



TESTING SERVICE CORPORATION

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Geotechnical & Environmental Engineering



Construction Materials Engineering & Testing



Laboratory Testing of Soils, Concrete & Asphalt



Geo-Environmental Drilling & Sampling

Report of Pavement Investigation

Pavement Core Investigation

2018 Street Improvement Program

Villa Park, Illinois

**Christopher B.
Burke Engineering,
Ltd.**

GEOTECHNICAL GROUP





Local Office
March 6, 2018

Mr. Andrew Pufundt
Christopher B. Burke Engineering, Ltd.
9575 West Higgins Road Suite 600
Rosemont, Illinois 60018-4920

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Re: L-87,867
Pavement Core Investigation
2018 Street Improvement Program
Villa Park, Illinois

Dear Mr. Pufundt:

This report presents results of a pavement investigation performed for the proposed 2018 Street Improvement Program in Villa Park, Illinois. These geotechnical engineering services are being provided in accordance with TSC Proposal No. 60,024 dated December 27, 2017 and the attached General Conditions, incorporated herein by reference. Environmental analysis in connection with IEPA Form LPC-663 was also performed in conjunction with this work and is reported separately.

The streets and parking lots listed below are included as part of the 2018 improvement program, with new storm sewers also being installed at a few locations:

- Biermann Avenue (St. Charles Road to Division Street) - 1,400 LF
- Second Avenue (St. Charles Road to Division Street) - 1,500 LF
- Holly Court (Westmore Avenue to Addison Road) - 1,300 LF
- Euclid Avenue (St. Charles Road to Division Street) - 1,200 LF
- Sugar Creek Golf Course Parking Lot (North of Van Buren Street) - SW Corner
- Public Works Parking Lot (South of Home Avenue)

Field Investigation and Laboratory Testing

Pavement Cores:

Work performed for this project included taking a total of fifteen (15) pavement cores as well as three (3) soil borings by the intersection of Holly Court and 2nd Avenue. Core locations were selected by the client and marked on the pavement by TSC. The cores were taken to determine the composition and general condition of the pavement and base course materials as well as the subgrade materials. Once they were marked, JULIE (Joint Utility Locating for Excavators) was contacted so that the various underground utility lines could be cleared. Reference is made to the Core Location Plan included with this report.

The pavement cores were obtained using a 4" diameter core barrel with an impregnated diamond matrix bit. Granular base course materials were also hand-augered and sampled at the core locations to determine their thickness and composition, with macro-core push samples then taken of the upper



subgrade to a depth of 3 to 4 feet below top of pavement. The core holes were immediately backfilled and patched to preclude possible hazards to the public.

The pavement cores and aggregate samples were examined by a construction materials technician in the laboratory. These detailed results are shown on the attached sheet titled "Pavement Core Results". Bituminous layers are listed individually, including their average thicknesses and condition comments. Total asphalt and base course thicknesses are also given, rounded to the nearest ¼" and 1", respectively.

Subgrade soil samples were examined in the laboratory to verify field descriptions and to classify them in accordance with the Unified Soil Classification System. Laboratory testing included moisture content determinations for all cohesive soils and intermediate (silt or loamy) soil types, along with dry unit weight determinations on cohesive fill. An estimate of unconfined compressive strength was also obtained for all cohesive soils using a calibrated pocket penetrometer. The soil descriptions at the core locations are summarized on the attached sheet titled "Subgrade Test Results". The depth of the samples are referenced to the top of the pavement (in feet).

Soil Borings

Borings 16 - 18 were drilled by the intersection of Holly Court and 2nd Avenue, the closest point that the new storm sewer comes to a known LUST (leaking underground storage tank) incident. They were extended to 10 feet below existing grade using a GeoProbe rig mounted on the coring van. Continuous macro-core push samples (1.5 inch diameter) are taken by it, from which representative test specimens were obtained at approximate 2-foot intervals. Water level readings were recorded during and following completion of drilling operations.

Soil samples were examined in the laboratory to verify field descriptions and to classify them in accordance with the Unified Soil Classification System. Laboratory testing included moisture content determinations for all cohesive and intermediate (silt or loamy) soil types. An estimate of unconfined compressive strength was obtained for all cohesive soils using a calibrated pocket penetrometer.

Reference is made to the attached boring logs indicating subsurface stratigraphy and soil descriptions, results of field and laboratory tests, as well as water level observations. Definitions of descriptive terminology are also included. While strata changes are shown as a definite line on the boring logs, the actual transition between soil layers are likely to be more gradual.

Discussion of Test Data

Pavement Cores

Results of the fifteen (15) pavement cores are summarized in the following table, i.e., bituminous concrete, P.C. concrete, and base course total thicknesses given:



SUMMARY OF CORE RESULTS

Core No.	General Locations	Total Bituminous Concrete Thickness* (in)	Total P.C. Concrete Thickness* (in)	Total Pavement Thickness (in)	Base Course Thickness** (in)
1	Bierman Ave.	1	8	9	-
2	Bierman Ave.	3	-	3	10
3	Bierman Ave.	2¼	7¼	9½	-
4	2 nd Avenue	¾	7¼	8	-
5	2 nd Avenue	1¼	7¼	8½	-
6	2 nd Avenue	1	7	8	-
7	Bierman Ave.	3¼	-	3¼	9
8	Holly Court	8¾	-	8¾	24+
9	Holly Court	7¼	-	7¼	24+
10	Euclid Avenue	6¼	-	6¼	3
11	Euclid Avenue	4½	-	4½	15
12	Euclid Avenue	5	-	5	24+
13	Sugar Creek Parking Lot	3	-	3	8
14	PW Parking Lot	4¼	-	4¼	12
15	PW Parking Lot	4½	-	4½	8

- * Total bituminous/P.C. concrete thicknesses rounded to the nearest ¼ inch.
- ** Base course thicknesses rounded to the nearest 1 inch.

Pavement Cores 1 - 15 were taken in order to determine an accurate thickness and composition of the pavement. Cores 2, 7 - 15 (10 total) generally revealed the presence of 3 to 9 inches Hot Mix Asphalt (bituminous concrete). Cores 1, and 3 - 6 (5 cores) consisted of ¾ to 2¼ inches of bituminous surface course overlying P.C. Concrete. P.C. concrete thickness ranged between 7 and 8 inches.

