Report of Geotechnical Investigation

Rochester Hills Auto Wash
2737 South Adams Road
Rochester Hills, Michigan
48309

Latitude 42.639699° N
Longitude 83.207202° W

Prepared for:

Stonefield
607 Shelby Street, Suite 200
Detroit, Michigan 48226

G2 Project No. 220884
February 5, 2023

g2consultinggroup.com

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February 5, 2023

Ms. Erin McMachen
Stonefield
607 Shelby Street, Suite 200
Detroit, Michigan 48226

Re: Report of Geotechnical Investigation
Rochester Hills Auto Wash
2737 South Adams Road
Rochester Hills, Michigan 48309
G2 Project No. 220884

Dear Ms. McMachen:

We have completed the geotechnical investigation for the proposed Auto Wash to be constructed in Rochester Hills, Michigan. This report presents the results of our observations and analyses and our recommendations for subgrade preparation, foundation and pavement design, and construction considerations as they relate to the geotechnical conditions at the site.

We appreciate the opportunity to be of service to Stonefield on this project and we look forward to discussing the recommendations presented herein. In the meantime, if you have any questions regarding this report or any other matter pertaining to the project, please contact us.

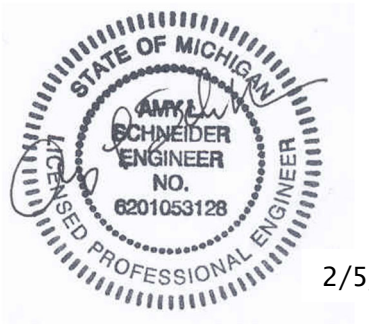
Sincerely,

G2 Consulting Group, LLC

Amy L. Schneider, P.E.
Project Manager

Noel J. Hargrave-Thomas, P.E.
Principal

ALS/NJHT/ljv



2/5/23

EXECUTIVE SUMMARY

We understand the proposed development will consist of constructing a 4,073 square-foot, single-story, slab-on-grade auto wash. A trash enclosure, pay stations, and vacuum stations will be constructed around the property. Associated pavements and utilities will be constructed in conjunction with this development. A below grade stormwater detention system will be installed on the northeast side of the property.

Approximately 2 to 12 inches of silty sand topsoil are present at the soil boring locations. Fill soils, consisting of loose to medium compact clayey sand and gravelly sand and stiff sandy clay and silty clay, are present below the topsoil at the boring locations, with the exception of boring B-2, and extend to approximate depths ranging from 1-1/2 to 3-1/2 feet. Native very loose to loose (and to a lesser extent medium compact) clayey sand, silty sand, and sand typically underlie the topsoil and fill and extend to approximate depths ranging 7 to 14 feet at borings B-1, B-3, and B-7 and the explored depth at the remaining boring locations. Very stiff to hard sandy clay underlies the granular soils at borings B-1, B-3, and B-7 and extends to the explored depths. No measurable groundwater was encountered during or upon completion of drilling operations at the boring locations.

Based on the existing subsurface conditions, estimated building loads, and estimated finished floor elevation, we recommend the proposed building be supported on conventional shallow strip and/or spread footings bearing on the native very loose to medium compact sand and gravelly sand. We further recommend a net allowable soil bearing capacity of 2,000 pounds per square foot (psf) for design of foundations bearing on the aforementioned soils. Exterior footings must extend to a minimum depth of 3-1/2 feet below finished grade elevations for protection against frost penetration. Interior footings may bear at shallower depths provided suitable native bearing soils are present and the foundations are protected from frost during construction. We recommend an engineer be on site during construction to observe the excavations, measure bearing depths, and verify the adequacy of the bearing soils.

The upper fill at borings B-1 and B-3 within the building footprint is clayey sand with brick and asphalt debris. This material is marginal for support of the proposed floor slab. Provided the potential for floor slab settlement can be tolerated, we anticipate the existing fill can remain in place for support of the floor slabs for the proposed building following completion of subgrade preparation as presented in the SITE RECOMMENDATIONS section of this report. If the potential for floor slab settlement cannot be tolerated, the existing fill within the building footprint must be completely removed to the underlying native soils and replaced with engineered fill for support of the proposed floor slabs.

Soil conditions consist of gravelly sand and sand near the proposed below-grade detention system location. We do not anticipate groundwater to be encountered within the below grade detention system bearing zone. Grain size analyses were performed on the samples obtained from 3-1/2 to 10 feet at borings B-1 and B-3. Sieve results are graphically presented on Figure No. 9 in the Appendix. Based on the results of the grain size analyses, the granular soils at and below an approximate depth of 3-1/2 feet have expected hydraulic conductivities ranging from $2x10^{-2}$ to $5x10^{-1}$ centimeters per second (cm/s). To verify the estimated infiltration rate, we recommend in-situ infiltration testing be performed in accordance with the Southeastern Michigan Council of Governments (SEMCOG) Low-Impact Design guide.

Caving and/or sloughing of the fill and native granular soils will occur during strip and spread foundation excavation operations. Therefore, we recommend the contractor be prepared to over-excavate and form shallow foundations, as necessary. The sides of the spread and/or strip footings should be constructed straight and vertical to reduce the risk of frozen soils adhering to the concrete and raising the foundations.

Do not consider this summary separate from the entire text of this report, with all the conclusions and qualifications mentioned herein. Details of our analysis and recommendations are discussed in the following sections and in the Appendix of this report.

PROJECT DESCRIPTION

We understand the proposed development will consist of constructing a 4,073 square-foot, single-story, slab-on-grade auto wash. A trash enclosure, pay stations, and vacuum stations will be constructed around the property. Associated pavements and utilities will be constructed in conjunction with this development. A below grade stormwater detention system will be installed on the northeast side of the property, estimated to bear between 5 and 7 feet below finished grade.

Structural loading conditions were not available at the time of the investigation; however, we anticipate the building will have column loads ranging from 30 to 50 kips and wall loads ranging from 1 to 3 kips. No information is available regarding proposed grades. We anticipate proposed grades will be similar to existing grades. If the final loading conditions and site grades vary from those assumed in this report, G2 Consulting Group, LLC (G2) must be notified so we can re-evaluate our recommendations.

