

## **Agenda Report**

**Subject:**                   **Stormwater Update – December 20, 2011**

Prepared By:               Steven M. Saunders, Director of Public Works/Village Engineer

Date:                         December 16, 2011

Attached are two documents detailing progress made to date and future actions in response to the July 2011 flooding event. The first document is an updated version of the “Stormwater and Sanitary Sewer Improvements – Schedule of Activities”, outlining implementation steps based on policy direction given by the Council, and the status of action on those steps. Updated items from the December 1 version are marked in red. This provides the Council and interested citizens with a detailed picture of where we are, and activities to be undertaken in the next few months.

Of note, staff and representatives from Christopher Burke Engineering met with representatives from the Illinois Environmental Protection Agency in Springfield on December 15 to review the project and discuss permit requirements. The project was reasonably well received and the permit requirements were provided. While the permit will require significant work and time to obtain, there do not appear to be any insurmountable obstacles. The Village will be required to screen the stormwater for floatables (i.e. trash), Total Suspended Solids (i.e. sedimentation), Biological Oxygen Demand (BOD, a measure of total bacteria and other nutrients like fertilizers and phosphorus) and Oils and Greases. The Village will likely need to perform sampling of existing stormwater flows in all of the areas that would be tributary to the tunnel project to determine a water quality baseline against which treatment and quality improvements could be measured.

The second item is the detailed soil boring report for the preliminary soil borings along the proposed Willow Road Tunnel Project route. The soil borings indicated no rock present, and also indicated that the soils are primarily dry, stiff, silty clays or dense sand, which do not pose any impediments to the project.

**Recommendation:**  
Informational Report.

**STORMWATER AND SANITARY SEWER IMPROVEMENTS**

**SCHEDULE OF ACTIVITIES**

15-Dec-11

Red = Updated since last report

<b>Spruce Street Outlet Improvements</b>	
<b>Activity</b>	<b>Status</b>
Identify Protection Levels - Determine what protection level to be provided to Tower/Foxdale and Sheridan/Maple areas.	Council discussion needed.
Identify Funding Sources - Determine how to fund these two projects.	Council discussion needed.
Design Engineering Proposals- Obtain fee proposals to complete design plans, specifications, and bidding documents.	Draft proposal received from CBBEL. Obtain fee proposals from other firms?
Permitting - Obtain appropriate permits from MWRD and US Army Corps	<b>Discussed project with MWRD and DNR. No prohibitions identified. Met with Army Corps. No prohibitions identified. Met with IEPA December 15. Permit requirements and water quality standards identified. No prohibitions identified. Water quality and anti-degradation permits will be required.</b>

<b>Greenwood Avenue Area Improvements</b>	
<b>Activity</b>	<b>Status</b>
Additional Engineering Evaluation - Evaluate whether improvements address all problem areas in watershed.	Review recent survey results to identify possible areas of watershed in need of additional evaluation
Identify Protection Levels - Determine what protection level to be provided to project areas.	Council discussion needed.
Identify Funding Sources - Determine how to fund this project.	Council discussion needed.
Utility Location - Identify major utility facilities in project area to test for conflicts.	Utility locate requests sent to AT&T, Comcast, North Shore Gas. MWRD information received.
Forest Preserve Coordination - Coordinate with Forest Preserve regarding additional outfall to flood control pond.	Pending further evaluation of proposed improvements
Secondary Cost Review - Obtain independent cost review of project.	Pending further evaluation of proposed improvements
Design Engineering Proposals- Obtain fee proposals to complete design plans, specifications, and bidding documents.	Pending further evaluation of proposed improvements

<b>Tunnel Project</b>	
<b>Activity</b>	<b>Status</b>
Soil Borings - Evaluate subsurface soil conditions along proposed route of tunnel.	<b>Contract awarded to TSC. Soil borings completed - no unsuitable soils or rock encountered. Report provided.</b>
Utility Location - Identify major utility facilities in project area to test for conflicts.	Utility locate requests sent to AT&T, Comcast, North Shore Gas. MWRD, Electric, Water, Comcast information received. North Shore Gas information received.
Railroad Coordination - Obtain information from Union Pacific Railroad concerning engineering and real	Initial contact made with UP Railroad. Received permit requirements for utility crossings. No major hurdles identified.
Regulatory Agency Meetings	<b>Discussed project with MWRD and DNR. No prohibitions identified. Met with Army Corps. No prohibitions identified. Met with IEPA December 15. Permit requirements and water quality standards identified. No prohibitions identified. Water quality and anti-degradation permits will be required.</b>

