Purchasing Division
Finance Department

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Duluth, Minnesota 55802

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Addendum 1
Solicitation 24-99028
Gary New Duluth Community Center & Recreation Area – Phase IV

This addendum serves to notify all bidders of the following changes to the solicitation documents:

1. A list of virtual pre-bid meeting attendees is attached. Attendees were encouraged to sign up as a planholder within Bid Express and provide contact information there.

2. For clarification, the GND Development Alliance is not a contractor. They are a non-profit organization that has been leading the effort to revitalize and transform the Gary New Duluth Recreation Area.

3. On site there is approximately 700 tons of crushed rock (oblong pile at top of attached photo) and a pile of sand (cone-shaped pile in middle of attached photo) available for use on this project.

4. Attached is revised page DI.2 with clarifications on dimensions.

5. Question: Are general contractors required to perform 40% of the work?
   Answer: While Minnesota Statute 161.3209 has a requirement for general contractors to self-perform 30% of the work, it is applicable only to trunk highways and <u>does not</u> apply to this project.

6. Question: Is there a geotechnical report available?
   Answer: Yes, the geotechnical evaluation report is attached to this addendum.

7. Question: Are there any permits that the skatepark contractor needs to take care of?
   Answer: If the alternate is accepted by the City, contractor will be responsible for permits for the parking lot.

8. Question: What is the wage scale?
   Answer: The minimum prevailing wage rates are included in the bid package. In addition, since a project labor agreement is required for any contract over $150,000, bidders should reach out to the Trades Council to fully understand the wage and benefit implications. Contact information is Jack Carlson, Duluth Building and Construction

Trades Council President, 218-727-2199, president@duluthbuildingtrades.com.

9. Question: Will there be construction administration performed by the designer?
   Answer: SAS + Associates will be performing construction administration. They did not design the skate park. The initial concept was completed by a skate park designer, which in turn lead to the designs of the foundations. It will now be up to constructors to make the existing infrastructure skateable.

Please acknowledge receipt of this Addendum by checking the acknowledgement box within the www.bidexpress.com solicitation.

Posted: **January 18, 2024**

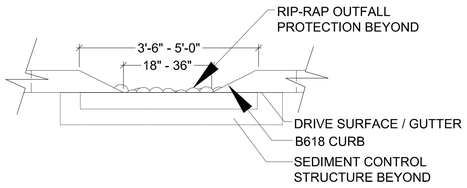
Attachments:

Pre-bid meeting attendees
Photo of available materials
Revised planset page DI.2
Geotechnical evaluation report

Virtual Pre-Bid Meeting Attendees
24-99028 Gary New Duluth Community Center & Recreation Area – Phase IV
January 9, 2024

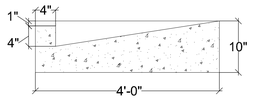
Name	Organization
Patti Stalvig	City of Duluth Purchasing Agent
Luke Sydow	SAS + Associates
Allison Adams	SAS + Associates
Mark Boben	Gary New Duluth Development Alliance
Rob Hurd	City of Duluth Project Coordinator
Jim Shoberg	City of Duluth Project Coordinator
Katie Bennett	City of Duluth Parks & Recreation
Mike Wolf	City of Duluth Purchasing
Laura Smith	City of Duluth Purchasing
Shane Feltus	TNT Construction Group
Rachelle Marchbanks	California Skateparks & Hardcore Skateparks
Jon Carlson	Northland Constructors of Duluth
Jeff Reiter	Custom Builders
Kyle Will	Grindline Skateparks
Jon Brostowitz	Veit & Company
Jay Pateman	California Skateparks & Hardcore Skateparks
James Klinedinst	Grindline Skateparks
Andy Dammer	Veit & Company





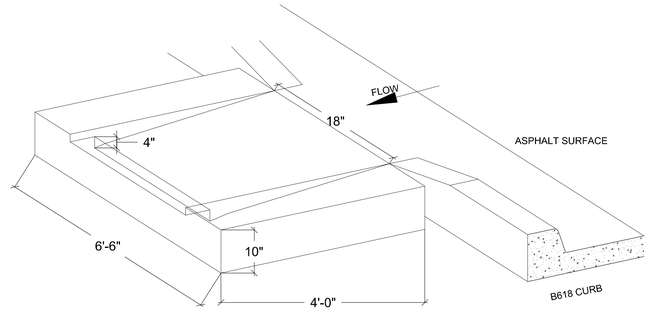
1 CURB DEPRESSION (ADD ALT #1)

SCALE: NOT TO SCALE



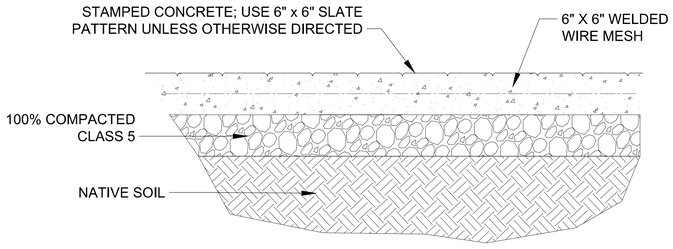
2 SEDIMENT COLLECTION STRUCTURE SECTION (ADD ALT #1)

SCALE: NOT TO SCALE



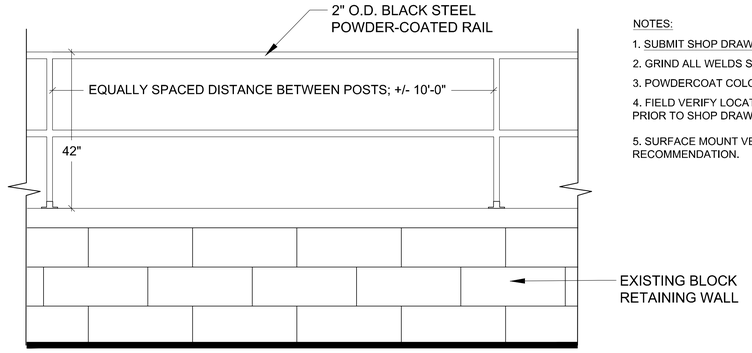
3 SEDIMENT COLLECTION STRUCTURE (ADD ALT #1)

SCALE: NOT TO SCALE



4 STAMPED CONCRETE DETAIL

SCALE: NOT TO SCALE

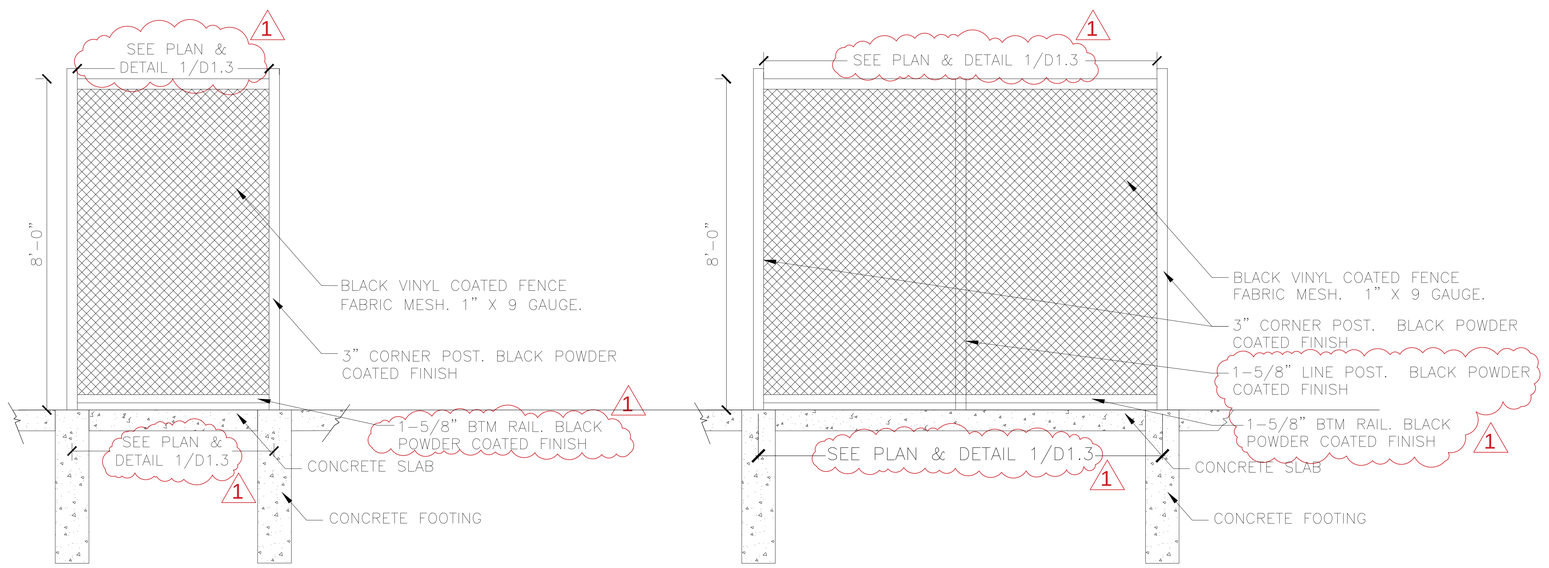


NOTES:

1. SUBMIT SHOP DRAWINGS FOR HANDRAIL BASED ON FIELD CONDITIONS.
2. GRIND ALL WELDS SMOOTH.
3. POWDERCOAT COLOR TO BE BLACK UNLESS OTHERWISE NOTIFIED.
4. FIELD VERIFY LOCATION OF ATTACHMENT PLATES/ VERTICAL POSTS PRIOR TO SHOP DRAWING SUBMITTAL.
5. SURFACE MOUNT VERTICAL RAILS PER MANUFACTURER'S RECOMMENDATION.

