/3/99	Project: US 33 ATHENS - DARWIN	Hole No. 371/40	
Date Finished: 8/3/99	Drilling Agency: CENTRAL STAR DRILLING	Sheet 1 of 2	
Soil Sampling: 12.0'	Driller: DAVID JAMISON	Line & Station:	
Rock Sampling: 48.0'	Bit Size and Type: NX-B	CME Sampler:	Offset:
Total Depth of Hole: 60.0	Casing Size: 3.0"	Spoon Size: 2.0" O.D.	N Coordinate:
No. of Undist. Samples: 2	Hollow-Stem: 3.25"	Hammer Wt.: 140#	E Coordinate:
Total Number of Core Boxes: 6	Drilling Fluid: H_2O	Hammer Drop: 30"	Elev. Top of Hole:
Groundwater Observations	Drill Rig: D-120		Direction of Hole
At 6 Ft. After 0 Hrs.			Vertical ☑ Inclined ☐
At ___ Ft. After ___ Hrs.			Degrees from Vertical
Elev. After Hrs.			Inspector:

Depth (Ft.)	Sample No.	Blows or RQD	Rec (Ft.)	Rec (%)	Legend	Description of Materials	Remarks
0						Topsoil 4"	
4.0	1	3-5-9-13	1.2'			RED TO MOTTLED RED AND MAROON SILTY CLAY W/TRACES OF SAND AND GRAVEL (CL); MOIST, STIFF	
4.5	2	9-10-20-26	1.1'	0.16	2.0'		No H_2O before coring
5							
4.5	3	4-13-30-24	1.1'			RED / MOTTLED RED AND YELLOW SILTY CLAY W/TRACES OF SAND (CL);	
4.5	4	7-18-39-50/1.1'	1.0'			SLIGHTLY MOIST TO MOIST, HARD	
	5	50/1.2'	0.1	2.3	7.5'	LIGHT BROWN, MEDIUM TO MODERATELY HARD SANDSTONE	
10							
12.0						AUGER REFUSAL	
	6	(14"/24") 58%	(14") 1.16'	3.6	12.5'	LIGHT BROWN TO WHITE MODERATELY HARD TO HARD SANDSTONE AND SOFT TO VERY SOFT LIGHT BROWN BEIGE SHALE FAIR ROCK QUALITY	
15						-- SANDSTONE LAYER ≈ 3" THICK IN CORE RUN	
	7	(27"/48") 56%	(42") 3.5'			-- MEDIUM HARD ARGILLACEOUS SHALE @ BOTTOM OF RUN (13.8' DEEP)	
18.0							
		(35"/72")	(71")			LIGHT BROWN W/TRACE RED, VERY SOFT TO SOFT W/TRACE MEDIUM HARD SHALE W/TRACES OF LIMESTONE NODULES	
20	8	49%	5.9'	4.2	14.0'	FAIR ROCK QUALITY	
24.6							
25		8"/60"	(52")			-- MEDIUM TO MODERATELY HARD FINE GRAINED, LIGHT BROWN SANDSTONE @ 17.5' IN CORE RUN	
	9	13%	4.3'	5.5	18.0'		
29.5						LIGHT BROWN W/TRACE RED, MEDIUM HARD FINE GRAINED SANDSTONE / SILTSTONE (NEXT PAGE)	

Remarks:

PUSHED SHELBY TUBES 2' to 4' rec. 2.0'
4' to 6' rec. 1.4'

Agency: CENTRAL STAR DRILLING
Driller: DAVE JAMISON
Inspector: HARLAMAN

DRILLING LOG

Gannett Fleming
ENGINEERS AND PLANNERS

Hole No. 374140
Sheet 2 of 2
Elev. Top of Hole:

Depth (Ft.)	Sample No.	Blows or RQD	Rec (Ft.)	Rec (%)	Legend	Description of Materials	Remarks
30		(49"/60")	(56")			W/ SOFT ARENACEOUS FISSILE SHALE LENSES	
	10	82%	4.7'	7.4	24.0	-- MODERATELY HARD, FINE TO MEDIUM GRAINED SANDSTONE SEAM @ ± 23.5'	
34.0							
35		(60"/60")	(60")			LIGHT BROWN, SOFT TO MEDIUM HARD, FINE GRAINED SANDSTONE/SILTSTONE W/ SOFT GRAY SHALE LENSES - FISSILE STRUCTURE	
	11	100% *	5.0'	8.8	29.0	- VERY POOR ROCK QUALITY SHALE @ 25.5'	
39.0							
40		(32"/60")	(59")			VERY SOFT TO SOFT, GRAY ARENACEOUS SHALE W/ MODERATELY HARD FINE GRAINED SANDSTONE LENSES; GOOD ROCK QUALITY	
	12	63%	4.9'	10.3	34.0'	-- SANDSTONE (6" THICK) @ 32.5'	
44.0						VERY SOFT GRAY TO DARK GRAY W/ TRACE MAROON SHALE; ROCK QUALITY MISLEADINGLY HIGH - MORE SOIL LIKE	
45		(44"/60")	(52")			-- MUD SEAMS FROM 39' TO 40.5'	
	13	73%	4.3'	12.5	41.0		
49.0							
50		(30"/60")	55"			SOFT TO MEDIUM HARD, OLIVE GRAY TO GRAY SHALE W/ LIMESTONE NODULES	
	14	50% *	4.6'	13.4	44.0'	FAIR ROCK QUALITY	
54.6							
55		(33"/36") *	3.0'			OLIVE GRAY TO GRAY, FINE TO MEDIUM GRAINED, MODERATELY HARD SANDSTONE; FAIR TO GOOD ROCK QUALITY	* RQD MISLEADINGLY HIGH
	15	92%	36"	15	49.0	-- MUD LENS @ TOP OF CORE RUN	
57.0			25"			VERY SOFT TO SOFT, FISSILE GRAY SHALE (W/) 2"-3" THICK MUD SEAMS)	
	16	(13"/36") 36%	2.1'	15.8	52.0	-- FAIR TO POOR ROCK QUALITY	
60						VERY SOFT, MARLED MAROON, GRAY, AND OLIVE SHALE	
						-- POOR ROCK QUALITY *	
65						-- LIGHT GRAY FINE SANDSTONE SEAM @ 62.5'	
						- MAROON W/ TRACE GRAY AND OLIVE COLORING BELOW ± 54.0'	
				19.2			
70						BOTTOM OF BORING @ 60.0'	

DRILLING LOG

Gannett Fleming ENGINEERS AND PLANNERS

Date Started: 7/27/99	Hole No. 37+660
Date Finished: 7/27/99	Sheet of
Soil Sampling: 28.7'	Line & Station:
Rock Sampling: —	Offset:
Total Depth of Hole: 28.7'	N Coordinate:
No. of Undist. Samples: 2	E Coordinate:
Total Number of Core Boxes:	Elev. Top of Hole:

Project: US 33 ATHENS - DARWIN

Drilling Agency: CENTRAL STAR DRILLING

Driller: DAVID SAMPSON

Bit Size and Type: CME Sampler:

Casing Size: Spoon Size:

Hollow-Stem: Hammer Wt.:

Drilling Fluid: Hammer Drop:

Drill Rig:

Direction of Hole: Vertical ☐ Inclined ☐ Degrees from Vertical

Inspector:

Groundwater Observations

At — Ft. After — Hrs.

At — Ft. After 24 Hrs.

Elev. After Hrs.

Depth (Ft.)	Sample No.	Blows or RQD	Rec (Ft.)	Rec (%)	Legend	Description of Materials	Remarks
0							
1.75 TSF	1	7-12-20-27	0.7			2" TOPSOIL	PUSHED ROCK #1-2
PUSHED ROCK	2	3-8-8-8	0.1			BROWN TO LIGHT BROWN VERY SILTY CLAY / CLAYEY SILT W/ TRACE ROOT HAIRS (CL, CL-ML); MOIST	PUSHED SHELBY TUBE 2'-4' REC 1.3'
3.0 TSF	3	9-12-16-17	0.9'	0.9	3.0'	VERY STIFF	
3.25 TSF	4	8-10-14-18	1.2'			RED / MAROON W/ TRACE GRAY AND LIGHT ORANGE SILTY CLAY (CL); MOIST, VERY STIFF	SHELBY TUBE FROM 4'-6' REC 1.3'
2.0 TSF 2.5 TSF	5	9-11-15-37	1.4'	2.6	8.5'	BEIGE / LIGHT BROWN W/ TRACE DARKER BROWN AND ORANGE SILTY CLAY (CL); MOIST, VERY STIFF	
13.5'						-- CLAYEY SILT SEAM W/ SOME FINE SAND NOTED IN SAMPLE #6	
1.25 TSF	6	10-14-	1.0'			-- OXIDE STAINS NOTED IN SAMPLE #6	
18.5'				5.4	18.0'	MEDIUM WEATHERED LIGHT BROWN TO GRAY FINE GRAINED SANDSTONE	
	7	50/1.4'	0.2'				
20				6.4	21.0'	SOFT GRAY ARENACEOUS SHALE	
23.5'	8	75/0.3'	0.3'				
25				8.5	28.0'	MEDIUM TO MODERATELY HARD, GRAY FINE TO MEDIUM GRAINED SANDSTONE	
28.5'	9	50/.2'	0.1	8.7		BOTTOM OF BORING 28.7'	

Remarks: No H_2O during drilling

Date Started: 7/22/99	**DRILLING LOG**		Hole No. 37+780
Date Finished: 7/22/99	**Gannett Fleming** ENGINEERS AND PLANNERS		Sheet 1 of 3
Soil Sampling: 18.5'			Line & Station:
Rock Sampling: 62.5'	Project: US 33 ATHENS - DARWIN		Offset: 20M Rt.
Total Depth of Hole: 81.0'	Drilling Agency: CENTRAL STAR DRILLING		N Coordinate:
No. of Undist. Samples: 0	Driller: DAVID SAMPSON		E Coordinate:
Total Number of Core Boxes: 4	Bit Size and Type: NX B	CME Sampler:	Elev. Top of Hole:
Groundwater Observations	Casing Size: 3"	Spoon Size: 2.0"	Direction of Hole
At 7 Ft. After 12 Hrs.	Hollow-Stem: 3.25"	Hammer Wt.: 140#	Vertical ☑ Inclined ☐
At 8.0 Ft. After 96 Hrs.	Drilling Fluid: H_2O	Hammer Drop: 30"	Degrees from Vertical
Elev. After Hrs.	Drill Rig: D-120		Inspector:

Depth (Ft.)	Sample No.	Blows or RQD	Rec (Ft.)	Rec (%)	Legend	Description of Materials	Remarks
0						1" TOPSOIL	
4.25 TSF	1	3-6-10-13	1.5'			LIGHT BROWN CLAYEY SILT w/ LITTLE FINE SAND AND ORIDES (ML, CL-ML) MOIST, VERY STIFF	
2.25 TSF	2	10-10-9-10	1.1'	1.5	5.0'		
2.25 TSF 3.0 TSF	3	4-6-10-10	1.6'			MOTTLED OLIVE BROWN AND ORANGE-BROWN SILTY CLAY w/ TRACES OF OFIDE STAINS (CL) MOIST, VERY STIFF	
4.0 TSF	4	5-6-9-11	1.7'				No H_2O NOTED BEFORE ROCK CORING
2.75 TSF	5	9-11-12-12	1.7'			-- SLIGHTLY HIGHER PLASTICITY BELOW 80' DEEP w/ INCREASED MOISTURE	
10							
-	6	33-50/.4'	0.4'	4.2	14.0	SOFT TO MEDIUM HARD GRAY ARENACEOUS SHALE w/ SILTSTONE/ FINE GRAINED SANDSTONE LENSES	
15							
18.5'	7	50/.2'					
20	8	(9/2.5') 0%	0.6'	6.9	20.6'	LIGHT BROWN, VERY SOFT, ARENACEOUS SHALE	
21.0'					21.0'		
	9	4"/100" 7%	3.5'	6.4		MAROON AND TRACE GRAY, VERY SOFT TO SOFT INDURATED CLAY/SHALE VERY POOR TO GOOD ROCK QUALITY ①	
25							
26.0'	10	40"/100" 76%	4.3'			-- LAMINATED STRUCTURE BELOW 26.0	

Remarks: ① SAMPLING TECHNIQUE (SPLIT INNER BARREL) RESULT IN A MISLEADINGLY HIGH ROD RATING FOR THE RED/MAROON CLAY/SHALE

Agency: CENTRAL STAR DRILLING
Driller: DAVID JAMISON
Inspector: HARGRAVES

DRILLING LOG

Gannett Fleming
ENGINEERS AND PLANNERS

Hole No. 37-780
Sheet 2 of 3
Elev. Top of Hole:

Depth (Ft.)	Sample No.	Blows or RQD	Rec (Ft.)	Rec (%)	Legend	Description of Materials	Remarks
30							
31.0'							
	11	39"/60" 65%	4.9'			-- MARLED CALCRETE IN "ROCK" CORE SAMPLE	
35							
36.0'							
	12	0"/60" 0%	3.3'				
40							
41.0'							
	13	(31"/60") 52%	4.5'			INCREASED RED/MAROON AND GRAY MARLING 43.0 to 46.0'	
45							
46.0'							
	14	(42"/60") 72%	4.2'	14.2	46.5'	GRAY, FINE TO MEDIUM GRAINED, MODERATELY HARD SANDSTONE W/ ALTERNATE LAYERS OF SOFT TO MEDIUM SHALE -- SANDSTONE AND SHALE LAYERS 5" TO 8' IN THICKNESS GOOD ROCK QUALITY	
50							
51.0'							
	15	(42"/60") 70%	5.0'	15.5	51.5'	GRAY, MEDIUM ARENACEOUS SHALE GOOD ROCK QUALITY	
55							
56.0'							
	16	(57"/60") 95%	5.0'	17.7	57.0'	GRAY MODERATELY HARD, FINE TO MEDIUM GRAINED SANDSTONE -- 6" SHALE LAYER @ ± 58.0' -- DARK STRIATIONS NOTED IN SANDSTONE	
60							
61.0'							
	17	(100"/120") 83%	10'			MUD SEAM NOTED @ ± 66.0' GOOD TO EXCELLENT ROCK QUALITY	RUN FROM 61.0' to 71.0' DRILLING DURING EXTRACTION
65							
				21	69.0'		
70						SOFT GRAY TO DARK GRAY SHALE FAIR ROCK QUALITY	
71.0'							

Agency: CENTRAL STAR DRILLING

Driller: DAVID JAMISON

Inspector: HALLMARK

DRILLING LOG

Gannett Fleming
ENGINEERS AND PLANNERS

Hole No. 37+780

Sheet 3 of 3

Elev. Top of Hole:

Depth (Ft.)	Sample No.	Blows or RQD	Rec (Ft.)	Rec (%)	Legend	Description of Materials	Remarks
75							
76	18	77"/120" 64%	10.0'	23.1	76.0	VERY SOFT TO SOFT GRAY SHALE FAIR QUALITY (1)	
80							
81.0				24.7		BOTTOM OF BORING @ 81.0'	
40						1) SPLIT BARREL RESULTED IN HIGHER RQD	
45							
50							
55							
60							
65							
70							

Date Started: 7/27/99	**DRILLING LOG**	Hole No. 37+920
Date Finished: 7/27/99	**Gannett Fleming** ENGINEERS AND PLANNERS	Sheet 1 of 1
Soil Sampling: 28.6'		Line & Station:
Rock Sampling: —	Project: US 33 ATHENS - DARWIN	Offset:
Total Depth of Hole: 28.6'	Drilling Agency: CENTRAL STAR DRILLING	N Coordinate:
No. of Undist. Samples: 1	Driller: DAVID SAMISON	E Coordinate:
Total Number of Core Boxes: —	Bit Size and Type: — CME Sampler:	Elev. Top of Hole:
Groundwater Observations	Casing Size: — Spoon Size: 2.0"	Direction of Hole
At — Ft. After — Hrs.	Hollow-Stem: 3.25" Hammer Wt.: 140#	Vertical ☑ Inclined ☐
At ① Ft. After 24 Hrs.	Drilling Fluid: — Hammer Drop: 30"	Degrees from Vertical
Elev. After Hrs.	Drill Rig: D-120	Inspector:

Depth (Ft.)	Sample No.	Blows or RQD	Rec (Ft.)	Rec (%)	Legend	Description of Materials	Remarks
0							
2.5 TSF	1	7-9-11-12	1.2'			LIGHT BROWN VERY SILTY CLAY / CLAYEY SILT W/ TRACES OF ROOT HAIRS (CL, CL-ML); VERY STIFF, MOIST	
4.0 TSF	2	8-9-12-20	0.6'	0.6	2.5'	REDDISH BROWN W/ TRACE LIGHT BROWN SILTY CLAY (CL); MOIST, VERY STIFF	SHELBY TUBE PUSHED 2.0'-4.0'
2.5 TSF	3	11-13-18-22	1.3'		4.0'	MOTTLED LIGHT BROWN / BEIGE W/ TRACE GRAY AND ORANGE VERY SILTY CLAY / CLAYEY SILT W/ SILT LENSES AND OXIDES (CL, CL-ML); SLIGHTLY MOIST, HARD	2.0' REC
SAMPLE CRUMBLES	4	22-47-50/.1	1.2'	1.2			
4.5 TSF	5	22-30-32 40	1.3'	1.3	6.0'		
10							
13.5'	6	50/.4'	0.3'			OLIVE BROWN / BEIGE SILTY CLAY W/ TRACES OF OXIDES (CL) SLIGHTLY MOIST HARD — LAMINATED STRUCTURE, SLICKENSIDES	
15							
18.5'	7	60/.2'	0.1'	4.0	17.0'	[EXTREMELY WEATHERED SHALE]	
20						EXTREMELY WEATHERED, SOFT TO MEDIUM, OLIVE BROWN / LIGHT BROWN SHALE	HARDER DRILLING BELOW ≈ 19.0'
23.5'	8	60/.1'	0.1'	4.8	22.0'	LIGHT BROWN TO LIGHT GRAY FINE GRAINED MEDIUM HARD SANDSTONE	
25				4.1		SOFT GRAY ARENACEOUS SHALE	SOFTER BELOW ≈ 25.0'
28.5'	9	50/.1	0.1'	8.6		BOTTOM OF BORING @ 28.6'	

