



OUR SERVICES: A WORLD OF SOLUTIONS

|                       |                        |              |   |
|-----------------------|------------------------|--------------|---|
| Sales representative: | Chris Sunday           | 717-629-7774 | csunday@usginc.net  |
| Company:              | Showcase Group         |              |   |
| Contact:              | Matt Kulp              |              |   |
| Address:              | 951 East Earl Rd       |              |   |
| Address:              | New Holland, PA, 17557 |              |   |
| Phone:                | 717-354-3226           |              |   |
| Email:                | matt@showcasegroup.biz |              |   |
| Mobile:               | 717-278-3889           |              |   |
|                       |                        |              | <input type="checkbox"/> Due upon completion  |
|                       |                        |              | <input checked="" type="checkbox"/> 25% down payment<br>Balance due upon completion |
|                       |                        | Date:        | 2/26/2021   |

|                      |   |
|----------------------|---|
| Project #            | 21902   |
| Project Location:    | 916 Walnut Street, New Holland, PA 17557  |
| Project Description: | <p><b>Summary description of challenge and solution:</b> A sink hole has opened adjacent to a cluster of seepage tanks near a residential house.</p> <p>Soils testing was completed by ECS Mid-Atlantic LLC on 2/12/2021 using Wild Cat borings. There is noted a 3-4" deep void below the bottom of the open-end seepage tank. Based on test results and drawings provided from ECS, USG proposes the following remediation plan:</p> <p>The area that is compromised has utilities and other structures in close proximity. Therefore, a sensitive approach to remediation must be considered. USG will inject high strength, rapidly expanding, structural geo-polymer under the seepage tank in various strategic locations to stabilize soils at depth and fill the void directly below the seepage tank with a stone and polymer matrix. Also, affected by the subsidence is a storm drain that has experienced settlement and voiding.</p> <p><b>The Process:</b> USG will begin by inserting 5/8" tubing in various locations and depths under the seepage tank and in surrounding weak soil zones. In accordance with DCP test results, approximately 12 locations will be stabilized from a depth just under the bottom of the seepage tank ring to -16' below the surface cap. Each injection location is essentially a column of injected polymer and densified soil in three stages: A top stage, mid stage and bottom stage. Stages are spaced 4' vertically. Total estimated number of injection points is 41. The tubes act as conduits for the polymer at different stages in the soil. Stages are injected one level at a time beginning with the top stage or directly below seepage tank.</p> <p>Next, we will fill the large, visible, voids with #57 stone. Placing the stone has a two-fold benefit for this unique project, (1) The stone will help fill the large voids without excess polymer being wasted and (2), when the polymer is injected into the stone it helps create a structure of expanded polymer and stone to act as a filtration system. The goal here is to allow water to seep through as was the original design. The polymer is Hydro Insensitive and will not degrade in watery conditions or become a sponge.</p> <p>The injection plan is comprised of 2 "rings" under the compromised tank. The outer ring (6 locations) act as a curtain wall of expanded polymer and newly densified soil. The inner ring injections (6 locations) will push against this newly</p> |

densified area and stabilize directly under the footprint of the tank. The polymer typically influences a zone of 3-4' in all directions when injected into the weak soils. 4' spacing of injections will ensure proper stabilization methods as the expanded polymer and densified soil overlap.

We will then inject (3) locations inside the bottom floor of the seepage tank where the main void was visible (now filled with stone). This will help hold the stone together while allowing for water seepage.

For the storm drain subsidence, injections directly under the settled area will stabilize soils at depth between -6 and -8'. We will fill the voids here with stone as well and inject here to hold structure. Pavement repair to be done by others when project completed.

All tubes are considered sacrificial and will either be left in the ground and cut well below the dirt line or pulled with a special stake puller if possible.

All injections will be monitored with laser levels, Zip level and construction levels so as not to lift structures.

*NOTE: Underground Utility Marking Service Requirement at end of page 3. All backfill and landscaping to be done by others after USG completes project. Not included in the proposal and as a contingency plan, if deemed necessary, USG will inject another grouping of polymer columns closer to the utilities if voids are present in these locations. There is no evidence of settlement in these areas at the time of this proposal date, however we want to have a plan of action set in place in case we find voids or the potential for settlement in the future. The price in addition to the proposal price below will have to be determined on site.*

Project Duration: 3-4 Days

Bid Price: \$39,550.00

NOTE: USG cannot make guarantees regarding the ability of its products as it pertains to lifting. Certain factors that are beyond the control of USG may prevent the ability to lift. USG will guarantee that it will stabilize any areas worked on, if the customer accepts the proposed remedy.

#### AGREEMENT TERMS

USG and CUSTOMER hereby enter into this AGREEMENT and hereby agree to the following:

1. USG will provide all labor, machinery, materials, personnel, and supervision to fill subterranean voids at the location described above in "Project Location", to complete the work described above in "Project Description". To obtain access to the subterranean voids USG will drill small holes used to inject synthetic resin material, referred to in the rest of this document as "Material." The holes that result from this process will be sealed with either wood putty or grout (as appropriate) upon completion of the work.
2. USG will conduct the work described above for the contract price of USD \$ 39,550.00 plus all applicable taxes.
3. **CAP AND UNIT TERMS:** USG estimates that 21,000 clicks of material will be required to complete the job. In the event that more than 21,500 clicks of material are required to complete the project, USG will submit a change order to be signed by CUSTOMER, and additional material will be injected at a discounted cost of USD \$1.35 per click.
4. **SITE PREPARATION:** In some circumstances, the CUSTOMER will be required to do some site preparation. USG will notify CUSTOMER of such site preparation need prior to start of any project. Examples of preparation activities include (i) performance and technical studies necessary to scope the project, (ii) adequate access to all work sites, (iii) necessary authorizations and/or permits, (iv) traffic control (if required), (v) and other activities as notified by USG to CUSTOMER. Should CUSTOMER not fulfill the site preparation requirements and a re-mobilization of USG machinery, material, or personnel is required, USG will charge CUSTOMER USD \$1,500.00 as a remobilization fee.
5. **PAYMENT:** Payment to USG is due in full upon completion of the job by CUSTOMER per the TERMS checked above.
6. **INSURANCE:** USG shall carry and maintain throughout the period of this AGREEMENT, Worker's Compensation Insurance as

\* Showcase will need to install Geotextile Fabric over area and Cap with Top Soil + Mulch After Completion.

1 click =  
approx 1#  
of liquid  
polymer

required by law, comprehensive general liability insurance, including contractual liability and comprehensive automobile liability insurance. If any part of the work is contracted to other organizations or companies, similar insurance shall be provided by or on behalf of the Subcontractor to cover their operations. Certificate of insurance is available upon request. Costs incurred for special endorsements will be added to contract sum.

7. **CONFIDENTIALITY:** USG and CUSTOMER shall hold in trust and confidence for each other and shall not disclose to any third party, any confidential information of either party. Confidential information is information which relates to USG's or CUSTOMER's research, development, trade secrets, methodologies, property characteristics, company or business-related information, project proposals, project quotes, contractual terms or business affairs. CUSTOMER hereby acknowledges that during the performance of this AGREEMENT, CUSTOMER may learn or receive USG confidential information and therefore CUSTOMER hereby confirms that all such information relating to the USG's business will be kept confidential by CUSTOMER, except to the extent that such information is required to be divulged to the CUSTOMER's clerical or support staff or associates in order to enable USG to complete the services hereunder.

8. **LIMITED WARRANTY:** USG WARRANTS to the customer and to the current owner of the Project Location (if not the Customer) (each a "Warranty"), that the MATERIAL will not shrink or deteriorate per manufacturer's statement. This Limited Warranty applies only to the injection locations completed at initial application and is for the benefit of the Warrantees only and may not be relied upon by any other person or entity. If any adjustment is necessary due to settlement in the locations specified during the first (1) year from the job completion date, USG will adjust the settled area without cost to the CUSTOMER. After the first (1) year period, or the one additional injections (whichever first occurs), reassessment of the project may be necessary at no additional cost to USG. The Limited Warranty is not assignable without the prior written consent of USG. This Limited Warranty is subject to the exclusions, terms and limitations stated below.