5 STEEL RAILING

SCALE: NOT TO SCALE



6 PORTABLE TOILET ENCLOSURE

SCALE: NOT TO SCALE

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ISSUE RECORD/REVISION

PURPOSE	DATE
ADDENDUM #1	1-18-2024

GARY NEW DULUTH
COMMUNITY CENTER AND
RECREATION AREA

DULUTH, MN

SHEET KEY

SHEET TITLE
DETAILS

DATE: 12/11/2023
DRAWN BY: LWS
CHECKED BY: LWS

PROJECT NUMBER
13342

SHEET NUMBER
D1.2

Jan 17, 2024 - 10:29am
P:\13341 - UMD\Phase 2 Bidding - Stair Surface\ADD 1 - Phase 4 - 1-17-24.dwg

Twin Ports Testing
1301 N 3rd St. ● Superior WI 54880 ● 715-392-7114 ● 1-800-373-2562 ● F 715-392-7163 ● www.twinportstesting.com

Geotechnical Evaluation Report

Proposed Gary New Duluth Recreation Center
Commonwealth Avenue
Duluth, Minnesota

Prepared for:

GND Development Alliance

I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the State of Minnesota.

Michael A. Haapala, PE
October 31, 2014

TPT Project Number: 14M6846



October 31, 2014
TPT Project No. 14M6846

Mr. Mark Boben
GND Development Alliance
Sent via email: greysolon2010@gmail.com

Re: Geotechnical Evaluation Report
Gary New Duluth Recreation Center
Duluth, Minnesota

Dear Mr. Boben:

Enclosed is our geotechnical evaluation report for the above referenced project. We have prepared this report and based our conclusions upon current applicable professional standards.

If you have any questions concerning the data, the recommendations presented, or if we may be of further service on this project, please contact us at (715) 392-7114. We appreciate the opportunity to be of service to you.

Sincerely,

Twin Ports Testing, Inc.



Brett Carlson, EIT
Project Engineer



Michael A. Haapala, PE
Principal Engineer

Attachment:
Geotechnical Evaluation Report

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Appendix: Boring Location Sketch (1 Page), Boring Logs B-1 through B-12 (12 Pages), Boring Notes (2 Pages)

1 Introduction

This report presents the results of our geotechnical evaluation for the proposed Gary New Duluth (GND) Recreation Center near the intersection of Commonwealth Avenue and Fillmore Street in Duluth, Minnesota.

1.1 Scope of Services

The scope of our geotechnical evaluation as outlined in our Proposal 14M6846, dated September 29, 2014, included:

- Performing a field exploration program consisting of 12 Standard Penetration Test (SPT) borings to nominal depths of 15 feet or refusal.
- Performing laboratory tests and observations of soil samples to evaluate pertinent engineering properties of materials encountered.
- Preparing a geotechnical evaluation report containing a description of the drilling program, a description of the geology and subsurface conditions encountered, groundwater conditions, boring logs with a Boring Location Sketch, results of laboratory testing, and recommendations for site preparation, foundation design, pavements , and construction.

Twin Ports Testing, Inc. (TPT) has prepared this report for design purposes only. It may not have sufficient subsurface information to prepare an accurate construction bid. We recommend that contractors preparing bids or proposals for this project be provided with a complete copy of this report as a supplement to the plans and specifications.

1.2 Proposed Project

We understand that the GND Development Alliance is in the design process for construction of a new recreation center in Duluth, Minnesota. The proposed project is expected to include soccer fields, parking and drive areas, a skatepark, water retention areas, a dog park, a pavilion, a sport court, and a disc golf course. The only structures that are expected to be constructed for this project include a pavilion and the skate park. Extensive earthwork and grading is expected during construction of this project.

It is our understanding that as part of the master plan for the GND Recreation Center a new community center structure is planned to be constructed. This structure was not included in our analysis and should be individually evaluated once the location, footprint, and structure type are determined.

Building loads and grading plans were not provided to TPT at the time of this report. We have assumed that maximum column loads will not exceed 5 kips. Parking and drive areas are expected to classify as light duty.

Changes in the nature, design, and location of all or parts of this project may occur during the design process. The conclusions and recommendations contained in this report shall not be considered applicable to changes unless they are reviewed by the geotechnical engineer of record. TPT will then make necessary changes or modifications to this report in writing only.

1.2.1 Reference Information

- SAS+ Associates Drawing "Gary New Duluth Community Center and Recreation Area Conceptual Master Plan," dated July 19, 2014.

2 Site Conditions

2.1 Geologic Setting

Through an understanding of the geologic history and processes of an area, we are better able to define and understand the range of geotechnical properties observed in the geological materials encountered at the site. Knowledge of the anticipated subsurface profile at the site is important for interpreting and correlating the borings from the field exploration program.

Based upon information from geologic survey reports and previous soil explorations in the area, the geology local to the site generally consists of glacial sediment (Barnum Formation) associated with the Superior lobe advance of the Wisconsinan glacial period. The glacial sediment is described as having a reddish brown clay matrix. Alluvial sediments are also common in the area from historic activity of the St. Louis River.

2.1.1 Geologic Hazards

The potential for most geologic hazards is generally low for this site. A hazard potential summary is shown in Table 1.

Table 1: Geologic Hazard Summary

Geologic Hazard	Present?	Comments
Earthquake/Seismic Activity	No	The site is in an area of low seismic activity.
Flooding	Unlikely	This site is not located within an area of historic flood activity.
Slope Failure/Landslides	No	This site is relatively flat with little potential for slope failure.
Made Ground	Yes	This site has been previously developed and fill soils exist.

Swelling/Shrinking Soil	Yes	Clay soils near the site have medium to high shrinking and swelling potential when exposed to changes in moisture and freezing temperatures.

2.2 Site Location and Existing Conditions

The proposed site is located adjacent to the intesection of Commonwealth Avenue and Fillmore Street in Duluth, Minnesota. The site is bordered to the north and west by forested areas, to the south by Stowe School, and to the east by Commonwealth Avenue.

This site is developed and has been graded in the past. Cleared areas consist primarily of grass with some trees and brush present throughout the site. 101st Avenue West runs north to south through the middle of this site. A skatepark and basketball area are located to the east of 101st Avenue West in a paved lot and are expected to be removed. A community center structure exists to the west of 101st Avenue West near the roadway. It is our understanding that this structure will be remodeled during this project but will not be expanded. To the northwest of the site are open grassy areas and gravel parking areas. The western portion of this site consists of an existing baseball field with perimeter fencing and lighting.

2.3 Topography and Elevations

This site is relatively flat and has been graded in the past. Elevations between the boring locations varied by 15.1 feet.

3 Field Procedures

The subsurface exploration program for this project consisted of 12 Standard Penetration Test (SPT) borings. Borings B-1 and B-2 were performed within the footprint of the proposed skatepark and Boring B-8 was performed within the proposed pavillion footprint. The remaining borings were spread throughout the project area as shown on the Boring Location Sketch in the Appendix.

SPT borings were performed with a CME 1050 flotation-tired drill rig using hollow stem auger drilling methods. Drilling operations were performed on September 16 and 17, 2014.

3.1 Boring Locations and Elevations

The boring locations were determined in the field by TPT personnel using the sketch provided by SAS + Associates. Approximate boring locations and UTM coordinates are shown on the attached Boring Location Sketch in the Appendix.

Surface elevations were determined in the field by TPT personnel on September 16, 2014. Elevations were referenced to the top of the floor slab near the northwest corner of the existing community center, as shown on the Boring Location Sketch. An elevation of 100.0 feet was assigned to this benchmark. Surface elevations are shown on the boring logs in the Appendix.

3.2 Sampling

3.2.1 Standard Penetration Tests

At selected depth intervals in the borings, Standard Penetration Tests (SPT) were conducted in substantial compliance with ASTM Method D1586. The SPT "N" values shown on the boring log are the number of blows required to drive a standard split barrel sampler 12 inches (two six-inch increments) into undisturbed soil using a 140 pound drive hammer dropped 30 inches per blow after an initial "set" of six inches. The "N" value is an index of the relative density of cohesion-less soils. Partially disturbed samples obtained from the SPT were sealed in glass jars and returned to the laboratory for testing.

Based upon the most recent calibration on August 15, 2014, our SPT drive hammer has an average energy transfer efficiency of 80.9%.

3.3 Boring Logs

Field boring logs were prepared for the boring by our field supervisor. The log contains factual information and field interpretations of the soil conditions observed, as described in substantial compliance with ASTM D420 and D2488.

The final boring logs are included in the Appendix. The final logs represent our interpretation of the contents of the field logs after laboratory observations by our geotechnical engineer and laboratory tests of the field samples were complete. Soils are described in this report according to the Unified Soil Classification System (USCS), as outlined in the Boring Log Notes in the Appendix.

3.4 Water Level Readings

Water level readings were observed in the borings at the times and under the conditions stated on the boring logs. We have reviewed the data and have reported interpretations in the text of this report. However, it must be noted that fluctuations in the level of the ground water may occur because of variations in rainfall, temperature, subsurface materials and other conditions or factors different from those observed at the time of our measurements. It should be noted that such conditions are subject to change.

4 Subsurface Conditions

4.1 Soil

The subsurface conditions encountered at this site generally consist of three stratigraphic units; (1) Fill, (2) Fat Clay, and (3) Silty Sand.

4.1.1 Fill

Fill soils were encountered at the surface of all boring locations to depths up to six feet. Fill soils generally consisted of fat clay with sand or silty sand with clay and contained trace roots and fibers. These soils ranged in color between brown, dark brown, and light brown. Moisture content ranged from moist to wet.

Between three and five incehs of topsoil was observed at the surface in Borings B-1, B-2, B-5, B-7, and B-9 through B-12.

Ashphalt pavement was encountered at the surface of Borings B-4 and B-3 to depths of four and five inches respectively.

4.1.2 Fat Clay

Fat clay soils were encountered beneath the surface soils in all boring locations to depths of seven feet to 16 feet. Fat clay soils were generally reddish brown in color and were wet.

SPT N-Values and pocket penetrometer tests suggest that fat clay soils are generally soft to medium in consistency. Additional laboratory data would be required to precisely estimate engineering properties for settlement analysis.

