A Geotechnical Evaluation Report

Proposed Medical Office Building
700 American Boulevard West
Bloomington, Minnesota

Prepared for

Frauenshuh Companies

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

Joshua J. Van Abel, PE
Project Engineer
License Number: 45108
February 8, 2008

Project BL-07-04393

Braun Intertec Corporation

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February 8, 2008

Project BL-07-04393

Mr. Dean Williamson
Frauenshuh Companies
7101 West 78th Street
Minneapolis, MN 55439-2504

Re: Geotechnical Evaluation
Proposed Medical Office Building
700 American Boulevard West
Bloomington, Minnesota

Dear Mr. Williamson:

The geotechnical evaluation you requested for the proposed medical office building on the parcel located at 700 American Boulevard West in Bloomington, Minnesota has been completed. The purpose of the evaluation was to provide you and your consultants with geotechnical information and recommendations regarding the design and construction of the proposed building. The evaluation was completed in general accordance with our Proposal to Conduct a Phase I Environmental Site Assessment and Geotechnical Evaluation, dated September 7, 2007.

Please see the attached report for a detailed discussion on the field exploration results and our geotechnical recommendations. The report should be read in its entirety. Separate reports were prepared for the environmental services.

We appreciate the opportunity to be of service to you on this project. If you have any questions regarding this report, please contact Josh Van Abel at 952.995.2310 or Greg Bialon at 952.995.2380.

Sincerely,

BRAUN INTERTEC CORPORATION

Joshua J. Van Abel, PE
Project Engineer

for: Gregory J. Bialon, PE
Principal Engineer

Attachment:
Geotechnical Evaluation Report

Georpt-Credit Union

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Appendix
Soil Boring Location Sketch
Log of Boring Sheets ST-5 to ST-10
Descriptive Terminology

A. Introduction

A.1. Project

Frauenshuh Companies (Frauenshuh) is proposing to develop the two vacant parcels of property located at 700 and 900 American Boulevard West in Bloomington, Minnesota. This report only addresses the soil boring results and recommendations for the 700 American Boulevard West Parcel. A separate report was prepared for the 900 American Boulevard Parcel.

We understand the current proposed development will consist of a two story medical office building on the eastern parcel (700 American Boulevard). New paved parking and drive areas would also be included in the project.

As part of the project, Braun Intertec was contracted by Frauenshuh to perform soil borings and geotechnical evaluations for the proposed credit union and medical office buildings.

Frauenshuh has also contracted Braun Intertec to perform a Phase I Environmental Site Assessment (Phase I ESA) and a Soils Evaluation (environmental) for the project sites. These services have been previously submitted under separate reports.

A.2. Purpose

The purpose of the soil borings and geotechnical evaluation was to provide Frauenshuh and their design team with geotechnical information regarding the existing soil conditions and recommendations regarding design and construction of the proposed building and associated site improvements.

A.3. Scope

The following scope of services was established in our Proposal for Phase I Environmental Site Assessment and Geotechnical Evaluation, dated September 7, 2007.

Our geotechnical services for the project were limited to the following:

- Choosing the locations of and staking prospective boring locations, determining surface elevations at the boring locations and coordinating the locating of underground utilities near the boring locations.
- Conducting ten standard penetration test borings to nominal depths of 20 to 30 feet below grade within or near the proposed building areas (Of these borings, six were performed for the proposed medical office building on the 700 American Boulevard Parcel).

- Classifying the samples and preparing boring logs.
- Completing limited laboratory tests on selected soil samples.
- Analyzing the results of the field and laboratory tests and formulating recommendations for soil corrections and earthwork, foundation design, floor slab support, pavement design and utility support.
- Submitting a geotechnical evaluation report containing logs of the borings, our analysis of the field and laboratory tests and our geotechnical recommendations.

A.4. Provided Information

For the geotechnical evaluation, Frauenshuh provided us with a proposed site plan titled "American Boulevard Development, Bloomington, MN". The plan was dated July 7, 2007 and included the proposed site layout and was prepared by Pope Associates. An electronic version of this plan was used to create the Soil Boring Location Sketch.

We were also provided with a sketch titled "Remnant Areas Near REI". The sketch included the existing site conditions and parcel locations as of the date of the sketch. The sketch was prepared by the City of Bloomington and was dated September 27, 2005.

A.5. Site Conditions

The proposed project site is the parcel of property located at 700 American Boulevard West. The site is approximately 1.85 acres in size and is located on the north side of American Boulevard West, directly west of Lyndale Avenue.

Although the site is a currently vacant, historical photographs and information gathered during compilation of the Phase I ESA indicated the site has been previously occupied by several structures. Please refer to the Phase I ESA for additional information regarding previous site usage and history.

B. Results

B.1. Boring Locations and Surface Elevations

We performed a total of six standard penetration soil borings for the medical office building project. The borings were denoted as ST-5 to ST-10, in sequence with the borings performed for the adjacent credit union site. The borings were performed at the approximate locations shown on the Soil Boring Location Sketch included in the Appendix.

The boring locations were selected and staked by Braun Intertec personnel. Surface elevations and locations were acquired with GPS technology through the use of the State of Minnesota's permanent GPS base station network.

B.2. Logs

Log of Boring sheets indicating the depths and identifications of the various soil strata, penetration resistances, laboratory test data and groundwater observations are attached. The strata changes were inferred from the changes in the penetration test samples and auger cuttings. The depths shown as changes between the strata are only approximate. The changes are likely transitions and the depths of the changes vary between the borings.

Geologic origins presented for each stratum on the Log of Boring sheets are based on the soil types, blows per foot, and available common knowledge of the depositional history of the site. Because of the complex glacial and post-glacial depositional environments, geologic origins can be difficult to ascertain. A detailed investigation of the geologic history of the site was not performed.

B.3. Soils

The general soil profile encountered at the soil boring locations in medical office building site consisted of a layer of previously placed fill overlying alluvial sand deposits. The following subsections discuss the strata in more detail.

B.3.a. Topsoil Fill

A layer of topsoil fill was generally encountered at the surface at most of the boring locations. The topsoil fill ranged in depth from approximately 1/2 to 1 feet and consisted of silty sand and clayey sand.

B.3.b. Fill

Below the topsoil fill or at the surface, a layer of previously placed fill was encountered at all of the boring locations. The fill ranged in depth from 5 to 11 feet below grade and primarily consisted of silty sand and poorly graded sand with silt. Occasional layers of clayey sand were also encountered. Some of the fill soils were classified as slightly organic and trace amounts of roots and concrete were encountered within the fill at two of the boring locations.