THIS LIMITED WARRANTY EXCLUDES ANY AND ALL EXTERNAL CAUSES NOT DEPENDENT ON SHRINKAGE OR DETERIORATION OF OUR MATERIAL, FOR EXAMPLE, (WITHOUT LIMITATION), SETTLEMENT, GROUND SUBSIDENCE OR HEAVE OF NATIVE SOILS. SETTLEMENT MAY RESULT FROM STRUCTURAL PROBLEMS, DYNAMIC OR STATIC LOADS HIGHER THAN THE DESIGN LOADS AT THE TIME OF THE USG INTERVENTION, DAMAGES CAUSED BY EXCAVATIONS, PRODUCT TAMPERING, WEAK OR INADEQUATE CONCRETE, NATURAL CATASTROPHES (STORMS, FLOODS, DROUGHT, TIDES, EARTHQUAKES, EXPLOSIONS, FIRE, ETC.), SOIL SHRINKAGE, OR OTHER CAUSES. SOIL SHRINKAGE MAY RESULT FROM REDUCTION IN SOIL MOISTURE, TREE TRANSPIRATION, EVAPORATION, LOWERING OF THE WATER TABLE, IMPROPER SOIL COMPACTION, THE DRYING OF SATURATED SOILS, OR OTHER CAUSES. HEAVE IS DEFINED AS THAT CONDITION CAUSED BY THE ADDITION OF MOISTURE IN ACTIVE CLAY SOILS, WHICH CAUSES THE SOIL TO SWELL. THIS CONDITION MAY BE CAUSED (WITHOUT LIMITATION) BY PLUMBING LEAKS, POOR DRAINAGE, RISING WATER TABLE, HYDROSTATIC PRESSURE FROM UPHILL GRADIENT FORCES, OR REBOUND FROM OVER-COMPACTED DRY SOILS.

To the extent assignable, USG will assign to the Customer the warranty, if any, extended by the manufacturer of the Material injected by USG. To the extent any claim by the Customer is covered by such manufacturer's warranty, then this Limited Warranty by USG does not apply.

In the event the MATERIAL does not conform to this Limited Warranty and a written claim setting forth the details thereof is submitted to USG by the Customer within the Warranty Period, then USG, in USG's sole discretion, will either refund the price paid by Customer for the applicable work performed or perform additional injections, at no cost to Customer, in an effort to remedy the situation. THE FOREGOING SETS FORTH THE CUSTOMER'S SOLE AND EXCLUSIVE REMEDY FOR BREACH OF THIS LIMITED WARRANTY. IN NO EVENT WILL USG BE LIABLE FOR ANY OTHER EXPENSES, COSTS, CLAIMS OR DAMAGES OF ANY KIND, HOWSOEVER CAUSED, INCLUDING (WITHOUT LIMITATION) ANY DIRECT, INDIRECT, CONSEQUENTIAL, INCIDENTAL OR SPECIAL DAMAGES, WHETHER OR NOT FORSEEABLE.

EXCEPT AS SET FORTH IN THIS LIMITED WARRANTY, CUSTOMER AGREES THAT THERE ARE NO WARRANTIES OF ANY KIND, EXPRESS OR IMPLIED, MADE BY USG CONCERNING THE WORK CONTEMPLATED BY THIS AGREEMENT. TO THE FULLEST EXTENT PERMITTED BY APPLICABLE LAW, USG HEREBY DISCLAIMS, AND CUSTOMER HEREBY WAIVES, ALL IMPLIED WARRANTIES RELATING TO THE WORK CONTEMPLATED BY THIS AGREEMENT INCLUDING, BUT NOT LIMITED TO, IMPLIED WARRANTIES OF MERCHANTABILITY, HABITABILITY, CONSTRUCTION IN A GOOD AND WORKMANLIKE MANNER, CONDITION, SUITABILITY, FITNESS FOR A PARTICULAR PURPOSE, NON-INFRINGEMENT OF THIRD-PARTY RIGHTS, AND ADEQUACY OF THE PLANS. ANY IMPLIED WARRANTIES WHICH CANNOT LAWFULLY BE DISCLAIMED ARE LIMITED IN DURATION TO A ONE (1) YEAR DURATION FROM THE DATE OF USG'S INITIAL INJECTIONS, NOT WORK COVERED BY CHANGE ORDER OR WARRANTY, TO THE EXTENT PERMITTED BY LAW.

9. **INDEMNIFICATION BY USG:** USG agrees to indemnify and hold harmless the CUSTOMER from any costs and damages imposed upon Customer in any suits and actions brought against it, arising or resulting solely from the grossly negligent acts or omissions of USG in its performance of the work required under this AGREEMENT at the Project Location.

USG agrees that it and its agents and employees, will use ordinary care and diligence in its or their activities and operations authorized by this AGREEMENT.

Notwithstanding any other terms of this Agreement, in no event shall USG be liable to Customer, by way of indemnity, damages or otherwise, in an amount in excess of the price paid to USG for the Work hereunder.

10. **INDEMNIFICATION BY CUSTOMER:** The CUSTOMER agrees to indemnify USG and CUSTOMER accepts all responsibility for any damage to: (i) utilities, (ii) plumbing, (iii) heating and electrical, (iv) sheetrock, (v) wall covering, (vi) carpet and flooring, (vii) door and/or window frames, (viii) any other rigid material(s), (ix) concrete cracking, (x) landscaping or sub-soil conditions, and/or (xi) any other damage resulting from USG work.

In some cases, USG may require CUSTOMER to independently contract with a professional utility locating service to locate and identify underground utility assets prior to start of a project. If this is a requirement of the project, USG will notify CUSTOMER in writing at the time this AGREEMENT is executed. If USG notifies the CUSTOMER and CUSTOMER does not utilize a professional utility locating service CUSTOMER agrees to indemnify USG and CUSTOMER accepts all responsibility for any damage or loss to: (i) underground utilities, (ii) underground cables, (iii) underground conduits, (iv) underground plumbing and or pipes, (v) underground tanks, or (vi) other similar types of property. Loss includes any business or asset interruption or similar subsequent loss, including loss of material contained within the underground property.

11. **INDEPENDENT CONTRACTOR:** USG is an independent contractor to the CUSTOMER, and no principal-agent or employer-employee relationship is created by this AGREEMENT. By entering into this AGREEMENT with the CUSTOMER, USG acknowledges that it will, in the performance of its duties under this AGREEMENT, be acting as an independent contractor and that no officer, agent or employee of USG will be for any purpose an employee of the CUSTOMER and that no officer, agent or employee of USG is entitled to any of the benefits and privileges of a CUSTOMER employee or officer.

12. **GOVERNING LAW:** This AGREEMENT is subject to and shall be construed in accordance with the laws of the State of Pennsylvania, the laws of the federal government of the United States and any rules and regulations of any regulatory body or officer having jurisdiction. In the event of controversy, Cumberland County in the State of Pennsylvania is the lawful jurisdiction. This AGREEMENT is to be performed and executed in the State(s) of Pennsylvania, Maryland (County), New Jersey, Delaware.

13. **SEVERABILITY:** If any provision of this AGREEMENT is determined to be legally invalid or unenforceable, such invalidity or unenforceability shall not affect the whole AGREEMENT; but the whole AGREEMENT shall be construed as if not containing the provision, and the rights and obligations of the parties shall be construed and enforced accordingly.

14. **MISCELLANEOUS:** All areas where USG performs work will be left free from trash and debris related to USG work upon completion of the job. The quantity of the synthetic resin material must be considered indicative only. USG by its many years of experience and mathematical calculations provides an almost precise quantity necessary for the project. However, the quantities can change according to the underground conditions. The CUSTOMER will be notified of any material change in estimates and has the right to refuse in cases the consumption approaches 5% greater than the estimated quantities.

Photography in any format, including social media posts, of USG equipment, processes and materials is not permitted without prior authorization.

The CUSTOMER authorizes USG to use the result of this AGREEMENT as a possible customer case study, in reference data, or marketing and permits USG to photograph and list the result of this AGREEMENT in electronic and printed matter, including but not limited to web sites, collateral, brochures, data sheets, video, and animation by using before and after photographs of the work performed at the job site listed on this AGREEMENT.

