LANDFORM
From Site to Finish

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October 29, 2019

Nine Mile Creek Watershed District

12800 Gerard Drive
Eden Prairie, MN 55346

RE: Permit #2019-120: Luther Bloomington Subaru

Dear Randy Anhorn,

This letter is to address concerns about mobilization of groundwater contaminants caused by infiltration practices at Luther Bloomington Subaru. Contamination was discovered in a water sample taken from the existing 500 American Blvd W site and groundwater mounding simulations were performed to determine the proximity and impact of the proposed infiltration areas. Refer to Appendix B: Site Layout Map by Landmark Environmental for location of contamination point. The Mounding Calculator and guide to using the mounding calculator provided in the MPCA Stormwater Manual were used to determine mounding distances. Soil borings presented in a Geotechnical Evaluation dated August 23, 2019 by Braun Intertec, yielded predominantly fine sands throughout the site and within the proposed infiltration areas. Refer to Appendix C for boring locations and boring logs. Figure 1, provided by the MPCA, shows aquifer hydraulic properties used for the mounding calculator based on fine sands. The MPCA also recommends using a value of 10 feet for the initial thickness of the aquifer as this value is very difficult to obtain.

Material	Range Ksat (m/s)[3]	Typical Ksat (m/s)	Range specific yield	Typical specific yield
Gravel	3×10^{-4} to 3×10^{-2}	3×10^{-3}	0.21-0.28	0.24
Coarse sand	9×10^{-7} to 6×10^{-3}	5×10^{-5}	0.26-0.30	0.26
Medium sand	9×10^{-7} to 5×10^{-4}	1×10^{-5}	0.26-0.30	0.26
Fine sand	2×10^{-7} to 2×10^{-4}	5×10^{-6}	0.20-0.30	0.21
Silt, loess	1×10^{-9} to 2×10^{-5}	1×10^{-7}		0.15
Till	1×10^{-12} to 2×10^{-6}	1×10^{-9}	0.06-0.16	0.10
Clay	1×10^{-11} to 4.7×10^{-9}	1×10^{-10}	0.06-0.10	0.08

Figure 1: Aquifer Hydraulic Properties

Mounding calculations were performed for Infiltration System 200 and Infiltration System 300. It was determined that Infiltration System 100 was not within proximity to the location of the contaminated sample to require analysis. Figure 2 shows the mounding results from Infiltration System 200. The USGS defines the maximum extent of groundwater as 0.25 f.t. water-level increase.The mounding calculator yielded a vertical mounding of 0.25 f.t. at a horizontal distance of 74 ft from the center of the infiltration system. Subtracting half of the length of the basin (50 f.t.) from the mounding distance, resulted in a mounding distance outside of the infiltration area of approximately 24 feet (74 f.t. – 50 f.t. = 24 f.t.). Applying a safety factor of 2, it is determined that the groundwater contamination point must be 48 feet or more from the edge of the infiltration practice.

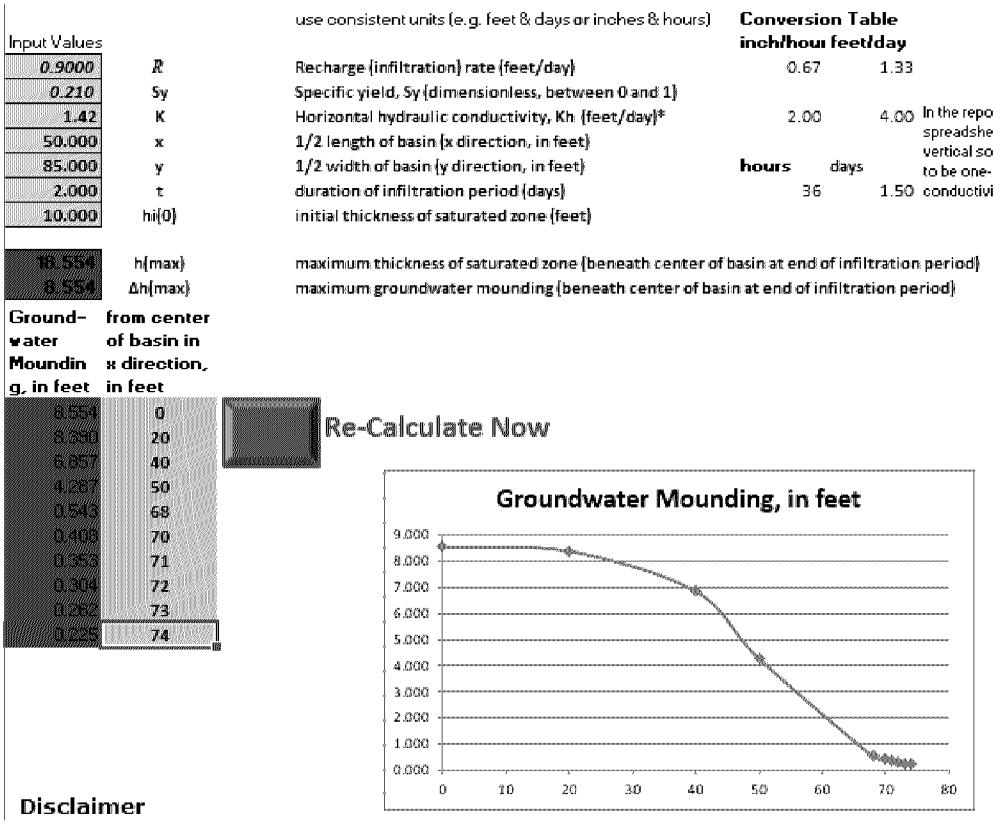


Figure 2: Infiltration System 200 Mounding Results

Similarly, for Infiltration System 300, the mounding calculator yielded a vertical mounding distance of 0.25 f.t. at a horizontal distance of 55 f.t. from the center of the infiltration area. Subtracting half the length of the infiltration system (31 f.t.) from the mounding distance, resulted in a mounding distance outside the infiltration area of 24 f.t. (55 f.t. – 31 f.t. = 24 f.t.). Applying a safety factor of 2, it is determined that the groundwater contamination point must be 48 feet or more from the edge of the infiltration practice. Figure 3 shows the mounding calculator results for Infiltration System 300.