The recorded penetration resistances (blow counts) in the fill soils ranged from 7 to 41 blows per foot (BPF). However, the penetration resistances at the 2 1/2 foot sample interval are likely elevated due to frozen soils encountered by the sampler and do not represent actual soil densities.

B.3.c. Debris

The proposed project site has been historically developed and structures previously located on the site are no longer present. Although only minimal amounts of debris were encountered by the borings, it is very possible some of the on-site fill soils contain appreciable amounts of building debris. It is also possible old foundations, floor slabs, utilities, etc. could potentially be present on the site.

B.3.d. Alluvial Deposits

Alluvial sand deposits were encountered below the fill soils at all of the boring locations. The alluvial deposits primarily consisted of poorly graded sand and poorly graded sand with silt. Lesser amounts of silty sand and sandy silt were also encountered at depth.

The recorded penetration resistances in the alluvial soils ranged from 4 to 93 BPF, indicating very loose to very dense relative densities. However, the penetration resistances generally ranged from 6 to 15 BPF, indicating typical relative densities of loose to medium dense.

B.4. Groundwater

Groundwater was not observed in the boreholes during or immediately after drilling operations. Based on the soil boring observations, it is our opinion groundwater levels on the project site were below the soil boring termination depths at the time of this evaluation. However, it is possible occasional zones of perched groundwater could be encountered in excavations on the project site. Annual and seasonal fluctuations of groundwater levels should be anticipated.

B.5. Soil Testing

B.5.a. Laboratory Testing

We performed moisture content tests on samples recovered from the soil borings in accordance with ASTM procedures. The laboratory test results are shown on the Log of Boring Sheets included in the Appendix, across from the associated soil sample.

B.5.b. Environmental Field Screening

Soil samples retrieved from the soil borings were examined by an environmental technician for unusual staining, odors and other apparent signs of contamination. In addition, the soil samples were screened for the presence of total organic vapors using a PID. The PID was equipped with a 10.6-electron-volt lamp and calibrated to an isobutylene standard. The PID was used to perform a headspace method of analyses, as recommended by the MPCA.

The PID field test results are included on the Log of Boring Sheet, across from the associated soil sample. For additional information regarding the environmental field screening and environmental laboratory test results, please refer to the environmental Soil Evaluation Report prepared for the project under separate cover.

C. Analyses and Discussion

C.1. Proposed Construction

Frauenshuh has indicated the proposed development will consist of a 17,500 square foot medical office building. We understand the medical office building will be a two-story slab on grade structure. Currently, we understand a below grade level is not planned for the structure.

Building grades were not available, although, they are anticipated to be within a few feet of existing grades. Proposed building loads were also not available. Given the type of proposed structure, we have assumed column loads will not exceed 250 kips (250,000 pounds) and wall loads will not exceed 6 kips per lineal foot.

We understand new paved parking and drive areas will be included with the project. Traffic loads were not provided for the project. For our analysis, we assumed an average daily traffic for the drive lanes of 500 automobiles and 5 light to medium duty trucks.

If the proposed loads exceed the assumed values, if the proposed grades differ by more than a few feet from existing grades, or if the design or location of the proposed building changes, we should be informed. Additional analyses and revised recommendations may be necessary.

C.2. Discussion of Construction Recommendations, Procedures and Difficulties

C.2.a. General Site Development

Based on the results of the soil borings, we anticipate the site is suitable for support of the proposed building using typical spread footing foundations. However, some soil correction excavations will be required below the proposed building foundations and floor slabs to remove fill soils that pose a risk of detrimental settlement under building and fill loads.

C.2.b. Building Pad Excavation

The borings encountered approximately 5 to 11 feet of previously placed fill in the medical office building pad. The fill soils were underlain by alluvial sands. Based on the recorded penetration resistances, the fill soils generally appear to have been placed with at least some compactive effort. However, some of the fill soils also contained organic material and debris. Given the unknown nature of the fill placement and past development of the site, leaving the fill soils in place below slabs and foundations would, in our opinion, result in a significant risk of detrimental settlement. Consequently, we recommend all previously placed fill be removed from below the proposed building and oversize areas.

Furthermore, if present, all existing foundations, slabs, utilities and associated backfill should be removed from below the proposed building pads.

After excavation of the unsuitable soils, the underlying alluvial sands should generally be suitable for foundation, slab and fill support. However, the alluvial sands should be surface compacted prior to fill or foundation placement to create a more uniform bearing surface and reduce the risk of settlement of the very loose to loose soils.

A geotechnical engineer should observe the excavation bottoms prior to fill or foundation placement.

C.2.c. Reuse of On-site Soils

We anticipate a significant portion of the previously placed fill soils will be suitable for reuse as structural fill. However, topsoil or fill soils containing organic material should not be used as structural fill. Debris laden soils should also not be reused as structural fill.

The actual amount of onsite fill soils suitable for reuse as structural fill for the building pad is unknown. Test pits could be performed to help quantify the amount of onsite soils that would be suitable for reuse. If excavated, the underlying alluvial sands should generally be suitable for reuse as structural fill.

C.2.d. Pavements

In general, we anticipate the previously placed fill soils and native soils present in the proposed pavement areas will generally be suitable for pavement support. The exception would be the topsoil and any areas of unstable silty or clayey sand fill soils (if present). The typical recommended pavement subgrade preparation procedures are outlined in Section C.8.

C.3. Building Pad Preparation

C.3.a. Excavation

We recommend topsoil, organic soils, pavements and previously placed fill be removed from the proposed building and oversize areas. Existing foundations, slabs, utilities and associated backfill should also be removed from proposed building and oversize areas.

After excavation of the unsuitable soils, the native alluvial sands should be surface compacted as recommended in Section C.3.d. After surface compaction, the alluvial sands should be directly suitable for support of foundations or engineered fill. Table 1 provides the anticipated soil correction depths at the soil boring locations for the proposed building.

Table 1. Anticipated Excavation Depths – Medical Office Building

Boring	Ground Surface Elevation	Anticipated Depth of Excavation (feet)	Approximate Bottom Elevation (Estimated)
ST-5	852.6	7	845 1/2
ST-6	855.3	9 1/2	845 1/2
ST-7	853.2	7	846
ST-8	854.4	7	847 1/2
ST-9	853.0	5	848
ST-10	854.4	11	843 1/2

Please note the excavation depths indicated in the above tabulations are approximate and will vary. The actual depth of excavation will differ between boring locations and should be determined in the field at the time of construction.