Meetings with State and Federal legislators	President Tucker, Trustee Rintz, Manager Bahan and Director Saunders met with U.S. Rep. Dold, State Rep. Biss, and State Rep. Gabel to brief them on tunnel project and discuss areas where legislative support may be needed. Project was well received. Meeting with Sen. Schoenberg scheduled for 11/16.
Critical Path Plan - CBBEL to provide fee proposal for critical path plan to complete tunnel project.	CBBEL to prepare critical path after initial meetings with MWRD and regulatory agencies
Willow Road Rehabilitation Coordination	Meeting held with Willow Road project consultant to coordinate Willow Road project with tunnel.
Secondary Cost Review - Obtain independent cost review of project.	
Identify Funding Sources - Determine how to fund this project.	Council discussion needed.

**Bulk Pricing for Property Assessments**

<b>Activity</b>	<b>Status</b>
Identify suitable firms to provide pricing.	Staff research in December/January timeframe
Negotiate pricing with several firms	Staff research in December/January timeframe
Publicize program.	

**Property Protection Seminar**

<b>Activity</b>	<b>Status</b>
Publicize IAFSM pamphlet via Winnetka Report, e-Winnetka, Village website.	Link on website. Published in Winnetka report November.
Identify resources for presenters.	Staff research in December/January timeframe
Explore value of joint presentation with other municipalities.	Staff research in December/January timeframe
Identify suitable location for seminar.	Staff research in December/January timeframe
Schedule and publicize seminar.	

**Sanitary Sewer Evaluation Study**

<b>Activity</b>	<b>Status</b>
Additional flooding data survey	1,046 responses received as of 10/18/2011
Evaluate survey data	Ongoing evaluations by staff and Trustee Kates. Data will be used to fine-tune project recommendations for Greenwood and Tunnel projects, and to develop Sanitary Sewer Evaluation Study.
Hold pre-proposal discussions with qualified engineering firms.	<b>Presented to Village Council 12/13/2011. Staff authorized to proceed with RFP.</b>
Discuss survey results and study strategy with Village Council	<b>Presented to Village Council 12/13/2011. Staff authorized to proceed with RFP.</b>
Develop RFP	<b>Draft RFP complete. Proposals due January 20, 2012.</b>
Evaluate RFP Responses	January-February 2012
Council awards contract	January-February 2012

**Detention Projects**

<b>Activity</b>	<b>Status</b>
Detailed coordination with Park District	Coordination discussions complete pending decision of tunnel vs. detention
Detailed coordination with School District	Discussions pending decision of tunnel vs. detention
Detailed coordination with New Trier	Initial meetings held. Further discussions pending decision of tunnel vs. detention
Detailed coordination with Forest Preserve	Discussions pending decision of tunnel vs. detention

**Financing**

<b>Activity</b>	<b>Status</b>
Discussion of stormwater financing and bond issuance.	Council discussed at November 8 Study Session

Local Office  
December 12, 2011



**TESTING SERVICE CORPORATION**

*Local Office:*

457 E. Gundersen Drive, Carol Stream, IL 60188-2492  
630.653.3920 • Fax 630.653.2726

*Corporate Office:*

360 S. Main Place, Carol Stream, IL 60188-2404  
630.462.2600 • Fax 630.653.2988

Mr. Steven M. Saunders  
Village of Winnetka  
1390 Willow Road  
Winnetka, Illinois 60093

RE: L-77,832  
Willow Road Storm Sewer  
Lake Michigan Outlet  
Winnetka, Illinois

Dear Mr. Saunders:

This report presents results of a preliminary soils exploration performed in connection with the proposed construction of a storm sewer under Willow Road in Winnetka, Illinois. These geotechnical services have been provided in accordance with TSC Proposal No. 47,968 dated October 28, 2011, and the attached General Conditions, incorporated herein by reference.

The proposed project consists of improvements to the storm water drainage system in areas of the Village of Winnetka. This will include construction of an 8-foot diameter storm sewer to be constructed by open-trench and tunneling methods, connecting portions of western Winnetka to Lake Michigan.

