

SOILS INVESTIGATION
PROPOSED MULTI-FAMILY MIXED-USE DEVELOPMENT
FORMER NORTHVILLE DOWNS SITE
301 S. CENTER STREET
NORTHVILLE, MICHIGAN

HUNTER PASTEUR HOMES
C/O FRANKLIN PROPERTY CORPORATION
300 S. WOODWARD AVENUE
BIRMINGHAM, MICHIGAN 48009

MARCH 16, 2018
BY
McDOWELL & ASSOCIATES

McDowell & Associates

Geotechnical, Environmental & Hydrogeological Services • Materials Testing & Inspection

21355 Hatcher Avenue, Ferndale, MI 48220
Phone: (248) 399-2066 • Fax: (248) 399-2157
www.mcdowasc.com

March 16, 2018

Hunter Pasteur Homes
c/o Franklin Property Corporation
300 S. Woodward Avenue
Birmingham, Michigan 48009

Job No. 18-053

Attention: Mr. Randy Wertheimer

Subject: Soils Investigation
Proposed Multi-Family Mixed-Use Development
Former Northville Downs Site
301 S. Center Street
Northville, Michigan

Gentlemen:

In accordance with your request, we have made a Soils Investigation on the subject project.

Twenty-three (23) Soil Test Borings, designated as 1 through 23, were performed at or near the locations you required. Boring 3 was moved due to a large snow pile at the planned location. Offset information is noted on the log of this boring. The approximate locations of the borings are shown on the Soil Boring Location Plan which accompanies this report. The borings were advanced to a depth of about twenty feet (20') below the existing ground surface at the boring locations.

Soil descriptions, groundwater observations and the results of field and laboratory tests are to be found on the accompanying Logs of Soil Test Borings and summary sheet of Sieve Analysis results.

Most of the borings encountered shallow fill soils to relatively deep fill soils. Shallow fills of six feet (6') or less were encountered in Borings 1, 2, 4, 5, 7, 12, 13, 16 through 19, 21 and 22. Specifically, these borings encountered one foot (1') to six feet (6') of fill soils consisting of asphalt pavement, surficial topsoil, buried topsoil, gray crushed stone, slightly compact to extremely compact brown, discolored brown, dark brown and black fine sand to sand and gravel and soft to very stiff brown, discolored brown and blue silty clay to sandy clay, followed by native soils composed of compact to extremely compact brown to gray silty fine sand to sand and gravel and stiff to extremely stiff brown to blue silty clay. Relatively deep fill soils were found

Mid-Michigan Office

3730 James Savage Road, Midland, MI 48642
Phone: (989) 496-3610 • Fax: (989) 496-3190

in Borings 3, 6, 8, 9, 10, 11, 14, 20 and 23. These borings encountered six feet four inches (6'4") to fourteen feet (14') of fill soils consisting of asphalt pavement, surficial topsoil, buried topsoil, slightly compact to extremely compact brown, discolored brown and dark brown clayey fine sand to sand and gravel and soft to stiff brown, discolored brown and blue silty clay to sandy clay, followed by compact to extremely compact brown to gray fine sand to sand and gravel and firm to very stiff brown to blue silty clay. Boring 15 encountered ten feet eight inches (10'8") of fill soils composed of surficial topsoil, buried topsoil, slightly compact to compact brown and discolored brown clayey fine sand to sand and gravel and firm to stiff brown and dark brown silty clay to sandy clay, one foot eight inches (1'8") of highly organic marl, followed by compact to very compact gray sand to sand and gravel. Two-inch (2") to six-inch (6") thick asphalt pavement was found at Borings 1, 6, 7, 8 through 11, 16 through 19 and 21. Gray crushed stone was found in Boring 4 between the depths of two inches (2") and seven inches (7"). Buried topsoil was found in Boring 2 between the depths of three inches (3") and one foot (1'), in Boring 6 between the depths of eight inches (8") and two feet four inches (2'4"), in Boring 7 between the depths of one foot five inches (1'5") and two feet eight inches (2'8"), in Boring 9 between the depths of five inches (5") and four feet (4'), in Boring 10 between the depths of three feet two inches (3'2") and three feet four inches (3'4"), in Boring 16 between the depths of ten inches (10") and two feet eight inches (2'8"), in Boring 17 between the depths of eleven inches (11") and one foot five inches (1'5"), in Boring 18 between the depths of six inches (6") and one foot eight inches (1'8"), and in Boring 20 between the depths of one foot ten inches (1'10") and two feet six inches (2'6"). Cobbles and boulders were encountered in Boring 1 between the depths of five feet seven inches (5'7") and six feet eight inches (6'8"), in Boring 5 between the depths of five inches (5") and six feet (6'), and in Boring 13 between the depths of six feet (6') and eight feet six inches (8'6"). Our drillers noted an odor in Boring 19 between the depths of six inches (6") and one foot six inches (1'6"). Our drillers described the fill soils at the site as containing varying amounts of concrete, brick, wood, asphalt, slag, topsoil, vegetation, cinders, peat and stones.

Soil descriptions and depths shown on the boring logs are approximate indications of change from one soil type to another and are not intended to represent an area of geological change or stratification. Also, the site is a former horse racing track with various buildings and shows signs of modification which could indicate fill and soil conditions different from those encountered at the boring locations.

Water was encountered in all of the borings except Boring 2 at depths ranging from two feet ten inches (2'10") to seventeen feet (17') below the existing ground surface. Water was measured upon completion of the drilling operation in Borings 1, 3 through 7, 10, 11, 12, 14, 15, 16, 18, 20 and 23 at depths ranging from one foot ten inches (1'10") to seventeen feet (17'). Borings 8, 9, 13, 17, 19, 21 and 22 were found to cave in upon completion at depths ranging from one foot five inches (1'5") to ten feet two inches (10'2"). It appears that artesian conditions were found at Boring 10. No water was encountered in Boring 2. It should be noted that short-term groundwater observations may not provide a reliable indication of the depth of the water table. In clay and highly organic soils, this is due to the slow rate of infiltration of water into the borehole as well as the potential for water to become trapped in overlying layers of granular soils

during periods of heavy rainfall. Water levels in granular soils fluctuate with seasonal and climatic changes, with the amount of rainfall in the area immediately prior to the measurements, as well as any changes in the water levels of nearby Rouge River and Mill Pond Stream. It should be expected that groundwater level fluctuations could occur on a seasonal basis and that seams of water-bearing sands or silts could be found within the various clay strata at the site.

Standard Penetration Tests were made during sampling with an automatic hammer in Borings 1, 4 through 7, 10, 11, 13 and 15 through 21. A conventional drop hammer with rope and cathead was used in the other borings. These tests indicate that the fill soils have variable densities while the underlying native non-organic soils have fair to very good strengths and densities. Tests taken in the fill soils gave results ranging from two (2) blows per foot to sixty-three (63) blows per three inches (3"). Tests taken in the native non-organic soils gave results ranging from four (4) blows per foot to fifty-two (52) blows per six inches (6").

Based on google Earth images of the site, the site contains a horse racing track with grandstands and various buildings. It appears that the stream from the Northville Mill Pond enters a sewer structure near the northeast corner of the site near Beal and River Streets. It is not clear where this sewer outlets. The Rouge River flows along the south edge of the property. It appears the river and stream may have been rerouted in the past, which could explain the buried marl found in Boring 15. Swamps and low lying areas probably existed near these waterways. Surface elevations at the site range from about 808 at the intersection of Center and Cady Streets to about 764 at the water level of Rouge River under the bridge for Seven Mile Road near River Street.

Present plans call for demolishing the existing race track, grandstands and buildings at the site and constructing a multi-family, mixed-use residential development with houses, townhouses and condominium structures. We would anticipate that the new structures will transmit relatively light loads to the supporting soils and basements will be eight feet (8') to ten feet (10') deep.

Based on the project information provided and the results of field and laboratory tests, it is believed that the structures could be supported by conventional spread or strip footings resting on competent non-organic soils or on properly installed and compacted engineered fill. It appears existing fill and marl soils were found in Borings 3, 6, 8 through 11, 14, 15, 20 and 23 down to depths of six feet four inches (6'4") to fourteen feet (14'). It may be more economical to install engineered fill than to install relatively deep conventional footings at these borings. As noted earlier, marl was found at Boring 15. Other swamps and low lying areas may have existed along Mill Stream and Rouge River. Additional borings and/or test pits should be performed at the site to better ascertain if swamp deposits, peat or marl soils exist at other areas at the site. Some dewatering may be needed to facilitate the excavation and installation of footings, especially in the vicinity of Borings 4, 8 through 18, 21 and 22. It appears that installing basements would be extremely difficult in the vicinity of Boring 12, very difficult in the vicinity of Borings 11, 13, 14, 16, 18, 22 and 23, and difficult in the vicinity of Borings 4, 9, 10, 15, 17 and 21 due to the observed groundwater levels in granular soils at these borings. Installing utilities may need dewatering at many areas of the site depending on the depth of these utilities.

If conventional footings for the structures are installed to rest on native- non-organic soils at the site, then all exterior footings should be constructed at or below a minimum frost penetration depth of three feet six inches (3'6") below finished grade. All footings should extend through non-engineered fill soils, soils containing a significant amount of organic substances or excessively weak soils. All strip footings should be continuously reinforced in order to minimize the noticeable effects of differential settlement.

Footings could be proportioned for the design soil pressures listed below provided this results in the footings bearing on native, non-organic soils.

<u>Boring</u>	<u>Depth</u>			<u>Soil Pressure (psf)</u>
1	7'0"	to	12'0"	4,000
2	1'6"	to	12'0"	4,000
3	8'6"	to	12'0"	3,000
4	5'0"	to	12'0"	4,000
5	2'6"	to	12'0"	4,000
6	6'6"	to	8'6"	2,500
	9'0"	to	10'6"	3,000
	11'0"	to	12'0"	2,000
7	3'6"	to	12'0"	4,000
8	13'0"	to	15'0"	4,000
9	6'6"	to	12'0"	4,000
10	7'0"	to	9'6"	2,500
	10'0"	to	12'0"	3,000
11	7'6"	to	12'0"	4,000
12	6'0"	to	12'0"	4,000
13	6'0"	to	8'6"	4,000
	9'0"	to	10'0"	3,000
	10'6"	to	12'0"	2,500

<u>Boring</u>	<u>Depth</u>			<u>Soils Pressure (psf)</u>
14	6'6"	to	7'6"	4,000
	8'0"	to	12'0"	3,500
15	12'6"	to	15'0"	2,500
16	4'0"	to	12'0"	4,000
17	3'6"	to	12'0"	4,000
18	6'0"	to	12'0"	4,000
19	1'6"	to	12'0"	4,000
20	14'0"	to	16'0"	2,500
21	4'6"	to	12'0"	4,000
22	3'6"	to	12'0"	4,000
23	14'0"	to	16'0"	2,000

Higher design soil pressures are available at various depths in some of the borings and could be detailed if desired. The presence of cobbles and boulders in the site soils may hamper the excavations for footings and basements.

It should be noted that footing and basement excavations may be near or below the level at which water was encountered in Borings 4 and 8 through 22. Depending upon the depth of the footings relative to the existing ground surface and the actual conditions at the time of construction, it may be necessary to depress the water table in these locations to allow for footings to be constructed. Water seepage in sand soils over clay or sand seams in clay soils in the vicinity of Borings 19 and 20 should be manageable with construction pumping and sumps. However, this is not known for certain. If large volumes of water or saturated granular soils are encountered, special dewatering techniques may be required. Wet sand and gravel soils were encountered in Borings 4, 8 through 18, 21 and 22. It is sometimes possible to construct strip footings a foot or so below the water table in coarser granular soils using a rapid sequence of excavation and placement of concrete. If this is not possible, it may be necessary to use special dewatering techniques to depress the water table in the vicinity of these borings. It should be noted that possible artesian conditions were found in Boring 10.

Extreme care must be exercised during the dewatering operation if any nearby houses, buildings or utilities are sensitive to settlement. Care must be taken to minimize the removal of soil fines during any pumping operation.

