



1500 Abbott Road, Suite 210  
 East Lansing, MI 48823  
 Telephone: (517) 337-0111  
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BORING NO. **MW-103D** SHEET **5 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			Dark gray Silty, CLAY with fine to coarse Sand and fine Gravel (coarse material is matrix supported), hard, and MOIST to DRY.	CL-ML		sand in spoon.	945.23	
205		SSS				CL-ML				
									Auger refusal, end of boring - 206' bgl.	941.73



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BORING NO. **MW-103I** SHEET **1 OF 2**  
 PROJECT **GSWA: Spring Hill Camp Phase III**  
 LOCATION **Osceola Township, MI**  
 PROJECT NO. **4065-005**  
 LOGGED BY **Mike Brennan**

COORDINATES **N 228,500.9 E 19,441,342.9**  
 SURFACE ELEVATION **1147.89** DATUM **USGS**

DRILLING CONTRACTOR  
**Stearns**  
 DRILLING METHOD EQUIPMENT  
**4 1/4" HSA CME 1050**  
 DRILLING STARTED ENDED  
**11/14/00 11/14/00**

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	2-2 2-2	75	Dark brown Silty very fine to medium SAND, trace fine Gravel, MOIST.	SM		No samples taken during MW-103I drilling. Lithology and sample information based on MW-103D boring log.	1147.89
					Light brown very fine to medium SAND, little Silt, MOIST.	SM			1146.89
5		SSS	2-4 6-6	100	Light brown, very fine to medium SAND, poorly graded, MOIST.	SP			1144.89
					Dark brown, fine to medium SAND, some Silt, MOIST.	SM			1142.39
10		SSS	3-3 4-3	75	Light brown, fine to medium SAND, poorly graded, MOIST.	SP			1140.39
					Light brown, fine to medium SAND, poorly graded, DRY.	SP			1135.39
15		SSS	2-3 5-6	75	Light brown, very fine to fine SAND, poorly graded, MOIST.	SP			1132.89
					Light brown, fine SAND, trace Silt, poorly graded, DRY. Sand is sub-angular to sub-rounded.	SP			1130.39
20		SSS	3-4 6-9	100	Light brown, Clayey SILT with occasional Sand stringers, MOIST.	ML-CL			1127.89
					Brown, medium to coarse SAND, poorly graded.	SP			1125.89
25		SSS		75	Brown, Silty, CLAY, thinly laminated (varved).	CL-ML			1123.39
					Light brown, fine SAND, trace Silt, poorly graded, DRY. Sand is well rounded and sub-spherical.	SP			1122.89
30		SSS	5-10 27-20	75	Light brown, fine to medium SAND, poorly graded, coarser with depth. Sand is well rounded, spherical.	SP			1120.39
					Light brown, Silty fine SAND, trace Clay, loose, WET.	SM			1115.39
35		SSS	5-7 8-10		Light brown, medium SAND, trace fine Sand, trace Silt, poorly graded, WET. Quartz grains are well rounded and highly spherical.	SP		WET at 35' bgl.	1112.89
						SP			1110.39
			3-5						



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BORING NO. **MW-1031** SHEET **2 OF 2**  
 PROJECT **GSWA: Spring Hill Camp Phase III**  
 LOCATION **Osceola Township, MI**  
 PROJECT NO. **4065-005**  
 LOGGED BY **Mike Brennan**

COORDINATES **N 228,500.9 E 19,441,342.9**  
 SURFACE ELEVATION **1147.89** 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		1100.39	
50		SSS	4-6 9-12			SP		1097.39	
55		SSS	6-17 26-24		Brown and gray mottled Silty, CLAY, thinly laminated (varved), stiff, MOIST.	CL-ML		1093.39	
					Brown, fine SAND, trace Silt, poorly graded, WET. Sand is well rounded, highly spherical, and approximately 80% quartz.	SP		1092.64	
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		1090.39	
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		1082.89	
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.	1080.39
75		SSS	12-60 65		Brown, fine to coarse GRAVEL, trace fine to coarse Sand, and WET.	GW		1072.39	
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		1070.39	
85		SSS			Brown, fine to coarse SAND, and SILT, trace fine Gravel, and WET.	SM	1063.39		
90					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	1060.39		
							End of boring - 90' bgl	1057.89	



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BORING NO. **MW-104D** 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 228,228.8 E 19,442,629.5**  
 SURFACE ELEVATION **1148.35** DATUM **USGS**

DRILLING CONTRACTOR  
**Stearns**  
 DRILLING METHOD **4 1/4" HSA** EQUIPMENT **CME 1050**  
 DRILLING STARTED **11/2/00** ENDED **11/6/00**

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 %					
		SSS	2-3 4-4	50	Black, SILT, some fine Sand, trace Clay, little Root debris, MOIST. (TOPSOIL)	ML/OL			1148.35 1147.85
		SSS	2-2 4-5	80	Brown to reddish brown SILT, some fine Sand, little to some Clay, laminated, mottled, MOIST. Light brown, medium SAND, some Clay, MOIST.	ML			1145.35
5		SSS	2-2 4-5	80	Dark brown SILT, some fine Sand, MOIST.	SC			1143.35
		SSS	2-2 4-5	100	Light brown to tan, medium to coarse SAND, little to some fine Sand, well graded, MOIST. Sand is rounded with high sphericity. Seam of coarse SAND, little Gravel @ 10.5'. Light brown, fine to medium SAND, trace to little Silt, poorly graded, WET. Sand is rounded with high sphericity. Brownish red, very fine SAND, little Silt, poorly graded, WET.	SW SP SP			1140.85 1138.35 1137.85
10		SSS	2-2 4-5	100	Brownish red, very fine SAND, little Silt, poorly graded, WET.	CL		Driller felt change @ 12' bgl.	1136.35
15		SSS	7-14 17-22	10	Light brown to brown, CLAY, some Silt, trace fine Gravel to coarse Sand, MOIST.				
		SSS	54-50 (5")	5	Three pieces medium GRAVEL, some medium to coarse Sand, well graded, MOIST.	GW/SW		Rock in spoon impeded sample. Driller indicates fine Gravel to coarse Sand.	1131.85
20		SSS	54-50 (5")	5	Interbedded light brown to tan, medium to coarse SAND, trace fine Gravel and very fine Sand, well graded, MOIST. Sand is rounded with high sphericity. 3" seam of fine to coarse Gravel at 24' bgs.	GW/SW		Observe fine to coarse gravel in cuttings.	1125.85
25		SSS	6-15 50 (5")	20	Light brown to brown, coarse to very coarse SAND, some fine to coarse Gravel, well graded, MOIST. Sand is well rounded. Gravel is angular.	SW			1120.85
30		SSS	18-50 (5")	25	Brown, fine to medium SAND, some Silt, trace Clay, trace to some fine Gravel, well graded, MOIST.	SW			1115.85
35		SSS	5-12 18-32	100	Tan, fine SAND, some medium Sand, poorly graded, little to some (1-2 cm thick) laminations, DRY to MOIST.	SP			1113.95
		SSS	5-12 18-32	100	Light brown, medium to coarse SAND, poorly graded, WET. Sand is sub-rounded to rounded with high sphericity.	SP		Wet at 39' bgl.	1110.85
		SSS	8-11						



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BORING NO. **MW-104D** 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 228,228.8 E 19,442,629.5**  
 SURFACE ELEVATION **1148.35** DATUM **USGS**