**Field Investigation and Laboratory Testing**

Four (4) soil borings were drilled along Willow Road to assist in determining the feasibility of constructing the 8-foot storm water management tunnel (to be constructed by open-cut methods in some areas) from western Winnetka to Lake Michigan. The borings were laid out in the field by TSC at the approximate locations selected by others. Reference is made to the enclosed Boring Location Plan for the drilling layout, ground surface elevations at the borings also being shown. The elevations were provided to us by the Client.

The borings were drilled to depths ranging from 20 to 40 feet below existing grade, or approximately 5 to 8 feet below the proposed invert elevation of the sewer. They were drilled and samples taken in accordance with currently recommended American Society for Testing and Materials specifications. Soil sampling was performed at 2½ to 5-foot intervals. The samples were taken in conjunction with the Standard Penetration Test (SPT), for which driving resistance to a 2" split-spoon sampler (N value in blows per foot) provides an indication of the relative density of granular materials and consistency of cohesive soils. Water level observations were made 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 water content determinations for all cohesive soil types. An estimate of unconfined compressive strength was obtained for all cohesive soils using a calibrated pocket penetrometer, with actual measurements of unconfined compressive strength performed on representative samples of native clay soils. Dry unit weight tests were also run on specimens of cohesive fill.

Reference is made to the enclosed boring logs which indicate 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 will probably be more gradual.

**Discussion of Test Data**

All of the borings were drilled on the existing pavement of Willow Road. Borings 1 and 2 drilled to the west of Green Bay Road encountered approximately 8 to 9 inches P.C. concrete at the surface, underlain by about 4 inches granular base materials. Borings 3 and 4 drilled to the east of Green Bay Road encountered approximately 4 to 5 inches bituminous concrete at the surface, underlain by about 7 to 11 inches crushed stone base materials. The pavement thicknesses were estimated from the disturbed sides of the augered holes and should be considered approximate. Pavement cores should be taken if more accurate thicknesses are required.

Fill materials were encountered underlying the pavement section in Borings 1 - 3, extending to depths of about 3 to 4 feet below existing grade. The fill consisted primarily of silty clay in Boring 1, silty clay and medium to fine sand layers in Boring 2, and clayey sand in B-3. The pavement section in Boring 4 was underlain by a firm medium to fine sand deposit (possible fill) that extended to a depth of 5½ feet. This granular soil type exhibited SPT N values of 14 to 16 blows per foot.

Native soils below the above described fill and firm medium to fine sand materials consisted of stiff to hard silty clays that extended to the bottom of the boreholes. These low to medium plasticity cohesive soils exhibited unconfined compressive strengths ranging from 0.8 to 4.5+ tons per square foot (tsf), typically exceeding 1.5 tsf, at water contents between 14 and 24 percent.

The majority of the borings were “dry” both during and upon completion of drilling operations. The only exception was Boring 4 where free water was first encountered at a depth of 18 feet, the water level remaining at the same approximate depth upon completion of field operations (i.e. after auger removal and prior to backfilling the hole).

**Analysis and Preliminary Recommendations**

A previously discussed, the proposed drainage improvements include an 8-foot (96-inch) diameter storm sewer to be constructed by open-trench and tunneling methods, connecting portions of western Winnetka to Lake Michigan. Four (4) soil borings were drilled along Willow Road to assist in determining the feasibility of constructing this structure. The following table summarizes the boring locations, ground surface elevations, and proposed invert elevation and depth below existing grade at each boring.

Boring Number	General Location	Approximate Ground Surface Elevation	Proposed Sewer Invert	
			Depth (Feet)	Elevation
1	Near Willow Road & Birch Street	633.0	22.3	610.7
2	Near Willow Road & Green Bay Road	638.0	33.0	605.0
3	Near Willow Road & Walnut Road	619.0	15.8	603.2
4	Near Willow Road & Sheridan Road	613.0	15.0	598.0

Based on the proposed invert depths/elevations, the proposed sewer/tunnel will be located within native clays soils in all of the borings. The clay soils were typically in a very tough to hard condition, the exception being Boring 2 where they were in a stiff (medium) to tough condition within and above the tunneling zone. Free water was not encountered for the full depth of Borings 1 - 3, with free water being only found in Boring 4 at a depth of about 3 feet below the proposed invert depth / elevation.

