



1500 Abbott Road, Suite 210  
 East Lansing, MI 48823  
 Telephone: (517) 337-0111  
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BORING NO. **PW-101** SHEET **1** OF **8**  
 PROJECT **GSWA: Spring Hill Camp Phase III**  
 LOCATION **Osceola Township, MI**  
 PROJECT NO. **4065-005**  
 LOGGED BY **Steve Smith**

COORDINATES **N 228,508.7 E 19,441,303.9**  
 SURFACE ELEVATION **1151.45** DATUM **USGS**

DRILLING CONTRACTOR  
**Stearns**  
 DRILLING METHOD EQUIPMENT  
**Cable Tool Bucyrus Erie 22-W**  
 DRILLING STARTED ENDED  
**4/5/01 4/19/01**

LOCATION DESCRIPTION:  
  
 See attached Site Diagram for location.

**STRATA KEY**

- SAND
- SILT
- CLAY
- CLAYEY SAND
- GRAVEL
- SILTY SAND

SAMPLE INFORMATION					DESCRIPTION	USCS	Strata	REMARKS	Elevation Feet
Depth feet	Lab Sample	Sample Type	Blow Counts	Rec- overy %					
5		GRAB			Medium brown, medium SAND, trace coarse Sand, trace fine Gravel, poorly graded, and damp. Sand is ~85% quartz, highly spherical, sub-rounded to rounded. Fine Gravel is sub-angular to sub-rounded, low sphericity, primarily rock fragments.	SP		Soil descriptions based on samples taken from sand bailer. Depths of samples are approximate.	1151.45
10		GRAB			Light brown, fine to medium SAND, trace Gravel, trace Silt, poorly graded, and damp. Approximately 85% quartz, high sphericity, sub-rounded to well rounded, low sphericity in rock fragments.	SP		1147.45	
15		GRAB			Light brown, fine to medium SAND, trace Gravel, trace Clay, poorly graded, and damp. Approximately 85% quartz, high sphericity, sub-rounded, low sphericity in rock fragments.	SP		1143.45	
		GRAB				SP		1134.45	



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BORING NO. **PW-101** SHEET **2 OF 8**  
 PROJECT **GSWA: Spring Hill Camp Phase III**  
 LOCATION **Osceola Township, MI**  
 PROJECT NO. **4065-005**  
 LOGGED BY **Steve Smith**

COORDINATES **N 228,508.7 E 19,441,303.9**  
 SURFACE ELEVATION **1151.45** DATUM **USGS**

SAMPLE INFORMATION					DESCRIPTION	USCS	Strata	REMARKS	Elevation Feet
Depth feet	Lab Sample	Sample Type	Blow Counts	Recovery %					
		GRAB			Brown, CLAY, some Silt, some fine Sand, trace medium Sand, moderately plastic. Sand is sub-rounded to well rounded, high sphericity, >75% quartz.	SP			
		GRAB			CLAY	CL		Increasing Clay in last bail at 21' bgl.	1130.45
25		GRAB			CLAY	CL		Sample based on muddy cuttings. Driller indicates presence of Clay.	1127.45
		GRAB			Brown, CLAY, some Silt, some fine Sand, trace medium Sand, moderately plastic, and soft. Sand is sub-rounded to well rounded, high sphericity, >75% quartz.	CL			1123.45
30		GRAB			CLAY	CL		Clay sample at 34' bgl taken from drill bit. Water in MW-103 (~20' offset) at ~35' bgl.	1117.45
		GRAB			Brown, fine SAND, some Silt, trace to little Clay, trace medium Sand, poorly graded. Sand is rounded to well rounded, highly spherical, >85% quartz.	SP-SM			1114.45
40		GRAB			Brown, very fine SAND, and Silt, little Clay, poorly graded. Sand is rounded to well rounded, highly spherical, >85% quartz. Clay occurs as 1/2" diameter clasts and is moderately plastic.	SM			1111.45
45		GRAB							



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BORING NO. **PW-101** SHEET **3 OF 8**  
 PROJECT **GSWA: Spring Hill Camp Phase III**  
 LOCATION **Osceola Township, MI**  
 PROJECT NO. **4065-005**  
 LOGGED BY **Steve Smith**

COORDINATES **N 228,508.7 E 19,441,303.9**  
 SURFACE ELEVATION **1151.45** DATUM **USGS**

SAMPLE INFORMATION					DESCRIPTION	USCS	Strata	REMARKS	Elevation Feet
Depth feet	Lab Sample	Sample Type	Blow Counts	Recovery %					
50		GRAB			Brown, very fine to fine SAND, some Silt, little Clay, trace medium Sand, poorly graded. Very fine to fine Sand is rounded to well rounded, highly spherical, >85% quartz. Medium Sand is sub-angular to sub-rounded, moderately spherical, >50% quartz. Clay occurs as 1/2" diameter clasts and is moderately plastic.	SM		Driller confirms rig and cuttings indicate silty fine Sand.	1104.45
55		GRAB			Brown, fine SAND, little to some Silt, little to some Clay, little medium Sand, poorly graded. Fine Sand is rounded to well rounded, highly spherical, >85% quartz. Medium Sand is sub-angular to sub-rounded, moderately spherical, >50% quartz. Clay occurs as 1 to 3" elongated, flat clasts.	SC-SM			1094.45
60		GRAB			Brown, fine SAND, little Silt, little Clay, little medium Sand, poorly graded. Fine Sand is rounded to well rounded, highly spherical, >85% quartz. Medium Sand is sub-angular to sub-rounded, moderately spherical, >50% quartz. Clay occurs as 1 to 3" elongated, flat clasts.	SC-SM			1093.45
65		GRAB			Brown, CLAY, little fine Sand, moderate plasticity, medium stiff.	CL			1091.45
70		GRAB			Brown, fine SAND, some medium Sand, little Silt, little Clay, poorly graded. Fine Sand is rounded to well rounded, highly spherical, >85% quartz. Medium Sand is sub-angular to sub-rounded, moderate sphericity, >50% quartz. Clay occurs as 1/4 to 1/2" diameter clasts, and has moderate plasticity.	SP-SC			1089.45
75		GRAB			Brown, fine SAND, some medium Sand, little Silt, little Clay, trace coarse Sand and fine Gravel, poorly graded. Fine Sand is rounded to well rounded, highly spherical, >85% quartz. Medium Sand is sub-angular to sub-rounded, moderate sphericity, >50% quartz. Coarse Sand and fine Gravel is sub-rounded to angular, low to moderate sphericity, <50% quartz. Clay occurs as 1/4 to 1/2" diameter clasts.	SP-SC		08:00 4-10-01 Water in drilling pipe at 10.45' bgl, and hole open 4' out the end of drilling pipe. Indicates still in confining unit.	1084.45
80		GRAB			Brown, fine to medium SAND, trace coarse Sand, trace Silt, poorly graded. Fine to medium Sand is sub-rounded to well rounded, highly spherical, >80% quartz. Coarse Sand is angular to sub-rounded, moderately spherical, <50% quartz.	SP		Switched from flat pattern bailer to dart valve bailer at 69' bgl.	1082.45
85		GRAB			Brown, fine to medium SAND, trace to little coarse Sand, trace Silt, poorly graded. Fine Sand is sub-rounded to well	SP			1079.45



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BORING NO. **PW-101** SHEET **4 OF 8**  
 PROJECT **GSWA: Spring Hill Camp Phase III**  
 LOCATION **Osceola Township, MI**  
 PROJECT NO. **4065-005**  
 LOGGED BY **Steve Smith**

COORDINATES **N 228,508.7 E 19,441,303.9**  
 SURFACE ELEVATION **1151.45** DATUM **USGS**

SAMPLE INFORMATION					DESCRIPTION	USCS	Strata	REMARKS	Elevation Feet
Depth feet	Lab Sample	Sample Type	Blow Counts	Recovery %					
75		GRAB			rounded, highly spherical, >80% quartz. Medium Sand is sub-angular to sub-rounded, low to high sphericity, >70% quartz. Coarse Sand is angular to sub-rounded, low to high sphericity, <50% quartz.	SP		1077.45	
		GRAB			Brown, fine to medium SAND, trace to little coarse Sand, little Silt, poorly graded. Fine to medium Sand is sub-rounded to well rounded, high to moderate sphericity, >75% quartz. Coarse Sand is angular to sub-rounded, low to moderate sphericity, <50% quartz.	SP		1076.45	
		GRAB			Brown, fine to medium SAND, and coarse Sand, little fine Gravel, trace Silt, well graded. Fine Sand is rounded to well rounded, high sphericity, >85% quartz. Medium to coarse Sand is angular to sub-rounded, low to moderate sphericity, <75% quartz. Fine Gravel is sub-angular to sub-rounded, ~1/4" diameter.	SW		1072.45	
80		GRAB			Brown, fine to coarse SAND, little fine Gravel, trace coarse Gravel, trace Silt, well graded. Fine Sand is rounded to well rounded, high sphericity, >85% quartz. Medium to coarse Sand is sub-angular to rounded, low to moderate sphericity, <75% quartz. Coarse Gravel is ~1" diameter.	SW		1069.45	
		GRAB			Brown, fine to coarse SAND, trace fine Gravel, trace Silt, well graded. Fine Sand is rounded to well rounded, high sphericity, >85% quartz. Medium to coarse Sand is angular to sub-rounded, low to moderate sphericity, <80% quartz. Fine Gravel is sub-angular to sub-rounded, moderate sphericity, and primarily rock fragments.	SW		1065.45	
		GRAB			Brown, fine to coarse SAND, trace Silt, trace fine Gravel, well graded. Fine to medium Sand is sub-angular to rounded, >80% quartz. Fine Sand is highly spherical, medium Sand is moderately spherical. Coarse Sand is angular to sub-rounded, low sphericity, and primarily rock fragments.	SW		1063.45	
90		GRAB			Brown, fine to medium SAND, little coarse Sand, trace fine Gravel, trace Silt, poorly graded. Fine to medium Sand is sub-angular to rounded, high to moderate sphericity, >80% quartz. Coarse Sand is angular to sub-rounded, low to moderate sphericity, and primarily rock fragments.	SP		1060.45	
		GRAB			Brown, fine to medium SAND, and coarse Sand, trace Silt, trace fine Gravel, moderately graded. Fine to medium Sand is sub-angular to sub-rounded, moderate to high sphericity, >80% quartz. Coarse Sand is angular to sub-rounded, low to moderate sphericity, and primarily rock fragments.	SP-SW		Heave at 91' bgl, switch to flat pattern bailer.	
		GRAB			Brown, fine SAND, some medium Sand, trace Silt, poorly graded. Sand is rounded to well rounded, highly spherical, >85% quartz.	SP		Switch back to dart valve bailer.	
95		GRAB			Brown, fine to medium SAND, trace coarse Sand, trace Silt, trace organic wood matter, poorly graded. Fine to medium Sand is rounded to well rounded, highly spherical, >85% quartz. Coarse Sand is angular to sub-rounded, low to moderate sphericity, and <65% quartz.	SP		1057.45	
		GRAB						1054.45	



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BORING NO. **PW-101** SHEET **5 OF 8**  
 PROJECT **GSWA: Spring Hill Camp Phase III**  
 LOCATION **Osceola Township, MI**  
 PROJECT NO. **4065-005**  
 LOGGED BY **Steve Smith**

COORDINATES **N 228,508.7 E 19,441,303.9**  
 SURFACE ELEVATION **1151.45** DATUM **USGS**

SAMPLE INFORMATION					DESCRIPTION	USCS	Strata	REMARKS	Elevation Feet
Depth feet	Lab Sample	Sample Type	Blow Counts	Recovery %					
		GRAB			Brown, fine to medium SAND, trace Silt, poorly graded. Sand is sub-rounded to well rounded, highly spherical, >85% quartz.	SP		Heave in drilling pipe even though driller keeping head of water in drill pipe. Ground water gradient upward at this depth and location.	1049.45
105		GRAB			Brown, fine to medium SAND, trace Silt, trace coarse Sand, poorly graded. Fine to medium Sand is sub-rounded to well rounded, highly spherical, >85% quartz.	SP			1046.45
		GRAB			Brown, fine to medium SAND, little coarse Sand, trace Silt, trace fine to coarse Gravel, poorly graded. Fine to medium Sand is sub-rounded to well rounded, highly spherical, >85% quartz. Coarse Sand and fine Gravel are angular to sub-rounded, low to moderate sphericity, <60% quartz. Coarse Gravel is ~1" diameter, sub-angular, and moderately spherical.	SP			1042.45
110		GRAB			Brown, fine to medium SAND, and Clay, little coarse Sand, little fine Gravel, trace Silt, poorly graded. Fine to medium Sand is sub-rounded to rounded, highly spherical, >85% quartz. Clay occurs as 1/2 to 1.5" diameter clasts. Coarse Sand is angular to sub-rounded, low sphericity, primarily rock fragments.	SC			1038.45
		GRAB			Brown, fine to medium SAND, some coarse Sand, trace Silt, trace fine Gravel, poorly graded. Fine to medium Sand is sub-rounded to rounded, highly spherical, >85% quartz. Coarse Sand is angular to sub-rounded, low sphericity, primarily rock fragments.	SP			1035.45
120		GRAB			Brown, fine to medium SAND, trace Silt, trace coarse Sand, poorly graded. Fine to medium Sand is sub-rounded to well rounded, highly spherical, >85% quartz. Coarse Sand is angular to sub-rounded, low sphericity, primarily rock fragments.	SP			1030.45
		GRAB			Silty CLAY.	CL-ML			1027.45
125		GRAB				SP			No recovery 124-125' bgl. Description based on hole staying open 2' past end of drill pipe and grey fines in water.



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BORING NO. **PW-101** SHEET **6 OF 8**  
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 LOCATION **Osceola Township, MI**  
 PROJECT NO. **4065-005**  
 LOGGED BY **Steve Smith**

COORDINATES **N 228,508.7 E 19,441,303.9**  
 SURFACE ELEVATION **1151.45** DATUM **USGS**

SAMPLE INFORMATION					DESCRIPTION	USCS	Strata	REMARKS	Elevation Feet
Depth feet	Lab Sample	Sample Type	Blow Counts	Recovery %					
130		GRAB			Brown, fine to medium SAND, little Silt, little coarse Sand, trace fine Gravel, poorly graded. Fine to medium Sand is rounded to well rounded, highly spherical, >85% quartz. Coarse Sand and fine Gravel are sub-angular to sub-rounded, moderate sphericity, <50% quartz. (continued)	SP	Substantial recovery 125-130' bgl.		
		GRAB			Brown, fine to medium SAND, little coarse Sand, trace Silt, trace fine Gravel, poorly graded. Fine to medium Sand is rounded to well rounded, highly spherical, >85% quartz. Coarse Sand and fine Gravel are sub-angular to sub-rounded, low to moderate sphericity, <50% quartz.	SP		Substantial Recovery 130-134' bgl.	1021.45
135		GRAB			Brown, fine to medium SAND, little coarse Sand, little Silt, little Clay, trace fine to coarse Gravel, poorly graded. Fine to medium Sand is rounded to well rounded, highly spherical, >85% quartz. Coarse Sand and fine Gravel are sub-angular to sub-rounded, low to moderate sphericity, <50% quartz. Clay occurs as 1/4 to 1.25" diameter clasts, moderate plasticity, firm.	SC-SM		1017.45	
		GRAB			Brown, fine to medium SAND, little coarse Sand, trace fine Gravel, trace Clay, poorly graded. Fine to medium Sand is rounded to well rounded, highly spherical, >85% quartz. Coarse Sand is angular to sub-rounded, low to moderate sphericity, and primarily rock fragments. Clay occurs as 1/2" diameter clasts.	SP		1016.45	
140		GRAB			Brown, fine to coarse SAND, some fine Gravel, trace coarse Gravel, trace Silt, well graded. Fine to medium Sand is rounded to well rounded, highly spherical, >85% quartz. Coarse Sand and fine Gravel are angular to sub-rounded, moderately spherical, primarily rock fragments. Coarse Gravel is ~1.25" diameter.	SW		1011.45	
		GRAB			Brown, fine to coarse SAND, trace to little fine Gravel, trace Silt, well graded. Fine to medium Sand is rounded to well rounded, highly spherical, >85% quartz. Coarse Sand is angular to sub-rounded, moderate to low sphericity, primarily rock fragments.	SW		1008.45	
145		GRAB			Brown, fine to medium SAND, trace coarse Sand, trace Silt, poorly graded. Fine to medium Sand is rounded to well rounded, highly spherical, >85% quartz. Coarse Sand is sub-angular to sub-rounded, low to moderate sphericity, primarily rock fragments.	SP		1006.45	
		GRAB			Brown, fine to medium SAND, trace coarse Sand, trace Silt, trace fine Gravel, poorly graded. Fine to medium Sand is rounded to well rounded, highly spherical, >85% quartz. Coarse Sand and fine Gravel are sub-angular, moderate sphericity, and primarily rock fragments.	SP		1001.45	