16. **EXHIBITS:** This AGREEMENT may contain additional provisions to take into account local municipal, county, or state codes and/or statutes. The following exhibits by their inclusion and attachment become part of this AGREEMENT between USG and CUSTOMER:

- Exhibit A: Enter Exhibit A Title

Initial: \_\_\_\_\_

This AGREEMENT contains all the agreements of the parties relating to the subject matter hereof and is the full and final expression of the agreement between the parties.

**CUSTOMER**

Utility Services Group Inc. (USG Inc.)

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Printed Name

\_\_\_\_\_  
Printed Name

\_\_\_\_\_  
Title

\_\_\_\_\_  
Date

\_\_\_\_\_  
Title

\_\_\_\_\_  
Date

**UNDERGROUND UTILITY MARKING SERVICE REQUIREMENT**

CUSTOMER IS RESPONSIBLE FOR ALL UNDERGROUND UTILITY MARKING PRIOR TO START OF PROJECT. CUSTOMER AGREES TO UTILIZE A PROFESSIONAL UNDERGROUND LOCATING SERVICE TO PERFORM THIS WORK. USG CAN PERFORM FOR AN ADDITIONAL CHARGE.

Customer Initials \_\_\_\_\_ USG Initials \_\_\_\_\_



**ECS MID-ATLANTIC, LLC**

*"Setting the Standard for Service"*

Geotechnical • Construction Materials • Environmental • Facilities

February 17, 2021

Ms. Donna Willwerth  
Winding Oaks HOA  
898 Walnut Street  
New Holland, Pennsylvania 17543

ECS Project No. 18.5160

Reference: WildCat™ Sinkhole Exploration  
**Walnut Street SWM Sinkhole**  
916 Walnut Street, New Holland, PA

Dear Ms. Willwerth:

As outlined in ECS Mid-Atlantic, LLC (ECS) proposal 18.7730-GP dated January 26, 2021, ECS is pleased to present the following report providing the results of the WildCat™ Sinkhole Exploration at the above referenced address.

#### PROJECT DESCRIPTION

The project site is located at 916 Walnut Street in New Holland, Pennsylvania. Currently, the site consists of a private residence home and a sinkhole has formed in the general area of several precast concrete stormwater management (SWM) infiltration chambers. The potential sinkhole is located off the west side of the driveway close to an existing inlet drain. We understand that the system has been in service for approximately 15 years.

ECS performed WildCat™ borings surrounding the stormwater chamber that has seen the most subsidence to explore the subsurface conditions in the general area and determine potential remediation recommendations.

Based on the previous site meeting, we understand that some limited excavation to expose the top and sidewalls of the concrete SWM infiltration chambers was performed by the Township in an effort to evaluate the subsidence. The lack of stone backfill between the SWM chambers, and the subsidence of the chamber floor within the first chamber, appears to indicate a loss of materials has occurred as a result of the subsidence. It should be noted that the chamber experiencing the subsidence is the first chamber in the series of 7 chambers, receiving all of the water entering the system from the adjacent inlet. In addition, it appears that during heavy rain events some water is making its way around the inlet and into the open stone backfill in between the chambers located within the low-lying landscape area.

#### SCOPE OF WORK

As outlined in our proposal, ECS performed WildCat™ Dynamic Cone Penetrometer (DCP) probes at four (4) locations surrounding the potential sinkhole feature. The WildCat™ probe locations were selected by ECS representatives upon arrival and are displayed on the attached Exploration Location Diagram. The exploration consisted of the advancement of the WildCat™ DCP into the subgrade to evaluate the subsurface conditions.

## EXPLORATION RESULTS

Upon arrival to site, the potential sinkhole had an approximate opening on the order of 8-foot diameter with an approximate depth of 5 feet located just southwest of the inlet drain in the driveway. It is worth mentioning that some materials appeared to have been removed with excavation equipment to the top of the concrete cover and expose portions of the sidewalls of the precast concrete chamber. To evaluate the vertical extents of the potential sinkhole and compromised soil strata, the WildCat™ DCP probes were advanced in the center and around the existing chamber closest to the inlet drain.

The logs attached to this report recorded the number of blows it took to advance the WildCat™ probe rods in 10 cm intervals. This value was converted to an associated Standard Penetration Test N-Value (blows per foot) to determine the relative density/consistency of the subsurface soils.

At the 4 locations tested, the soil conditions generally displayed N values ranging from 1 to 25+. Zones of loose/soft materials were observed in all the WildCat™ probes performed, at varying depths. Refusals were encountered at each probe location, which is likely associated with denser soils, increased percentages of rock fragments, or the top of a weathered or intact bedrock.

Given the limited amount of space and uneven terrain, each WildCat™ probe was performed by standing on top of the concrete chamber, since this was an even level surface to set up on. According to the provided plan the approximate elevation for this structure should be approximately El. 508.00.

A summary of the DCP test results are given below:

Table 1- WildCat™ DCP Results Summary

| Probe # | Depth from Top of Concrete Cover to Soil (feet) | Approximate Depth Range (ft) of N value less than 5 | Refusal (ft) |
|---------|---|---|--------------|
| WC-1    | 0.0   | 1.6 to 2.3  | 8.5          |
| WC-2    | 11.8  | 11.8 to 12.8<br>16.4 to 18.4<br>20.0 to 20.7        | 20.7         |
| WC-3    | 3.3   | 3.3 to 10.8   | 16.0         |
| WC-4    | 2.3   | 2.3 to 3.6<br>6.9 to 11.2<br>13.5 to 13.8           | 15.7         |

## RECOMMENDATIONS AND CONSIDERATIONS

This site is underlain by the Zooks Corner Formation which is composed of Dolomite bedrock that is susceptible to karst activity. Karst activity can take the form of soft and loose soils above the bedrock, uneven bedrock surfaces, closed surficial depressions, and sinkholes. The Karst Features Map attached to this report shows mapped sinkholes and closed depressions in the vicinity of the site. A total of 0 sinkholes and 15 surficial depressions were noted within a ½ mile radius of the site. Based on our experience in the area, known karst features at nearby sites, and the results of the subsurface exploration, the risk of sinkholes and related karst activity at this site is moderate.

Based on the results of the WildCat™ DCP probes, the subsurface materials onsite have variable densities/consistency. The occurrence of SPT-N Values less than 5, indicates that some of the materials in the subsurface have a soft/ loose profile. The results presented in Table 1 show that these zones start as shallow as 1.6 feet below existing grade and were noted as deep as 20.7 feet below existing grade.

The plans provided show the concrete cap being approximately 9.0 feet above the bottom of the facility. During our exploration, WC-2 was performed in the center of the SWM infiltration chamber and the bottom was recorded at 11.8 feet below existing grade, which means this feature could have subsided approximately 2.8 feet. The plans also state that these infiltration chambers should be backfilled with stone; however, limited stone backfill was observed around these structures while onsite.

Based on our experience working in areas of karst geology and the results of the WildCat™ probes, the potential sinkhole could have developed because of the concentration of stormwater into this facility, the effects of some erosion (both in the bottom and along the sides of the tank) and the underlying bedrock weathering. The increased amount of stormwater in these areas could have triggered a chain reaction causing the soils to become saturated and collapse into an epi-karst created by the underlying bedrock.

### Remediation

Remediation of the potential sinkhole will occur at a later date. We understand that removal and re-installation of this facility was not a suitable option for repair due to the number and orientation of existing underground utilities in the area.

#### **Option 1 – Expansive Foam Polymer Injection and Stabilization:**

Based on our experience dealing with similar projects, ECS recommends that the subsurface conditions be stabilized by drilling a series of 'injection points' surrounding the existing opening and pumping a urethane foam into the compromised soil layers identified during our exploration. The specific method, depths, and sequence of the injection will be provided by the specialty contractor. ECS has worked directly with Hi-Tech Soil Stabilization (recently purchased and now USG – Utility Services Group) to perform this type of remediation on past projects. This repair method was determined to be the most rapid and least intrusive method of reestablishing subgrade materials beneath this stormwater management facility and other existing utilities. The repair methodology may not completely fill the soft or collapse areas but will improve the subgrade support. In addition, further loss of material should be greatly reduced or eliminated by this repair effort.