All asphalt sections were typically comprised of 0 to 2 bituminous surface courses and 1 to 2 binder courses. Cores 1, 3, 6, 8, 11, and 12 (6 total), revealed a lack of bonding between the bituminous course layers. The asphalt was found overlying 8 to 15 inches granular base course materials, as low as 3 inches in Core 10. It should be noted that Cores 8, 9 and 12 revealed base course materials to core completion depths, i.e. 24+ inches thick. It should also be noted that the P.C. concrete pavements

were not underlain by granular base course materials. The granular materials typically consisted of crushed stone up to 1 inch in size.

Clayey topsoil with moisture contents ranging from 30 to 36 percent was found underlying the pavement section at Cores 3 and 4. The topsoil was found overlying silty clay in a tough to very tough condition extending to core completion depths. These soils revealed pocket penetrometer readings of 1.5 to 2.5 tons per square foot (tsf) at moisture contents on the order of 22 percent.

The subgrade soils in Cores 1, 2, 5 - 7, 10, and 13 - 15 (9 total) consisted of silty clay soils (native and/or fill) in a tough to hard condition extending to core completion depths. The cohesive soils revealed pocket penetrometer readings typically ranging from 1.0 to 4.5+ tsf, occasionally as low as 0.25 tsf in the upper soils of Core 7. Moisture contents typically ranged from 14 to 26. It should be noted that Core 11 revealed 5 inches of silty clay materials in between layers of granular base course materials. The cores were all noted as "dry" both during and following completion of field operations.

Soil Borings

Borings 16 - 18 were drilled on existing asphalt pavements by the intersection of Holly Court and 2nd Avenue. Cores 16 and 17 revealed approximately 11 and 3¼ inches bituminous concrete overlying 4 and 15 inches of granular base course materials, respectively. Boring 18 revealed 1½ inches bituminous surface course over 7 inches P.C. concrete.

Tough to very tough silty clay soils were found underlying the pavement section and extended to the bottom of Borings 16 - 18 at 10 feet in depth. These cohesive materials had unconfined compressive strengths typically ranging from 1.75 to 3.5 tsf at moisture contents of 15 to 30 percent. A very soft layer encountered between 4 and 5½ feet in depth at Boring 17 had an unconfined strength on the order of 0.25 tsf at moisture content of 36 percent, thought to likely represent a root zone. A 1-foot thick layer of clayey sand was also present at 6 feet below existing grade in B-18.

Borings 16 and 17 were "dry" both during and following completion of drilling operations. Free water was encountered at approximately 6 feet below existing grade in Boring 18, appearing to be perched within the clayey sand layer present at this location.

Analysis and Recommendations

Cores 1 - 15 were drilled for the 2018 street improvement program in Villa Park. Cores 8 - 12, 14 and 15 (7 total) revealed 4¼ to 8¾ inches of asphalt pavement, considered suitable for milling and resurfacing, as long as some reflective cracking can be tolerated. It should be understood that this option is a temporary fix with a limited lifespan and will not have the same results as total pavement reconstruction. A 4.75mm Sand mix layer may be applied first in order to help reduce reflective cracking. It is recommended that a tack coat also be used to create a strong adhesive bond without slippage.

Cores 1 and 3 - 6 (5 total) revealed between ¾ and 2¼ inches of asphalt pavement over approximately 7 to 8 inches of P.C. Concrete (PCC). As long as reflective cracking can be tolerated, the these cores may be milled, with the underlying PCC considered suitable for resurfacing. It should

be understood that this option is a temporary fix with a limited lifespan and will not have the same results as total pavement reconstruction.

Cores 2, 7, and 13 revealed 3 to 3¼ inches of asphalt, considered deficient for milling and resurfacing (i.e. too thin to save). If the pavements are milled it is possible that the exposed asphalt pavement section may fall apart with the use of typical heavy milling equipment and associated truck traffic. During wet times of the year, milling and overlaying may be more problematic due to a wet subgrade, with the trucks and heavy milling equipment aggravating this condition. If a long-term solution is desired, it is recommended that the entire pavement be reconstructed.

In areas where a partial replacement is performed, it will be necessary to remove any distressed pavement sections and/or any unbonded pavement sections (i.e. Cores 1, 3, 6, 8, 11, and 12). The evaluation of the failed areas should be performed after the milling work has been completed. At this time additional failures may become evident. In the event deficient pavement conditions are noted, it will be necessary to remove the distressed pavement sections. Subgrade support for improvements will be related to the thickness of the remaining asphalt section, existing granular base course materials, as well as the condition of the subgrade soils.

If the bituminous concrete is entirely removed, the exposed granular base course may remain in place provided that it passes a proof-roll. In our experience the granular base course materials will often fail to pass a proof-roll in areas that are less than 10 inches thick and/or in time of wetter weather. Therefore, the granular section in the area of Cores 7, 10, 13, and 15 (4 total) may not pass a proof-roll, as well as elsewhere around the site.

The proof-roll should be performed using a heavily loaded 6-wheel dump truck or equivalent piece of construction equipment. Areas where the rutting depths of the granular base course are in the range of ½ inch should be marked out for partial or full depth patching with a bituminous concrete binder course mixture. If rutting depths are greater than 1 inch, the remediation of the underlying granular base course (and/or subgrade) by removal and replacement methods with granular materials should be scheduled. Undercut areas may be backfilled with crushed concrete, limestone or gravel that meet IDOT gradation CA-1, CA-3 or CA-7.

Borings 16 - 18 were drilled in connection with new storm sewer. Tough to very tough silty clay soils were encountered at the anticipated invert level of approximately 8 feet below existing grade. These materials are considered suitable for support of the sewer pipe and trench backfill. Minor undercutting may be required if very soft silty clay soils encountered in Boring 17 are present at the invert level.

Closure

The analyses and recommendations submitted in this report are based upon the data obtained from the fifteen (15) pavement cores and three (3) soil borings performed at the locations indicated on the Core Location Plan. This report does not reflect any variations which may occur between core locations, the nature and extent of which may not become evident until during the course of construction. If variations are then identified, recommendations contained in this report should be re-evaluated after performing on-site observations.