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BORING NO. **PW-101**

SHEET **7** OF **8**

PROJECT **GSWA: Spring Hill Camp Phase III**

LOCATION **Osceola Township, MI**

COORDINATES **N 228,508.7 E 19,441,303.9**

PROJECT NO. **4065-005**

SURFACE ELEVATION **1151.45** DATUM **USGS**

LOGGED BY **Steve Smith**

SAMPLE INFORMATION					DESCRIPTION	USCS	Strata	REMARKS	Elevation Feet	
Depth feet	Lab Sample	Sample Type	Blow Counts	Rec- overy %						
155		GRAB			Brown, fine to medium SAND, trace coarse Sand, trace Silt, poorly graded. Fine to medium Sand is rounded to well rounded, highly spherical, >85% quartz. (continued)	SP		Sand heaving up into drilling pipe, due to high pore pressure.	998.45	
		GRAB			Brown, fine to medium SAND, little coarse Sand, trace fine Gravel, trace Silt, poorly graded. Fine to medium Sand is rounded to well rounded, highly spherical, >85% quartz. Coarse Sand is sub-angular to sub-rounded, low to moderate sphericity, and primarily rock fragments. Fine Gravel is sub-angular to sub-rounded, with moderate sphericity.	SP		Switch to dart valve bailer at 156' bgl.	996.45	
160		GRAB			Brown, fine to medium SAND, little coarse Sand, trace fine Gravel, trace Silt, poorly graded. Fine to medium Sand is sub-rounded to rounded, highly spherical, >85% quartz. Coarse Sand is angular to sub-rounded, low to moderate sphericity, and primarily rock fragments.	SP		Switch to flat pattern bailer at 160' bgl.	991.45	
		GRAB			Brown, fine to medium SAND, some coarse Sand, some fine Gravel, trace Silt, trace coarse Gravel, well graded. Fine to medium Sand is sub-rounded to rounded, highly spherical, >85% quartz. Coarse Sand is angular to sub-rounded, low to moderate sphericity, and primarily rock fragments. Gravel is sub-angular to sub-rounded, moderately spherical. Coarse Gravel is ~2" in diameter.	SW			987.45	
165		GRAB			Brown, medium to coarse SAND, and fine Gravel, little fine Sand, little coarse Gravel, well graded. Medium to coarse Sand is angular to rounded, moderately spherical, ~75% quartz. Fine Gravel is sub-rounded, moderately spherical. Coarse Gravel is 0.75-2.5" in diameter.	SW-GW			986.45	
		GRAB			Brown, medium to coarse SAND, and fine Gravel, little coarse Gravel, trace fine Sand, moderately graded. Medium to coarse Sand is angular to rounded, moderately spherical, ~75% quartz. Fine Gravel is sub-angular to sub-rounded, moderately spherical. Coarse Gravel is 0.75-1.5" in diameter.	SW-GW			985.45	
170		GRAB			Brown, medium to coarse SAND, little fine Sand, little fine Gravel, trace Silt, moderately graded. Medium to coarse Sand is angular to rounded, moderately spherical, ~65% quartz. Fine Sand is sub-rounded to rounded, highly spherical, and ~90% quartz. Fine Gravel is angular to sub-rounded, with low sphericity.	SP-SW			980.45	
175		GRAB			Brown, medium to coarse SAND, some fine Sand, trace fine Gravel, trace Silt, trace Clay, well graded. Medium to coarse Sand is sub-angular to rounded, moderate to high sphericity, ~65% quartz. Clay occurs as grey fines in water. Fine Gravel is ~20 mm in diameter, angular to sub-angular, low to moderate sphericity, and primarily rock fragments.	SW			976.45	
		GRAB			Brown, coarse SAND, and fine GRAVEL, some Clay, little medium Sand, trace fine Sand, trace Silt. Coarse Sand is angular to sub-rounded, moderately spherical, and primarily rock fragments. Clay and Silt occur as grey fines in water.	SC-GC			Drilling change at 177.5' bgl. Hole is staying open past drilling casing, which indicates presence of	973.45



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BORING NO. **PW-101** SHEET **8** OF **8**  
 PROJECT **GSWA: Spring Hill Camp Phase III**  
 LOCATION **Osceola Township, MI**  
 PROJECT NO. **4065-005**  
 LOGGED BY **Steve Smith**

COORDINATES **N 228,508.7 E 19,441,303.9**  
 SURFACE ELEVATION **1151.45** DATUM **USGS**

SAMPLE INFORMATION					DESCRIPTION	USCS	Strata	REMARKS	Elevation Feet
Depth feet	Lab Sample	Sample Type	Blow Counts	Recovery %					
		GRAB				SC-GC	Clay.		
		GRAB			Brown, coarse SAND, some fine GRAVEL, some medium Sand, trace Silt, well graded. Coarse Sand is angular to sub-rounded, moderately spherical, and <60% quartz. Medium Sand is sub-rounded to rounded, highly spherical, >75% quartz. Fine Gravel is angular to sub-rounded, and moderately spherical.	SW	Hole stayed open past drilling pipe to 181' bgl. Sand starts at 181' bgl.	970.45	
185		GRAB			Brown, coarse SAND, some medium Sand, little fine GRAVEL, trace Clay, trace Silt, well graded. Coarse Sand is angular to sub-rounded, moderately spherical, and primarily rock fragments. Grey, Clay occurs as 1/4 to 1/2" diameter clay clasts, with some fine to coarse Sand, moderately plastic, and hard.	SW	End of drilling casing at 187' bgl. Hole stays open past casing, indicating Clay or Silt. Bailed sample does not indicate Clay or Silt.	967.45	
190		GRAB			Grey, Clay, some fine to coarse Sand, little Silt, moderately plastic, and hard. Sand is matrix supported.	CL	Till	961.45	
		GRAB			Grey, Clay, and fine to coarse Sand, little fine Gravel, little Silt, moderately plastic, and hard. Sand is matrix supported.	CL		959.45	
195							End of boring - 195' bgl	956.45	





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BORING NO. **TW-1** SHEET **1 OF 2**  
 PROJECT **GSWA: Spring Hill Camp Phase III**  
 LOCATION **Osceola Township, MI**  
 PROJECT NO. **4065-005**  
 LOGGED BY **Joel Henry**

COORDINATES **N 227,159.9 E 19,440,658.2**  
 SURFACE ELEVATION **1099.13** DATUM **USGS**

DRILLING CONTRACTOR  
**Stearns**  
 DRILLING METHOD **10 1/4" HSA** EQUIPMENT **CME 1050**  
 DRILLING STARTED **7/5/00** ENDED **7/6/00**

LOCATION DESCRIPTION:  
  
 See attached Site Diagram for location.

**STRATA KEY**

SAND	SILT
CLAY	CLAYEY SAND
GRAVEL	SILTY SAND

SAMPLE INFORMATION					DESCRIPTION	USCS	Strata	REMARKS	Elevation Feet
Depth feet	Lab Sample	Sample Type	Blow Counts	Recovery %					
5					Brown loam (TOPSOIL). Red, MEDIUM TO FINE SAND, little silt.	SM		Stratigraphic information taken from MW-1d boring log. TW-1 drilled approx. 15' from MW-1d. Hand auger to 8' bgl to clear utilities.	1099.13
					Light brown, FINE TO MEDIUM SAND, little silt, moist.	SM			1098.13
					Light brown, FINE TO MEDIUM SAND, little silt, trace fine to medium gravel, poorly sorted, round and spherical, wet.	SM			1096.13
						SM			1095.13
10					Light brown, FINE TO MEDIUM SAND, little fine to medium gravel, little silt, poorly sorted, round and spherical, loose, wet at 9.5'- 2" clayey gravel and silt seam.	SP		0.25" clay seam at 9.6' bgl	1091.13
15					Gray to brown, CLAY, trace silt and fine sand, medium plasticity, firm to hard, dry to moist clay.	CL		Driller notes change at 12.5' bgl.	1086.53
20					Grayish brown, MEDIUM SAND, some silt and clay, sand is round and spherical, very loose, moist to wet.	SC		Soft from 18-19.5' bgl per driller and blow counts. Fairly low K. Interbedded/gradation band per driller.	1082.13
25					Grayish brown, FINE SAND, some silt, trace medium sand, medium density, round and spherical, moist with wet sandier seams, 1/4" seam of clay at 22.75', gray 1" seam of silt at 23', 1" seam of medium sand with little silt at 23.5'.	SM		Soft from 18-19.5' bgl per driller and blow counts. Fairly low K.	1076.63
30					Buff to light brown, MEDIUM TO COARSE SAND, few fine to medium gravel, subrounded and spherical, loose, wet.	SP		Driller notes change at 26' bgl. Sample looks like outwash or glaciofluvial deposits.	1073.13
35					Buff, MEDIUM TO COARSE SAND, few fine to medium gravel, subrounded and spherical, loose, wet.	SP		Granite fragments.	1066.13
					Buff, MEDIUM TO COARSE SAND, few fine to medium gravel, few medium angular gravel, subrounded, spherical to elongate, loose, wet.	SP			1065.63
					Buff, MEDIUM SAND, little coarse sand, few fine gravel, sand is round and spherical, gravel is subangular and elongate, loose, poorly sorted, wet.	SP			1062.13



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BORING NO. **TW-1** SHEET **2 OF 2**  
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 LOCATION **Osceola Township, MI**  
 PROJECT NO. **4065-005**  
 LOGGED BY **Joel Henry**

COORDINATES **N 227,159.9 E 19,440,658.2**  
 SURFACE ELEVATION **1099.13** DATUM **USGS**

SAMPLE INFORMATION					DESCRIPTION	USCS	Strata	REMARKS	Elevation Feet
Depth feet	Lab Sample	Sample Type	Blow Counts	Recovery %					
					Buff, MEDIUM SAND, little coarse sand, few fine gravel, sand is round and spherical, gravel is subangular and elongate, loose, poorly sorted, wet. <i>(continued)</i>	SP			
45					Buff, MEDIUM SAND, few fine sand, round and spherical, poorly sorted, loose, wet. Buff, MEDIUM TO COARSE SAND, little coarse sand, few fine gravel, subrounded and subspherical, poorly sorted, loose, wet.	SP SP		Outwash or glaciofluvial.	1055.63 1054.63
50					Buff, COARSE SAND, little medium sand, few fine gravel, round and subspherical, poorly sorted, loose, wet.	SP		Outwash or glaciofluvial.	1051.13
55					Buff, MEDIUM TO COARSE SAND, little fine to medium sand, few coarse sand, trace fine gravel, round and spherical, poorly sorted, loose, wet.	SP		Bail approx. 3.25' heave from augers.	1046.13
60					Buff, MEDIUM TO COARSE SAND, little coarse sand, few fine sand, trace fine gravel, round and spherical, poorly sorted, loose, wet.	SP			1041.13
65					Buff, MEDIUM SAND, little medium to coarse sand, few fine sand, trace coarse sand, round and very spherical, poorly sorted, loose, wet.	SP		Bail approx. 3' heave from augers.	1036.13
70					Buff, MEDIUM SAND, trace medium to coarse sand, trace fine sand, round and very spherical, sorted, loose, wet.	SP		Bail approx. 2' heave from augers.	1031.13
75					Buff, MEDIUM SAND, trace medium to coarse sand, trace fine sand, trace fine gravel, round and very spherical, sorted, very loose, wet.	SP		Bail approx. 2.5' heave from augers.	1026.13
80					Buff, FINE TO MEDIUM SAND, trace fine to medium sand, trace fine sand, round and very spherical, sorted, loose, wet.	SP		Bail approx. 1.9' heave from augers.	1021.13
85					Buff, FINE TO MEDIUM SAND, few fine sand, round and spherical, sorted, very loose, wet.	SP		End of boring - 85' bgl.	1016.13



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BORING NO. **MW-1d** SHEET **1 OF 3**  
 PROJECT **GSWA: Spring Hill Camp Phase III**  
 LOCATION **Osceola Township, MI**  
 PROJECT NO. **4065-005**  
 LOGGED BY **Ken Ewers**

COORDINATES **N 227,166.0 E 19,440,642.4**  
 SURFACE ELEVATION **1099.43** DATUM **USGS**

DRILLING CONTRACTOR  
**Stearns**  
 DRILLING METHOD **4 1/4" HSA** EQUIPMENT **CME 1050**  
 DRILLING STARTED **6/26/00** ENDED **6/27/00**

LOCATION DESCRIPTION:  
  
 See attached Site Diagram for location.

**STRATA KEY**

SAND	SILT
CLAY	CLAYEY SAND
GRAVEL	SILTY SAND

SAMPLE INFORMATION					DESCRIPTION	USCS	Strata	REMARKS	Elevation Feet
Depth feet	Lab Sample	Sample Type	Blow Counts	Recovery %					
5		Hand Auger			Brown loam (TOPSOIL). Red, MEDIUM TO FINE SAND, little silt.	SM		Hand auger to 8' bgl to clear utilities.	1099.43
					Light brown, FINE TO MEDIUM SAND, little silt, moist.	SM			1098.43
					Light brown, FINE TO MEDIUM SAND, little silt, trace fine to medium gravel, poorly sorted, round and spherical, wet.	SM			1096.43
						SM			1095.43
10		SSS	3-4 7-7	100	Light brown, FINE TO MEDIUM SAND, little fine to medium gravel, little silt, poorly sorted, round and spherical, loose, wet at 9.5'- 2" clayey gravel and silt seam.	SP		0.25" clay seam at 9.6' bgl	1091.43
15		SSS	3-6 10-11	95	Gray to brown, CLAY, trace silt and fine sand, medium plasticity, firm to hard, dry to moist clay.	CL		Driller notes change at 12.5' bgl.	1086.83
20		SSS	1-0 1-6	100	Grayish brown, MEDIUM SAND, some silt and clay, sand is round and spherical, very loose, moist to wet.	SC		Soft from 18-19.5' bgl per driller and blow counts. Fairly low K. Interbedded/gradation band per driller.	1082.43
25		SSS	10-13 15-16	100	Grayish brown, FINE SAND, some silt, trace medium sand, medium density, round and spherical, moist with wet sandier seams, 1/4" seam of clay at 22.75', gray 1" seam of silt at 23', 1" seam of medium sand with little silt at 23.5'.	SM		Soft from 18-19.5' bgl per driller and blow counts. Fairly low K.	1076.93
30		SSS	1-1 8-6	100	Buff to light brown, MEDIUM TO COARSE SAND, few fine to medium gravel, subrounded and spherical, loose, wet.	SP		Driller notes change at 26' bgl. Sample looks like outwash or glaciofluvial deposits.	1073.43
35		SSS	3-0 3-5	75	Buff, MEDIUM TO COARSE SAND, few fine to medium gravel, subrounded and spherical, loose, wet.	SP		Granite fragments.	1066.43
					Buff, MEDIUM TO COARSE SAND, few fine to medium gravel, few medium angular gravel, subrounded, spherical to elongate, loose, wet.	SP			1065.93
					Buff, MEDIUM SAND, little coarse sand, few fine gravel, sand is round and spherical, gravel is subangular and elongate, loose, poorly sorted, wet.	SP			1062.43



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BORING NO. **MW-1d** SHEET **2 OF 3**  
 PROJECT **GSWA: Spring Hill Camp Phase III**  
 LOCATION **Osceola Township, MI**  
 PROJECT NO. **4065-005**  
 LOGGED BY **Ken Ewers**