For excavations within the building areas that extend below design footing elevation, we recommend the excavation bottoms be extended laterally beyond the edges of the proposed footings a minimum of 1 foot for each vertical foot below the footing at that location (i.e. 1:1 lateral oversizing). This oversizing is necessary for the lateral distribution of the footing loads through the fill sequence.

C.3.b. Fill and Backfill

Structural backfill should consist of non-organic, on or off-site soils. Fill containing foreign debris or organic material should not be reused as structural fill. If imported soils are used, we recommend they consist of non-organic, debris-free soils with less than 20 percent by weight passing the number 200 sieve, similar to the onsite soils.

If there are areas where structural fill exceeds 10 feet below the floor slab elevation, we recommend the use of clean sand with less than 7 percent fines by weight passing a number 200 sieve. The clean sand backfill will help reduce the risk of differential settlement between the varying backfill depths, caused by consolidation of the thicker fills under their own weight

C.3.c. Compaction

We recommend the backfill and fill be placed in lifts not exceeding 8 inches in thickness. We recommend fill soils be compacted to the minimum densities summarized in Table 3, determined in accordance with American Society for Testing and Materials (ASTM) Test Method D 698 (standard Proctor). Fill and backfill should be within 3 percentage points of its optimum moisture content. However, clayey fill should be placed within 3 percentage points above and 1 percentage point below its optimum moisture content.

Table 3. Recommended Compaction Levels

Location	Minimum Compaction (Standard Proctor)
Below Footings	98 percent
Below Exterior and Interior Slabs	95 percent
Exterior Wall Backfill in Green Areas	90 percent
Within 3 feet of Pavement	100 percent
Below 3 feet in Pavement Areas	95 percent

C.3.d. Surface Compaction

After excavation of the previously placed fill and other soils judged unsuitable for foundation or fill support, we recommend the exposed native sands be surface compacted to a minimum of 98 percent of their standard Proctor density with a large self-propelled, smooth drummed dynamic compactor.

C.4. Recommendations for Foundation Design

Based on the boring results and proposed grades, it is our opinion typical spread footings can be used for support of the proposed building. This recognizes that soil corrections will be required to prepare the building pads.

C.4.a. Depth

We recommend the perimeter building footings bear a minimum of 3 1/2 feet below exterior grade for frost protection. Interior footings may be placed directly below the slab.

If unheated or isolated structures are built, the foundations should bear a minimum of 5 feet below grade for frost protection. The piers on top of the footings should be tied to the footings with reinforcing so that frost does not heave them off the footings.

C.4.b. Bearing Capacity

Based on the soils encountered in the borings and assuming the site corrections are completed as recommended, it is our opinion the spread footings can be designed using a maximum bearing capacity of 4,000 pounds per square foot (psf).

C.4.c. Settlement

Assuming the recommendations regarding soil corrections are performed as recommended, we anticipate total and differential settlement of the foundations will be less than 1 inch and 1/2 inch, respectively, under the assumed loads.

C.5. Floor Slabs

C.5.a. Subgrade

After the building pad preparations have been completed, we anticipate the floor subgrade will generally consist of engineered sand backfill suitable for slab support. Backfill in footing and mechanical trenches should be compacted to a minimum of 95 percent of its standard Proctor maximum dry density.

C.5.b. Floor Slab Support

Assuming the floor subgrades consist of engineered fill generally comprised of poorly graded sand with silt and silty sand, it is our opinion that a modulus of subgrade reaction of 'k' value of 150 pounds per square inch per inch of deflection (pci) may be used to design the floors. If a minimum of 6 inches of compacted crushed gravel road base is placed immediately beneath the floor slabs, it is our opinion that the modulus may be increased by 50 pci.

C.5.c. Vapor Barrier

Moisture or water vapor is generally present in subgrade soils. In the absence of a vapor venting system, naturally occurring environmental and climatic changes (e.g., temperature and humidity changes, high/low air pressure conditions) and the building's mechanical systems (heating and air conditioning) can cause fluctuations in water vapor transmission through the slab.

Excess transmission of water vapor could cause floor dampness, certain types of floor bonding agents to separate, or floor coverings to mildew. Materials stored within the building or the building's components or manufacturing processes may also require controlled moisture conditions. If vapor transmission through the slab is a concern, we recommend that a vapor retarder or barrier be considered. Some floor coverings, coatings, or situations may require a vapor barrier; i.e., a membrane with a permeance of less than 0.3 perms. This should be explored as the design progresses.

C.6. Exterior Stoops and Slabs

C.6.a. Subgrade

We recommend all vegetation, topsoil, pavement, and organic or unstable fill soils be removed from beneath any proposed exterior slabs adjoining the proposed building. Fills and backfills should be compacted to a minimum of 95 percent of their standard Proctor density.

C.6.b. Frost Protection

The on-site silty sand and clayey sand soils are considered frost susceptible. Constructing directly on these soils could cause unfavorable amounts of frost heave to occur. This heave can be a nuisance for slabs or steps in front of doors and at other critical grade areas. One way to reduce this heave is to remove the frost-susceptible soils down to bottom-of-footing level or until poorly graded sand and poorly graded sand with silt soils are encountered and replace them with nonfrost-susceptible sand or sandy gravel. Sand or sandy gravel with less than 7 percent of the particles by weight passing a number 200 sieve and less than 50 percent passing a number 40 sieve are considered non frost-susceptible. If poorly graded sand and poorly graded sand with silt soils are not encountered at the excavation bottom, we recommend a drainpipe be installed to remove any water that may collect in the sand. The bottom of the subexcavation should be graded so that water flows to the center where it can be collected by a pipe and drained to a storm sewer, another drain tile, or a water collector system for discharge.

Another alternative for reducing frost heave is to support the steps or slabs on frost-depth footings. A void space of at least 4 inches should be provided between the bottoms of the steps/slabs and frost-susceptible soils to allow the soils to heave without affecting the steps/slabs.

To reduce frost heave at the intersection of sidewalks and stoops, we recommend placing nonfrost-susceptible sand to a depth of 3 feet below the stoop and upwards at 10:1 (horizontal:vertical) ratio below the sidewalk. The sand should also be extended 2 feet laterally beyond the sidewalk. This approach should dissipate frost heave related movement. If this approach is used, we recommend a drainpipe be installed to remove any water that may collect in the sand or sandy gravel.

C.7. Utilities

C.7.a. Excavation

The alluvial soils and non-organic fill soils encountered at typical invert elevations generally appear suitable for pipe support. However, if unstable or organic fill soils are encountered at pipe invert elevations, they should be subcut and replaced with engineered backfill or crushed rock. We recommend a geotechnical engineer observe all utility trench excavations.