SCOPE OF SERVICES

The field operations, laboratory testing, and engineering report preparation were performed under the direction and supervision of a licensed professional engineer. Our services were performed according to generally accepted standards and procedures in the practice of geotechnical engineering in this area. Our scope of services for this project is as follows:

1. We drilled eight soil borings throughout the proposed development. Borings B-1 through B-3 were drilled within the proposed structure footprint and extended to a depth of 15 feet each below existing grade. Borings B-4 through B-8 were drilled in the proposed pavement/trash enclosure areas and extended to depths of 5 feet, 10 feet, or 15 feet each below existing grade.

2. We performed laboratory testing on representative samples obtained from the soil boring. Laboratory testing included visual engineering classification, natural moisture content, grain size distribution, and unconfined compressive strength determination.

3. We prepared this engineering report which includes our recommendations regarding foundation types, allowable bearing capacity, estimated settlement, pavement recommendations, and construction considerations as they relate to the subsurface conditions.

FIELD OPERATIONS

G2, in conjunction with Stonefield, selected the number, depth, and location of the soil borings. The soil boring locations were determined in the field by the drillers on site measuring from existing site features using conventional taping methods. The approximate soil boring locations are shown on the Soil Boring Location Plan, Plate No. 1 in the Appendix. Ground surface elevations were not available at the time of this investigation. We recommend the soil boring locations be surveyed to determine ground surface elevations so that soil stratigraphy can be referenced by elevations during construction operations.

The soil borings were drilled using an all-terrain vehicle (ATV) rotary drilling rig. Continuous flight 2-1/4 inch inside-diameter hollow stem augers were used to advance boreholes to the explored depth. Soil samples were obtained at intervals of 2-1/2 feet within the upper 10 feet and an additional sample was obtained at 15 feet, where applicable. The samples were obtained by the Standard Penetration Test method (ASTM D 1586), which involves driving a 2-inch diameter split-spoon sampler into the soil with a 140-pound weight falling 30 inches. The sampler is generally driven three successive 6-inch increments with the number of blows for each increment recorded. The number of blows required to advance the sampler the last 12 inches is termed the Standard Penetration Resistance (N). Blow counts for each 6-inch increment and the resulting N-values are presented on the soil boring logs. Upon completion, the boreholes were backfilled with auger cuttings.

The soil samples were placed in sealed containers in the field and brought to our laboratory for testing and classification. During drilling operations, the driller maintained field logs of the encountered

subsurface conditions, including changes in stratigraphy and observed groundwater levels. The final boring logs are based on the field logs supplemented by laboratory soil classification and test results.

LABORATORY TESTING

Representative samples were subjected to laboratory testing to determine soil parameters pertinent to foundation design and site preparation. An experienced geotechnical engineer classified the soils in accordance with the G2 General Notes Terminology and Unified Soil Classification System ASTM D2488.

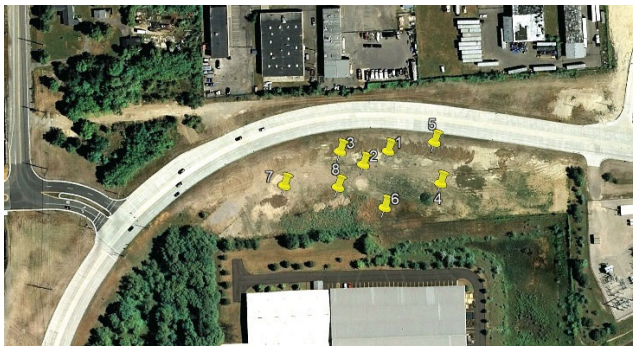
Laboratory testing included natural moisture content, grain size distribution, and unconfined compressive strength determination. Grain size distribution was determined in general conformance with ASTM C 136 method of testing. The unconfined compressive strengths were determined using a spring-loaded hand penetrometer. The hand penetrometer estimates the unconfined compressive strength to a maximum of 4-1/2 tons per square foot (tsf) by measuring the resistance of the soil sample to the penetration of a calibrated spring-loaded cylinder.

The results of the moisture content and unconfined compressive strength laboratory tests are indicated on the soil boring logs at the depths the samples were obtained. The grain-size distribution results are presented graphically on Figure No. 9 in the Appendix. We will hold the soil samples for 60 days from the date of this report, after which time they will be discarded. If you would like to retain the samples beyond that date, please let us know.

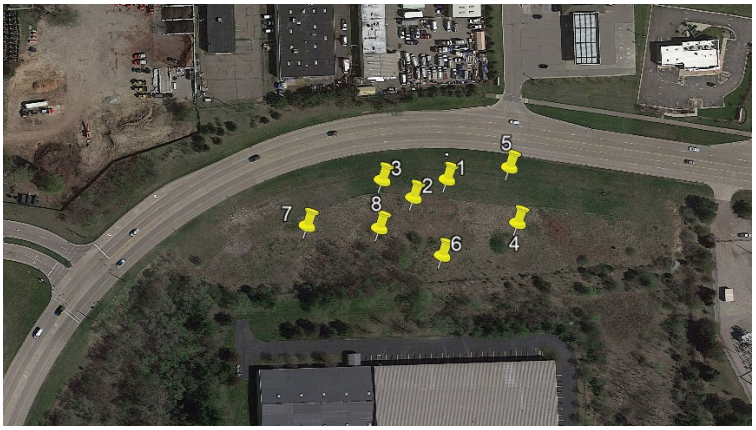
SITE DESCRIPTION

The proposed development will be constructed on the south side of South Adams Road in Rochester Hills, Michigan. Based on historical Google Earth imagery shown below earthwork has occurred across the property in conjunction with construction of South Adams Road between 2005 and 2007.

2005 Imagery



2007 Imagery



2022 Imagery

The north half of the site is covered with grass and low vegetation and the south side with mature trees. Existing utilities are present in the right of way, including a water main. Based on visual observations, the overall property is relatively flat with a slight downward slope to the south. Surrounding properties are commercial and industrial in nature.

SOIL CONDITIONS

Approximately 2 to 12 inches of silty sand topsoil are present at the soil boring locations. Fill soils, consisting of clayey sand, gravelly sand, sandy clay, and silty clay, are present below the topsoil at the boring locations, with the exception of boring B-2, and extend to approximate depths ranging from 1-1/2 to 3-1/2 feet. Native clayey sand, silty sand, and sand typically underlie the topsoil and fill and extend to approximate depths ranging 7 to 14 feet at borings B-1, B-3, and B-7 and the explored depth at the remaining boring locations. Sandy clay underlies the granular soils at borings B-1, B-3, and B-7 and extends to the explored depths. No measurable groundwater was encountered during or upon completion of drilling operations at the boring locations.