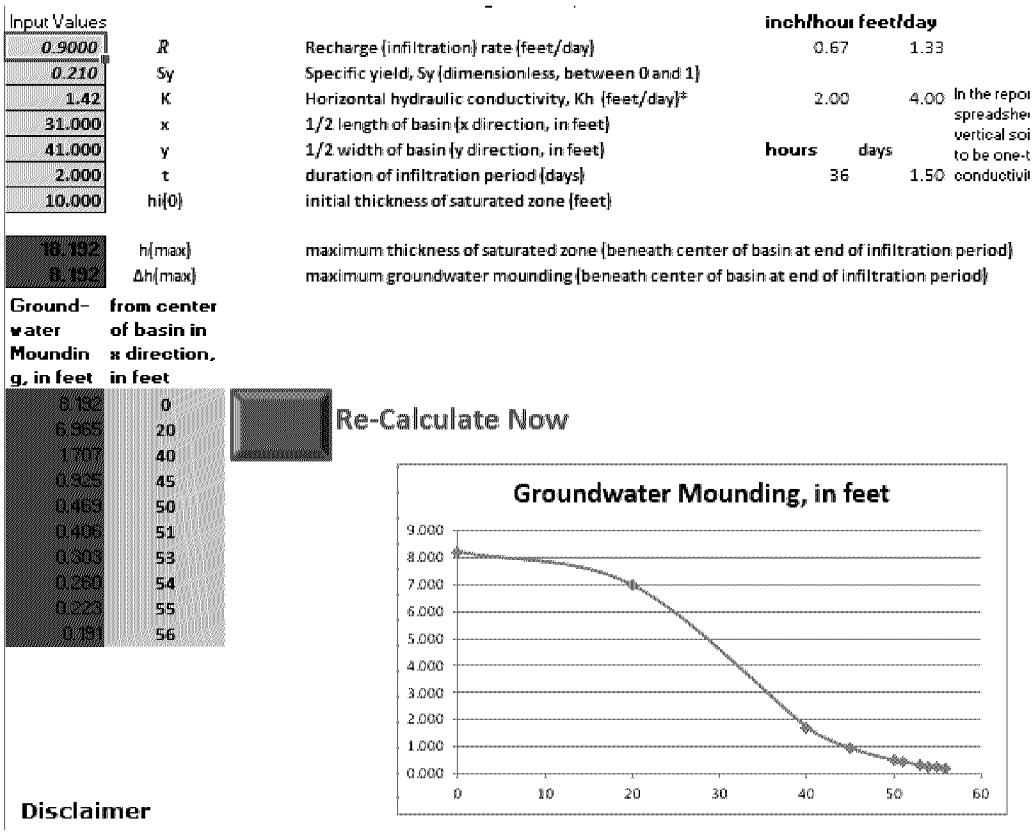


Figure 3: Infiltration System 300 Mounding Results

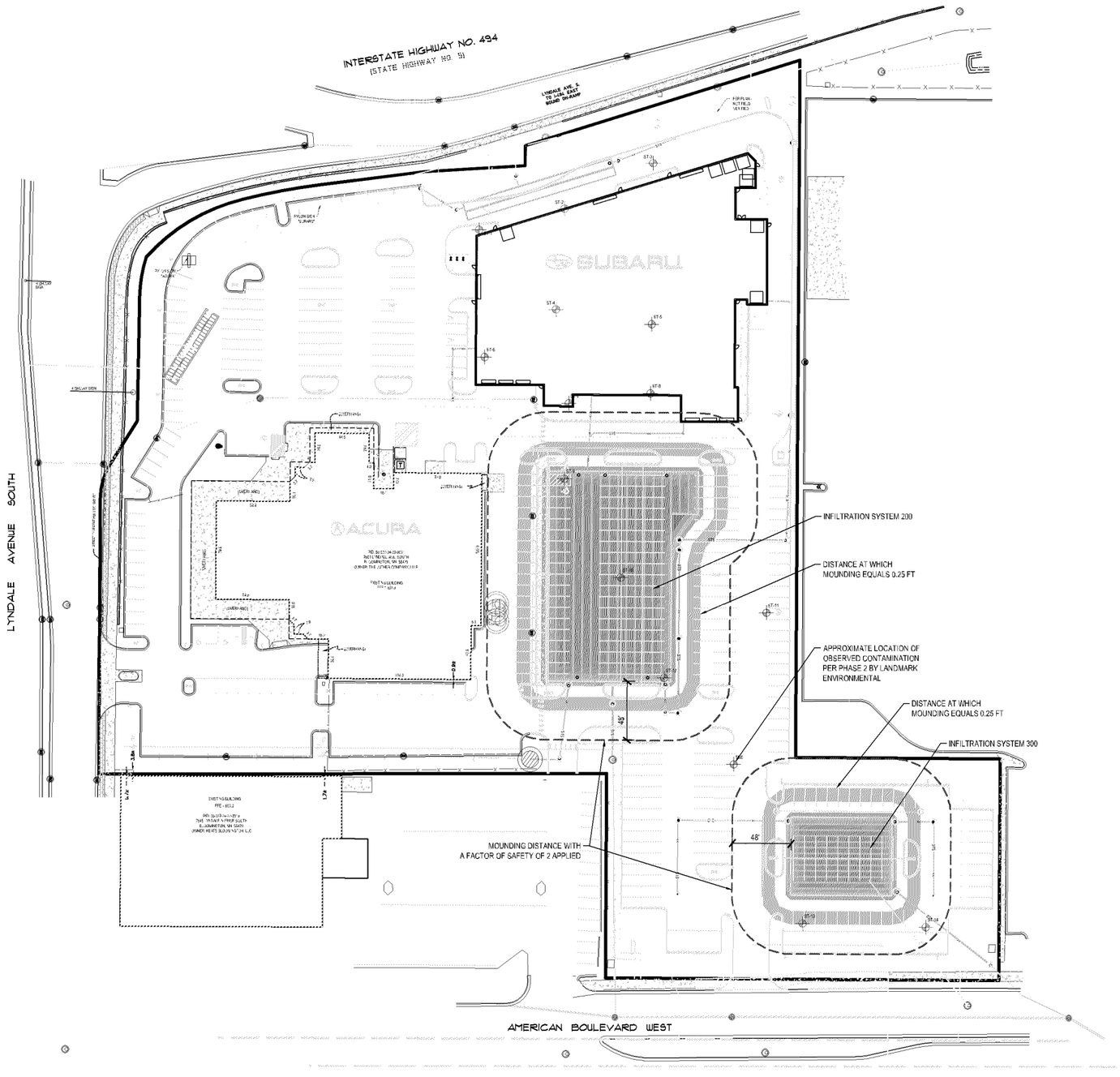
It is determined from the mounding calculator that the contamination point is outside the minimum distance from the edges of the infiltration practices. Appendix A shows the approximate location of the contamination point and the proximity to Infiltration Systems 200 and 300.

Sincerely,
Landform

Steve Sabraski, PE

COPY: Bob Obermeyer

APPENDIX A: Groundwater Mounding Exhibit



VERTICAL MOUNDING

- :0.25 FT - 1 FT
- :1 FT - 2 FT
- :2 FT - 3 FT
- :3 FT - 4 FT
- :4 FT - 5 FT
- :5 FT - 6 FT
- :6 FT - 7 FT
- :7 FT - 8 FT
- :8 FT - 9 FT

NORTH

0 100

LANDFORM

APPENDIX A

LUTHER ACURA SUBARU • Bloomington, MN

10.25.2019

APPENDIX B: Site Layout Map

F:\GIS\Client\TIc\18\Key Collision\projects\Figure 2 Updated.mxd

Legend

- Proposed Groundwater Location
- Proposed Soil Vapor Location
- Proposed Soil and Soil Vapor location
- Approximate Sump Location
- Approximate Drain Location
- Property Boundary
- Approximate Basement Location
- Paint Booth
- Paint Blending Area
- AST Location
- Misc Barrel Storage