COORDINATES **N 227,166.0 E 19,440,642.4**  
 SURFACE ELEVATION **1099.43** DATUM **USGS**

SAMPLE INFORMATION					DESCRIPTION	USCS	Strata	REMARKS	Elevation Feet
Depth feet	Lab Sample	Sample Type	Blow Counts	Recovery %					
					Buff, MEDIUM SAND, little coarse sand, few fine gravel, sand is round and spherical, gravel is subangular and elongate, loose, poorly sorted, wet. <i>(continued)</i>	SP			
45		SSS	1-4 5-8	88	Buff, MEDIUM SAND, few fine sand, round and spherical, poorly sorted, loose, wet. Buff, MEDIUM TO COARSE SAND, little coarse sand, few fine gravel, subrounded and subspherical, poorly sorted, loose, wet.	SP		Outwash or glaciofluvial.	1055.93 1054.93
50		SSS	5-6 6-3	60	Buff, COARSE SAND, little medium sand, few fine gravel, round and subspherical, poorly sorted, loose, wet.	SP		Outwash or glaciofluvial.	1051.43
55		SSS	8-6 4-5	50	Buff, MEDIUM TO COARSE SAND, little fine to medium sand, few coarse sand, trace fine gravel, round and spherical, poorly sorted, loose, wet.	SP		Bail approx. 3.25' heave from augers.	1046.43
60		SSS	4-5 9-8	80	Buff, MEDIUM TO COARSE SAND, little coarse sand, few fine sand, trace fine gravel, round and spherical, poorly sorted, loose, wet.	SP			1041.43
65		SSS	4-5 5-11	85	Buff, MEDIUM SAND, little medium to coarse sand, few fine sand, trace coarse sand, round and very spherical, poorly sorted, loose, wet.	SP		Bail approx. 3' heave from augers.	1036.43
70		SSS	0-2 5-9	70	Buff, MEDIUM SAND, trace medium to coarse sand, trace fine sand, round and very spherical, sorted, loose, wet.	SP		Bail approx. 2' heave from augers.	1031.43
75		SSS	0-0 0-0	90	Buff, MEDIUM SAND, trace medium to coarse sand, trace fine sand, trace fine gravel, round and very spherical, sorted, very loose, wet.	SP		Bail approx. 2.5' heave from augers.	1026.43
80		SSS	1-5 12-13	50	Buff, FINE TO MEDIUM SAND, trace fine to medium sand, trace fine sand, round and very spherical, sorted, loose, wet.	SP		Bail approx. 1.9' heave from augers.	1021.43
85		SSS	1-0 1-0	55	Buff, FINE TO MEDIUM SAND, few fine sand, round and spherical, sorted, very loose, wet.	SP		Bail approx. 2.5' heave from augers.	1016.43
90		SSS	5-15 20-27	90	Buff, FINE SAND, round and spherical, well sorted, loose, medium density, wet.	SP		Possible till at 89' bgl.	1011.43
					Gray, VERY FINE SANDY SILT, trace fine to medium gravel, poorly sorted, moist to wet.	SM		Bail approx. 1.0' heave from augers.	1010.43



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BORING NO. **MW-1d** SHEET **3 OF 3**  
 PROJECT **GSWA: Spring Hill Camp Phase III**  
 LOCATION **Osceola Township, MI**  
 PROJECT NO. **4065-005**  
 LOGGED BY **Ken Ewers**

COORDINATES **N 227,166.0 E 19,440,642.4**  
 SURFACE ELEVATION **1099.43** DATUM **USGS**

SAMPLE INFORMATION					DESCRIPTION	USCS	Strata	REMARKS	Elevation Feet
Depth feet	Lab Sample	Sample Type	Blow Counts	Recovery %					
95		SSS	9-17 44-59	100	Gray, SILTY CLAY, trace fine sand and fine to medium gravel, low to medium plasticity, hard, dry to moist. <i>(continued)</i>	CL		Varved 93-95' bgl.	1006.43
100		SSS	5-12 11-12	25	Brown to gray, FINE TO MEDIUM SAND, trace silt and clay, loose, round and spherical, wet.	SP		Driller notes change at 97' bgl.	1002.43
105		SSS	3-4 10-11	90	Buff, MEDIUM TO COARSE SAND, little fine sand, few coarse sand, trace gray sand and clay, round and spherical, poorly sorted, loose, wet.	SP		Bail approx. 1.0' heave from augers.	996.33
110		SSS	4-12 18-28	100	Buff, MEDIUM TO COARSE SAND, little fine sand, trace fine gravel, subrounded and elongate to spherical, poorly sorted, loose, wet, 1" gray clay stringers at 109.5' and at 110' bgl.	SP		Bail approx. 0.5' heave from augers.	991.43
115		SSS	6-5 29-52	95	Buff, MEDIUM TO COARSE SAND, little fine sand, trace fine gravel, subrounded and subspherical, poorly sorted, loose, wet.	SP			986.43
					Gray, SILT, little medium sand, dense, moist.	SM		End of boring - 115' bgl.	984.93



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BORING NO. **MW-1i** SHEET **1 OF 1**  
 PROJECT **GSWA: Spring Hill Camp Phase III**  
 LOCATION **Osceola Township, MI**  
 PROJECT NO. **4065-005**  
 LOGGED BY **Ken Ewers**

COORDINATES **N 227,171.9 E 19,440,645.7**  
 SURFACE ELEVATION **1100.16** DATUM **USGS**

DRILLING CONTRACTOR  
**Stearns**  
 DRILLING METHOD **4 1/4" HSA** EQUIPMENT **CME 1050**  
 DRILLING STARTED **6/26/00** ENDED **6/27/00**

LOCATION DESCRIPTION:  
  
 See attached Site Diagram for location.

**STRATA KEY**

SAND	SILT
CLAY	CLAYEY SAND
GRAVEL	SILTY SAND

SAMPLE INFORMATION					DESCRIPTION	USCS	Strata	REMARKS	Elevation Feet
Depth feet	Lab Sample	Sample Type	Blow Counts	Recovery %					
5					Brown loam (TOPSOIL). Red, medium to fine SAND, little silt.	SM		Stratigraphic information taken from MW-1d boring log. MW-1i drilled approx. 10' from MW-1d.	1100.16
					Light brown, fine to medium SAND, little silt, moist.	SM			1099.16
					Light brown, fine to medium SAND, little silt, trace fine to medium gravel, poorly sorted, round and spherical, wet.	SM			1097.16
						SM			1096.16
10					Light brown, fine to medium SAND, little fine to medium gravel, little silt, poorly sorted, round and spherical, loose, wet, at 9.5' - 2" clayey gravel and silt seam.	SP		0.25" clay seam at 9.6' bgl	1092.16
15					Gray to brown, CLAY, trace silt and fine sand, medium plasticity, firm to hard, dry to moist clay.	CL		Driller notes change at 12.5' bgl.	1087.56
20					Grayish brown, medium SAND, some silt and clay, sand is round and spherical, very loose, moist to wet.	SC		Soft from 18-19.5' bgl per driller and blow counts. Fairly low K. Interbedded/gradation band per driller.	1083.16
25					Grayish brown, fine SAND, some silt, trace medium sand, medium density, round and spherical, moist with wet sandier seams, 1/4" seam of clay at 22.75', gray 1" seam of silt at 23', 1" seam of medium sand with little silt at 23.5'.	SM		Soft from 18-19.5' bgl per driller and blow counts. Fairly low K.	1077.66
30					Buff to light brown, medium to coarse SAND, few fine to medium gravel, subrounded and spherical, loose, wet.	SP		Driller notes change at 26' bgl. Sample looks like outwash or glaciofluvial deposits.	1074.16
35					Buff, medium to coarse SAND, few fine to medium gravel, subrounded and spherical, loose, wet.	SP		Granite fragments.	1067.16
					Buff, medium to coarse SAND, few fine to medium gravel, few medium angular gravel, subrounded, spherical to elongate, loose, wet.	SP			1066.66
					Buff, medium SAND, little coarse sand, few fine gravel, sand is round and spherical, gravel is subangular and elongate, loose, poorly sorted, wet.	SP			End of boring - 39' bgl. 1063.16



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BORING NO. **MW-1s** SHEET **1 OF 1**  
 PROJECT **GSWA: Spring Hill Camp Phase III**  
 LOCATION **Osceola Township, MI**  
 PROJECT NO. **4065-005**  
 LOGGED BY **M.B. & J.H.**

COORDINATES **N 227,160.9 E 19,440,643.2**  
 SURFACE ELEVATION **1098.93** DATUM **USGS**

DRILLING CONTRACTOR  
**NA**  
 DRILLING METHOD EQUIPMENT  
**Hand Auger Auger**  
 DRILLING STARTED ENDED  
**6/29/00 6/29/00**

LOCATION DESCRIPTION:  
  
 See attached Site Diagram for location.

**STRATA KEY**

SAND	SILT
CLAY	CLAYEY SAND
GRAVEL	SILTY SAND

SAMPLE INFORMATION					DESCRIPTION	USCS	Strata	REMARKS	Elevation Feet
Depth feet	Lab Sample	Sample Type	Blow Counts	Recovery %					
5					Brown loam (TOPSOIL). Red, MEDIUM TO FINE SAND, little silt.	SM		Stratigraphic information taken from MW-1d boring log. MW-1s drilled approx. 10' from MW-1s. Hand auger to 8' bgl to clear utilities.	1098.93
					Light brown, FINE TO MEDIUM SAND, little silt, moist.	SM			1097.93
					Light brown, FINE TO MEDIUM SAND, little silt, trace fine to medium gravel, poorly sorted, round and spherical, wet.	SM			1095.93
						SM			1094.93
					Light brown, FINE TO MEDIUM SAND, little fine to medium gravel, little silt, poorly sorted, round and spherical, loose.	SP		End of boring - 8.4' bgl.	1090.93



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BORING NO. **MW-3** SHEET **1 OF 3**  
 PROJECT **GSWA: Spring Hill Camp Phase III**  
 LOCATION **Osceola Township, MI**  
 PROJECT NO. **4065-005**  
 LOGGED BY **Ken Ewers**

COORDINATES **N 227,038.7 E 19,440,679.4**  
 SURFACE ELEVATION **1108.77** DATUM **USGS**

DRILLING CONTRACTOR  
**Stearns**  
 DRILLING METHOD EQUIPMENT  
**4 1/4" HSA CME 1050**  
 DRILLING STARTED ENDED  
**6/28/00 6/28/00**

LOCATION DESCRIPTION:  
  
 See attached Site Diagram for location.

**STRATA KEY**

SAND	SILT
CLAY	CLAYEY SAND
GRAVEL	SILTY SAND

SAMPLE INFORMATION					DESCRIPTION	USCS	Strata	REMARKS	Elevation Feet
Depth feet	Lab Sample	Sample Type	Blow Counts	Recovery %					
					TOPSOIL.	SM			1108.77
					Medium reddish brown, SANDY CLAY, slightly moist.	CL			1108.27
5		AUG			Light brown FINE TO COARSE SAND.	SP			1105.77
10		SSS	5-5 4-4	100	Buff, interbedded lenses of fine to coarse SAND, with lenses of buff sandy clay and clayey sand.	SP			1100.77
15		SSS	2-3 6-7	100	Medium buff, clayey SAND/sandy CLAY, soft, damp, could roll to about 5", trace fine rounded gravel,	SC			1095.77
20		SSS	5-6 4-4	100	Medium buff, clayey SAND, hard, damp to moist, (till?).	SC			1090.77
25		SSS	2-3 4-4	80	Medium buff, clayey SAND, hard, damp to moist, stringers of medium to coarse saturated sand	SC			1085.77
30		SSS	3-3 4-4	100	Medium gray, clayey SAND, hard, damp, trace fine rounded gravel, (till?).	SC			1080.77
35		SSS	5-7 7-8	100	Medium gray, clayey SAND, hard, damp, trace fine rounded gravel, (till?).	SC			1075.77
		SSS	5-9 10-12	100	Medium gray, clayey SAND, hard, damp, trace fine rounded gravel, (till?).	SC			1070.77





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BORING NO. **MW-3** SHEET **2 OF 3**  
 PROJECT **GSWA: Spring Hill Camp Phase III**  
 LOCATION **Osceola Township, MI**  
 PROJECT NO. **4065-005**  
 LOGGED BY **Ken Ewers**

COORDINATES **N 227,038.7 E 19,440,679.4**  
 SURFACE ELEVATION **1108.77** DATUM **USGS**

SAMPLE INFORMATION					DESCRIPTION	USCS	Strata	REMARKS	Elevation Feet
Depth feet	Lab Sample	Sample Type	Blow Counts	Recovery %					
					Buff, clayey fine to medium SAND, soft, trace gravel.			Rock wedged in tip of 43-45' sample.	1068.77
45		SSS	6-4 4-4	10		SC			
50		SSS	1-2 2-2	100	Buff, clayey fine to medium SAND, soft, few rounded gravel, saturated.	SC		48-50' sample is much softer than 43-45' sample.	1060.77
55		SSS	1-2 1-6	100	Buff, clayey fine to medium SAND, soft, few rounded gravel, saturated.	SC			1055.77
60		SSS	1-1 1-1	20	Buff, medium SAND, loose, trace fine and coarse sand, trace fine rounded gravel, rounded to subrounded, saturated .	SP			1050.77
65		SSS	1-1 3-2	100	Buff, medium SAND, loose, trace fine and coarse sand, trace clay, rounded to subrounded, saturated.	SP			1045.77
70		SSS	1-1 2-2	100	Buff, fine to medium SAND, trace coarse sand and fine gravel, loose, rounded to subrounded, saturated.	SP			1040.77
75		SSS	1-4 2-7	40	Buff, medium SAND, trace fine and coarse sand, loose, rounded to subrounded, saturated.	SP			1035.77
80		SSS	3-3 4-5	90	Buff, fine to medium SAND, loose, saturated, trace coarse sand and silt, trace fine gravel.	SP			1030.77
85		SSS	1-2 2-3	100	Buff, medium SAND, loose, rounded to subrounded, saturated, with lenses of fine and coarse sand. Coarse to very coarse SAND, fine to medium gravel, little medium sand.	SP			1025.77
						SP			1024.27
90		SSS	2-2 2-3	100	Buff, fine to medium SAND, loose, rounded to subrounded, saturated, trace coarse sand.	SP			1020.77



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BORING NO. **MW-3** SHEET **3 OF 3**  
 PROJECT **GSWA: Spring Hill Camp Phase III**  
 LOCATION **Osceola Township, MI**  
 PROJECT NO. **4065-005**  
 LOGGED BY **Ken Ewers**

COORDINATES **N 227,038.7 E 19,440,679.4**  
 SURFACE ELEVATION **1108.77** DATUM **USGS**

SAMPLE INFORMATION					DESCRIPTION	USCS	Strata	REMARKS	Elevation Feet
Depth feet	Lab Sample	Sample Type	Blow Counts	Recovery %					
95		SSS	6-7 7-9	100	Buff, fine to medium SAND, loose, rounded to subrounded, saturated, trace coarse sand. <i>(continued)</i>	SP			
100		SSS	5-6 7-9	100	Mix of coarse SAND and fine GRAVEL seams in fine to medium sand, very saturated, trace clay.	SP SP			1010.77 1009.77
		SSS	6-9 13-15	50	Gray, fine SAND, hard, few clay and silt (till?). Gray, fine to medium SAND, medium hardness, silt, clay till.	SP		End of boring - 102' bgl.	1008.77



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BORING NO. **MW-7** SHEET **1 OF 3**  
 PROJECT **GSWA: Spring Hill Camp Phase III**  
 LOCATION **Osceola Township, MI**  
 PROJECT NO. **4065-005**  
 LOGGED BY **Jeff Groncki**

COORDINATES **N 227,422.3 E 19,440,738.9**  
 SURFACE ELEVATION **1149.05** DATUM **USGS**

DRILLING CONTRACTOR  
**Stearns**  
 DRILLING METHOD EQUIPMENT  
**4 1/4" HSA CME 1050**  
 DRILLING STARTED ENDED  
**7/18/00 7/19/00**

LOCATION DESCRIPTION:  
  
 See attached Site Diagram for location.