This method appears to be the preferred repair methodology because of the ability to limit disturbance of the existing system and the surrounding utilities, and to perform work without extensive heavy equipment.

In general, this urethane foam has the ability to expand at a rate of 20:1, once it is injected. The urethane spray application has a zone of influence of approximately 3 feet below the injection tip, once it's injected and should stabilize the subgrade as a result.

We recommend that the injection design consist of sufficient injection points to provide support around the perimeter of the precast concrete chamber to allow for limited vacuum excavation of the floor inside the chamber to remove the collapsed/compromised soils. Following the vacuum excavation, the

subgrade should be stabilized with a stabilized stone plug, consisting of clean stone that is injected with the polymer to provide stabilization, while still allowing for limited infiltration. Deep injections in the center of the subsidence are also recommended to address other low strength and collapse areas identified in the probe borings.

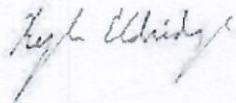
**Option 2 – Conventional over-excavation, repair, and replacement.**

A more conventional repair methodology is also feasible at this location, although we anticipate it could be problematic due to the extensive area that will be impacted. Conventional repair would include removal of affected stormwater chambers, which would likely affect several units, and overexcavated to rock to facilitate remediation on the collapse zones, followed by reconstruction of the stormwater facility. As previously alluded to, this effort would also affect several nearby utilities, including the PPL power service and the sanitary pump station. Disturbance of the adjacent utilities would be necessary as part of the remediation, which would require considerable coordination, effort, and cost. For this reason, Option 1 is the recommended repair methodology.

**Closing**

We are pleased to have this opportunity to offer our services and look forward to continuing to work with you on the project. If you have any questions or comments concerning the contents of the enclosed documents or other related topics, please feel free to contact us.

Respectfully,  
ECS MID-ATLANTIC, LLC



Kyle Eldridge  
Geotechnical Staff Project Manager  
[keldridge@ecslimited.com](mailto:keldridge@ecslimited.com)

J. Matthew Carroll, P.E.  
Principal Engineer  
[mcarroll@ecslimited.com](mailto:mcarroll@ecslimited.com)

Enclosures:    Site Location  
                  Regional Bedrock Geology Map  
                  Karst Features Diagram  
                  Boring Location Diagram  
                  WildCat™ Boring Logs





Source: Layer Credits: Bing, HERE, DeLorme, © OpenStreetMap contributors

Winding Ln

488

Walnut St

201

Walnut St

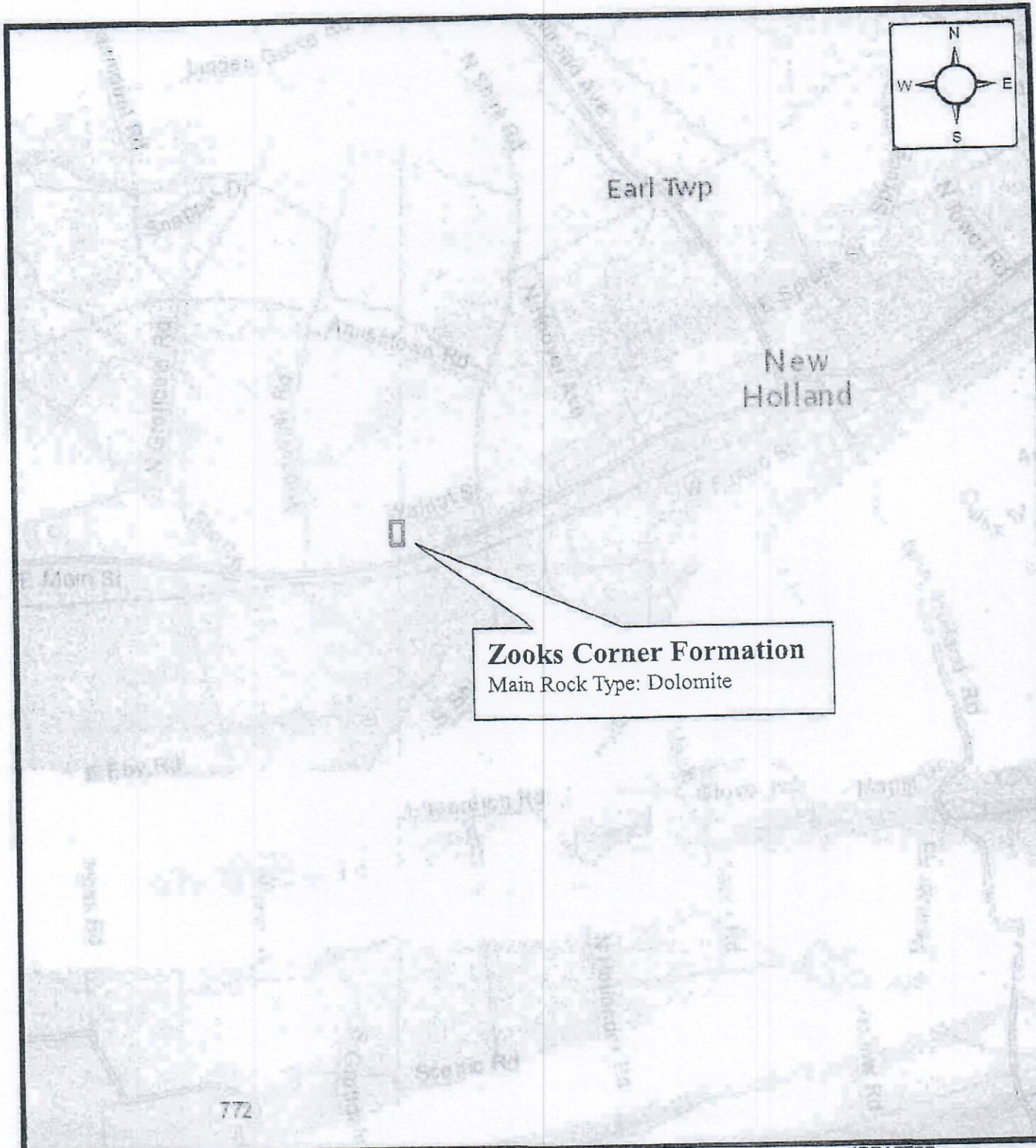


|             |          |
|-------------|----------|
| ENGINEER    | JMC2     |
| SCALE       | AS NOTED |
| PROJECT NO. | 18:5160  |
| SHEET       | 1 OF 1   |
| DATE        | 2/5/2021 |