Vieau Previous Investigation Locations

- P - Soil Probe
- VP - Soil Vapor Probe

N

0 30 60 120 Feet

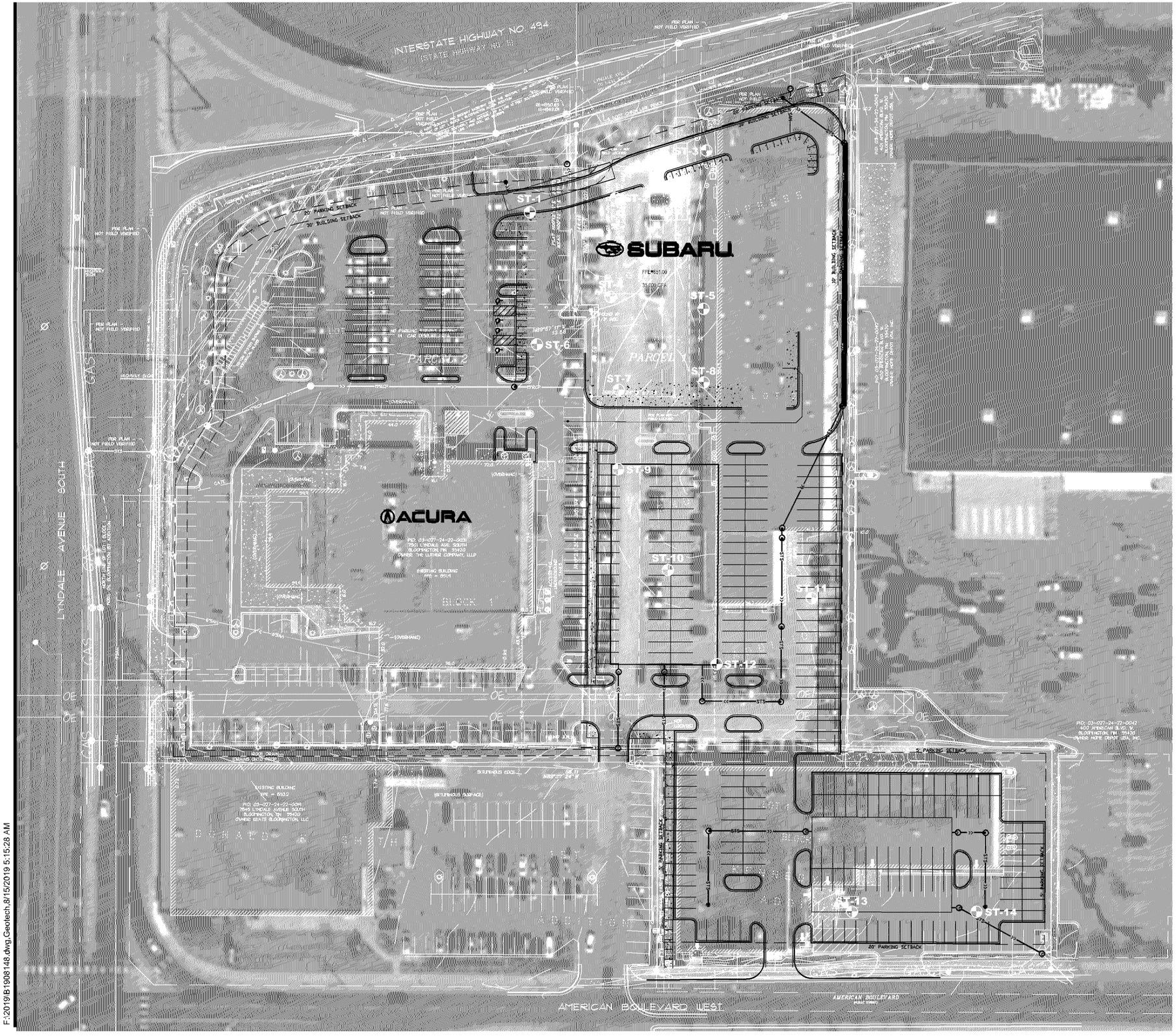
1 inch = 50 feet

Figure 2

PROPERTY LAYOUT MAP
500 American Boulevard West
Bloomington, Minnesota

LANDMARK ENVIRONMENTAL, LLC

APPENDIX C: Boring Locations Map and Boring Logs



DENOTES APPROXIMATE LOCATION OF STANDARD PENETRATION TEST BORING

40' 0 80'

SCALE: 1"= 80'

BRAUN INTERTEC
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11001 Hampshire Avenue S
Minneapolis, MN 55438
952.995.2000
braunintertec.com

Drawing Information

Project No:	B1908148
Drawing No:	B1908148
Drawn By:	JAG
Date Drawn:	7/30/19
Checked By:	EJD
Last Modified:	8/15/19

Project Information

New Luther Subaru Bloomington Dealership

7801 Lyndale Avenue S.

Bloomington, Minnesota

Soil Boring Location Sketch

F:\2019\B1908148.dwg,Geotech,8/15/2019 5:15:28 AM

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LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B1908148
Geotechnical Evaluation
Luther Subaru - New Dealership
7801 Lyndale Avenue South
Bloomington, Minnesota

BORING: **ST-1**

LOCATION: See attached sketch. Benchmark: Elevations were obtained using GPS and the State of Minnesota's permanent base station network.

NORTHING:	125546	EASTING:	524975
DRILLER:	J. Chermak	LOGGED BY:	J. Carlson
START DATE:	08/06/19	END DATE:	08/06/19
SURFACE ELEVATION:	849.0 ft	RIG:	7519
METHOD:	3 1/4" HSA	SURFACING:	Asphalt
WEATHER:	Sunny		

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
848.0		PAVEMENT, 4 1/2 inches of bituminous over 7 1/2 inches of aggregate base					
1.0		FILL: SILTY SAND (SM), fine to medium-grained Sand, dark brown, moist		2-1-2 (3) 17"			
846.0							
3.0		FILL: SILTY SAND (SM), fine to medium-grained Sand, brown, moist					
			5	2-2-3 (5) 18"			
842.0							
7.0		POORLY GRADED SAND (SP), fine to medium-grained Sand, trace Gravel, brown, moist, loose (ALLUVIUM)		3-2-3 (5) 18"			
840.0							
9.0		POORLY GRADED SAND with SILT (SP-SM), fine-grained Sand, trace Gravel, light brown, moist, loose to medium dense (ALLUVIUM)	10	4-4-5 (9) 17"			
				4-4-5 (9) 18"			
			15	8-9-11 (20) 18"			
830.0							
19.0		POORLY GRADED SAND (SP), fine-grained Sand, light brown, moist, medium dense (ALLUVIUM)	20	6-6-6 (12) 18"			
828.0							
21.0		END OF BORING					Water not observed while drilling.
		Boring immediately backfilled with bentonite grout					
			25				
			30				

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See Descriptive Terminology sheet for explanation of abbreviations

Project Number B1908148
Geotechnical Evaluation
Luther Subaru - New Dealership
7801 Lyndale Avenue South
Bloomington, Minnesota

BORING: **ST-2**
LOCATION: See attached sketch
NORTHING: 125558 EASTING: 525044
DRILLER: J. Chermak LOGGED BY: J. Carlson START DATE: 08/05/19 END DATE: 08/05/19
SURFACE ELEVATION: 848.4 ft RIG: 7519 METHOD: 3 1/4" HSA SURFACING: Asphalt WEATHER: Sunny