As an alternative to relatively deep footings, house spread or strip footings could be supported on engineered fill in the vicinity of Borings 3, 6, 8 through 11, 14, 15, 20 and 23. All topsoil, buried topsoil, existing non-engineered fill, highly organic soils, soft soils and loose granular soils should be excavated and removed from the proposed building areas. The excavations should extend beyond the edge of the structures' footings one foot (1') for every foot below the footing. Groundwater flow into the excavation will require special dewatering techniques in order to facilitate the excavation of the unsuitable soils, especially in the vicinity of Borings 8 through 11, 14, 15 and 23. Extreme caution should be practiced during the dewatering operation if nearby houses, buildings or utilities or other structures are sensitive to settlement. After the unsuitable soils have been removed, the excavation should be backfilled with compacted bank run sand similar to MDOT Type I or II granular soils. If the bottom of the excavation is not sufficiently stable to install the bank run sand, then a layer of coarse stone fill such as MDOT 6AA could be installed. Geotextile fabric should be placed between the coarse stone engineered fill material and lower native granular soils and upper granular engineered fill materials to minimize the amount of fines infiltrating into the aggregate material. The granular MDOT Type I or II soils should be deposited in horizontal lifts not to exceed nine inches (9") in thickness with each lift being compacted uniformly to a minimum density of 95% of its maximum value as determined by the Modified Proctor Test (AASHTO T-180 or ASTM D-1557). Engineered fill should be placed and compacted up to footing and floor invert elevations.

One-inch (1") to three-inch (3") size crushed stone or crushed concrete could be used in lieu of the MDOT Type 6AA aggregate and bank run sand that we recommended above. The crushed material would need to be placed and compacted in lifts not exceeding nine inches (9") up to about one foot (1') below the planned buildings' footings and floor slabs. About a one-foot (1') thick layer of MDOT 21AA dense aggregate could then be placed above the crushed material in an effort to choke off the stone. The crushed stone or crushed concrete material should not contain significant amounts of brick and should be relatively clean of lime or cement dust which could potentially foul up or clog the drain tiles. We suggest that the brick content should be less than 5% and cement/lime dust should be less than 3%. The large crushed material will need to be separated from the existing site granular soils by a geotextile fabric. We suggest that a Mirafi 500 type fabric or equivalent be placed along the bottom and sides of the engineered fill excavation in an effort to minimize fines from migrating into the voids within the crushed material. It should be noted that the use of crushed concrete could cause problems for basement drains and sump pumps. When water percolates through crushed concrete, the pH of the water can increase and minerals can precipitate out of the solution (mostly calcium salts and in some cases calcium hydroxide). Mineral deposits precipitating from the solution can shorten the life of sump pumps and plug drain tiles. High pH water can also corrode metal piles. See AASHTO M 319-02 for discussion of these problems.

Foundations placed on the engineered fill material can be proportioned for a design soil pressure of three thousand pounds per square foot (3,000 psf) provided the design soil pressure is not limited by the strength of the underlying soils. All exterior footings should be constructed at or below a minimum frost penetration depth of three feet six inches (3'6") below finished grade.

As noted earlier, it appears that excavating and installing basements may be difficult to extremely difficult at many lots in this subdivision. Based on water conditions observed in the borings, it appears installing basements three feet (3') below the existing ground surface at Boring 12 will be extremely difficult. Installing basements three feet (3') to six feet (6') below the existing ground surface will be very difficult at Borings 11, 13, 14, 16, 18, 22 and 23. Installing basements six feet (6') to nine feet (9') below the existing ground surface will be difficult at Borings 4, 9, 10, 15, 17 and 21. It should be noted that possible artesian conditions were found at Boring 10. Excavating and maintaining dry basements below the long-term water table in the vicinity of these borings may be difficult. It is suggested that consideration be given to installing storm sewers at a sufficient depth in the vicinity of these borings so that auxiliary drains could be installed, if necessary, around or between houses to depress the water table. It would be prudent to gravity drain the footing drains to daylight if lot grading permits it. Consideration should also be given to raising the grades for houses in these areas several feet above existing grade to facilitate the installation of basements. Also, raising the basement floors and lowering the brick ledges may be possible.

We typically recommend that basements be kept at least one foot (1') above these long-term groundwater levels and floor levels of nearby Mill Stream and Rouge River. If the basements are constructed in close proximity to the groundwater level or floor plain levels, then it is suggested that a fairly elaborate drainage system be provided. We suggest the following:

1. In order to lessen the possibility of soil fines affecting the perimeter drain system. It is recommended that exterior footing drains would be nominally four-inch (4") diameter slotted or perforated pipe wrapped with a filter sock. These would be embedded in at least four inches (4"), and preferably six inches (6"), of MDOT Specification 2NS sand. The 2NS sand should be extended vertically over the drain to within about one foot (1') to two feet (2') of the final grade. The 2NS sand should be maintained at a width of at least twelve inches (12") measured perpendicular to the walls and footings. The accompanying Figure 1 depicts the recommended minimum cross section requirements for the exterior drains. The accompanying Figure 2 depicts the gradation requirements for MDOT Specification 2NS sand.
2. Interior underfloor drains should be provided and should be nominally four-inch (4") diameter slotted or perforated pipe wrapped with a filter sock. These should be placed at ten-foot (10') to fifteen-foot (15') centers and along the inside of the footing. The drain tiles should be surrounded by about three inches (3") or four inches (4") of clean pea gravel. The pea gravel and wrapped drain tile should be underlain and enclosed by a punched non-woven geotextile fabric such as Mirafi 140 or equivalent. Cleanouts should be provided for the underfloor drains. A good moisture barrier should be placed between the floor slab and pea gravel.
3. Note that under no circumstances are crushed concrete materials allowed since they have a tendency to clog/plug drain tiles and ruin sump pumps.

4. The drain tiles should be pitched downward towards the sumps so that standing water will not collect in the pipes.
5. The interior drain tiles should be connected to a second sump and pump which is capable of operating on backup power in case of power outages.
6. It would be preferable to provide an overflow connection between the two sumps as an additional precaution.

Fill and possible fill soils were encountered in Borings 1 through 14 and 16 through 23. If the possibility of more than normal differential movement can be tolerated, slab-on-grade floors or floor-supporting backfill could be placed at or near the present grade in the vicinity of these borings. All asphalt or concrete pavements should be removed from planned structure areas. Any topsoil or other obviously objectionable material should be removed and the subgrade thoroughly proof-compacted with heavy, rubber-tired equipment. Buried topsoil found in Borings 2, 6, 7, 9, 10, 16, 17, 18 and 20 should be removed in its entirety from planned house or structure locations. If during the proof-compaction operation areas are found where the soils yield excessively, the yielding materials should be scarified, dried and recompacted or removed and replaced with engineered fill as outlined above.

If the possibility of more than normal differential movement cannot be tolerated, then all existing fill material in the vicinity of these borings should be removed and replaced with engineered fill meeting the requirements outlined above or floor slabs should be structurally supported.

Buried marl was found in Boring 15. All marl or highly organic soils should be removed in their entirety from structures, pavements, sidewalks and patio areas and replaced with engineered fill, or these structures, pavements, sidewalks and patio areas should be structurally supported.

If any existing structure foundations, slabs or buried utilities are encountered in planned structure areas, they should be entirely removed. In lawns, sidewalk or pavement areas, any existing structure foundations should be removed to a minimum depth of three feet (3') below finished grade. The resulting excavations should be backfilled with engineered fill meeting the requirements outlined above. If any existing basement floors are found outside of a proposed structure, then they can remain but should be broken up.

Moisture contents greater than 20% were found in shallow soils at Borings 6, 12, 14, 15, 18 and 23. High moistures may tend to make these soils unstable under vehicular loading. During periods of wet weather in the spring and fall, these soils could rut and pump under construction traffic. Undercutting and compacted crushed stone may be required in various areas to stabilize subgrades or entail the complete removal of these soils. Edge drains should be installed in shallow groundwater areas, such as possibly Boring 12.

Odor was noted in Boring 19. Cinders and slag were noted in the fill soils at Borings 9 and 15. This report does not include an environmental assessment of the site.



McDOWELL & ASSOCIATES
 Geotechnical, Environmental, & Hydrogeologic Services
 21355 Hatcher Avenue • Ferndale, MI 48220
 Phone: (248) 399-2066 • Fax: (248) 399-2157

LOG OF SOIL BORING NO. 1

PROJECT Preliminary Soils Investigation

LOCATION Proposed Mixed Use Development
 Former Northville Downs
 301 South Center Street
 Northville, Michigan

JOB NO. 18-053

SURFACE ELEV. _____ DATE 3-9-18

Sample & Type	Depth	Legend	SOIL DESCRIPTION	Penetration Blows for 6"	Moisture %	Natural Wt. P.C.F.	Dry Den Wt. P.C.F.	Unc. Comp. Strength PSF.	Str. %
			0'3" ASPHALT						
	1		Moist brown fine to medium SAND with gravel, occasional stones and clayey sand seams, fill						
A	2		1'8" Stiff moist brown silty CLAY with sand and pebbles, occasional stones, topsoil streaks and occasional gravelly loose sand lenses, fill	3					
UL	3			4	19.9				
	4			5			*	(2500)	
B	5		3'6" Very stiff moist brown silty CLAY with sand and pebbles, sand and gravel seams and stones, fill	3					
UL	6			9	8.0				
	7		5'7" COBBLES & BOULDERS	17					
C	8		6'8" Extremely compact moist brown gravelly SAND with little silt and occasional stones	6					
UL	9			10	6.3	103			
	10		8'6" Extremely stiff moist variegated silty CLAY with sand and pebbles and gravelly sand lenses	5					
D	11		9'6" Extremely stiff moist brown silty CLAY with sand and pebbles	8					
UL	12			14					
	13		11'6" Very stiff moist blue silty CLAY with sand and pebbles						
	14		12'6"						
E	15		17'6" Compact wet gray SAND & GRAVEL	3					
UL	16			5	11.5	142			
	17			6					
	18		Very compact wet gray SAND & GRAVEL						
F	19			3					
UL	20			6					
	21		20'6"	9					
	22								
	23		Notes:						
	24		(1) Used automatic hammer.						
	25		(2) Hit obstruction at 5'7". Three attempts to drill past cobbles and boulders at this depth.						

TYPE OF SAMPLE
 D. - DISTURBED
 U.L. - UNDIST. LINER
 S.T. - SHELBY TUBE
 S.S. - SPLIT SPOON
 R.C. - ROCK CORE
 () - PENETROMETER

REMARKS: *Calibrated Penetrometer

Standard Penetration Test - Driving 2" OD Sampler 1' With
 140# Hammer Falling 30": Count Made at 6" Intervals

GROUND WATER OBSERVATIONS

G.W. ENCOUNTERED AT 12 FT. 2 INS.
 G.W. ENCOUNTERED AT _____ FT. _____ INS.
 G.W. AFTER COMPLETION 7 FT. 6 INS.
 G.W. AFTER _____ HRS. _____ FT. _____ INS.
 G.W. VOLUMES Heavy



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 21355 Hatcher Avenue • Ferndale, MI 48220
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LOG OF SOIL BORING NO. 2

PROJECT Preliminary Soils Investigation
Proposed Mixed Use Development

JOB NO. 18-053

LOCATION Former Northville Downs
301 South Center Street
Northville, Michigan

SURFACE ELEV. _____ DATE 3-9-18

Sample & Type	Depth	Legend	SOIL DESCRIPTION	Penetration Blows for 6"	Moisture %	Natural WL P.C.F.	Dry Den WL P.C.F.	Unc. Comp. Strength PSF.	Str. %
	1		0'3" Moist brown silty SAND with gravel and occasional stones, fill						
	2		1'0" Moist dark brown clayey TOPSOIL						
A	2		2'0" Stiff moist brown silty CLAY	4					
UL	3			13	18.2	112			
	4		Extremely stiff moist brown silty CLAY with trace of pebbles and moist brown silt seams	20			*	(9000+)	
B	5		4'6"	5					
UL	5		Very compact moist brown fine SAND with trace of silt	7	3.1	104			
	6			10					
C	7		6'6"						
UL	7			10					
	8			18	3.3	108			
	9			22					
D	10		Extremely compact moist brown fine SAND with trace of silt						
UL	10			11					
	11			22					
	12			23					
	13								
	14		14'0"						
E	15			11					
UL	15			18					
	16			22					
	17		Extremely compact moist brown silty fine to medium SAND with trace of gravel and occasional stones						
	18								
	19								
F	20		19'0"						
UL	20		Extremely compact moist brown fine to medium SAND with trace of silt and occasional stones	16					
	21		20'3"	26					
	22			26 / 3"					
	23								
	24								
	25								

TYPE OF SAMPLE
 D. - DISTURBED
 U.L. - UNDIST. LINER
 S.T. - SHELBY TUBE
 S.S. - SPLIT SPOON
 R.C. - ROCK CORE
 () - PENETROMETER

REMARKS: *Calibrated Penetrometer

GROUND WATER OBSERVATIONS

G.W. ENCOUNTERED AT _____ FT. INS.
 G.W. ENCOUNTERED AT _____ FT. INS.
 G.W. AFTER COMPLETION _____ FT. INS.
 G.W. AFTER _____ HRS. FT. INS.
 G.W. VOLUMES _____ None