**STRATA KEY**

SAND	SILT
CLAY	CLAYEY SAND
GRAVEL	SILTY SAND

SAMPLE INFORMATION					DESCRIPTION	USCS	Strata	REMARKS	Elevation Feet
Depth feet	Lab Sample	Sample Type	Blow Counts	Recovery %					
5		SSS	2-3 4-4	75	Brown, stiff CLAY, dry-moist.	CL			1144.05
10		SSS	4-7 9-10	40	Light brown FINE TO VERY FINE SAND, with trace medium to coarse sand, dry.	SP			1139.05
15		SSS	4-6 10-10	75	Light brown, medium SAND, large to medium gravel, coarse sand, dry.	SP			1135.05
20		SSS	2-4 8-9	80	Brown, stiff to very stiff CLAY, dry.	CL			1129.05
25		SSS	5-7 12-13	60	Light brown, medium to fine SAND, some medium to fine gravel, little coarse gravel.	SP			1124.85
30		SSS	6-10 14-21	60	Light brown, medium to fine SAND, some medium to fine gravel, little coarse gravel, two 1/4" clay lenses, one at 29 ft. bgl, one at 31.5 ft. bgl.	SP			1120.05
35		SSS	24-28 18-32	5	Light brown, medium SAND, some coarse sand, fine gravel.	SP		Driller comment: Pushed stone 34-36 ft. bgl.	1115.05
			7-12			SM			1110.05



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BORING NO. **MW-7** SHEET **2 OF 3**  
 PROJECT **GSWA: Spring Hill Camp Phase III**  
 LOCATION **Osceola Township, MI**  
 PROJECT NO. **4065-005**  
 LOGGED BY **Jeff Groncki**

COORDINATES **N 227,422.3 E 19,440,738.9**  
 SURFACE ELEVATION **1149.05** DATUM **USGS**


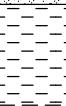
SAMPLE INFORMATION					DESCRIPTION	USCS	Strata	REMARKS	Elevation Feet
Depth feet	Lab Sample	Sample Type	Blow Counts	Recovery %					
		SSS	28-26	90	Brown clay 2", Light brown, fine silty sand 2", Light brown very FINE SAND, very dry. (continued)	SM			
45		SSS	7-12 17-45	90	Brown clay 2", Light brown, fine silty sand 2", Light brown very FINE SAND, very dry.	SM			1105.05
50		SSS	10-11 14-16	90	Light brown VERY FINE SILTY SAND, 6" very stiff brown CLAY, brown VERY FINE CLAYEY SAND, with many thin (1/8-1/4") clay lenses.	SC		Driller comment: Hard drilling 52-53 ft. bgl.	1100.05
55		SSS	7-14 15-18	90	Brown FINE CLAYEY SAND, wet.	SC			1095.05
					Brown CLAY, wet, trace fine sand.	CL			1094.05
					Light brown FINE SAND, brown wet clay with little fine to very fine sand.	SP		Wet at 59' bgl.	1093.55
60		SSS	1-2 4-7	60	Light brown MEDIUM SAND, with some coarse and fine sand and little fine gravel. 1/2" of brown clay at approx. 61 ft. bgl.	SP			1090.05
		SSS	3-4 7-9	100	FINE GRAVEL, with some medium gravel and coarse sand.	GP		Sand bailed auger.	1088.05
65		SSS	5-5 9-13	70	Light brown MEDIUM TO FINE SAND, with some coarse sand, trace fine gravel. 2" brown clay approx. 65.6 ft. bgl., light brown medium to coarse sand approx. 66 ft. bgl.	SP		Sand bailed auger.	1085.05
70		SSS	4-9 15-18	90	Light brown MEDIUM SAND, with some coarse and fine sand, little fine gravel, becomes clayey approx. 71' bgl.	SP		Sand bailed auger.	1080.05
75		SSS	11-13 16-18	90	Light brown MEDIUM TO COARSE SAND, with some fine gravel and little to trace fine sand and medium gravel. 6" gravel seam approx. 75 ft. bgl.	SP		Sand bailed auger.	1075.05
80		SSS	8-21 18-23	90	Brown CLAYEY SAND, with coarse gravel.	SC		Driller comment: Easier drilling 83-84' bgl.	1069.05
85		SSS	4-7 14-20	80	Light brown MEDIUM SAND, with little to some coarse sand. 3/4" brown clay with some fine sand approx 86 ft. bgl.	SP			1065.05
					Light brown MEDIUM TO COARSE SAND, trace fine to medium gravel.	SP			1063.55
90		SSS	6-11 13-15	80	Light brown MEDIUM SAND, little to some coarse sand.	SP		Sand bailed auger.	1060.05
					Light brown COARSE SAND, with some fine gravel and trace medium gravel and medium sand.	SP			1058.55



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BORING NO. **MW-7** SHEET **3 OF 3**  
 PROJECT **GSWA: Spring Hill Camp Phase III**  
 LOCATION **Osceola Township, MI**  
 PROJECT NO. **4065-005**  
 LOGGED BY **Jeff Groncki**

COORDINATES **N 227,422.3 E 19,440,738.9**  
 SURFACE ELEVATION **1149.05** DATUM **USGS**

SAMPLE INFORMATION					DESCRIPTION	USCS	Strata	REMARKS	Elevation Feet
Depth feet	Lab Sample	Sample Type	Blow Counts	Recovery %					
95		SSS	12-16 27-0	50	Light brown MEDIUM TO COARSE SAND, with 2" fine to medium gravel.	SP		Sand bailed auger.	1055.05
					Brown CLAY, alternating with gravel.	CL			1053.55
100		SSS	5-11 32-0		Light brown MEDIUM SAND, with some fine to coarse sand, trace fine gravel.	SP		End of boring - 101' bgl.	1050.05



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BORING NO. **MW-12d** SHEET **1 OF 3**  
 PROJECT **GSWA: Spring Hill Camp Phase III**  
 LOCATION **Osceola Township, MI**  
 PROJECT NO. **4065-005**  
 LOGGED BY **J.Henry/G.Fox**

COORDINATES **N 229,063.8 E 19,441,312.0**  
 SURFACE ELEVATION **1162.56** DATUM **USGS**

DRILLING CONTRACTOR  
**Stearns**  
 DRILLING METHOD EQUIPMENT  
**4 1/4" HSA CME 1050**  
 DRILLING STARTED ENDED  
**7/24/00 7/25/00**

LOCATION DESCRIPTION:  
  
 See attached Site Diagram for location.

**STRATA KEY**

SAND	SILT
CLAY	CLAYEY SAND
GRAVEL	SILTY SAND

SAMPLE INFORMATION					DESCRIPTION	USCS	Strata	REMARKS	Elevation Feet
Depth feet	Lab Sample	Sample Type	Blow Counts	Recovery %					
5		SSS	3-3 5-6	50	Moderate reddish-brown, cohesive CLAYEY FINE TO COARSE SAND, clast supported, dry to moist.	SC			1158.56
10		SSS	7-1 3-5	70	Moist to wet, soft CLAYEY FINE TO COARSE SAND, cohesive, trace fine gravel.	SC			1153.56
15		SSS	3-2 1(12")	100	Moist to wet, semi-cohesive, light yellow brown MEDIUM SAND, trace coarse sand, trace gravel, trace clay. Saturated, very loose, light yellow brown FINE TO MEDIUM SAND, trace silt, trace clay.	SP			1148.56 1147.56
20		SSS	1-0 0-6	100	Saturated, very loose, MEDIUM TO COARSE SAND, light yellow brown, trace coarse gravel, trace silt. Moist, stiff to hard moderate yellow brown CLAY, with trace medium sand, very cohesive.	SP CL	 		1143.56 1142.56
25		SSS	5-8 16-27	75	Dry, light buff MEDIUM SAND, trace fine sand, trace coarse sand, trace gravel, rounded to subrounded.	SP			1138.56
30		SSS	8-15 33-28	75	Dry, light buff MEDIUM SAND, dense, well packed, light/dark banding at 30.5 ft. bgl (light buff to medium buff, 1/4" bands).	SP			1133.56
35		SSS	8-8 16-25	75	Dry, light buff, MEDIUM SAND, medium dense, subrounded.	SP			1128.56
			5-11		Dry, light buff, MEDIUM SAND, loose.	SP			1123.56



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BORING NO. **MW-12d** SHEET **2 OF 3**  
 PROJECT **GSWA: Spring Hill Camp Phase III**  
 LOCATION **Osceola Township, MI**  
 PROJECT NO. **4065-005**  
 LOGGED BY **J.Henry/G.Fox**

COORDINATES **N 229,063.8 E 19,441,312.0**  
 SURFACE ELEVATION **1162.56** DATUM **USGS**

SAMPLE INFORMATION					DESCRIPTION	USCS	Strata	REMARKS	Elevation Feet
Depth feet	Lab Sample	Sample Type	Blow Counts	Recovery %					
		SSS	24-29	75	Dry, light buff, FINE SAND, loose. <i>(continued)</i>	SP			1123.06
45		SSS	5-8 14-19	75	Saturated light yellow brown MEDIUM SAND, trace coarse sand, trace silt and clay. Dry to moist, stiff, moderate yellow brown SILTY CLAY.	SP CL			1118.56 1117.06
50		SSS	5-8 9-9	75	Saturated, loose, light yellow brown MEDIUM TO COARSE SAND, trace gravel, trace clay, rounded to subrounded.	SP			1113.56
55		SSS	3-6 9-13	60	Saturated, loose, light yellow brown MEDIUM SAND, trace coarse sand, trace fine sand.	SP			1108.56
60		SSS	5-5 16-23	60	Saturated, loose, light yellow brown FINE TO MEDIUM SAND, trace coarse sand, trace fine gravel, rounded to subrounded, subangular gravel.	SP			1103.56
65		SSS	6-18 50(4")	100	Saturated, loose, light yellow brown MEDIUM TO COARSE SAND, trace gravel. Saturated, loose, light yellow brown FINE TO VERY FINE SAND, some silt.	SP SM			1098.56 1097.56
70		SSS	10-14 30-34	100	Saturated, loose, light yellow brown, interbedded layers of MEDIUM TO COARSE SAND, and FINE SAND.	SP			1093.56
75		SSS	23-50 (6")	100	Saturated loose, light yellow brown MEDIUM TO COARSE SAND (probably fallback). Wet, stiff and very hard, light yellow brown CLAYEY MEDIUM SAND.	SP SP-SC			1088.56 1087.56
80		SSS	6-26 50 (5"0)	50	Wet, stiff, dense, MEDIUM SAND, with few clay, cohesive.	SP			1083.56
85		SSS	28-50 (6")	60	Saturated light yellow brown MEDIUM SAND. Saturated, rounded to subrounded, FINE GRAVEL, trace medium sand.	SP GP			1078.56 1077.56
90		SSS		100	Light yellow brown MEDIUM SAND, saturated, loose, medium dense. Three inches coarse sand and fine to medium rounded gravel lens at 90 ft. bgl. Interbedded light yellow brown, saturated, FINE TO MEDIUM SAND, with moderate yellow brown dry to moist	SP SP		Did not get blow counts, rig line blew. Very hard drilling 90-93' bgl.	1073.56 1072.56



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BORING NO. **MW-12d** SHEET **3 OF 3**  
 PROJECT **GSWA: Spring Hill Camp Phase III**  
 LOCATION **Osceola Township, MI**  
 PROJECT NO. **4065-005**  
 LOGGED BY **J.Henry/G.Fox**

COORDINATES **N 229,063.8 E 19,441,312.0**  
 SURFACE ELEVATION **1162.56** DATUM **USGS**

SAMPLE INFORMATION					DESCRIPTION	USCS	Strata	REMARKS	Elevation Feet
Depth feet	Lab Sample	Sample Type	Blow Counts	Recovery %					
95		SSS	8-12 18-18	80	silt. Lenses approx. 3-5" each. Interbedded light yellow brown, saturated FINE SAND, and light yellow brown dry silt. Light yellow brown FINE TO MEDIUM SAND, few silt, wet, soft.	SP SP			1068.56 1068.06
100		SSS	13-17 28-32	100	Light yellow brown FINE TO MEDIUM SAND, trace coarse sand, few silt, saturated, dense, semi-cohesive.	SP			1063.56
105		SSS	24-50 (6")	50	Moderate gray brown, moist SILTY CLAY, not varved. Light yellow brown moist SILT.	CL-ML ML			1058.56 1057.96
110		SSS	2-6 16-17	50	Light yellow brown FINE TO COARSE SAND, one lens varved gray/brown, moist silt at 109.8 ft. bgl.	SP			1053.56
115		SSS	14-32 50 (5")	75	Light yellow brown FINE TO MEDIUM SAND, saturated, increasing silt content and density from 115 to 115.5 ft. bgl.	SP		End of boring - 115.5' bgl.	1048.56





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BORING NO. **MW-12i** SHEET **1 OF 2**  
 PROJECT **GSWA: Spring Hill Camp Phase III**  
 LOCATION **Osceola Township, MI**  
 PROJECT NO. **4065-005**  
 LOGGED BY **Greg Fox**

COORDINATES **N 229,055.9 E 19,441,312.1**  
 SURFACE ELEVATION **1161.92** DATUM **USGS**

DRILLING CONTRACTOR  
**Stearns**  
 DRILLING METHOD EQUIPMENT  
**4 1/4" HSA CME 1050**  
 DRILLING STARTED ENDED  
**7/27/00 7/27/00**

LOCATION DESCRIPTION:  
  
 See attached Site Diagram for location.

**STRATA KEY**

SAND	SILT
CLAY	CLAYEY SAND
GRAVEL	SILTY SAND

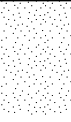


SAMPLE INFORMATION					DESCRIPTION	USCS	Strata	REMARKS	Elevation Feet
Depth feet	Lab Sample	Sample Type	Blow Counts	Recovery %					
5					Moderate reddish-brown, cohesive CLAYEY FINE TO COARSE SAND, clast supported, dry to moist.	SC		Stratigraphic information taken from MW-12d boring log. MW-12i drilled approx. 10' from MW-12d.	1157.92
10					Moist to wet, soft CLAYEY FINE TO COARSE SAND, cohesive, trace fine gravel.	SC			1152.92
15					Moist to wet, semi-cohesive, light yellow brown MEDIUM SAND, trace coarse sand, trace gravel, trace clay.	SP			1147.92
					Saturated, very loose, light yellow brown FINE TO MEDIUM SAND, trace silt, trace clay.	SP			1146.92
20					Saturated, very loose, MEDIUM TO COARSE SAND, light yellow brown, trace coarse gravel, trace silt.	SP			1142.92
					Moist, stiff to hard moderate yellow brown CLAY, with trace medium sand, very cohesive.	CL			1141.92
25					Dry, light buff MEDIUM SAND, trace fine sand, trace coarse sand, trace gravel, rounded to subrounded.	SP			1137.92
30					Dry, light buff MEDIUM SAND, dense, well packed, light/dark banding at 30.5 ft. bgl (light buff to medium buff, 1/4" bands).	SP			1132.92
35					Dry, light buff, MEDIUM SAND, medium dense, subrounded.	SP			1127.92
					Dry, light buff, MEDIUM SAND, loose.	SP			1122.92



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BORING NO. **MW-12i** SHEET **2 OF 2**  
 PROJECT **GSWA: Spring Hill Camp Phase III**  
 LOCATION **Osceola Township, MI**  
 PROJECT NO. **4065-005**  
 LOGGED BY **Greg Fox**

COORDINATES **N 229,055.9 E 19,441,312.1**  
 SURFACE ELEVATION **1161.92** DATUM **USGS**

SAMPLE INFORMATION					DESCRIPTION	USCS	Strata	REMARKS	Elevation Feet
Depth feet	Lab Sample	Sample Type	Blow Counts	Recovery %					
					Dry, light buff, FINE SAND, loose. <i>(continued)</i>	SP			1122.42
45					Saturated light yellow brown MEDIUM SAND, trace coarse sand, trace silt and clay.	SP			1117.92
					Dry to moist, stiff, moderate yellow brown SILTY CLAY.	CL			1116.42
50					Saturated, loose, light yellow brown MEDIUM TO COARSE SAND, trace gravel, trace clay, rounded to subrounded.	SP			1112.92
55					Saturated, loose, light yellow brown MEDIUM SAND, trace coarse sand, trace fine sand.	SP			1107.92
60					Saturated, loose, light yellow brown FINE TO MEDIUM SAND, trace coarse sand, trace fine gravel, rounded to subrounded, subangular gravel.	SP		End of boring - 62'	1102.92



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BORING NO. **MW-101D** SHEET **1 OF 4**  
 PROJECT **GSWA: Spring Hill Camp Phase III**  
 LOCATION **Osceola Township, MI**  
 PROJECT NO. **4065-005**  
 LOGGED BY **Phil Odenkirk**

COORDINATES **N 228,682.3 E 19,440,042.4**  
 SURFACE ELEVATION **1155.82** DATUM **USGS**

DRILLING CONTRACTOR  
**Stearns**  
 DRILLING METHOD EQUIPMENT  
**4 1/4" HSA CME 1050**  
 DRILLING STARTED ENDED  
**11/1/00 11/2/00**

LOCATION DESCRIPTION:  
  
 See attached Site Diagram for location.