SAMPLE INFORMATION					DESCRIPTION	USCS	Strata	REMARKS	Elevation Feet
Depth feet	Lab Sample	Sample Type	Blow Counts	Recovery %					
		SSS	14-14	80	Light brown, medium to coarse SAND, poorly graded, WET. Sand is sub-rounded to rounded with high sphericity. (continued)	SP		Bailing ~2' heave.	1105.85
45		SSS	8-11 14-13	100	Light brown, fine to medium SAND, poorly graded, WET. Sand is sub-rounded to rounded with high sphericity.	SP			1100.85
50		SSS	30-40 15-16	40	Light brown, medium to coarse SAND, trace fine Sand, poorly graded, WET. Sand is sub-rounded to rounded with high sphericity.	SP			1095.85
55		SSS	4-15 30-34	100	Light brown, fine to medium SAND, trace coarse Sand, poorly graded, WET. Sand is well rounded with high sphericity. Trace fine Gravel 54-54.5' bgl.	SP		Bailed ~1' heave.	1091.35
60		SSS	3-9 18-19	100	Light brown SILT, some fine Sand, soft, WET.	ML			1088.35
65		SSS	12-15 17-23	100	Light brown, fine to medium SAND, some Silt, trace fine Gravel to coarse Sand, WET. Sand is well rounded with high sphericity.	SM			1085.85
70		SSS	5-11 16-23	90	Light brown, fine to medium SAND, trace to little Silt, poorly graded, WET. Sand is well rounded with high sphericity.	SP			1082.55
75		SSS	10-12 22-27	100	Light brown SILT, some fine Sand, soft, WET.	ML			1080.85
80		SSS	17-34 50 (5")	70	Light brown, medium to coarse SAND, little fine and very coarse Sand, trace fine Gravel, well graded, WET. 1" seam of fine to medium Gravel at 71' bgl.	SW			1075.85
85		SSS	1-2 17-42	60	Light brown, fine to medium SAND, trace coarse Sand, poorly graded, WET. Sand is well rounded with high sphericity.	SP			1073.35
90		SSS	0-5 8-13	90	Light brown, medium to coarse SAND, little fine Gravel, well graded, WET. Sand is well rounded with high sphericity; grades into more Gravel (some); Clay clast (2 cm diam.) at 75.5' bgl.	SW/GW SP		1072.85	
		SSS	17-34 50 (5")	70	Light brown, fine to medium SAND, poorly graded, WET. Sand is well rounded with high sphericity.	ML	Driller felt change @ 78' bgl.	1070.35	
		SSS	1-2 17-42	60	Brown to gray SILT, some Clay, soft, MOIST.	ML		1065.35	
		SSS	1-2 17-42	60	Light brown, medium to coarse SAND, little to some fine Sand, trace fine Gravel, well graded, WET. Sand is well rounded with high sphericity. 1" seam of, SILT, some fine Sand at 86' bgl.	SW	Driller feels sand @ 83' bgl. ~1' heave.	1060.85	
		SSS	0-5 8-13	90	Light brown, medium to coarse SAND, trace fine Sand, poorly to moderately graded, WET. Sand is well rounded with high sphericity.	SP	~2' heave	1060.85	



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BORING NO. **MW-104D** 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 228,228.8 E 19,442,629.5**  
 SURFACE ELEVATION **1148.35** DATUM **USGS**

SAMPLE INFORMATION					DESCRIPTION	USCS	Strata	REMARKS	Elevation Feet
Depth feet	Lab Sample	Sample Type	Blow Counts	Recovery %					
95		SSS	7-10 16-20	90	Light brown, medium to coarse SAND, trace fine Sand, poorly to moderately graded, WET. Sand is well rounded with high sphericity. (continued)	SP			
					Light brown to gray SILT, some fine Sand, WET.	ML		Driller feels change @98' bgl.	1050.85
100		SSS	4-11 20-32	75	Gray, CLAY, little Silt, hard, laminated with occasional Silt lenses, MOIST.	CL		Varved? ~2' heave. Driller feels change	1047.45
					Light brown to grey, fine to medium SAND, some Silt, WET. Sand is well rounded with high sphericity.	SM		106-108', and @ 113'	1045.85
105		SSS	7-11 20-27	90					
					Light brown to grey SILT, some fine Sand, little to some Clay, soft, low plasticity, MOIST to WET.	ML			1040.85
110		SSS	10-28 30-30 (3")	100					
					Light brown, medium SAND to medium GRAVEL, well graded, WET. Sand is rounded with high sphericity. Gravel is angular to sub-angular, coarsens downward. ~4 (~3mm thick) Clay clasts (till balls?).	SW		Driller notes change at 113' bgl. ~2' heave	1035.85
115		SSS	0-0 4-4	50					
					Light brown, fine to coarse SAND, trace fine to medium Gravel, well graded, WET. Sand is well rounded with high sphericity.	SW			1030.85
120		SSS	5-14 30-33 (3")	10					
					Light brown, fine to medium SAND, trace coarse Sand, poorly graded, WET. Sand is well rounded with high sphericity.	SP		~2' heave	1025.85
125		SSS	5-9 20-25	50					
					Light brown, medium to coarse SAND, trace fine Sand, trace fine Gravel, well graded, WET. Sand is well rounded with high sphericity.	SW			1023.35
					Light brown, medium to coarse SAND, trace fine Sand, poorly to moderately graded, WET. Sand is sub-rounded to rounded with low to high sphericity. Coarse Sand to fine Gravel seam (~1") @ 131'.	SP		~4' heave	1020.85
130		SSS	3-10 27-40	80					
					Light brown, fine to medium SAND, little coarse Sand, well graded, and WET. Sand is well rounded and spherical.	SW		~2' heave	1015.85
135		SSS	7-8 18-30 (3")	10					
					Light brown to gray SILT, little Clay, soft, WET.	ML		Stiffer drilling.	1009.35
140		SSS	10-15 30-34	70					
					Light brown, medium to coarse SAND, some very coarse Sand, trace fine Gravel, well graded, WET. Sand is sub-rounded to rounded with high sphericity.	SW		~2' heave	1007.55
					Light brown, medium to coarse SAND, some very coarse Sand, trace fine Sand, well graded, WET. Sand is sub- to well rounded with high sphericity. Clast of gray Clay (~2" thick) at 145'10" (till ball?).	SW		~1' heave	1005.85
145		SSS	10-22 50 (3")	50					



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BORING NO. **MW-104D** 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 228,228.8 E 19,442,629.5**  
 SURFACE ELEVATION **1148.35** DATUM **USGS**

SAMPLE INFORMATION					DESCRIPTION	USCS	Strata	REMARKS	Elevation Feet
Depth feet	Lab Sample	Sample Type	Blow Counts	Recovery %					
150		SSS	1-11 31-30 (3")	5	Light brown, fine to medium SAND, some coarse Sand, well graded, WET. Sand is rounded with high sphericity. ~1/4" lense of Clayey Silt @149.1' bgl.	SW		~1' heave	1000.85
155		SSS	2-10 25-30 (3")	80	Light brown, fine to medium SAND, some coarse Sand, well graded, WET. Sand is rounded with high sphericity. ~1/4" lense of Clayey Silt at 155'.	SW		~1/2' heave	995.85
160		SSS	0-3 12-35	70	Light brown, coarse to very coarse SAND, some medium Sand, little fine Sand, little to some fine Gravel, well graded, WET. Sand is well rounded with high sphericity.	SW		~1' heave	993.35
165		SSS	3-7 12-20	60	Light brown, fine to medium SAND, trace coarse Sand, poorly graded, WET. Sand is rounded with high sphericity.	SP			990.85
170		SSS	2-6 19-30 (5")	20	Light brown, medium to coarse SAND, little very coarse Sand, well graded, WET. Sand is well rounded with high sphericity.	SW			988.35
175		SSS	0-6 36-30 (2")	50	Gray SILT, trace fine Sand, soft, WET.	ML			987.45
180		SSS	0-4 23-40 (3")	10	Gray to light brown SILT, some Clay, soft, WET.	ML			985.85
185		SSS	0-6 26-40 (3")	60	Interbedded: light brown, fine to medium SAND, trace coarse Sand, moderately graded, WET and light brown, medium to coarse SAND, some fine Sand, trace of fine Gravel, moderately to well graded, WET. Sand is rounded with high sphericity.	SP/SW		~1' heave	984.05
190		SSS	0-4 21-65	50	Light brown, fine to medium SAND, trace coarse Sand, poorly graded, WET. Sand is rounded with high sphericity.	SP		~1' heave	980.85
195		SSS	3-8		Light brown, fine to medium SAND, trace coarse Sand, poorly graded, WET. Two inch seam of coarse to very coarse Sand @190.8' bgl. Sand is rounded and highly spherical.	SP		~4' heave	975.85
					Light brown, fine to medium SAND, trace coarse Sand, poorly graded, WET. Sand is rounded and highly spherical.	SP	~3' heave	970.85	
					Light brown, fine to medium SAND, trace coarse Sand, poorly graded, WET. Sand is rounded and highly spherical.	SP		965.85	
					Light brown, fine to medium SAND, trace coarse Sand, poorly graded, WET. Two inch seam of coarse to very coarse Sand @190.8' bgl. Sand is rounded and highly spherical.	SP		960.85	
					Light brown, medium to coarse SAND, little fine Gravel, well graded, WET. Sand is sub-angular to well rounded, low to highly spherical, and >80% quartz. Gravel is sub-angular. Two inch lense of light brown to gray, CLAY, some Silt, stiff, high plasticity @ 200.8' bgl.	SW	~1' heave	953.35	