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
847.6		PAVEMENT, 4 inches of bituminous over 6 inches of aggregate base					
0.8		FILL: CLAYEY SAND (SC), fine-grained Sand, trace roots, dark brown, moist		2-2-4 (6) 18"		17	OC=3.2%
845.4							
3.0		FILL: POORLY GRADED SAND with SILT (SP-SM), fine to medium-grained Sand, trace Gravel, brown, moist	5	4-5-5 (10) 18"			
841.4							
7.0		POORLY GRADED SAND (SP), fine to medium-grained Sand, trace Gravel, brown, moist, very loose (ALLUVIUM)		2-2-2 (4) 17"			
839.4							
9.0		SILTY SAND (SM), fine-grained Sand, contains lenses of Silt, light brown, moist, loose (ALLUVIUM)	10	2-3-4 (7) 17"			
836.4							
12.0		POORLY GRADED SAND (SP), fine to medium-grained Sand, trace Gravel, light brown, moist, loose (ALLUVIUM)		2-2-2 (4) 16"			
			15	3-4-4 (8) 17"			
			20	4-4-4 (8) 18"			
827.4							
21.0		END OF BORING Boring immediately backfilled with bentonite grout					Water not observed while drilling.
			25				
			30				

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See Descriptive Terminology sheet for explanation of abbreviations

Project Number B1908148
Geotechnical Evaluation
Luther Subaru - New Dealership
7801 Lyndale Avenue South
Bloomington, Minnesota

BORING: **ST-3**
LOCATION: See attached sketch
NORTHING: 125596 EASTING: 525118
DRILLER: J. Chermak LOGGED BY: J. Carlson START DATE: 08/06/19 END DATE: 08/06/19
SURFACE ELEVATION: 848.8 ft RIG: 7519 METHOD: 3 1/4" HSA SURFACING: Asphalt WEATHER: Sunny

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
847.9		PAVEMENT, 4 1/2 inches of bituminous over 7 inches of aggregate base					
0.9		FILL: CLAYEY SAND (SC), fine-grained Sand, dark brown and brown, moist		2-2-2 (4) 17"		16	
845.8							
3.0		POORLY GRADED SAND with SILT (SP-SM), fine to medium-grained Sand, brown, moist, loose (ALLUVIUM)		4-4-4 (8) 18"			
841.8			5				
7.0		POORLY GRADED SAND (SP), fine to medium-grained Sand, trace Gravel, brown, moist, very loose to loose (ALLUVIUM)		1-2-2 (4) 16"			
836.8			10	2-2-3 (5) 17"			
12.0		POORLY GRADED SAND with SILT (SP-SM), fine to medium-grained Sand, trace Gravel, brown, moist, loose to medium dense (ALLUVIUM)		4-4-5 (9) 17"			
829.8			15	5-5-6 (11) 18"			
19.0		POORLY GRADED SAND with SILT (SP-SM), fine-grained Sand, light brown, moist, medium dense (ALLUVIUM)	20	7-8-8 (16) 18"			
827.8							
21.0		END OF BORING					Water not observed while drilling.
		Boring immediately backfilled with bentonite grout					
			25				
			30				

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See Descriptive Terminology sheet for explanation of abbreviations

Project Number B1908148
Geotechnical Evaluation
Luther Subaru - New Dealership
7801 Lyndale Avenue South
Bloomington, Minnesota

BORING: **ST-4**

LOCATION: See attached sketch

NORTHING: 125478 EASTING: 525040

DRILLER: J. Chermak | LOGGED BY: J. Carlson | START DATE: 08/05/19 | END DATE: 08/05/19

SURFACE ELEVATION: 848.2 ft | RIG: 7519 | METHOD: 3 1/4" HSA | SURFACING: Asphalt | WEATHER: Sunny

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
847.4		PAVEMENT, 4 inches of bituminous over 6 inches of aggregate base					
0.8		FILL: SILTY SAND (SM), fine to medium-grained Sand, brown and dark brown, moist		2-1-2 (3) 17"			
845.2							
3.0		POORLY GRADED SAND with SILT (SP-SM), fine to medium-grained Sand, trace Gravel, brown to light brown, moist, loose to very loose (ALLUVIUM)		4-4-5 (9) 17"			
			5	2-1-2 (3) 17"			
				2-2-3 (5) 18"			
			10				
836.2							
12.0		POORLY GRADED SAND with SILT (SP-SM), fine-grained Sand, contains lenses of Silt, light brown, moist, loose to medium dense (ALLUVIUM)		2-2-4 (6) 17"			
			15	5-8-11 (19) 18"			
			20	5-5-5 (10) 18"			
827.2							
21.0		END OF BORING					Water not observed while drilling.
		Boring immediately backfilled with bentonite grout					
			25				
			30				

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See Descriptive Terminology sheet for explanation of abbreviations

Project Number B1908148
Geotechnical Evaluation
Luther Subaru - New Dealership
7801 Lyndale Avenue South
Bloomington, Minnesota

BORING: **ST-5**

LOCATION: See attached sketch

NORTHING: 125468 EASTING: 525116

DRILLER: J. Chermak | LOGGED BY: J. Carlson | START DATE: 08/06/19 | END DATE: 08/06/19

SURFACE ELEVATION: 848.3 ft | RIG: 7519 | METHOD: 3 1/4" HSA | SURFACING: Asphalt | WEATHER: Sunny