The soil borings have revealed the presence of native clay soil basically from the ground surface to the proposed tunnel invert that are conducive for tunneling. Based on the results of the borings, groundwater is also not expected to be a problem due to both the practically impervious nature of the clay soils as well as water observations made in the borings. While serious groundwater problems are not expected at the boring locations, it should be noted that the borings were spaced up to approximately 2000 feet apart. Therefore, it is possible that different soil and groundwater conditions may be encountered between these locations. In this regard, the cohesive glacial till soils as encountered by the borings often contained sand seams/layers that may produce significant amounts of water.

In regards to tunneling, the relatively high unconfined compressive strengths revealed by the borings which generally exceeded 1.5 tsf (i.e. undrained shear strengths,  $S_u$ , in excess of 1.5 ksf) indicate a firm ground condition in which heading may be advanced without initial support. However, tunnel face stability should be carefully evaluated in the area of Boring 2 due to the presence of marginal strength clay soils below a depth of about 17 feet below existing grade (approximate Elevation 621), i.e. within and above the tunneling zone. In this regard, it should be noted that it is the responsibility of the tunneling contractor to evaluate tunneling means and methods.

In regards to open-cut methods, the very tough to hard cohesive soils which predominate at the boring locations will generally stand, at least temporarily, on relative steep slopes. However, this represents a short-term condition, and blocks of soil will frequently fall into apparently stable excavations. To the extent that laborers will work in the excavation, protection against cave-ins must be provided. Protective measures should include the use of safety trench boxes, sheeting and bracing, or other appropriate methods. In this regard, the contractor must be responsible for meeting OSHA requirements, local regulations and/or project specifications with the respect to the safety of his work force.

The soils at the proposed pipe invert levels consisted of tough to very tough native silty clay at the boring locations. These cohesive soils will provide a stable/firm base for pipe installation and backfill support as well as an adequate factor of safety against basal heave.

Groundwater problems are not anticipated due to in large part to the cohesive nature of the soils encountered by the borings. However, the accumulation of run-off water or seepage at the base of excavations should still be expected to occur during trench excavation and site work. The Contractor should be prepared to remove these accumulations by pumping from strategically placed sumps.

### **Closure**

The analyses and preliminary recommendations submitted in this report are based upon the data obtained from the four (4) soil borings performed at the location shown on the Boring Location Plan. This report does not reflect and variations which may occur between this boring and the project site, 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



Alfredo J. Bermudez  
Registered Professional Engineer  
Illinois No. 062-046608



Charles R. DuBose, P.E.  
Vice President

AJB:CRD:ab  
Enc.



## TESTING SERVICE CORPORATION

# GENERAL CONDITIONS

## Geotechnical and Construction Services

**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.

**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.

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.