Remarks:

NO H_2O after drilling

1) Soil / Cutting obstruction @ 18.5' MOISTURE NOTED ON TAPE

DRILLING LOG

Gannett Fleming ENGINEERS AND PLANNERS

Date Started: 7/14/99	Project: US 33 ATHENS-DARWIN	Hole No. 384420	
Date Finished: 7/14/99	Drilling Agency: CENTRAL STAR DRILLING	Sheet 1 of 2	
Soil Sampling: 43.5'	Driller: DAVID JAMISON	Line & Station:	
Rock Sampling: 31.5'	Bit Size and Type:	Offset:	
Total Depth of Hole: 75.0'	Casing Size:	CME Sampler:	N Coordinate:
No. of Undist. Samples:	Hollow-Stem: 3.25"	Spoon Size: 2" OD.	E Coordinate:
Total Number of Core Boxes:	Drilling Fluid: WATER	Hammer Wt.: 140 #	Elev. Top of Hole:
Groundwater Observations	Drill Rig:	Hammer Drop: 30"	Direction of Hole
At 12.5 Ft. After 0 Hrs.			Vertical ☑ Inclined ☐
At 12.0 Ft. After 15 Hrs.			Degrees from Vertical
Elev. After Hrs.			Inspector:

Depth (Ft.)	Sample No.	Blows or RQD	Rec (Ft.)	Rec (%)	Legend	Description of Materials	Remarks
0							
—	1	8-11-8-9	0.5'			0.0' Topsoil	
2.0'						LIGHT BROWN CLAYEY SILT w/ TRACES OF ROOT HAIRS (CL); SLIGHTLY MOIST, VERY STIFF	
4.5 TSF	2	11-13-13-12	1.2'	0.9	3.0'		
4.0							
5 —	3	11-11-15-24	0.1'			LIGHT ORANGE BROWN AND BEIGE w/ TRACE GRAY VERY SILTY CLAY / CLAYEY SILT (CL) SLIGHTLY MOIST, VERY STIFF	
6.0							
4.5+ TSF	4	8-12-18-17	1.3'				
8.0							
2.75 TSF	5	7-12-11-14	1.5'			-- TRACES OF OXIDE STAINS IN SAMPLE # 4	
10							
2.75 TSF	6	6-7-8-9	1.3'			-- MOIST AT SAMPLE #5	
12.0							
13.5				4.0	13.0'		
4.5+ TSF	7	8-12-16	1.3'			RED / BROWN AND TRACE GRAY SILTY CLAY (CL) MOIST, VERY STIFF TO HARD	
15							
18.5'							
4.5+ TSF	8	13-30-29	1.5'				
20							
23.5'							
4.5+ TSF	9	55-50/3	0.8'				
25							
28.5'							
4.5+ TSF	10	70-50/2'	0.7'				

Remarks:

BAG SAMPLE OF RED RESIDUAL CLAY TAKEN

Agency: CENTRAL STAR DRILLING
Driller: DAVID JAMISON
Inspector: HARGRAVES

DRILLING LOG

Gannett Fleming
ENGINEERS AND PLANNERS

Hole No. 384120
Sheet 2 of 2
Elev. Top of Hole:

Depth (Ft.)	Sample No.	Blows or RQD	Rec (Ft.)	Rec (%)	Legend	Description of Materials	Remarks
30						-- ISOLATED SANDSTONE LENSES @ ≈ 32.0'	
33.5'	11	80/5'	0.5'			-- MAROON / RED AND GRAY IN SAMPLE # 11 W/ SLIGHTLY LAMINATED STRUCTURE	
35							
38.5'	12	75/0.5'	0.5'			-- ISOLATED SANDSTONE LENS @ ≈ 38.0'	
40							
43.5'	13	75/0.0'	0.0'	19.1	43.5'	SPOON REFUSAL @ 43.5'	
45		41' / 60" 68%	5.8' 96.7%	96%		SOFT GRAY SHALE FAIR ROCK QUALITY	
49.5'							
50		8.8/10.0 88%	9.9'	19.7 99%	51.3	GRAY, FINE GRAINED, MEDIUM SANDSTONE GOOD ROCK QUALITY	
55				17.2	56.8'	LIGHT BROWN, FINE TO MEDIUM GRAINED MEDIUM TO MODERATELY HARD SANDSTONE GOOD ROCK QUALITY	
59.5'							
60		27" / 18"	(18") 6.5'	19.0	62.0'	SOFT TO VERY SOFT GRAY SHALE; POOR ROCK QUALITY	
65							
66.0		30%	3.0	20 100% 41	66.0' 69.0'	VERY SOFT BROWNISH GRAY SHALE (33%) W/ SOFT TO MEDIUM GRAY ARGILLACEOUS SHALE SEAMS (66%) POOR ROCK QUALITY	
69.0						SOFT TO VERY SOFT GRAY SHALE	
70		70%	5.7'	21.6 95%	71.5'	MODERATELY HARD MARLED SHALE AND LIMESTONE W/ SHALE PARTINGS; FAIR TO GOOD ROCK QUALITY	
75.0'					73	BOTTOM OF BORING @ 75.0'	

DRILLING LOG

Gannett Fleming ENGINEERS AND PLANNERS

Date Started: 5/24/99	Project: US 33 Athens-Dawson	Hole No. 38+680	
Date Finished: 5/25/99	Drilling Agency: Central Star Drilling	Sheet 1 of 2	
Soil Sampling: 40.0'	Driller: Matt Samison	Line & Station:	
Rock Sampling: 20.0'	Bit Size and Type:	CME Sampler:	Offset:
Total Depth of Hole: 60.0	Casing Size:	Spoon Size: 2" OD.	N Coordinate:
No. of Undist. Samples: 0	Hollow-Stem: 3.25"	Hammer Wt.: 140 #	E Coordinate:
Total Number of Core Boxes: 2	Drilling Fluid: Water	Hammer Drop: 30"	Elev. Top of Hole:
Groundwater Observations	Drill Rig: D-50 ATV		Direction of Hole
At 4.5 Ft. After 0 Hrs.			Vertical ☑ Inclined ☐
At — Ft. After — Hrs.			Degrees from Vertical ⬭
Elev. After Hrs.			Inspector: Hargraves

Depth (Ft.)	Sample No.	Blows or RQD	Rec (Ft.)	Rec (%)	Legend	Description of Materials	Remarks
0						2" topsoil	
2.25 tsf	1	3-4-3-7	1.3	0.6	2.0'	Reddish Brown Silty Clay w/traces of root hairs (CL); moist, medium stiff	
4.5 tsf	2	5-8-15-23	1.8				
4.5+ tsf	3	15-29-39 50/4"	1.6	1.1	3.5'	Reddish Brown to Red Silty Clay w/ trace light gray marbling (CL) slightly moist very stiff	
4.5+ tsf	4	23-30-49 50/4"	15'				
4.5 tsf	5	15-23-50/4"	1.0'			Red w/ trace Gray Silty Clay (CL); slightly moist, hard	
10						-- traces of slickensides, yellow coloring noted in sample #4	Softer Drilling noted @ ± 12.0'
13.5'				4.0	13.0'		
2.25 tsf	6	9-20-26	1.4'			Dark Red / Maroon and Gray Silty Clay (CL); moist, hard	
15						-- traces of Beige and Yellow in Sample #7	
18.5'							
4.25 tsf	7	12-20-47	1.5'				
20				6.7	22.0'		
22.5'						Light Brown / Beige Siltstone (fragments) soft	
	8	50/2"	0.1'				
25							
				8.3	27.0'		
28.5'						Soft to Medium Gray Silty, Arenaceous Shale (fragments in spoon)	
	9	75/0.3'	0.2'				

Remarks:

Agency: CENTRAL STAR DRILLING
Driller: MATT JAMISON
Inspector: HARGRAVES

DRILLING LOG
Gannett Fleming
ENGINEERS AND PLANNERS

Hole No. 387680
Sheet 2 of 2
Elev. Top of Hole:

Depth (Ft.)	Sample No.	Blows or RQD	Rec (Ft.)	Rec (%)	Legend	Description of Materials	Remarks
30						SOFT TO MEDIUM GRAY SHALE (CONT'D)	
33.5	10	50/3"	0.3'				
35				11.1	37.0'	MEDIUM TO MODERATELY HARD GRAY SANDSTONE	
38.5	11	50/2"					
40				12.2	40.0'	AUGER REFUSAL	
	12	74%	6.1'	100%		LIGHT GRAY TO GRAY MODERATELY HARD FINE TO MEDIUM GRAINED SANDSTONE (50%), GRAY, MEDIUM HARD SILTSTONE (20%) AND GRAY TO DARK GRAY, SOFT TO MEDIUM HARD, FISSILE, MICACEOUS SHALE (GOOD ROCK QUALITY)	
45	46.0			14.0	46.1	— THIN LAMINATIONS NOTED IN SILTSTONE	
	13	0	4.0'	65%		DARK GRAY TO MOTTLED DARK RED/MAROON SOFT SHALE / MUDSTONE; LAMINATED STRUCTURE IN GRAY SHALE, LACK OF BEDDING IN RED MUDSTONE / SHALE; VERY POOR ROCK QUALITY	H2O CIRCULATION BLOCKED; SAMPLES DISTORTED
50				16.0	52.0'		
	52.1	54%	3.7'	55%	53.6'	GRAY, FINE GRAINED, MEDIUM TO MODERATELY HARD SANDSTONE (POSSIBLY CALCAREOUS) FAIR ROCK QUALITY	
55	55.8			16.5			
		55%	4.0'	92%		GRAY TO LIGHT GRAY CALCAREOUS SANDSTONE, MEDIUM TO MODERATELY HARD, CEMENTED FAIR ROCK QUALITY	
60	60.0'			16.0	60.0		
						BOTTOM OF BORING @ 60.0'	
65							
70							

DRILLING LOG

Gannett Fleming
ENGINEERS AND PLANNERS

Date Started:	7/28/99
Date Finished:	7/28/99
Soil Sampling:	33.7'
Rock Sampling:	—
Total Depth of Hole:	33.7'
No. of Undist. Samples:	—
Total Number of Core Boxes:	—

Groundwater Observations
At — Ft. After 0 Hrs.
At 11* Ft. After 48 Hrs.
Elev. After Hrs.

Project: US 33 ATHENS - DARWIN
Drilling Agency: CENTRAL STAR DRILLING
Driller: DAVID SAMPSON
Bit Size and Type: —
Casing Size: —
Hollow-Stem: 3.25"
Drilling Fluid: —
Drill Rig: D-120
CME Sampler: —
Spoon Size: 2.0" O.D.
Hammer Wt.: 140#
Hammer Drop: 30"

Hole No. 38+880
Sheet 1 of 2
Line & Station:
Offset:
N Coordinate:
E Coordinate:
Elev. Top of Hole:
Direction of Hole
Vertical ☒ Inclined ☐
Degrees from Vertical
Inspector: J.A. LORANGER

Depth (Ft.)	Sample No.	Blows or RQD	Rec (Ft.)	Rec (%)	Legend	Description of Materials	Remarks
0							
CRUMBLES	1	12-26-38 -33	0.9'			Topsoil 7"	
						LIGHT BROWN SILT w/ LITTLE TO SOME FINE SAND (ML); SLIGHTLY MOIST,	
4.0 TSF	2	20-25-30 45	1.2'		3.5'	DENSE TO VERY DENSE	
5	3	50/.5'	0.3'	1.1		LIGHT BROWN EXTREMELY WEATHERED FINE GRAINED SANDSTONE (FRAGMENTS) & SOFT	
	4	30-50/.2'	0.6'		7.5'		
	5	17-45-50/.5'	1.1'	2.3		SOFT, LIGHT BROWN / BEIGE VERY WEATHERED SHALE	
10							
						OLIVE BROWN BELOW 12.0'	
13.5'						GRAY BELOW ≈ 16.0'	
	6	50/.5'	0.4'				
15							
				5.5	18.0'		
18.5'	7	27-50/.2'	0.6'			MAROON AND GRAY VERY SOFT TO SOFT WEATHERED CLAY SHALE	
20							
				7.0	23.0'	LIGHT GRAY TO OLIVE BROWN SOFT SHALE	
23.5'	8	40-50/.2'	0.6'				
				1.5	24.5'	OLIVE BROWN SOFT ARGILLACEOUS SHALE	
25				4.3	27.0'	MOTTLED OLIVE, GRAY, AND MAROON VERY SOFT TO SOFT SHALE	
28.5'	9	15-50/.5'	0.7'				

Remarks: * 48 hr H2O STRONGLY INFLUENCED BY LATE NIGHT THUNDERSTORM RAINS

Agency: CENTRAL STAR DRILLING
Driller: DAVID JAMISIN
Inspector: HALCHAVOD

DRILLING LOG

Gannett Fleming
ENGINEERS AND PLANNERS

Hole No. 384880
Sheet 2 of 2
Elev. Top of Hole:

Depth (Ft.)	Sample No.	Blows or RQD	Rec (Ft.)	Rec (%)	Legend	Description of Materials	Remarks
30				9.8	32.0'	MAROON / RED SOFT TO VERY SOFT SHALE	
33.5'	10	50/.2'	0.2'	10.1		BOTTOM OF BORING @ 33.7'	
35							
40							
45							
50							
55							
60							
65							
70							

US 33 - ATHENS TO DARWIN
PRELIMINARY CULVERT DESIGN DATA

By Prime for ml culverts

Revised 9-9-98

D.A.	Q50 (cms)	Q100 (cms)	Upstream Invert	Upstream Station	Upstream Elev. Near EP	Upstream Elev. PG	Centerline Station	Centerline Elev. PG	Downstream Invert	Length (m)	Slope	Size (mm)	NOTE
1	2.080	2.500	238.5	30+240	241.5	241.6	30+200	240.2	234.3	99.1	0.0424	1050	1, 3
2	4.330	5.170	244.6	30+745	259.2	259.3	30+738	259.1	237.5	153.5	0.0463	1350	3
3	2.620	3.150	251.5	31+230	271.1	271.2	31+195	270.6	235.7	201.7	0.0783	1050	2, 3
4	5.310	6.380	237.3	31+668	277.7	277.8	30+681	278.0	228.3	257.7	0.0349	1500	3
5	3.040	3.640	255.7	32+200	281.5	281.6	32+157	281.8	240.5	258.2	0.0589	1200	3
6	3.310	3.960	251.5	32+730	284.2	284.3	32+725	284.1	243.4	233.1	0.0347	1200	2, 3
7			Flow to be diverted to #8										
8	2.530	3.040	264.0	33+120	293.5	293.6	33+050	292.2	245.5	405.2	0.0457	1050	2, 3
9	1.490	1.770	270.0	33+660	292.4	292.5	33+710	292.1	261.2	202.2	0.0435	1050	
10	2.370	2.820	264.9	34+120	284.7	284.8	34+160	284.1	260.1	121.2	0.0396	1050	3
11	2.350	2.770	259.8	34+420	279.8	279.7	34+410	279.6	255.4	125.3	0.0351	1050	2, 3
12	2.100	2.510	266.4	34+730	282.2	282.3	34+730	282.3	258.9	123.9	0.0605	1050	2, 3
13	0.406	0.458	284.2	35+085	286.2	286.3	35+095	286.2	282.0	60.9	0.0361	750	1
14	4.100	4.880	263.6	35+875	283.4	283.5	35+980	281.5	258.7	195.7	0.0353	1350	2, 3
15	3.050	3.640	269.0	37+525	274.1	274.2	37+540	274.3	266.0	89.9	0.0334	1200	3
16	1.260	1.510	269.4	38+050	271.2	271.3	38+050	271.3	268.5	73.5	0.0122	900	1
17	2.460	2.950	267.0	38+290	268.7	268.8	38+270	269.1	264.0	69.4	0.0432	1050	1, 3
18	1.430	1.720	264.0	38+600	265.7	265.8	38+600	265.8	263.0	58.1	0.0172	900	1
19	0.990	1.180	262.2	38+790	263.9	264.0	38+815	263.6	256.0	65.5	0.0725	900	1, 3
20	1.610	1.920	255.6	38+970	261.9	262.0	38+990	261.8	249.5	66.3	0.0707	900	2, 3
21	1.430	1.710	256.8	39+310	258.5	258.6	39+325	258.5	250.0	88.4	0.0769	900	3
22			Bridge										
23			Box Culvert - See Preliminary Drainage Report										
24	7.370	8.880	229.4	40+335	249.3	249.4	40+380	249.6	228.0	215.0	0.0158	1800	3
25	2.410	2.890	238.3	40+880	255.2	255.3	40+895	255.5	231.5	177.1	0.0384	1050	2,3
26	8.820	10.170	227.5	41+300	260.5	260.6	41+340	261.1	225.0	254.5	0.0096	1950	2
27			Flow to be diverted to #26										
28	1.820	2.180	256.5	42+120	270.5	270.6	42+110	270.4	252.4	140.1	0.0293	1050	
29a	1.200	1.420	255.3	42+600	269.7	269.8	42+620	269.7	237.5	151.9	0.1172	1050	3
29b	1.200	1.430	244.0	42+730	268.7	268.8	42+760	268.6	234.0	187.0	0.0535	1050	2
30	2.210	2.650	246.0	42+990	268.7	268.8	43+020	268.7	230.0	221.3	0.0723	1050	2, 3
31	4.750	5.640	226.0	43+690	261.5	261.6	43+790	260.9	220.0	353.1	0.0170	1500	2
32	3.630	4.340	231.3	44+430	256.0	256.1	44+430	256.1	222.0	227.1	0.0410	1200	2, 3
33	2.320	2.780	226.0	44+890	247.1	247.2	44+965	244.8	212.5	260.7	0.0518	1050	2, 3
34	1.660	2.000	219.4	45+280	234.2	234.3	45+300	233.7	208.9	175.2	0.0599	1050	3
35	0.601	0.681	225.5	46+020	231.9	232.0	46+025	232.0	214.0	125.6	0.0916	1050	2
36	0.848	0.962	240.5	46+640	241.8	241.9	46+910	241.7	231.5	140.9	0.0639	900	1
37	0.669	0.766	234.5	47+130	239.3	239.4	47+140	239.3	229.2	89.2	0.0594	900	
38	1.630	1.960	225.5	47+560	233.7	233.8	47+600	233.3	216.7	189.7	0.0464	1050	3
39			Flow to be diverted to #47										
40	1.740	2.090	217.8	48+120	226.4	226.5	48+150	226.1	211.9	152.1	0.0388	1050	2
41	0.330	0.373	222.4	48+310	223.0	223.1	48+300	224.2	217.0	87.7	0.0798	750	1
42			Flow to be diverted to #43										
43	2.300	2.730	208.0	48+680	216.9	217.0	48+680	217.0	205.9	105.6	0.0199	1050	
44	9.080	10.750	204.5	49+500	208.7	208.8	49+330	204.7	201.9	257.1	0.0101	1950	2
45			Bridge										
46			Bridge										
47	0.597	0.877	227.0	47+750	231.2	231.3	47+780	231.2	218.0	100.4	0.0896	900	2, 3
48	1.840	2.200	239.0	43+955	259.6	259.7	43+955	259.7	221.4	233.5	0.0754	1050	2, 3

NOTES: 1 = SLOPE TAPERED OR DROP INLET NECESSARY
2 = ANGLE POINT OR CURVED PIPE NECESSARY
3 = ENERGY DISSIPATOR NECESSARY

153176.2

PRIME ENGINEERING
& ARCHITECTURE INC.