The silty sand fill and clayey sand fill are loose to medium compact with Standard Penetration Test N-values ranging from 15 to 21 blows per foot. The native granular soils consisting of silty sand, sand, and gravelly sand are typically very loose to loose in compactness with N-values ranging from 4 to 9 blows per foot. However, occasional medium compact layers are present with N-values ranging from 11 to 21 blows per foot. The sandy clay is very stiff to hard in consistency with natural moisture contents ranging from 9 to 14 percent and unconfined compressive strengths ranging from 5,000 to 9,000 psf

The stratification depths shown on the soil boring logs represent the soil conditions at the boring locations. Variations may occur between borings. Additionally, the stratigraphic lines represent the approximate boundaries between soil types. The transition may be more gradual than what is shown. We have prepared the individual soil boring logs on the basis of the laboratory soil classification and testing in conjunction with the field logs of the encountered soil conditions.

The Soil Boring Location Plan, Plate No. 1, Soil Boring Logs, Figure Nos. 1 through 8, and Grain Size Distribution, Figure No. 9, are presented in the Appendix. The soil profiles described above are generalized descriptions of the conditions encountered at the boring locations. General Notes Terminology defining the nomenclature used on the soil boring logs and elsewhere in this report is presented on Figure No. 10.

GROUNDWATER CONDITIONS

No measurable groundwater was encountered during or upon completion of drilling operations at the boring locations. Fluctuations in perched and long-term groundwater levels should be anticipated due to seasonal variations and following periods of prolonged precipitation.

SITE PREPARATION RECOMMENDATIONS

We anticipate earthwork operations will consist of removing the existing trees, vegetation, and topsoil, grading the site, proof compacting the exposed subgrade, excavating for the proposed foundations and utilities, and preparing the site for floor slab and pavement support. We recommend all earthwork operations be performed in accordance with comprehensive specifications and be properly monitored in the field by G2 geotechnical engineers or technicians under the direction of a licensed professional engineer.

At the start of earthwork operations, any topsoil, vegetation, trees, and associated root structures must be removed in their entirety within the proposed pavement and structure locations. Following removal of the topsoil and vegetation and prior to placement of any engineered fill, the exposed granular subgrade should be thoroughly proof compacted with a heavy vibratory roller making a minimum of 10 passes across the subgrade in two perpendicular directions. Any unstable or unsuitable areas noted

during proof compaction operations should be improved by additional compaction. Any soils that are disturbed should be removed and replaced with engineered fill.

Based on the presence of clayey sand fill with miscellaneous debris, we anticipate subgrade instability may occur during proof compaction operations, especially if exposed to moisture. We recommend a budget be allocated for undercutting. To minimize subgrade instability and undercuts, we recommend the exposed subgrade not be left exposed to precipitation and construction operations be performed during the summer months to ensure dry, warm, weather. Additionally, the subgrade may become unstable under repeated loading of construction traffic; therefore, construction equipment should be limited on the exposed subgrade.

Engineered fill should be free of organic matter, frozen soil, clods, or otherwise harmful material. The fill should be placed in uniform horizontal layers, not to exceed 9 inches in loose thickness. The engineered fill should be compacted to achieve a density of at least 95 percent of the maximum dry density as determined by the Modified Proctor Compaction test (ASTM D1557). Any engineered fill should be placed at the approximate optimum moisture content. Frozen material should not be used as fill, nor should fill be placed on a frozen subgrade.

We recommend using granular engineered fill within confined areas, such as utility trenches, areas adjacent to foundations, and catch basins. Granular engineered fill is generally more easily compacted than cohesive soils within these confined areas. Additionally, the proper placement and compaction of backfill within these areas is imperative to provide adequate support for overlying floor slabs and pavements.

FOUNDATION RECOMMENDATIONS

Based on the existing subsurface conditions, estimated building loads, and estimated finished floor elevation, we recommend the proposed building be supported on conventional shallow strip and/or spread footings bearing on the native very loose to medium compact sand and gravelly sand. We further recommend a net allowable soil bearing capacity of 2,000 psf for design of foundations bearing on the aforementioned soils.

Exterior footings must extend to a minimum depth of 3-1/2 feet below finished grade elevations for protection against frost penetration. Interior footings may bear at shallower depths provided suitable native bearing soils are present and the foundations are protected from frost during construction. We recommend an engineer be on site during construction to observe the excavations, measure bearing depths, and verify the adequacy of the bearing soils.

Continuous wall or strip footings should be at least 16 inches in width and isolated spread footings should be at least 30 inches in their least dimension. To achieve a change in the level of a strip footing, the footing should be gradually stepped at a grade no steeper than two units horizontal to one unit vertical. We recommend all strip and spread footings be suitably reinforced to minimize the effects of differential settlements associated with local variations in subsoil conditions.

If the recommendations outlined in this report are adhered to, total and differential settlements for the completed structure should be within 1 inch and 1/2 inch, respectively. We expect settlements of these magnitudes are within tolerable limits for the type of structure proposed.

FLOOR SLAB RECOMMENDATIONS

The upper fill at borings B-1 and B-3 within the building footprint is clayey sand with brick and asphalt debris. This material is marginal for support of the proposed floor slab. Provided the potential for floor slab settlement can be tolerated, we anticipate the existing fill can remain in place for support of the floor slabs for the proposed building following completion of subgrade preparation as presented in the

SITE RECOMMENDATIONS section of this report. A modulus of subgrade reaction value (k) of 90 pci may be used in design of floor slabs supported on the existing fill soils.

If the potential for floor slab settlement cannot be tolerated, the existing fill within the footprint of the proposed building must be completely removed to the underlying native soils and replaced with engineered fill for support of the proposed floor slabs. A modulus of k-value of 150 pci may be used in design of floor slabs supported on the engineered fill overlying native soils.

We recommend at least 4 inches of clean coarse sand or pea gravel be placed between the subgrade and the bottom of the floor slab for use as a capillary break to reduce moisture transmission through the concrete floors and reduce the potential for concrete curling. If moisture sensitive floor coverings are planned or if greater protection against vapor transmission is desired, a vapor barrier consisting of 10-mil plastic sheeting, or equivalent, may be placed on the sand layer beneath floor slabs. The floor slab should be isolated from the foundation system to allow for independent movement.