**Site Location Map**  
**WALNUT STREET SWM SINKHOLE**

916 WALNUT STREET, NEW HOLLAND, PENNSYLVANIA  
 WINDING OAKS HOA



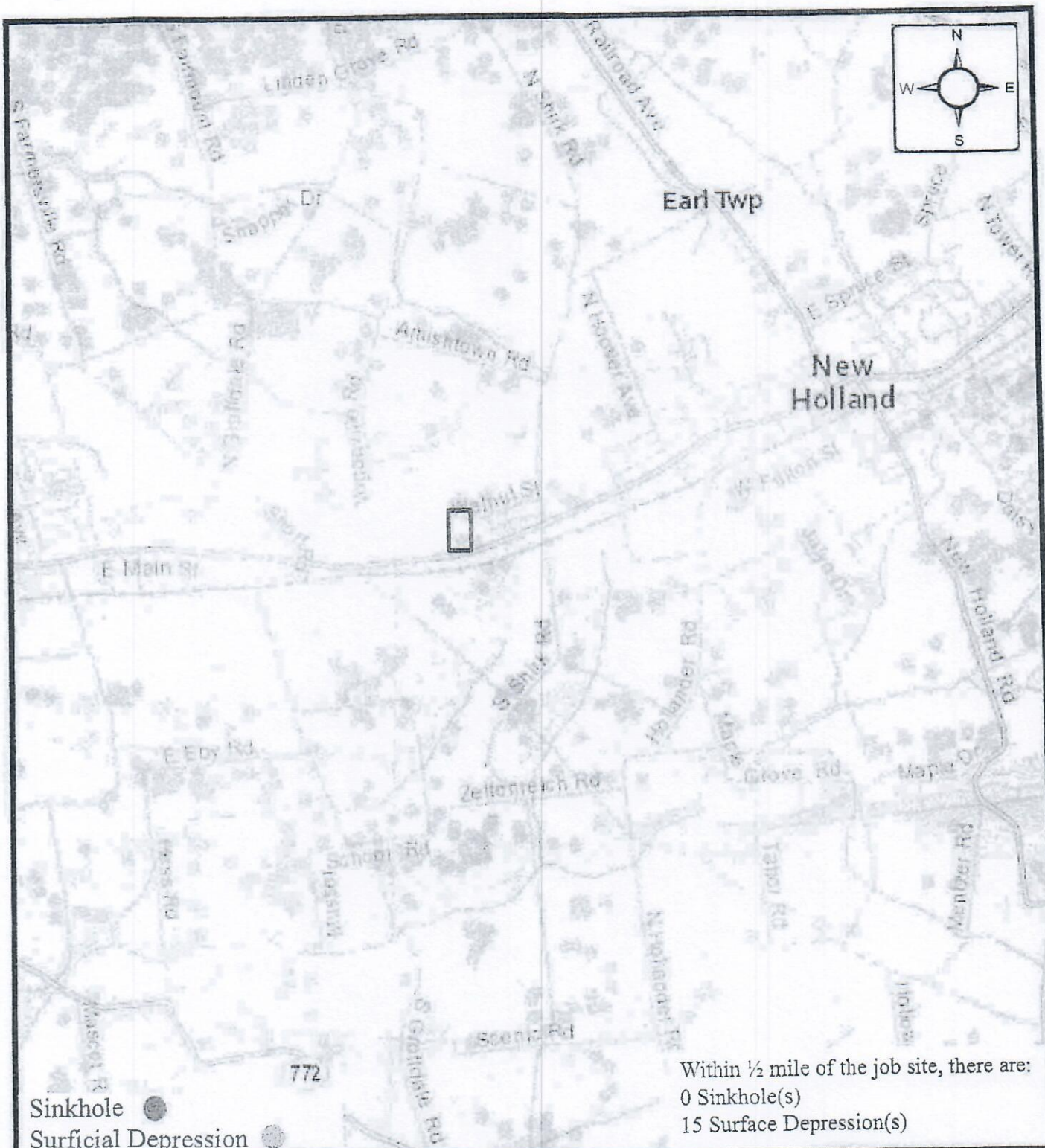
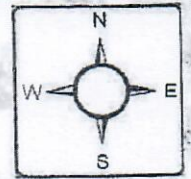


**Zooks Corner Formation**  
Main Rock Type: Dolomite



**Geology Map**  
**WALNUT STREET SWM SINKHOLE**  
916 WALNUT STREET, NEW HOLLAND,  
PENNSYLVANIA  
WINDING OAKS HOA

|             |   |
|-------------|---|
| DRAFTER     | HCH   |
| SCALE       | NTS   |
| PROJECT NO. | 18:5160   |
| DATE        | 2/5/2021  |
| SOURCE      | PA DCNR Geologic Map<br><a href="http://www.gis.dcnr.state.pa.us">http://www.gis.dcnr.state.pa.us</a> |

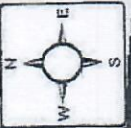
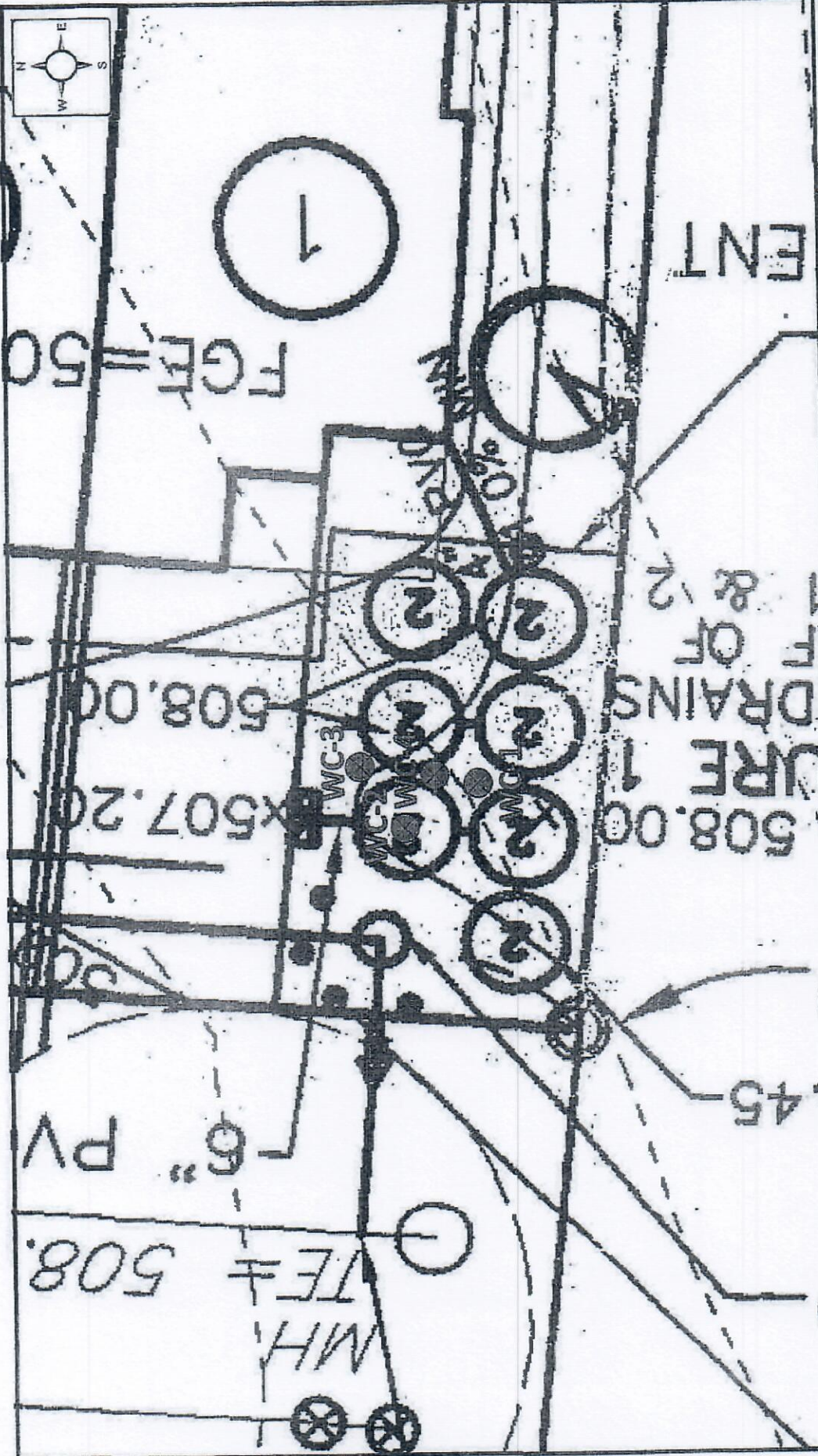


Within 1/2 mile of the job site, there are:  
 0 Sinkhole(s)  
 15 Surface Depression(s)



**Karst Features Map**  
**WALNUT STREET SWM SINKHOLE**  
 916 WALNUT STREET, NEW HOLLAND,  
 PENNSYLVANIA  
 WINDING OAKS HOA

|             |   |
|-------------|---|
| DRAFTER     | HCH   |
| SCALE       | NTS   |
| PROJECT NO. | 18:5160   |
| DATE        | 2/5/2021  |
| SOURCE      | PA DCNR Geologic Map<br><a href="http://www.pis.dcnr.state.pa.us">http://www.pis.dcnr.state.pa.us</a> |



|             |              |
|-------------|--------------|
| DRAFTER     | HCH          |
| SCALE       | NTS          |
| PROJECT NO. | 18-5160      |
| DATE        | 2/15/2021    |
| SOURCE      | Google Earth |

**Exploration Location Plan**  
**WALNUT STREET SWM SINKHOLE**  
 916 WALNUT STREET, NEW HOLLAND, PENNSYLVANIA  
 WINDING OAKS HOA