- Geotechnical & Materials Testing
- Inspection
- Civil
- Highways & Bridges
- Structural
- Architecture

FAX

To: Malcolm Hargrave **From:** Matt Boyer

Fax: 614-794-9442 **Pages: (including cover sheet)** 32

Phone: **Date:** 12-7-99

Company: Gannett Fleming **Time:** 10:30 a.m.

Comments:

Here are preliminary logs for Athens 33 project. Please let us know if we can be of further assistance.

Matt

1038 Ghent Rd. Akron, Ohio 44333
Phone: (330) 666-5432 Fax: (330) 666-4130 E-mail: pegeotec@aol.com

PRIME ENGINEERING & ARCHITECTURE INC.

TEST BORING No.: Sta 30+203

APPROX. STA. & OFFSET: Sta 30+203

ELEVATION: 239.810 m

DRAFT

CLIENT: Gannett Fleming

PROJECT: ATH-33-30.981 PROJECT No.: 99043

LOCATION: Athens County, Athens, Ohio

DATE STARTED: 10/25/99 DATE COMPLETED: 10/26/99

SAMPLER DIAM: 2.0" TYPE: SS HAMMER WT.: 140lb FALL: 30"

CASING DIAM: 3.25" TYPE: HSA OTHER:

DRILLING INFORMATION:
Ohio Testbor

GROUNDWATER INFORMATION:
Dry during drilling operations and upon completion.

ELEV (ft.)	DEPTH (ft.)	Soil/Rock symbol	MATERIAL DESCRIPTION	SAMPLE NUMBER	SAMPLE DEPTH	BLOWS/6 INCHES N-VALUE (BLOWS/FT) OR RECOVERY(ROD%)	PENETROMETER (tons/ft²)	MOISTURE CONTENT (%)	ATTERBERG LIMITS (%) LIQUID LIMIT LL	PLASTIC LIMIT PL	PLASTICITY INDEX PI	AGGREGATE (%)	COARSE AND FINE SAND (%)	SILT AND CLAY COMBINED(%) OR SILT(%)/CLAY(%)	CLASSIFICATION SYMBOL
			FIELD DATA						**LABORATORY DATA**						
			Stiff, reddish brown ELASTIC CLAY.	1	0.0	2 5 3 7 — 8	3.75	19	64	32	32	0	0		A-7-5
0.6	2.0		Very stiff, reddish brown CLAY, trace rock fragments, trace sand, moist.	2	2.5	5 10 13 — 23	4.0	13	47	24	23	1	2		A-7-6
1.5	5.0		Medium hard to soft, reddish brown to gray, decomposed CLAY SHALE.	3	5.0	9 16 22 — 38	2.75	11				--	--		VISUAL
				4	7.5	28 50+ 44	1.5	9				--	--		VISUAL
				5	10.0	16 17 21 — 38	2.5-4.0	10				--	--		VISUAL
				6	15.0	40 50+ 3cm in	--	8				--	--		VISUAL
				7	20.0	33 21 22 — 43	0.75	8				--	--		VISUAL
7.4	24.0		Note: Auger refusal on bedrock at 24.0 feet. Began coring for rock. Medium hard, gray, weathered SILTY SHALE, fissile with laminar bedding. Quality of rock considered excellent as per RQD.	RUN 1	24.0	98% (99%)									
3.3	27.3		Hard, gray, slightly weathered, slightly micaceous, fine grained SANDSTONE, with very thin to thick bedding.												
2.0	29.5		TERMINATION DEPTH = 29.5 FEET		29.5										

NOTES/REMARKS:

Sta 30+203; PAGE 1 OF 1

TEST BORING LOG) 8X11.DF - PEMENG.GDT - 2/7/99

PRIME ENGINEERING & ARCHITECTURE INC.

TEST BORING No.: Sta 30+738

APPROX. STA. & OFFSET: Sta 30+738

ELEVATION:

DRAFT

CLIENT: Gannett Fleming

PROJECT: ATH-33-30.981 PROJECT No.: 99043

LOCATION: Athens County, Athens, Ohio

DATE STARTED: 10/25/99 DATE COMPLETED: 10/25/99

SAMPLER DIAM: 2.0" TYPE: SS HAMMER WT.: 140lb FALL: 30"

CASING DIAM: 3.25" TYPE: HSA OTHER:

DRILLING INFORMATION:
Ohio Testbor

GROUNDWATER INFORMATION:
Dry during drilling operations and upon completion.

ELEV (ft.)	DEPTH (ft.)	Soil Rock Symbol	MATERIAL DESCRIPTION	SAMPLE NUMBER	SAMPLE DEPTH	BLOWS/6 INCHES; N-VALUE (BLOWS/FT) OR RECH/RQD%	PENETROMETER (tons/ft²)	MOISTURE CONTENT (%)	ATTERBERG LIMITS (%) LL: LIQUID LIMIT	PL: PLASTIC LIMIT	PI: PLASTICITY INDEX	AGGREGATE (%)	COARSE AND FINE SAND (%)	SILT AND CLAY COMBINED (%) OR SILT(%)/CLAY(%)	CLASSIFICATION SYMBOL
			TOPSOIL												
0.3	1.0		Medium stiff to very stiff, brown SILTY CLAY	1	1.0	3 3 4 = 7	2.25	14	33	21	12	1	25		A-6a
				ST	3.5							--	--		VISUAL
				3	5.5	3 4 26 = 30	3.0	10	37	21	16	16	18		A-6b
1.7	9.0		Soft, gray, decomposed CLAY SHALE	4	9.0	50/3 in.	1.5	7				--	--		VISUAL
3.2	10.5		Note: Auger refusal on bedrock at 10.5 feet. Began coring for rock.	RUN 1	10.5	50/3 in.									
			Very soft to soft, red, highly weathered to decomposed CLAYSTONE, with indistinct bedding.												
			Note: Quality of rock of Run 1 considered poor as per RQD.			84% (38%)									
				RUN 2	15.5										
			Note: Quality of rock of Run 2 considered excellent as per RQD.			100% (90%)									
4.2	20.5		TERMINATION DEPTH = 20.5 FEET		20.5										

NOTES/REMARKS: ST=Shelby Tube

Sta 30+738; PAGE 1 OF 1

TEST BORING LOG (ANSI) PRIME.GDT 12/7/99

PRIME ENGINEERING & ARCHITECTURE INC.

TEST BORING No.: Sta 32+156

APPROX. STA. & OFFSET: Sta 32+156

ELEVATION: 249.198 m

DRAFT

CLIENT: Gannett Fleming

PROJECT: ATH-33-30.981 PROJECT No.: 99043

LOCATION: Athens County, Athens, Ohio

DATE STARTED: 10/11/99 DATE COMPLETED: 10/11/99

SAMPLER DIAM: 2.0" TYPE: SS HAMMER WT.: 140lb FALL: 30"

CASING DIAM: 3.25" TYPE: HSA OTHER:

DRILLING INFORMATION:
Chris Teather

GROUNDWATER INFORMATION:
Dry during drilling operations and at 1.0 feet upon completion.

GROUNDWATER UPON COMPLETION

ELEV (ft)	DEPTH (ft)	Soil/Rock Symbol	MATERIAL DESCRIPTION	SAMPLE NUMBER	SAMPLE DEPTH	BLOWS/6 INCHES (N-VALUE (BLOWS/FT) OR REC%/RQD%)	PENETROMETER (tons/ft²)	FIELD DATA
0.2	0.7		TOPSOIL Medium stiff to very stiff CLAY	1	0.0	1 2 2 (4)		
				ST	2.0	2 3 4 (7)		
				3	4.0			
				4	6.5	4 7 10 (17)		
				5	9.0	7 10 14 (24)		
3.5	11.6		Reddish brown, decomposed CLAY SHALE	6	11.5	10 21 29 (50)		
				7	14.0	9 17 24 (41)		
				8	16.5	21 50/4 in (50+)		
				9	19.0	50/3 in (50+)		
7.6	25.0		Note: Auger refusal on bedrock at 25.0 feet. Began coring for rock.	10	24.0	50/4 in (50+)		
			Very soft, red, weathered to highly weathered CLAYSTONE with indistinct bedding. Quality of rock considered excellent as per RQD.	RUN 1	25.0	(93%)		
9.0	30.0		TERMINATION DEPTH = 30.0 FEET		30.0			

LABORATORY DATA							
MOISTURE CONTENT (%)	ATTERBERG LIMITS (%) LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	AGGREGATE (%)	COARSE AND FINE SAND (%)	SILT AND CLAY COMBINED (%) OR SILT(%)/CLAY(%)	CLASSIFICATION SYMBOL
17	37	21	16	11	29		A-6b
				–	–		VISUAL
19	36	21	15	18	29		A-6a
21	51	28	23	0	2		A-7-6
19	52	27	25	1	2		A-7-6
15				–	–		VISUAL
14				–	–		VISUAL
10				–	–		VISUAL
7				–	–		VISUAL
				–	–		VISUAL

NOTES/REMARKS:

Sta 32+156: PAGE 1 OF 1

TEST BORING LOG1 Sta3 GPJ PRIME.HG BOT 12/7/99

PRIME ENGINEERING & ARCHITECTURE INC.

TEST BORING No.: Sta 32+760

APPROX. STA. & OFFSET: Sta 32+760

ELEVATION: 253.813 m

DRAFT

CLIENT: Gannett Fleming

PROJECT: ATH-33-30.981 PROJECT No.: 99043

LOCATION: Athens County, Athens, Ohio

DATE STARTED: 10/11/99 DATE COMPLETED: 10/11/99

SAMPLER DIAM: 2.0" TYPE: SS HAMMER WT.: 140lb FALL: 30"

CASING DIAM: 3.25" TYPE: HSA OTHER:

DRILLING INFORMATION:
Ohio Testbor

GROUNDWATER INFORMATION:
Water encountered at 4.5 feet during drilling operations and at 1.0 feet upon completion.

▼ GROUNDWATER DURING DRILLING ▽ GROUNDWATER UPON COMPLETION

ELEV (ft)	DEPTH (ft)	Soil/Rock Symbol	MATERIAL DESCRIPTION	SAMPLE NUMBER	SAMPLE DEPTH	BLOWS/6 INCHES N-VALUE (BLOWS/FT) OR RECOVERY(%)	PENETROMETER (tons/sf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS (%) LIQUID LIMIT LL	PLASTIC LIMIT PL	PLASTICITY INDEX PI	AGGREGATE (%)	COARSE AND FINE SAND (%)	SILT AND CLAY COMBINED(%) OR SILT(%)/CLAY(%)	CLASSIFICATION SYMBOL
0.5	0.5		TOPSOIL												
			Soft to hard CLAY	1	1.0	1 1 2 — 3		23	33	20	13	5	0		A-6a
				ST	3.5				--	--		--	--		VISUAL
				3	5.5	2 3 5 — 8		21	42	26	16	10	15		A-7-6
				4	8.5	7 13 18 — 31		15	42	26	16	11	7		A-7-6
3.2	11.0		Reddish brown, decomposed CLAY SHALE	5	11.0	11 17 17 — 34		18	--	--		--	--		VISUAL
				6	13.5	16 18 26 — 44		19	--	--		--	--		VISUAL
				7	16.0	50/4" 21 30 — 50+		13	--	--		--	--		VISUAL
				8	18.5	50/5" 25 25 — 50+ 606 in		12	--	--		--	--		VISUAL
				9	23.5	25 50/5" 55 — 50+		9	--	--		--	--		VISUAL
-7.9	26.5		Note: Auger refusal on bedrock at 26.5 feet. Began coring for rock. Very soft, red, weathered CLAYSTONE, with indistinct bedding. Quality of rock considered good as per RQD.	RUN 1	25.5										
						(82%)									
-9.3	30.5		TERMINATION DEPTH = 30.5 FEET		30.5										

NOTES/REMARKS: ST=Shelby Tube

Sta 32+760: PAGE 1 OF 1

TEST BORING LOGS SHT2_PRIMENG.RPT 12/7/99

PRIME ENGINEERING & ARCHITECTURE INC.

TEST BORING No.: Sta 33+003

APPROX. STA. & OFFSET: Sta 33+003

ELEVATION: 257.896 m

CLIENT: Gannett Fleming

DRAFT

PROJECT: ATH-33-30.981 PROJECT No.: 99043

LOCATION: Athens County, Athens, Ohio

DATE STARTED: 10/26/99 DATE COMPLETED: 10/26/99

SAMPLER DIAM: 2.0" TYPE: SS HAMMER WT.: 140lb FALL: 30"

CASING DIAM: 3.25" TYPE: HSA OTHER:

DRILLING INFORMATION:
Ohio Testbor

GROUNDWATER INFORMATION:
Dry during drilling operations and upon completion

ELEV (m.)	DEPTH (m.)	Soil/Rock Symbols	MATERIAL DESCRIPTION	SAMPLE NUMBER	SAMPLE DEPTH	BLOWS/6 INCHES	N-VALUE (BLOWS/FT) OR REC%(ROD%)	PENETROMETER (tons/ft²)	MOISTURE CONTENT (%)	ATTERBERG LIMITS (%) LL	PL	PI	AGGREGATE (%)	COARSE AND FINE SAND (%)	SILT AND CLAY COMBINED (%) OR SILT%/CLAY(%)	CLASSIFICATION SYMBOL
0.15	0.0		TOPSOIL Medium stiff to very stiff CLAY	1	0.0	1 2 3	5	.5	11	30	19	11	12	31		A-6a
				2	2.5	6 9 8	13	0.6	12	41	25	16	0	23		A-7-6
				3	5.0	7 10 15	25	1.0	11	48	26	22	1	7		A-7-6
				4	7.5	8 11 18	29	1.5	10	40	23	17	1	9		A-7-6
3.0	10.0		Brown, decomposed CLAY SHALE	5	10.0	15 34 46	50+	0	8	--	--		--	--		VISUAL
4.6	15.0		Note: Auger refusal on bedrock at 15.0 feet. Began coring for rock.	RUN 1	15.0											
4.8	15.2		Hard, brown, weathered, fine grained SANDSTONE with thin bedding.													
5.0	16.2		Very soft, brown, highly weathered CLAY SHALE, with indistinct bedding.													
			Hard, gray, weathered, micaceous, fine grained SANDSTONE, with thin to moderate bedding.				100% (72%)									
			Note: 2 inch highly weathered clay shale seam at 17.1 feet.													
			Note: Quality of rock considered fair as per RQD.													
6.5	21.1		Hard, gray, slightly weathered to weathered SILTSTONE, with very thin to thin bedding.		22.6											
6.8	22.6		TERMINATION DEPTH = 22.6 FEET													

NOTES/REMARKS:

TEST BORING LOG1 9043.DPJ PRIME.GPJ GINT 12/1/99

PRIME ENGINEERING & ARCHITECTURE INC.

TEST BORING No.: Sta 33+727

APPROX. STA. & OFFSET: Sta 33+727

ELEVATION: 288.727 m

DRAFT

CLIENT: Gannett Fleming

PROJECT: ATH-33-30.981 PROJECT No.: 99043

LOCATION: Athens County, Athens, Ohio

DATE STARTED: 10/14/99 DATE COMPLETED: 10/14/99

SAMPLER DIAM: 2.0" TYPE: SS HAMMER WT.: 140lb FALL: 30"

CASING DIAM: 3.25" TYPE: HSA OTHER:

DRILLING INFORMATION:
Ohio Testbor

GROUNDWATER INFORMATION:
Dry during drilling operations and at 1.0 feet upon completion.