PAVEMENT RECOMMENDATIONS

We anticipate the proposed pavement areas will consist of both flexible bituminous concrete pavement and rigid Portland cement concrete pavement. We estimate the proposed pavements will be subjected to regular passenger vehicle traffic and delivery vehicle traffic, seasonal snow removal equipment, and irregular emergency vehicle traffic. As such, we assume the standard-duty pavements will be subjected to 75,000 equivalent single-axle loads (ESALs) over a 20-year design life. If any actual traffic volume information becomes available, G2 should be notified so we can re-evaluate our recommendations.

The subgrade soils will consist of loose to medium compact clayey sand fill, stiff silty clay and sandy clay fill, and native loose to medium compact sand and gravelly sand. For the purposes of design, we recommend a soil resilient modulus of 8,000 pounds per square inch (psi), a serviceability loss of 2.0, a standard deviation of 0.45 for flexible pavements and 0.35 for rigid pavements, and a reliability factor of 0.90. Based on the results of our analysis, we recommend the following minimum pavement design cross-section:

Typical Standard-Duty Flexible Pavement Section		
Material Type	**Minimum Thickness (in)**	**Structural Coefficient**
MDOT 5EML Bituminous Wearing Course	2	0.42
MDOT 4EML Bituminous Leveling Course	2	0.42
MDOT 21AA dense-graded aggregate	8	0.14

Standard-Duty Rigid Pavement Section	
Material	**Thickness**
Portland Cement Concrete	6 inches
MDOT 21AA dense-graded aggregate	6 inches

Large front-loading refuse trucks can impose significant concentrated wheel loads within trash dumpster pick-up areas. This type of loading can result in rutting of asphalt pavements and ultimately in failure. Therefore, we recommend reinforced Portland cement concrete pavement be used in this area and be large enough to accommodate the entire truck during pick-up operations.

All pavement materials are specified within the 2012 Standard Specifications for Construction from the Michigan Department of Transportation. The bituminous pavement materials are described in Section 501 and can be assigned a structural coefficient number of 0.42. We recommend that bituminous concrete utilize grade PG 68-22 binder, with no more than 17 percent of the overall binder content from

reclaimed asphalt pavement (RAP) within the top wearing course layer. This will help minimize the potential for rutting and long-term cracking.

Proper drainage is an important consideration for pavement design, especially in consideration of the anticipated water infiltration associated with the car wash facility. The pavement should be properly sloped to promote effective surface and subsurface drainage and prevent water ponding.

Regular timely maintenance should be performed on the pavement to reduce the potential deterioration associated with moisture infiltration through surface cracks. The owner should be prepared to seal the bituminous cracks with a hot-applied elastic crack filler as soon as possible after cracking develops and as often as necessary to block the passage of water to the subgrade soils.

BELOW GRADE DETENTION SYSTEM RECOMMENDATIONS

A below-grade detention system will be constructed at the northeast side of the property near borings B-1 and B-3, which typically bears 5 to 7 feet below finished grade. Soil conditions consist of gravelly sand and sand. We do not anticipate groundwater to be encountered within the below grade detention system bearing zone.

Grain size analyses were performed on the samples obtained from 3-1/2 to 10 feet at borings B-1 and B-3. Sieve results are graphically presented on Figure No. 9 in the Appendix. Based on the results of the grain size analyses, the granular soils at and below an approximate depth of 3-1/2 feet have expected hydraulic conductivities ranging from $2x10^{-2}$ to $5x10^{-1}$ centimeters per second (cm/s). To verify the estimated infiltration rate, we recommend in-situ infiltration testing be performed in accordance with the Southeastern Michigan Council of Governments (SEMCOG) Low-Impact Design guide.

CONSTRUCTION CONSIDERATIONS

Caving and/or sloughing of the granular soils will occur during strip and spread foundation excavation operations. Therefore, we recommend the contractor be prepared to over-excavate and form shallow foundations, as necessary. The sides of the spread and/or strip footings should be constructed straight and vertical to reduce the risk of frozen soils adhering to the concrete and raising the foundations.

We do not anticipate groundwater will be encountered within foundation excavations or utility excavations. In general, we expect accumulations of groundwater or surface run-off water should be controllable with normal pumping from properly constructed sumps.

Where excavations extend deeper than 5 feet and sufficient space is available, we recommend maximum slope of 2 horizontal units to 1 vertical unit (2H:1V) within the very loose to medium compact granular soils. Slopes should be barricaded to prevent vehicles and storage loads within 10 feet of the tops of the slopes. If the temporary construction excavations are to be maintained during the rainy season, berms are suggested along the tops of the slopes to prevent runoff water from entering the excavation and eroding the slope faces.

All excavations should be safely sheeted, shored, sloped, or braced in accordance with OSHA requirements. If material is stored or equipment is operated near an excavation, lower angle slopes or stronger shoring must be used to resist the extra pressure due to the superimposed loads. Care should always be exercised where excavating near utilities and pavements to avoid undermining. In no case shall excavations extend below the level of adjacent utilities or pavements without properly designed underpinning.

GENERAL COMMENTS

We have formulated the evaluations and recommendations presented in this report relative to site preparation and foundations on the basis of data provided to us relating to the project location, type of