Please call if there are any questions in regard to this matter or if we may be of further service.

Respectfully submitted,

TESTING SERVICE CORPORATION

A handwritten signature in blue ink, appearing to read "A. Phillips".

Alexander P. Phillips, E.I.T.
Staff Engineer

A handwritten signature in blue ink, appearing to read "M. Machalinski".

Michael V. Machalinski
Vice President
Registered Professional Engineer
Illinois No. 062-038559

APP:TRP:app



TESTING SERVICE CORPORATION

1. PARTIES AND SCOPE OF WORK: If Client is ordering the services on behalf of another, Client represents and warrants that Client is the duly authorized agent of said party for the purpose of ordering and directing said services, and in such case the term "Client" shall also include the principal for whom the services are being performed. Prices quoted and charged by TSC for its services are predicated on the conditions and the allocations of risks and obligations expressed in these General Conditions. Unless otherwise stated in writing, Client assumes sole responsibility for determining whether the quantity and the nature of the services ordered by Client are adequate and sufficient for Client's intended purpose. Unless otherwise expressly assumed in writing, TSC's services are provided exclusively for client. TSC shall have no duty or obligation other than those duties and obligations expressly set forth in this Agreement. TSC shall have no duty to any third party. Client shall communicate these General Conditions to each and every party to whom the Client transmits any report prepared by TSC. Ordering services from TSC shall constitute acceptance of TSC's proposal and these General Conditions.

2. SCHEDULING OF SERVICES: The services set forth in this Agreement will be accomplished in a timely and workmanlike manner. If TSC is required to delay any part of its services to accommodate the requests or requirements of Client, regulatory agencies, or third parties, or due to any cause beyond its reasonable control, Client agrees to pay such additional charges, if any, as may be applicable.

3. ACCESS TO SITE: TSC shall take reasonable measures and precautions to minimize damage to the site and any improvements located thereon as a result of its services or the use of its equipment; however, TSC has not included in its fee the cost of restoration of damage which may occur. If Client desires or requires TSC to restore the site to its former condition, TSC will, upon written request, perform such additional work as is necessary to do so and Client agrees to pay to TSC the cost thereof plus TSC's normal markup for overhead and profit.

4. CLIENT'S DUTY TO NOTIFY ENGINEER: Client represents and warrants that Client has advised TSC of any known or suspected hazardous materials, utility lines and underground structures at any site at which TSC is to perform services under this Agreement. Unless otherwise agreed in writing, TSC's responsibility with respect to underground utility locations is to contact the Illinois Joint Utility Locating Information for Excavators for the location of public, but not private, utilities.

5. DISCOVERY OF POLLUTANTS: TSC's services shall not include investigation for hazardous materials as defined by the Resource Conservation Recovery Act, 42 U.S.C. § 6901, et, seq., as amended ("RCRA") or by any state or Federal statute or regulation. In the event that hazardous materials are discovered and identified by TSC, TSC's sole duty shall be to notify Client.

6. MONITORING: If this Agreement includes testing construction materials or observing any aspect of construction of improvements, Client's construction personnel will verify that the pad is properly located and sized to meet Client's projected building loads. Client shall cause all tests and inspections of the site, materials and work to be timely and properly performed in accordance with the plans, specifications, contract documents, and TSC's recommendations. No claims for loss, damage or injury shall be brought against TSC unless all tests and inspections have been so performed and unless TSC's recommendations have been followed.

TSC's services shall not include determining or implementing the means, methods, techniques or procedures of work done by the contractor(s) being monitored or whose work is being tested. TSC's services shall not include the authority to accept or reject work or to in any manner supervise the work of any contractor. TSC's services or failure to

perform same shall not in any way operate or excuse any contractor from the performance of its work in accordance with its contract. "Contractor" as used herein shall include subcontractors, suppliers, architects, engineers and construction managers.

Information obtained from borings, observations and analyses of sample materials shall be reported in formats considered appropriate by TSC unless directed otherwise by Client. Such information is considered evidence, but any inference or conclusion based thereon is, necessarily, an opinion also based on engineering judgment and shall not be construed as a representation of fact. Subsurface conditions may not be uniform throughout an entire site and ground water levels may fluctuate due to climatic and other variations. Construction materials may vary from the samples taken. Unless otherwise agreed in writing, the procedures employed by TSC are not designed to detect intentional concealment or misrepresentation of facts by others.

7. DOCUMENTS AND SAMPLES: Client is granted an exclusive license to use findings and reports prepared and issued by TSC and any sub-consultants pursuant to this Agreement for the purpose set forth in TSC's proposal provided that TSC has received payment in full for its services. TSC and, if applicable, its sub-consultant, retain all copyright and ownership interests in the reports, boring logs, maps, field data, field notes, laboratory test data and similar documents, and the ownership and freedom to use all data generated by it for any purpose. Unless otherwise agreed in writing, test specimens or samples will be disposed immediately upon completion of the test. All drilling samples or specimens will be disposed sixty (60) days after submission of TSC's report.

8. TERMINATION: TSC's obligation to provide services may be terminated by either party upon (7) seven days prior written notice. In the event of termination of TSC's services, TSC shall be compensated by Client for all services performed up to and including the termination date, including reimbursable expenses. The terms and conditions of these General Conditions shall survive the termination of TSC's obligation to provide services.

9. PAYMENT: Client shall be invoiced periodically for services performed. Client agrees to pay each invoice within thirty (30) days of its receipt. Client further agrees to pay interest on all amounts invoiced and not paid or objected to in writing for valid cause within sixty (60) days at the rate of twelve (12%) per annum (or the maximum interest rate permitted by applicable law, whichever is the lesser) until paid and TSC's costs of collection of such accounts, including court costs and reasonable attorney's fees.

10. WARRANTY: TSC's professional services will be performed, its findings obtained and its reports prepared in accordance with these General Conditions and with generally accepted principles and practices. In performing its professional services, TSC will use that degree of care and skill ordinarily exercised under similar circumstances by members of its profession. In performing physical work in pursuit of its professional services, TSC will use that degree of care and skill ordinarily used under similar circumstances. This warranty is in lieu of all other warranties or representations, either express or implied. Statements made in TSC reports are opinions based upon engineering judgment and are not to be construed as representations of fact.