Standard Penetration Test - Driving 2" OD Sampler 1' With
 140# Hammer Falling 30". Count Made at 6" Intervals



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LOG OF SOIL BORING NO. 3

PROJECT Preliminary Soils Investigation

LOCATION Proposed Mixed Use Development
 Former Northville Downs
 301 South Center Street
 Northville, Michigan

JOB NO. 18-053

SURFACE ELEV. _____ DATE 3-9-18

Sample & Type	Depth	Legend	SOIL DESCRIPTION	Penetration Blows for 6"	Moisture %	Natural Wt. P.C.F.	Dry Den Wt. P.C.F.	Unc. Comp. Strength PSF.	Str. %
	1		Moist brown fine to medium SAND with traces of silt and clay, fill						
A	2		1'6"	25					
UL	3			Very compact moist brown fine to medium SAND with trace of clay and dark brown clayey topsoil seams, fill	13	7.7			
	4		4'0"	7					
B	5			Extremely compact moist dark clayey SAND with topsoil, trace of gravel and occasional stones, fill	60 / 3"				
UL	6			--					
	7		7'0"	6					
C	8			Compact moist brown fine SAND with trace of gravel and discolored streaks, fill	6	8.2	96		
UL	9		8'6"	5					
	10			Compact moist brown fine to medium SAND with traces of silt and gravel	5	6.5	114		
D	11			5					
UL	12			5					
	13		12'6"						
	14								
E	15		17'0"	8					
UL	16			Extremely compact moist brown silty fine to medium SAND with trace of gravel and occasional stones	18				
	17			22					
	18								
	19		20'6"						
F	20			Extremely compact wet brown SAND & GRAVEL	12				
UL	21			24					
	22			13					
	23								
	24								
	25								

NOTE: Boring offset 30' north of planned location due to large snow pile

TYPE OF SAMPLE
 D. - DISTURBED
 U.L. - UNDIST. LINER
 S.T. - SHELBY TUBE
 S.S. - SPLIT SPOON
 R.C. - ROCK CORE
 () - PENETROMETER

REMARKS:

Standard Penetration Test - Driving 2" OD Sampler 1' With
 140# Hammer Falling 30". Count Made at 6" Intervals

GROUND WATER OBSERVATIONS

G.W. ENCOUNTERED AT 17 FT. 0 INS.
 G.W. ENCOUNTERED AT FT. INS.
 G.W. AFTER COMPLETION 15 FT. 7 INS.
 G.W. AFTER HRS. FT. INS.
 G.W. VOLUMES Medium



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LOG OF SOIL BORING NO. 4

PROJECT Preliminary Soils Investigation
Proposed Mixed Use Development
 LOCATION Former Northville Downs
301 South Center Street
Northville, Michigan

JOB NO. 18-053

SURFACE ELEV. _____ DATE 3-12-18

Sample & Type	Depth	Legend	SOIL DESCRIPTION	Penetration Blows for 6"	Moisture %	Natural Wt. P.C.F.	Dry Den Wt. P.C.F.	Unc. Comp. Strength PSF.	Str. %
			0'2" Moist brown SAND & GRAVEL, fill						
	1		0'7" Moist gray crushed STONE, fill						
A	2		Compact moist brown clayey fine SAND with gravel, topsoil streaks and occasional stones, fill	5	11.8				
UL	3			4					
	4			3					
B	4		3'3" Stiff moist brown sandy CLAY with pebbles and topsoil streaks, fill	4					
UL	5		5'0" Compact moist brown fine to medium SAND with trace of gravel	5	16.9	122	*	(3000)	
	6			6					
	7			4					
C	7		6'8" Very compact wet brown silty fine SAND	6	17.8	127			
UL	8			8					
	9								
D	10		7'10" Very compact wet brown SAND & GRAVEL	4	16.0	131			
UL	11			8					
	12			9					
	13		12'6" Extremely stiff moist blue silty CLAY with sand and pebbles	7					
E	15		15'10" Very compact wet gray SAND & GRAVEL	9					
UL	16			16					
	17								
	18		16'6" Very stiff moist blue silty CLAY with sand and pebbles						
F	20		20'6" NOTE: Used automatic hammer	3					
UL	21			3					
	22			9					
	23								
	24								
	25								

TYPE OF SAMPLE
 D. - DISTURBED
 U.L. - UNDIST. LINER
 S.T. - SHELBY TUBE
 S.S. - SPLIT SPOON
 R.C. - ROCK CORE
 () - PENETROMETER

REMARKS: *Calibrated Penetrometer

Standard Penetration Test - Driving 2" OD Sampler 1' With
 140# Hammer Falling 30"; Count Made at 6" Intervals

GROUND WATER OBSERVATIONS

G.W. ENCOUNTERED AT 6 FT. 8 INS.
 G.W. ENCOUNTERED AT FT. INS.
 G.W. AFTER COMPLETION 6 FT. 6 INS.
 G.W. AFTER HRS. FT. INS.
 G.W. VOLUMES Heavy



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JOB NO. 18-053

LOG OF SOIL BORING NO. 5

PROJECT Preliminary Soils Investigation
Proposed Mixed Use Development

LOCATION Former Northville Downs
301 South Center Street
Northville, Michigan

SURFACE ELEV. _____ DATE 3-12-18

Sample & Type	Depth	Legend	SOIL DESCRIPTION	Penetration Blows for 6"	Moisture %	Natural Wt. P.C.F.	Dry Den Wt. P.C.F.	Unc. Comp. Strength PSF.	Str. %
	1	[Diagonal Hatching]	0'5" Moist brown SAND & GRAVEL with some crushed stone, fill						
A UL	2		Very stiff moist brown silty CLAY with gravel and occasional stones and cobbles, fill	10					
	3	[Stippled]	2'4" Very compact moist brown SAND & GRAVEL	10	3.7				
	4		3'6" Very compact moist brown SAND & GRAVEL	7					
B UL	5	[Stippled]	6" Very compact moist brown SAND & GRAVEL with stones and cobbles	6					
	6		6'0" Very compact moist brown SAND & GRAVEL with stones and cobbles	8	4.2				
	7		6" Very compact moist brown SAND & GRAVEL with stones and cobbles	7					
C UL	8	[Stippled]	6'0" Compact moist brown SAND & GRAVEL with trace of silt and occasional stones	4					
	9		8'6" Compact moist brown SAND & GRAVEL with trace of silt and occasional stones	5	4.6	105			
	10		8'6" Compact moist brown SAND & GRAVEL with trace of silt and occasional stones	6					
D UL	11	[Stippled]	8'6" Compact moist brown SAND & GRAVEL with trace of silt and occasional stones	3					
	12		8'6" Compact moist brown SAND & GRAVEL with trace of silt and occasional stones	6	6.0	109			
	13		8'6" Compact moist brown SAND & GRAVEL with trace of silt and occasional stones	9					
E UL	14	[Stippled]	13'6" Very compact moist brown SAND & GRAVEL with occasional stones	6					
	15		13'6" Very compact moist brown SAND & GRAVEL with occasional stones	7					
	16		13'6" Very compact moist brown SAND & GRAVEL with occasional stones	8					
	17	[Stippled]	17'0" Very compact moist brown SAND & GRAVEL with occasional stones						
	18		17'0" Very compact moist brown SAND & GRAVEL with occasional stones						
	19		17'0" Very compact moist brown SAND & GRAVEL with occasional stones						
F UL	20	[Stippled]	17'0" Extremely compact wet brown SAND & GRAVEL	5					
	21		20'6" Extremely compact wet brown SAND & GRAVEL	7					
	22		20'6" Extremely compact wet brown SAND & GRAVEL	11					
	23								
	24								
	25								

NOTE: Used automatic hammer

TYPE OF SAMPLE
 D. - DISTURBED
 U.L. - UNDIST. LINER
 S.T. - SHELBY TUBE
 S.S. - SPLIT SPOON
 R.C. - ROCK CORE
 () - PENETROMETER

REMARKS:
 Standard Penetration Test - Driving 2" OD Sampler 1' With
 140# Hammer Falling 30": Count Made at 6" Intervals

GROUND WATER OBSERVATIONS
 G.W. ENCOUNTERED AT 13 FT. 6 INS.
 G.W. ENCOUNTERED AT _____ FT. _____ INS.
 G.W. AFTER COMPLETION 13 FT. 6 INS.
 G.W. AFTER _____ HRS. _____ FT. _____ INS.
 G.W. VOLUMES Heavy



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LOG OF SOIL BORING NO. 6

PROJECT Preliminary Soils Investigation

LOCATION Proposed Mixed Use Development

Former Northville Downs

301 South Center Street

Northville, Michigan

JOB NO. 18-053

SURFACE ELEV. _____ DATE 3-12-18

Sample & Type	Depth	Legend	SOIL DESCRIPTION	Penetration Blows for 6"	Moisture %	Natural Wt. P.C.F.	Dry Den Wt. P.C.F.	Unc. Comp. Strength PSF.	Str. %
			0'3 1/2" ASPHALT						
	1		0'8" Moist brown SAND & GRAVEL, aggregate fill						
A	2		Moist dark brown and discolored brown sandy TOPSOIL with gravel and trace of asphalt, fill	31					
UL	3		2'4" Very compact moist brown fine SAND with traces of gravel, concrete and crushed stone, fill	9	3.4	116			
	4		3'6" Firm moist brown sandy CLAY with trace of gravel and topsoil streaks, fill	4					
B	5			1					
UL	6			2	17.3				
	7			2					
C	8		6'4" Stiff moist brown silty CLAY with moist fine sand seams	3	23.0	123			
UL	9			4			*	(2500)	
	10		8'6" Stiff moist variegated silty CLAY						
D	11			3					
UL	12			4	27.7	120			
	13			5			*	(3000)	
	14								
E	15		14'5" Compact wet brown fine SAND	1					
UL	16		14'6" Firm moist blue silty CLAY	2					
	17			3					
	18								
	19								
F	20			2					
UL	21		20'6" NOTE: Used automatic hammer	2					
	22			2					
	23								
	24								
	25								

<p>TYPE OF SAMPLE</p> <p>D. - DISTURBED</p> <p>U.L. - UNDIST. LINER</p> <p>S.T. - SHELBY TUBE</p> <p>S.S. - SPLIT SPOON</p> <p>R.C. - ROCK CORE</p> <p>() - PENETROMETER</p>	<p>REMARKS: *Calibrated Penetrometer</p> <p>Standard Penetration Test - Driving 2" OD Sampler 1' With 140# Hammer Falling 30": Count Made at 6" Intervals</p>	<p>GROUND WATER OBSERVATIONS</p> <p>G.W. ENCOUNTERED AT 14 FT. 6 INS.</p> <p>G.W. ENCOUNTERED AT FT. INS.</p> <p>G.W. AFTER COMPLETION 17 FT. 0 INS.</p> <p>G.W. AFTER HRS. FT. INS.</p> <p>G.W. VOLUMES Medium</p>
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LOG OF SOIL BORING NO. 7

PROJECT Preliminary Soils Investigation
Proposed Mixed Use Development
 LOCATION Former Northville Downs
301 South Center Street
Northville, Michigan

JOB NO. 18-053

SURFACE ELEV. _____ DATE 3-12-18

Sample & Type	Depth	Legend	SOIL DESCRIPTION	Penetration Blows for 6"	Moisture %	Natural WL P.C.F.	Dry Den WL P.C.F.	Unc. Comp. Strength PSF.	Str. %
			0'3" ASPHALT						
	1		0'10" Moist dark brown to black SAND & GRAVEL, fill						
			1'5" Moist dark brown to black fine SAND, fill						
A	2		Stiff moist dark brown clayey TOPSOIL, fill	4					
UL	3		Stiff moist discolored brown silty CLAY with traces of sand and pebbles, fill	3	17.8	109			
	4			4					
B	5		Extremely stiff moist variegated silty CLAY with traces of sand and pebbles	5					
UL	6			7	14.2	134	*	(7500)	
				11					
C	7		Extremely stiff moist brown silty CLAY with traces of sand and pebbles	5					
UL	8			9	13.8	136	*	(8000)	
				11					
D	9		Extremely stiff moist brown silty CLAY with traces of sand and pebbles	5					
UL	10			9					
				14					
	11		Very stiff moist blue silty CLAY with sand and pebbles and wet heaving sand and gravel seams						
	12								
	13								
E	14		Very stiff moist blue silty CLAY with sand and pebbles and wet gray sand and gravel seams	2					
UL	15			6					
				8					
	16		Very stiff moist blue silty CLAY with sand and pebbles and wet gray sand and gravel seams						
	17								
	18								
F	19		Very stiff moist blue silty CLAY with sand and pebbles and wet gray sand and gravel seams	4					
UL	20			4					
				9					
	21		20'6"						
	22								
	23								
	24								
	25								