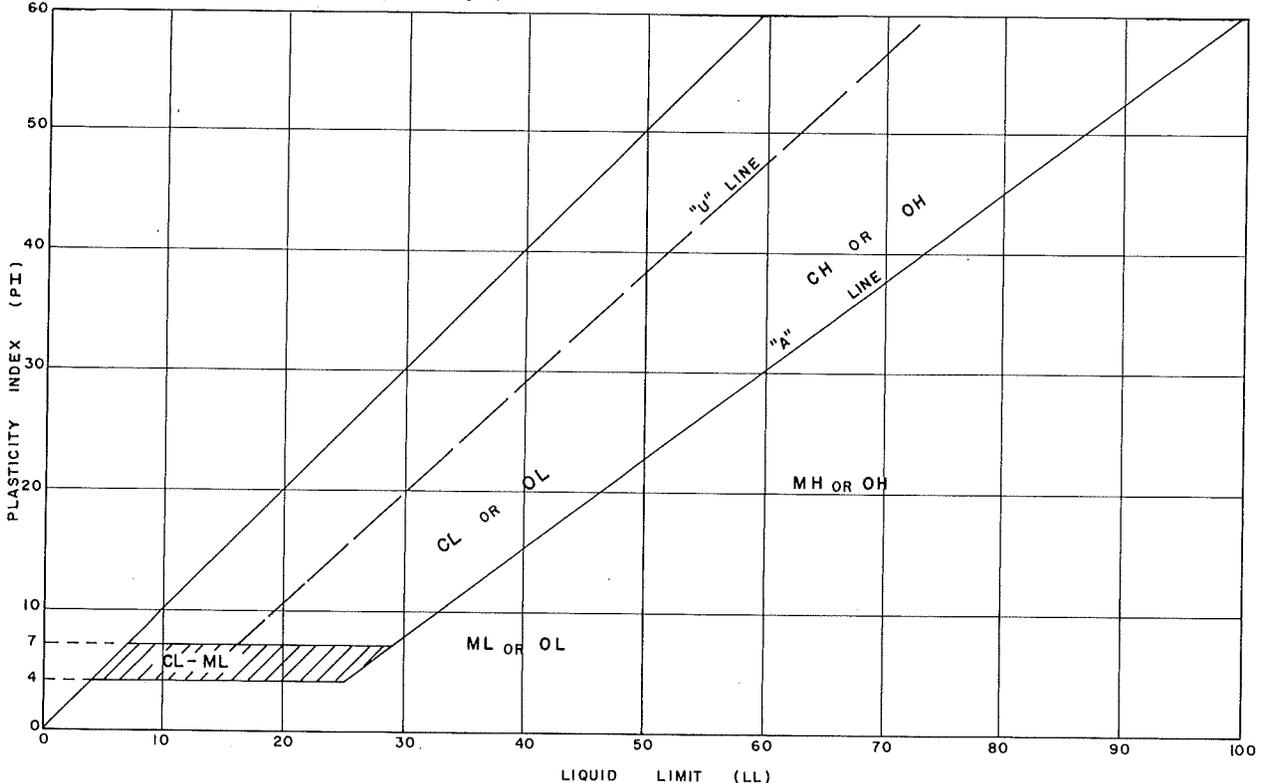
**13. OTHER AGREEMENTS:** TSC shall not be bound by any provision or agreement (i) requiring or providing for arbitration of disputes or controversies arising out of this Agreement or its performance, (ii) wherein TSC waives any rights to a mechanics lien or surety bond claim; (iii) that conditions TSC's 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 TESTS <sup>a</sup>				SOIL CLASSIFICATION	
				GROUP SYMBOL	GROUP NAME <sup>b</sup>
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 <sup>c</sup>	$C_u \geq 4$ and $1 \leq C_c \leq 3$ <sup>e</sup>	GW	Well graded gravel <sup>f</sup>
			$C_u < 4$ and/or $1 > C_c > 3$ <sup>e</sup>	GP	Poorly graded gravel <sup>f</sup>
		GRAVELS WITH FINES More than 12% fines <sup>c</sup>	Fines classify as ML or MH	GM	Silty gravel <sup>f,g,h</sup>
			Fines classify as CL or CH	GC	Clayey gravel <sup>f,g,h</sup>
	SANDS 50% or more of coarse fraction passes No. 4 sieve	CLEAN SANDS Less than 5% fines <sup>d</sup>	$C_u \geq 6$ and $1 \leq C_c \leq 3$ <sup>e</sup>	SW	Well-graded sand <sup>i</sup>
			$C_u < 6$ and/or $1 > C_c > 3$ <sup>e</sup>	SP	Poorly graded sand <sup>i</sup>
		SANDS WITH FINES More than 12% fines <sup>d</sup>	Fines classify as ML or MH	SM	Silty sand <sup>g,h,f</sup>
			Fines classify as CL or CH	SC	Clayey sand <sup>g,h,f</sup>
FINE-GRAINED SOILS 50% or more passed the No. 200 sieve	SILTS & CLAYS Liquid limit less than 50%	Inorganic	PI $\geq 7$ and plots on or above "A" line j	CL	Lean clay <sup>k,l,m</sup>
			PI $< 4$ or plots below "A" line j	ML	Silt <sup>k,l,m</sup>
		Organic	$\frac{\text{Liquid limit - oven dried}}{\text{Liquid limit - not dried}} < 0.75$	OL	Organic clay <sup>k,l,m,n</sup> Organic silt <sup>k,l,m,o</sup>
	SILTS & CLAYS Liquid limit 50% or more	Inorganic	PI plots on or above "A" line	CH	Fat clay <sup>k,l,m</sup>
			PI plots below "A" line	MH	Elastic silt <sup>k,l,m</sup>
		Organic	$\frac{\text{Liquid limit - oven dried}}{\text{Liquid limit - not dried}} < 0.75$	OH	Organic clay <sup>k,l,m,p</sup> Organic silt <sup>k,l,m,q</sup>
Highly organic soils	Primarily organic matter, dark in color, and organic odor			PT	Peat