Should TSC or any of its employees be found to have been negligent in performing professional services or to have made and breached any express or implied warranty, representation or contract, Client, all parties claiming through Client and all parties claiming to have in any way relied upon TSC's services or work agree that the maximum aggregate amount of damages for which TSC, its officers, employees and agents shall be liable is limited to \$50,000 or the total amount of the fee paid to TSC for its services performed with respect to the project, whichever amount is greater.

GENERAL CONDITIONS

Geotechnical and Construction Services

In the event Client is unwilling or unable to limit the damages for which TSC may be liable in accordance with the provisions set forth in the preceding paragraph, upon written request of Client received within five days of Client's acceptance of TSC's proposal together with payment of an additional fee in the amount of 5% of TSC's estimated cost for its services (to be adjusted to 5% of the amount actually billed by TSC for its services on the project at time of completion), the limit on damages shall be increased to \$500,000 or the amount of TSC's fee, whichever is the greater. This charge is not to be construed as being a charge for insurance of any type, but is increased consideration for the exposure to an award of greater damages.

11. INDEMNITY: Subject to the provisions set forth herein, TSC and Client hereby agree to indemnify and hold harmless each other and their respective shareholders, directors, officers, partners, employees, agents, subsidiaries and division (and each of their heirs, successors, and assigns) from any and all claims, demands, liabilities, suits, causes of action, judgments, costs and expenses, including reasonable attorneys' fees, arising, or allegedly arising, from personal injury, including death, property damage, including loss of use thereof, due in any manner to the negligence of either of them or their agents or employees or independent contractors. In the event both TSC and Client are found to be negligent or at fault, then any liability shall be apportioned between them pursuant to their pro rata share of negligence or fault. TSC and Client further agree that their liability to any third party shall, to the extent permitted by law, be several and not joint. The liability of TSC under this provision shall not exceed the policy limits of insurance carried by TSC. Neither TSC nor Client shall be bound under this indemnity agreement to liability determined in a proceeding in which it did not participate represented by its own independent counsel. The indemnities provided hereunder shall not terminate upon the termination or expiration of this Agreement, but may be modified to the extent of any waiver of subrogation agreed to by TSC and paid for by Client.

12. SUBPOENAS: TSC's employees shall not be retained as expert witnesses except by separate, written agreement. Client agrees to pay TSC pursuant to TSC's then current fee schedule for any TSC employee(s) subpoenaed by any party as an occurrence witness as a result of TSC's services.

13. OTHER AGREEMENTS: TSC shall not be bound by any provision or agreement (i) requiring or providing for arbitration of disputes or controversies arising out of this Agreement or its performance, (ii) wherein TSC waives any rights to a mechanics lien or surety bond claim; (iii) that conditions TSC's right to receive payment for its services upon payment to Client by any third party or (iv) that requires TSC to indemnify any party beyond its own negligence. These General Conditions are notice, where required, that TSC shall file a lien whenever necessary to collect past due amounts. This Agreement contains the entire understanding between the parties. Unless expressly accepted by TSC in writing prior to delivery of TSC's services, Client shall not add any conditions or impose conditions which are in conflict with those contained herein, and no such additional or conflicting terms shall be binding upon TSC. The unenforceability or invalidity of any provision or provisions shall not render any other provision or provisions unenforceable or invalid. This Agreement shall be construed and enforced in accordance with the laws of the State of Illinois. In the event of a dispute arising out of or relating to the performance of this Agreement, the breach thereof or TSC's services, the parties agree to try in good faith to settle the dispute by mediation under the Construction Industry Mediation Rules of the American Arbitration Association as a condition precedent to filing any demand for arbitration, or any petition or complaint with any court. Paragraph headings are for convenience only and shall not be construed as limiting the meaning of the provisions contained in these General Conditions.

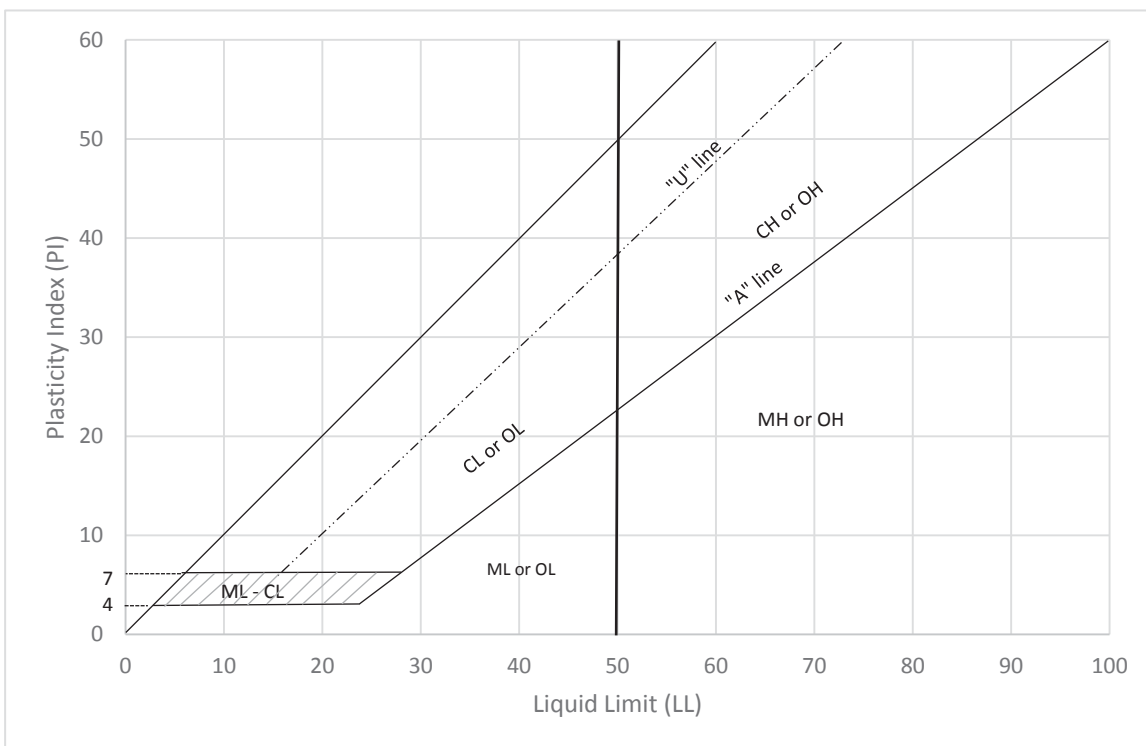
Testing Service Corporation Unified Classification Chart