▽ GROUNDWATER UPON COMPLETION

ELEV (ft.)	DEPTH (ft.)	Soil/Rock Symbol	MATERIAL DESCRIPTION	SAMPLE NUMBER	SAMPLE DEPTH	BLOWS/6 INCHES (N-VALUE (BLOWS/FT) OR RECK=(ROD%)	PENETROMETER (tons/ft²)	MOISTURE CONTENT (%)	ATTERBERG LIMITS (%) LIQUID LIMIT LL	PLASTIC LIMIT PL	PLASTICITY INDEX PI	AGGREGATE (%)	COARSE AND FINE SAND (%)	SILT AND CLAY COMBINED (%) OR SILT (%), CLAY (%)	CLASSIFICATION SYMBOL
287.5	0.0		TOPSOIL.												
			Medium stiff to hard, brown SILT AND CLAY	1	1.0	3 6 7 = 13		17	41	24	17	4	9		A-7-6
				2	3.5	8 10 12 = 22		12	34	18	15	2	11		A-6a
1.7	6.0		Brown, decomposed to highly weathered SANDSTONE	3	6.0	50/3" = 50+		5	--	--		--	--		VISUAL
				4	8.5	50/1 in. = 50+		5	--	--		--	--		VISUAL
3.0	10.0		Note: Auger refusal on bedrock at 10.0 feet. Began to core rock.	RUN 1	10.0										
			Hard, brown, slightly weathered, micaceous, fine grained SANDSTONE, with very thin to moderate bedding. Quality of rock considered excellent as per RQD. Note: Iron staining present from 10.0 feet to 11.9 feet. Note: Color change to gray at 11.9 feet. Note: Many carbonaceous lamination present from 11.9 feet to 20.0 feet. Bedding planes weaker along laminations.											
						(93%)									
			Note: Sandstone grain size changes to very fine grained at 18.3 feet.												
6.1	20.0		TERMINATION DEPTH = 20.0 FEET		20.0										

NOTES/REMARKS:

Sta 33+727; PAGE 1 OF 1

TEST BORING LOG1 SHAS.GPJ PRIMENG.GDT 11/7/99

PRIME ENGINEERING & ARCHITECTURE INC.

TEST BORING No.: Sta 34+133

APPROX. STA. & OFFSET: Sta 34+133

ELEVATION: 289.800 m

DRAFT

CLIENT: Gannett Fleming

PROJECT: ATH-33-30.981

PROJECT No.: 99043

LOCATION: Athens County, Athens, Ohio

DATE STARTED: 10/26/99 DATE COMPLETED: 10/26/99

SAMPLER DIAM: 2.0" TYPE: SS HAMMER WT.: 140lb FALL: 30"

CASING DIAM: 3.25" TYPE: HSA OTHER:

DRILLING INFORMATION:
Ohio Testboring

GROUNDWATER INFORMATION:
Dry during drilling operations and upon completion.

ELEV (ft.)	DEPTH (ft.)	SOIL/Rock Symbol	MATERIAL DESCRIPTION	SAMPLE NUMBER	SAMPLE DEPTH	BLOWS/6 INCHES	N-VALUE (BLOWS/FT) OR REC%/RQD%	PENETROMETER (tons/ft²)	MOISTURE CONTENT (%)	ATTERBERG LIMITS (%) LIQUID LIMIT LL	PLASTIC LIMIT PL	PLASTICITY INDEX PI	AGGREGATE (%)	COARSE AND FINE SAND (%)	SILT AND CLAY COMBINED (%) OR SIL T%/CLAY(%)	CLASSIFICATION SYMBOL
			Soft to very stiff SILT AND CLAY	1	0.0	1 2 1 3	3	1.5	19	33	23	10	10	26		A-4a
				ST	2.0		–			–	–		–	–		VISUAL
				3	4.0	4 7 11	18	3.0	15	38	21	15	14	20		A-6a
291	7.0		Brown, decomposed SANDSTONE	4	7.0	50+ 5/5 in.	–		9	36	28	13	25	20		A-6a
2-3	7.5		Note: Auger refusal on bedrock at 7.5 feet. Began coring for rock.	RUN 1	7.5											
			Hard, gray, weathered, micaceous, fine grained SANDSTONE, with thin to thick bedding. Quality of rock considered excellent as per ROD.													
			Note: Iron staining present from 7.5 feet to 11.4 feet.													
			Note: Few small voids present from 8.1 feet to 10.6 feet.			100% (98%)										
4.6	15.2		TERMINATION DEPTH = 15.2 FEET		15.2											

NOTES/REMARKS: ST=Shelby Tube

Sta 34+133: PAGE 1 OF 1

TEST BORING LOG! 99-43.GPJ PRIMENG.GDT 12/7/99

PRIME ENGINEERING & ARCHITECTURE INC.

TEST BORING No.: Sta 34+425

APPROX. STA. & OFFSET: Sta 34+425

ELEVATION:

DRAFT

CLIENT: Gannett Fleming

PROJECT: ATH-33-30.981

PROJECT No.: 99043

LOCATION: Athens County, Athens, Ohio

DATE STARTED: 10/27/99 DATE COMPLETED: 10/27/99

SAMPLER DIAM: 2.0" TYPE: SS HAMMER WT.: 140lb FALL: 30"

CASING DIAM: 3.25" TYPE: HSA OTHER:

DRILLING INFORMATION:
Ohio Testboring

GROUNDWATER INFORMATION:
Dry during drilling operations and upon completion.

PEN/REC (ft.)	DEPTH (ft.)	Soil/Rock Symbol	MATERIAL DESCRIPTION	SAMPLE NUMBER	SAMPLE DEPTH	BLOWS/6 INCHES N-VALUE (BLOWS/FT) OR RECK/RQD(%)	PENETROMETER (tons/ft²)	MOISTURE CONTENT (%)	ATTERBERG LIMITS (%) LIQUID LIMIT LL	PLASTIC LIMIT PL	PLASTICITY INDEX PI	AGGREGATE (%)	COURSE AND FINE SAND (%)	SILT AND CLAY COMBINED (%) OR SILT (%)/CLAY (%)	CLASSIFICATION SYMBOL
0.15	0.0		TOPSOIL	1	0.5	11 (3, 4, 7)	1.25	15	38	25	13	5	15		A-6a
			Stiff to very stiff SILT AND CLAY	2	3.0	19 (7, 9, 10)	2.0	15	42	24	18	9	15		A-7-6
1.5	5.0		Brown, decomposed CLAY SHALE, some sandstone fragments.	3	5.0	41 (10, 15, 26)	1.75	17	--	--	--	--	--		VISUAL
2.5	8.0		Note: Auger refusal on bedrock at 8.0 feet. Began coring for rock. Hard, gray, weathered LIMESTONE, with indistinct bedding. Quality of rock considered poor as per RQD.	4	7.5	50/2 in.	--	--	--	--	--	--	--		VISUAL
			Note: Becoming very soft and highly weathered from 9.6 feet to 11.4 feet.	RUN 1	8.0	100% (38%)									
4.0	13.0		Note: 1 inch thick very soft and decomposed limestone at 12.8 feet. TERMINATION DEPTH = 13.0 FEET		13.0										

NOTES/REMARKS:

TES_BORING_.OG1 SMS.GPJ PRIMENG.GDT 12/7/99

PRIME ENGINEERING & ARCHITECTURE INC.

TEST BORING No.: Sta 34+736

APPROX. STA. & OFFSET: Sta 34+736

ELEVATION: 288.876 m

CLIENT: Gannett Fleming

PROJECT: ATH-33-30.981

PROJECT No.: 99043

LOCATION: Athens County, Athens, Ohio

DATE STARTED: 10/12/99 DATE COMPLETED: 10/12/99

SAMPLER DIAM: 2.0" TYPE: SS HAMMER WT.: 140lb FALL: 30"

CASING DIAM: 3.25" TYPE: HSA OTHER:

DRILLING INFORMATION:
Ohio Testbar

GROUNDWATER INFORMATION:
Dry during drilling operations and upon completion.

ELEV (ft)	DEPTH (ft.)	Soil/Rock Symbol	MATERIAL DESCRIPTION	SAMPLE NUMBER	SAMPLE DEPTH	BLOWS/6 INCHES N-VALUE (BLOWS/FT) OR RECS%(RQD%)	PENETROMETER (tons/ft²)	MOISTURE CONTENT (%)	ATTERBERG LIMITS (%) LIQUID LIMIT LL	PLASTIC LIMIT PL	PLASTICITY INDEX PI	AGGREGATE (%)	COARSE AND FINE SAND (%)	SILT AND CLAY COMBINED(%) OR SILT(%)/CLAY(%)	CLASSIFICATION SYMBOL
0.15	0.8		TOPSOIL Medium stiff to stiff ELASTIC CLAY	1	1.0	2 3 3 — 6		22	63	30	33	1	8		A-7-6
				2	3.5	4 5 7 — 12		15	52	30	22	0	5		A-7-5
				ST	6.0				--	--	--	--	--		VISUAL
2.15	7.0		Brown, highly weathered CLAY SHALE	4	7.0	16 24 26 — 50+		5	--	--	--	--	--		VISUAL
				5	9.5	23 27 44 — 50+		7	--	--	--	--	--		VISUAL
4.6	15.0		Note: Auger refusal on bedrock at 15.0 feet. Began to core rock. Very soft, gray, highly weathered CLAY SHALE, fissile with indistinct to laminar bedding	6 RUN 1	14.5 15.0	50+ for 6"		3	--	--	--	--	--		VISUAL
5.6	18.4		Medium hard, gray, weathered, micaceous SILTSTONE, with thin bedding.			(80%)									
6.0	20.0		Hard, gray, weathered, fine grained SANDSTONE, with thin to thick bedding. Quality of rock for Run 1 considered good as per RQD.		20.0										
7.6	25.0		TERMINATION DEPTH = 25.0 FEET												

NOTES/REMARKS: ST=Shelby Tube

TEST BORING LOG? 9043.GPJ PRIMENG.GDT 12/7/99

PRIME ENGINEERING & ARCHITECTURE INC.

TEST BORING No.: Sta 35+100

APPROX. STA. & OFFSET: Sta 35+100

ELEVATION: 285.420 m

DRAFT

CLIENT: Gannett Fleming

PROJECT: ATH-33-30.981 PROJECT No.: 99043

LOCATION: Athens County, Athens, Ohio

DATE STARTED: 10/12/99 DATE COMPLETED: 10/12/99

SAMPLER DIAM: 2.0" TYPE: SS HAMMER WT.: 140lb FALL: 30"

CASING DIAM: 3.25" TYPE: HSA OTHER:

DRILLING INFORMATION:
Ohio Testhor

GROUNDWATER INFORMATION:
Dry during drilling operations and at 2.0 feet upon completion.

▽ GROUNDWATER UPON COMPLETION

ELEV (ft.)	DEPTH (ft.)	Soil/Rock Symbol	MATERIAL DESCRIPTION	SAMPLE NUMBER	SAMPLE DEPTH	BLOWS/6 INCHES, N-VALUE (BLOWS/FT) OR REC% (RUN)	PENETROMETER (tons/ft²)	MOISTURE CONTENT (%)	ATTERBERG LIMITS (%) LL	PL	PI	AGGREGATE (%)	COARSE AND FINE SAND (%)	SILT AND CLAY COMBINED (%) OR SILT(%)/CLAY(%)	CLASSIFICATION SYMBOL
285	0.5		TOPSOIL Medium dense to dense SANDY SILT	1	1.0	3 4 9		13		NP		4	40	32/24	A-4a
				2	3.5	5 12 16		10		NP		2	64		A-3a
				3	6.0	10 14 22		14	--	--		5	59		A-4a
279.6	5.8		Brown to gray, highly weathered CLAY SHALE	4	8.5	17 23 43	50+	12	--	--		--	--		VISUAL
				5	13.5	17 34 39	50+	16	--	--		--	--		VISUAL
				6	18.5	18 50/4 in.	50+	11	--	--		--	--		VISUAL
265.4	20.0		Note: Auger refusal on bedrock at 20.0 feet. Began coring for rock.	RUN 1	20.0										
265.2	20.2		Soft, gray, weathered CLAY SHALE, fissile with laminar bedding.												
			Hard, gray, slightly weathered, slightly micaceous, very fine grained SANDSTONE, thickly bedded.			(92%)									
261.4	24.3		Soft, gray, weathered CLAY SHALE, fissile with laminar bedding.		25.0										
260.6	25.0														

NOTES/REMARKS:

TEST BORING .GDT 9/4/5 DPJ PRIME.MS.GDT 12/7/99

PRIME ENGINEERING & ARCHITECTURE INC.

TEST BORING No.: Sta 35+100

APPROX. STA. & OFFSET: Sta 35+100

ELEVATION: 285.420 m

PROJECT: ATH-33-30.981

PROJECT No.: 99043

DRILLING INFORMATION:

Ohio Testbor

GROUNDWATER INFORMATION:

Dry during drilling operations and at 2.0 feet upon completion.

▽ GROUNDWATER UPON COMPLETION

DRAFT

ELEV (ft)	DEPTH (ft.)	Soil/ Rock Symbol	MATERIAL DESCRIPTION	SAMPLE NUMBER	SAMPLE DEPTH	BLOWS/6 INCHES N-VALUE (BLOWS/FT) OR REC.%(RQD%)	PENETROMETER (tons/ft²)	MOISTURE CONTENT (%)	ATTERBERG LIMITS (%) LL - LIQUID LIMIT	PL - PLASTIC LIMIT	PI - PLASTICITY INDEX	AGGREGATE (%)	COARSE AND FINE SAND (%)	SILT AND CLAY COMBINED(%) OR SILT(%)/CLAY(%)	CLASSIFICATION SYMBOL
			Note: 1 inch thick sandstone seam at 24.4 feet. TERMINATION DEPTH = 25.0 FEET												

FIELD DATA | LABORATORY DATA

NOTES/REMARKS:

TEST BORING LOG1 SHEETS.GPJ PRIMENG.GDT 12/7/99

PRIME ENGINEERING & ARCHITECTURE INC.

TEST BORING No.: Sta 35+970

APPROX. STA. & OFFSET: Sta 35+970

ELEVATION: 288.221 m

DRAFT

CLIENT: Gannett Fleming

PROJECT: ATH-33-30.981

PROJECT No.: 99043

LOCATION: Athens County, Athens, Ohio

DATE STARTED: 10/7/99 DATE COMPLETED: 10/7/99

SAMPLER DIAM: 2.0" TYPE: SS HAMMER WT.: 140lb FALL: 30"

CASING DIAM: 3.25" TYPE: HSA OTHER:

DRILLING INFORMATION:
Ohio Testbor

GROUNDWATER INFORMATION:
Dry during drilling operations and upon completion.

ELEV (m.)	DEPTH (m.)	Soil/ Rock Symbol	MATERIAL DESCRIPTION	SAMPLE NUMBER	SAMPLE DEPTH	BLOWS/6 INCHES N-VALUE (BLOWS/FT) OR REC%/(RQD%)	PENETROMETER (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS (%) LL	PL	PI	AGGREGATE (%)	COARSE AND FINE SAND (%)	SILT AND CLAY COMBINED (%) OR SILT%/CLAY(%)	CLASSIFICATION SYMBOL
287.9	0.3		TOPSOIL Stiff CLAY	1	1.0	8 (4 4 4)	--	13	28	19	9	9	23		A-4
				2	4.0	10 (5 5 5)	4.5+	20	48	22	26	1	15		A-7-6
281.9	6.0		Brown, highly weathered SHALE	3	6.5	50+ (18 / 50/2in)	--	10	--	--	--	--	--		VISUAL
				4	9.0	50+ (50/1 in.)	--		--	--	--	--	--		VISUAL
278.9	10.0		Note: Auger refusal on bedrock at 10.0 feet. Began coring for rock. Very soft, gray, highly weathered to decomposed CLAY SHALE, fissile with laminar bedding, iron staining present throughout length of core. Quality of rock considered poor as per RQD. Note: 2.0 inch thick very fine grained sandstone seam at 10.0 feet.	RUN 1	10.0	86% (45%)									
272.9	16.0		TERMINATION DEPTH = 15.0 FEET		15.0										

NOTES/REMARKS:

Sta 35+970: PAGE 1 OF 1

TEST BORING LOG1 5X13.GPJ PRIMENG.GDT 12/7/99

PRIME ENGINEERING & ARCHITECTURE INC.

TEST BORING No.: Sta 36+167

APPROX. STA. & OFFSET: Sta 36+167

ELEVATION: 274.842 m

CLIENT: Gannett Fleming

DRAFT

PROJECT: ATH-33-30.981 PROJECT No.: 99043

LOCATION: Athens County, Athens, Ohio

DATE STARTED: 10/8/99 DATE COMPLETED: 10/8/99

SAMPLER DIAM: 2.0" TYPE: SS HAMMER WT.: 140lb FALL: 30"

CASING DIAM: 3.25" TYPE: HSA OTHER:

DRILLING INFORMATION:
Ohio Testbor

GROUNDWATER INFORMATION:
Dry during drilling operations and at 1.0 feet upon completion.