- a. Based on the material passing the 3-in (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 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  
 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 soil 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 soil 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 soil 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 soil 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  $\geq 4$  or 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



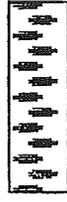
FILL



TOPSOIL



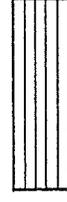
PEAT



GRAVEL



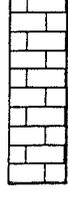
SAND



SILT



CLAY



DOLOMITE

### SAMPLE TYPE:

SS = Split Spoon  
 ST = Thin-Walled Tube  
 A = Auger

### 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  
 γD = Dry Unit Weight in Pounds per Cubic Foot

### WATER LEVELS:

▽ While Drilling  
 ▽ End of Boring  
 ▼ 24 Hours

### 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</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</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

PROJECT **Willow Road Storm Sewer, Lake Michigan Outlet, Winnetka, Illinois**

CLIENT **Village of Winnetka, Winnetka, Illinois**



BORING **1** DATE STARTED **12-5-11** DATE COMPLETED **12-5-11** JOB **L-77,832**

ELEVATIONS  
 GROUND SURFACE **633.0**  
 END OF BORING **603.0**

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 <sub>DRY</sub>	DEPTH	ELEV.	SOIL DESCRIPTIONS
		NO.	TYPE							
0								0.7	632.3	8" P.C. Concrete **
								1.0	632.0	4" Crushed Stone **
		1	SS	12	11.0	2.25*	119.1			FILL - Gray silty CLAY, little sand and gravel, trace crushed stone, moist (CL)
5		2	SS	22	14.1	7.10 4.5+*				
		3	SS	23	17.7	8.68 4.5+*				
10		4	SS	20	17.2	4.5+*				Hard brown and gray silty CLAY, little sand and gravel, moist (CL)
15		5	SS	14	17.9	4.08 4.25*				
20		6	SS	13	18.2	3.75*		18.0	615.0	Very tough brown silty CLAY, little sand and gravel, moist (CL)
25		7	SS	10	18.3	2.77 2.5*		23.0	610.0	Very tough gray silty CLAY, little sand and gravel, moist (CL)
30		8	SS	12	19.8	2.0*				End of Boring at 30.0'
35										* Approximate unconfined compressive strength based on measurements with a calibrated pocket penetrometer.
										** Approximate thicknesses determined by flight auger methods
										SPT Hammer = CME Automatic

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

DRILL RIG NO. **315**

PROJECT **Willow Road Storm Sewer, Lake Michigan Outlet, Winnetka, Illinois**



CLIENT **Village of Winnetka, Winnetka, Illinois**

BORING **2** DATE STARTED **12-5-11** DATE COMPLETED **12-5-11** JOB **L-77,832**

ELEVATIONS  
 GROUND SURFACE **638.0**  
 END OF BORING **598.0**

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 <sub>DRY</sub>	DEPTH	ELEV.	SOIL DESCRIPTIONS
		NO.	TYPE							
0									637.2	9" P.C. Concrete **
									636.9	4" Crushed Stone **
		1	SS	21	12.5	1.75*	117.5			FILL - Brown and gray silty CLAY, little sand and gravel, moist (CL)
		A			16.5					FILL - Brown medium to fine SAND, trace gravel, moist (SP)
		2	SS	6	23.7	2.25*				Very tough gray silty CLAY, trace sand and gravel, trace organic, moist (CL)
5		B								
		3	SS	18	16.4	6.73 4.50+*				
		4	SS	15	17.7	3.75*				Hard to very tough brownish-gray silty CLAY, little sand, trace gravel, moist (CL)
10										
		5	SS	13	18.1	4.08 3.75*				
15										
		6	SS	7	22.2	0.75*		17.0	621.0	Stiff brownish-gray to gray silty CLAY, little sand, trace gravel, very moist (CL)
20										
		7	SS	6	22.3	0.89 0.75*				
25										
		8	SS	12	19.3	1.75*		27.0	611.0	Tough gray silty CLAY, little sand, trace gravel, moist (CL)
30										
		9	SS	8	17.0	1.91 1.5*				* Approximate unconfined compressive strength based on measurements with a calibrated pocket penetrometer.
35										** Approximate thicknesses determined by flight auger methods
		10	SS	10	19.6	1.5*				SPT Hammer = CME Automatic
40										