CRITERIA FOR ASSIGNING GROUP SYMBOLS AND GROUP NAMES USING LABORATORY TEST ^a				SOIL CLASSIFICATION		
				Group Symbol	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 less than 5% fines ^c	$C_u \geq 4$ and $1 \leq C_c \leq 3$ ^e	GW	Well-graded gravel ^f	
			$C_u < 4$ and/or $1 > C_c > 3$ ^e	GP	Poorly-graded gravel ^f	
		GRAVELS WITH FINES more than 12% fines ^c		Fines classify as ML or MH	GM	Silty gravel ^{f, g, h}
				Fines classify as CL or CH	GC	Clayey gravel ^{f, g, h}
	SANDS 50% or more of coarse fraction passes No. 4 sieve	CLEAN SANDS less than 5% fines ^d	$C_u \geq 6$ and $1 \leq C_c \leq 3$ ^e	SW	Well-graded sand ^l	
			$C_u < 6$ and/or $1 > C_c > 3$ ^e	SP	Poorly-graded sand ^l	
		SANDS WITH FINES more than 12% fines ^d		Fines classify as ML or MH	SM	Silty sand ^{g, h, f}
				Fines classify as CL or CH	SC	Clayey sand ^{g, h, f}
FINE - GRAINED SOILS 50% or more passed the No. 200 sieve	SILTS & CLAYS Liquid limit less than 50%	Inorganic	$PI > 7$ or 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		$\frac{\text{Liquid limit} - \text{oven dried}}{\text{Liquid limit} - \text{not dried}} < 0.75$	OL	Organic clay ^{k, l, m, n} Organic silt ^{k, l, m, o}
				PI plots on or above "A" line	CH	Fat clay ^{k, l, m}
	SILTS & CLAYS Liquid limit 50% or more	Inorganic	PI plots below "A" line	MH	Elastic silt ^{k, l, m}	
			$\frac{\text{Liquid limit} - \text{oven dried}}{\text{Liquid limit} - \text{not dried}} < 0.75$	OH	Organic clay ^{k, l, m, p} Organic silt ^{k, l, m, q}	
		Organic		PI plots on or above "A" line	PT	Peat
				PI plots below "A" line	PT	Peat
Highly organic soils		Primarily organic matter, dark in color, and organic odor		PT	Peat	

- a. Based on the material passing the 3-inch (75-mm) sieve.
- b. If field sample contained cobbles and/or boulders, add "with cobbles and/or boulders" to group name
- c. Gravels with 5 to 12% fines required 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
- d. 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
- e. $C_u = D_{60}/D_{10}$ $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$

- f. If soils contains $\geq 15\%$ sand, add "with sand" to group name.
- g. If fines classify as CL-ML, use dual symbol GC-GM, SC-SM
- h. If fines are organic, add "with organic fines" to group name
- i. If soils contains $\geq 15\%$ gravel, add "with gravel" to group name
- j. If Atterberg Limits plot in hatched area, soil is a CL - ML, silty clay
- k. If soils contains 15 to 29% plus No. 200, add "with sand" or "with gravel" whichever is predominant
- l. If soil contains $\geq 30\%$ plus No. 200, predominantly sand, add "sandy" to group name.
- m. If soils contains $\geq 30\%$ plus No. 200, predominantly gravel, add "gravelly" to group name
- n. $PI \geq 4$ and plots on or above "A" line
- o. $PI \geq 4$ and plots below "A" line
- p. PI plots on or above "A" line
- q. PI plots below "A" line





TESTING SERVICE CORPORATION

LEGEND FOR BORING LOGS



FILL



TOPSOIL



PEAT



GRAVEL



SAND



SILT



CLAY



DOLOMITE

SAMPLE TYPE

- SS = Split Spoon
- ST = Thin-Walled Tube
- A = Auger
- MC = Macro-Core (Geo Probe)

WATER LEVELS

- ▼ While Drilling
- ▽ End of Boring
- ▼ 24 Hours

FIELD AND LABORATORY TEST DATA

- N = Standard Penetration Resistance in Blows per Foot
- WC = In-Situ Water Content
- Qu = Unconfined Compressive Strength in Tons per Square Foot
 - * Pocket Penetrometer Measurement: Maximum Reading = 4.5 tsf
- Y_{DRY} = Dry Unit Weight in Pounds per Cubic Foot

SOIL DESCRIPTION

MATERIAL

- BOULDER
- COBBLE
- Coarse GRAVEL
- Small GRAVEL
- Coarse SAND
- Medium SAND
- Fine SAND
- SILT and CLAY

PARTICLE SIZE RANGE

- Over 12 inches
- 12 inches to 3 inches
- 3 inches to ¾ inch
- ¾ inch to No. 4 Sieve
- No. 4 Sieve to No. 10 Sieve
- No. 10 Sieve to No. 40 Sieve
- No. 40 Sieve to No. 200 Sieve
- Passing No. 200 Sieve

COHESIVE SOILS

<u>CONSISTENCY</u>	<u>Qu (tsf)</u>
Very Soft	Less than 0.3
Soft	0.3 to 0.6
Stiff	0.6 to 1.0
Tough	1.0 to 2.0
Very Tough	2.0 to 4.0
Hard	4.0 and over

COHESIONLESS SOILS

<u>RELATIVE DENSITY</u>	<u>N (bpf)</u>
Very Loose	0 - 4
Loose	4 - 10
Firm	10 - 30
Dense	30 - 50
Very Dense	50 and over

MODIFYING TERM

- Trace
- Little
- Some

PERCENT BY WEIGHT

- 1 - 10
- 10 - 20
- 20 - 35



ELEVATIONS
 GROUND SURFACE **T/Pavement**
 END OF BORING _____

WATER LEVEL OBSERVATIONS
 ▽ WHILE DRILLING **Dry**
 ▽ AT END OF BORING **Dry**
 ▽ 24 HOURS _____

DISTANCE BELOW SURFACE IN FEET	LENGTH RECOVERY	SAMPLE		N	WC	Qu	γ _{DRY}	DEPTH	ELEV.	SOIL DESCRIPTIONS
		NO.	TYPE							
0		1	CORE							11½" Bituminous Concrete
		2	A					1.0 1.3		4" Crushed Stone
		3	MC		26.5	1.75*				Tough brown trace black silty CLAY, trace sand, trace organic, moist (CL/CH)
5		A			25.8	1.75*				
		4	MC					6.0		Very tough gray silty CLAY, little to some sand and gravel, moist (CL)
		B			14.9	3.0*				
		5	MC		15.9	2.5*				
10		End of Boring at 10.0'								
		* Approximate unconfined compressive strength based on measurements with a calibrated pocket penetrometer.								