C.7.b. Backfilling and Compaction

We recommend bedding material be thoroughly compacted around the pipes. We also recommend that the utility trench backfill be compacted to a minimum of 95 percent of its standard Proctor density, except in the upper 3 feet of pavement areas, where the compaction level should be increased to a minimum of 100 percent.

C.8. Pavement

C.8.a. Subgrade Preparation

For construction of new paved areas, we recommend stripping vegetation, topsoil and other organic soils to a minimum depth of 3 feet vertically of the pavement subgrade. If present, organic soils below 3 feet of the subgrade could potentially be left in place. However, we should be consulted prior to leaving any organic soils in place.

After stripping, we recommend the subgrade be surface-compacted with a large self-propelled vibratory compactor. We recommend the existing subgrade be surface compacted to a minimum of 100 percent of standard Proctor density if within 3 feet of the proposed pavement subgrade. If below 3 feet, surface compaction to 95 percent should be adequate.

If there are areas where the subgrade cannot be compacted, we recommend that the upper 2 feet of the resulting subgrade be scarified to a moisture content not more than 2 percent above optimum or 1 percent below, and compacted to a minimum of 100 percent of its standard Proctor maximum dry density. If there are areas which still cannot be compacted, we recommend that the unstable materials be subexcavated to a depth of 3 feet and be replaced by materials which can be compacted.

Where fill is required, we recommend that it be compacted to minimum of 100 percent of standard Proctor density within 3 feet of the subgrade. For fills more than 3 feet below final subgrades, 95 percent compaction should be sufficient.

If fill soils are imported to the site, we recommend they consist of sands with less than 20 percent by weight passing the number 200 sieve, similar to the onsite soils.

C.8.b. Proofrolls

Prior to the placement of the aggregate base, we recommend the subgrade soil be proofrolled with a loaded tandem-axle truck and observed by a geotechnical engineer. This will assist in identifying any soft or weak areas that will require additional soil correction work. Areas that yield or rut more than 1 inch due to wheel traffic should be corrected. Failed areas should be compacted, or if too wet, subcut and replaced with suitable soil and compacted as specified for the fill.

C.8.c. Anticipated Subgrade and Assumed R-Value

After the site has been graded, we anticipate the pavement subgrade soils will primarily consist of silty sand and poorly graded sand with silt soils. Laboratory tests to determine the R-values of these soils were not included in our scope of services. However, these soils typically have assumed R-values ranging from 15 to 50. We used an assumed R-value of 30 for our pavement design.

C.8.d. Bituminous Design Sections

For the above subgrade and assumed traffic (Section C.1), we recommend the following minimum section thicknesses be used for pavement design. The medium duty section is recommended for the car parking areas and the heavy-duty section is recommended for drive areas and truck parking areas.

Table 4: Recommended Bituminous Pavement Thicknesses

Course	Medium Duty (inches)	Heavy Duty (inches)
Bituminous	3	4
Gravel Base	7	8

The above pavement designs are based upon a 20-year performance life. This is the amount of time before major reconstruction is anticipated. This performance life assumes proper care; such as seal coating and crack sealing is routinely performed. The actual pavement life will vary depending on variations in weather, traffic conditions, and maintenance. Other pavement design sections providing equivalent structural capacity also could be considered.

C.8.e. Materials

We recommend specifying Class 5 or Class 7 aggregate base that meets the requirements of Mn/DOT (Minnesota Department of Transportation) Specification (Standard Specifications of Construction Article) 3138. We recommend bituminous base and wear courses meeting the requirements of Mn/DOT Specification 2360.

We recommend the crushed aggregate base be compacted to a minimum of 100 percent of its standard Proctor maximum dry density. We recommend the bituminous mixtures be compacted to a minimum of 92 percent of their Rice densities.

C.8.f. Drainage Considerations

In low areas with catch basins, if slow draining silty or clayey soils are present, we recommend finger drains be considered below the aggregate base which would be tied into the catch basins to help remove any water trapped above the subgrade within the aggregate base.

C.9. Site Grading and Drainage

We recommend the site be graded to provide a positive run-off away from the proposed and existing structures. We recommend landscaped areas be sloped a minimum of 6 inches within 10 feet of the building and slabs be sloped a minimum of 2 inches. In addition, we recommend gutters and downspouts with long splash blocks or extensions.

D. Additional Recommendations for Construction

D.1. Excavation

All excavations must comply with the requirements of OSHA 29 CFR, Part 1926, Subpart P, "Excavations and Trenches." This document states that excavation safety is the responsibility of the contractor. Reference to these OSHA requirements should be included in the project specifications.

The soils encountered at the soil boring locations generally were Type C soils under OSHA guidelines. Type C soils should be anticipated to lie back at a horizontal slope of 1 1/2 to 1 or shallower. Groundwater can also cause sideslopes to become unstable and result in slopes flatter than anticipated.

D.2. Observations

A geotechnical engineer should observe the excavation, footing and slab subgrades to evaluate if the subgrade soils are similar to those encountered by the borings and adequate to support the proposed construction. Oversize of excavations below perimeter footing grades should be checked. These observations should be conducted prior to placing backfills, fills or forms for footings.

After excavating for footings, we recommend that tests be conducted on the subgrades to evaluate if the bearing capacity is at least 4,000 psf. Typical instruments used for these tests include hand augers and dynamic cone penetrometers.

D.3. Testing

We recommend density tests of backfills and fills placed beneath footings, floor slabs, and along foundation walls. Samples of proposed backfill and fill materials should be submitted to our testing laboratory at least three days prior to placement for evaluation of their suitability and determination of their optimum moisture contents and maximum dry densities.

D.4. Cold Weather Construction

If site grading and construction is anticipated during cold weather, we recommend that good winter construction practices be observed. All snow and ice should be removed from cut and fill areas prior to additional grading. No fill should be placed on soil, which has frozen or contains frozen material. No frozen soils should be used as fill.

Concrete delivered to the site should meet the temperature requirements of ASTM C 94. Concrete should not be placed upon frozen soils or soils that contain frozen material. Concrete should be protected from freezing until the necessary strength is attained. Frost should not be permitted to penetrate below footings bearing on frost-susceptible soil since such freezing could heave and crack the footings and/or foundation walls.