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BORING NO. **MW-104D** 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 228,228.8 E 19,442,629.5**  
 SURFACE ELEVATION **1148.35** DATUM **USGS**

SAMPLE INFORMATION					DESCRIPTION	USCS	Strata	REMARKS	Elevation Feet
Depth feet	Lab Sample	Sample Type	Blow Counts	Recovery %					
		SSS	40-30 (3")	70	Light brown, medium to coarse SAND, some very coarse Sand to fine Gravel, well graded, WET. Medium to very coarse sand is sub-angular to rounded, low to highly spherical, and >80% quartz. Very coarse sand and fine gravel are sub-angular.	SW		~2' heave	945.85
205		SSS	9-17 24-30 (2")	70		Light brown, medium to coarse SAND, little fine Gravel, well graded, WET. Medium to coarse sand is sub-angular to well rounded, highly spherical, and >80% quartz. Fine gravel is sub-angular.			
210		SSS	3-16 28-30 (3")	100	Light brown to gray SILT, some very fine Sand, little Clay, trace very coarse Sand, stiff, low plasticity, MOIST TO DRY.	ML			938.35
215		SSS	11-5 5-15	60	Light brown, medium to fine SAND, trace coarse Sand, poorly graded, WET. Sand is sub-angular to well rounded, highly spherical, and >80% Quartz.	SP		Driller felt change @213'.	935.35
220		SSS	-10 15-15	60	Light brown to gray, CLAY, some Silt, little fine Sand, trace very coarse Sand, stiff, low plasticity, MOIST.	CL/CH		~5' heave	933.35
					Light brown to gray, CLAY, some fine Sand, trace fine Gravel, soft, moderate plasticity, WET; interbedded with light brown to gray, CLAY, some fine Sand, trace fine Gravel, stiff, high plasticity, MOIST TO DRY. Fine gravel is sub-rounded.			~1' heave in 219-221 spoon.	930.85
225		SSS	-10 17-40 (3")	100	Light brown to gray, CLAY, some fine Sand, trace fine Gravel, stiff, low plasticity, MOIST. Fine gravel is sub-rounded.	CL		Drilling harder @221'.	927.35
					Light brown to gray SILT, some Clay, stiff, low plasticity, laminated, MOIST. Laminations are Silt lenses, some Clay, non-plastic, (Clayey Silt).			Rig beginning to overheat (very stiff).	922.55
230		SSS	-5 48-30 (3")	60	Light brown to gray, CLAY, some fine Sand, trace fine Gravel, stiff, low to moderate plasticity, MOIST; interbedded with light brown to gray SILT, some Clay, stiff, laminated, MOIST. Laminations are Clayey Silt. Fine gravel is sub-rounded. Two inch seam of light brown, medium to coarse SAND, WET. Medium to coarse sand is well rounded, highly spherical, and >80% quartz.	CL/ML		Feel sand @228'.	920.35
					Light brown, medium to coarse SAND, trace fine Gravel, stiff, poorly graded, MOIST. Fine gravel is sub-rounded.			~1' heave	915.85
235		SSS	-7 27-40 (3")	60	Light brown to gray, CLAY, some fine Sand, trace fine Gravel, stiff, low to moderate plasticity, MOIST. Fine gravel is sub-rounded.	CL		Driller feels ~1' sand seam.	913.35
					Light brown to gray, CLAY, some fine Sand, trace fine Gravel, stiff, low to moderate plasticity, MOIST. Fine gravel is sub-rounded.			~1' heave	910.85
240		SSS	10-10 15-50	80	Light brown to gray, CLAY, some fine Sand, trace fine Gravel, stiff, moderate to high plasticity, WET. Fine gravel is sub-rounded.	CL		Driller feels sand @241'. ~1' heave.	907.85
					Light brown, fine to medium SAND, trace coarse Sand, dense, moderately graded, interbedded, WET, with light brown to grey, CLAY, some fine Sand, trace fine Gravel, soft, moderate plasticity, WET. Sand is rounded to sub-angular, low to high sphericity, >80% quartz.				907.35
245		SSS	11-24 50	50	Light brown, medium to coarse SAND, some very coarse Sand to fine Gravel, trace Clay, well graded, WET. Sand is sub- to well rounded, low to highly spherical, and >80% quartz. Clay occurs as lenses (~1" thick) of light brown to gray, CLAY, soft, moderate plasticity, WET.	SC			
250		SSS	12-18 27-30 (3")			SW			900.85
									End of boring - 251' bgs.





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BORING NO. **MW-104I** SHEET **1 OF 3**  
 PROJECT **GSWA: Spring Hill Camp Phase III**  
 LOCATION **Osceola Township, MI**  
 PROJECT NO. **4065-005**  
 LOGGED BY **Larry Jordan**

COORDINATES **N 228,238.9 E 19,442,631.1**

SURFACE ELEVATION **1148.09** DATUM **USGS**

DRILLING CONTRACTOR  
**Stearns**  
 DRILLING METHOD EQUIPMENT  
**4 1/4" HSA CME 1050**  
 DRILLING STARTED ENDED  
**11/16/00 11/16/00**

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	50	Black, SILT, some fine Sand, trace Clay, little Root debris, MOIST. (TOPSOIL)	ML/OL		No samples taken during MW-104I drilling. Lithology and sample information based on MW-104D boring log.	1148.09
					Brown to reddish brown SILT, some fine Sand, little to some Clay, laminated, mottled, MOIST.	ML			1147.59
5		SSS	2-2 4-5	80	Light brown, medium SAND, some Clay, MOIST.	SC			1145.09
					Dark brown SILT, some fine Sand, MOIST.	ML			1143.09
10		SSS	2-2 4-5	100	Light brown to tan, medium to coarse SAND, little to some fine Sand, well graded, MOIST. Sand is rounded with high sphericity. Seam of coarse SAND, little Gravel @ 10.5'.	SW			1140.59
					Light brown, fine to medium SAND, trace to little Silt, poorly graded, WET. Sand is rounded with high sphericity.	SP			1138.09
15		SSS	7-14 17-22	10	Brownish red, very fine SAND, little Silt, poorly graded, WET.	SP		Driller felt change @ 12' bgl.	1137.59
					Light brown to brown, CLAY, some Silt, trace fine Gravel to coarse Sand, MOIST.	CL			1136.09
20		SSS	54-50 (5")	5	Three pieces medium GRAVEL, some medium to coarse Sand, well graded, MOIST.	GW/SW		Rock in spoon impeded sample. Driller indicates fine Gravel to coarse Sand.	1131.59
					Interbedded light brown to tan, medium to coarse SAND, trace fine Gravel and very fine Sand, well graded, MOIST.	GW/SW			1125.59
25		SSS	6-15 50 (5")	20	Sand is rounded with high sphericity. 3" seam of fine to coarse Gravel at 24' bgs.	GW/SW		Observe fine to coarse gravel in cuttings.	1120.59
					Light brown to brown, coarse to very coarse SAND, some fine to coarse Gravel, well graded, MOIST. Sand is well rounded. Gravel is angular.	SW			1115.59
30		SSS	18-50 (5")	25	Brown, fine to medium SAND, some Silt, trace Clay, trace to some fine Gravel, well graded, MOIST.	SW			1113.69
					Tan, fine SAND, some medium Sand, poorly graded, little to some (1-2 cm thick) laminations, DRY to MOIST.	SP			1110.59
35		SSS	5-12 18-32	100	Light brown, medium to coarse SAND, poorly graded, WET. Sand is sub-rounded to rounded with high sphericity.	SP		Wet at 39' bgl.	1110.59