▽ GROUNDWATER UPON COMPLETION

ELEV (ft)	DEPTH (ft)	Soil/Rock Symbol	MATERIAL DESCRIPTION	SAMPLE NUMBER	SAMPLE DEPTH	BLOWS/6 INCHES N-VALUE (BLOWS/FT) OR REC%(RQD%)	PENETROMETER (tons/ft²)	MOISTURE CONTENT (%)	ATTERBERG LIMITS (%) LL	PL	PI	AGGREGATE (%)	COARSE AND FINE SAND (%)	SILT AND CLAY COMBINED(%) OR SILT(%)/CLAY(%)	CLASSIFICATION SYMBOL
0.1	0.3		TOPSOIL Very stiff to hard CLAY	1	1.0	69 5 59 11	2.25	19							
				2	3.5	32 10 13 19	4.5+	13	51	28	23				
				3	6.0	50+ 50/2 in.	–								
2.1	7.0		Note: Auger refusal on bedrock at 7.0 feet. Began coring for rock. Hard, tan, slightly weathered to weathered, slightly micaceous, fine grained SANDSTONE, with indistinct to massive bedding. Note: Iron staining present from 7.0 feet to 8.0 feet.	RUN 1	7.0	1880% (80%)									
3.2	10.0		Note: Iron staining present from 10.4 feet to 10.8 feet. Note: Microfolding (slickensides) present at 10.8 feet. Hard, gray, highly weathered SILTSTONE, with indistinct bedding and iron staining throughout. Note: Microfolding (slickensides) present at 11.2 feet.												
3.7	12.0		TERMINATION DEPTH = 12.0 FEET		12.0										

NOTES/REMARKS:

Sta 36+167: PAGE 1 OF 1

TEST BORING LOG (ENGLISH) PRIMENG.GDT 12/7/99

ST MORGAN

NOTES/REMARKS:

PRIME ENGINEERING & ARCHITECTURE INC.

TEST BORING No.: Sta 36+750

APPROX. STA. & OFFSET: Sta 36+750

ELEVATION: 260.300 m

DRAFT

CLIENT: Gannett Fleming

PROJECT: ATH-33-30.981 PROJECT No.: 99043

LOCATION: Athens County, Athens, Ohio

DATE STARTED: 10/13/99 DATE COMPLETED: 10/13/99

SAMPLER DIAM: 2.0" TYPE: SS HAMMER WT.: 140lb FALL: 30"

CASING DIAM: 3.25" TYPE: HSA OTHER:

DRILLING INFORMATION:
Ohio Testboring

GROUNDWATER INFORMATION:
Dry during drilling operations and at 1.0 feet upon completion.

▽ GROUNDWATER UPON COMPLETION

CLEV (ft)	DEPTH (ft)	Soil/Rock Symbol	MATERIAL DESCRIPTION	SAMPLE NUMBER	SAMPLE DEPTH	BLOWS/6 INCHES	N-VALUE (BLOWS/FT) OR REC%-(RQD%)	PENETROMETER (tons/ft²)	MOISTURE CONTENT (%)	ATTERBERG LIMITS (%) LIQUID LIMIT LL	PLASTIC LIMIT PL	PLASTICITY INDEX PI	AGGREGATE (%)	COARSE AND FINE SAND (%)	SILT AND CLAY COMBINED (%) OR SILT (%)/CLAY (%)	CLASSIFICATION SYMBOL
0.15	0.5		TOPSOIL Very stiff CLAY	1	1.0	5 7 9	16		15	55	28	27	31	11		A-7-6
1.2	4.0		Brown, decomposed CLAY SHALE	2	4.0	7 21 44	60+		14	--	--		--	--		VISUAL
2.0	6.5		Brown, weathered SANDSTONE	3	6.5	50/1 in.	50+		5	--	--		--	--		VISUAL
2.7	9.0		Brown to grey, highly weathered CLAY SHALE	4	9.0	50/6 in.	50+		9	--	--		--	--		VISUAL
				5	14.0	50/4 in.	50+		7	--	--		--	--		VISUAL
4.4	15.0		Note: Auger refusal on bedrock at 15.0 feet. Began coring for rock.	RUN 1	15.0		(82%)									
			Soft, gray, weathered SILTY SHALE, fissile with laminar bedding. Quality of rock considered good as per RQD.													
5.0	20.0		TERMINATION DEPTH = 20.0 FEET		20.0											

NOTES/REMARKS:

TES: BORING LOG1 9043.GPJ PRIMENG.GDT 12/7/99

PRIME ENGINEERING & ARCHITECTURE INC.

TEST BORING No.: Sta 36+911

APPROX. STA. & OFFSET: Sta 36+911

ELEVATION: 237.460 m

CLIENT: Gannett Fleming

DRAFT

PROJECT: ATH-33-30.981 PROJECT No.: 99043

LOCATION: Athens County, Athens, Ohio

DATE STARTED: 10/13/99 DATE COMPLETED: 10/13/99

SAMPLER DIAM: 2.0" TYPE: SS HAMMER WT.: 140lb FALL: 30"

CASING DIAM: 3.25" TYPE: HSA OTHER:

DRILLING INFORMATION:
Ohio Testbor

GROUNDWATER INFORMATION:
Water encountered at 4.0 feet during drilling operations and at 2.0 feet upon completion.

▼ GROUNDWATER DURING DRILLING ▽ GROUNDWATER UPON COMPLETION

ELEV (ft)	DEPTH (ft)	Bdr Rock Symbol	MATERIAL DESCRIPTION	SAMPLE NUMBER	SAMPLE DEPTH	BLOWS/6 INCHES N-VALUE (BLOWS/FT) OR REC%(RQD%)	PENETROMETER (tons/ft²)	MOISTURE CONTENT (%)	ATTERBERG LIMITS (%) LIQUID LIMIT LL	PLASTIC LIMIT PL	PLASTICITY INDEX PI	AGGREGATE (%)	COARSE AND FINE SAND (%)	SILT AND CLAY COMBINED (%) OR SILT (%)/CLAY(%)	CLASSIFICATION SYMBOL
			FIELD DATA					LABORATORY DATA							
237.1	0.3		TOPSOIL												
			Loose to very dense SANDY SILT	1	1.0	4 (1, 1, 3)		18	27	17	10	28	33		A-4a
				ST	2.5				--	--		--	--		VISUAL
				3	4.5	50+ 6in		11	--	--		45	32		A-1-b
232.5	5.0		Note: Auger refusal on bedrock at 5.0 feet. Began to core rock. Hard, gray, slightly weathered, micaceous, fine grained to very fine grained SANDSTONE, thinly bedded.	RUN 1	5.0										
			Quality of rock for Run 1 considered fair as per RQD.			(48%)									
229.4	7.8		Soft, gray, highly weathered CLAY SHALE, fissile with laminar bedding.												
227.0	10.0		TERMINATION DEPTH = 10.0 FEET		10.0										

NOTES/REMARKS: ST=Shelby Tube

Sta 36+911: PAGE 1 OF 1

TES_BORING_LOG1 6043.GPJ PRIMENG.GDT 12/7/99

PRIME ENGINEERING & ARCHITECTURE INC.

TEST BORING No.: Sta 37+540

APPROX. STA. & OFFSET: Sta 37+540

ELEVATION: 267.717 m

DRAFT

CLIENT: Gannett Fleming

PROJECT: ATH-33-30.981 PROJECT No.: 99043

LOCATION: Athens County, Athens, Ohio

DATE STARTED: 10/6/99 DATE COMPLETED: 10/6/99

SAMPLER DIAM: 2.0" TYPE: SS HAMMER WT.: 140lb FALL: 30"

CASING DIAM: 3.25" TYPE: HSA OTHER:

DRILLING INFORMATION:
Ohio Testbor

GROUNDWATER INFORMATION:

ELEV (ft.)	DEPTH (ft.)	Soil/Rock Symbol	MATERIAL DESCRIPTION	SAMPLE NUMBER	SAMPLE DEPTH	BLOWS/6 INCHES N-VALUE (BLOWS/FT) OR REC%/(RQD%)	PENETROMETER (tons/ft²)	MOISTURE CONTENT (%)	ATTERBERG LIMITS (%) LIQUID LIMIT LL	PLASTIC LIMIT PL	PI PLASTICITY INDEX	AGGREGATE (%)	COARSE AND FINE SAND (%)	SILT AND CLAY COMBINED(%) OR SILT(%)/CLAY(%)	CLASSIFICATION SYMBOL
267.3	0.4		TOPSOIL Medium stiff to hard SILT AND CLAY	1	1.0	7 (3 3 4)	2.0	20	38	25	11	6	31		A-6a
				ST	3.5	Shelby									VISUAL
				4	5.5	21 (5 8 13)	2.25	19	42	20	22	0	0		A-7-6
				4	8.5	50+ (10 15 50/3 in.)	3.0	12	27	21	6	24	0		A-4
257.6	10.0		Note: Auger refusal on bedrock at 10.0 feet. Began coring for rock. Hard, gray, weathered to slightly weathered, slightly micaceous, fine grained to very fine grained SANDSTONE, with thick to massive bedding. Note: Calcite cementation present from 11.9 feet to 13.2 feet. Quality of rock for Run 1 considered excellent as per RQD.	Run 1	10.0	100% (100%)									
253.2	13.8		Soft to very soft, gray, highly weathered CLAY SHALE, with laminar bedding (fissile).												
252.9	15.0		TERMINATION DEPTH = 15.0 FEET		15.0										

NOTES/REMARKS:

Sta 37+540; PAGE 1 OF 1

TEST BORING LOG1 1041.GPJ PRIMENGGDT 12/7/99

PRIME ENGINEERING & ARCHITECTURE INC.

TEST BORING No.: Sta 38+050

APPROX. STA. & OFFSET: Sta 38+050

ELEVATION: 273.298 m

CLIENT: Gannett Fleming

DRAFT

PROJECT: ATH-33-30.981 PROJECT No.: 99043

LOCATION: Athens County, Athens, Ohio

DATE STARTED: 10/6/99 DATE COMPLETED: 10/6/99

SAMPLER DIAM: 2.0" TYPE: SS HAMMER WT.: 140lb FALL: 30"

CASING DIAM: 3.25" TYPE: HSA OTHER:

DRILLING INFORMATION:
Ohio Testbor

GROUNDWATER INFORMATION:

▽ GROUNDWATER UPON COMPLETION

ELEV (ft.)	DEPTH (ft.)	Soil/Rock Symbol	MATERIAL DESCRIPTION	SAMPLE NUMBER	SAMPLE DEPTH	FIELD DATA: BLOWS/6 INCHES (N-VALUE (BLOWS/FT) OR REC %/(RQD%))	FIELD DATA: PENETROMETER (tons/ft²)	LABORATORY DATA: MOISTURE CONTENT (%)	ATTERBERG LIMITS (%): LL LIQUID LIMIT	ATTERBERG LIMITS (%): PL PLASTIC LIMIT	ATTERBERG LIMITS (%): PI PLASTICITY INDEX	AGGREGATE (%)	COARSE AND FINE SAND (%)	SILT AND CLAY COMBINED(%) OR SILT(%)/CLAY(%)	CLASSIFICATION SYMBOL
0.1	0.5		TOPSOIL Brown, decomposed SANDSTONE	1	1.0	36 (6, 9, 27)	4.5	9	--	--	--	--	--		VISUAL
1.2	4.0		Brown to gray, decomposed to weathered CLAY SHALE	2	4.0	44 (6, 16, 28)	4.25	14	--	--	--	--	--		VISUAL
				3	6.5	50+ (12, 19, 33)	2.5	14	--	--	--	--	--		VISUAL
				4	9.0	50+ 4 in.	--	6	--	--	--	--	--		VISUAL
				5	14.0	50+ 5 in.	--	2	--	--	--	--	--		VISUAL
4.6	15.0		Note: Auger refusal on bedrock at 15.0 feet. Began coring for rock. Hard, gray, slightly weathered, very fine grained SANDSTONE, with massive bedding. Quality of rock considered excellent as per RQD.		15.0	100% (100%)									
6.0	20.1		TERMINATION DEPTH = 20.1 FEET		20.1										

NOTES/REMARKS:

Sta 38+050: PAGE 1 OF 1

TEST BORING LOG: 99043.GPJ PRIMENG.GDT 12/7/99

PRIME ENGINEERING & ARCHITECTURE INC.

TEST BORING No.: Sta 38+250

APPROX. STA. & OFFSET: Sta 38+250

ELEVATION:

CLIENT: Gannett Fleming

PROJECT: ATH-33-30.981 DRAFT PROJECT No.: 99043

LOCATION: Athens County, Athens, Ohio

DATE STARTED: 10/6/99 DATE COMPLETED: 10/6/99

SAMPLER DIAM: 2.0" TYPE: SS HAMMER WT.: 140lb FALL: 30"

CASING DIAM: 3.25" TYPE: HSA OTHER:

DRILLING INFORMATION:

Ohio Textbor

GROUNDWATER INFORMATION:

CLEV (ft.)	DEPTH (ft.)	Soil/Rock Symbol	MATERIAL DESCRIPTION	SAMPLE NUMBER	SAMPLE DEPTH	BLOWS/6 INCHES N-VALUE (BLOWS/FT) OR REC%(RQD%)	PENETROMETER (tons/ft²)	MOISTURE CONTENT (%)	ATTERBERG LIMITS (%) LL	PL	PI	AGGREGATE (%)	COARSE AND FINE SAND (%)	SILT AND CLAY COMBINED(%) OR SILT(%)/CLAY(%)	CLASSIFICATION SYMBOL
613	0.4		TOPSOIL												
			Stiff to very stiff CLAY	1	1.0	2 4 5 — 9	2.5	21	46	23	23	7	13		A-7-6
				2	3.5	4 11 16 — 27	4.25	16	48	29	19	3	6		A-7-6
1.9	6.0		Reddish brown, decomposed CLAY SHALE	3	6.0	7 19 30 — 49	—	15	—	—		—	—		VISUAL
				4	9.0	50/3" 39 50/0.6 in — 50+	4.5+	12	—	—		—	—		VISUAL
				5	14.0	50/1" 43 45 — 50+	3.5	10	—	—		—	—		VISUAL
6.1	20.0		Note: Auger refusal on bedrock at 20.0 feet. Began coring for rock.	6	19.0	50/3" — 50+	—	—	—	—		—	—		VISUAL
			Soft, gray, highly weathered SILTY SHALE, with indistinct bedding.		20.0										
6.4	22.6		Quality of rock for Run 1 considered fair as per RQD. Hard, gray, slightly weathered, fine grained SANDSTONE, with indistinct to thick bedding.			96% (66%)									
7.6	25.0		TERMINATION DEPTH = 25.0 FEET		25.0										

NOTES/REMARKS:

TEST BORING LOG1 PRJ.GPJ PRIMENG.GDT 12/7/99

PRIME ENGINEERING & ARCHITECTURE INC.

TEST BORING No.: Sta 38+600

APPROX. STA. & OFFSET: Sta 38+600

ELEVATION: 265.397 m

DRAFT

CLIENT: Gannett Fleming

PROJECT: ATH-33-30.961 PROJECT No.: 99043

LOCATION: Athens County, Athens, Ohio

DATE STARTED: 10/6/99 DATE COMPLETED: 10/6/99

SAMPLER DIAM: 2.0" TYPE: SS HAMMER WT.: 140lb FALL: 30"

CASING DIAM: 3.25" TYPE: HSA OTHER:

DRILLING INFORMATION:
Ohio Testbor

GROUNDWATER INFORMATION:

ELEV (ft.)	DEPTH (ft.)	Soil/Rock Symbol	MATERIAL DESCRIPTION	SAMPLE NUMBER	SAMPLE DEPTH	FIELD DATA: BLOWS/6 INCHES; N-VALUE (BLOWS/FT) OR REC%(REC/DOM)	FIELD DATA: PENETROMETER (tons/ft²)	LAB: MOISTURE CONTENT (%)	LAB: ATTERBERG LIMITS (%) LIQUID LIMIT LL	LAB: ATTERBERG LIMITS (%) PLASTIC LIMIT PL	LAB: ATTERBERG LIMITS (%) PLASTICITY INDEX PI	LAB: AGGREGATE (%)	LAB: COARSE AND FINE SAND (%)	LAB: SILT AND CLAY COMBINED(%) OR SILT(%)/CLAY(%)	CLASSIFICATION SYMBOL
265.13	0.0		TOPSOIL												
			Very stiff CLAY	1	1.0	19 (4 / 9 / 10)	4.0	17	45	23	22	1	11		A-7-6
				ST	3.0	Shelby (Shelby)			--	--		--	--		VISUAL
				3	5.0	22 (6 / 10 / 12)	4.5+	18	43	22	21	0	8		A-7-6
258.3	7.6		Brown, highly weathered, micaceous CLAY SHALE	4	7.5	50+ (50/6 in.)		7	--	--		--	--		VISUAL
255.0	10.0		Note: Auger refusal on bedrock at 10.0 feet. Began coring for rock. Very soft, brown, highly weathered CLAYSTONE, with indistinct bedding. *Note: Iron staining present throughout length of core.*		10.0										
						80% (36%)									
249.6	15.8		TERMINATION DEPTH = 15.0 FEET		15.0										

NOTES/REMARKS:

TEST BORING - OGS SOILS.GPJ PRIMENG.GDT 12/7/99

Sta 38+600: PAGE 1 OF 1

PRIME ENGINEERING & ARCHITECTURE INC.