E. Procedures

E.1. Drilling and Sampling

We performed the penetration test borings on January 10 and 11, 2008, with a core-and-auger drill equipped with 3 1/4-inch inside-diameter hollow-stem auger mounted on an all-terrain vehicle carrier. Sampling for the borings was conducted in general accordance with ASTM D 1586, "Penetration Test and Split-Barrel Sampling of Soils." We advanced the boreholes with the hollow-stem auger to the desired test depths. A 140-pound hammer falling 30 inches was then used to drive the standard 2-inch split-barrel sampler a total penetration of 1 1/2 feet below the tip of the hollow-stem auger. The blows for the last foot of penetration were recorded and are an index of soil strength characteristics. Samples were taken at 2 1/2-foot vertical intervals to a depth of 15 feet below grade and then at 5-foot intervals to the test boring termination. A representative portion of each sample was then sealed in a glass jar.

E.2. Soil Classification

The drill crew chief visually and manually classified the soils encountered in the borings in general accordance with ASTM D 2488, "Description and Identification of Soils (Visual-Manual Procedure)." A summary of the ASTM classification system is attached. The samples were then returned to our laboratory for review of the field classifications by a soils engineer. Representative samples will remain in our Minneapolis office for a period of 30 days to be available for your examination.

E.3. Groundwater Observations

Immediately after taking the final samples in the bottoms of the borings, the holes were probed through the hollow-stem auger to check for the presence of groundwater. Immediately after withdrawal of the auger, the holes were again probed and the depths to water or cave-ins were noted. The borings were then backfilled.

F. General Conditions

F.1. Basis of Recommendations

The analyses and recommendations submitted in this report are based upon the data obtained from the soil borings performed at the locations indicated on the attached sketch. Often, variations occur between these borings, the nature and extent of which do not become evident until additional exploration or construction is conducted. A reevaluation of the recommendations in this report should be made after performing on-site observations during construction to note the characteristics of any variations. The variations may result in additional foundation costs, and it is suggested that a contingency be provided for this purpose.

It is recommended that we be retained to perform the observation and testing program for the site preparation phase of this project. This will allow correlation of the soil conditions encountered during construction to the soil borings, and will provide continuity of professional responsibility.

F.2. Review of Design

This report is based on the design of the proposed structure as related to us for preparation of this report. It is recommended that we be retained to review the geotechnical aspects of the designs and specifications. With the review, we will evaluate whether any changes in design have affected the validity of the recommendations, and whether our recommendations have been correctly interpreted and implemented in the design and specifications.

F.3. Groundwater Fluctuations

We made water-level observations in the borings at the times and under the conditions stated on the boring logs. These data were interpreted in the text of this report. The period of observation was relatively short, and fluctuations in the groundwater level may occur due to rainfall, flooding, irrigation, spring thaw, drainage, and other seasonal and annual factors not evident at the time the observations were made. Design drawings and specifications and construction planning should recognize the possibility of fluctuations.

F.4. Use of Report

This report is for the exclusive use of Frauenshuh and their design team to use to design the proposed building and prepare construction documents. In the absence of our written approval, we make no representation and assume no responsibility to other parties regarding this report. The data, analyses and recommendations may not be appropriate for other structures or purposes. We recommend that parties contemplating other structures or purposes contact us.

F.5. Level of Care

In performing our services, Braun Intertec has used that degree of care and skill ordinarily exercised under similar circumstances by reputable members of our profession currently practicing in the same locality. No warranty, express or implied, is made.

Appendix

BRAUN INTERTEC

LOG OF BORING

Braun Project BL-07-04393 GEOTECHNICAL EVALUATION Proposed Medical Office Building American Boulevard West Bloomington, Minnesota	BORING: ST-5 LOCATION: See attached sketch.

DRILLER: Mark Barber | METHOD: 3 1/4" HSA Autohammer | DATE: 1/10/08 | SCALE: 1" = 4'

Elev. feet 852.6	Depth feet 0.0	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	MC %	PID ppm	Tests or Notes
851.5	1.1	FILL	FILL: Silty Sand, fine- to medium-grained, non- to slightly organic, with a trace of Gravel and Roots, dark brown, frozen. (Topsoil/Fill)					
		FILL	FILL: Silty Sand, fine- to medium-grained, with occasional Clayey Sand layers, dark brown, frozen to moist.	15		8	0	
				9		15	0	
845.6	7.0	SP	POORLY GRADED SAND, fine- to medium-grained, with occasional Sandy Silt seams, brown to light brown, moist, loose to medium dense. (Alluvium)	10			0	
				9			0	
				11			0	
				9			0	
				9			0	
828.6	24.0	SP-SM	POORLY GRADED SAND with SILT, fine- to medium-grained, light brown, moist, medium dense. (Alluvium)	21			0	*Water not observed with 29 1/2 feet of hollow-stem auger in the ground. Boring immediately backfilled.
				18			0	
821.6	31.0		END OF BORING.*					

(See Descriptive Terminology sheet for explanation of abbreviations)

LOG OF BORING 04393-MOB.GPJ BRAUN.GDT 5/30/08 13:53

BRAUN INTERTEC

LOG OF BORING

Braun Project BL-07-04393 **GEOTECHNICAL EVALUATION** **Proposed Medical Office Building** **American Boulevard West** **Bloomington, Minnesota**	BORING: **ST-6** LOCATION: See attached sketch.

DRILLER: Mark Barber	METHOD: 3 1/4" HSA Autohammer	DATE: 1/10/08	SCALE: 1" = 4'

Elev. feet 855.3	Depth feet 0.0	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	MC %	PID ppm	Tests or Notes
		FILL	FILL: Silty Sand, fine- to medium-grained, with a trace of Gravel and Concrete, with Clayey Sand layers, dark brown, frozen to moist.					
				41		9	0	
				17			0	
				7		12	0	
845.8	9.5	SP	POORLY GRADED SAND, fine- to medium-grained, brown to light brown, moist, loose to medium dense. (Alluvium)	9			0	
				6			0	
				12			0	
				14			0	
831.3	24.0	SP-SM	POORLY GRADED SAND with SILT, fine-grained, light brown, moist, medium dense. (Alluvium)	13			0	*Water not observed with 29 1/2 feet of hollow-stem auger in the ground. Water not observed to cave-in depth of 18 feet immediately after withdrawing the auger.
826.3	29.0	SM	SILTY SAND, fine-grained, light brown, moist, very dense. (Alluvium)	93			0	Boring immediately backfilled.
824.3	31.0		END OF BORING.*					

(See Descriptive Terminology sheet for explanation of abbreviations)

LOG OF BORING 04393-MOB.GPJ BRAUN.GDT 5/30/08 14:05

BRAUN INTERTEC

LOG OF BORING

Braun Project BL-07-04393
GEOTECHNICAL EVALUATION
Proposed Medical Office Building
American Boulevard West
Bloomington, Minnesota

BORING: **ST-7**

LOCATION: See attached sketch.