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BORING NO. **MW-1041** SHEET **2 OF 3**  
 PROJECT **GSWA: Spring Hill Camp Phase III**  
 LOCATION **Osceola Township, MI**  
 PROJECT NO. **4065-005**  
 LOGGED BY **Larry Jordan**

COORDINATES **N 228,238.9 E 19,442,631.1**

SURFACE ELEVATION **1148.09** DATUM **USGS**

SAMPLE INFORMATION					DESCRIPTION	USCS	Strata	REMARKS	Elevation Feet
Depth feet	Lab Sample	Sample Type	Blow Counts	Recovery %					
		SSS	14-14	80	Light brown, medium to coarse SAND, poorly graded, WET. Sand is sub-rounded to rounded with high sphericity. (continued)	SP		Bailing ~2' heave.	1105.59
45		SSS	8-11 14-13	100	Light brown, fine to medium SAND, poorly graded, WET. Sand is sub-rounded to rounded with high sphericity.	SP		1100.59	
50		SSS	30-40 15-16	40	Light brown, medium to coarse SAND, trace fine Sand, poorly graded, WET. Sand is sub-rounded to rounded with high sphericity.	SP		1095.59	
55		SSS	4-15 30-34	100	Light brown, fine to medium SAND, trace coarse Sand, poorly graded, WET. Sand is well rounded with high sphericity. Trace fine Gravel 54-54.5' bgl.	SP		1091.09	
60		SSS	3-9 18-19	100	Light brown SILT, some fine Sand, soft, WET.	ML		1088.09	
65		SSS	12-15 17-23	100	Light brown, fine to medium SAND, some Silt, trace fine Gravel to coarse Sand, WET. Sand is well rounded with high sphericity.	SM		1085.59	
70		SSS	5-11 16-23	90	Light brown, fine to medium SAND, trace to little Silt, poorly graded, WET. Sand is well rounded with high sphericity.	SP		1082.29	
75		SSS	10-12 22-27	100	Light brown SILT, some fine Sand, soft, WET.	ML		1080.59	
80		SSS	17-34 50 (5")	70	Light brown, medium to coarse SAND, little fine and very coarse Sand, trace fine Gravel, well graded, WET. 1" seam of fine to medium Gravel at 71' bgl.	SW		1075.59	
85		SSS	1-2 17-42	60	Light brown, fine to medium SAND, trace coarse Sand, poorly graded, WET. Sand is well rounded with high sphericity.	SP		1073.09 1072.59	
90		SSS	0-5 8-13	90	Light brown, medium to coarse SAND, little fine Gravel, well graded, WET. Sand is well rounded with high sphericity; grades into more Gravel (some); Clay clast (2 cm diam.) at 75.5' bgl.	SW/GW SP	Driller felt change @ 78' bgl.	1070.09	
		SSS	17-34 50 (5")	70	Light brown, fine to medium SAND, poorly graded, WET. Sand is well rounded with high sphericity.	ML	Driller feels sand @ 83' bgl. ~1' heave.	1065.09	
		SSS	1-2 17-42	60	Light brown, medium to coarse SAND, trace fine Sand, trace fine Gravel, well graded, WET. Sand is well rounded with high sphericity. 1" seam of, SILT, some fine Sand at 86' bgl.	SW	~2' heave	1060.59	
		SSS	0-5 8-13	90	Light brown, medium to coarse SAND, trace fine Sand, poorly to moderately graded, WET. Sand is well rounded with high sphericity.	SP			



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BORING NO. **MW-1041** SHEET **3 OF 3**  
 PROJECT **GSWA: Spring Hill Camp Phase III**  
 LOCATION **Osceola Township, MI**  
 PROJECT NO. **4065-005**  
 LOGGED BY **Larry Jordan**

COORDINATES **N 228,238.9 E 19,442,631.1**  
 SURFACE ELEVATION **1148.09** DATUM **USGS**

SAMPLE INFORMATION					DESCRIPTION	USCS	Strata	REMARKS	Elevation Feet
Depth feet	Lab Sample	Sample Type	Blow Counts	Recovery %					
95		SSS	7-10 16-20	90	Light brown, medium to coarse SAND, trace fine Sand, poorly to moderately graded, WET. Sand is well rounded with high sphericity. (continued)	SP			
					Light brown to gray SILT, some fine Sand, WET.	ML		Driller feels change @98' bgl.	1050.59
100		SSS	4-11 20-32	75	Gray, CLAY, little Silt, hard, laminated with occasional Silt lenses, MOIST.	CL		Varved? ~2' heave. Driller feels change	1047.19
					Light brown to grey, fine to medium SAND, some Silt, WET. Sand is well rounded with high sphericity.	SM		106-108', and @ 113'.	1045.59
105		SSS	7-11 20-27	90					
					Light brown to grey SILT, some fine Sand, little to some Clay, soft, low plasticity, MOIST to WET.	ML			1040.59
110		SSS	10-28 30-30 (3")	100					
					Light brown, medium SAND to medium GRAVEL, well graded, WET. Sand is rounded with high sphericity. Gravel is angular to sub-angular, coarsens downward. ~4 (~3mm thick) Clay clasts (till balls?).	SW		Driller notes change at 113' bgl. ~2' heave	1035.59
115		SSS	0-0 4-4	50					
					Light brown, fine to coarse SAND, trace fine to medium Gravel, well graded, WET. Sand is well rounded with high sphericity.	SW			1030.59
120		SSS	5-14 30-33 (3")	10					
					Light brown, fine to medium SAND, trace coarse Sand, poorly graded, WET. Sand is well rounded with high sphericity.	SP		~2' heave	1025.59
125		SSS	5-9 20-25	50					
					Light brown, medium to coarse SAND, trace fine Sand, trace fine Gravel, well graded, WET. Sand is well rounded with high sphericity.	SW			1023.09
					Light brown, medium to coarse SAND, trace fine Sand, poorly to moderately graded, WET. Sand is sub-rounded to rounded with low to high sphericity. Coarse Sand to fine Gravel seam (~1") @ 131'.	SP		~4' heave	1020.59
130								End of boring - 130' bgs.	1018.09



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BORING NO. **MW-105D** SHEET **1** OF **4**  
 PROJECT **GSWA: Spring Hill Camp Phase III**  
 LOCATION **Osceola Township, MI**  
 PROJECT NO. **4065-005**  
 LOGGED BY **Bobbi McClead**