**STRATA KEY**

SAND	SILT
CLAY	CLAYEY SAND
GRAVEL	SILTY SAND

SAMPLE INFORMATION					DESCRIPTION	USCS	Strata	REMARKS	Elevation Feet
Depth feet	Lab Sample	Sample Type	Blow Counts	Recovery %					
		SSS	1-1 2-2	100	Dark brown, fine SAND, little Silt, trace Clay, very loose, poorly graded, somewhat stratified, MOIST. Sand is well rounded, highly spherical, and 80-90% quartz. Spoon shows some stratification with silts in top 3" and an organic rich 2" thick layer at the bottom.	SP		MW-101D sample and lithology information is based on MW-101L boring log.	1155.82
5		SSS	4-5 7-7	75	Dark brown, fine SAND, some Clay, trace medium Sand, medium dense, poorly graded, massive, MOIST. Sand is well rounded, highly spherical, and 60-80% quartz.	SC			1152.32
10		SSS	7-8 9-10	75	Brown, fine to medium SAND, trace Silt, trace medium Gravel, medium dense, poorly graded, massive, MOIST. Sands are angular to sub-rounded with medium sphericity and ~80-90% quartz.	SP			1147.82
15		SSS	25-13 10-10	50	Light brown, fine to medium SAND, trace clay clasts, trace Silt, trace medium Gravel, medium dense, poorly graded, massive, MOIST. Sand is well rounded, highly spherical, and 80-90% quartz. Clay clasts occur throughout the sample interval and are ~1/4" in diameter.	SP			1142.82
20		SSS	14-15 17-25	75	Light brown fine to medium SAND, trace Gravel size clay clasts, trace Silt, trace medium Gravel, medium dense, poorly graded, massive, MOIST. Sand is well rounded, highly spherical, and 80-90% quartz. Clay clasts occur throughout the sample interval and are ~1/4" to 1/2" in diameter.	SP			1136.82
25		SSS	7-11 15-24	75	Brown SILT, little to some fine Sand, little to some Clay, very stiff, massive, MOIST. Spoon shows red and black mottling and blocky structure.	ML			1133.82
30		SSS	11-17 18-18	75	Light brown, fine SAND, little to some Clay, trace Silt, dense, poorly graded, slightly stratified, MOIST. Sand is well rounded, moderately spherical, and 80-100% quartz. 1-2" thick Clay layers occur throughout spoon.	SP			1127.82
35		SSS	6-8 11-15	62	Light brown, fine SAND, trace Clay clasts, trace Silt, medium dense, poorly graded, massive, MOIST. Sand is well rounded, moderately spherical, and 80-90% quartz. Clay clasts are ~1" in diameter.	SP			1121.82
			8-11			SP			1117.82



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BORING NO. **MW-101D** SHEET **2 OF 4**  
 PROJECT **GSWA: Spring Hill Camp Phase III**  
 LOCATION **Osceola Township, MI**  
 PROJECT NO. **4065-005**  
 LOGGED BY **Phil Odenkirk**

COORDINATES **N 228,682.3 E 19,440,042.4**

SURFACE ELEVATION **1155.82** DATUM **USGS**

SAMPLE INFORMATION					DESCRIPTION	USCS	Strata	REMARKS	Elevation Feet
Depth feet	Lab Sample	Sample Type	Blow Counts	Recovery %					
		SSS	14-16	62	Light brown, fine SAND, trace Silt, medium dense, poorly graded, massive, MOIST. Sand is well rounded with high sphericity and 80-100% quartz. (continued)	SP			
45		SSS	11-10 12-13	62	Light brown, fine to medium SAND, trace Silt, trace Clay clasts, medium dense, poorly graded, massive, WET. Sand is well rounded with high sphericity and 80-100% quartz. Clay clasts are ~1/8" diameter.	SP		Water encountered at 44' BLS	1111.82
50		SSS	12-7 7-9	62	Light brown, fine SAND, trace Clay, trace Silt, medium dense, poorly graded, massive, WET. Sand is well rounded, highly spherical, and 80-100% quartz. Clay occurs as 1.5" seam at 51' bgl.	SP			1106.82
55		SSS	7-8 12-13	75	Light brown, fine SAND, trace Clay, trace Silt, medium dense, poorly graded, massive, WET. Sand is well rounded, highly spherical, and 80-90% quartz.	SP			1101.82
60		SSS	2-7 9-12	75	Light brown, fine SAND, trace Silt, loose, poorly graded, massive, WET. Sand is well rounded, highly spherical, and 80-90% quartz.	SP			1096.82
65		SSS	3-3 7-10	62	Light brown, fine to medium SAND, trace Clay, trace Silt, loose, poorly graded, massive, WET. Sand is well rounded, highly spherical, and 80-100% quartz.	SP			1091.82
70		SSS	4-7 9-11	75	Light brown, fine to coarse SAND, little Gravel, trace Clay, trace Silt, medium dense, poorly graded, stratified, WET. Fine to medium sand is well rounded, highly spherical, and 80-100% quartz. Coarse sand and gravels are angular to sub-rounded with low sphericity and 60-80% quartz. 2" thick gravel seam at 71' bgl.	SP			1086.82
75		SSS	5-15 17-20	100	Gray-brown, fine to medium SAND, little Silt, trace Clay, dense, poorly graded, stratified, WET. Sand is well rounded, highly spherical, and 80-90% quartz. 1" thick sandier layers occur through out spoon.	SP			1082.82
80		SSS	2-4 8-10	25	Light brown, fine to medium SAND, little Silt, trace Clay, medium dense, poorly graded, slightly stratified, WET. Sand is well rounded, moderately spherical, and 70-90% quartz.	SP			1077.82
85		SSS	4-12 16-24	25	Brown, fine to medium SAND, trace coarse Sand, trace Clay, dense, poorly graded, stratified, WET. Fine to medium sand is well rounded with medium to high sphericity and 80-90% quartz. Coarse sand is rounded with medium to low sphericity. Clayey layers occur throughout the spoon comprising up to ~40 % of one 3" thick seam.	SP-SC			1071.82
90		SSS	4-11 18-18	75	Brown, fine to medium SAND, few coarse Sand, trace Silt, dense, poorly graded, massive, WET. Fine to medium sand is well rounded with high sphericity and 80-90% quartz. Coarse sand is sub-rounded with low sphericity	SP			1066.82





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BORING NO. **MW-101D** SHEET **4 OF 4**  
 PROJECT **GSWA: Spring Hill Camp Phase III**  
 LOCATION **Osceola Township, MI**  
 PROJECT NO. **4065-005**  
 LOGGED BY **Phil Odenkirk**

COORDINATES **N 228,682.3 E 19,440,042.4**  
 SURFACE ELEVATION **1155.82** DATUM **USGS**

SAMPLE INFORMATION					DESCRIPTION	USCS	Strata	REMARKS	Elevation Feet
Depth feet	Lab Sample	Sample Type	Blow Counts	Recovery %					
150		SSS	6-12 27-50		Light brown, fine to medium SAND, trace coarse Sand, trace Silt, dense, poorly graded, massive, WET. Fine to medium Sand is well rounded with high sphericity and 80-90% quartz. Coarse sand is sub-angular with low sphericity and 60-70% quartz.	SP			1006.82
155		SSS	15-35 50/3"...		Light brown, fine to medium SAND, trace coarse Sand, trace Silt, very dense, poorly graded, massive, WET. Fine to medium Sand is well rounded with high sphericity and 80-90% quartz. Coarse sand is sub-angular with low sphericity and 70-80% quartz.	SP			1001.82
160					Light brown, fine to medium SAND, little to some coarse Sand, little fine to medium Gravel, trace Silt, trace coarse Sand, very dense, poorly graded, massive, WET. Fine to medium sand is well rounded with high sphericity and 80-90% quartz. Coarse sand is sub-angular with low sphericity and 70-80% quartz.	SP		End of boring - 160' bgl	996.82 995.82



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BORING NO. **MW-1011** SHEET **1 OF 2**  
 PROJECT **GSWA: Spring Hill Camp Phase III**  
 LOCATION **Osceola Township, MI**  
 PROJECT NO. **4065-005**  
 LOGGED BY **Phil Odenkirk**

COORDINATES **N 228,693.8 E 19,440,782.1**

SURFACE ELEVATION **1179.47** DATUM **USGS**

DRILLING CONTRACTOR  
**Stearns**  
 DRILLING METHOD EQUIPMENT  
**4 1/4" HSA CME 1050**  
 DRILLING STARTED ENDED  
**11/17/00 11/17/00**

LOCATION DESCRIPTION:  
  
 See attached Site Diagram for location.

**STRATA KEY**

- SAND
- SILT
- CLAY
- CLAYEY SAND
- GRAVEL
- SILTY SAND

SAMPLE INFORMATION					DESCRIPTION	USCS	Strata	REMARKS	Elevation Feet
Depth feet	Lab Sample	Sample Type	Blow Counts	Recovery %					
		SSS	1-1 2-2	100	Dark brown, fine SAND, little Silt, trace Clay, very loose, poorly graded, somewhat stratified, MOIST. Sand is well rounded, highly spherical, and 80-90% quartz. Spoon shows some stratification with silts in top 3" and an organic rich 2" thick layer at the bottom.	SP		MW-1011 sample and lithology information is based on MW-101L boring log.	1179.47
5		SSS	4-5 7-7	75	Dark brown, fine SAND, some Clay, trace medium Sand, medium dense, poorly graded, massive, MOIST. Sand is well rounded, highly spherical, and 60-80% quartz.	SC			1175.97
10		SSS	7-8 9-10	75	Brown, fine to medium SAND, trace Silt, trace medium Gravel, medium dense, poorly graded, massive, MOIST. Sands are angular to sub-rounded with medium sphericity and ~80-90% quartz.	SP			1171.47
15		SSS	25-13 10-10	50	Light brown, fine to medium SAND, trace clay clasts, trace Silt, trace medium Gravel, medium dense, poorly graded, massive, MOIST. Sand is well rounded, highly spherical, and 80-90% quartz. Clay clasts occur throughout the sample interval and are ~1/4" in diameter.	SP			1166.47
20		SSS	14-15 17-25	75	Light brown fine to medium SAND, trace Gravel size clay clasts, trace Silt, trace medium Gravel, medium dense, poorly graded, massive, MOIST. Sand is well rounded, highly spherical, and 80-90% quartz. Clay clasts occur throughout the sample interval and are ~1/4" to 1/2" in diameter.	SP			1160.47
25		SSS	7-11 15-24	75	Brown SILT, little to some fine Sand, little to some Clay, very stiff, massive, MOIST. Spoon shows red and black mottling and blocky structure.	ML			1157.47
30		SSS	11-17 18-18	75	Light brown, fine SAND, little to some Clay, trace Silt, dense, poorly graded, slightly stratified, MOIST. Sand is well rounded, moderately spherical, and 80-100% quartz. 1-2" thick Clay layers occur throughout spoon.	SP			1151.47
35		SSS	6-8 11-15	62	Light brown, fine SAND, trace Clay clasts, trace Silt, medium dense, poorly graded, massive, MOIST. Sand is well rounded, moderately spherical, and 80-90% quartz. Clay clasts are ~1" in diameter.	SP			1145.47
			8-11			SP			1141.47



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BORING NO. **MW-1011** SHEET **2 OF 2**  
 PROJECT **GSWA: Spring Hill Camp Phase III**  
 LOCATION **Osceola Township, MI**  
 PROJECT NO. **4065-005**  
 LOGGED BY **Phil Odenkirk**

COORDINATES **N 228,693.8 E 19,440,782.1**  
 SURFACE ELEVATION **1179.47** DATUM **USGS**

SAMPLE INFORMATION					DESCRIPTION	USCS	Strata	REMARKS	Elevation Feet
Depth feet	Lab Sample	Sample Type	Blow Counts	Recovery %					
		SSS	14-16	62	Light brown, fine SAND, trace Silt, medium dense, poorly graded, massive, MOIST. Sand is well rounded with high sphericity and 80-100% quartz. (continued)	SP			
45		SSS	11-10 12-13	62	Light brown, fine to medium SAND, trace Silt, trace Clay clasts, medium dense, poorly graded, massive, WET. Sand is well rounded with high sphericity and 80-100% quartz. Clay clasts are ~1/8" diameter.	SP		Water encountered at 44' BLS	1135.47
50		SSS	12-7 7-9	62	Light brown, fine SAND, trace Clay, trace Silt, medium dense, poorly graded, massive, WET. Sand is well rounded, highly spherical, and 80-100% quartz. Clay occurs as 1.5" seam at 51' bgl.	SP			1130.47
55		SSS	7-8 12-13	75	Light brown, fine SAND, trace Clay, trace Silt, medium dense, poorly graded, massive, WET. Sand is well rounded, highly spherical, and 80-90% quartz.	SP			1125.47
60		SSS	2-7 9-12	75	Light brown, fine SAND, trace Silt, loose, poorly graded, massive, WET. Sand is well rounded, highly spherical, and 80-90% quartz.	SP			1120.47
65		SSS	3-3 7-10	62	Light brown, fine to medium SAND, trace Clay, trace Silt, loose, poorly graded, massive, WET. Sand is well rounded, highly spherical, and 80-100% quartz.	SP			1115.47
70		SSS	4-7 9-11	75	Light brown, fine to coarse SAND, little Gravel, trace Clay, trace Silt, medium dense, poorly graded, stratified, WET. Fine to medium sand is well rounded, highly spherical, and 80-100% quartz. Coarse sand and gravels are angular to sub-rounded with low sphericity and 60-80% quartz. 2" thick gravel seam at 71' bgl.	SP			1110.47
75					Gray-brown, fine to medium SAND, little Silt, trace Clay, dense, poorly graded, stratified, WET. Sand is well rounded, highly spherical, and 80-90% quartz. 1" thick sandier layers occur through out spoon.	SP		End of boring - 75' bgl	1106.47 1104.47





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BORING NO. **MW-101L** SHEET **1 OF 5**  
 PROJECT **GSWA: Spring Hill Camp Phase III**  
 LOCATION **Osceola Township, MI**  
 PROJECT NO. **4065-005**  
 LOGGED BY **Phil Odenkirk**

COORDINATES **N 228,691.7 E 19,440,040.7**  
 SURFACE ELEVATION **1155.86** DATUM **USGS**

DRILLING CONTRACTOR  
**Stearns**  
 DRILLING METHOD EQUIPMENT  
**4 1/4" HSA CME 1050**  
 DRILLING STARTED ENDED  
**10/30/00 11/1/00**

LOCATION DESCRIPTION:  
  
 See attached Site Diagram for location.