TEST BORING No.: Sta 38+815

APPROX. STA. & OFFSET: Sta 38+815

ELEVATION: 261.779 m

CLIENT: Gannett Fleming

DRAFT

PROJECT: ATH-33-30.981 PROJECT No.: 99043

LOCATION: Athens County, Athens, Ohio

DATE STARTED: 10/7/99 DATE COMPLETED: 10/7/99

SAMPLER DIAM: 2.0" TYPE: SS HAMMER WT.: 140lb FALL: 30"

CASING DIAM: 3.25" TYPE: HSA OTHER:

DRILLING INFORMATION: Ohio Testbor

GROUNDWATER INFORMATION:

ELEV (ft.)	DEPTH (ft.)	Soil/Rock Symbol	MATERIAL DESCRIPTION	SAMPLE NUMBER	SAMPLE DEPTH	BLOWS/6 INCHES N-VALUE (BLOWS/FT) OR RECH (RQD%)	PENETROMETER (tons/ft²)	MOISTURE CONTENT (%)	ATTERBERG LIMITS (%) LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	AGGREGATE (%)	COARSE AND FINE SAND (%)	SILT AND CLAY COMBINED (%) OR SILT (%)/CLAY (%)	CLASSIFICATION SYMBOL
0.1	0.3		TOPSOIL												
			Medium stiff SILT AND CLAY	1	1.0	7 (4, 4, 3)	1.0	22	39	24	15	13	24		A-6a
1.1	3.5		Brown, highly weathered SANDSTONE	2	3.5	50+ (12, 50/3 in.)	–	9	--	--	--	--	--		VISUAL
1.5	5.0		Note: Auger refusal on bedrock at 5.0 feet. Began coring for rock. Hard, gray, slightly weathered, slightly micaceous, fine grained SANDSTONE, with indistinct to very thin bedding. Note: Iron staining present from 5.0 feet to 5.4 feet.	Run 1	5.0										
			Quality of rock for Run 1 considered fair as per RQD.			100% (68%)									
2.6	8.7		Soft, gray, weathered, slightly micaceous SILTSTONE, with indistinct to very thin bedding.												
3.0	10.0		TERMINATION DEPTH = 10.0 FEET		10.0										

NOTES/REMARKS:

Sta 38+815; PAGE 1 OF 1

TEST BORING LOG - BOAS.GPJ PRIMENG.GDT 12/7/99

PRIME ENGINEERING & ARCHITECTURE INC.

TEST BORING No.: Sta 38+980

APPROX. STA. & OFFSET: Sta 38+980

ELEVATION:

DRAFT

CLIENT: Gannett Fleming

PROJECT: ATH-33-30.981 PROJECT No.: 99043

LOCATION: Athens County, Athens, Ohio

DATE STARTED: 10/7/99 DATE COMPLETED: 10/7/99

SAMPLER DIAM: 2.0" TYPE: SS HAMMER WT.: 140lb FALL: 30"

CASING DIAM: 3.25" TYPE: HSA OTHER:

DRILLING INFORMATION:
Ohio Testboring

GROUNDWATER INFORMATION:

CLEV (ft)	DEPTH (ft)	Soil/Rock Symbols	MATERIAL DESCRIPTION	SAMPLE NUMBER	SAMPLE DEPTH	FIELD DATA: BLOWS/6 INCHES, N-VALUE (BLOWS/FT) OR RECNUM/RQD(%)	FIELD DATA: PENETROMETER (tons/sf)	LABORATORY DATA: MOISTURE CONTENT (%)	ATTERBERG LIMITS (%): LIQUID LIMIT	ATTERBERG LIMITS (%): PLASTIC LIMIT	ATTERBERG LIMITS (%): PLASTICITY INDEX	AGGREGATE (%)	COARSE AND FINE SAND (%)	SILT AND CLAY COMBINED (%) OR SILT (%)/CLAY (%)	CLASSIFICATION SYMBOL
p.1	0.3		TOPSOIL Stiff CLAY												
				1	1.0	14 4 5 4 1.5	4.5+	18	49	27	22	0	4		A-7-6
1.1	3.5		Very stiff to hard SILTY CLAY	2	3.5	30 8 13 17 1.5	3.75	12	39	22	17	8	13		A-6b
			Note: No recovery for Sample 3.	3	8.0	50+ 50/1 in	–								VISUAL
2.0	6.6		Note: Auger refusal on bedrock at 6.5 feet. Began coring for rock.	Run 1	6.5										
			Hard, brown to light brown, slightly weathered, micaceous, fine grained SANDSTONE, with indistinct bedding. Calcite cementation present from 6.5 feet to 6.6 feet. Quality of rock considered fair as per RQD.			100% (79%)									
			Note: Calcite cementation present from 9.6 feet to 11.6 feet.												
3.5	11.6		TERMINATION DEPTH = 11.6 FEET		11.6										

NOTES/REMARKS:

TEST BORING LOG1 BCA3.GPJ PRIMENG.GDT 12/7/99

PRIME ENGINEERING & ARCHITECTURE INC.

TEST BORING No.: Sta 39+319

APPROX. STA. & OFFSET: Sta 39+319

ELEVATION:

DRAFT

CLIENT: Gannett Fleming

PROJECT: ATH-33-30.981 PROJECT No.: 99043

LOCATION: Athens County, Athens, Ohio

DATE STARTED: 10/7/99 DATE COMPLETED: 10/7/99

SAMPLER DIAM: 2.0" TYPE: SS HAMMER WT.: 140lb FALL: 30"

CASING DIAM: 3.25" TYPE: HSA OTHER:

DRILLING INFORMATION:
Ohio Testbor

GROUNDWATER INFORMATION:

▼ GROUNDWATER UPON COMPLETION

ELEV (ft.)	DEPTH (ft.)	Strip Rock Symbol	MATERIAL DESCRIPTION	SAMPLE NUMBER	SAMPLE DEPTH	BLOWS/6 INCHES	N-VALUE (BLOWS/FT) OR REC%(RQD%)	PENETROMETER (tons/ft²)	MOISTURE CONTENT (%)	ATTERBERG LIMITS (%) LIQUID LIMIT (LL)	PLASTIC LIMIT (PL)	PLASTICITY INDEX (PI)	AGGREGATE (%)	COARSE AND FINE SAND (%)	SILT AND CLAY COMBINED(%) OR SILT(%)/CLAY(%)	CLASSIFICATION SYMBOL
0.1	0.3		TOPSOIL Stiff CLAY													
				1	1.0	2 5 7	12	4.5+	21	60	29	31	0	2		A-7-6
1.1	3.5		Very stiff ELASTIC CLAY	2	3.5	6 9 14	23	4.25	15	46	25	21	2	3		A-7-5
1.9	6.0		Brown, decomposed CLAY SHALE	3	6.0	33 51	50+	–	6	–	–		–	–		VISUAL
				4	8.5	28 50/5 in.	50+	–	7	–	–		–	–		VISUAL
3.0	10.0		Note: Auger refusal on bedrock at 10.0 feet. Began coring for rock. Soft to very soft, brown, highly weathered CLAYSTONE with indistinct bedding. Iron staining present throughout length of core. Quality of rock considered very poor as per RQD. Note: 5.0 inch thick very fine grained sandstone seam at 10.7 feet. Note: 3.5 inch thick very fine grained sandstone seam at 11.5 feet.	Run 1	10.0		94% (16%)									
4.9	15.0		TERMINATION DEPTH = 15.0 FEET		15.0											

NOTES/REMARKS:

TEST BORING LOG1 99043.GPJ FLEMING.GDT 12/7/99

PRIME ENGINEERING & ARCHITECTURE INC.

TEST BORING No.: CR 16:Sta 50+405

APPROX. STA. & OFFSET: CR 16: Sta 50+405

ELEVATION: 277.656 m

DRAFT

CLIENT: Gannett Fleming

PROJECT: ATH-33-30.981 PROJECT No.: 99043

LOCATION: Athens County, Athens, Ohio

DATE STARTED: 10/12/99 DATE COMPLETED: 10/12/99

SAMPLER DIAM: 2.0" TYPE: SS HAMMER WT.: 140lb FALL: 30"

CASING DIAM: 3.25" TYPE: HSA OTHER:

DRILLING INFORMATION:
Ohio Testboring

GROUNDWATER INFORMATION:
Dry during drilling operations and at 1.0 feet upon completion.

▽ GROUNDWATER UPON COMPLETION

ELEV (m)	DEPTH (m)	Soil Rock Symbol	MATERIAL DESCRIPTION	SAMPLE NUMBER	SAMPLE DEPTH	BLOWS/6 INCHES (N-VALUE (BLOWS/FT)) OR REC% (RQD%)	PENETROMETER (tonsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS (%) LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	AGGREGATE (%)	COARSE AND FINE SAND (%)	SILT AND CLAY COMBINED (%) OR SILT (%)/CLAY(%)	CLASSIFICATION SYMBOL
0.1	0.8		TOPSOIL												
			Brown SANDY SILT, trace rock fragments, trace roots, moist.	1	1.0	2 3 4 (7)		17	27	22	6	3	34		A-4
1.1	3.5		Brown CLAY, trace sand, moist.	2	3.5	3 6 8 (14)		20	–	–		0	6		A-7-6
				ST	5.0			–	–	–		–	–		WSUM
2.0	6.5		Brown, decomposed CLAY SHALE.	4	6.5	50+ 5/6 in.		7	–	–		–	–		WSUM
				5	9.5	50+ 5/6 in.		7	–	–		–	–		WSUM
4.2	14.0		Brown, highly weathered SANDSTONE.	6	14.0			3	–	–		–	–		WSUM
4.6	15.0		Note: Auger refusal on bedrock at 15.0 feet. Began coring for rock.	RUN 1	15.0										
			Very soft, gray, highly weathered CLAYSTONE, with indistinct bedding. Quality of rock considered good as per RQD.			(82%)									
			Note: 6 inch sandy shale seam at 15.3 feet.												
			Note: Color change to red at 17.0 feet												
6.2	20.5		TERMINATION DEPTH = 20.5 FEET		20.5										

NOTES/REMARKS: ST=Shelby Tube

PRIME ENGINEERING & ARCHITECTURE INC.

TEST BORING No.: CR 16:Sta 50+588

APPROX. STA. & OFFSET: CR 16: Sta 50+588

DRAFT

ELEVATION: 270.012 m

CLIENT: Gannett Fleming

PROJECT: ATH-33-30.981

PROJECT No.: 99043

LOCATION: Athens County, Athens, Ohio

DATE STARTED: 10/5/99 DATE COMPLETED: 10/5/99

SAMPLER DIAM: 2.0" TYPE: SS HAMMER WT.: 140lb FALL: 30"

CASING DIAM: 3.25" TYPE: HSA OTHER:

DRILLING INFORMATION:

Ohio Testbor

GROUNDWATER INFORMATION:

Water encountered at 18.5 feet during drilling operations and at 1.0 feet upon completion.

▼ GROUNDWATER DURING DRILLING ▽ GROUNDWATER UPON COMPLETION

ELEV (ft)	DEPTH (ft)	MATERIAL DESCRIPTION	SAMPLE NUMBER	SAMPLE DEPTH	BLOWS/6 INCHES	N-VALUE (BLOWS/FT) OR REC%(RQD%)	PENETROMETER (tsf)	MOISTURE CONTENT (%)	LIQUID LIMIT LL	PLASTIC LIMIT PL	PLASTICITY INDEX PI	AGGREGATE (%)	COARSE AND FINE SAND (%)	SILT AND CLAY COMBINED(%) OR SILT(%)/CLAY(%)	CLASSIFICATION SYMBOL
0.3	1.0	BERM MATERIAL Brown to gray SILT AND CLAY, little sand, moist	1	1.0	3 2 2	4			–	–		–	–		VISUAL
			2	3.5	2 2 4	6	2.0	22	36	21	14	0	–	83	A-6a
1.6	6.0	Brown CLAY, trace rock fragments, little sand, moist	3	6.0	3 7 8	15	3.5	22	42	21	21	1	12		A-7-6
2.6	8.5	Brown to gray SILTY CLAY, trace rock fragments, some sand, moist.	4	8.5	5 6 8	14	3.5	20	37	21	16	3	23		A-6b
3.4	11.0	Brown CLAY, trace rock fragments, little sand, moist.	5	11.0	6 8 20	28	2.75	24	44	27	17	0	5	95	A-7-6
			6	13.5	6 1 18	19	2.5	24	44	28	16	0	0		A-7-6
5.0	18.5	Very soft, brown to grey, decomposed SANDSTONE.	7	18.5	50/[illegible]	50+		–	–	–		–	–		VISUAL
6.0	20.0	Note: Auger refusal on bedrock at 20.0 feet. Began coring for rock. Hard, gray, slightly weathered, micaceous, fossiliferous fine grained SANDSTONE with indistinct to massive bedding.	RUN 1	20.0		86% (82%)									
7.4	24.3														
7.6	25.0	Very soft, gray, highly weathered CLAY SHALE with indistinct to laminar bedding (fissile). Note: 1.0 inch hard, gray, weathered limestone seam present at 24.8 feet.		25.0											

TERMINATION DEPTH = 25.0 FEET

NOTES/REMARKS:

TEST BORING LOG 99043.GPJ PRIME ENG.GDT 12/7/99

PRIME ENGINEERING & ARCHITECTURE INC.

TEST BORING No.: CR 16:Sta 50+660

APPROX. STA. & OFFSET: CR 16: Sta 50+660

ELEVATION: 270.957 m

DRAFT

CLIENT: Gannett Fleming

PROJECT: ATH-33-30.981 PROJECT No.: 99043

LOCATION: Athens County, Athens, Ohio

DATE STARTED: 10/5/99 DATE COMPLETED: 10/5/99

SAMPLER DIAM: 2.0" TYPE: SS HAMMER WT.: 140lb FALL: 30"

CASING DIAM: 3.25" TYPE: HSA OTHER:

DRILLING INFORMATION:
Ohio Testing

GROUNDWATER INFORMATION:
Dry during drilling operations and at 2.0 feet upon completion.

▽ GROUNDWATER UPON COMPLETION

ELEV (ft.)	DEPTH (ft.)	Soil/Rock Symbol	MATERIAL DESCRIPTION	SAMPLE NUMBER	SAMPLE DEPTH	BLOWS/6 INCHES (N-VALUE (BLOWS/FT) OR REC%/RQD%)	PENETROMETER (tons/sf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS (%) LL	PL	PI	AGGREGATE (%)	COARSE AND FINE SAND (%)	SILT AND CLAY COMBINED (%) OR SILT (%)/CLAY (%)	CLASSIFICATION SYMBOL
			FIELD DATA					**LABORATORY DATA**							
			PERM MATERIAL												
0.46	1.5		Brown SILT AND CLAY, little sand, moist.	1	1.0	1 2 2 (4)	0.25	25	32	18	14	0	14		A-6a
1.2	4.0		Note: Shelby tube pushed at 3.5 feet. Brown SILTY CLAY, some sand, moist.	ST	3.5		--		-	-		--	--		VISUAL
				3	6.5	4 6 9 (15)	2.75	21	40	21	19	0	24		A-6b
2.6	5.5		Very soft, brown to reddish brown, decomposed CLAY SHALE.	4	8.5	14 23 28 (51)	4.25	17	--	--		--	--		VISUAL
				5	11.0	50+ 75/5" 49	3.5	13	--	--		--	--		VISUAL
				6	13.5	50+ 50/3 in	4.25	13	--	--		--	--		VISUAL
4.6	15.0		Note: Auger refusal on bedrock at 15.0 feet. Began coring rock. Very soft, red, decomposed CLAY SHALE with indistinct bedding. Rock quality very poor as per RQD.	RUN 1	15.0	88% (17%)									
6.0	20.0		TERMINATION DEPTH = 20.0 FEET		20.0										

NOTES/REMARKS: ST=Shelby Tube

TEST BORING LOG1 9903.GPJ PRIMENG.GDT 12/7/99

PRIME ENGINEERING & ARCHITECTURE INC.

TEST BORING No.: CR 21:Sta 3+074

APPROX. STA. & OFFSET: CR 21: Sta 3+074

DRAFT

ELEVATION: 294.380 m

CLIENT: Gannett Fleming

PROJECT: ATH-33-30.981 PROJECT No.: 99043

LOCATION: Athens County, Athens, Ohio

DATE STARTED: 10/14/99 DATE COMPLETED: 10/14/99

SAMPLER DIAM: 2.0" TYPE: SS HAMMER WT.: 140lb FALL: 30"

CASING DIAM: 3.25" TYPE: HSA OTHER:

DRILLING INFORMATION:
Ohio Testbor

GROUNDWATER INFORMATION:
Dry during drilling operations and upon completion.

FIELD DATA				LABORATORY DATA							
					ATTERBERG LIMITS (%)						
PIEV (ft.)	DEPTH (ft.)	Soil/Rock Symbol	MATERIAL DESCRIPTION	SAMPLE NUMBER	SAMPLE DEPTH	BLOWS/6 INCHES (N-VALUE (BLOWS/FT) OR REC%/RQD%)	PENETROMETER (tons/ft²)	MOISTURE CONTENT (%)	LIQUID LIMIT LL	PLASTIC LIMIT PL	PLASTICITY INDEX PI	AGGREGATE (%)	COARSE AND FINE SAND (%)	SILT AND CLAY COMBINED (%) OR SILT (%)/CLAY (%)	CLASSIFICATION SYMBOL
			ASPHALT												
0.5?	1.7		Medium stiff to hard, brown SILTY CLAY.	1	2.0	8 (4 4 4)		13	31	18	13	23	25		A-6a
				2	4.8	4 (1 3 3)		28	29	21	8	0	2	65/33	A-6b
				ST	7.5			--	--	--		--	--		VISUAL
				4	9.5	18 (8 9 10)		23	49	21	22	5	10		A-7-6
3.6	12.0		Hard, brown, highly weathered to decomposed SANDSTONE	5	12.0	50+ (50/3 in)		8	--	--		--	--		VISUAL
4.4	14.8		Very soft, brown to gray, highly weathered to decomposed CLAY SHALE.	6	14.8	50+ (50/3 in)		7	--	--		--	--		VISUAL
				7	19.5	50+ (15 35 50/4 in)		12	--	--		--	--		VISUAL
7.6	25.0		Note: Auger refusal on bedrock at 25.0 feet. Began coring for rock.	8	24.5	50/1			--	--		--	--		VISUAL
7.7	25.3		Soft, gray, highly weathered SILTY SHALE, with indistinct to laminar bedding.	RUN 1	25.0	(8%)									
			Very soft, gray, highly weathered CLAY SHALE, with indistinct to laminar bedding (fissile). Quality of rock considered very poor as per RQD.												
9.2	30.0		Note: 5 inch thick silty shale seam at 25.8 feet. TERMINATION DEPTH = 30.0 FEET		30.0										

NOTES/REMARKS: ST=Shelby Tube

CR 21:Sta 3+074; PAGE 1 OF 1

TEST BOR 40 LOG: SHALE.GPJ PRIMENG.GDT 12/7/99

PRIME ENGINEERING & ARCHITECTURE INC. APPROX. REF. OF TEST: CR 21: Sta 3+293

DRAFT

TEST BORING No.: CR 21:Sta 3+293

ELEVATION: 292.428 m

CLIENT: Gannett Fleming

PROJECT: ATH-33-30.981 PROJECT No.: 99043

LOCATION: Athens County, Athens, Ohio

DATE STARTED: 10/14/99 DATE COMPLETED: 10/14/99

SAMPLER DIAM: 2.0" TYPE: SS HAMMER WT.: 140lb FALL: 30"

CASING DIAM: 3.25" TYPE: HSA OTHER:

DRILLING INFORMATION:
Ohio Testbor

GROUNDWATER INFORMATION:
Dry during drilling operations and at 1.0 feet upon completion.