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
847.5		PAVEMENT, 4 inches of bituminous over 6 1/2 inches of aggregate base					
0.8		FILL: SILTY SAND (SM), fine to medium-grained Sand, brown and dark brown, moist		6-6-10 (16) 17"		12	
			5	5-5-4 (9) 17"			
841.3							
7.0		POORLY GRADED SAND (SP), fine to medium-grained Sand, brown, moist, very loose (ALLUVIUM)		1-1-1 (2) 17"			
839.3							
9.0		POORLY GRADED SAND (SP), fine-grained Sand, contains lenses of Silt, light brown, moist, very loose to loose (ALLUVIUM)	10	1-1-2 (3) 18"			
				2-2-2 (4) 17"			
			15	2-2-3 (5) 18"			
829.3							
19.0		SILTY SAND (SM), fine-grained Sand, light brown, moist, loose (ALLUVIUM)	20	4-4-5 (9) 18"			
827.3							
21.0		END OF BORING					Water not observed while drilling.
		Boring immediately backfilled with bentonite grout					
			25				
			30				

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See Descriptive Terminology sheet for explanation of abbreviations

Project Number B1908148
Geotechnical Evaluation
Luther Subaru - New Dealership
7801 Lyndale Avenue South
Bloomington, Minnesota

BORING: **ST-6**
LOCATION: See attached sketch
NORTHING: 125439 EASTING: 524980
DRILLER: J. Chermak LOGGED BY: J. Carlson START DATE: 08/06/19 END DATE: 08/06/19
SURFACE ELEVATION: 849.5 ft RIG: 7519 METHOD: 3 1/4" HSA SURFACING: Asphalt WEATHER: Sunny

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
848.6		PAVEMENT, 4 inches of bituminous over 7 inches of aggregate base					
0.9		FILL: SILTY SAND (SM), fine to medium-grained Sand, black, moist		2-2-2 (4) 17"			
845.5							
4.0		FILL: SILTY SAND (SM), fine to medium-grained Sand, trace Organic Clay, dark brown with trace black, moist	5	1-1-1 (2) 18"		13	OC=1.7%
843.5							
6.0		FILL: POORLY GRADED SAND (SP), fine to medium-grained Sand, with Clayey Sand, brown and dark brown, moist		1-2-0 (2) 17"			
840.5							
9.0		POORLY GRADED SAND with SILT (SP-SM), fine-grained Sand, contains seams of Silt, light brown, moist, very loose (ALLUVIUM)	10	2-2-2 (4) 18"			
837.5							
12.0		POORLY GRADED SAND (SP), fine-grained Sand, light brown, moist, loose (ALLUVIUM)		2-2-3 (5) 18"			
			15	4-4-5 (9) 18"			
			20	4-4-5 (9) 18"			
828.5							
21.0		END OF BORING Boring immediately backfilled with bentonite grout					Water not observed while drilling.
			25				
			30				

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See Descriptive Terminology sheet for explanation of abbreviations

Project Number B1908148
Geotechnical Evaluation
Luther Subaru - New Dealership
7801 Lyndale Avenue South
Bloomington, Minnesota

BORING: **ST-7**

LOCATION: See attached sketch

NORTHING: 125402 EASTING: 525047

DRILLER: J. Chermak | LOGGED BY: J. Carlson | START DATE: 08/05/19 | END DATE: 08/05/19

SURFACE ELEVATION: 847.3 ft | RIG: 7519 | METHOD: 3 1/4" HSA | SURFACING: Asphalt | WEATHER: Sunny

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
846.4		PAVEMENT, 3 1/2 inches of bituminous over 7 inches of aggregate					
0.9							
845.3		FILL: SILTY SAND (SM), fine to medium-grained Sand, black, moist					
2.0		FILL: SILTY SAND (SM), fine to medium-grained Sand, brown, moist		2-1-2 (3) 16"			
			5	4-4-5 (9) 17"		12	P200=12%
840.3							
7.0		POORLY GRADED SAND (SP), fine to medium-grained Sand, trace Gravel, brown, moist, very loose (ALLUVIUM)		2-2-2 (4) 17"			
838.3							
9.0		POORLY GRADED SAND with SILT (SP-SM), fine-grained Sand, light brown, moist, loose to medium dense (ALLUVIUM)	10	3-2-5 (7) 18"			
				2-2-3 (5) 18"			
			15	6-10-13 (23) 18"			
828.3							
19.0		SILT (ML), brown, moist, medium dense (ALLUVIUM)	20	5-5-6 (11) 18"			
826.3							
21.0		END OF BORING					Water not observed while drilling.
		Boring immediately backfilled with bentonite grout					
			25				
			30				

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LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B1908148
Geotechnical Evaluation
Luther Subaru - New Dealership
7801 Lyndale Avenue South
Bloomington, Minnesota

BORING: **ST-8**
LOCATION: See attached sketch
NORTHING: 125408 EASTING: 525116
DRILLER: J. Chermak LOGGED BY: J. Carlson START DATE: 08/05/19 END DATE: 08/05/19
SURFACE ELEVATION: 847.3 ft RIG: 7519 METHOD: 3 1/4" HSA SURFACING: Asphalt WEATHER: Sunny