NOTE: Used automatic hammer

TYPE OF SAMPLE
 D. - DISTURBED
 U.L. - UNDIST. LINER
 S.T. - SHELBY TUBE
 S.S. - SPLIT SPOON
 R.C. - ROCK CORE
 () - PENETROMETER

REMARKS: *Calibrated Penetrometer

Standard Penetration Test - Driving 2" OD Sampler 1' With
 140# Hammer Falling 30"; Count Made at 6" Intervals

GROUND WATER OBSERVATIONS

G.W. ENCOUNTERED AT 11 FT. 2 INS.
 G.W. ENCOUNTERED AT FT. INS.
 G.W. AFTER COMPLETION 5 FT. 6 INS.
 G.W. AFTER HRS. FT. INS.
 G.W. VOLUMES Heavy



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LOG OF SOIL
 BORING NO. 8

PROJECT Preliminary Soils Investigation
Proposed Mixed Use Development
 LOCATION Former Northville Downs
301 South Center Street
Northville, Michigan

JOB NO. 18-053

SURFACE ELEV. _____ DATE 3-12-18

Sample & Type	Depth	Legend	SOIL DESCRIPTION	Penetration Blows for 6"	Moisture %	Natural WL P.C.F.	Dry Den WL P.C.F.	Unc. Comp. Strength PSF.	Str. %
			0'4" ASPHALT						
	1		Moist brown gravelly SAND with trace of clay, fill						
A	2		1'6" Extremely compact moist discolored brown fine to medium SAND with traces of topsoil and asphalt, fill	8					
UL	3	16							
	4	15							
B	5		4'0" Compact moist to wet discolored brown fine to medium SAND with asphalt, trace of topsoil and moist discolored brown sandy clay seams, fill	9					
UL	6	4		15.4	108				
	7	6							
C	8		6'6" Extremely compact moist discolored brown SAND with some brick, fill	11					
UL	9	20		8.4	117				
	10	17							
D	11		9'0" Compact moist to wet discolored brown silty SAND & GRAVEL, fill	10					
UL	12	6		5.8	126				
	13	8							
	14		13'0" Extremely compact wet brown silty SAND & GRAVEL with wet gray silty sand seams						
E	15	19							
UL	16	19		8.3	134				
	17		18'0" Extremely compact wet brown silty SAND & GRAVEL with occasional stones						
	18								
	19								
F	20		20'6" Extremely compact wet brown silty SAND & GRAVEL with occasional stones	12					
UL	21	21							
	22	14							
	23								
	24								
	25								

TYPE OF SAMPLE D. - DISTURBED U.L. - UNDIST. LINER S.T. - SHELBY TUBE S.S. - SPLIT SPOON R.C. - ROCK CORE () - PENETROMETER	REMARKS: Standard Penetration Test - Driving 2" OD Sampler 1' With 140# Hammer Falling 30": Count Made at 6" Intervals	GROUND WATER OBSERVATIONS G.W. ENCOUNTERED AT 5 FT. 2 INS. G.W. ENCOUNTERED AT 10 FT. 4 INS. G.W. AFTER COMPLETION 7 FT. 0 INS. G.W. AFTER HRS. FT. INS. G.W. VOLUMES Heavy Cave-in at 7'0"
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LOG OF SOIL
 BORING NO. 9

PROJECT Preliminary Soils Investigation
Proposed Mixed Use Development
 LOCATION Former Northville Downs
301 South Center Street
Northville, Michigan

JOB NO. 18-053

SURFACE ELEV. _____ DATE 3-12-18

Sample & Type	Depth	Legend	SOIL DESCRIPTION	Penetration Blows for 6"	Moisture %	Natural Wt. P.C.F.	Dry Den Wt. P.C.F.	Unc. Comp. Strength PSF.	Str. %
			0'5" ASPHALT						
	1								
			Moist dark brown sandy TOPSOIL with brown sand seams and occasional stones, fill						
A	2			5					
UL			Stiff moist dark brown clayey TOPSOIL with gravel and traces of asphalt and slag, fill	6	13.1	129			
	3			4			*	(4000)	
	4								
B			4'0"	8					
UL	5		Very compact moist discolored brown fine SAND with topsoil and gravel and trace of clay, fill	10	15.2	111			
	6			11					
	7		6'6"	9					
C			Very compact wet brown SAND with traces of silt and gravel and wet brown fine sand seams	9	15.0	127			
UL	8			10					
	9								
			9'0"	8					
D			Very compact wet brown fine to medium SAND with trace of silt	10	13.7	129			
UL	10			13					
	11								
	12								
	13								
			13'6"						
	14								
E			Extremely compact wet brown SAND & GRAVEL	15					
UL	15			23					
	16			--					
	17								
	18								
	19								
F			20'6"	21					
UL	20			23					
	21			18					
	22								
	23								
	24								
	25								

TYPE OF SAMPLE
 D. - DISTURBED
 U.L. - UNDIST. LINER
 S.T. - SHELBY TUBE
 S.S. - SPLIT SPOON
 R.C. - ROCK CORE
 () - PENETROMETER

REMARKS: *Calibrated Penetrometer

Standard Penetration Test - Driving 2" OD Sampler 1' With
 140# Hammer Falling 30". Count Made at 6" Intervals

GROUND WATER OBSERVATIONS

G.W. ENCOUNTERED AT 6 FT. 6 INS.
 G.W. ENCOUNTERED AT FT. INS.
 G.W. AFTER COMPLETION 6 FT. 0 INS.
 G.W. AFTER HRS. FT. INS.
 G.W. VOLUMES Heavy Cave-in at 6'0"



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LOG OF SOIL
 BORING NO. 10

PROJECT Preliminary Soils Investigation
 Proposed Mixed Use Development
 LOCATION Former Northville Downs
 301 South Center Street
 Northville, Michigan

JOB NO. 18-053

SURFACE ELEV. _____ DATE 3-8-18

Sample & Type	Depth	Legend	SOIL DESCRIPTION	Penetration Blows for 6"	Moisture %	Natural Wt. P.C.F.	Dry Den Wt. P.C.F.	Unc. Comp. Strength PSF.	Str. %
			0'3" ASPHALT						
	1		0'6" Moist dark brown to black fine SAND with gravel, fill						
A	2		1'4" Moist discolored brown fine SAND with gravel, fill	8					
SS	3		Moist discolored brown fine SAND with gravel, fill	8	17.5	110			
	4		3'2" Very compact moist brown fine SAND with gravel, discolored clay streaks and trace of topsoil, fill	9				(5000)	
B	5		3'4" Stiff moist dark brown clayey TOPSOIL with wood, fill	2					
SS	6		Stiff moist discolored brown sandy CLAY with topsoil streaks, gravel and occasional stones, fill	4	11.9	128			
	7		5'10" Moist discolored brown SAND & GRAVEL with stones, fill	7					
C	8		6'7" Moist discolored brown SAND & GRAVEL with stones, fill	2					
SS	9		Compact wet brown fine to medium SAND with traces of silt and gravel	3	17.5	124			
	10			4					
D	11		9'6" Very compact wet brown fine SAND with trace of gravel	2					
SS	12			6	15.4	131			
	13			7					
	14		13'0" Very compact wet brown fine SAND with trace of gravel						
E	15		Compact wet brown fine SAND with sand and gravel seams	2					
SS	16			4	14.1				
	17			4					
	18		17'6" Very compact wet gray fine SAND with trace of gravel						
	19								
F	20		20'0" Extremely compact wet gray fine SAND with trace of silt	6					
SS	21		20'6" Extremely compact wet gray fine SAND with trace of silt	8					
	22			11					
	23								
	24								
	25								

Note: Used automatic hammer.

TYPE OF SAMPLE
 D. - DISTURBED
 U.L. - UNDIST. LINER
 S.T. - SHELBY TUBE
 S.S. - SPLIT SPOON
 R.C. - ROCK CORE
 () - PENETROMETER

REMARKS: *Calibrated Penetrometer

Standard Penetration Test - Driving 2" OD Sampler 1' With
 140# Hammer Falling 30": Count Made at 6" Intervals

GROUND WATER OBSERVATIONS

G.W. ENCOUNTERED AT 6 FT. 7 INS.
 G.W. ENCOUNTERED AT _____ FT. _____ INS.
 G.W. AFTER COMPLETION 1 FT. 10 INS.
 G.W. AFTER _____ HRS. _____ FT. _____ INS.
 G.W. VOLUMES Heavy



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LOG OF SOIL BORING NO. 11

PROJECT Preliminary Soils Investigation
Proposed Mixed Use Development
 LOCATION Former Northville Downs
301 South Center Street
Northville, Michigan

JOB NO. 18-053

SURFACE ELEV. _____ DATE 3-8-18

Sample & Type	Depth	Legend	SOIL DESCRIPTION	Penetration Blows for 6"	Moisture %	Natural Wt. P.C.F.	Dry Den Wt. P.C.F.	Unc. Comp. Strength PSF.	Str. %
	1		0'4½" ASPHALT						
			1'3" Moist dark brown to black fine SAND with gravel, fill						
A	2		Compact moist brown clayey fine SAND with topsoil streaks and trace of gravel, fill	4					
SS	3			3	19.5	124			
			Compact moist brown SAND & GRAVEL with Stones, fill	5					
	4								
B	5		Very compact wet brown SAND & GRAVEL with trace of silt and topsoil streaks, fill	3					
SS	6			7	8.1	131			
	7			7					
			Very compact wet brown SAND & GRAVEL with stones	5					
C	8			6	12.3	125			
SS	9			7					
			Very compact wet gray SAND & GRAVEL with occasional stones	4					
D	10			6					
SS	11			7					
	12		Compact wet gray SAND & GRAVEL						
	13								
	14								
E	15		Compact wet gray fine SAND with trace of gravel and occasional sand and gravel seams	3					
SS	16			5					
	17			6					
	18		Compact wet gray fine SAND with trace of gravel and occasional sand and gravel seams						
	19								
F	20								
SS	21			2					
	22			3					
	23			5					
	24								
	25								

Note: Used automatic hammer.

TYPE OF SAMPLE
 D. - DISTURBED
 U.L. - UNDIST. LINER
 S.T. - SHELBY TUBE
 S.S. - SPLIT SPOON
 R.C. - ROCK CORE
 () - PENETROMETER

REMARKS:

Standard Penetration Test - Driving 2" OD Sampler 1' With
 140# Hammer Falling 30": Count Made at 6" Intervals

GROUND WATER OBSERVATIONS

G.W. ENCOUNTERED AT 4 FT. 1 INS.
 G.W. ENCOUNTERED AT FT. INS.
 G.W. AFTER COMPLETION 5 FT. 7 INS.
 G.W. AFTER HRS. FT. INS.
 G.W. VOLUMES Heavy



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LOG OF SOIL
 BORING NO. 12

PROJECT Preliminary Soils Investigation
Proposed Mixed Use Development
 LOCATION Former Northville Downs
301 South Center Street
Northville, Michigan

JOB NO. 18-053

SURFACE ELEV. _____ DATE 3-8-18

Sample & Type	Depth	Legend	SOIL DESCRIPTION	Penetration Blows for 6"	Moisture %	Natural Wt. P.C.F.	Dry Den Wt. P.C.F.	Unc. Comp. Strength PSF.	Str. %
	1		Moist discolored brown silty CLAY with trace of topsoil and sand seams, fill						
A	2		16" Very stiff moist brown silty CLAY with trace of topsoil and moist to wet brown sand and gravel seams, fill	8					
SS	3			9	21.9	121			
	4			16			*	(3000)	
B	5		4'0" Extremely compact wet brown silty fine to medium SAND with trace of brick and wet brown sand and gravel seams, fill	8					
SS	6			12	32.8				
	7			15					
C	8		6'0" Compact wet brown gravelly SAND with trace of silt and wet silty fine to medium sand seams	6					
SS	9			8	12.0				
	10			8					
D	11		9'6" Extremely compact wet SAND & GRAVEL with wet fine to medium sand seams	9					
SS	12			16	9.8				
	13			16					
	14		11'6" Very stiff moist blue silty CLAY with sand and pebbles						
E	15			6					
SS	16			10					
	17			14					
	18								
	19								
F	20		20'6" Very stiff moist blue silty CLAY with sand and pebbles	5					
SS	21			10					
	22			12					
	23								
	24								
	25								

TYPE OF SAMPLE
 D. - DISTURBED
 U.L. - UNDIST. LINER
 S.T. - SHELBY TUBE
 S.S. - SPLIT SPOON
 R.C. - ROCK CORE
 () - PENETROMETER

REMARKS: *Calibrated Penetrometer

Standard Penetration Test - Driving 2" OD Sampler 1' With
 140# Hammer Falling 30": Count Made at 6" Intervals