ELEV (m)	DEPTH (m)	Soil/Rock Symbol	MATERIAL DESCRIPTION	SAMPLE NUMBER	SAMPLE DEPTH	FIELD DATA: BLOWS/6 INCHES, N-VALUE (BLOWS/FT) OR REC%/RQD%	FIELD DATA: PENETROMETER (tons/ft²)	LABORATORY DATA: MOISTURE CONTENT (%)	ATTERBERG LIMITS (%): LIQUID LIMIT (LL)	ATTERBERG LIMITS (%): PLASTIC LIMIT (PL)	ATTERBERG LIMITS (%): PLASTICITY INDEX (PI)	AGGREGATE (%)	COARSE AND FINE SAND (%)	SILT AND CLAY COMBINED (%) OR SILT (%)/CLAY (%)	CLASSIFICATION SYMBOL
6.15	0.3		TOPSOIL.												
			Soft, brown SILT AND CLAY, trace rock fragments, little sand, moist.	1	1.0	4 (1, 2, 2)		22	34	21	13	4	13		A-6a
1.1	3.8		Very stiff, brown CLAY, some rock fragments, little sand, moist.	2A	3.5	17 (5, 7, 10)		14	41	28	13	18	10		A-7-6
291 1.4	4.5		*Brown, decomposed* CLAY SHALE.	2B	4.5			11	--	--		--	--		VISUAL
				3	6.0	47 (15, 24, 23)		14	--	--		--	--		VISUAL
				4	8.5	50+ (6, 30, 50/1 in.)		12	--	--		--	--		VISUAL
				5	13.5	50+ (45, 50/1 in.)		6	--	--		--	--		VISUAL
287.8 4.6	15.0		Note: Auger refusal on bedrock at 15.0 feet. Began coring for rock.	RUN 1	15.0										
			Soft, gray, highly weathered CLAY SHALE, fissile with laminar bedding. *Quality of rock considered fair as per* RQD.												
			Note: Iron staining present from 15.3 feet to 17.2 feet.			(62%)									
			Note: 1.3 feet hard, gray, weathered silty shale seam at 15.9 feet.												
284.4 6.0	20.0		TERMINATION DEPTH = 20.0 FEET		20.0										

NOTES/REMARKS:

TEST BORING LOGS ATH-33-30.981 PRIME.GDT - 2/7/99

PRIME ENGINEERING & ARCHITECTURE INC.

TEST BORING No.: TR55: Sta 48+365

APPROX. STA. & OFFSET: TR55: Sta 48+365

ELEVATION: 261.598 m

CLIENT: Gannett Fleming

PROJECT: ATH-33-30.981 **DRAFT** PROJECT No.: 99043

LOCATION: Athens County, Athens, Ohio

DATE STARTED: 10/15/99 DATE COMPLETED: 10/15/99

SAMPLER DIAM: 2.0" TYPE: SS HAMMER WT.: 140lb FALL: 30"

CASING DIAM: 3.25" TYPE: HSA OTHER:

DRILLING INFORMATION:
Ohio Testbor

GROUNDWATER INFORMATION:

▽ GROUNDWATER UPON COMPLETION

ELEV (ft.)	DEPTH (ft.)	MATERIAL DESCRIPTION	SAMPLE NUMBER	SAMPLE DEPTH	BLOWS/6 INCHES / N-VALUE (BLOWS/FT) OR REC%/(RQD%)	PENETROMETER (tons/ft²)	MOISTURE CONTENT (%)	LL LIQUID LIMIT	PL PLASTIC LIMIT	PI PLASTICITY INDEX	AGGREGATE (%)	COARSE AND FINE SAND (%)	SILT AND CLAY COMBINED(%) OR SILT(%)/CLAY(%)	CLASSIFICATION SYMBOL
		ASPHALT												
0.46	1.5	ROAD BASE	1A	1.5	31 / 33		5	--	--		41	38		A-1-b
0.75	2.5	Hard SILT AND CLAY	1B	2.5	19, 14		9	33	19	14	41	17		A-6a
1.2	4.0	Medium stiff CLAY	2	4.0	2, 4, 4 / 8		23	43	20	23	0	3		A-7-6
2.0	6.5	Medium stiff ELASTIC CLAY	3	6.5	2, 4, 4 / 8		25	58	30	28	2	5		A-7-5
			ST	9.0	Shelby			--	--		--	--		VISUAL
3.4	11.0	Brown, decomposed CLAY SHALE	5	11.0	15, 48, 27 / 50+		12	--	--		--	--		VISUAL
4.2	14.0	Brown, highly weathered SANDSTONE	6	14.0	50/3 in. / 50+		10	--	--		--	--		VISUAL
4.41	14.5	Note: Auger refusal on bedrock at 14.5 feet. Began coring for rock. Medium hard, brown, slightly weathered, micaceous, fine grained SANDSTONE, with thin to moderate bedding. Iron staining present throughout length of core. Quality of rock considered excellent as per RQD. Note: Some very thin, carbonaceous laminations present from 16.6 feet to 20.0 feet. Bedding planes are weak along these laminations.	Run 1	14.5	100% (100%)									
6.0	20.0	TERMINATION DEPTH = 20.0 FEET		20.0										

NOTES/REMARKS:

TEST BORING LOG 5023 GPJ PR WEHO GDT 12/7/99

PRIME ENGINEERING & ARCHITECTURE INC.

TEST BORING No.: TR64: Sta 49+145

APPROX. STA. & OFFSET: TR64: Sta 49+145

ELEVATION: 263.383 m

DRAFT

CLIENT: Gannett Fleming

PROJECT: ATH-33-30.981 PROJECT No.: 99043

LOCATION: Athens County, Athens, Ohio

DATE STARTED: 10/13/99 DATE COMPLETED: 10/13/99

SAMPLER DIAM: 2.0" TYPE: SS HAMMER WT.: 140lb FALL: 30"

CASING DIAM: 3.25" TYPE: HSA OTHER:

DRILLING INFORMATION:
Ohio Testbor

GROUNDWATER INFORMATION:

ELEV (ft)	DEPTH (ft)	Geol Rock Symbol	MATERIAL DESCRIPTION	SAMPLE NUMBER	SAMPLE DEPTH	FIELD DATA: BLOWS/6 INCHES; N-VALUE (BLOWS/FT) OR REC%-(RQD)%	FIELD DATA: PENETROMETER (tons/ft²)	LAB: MOISTURE CONTENT (%)	LAB: ATTERBERG LIMITS (%) LIQUID LIMIT LL	LAB: ATTERBERG LIMITS (%) PLASTIC LIMIT PL	LAB: ATTERBERG LIMITS (%) PLASTICITY INDEX PI	LAB: AGGREGATE [%]	LAB: COARSE AND FINE SAND (%)	LAB: SILT AND CLAY COMBINED(%) OR SILT(%)/CLAY(%)	CLASSIFICATION SYMBOL
6.13	0.0		TOPSOIL Medium stiff SILTY CLAY	1	1.0	2 2 4 = 6		19	39	19	20	0	21		A-6b
				ST	3.0			--	--	--		--	--		VISUAL
1.5	5.0		Medium dense SANDY SILT	3	5.0	4 6 8 = 14		22	27	18	9	0	32	22/46	A-4a
2.3	7.5		Hard ELASTIC CLAY	4	7.5	3 6 60/5 in. = 60+		22	51	25	26	1	1		A-7-5
3.0	10.0		Note: Auger refusal on bedrock at 10.0 feet. Began coring for rock. Hard, tan, weathered, very fine grained SANDSTONE, with very thin to moderate bedding.	Run 1	10.0										
3.9	12.7		Medium hard, grey, weathered CLAY SHALE, fissile with laminar bedding. Quality of Run 1 considered very poor as per RQD.			100% (14%)									
4.6	15.0		TERMINATION DEPTH = 15.0 FEET		15.0										

NOTES/REMARKS:

TEST_BORING_OSI_604.GPJ, PRIME.NS.GDT 12/7/99

PRIME ENGINEERING & ARCHITECTURE INC.

TEST BORING No.: TR64: Sta 49+270

APPROX. STA. & OFFSET: TR64: Sta 49+270

ELEVATION: 295.329 m

CLIENT: Gannett Fleming

DRAFT

PROJECT: ATH-33-30.981 PROJECT No.: 99043

LOCATION: Athens County, Athens, Ohio

DATE STARTED: 10/13/99 DATE COMPLETED: 10/13/99

SAMPLER DIAM: 2.0" TYPE: SS HAMMER WT.: 140lb FALL: 30"

CASING DIAM: 3.25" TYPE: HSA OTHER:

DRILLING INFORMATION:
Ohio Testboring

GROUNDWATER INFORMATION:

ELEV (ft)	DEPTH (ft)	Soil/Rock Symbol	MATERIAL DESCRIPTION	SAMPLE NUMBER	SAMPLE DEPTH	BLOWS/6 INCHES (N-VALUE (BLOWS/FT) OR RECOVERY/RQD%)	PENETROMETER (tons/ft²)	MOISTURE CONTENT (%)	ATTERBERG LIMITS (%) LL LIQUID LIMIT	PL PLASTIC LIMIT	PI PLASTICITY INDEX	AGGREGATE (%)	COARSE AND FINE SAND (%)	SILT AND CLAY COMBINED(%) OR SILT(%)/CLAY(%)	CLASSIFICATION SYMBOL
0.13	0.4		TOPSOIL Stiff CLAY	1	1.0	3 5 8 13		25							
291.2 1.1	3.5		Stiff ELASTIC CLAY	2	3.5	2 4 4 8		31							
				ST	5.0			–							
				4	7.0	4 6 7 13		31							
				5	9.5	6 6 8 14		28							
291.7 3.6	12.0		Stiff to very stiff CLAY	6	12.0	4 7 7 14		31							
				7	14.5	3 5 6 11		29							
				8	17.0	7 13 9 22		20							
5.9	19.5		Hard SILTY CLAY	9A	19.5	50/5 IN.		16							
6.2	20.5		Brown, decomposed to highly weathered CLAY SHALE	9B	20.5	24 50/6 in.		10							
7.6	25.0		Note: Auger refusal on bedrock at 15.0 feet. Began coring for rock.	10 Run 1	24.5 25.0			5							
			Hard, light gray, slightly weathered, micaceous, fine grained SANDSTONE, with very thin to moderate bedding. Some iron staining present from 25.8 feet to 27.0 feet and from 28.9 feet to 30.0 feet. Note: Many to some very thin carbonaceous laminations present from 26.3 feet to 30.0 feet. Quality of rock for Run 1 considered excellent as per RQD.			100% (98%)									
9.1	30.0				30.0										

NOTES/REMARKS:

TR64: Sta 49+270: PAGE 1 OF 2

TEST BORING LOG1 99043.PJ PRIMENG.GDT 12/7/99

PRIME ENGINEERING & ARCHITECTURE INC.

TEST BORING No.: TR64: Sta 49+270

APPROX. STA. & OFFSET: TR64: Sta 49+270

ELEVATION: 295.329 m

DRAFT

PROJECT: ATH-33-30.981 PROJECT No.: 99043

DRILLING INFORMATION:
Ohio Tether

GROUNDWATER INFORMATION:

FIELD DATA					LABORATORY DATA								
						ATTERBERG LIMITS (%)							
SAMPLE NUMBER	SAMPLE DEPTH	BLOWS/6 INCHES N-VALUE (BLOWS/FT) OR REC%(RQD%)	PENETROMETER (tonsf/ft²)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	AGGREGATE (%)	COARSE AND FINE SAND (%)	SILT AND CLAY COMBINED(%) OR SILT(%)/CLAY(%)	CLASSIFICATION SYMBOL
					LL	PL	PI				

ELEV (ft)	DEPTH (ft.)	SAM/ Rock Symbol	MATERIAL DESCRIPTION
			TERMINATION DEPTH = 30.0 FEET

NOTES/REMARKS:

TEST_BORING_CGI 9043.GPJ PRIMENG.GDT 12/7/99

PRIME ENGINEERING
& ARCHITECTURE INC.

- Geotechnical & Materials Testing
- Inspection
- Civil
- Highways & Bridges
- Structural
- Architecture

FAX

To: Malcolm Hargraves
From: Steve Mileski
Fax: (614) 794-9442
Pages: (including cover sheet) 14
Phone:
Date: 10/12
Company: Gannett Fleming
Time:

Comments:

Malcolm,

Attached, please find all of the slake durability test results for the samples you sent up. Also find the triax test results for 35+000 @ 2.0'-4.0' and 38+420 (~~Bag sample~~ tube sample) 37+140. If you have any questions regarding the triax results please call Gene Sabic or Barry Wong at Dodson Stilson Labs@(614) 888-0576.

Thank You,

Steve

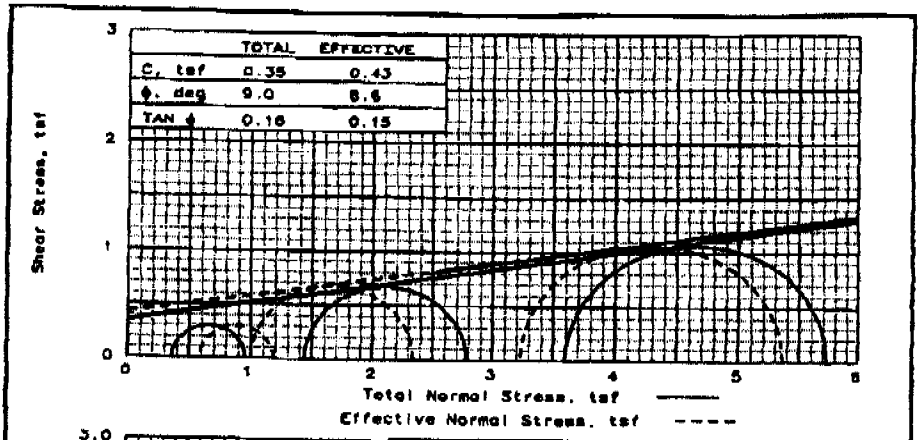
1038 Ghent Rd. Akron, Ohio 44333
Phone: (330) 666-5432 Fax: (330) 666-4130 E-mail: pegeotec@aol.com

PRIME ENGINEERING: PROJECT NO. 99043
SLAKE DURABILITY TEST RESULTS

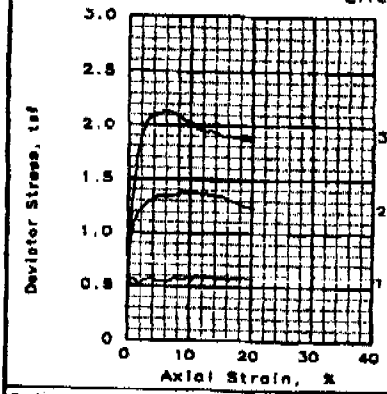
Sample	Slake Durability Index 1st cycle Id1 %	2nd cycle Id2 %
33+900/11.0'	75.3	54.6
33+900/22.0'	69.8	56.8
33+900/30.0'	66.1	28.9
35+000/38.0'	87.5	82.1
36+560/26.5'	99.0	98.8
36+560/30.0'	83.7	59.8
37+140/12.5'	84.9	73.8
37+140/21.0'	95.7	94.2
37+140/26.5'	65.3	58.6
37+140/30.0'	7.4	2.3
37+140/36.0'	42.4	29.7
37+140/56.0'	0.8	0.7
37+780/23.0'	74.5	41.4
37+780/27.0'	55.7	32.7
37+780/33.0'	83.4	78.2
37+780/50.0'	16.8	6.2
37+780/59.0'	93.0	80.1
37+780/66.0'	96.1	94.2
37+780/71.0'	95.7	89.4
37+780/79.0'	0.7	0.7
38+420/46.0'	87.4	62.7
38+420/64.0'	66.5	58.5
38+420/70.0'	12.0	1.7
38+420/73.0'	95.0	92.6
TR55-1/32.0'	83.2	73.9
TR55-1/37.5'	94.8	84.9
TR55-1/41.0'	99.6	99.3
TR55-1/47.0'	98.7	97.8
TR64-4/10.0'	98.0	96.8
TR64-5/23.0'	95.8	93.5
37+140/46.0'	98.7	98.3
37+140/55.0'	0.7	0.5
37+780/76.0'	49.8	23.9

Slake Durability Rating:

High:	greater than 95%
Medium:	85% to 95%
Low:	60% to 85%
Very Low:	less than 60%