4.1.3 Silty Sand

Silty sand soils were encountered beneath the fat clay soils in all boring locations to boring termination depths up to 16 feet. Boring B-11 encountered silty sand soils beneath the topsoil to the boring termination depth. Silty sand soils were generally light brown to greyish brown, fine grained, and wet to waterbearing.

SPT N-values suggest that silty sand soils were generally medium dense in relative density.

4.2 Groundwater

Groundwater was observed in three borings at this site between the depths of 12 and 14 feet. A detailed evaluation of groundwater levels at the site would require long term monitoring of piezometers and was not included in the scope of this evaluation.

5 Laboratory Testing

Results of the field testing and observed subsurface conditions were evaluated to develop a laboratory testing program. Laboratory testing included visual classification, pocket penetrometer readings, and moisture content testing. Results are shown on the Boring Logs in the Appendix.

5.1 Water Content

Laboratory water content testing was performed on collected samples from the field exploration. Values of water content in native fat clay soils ranged from 18% to 86%. Values of water content in native silty sand soils ranged from 6% to 36%.

5.2 Pocket Penetrometer

Pocket penetrometer tests were performed in the laboratory on collected fine grained samples. Results are shown on the Boring Logs in the Appendix.

6 Analyses and Design Recommendations

6.1 Site Preparation

Field explorations at this site encountered fill, topsoil, or asphalt pavement at the surface of all boring locations. Fill soils were observed to depths between four and six feet in Borings B-3, B-4, B-5, B-10, and B-12. Fill and topsoil at the remaining locations were relatively shallow.

It is our understanding that much of the proposed project will consist of grading and earthwork. Proposed structures are small and will be lightly loaded. Generally, we do not recommend supporting new structures on uncontrolled fill soils due to the potential for settlement and poor foundation performance. However, due to the small size of proposed structures, it appears that both existing fill soils and native clay or sand soils are suitable for foundation support if some risk of settlement is acceptable. Any areas prepared in this manner should be proof rolled and evaluated by a geotechnical engineer prior to construction. This recommendation does not apply to future proposed buildings without additional testing and analysis.

We recommend that all topsoil be removed beneath proposed construction at the site and stockpiled for later use. Topsoil should also be stripped prior to placing fill throughout the site.

If some risk of settlement is not acceptable for this project, we recommend removing all surface fill soils encountered within the footprint and influence area (1H:1V out from the outside edge of slabs/footings) of proposed structures and replacing with compacted

engineered fill to reach design elevations. Estimated minimum excavation depths to remove fill soils are shown in Table 2.

Table 2: Estimated Minimum Excavation Depths

Location	Estimated Fill/Topsoil Depth (ft)	Surface Elevation (ft)	Estimated Bottom of Fill Elevation (ft)
B-1	0.4	93.4	93.0
B-2	0.3	93.9	93.6
B-3	5.0	96.4	91.4
B-4	5.0	96.5	91.5
B-5	4.0	99.6	95.6
B-6	1.0	101.0	100.0
B-7	0.4	101.1	100.7
B-8	1.0	105.7	104.7
B-9	0.3	103.8	103.5
B-10	6.0	104.2	98.2
B-11	0.3	108.5	108.2
B-12	4.0	108.5	104.5

6.2 Shallow Foundations

Shallow foundations, including both frost depth footings and frost protected foundations are feasible options for this site. Frost protected shallow foundations will likely be the most feasible option for support of the pavilion. Recommendations for frost protected shallow foundations are provided below.

6.2.1 Frost Protected Shallow Foundations

Frost protected shallow foundations are also a feasible option for this site. We recommend using design methods outlined in ASCE 32-01 “Design and Construction of Frost-Protected Shallow Foundations”. Recommended R-Values for insulation assuming a design Air Freezing Index of 3,000º F days are provided for both unheated structures and structures heated to at least 63º F as shown in Table 3.

Table 3: Minimum Insulation R-Values

	Vertical Insulation R-Value	Horizontal R-Value, Along Walls	Horizontal R-Value, At Corners
Unheated Structure	-	18.2	18.2
Heated Structures	7.8	6.5	8.6

For heated structures, insulation should extend out at least 24 inches horizontally within 40 inches of outside corners and at least 12 inches horizontally away from outside corners. Vertical insulation should be extended from the sill plate to the bottom of the footing to avoid cold bridging. Insulation above grade should be provided with UV protection.

For unheated structures, insulation should extend horizontally a minimum of 79 inches outside of foundations both along walls and at corners.

If six feet or more of non-frost susceptible fill soil (less than 5% passing the #200 sieve) is used beneath shallow foundations, insulation is not required to provide frost protection. Insulation may be required to meet energy code requirements.

We recommend a minimum footing depth of 18 inches for frost protected shallow foundations of heated structures.

6.2.3 Frost Depth Footings

The use of frost depth footings is also a feasible option for this project. We recommend that perimeter footings for heated structures bear at a minimum depth of five feet below the ground surface. Isolated exterior footings or footings for unheated structures should be provided with a minimum of six feet of cover.

6.2.3 Net Allowable Bearing Stress

Results of the field and laboratory testing program were used to evaluate the net allowable bearing stress for proposed shallow foundations. **In our opinion, a net allowable bearing stress (with a minimum factor of safety of at least 2.5) of 1,500 psf may be used to design shallow foundations placed directly on approved existing fill soils, native clay soil or compacted engineered fill over native clay.**

6.2.4 Settlement Estimate

For foundations designed for a net allowable bearing stress of 1,500 psf, we estimate total settlement of less than one inch and differential settlements less than one-half inch.

6.3 Slabs

6.3.1 Heated Structures

Interior slabs for heated structures can be supported on a layer of well-graded granular fill material placed over approved existing fill soils, native soil or engineered backfill. We recommend a minimum of six inches of well-graded granular fill be used beneath slabs.

6.3.2 Unheated Structures or Isolated Exterior Slabs

Encountered soils at the site are considered frost susceptible. If provided with a water source and freezing temperatures, several inches of frost heave could occur. Slabs for unheated structures should be provided with frost protection as outlined in section 6.2.1.

6.3.3. Modulus of Subgrade Reaction

The anticipated floor subgrade is a minimum of six inches of granular fill over native soils or engineered fill. It is our opinion that a modulus of subgrade reaction, k, of 100 pounds per square inch per inch of deflection (pci) may be used to design the floor slabs.

6.4 Slopes and Drainage

Slope backfill next to the proposed structure away from the foundation at a minimum slope of 10H:1V to promote drainage away from the structure.

6.5 Backfill and Fill

A wide variety of materials can be considered as suitable for engineered backfill and fill. The choice of materials is a function of structural requirements, water table conditions, seasonal construction constraints, placement and compaction methods, and other site or project specific needs. Soils which classify as SP, SP-SM, or SM in the Unified Soil Classification System (ASTM D2487) are usually the most available suitable soils for engineered backfill and fill.

6.5.1 Recommended Gradation for Engineered Backfill and Fill

Table 4: Recommended Gradation for Engineered Backfill and Fill

Sieve Size	Percent Passing
3''	100
2''	85-100
3/4''	71-100
#4	35-100
#200	0-7

Alternative gradations should be evaluated by a geotechnical engineer for acceptability if these guidelines cannot be satisfied by locally available backfill materials. Existing fill and clay soils are not recommended for use as engineered fill.

6.5.2 Compaction Standard

We recommend using ASTM D1557 - Modified Proctor as the laboratory compaction standard.

6.5.3 Density

We recommend compacting each lift to a minimum of the following percentage of the above compaction standard for the respective types of fill materials:

Table 5: Compaction Recommendation

Type of Engineered Fill	% Minimum Compaction
Structural Backfill	95%
Exterior Slab Backfill	95%
Non-structural Foundation Backfill	90%
Utility Trenches	90%
Backfill within 3' of Pavement Surface	95%

6.5.4 Lift Thickness

Place engineered backfill and fill materials in lifts not to exceed eight inches in a loose condition, unless the contractor can demonstrate satisfactory results when placing thicker lifts. Maximum compacted lift thickness should not exceed 12 inches.

6.5.5 Moisture

In general, granular fill materials should be placed and compacted within two percent of optimum moisture content, as determined by the above applicable compaction standard. When fill materials are not in this range of moisture content, compaction to the required density may be difficult or not possible. Clay soils are considered moisture sensitive, particular care should be taken when grading clay soils. The excavating contractor is responsible for controlling and adjusting moisture content.

6.6 Parking and Drive Areas

Based on preliminary drawings for this project, asphalt parking and drive areas will be located throughout this site. Paved areas will likely consist of light duty sections.

6.6.1 Site Preparation

We recommend removing all existing pavements and topsoil beneath paved sections along with any additional soils required to reach design elevations. The surface of all excavated areas on which engineered fill will be placed should be prepared by scarifying to a depth of at least six inches and re-compacting to achieve uniform subgrade conditions before fill is placed. The site should then be proof rolled and observed by a geotechnical engineer. Selection of procedures and equipment should be the responsibility of the contractor. In general, compaction of cohesive soils is usually best achieved with a sheepsfoot compactor. Cohesionless soils are usually best compacted with a vibrating roller or vibrating plate compactor.

6.6.2 Drainage

Clay subgrade should be shaped with a minimum 2% cross-section slope to allow subsurface water to drain naturally to drain tile. In the areas where the subgrade is granular surrounded by

clays, or is over-excavated to achieve a more uniform subgrade and/or for utility installations, care must be taken not to create a "bathtub" effect, where water ponds on or in the subgrade surface after construction. In dealing with this potential problem, we offer the following recommendations:

• Slope the subgrade and final grade to naturally drain water away from the pavement cross-section.

• Provide subsurface edge drains with a geofabric wrap routed to daylight or storm sewer. Additional drain tile in low-lying areas or "bathtub areas" is recommended.