# WILDCAT DYNAMIC CONE LOG

ECS Mid-Atlantic, LLC  
52-6 Grumbacher Road  
York, PA 17406

PROJECT NUMBER: 5160  
DATE STARTED: 02-12-2021  
DATE COMPLETED: 02-12-2021

HOLE #: WC-1  
CREW: KTE & CH  
PROJECT: Walnut Street SWM Sinkhole  
ADDRESS: 916 Walnut Street  
LOCATION: New Holland, USA

SURFACE ELEVATION: 508.0  
WATER ON COMPLETION: \_\_\_\_\_  
HAMMER WEIGHT: 35 lbs.  
CONE AREA: 10 sq. cm

| DEPTH | BLOWS PER 10 cm | RESISTANCE Kg/cm <sup>2</sup> | GRAPH OF CONE RESISTANCE |    |     |     | N'  | TESTED CONSISTENCY |              |
|-------|-----------------|-------------------------------|--------------------------|----|-----|-----|-----|--------------------|--------------|
|       |                 |                               | 0                        | 50 | 100 | 150 |     | NON-COHESIVE       | COHESIVE     |
|       | 10              | 44.4                          | .....                    |    |     |     | 12  | MEDIUM DENSE       | STIFF        |
|       | 4               | 17.8                          | .....                    |    |     |     | 5   | LOOSE              | MEDIUM STIFF |
| 1 ft  | 5               | 22.2                          | .....                    |    |     |     | 6   | LOOSE              | MEDIUM STIFF |
|       | 5               | 22.2                          | .....                    |    |     |     | 6   | LOOSE              | MEDIUM STIFF |
|       | 2               | 8.9                           | ..                       |    |     |     | 2   | VERY LOOSE         | SOFT         |
| 2 ft  | 2               | 8.9                           | ..                       |    |     |     | 2   | VERY LOOSE         | SOFT         |
|       | 2               | 8.9                           | ..                       |    |     |     | 2   | VERY LOOSE         | SOFT         |
|       | 5               | 22.2                          | .....                    |    |     |     | 6   | LOOSE              | MEDIUM STIFF |
| 3 ft  | 10              | 44.4                          | .....                    |    |     |     | 12  | MEDIUM DENSE       | STIFF        |
| 1 m   | 9               | 40.0                          | .....                    |    |     |     | 11  | MEDIUM DENSE       | STIFF        |
|       | 9               | 34.7                          | .....                    |    |     |     | 9   | LOOSE              | STIFF        |
| 4 ft  | 7               | 27.0                          | .....                    |    |     |     | 7   | LOOSE              | MEDIUM STIFF |
|       | 5               | 19.3                          | .....                    |    |     |     | 5   | LOOSE              | MEDIUM STIFF |
|       | 6               | 23.2                          | .....                    |    |     |     | 6   | LOOSE              | MEDIUM STIFF |
| 5 ft  | 14              | 54.0                          | .....                    |    |     |     | 15  | MEDIUM DENSE       | STIFF        |
|       | 28              | 108.1                         | .....                    |    |     |     | 25+ | MEDIUM DENSE       | VERY STIFF   |
|       | 22              | 84.9                          | .....                    |    |     |     | 24  | MEDIUM DENSE       | VERY STIFF   |
| 6 ft  | 19              | 73.3                          | .....                    |    |     |     | 20  | MEDIUM DENSE       | VERY STIFF   |
|       | 21              | 81.1                          | .....                    |    |     |     | 23  | MEDIUM DENSE       | VERY STIFF   |
| 2 m   | 21              | 81.1                          | .....                    |    |     |     | 23  | MEDIUM DENSE       | VERY STIFF   |
| 7 ft  | 10              | 34.2                          | .....                    |    |     |     | 9   | LOOSE              | STIFF        |
|       | 14              | 47.9                          | .....                    |    |     |     | 13  | MEDIUM DENSE       | STIFF        |
|       | 9               | 30.8                          | .....                    |    |     |     | 8   | LOOSE              | MEDIUM STIFF |
| 8 ft  | 10              | 34.2                          | .....                    |    |     |     | 9   | LOOSE              | STIFF        |
|       | 17              | 58.1                          | .....                    |    |     |     | 16  | MEDIUM DENSE       | VERY STIFF   |
| 9 ft  | 100             | 342.0                         | REFUSAL @ 8.5'           |    |     |     | 25+ | VERY DENSE         | HARD         |
| 3 m   | 10 ft           |                               |                          |    |     |     |     |                    |              |
|       | 11 ft           |                               |                          |    |     |     |     |                    |              |
|       | 12 ft           |                               |                          |    |     |     |     |                    |              |
| 4 m   | 13 ft           |                               |                          |    |     |     |     |                    |              |

# WILDCAT DYNAMIC CONE LOG

ECS Mid-Atlantic, LLC  
 52-6 Grumbacher Road  
 York, PA 17406

PROJECT NUMBER: 5160  
 DATE STARTED: 02-12-2021  
 DATE COMPLETED: 02-12-2021

HOLE #: WC-2  
 CREW: KTE & CH  
 PROJECT: Walnut Street SWM Sinkhole  
 ADDRESS: 916 Walnut Street  
 LOCATION: New Holland, USA

SURFACE ELEVATION: 508.0  
 WATER ON COMPLETION: 540 cm  
 HAMMER WEIGHT: 35 lbs.  
 CONE AREA: 10 sq. cm

| DEPTH | BLOWS<br>PER 10 cm | RESISTANCE<br>Kg/cm <sup>2</sup> | GRAPH OF CONE RESISTANCE |    |     |     | N'         | TESTED CONSISTENCY |          |
|-------|--------------------|----------------------------------|--------------------------|----|-----|-----|------------|--------------------|----------|
|       |                    |                                  | 0                        | 50 | 100 | 150 |            | NON-COHESIVE       | COHESIVE |
| 1 ft  |                    |                                  |                          |    |     |     |            |                    |          |
| 2 ft  |                    |                                  |                          |    |     |     |            |                    |          |
| 3 ft  |                    |                                  |                          |    |     |     |            |                    |          |
| 1 m   |                    |                                  |                          |    |     |     |            |                    |          |
| 4 ft  |                    |                                  |                          |    |     |     |            |                    |          |
| 5 ft  |                    |                                  |                          |    |     |     |            |                    |          |
| 6 ft  |                    |                                  |                          |    |     |     |            |                    |          |
| 2 m   |                    |                                  |                          |    |     |     |            |                    |          |
| 7 ft  |                    |                                  |                          |    |     |     |            |                    |          |
| 8 ft  |                    |                                  |                          |    |     |     |            |                    |          |
| 9 ft  |                    |                                  |                          |    |     |     |            |                    |          |
| 3 m   |                    |                                  |                          |    |     |     |            |                    |          |
| 10 ft |                    |                                  |                          |    |     |     |            |                    |          |
| 11 ft |                    |                                  |                          |    |     |     |            |                    |          |
| 12 ft | 3                  | 9.2                              | ..                       |    |     | 2   | VERY LOOSE | SOFT               |          |
|       | 3                  | 9.2                              | ..                       |    |     | 2   | VERY LOOSE | SOFT               |          |
|       | 2                  | 6.1                              | .                        |    |     | 1   | VERY LOOSE | VERY SOFT          |          |
|       | 4                  | 12.2                             | ...                      |    |     | 3   | VERY LOOSE | SOFT               |          |
| 4 m   | 13 ft              | 24.5                             | .....                    |    |     | 6   | LOOSE      | MEDIUM STIFF       |          |

HOLE #: WC-2

**WILDCAT DYNAMIC CONE LOG**

Page 2 of 2

PROJECT: Walnut Street SWM Sinkhole

PROJECT NUMBER:

5160

| DEPTH | BLOWS<br>PER 10 cm | RESISTANCE<br>Kg/cm <sup>2</sup> | GRAPH OF CONE RESISTANCE |    |     |     | N'  | TESTED CONSISTENCY |              |
|-------|--------------------|----------------------------------|--------------------------|----|-----|-----|-----|--------------------|--------------|
|       |                    |                                  | 0                        | 50 | 100 | 150 |     | NON-COHESIVE       | COHESIVE     |
|       | 10                 | 27.7                             | .....                    |    |     |     | 7   | LOOSE              | MEDIUM STIFF |
|       | 8                  | 22.2                             | .....                    |    |     |     | 6   | LOOSE              | MEDIUM STIFF |
| 14 ft | 12                 | 33.2                             | .....                    |    |     |     | 9   | LOOSE              | STIFF        |
|       | 5                  | 13.9                             | ....                     |    |     |     | 3   | VERY LOOSE         | SOFT         |
|       | 8                  | 22.2                             | .....                    |    |     |     | 6   | LOOSE              | MEDIUM STIFF |
| 15 ft | 8                  | 22.2                             | .....                    |    |     |     | 6   | LOOSE              | MEDIUM STIFF |
|       | 11                 | 30.5                             | .....                    |    |     |     | 8   | LOOSE              | MEDIUM STIFF |
|       | 10                 | 27.7                             | .....                    |    |     |     | 7   | LOOSE              | MEDIUM STIFF |
| 16 ft | 8                  | 22.2                             | .....                    |    |     |     | 6   | LOOSE              | MEDIUM STIFF |
| 5 m   | 5                  | 13.9                             | ....                     |    |     |     | 3   | VERY LOOSE         | SOFT         |
|       | 4                  | 10.2                             | ..                       |    |     |     | 2   | VERY LOOSE         | SOFT         |
| 17 ft | 3                  | 7.6                              | ..                       |    |     |     | 2   | VERY LOOSE         | SOFT         |
|       | 4                  | 10.2                             | ..                       |    |     |     | 2   | VERY LOOSE         | SOFT         |
|       | 2                  | 5.1                              | .                        |    |     |     | 1   | VERY LOOSE         | VERY SOFT    |
| 18 ft | 1                  | 2.5                              |                          |    |     |     | 0   | VERY LOOSE         | VERY SOFT    |
|       | 5                  | 12.7                             | ...                      |    |     |     | 3   | VERY LOOSE         | SOFT         |
|       | 11                 | 27.9                             | .....                    |    |     |     | 7   | LOOSE              | MEDIUM STIFF |
| 19 ft | 11                 | 27.9                             | .....                    |    |     |     | 7   | LOOSE              | MEDIUM STIFF |
|       | 10                 | 25.4                             | .....                    |    |     |     | 7   | LOOSE              | MEDIUM STIFF |
| 6 m   | 10                 | 25.4                             | .....                    |    |     |     | 7   | LOOSE              | MEDIUM STIFF |
| 20 ft | 5                  | 11.7                             | ...                      |    |     |     | 3   | VERY LOOSE         | SOFT         |
|       | 4                  | 9.3                              | ..                       |    |     |     | 2   | VERY LOOSE         | SOFT         |
| 21 ft | 100                | 233.0                            | REFUSAL @ 20.7'          |    |     |     | 25+ | VERY DENSE         | HARD         |
| 22 ft |                    |                                  |                          |    |     |     |     |                    |              |
| 7 m   | 23 ft              |                                  |                          |    |     |     |     |                    |              |
|       | 24 ft              |                                  |                          |    |     |     |     |                    |              |
|       | 25 ft              |                                  |                          |    |     |     |     |                    |              |
|       | 26 ft              |                                  |                          |    |     |     |     |                    |              |
| 8 m   | 27 ft              |                                  |                          |    |     |     |     |                    |              |
|       | 28 ft              |                                  |                          |    |     |     |     |                    |              |
|       | 29 ft              |                                  |                          |    |     |     |     |                    |              |
| 9 m   |                    |                                  |                          |    |     |     |     |                    |              |

# WILDCAT DYNAMIC CONE LOG

ECS Mid-Atlantic, LLC  
 52-6 Grumbacher Road  
 York, PA 17406

PROJECT NUMBER: 5160  
 DATE STARTED: 02-12-2021  
 DATE COMPLETED: 02-12-2021

HOLE #: WC-3  
 CREW: KTE & CH  
 PROJECT: Walnut Street SWM Sinkhole  
 ADDRESS: 916 Walnut Street  
 LOCATION: New Holland, USA

SURFACE ELEVATION: 508.0  
 WATER ON COMPLETION: 170 cm  
 HAMMER WEIGHT: 35 lbs.  
 CONE AREA: 10 sq. cm

| DEPTH | BLOWS PER 10 cm | RESISTANCE Kg/cm <sup>2</sup> | GRAPH OF CONE RESISTANCE |       |     |     | N'         | TESTED CONSISTENCY |          |
|-------|-----------------|-------------------------------|--------------------------|-------|-----|-----|------------|--------------------|----------|
|       |                 |                               | 0                        | 50    | 100 | 150 |            | NON-COHESIVE       | COHESIVE |
| 1 ft  |                 |                               |                          |       |     |     |            |                    |          |
| 2 ft  |                 |                               |                          |       |     |     |            |                    |          |
| 3 ft  |                 |                               |                          |       |     |     |            |                    |          |
| 1 m   | 2               | 8.9                           | ..                       |       |     | 2   | VERY LOOSE | SOFT               |          |
|       | 3               | 11.6                          | ...                      |       |     | 3   | VERY LOOSE | SOFT               |          |
| 4 ft  | 2               | 7.7                           | ..                       |       |     | 2   | VERY LOOSE | SOFT               |          |
|       | 1               | 3.9                           | .                        |       |     | 1   | VERY LOOSE | VERY SOFT          |          |
|       | 4               | 15.4                          | ....                     |       |     | 4   | VERY LOOSE | SOFT               |          |
| 5 ft  | 2               | 7.7                           | ..                       |       |     | 2   | VERY LOOSE | SOFT               |          |
|       | 4               | 15.4                          | ....                     |       |     | 4   | VERY LOOSE | SOFT               |          |
|       | 2               | 7.7                           | ..                       |       |     | 2   | VERY LOOSE | SOFT               |          |
| 6 ft  | 1               | 3.9                           | .                        |       |     | 1   | VERY LOOSE | VERY SOFT          |          |
|       | 3               | 11.6                          | ...                      |       |     | 3   | VERY LOOSE | SOFT               |          |
| 2 m   | 1               | 3.9                           | .                        |       |     | 1   | VERY LOOSE | VERY SOFT          |          |
| 7 ft  | 3               | 10.3                          | ..                       |       |     | 2   | VERY LOOSE | SOFT               |          |
|       | 2               | 6.8                           | .                        |       |     | 1   | VERY LOOSE | VERY SOFT          |          |
|       | 3               | 10.3                          | ..                       |       |     | 2   | VERY LOOSE | SOFT               |          |
| 8 ft  | 5               | 17.1                          | ....                     |       |     | 4   | VERY LOOSE | SOFT               |          |
|       | 4               | 13.7                          | ...                      |       |     | 3   | VERY LOOSE | SOFT               |          |
|       | 1               | 3.4                           | .                        |       |     | 0   | VERY LOOSE | VERY SOFT          |          |
| 9 ft  | 1               | 3.4                           | .                        |       |     | 0   | VERY LOOSE | VERY SOFT          |          |
|       | 1               | 3.4                           | .                        |       |     | 0   | VERY LOOSE | VERY SOFT          |          |
|       | 2               | 6.8                           | .                        |       |     | 1   | VERY LOOSE | VERY SOFT          |          |
| 3 m   | 10 ft           | 2                             | 6.8                      | .     |     | 1   | VERY LOOSE | VERY SOFT          |          |
|       |                 | 3                             | 9.2                      | ..    |     | 2   | VERY LOOSE | SOFT               |          |
|       |                 | 2                             | 6.1                      | .     |     | 1   | VERY LOOSE | VERY SOFT          |          |
|       |                 | 3                             | 9.2                      | ..    |     | 2   | VERY LOOSE | SOFT               |          |
|       | 11 ft           | 12                            | 36.7                     | ..... |     | 10  | LOOSE      | STIFF              |          |
|       |                 | 10                            | 30.6                     | ..... |     | 8   | LOOSE      | MEDIUM STIFF       |          |
|       |                 | 7                             | 21.4                     | ..... |     | 6   | LOOSE      | MEDIUM STIFF       |          |
| 12 ft | 10              | 30.6                          | .....                    |       |     | 8   | LOOSE      | MEDIUM STIFF       |          |
|       | 10              | 30.6                          | .....                    |       |     | 8   | LOOSE      | MEDIUM STIFF       |          |
|       | 10              | 30.6                          | .....                    |       |     | 8   | LOOSE      | MEDIUM STIFF       |          |
| 4 m   | 13 ft           | 8                             | 24.5                     | ..... |     | 6   | LOOSE      | MEDIUM STIFF       |          |