**STRATA KEY**

SAND	SILT
CLAY	CLAYEY SAND
GRAVEL	SILTY SAND

SAMPLE INFORMATION					DESCRIPTION	USCS	Strata	REMARKS	Elevation Feet
Depth feet	Lab Sample	Sample Type	Blow Counts	Recovery %					
		SSS	1-1 2-2	100	Dark brown, fine SAND, little Silt, trace Clay, very loose, poorly graded, somewhat stratified, MOIST. Sand is well rounded, highly spherical, and 80-90% quartz. Spoon shows some stratification with silts in top 3" and an organic rich 2" thick layer at the bottom.	SP			1155.86
5		SSS	4-5 7-7	75	Dark brown, fine SAND, some Clay, trace medium Sand, medium dense, poorly graded, massive, MOIST. Sand is well rounded, highly spherical, and 60-80% quartz.	SC			1152.36
10		SSS	7-8 9-10	75	Brown, fine to medium SAND, trace Silt, trace medium Gravel, medium dense, poorly graded, massive, MOIST. Sands are angular to sub-rounded with medium sphericity and ~80-90% quartz.	SP			1147.86
15		SSS	25-13 10-10	50	Light brown, fine to medium SAND, trace clay clasts, trace Silt, trace medium Gravel, medium dense, poorly graded, massive, MOIST. Sand is well rounded, highly spherical, and 80-90% quartz. Clay clasts occur throughout the sample interval and are ~1/4" in diameter.	SP			1142.86
20		SSS	14-15 17-25	75	Light brown fine to medium SAND, trace Gravel size clay clasts, trace Silt, trace medium Gravel, medium dense, poorly graded, massive, MOIST. Sand is well rounded, highly spherical, and 80-90% quartz. Clay clasts occur throughout the sample interval and are ~1/4" to 1/2" in diameter.	SP			1136.86
25		SSS	7-11 15-24	75	Brown SILT, little to some fine Sand, little to some Clay, very stiff, massive, MOIST. Spoon shows red and black mottling and blocky structure.	ML			1133.86
30		SSS	11-17 18-18	75	Light brown, fine SAND, little to some Clay, trace Silt, dense, poorly graded, slightly stratified, MOIST. Sand is well rounded, moderately spherical, and 80-100% quartz. 1-2" thick Clay layers occur throughout spoon.	SP			1127.86
35		SSS	6-8 11-15	62	Light brown, fine SAND, trace Clay clasts, trace Silt, medium dense, poorly graded, massive, MOIST. Sand is well rounded, moderately spherical, and 80-90% quartz. Clay clasts are ~1" in diameter.	SP			1121.86
			8-11			SP			1117.86



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BORING NO. **MW-101L** SHEET **2 OF 5**  
 PROJECT **GSWA: Spring Hill Camp Phase III**  
 LOCATION **Osceola Township, MI**  
 PROJECT NO. **4065-005**  
 LOGGED BY **Phil Odenkirk**

COORDINATES **N 228,691.7 E 19,440,040.7**  
 SURFACE ELEVATION **1155.86** DATUM **USGS**

SAMPLE INFORMATION					DESCRIPTION	USCS	Strata	REMARKS	Elevation Feet
Depth feet	Lab Sample	Sample Type	Blow Counts	Recovery %					
		SSS	14-16	62	Light brown, fine SAND, trace Silt, medium dense, poorly graded, massive, MOIST. Sand is well rounded with high sphericity and 80-100% quartz. (continued)	SP			
45		SSS	11-10 12-13	62	Light brown, fine to medium SAND, trace Silt, trace Clay clasts, medium dense, poorly graded, massive, WET. Sand is well rounded with high sphericity and 80-100% quartz. Clay clasts are ~1/8" diameter.	SP		Water encountered at 44' BLS	1111.86
50		SSS	12-7 7-9	62	Light brown, fine SAND, trace Clay, trace Silt, medium dense, poorly graded, massive, WET. Sand is well rounded, highly spherical, and 80-100% quartz. Clay occurs as 1.5" seam at 51' bgl.	SP			1106.86
55		SSS	7-8 12-13	75	Light brown, fine SAND, trace Clay, trace Silt, medium dense, poorly graded, massive, WET. Sand is well rounded, highly spherical, and 80-90% quartz.	SP			1101.86
60		SSS	2-7 9-12	75	Light brown, fine SAND, trace Silt, loose, poorly graded, massive, WET. Sand is well rounded, highly spherical, and 80-90% quartz.	SP			1096.86
65		SSS	3-3 7-10	62	Light brown, fine to medium SAND, trace Clay, trace Silt, loose, poorly graded, massive, WET. Sand is well rounded, highly spherical, and 80-100% quartz.	SP			1091.86
70		SSS	4-7 9-11	75	Light brown, fine to coarse SAND, little Gravel, trace Clay, trace Silt, medium dense, poorly graded, stratified, WET. Fine to medium sand is well rounded, highly spherical, and 80-100% quartz. Coarse sand and gravels are angular to sub-rounded with low sphericity and 60-80% quartz. 2" thick gravel seam at 71' bgl.	SP			1086.86
75		SSS	5-15 17-20	100	Gray-brown, fine to medium SAND, little Silt, trace Clay, dense, poorly graded, stratified, WET. Sand is well rounded, highly spherical, and 80-90% quartz. 1" thick sandier layers occur through out spoon.	SP			1082.86
80		SSS	2-4 8-10	25	Light brown, fine to medium SAND, little Silt, trace Clay, medium dense, poorly graded, slightly stratified, WET. Sand is well rounded, moderately spherical, and 70-90% quartz.	SP			1077.86
85		SSS	4-12 16-24	25	Brown, fine to medium SAND, trace coarse Sand, trace Clay, dense, poorly graded, stratified, WET. Fine to medium sand is well rounded with medium to high sphericity and 80-90% quartz. Coarse sand is rounded with medium to low sphericity. Clayey layers occur throughout the spoon comprising up to ~40 % of one 3" thick seam.	SP-SC			1071.86
90		SSS	4-11 18-18	75	Brown, fine to medium SAND, few coarse Sand, trace Silt, dense, poorly graded, massive, WET. Fine to medium sand is well rounded with high sphericity and 80-90% quartz. Coarse sand is sub-rounded with low sphericity	SP			1066.86





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BORING NO. **MW-101L** SHEET **4 OF 5**  
 PROJECT **GSWA: Spring Hill Camp Phase III**  
 LOCATION **Osceola Township, MI**  
 PROJECT NO. **4065-005**  
 LOGGED BY **Phil Odenkirk**

COORDINATES **N 228,691.7 E 19,440,040.7**  
 SURFACE ELEVATION **1155.86** DATUM **USGS**

SAMPLE INFORMATION					DESCRIPTION	USCS	Strata	REMARKS	Elevation Feet
Depth feet	Lab Sample	Sample Type	Blow Counts	Recovery %					
150		SSS	6-12 27-50		Light brown, fine to medium SAND, trace coarse Sand, trace Silt, dense, poorly graded, massive, WET. Fine to medium Sand is well rounded with high sphericity and 80-90% quartz. Coarse sand is sub-angular with low sphericity and 60-70% quartz.	SP			1006.86
155		SSS	15-35 50/3"---		Light brown, fine to medium SAND, trace coarse Sand, trace Silt, very dense, poorly graded, massive, WET. Fine to medium Sand is well rounded with high sphericity and 80-90% quartz. Coarse sand is sub-angular with low sphericity and 70-80% quartz.	SP			1001.86
160		SSS	12-30 50/2"---		Light brown, fine to medium SAND, little to some coarse Sand, little fine to medium Gravel, trace Silt, trace coarse Sand, very dense, poorly graded, massive, WET. Fine to medium sand is well rounded with high sphericity and 80-90% quartz. Coarse sand is sub-angular with low sphericity and 70-80% quartz.	SP			996.86
165		SSS	10-37 50/2"---		Light brown fine to coarse SAND, trace Silt, very dense, well graded, massive, WET. Sand is well rounded with high sphericity and 80-90% quartz.	SW			992.86
170		SSS	35-50/6' ---		Light brown, fine to medium SAND, little coarse Sand, trace Silt, very dense, poorly graded, massive, WET. Fine to medium sand is well rounded with high sphericity 80-90% quartz. Coarse sand is sub-angular with low sphericity and 70-80% quartz.	SP		No sample obtained 174-176', due to heaving sands. Driller attempted to overdrill and the sample spoon dropped to 179', where the next sample was collected.	987.86
175		SSS	---	0					
180		SSS	25-50/6' ---	25	Dark gray, CLAY, some Silt, trace fine to coarse Sand, hard, moderate plasticity, MOIST. Sand is well rounded with low sphericity and 60-70% quartz.	CL			978.36
185		SSS	41-50/5' ---		Dark gray, CLAY, some Silt, trace fine to coarse Sand, trace fine to medium Gravel, hard, moderate plasticity, MOIST. Sand is rounded with moderate sphericity and 70-80% quartz. Gravel is sub-rounded, moderately spherical, and 60-70% quartz.	CL			971.86
190		SSS	20-50/5' ---	62	Light brown, fine to medium SAND, trace Silt, very dense, massive, WET. Sand is well rounded with high sphericity and 80-90% quartz.	SP			965.86
195		SSS	4-25 50/5"---	56	Light brown, fine to medium SAND, trace fine to medium Gravel, trace Clay, very dense, poorly graded, stratified, WET. Clay occurs at 194'. Gravels occur below clay with 4" thickness and are rounded, with low sphericity. Sand is well rounded with high sphericity, 80-90% quartz.	SP			962.86
					GRAVEL, well graded.	GW			961.36
					Light brown, fine to medium SAND, trace coarse Sand, trace fine to medium Gravel, trace Clay, very dense, poorly	SP			960.86
			30-32						



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BORING NO. **MW-101L** SHEET **5 OF 5**  
 PROJECT **GSWA: Spring Hill Camp Phase III**  
 LOCATION **Osceola Township, MI**  
 PROJECT NO. **4065-005**  
 LOGGED BY **Phil Odenkirk**

COORDINATES **N 228,691.7 E 19,440,040.7**  
 SURFACE ELEVATION **1155.86** DATUM **USGS**

SAMPLE INFORMATION					DESCRIPTION	USCS	Strata	REMARKS	Elevation Feet
Depth feet	Lab Sample	Sample Type	Blow Counts	Recovery %					
		SSS	50/6"--	75	graded, massive, WET. Sand is well rounded, highly spherical, ~80-90% quartz. Gravel is sub-angular, low sphericity, ~70-80% quartz.	CL			955.86
205		SSS	15-18 25-29	50	Dark gray, CLAY, trace fine to coarse Sand, medium plasticity, massive, MOIST. Sand is well rounded with high sphericity and 80-90% quartz.	ML			952.86
210		SSS	10-22 23-21	50	Gray-brown SILT, little fine to medium Sand, little Clay, hard, moderately plastic, massive, MOIST. Sand is well rounded with high sphericity and 80-90% quartz.	ML			946.86
215		SSS	7-11 13-13	38	Gray-brown SILT, little fine to medium Sand, little to some Clay, very hard, moderately plastic, massive, MOIST. Sand is well rounded with high sphericity and 80-90% quartz.	ML			941.86
220		SSS	21-8 50/4"--	0	Light brown, fine to medium SAND, trace Silt, very dense, poorly graded, massive, WET. Sand is well rounded with high sphericity and 80-90% quartz.	SP		No recovery in 219-221' sample. Sand is likely.	937.86
225		SSS	8-50 50/3"----						
230		SSS			Light brown, fine to medium SAND, trace Silt, very dense, poorly graded, massive, WET. Sand is well rounded with high sphericity and 80-90% quartz.	SP			926.86
235		SSS							
240		SSS	24-30 50/3"	33	Light brown, fine to medium SAND, trace Silt, very dense, poorly graded, massive, WET.	SP		No recovery in 234-236' sample. Sand is likely. After driving split spoon, had trouble removing spoon; add water and remove.	919.86
245		SSS	-12 20-50 for 4"	20	Multicolored GRAVEL, some fine to coarse Sand, trace Silt, very dense, well graded, massive, WET. Gravel is sub-rounded with low-sphericity and 70-80% quartz. Sand is rounded, moderately spherical, ~90% quartz.	GW			912.86
								End of boring - 246' bgl	909.86



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BORING NO. **MW-102D** SHEET **1** OF **5**  
 PROJECT **GSWA: Spring Hill Camp Phase III**  
 LOCATION **Osceola Township, MI**  
 PROJECT NO. **4065-005**  
 LOGGED BY **Mike Brennan**

COORDINATES **N 228,682.9 E 19,440,788.1**

SURFACE ELEVATION **1179.73** DATUM **USGS**

DRILLING CONTRACTOR  
**Stearns**  
 DRILLING METHOD EQUIPMENT  
**4 1/4" HSA CME 1050**  
 DRILLING STARTED ENDED  
**10/30/00 10/31/00**

LOCATION DESCRIPTION:  
  
 See attached Site Diagram for location.

**STRATA KEY**

- SAND
- SILT
- CLAY
- CLAYEY SAND
- GRAVEL
- SILTY SAND

SAMPLE INFORMATION					DESCRIPTION	USCS	Strata	REMARKS	Elevation Feet
Depth feet	Lab Sample	Sample Type	Blow Counts	Recovery %					
		SSS	1-1 1-1		Light brown to brown, fine to medium SAND, poorly graded, well rounded, and MOIST.	SP			1179.73
5		SSS	2-2 2-2		Brown to orange brown, fine to medium SAND, trace Silt, poorly graded, MOIST. Sand is well rounded.	SP			1176.73
					Light brown, fine to medium SAND, poorly graded, MOIST to WET. Sand is well rounded.	SP			1174.73
10					Light brown, fine to medium SAND, trace to little Silt, MOIST to WET.	SP			1172.23
		SSS	0-0 3-6		Light brown, fine to medium SAND, and SILT, WET. Occasional millimeter scale clay laminations.	SM		Very hard drilling at ~11' bgs.	1169.23
15		SSS	50/5"--- ---	100	Brown SILT, and fine to coarse SAND, little to some Clay, trace to little Gravel, MOIST.	SM		Drilling became easier at ~18' bgs., no gravel in cuttings.	1167.23
20		SSS	5-8 22-21		Light brown, fine to medium SAND, trace coarse Sand, trace fine Gravel, poorly graded, MOIST.	SP			1161.73
					Light brown, fine to medium SAND, trace coarse Sand, trace fine Gravel, poorly graded, MOIST.	SP			1157.23
25		SSS	8-13 21-23		Light brown, fine to medium SAND, trace to little very coarse Sand to very fine Gravel, poorly graded, MOIST. Sand is well rounded with high sphericity.	SP		L Jordan logged(0-26');M Brennan took over at 26' bgs.	1152.23
30		SSS	10-15 21-13	90	Light brown, fine to medium SAND, poorly graded, MOIST. Sand is well rounded with high sphericity.	SP			1148.23
35		SSS	10-17 23-27	100	Light brown, medium to coarse SAND, trace to little fine Gravel, poorly graded, MOIST. Sand is well rounded with high sphericity.	SP			1143.23
			10-17						



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BORING NO. **MW-102D** SHEET **2** OF **5**  
 PROJECT **GSWA: Spring Hill Camp Phase III**  
 LOCATION **Osceola Township, MI**  
 PROJECT NO. **4065-005**  
 LOGGED BY **Mike Brennan**

COORDINATES **N 228,682.9 E 19,440,788.1**  
 SURFACE ELEVATION **1179.73** DATUM **USGS**

SAMPLE INFORMATION					DESCRIPTION	USCS	Strata	REMARKS	Elevation Feet
Depth feet	Lab Sample	Sample Type	Blow Counts	Recovery %					
		SSS	27-32	100	Light brown, fine to medium SAND, poorly graded, MOIST. Sand is well rounded with high sphericity.	SP			1137.23
45		SSS	15-22 25-30	100	Light brown, fine to medium SAND, poorly graded, MOIST. Sand is well rounded with high sphericity.	SP		1132.23	
50		SSS	10-15 32-40	100	Light brown, fine to medium SAND, poorly graded, MOIST. Sand is angular to well rounded with high sphericity.	SP		1127.23	
55		SSS	12-15 20-24	90	Light brown SILT , little very fine Sand, MOIST.	SP		1122.23	
60		SSS	11-20 24-24	100	Light brown, medium to coarse SAND, poorly graded, MOIST. Sand is well rounded with high sphericity.	ML		1117.23	
65		SSS	10-12 14-16	100	Light brown SILT , little very fine Sand, MOIST.	SP		Rods wet at ~67' bgl.	1114.73
70		SSS	5-8 10-13	30	Light brown, fine to medium SAND, little coarse Sand, trace very coarse Sand, well graded, WET. Sand is well rounded with high sphericity.	ML		1112.23	
75		SSS	3-5 7-8	75	Light brown, fine SAND, little very fine Sand, trace Silt, poorly graded, WET. Sand is well rounded with high sphericity.	SW		No recovery (79-81'); No change in drilling over lost interval.	1107.23
80		SSS	3-5 7-7	0	Light brown, coarse to very coarse SAND, trace fine Gravel, well graded, WET. Sand is sub-angular to sub-rounded with high sphericity.	SW			1104.23
85		SSS	1-1 2-3	60	Light brown, medium to coarse SAND, little very coarse Sand, trace fine Gravel, well graded, WET. Sand is sub-angular to well rounded with high sphericity.	SW			1097.23
90		SSS	2-2 6-7	30	Light brown, medium to coarse SAND, little very coarse Sand to fine Gravel, well graded, WET. Sand is well rounded with high sphericity; ~1" diameter chunk of brown clay and silt, some very coarse sand.	SW	1092.23		
						SW		1087.23	