• Limiting the excavation depth (subcut) to the extent that water will not pond in/on the subgrade. Allow for drying after precipitation events.

• Emphasize proper surface drainage. Avoid standing or ponded water conditions.

• Place geotextile fabric between subgrade and base/subbase layers to promote drainage and provide separation.

6.6.3 Minimum Pavement Sections

We recommend the minimum light duty pavement cross section as follows:

Light Duty Pavement

- 3 inches of bituminous pavement (2 lifts, base and wear course)
- 6 inches of crushed aggregate (MnDOT Class 5)
- 12 inches of MnDOT Select Granular Borrow (Modified to 7% max. passing #200) sub-base

We recommend a geotextile fabric (MnDOT Type 5) be placed between the subgrade and the engineered pavement section to provide separation and promote drainage.

7 Recommendations for Construction

7.1 Excavation

Excavations in clay soils which will be backfilled with granular soils should be provided with drainage as outlined in section 6.6.2.

7.1.1 Dewatering

We do not anticipate that groundwater will be encountered in excavations at this site. Perched water or collected stormwater could be encountered during excavations at this site. We anticipate that water, if encountered, can be removed with temporary sumps and pumps.

7.1.2 Over Sizing

Excavations for the placement of engineered backfill should extend horizontally at least a minimum of one foot beyond the bottom of footing for every one foot of over excavation depth required below the footing.

7.2 Observation

7.2.1 Excavations

Excavation bottoms and engineered fill operations should be observed by a geotechnical engineer or a designated representative. In-place density testing should be performed to document that project specifications are met.

7.2.2 Foundations

Installation of foundations should be observed and documented by a qualified technician or engineer. We recommend that at a minimum, concrete be tested for air content, temperature, slump, and compressive strength.

7.3 Frequency of Testing

For this project, we recommend a minimum density testing frequency of one test per 1,000 square feet of backfill area of backfill and fill (per lift), with a minimum of one test per lift. For isolated locations or questionable areas, we recommend a minimum of one test per occasion.

8 Limitations of Evaluation and Report

8.1 Site Variations

We have based the preliminary analyses and recommendations submitted in this report in part on the data obtained from 12 SPT borings. The nature and extent of variations at the site will not become evident until construction. Where major variations appear it will be necessary for us to re-evaluate the recommendations of this report.

8.2 Design Review

As the geotechnical engineer for this project, we recommend that we be provided an opportunity to perform a general review of final plans and specifications for this project to determine that recommendations provided have been properly interpreted and included. We assume no responsibility for misinterpretation or improper application of our recommendations and conclusions by others.

8.3 Continuity of Professional Responsibility

TPT recommends that we be retained to provide geotechnical engineering services during construction. This would allow us to observe compliance with the plans, specifications and our recommendations, provides continuity of professional responsibility, and allows design changes to be made in the event that subsurface conditions differ from those anticipated.

8.4 Safe Working Conditions

Responsibility to provide safe working conditions for earthwork and below grade aspects of this project is solely that of the contractors working on the project. It appears that native soils on site are generally OSHA Type B and C soils. However, our site exploration was limited to 12 boring locations and therefore all excavations should be evaluated individually at the time of construction by the contractor. All local, state and federal requirements, statutes, ordinances, or building codes relating to slopes or temporary sheeting and bracing of trenches and excavations must be observed during construction.

8.5 Exclusive Use

TPT has prepared this report for the exclusive use of the GND Development Alliance and their design team, for specific application to the proposed GND Recreation Center. Professional services provided to this project by TPT were completed, findings obtained, and recommendations prepared using generally accepted engineering principles and practices. Conclusions and recommendations contained herein are based upon the applicable standards of our profession at the time this report was prepared. No warranty, express or implied, is made.

APPENDIX

Boring Location Sketch

Boring Logs B-1 through B-12 (12 pages)

Boring Log Notes (2 Pages)



Location	UTM
B-1	46.6651
	-92.2268
B-2	46.6652
	-92.2271
B-3	46.6654
	-92.2275
B-4	46.6650
	-92.2277
B-5	46.6652
	-92.2285
B-6	46.6658
	-92.2284
B-7	46.6661
	-92.2284
B-8	46.6659
	-92.2294
B-9	46.6657
	-92.2290
B-10	46.6652
	-92.2291
B-11	46.6652
	-92.2302
B-12	46.6658
	-92.2302

Twin Ports Testing

Boring Location Sketch
Gary New Duluth Recreation Center
Near Commonwealth Avenue
Duluth, Minnesota

DRAWN BY	BMC
SCALE	NONE
BASE IMAGE BY	Google
DATE	10/17/14
TPT NO.	14M6846

Approximate Boring Location

Approximate Benchmark Location

Twin Ports Testing

B-1

BORING LOG

PROJECT:	CLIENT:	TPT Project No.:
Gary New Duluth Recreation Center	**GND Development Alliance**	**14M6846**

ARCHITECT - ENGINEER:	SITE LOCATION:
SAS+ Associates	**Duluth, Minnesota**

BORING LOCATION:	REPORT DATE:
See Boring Location Sketch	**10/17/14**

SURFACE ELEVATION: **93.4 ft.**

DEPTH (ft) / ELEVATION (ft)	SAMPLE NO.	SAMPLE TYPE	STRATA CHANGE DEPTH	DESCRIPTION OF MATERIAL	Test Results
0.0 / 93.4	1	SS	0.4	(TOPSOIL) Clayey Sand, trace roots and fibers, dark brown, moist (CH) FAT CLAY, trace sand and gravel, reddish brown, moist to wet	3 ⊗, 23 ●, 1.25 PP ○, 7 ⊗, 26 ●, 1.5 PP ○, 11 ⊗, 28 ●, 1.75 PP ○, 6 ⊗, 35 ●, 1.25 PP ○, 53 ●
	2	SS			
		PA			
	3	SS			
		PA			
	4	SS			
10.0 / 83.4		PA			
	5	SS	10.0	(SM) SILTY SAND, fine grained, brown, moist	26 ⊗, 10 ●, 7 ●, 23 ⊗, 16 ●, 29 ⊗
		PA			
	6	SS			
		PA			
	7	SS			
			16.0	Borehole backfilled with bentonite chips End of Boring	
20.0 / 73.4					

UNCONFINED COMPRESSIVE STRENGTH (TONS/FT²) ○ 1 2 3 4 5

☆ PERCENT PASSING #200 SIEVE 10 20 30 40 50

× PLASTIC LIMIT % ● WATER CONTENT % △ LIQUID LIMIT % 10 20 30 40 50

⊗ STANDARD PENETRATION TEST N-VALUE 10 20 30 40 50

WATER LEVEL: **NE WD**	*THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES IN-SITU, THE TRANSITION MAY BE GRADUAL.*	
WATER LEVEL	BORING STARTED: **10/16/14**	BORING COMPLETED: **10/16/14**
WATER LEVEL	CAVE IN LEVEL: **None Observed**	
SPT HAMMER: **CME Autohammer**	RIG: **CME 1050**	CREW CHIEF: **Lou Dinnan**

ABBREVIATIONS: ACR-After Casing Removal, BCR-Before Casing Removal, AB-After Boring, WD-While Drilling, WS-While Sampling, NE-None Encountered, DB-Diamond Bit, RB-Rock Bit, SS-Split Spoon, ST-Shelby Tube, PA-Power Auger, MR-Mud Rotary, CS-Continuous, WL-Water Level, WO-Wash Out, WOH-Weight of Hammer, EIL-Exceeds Instrument Level, TS-Topsoil, HP-Hydraulic Probe, PP-Pocket Penetrometer

Twin Ports Testing

B-2

BORING LOG

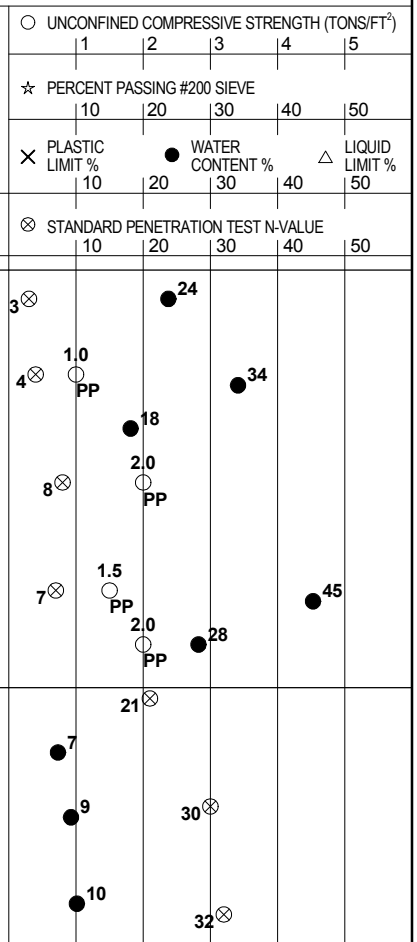
PROJECT:	CLIENT:	TPT Project No.:
Gary New Duluth Recreation Center	**GND Development Alliance**	**14M6846**

ARCHITECT - ENGINEER:	SITE LOCATION:
SAS+ Associates	**Duluth, Minnesota**

BORING LOCATION:	REPORT DATE:
See Boring Location Sketch	**10/17/14**

SURFACE ELEVATION: **93.9 ft.**

DEPTH (ft) / ELEVATION (ft)	SAMPLE NO.	SAMPLE TYPE	STRATA CHANGE DEPTH	DESCRIPTION OF MATERIAL
0.0 / 93.9	1	SS	0.3	(TOPSOIL) Clayey Sand, trace roots and fibers, dark brown, moist
				(CH) FAT CLAY, trace sand and gravel, reddish brown, moist to wet
	2	SS		
		PA		
	3	SS		
		PA		
	4	SS		
		PA		
10.0 / 83.9	5	SS	10.0	(SM) SILTY SAND, fine grained, brown, moist
		PA		
	6	SS		
		PA		
	7	SS		
			16.0	Borehole backfilled with bentonite chips
20.0 / 73.9				End of Boring