TSC 87867.GPJ TSC_ALL.GDT 3/6/18



ELEVATIONS
 GROUND SURFACE **T/Pavement**
 END OF BORING _____

WATER LEVEL OBSERVATIONS
 ▽ WHILE DRILLING **Dry**
 ▽ AT END OF BORING **Dry**
 ▽ 24 HOURS _____

DISTANCE BELOW SURFACE IN FEET	LENGTH RECOVERY	SAMPLE		N	WC	Qu	γ_{DRY}	DEPTH	ELEV.	SOIL DESCRIPTIONS
		NO.	TYPE							
0		1	CORE					0.3		3½" Bituminous Concrete
		2	A					1.5		14" Crushed Stone
		3	MC		19.1	3.0*				Very tough brown silty CLAY, little sand and gravel, moist (CL)
5		A			35.6	0.25*		5.5		Very soft brown and dark gray silty CLAY, trace sand, trace to little organic, very moist (CL/CH) [Possible Root Zone]
		4	MC							Hard brown and gray silty CLAY, little sand and gravel, moist (CL)
		B			15.4	4.5+*				
		5	MC		15.8	3.75*		8.0		Very tough gray silty CLAY, little sand and gravel, moist (CL)
10		End of Boring at 10.0'								
		* Approximate unconfined compressive strength based on measurements with a calibrated pocket penetrometer.								

Division lines between deposits represent approximate boundaries between soil types; in-situ, the transition may be gradual.

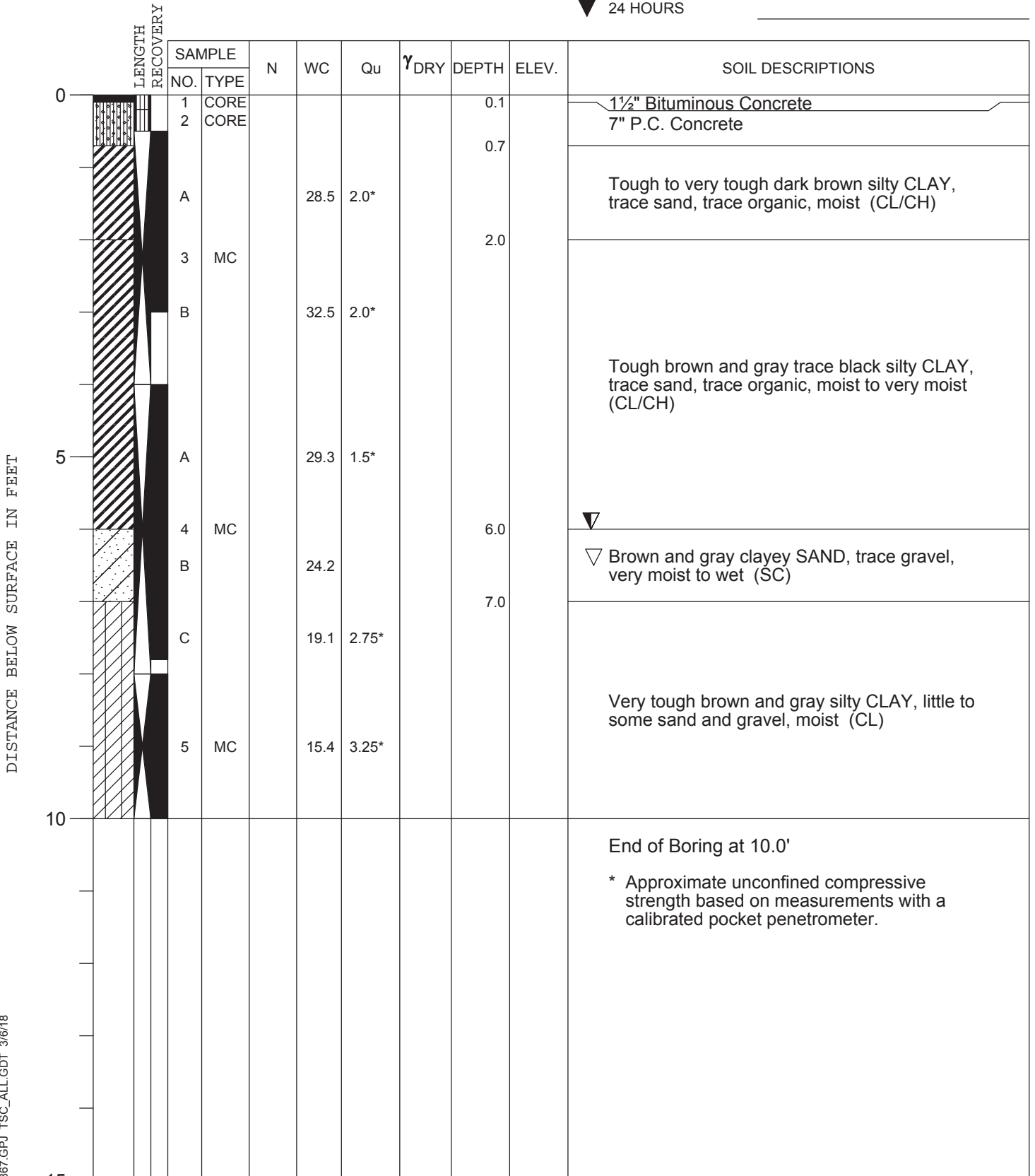


ELEVATIONS

GROUND SURFACE **T/Pavement**
 END OF BORING _____

WATER LEVEL OBSERVATIONS

▽ WHILE DRILLING **6.0'**
 ▽ AT END OF BORING **6.5'**
 ▼ 24 HOURS _____



TSC 87867.GPJ TSC_ALL.GDT 3/6/18

Division lines between deposits represent approximate boundaries between soil types; in-situ, the transition may be gradual.