DRILLER: Mark Barber | METHOD: 3 1/4" HSA Autohammer | DATE: **1/10/08** | SCALE: **1" = 4'**

Elev. feet 853.2	Depth feet 0.0	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	MC %	PID ppm	Tests or Notes
852.3	0.9	FILL	FILL: Clayey Sand, fine-grained, slightly organic, black, frozen. (Topsoil/Fill)					
848.2	5.0	FILL	FILL: Silty Sand, fine- to medium-grained, non- to slightly organic, black and dark brown, frozen to moist.	19		10	0	
846.2	7.0	FILL	FILL: Silty Sand, fine- to medium-grained, dark brown and brown, moist.	9		7	0	
829.2	24.0	SP	POORLY GRADED SAND, fine- to medium-grained, brown to light brown, moist, very loose to medium dense. (Alluvium)	7			0	
				4			0	
				8			0	
				5			0	
				11			0	*Water not observed with 29 1/2 feet of hollow-stem auger in the ground.
822.2	31.0	SP-SM	POORLY GRADED SAND with SILT, fine- to medium-grained, light brown, moist, loose to medium dense. (Alluvium)	8			0	Water not observed to cave-in depth of 22 feet immediately after withdrawing the auger.
				20			0	Boring immediately backfilled.
			END OF BORING.*					

(See Descriptive Terminology sheet for explanation of abbreviations)

LOG OF BORING 04393-MOB.GPJ BRAUN.GDT 5/30/08 14:05

BRAUN INTERTEC

LOG OF BORING

Braun Project BL-07-04393
GEOTECHNICAL EVALUATION
Proposed Medical Office Building
American Boulevard West
Bloomington, Minnesota

BORING: **ST-8**

LOCATION: See attached sketch.

DRILLER: Mike Rowland | METHOD: 3 1/4" HSA Autohammer | DATE: **1/11/08** | SCALE: **1" = 4'**

Elev. feet 854.4	Depth feet 0.0	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	MC %	PID ppm	Tests or Notes
854.0	0.4	FILL	FILL: Silty Sand, fine- to medium-grained, non- to slightly organic, black, frozen. (Topsoil/Fill)					
847.4	7.0	FILL	FILL: Poorly Graded Sand with Silt, fine- to medium-grained, with a trace of Gravel, with Silty Sand seams, dark brown and brown, frozen to moist.	16			0	
				13		7	0	
830.4	24.0	SP	POORLY GRADED SAND, fine- to medium-grained, brown to light brown, moist, loose to medium dense. (Alluvium)	10			0	
				6			0	
				8			0	
				10			0	
				19			0	*Water not observed with 29 1/2 feet of hollow-stem auger in the ground.
823.4	31.0	SM	SILTY SAND, fine-grained, light brown, moist, medium dense. (Alluvium)	12			0	Water not observed to cave-in depth of 22 feet immediately after withdrawing the auger.
				13			0	Boring immediately backfilled.
			END OF BORING.*					

(See Descriptive Terminology sheet for explanation of abbreviations)

LOG OF BORING 04393-MOB.GPJ BRAUN.GDT 5/30/08 14:05

BRAUN℠
INTERTEC

LOG OF BORING

Braun Project BL-07-04393 **GEOTECHNICAL EVALUATION** **Proposed Medical Office Building** **American Boulevard West** **Bloomington, Minnesota**	BORING: **ST-9** LOCATION: See attached sketch.

DRILLER: Mark Barber	METHOD: 3 1/4" HSA Autohammer	DATE: **1/11/08**	SCALE: **1" = 4'**

Elev. feet 853.0	Depth feet 0.0	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	PID ppm	Tests or Notes
852.5	0.5	FILL	FILL: Clayey Sand, fine-grained, slightly organic, black, frozen. (Topsoil/Fill)				
848.0	5.0	FILL	FILL: Silty Sand, fine- to medium-grained, dark brown and brown, frozen to moist.	13		0	
829.0	24.0	SP	POORLY GRADED SAND, fine- to medium-grained, brown to light brown, moist, loose to medium dense. (Alluvium)	7 7 5 8 9 17		0 0 0 0 0 0	
824.0	29.0	SM	SILTY SAND, fine-grained, light brown, moist, medium dense. (Alluvium)	13		0	*Water not observed with 29 1/2 feet of hollow-stem auger in the ground. Water not observed to cave-in depth of 23 feet immediately after withdrawing the auger.
822.0	31.0	ML	SANDY SILT, light brown, moist, medium dense. (Alluvium)	14		0	Boring immediately backfilled.
			END OF BORING.*				

(See Descriptive Terminology sheet for explanation of abbreviations)

LOG OF BORING 04393-MOB.GPJ BRAUN.GDT 5/30/08 13:53

BRAUN℠
INTERTEC

LOG OF BORING

Braun Project BL-07-04393 GEOTECHNICAL EVALUATION Proposed Medical Office Building American Boulevard West Bloomington, Minnesota	BORING: ST-10 LOCATION: See attached sketch.

DRILLER: Mike Rowland	METHOD: 3 1/4" HSA Autohammer	DATE: 1/11/08	SCALE: 1" = 4'

Elev. feet 854.4	Depth feet 0.0	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	MC %	PID ppm	Tests or Notes
854.0	0.4	FILL	FILL: Silty Sand, fine- to medium-grained, non- to slightly organic, black, frozen. (Topsoil/Fill)					
		FILL	FILL: Silty Sand, fine- to medium-grained, with a trace of Gravel, Roots and Concrete, with occasional Clayey Sand layers, dark brown and brown, frozen to moist.	13		5	0	
				11			0	
				9		13	0	
845.4	9.0	FILL	FILL: Poorly Graded Sand with Silt, fine- to medium-grained, with Gravel, dark brown and brown, moist.	9			0	
843.4	11.0	SP	POORLY GRADED SAND, fine- to medium-grained, brown to light brown, moist, loose to medium dense. (Alluvium)	8			0	
				24			0	
835.4	19.0	SP-SM	POORLY GRADED SAND with SILT, fine- to medium-grained, light brown, moist, medium dense. (Alluvium)	18			0	*Water not observed with 29 1/2 feet of hollow-stem auger in the ground.
830.4	24.0	SM	SILTY SAND, fine-grained, with Sandy Silt seams, light brown, moist, medium dense. (Alluvium)	21			0	Water not observed to cave-in depth of 19 feet immediately after withdrawing the auger.
				30			0	Boring immediately backfilled.
823.4	31.0		END OF BORING.*					