WATER LEVEL	*THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES IN-SITU, THE TRANSITION MAY BE GRADUAL.*
NE WD	

WATER LEVEL	BORING STARTED	BORING COMPLETED
	10/16/14	**10/16/14**
WATER LEVEL	CAVE IN LEVEL	
	None Observed	
SPT HAMMER	RIG	CREW CHIEF
CME Autohammer	**CME 1050**	**Lou Dinnan**

ABBREVIATIONS: ACR-After Casing Removal, BCR-Before Casing Removal, AB-After Boring, WD-While Drilling, WS-While Sampling, NE-None Encountered, DB-Diamond Bit, RB-Rock Bit, SS-Split Spoon, ST-Shelby Tube, PA-Power Auger, MR-Mud Rotary, CS-Continuous, WL-Water Level, WO-Wash Out, WOH-Weight of Hammer, EIL-Exceeds Instrument Level, TS-Topsoil, HP-Hydraulic Probe, PP-Pocket Penetrometer

Twin Ports Testing

B-3

BORING LOG

PROJECT:	CLIENT:	TPT Project No.:
Gary New Duluth Recreation Center	**GND Development Alliance**	**14M6846**

ARCHITECT - ENGINEER:	SITE LOCATION:
SAS+ Associates	**Duluth, Minnesota**

BORING LOCATION:	REPORT DATE:
See Boring Location Sketch	**10/17/14**

SURFACE ELEVATION: **96.4 ft.**

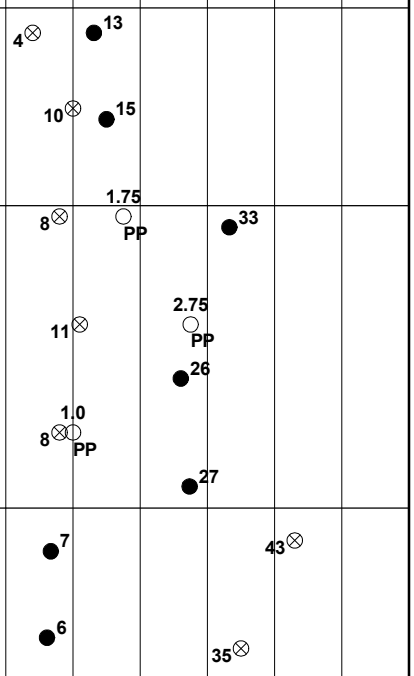
DEPTH (ft) / ELEVATION (ft)	SAMPLE NO.	SAMPLE TYPE	STRATA CHANGE DEPTH	DESCRIPTION OF MATERIAL
0.0 / 96.4				(ASPHALT) 5 inches of asphalt pavement
	1	SS	0.4	(FILL) Silty Sand, trace clay and gravel, fine to medium grained, dark brown, moist
	2	SS		
		PA		
	3	SS	5.0	(CH) FAT CLAY, trace sand, reddish brown, moist to wet
		PA		
	4	SS		
		PA		
10.0 / 86.4	5	SS		
		PA		
	6	SS	12.0	(SM) SILTY SAND, fine grained, brown, moist
		PA		
	7	SS		
			16.0	Borehole backfilled with bentonite chips End of Boring
20.0 / 76.4				

○ UNCONFINED COMPRESSIVE STRENGTH (TONS/FT^2) — 1 2 3 4 5

☆ PERCENT PASSING #200 SIEVE — 10 20 30 40 50

× PLASTIC LIMIT % ● WATER CONTENT % △ LIQUID LIMIT % — 10 20 30 40 50

⊗ STANDARD PENETRATION TEST N-VALUE — 10 20 30 40 50



WATER LEVEL	*THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES IN-SITU, THE TRANSITION MAY BE GRADUAL.*
NE WD	

WATER LEVEL	BORING STARTED	BORING COMPLETED
	10/16/14	**10/16/14**
WATER LEVEL	CAVE IN LEVEL	
	None Observed	
SPT HAMMER	RIG	CREW CHIEF
CME Autohammer	**CME 1050**	**Lou Dinnan**

ABBREVIATIONS: ACR-After Casing Removal, BCR-Before Casing Removal, AB-After Boring, WD-While Drilling, WS-While Sampling, NE-None Encountered, DB-Diamond Bit, RB-Rock Bit, SS-Split Spoon, ST-Shelby Tube, PA-Power Auger, MR-Mud Rotary, CS-Continuous, WL-Water Level, WO-Wash Out, WOH-Weight of Hammer, EIL-Exceeds Instrument Level, TS-Topsoil, HP-Hydraulic Probe, PP-Pocket Penetrometer

Twin Ports Testing

B-4

BORING LOG

PROJECT:	CLIENT:	TPT Project No.:
Gary New Duluth Recreation Center	**GND Development Alliance**	**14M6846**

ARCHITECT - ENGINEER:	SITE LOCATION:
SAS+ Associates	**Duluth, Minnesota**

BORING LOCATION:	REPORT DATE:
See Boring Location Sketch	**10/17/14**

SURFACE ELEVATION: **96.5 ft.**

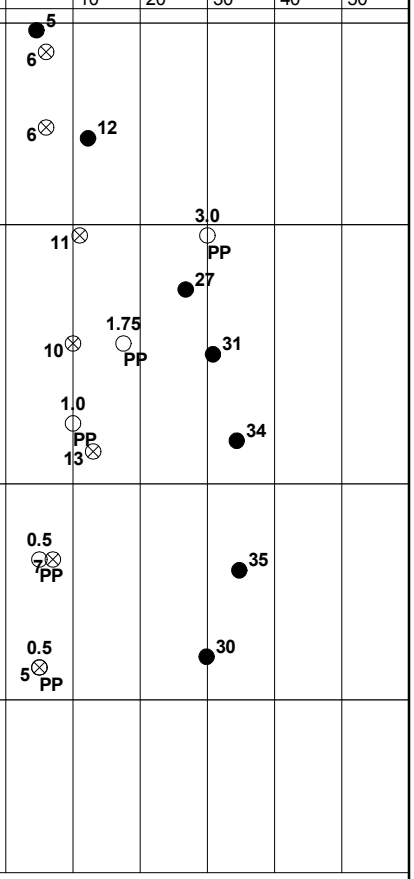
DEPTH (ft) / ELEVATION (ft)	SAMPLE NO.	SAMPLE TYPE	STRATA CHANGE DEPTH	DESCRIPTION OF MATERIAL
0.0 / 96.5				(ASPHALT) 4 inches of asphalt pavement
	1	SS	0.3	(FILL) Silty Sand, trace gravel, fine to medium grained, dark brown, moist
	2	SS		
		PA		
	3	SS	5.0	(CH) FAT CLAY, trace sand, reddish brown, moist to wet
		PA		
	4	SS		
		PA		
10.0 / 86.5	5	SS		
		PA	11.0	(SM) SILTY SAND, fine grained, brown, moist
	6	SS		
		PA		
	7	SS		
			16.0	Borehole backfilled with bentonite chips End of Boring
20.0 / 76.5				

UNCONFINED COMPRESSIVE STRENGTH (TONS/FT^2) 1 2 3 4 5

PERCENT PASSING #200 SIEVE 10 20 30 40 50

PLASTIC LIMIT % ● WATER CONTENT % △ LIQUID LIMIT % 10 20 30 40 50

STANDARD PENETRATION TEST N-VALUE 10 20 30 40 50



WATER LEVEL	*THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES IN-SITU, THE TRANSITION MAY BE GRADUAL.*
NE WD	

WATER LEVEL	BORING STARTED	BORING COMPLETED
	10/16/14	**10/16/14**

WATER LEVEL	CAVE IN LEVEL
	None Observed

SPT HAMMER	RIG	CREW CHIEF
CME Autohammer	**CME 1050**	**Lou Dinnan**

ABBREVIATIONS: ACR-After Casing Removal, BCR-Before Casing Removal, AB-After Boring, WD-While Drilling, WS-While Sampling, NE-None Encountered, DB-Diamond Bit, RB-Rock Bit, SS-Split Spoon, ST-Shelby Tube, PA-Power Auger, MR-Mud Rotary, CS-Continuous, WL-Water Level, WO-Wash Out, WOH-Weight of Hammer, EIL-Exceeds Instrument Level, TS-Topsoil, HP-Hydraulic Probe, PP-Pocket Penetrometer

Twin Ports Testing

B-5

BORING LOG

PROJECT:	CLIENT:	TPT Project No.:
Gary New Duluth Recreation Center	**GND Development Alliance**	**14M6846**

ARCHITECT - ENGINEER:	SITE LOCATION:
SAS+ Associates	**Duluth, Minnesota**

BORING LOCATION:	REPORT DATE:
See Boring Location Sketch	**10/17/14**

SURFACE ELEVATION: **99.6 ft.**

DEPTH (ft) / ELEVATION (ft)	SAMPLE NO.	SAMPLE TYPE	STRATA CHANGE DEPTH	DESCRIPTION OF MATERIAL	UNCONFINED COMPRESSIVE STRENGTH (TONS/FT²) / PERCENT PASSING #200 SIEVE / PLASTIC LIMIT % / WATER CONTENT % / LIQUID LIMIT % / STANDARD PENETRATION TEST N-VALUE
0.0 / 99.6	1	SS	0.3	(TOPSOIL) Silty Sand, trace clay and gravel, trace roots and fibers, dark brown, moist (FILL) Silty Sand, fine to medium grained, brown to reddish brown, moist	5 ⊗ 24 ●
	2	SS			0.25 ○ PP 10 ⊗ 22 ●
		PA	4.0	(CH) FAT CLAY, reddish brown, moist to wet	
	3	SS			9 ⊗ 2.5 ○ PP 29 ●
		PA			
	4	SS	7.0	(SM) SILTY SAND, fine grained, brown, moist	15 ● 35 ⊗
		PA			
10.0 / 89.6	5	SS			13 ● 35 ⊗
		PA			
	6	SS		Trace clay at 13 feet	17 ● 41 ⊗
		PA			
	7	SS			17 ● 40 ⊗
			16.0	Borehole backfilled with bentonite chips End of Boring	
20.0 / 79.6					