GROUND WATER OBSERVATIONS

G.W. ENCOUNTERED AT 2 FT. 10 INS.
 G.W. ENCOUNTERED AT 4 FT. 0 INS.
 G.W. AFTER COMPLETION 3 FT. 0 INS.
 G.W. AFTER HRS.
 G.W. VOLUMES Heavy



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LOG OF SOIL BORING NO. 13

PROJECT Preliminary Soils Investigation

LOCATION Proposed Mixed Use Development
 Former Northville Downs
 301 South Center Street
 Northville, Michigan

JOB NO. 18-053

SURFACE ELEV. _____ DATE 3-8-18

Sample & Type	Depth	Legend	SOIL DESCRIPTION	Penetration Blows for 6"	Moisture %	Natural Wt. P.C.F.	Dry Den Wt. P.C.F.	Unc. Comp. Strength PSF.	Str. %
	1		0'6" Moist dark brown clayey TOPSOIL with gravel, fill						
A	2		Extremely stiff moist brown silty CLAY with topsoil streaks, pebbles and stones, fill	3	19.8				
SS	3	7							
	4	12							
B	5		4'4" Very compact wet brown fine to medium SAND with gravel, stones and topsoil streaks, fill	7	7.3	126			
SS	6	8							
	7		6'0" Compact wet brown silty SAND & GRAVEL with occasional stones and cobbles	4	10.3				
C	8	5							
SS	9	5							
D	10		8'6" Very compact wet brown medium SAND & GRAVEL with occasional stones	7					
SS	11	7							
	12		11'6" Medium compact wet brown fine SAND with trace of gravel	7					
	13	7							
	14	8							
E	15		14'6" Compact wet gray fine SAND with trace of gravel	2					
SS	16	3							
	17	3							
	18		18'6" Compact wet gray SAND & GRAVEL with occasional stones	2					
F	19	2							
SS	20	3							
	21		20'6"	3					
	22								
	23								
	24								
	25								

Note: Used automatic hammer.

- TYPE OF SAMPLE
 D. - DISTURBED
 U.L. - UNDIST. LINER
 S.T. - SHELBY TUBE
 S.S. - SPLIT SPOON
 R.C. - ROCK CORE
 () - PENETROMETER

REMARKS:

Standard Penetration Test - Driving 2" OD Sampler 1' With
 140# Hammer Falling 30". Count Made at 6" Intervals

GROUND WATER OBSERVATIONS

G.W. ENCOUNTERED AT 4 FT. 4 INS.
 G.W. ENCOUNTERED AT FT. INS.
 G.W. AFTER COMPLETION 1 FT. 5 INS.
 G.W. AFTER HRS. FT. INS.
 G.W. VOLUMES Heavy Cave-in at 1'5"



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LOG OF SOIL BORING NO. 14

PROJECT Preliminary Soils Investigation
 LOCATION Proposed Mixed Use Development
Former Northville Downs
301 South Center Street
Northville, Michigan

JOB NO. 18-053

SURFACE ELEV. _____ DATE 3-8-18

Sample & Type	Depth	Legend	SOIL DESCRIPTION	Penetration Blows for 6"	Moisture %	Natural Wt. P.C.F.	Dry Den Wt. P.C.F.	Unc. Comp. Strength PSF.	Str. %
	1		0'4" Moist dark brown clayey TOPSOIL with vegetation, fill						
A	2		2'0" Moist brown sandy CLAY with sand and trace of vegetation, fill	2					
SS	3			3	22.5				
	4			5			*	(3000)	
B	5		4'0" Very compact wet discolored brown SAND & GRAVEL with trace of silt and wet brown fine seams, fill	7					
SS	6			12	9.0	138			
	7			10					
C	8		6'6" Compact wet brown silty fine to medium SAND with wet brown sand and gravel seams	8					
SS	9			8	9.4	130			
	10			7					
D	11		9'0" Compact wet brown SAND & GRAVEL with occasional stone	3					
SS	12			6	7.7	136			
	13			6					
	14		12'0" Stiff moist brown silty CLAY						
E	15		14'6" Very compact wet brown SAND & GRAVEL with occasional stones and wet gray fine to medium sand seams	8					
SS	16			11					
	17			10					
	18		18'0" Compact wet gray SAND & GRAVEL						
F	19		20'6" Compact wet gray SAND & GRAVEL	7					
SS	20			7					
	21			8					
	22								
	23								
	24								
	25								

- TYPE OF SAMPLE
 D. - DISTURBED
 U.L. - UNDIST. LINER
 S.T. - SHELBY TUBE
 S.S. - SPLIT SPOON
 R.C. - ROCK CORE
 () - PENETROMETER

REMARKS: *Calibrated Penetrometer
 Standard Penetration Test - Driving 2" OD Sampler 1' With
 140# Hammer Falling 30": Count Made at 6" Intervals

GROUND WATER OBSERVATIONS
 G.W. ENCOUNTERED AT 4 FT. 0 INS.
 G.W. ENCOUNTERED AT FT. INS.
 G.W. AFTER COMPLETION G.W. AFTER HRS. 3 FT. 0 INS.
 G.W. VOLUMES Heavy



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JOB NO. 18-053

SURFACE ELEV. _____ DATE 3-8-18

LOG OF SOIL BORING NO. 15

PROJECT Preliminary Soils Investigation
Proposed Mixed Use Development
 LOCATION Former Northville Downs
301 South Center Street
Northville, Michigan

Sample & Type	Depth	Legend	SOIL DESCRIPTION	Penetration Blows for 6"	Moisture %	Natural Wt. P.C.F.	Dry Den Wt. P.C.F.	Unc. Comp. Strength PSF.	Str. %
	1		0'5" Moist dark brown sandy TOPSOIL with trace of gravel, fill						
A	2		1'7" Moist brown sandy CLAY with sand and pebbles and little topsoil streaks, fill	5					
SS	3		Firm to stiff moist dark brown silty CLAY with sand and pebbles, trace of topsoil, occasional stones and moist brown sand and gravel seams, fill	4	19.5	111	*	(2500)	
	4			2					
B	5		5'0" Medium compact moist discolored brown SAND & GRAVEL with some cinders, fill	1					
SS	6			2	22.1	102	*	(2000)	
	7		6'4" Soft moist dark brown clayey TOPSOIL with trace of gravel, fill	3					
C	8		7'3" Slightly compact wet brown clayey fine SAND with traces of gravel and silt, fill	2	18.5	111	*	(2000)	
SS	9			1					
	10		9'0" Compact wet brown silty SAND with traces of gravel and organics and gray fine sand lenses, fill	4					
D	11			5	11.7				
SS	12		10'8" Firm moist dark brown clayey MARL with organics and shells	5					
	13								
	14		12'4" Compact wet gray fine to medium SAND with trace of gravel	2					
E	15			3	12.8	136			
SS	16			3					
	17		16'0" Very compact wet gray SAND & GRAVEL						
	18								
	19								
F	20			3					
SS	21		20'6" Note: Used automatic hammer.	6					
	22			6					
	23								
	24								
	25								

TYPE OF SAMPLE
 D. - DISTURBED
 U.L. - UNDIST. LINER
 S.T. - SHELBY TUBE
 S.S. - SPLIT SPOON
 R.C. - ROCK CORE
 () - PENETROMETER

REMARKS: *Calibrated Penetrometer

Standard Penetration Test - Driving 2" OD Sampler 1' With
 140# Hammer Falling 30": Count Made at 6" Intervals

GROUND WATER OBSERVATIONS

G.W. ENCOUNTERED AT 7 FT. 3 INS.
 G.W. ENCOUNTERED AT _____ FT. _____ INS.
 G.W. AFTER COMPLETION 9 FT. 0 INS.
 G.W. AFTER _____ HRS. _____ FT. _____ INS.
 G.W. VOLUMES Heavy



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LOG OF SOIL BORING NO. 16

PROJECT Preliminary Soils Investigation
Proposed Mixed Use Development
 LOCATION Former Northville Downs
301 South Center Street
Northville, Michigan

JOB NO. 18-053

SURFACE ELEV. _____ DATE 3-9-18

Sample & Type	Depth	Legend	SOIL DESCRIPTION	Penetration Blows for 6"	Moisture %	Natural Wt. P.C.F.	Dry Den Wt. P.C.F.	Unc. Comp. Strength PSF.	Str. %
			0'2" ASPHALT						
	1		0'5" Moist dark brown SAND & GRAVEL, aggregate fill						
			0'10" Moist discolored brown silty CLAY with sand and pebbles, fill						
A	2			2					
UL				3	19.6	125			
	3		Firm moist dark brown and black clayey TOPSOIL with sand and pebbles, fill	4			*	(3000)	
			2'8" Stiff moist discolored brown silty CLAY with traces of sand and pebbles, fill						
	4		3'10"						
B									
UL	5		Very compact to extremely compact wet brown SAND & GRAVEL with stones	5					
				7	18.9				
	6			12					
C									
UL	7		7'0"	3					
				5	17.5	130			
	8		Very compact wet gray silty fine SAND	7					
	9		8'6"						
D									
UL	10		Very compact wet gray gravelly SAND with blue silty clay seams	5					
				6	15.8	132			
	11			7					
	12								
	13		12'6"						
	14								
E									
UL	15			3					
				6					
	16		Very stiff moist blue silty CLAY with sand and pebbles	8					
	17								
	18								
	19								
F									
UL	20			3					
				5					
	21		20'6"	9					
	22								
	23								
	24								
	25								

NOTE: Used automatic hammer

TYPE OF SAMPLE
 D. - DISTURBED
 U.L. - UNDIST. LINER
 S.T. - SHELBY TUBE
 S.S. - SPLIT SPOON
 R.C. - ROCK CORE
 () - PENETROMETER

REMARKS: *Calibrated Penetrometer

Standard Penetration Test - Driving 2" OD Sampler 1' With
 140# Hammer Falling 30"; Count Made at 6" Intervals

GROUND WATER OBSERVATIONS

G.W. ENCOUNTERED AT 3 FT. 10 INS.
 G.W. ENCOUNTERED AT FT. INS.
 G.W. AFTER COMPLETION 4 FT. 1 INS.
 G.W. AFTER HRS. FT. INS.
 G.W. VOLUMES Heavy



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LOG OF SOIL
 BORING NO. 17

PROJECT Preliminary Soils Investigation
Proposed Mixed Use Development
 LOCATION Former Northville Downs
301 South Center Street
Northville, Michigan

JOB NO. 18-053

SURFACE ELEV. _____ DATE 3-9-18

Sample & Type	Depth	Legend	SOIL DESCRIPTION	Penetration Blows for 6"	Moisture %	Natural Wt. P.C.F.	Dry Den Wt. P.C.F.	Unc. Comp. Strength PSF.	Str. %
			0'3 1/2" ASPHALT						
	1		0'11" Moist brown SAND & GRAVEL with stones, aggregate fill						
A	2		1'5" Dark brown sandy TOPSOIL, fill	3					
UL	3		Soft moist discolored brown sandy CLAY with topsoil streaks and clayey fine sand seams, fill	2	17.0	117	*	(2500)	
	4		3'6"						
B	5		Compact moist brown gravelly fine to medium SAND with occasional stones	6					
UL	6			5	6.5	109			
	7			5					
C	8		7'2" Compact wet brown fine to medium SAND with traces of gravel and silt and occasional stones and cobbles	4	15.5	123			
UL	9			5					
	10		9'6" Very compact wet brown SAND & GRAVEL with occasional stones	3					
D	11			5					
UL	12			10					
	13		13'0"						
E	14		Extremely stiff moist brown silty CLAY with sand and pebbles and wet sand and gravel seams	5					
UL	15			8					
	16		15'6" Extremely stiff moist blue silty CLAY with sand and pebbles	12					
	17		16'6"						
	18								
	19		Very compact wet gray SAND & GRAVEL with stones and blue silty clay seams						
F	20			8					
UL	21		20'6"	8					
	22			9					
	23								
	24								
	25								

NOTE: Used automatic hammer

TYPE OF SAMPLE
 D. - DISTURBED
 U.L. - UNDIST. LINER
 S.T. - SHELBY TUBE
 S.S. - SPLIT SPOON
 R.C. - ROCK CORE
 () - PENETROMETER

REMARKS: *Calibrated Penetrometer

Standard Penetration Test - Driving 2" OD Sampler 1' With
 140# Hammer Falling 30": Count Made at 6" Intervals

GROUND WATER OBSERVATIONS

G.W. ENCOUNTERED AT 7 FT. 2 INS.
 G.W. ENCOUNTERED AT 7 FT. 10 INS.
 G.W. AFTER COMPLETION 7 FT. 10 INS.
 G.W. AFTER HRS. FT. INS.
 G.W. VOLUMES Heavy Cave-in at 7'10"