COORDINATES **N 229,025.3 E 19,443,869.6**  
 SURFACE ELEVATION **1165.02** 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 %					
					Dark brown, fine to medium SAND, some Silt, trace Roots, and MOIST. Sand is well rounded and spherical.	SM		No samples taken during MW-105D drilling. Lithology and sample information based on MW-105L boring log.	1165.02
5		SSS	1-1 2-2	90	Light brown to tan, fine SAND, poorly graded, MOIST. Sand is rounded and spherical.	SP			1160.77
					Light brown to gray SILT, some fine Sand, MOIST.	ML			1160.27
					Light brown, medium to coarse SAND, little very coarse Sand, trace fine Sand, well graded, MOIST. Fine to coarse sand is well rounded and spherical. Very coarse sand is sub-angular.	SW			1159.52
10		SSS	7-13 13-17	100	Brown, fine to very fine SAND, some Silt, little fine to medium Gravel, MOIST. Seam of Silty, CLAY @10.7 (~2"). Gravel is sub-angular. Sand is rounded and spherical.	SM			1157.52
15		SSS	2-3 6-7	100	Tan to light brown, medium to coarse SAND, trace very coarse Sand, poorly graded, and MOIST. Lense of brown Clay @15.75' (~2" thick). Sand is rounded and spherical.	SP			1152.52
20		SSS	5-6 8-6	100	Tan to light brown, medium to coarse SAND, trace very coarse Sand, moderately graded, trace reddish brown laminations. Sand is rounded and spherical.	SW			1147.52
25		SSS	6-11 13-9	60	Light brown, fine to very fine SAND, trace very coarse Sand, trace Silt, moderately graded, MOIST.	SW			1142.52
30		SSS	0-0 40 (3")	10	Light brown, fine to medium SAND, some coarse Sand, trace fine Gravel, well graded, MOIST. Sand is rounded and spherical. Gravel is sub-angular.	SW		Driller feels gravelly material @28' bgl.	1137.52
35		SSS	8-12 15-20	100	Tan, medium SAND, trace coarse Sand, trace Silt laminations, well graded, MOIST. Coarse sand is sub-angular. Medium sand is well rounded and highly spherical.	SW			1132.52
			8-13		Tan, medium SAND, trace coarse Sand, poorly graded, MOIST. Coarse sand is sub-angular. Medium Sand is highly spherical.	SP			1127.52





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BORING NO. **MW-105D** SHEET **3 OF 4**  
 PROJECT **GSA: Spring Hill Camp Phase III**  
 LOCATION **Osceola Township, MI**  
 PROJECT NO. **4065-005**  
 LOGGED BY **Bobbi McClead**

COORDINATES **N 229,025.3 E 19,443,869.6**  
 SURFACE ELEVATION **1165.02** DATUM **USGS**

SAMPLE INFORMATION					DESCRIPTION	USCS	Strata	REMARKS	Elevation Feet
Depth feet	Lab Sample	Sample Type	Blow Counts	Recovery %					
95		SSS	3-8 13-17	70	spherical. Light brown, medium to coarse SAND, little very coarse Sand, trace fine Sand, moderately graded, WET. Sand is rounded and moderately spherical, (continued)	SP-SW			1067.52
100		SSS	11-29 40 (4")	70	Light brown, medium to coarse SAND, some fine Sand, little Silt, moderately graded, WET. Sand is rounded and spherical. Light brown SILT, some fine to very fine Sand, WET.	SP-SW ML			1065.02
105		SSS	10-17 17-29	100	Light brown, fine to medium SAND, trace coarse Sand, poorly graded, WET. Two inch seam of brown SILT, some fine Sand, little Clay @105.75' bgl. Fine to medium sand is rounded and moderately spherical. Coarse sand is sub-rounded.	SP			1062.52
110		SSS	7-16 30-30 (5")	90	Light brown, fine to medium SAND, trace coarse Sand, poorly graded, WET. Fine to medium sand is rounded and spherical. Coarse sand is sub-rounded. Sands are ~50-70% Quartz.	SP		1057.52	
115		SSS	7-14 25-30 (3")	60	Light brown, fine to medium SAND, trace coarse Sand, poorly graded, WET. Fine to medium sand is rounded and spherical. Coarse sand is sub-angular. Sands are ~50-70% Quartz.	SP		1052.52	
120		SSS	8-15 25-30 (4")	50	Light brown, fine to medium SAND, trace coarse Sand, poorly graded, WET. Fine to medium Sand is sub-rounded to rounded and moderately spherical. Coarse sand is sub-angular. Sands are ~50-70% Quartz.	SP		Drilling easier at 118' bgl.	1047.52
125		SSS	0-9 21-22	60	Light brown, medium to coarse SAND, trace coarse Sand, poorly graded, WET. Sand and gravel are sub-angular to sub-rounded.	SP		1044.52	
130		SSS	2-5 7-10	50	Light brown, fine to medium SAND, trace coarse Sand, poorly graded, WET. Fine to medium Sand is rounded and spherical. Coarse sand is sub-rounded.	SP		1042.52	
135		SSS	1-8 8-14	60	Light brown, medium to coarse SAND, trace to little very coarse Sand, poorly graded, WET, 1" seam of fine Gravel, sub-angular to sub-rounded @126' bgl. Fine to medium sand is rounded and spherical. Very coarse sand is sub-rounded.	SP		1040.02	
140		SSS	2-11 14-20	100	Light brown, medium to coarse SAND, trace fine Sand, poorly graded, WET. Sand is rounded and highly spherical.	SP		1037.52	
145		SSS	0-3 11-22	80	Light brown SILT, some fine Sand, soft, WET.	ML		1032.52	
		SSS	1-8 8-14	60	Light brown, fine to medium SAND, trace coarse Sand, poorly graded, WET. Sand is rounded and spherical.	SP		1030.02	
		SSS	2-11 14-20	100	Light brown, fine to medium SAND, trace coarse Sand, poorly graded, and WET. Two inch seam of brown SILT, some very fine Sand @140'. Fine to medium Sand is rounded and spherical. Coarse sand is sub-rounded.	SP	1027.52		
		SSS	0-3 11-22	80	Light brown, fine to medium SAND, trace coarse Sand, poorly graded, and WET. One inch seam of coarse to very coarse Sand @145.8' bgl. Fine to medium sand is rounded and spherical. Coarse sand is sub-rounded.	SP	~1.5' heave	1022.52	



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BORING NO. **MW-105D** SHEET **4 OF 4**  
 PROJECT **GSWA: Spring Hill Camp Phase III**  
 LOCATION **Osceola Township, MI**  
 PROJECT NO. **4065-005**  
 LOGGED BY **Bobbi McClead**

COORDINATES **N 229,025.3 E 19,443,869.6**  
 SURFACE ELEVATION **1165.02** DATUM **USGS**

SAMPLE INFORMATION					DESCRIPTION	USCS	Strata	REMARKS	Elevation Feet
Depth feet	Lab Sample	Sample Type	Blow Counts	Recovery %					
150		SSS	0-0 13-30	70	Light brown, fine to medium SAND, trace coarse to very coarse Sand, poorly graded, WET. Fine to medium sand is rounded and spherical. Very coarse sand is sub-angular.	SP		~1.5' heave	1017.52
						SP			
155		SSS	0-0 14-30	100	Light brown, fine to medium SAND, trace coarse Sand, poorly graded, and WET. Fine to medium sand is rounded and spherical. Coarse sand is sub-angular.	SP		~1.5' heave	1012.52
160		SSS	0-0 3-12	100	Light brown, fine to medium SAND, trace to little coarse Sand, poorly graded, WET. Fine to medium sand is rounded and spherical. Coarse sand is sub-angular.	SP			1007.52
165					Light brown, fine to medium SAND, trace to little coarse Sand, poorly graded, WET. Coarse sand is sub-rounded.	SP			1002.52
								End of boring - 165' bgl	1000.02



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BORING NO. **MW-105L** SHEET **1** OF **6**  
 PROJECT **GSWA: Spring Hill Camp Phase III**  
 LOCATION **Osceola Township, MI**  
 PROJECT NO. **4065-005**  
 LOGGED BY **Mike Brennan**

COORDINATES **N 229,026.0 E 19,443,861.7**  
 SURFACE ELEVATION **1165.06** DATUM **USGS**

DRILLING CONTRACTOR  
**Stearns**  
 DRILLING METHOD EQUIPMENT  
**4 1/4" HSA CME 1050**  
 DRILLING STARTED ENDED  
**11/7/00 11/8/00**