WATER LEVEL **NE WD**	*THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES IN-SITU, THE TRANSITION MAY BE GRADUAL.*		
WATER LEVEL	BORING STARTED **10/16/14**	BORING COMPLETED **10/16/14**	ABBREVIATIONS: ACR-After Casing Removal, BCR-Before Casing Removal, AB-After Boring, WD-While Drilling, WS-While Sampling, NE-None Encountered, DB-Diamond Bit, RB-Rock Bit, SS-Split Spoon, ST-Shelby Tube, PA-Power Auger, MR-Mud Rotary, CS-Continuous, WL-Water Level, WO-Wash Out, WOH-Weight of Hammer, EIL-Exceeds Instrument Level, TS-Topsoil, HP-Hydraulic Probe, PP-Pocket Penetrometer
WATER LEVEL	CAVE IN LEVEL **None Observed**		
SPT HAMMER **CME Autohammer**	RIG **CME 1050**	CREW CHIEF **Lou Dinnan**	

Twin Ports Testing

B-6

BORING LOG

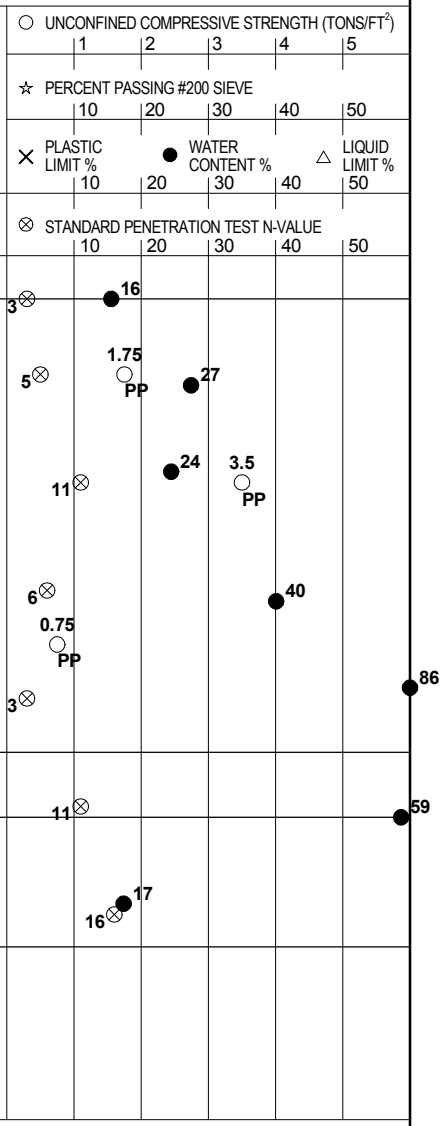
PROJECT:	CLIENT:	TPT Project No.:
Gary New Duluth Recreation Center	**GND Development Alliance**	**14M6846**

ARCHITECT - ENGINEER:	SITE LOCATION:
SAS+ Associates	**Duluth, Minnesota**

BORING LOCATION:	REPORT DATE:
See Boring Location Sketch	**10/17/14**

SURFACE ELEVATION: **101.0 ft.**

DEPTH (ft) / ELEVATION (ft)	SAMPLE NO.	SAMPLE TYPE	STRATA CHANGE DEPTH	DESCRIPTION OF MATERIAL
0.0 / 101.0	1	SS		(FILL) Silty Sand, trace roots and fibers, fine to medium grained, brown, moist
			1.0	(CH) FAT CLAY, trace roots and fibers to 6 feet, reddish brown with grey, moist to wet
	2	SS		
		PA		
	3	SS		
		PA		
	4	SS		
		PA		Silt lenses at 8 feet
10.0 / 91.0	5	SS		
		PA	11.5	(CH) FAT CLAY with Sand, brown, wet
	6	SS		
		PA	13.0	(SM) SILTY SAND, fine to medium grained, brown, wet
	7	SS		
			16.0	Borehole backfilled with bentonite chips End of Boring
20.0 / 81.0				



WATER LEVEL	*THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES IN-SITU, THE TRANSITION MAY BE GRADUAL.*
12 ft. WD	

WATER LEVEL	BORING STARTED	BORING COMPLETED
	10/17/14	**10/17/14**
WATER LEVEL	CAVE IN LEVEL	
	None Observed	
SPT HAMMER	RIG	CREW CHIEF
CME Autohammer	**CME 1050**	**Lou Dinnan**

ABBREVIATIONS: ACR-After Casing Removal, BCR-Before Casing Removal, AB-After Boring, WD-While Drilling, WS-While Sampling, NE-None Encountered, DB-Diamond Bit, RB-Rock Bit, SS-Split Spoon, ST-Shelby Tube, PA-Power Auger, MR-Mud Rotary, CS-Continuous, WL-Water Level, WO-Wash Out, WOH-Weight of Hammer, EIL-Exceeds Instrument Level, TS-Topsoil, HP-Hydraulic Probe, PP-Pocket Penetrometer

Twin Ports Testing

B-7

BORING LOG

PROJECT:	CLIENT:	TPT Project No.:
Gary New Duluth Recreation Center	**GND Development Alliance**	**14M6846**

ARCHITECT - ENGINEER:	SITE LOCATION:
SAS+ Associates	**Duluth, Minnesota**

BORING LOCATION:	REPORT DATE:
See Boring Location Sketch	**10/17/14**

SURFACE ELEVATION: **101.1 ft.**

DEPTH (ft) / ELEVATION (ft)	SAMPLE NO.	SAMPLE TYPE	STRATA CHANGE DEPTH	DESCRIPTION OF MATERIAL
0.0 / 101.1				(TOPSOIL) Silty Sand with clay, trace roots and fibers, brown, moist
	1	SS	0.4	(CH) FAT CLAY, trace roots and fibers to 6 feet, reddish brown, moist
	2	SS		
		PA		
	3	SS		
		PA		
	4	SS		Silt lensing at 8 feet
		PA		
10.0 / 91.1	5	SS		
		PA		
	6	SS	12.0	(CH) FAT CLAY with Sand, reddish brown to brown, wet
		PA		
	7	SS		
			16.0	Borehole backfilled with bentonite chips End of Boring
20.0 / 81.1				

○ UNCONFINED COMPRESSIVE STRENGTH (TONS/FT²) — 1 2 3 4 5

☆ PERCENT PASSING #200 SIEVE — 10 20 30 40 50

× PLASTIC LIMIT % ● WATER CONTENT % △ LIQUID LIMIT % — 10 20 30 40 50

⊗ STANDARD PENETRATION TEST N-VALUE — 10 20 30 40 50

1	4⊗			34●		
2	5⊗	1.25 ○ PP		26●		
3	7⊗			2.75 ○ PP 25●		
4	6⊗	1.0 ○ PP		33●		
5	0.25 ○ PP 9⊗			32●		
6	5⊗			34●		
7	3⊗			36●		

WATER LEVEL	*THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES IN-SITU, THE TRANSITION MAY BE GRADUAL.*
NE WD	

WATER LEVEL	BORING STARTED	BORING COMPLETED
	10/17/14	**10/17/14**
WATER LEVEL	CAVE IN LEVEL	
	None Observed	
SPT HAMMER	RIG	CREW CHIEF
CME Autohammer	**CME 1050**	**Lou Dinnan**

ABBREVIATIONS: ACR-After Casing Removal, BCR-Before Casing Removal, AB-After Boring, WD-While Drilling, WS-While Sampling, NE-None Encountered, DB-Diamond Bit, RB-Rock Bit, SS-Split Spoon, ST-Shelby Tube, PA-Power Auger, MR-Mud Rotary, CS-Continuous, WL-Water Level, WO-Wash Out, WOH-Weight of Hammer, EIL-Exceeds Instrument Level, TS-Topsoil, HP-Hydraulic Probe, PP-Pocket Penetrometer

Twin Ports Testing

B-8

BORING LOG

PROJECT:	CLIENT:	TPT Project No.:
Gary New Duluth Recreation Center	**GND Development Alliance**	**14M6846**

ARCHITECT - ENGINEER:	SITE LOCATION:
SAS+ Associates	**Duluth, Minnesota**

BORING LOCATION:	REPORT DATE:
See Boring Location Sketch	**10/17/14**

SURFACE ELEVATION: **105.7 ft.**

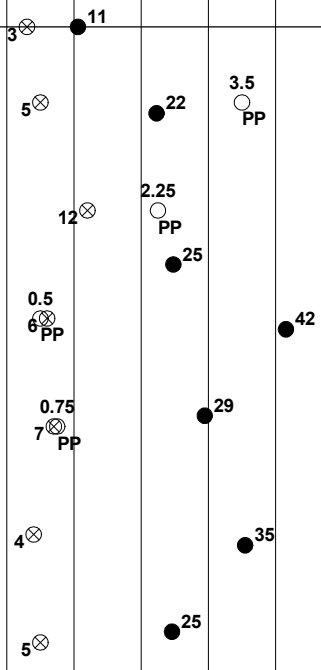
DEPTH (ft) / ELEVATION (ft)	SAMPLE NO.	SAMPLE TYPE	STRATA CHANGE DEPTH	DESCRIPTION OF MATERIAL
0.0 / 105.7				(FILL) Silty Sand, fine to medium grained, light brown, moist
	1	SS	1.0	(CH) FAT CLAY, trace sand and silt, reddish brown, moist to wet
	2	SS		
		PA		
	3	SS		
		PA		
	4	SS		
		PA		
10.0 / 95.7	5	SS		
		PA		
	6	SS		
		PA		
	7	SS		
			16.0	Borehole backfilled with bentonite chips End of Boring
20.0 / 85.7				