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LOG OF SOIL BORING NO. 18

PROJECT Preliminary Soils Investigation
Proposed Mixed Use Development
 LOCATION Former Northville Downs
301 South Center Street
Northville, Michigan

JOB NO. 18-053

SURFACE ELEV. _____ DATE 3-9-18

Sample & Type	Depth	Legend	SOIL DESCRIPTION	Penetration Blows for 6"	Moisture %	Natural WL P.C.F.	Dry Den WL P.C.F.	Unc. Comp. Strength PSF.	Str. %
			0'2" ASPHALT						
	1		0'6" Moist brown SAND & GRAVEL with occasional stones, aggregate fill						
A	2		1'8" Moist dark brown to black clayey TOPSOIL with discolored clay seams, fill	15					
UL	3		2'6" Compact moist discolored brown clayey SAND & GRAVEL, fill	6	23.1	118			
	4		3'10" Compact moist discolored brown fine SAND with trace of topsoil, fill	5					
B	5								
UL	6		Slightly compact wet discolored brown fine SAND with topsoil streaks and stones, fill	3					
	7			2	12.2				
C	8			1					
UL	9		6'0" Compact wet gray fine to medium SAND with traces of silt and gravel and occasional stones	5					
	10			7	18.4	126			
	11			12					
D	12								
UL	13		8'6" Stiff moist blue silty CLAY with sand and pebbles and occasional stones	5					
	14			9					
	15			12					
E	16								
UL	17			5					
	18			7					
	19			8					
F	20								
UL	21		20'6" Very stiff moist blue silty CLAY with sand and pebbles	3					
	22			7					
	23			8					
	24								
	25								

NOTE: Used automatic hammer

TYPE OF SAMPLE
 D. - DISTURBED
 U.L. - UNDIST. LINER
 S.T. - SHELBY TUBE
 S.S. - SPLIT SPOON
 R.C. - ROCK CORE
 () - PENETROMETER

REMARKS:

Standard Penetration Test - Driving 2" OD Sampler 1' With
 140# Hammer Falling 30". Count Made at 6" Intervals

GROUND WATER OBSERVATIONS

G.W. ENCOUNTERED AT 3 FT. 10 INS.
 G.W. ENCOUNTERED AT 4 FT. 3 INS.
 G.W. AFTER COMPLETION 4 FT. 3 INS.
 G.W. AFTER HRS. FT. INS.
 G.W. VOLUMES Heavy



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LOG OF SOIL
 BORING NO. 19

PROJECT Preliminary Soils Investigation
 Proposed Mixed Use Development
 LOCATION Former Northville Downs
 301 South Center Street
 Northville, Michigan

JOB NO. 18-053

SURFACE ELEV. _____ DATE 3-12-18

Sample & Type	Depth	Legend	SOIL DESCRIPTION	Penetration Blows for 6"	Moisture %	Natural Wt. P.C.F.	Dry Den Wt. P.C.F.	Unc. Comp. Strength PSF.	Str. %
			0'6" ASPHALT						
	1		Moist dark brown gravelly SAND with asphalt and trace of odor, fill						
A	2		1'6" Extremely stiff moist brown silty CLAY	13					
UL				12	12.7	135			
	3			14			*	(9000+)	
	4		4'0" Extremely stiff moist variegated silty CLAY with traces of sand and pebbles						
B	5			17					
UL				24	13.6	136		*	(9000+)
	6		6'0" Extremely stiff moist brown silty CLAY with sand and pebbles and wet gray fine sand seams						
C	7			14					
UL				18	13.1	138		*	(9000+)
	8		11'6" Very stiff very moist to moist blue silty CLAY with sand and pebbles and wet gray fine sand seams						
	9			23					
D	10			14					
UL			20						
	11		18'0" Extremely compact wet gray silty fine to medium SAND with occasional stones and moist blue silty clay seams						
	12			24					
	13								
	14		20'6" NOTE: Used automatic hammer						
E	15			8					
UL				7					
	16			13					
	17								
	18								
	19								
F	20			7					
UL				17					
	21			20					
	22								
	23								
	24								
	25								

TYPE OF SAMPLE
 D. - DISTURBED
 U.L. - UNDIST. LINER
 S.T. - SHELBY TUBE
 S.S. - SPLIT SPOON
 R.C. - ROCK CORE
 () - PENETROMETER

REMARKS: *Calibrated Penetrometer

Standard Penetration Test - Driving 2" OD Sampler 1' With
 140# Hammer Falling 30". Count Made at 6" Intervals

GROUND WATER OBSERVATIONS

G.W. ENCOUNTERED AT 6 FT. 6 INS.
 G.W. ENCOUNTERED AT 11 FT. 6 INS.
 G.W. AFTER COMPLETION 10 FT. 2 INS.
 G.W. AFTER HRS. FT. INS.
 G.W. VOLUMES Medium - Heavy Cave-in at 10'2"



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LOG OF SOIL BORING NO. 20

PROJECT Preliminary Soils Investigation
Proposed Mixed Use Development
 LOCATION Former Northville Downs
301 South Center Street
Northville, Michigan

JOB NO. 18-053

SURFACE ELEV. _____ DATE 3-9-18

Sample & Type	Depth	Legend	SOIL DESCRIPTION	Penetration Blows for 6"	Moisture %	Natural Wt. P.C.F.	Dry Den Wt. P.C.F.	Unc. Comp. Strength PSF.	Str. %
	1		0'3" Moist brown SAND & GRAVEL with stones, fill						
	2		Moist brown clayey fine SAND with trace of gravel and topsoil streaks, fill						
A	2		1'10" Medium compact moist dark brown sandy TOPSOIL with trace of gravel, fill	2					
UL	3		2'6" Compact moist brown fine SAND with trace of gravel, fill	3					
	4		3'6" Stiff moist brown silty CLAY with sand, pebbles, occasional stones and topsoil streaks, fill	4					
B	5		6'0" Medium compact moist brown fine SAND, fill	3	15.0	125		(2000)	
UL	6		8'6" Slightly compact moist brown fine to medium SAND with trace of gravel, fill	4			*		
	7		13'10" Medium compact wet brown SAND & GRAVEL, fill	1	7.9	104			
C	8		14'0" Stiff moist brown silty CLAY with sand and pebbles	2					
UL	9		14'6" Stiff moist blue silty CLAY with sand and pebbles	1	11.8	102		(2500)	
	10		16'6" Very stiff moist blue silty CLAY with sand and pebbles	1					
D	11		19'8" Extremely compact wet brown SAND & GRAVEL	2					
UL	12		20'6"	1					
	13			1					
	14			2					
E	15			3					
UL	16			4					
	17			11					
	18			13					
	19								
F	20								
UL	21								
	22								
	23								
	24								
	25								

NOTE: Used automatic hammer

TYPE OF SAMPLE
 D. - DISTURBED
 U.L. - UNDIST. LINER
 S.T. - SHELBY TUBE
 S.S. - SPLIT SPOON
 R.C. - ROCK CORE
 () - PENETROMETER

REMARKS: *Calibrated Penetrometer

Standard Penetration Test - Driving 2" OD Sampler 1" With
 140# Hammer Falling 30". Count Made at 6" Intervals

GROUND WATER OBSERVATIONS

G.W. ENCOUNTERED AT 13 FT. 10 INS.
 G.W. ENCOUNTERED AT 19 FT. 8 INS.
 G.W. AFTER COMPLETION 17 FT. 0 INS.
 G.W. AFTER HRS. FT. INS.
 G.W. VOLUMES Medium



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LOG OF SOIL
 BORING NO. 21

PROJECT Preliminary Soils Investigation
Proposed Mixed Use Development
 LOCATION Former Northville Downs
301 South Center Street
Northville, Michigan

JOB NO. 18-053

SURFACE ELEV. _____ DATE 3-12-18

Sample & Type	Depth	Legend	SOIL DESCRIPTION	Penetration Blows for 6"	Moisture %	Natural Wt. P.C.F.	Dry Den Wt. P.C.F.	Unc. Comp. Strength PSF.	Str. %
			0'2" ASPHALT						
	1		Moist brown fine to medium SAND with traces of clay and topsoil, fill						
A	2		1'6" Very stiff moist blue and discolored brown silty CLAY with sand and occasional stones and some topsoil streaks, fill	6					
UL	3			11	10.8	124			
	4			6					
B	5		4'6" Extremely compact moist brown silty fine to medium SAND with trace of gravel	9					
UL	6			15	4.2	111			
	7			13					
C	8		7'0" Extremely compact wet brown SAND & GRAVEL with trace of clay and moist to wet brown sand seams	8					
UL	9			14	5.5	123			
	10			16					
D	11		9'0" Very compact wet brown SAND & GRAVEL with trace of clay	10					
UL	12			10	5.1				
	13			9					
	14		13'0" Extremely compact wet brown SAND & GRAVEL with wet brown silty fine sand seams						
E	15			10					
UL	16			14	17.2	125			
	17			15					
	18								
	19		19'0" Very stiff moist blue silty CLAY with wet gray fine sand seams						
F	20			8					
UL	21			10					
	22		20'6"	13					
	23								
	24								
	25								

NOTE: Used automatic hammer

TYPE OF SAMPLE
 D. - DISTURBED
 U.L. - UNDIST. LINER
 S.T. - SHELBY TUBE
 S.S. - SPLIT SPOON
 R.C. - ROCK CORE
 () - PENETROMETER

REMARKS:

Standard Penetration Test - Driving 2" OD Sampler 1" With
 140# Hammer Falling 30". Count Made at 6" Intervals

GROUND WATER OBSERVATIONS

G.W. ENCOUNTERED AT 7 FT. 0 INS.
 G.W. ENCOUNTERED AT 6 FT. 8 INS.
 G.W. AFTER COMPLETION 6 FT. 8 INS.
 G.W. AFTER HRS. FT. INS.
 G.W. VOLUMES Heavy Cave-in at 6'8"



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LOG OF SOIL BORING NO. 22

PROJECT Preliminary Soils Investigation
Proposed Mixed Use Development
 LOCATION Former Northville Downs
301 South Center Street
Northville, Michigan

JOB NO. 18-053

SURFACE ELEV. _____ DATE 3-8-18

Sample & Type	Depth	Legend	SOIL DESCRIPTION	Penetration Blows for 6"	Moisture %	Natural Wt. P.C.F.	Dry Den Wt. P.C.F.	Unc. Comp. Strength PSF.	Str. %
	1		0'6" Moist dark brown sandy TOPSOIL with vegetation and clay, fill						
A SS	2		Very stiff moist discolored brown silty CLAY with traces of sand and topsoil, fill	6	16.1			(4000)	
	3	8							
	4	7							
B SS	5		3'6" Very compact wet brown gravelly SAND with little silt and occasional stones	8	10.7				
	6	11							
	7	6							
C SS	8	12							
	9		9'0" Compact wet brown SAND & GRAVEL with trace of silt and occasional stones	12	7.2	132			
	10	12							
D SS	11	6							
	12	7							
	13		14'0" Very compact wet gray silty fine to medium SAND	8	6.7	117			
	14	6							
E SS	15	9							
	16	14							
	17		18'6" Extremely stiff moist blue silty CLAY with sand and pebbles						
	18	10							
F SS	19	13							
	20		20'6"	18					
	21								
	22								
	23								
	24								
	25								

TYPE OF SAMPLE
 D. - DISTURBED
 U.L. - UNDIST. LINER
 S.T. - SHELBY TUBE
 S.S. - SPLIT SPOON
 R.C. - ROCK CORE
 () - PENETROMETER

REMARKS: *Calibrated Penetrometer

Standard Penetration Test - Driving 2" OD Sampler 1" With
 140# Hammer Falling 30". Count Made at 6" Intervals

GROUND WATER OBSERVATIONS

G.W. ENCOUNTERED AT 3 FT. 6 INS.
 G.W. ENCOUNTERED AT _____ FT. _____ INS.
 G.W. AFTER COMPLETION 3 FT. 4 INS.
 G.W. AFTER _____ HRS. _____ FT. _____ INS.
 G.W. VOLUMES Heavy Cave-in at 3'4"



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LOG OF SOIL BORING NO. 23

PROJECT Preliminary Soils Investigation
Proposed Mixed Use Development
 LOCATION Former Northville Downs
301 South Center Street
Northville, Michigan