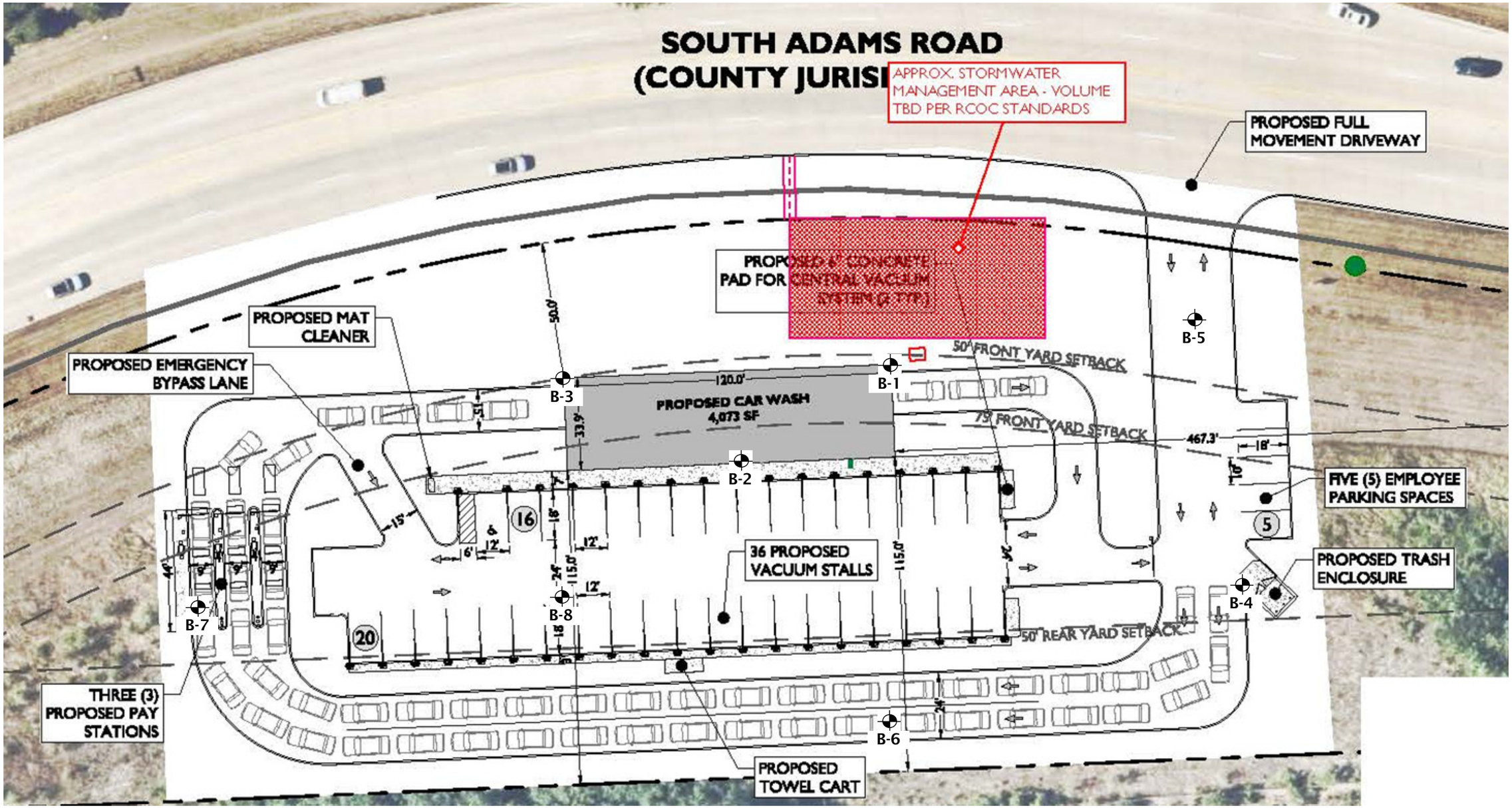
structure, and anticipated surface grade for the proposed site. Any significant change in this data should be brought to our attention for review and evaluation with respect to prevailing subsurface conditions. Furthermore, if changes occur in the design, location, or concept of the project, conclusions and recommendations contained in this report are not valid unless G2 Consulting Group, LLC reviews the changes. G2 Consulting Group, LLC will then confirm the recommendations presented herein or make changes in writing.

The scope of this report is limited to evaluation of subsurface conditions for the support of the proposed building and other related aspects of the development. No chemical, environmental, or hydrogeological testing or analyses were included in the scope of this report.

We base the analyses and recommendations submitted in this report upon the data from the soil boring performed at the approximate location shown on the Soil Boring Location Plan, Plate No. 1. This report does not reflect variations that may occur between the actual boring location and the actual structure location. The nature and extent of any such variations may not become clear until the time of construction. If significant variations then become evident, it may be necessary for us to re-evaluate our report recommendations.

We recommend G2 Consulting Group, LLC observe all geotechnical related work, including foundation construction, subgrade preparation, and engineered fill placement. G2 Consulting Group, LLC will perform the appropriate testing to confirm the geotechnical conditions given in the report are found during construction.

APPENDIX



Manager

LEGEND

Soil Borings Drilled by Strata Drilling, Inc. on January 12, 2022

N

Soil Boring Location Plan

Rochester Hills Auto Wash
2737 South Adams Road
Rochester Hills, Michigan 48309

2G CONSULTING GROUP

Project No. 220884	
Drawn by: ALS	
Date: 2/3/23	Plate No. 1
Scale: NTS	

Project Name: Rochester Hills Auto Wash

Project Location: 2737 South Adams Road
Rochester Hills, Michigan 48309

G2 Project No. 220884

Latitude: N/A Longitude: N/A

Soil Boring No. B-1

CONSULTING GROUP

SUBSURFACE PROFILE

SOIL SAMPLE DATA

DEPTH (ft)	PRO-FILE	GROUND SURFACE ELEVATION: N/A	DEPTH (ft)	SAMPLE TYPE-NO.	BLOWS/ 6-INCHES	STD. PEN. RESISTANCE (N)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	UNCONF. COMP. STR. (PSF)
		Topsoil: Dark Brown Sllty Sand (5 inches) 0.4							
		Fill: Medium Compact Dark Brown Clayey Sand with trace silt and gravel, brick debris 1.5		S-1	8 10 11	21			
		Loose to Medium Compact Brown Gravely Sand with trace silt							
5		5.0	5	S-2	4 3 4	7			
				S-3	4 3 3	6			
		Loose Brown Sand with trace silt							
10			10	S-4	3 3 4	7			
		13.5							
		Very Stiff Brown Sandy Clay with trace silt and gravel							
15		15.0	15	S-5	3 3 6	9	13.5		5000*
		End of Boring @ 15 ft							
20			20						

Total Depth: 15 ft
Drilling Date: January 12, 2023
Inspector:
Contractor: Strata Drilling, Inc.
Driller: J. Haynor

Drilling Method:
2-1/4 inch inside diameter hollow stem augers

Water Level Observation:
Dry during and upon completion of drilling operations

Notes:
* Calibrated Hand Penetrometer

Excavation Backfilling Procedure:
Auger cuttings

Figure No. 1

SOIL / PAVEMENT BORING 220884.GPJ 20150116 G2 CONSULTING DATA TEMPLATE.GDT 2/7/23

Project Name: Rochester Hills Auto Wash

Project Location: 2737 South Adams Road
Rochester Hills, Michigan 48309

G2 Project No. 220884

Latitude: N/A Longitude: N/A

Soil Boring No. B-2

CONSULTING GROUP

SUBSURFACE PROFILE				SOIL SAMPLE DATA					
DEPTH (ft)	PRO-FILE	GROUND SURFACE ELEVATION: N/A	DEPTH (ft)	SAMPLE TYPE-NO.	BLOWS/ 6-INCHES	STD. PEN. RESISTANCE (N)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	UNCONF. COMP. STR. (PSF)
		Topsoil: Dark Brown Sllty Sand (2 inches) 0.2							
				S-1	3 4 5	9			
5			5	S-2	2 2 2	4			
		Very Loose to Loose Brown Sand with trace silt		S-3	2 2 3	5			
10			10	S-4	2 3 3	6			
		12.0							
		Medium Compact Brown Silty Sand with little gravel							
15		15.0	15	S-5	11 10 9	19			
		End of Boring @ 15 ft							
20			20						