○ UNCONFINED COMPRESSIVE STRENGTH (TONS/FT²) — 1 | 2 | 3 | 4 | 5

☆ PERCENT PASSING #200 SIEVE — 10 | 20 | 30 | 40 | 50

× PLASTIC LIMIT % ● WATER CONTENT % △ LIQUID LIMIT % — 10 | 20 | 30 | 40 | 50

⊗ STANDARD PENETRATION TEST N-VALUE — 10 | 20 | 30 | 40 | 50



WATER LEVEL	*THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES IN-SITU, THE TRANSITION MAY BE GRADUAL.*
NE WD	

WATER LEVEL	BORING STARTED	BORING COMPLETED
	10/17/14	**10/17/14**
WATER LEVEL	CAVE IN LEVEL	
	None Observed	
SPT HAMMER	RIG	CREW CHIEF
CME Autohammer	**CME 1050**	**Lou Dinnan**

ABBREVIATIONS: ACR-After Casing Removal, BCR-Before Casing Removal, AB-After Boring, WD-While Drilling, WS-While Sampling, NE-None Encountered, DB-Diamond Bit, RB-Rock Bit, SS-Split Spoon, ST-Shelby Tube, PA-Power Auger, MR-Mud Rotary, CS-Continuous, WL-Water Level, WO-Wash Out, WOH-Weight of Hammer, EIL-Exceeds Instrument Level, TS-Topsoil, HP-Hydraulic Probe, PP-Pocket Penetrometer

Twin Ports Testing

B-9

BORING LOG

PROJECT:	CLIENT:	TPT Project No.:
Gary New Duluth Recreation Center	**GND Development Alliance**	**14M6846**

ARCHITECT - ENGINEER:	SITE LOCATION:
SAS+ Associates	**Duluth, Minnesota**

BORING LOCATION:	REPORT DATE:
See Boring Location Sketch	**10/17/14**

SURFACE ELEVATION: **103.8 ft.**

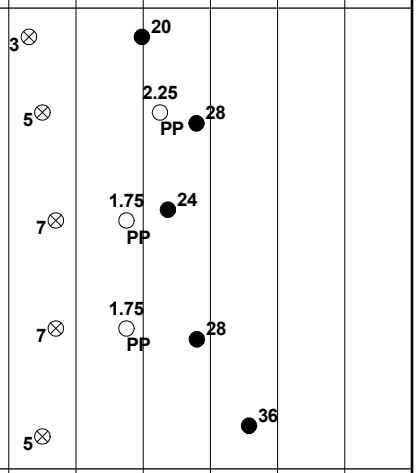
DEPTH (ft) / ELEVATION (ft)	SAMPLE NO.	SAMPLE TYPE	STRATA CHANGE DEPTH	DESCRIPTION OF MATERIAL
0.0 / 103.8				
	1	SS	0.3	(TOPSOIL) Fat Clay with sand, trace roots and fibers, brown to dark brown, moist
				(CH) FAT CLAY, trace sand, trace roots and fibers to 4 feet, reddish brown, moist to wet
	2	SS		
		PA		
	3	SS		
		PA		
	4	SS		
		PA		
10.0 / 93.8	5	SS		
		PA	11.0	(CH) FAT CLAY with Silt and Sand, reddish brown, moist to wet
	6	SS		
		PA	14.0	(SM) SILTY SAND, fine to medium grained, brown, waterbearing
	7	SS		
			16.0	Borehole backfilled with bentonite chips End of Boring
20.0 / 83.8				

UNCONFINED COMPRESSIVE STRENGTH (TONS/FT^2) ○ 1 2 3 4 5

PERCENT PASSING #200 SIEVE ☆ 10 20 30 40 50

PLASTIC LIMIT % × 10 20 30 40 50 WATER CONTENT % ● LIQUID LIMIT % △

STANDARD PENETRATION TEST N-VALUE ⊗ 10 20 30 40 50



WATER LEVEL	*THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES IN-SITU, THE TRANSITION MAY BE GRADUAL.*
14 ft. WD	

WATER LEVEL	BORING STARTED	BORING COMPLETED
	10/17/14	**10/17/14**
WATER LEVEL	CAVE IN LEVEL	
	None Observed	
SPT HAMMER	RIG	CREW CHIEF
CME Autohammer	**CME 1050**	**Lou Dinnan**

ABBREVIATIONS: ACR-After Casing Removal, BCR-Before Casing Removal, AB-After Boring, WD-While Drilling, WS-While Sampling, NE-None Encountered, DB-Diamond Bit, RB-Rock Bit, SS-Split Spoon, ST-Shelby Tube, PA-Power Auger, MR-Mud Rotary, CS-Continuous, WL-Water Level, WO-Wash Out, WOH-Weight of Hammer, EIL-Exceeds Instrument Level, TS-Topsoil, HP-Hydraulic Probe, PP-Pocket Penetrometer

Twin Ports Testing

B-10

BORING LOG

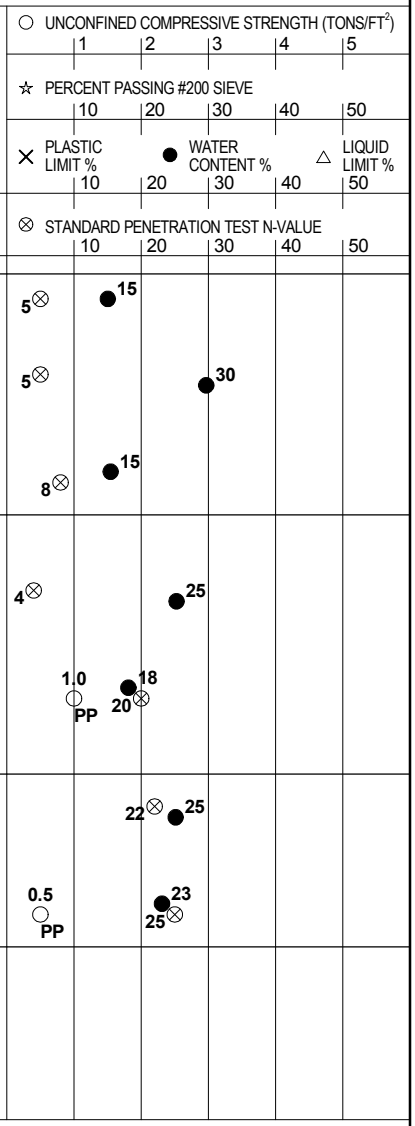
PROJECT:	CLIENT:	TPT Project No.:
Gary New Duluth Recreation Center	**GND Development Alliance**	**14M6846**

ARCHITECT - ENGINEER:	SITE LOCATION:
SAS+ Associates	**Duluth, Minnesota**

BORING LOCATION:	REPORT DATE:
See Boring Location Sketch	**10/17/14**

SURFACE ELEVATION: **104.2 ft.**

DEPTH (ft) / ELEVATION (ft)	SAMPLE NO.	SAMPLE TYPE	STRATA CHANGE DEPTH	DESCRIPTION OF MATERIAL
0.0 / 104.2				(TOPSOIL) Silty Sand, trace roots and fibers, dark brown, moist
	1	SS	0.4	(FILL) Fat Clay with sand, trace roots and fibers, dark brown to brown, moist
	2	SS		
		PA		
	3	SS		
		PA	6.0	(CH) FAT CLAY with Sand, reddish brown, moist to wet
	4	SS		
		PA		
10.0 / 94.2	5	SS		
		PA		
	6	SS	12.0	(CH) FAT CLAY with Silt and Sand, brown, wet
		PA		
	7	SS		
			16.0	Borehole backfilled with bentonite chips End of Boring
20.0 / 84.2				



WATER LEVEL	*THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES IN-SITU, THE TRANSITION MAY BE GRADUAL.*
NE WD	

WATER LEVEL	BORING STARTED	BORING COMPLETED
	10/17/14	**10/17/14**
WATER LEVEL	CAVE IN LEVEL	
	None Observed	
SPT HAMMER	RIG	CREW CHIEF
CME Autohammer	**CME 1050**	**Lou Dinnan**

ABBREVIATIONS: ACR-After Casing Removal, BCR-Before Casing Removal, AB-After Boring, WD-While Drilling, WS-While Sampling, NE-None Encountered, DB-Diamond Bit, RB-Rock Bit, SS-Split Spoon, ST-Shelby Tube, PA-Power Auger, MR-Mud Rotary, CS-Continuous, WL-Water Level, WO-Wash Out, WOH-Weight of Hammer, EIL-Exceeds Instrument Level, TS-Topsoil, HP-Hydraulic Probe, PP-Pocket Penetrometer

Twin Ports Testing

B-11

BORING LOG

PROJECT:	CLIENT:	TPT Project No.:
Gary New Duluth Recreation Center	**GND Development Alliance**	**14M6846**

ARCHITECT - ENGINEER:	SITE LOCATION:
SAS+ Associates	**Duluth, Minnesota**

BORING LOCATION:	REPORT DATE:
See Boring Location Sketch	**10/17/14**

SURFACE ELEVATION: **108.5 ft.**

DEPTH (ft) / ELEVATION (ft)	SAMPLE NO.	SAMPLE TYPE	STRATA CHANGE DEPTH	DESCRIPTION OF MATERIAL
0.0 / 108.5			0.3	(TOPSOIL) Fat Clay with sand, trace roots and fibers, dark brown, moist
	1	SS		(SM) SILTY SAND, fine grained, light brown to greyish brown, wet to waterbearing
	2	SS		
		PA		
	3	SS		
		PA		
	4	SS		
		PA		
10.0 / 98.5	5	SS		
		PA		
	6	SS		
		PA		
	7	SS		
			16.0	Borehole backfilled with bentonite chips End of Boring
20.0 / 88.5				