JOB NO. 18-053

SURFACE ELEV. _____ DATE 3-8-18

Sample & Type	Depth	Legend	SOIL DESCRIPTION	Penetration Blows for 6"	Moisture %	Natural Wt. P.C.F.	Dry Den Wt. P.C.F.	Unc. Comp. Strength PSF.	Str. %
	1		0'6" Moist dark brown clayey TOPSOIL, fill						
	2		1'6" Moist brown and discolored brown CLAY with topsoil, fill	2					
A SS	3		Soft moist brown silty CLAY with moist dark brown clayey topsoil seams, fill	2	38.4	112			
	4								
B SS	5		4'0" Compact wet discolored brown gravelly SAND with trace of silt, fill	2					
	6			5	16.1				
	7			5					
C SS	8		6'6" Compact wet brown SAND & GRAVEL with wet gray silty sand seams, fill	7					
	9			9	10.6				
	10			7					
D SS	11		9'0" Firm moist blue and discolored brown sandy CLAY with trace of peat and wet gray silty sand seams, fill	2					
	12			2	18.4	125		(2000)	
	13			4					
	14			2					
E SS	15		14'0" Compact wet gray silty fine to medium SAND with trace of clay	4					
	16			4	11.5	137			
	17			3					
	18								
	19								
F SS	20		19'0" Very compact wet gray fine to medium SAND	8					
	21			9	14.0				
	22			10					
	23								
	24								
	25								

TYPE OF SAMPLE
 D. - DISTURBED
 U.L. - UNDIST. LINER
 S.T. - SHELBY TUBE
 S.S. - SPLIT SPOON
 R.C. - ROCK CORE
 () - PENETROMETER

REMARKS: *Calibrated Penetrometer

Standard Penetration Test - Driving 2" OD Sampler 1" With
 140# Hammer Falling 30": Count Made at 6" Intervals

GROUND WATER OBSERVATIONS

G.W. ENCOUNTERED AT 4 FT. 0 INS.
 G.W. ENCOUNTERED AT _____ FT. _____ INS.
 G.W. AFTER COMPLETION _____ FT. 8 INS.
 G.W. AFTER _____ HRS. _____ FT. _____ INS.
 G.W. VOLUMES Heavy

SIEVE ANALYSIS

Boring	Sample	% Passing #4 Sieve	% Passing #10 Sieve	% Passing #40 Sieve	% Passing #100 Sieve	% Passing #200 Sieve
1	C	76.1	58.5	24.9	16.3	13.0
2	C	99.7	99.0	93.1	22.8	10.4
3	D	91.8	85.5	62.1	15.5	10.5
4	C	100.0	98.2	86.0	38.7	17.1
5	C	53.4	39.7	13.5	7.6	5.6
8	D	48.6	38.2	22.5	16.2	13.1
9	C	96.3	82.1	57.4	14.3	10.9
10	C	98.1	95.3	69.2	11.7	9.0
11	B	46.7	29.9	14.1	7.7	6.0
12	C	77.7	44.6	17.7	10.1	8.2
13	B	55.3	42.8	29.5	17.8	14.5
14	B	62.6	48.0	32.6	12.7	8.5
15	D	91.6	68.5	37.8	21.4	14.4
16	C	100.0	100.0	95.4	39.9	17.5
17	C	96.0	89.6	59.5	9.5	6.8
18	C	93.0	87.2	65.3	16.1	7.6
21	C	54.0	40.9	22.5	14.1	11.7
22	B	71.3	53.5	30.6	21.0	17.8
23	B	74.4	63.0	39.6	11.1	7.8

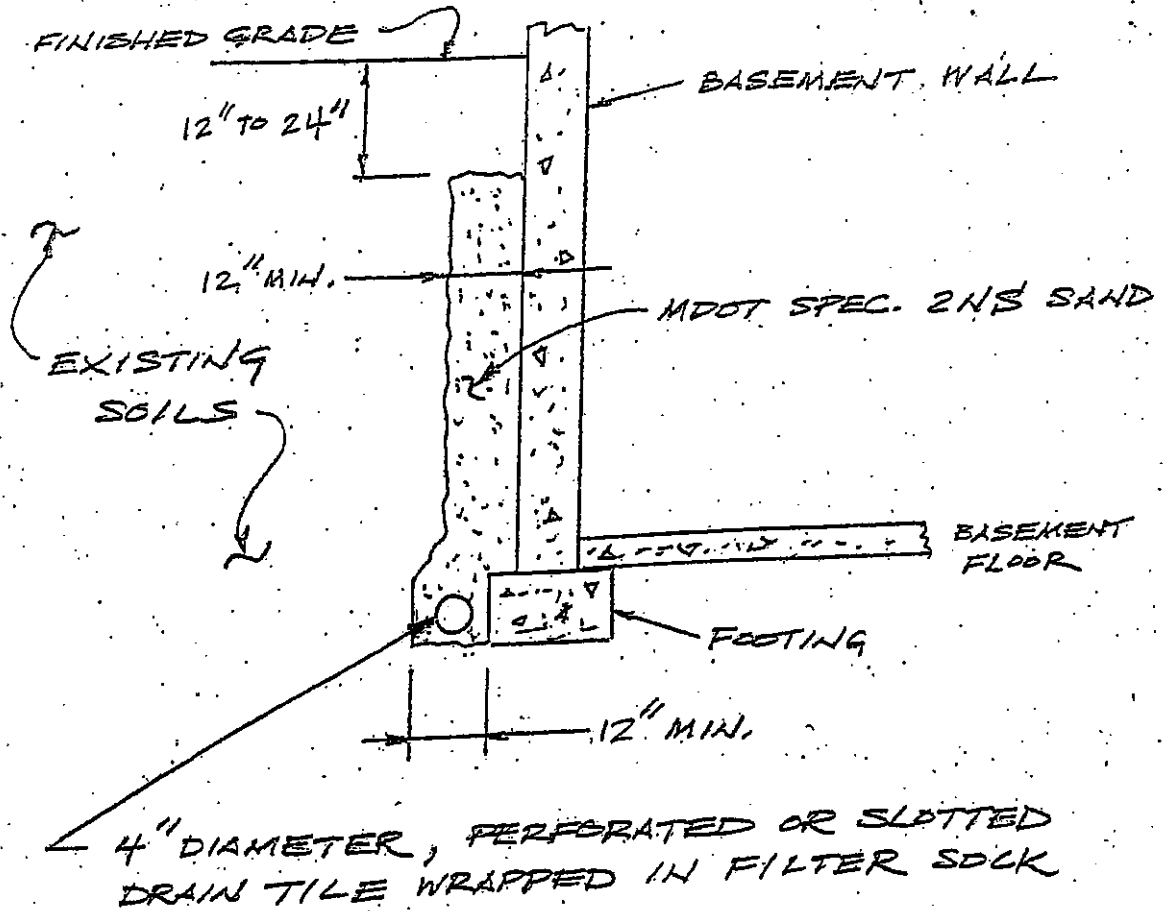


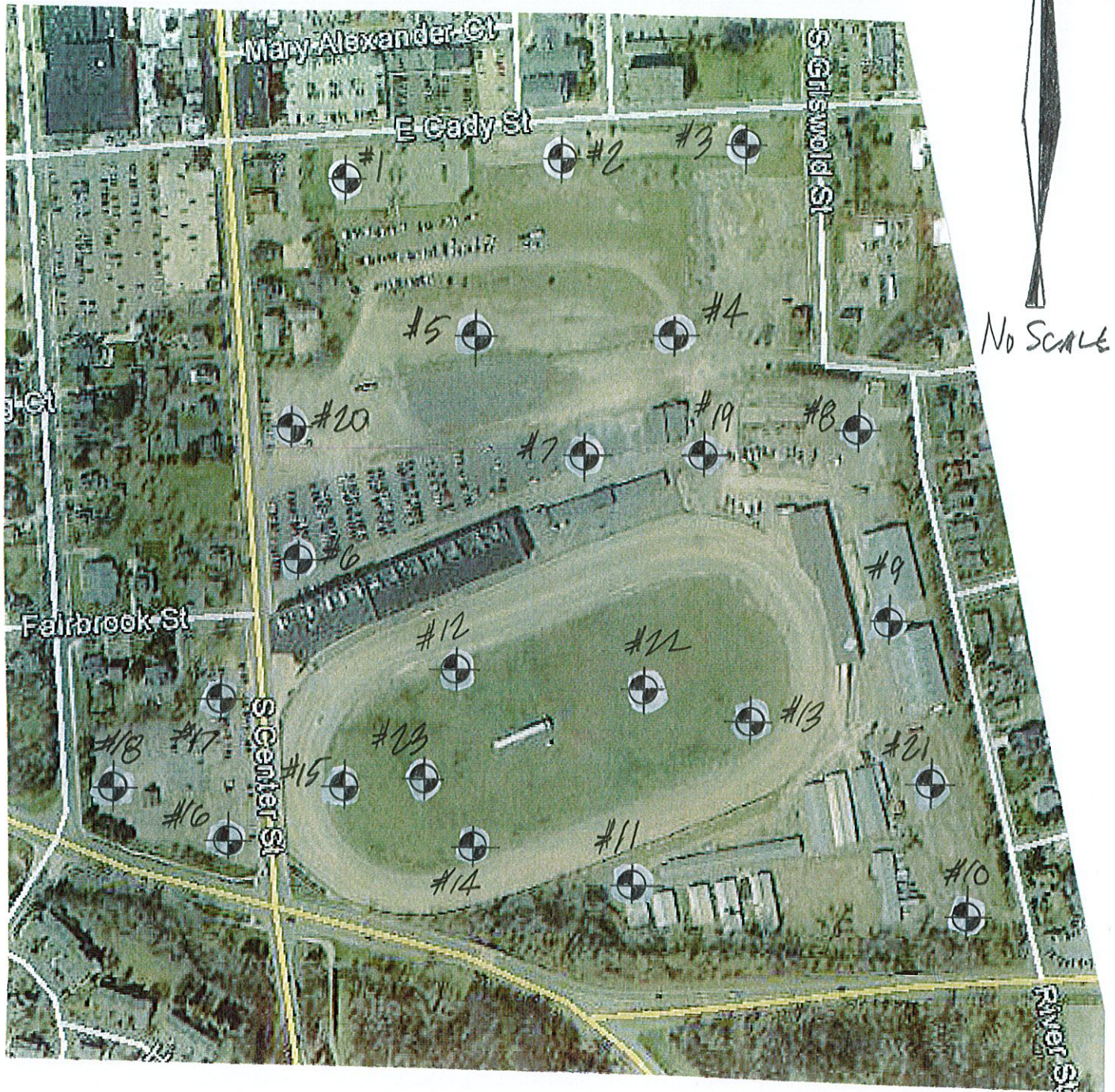
FIGURE 1 - CROSS SECTION EXTERIOR DRAIN

Table 902.4 Grading Requirements for Fine Aggregates

Material	Sieve Analysis (MTM 109) Total % Passing (a)								Loss by Washing % Passing No. 200 (a)(b)	Fineness Modulus Variation (c)
	3/8"	No. 4	No. 8	No. 16	No. 30	No. 50	No. 100			
k	100	95-100	65-95	35-75	20-55	10-30	0-10	0-3.0	±0.20 (d)	
2SS (e)	100	95-100	65-95	35-75	20-55	10-30	0-10	0-4.0	±0.20 (d)	
2MS		100	95-100			15-40	0-10	0-3.0	±0.20 (d)	
2FA (f)	100	90-100	65-90	45-70	30-50	18-30	10-21	5-15 (g)		
3FA (f)	100	70-90	45-70	28-50	19-34	12-25	7-18	5-15 (g)		

a. Test results based on dry weights.
b. Use test method MTM 108 for Loss by Washing.
c. Aggregate having a fineness modulus differing from the base fineness modulus of the source by the amount exceeding the maximum variation specified in the table will be rejected. Use ASTM C 136.
d. The base fineness modulus will be supplied by the aggregate producer at the start of each construction season and be within the range of 2.50-3.35. The base FM, including the permissible variation, will be within the 2.50-3.35 range.
e. Not for any application subject to vehicular traffic.
f. Gradation represents the final blended product.
g. The limits for Loss by Washing of Fine Aggregates, 2FA and 3FA are significant to the nearest whole percent.