(See Descriptive Terminology sheet for explanation of abbreviations)

LOG OF BORING 04393-MOB.GPJ BRAUN.GDT 5/30/08 14:05

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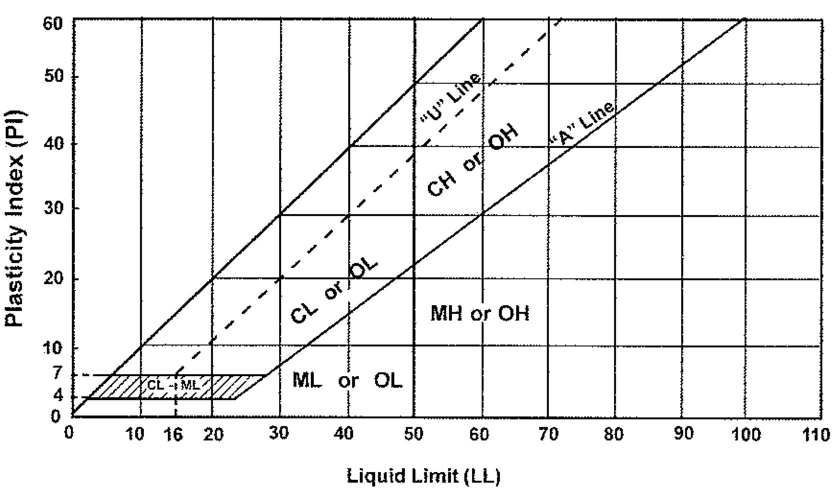
Descriptive Terminology of Soil

Standard D 2487 - 00
Classification of Soils for Engineering Purposes
(Unified Soil Classification System)

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests [a]				Soils Classification: Group Symbol	Soils Classification: Group Name [b]
Coarse-grained Soils more than 50% retained on No. 200 sieve	Gravels More than 50% of coarse fraction retained on No. 4 sieve	Clean Gravels 5% or less fines [e]	$C_u \geq 4$ and $1 \leq C_c \leq 3$ [c]	GW	Well-graded gravel [d]
			$C_u < 4$ and/or $1 > C_c > 3$ [c]	GP	Poorly graded gravel [d]
		Gravels with Fines More than 12% fines [e]	Fines classify as ML or MH	GM	Silty gravel [d,f,g]
			Fines classify as CL or CH	GC	Clayey gravel [d,f,g]
	Sands 50% or more of coarse fraction passes No. 4 sieve	Clean Sands 5% or less fines [i]	$C_u \geq 6$ and $1 \leq C_c \leq 3$ [c]	SW	Well-graded sand [h]
			$C_u < 6$ and/or $1 > C_c > 3$ [c]	SP	Poorly graded sand [h]
		Sands with Fines More than 12% [i]	Fines classify as ML or MH	SM	Silty sand [f,g,h]
			Fines classify as CL or CH	SC	Clayey sand [f,g,h]
Fine-grained Soils 50% or more passed the No. 200 sieve	Silts and Clays Liquid limit less than 50	Inorganic	PI > 7 and plots on or above "A" line [j]	CL	Lean clay [k,l,m]
			PI < 4 or plots below "A" line [j]	ML	Silt [k,l,m]
		Organic	$\frac{\text{Liquid limit - oven dried}}{\text{Liquid limit - not dried}} < 0.75$	OL	Organic clay [k,l,m,n]
				OL	Organic silt [k,l,m,o]
	Silts and clays Liquid limit 50 or more	Inorganic	PI plots on or above "A" line	CH	Fat clay [k,l,m]
			PI plots below "A" line	MH	Elastic silt [k,l,m]
		Organic	$\frac{\text{Liquid limit - oven dried}}{\text{Liquid limit - not dried}} < 0.75$	OH	Organic clay [k,l,m,p]
				OH	Organic silt [k,l,m,q]
Highly Organic Soils		Primarily organic matter, dark in color and organic odor		PT	Peat

a. Based on the material passing the 3-in (75mm) sieve.
b. If field sample contained cobbles or boulders, or both, add "with cobbles or boulders or both" to group name.
c. $C_u = D_{60} / D_{10}$ $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$
d. If soil contains ≥15% sand, add "with sand" to group name.
e. Gravels with 5 to 12% fines require dual symbols:
   GW-GM well-graded gravel with silt
   GW-GC well-graded gravel with clay
   GP-GM poorly graded gravel with silt
   GP-GC poorly graded gravel with clay
f. If fines classify as CL-ML, use dual symbol GC-GM or SC-SM.
g. If fines are organic, add "with organic fines" to group name.
h. If soil contains ≥ 15% gravel, add "with gravel" to group name.
i. Sands with 5 to 12% fines require dual symbols:
   SW-SM well-graded sand with silt
   SW-SC well-graded sand with clay
   SP-SM poorly graded sand with silt
   SP-SC poorly graded sand with clay
j. If Atterberg limits plot in hatched area, soil is a CL-ML, silty clay.
k. If soil contains 10 to 29% plus No. 200, add "with sand" or "with gravel" whichever is predominant.
l. If soil contains ≥30% plus No. 200, predominantly sand, add "sandy" to group name.
m. If soil contains ≥30% plus No. 200 predominantly gravel, add "gravelly" to group name.
n. PI ≥ 4 and plots on or above "A" line.
o. PI < 4 or plots below "A" line.
p. PI plots on or above "A" line.
q. PI plots below "A" line.



Laboratory Tests

DD	Dry density, pcf	OC	Organic content, %
WD	Wet density, pcf	S	Percent of saturation, %
MC	Natural moisture content, %	SG	Specific gravity
LL	Liquid limit, %	C	Cohesion, psf
PL	Plastic limit, %	∅	Angle of internal friction
PI	Plasticity index, %	qu	Unconfined compressive strength, psf
P200	% passing 200 sieve	qp	Pocket penetrometer strength, tsf

Particle Size Identification

Boulders	over 12"
Cobbles	3" to 12"
Gravel	
Coarse	3/4" to 3"
Fine	No. 4 to 3/4"
Sand	
Coarse	No. 4 to No. 10
Medium	No. 10 to No. 40
Fine	No. 40 to No. 200
Silt	< No. 200, PI < 4 or below "A" line
Clay	< No. 200, PI ≥ 4 and on or above "A" line

Relative Density of Cohesionless Soils

Very loose	0 to 4 BPF
Loose	5 to 10 BPF
Medium dense	11 to 30 BPF
Dense	31 to 50 BPF
Very dense	over 50 BPF

Consistency of Cohesive Soils

Very soft	0 to 1 BPF
Soft	2 to 3 BPF
Rather soft	4 to 5 BPF
Medium	6 to 8 BPF
Rather stiff	9 to 12 BPF
Stiff	13 to 16 BPF
Very stiff	17 to 30 BPF
Hard	over 30 BPF

Drilling Notes

Standard penetration test borings were advanced by 3 1/4" or 6 1/4" ID hollow-stem augers unless noted otherwise, Jetting water was used to clean out auger prior to sampling only where indicated on logs. Standard penetration test borings are designated by the prefix "ST" (Split Tube). All samples were taken with the standard 2" OD split-tube sampler, except where noted.