* Approximate unconfined compressive strength based on measurements with a calibrated pocket penetrometer.



PAVEMENT CORE RESULTS

(Each component of pavement section listed from top down.)

Core 1:	1.0" <u>8.0"</u> 9"	Bituminous Surface Course <u>Portland Cement Concrete</u> Total Pavement Thickness	(Not bonded to layer below) (3/16" dia. steel 4¼" below top of PCC)
Core 2:	<u>2.9"</u> 3" 10"	<u>Bituminous Binder Course</u> Total Asphalt Thickness Crushed Stone Base Course	(1" Max to fine)
Core 3:	2.2" <u>7.3"</u> 9½"	Bituminous Surface Course <u>Portland Cement Concrete</u> Total Pavement Thickness	(Not bonded to layer below) (3/16" dia. steel 4½" below top of PCC)
Core 4:	0.7" <u>7.2"</u> 8"	Bituminous Surface Course <u>Portland Cement Concrete</u> Total Pavement Thickness	(PCC fractured horizontally, no steel observed)
Core 5:	1.2" <u>7.3"</u> 8½"	Bituminous Surface Course <u>Portland Cement Concrete</u> Total Pavement Thickness	(3/16" dia. steel 5" below top of PCC) (PCC fractured horizontally)
Core 6:	0.9" <u>7.2"</u> 8"	Bituminous Surface Course <u>Portland Cement Concrete</u> Total Pavement Thickness	(Not bonded to layer below) (3/16" dia. steel 5" below top of PCC)
Core 7:	1.5" <u>1.7"</u> 3¼" 9"	Bituminous Surface Course <u>Bituminous Binder Course</u> Total Asphalt Thickness Crushed Stone Base Course	(¾" Max to fine)
Core 8:	1.7" 3.0" <u>4.0"</u> 8¾" 39"	Bituminous Surface Course Bituminous Binder Course <u>Bituminous Binder Course</u> Total Asphalt Thickness Crushed Stone Base Course	(Not bonded to layer below) (½" Max to fine)



Core 9:	0.7"	Bituminous Surface Course	
	4.0"	Bituminous Binder Course	
	<u>2.5"</u>	<u>Bituminous Binder Course</u>	
	7¼"	Total Asphalt Thickness	
	41"	Crushed Stone Base Course	(¾" Max to fine)
Core 10:	2.9"	Bituminous Surface Course	
	<u>3.4"</u>	<u>Bituminous Binder Course</u>	
	6¼"	Total Asphalt Thickness	
	3"	Crushed Stone Base Course	(¾" Max to fine)
Core 11:	1.5"	Bituminous Surface Course	(Not bonded to layer below)
	<u>3.1"</u>	<u>Bituminous Binder Course</u>	
	4½"	Total Asphalt Thickness	
	15"	Crushed Stone Base Course	(¾" Max to fine)
Core 12:	1.5"	Bituminous Surface Course	(Not bonded to layer below)
	1.5"	Bituminous Surface Course	
	<u>2.1"</u>	<u>Bituminous Binder Course</u>	
	5"	Total Asphalt Thickness	
	31"	Crushed Stone Base Course	(1" Max to fine)
Core 13:	1.2"	Bituminous Surface Course	
	<u>1.7"</u>	<u>Bituminous Binder Course</u>	
	3"	Total Asphalt Thickness	
	8"	Crushed Stone Base Course	(1" Max to fine)
Core 14:	2.2"	Bituminous Surface Course	
	<u>2.0"</u>	<u>Bituminous Binder Course</u>	
	4¼"	Total Asphalt Thickness	
	12"	Crushed Stone Base Course	(1" Max to fine)
Core 15:	1.9"	Bituminous Surface Course	
	<u>2.5"</u>	<u>Bituminous Binder Course</u>	
	4½"	Total Asphalt Thickness	
	8"	Crushed Stone Base Course	(1" Max to fine)



TESTING SERVICE CORPORATION

457 EAST GUNDERSEN DR. · CAROL STREAM, ILLINOIS 60188-2492 · FAX: (630) 653-2726 · TEL: (630) 653-3920

Client: **Christopher B. Burke Engineering, Ltd.**
9575 West Higgins Road Suite 600
Rosemont, IL 60018-4920

Subgrade Test Results

Date Tested	02/28/18
Job Number	L-87,867
Page Number	1 of 3

Project: **Pavement Core Investigation**
2018 Street Improvement Program
Villa Park, IL

Test Data					
Location	Depth	Moisture (%)	Qp (tsf)	γ Dry (pcf)	Soil Description
Core 1	0.8' - 3.2'	21.3	1.5	---	Brown silty CLAY, trace sand, very moist (CL)
	3.2' - 4.0'	20.2	2.0	---	Brown and gray silty CLAY, trace sand, moist (CL)
Core 2	1.1' - 2.3'	25.3	1.0	98	FILL - Dark brown little brown silty CLAY, trace sand and gravel, very moist, (CL)
	2.3' - 4.0'	18.1	4.5+	113	Brown trace gray silty CLAY, trace sand and gravel, moist (CL)
Core 3	0.8' - 2.2'	30.6	1.5	---	Dark brown clayey TOPSOIL, very moist (OL)
	2.2' - 3.0'	22.2	2.5	---	Brown silty CLAY, little sand, trace gravel, moist (CL)
Core 4	0.6' - 1.6'	35.7	---	---	Black clayey TOPSOIL, trace sand, very moist (OL)
	1.6' - 4.0'	21.1	1.5	---	Brown little gray silty CLAY, trace sand, very moist (CL)
Core 5	0.7' - 2.5'	26.1	1.0	87	Brown little gray silty CLAY, trace sand, very moist (CL)
	2.5' - 4.0'	18.5	4.5+	112	Brown trace gray silty CLAY, trace sand and gravel, moist (CL)

Depth = Feet below top of pavement

Qp = Unconfined compressive strength in tons per square foot based on readings with a calibrated pocket penetrometer

Comments

Subgrade samples taken to approximately 4 feet below existing grade.