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
846.4		PAVEMENT, 4 1/2 inches of bituminous over 6 1/2 inches of aggregate base					
0.9		FILL: POORLY GRADED SAND with SILT (SP-SM), fine to medium-grained Sand, with Silty Sand, brown and dark brown, moist		2-2-2 (4) 17"			
843.3							
4.0		FILL: POORLY GRADED SAND with SILT (SP-SM), fine to medium-grained Sand, brown, moist	5	2-2-2 (4) 16"		7	P200=6%
840.3							
7.0		POORLY GRADED SAND (SP), fine to medium-grained Sand, trace Gravel, brown, moist, very loose (ALLUVIUM)		1-1-1 (2) 17"			
838.3							
9.0		POORLY GRADED SAND (SP), fine-grained Sand, light brown, moist, loose (ALLUVIUM)	10	3-2-3 (5) 17"			
835.3							
12.0		SILTY SAND (SM), fine-grained Sand, light brown, moist, very loose to medium dense (ALLUVIUM)		2-2-2 (4) 18"			
			15	4-6-6 (12) 17"			
828.3							
19.0		SILT (ML), contains lenses of Silty Sand, light brown, moist, loose (ALLUVIUM)	20	4-4-6 (10) 18"			
826.3							
21.0		END OF BORING					Water not observed while drilling.
		Boring immediately backfilled with bentonite grout					
			25				
			30				

BRAUN INTERTEC
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LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B1908148
Geotechnical Evaluation
Luther Subaru - New Dealership
7801 Lyndale Avenue South
Bloomington, Minnesota

BORING: **ST-9**

LOCATION: See attached sketch

NORTHING: 125338 EASTING: 525046

DRILLER: J. Chermak | LOGGED BY: J. Carlson | START DATE: 08/05/19 | END DATE: 08/05/19

SURFACE ELEVATION: 846.4 ft | RIG: 7519 | METHOD: 3 1/4" HSA | SURFACING: Asphalt | WEATHER: Sunny

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
845.6		PAVEMENT, 4 inches of bituminous over 6 inches of aggregate base					
0.8		FILL: CLAYEY SAND (SC), fine to medium-grained Sand, dark brown to brown, moist		1-1-2 (3) 16"		14	
842.4							
4.0		FILL: POORLY GRADED SAND with SILT (SP-SM), fine to medium-grained Sand, with black Silty Sand, brown, moist	5	4-4-5 (9) 17"			
839.4							
7.0		POORLY GRADED SAND (SP), fine-grained Sand, light brown, moist, very loose to medium dense (ALLUVIUM)		1-1-2 (3) 17"			
			10	4-4-5 (9) 18"			
				4-4-5 (9) 17"			
			15	6-11-15 (26) 18"			
		Trace Gravel at 20 feet	20	8-8-12 (20) 18"			
825.4							
21.0		END OF BORING					Water not observed while drilling.
		Boring immediately backfilled with bentonite grout					
			25				
			30				

BRAUN INTERTEC
The Science You Build On.

LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B1908148
Geotechnical Evaluation
Luther Subaru - New Dealership
7801 Lyndale Avenue South
Bloomington, Minnesota

BORING: **ST-10**
LOCATION: See attached sketch
NORTHING: 125256 EASTING: 525087
DRILLER: J. Chermak LOGGED BY: J. Carlson START DATE: 08/06/19 END DATE: 08/05/19
SURFACE ELEVATION: 846.3 ft RIG: 7519 METHOD: 3 1/4" HSA SURFACING: Asphalt WEATHER: Sunny

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
845.4		PAVEMENT, 4 inches of bituminous over 7 inches of aggregate base					
0.9		FILL: SILTY SAND (SM), fine to medium-grained Sand, dark brown, moist		2-2-3 (5) 18"		13	OC=2.6%
841.3			5	5-6-6 (12) 18"			
5.0		POORLY GRADED SAND with SILT (SP-SM), fine-grained Sand, trace Gravel, light brown, moist, medium dense (ALLUVIUM)		6-7-6 (13) 18"			
			10	8-8-15 (23) 18"			
834.3							
12.0		POORLY GRADED SAND (SP), fine to medium-grained Sand, trace Gravel, brown, moist, loose (ALLUVIUM)		4-4-4 (8) 17"			
832.3							
14.0		POORLY GRADED SAND (SP), fine-grained Sand, light brown, moist, medium dense to very loose (ALLUVIUM)	15	5-5-6 (11) 18"			
			20	1-1-3 (4) 18"			
825.3							
21.0		END OF BORING Boring immediately backfilled with bentonite grout					Water not observed while drilling.
			25				
			30				

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LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B1908148
Geotechnical Evaluation
Luther Subaru - New Dealership
7801 Lyndale Avenue South
Bloomington, Minnesota

BORING: **ST-11**

LOCATION: See attached sketch

NORTHING: 125233 EASTING: 525203

DRILLER: J. Chermak | LOGGED BY: J. Carlson | START DATE: 08/05/19 | END DATE: 08/05/19

SURFACE ELEVATION: 846.9 ft | RIG: 7519 | METHOD: 3 1/4" HSA | SURFACING: Asphalt | WEATHER: Sunny