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 %					
					Dark brown, fine to medium SAND, some Silt, trace Roots, and MOIST. Sand is well rounded and spherical.	SM			1165.06
5		SSS	1-1 2-2	90	Light brown to tan, fine SAND, poorly graded, MOIST. Sand is rounded and spherical.	SP			1160.81
					Light brown to gray SILT, some fine Sand, MOIST.	ML			1160.31
					Light brown, medium to coarse SAND, little very coarse Sand, trace fine Sand, well graded, MOIST. Fine to coarse sand is well rounded and spherical. Very coarse sand is sub-angular.	SW			1159.56
10		SSS	7-13 13-17	100	Brown, fine to very fine SAND, some Silt, little fine to medium Gravel, MOIST. Seam of Silty, CLAY @10.7 (~2"). Gravel is sub-angular. Sand is rounded and spherical.	SM			1157.56
15		SSS	2-3 6-7	100	Tan to light brown, medium to coarse SAND, trace very coarse Sand, poorly graded, and MOIST. Lense of brown Clay @15.75' (~2" thick). Sand is rounded and spherical.	SP			1152.56
20		SSS	5-6 8-6	100	Tan to light brown, medium to coarse SAND, trace very coarse Sand, moderately graded, trace reddish brown laminations. Sand is rounded and spherical.	SW			1147.56
25		SSS	6-11 13-9	60	Light brown, fine to very fine SAND, trace very coarse Sand, trace Silt, moderately graded, MOIST.	SW			1142.56
30		SSS	0-0 40 (3")	10	Light brown, fine to medium SAND, some coarse Sand, trace fine Gravel, well graded, MOIST. Sand is rounded and spherical. Gravel is sub-angular.	SW		Driller feels gravelly material @28' bgl.	1137.56
35		SSS	8-12 15-20	100	Tan, medium SAND, trace coarse Sand, trace Silt laminations, well graded, MOIST. Coarse sand is sub-angular. Medium sand is well rounded and highly spherical.	SW			1132.56
			8-13		Tan, medium SAND, trace coarse Sand, poorly graded, MOIST. Coarse sand is sub-angular. Medium Sand is highly spherical.	SP			1127.56







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BORING NO. **MW-105L** SHEET **3 OF 6**  
 PROJECT **GSWA: Spring Hill Camp Phase III**  
 LOCATION **Osceola Township, MI**  
 PROJECT NO. **4065-005**  
 LOGGED BY **Mike Brennan**

COORDINATES **N 229,026.0 E 19,443,861.7**  
 SURFACE ELEVATION **1165.06** DATUM **USGS**

SAMPLE INFORMATION					DESCRIPTION	USCS	Strata	REMARKS	Elevation Feet
Depth feet	Lab Sample	Sample Type	Blow Counts	Recovery %					
95		SSS	3-8 13-17	70	spherical. Light brown, medium to coarse SAND, little very coarse Sand, trace fine Sand, moderately graded, WET. Sand is rounded and moderately spherical, (continued)	SP-SW			1067.56
100		SSS	11-29 40 (4")	70	Light brown, medium to coarse SAND, some fine Sand, little Silt, moderately graded, WET. Sand is rounded and spherical. Light brown SILT, some fine to very fine Sand, WET.	SP-SW ML			1065.06
105		SSS	10-17 17-29	100	Light brown, fine to medium SAND, trace coarse Sand, poorly graded, WET. Two inch seam of brown SILT, some fine Sand, little Clay @105.75' bgl. Fine to medium sand is rounded and moderately spherical. Coarse sand is sub-rounded.	SP			1062.56
110		SSS	7-16 30-30 (5")	90	Light brown, fine to medium SAND, trace coarse Sand, poorly graded, WET. Fine to medium sand is rounded and spherical. Coarse sand is sub-rounded. Sands are ~50-70% Quartz.	SP		1057.56	
115		SSS	7-14 25-30 (3")	60	Light brown, fine to medium SAND, trace coarse Sand, poorly graded, WET. Fine to medium sand is rounded and spherical. Coarse sand is sub-angular. Sands are ~50-70% Quartz.	SP		1052.56	
120		SSS	8-15 25-30 (4")	50	Light brown, fine to medium SAND, trace coarse Sand, poorly graded, WET. Fine to medium Sand is sub-rounded to rounded and moderately spherical. Coarse sand is sub-angular. Sands are ~50-70% Quartz.	SP		Drilling easier at 118' bgl.	1047.56
125		SSS	0-9 21-22	60	Light brown, medium to coarse SAND, trace coarse Sand, poorly graded, WET. Sand and gravel are sub-angular to sub-rounded.	SP		1044.56	
130		SSS	2-5 7-10	50	Light brown, fine to medium SAND, trace coarse Sand, poorly graded, WET. Fine to medium Sand is rounded and spherical. Coarse sand is sub-rounded.	SP		1042.56	
135		SSS	1-8 8-14	60	Light brown, medium to coarse SAND, trace to little very coarse Sand, poorly graded, WET, 1" seam of fine Gravel, sub-angular to sub-rounded @126' bgl. Fine to medium sand is rounded and spherical. Very coarse sand is sub-rounded.	SP		1040.06	
140		SSS	2-11 14-20	100	Light brown, medium to coarse SAND, trace fine Sand, poorly graded, WET. Sand is rounded and highly spherical.	SP		1037.56	
145		SSS	0-3 11-22	80	Light brown SILT, some fine Sand, soft, WET.	ML			1032.56
		SSS	1-8 8-14	60	Light brown, fine to medium SAND, trace coarse Sand, poorly graded, WET. Sand is rounded and spherical.	SP			1030.06
		SSS	2-11 14-20	100	Light brown, fine to medium SAND, trace coarse Sand, poorly graded, and WET. Two inch seam of brown SILT, some very fine Sand @140'. Fine to medium Sand is rounded and spherical. Coarse sand is sub-rounded.	SP		1027.56	
		SSS	0-3 11-22	80	Light brown, fine to medium SAND, trace coarse Sand, poorly graded, and WET. One inch seam of coarse to very coarse Sand @145.8' bgl. Fine to medium sand is rounded and spherical. Coarse sand is sub-rounded.	SP	~1.5' heave	1022.56	



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BORING NO. **MW-105L** SHEET **4 OF 6**  
 PROJECT **GSWA: Spring Hill Camp Phase III**  
 LOCATION **Osceola Township, MI**  
 PROJECT NO. **4065-005**  
 LOGGED BY **Mike Brennan**