Field Technician(s)	Lab Technician	Reviewed By
J.J.M.	P.J.T.	A.P.P.



Subgrade Test Results

TESTING SERVICE CORPORATION

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Date Tested	02/28/18
Job Number	L-87,867
Page Number	2 of 3

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Villa Park, IL

Test Data					
Location	Depth	Moisture (%)	Qp (tsf)	γ Dry (pcf)	Soil Description
Core 6	0.7' - 3.0'	19.4	3.0	---	Brown silty CLAY, little sand, trace gravel, moist (CL)
Core 7	1.0' - 1.9'	24.7	0.25	101	FILL - Dark brown silty CLAY, little sand, very moist (CL)
	1.9' - 4.0'	17.7	4.5+	112	Brown trace gray silty CLAY, trace sand and gravel, moist (CL)
Core 8	1.0' - 4.0'	5.7	---	---	FILL - Brown crushed stone with fines, moist (CA-6)
Core 9	1.0' - 4.0'	6.0	---	---	FILL - Brown crushed stone with fines, moist (CA-6)
Core 10	0.8' - 2.6'	19.3	4.5+	111	FILL - Brown silty CLAY, trace sand and gravel, moist (CL)
	2.6' - 4.0'	19.1	4.5+	110	Brown trace gray silty CLAY, trace sand and gravel, moist (CL)
Core 11	1.0' - 1.7'	9.4	---	---	FILL - Brown crushed stone with fines, moist (CA-6)
	1.7' - 2.1'	23.3	2.0	103	FILL - Brown little dark brown silty CLAY, little sand, trace gravel, moist (CL)
	2.1' - 4.0'	7.6	---	---	FILL - Brown crushed stone with fines, moist (CA-6)

Depth = Feet below top of pavement

Qp = Unconfined compressive strength in tons per square foot based on readings with a calibrated pocket penetrometer

Comments

Subgrade samples taken to approximately 4 feet below existing grade.

Field Technician(s)	Lab Technician	Reviewed By
J.J.M.	P.J.T	A.P.P.



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Date Tested	02/28/18
Job Number	L-87,867
Page Number	3 of 3

Project: **Pavement Core Investigation**
2018 Street Improvement Program
Villa Park, IL

Test Data					
Location	Depth	Moisture (%)	Qp (tsf)	γ Dry (pcf)	Soil Description
Core 12	1.0' - 3.0'	4.3	---	---	FILL - Gray brownish gray crushed stone, damp (CA-6)
Core 13	1.1' - 3.0'	18.2	4.5+	---	Brown trace gray silty CLAY, little sand, trace gravel, moist (CL)
Core 14	1.3' - 3.0'	14.4	2.0	---	Brown and gray silty CLAY, little sand, trace gravel, moist (CL)
Core 15	1.1' - 1.7'	24.9	3.0	---	Dark brown to dark grayish brown silty CLAY, trace sand and organice, moist (CL)
	1.7' - 3.0'	24.3	2.5	---	Brown and gray silty CLAY, little sand, moist (CL)
<p>Depth = Feet below top of pavement</p> <p>Qp = Unconfined compressive strength in tons per square foot based on readings with a calibrated pocket penetrometer</p>					
Comments					
Subgrade samples taken to approximately 4 feet below existing grade.					
Field Technician(s)		Lab Technician		Reviewed By	
J.J.M.		P.J.T		A.P.P.	




NOTE: GROUND SURFACE ELEVATIONS AT THE BORINGS WERE ACQUIRED BY TSC USING A TRIMBLE R8 GNSS RECEIVER, BEING ROUNDED TO THE NEAREST 0.5 FOOT.

LEGEND

-  **CORE LOCATION**
-  **SOIL BORING LOCATION**

BORING LOCATION PLAN
 2018 STREET IMPROVEMENT PROGRAM
 VILLA PARK
 VILLA PARK, ILLINOIS

 **TESTING SERVICE CORPORATION**
 457 EAST GUNDERSEN DRIVE
 CAROL STREAM, ILLINOIS 60188

DRAWN BY: APP	PAGE NO. 1 OF 4
CHECKED BY: TRP	
JOB NO.: L-87,867	
DATE: 03-06-18	



NOTE: GROUND SURFACE ELEVATIONS AT THE BORINGS WERE ACQUIRED BY TSC USING A TRIMBLE R8 GNSS RECEIVER, BEING ROUNDED TO THE NEAREST 0.5 FOOT.

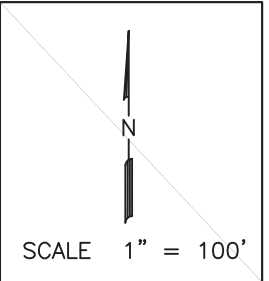
LEGEND
 **CORE LOCATION**

BORING LOCATION PLAN
 2018 STREET IMPROVEMENT PROGRAM
 VILLA PARK
 VILLA PARK, ILLINOIS




TESTING SERVICE CORPORATION
 457 EAST GUNDERSEN DRIVE
 CAROL STREAM, ILLINOIS 60188

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JOB NO.: L-87,867	
DATE: 03-06-18	



<p><u>LEGEND</u></p> <p> CORE LOCATION</p>
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<p><u>BORING LOCATION PLAN</u> 2018 ST. IMPROVEMENT PROGRAM VILLA PARK VILLA PARK, ILLINOIS</p>
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 <p>TESTING SERVICE CORPORATION 457 EAST GUNDERSEN DRIVE CAROL STREAM, ILLINOIS 60188</p>

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<p>DATE: 03-06-18</p>


<p>PAGE NO.</p> <p>3 OF 4</p>



N
SCALE 1" = 100'

LEGEND
 **CORE LOCATION**

BORING LOCATION PLAN
 2018 ST. IMPROVEMENT PROGRAM
 VILLA PARK
 VILLA PARK, ILLINOIS

 **TESTING SERVICE CORPORATION**
 457 EAST GUNDERSEN DRIVE
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