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BORING NO. **MW-102D** SHEET **3 OF 5**  
 PROJECT **GSWA: Spring Hill Camp Phase III**  
 LOCATION **Osceola Township, MI**  
 PROJECT NO. **4065-005**  
 LOGGED BY **Mike Brennan**

COORDINATES **N 228,682.9 E 19,440,788.1**  
 SURFACE ELEVATION **1179.73** DATUM **USGS**

SAMPLE INFORMATION					DESCRIPTION	USCS	Strata	REMARKS	Elevation Feet
Depth feet	Lab Sample	Sample Type	Blow Counts	Recovery %					
95		SSS	5-5 10-15	100	Light brown, medium to coarse SAND, little fine Gravel, well graded, WET. Sand is well rounded with high sphericity. <i>(continued)</i>	SW		Tip had silty clay.	1084.73
					Light brown SILT, some very fine Sand, WET. Light brown to gray, Silty CLAY, MOIST.	ML CL-ML			1084.23
100		SSS	3-3 4-3	80	Light brown, medium to coarse SAND, little fine Sand, well graded, WET. Sand is well rounded with high sphericity.	SW			1082.23
					Light brown, Clayey SILT, thinly laminated, MOIST.	MH			1079.73
105		SSS	2-4 7-8	60	Light brown, CLAY, some fine to medium Sand, MOIST.	CL			1077.23
					Light brown to gray, CLAY, some fine to medium Sand, laminated, MOIST.	CL			1074.73
					Light brown, CLAY, some fine to medium Sand, MOIST. Sand is well rounded with high sphericity.	CL			1074.23
110		SSS	4-5 6-6	100	Light brown to gray, fine SAND, and CLAY, trace fine Gravel, WET.	SC		Bailed heave.	1072.23
					Light brown, fine to medium SAND, little to some Silt, little very coarse Sand, trace fine Gravel, WET. Sand is well rounded with high sphericity.	SM			1067.23
120		SSS	2-3 3-4	10	Light brown, medium to coarse SAND, little to some Silt, well graded, WET. Sand is sub-angular to well rounded with high sphericity.	SW			1062.23
					Light brown, medium to coarse SAND, little very coarse Sand, trace fine Gravel, well graded, WET. Sand is sub-angular to well rounded with high sphericity.	SW			1057.23
130		SSS	5-7 12-10	80	Light brown, medium to coarse SAND, little very coarse Sand, trace fine gravel, well graded, WET. Sand is sub-angular to well rounded with high sphericity.	SW		Bailed ~2' heave.	1052.23
					Light brown, medium to coarse SAND, little very coarse Sand, trace fine gravel, well graded, WET. Sand is sub-angular to well rounded with high sphericity.	SW			
135		SSS	7-11 20-24	0	Light brown, fine to medium SAND, little to some Silt, WET. Sand is well rounded with high sphericity.	SM		Bailed ~2' heave.	1044.73
140		SSS	0-0 7-14	10					
145		SSS	3-5 7-11	50	Light brown SILT, some fine to coarse Sand, trace Clay, WET.	ML		Silty clay found in tip; bailed ~2' heave.	1037.23





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BORING NO. **MW-102D** SHEET **4 OF 5**  
 PROJECT **GSWA: Spring Hill Camp Phase III**  
 LOCATION **Osceola Township, MI**  
 PROJECT NO. **4065-005**  
 LOGGED BY **Mike Brennan**

COORDINATES **N 228,682.9 E 19,440,788.1**  
 SURFACE ELEVATION **1179.73** DATUM **USGS**

SAMPLE INFORMATION					DESCRIPTION	USCS	Strata	REMARKS	Elevation Feet
Depth feet	Lab Sample	Sample Type	Blow Counts	Recovery %					
150		SSS	0-1 2-6	50	Light brown, fine to medium SAND, trace Silt, poorly graded, WET. Sand is well rounded with high sphericity.	ML		Bailed ~1' heave.	1032.23
155		SSS	7-13 15-18	60	Light brown, fine to medium SAND, trace Silt, poorly graded, WET. Sand is well rounded with high sphericity.	SP		Stopped drilling (10/30) bailed ~2' heave. Resumed (10/31) bailed ~5' heave. Measure DTW=62' bgl.	1027.23
160		SSS	7-10 14-21	30	Light brown, fine to medium SAND, trace Silt, poorly graded, WET. Sand is well rounded with high sphericity.	SP		First split spoon attempt 159-161' bgl, no recovery.	1020.73
165		SSS	3-9 23-34	80	Light brown, fine to medium SAND, few very fine Sand, poorly graded, WET. Sand is well rounded with high sphericity.	SP		Bailed ~2' heave.	1017.23
					Light brown SILT, some Clay, WET.	MH		Bailed ~3' heave.	1013.93
170		SSS	0-10 22-24/3'	40	Light brown, fine to medium SAND, trace very fine Sand, poorly graded, WET. Sand is rounded and spherical.	SP			1012.23
175		SSS	4-6 24-30	30	Light brown, fine to medium SAND, few very fine Sand, trace coarse Sand, poorly graded, WET. Sand is well rounded with high sphericity.	SP		Two spoon attempts before recovery; bailed ~2' heave.	1007.23
180		SSS	2-7 15-33	0	Light brown, fine to medium SAND, little to some very fine Sand, few coarse Sand, well graded, WET. Sand is well rounded with high sphericity.	SW		Had to log heave due to both spoon attempts failing to recover sample; bailed ~4' heave.	1002.23
185		SSS	1-7 22-25/3'	15	Light brown, fine to medium SAND, few coarse Sand, trace very fine Sand, well graded, WET. Sand is sub-angular to well rounded with high sphericity.	SW		Bailed ~3' heave.	997.23
190		SSS	0-0 10-27	40	Light brown, fine to medium SAND, little coarse Sand, trace very fine Sand, moderately to poorly graded, WET. Sand is sub-angular to well rounded with high sphericity.	SP/SW		Bailed ~2' heave.	992.23
195		SSS	0-8 20-38	40	Light brown, fine to medium SAND, trace to little coarse Sand, trace very fine Sand, poorly graded, WET. Sand is sub-angular to well rounded with high sphericity.	SP		Bailed ~1' heave.	987.23
			0-9		Light brown, medium to coarse SAND, little to some very coarse Sand, trace fine Sand, moderately to poorly graded, WET. Sand is angular to well rounded with high sphericity.	SP/SW		Had to log heave due to both spoon attempts failing to recover	982.23



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BORING NO. **MW-102D** SHEET **5 OF 5**  
 PROJECT **GSWA: Spring Hill Camp Phase III**  
 LOCATION **Osceola Township, MI**  
 PROJECT NO. **4065-005**  
 LOGGED BY **Mike Brennan**

COORDINATES **N 228,682.9 E 19,440,788.1**  
 SURFACE ELEVATION **1179.73** DATUM **USGS**

SAMPLE INFORMATION					DESCRIPTION	USCS	Strata	REMARKS	Elevation Feet
Depth feet	Lab Sample	Sample Type	Blow Counts	Recovery %					
		SSS	34-40/4'	0		SP/SW		sample.	
205		SSS	0-15 15-19	20	Light brown, fine to coarse SAND, well graded, WET. Sand is angular well rounded with high sphericity; Some wet fine gravel in bottom half of sample.	SW		Bailed ~1/2' heave.	977.23
210		SSS	12-17 25-30/3'	40	Light brown, medium to coarse SAND, little fine Sand, well graded, WET. Sand is angular to well rounded with high sphericity; Little fine gravel beginning at ~210' 10".	SW		Bailed ~2' heave.	972.23
215		SSS	0-8 41-50/3'	80	Light brown, fine to medium SAND, some coarse Sand, trace Silt, well graded, WET. Sand is sub- to well rounded with high sphericity.	SW		Driller feels gravel at 215' bgl; bailed ~1/2' heave.	967.23
					Light brown, fine SAND, some Silt, WET.	SM			964.73
					Light brown,, SILT, some Sand, WET.	ML			963.83
220		SSS	0-0 10-40	20	Light brown, fine to medium SAND, some coarse Sand, trace Silt, trace fine Gravel, well graded, WET. Sand is angular to well rounded with high sphericity.	SW			962.23
225		SSS	0-10 17-26	75	Light brown, fine to medium SAND, some coarse Sand, trace Silt, well graded, WET. Sand is angular to well rounded with high sphericity.	SW		Bailed ~1' heave.	957.23
					Light brown to gray, fine to medium SAND, some Clay, trace to some fine Gravel, MOIST.	SC		Driller feels clay lens at 227' bgl.	954.73
230		SSS	0-20 41-40/5'	100	Light brown, fine to medium SAND, trace coarse Sand, poorly graded, WET. Sand is well rounded with high sphericity.	SP		Bailed ~1' heave.	952.23
					Light brown to grey, CLAY, some Silt, trace to few fine Gravel, stiff, high plasticity, MOIST. Few light brown to grey clay and gravel lenses.	CL		Auger bit had grey, clay, few fine sand, trace fine gravel, soft, moderately plastic, moist. End of boring - 231' bgl	949.73 948.73



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BORING NO. **MW-102I** SHEET **1 OF 4**  
 PROJECT **GSWA: Spring Hill Camp Phase III**  
 LOCATION **Osceola Township, MI**  
 PROJECT NO. **4065-005**  
 LOGGED BY **Mike Brennan**

COORDINATES **N 228,693.8 E 19,440,782.1**

SURFACE ELEVATION **1179.47** DATUM **USGS**

DRILLING CONTRACTOR  
**Stearns**  
 DRILLING METHOD EQUIPMENT  
**4 1/4" HSA CME 1050**  
 DRILLING STARTED ENDED  
**11/1/00 11/2/00**

LOCATION DESCRIPTION:  
  
 See attached Site Diagram for location.

**STRATA KEY**

- SAND
- SILT
- CLAY
- CLAYEY SAND
- GRAVEL
- SILTY SAND

SAMPLE INFORMATION					DESCRIPTION	USCS	Strata	REMARKS	Elevation Feet
Depth feet	Lab Sample	Sample Type	Blow Counts	Rec- overy %					
		SSS	1-1 1-1		Light brown to brown, fine to medium SAND, poorly graded, well rounded, and MOIST.	SP		No samples taken during MW-102I drilling. Lithology and sample information based on MW-102D boring log.	1179.47
5		SSS	2-2 2-2		Brown to orange brown, fine to medium SAND, trace Silt, poorly graded, MOIST. Sand is well rounded.	SP			1176.47
					Light brown, fine to medium SAND, poorly graded, MOIST to WET. Sand is well rounded.	SP			1174.47
					Light brown, fine to medium SAND, trace to little Silt, MOIST to WET.	SP			1171.97
10		SSS	0-0 3-6		Light brown, fine to medium SAND, and SILT, WET. Occasional millimeter scale clay laminations.	SM		Very hard drilling at ~11' bgs. Drilling became easier at ~18' bgs., no gravel in cuttings.	1168.97
15		SSS	50/5"--- ---	100	Brown SILT, and fine to coarse SAND, little to some Clay, trace to little Gravel, MOIST.	SM			1166.97
20		SSS	5-8 22-21		Light brown, fine to medium SAND, trace coarse Sand, trace fine Gravel, poorly graded, MOIST.	SP			1161.47
					Light brown, fine to medium SAND, trace coarse Sand, trace fine Gravel, poorly graded, MOIST.	SP			1156.97
25		SSS	8-13 21-23		Light brown, fine to medium SAND, trace to little very coarse Sand to very fine Gravel, poorly graded, MOIST. Sand is well rounded with high sphericity.	SP			1151.97
30		SSS	10-15 21-13	90	Light brown, fine to medium SAND, poorly graded, MOIST. Sand is well rounded with high sphericity.	SP		L Jordan logged(0-26');M Brennan took over at 26' bgs.	1147.97
					Light brown, fine to medium SAND, poorly graded, MOIST. Sand is well rounded with high sphericity.	SP			1142.97
35		SSS	10-17 23-27	100	Light brown, medium to coarse SAND, trace to little fine Gravel, poorly graded, MOIST. Sand is well rounded with high sphericity.	SP			1142.97
			10-17						



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BORING NO. **MW-1021** SHEET **2 OF 4**  
 PROJECT **GSWA: Spring Hill Camp Phase III**  
 LOCATION **Osceola Township, MI**  
 PROJECT NO. **4065-005**  
 LOGGED BY **Mike Brennan**

COORDINATES **N 228,693.8 E 19,440,782.1**  
 SURFACE ELEVATION **1179.47** DATUM **USGS**

SAMPLE INFORMATION					DESCRIPTION	USCS	Strata	REMARKS	Elevation Feet
Depth feet	Lab Sample	Sample Type	Blow Counts	Recovery %					
		SSS	27-32	100	Light brown, fine to medium SAND, poorly graded, MOIST. Sand is well rounded with high sphericity.	SP			1136.97
45		SSS	15-22 25-30	100	Light brown, fine to medium SAND, poorly graded, MOIST. Sand is well rounded with high sphericity.	SP		1131.97	
50		SSS	10-15 32-40	100	Light brown, fine to medium SAND, poorly graded, MOIST. Sand is angular to well rounded with high sphericity.	SP		1126.97	
55		SSS	12-15 20-24	90	Light brown SILT , little very fine Sand, MOIST.	SP		1121.97	
60		SSS	11-20 24-24	100	Light brown, medium to coarse SAND, poorly graded, MOIST. Sand is well rounded with high sphericity.	ML		1116.97	
65		SSS	10-12 14-16	100	Light brown SILT , little very fine Sand, MOIST.	SP		Rods wet at ~67' bgl.	1114.47
70		SSS	5-8 10-13	30	Light brown, fine to medium SAND, little coarse Sand, trace very coarse Sand, well graded, WET. Sand is well rounded with high sphericity.	ML		1111.97	
75		SSS	3-5 7-8	75	Light brown, fine SAND, little very fine Sand, trace Silt, poorly graded, WET. Sand is well rounded with high sphericity.	SW		No recovery (79-81'); No change in drilling over lost interval.	1106.97
80		SSS	3-5 7-7	0	Light brown, coarse to very coarse SAND, trace fine Gravel, well graded, WET. Sand is sub-angular to sub-rounded with high sphericity.	SP			1103.97
85		SSS	1-1 2-3	60	Light brown, medium to coarse SAND, little very coarse Sand, trace fine Gravel, well graded, WET. Sand is sub-angular to well rounded with high sphericity.	SW			1096.97
90		SSS	2-2 6-7	30	Light brown, medium to coarse SAND, little very coarse Sand to fine Gravel, well graded, WET. Sand is well rounded with high sphericity; ~1" diameter chunk of brown clay and silt, some very coarse sand.	SW	1091.97		
						SW		1086.97	



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BORING NO. **MW-1021** SHEET **3 OF 4**  
 PROJECT **GSWA: Spring Hill Camp Phase III**  
 LOCATION **Osceola Township, MI**  
 PROJECT NO. **4065-005**  
 LOGGED BY **Mike Brennan**