Total Depth: 15 ft
Drilling Date: January 12, 2023
Inspector:
Contractor: Strata Drilling, Inc.
Driller: J. Haynor

Water Level Observation:
Dry during and upon completion of drilling operations

Excavation Backfilling Procedure:
Auger cuttings

Drilling Method:
2-1/4 inch inside diameter hollow stem augers

Figure No. 2

SOIL / PAVEMENT BORING 220884.GPJ 20150116 G2 CONSULTING DATA TEMPLATE.GDT 2/7/23

Project Name: Rochester Hills Auto Wash

Project Location: 2737 South Adams Road
Rochester Hills, Michigan 48309

G2 Project No. 220884

Latitude: N/A Longitude: N/A

Soil Boring No. B-3

CONSULTING GROUP

SUBSURFACE PROFILE

SOIL SAMPLE DATA

DEPTH (ft)	PRO-FILE	GROUND SURFACE ELEVATION: N/A	DEPTH (ft)	SAMPLE TYPE-NO.	BLOWS/ 6-INCHES	STD. PEN. RESISTANCE (N)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	UNCONF. COMP. STR. (PSF)
		Topsoil: Dark Brown SIlty Sand (12 inches) 1.0							
		Fill: Medium Compact Brown Clayey Sand with trace silt, asphalt debris 2.0		S-1	4 7 8	15			
5		Medium Compact Brown Gravelly Sand with trace silt	5	S-2	5 6 5	11			
		6.0		S-3	2 2 2	4			
10		Very Loose to Loose Brown Sand with trace silt	10	S-4	3 2 3	5			
		14.0		S-5	11 13 15	28	9.1		9000*
15		Hard Brown and Gray Mottled Sandy Clay with trace silt and gravel 15.0	15						
		End of Boring @ 15 ft							
20			20						

Total Depth: 15 ft
Drilling Date: January 12, 2023
Inspector:
Contractor: Strata Drilling, Inc.
Driller: J. Haynor

Drilling Method:
2-1/4 inch inside diameter hollow stem augers

Water Level Observation:
Dry during and upon completion of drilling operations

Notes:
* Calibrated Hand Penetrometer

Excavation Backfilling Procedure:
Auger cuttings

Figure No. 3

SOIL / PAVEMENT BORING 220884.GPJ 20150116 G2 CONSULTING DATA TEMPLATE.GDT 2/7/23

Project Name: Rochester Hills Auto Wash

Project Location: 2737 South Adams Road
Rochester Hills, Michigan 48309

G2 Project No. 220884

Latitude: N/A Longitude: N/A

Soil Boring No. B-4

CONSULTING GROUP

SUBSURFACE PROFILE				SOIL SAMPLE DATA					
DEPTH (ft)	PRO-FILE	GROUND SURFACE ELEVATION: N/A	DEPTH (ft)	SAMPLE TYPE-NO.	BLOWS/ 6-INCHES	STD. PEN. RESISTANCE (N)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	UNCONF. COMP. STR. (PSF)
		Topsoil: Dark Brown SIlty Sand (12 inches) 1.0							
		Fill: Stiff Brown Sandy Clay with trace silt and gravel 2.0		S-1	3 8 14	22	16.0		4000*
		Medium Compact Brown Gravelly Sand with trace silt 3.0							
5			5	S-2	8 5 3	8			
		Loose Brown Sand with trace silt		S-3	4 3 4	7			
10		10.0	10	S-4	5 4 5	9			
		End of Boring @ 10 ft							
15			15						
20			20						

Total Depth: 10 ft
Drilling Date: January 12, 2023
Inspector:
Contractor: Strata Drilling, Inc.
Driller: J. Haynor

Drilling Method:
2-1/4 inch inside diameter hollow stem augers

Water Level Observation:
Dry during and upon completion of drilling operations

Notes:
* Calibrated Hand Penetrometer

Excavation Backfilling Procedure:
Auger cuttings

Figure No. 4

SOIL / PAVEMENT BORING 220884.GPJ 20150116 G2 CONSULTING DATA TEMPLATE.GDT 2/7/23

Project Name: Rochester Hills Auto Wash

Project Location: 2737 South Adams Road
Rochester Hills, Michigan 48309

G2 Project No. 220884

Latitude: N/A Longitude: N/A

Soil Boring No. B-5

CONSULTING GROUP

SUBSURFACE PROFILE				SOIL SAMPLE DATA					
DEPTH (ft)	PRO-FILE	GROUND SURFACE ELEVATION: N/A	DEPTH (ft)	SAMPLE TYPE-NO.	BLOWS/ 6-INCHES	STD. PEN. RESISTANCE (N)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	UNCONF. COMP. STR. (PSF)
		Topsoil: Dark Brown Sllty Sand (6 inches) 0.5							
		Fill: Medium Compact Brown Gravelly Sand with little silt		S-1	8 11 8	19			
		3.5							
5		Loose Brown Clayey Sand with trace silt and gravel 5.0	5	S-2	5 4 3	7			
		End of Boring @ 5 ft							
10			10						
15			15						
20			20						

Total Depth: 5 ft
Drilling Date: January 12, 2023
Inspector:
Contractor: Strata Drilling, Inc.
Driller: J. Haynor