COORDINATES **N 229,026.0 E 19,443,861.7**  
 SURFACE ELEVATION **1165.06** DATUM **USGS**

SAMPLE INFORMATION					DESCRIPTION	USCS	Strata	REMARKS	Elevation Feet
Depth feet	Lab Sample	Sample Type	Blow Counts	Recovery %					
150		SSS	0-0 13-30	70	Light brown, fine to medium SAND, trace coarse to very coarse Sand, poorly graded, WET. Fine to medium sand is rounded and spherical. Very coarse sand is sub-angular.	SP		~1.5' heave	1017.56
155		SSS	0-0 14-30	100	Light brown, fine to medium SAND, trace coarse Sand, poorly graded, and WET. Fine to medium sand is rounded and spherical. Coarse sand is sub-angular.	SP		~1.5' heave	1012.56
160		SSS	0-0 3-12	100	Light brown, fine to medium SAND, trace to little coarse Sand, poorly graded, WET. Fine to medium sand is rounded and spherical. Coarse sand is sub-angular.	SP			1007.56
165		SSS	5-18 20 (5")	80	Light brown, fine to medium SAND, trace to little coarse Sand, poorly graded, WET. Coarse sand is sub-rounded.	SP			1002.56
170		SSS	1-0 2-5	60	Light brown SILT, some fine Sand, soft, WET. Trace laminations of gray Silt. Gray SILT, trace Clay, medium stiff, non-plastic, laminated. Laminations are varve like sequences (dark and light laminae).	ML ML		Driller feels clay @167'. ~1.5' heave.	999.56 997.56
175		SSS	4-8 10-20	90	Light brown, medium to coarse SAND, little coarse Sand and fine Gravel, little fine Sand, well graded, WET. Fine to medium sand is rounded and spherical. Gravel is sub-rounded. Sand is rounded and spherical.	SW SP			995.06 992.56
180		SSS	4-22 40 (5")	50	Light brown to gray SILT, some Clay, soft, WET; interbedded with gray, CLAY, some fine Sand, trace fine Gravel, soft, low plasticity, WET. Silt ~4" thick; Clay 1-2" thick. Gravel is sub-rounded. Light brown to gray SILT, little Clay, soft, WET. At 180': two inch seam of gray, CLAY, some fine Sand, trace fine Gravel, stiff, WET. Gravel is sub-rounded.	ML ML		Harder drilling, possible diamicton. ~1.5' heave	990.76 987.56
185		SSS	4-7 20-30 (4")	70	Light brown, fine to medium SAND, some coarse to very coarse Sand, WET; interbedded with light gray SILT, and CLAY, trace fine Gravel. Sand ~4" seams, Silt and Clay ~2" seams. Fine to medium sand is rounded and spherical. Coarse to very coarse sand is sub-angular.	SP/CL /ML			Easier drilling @183'.
190		SSS	6-12 24-35 (5")	40	Light brown, fine to medium SAND, trace coarse Sand, poorly graded, WET. Sands are rounded, spherical, and ~50-80% Quartz.	SP			977.56
195		SSS	8-17 40 (5")	70	Light brown, medium to coarse SAND, trace to little very coarse Sand, poorly graded, WET. Medium to coarse sand is rounded, spherical, and 50-80% Quartz.. Very coarse sand is sub-angular.	SP		~3' heave	972.56
			3-8		Light brown, fine to medium SAND, trace coarse Sand, poorly graded, WET. Fine to medium sand is rounded, spherical, and 50-80% quartz. Coarse sand is sub-angular.	SP			967.56



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BORING NO. **MW-105L** SHEET **5 OF 6**  
 PROJECT **GSWA: Spring Hill Camp Phase III**  
 LOCATION **Osceola Township, MI**  
 PROJECT NO. **4065-005**  
 LOGGED BY **Mike Brennan**

COORDINATES **N 229,026.0 E 19,443,861.7**  
 SURFACE ELEVATION **1165.06** DATUM **USGS**

SAMPLE INFORMATION					DESCRIPTION	USCS	Strata	REMARKS	Elevation Feet
Depth feet	Lab Sample	Sample Type	Blow Counts	Recovery %					
		SSS	35-30 (3")	30	Light brown, fine to medium SAND, little coarse Sand, poorly graded, WET. Fine to medium sand is rounded, moderately spherical, and ~50-80% quartz. Coarse sand is sub-angular to sub-rounded.	SP		~2' heave	962.56
205		SSS	11-10 21-30 (3")	90			SP		~2' heave
210		SSS	3-8 16-30 (3")	50	Light brown, fine to medium SAND, trace to little coarse Sand, poorly graded, WET. Fine to medium sand is rounded, moderately spherical, and ~50-80% quartz. Coarse sand is sub-rounded to rounded.	SP			
215		SSS	7-13 28-30 (4")	90	Light brown to gray SILT , some very fine Sand, trace Clay, soft, non-plastic, WET.	ML		Harder drilling @217'.	950.81
220		SSS	2-9 31-30 (3")	80	Light brown to gray SILT , some very fine Sand, trace Clay, soft, laminated, WET. Lamination occurs as ~2" thick seam of light brown to gray SILT (lighter), and Clay (darker), stiff.	ML		Varved	948.06
225		SSS	1-3 3-7	40	Light brown to gray SILT , little to some Clay and fine Sand, soft, WET.	ML		Harder drilling @223'.	942.06
230		SSS	3-5 4-13	90	Light brown, fine to medium SAND, trace coarse Sand, poorly graded, WET. Fine to medium sand is rounded, moderately spherical, and ~50-80% Quartz. Coarse sand is sub-rounded.	SP			940.06
235		SSS	3-2 5-13	70	Light brown to gray SILT , some very fine Sand, soft, laminated, WET; interbedded with light brown, fine to medium SAND, trace coarse Sand, poorly graded, WET. Silt seams ~1" thick, sand seams ~4" thick. ~1" diameter Clast of gray SILT , some Clay @230.5'. Fine to medium sand is rounded with moderate sphericity. Coarse sand is sub-rounded.	ML/SP		~2' heave	935.06
240		SSS	7-18 30 (5")	25	Light brown, fine to medium SAND, trace coarse Sand, poorly graded, WET. Occasional Silt laminations. Fine to medium sand is rounded and spherical with ~50-80% quartz. Coarse sand is sub-rounded.	SP		~1' heave	927.56
245		SSS	3-5 17-25	50	Light brown, fine to medium SAND, trace coarse Sand, poorly graded, WET. ~1" seam of gray SILT @245.8'. Fine to medium sand is rounded, moderately spherical, and ~50-80% quartz. Coarse sand is sub-rounded.	SP			922.56
250		SSS	2-2 4-7		Light brown, fine to medium SAND, trace coarse Sand, poorly graded, WET. Fine to medium sand is well rounded, moderately spherical, and ~50-80% quartz. Coarse sand is sub-rounded.	SP		~2' heave	917.56
					Light brown, medium to coarse SAND, little fine Sand, well graded, trace very coarse Sand, WET; interbedded with light brown to gray SILT , some very fine Sand, soft, WET.	SW-ML SM		~1' heave	914.56 912.56



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BORING NO. **MW-105L** SHEET **6 OF 6**  
 PROJECT **GSWA: Spring Hill Camp Phase III**  
 LOCATION **Osceola Township, MI**  
 PROJECT NO. **4065-005**  
 LOGGED BY **Mike Brennan**

COORDINATES **N 229,026.0 E 19,443,861.7**  
 SURFACE ELEVATION **1165.06** DATUM **USGS**

SAMPLE INFORMATION					DESCRIPTION	USCS	Strata	REMARKS	Elevation Feet
Depth feet	Lab Sample	Sample Type	Blow Counts	Recovery %					
255		SSS	0-0 0-0		Sand ~4" seams, Silt ~1" seams. Medium to coarse sand is rounded, and moderately spherical. Very coarse sand is sub-rounded. Light brown, fine to medium SAND, some Silt, trace to little coarse Sand. Sand is sub-angular. (continued) Light brown to gray, fine SAND and, CLAY, trace to little very coarse Sand to fine Gravel, very soft, non-plastic. Gravel is sub-angular. Material becomes stiffer @257'. Light brown to gray, fine to coarse SAND and, CLAY, little Silt, trace to little fine to medium Gravel, very soft, WET. Gravel is sub-angular.	SM SC/CL		Hammer never drove split spoon, very unconsolidated unit? Drove spoon further to get sample (254-257').	910.06 907.56
260		SSS	1-0 0-10	80	Light brown to gray, CLAY, some fine to medium Sand and Silt, trace fine Gravel to very coarse Sand, soft, low plasticity, WET; interbedded with light brown to gray, SILT, some fine Sand, little Clay.	SC/CL			902.56
265		SSS	0-0 28-25	60	Light brown, medium to coarse SAND, some fine Sand, little very coarse Sand to fine Gravel. Gravel is sub-rounded.	SP CL			899.36 899.26
270		SSS	4-13 28-28	80	Light brown to gray, CLAY, some fine to medium Sand, little Silt, trace to little fine to medium Gravel, stiff, DRY. Gravel is sub-rounded. Light brown, fine to coarse SAND, little Silt, trace Clay, WET. Sand is rounded, spherical, and 80-90% quartz. Clay occurs as gravel size clasts. Grayish brown, very fine to medium SAND, some Silt, WET. Sand is rounded, spherical, and 80-90% quartz.	SW SM		11-8 Phil Odenkirk took over logging @269' through well construction. End of boring - 271' bgl.	897.56 895.76 894.06