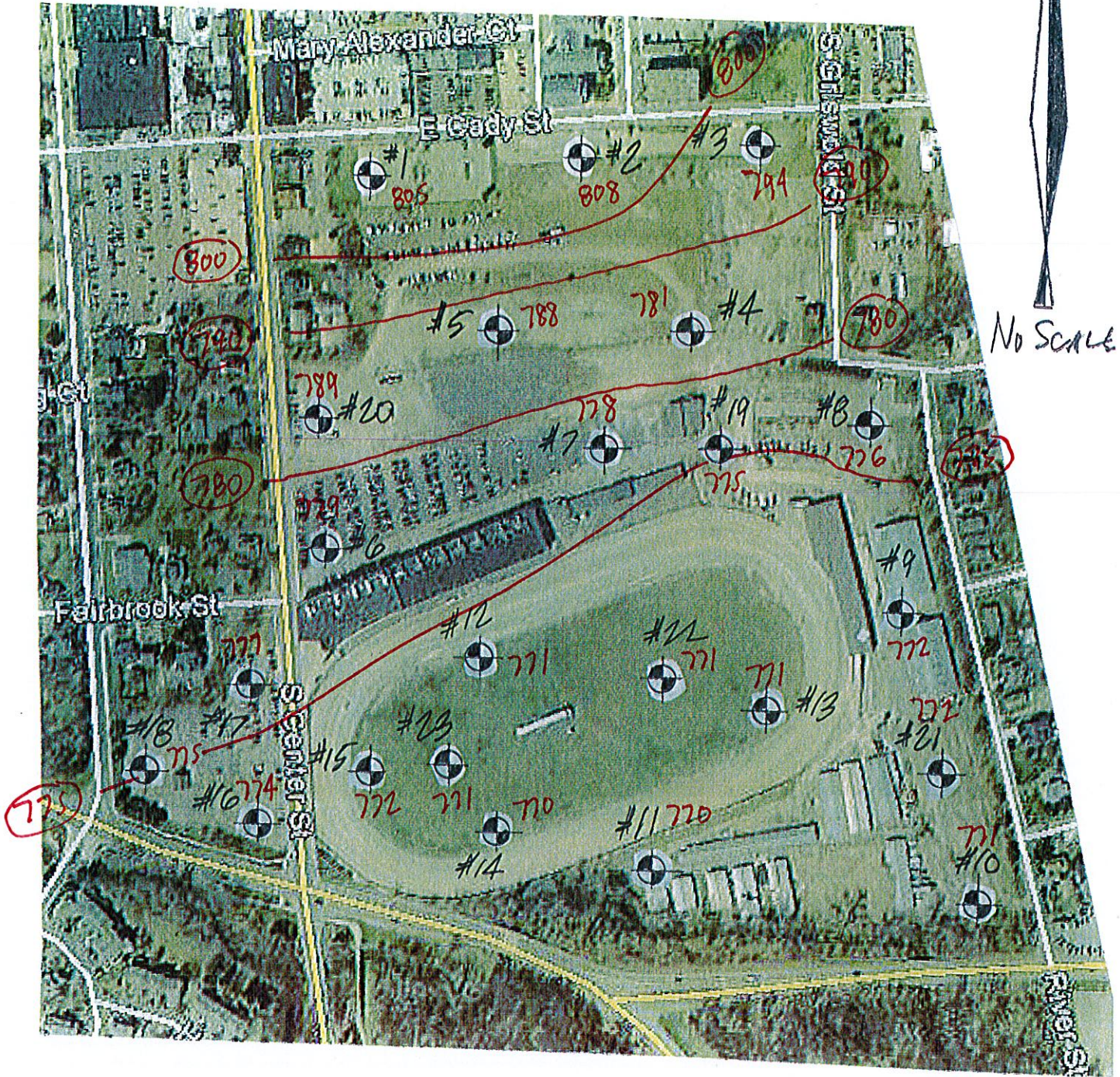
Figure 2 - MDOT Specification 2NS Sand



Soil Boring Location Plan

#18-053

SURFACE ELEVATIONS



No SCALE

Soil BORING LOCATION PLAN

#18-053

BOTTOM OF EXISTING FILL ELEVATIONS

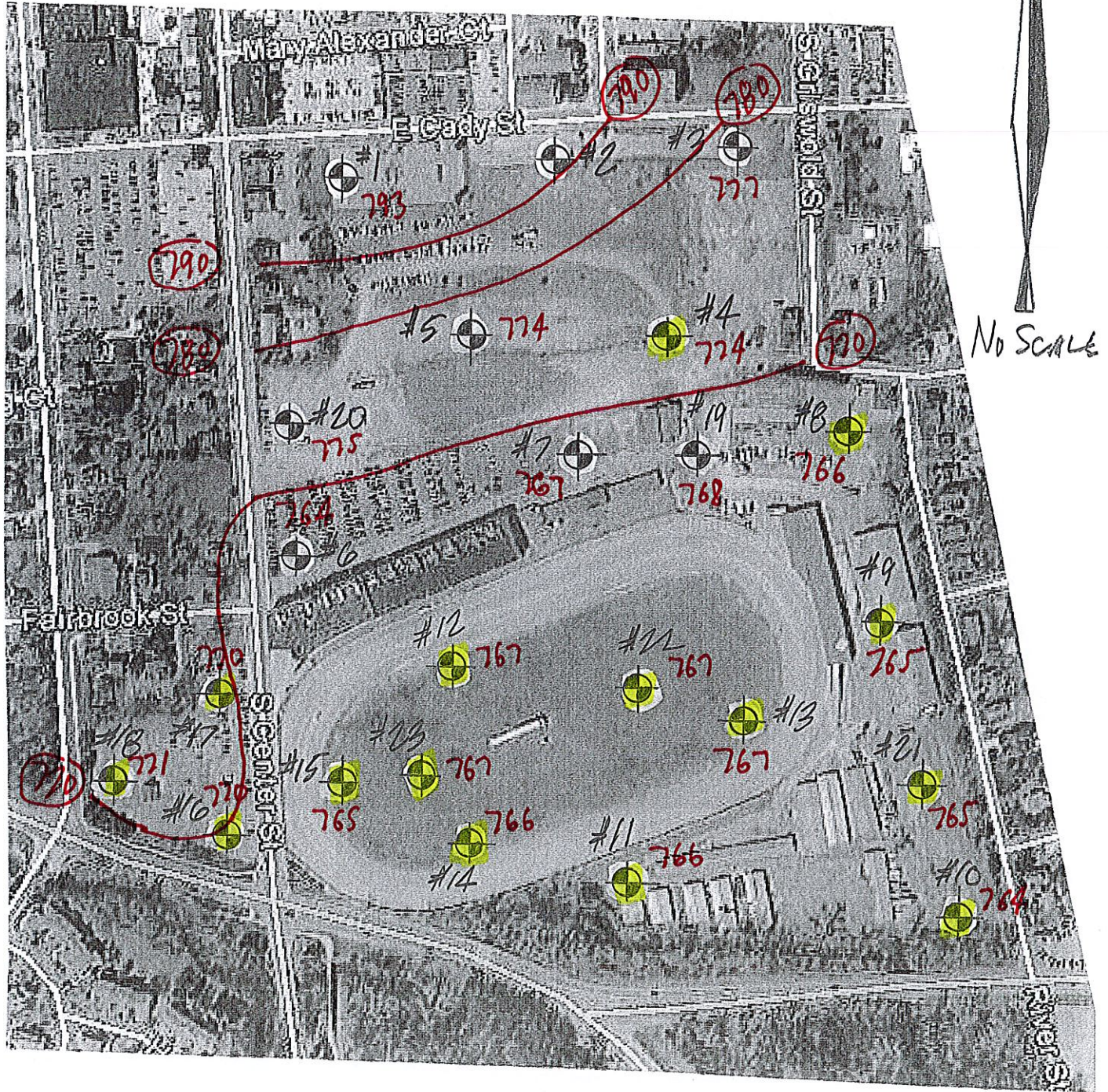
ENGINEERED FILL AREAS



Soil Boring Location Plan

#18-053

GROUNDEWATER ELEVATION
WET SAND DEWATERING AREAS

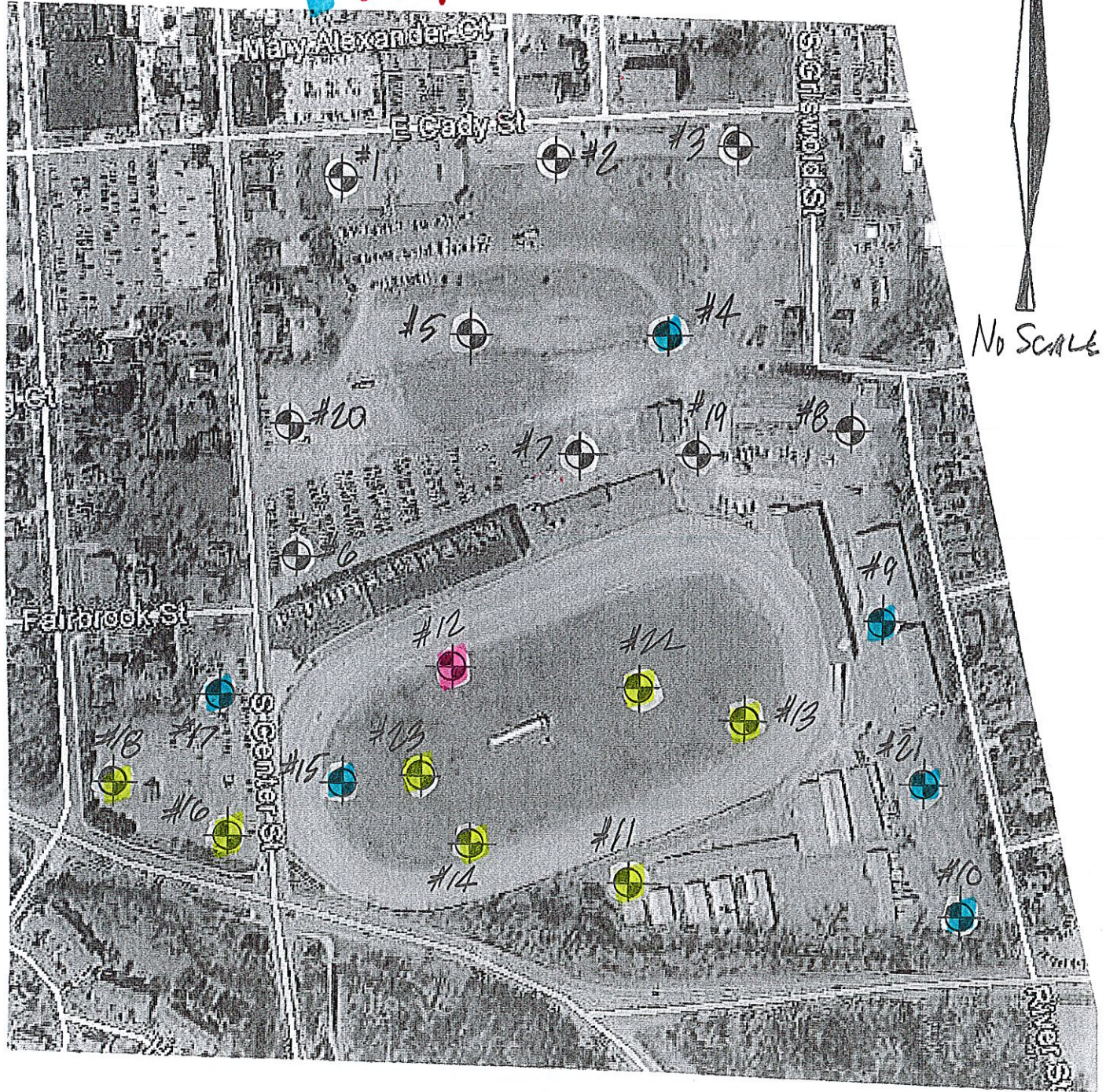


Soil Boring Location Plan

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BASEMENTS

- 0 to 3'
- 3' to 6'
- 6' to 9'



Soil Boring Location Plan

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<u>BOWM</u>	<u>SURF EL.</u>	<u>FUN DEPTH</u>	<u>FUN EL</u>	<u>WATER</u>	<u>WATER EL</u>
1	805	5'-8	798.3	12'-2"	792.8
2	808	1'-0	807	NONE	-
3	794	8'-6	785.5	17'-0	777
4	781	5'-0	776	6'-8	774.3
5	788	2'-4	785.7	13'-6	774.5
6	779	6'-4	772.7	14'-6	764.5
7	778	3'-6	774.5	11'-2	766.8
8	776	13'-0	763	10'-4	765.7
9	772	6'-6	765.5	6'-6	765.5
10	771	6'-7	764.4	6'-7	764.4
11	770	7'-6	762.5	4'-1	765.9
12	771	6'-0	765	4'-0	767
13	771	6'-0	765	4'-4	766.7
14	770	6'-6	763.5	4'-0	766
15	772	12'-4	759.7	7'-3	764.8
16	774	3'-10	770.2	3'-10	770.2
17	777	3'-6	773.5	7'-2	769.8
18	775	6'-0	769	3'-10	771.2
19	775	1'-6	773.5	6'-6	768.5
20	789	13'-10	775.2	13'-10	775.2
21	772	4'-6	767.5	7'-0	765.0
22	771	3'-6	767.5	3'-6	767.5
23	771	14'-0	757	4'-0	767