Power auger borings were advanced by 4" or 6" diameter continuous-flight, solid-stem augers. Soil classifications and strata depths were inferred from disturbed samples augered to the surface and are, therefore, somewhat approximate. Power auger borings are designated by the prefix "B."

Hand auger borings were advanced manually with a 1 1/2" or 3 1/4" diameter auger and were limited to the depth from which the auger could be manually withdrawn. Hand auger borings are indicated by the prefix "H."

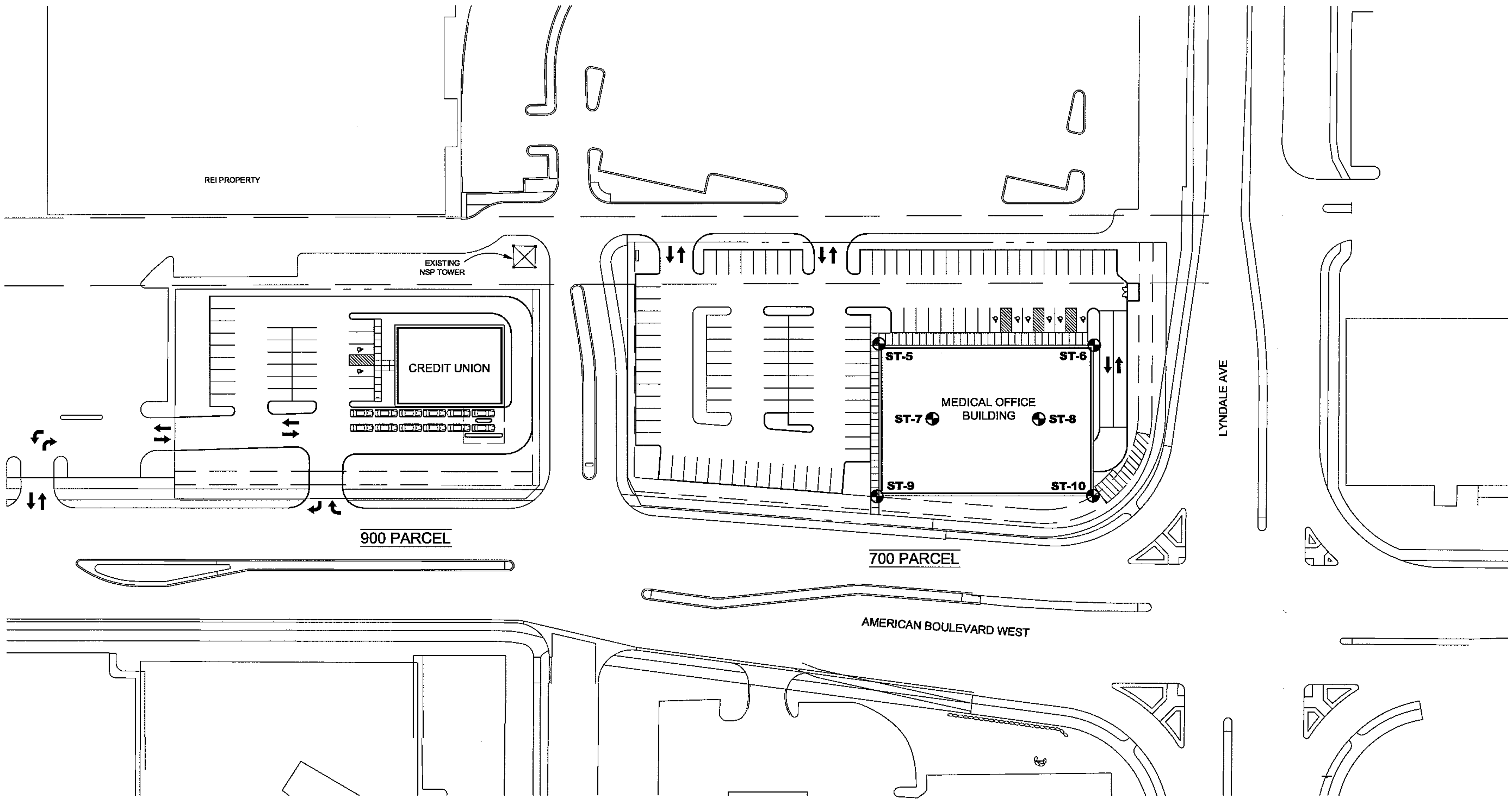
BPF: Numbers indicate blows per foot recorded in standard penetration test, also known as "N" value. The sampler was set 6" into undisturbed soil below the hollow-stem auger. Driving resistances were then counted for second and third 6" increments and added to get BPF. Where they differed significantly, they are reported in the following form: 2/12 for the second and third 6" increments, respectively.

WH: WH indicates the sampler penetrated soil under weight of hammer and rods alone; driving not required.

WR: WR indicates the sampler penetrated soil under weight of rods alone; hammer weight and driving not required.

TW indicates thin-walled (undisturbed) tube sample.

Note: All tests were run in general accordance with applicable ASTM standards.



DENOTES APPROXIMATE LOCATION OF STANDARD PENETRATION TEST BORING

50' 0 100'

SCALE: 1" = 100'

BRAUN INTERTEC

11001 Hampshire Avenue So.
Minneapolis, MN 55438
PH. (952) 995-2000
FAX (952) 995-2020

Base Dwg Provided By:

SOIL BORING LOCATION SKETCH
GEOTECHNICAL EVALUATION
MEDICAL OFFICE BUILDING
700 AMERICAN BOULEVARD WEST
BLOOMINGTON, MINNESOTA

Project No:	BL0704393
Drawing No:	BL0704393
Scale:	1"= 100'
Drawn By:	MRG
Date Drawn:	1/17/08
Checked By:	JJV
Last Modified:	5/30/08
Sheet: of	Fig:

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