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

End of Boring at 40.0'

TSC 77832.GPJ TSC\_ALL.GDT 12.7.11

DRILL RIG NO. **315**

PROJECT Willow Road Storm Sewer, Lake Michigan Outlet, Winnetka, Illinois



CLIENT Village of Winnetka, Winnetka, Illinois

BORING 3 DATE STARTED 12-2-11 DATE COMPLETED 12-2-11 JOB L-77,832

ELEVATIONS  
 GROUND SURFACE 619.0  
 END OF BORING 599.0

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								0.4	618.6	5" Bituminous Concrete **
								1.3	617.7	11" Crushed Stone **
		1	SS	11	15.8					FILL - Brown clayey SAND, trace gravel, moist (SC)
5		2	SS	10	16.0	4.92 4.5+*				Hard brownish-gray silty CLAY, little sand and gravel, moist (CL)
		3	SS	16	16.2	4.59 4.5+*				
		4	SS	23	15.8	4.5+*		8.0	611.0	
15		5	SS	12	16.4	3.21 3.0*				Hard to very tough gray silty CLAY, little sand and gravel, moist (CL)
		6	SS	10	16.4	2.75*				
20		End of Boring at 20.0'								
25		* Approximate unconfined compressive strength based on measurements with a calibrated pocket penetrometer.								
		** Approximate thicknesses determined by flight auger methods								
		SPT Hammer = CME Automatic								
30										
35										
40										