	TOTAL	EFFECTIVE
C, tsf	0.35	0.43
ϕ, deg	9.0	8.6
TAN ϕ	0.16	0.15



SAMPLE NO.:		1	2	3
INITIAL	WATER CONTENT, %	27.6	27.6	27.6
	DRY DENSITY, pcf	86.8	87.2	92.2
	SATURATION, %	77.1	79.5	89.6
	VOID RATIO	0.984	0.934	0.829
	DIAMETER, in	2.83	2.79	2.85
	HEIGHT, in	5.53	5.59	5.60
AT TEST	WATER CONTENT, %	33.2	31.8	27.1
	DRY DENSITY, pcf	88.9	91.0	97.4
	SATURATION, %	100.0	100.0	100.0
	VOID RATIO	0.897	0.853	0.731
	DIAMETER, in	2.80	2.75	2.78
	HEIGHT, in	5.47	5.41	5.50
Strain rate, %/min		0.0024	0.0024	0.0024
BACK PRESSURE, tsf		4.03	4.03	4.03
CELL PRESSURE, tsf		4.39	5.47	7.85
FAIL. STRESS, tsf		0.59	1.34	2.13
TOTAL PORE PR., tsf		3.80	4.47	4.40
ULT. STRESS, tsf		0.59	1.34	2.13
TOTAL PORE PR., tsf		3.80	4.47	4.40
σ_1 FAILURE, tsf		1.18	2.34	5.36
σ_3 FAILURE, tsf		0.59	1.00	3.23

TYPE OF TEST:
CU with Pore Pressures
SAMPLE TYPE: 2.8" press tube
DESCRIPTION: Fat clay, A-7-6
GI (59)
LL= 77 PL= 26 PI= 51
SPECIFIC GRAVITY= 2.7
REMARKS:

Fig. No.: _____

CLIENT: Prime Engineering

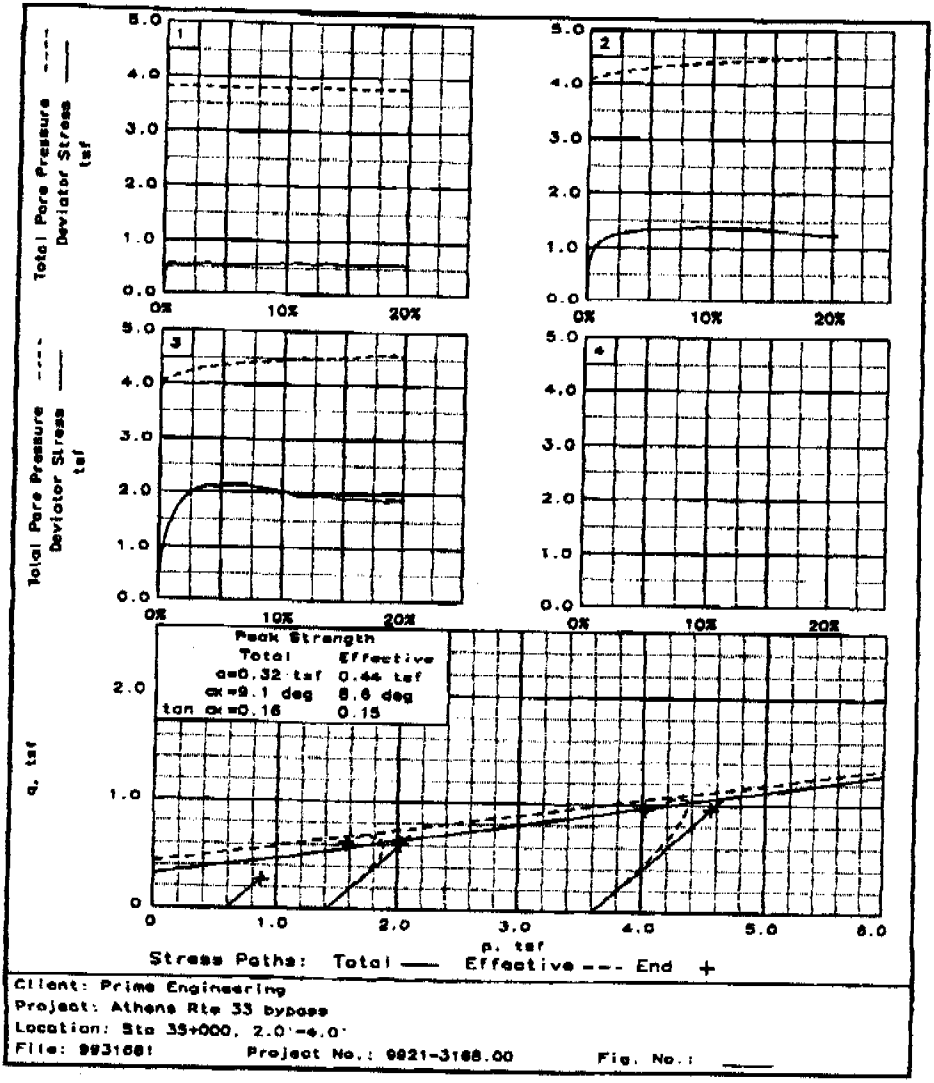
PROJECT: Athens Rte 33 bypass

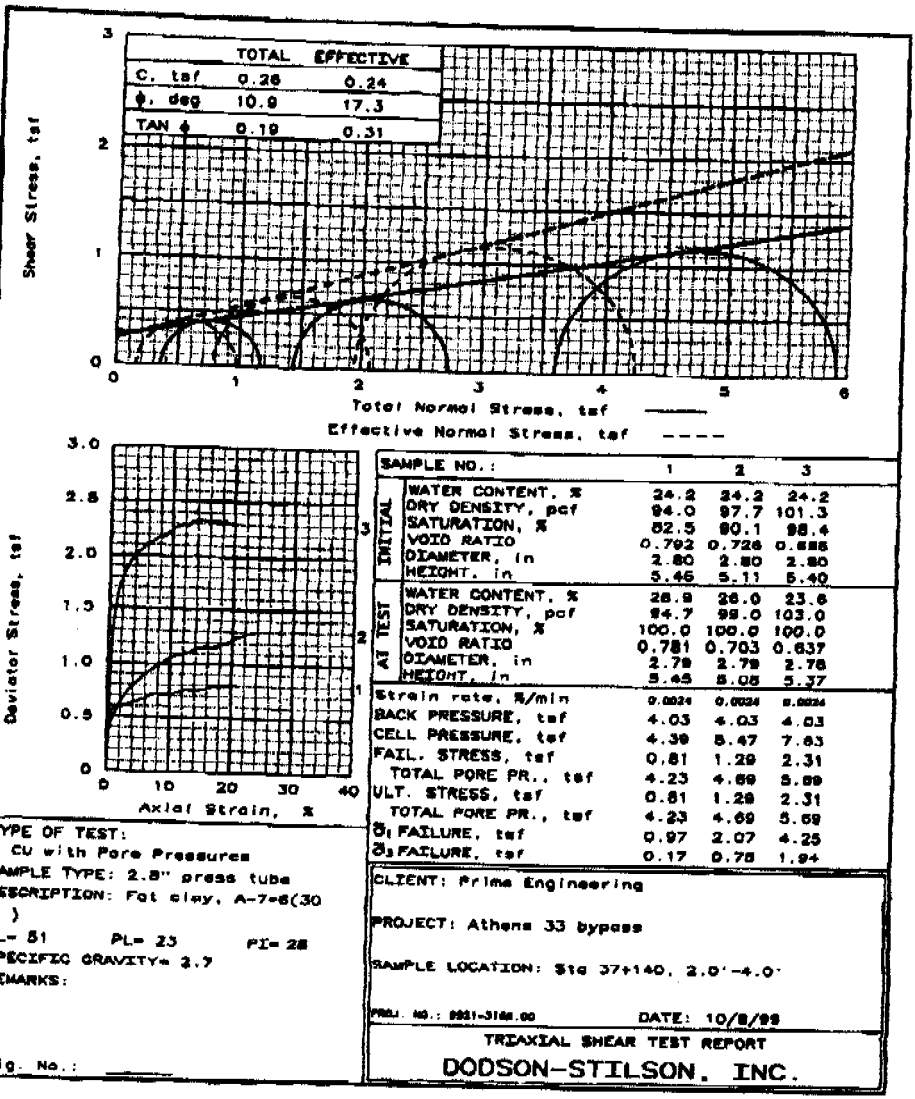
SAMPLE LOCATION: Sta 38+000, 2.0'-4.0'

PROJ. NO.: 9921-3166.00 DATE: 10/4/99

TRIAXIAL SHEAR TEST REPORT

DODSON-STILSON, INC.


Total Pore Pressure ----
Deviator Stress ——
tsf
1
2
3
4
5.0
4.0
3.0
2.0
1.0
0.0
0%
10%
20%
Peak Strength
Total Effective
c=0.32 tsf 0.44 tsf
α=9.1 deg 8.6 deg
tan α=0.16 0.15
q, tsf
p, tsf
0
1.0
2.0
3.0
4.0
5.0
6.0
Stress Paths: Total —— Effective --- End +
Client: Prime Engineering
Project: Athens Rte 33 bypass
Location: Sta 35+000, 2.0'-4.0'
File: 993168! Project No.: 9921-3168.00 Fig. No.:



SAMPLE NO.:		1	2	3
INITIAL	WATER CONTENT, %	24.2	24.2	24.2
	DRY DENSITY, pcf	94.0	97.7	101.3
	SATURATION, %	82.5	90.1	98.4
	VOID RATIO	0.792	0.726	0.666
	DIAMETER, in	2.80	2.80	2.80
	HEIGHT, in	5.46	5.11	5.40
AT TEST	WATER CONTENT, %	28.9	26.0	23.6
	DRY DENSITY, pcf	94.7	99.0	103.0
	SATURATION, %	100.0	100.0	100.0
	VOID RATIO	0.781	0.703	0.637
	DIAMETER, in	2.79	2.79	2.78
	HEIGHT, in	5.45	5.05	5.37
Strain rate, %/min		0.0024	0.0024	0.0024
BACK PRESSURE, tsf		4.03	4.03	4.03
CELL PRESSURE, tsf		4.30	5.47	7.83
FAIL. STRESS, tsf		0.81	1.29	2.31
TOTAL PORE PR., tsf		4.23	4.69	5.89
ULT. STRESS, tsf		0.81	1.29	2.31
TOTAL PORE PR., tsf		4.23	4.69	5.89
σ_1 FAILURE, tsf		0.97	2.07	4.25
σ_3 FAILURE, tsf		0.17	0.78	1.94

TYPE OF TEST:
CU with Pore Pressures
SAMPLE TYPE: 2.8" press tube
DESCRIPTION: Fat clay, A-7-6(30)
LL= 51 PL= 23 PI= 28
SPECIFIC GRAVITY= 2.7
REMARKS:

Fig. No.:

CLIENT: Prime Engineering

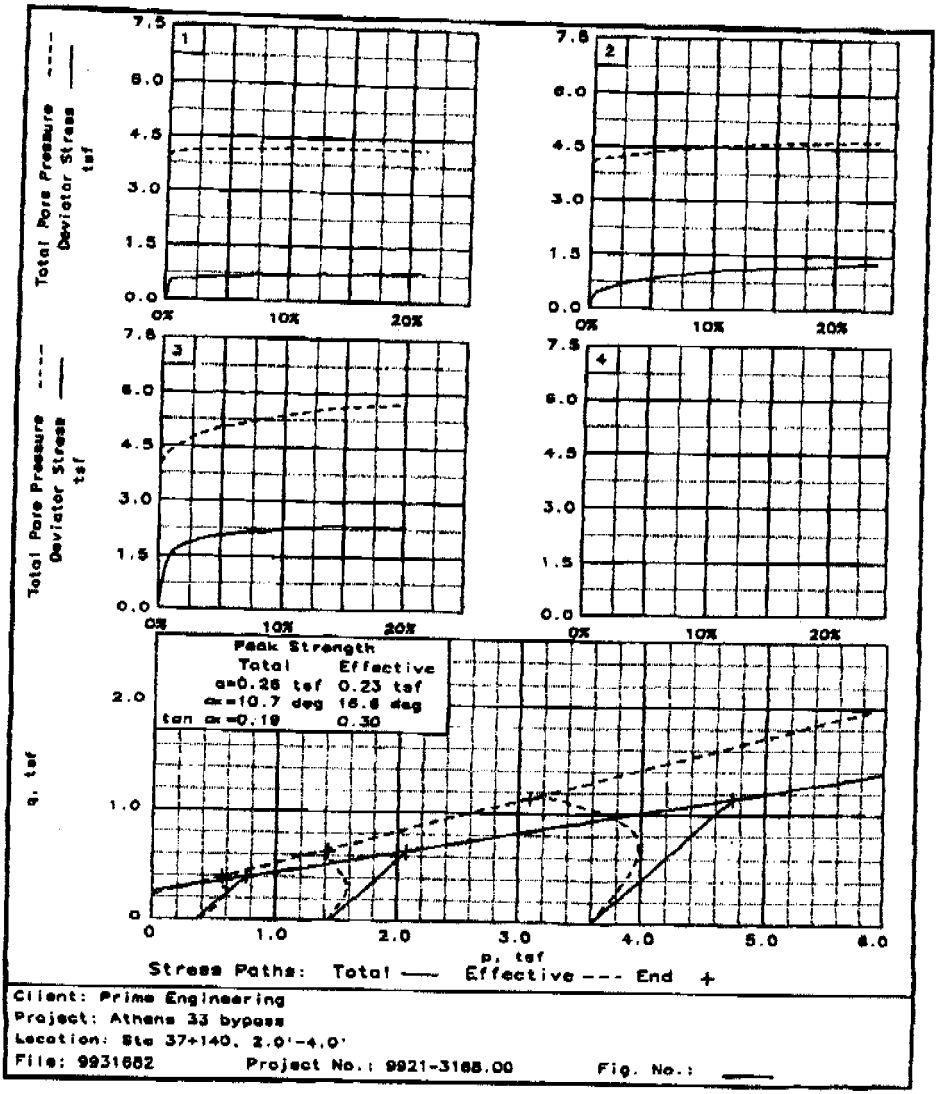
PROJECT: Athens 33 bypass

SAMPLE LOCATION: Sta 37+140, 2.0'-4.0'

PROJ. NO.: 9921-3188.00 DATE: 10/8/99

TRIAXIAL SHEAR TEST REPORT

DODSON-STILSON, INC.


Total Pore Pressure ----
Deviator Stress ——
tsf
1
2
3
4
7.5
6.0
4.5
3.0
1.5
0.0
0%
10%
20%
Peak Strength
Total Effective
c=0.26 tsf 0.23 tsf
α=10.7 deg 16.6 deg
tan α=0.19 0.30
q, tsf
2.0
1.0
0
1.0
2.0
3.0
4.0
5.0
6.0
p, tsf
Stress Paths: Total —— Effective --- End +
Client: Prime Engineering
Project: Athens 33 bypass
Location: Sta 37+140, 2.0'-4.0'
File: 9931682
Project No.: 9921-3188.00
Fig. No.: ——

MOISTURE-DENSITY RELATION TEST RESULTS

Project: Athens Rte. 33 bypass
Client: Prime Engineering
DSI Job No. 9921-3188.00

Curve Number: C-1

MAXIMUM DRY DENSITY: 109.8 pcf

OPTIMUM MOISTURE: 16.2 %

Sample Description: Loam clay, A-7-6(20)

Sample Source: Bh 36-420

Date Sampled:

Procter: Standard

ASTM: D-698 Method A

Remarks:

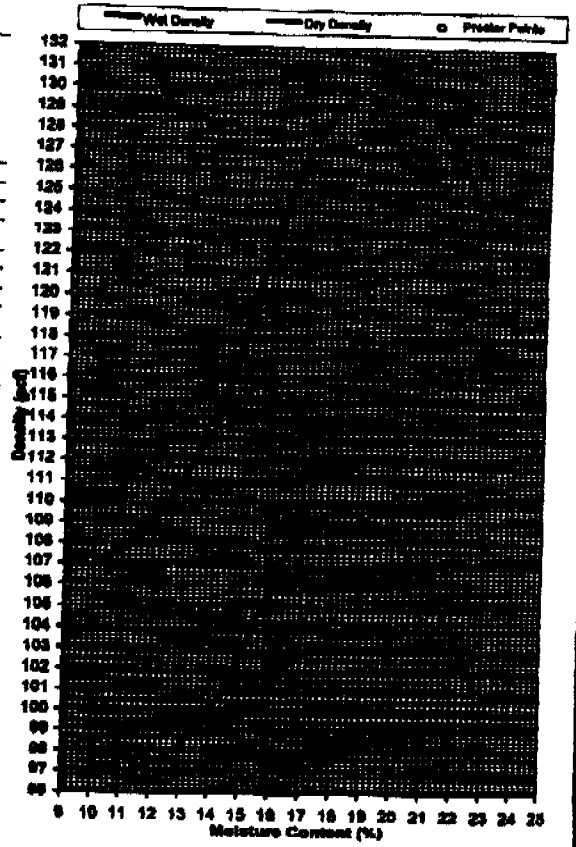
Moisture Content 4.5 %

Specific Gravity

Size	Description	%
0.1875"-3.0000"	Aggregate	0.0
0.0787"-0.1870"	Coarse Sand	0.0
0.0165"-0.0787"	Med. Sand	8.1
0.0029"-0.0165"	Fine Sand	7.6
0.0002"-0.0029"	Silt	27.1
Smaller than 0.0002"	Clay	60.2

Atterberg

Liquid Limit 42
Plastic Limit 16
Plasticity Index 26



Dodson Stilson

Dodson-Stilson, Inc.
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ENGINEERS ARCHITECTS SCIENTISTS