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
846.0		PAVEMENT, 4 inches of bituminous over 7 inches of aggregate base					
0.9		FILL: CLAYEY SAND (SC), fine to medium-grained Sand, with Sandy Lean Clay, brown and dark brown, moist		3-4-4 (8) 18"		15	
843.9		POORLY GRADED SAND (SP), fine to medium-grained Sand, trace Gravel, light brown, moist, loose to medium dense (ALLUVIUM)	5	4-6-6 (12) 18"			
3.0				2-2-3 (5) 17"			
			10	4-6-7 (13) 18"			
834.9		POORLY GRADED SAND (SP), fine-grained Sand, trace Gravel, light brown, moist, very loose to medium dense (ALLUVIUM)		2-2-2 (4) 16"			
12.0			15	6-7-8 (15) 18"			
827.9		SILTY SAND (SM), fine-grained Sand, light brown, moist, loose (ALLUVIUM)	20	3-3-3 (6) 18"			
19.0							
825.9		END OF BORING					Water not observed while drilling.
21.0		Boring immediately backfilled with bentonite grout					
			25				
			30				

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LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B1908148
Geotechnical Evaluation
Luther Subaru - New Dealership
7801 Lyndale Avenue South
Bloomington, Minnesota

BORING: **ST-12**

LOCATION: See attached sketch

NORTHING: 125180 EASTING: 525126

DRILLER: J. Chermak | LOGGED BY: J. Carlson | START DATE: 08/02/19 | END DATE: 08/02/19

SURFACE ELEVATION: 847.7 ft | RIG: 7519 | METHOD: 3 1/4" HSA | SURFACING: Asphalt | WEATHER: Sunny

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
846.9		PAVEMENT, 3 inches of bituminous over 7 inches of aggregate base					
0.8		FILL: SILTY SAND (SM), fine to medium-grained Sand, brown and dark brown, moist		3-2-3 (5) 17"			
844.7							
3.0		POORLY GRADED SAND with SILT (SP-SM), fine to medium-grained Sand, brown, moist, loose (ALLUVIUM)		3-4-4 (8) 17"			
840.7			5				
7.0		POORLY GRADED SAND (SP), fine to medium-grained Sand, light brown, moist, loose to medium dense (ALLUVIUM)		1-2-3 (5) 16"			
			10	4-5-7 (12) 18"			
				3-3-3 (6) 17"			
833.7							
14.0		POORLY GRADED SAND with SILT (SP-SM), fine-grained Sand, light brown, moist, medium dense (ALLUVIUM)	15	3-5-8 (13) 18"			
			20	5-5-8 (13) 18"			
826.7							
21.0		END OF BORING					Water not observed while drilling.
		Boring immediately backfilled with bentonite grout					
			25				
			30				

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LOG OF BORING

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Project Number B1908148
Geotechnical Evaluation
Luther Subaru - New Dealership
7801 Lyndale Avenue South
Bloomington, Minnesota

BORING: **ST-13**
LOCATION: See attached sketch
NORTHING: 124979 EASTING: 525236
START DATE: 08/02/19 END DATE: 09/02/19
DRILLER: J. Chermak LOGGED BY: J. Carlson
SURFACE ELEVATION: 847.1 ft RIG: 7519 METHOD: 3 1/4" HSA
SURFACING: Asphalt WEATHER: Sunny

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
846.0		PAVEMENT, 4 1/2 inches of bituminous over 8 inches of aggregate base					
1.1		FILL: SANDY SILT (ML), trace Gravel, with Poorly Graded Sand, brown and dark brown, moist		4-2-2 (4) 18"		10	P200=61%
843.1							
4.0		POORLY GRADED SAND (SP), fine to medium-grained Sand, trace Gravel, brown and light brown, moist, very loose to loose (ALLUVIUM)	5	2-1-2 (3) 17"			
				1-1-4 (5) 17"			
			10	2-3-4 (7) 18"			
835.1							
12.0		POORLY GRADED SAND with SILT (SP-SM), fine-grained Sand, light brown, moist, loose to medium dense (ALLUVIUM)		3-3-3 (6) 16"			
			15	5-8-8 (16) 16"			
828.1							
19.0		SANDY SILT (ML), contains lenses of Silty Sand, light brown, moist, medium dense (ALLUVIUM)	20	5-6-6 (12) 18"			
826.1							
21.0		END OF BORING					Water not observed while drilling.
		Boring immediately backfilled with bentonite grout					
			25				
			30				

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LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B1908148
Geotechnical Evaluation
Luther Subaru - New Dealership
7801 Lyndale Avenue South
Bloomington, Minnesota

BORING: **ST-14**
LOCATION: See attached sketch
NORTHING: 124979 EASTING: 525337
DRILLER: J. Chermak LOGGED BY: J. Carlson START DATE: 08/02/19 END DATE: 08/02/19
SURFACE ELEVATION: 845.9 ft RIG: 7519 METHOD: 3 1/4" HSA SURFACING: Asphalt WEATHER: Sunny

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
844.8		PAVEMENT, 4 1/2 inches of bituminous over 8 inches of aggregate base					
1.1		FILL: POORLY GRADED SAND (SP), fine to medium-grained Sand, trace Gravel, with Silty Sand, brown with trace black, moist		4-4-4 (8) 16"			
841.9							
4.0		POORLY GRADED SAND (SP), fine to medium-grained Sand, trace Gravel, light brown, moist, medium dense to loose (ALLUVIUM)	5	9-9-9 (18) 18"			
				4-4-6 (10) 18"			
			10	4-4-6 (10) 18"			
831.9				3-3-3 (6) 18"			
14.0		SILTY SAND (SM), fine-grained Sand, contains seams of Silt, light brown, moist, loose (ALLUVIUM)	15	4-4-4 (8) 18"			
			20	3-4-4 (8) 18"			
824.9							
21.0		END OF BORING					Water not observed while drilling.
		Boring immediately backfilled with bentonite grout					
			25				
			30				