UNCONFINED COMPRESSIVE STRENGTH (TONS/FT^2) 1 2 3 4 5

PERCENT PASSING #200 SIEVE 10 20 30 40 50

PLASTIC LIMIT % ✕ WATER CONTENT % ● LIQUID LIMIT % △ 10 20 30 40 50

STANDARD PENETRATION TEST N-VALUE ⊗ 10 20 30 40 50

2 ⊗ 29 ●
0.75 PP
5 ⊗ ○ 26 ●
23 ⊗ 26 ●
21 ⊗ 30 ●
19 ⊗ 30 ●
19 ⊗ 34 ●
16 ⊗ 24 ●

WATER LEVEL	*THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES IN-SITU, THE TRANSITION MAY BE GRADUAL.*
11 ft. WD	

WATER LEVEL	BORING STARTED	BORING COMPLETED
	10/17/14	**10/17/14**
WATER LEVEL	CAVE IN LEVEL	
	None Observed	
SPT HAMMER	RIG	CREW CHIEF
CME Autohammer	**CME 1050**	**Lou Dinnan**

ABBREVIATIONS: ACR-After Casing Removal, BCR-Before Casing Removal, AB-After Boring, WD-While Drilling, WS-While Sampling, NE-None Encountered, DB-Diamond Bit, RB-Rock Bit, SS-Split Spoon, ST-Shelby Tube, PA-Power Auger, MR-Mud Rotary, CS-Continuous, WL-Water Level, WO-Wash Out, WOH-Weight of Hammer, EIL-Exceeds Instrument Level, TS-Topsoil, HP-Hydraulic Probe, PP-Pocket Penetrometer

Twin Ports Testing

B-12

BORING LOG

PROJECT:	CLIENT:	TPT Project No.:
Gary New Duluth Recreation Center	**GND Development Alliance**	**14M6846**

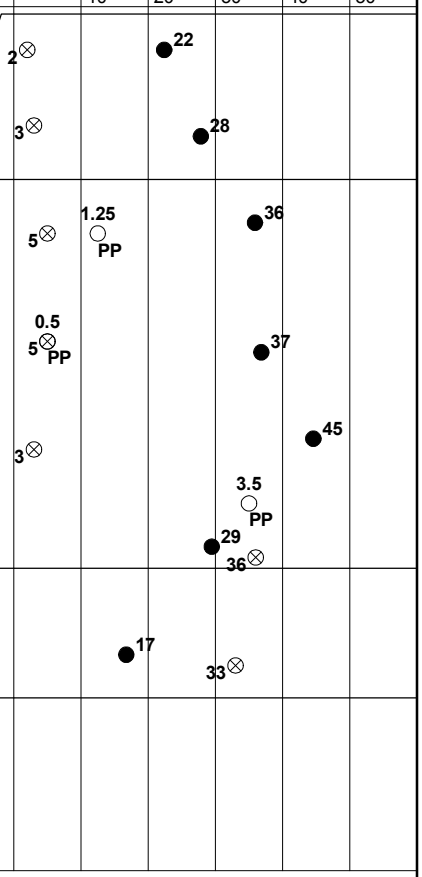
ARCHITECT - ENGINEER:	SITE LOCATION:
SAS+ Associates	**Duluth, Minnesota**

BORING LOCATION:	REPORT DATE:
See Boring Location Sketch	**10/17/14**

SURFACE ELEVATION: **108.5 ft.**

DEPTH (ft) / ELEVATION (ft)	SAMPLE NO.	SAMPLE TYPE	STRATA CHANGE DEPTH	DESCRIPTION OF MATERIAL
0.0 / 108.5	1	SS	0.2	(TOPSOIL) Silty Sand with clay, trace roots and fibers, brown, moist
				(FILL) Fat Clay with sand, trace roots and fibers, dark brown, moist
	2	SS		
		PA	4.0	(CH) FAT CLAY, reddish brown with grey, moist to wet
	3	SS		
		PA		
	4	SS		
		PA		
10.0 / 98.5	5	SS		
		PA		
	6	SS		Silt lenses at 12 feet
		PA	13.0	(SM) SILTY SAND, fine grained, greyish brown, waterbearing
	7	SS		
			16.0	Borehole backfilled with bentonite chips End of Boring
20.0 / 88.5				

UNCONFINED COMPRESSIVE STRENGTH (TONS/FT²) — 1 2 3 4 5
PERCENT PASSING #200 SIEVE — 10 20 30 40 50
PLASTIC LIMIT % / WATER CONTENT % / LIQUID LIMIT % — 10 20 30 40 50
STANDARD PENETRATION TEST N-VALUE — 10 20 30 40 50



WATER LEVEL	*THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES IN-SITU, THE TRANSITION MAY BE GRADUAL.*
14 ft. WD	

WATER LEVEL	BORING STARTED	BORING COMPLETED
	10/17/14	**10/17/14**
WATER LEVEL	CAVE IN LEVEL	
	None Observed	
SPT HAMMER	RIG	CREW CHIEF
CME Autohammer	**CME 1050**	**Lou Dinnan**

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Twin Ports Testing Inc.

BORING LOG NOTES

Water Level

Water levels indicated on the boring logs are as measured at stated times. In clean sand soils, the elevations indicated are considered relatively reliable levels. However, in less permeable soils, even after several days of monitoring, accurate determinations may not be possible. Therefore, additional/alternative methods of groundwater elevation monitoring should be sought.

Commonly Used Moisture Conditions of Soils

Term	Meaning
Dry	Requires the addition of considerable moisture to attain optimum for compaction
Moist	Near optimum moisture for compaction
Wet	Requires drying to attain optimum moisture for compaction
Saturated (Waterbearing)	Very wet

Gradation Description and Terminology

Soil Type	Particle Name	Size Range
Coarse Grained Soils	Boulders	Over 12”
	Cobbles	3”-12”
	Gravels	#4-3”
	Gravels – Coarse	¾”-3”
	Gravels – Fine	#4-¾”
	Sands	#200-#4
	Sands – Coarse	#10-#4
	Sands – Medium	#40-#10
	Sands – Fine	#200-#40
Fine Grained Soils	Silt	0.005 mm-#200
	Clay	Less than 0.005 mm

Descriptive Terms of Components Present in Sample (other than ASTM D 2487)

Term	Percent of Dry Weight
Trace	1-5%
With	5-12%
Some	12-30%
And	30-50%

Relative Density of Granular Soils

N-Value (SPT)	Relative Density	Standard “N” Penetration
0-4	Very Loose	Blows per foot of a 140 pound hammer
5-10	Loose	falling 30” on a 2” outside diameter
11-30	Medium Dense	split barrel sampler
31-50	Dense	
Over 50	Very Dense	

Consistency of Cohesive Soils

N-Value (SPT)	Consistency	(Q_u, tsf or kg/cm^2)
0-2	Very Soft	Less than 0.25
3-4	Soft	0.25-0.50
5-8	Medium	0.50-1.00
9-15	Stiff	1.00-2.00
16-30	Very Stiff	2.00-4.00
Over 30	Hard	4.00-8.00

Twin Ports Testing Inc.

UNIFIED SOIL CLASSIFICATION SYSTEM – ASTM D 2487

UNIFIED SOIL CLASSIFICATION AND SYMBOL CHART

COARSE-GRAINED SOILS (more than 50% of material is larger than No. 200 sieve size.)			
GRAVELS More than 50% of coarse fraction larger than No. 4 sieve size	Clean Gravels (Less than 5% fines)	GW	Well-graded gravels, gravel-sand mixtures, little or no fines
		GP	Poorly-graded gravels, gravel-sand mixtures, little or no fines
	Gravels with fines (More than 12% fines)	GM	Silty gravels, gravel-sand-silt mixtures
		GC	Clayey gravels, gravel-sand-clay mixtures
SANDS 50% or more of coarse fraction smaller than No. 4 sieve size	Clean Sands (Less than 5% fines)	SW	Well-graded sands, gravelly sands, little or no fines
		SP	Poorly graded sands, gravelly sands, little or no fines
	Sands with fines (More than 12% fines)	SM	Silty sands, sand-silt mixtures
		SC	Clayey sands, sand-clay mixtures
FINE-GRAINED SOILS (50% or more of material is smaller than No. 200 sieve size.)			
SILTS AND CLAYS Liquid limit less than 50%		ML	Inorganic silts and very fine sands, rock flour, silty of clayey fine sands or clayey silts with slight plasticity
		CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
		OL	Organic silts and organic silty clays of low plasticity
SILTS AND CLAYS Liquid limit 50% or greater		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
		CH	Inorganic clays of high plasticity, fat clays
		OH	Organic clays of medium to high plasticity, organic silts
HIGHLY ORGANIC SOILS		PT	Peat and other highly organic soils

LABORATORY CLASSIFICATION CRITERIA

GW	$C_u = \frac{D_{60}}{D_{10}}$ greater than 4; $C_c = \frac{D_{30}}{D_{10} \times D_{60}}$ between 1 and 3	
GP	Not meeting all gradation requirements for GW	
GM	Atterberg limits below "A" line or P.I. less than 4	Above "A" line with P.I. between 4 and 7 are borderline cases requiring use of dual symbols
GC	Atterberg limits above "A" line with P.I. greater than 7	
SW	$C_u = \frac{D_{60}}{D_{10}}$ greater than 4; $C_c = \frac{D_{30}}{D_{10} \times D_{60}}$ between 1 and 3	
SP	Not meeting all gradation requirements for GW	
SM	Atterberg limits below "A" line or P.I. less than 4	Limits plotting in shaded zone with P.I. between 4 and 7 are borderline cases requiring use of dual symbols.
SC	Atterberg limits above "A" line with P.I. greater than 7	

Determine percentages of sand and gravel from grain-size curve. Depending on percentage of fines (fraction smaller than No. 200 sieve size), coarse-grained soils are classified as follows:

Less than 5 percent ..... GW, GP, SW, SP
More than 12 percent ..... GM, GC, SM, SC
5 to 12 percent ..... Borderline cases requiring dual symbols

PLASTICITY CHART