Water Level Observation:
Dry during and upon completion of drilling operations

Excavation Backfilling Procedure:
Auger cuttings

Drilling Method:
2-1/4 inch inside diameter hollow stem augers

Figure No. 5

SOIL / PAVEMENT BORING 220884.GPJ 20150116 G2 CONSULTING DATA TEMPLATE.GDT 2/7/23

Project Name: Rochester Hills Auto Wash

Project Location: 2737 South Adams Road
Rochester Hills, Michigan 48309

G2 Project No. 220884

Latitude: N/A Longitude: N/A

Soil Boring No. B-6

CONSULTING GROUP

SUBSURFACE PROFILE

SOIL SAMPLE DATA

DEPTH (ft)	PRO-FILE	GROUND SURFACE ELEVATION: N/A	DEPTH (ft)	SAMPLE TYPE-NO.	BLOWS/ 6-INCHES	STD. PEN. RESISTANCE (N)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	UNCONF. COMP. STR. (PSF)
		Topsoil: Dark Brown Sllty Sand (4 inches) 0.3							
		Fill: Brown Silty Clay with trace sand and gravel, brick and wood debris 1.2		S-1	3 4 5	9			
5		Loose Brown Sand with trace silt and gravel 5.0	5	S-2	4 3 3	6			
		End of Boring @ 5 ft							
10			10						
15			15						
20			20						

Total Depth: 5 ft
Drilling Date: January 12, 2023
Inspector:
Contractor: Strata Drilling, Inc.
Driller: J. Haynor

Water Level Observation:
Dry during and upon completion of drilling operations

Excavation Backfilling Procedure:
Auger cuttings

Drilling Method:
2-1/4 inch inside diameter hollow stem augers

Figure No. 6

SOIL / PAVEMENT BORING 220884.GPJ 20150116 G2 CONSULTING DATA TEMPLATE.GDT 2/7/23

Project Name: Rochester Hills Auto Wash

Project Location: 2737 South Adams Road
Rochester Hills, Michigan 48309

G2 Project No. 220884

Latitude: N/A Longitude: N/A

Soil Boring No. B-7

CONSULTING GROUP

SUBSURFACE PROFILE

SOIL SAMPLE DATA

DEPTH (ft)	PRO-FILE	GROUND SURFACE ELEVATION: N/A	DEPTH (ft)	SAMPLE TYPE-NO.	BLOWS/ 6-INCHES	STD. PEN. RESISTANCE (N)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	UNCONF. COMP. STR. (PSF)
		Topsoil: Dark Brown Sllty Sand (7 inches) 0.6							
		Fill: Loose Brown Clayey Sand with trace silt and gravel 1.3							
		Loose Brown Sand with trace silt and gravel		S-1	5 4 4	8			
		3.0							
5		Loose Brown Sand with trace silt	5	S-2	3 3 4	7			
		7.0		S-3	6 9 10	19	9.2		9000*
		Hard Brown Sandy Clay with trace silt and gravel		S-4	6 10 18	28	10.9		8000*
10		10.0	10						
		End of Boring @ 10 ft							
15			15						
20			20						

Total Depth: 10 ft
Drilling Date: January 12, 2023
Inspector:
Contractor: Strata Drilling, Inc.
Driller: B. Sienkiewicz

Drilling Method:
2-1/4 inch inside diameter hollow stem augers

Water Level Observation:
Dry during and upon completion of drilling operations

Notes:
* Calibrated Hand Penetrometer

Excavation Backfilling Procedure:
Auger cuttings

Figure No. 7

SOIL / PAVEMENT BORING 220884.GPJ 20150116 G2 CONSULTING DATA TEMPLATE.GDT 2/7/23

Project Name: Rochester Hills Auto Wash

Project Location: 2737 South Adams Road
Rochester Hills, Michigan 48309

G2 Project No. 220884

Latitude: N/A Longitude: N/A

Soil Boring No. **B-8**

CONSULTING GROUP

SUBSURFACE PROFILE				SOIL SAMPLE DATA					
DEPTH (ft)	PRO-FILE	GROUND SURFACE ELEVATION: N/A	DEPTH (ft)	SAMPLE TYPE-NO.	BLOWS/ 6-INCHES	STD. PEN. RESISTANCE (N)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	UNCONF. COMP. STR. (PSF)
		Topsoil (9 inches) 0.8							
		Fill: Loose Brown Clayey Sand with trace silt and gravel 2.0		S-1	6 4 3	7			
5		Very Loose to Loose Brown Sand with trace silt and gravel 5.0	5	S-2	2 2 2	4			
		End of Boring @ 5 ft							
10			10						
15			15						
20			20						

Total Depth: 5 ft
Drilling Date: January 12, 2023
Inspector:
Contractor: Strata Drilling, Inc.
Driller: B. Sienkiewicz

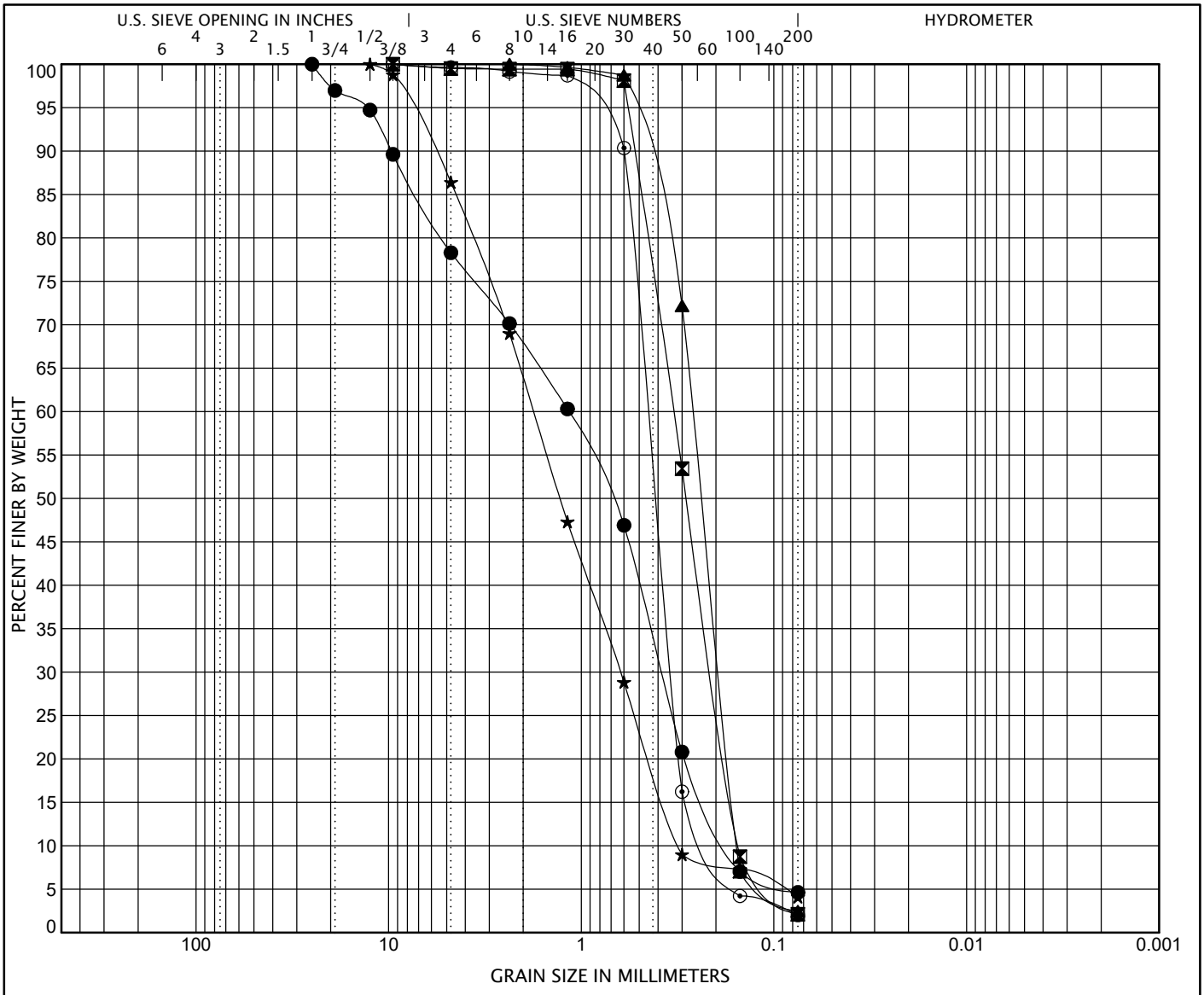
Water Level Observation:
Dry during and upon completion of drilling operations