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

TSC 77832.GPJ TSC\_ALL.GDT 12/9/11

DRILL RIG NO. 256

PROJECT Willow Road Storm Sewer, Lake Michigan Outlet, Winnetka, Illinois



CLIENT Village of Winnetka, Winnetka, Illinois

BORING 4 DATE STARTED 12-2-11 DATE COMPLETED 12-2-11 JOB L-77,832

ELEVATIONS  
 GROUND SURFACE 613.0  
 END OF BORING 593.0

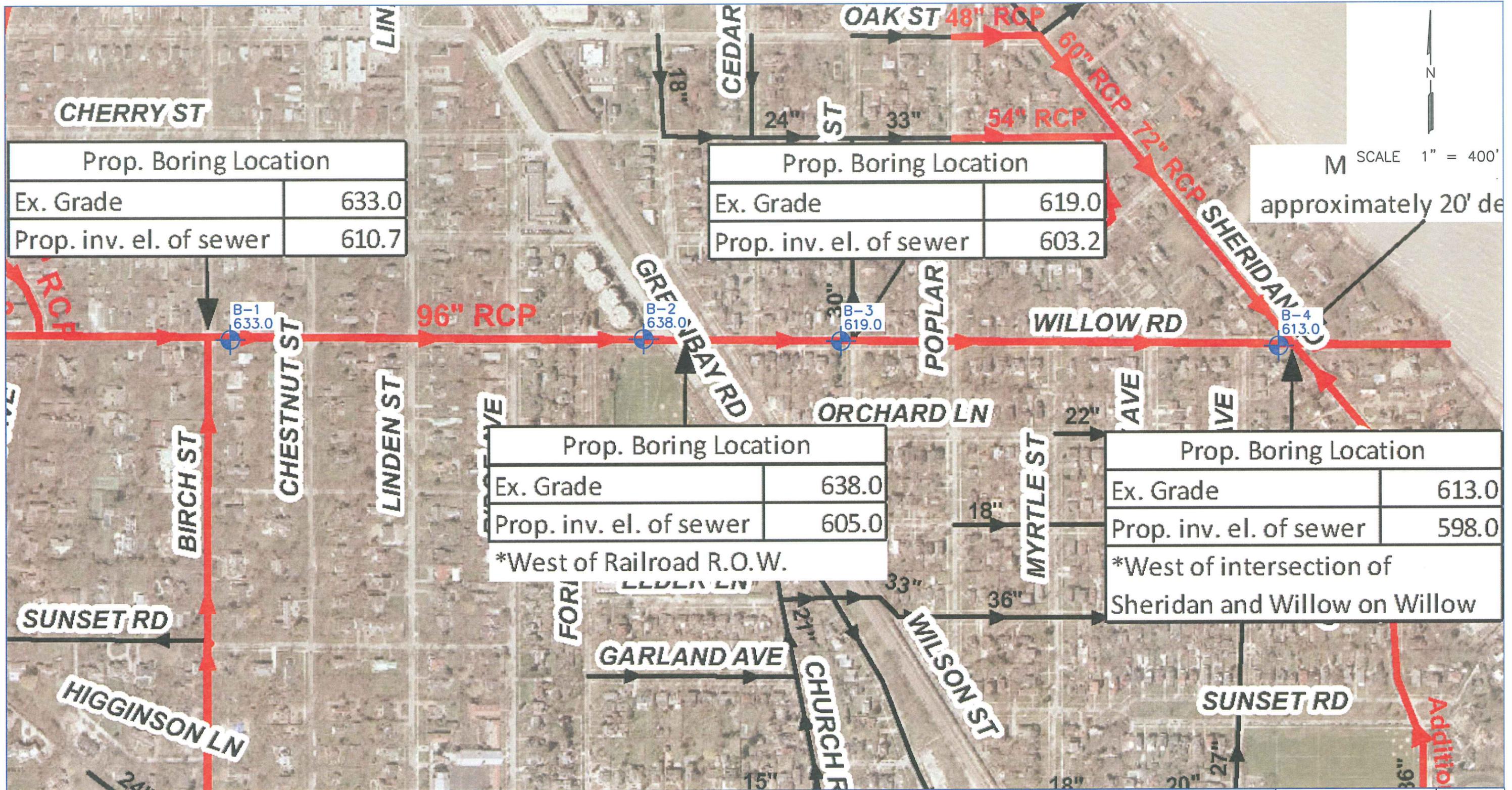
WATER LEVEL OBSERVATIONS  
 ▽ WHILE DRILLING 18.0'  
 ▽ AT END OF BORING 18.0'  
 ▽ 24 HOURS

DISTANCE BELOW SURFACE IN FEET	LENGTH RECOVERY	SAMPLE		N	WC	Qu	γ DRY	DEPTH	ELEV.	SOIL DESCRIPTIONS
		NO.	TYPE							
0								0.3	612.7	4" Bituminous Concrete **
								0.9	612.1	7" Crushed Stone **
		1	SS	16	8.8					Firm brownish-gray medium to fine SAND, moist (SP) [Possible Fill]  Hard to very tough gray silty CLAY, little sand and gravel, moist (CL)
		2	SS	14	14.3					
5		3	SS	15	15.9	3.67 4.25*		5.5	607.5	
		4	SS	16	16.0	4.79 4.5+*				
10		5	SS	12	16.9	3.25*				
		6	SS	9	19.1	2.76 3.0*				
20										End of Boring at 20.0' * Approximate unconfined compressive strength based on measurements with a calibrated pocket penetrometer. ** Approximate thicknesses determined by flight auger methods SPT Hammer = CME Automatic
25										
30										
35										
40										

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

TSC 77832.GPJ TSC\_ALL.GDT 12/12/11

DRILL RIG NO. 256



Prop. Boring Location	
Ex. Grade	633.0
Prop. inv. el. of sewer	610.7

Prop. Boring Location	
Ex. Grade	619.0
Prop. inv. el. of sewer	603.2

Prop. Boring Location	
Ex. Grade	638.0
Prop. inv. el. of sewer	605.0

Prop. Boring Location	
Ex. Grade	613.0
Prop. inv. el. of sewer	598.0

\*West of Railroad R.O.W.

\*West of intersection of Sheridan and Willow on Willow

M SCALE 1" = 400'  
approximately 20' de

LEGEND  
 SOIL BORING LOCATION

BORING LOCATION PLAN  
 WILLOW ROAD STORM SEWER  
 LAKE MICHIGAN OUTLET  
 WINNETKA, ILLINOIS

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

DRAWN BY: TRP	PAGE NO.
CHECKED BY: AJB	1 OF 1
JOB NO. : L-77,832	
DATE: 12-09-11	