COORDINATES **N 228,693.8 E 19,440,782.1**  
 SURFACE ELEVATION **1179.47** DATUM **USGS**

SAMPLE INFORMATION					DESCRIPTION	USCS	Strata	REMARKS	Elevation Feet
Depth feet	Lab Sample	Sample Type	Blow Counts	Recovery %					
95		SSS	5-5 10-15	100	Light brown, medium to coarse SAND, little fine Gravel, well graded, WET. Sand is well rounded with high sphericity. <i>(continued)</i>	SW		Tip had silty clay.	1084.47
					Light brown SILT, some very fine Sand, WET.	ML			1083.97
					Light brown to gray, Silty CLAY, MOIST.	CL-ML			
100		SSS	3-3 4-3	80	Light brown, medium to coarse SAND, little fine Sand, well graded, WET. Sand is well rounded with high sphericity.	SW			1081.97
					Light brown, Clayey SILT, thinly laminated, MOIST.	MH			1079.47
					Light brown, CLAY, some fine to medium Sand, MOIST.	CL			1076.97
105		SSS	2-4 7-8	60	Light brown to gray, CLAY, some fine to medium Sand, laminated, MOIST.	CL			1074.47
					Light brown, CLAY, some fine to medium Sand, MOIST.	CL			1073.97
					Sand is well rounded with high sphericity.				
110		SSS	4-5 6-6	100	Light brown to gray, fine SAND, and CLAY, trace fine Gravel, WET.	SC		Bailed heave.	1071.97
					Light brown, fine to medium SAND, little to some Silt, little very coarse Sand, trace fine Gravel, WET. Sand is well rounded with high sphericity.	SM			1066.97
115		SSS	0-0 1-3	80					
					Light brown, medium to coarse SAND, little to some Silt, well graded, WET. Sand is sub-angular to well rounded with high sphericity.	SW			1061.97
120		SSS	2-3 3-4	10	Light brown, medium to coarse SAND, little very coarse Sand, trace fine Gravel, well graded, WET. Sand is sub-angular to well rounded with high sphericity.	SW			1056.97
125		SSS	7-10 17-24	40					
					Light brown, medium to coarse SAND, little very coarse Sand, trace fine gravel, well graded, WET. Sand is sub-angular to well rounded with high sphericity.	SW		Bailed ~2' heave.	1051.97
130		SSS	5-7 12-10	80		SW			
135		SSS	7-11 20-24	0	Light brown, fine to medium SAND, little to some Silt, WET. Sand is well rounded with high sphericity.			Bailed ~2' heave.	1044.47
						SM			
140		SSS	0-0 7-14	10					
					Light brown SILT, some fine to coarse Sand, trace Clay, WET.				
145		SSS	3-5 7-11	50		ML		Silty clay found in tip; bailed ~2' heave.	1036.97



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BORING NO. **MW-102I** SHEET **4 OF 4**  
 PROJECT **GSWA: Spring Hill Camp Phase III**  
 LOCATION **Osceola Township, MI**  
 PROJECT NO. **4065-005**  
 LOGGED BY **Mike Brennan**

COORDINATES **N 228,693.8 E 19,440,782.1**  
 SURFACE ELEVATION **1179.47** DATUM **USGS**

SAMPLE INFORMATION					DESCRIPTION	USCS	Strata	REMARKS	Elevation Feet
Depth feet	Lab Sample	Sample Type	Blow Counts	Recovery %					
150		SSS	0-1 2-6	50	Light brown, fine to medium SAND, trace Silt, poorly graded, WET. Sand is well rounded with high sphericity.	ML		Bailed ~1' heave.	1031.97
155		SSS	7-13 15-18	60	Light brown, fine to medium SAND, trace Silt, poorly graded, WET. Sand is well rounded with high sphericity.	SP		Stopped drilling (10/30) bailed ~2' heave. Resumed (10/31) bailed ~5' heave. Measure DTW=62' bgl.	1026.97
160		SSS	7-10 14-21	30	Light brown, fine to medium SAND, trace Silt, poorly graded, WET. Sand is well rounded with high sphericity.	SP		First split spoon attemp 159-161' bgl, no recovery.	1020.47
					Light brown, fine to medium SAND, few very fine Sand, poorly graded, WET. Sand is well rounded with high sphericity.	SP		Bailed ~2' heave. End of boring - 163' bgl	1016.97 1016.47



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BORING NO. **MW-103D** SHEET **1** OF **5**  
 PROJECT **GSWA: Spring Hill Camp Phase III**  
 LOCATION **Osceola Township, MI**  
 PROJECT NO. **4065-005**  
 LOGGED BY **GF/BM**

COORDINATES **N 228,511.9 E 19,441,342.2**  
 SURFACE ELEVATION **1147.73** DATUM **USGS**

DRILLING CONTRACTOR  
**Stearns**  
 DRILLING METHOD EQUIPMENT  
**4 1/4" HSA CME 95**  
 DRILLING STARTED ENDED  
**10/30/00 11/1/00**

LOCATION DESCRIPTION:  
  
 See attached Site Diagram for location.

**STRATA KEY**

- SAND
- SILT
- CLAY
- CLAYEY SAND
- GRAVEL
- SILTY SAND

SAMPLE INFORMATION					DESCRIPTION	USCS	Strata	REMARKS	Elevation Feet
Depth feet	Lab Sample	Sample Type	Blow Counts	Recovery %					
		SSS	2-2	75	Dark brown Silty very fine to medium SAND, trace fine Gravel, MOIST.	SM			1147.73
			2-2		Light brown very fine to medium SAND, little Silt, MOIST.	SM			1146.73
5		SSS	2-4	100	Light brown, very fine to medium SAND, poorly graded, MOIST.	SP			1144.73
			6-6		Dark brown, fine to medium SAND, some Silt, MOIST.	SM			1142.23
10		SSS	3-3	75	Light brown, fine to medium SAND, poorly graded, MOIST.	SP			1140.23
			4-3		Light brown, fine to medium SAND, poorly graded, DRY.				SP
15		SSS	2-3	75	Light brown, very fine to fine SAND, poorly graded, MOIST.	SP			1132.73
			5-6		Light brown, fine SAND, trace Silt, poorly graded, DRY. Sand is sub-angular to sub-rounded.				SP
20		SSS	3-4	100	Light brown, Clayey SILT with occasional Sand stringers, MOIST.	ML-CL			1127.73
			6-9		Brown, medium to coarse SAND, poorly graded.	SP			1125.73
25		SSS		75	Brown, Silty, CLAY, thinly laminated (varved).	CL-ML			1123.23
					Light brown, fine SAND, trace Silt, poorly graded, DRY. Sand is well rounded and sub-spherical.	SP			1122.73
30		SSS	5-10	75	Light brown, fine to medium SAND, poorly graded, coarser with depth. Sand is well rounded, spherical.	SP			1120.23
			27-20		Light brown, Silty fine SAND, trace Clay, loose, WET.				SM
35		SSS	5-7		Light brown, medium SAND, trace fine Sand, trace Silt, poorly graded, WET. Quartz grains are well rounded and highly spherical.	SP			1112.73
			8-10						SP
			3-5						



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BORING NO. **MW-103D** SHEET **2 OF 5**  
 PROJECT **GSWA: Spring Hill Camp Phase III**  
 LOCATION **Osceola Township, MI**  
 PROJECT NO. **4065-005**  
 LOGGED BY **GF/BM**

COORDINATES **N 228,511.9 E 19,441,342.2**  
 SURFACE ELEVATION **1147.73** DATUM **USGS**

SAMPLE INFORMATION					DESCRIPTION	USCS	Strata	REMARKS	Elevation Feet
Depth feet	Lab Sample	Sample Type	Blow Counts	Recovery %					
		SSS	9-16		Brown, medium SAND, trace fine Sand, poorly graded, WET. Sand is well rounded, highly spherical, and approximately 80% quartz. (continued)	SP			
45		SSS	3-4 8-14		Brown, fine to coarse SAND, trace Silt, WET. Fine to medium component is well rounded, highly spherical, and approximately 80% quartz. Coarse sand component is sub-angular and sub-rounded. Brown, fine SAND, trace to some Silt, WET.	SW			1100.23
50		SSS	4-6 9-12			SP			1097.23
55		SSS	6-17 26-24		Brown and gray mottled Silty, CLAY, thinly laminated (varved), stiff, MOIST.	CL-ML			1093.23
					Brown, fine SAND, trace Silt, poorly graded, WET. Sand is well rounded, highly spherical, and approximately 80% quartz.	SP			1092.48
60		SSS	10-14 38-30		Brown, fine to medium SAND, trace Silt, poorly graded, WET. Quartz component (approx. 80%) is well rounded and highly spherical. Non-quartz component is sub-angular to sub-rounded.	SP			1090.23
65		SSS	18-27 100 / 5"--		Gray Clayey fine to medium SAND, trace coarse Sand, trace Gravel, occasional seams (~1 inch thick) of medium Sand.	SC			1082.73
70		SSS			Brown, medium to coarse SAND, trace fine Sand, poorly graded, WET. Sand is well rounded, highly spherical, and approximately 70% quartz.	SP		Driller noted change in lithology.	1080.23
75		SSS	12-60 65		Brown, fine to coarse GRAVEL, trace fine to coarse Sand, and WET.	GW			1072.23
80		SSS	6-8 12-30		Brown, medium to coarse SAND, trace fine Sand, occasional fine to medium Gravel layers, poorly graded, WET. Sand is well rounded, highly spherical, and approximately 80% quartz.	SP			1070.23
85		SSS			Brown, fine to coarse SAND, and SILT, trace fine Gravel, and WET.	SM			1063.23
90		SSS	5-7 12-16		Brown, fine to coarse SAND, trace to some fine to medium Gravel, trace Silt, well graded, and WET. Sand and gravel are well rounded and highly spherical. Sand is compositionally mature.	SW			1060.23
						SP			1055.23





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BORING NO. **MW-103D** SHEET **3 OF 5**  
 PROJECT **GSWA: Spring Hill Camp Phase III**  
 LOCATION **Osceola Township, MI**  
 PROJECT NO. **4065-005**  
 LOGGED BY **GF/BM**

COORDINATES **N 228,511.9 E 19,441,342.2**  
 SURFACE ELEVATION **1147.73** DATUM **USGS**

SAMPLE INFORMATION					DESCRIPTION	USCS	Strata	REMARKS	Elevation Feet
Depth feet	Lab Sample	Sample Type	Blow Counts	Recovery %					
95		SSS	5-17 12-15		Brown, fine to coarse SAND, trace fine Gravel, trace Silt, poorly graded, and WET. Sand is well rounded, highly spherical, and ~70-80% quartz. (continued)	SP		Last sample on 10/30/00  Began drilling @ 07:15, 10/31/00. No recovery on first attempt.	1050.23
100		SSS	5-51 60 / 3"		Brown, medium to coarse SAND, trace fine Sand, trace Silt, poorly graded, and WET. Sand is well rounded, highly spherical, and 70-80% quartz.	SP			
105		SSS	6-8 12-21		Brown, medium to coarse SAND, trace fine Sand, trace Silt, poorly graded, and WET. Sands are well rounded, highly spherical, and 70-80% quartz.	SP			
110		SSS	4-4 12-28		Brown, medium SAND, trace to some fine Sand, poorly graded, and WET. Sand is well rounded, highly spherical, and 70-80% quartz,	SP			
115		SSS	5-3 10-23		Medium brown, fine to coarse SAND, trace to some fine to medium Gravel, well graded, massive, and WET. Fine to med. sands are well rounded, highly spherical, and 70-80% quartz. Coarser component is sub-angular to sub-rounded and less than 10% quartz.	SW			
120		SSS	3-10 30-50		Medium brown, fine to medium SAND, some coarse Sand, trace to some fine Gravel, well graded, massive, and WET. Fine to medium sands are well rounded, highly spherical, and 70-80% quartz. Coarse component is ~80% quartz.	SW			
125		SSS	3-8 21-25		Medium brown, fine to medium SAND, some coarse Sand, trace fine Gravel, well graded, massive, and WET. Fine to med. sands are well rounded, highly spherical, and ~70 to 80% quartz. Coarse component is ~30-50% quartz.	SW			
130		SSS	4-7 9-17		Medium brown, medium SAND, trace to some fine Sand, trace to some coarse Sand, poorly graded, massive, and WET. Fine and med. sands are well rounded, highly spherical, and ~70-80% quartz. Coarser component is sub-rounded, sub-spherical, and ~30-40% quartz.	SP			
135		SSS	4-7 9-17		Medium brown, medium SAND, trace to some fine Sand, trace to some coarse Sand, poorly graded, massive, and WET. Fine to med. sands are well rounded, highly spherical, and ~70-80% quartz. Coarser component is sub-rounded, sub-spherical, and ~30-40% quartz.	SP			
140		SSS	5-12 38-50 / 3"		Brown, fine SAND and, SILT grading to gray, CLAY, and SILT that is thinly laminated. Clay is interbedded with fine SAND and, SILT.	SM			
140		SSS	5-12 38-50 / 3"		Medium brown, medium SAND, trace to some fine Sand, trace to some coarse Sand, poorly graded, massive, and WET. Fine and med. sands are well rounded, highly spherical, and 70-80% quartz. Coarser components are sub-rounded to sub-angular and 20-30% quartz.	SP			
145		SSS	4-7 10-38		Medium brown, fine to medium SAND, trace to some coarse Sand, poorly graded, massive, and WET. Fine and med. sands are well rounded, highly spherical, and 70-80% quartz. Coarser components are sub-rounded to	SP			



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BORING NO. **MW-103D** SHEET **4 OF 5**  
 PROJECT **GSWA: Spring Hill Camp Phase III**  
 LOCATION **Osceola Township, MI**  
 PROJECT NO. **4065-005**  
 LOGGED BY **GF/BM**

COORDINATES **N 228,511.9 E 19,441,342.2**  
 SURFACE ELEVATION **1147.73** DATUM **USGS**

SAMPLE INFORMATION					DESCRIPTION	USCS	Strata	REMARKS	Elevation Feet
Depth feet	Lab Sample	Sample Type	Blow Counts	Recovery %					
150		SSS	10-13 21-38		sub-angular and 20-30% quartz. Medium brown, fine to medium SAND, trace to some coarse Sand, poorly graded, massive, and WET. Fine and med. sands are well rounded, highly spherical and 70-80% quartz. Coarser components are sub-rounded, sub-spherical, and 20-30% quartz.	SP			1000.23
155		SSS	4-11 23-50		Medium brown, fine to medium SAND, trace to some coarse Sand, poorly graded, massive, and WET. Fine and med. sands are well rounded, moderately spherical, and 70-80% quartz. Coarser components are sub-rounded to sub-angular and 20-30% quartz.	SP			995.23
160		SSS	18-27 50 / 4"--		Medium brown, medium to coarse SAND, trace fine Sand, well graded, massive, and WET. Medium sand is well rounded, highly spherical and 80-90% quartz. Coarse sand is sub-rounded with low sphericity and 10-20% quartz.	SW			990.23
165		SSS	10-15 32-50 /3"		Medium brown, medium to very coarse SAND and fine to coarse GRAVEL, trace fine Sand, trace Silt, well graded, and WET, with occasional very coarse Sand lenses. Fine and medium sand is well rounded, highly spherical, and 60-70% quartz. Coarser components are sub-rounded to angular, sub-spherical, and ~10-20% quartz.	SW-GW		Driller indicates lithology change.	986.23
170		SSS	11-17 28-42		Medium brown, medium to very coarse SAND, and fine to coarse GRAVEL, trace fine Sand, trace Silt, well graded, and WET. Fine gravel and coarse sand occur in layers. Fine to medium sand is well rounded, highly spherical, and 70-80% quartz. Coarser components are sub-angular, sub-spherical, and ~10-20% quartz.	SW-GW			980.23
175		SSS	10-23 62--		Brown to gray, Silty, CLAY and fine to coarse SAND, medium stiff, moderately plastic, and WET. Grades to brown to gray SAND, and CLAY, trace to some Gravel.	CL-SC		Elevation of change in lithology was noted by driller.	974.73
180		SSS	31-42 60 / 3"--		Brown, medium to very coarse SAND, and fine to medium Gravel, trace fine Sand, trace Silt, well graded, massive, and WET. All components are sub-angular to sub-rounded with low sphericity and are compositionally moderately mature.	SW-GW		Elevation of change in lithology was noted by driller.	970.73
185		SSS	4-7 17-35		Brown, medium to very coarse SAND and fine to medium GRAVEL, trace fine Sand and Silt, well graded, massive, and WET. Fine and medium sands are well rounded, highly spherical, and compositionally mature (70-80% quartz). Coarser component is sub-angular, sub-spherical, and 10-15% quartz.	SW-GW			965.23
190		SSS	4-3 28-60		Gray brown Silty, CLAY, some fine to very coarse (matrix supported) Sand, very stiff, and MOIST.	CL-ML			957.73
195		SSS	12-18 70 / 3"--		Brown Silty fine SAND, dense, massive, and WET.	SM		Drilling change @ 192.5'	955.23
					Dark gray Silty, CLAY with fine to coarse Sand and fine Gravel (coarse material is matrix supported), very hard and MOIST to DRY.	CL-ML		Heave to 195' in augers, 3" spoon to clean auger, gray fine	950.23