Excavation Backfilling Procedure:
Auger cuttings

Drilling Method:
2-1/4 inch inside diameter hollow stem augers

Figure No. 8

SOIL / PAVEMENT BORING 220884.GPJ 20150116 G2 CONSULTING DATA TEMPLATE.GDT 2/7/23



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen ID		Description	LL	PL	PI	Cc	Cu
●	B-1	S-2	Gravelly Sand with trace silt				0.7	6.7
⊠	B-1	S-3	Sand with trace silt				0.9	2.2
▲	B-1	S-4	Sand with trace silt				0.9	1.7
★	B-3	S-2	Gravelly Sand with trace silt				0.7	5.7
⊙	B-3	S-3	Sand with trace silt				1.2	2.2

	Specimen ID		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	B-1	S-2	25	1.162	0.383	0.174	21.7	73.7	4.6	
⊠	B-1	S-3	9.5	0.332	0.209	0.153	0.5	97.4	2.1	
▲	B-1	S-4	2.36	0.264	0.192	0.155	0.0	97.6	2.4	
★	B-3	S-2	12.5	1.77	0.626	0.311	13.6	82.3	4.1	
⊙	B-3	S-3	9.5	0.452	0.341	0.209	0.4	97.6	2.0	

GRAIN SIZE DISTRIBUTION

Project Name: Rochester Hills Auto Wash

Project Location: 2737 South Adams Road
Rochester Hills, Michigan 48309

G2 Project No.: 220884

Figure No. 9

G2 CONSULTING GROUP

US_GRAIN_SIZE 220884.GPJ 20140820 G2 CONSULTING DATA TEMPLATE.GDT 2/7/23

GENERAL NOTES TERMINOLOGY

Unless otherwise noted, all terms herein refer to the Standard Definitions presented in ASTM 653.

PARTICLE SIZE

Boulders		- greater than 12 inches
Cobbles		- 3 inches to 12 inches
Gravel	- Coarse	- 3/4 inches to 3 inches
	- Fine	- No. 4 to 3/4 inches
Sand	- Coarse	- No. 10 to No. 4
	- Medium	- No. 40 to No. 10
	- Fine	- No. 200 to No. 40
Silt		- 0.005mm to 0.074mm
Clay		- Less than 0.005mm

CLASSIFICATION

The major soil constituent is the principal noun, i.e. clay, silt, sand, gravel. The second major soil constituent and other minor constituents are reported as follows:

Second Major Constituent (percent by weight)	Minor Constituent (percent by weight)
Trace - 1 to 12%	Trace - 1 to 12%
Adjective - 12 to 35%	Little - 12 to 23%
And - over 35%	Some - 23 to 33%

COHESIVE SOILS

If clay content is sufficient so that clay dominates soil properties, clay becomes the principal noun with the other major soil constituent as modifier, i.e. sandy clay. Other minor soil constituents may be included in accordance with the classification breakdown for cohesionless soils, i.e. silty clay, trace sand, little gravel.

Consistency	Unconfined Compressive Strength (psf)	Approximate Range of (N)
Very Soft	Below 500	0 - 2
Soft	500 - 1,000	3 - 4
Medium	1,000 - 2,000	5 - 8
Stiff	2,000 - 4,000	9 - 15
Very Stiff	4,000 - 8,000	16 - 30
Hard	8,000 - 16,000	31 - 50
Very Hard	Over 16,000	Over 50

Consistency of cohesive soils is based upon an evaluation of the observed resistance to deformation under load and not upon the Standard Penetration Resistance (N).

COHESIONLESS SOILS

Density Classification	Relative Density %	Approximate Range of (N)
Very Loose	0 - 15	0 - 4
Loose	16 - 35	5 - 10
Medium Compact	36 - 65	11 - 30
Compact	66 - 85	31 - 50
Very Compact	86 - 100	Over 50

Relative Density of cohesionless soils is based upon the evaluation of the Standard Penetration Resistance (N), modified as required for depth effects, sampling effects, etc.

SAMPLE DESIGNATIONS

AS - Auger Sample – Cuttings directly from auger flight
BS - Bottle or Bag Samples
S - Split Spoon Sample - ASTM D 1586
LS - Liner Sample with liner insert 3 inches in length
ST - Shelby Tube sample - 3 inch diameter unless otherwise noted
PS - Piston Sample - 3 inch diameter unless otherwise noted
RC - Rock Core - NX core unless otherwise noted

STANDARD PENETRATION TEST (ASTM D 1586) - A 2.0 inch outside-diameter, 1-3/8 inch inside-diameter split barrel sampler is driven into undisturbed soil by means of a 140-pound weight falling freely through a vertical distance of 30 inches. The sampler is normally driven three successive 6-inch increments. The total number of blows required for the final 12 inches of penetration is the Standard Penetration Resistance (N).