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BORING NO. **MW-105S** SHEET **1** OF **2**  
 PROJECT **GSWA: Spring Hill Camp Phase III**  
 LOCATION **Osceola Township, MI**  
 PROJECT NO. **4065-005**  
 LOGGED BY **Bobbi McClead**

COORDINATES **N 229,024.5 E 19,443,879.9**

SURFACE ELEVATION **1164.53** DATUM **USGS**

DRILLING CONTRACTOR  
**Stearns**  
 DRILLING METHOD EQUIPMENT  
**4 1/4" HSA CME 1050**  
 DRILLING STARTED ENDED  
**11/20/00 11/20/00**

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 %					
					Dark brown, fine to medium SAND, some Silt, trace Roots, and MOIST. Sand is well rounded and spherical.	SM		No samples taken during MW-105S drilling. Lithology and sample information based on MW-105L boring log.	1164.53
5		SSS	1-1 2-2	90	Light brown to tan, fine SAND, poorly graded, MOIST. Sand is rounded and spherical.	SP			1160.28
					Light brown to gray SILT, some fine Sand, MOIST.	ML			1159.78
					Light brown, medium to coarse SAND, little very coarse Sand, trace fine Sand, well graded, MOIST. Fine to coarse sand is well rounded and spherical. Very coarse sand is sub-angular.	SW			1159.03
10		SSS	7-13 13-17	100	Brown, fine to very fine SAND, some Silt, little fine to medium Gravel, MOIST. Seam of Silty, CLAY @10.7 (~2"). Gravel is sub-angular. Sand is rounded and spherical.	SM			1157.03
15		SSS	2-3 6-7	100	Tan to light brown, medium to coarse SAND, trace very coarse Sand, poorly graded, and MOIST. Lense of brown Clay @15.75' (~2" thick). Sand is rounded and spherical.	SP			1152.03
20		SSS	5-6 8-6	100	Tan to light brown, medium to coarse SAND, trace very coarse Sand, moderately graded, trace reddish brown laminations. Sand is rounded and spherical.	SW			1147.03
25		SSS	6-11 13-9	60	Light brown, fine to very fine SAND, trace very coarse Sand, trace Silt, moderately graded, MOIST.	SW			1142.03
30		SSS	0-0 40 (3")	10	Light brown, fine to medium SAND, some coarse Sand, trace fine Gravel, well graded, MOIST. Sand is rounded and spherical. Gravel is sub-angular.	SW		Driller feels gravelly material @28' bgl.	1137.03
35		SSS	8-12 15-20	100	Tan, medium SAND, trace coarse Sand, trace Silt laminations, well graded, MOIST. Coarse sand is sub-angular. Medium sand is well rounded and highly spherical.	SW			1132.03
			8-13		Tan, medium SAND, trace coarse Sand, poorly graded, MOIST. Coarse sand is sub-angular. Medium Sand is highly spherical.	SP			1127.03



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BORING NO. **MW-105S** SHEET **2 OF 2**  
 PROJECT **GSWA: Spring Hill Camp Phase III**  
 LOCATION **Osceola Township, MI**  
 PROJECT NO. **4065-005**  
 LOGGED BY **Bobbi McClead**

COORDINATES **N 229,024.5 E 19,443,879.9**  
 SURFACE ELEVATION **1164.53** DATUM **USGS**

SAMPLE INFORMATION					DESCRIPTION	USCS	Strata	REMARKS	Elevation Feet	
Depth feet	Lab Sample	Sample Type	Blow Counts	Recovery %						
		SSS	15-22	100	Tan to light brown, medium to coarse SAND, trace fine Sand, poorly graded, trace (<1 cm) laminations black in color, MOIST. Sand is rounded and spherical.	SP		Manganese staining?	1122.03	
45		SSS	7-16 17-23	100						
		SSS	5-11 15-23	100		Tan to light brown, medium to coarse SAND, trace fine Sand, poorly graded, trace laminations (<2 cm thickness) of Silt, WET @50' bgl. Sand is rounded and spherical.		SP	Saturated @50'	1117.03
50		SSS	9-13 13-17	100						
		SSS	7-9 13-18	50		Light brown, fine to medium SAND, trace coarse Sand, poorly graded, WET. Fine to medium Sand is rounded and spherical. Coarse sand is sub-rounded.		SP		1112.03
55		SSS								
60		SSS			Light brown, fine to medium SAND, trace very fine Sand, poorly graded, WET. Sand is rounded and moderately spherical.	SP		1102.03		
65							End of boring - 65' bgl	1099.53		



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BORING NO. **MW-106D** SHEET **1 OF 5**  
 PROJECT **GSWA: Spring Hill Camp Phase III**  
 LOCATION **Osceola Township, MI**  
 PROJECT NO. **4065-005**  
 LOGGED BY **GF/PO**

COORDINATES **N 229,936.2 E 19,442,633.1**

SURFACE ELEVATION **1183.75** DATUM **USGS**

DRILLING CONTRACTOR  
**Stearns**  
 DRILLING METHOD EQUIPMENT  
**4 1/4" HSA CME 95**  
 DRILLING STARTED ENDED  
**11/2/00 11/7/00**

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	4-4 4-6	10	Light brown to brown, fine to medium SAND, some Silt, trace coarse Sand, poorly graded.	SM		Drillers indicate cobbles.	1183.75
5		SSS	5-6 6-8	100	Brown Silty, CLAY, some fine to medium Sand, trace coarse Sand, stiff, low plasticity, massive, MOIST. Sand is matrix supported.	CL-ML		Elevation of change in lithology indicated by drillers.	1180.75
10		SSS	1-2 2-4	100	Gray, Silty, CLAY, some fine to coarse Sand, some fine Gravel, medium stiff, low plasticity, massive, MOIST. Sand is matrix supported.	CL-ML		Elevation of change in lithology indicated by drillers.	1176.25
15		SSS	5-7 16-8	100	Brown, fine to medium SAND, some Silt, some Clay, trace coarse Sand, medium dense, MOIST TO WET.	SC		Elevation of change in lithology indicated by drillers.	1171.25
		SSS	5-7 16-8	100	Brown, fine to medium SAND, some Silt, some Clay, trace coarse Sand, medium dense, MOIST.	SC			1168.75
20		SSS	---	0	Light brown, fine to medium SAND, trace to some coarse Sand, trace fine Gravel, loose, well graded, massive, DRY. Fine to med. sand is well rounded with moderate sphericity and ~70-80% quartz.	SW		No recovery in 19-21' split spoon sample. Rock in tip of spoon.	1163.75
25		SSS	5-9 10-11	100					
30		SSS	14-20 37-25	100	Light brown, fine SAND, some medium Sand, trace coarse Sand, trace fine Gravel, loose, poorly graded, massive, DRY. Fine sand is well rounded with moderate sphericity, and ~70-80% quartz. Coarse fraction is sub-rounded with low sphericity and ~10% quartz.	SP			1156.25
35		SSS	21-34 60 for 5'--	100	Light brown, fine SAND, some medium Sand, trace coarse Sand, trace fine Gravel, loose, poorly graded, massive, DRY. Fine to medium sand is well rounded with moderate sphericity and ~70-80% quartz. Coarse fraction is sub-rounded with low sphericity and ~10% quartz.	SP			1151.25
			9-20		Light brown, fine to medium SAND, trace to some coarse Sand, trace fine Gravel, loose, well graded, massive, DRY. Fine to medium sand is well rounded with moderate	SW			1146.25