HOLE #: WC-3

**WILDCAT DYNAMIC CONE LOG**

Page 2 of 2

PROJECT: Walnut Street SWM Sinkhole

PROJECT NUMBER:

5160

| DEPTH | BLOWS<br>PER 10 cm | RESISTANCE<br>Kg/cm <sup>2</sup> | GRAPH OF CONE RESISTANCE |    |     |     | N'  | TESTED CONSISTENCY |              |
|-------|--------------------|----------------------------------|--------------------------|----|-----|-----|-----|--------------------|--------------|
|       |                    |                                  | 0                        | 50 | 100 | 150 |     | NON-COHESIVE       | COHESIVE     |
|       | 9                  | 24.9                             | .....                    |    |     |     | 7   | LOOSE              | MEDIUM STIFF |
|       | 10                 | 27.7                             | .....                    |    |     |     | 7   | LOOSE              | MEDIUM STIFF |
| 14 ft | 10                 | 27.7                             | .....                    |    |     |     | 7   | LOOSE              | MEDIUM STIFF |
|       | 11                 | 30.5                             | .....                    |    |     |     | 8   | LOOSE              | MEDIUM STIFF |
|       | 10                 | 27.7                             | .....                    |    |     |     | 7   | LOOSE              | MEDIUM STIFF |
| 15 ft | 11                 | 30.5                             | .....                    |    |     |     | 8   | LOOSE              | MEDIUM STIFF |
|       | 14                 | 38.8                             | .....                    |    |     |     | 11  | MEDIUM DENSE       | STIFF        |
|       | 30                 | 83.1                             | .....                    |    |     |     | 23  | MEDIUM DENSE       | VERY STIFF   |
| 16 ft | 100                | 277.0                            | REFUSAL @ 16.0'          |    |     |     | 25+ | VERY DENSE         | HARD         |
| 5 m   |                    |                                  |                          |    |     |     |     |                    |              |
| 17 ft |                    |                                  |                          |    |     |     |     |                    |              |
| 18 ft |                    |                                  |                          |    |     |     |     |                    |              |
| 19 ft |                    |                                  |                          |    |     |     |     |                    |              |
| 6 m   |                    |                                  |                          |    |     |     |     |                    |              |
| 20 ft |                    |                                  |                          |    |     |     |     |                    |              |
| 21 ft |                    |                                  |                          |    |     |     |     |                    |              |
| 22 ft |                    |                                  |                          |    |     |     |     |                    |              |
| 7 m   |                    |                                  |                          |    |     |     |     |                    |              |
| 23 ft |                    |                                  |                          |    |     |     |     |                    |              |
| 24 ft |                    |                                  |                          |    |     |     |     |                    |              |
| 25 ft |                    |                                  |                          |    |     |     |     |                    |              |
| 26 ft |                    |                                  |                          |    |     |     |     |                    |              |
| 8 m   |                    |                                  |                          |    |     |     |     |                    |              |
| 27 ft |                    |                                  |                          |    |     |     |     |                    |              |
| 28 ft |                    |                                  |                          |    |     |     |     |                    |              |
| 29 ft |                    |                                  |                          |    |     |     |     |                    |              |
| 9 m   |                    |                                  |                          |    |     |     |     |                    |              |

# WILDCAT DYNAMIC CONE LOG

ECS Mid-Atlantic, LLC  
52-6 Grumbacher Road  
York, PA 17406

PROJECT NUMBER: 5160  
DATE STARTED: 02-12-2021  
DATE COMPLETED: 02-12-2021

HOLE #: WC-4  
CREW: KTE & CH  
PROJECT: Walnut Street SWM Sinkhole  
ADDRESS: 916 Walnut Street  
LOCATION: New Holland, USA

SURFACE ELEVATION: 508.0  
WATER ON COMPLETION: \_\_\_\_\_  
HAMMER WEIGHT: 35 lbs.  
CONE AREA: 10 sq. cm

| DEPTH | BLOWS PER 10 cm | RESISTANCE Kg/cm <sup>2</sup> | GRAPH OF CONE RESISTANCE |    |     |     | N' | TESTED CONSISTENCY |              |
|-------|-----------------|-------------------------------|--------------------------|----|-----|-----|----|--------------------|--------------|
|       |                 |                               | 0                        | 50 | 100 | 150 |    | NON-COHESIVE       | COHESIVE     |
| 1 ft  |                 |                               |                          |    |     |     |    |                    |              |
| 2 ft  | 2               | 8.9                           | ..                       |    |     |     | 2  | VERY LOOSE         | SOFT         |
|       | 2               | 8.9                           | ..                       |    |     |     | 2  | VERY LOOSE         | SOFT         |
| 3 ft  | 1               | 4.4                           | .                        |    |     |     | 1  | VERY LOOSE         | VERY SOFT    |
| 1 m   | 1               | 4.4                           | .                        |    |     |     | 1  | VERY LOOSE         | VERY SOFT    |
|       | 2               | 7.7                           | ..                       |    |     |     | 2  | VERY LOOSE         | SOFT         |
| 4 ft  | 7               | 27.0                          | .....                    |    |     |     | 7  | LOOSE              | MEDIUM STIFF |
|       | 1               | 3.9                           | .                        |    |     |     | 1  | VERY LOOSE         | VERY SOFT    |
|       | 8               | 30.9                          | .....                    |    |     |     | 8  | LOOSE              | MEDIUM STIFF |
| 5 ft  | 6               | 23.2                          | .....                    |    |     |     | 6  | LOOSE              | MEDIUM STIFF |
|       | 5               | 19.3                          | .....                    |    |     |     | 5  | LOOSE              | MEDIUM STIFF |
|       | 2               | 7.7                           | ..                       |    |     |     | 2  | VERY LOOSE         | SOFT         |
| 6 ft  | 9               | 34.7                          | .....                    |    |     |     | 9  | LOOSE              | STIFF        |
|       | 8               | 30.9                          | .....                    |    |     |     | 8  | LOOSE              | MEDIUM STIFF |
| 2 m   | 2               | 7.7                           | ..                       |    |     |     | 2  | VERY LOOSE         | SOFT         |
| 7 ft  | 1               | 3.4                           | .                        |    |     |     | 0  | VERY LOOSE         | VERY SOFT    |
|       | 3               | 10.3                          | ..                       |    |     |     | 2  | VERY LOOSE         | SOFT         |
|       | 2               | 6.8                           | .                        |    |     |     | 1  | VERY LOOSE         | VERY SOFT    |
| 8 ft  | 2               | 6.8                           | .                        |    |     |     | 1  | VERY LOOSE         | VERY SOFT    |
|       | 1               | 3.4                           | .                        |    |     |     | 0  | VERY LOOSE         | VERY SOFT    |
|       | 1               | 3.4                           | .                        |    |     |     | 0  | VERY LOOSE         | VERY SOFT    |
| 9 ft  | 1               | 3.4                           | .                        |    |     |     | 0  | VERY LOOSE         | VERY SOFT    |
|       | 3               | 10.3                          | ..                       |    |     |     | 2  | VERY LOOSE         | SOFT         |
|       | 3               | 10.3                          | ..                       |    |     |     | 2  | VERY LOOSE         | SOFT         |
| 3 m   | 10 ft           | 13.7                          | ...                      |    |     |     | 3  | VERY LOOSE         | SOFT         |
|       | 5               | 15.3                          | .....                    |    |     |     | 4  | VERY LOOSE         | SOFT         |
|       | 3               | 9.2                           | ..                       |    |     |     | 2  | VERY LOOSE         | SOFT         |
|       | 4               | 12.2                          | ...                      |    |     |     | 3  | VERY LOOSE         | SOFT         |
| 11 ft | 5               | 15.3                          | .....                    |    |     |     | 4  | VERY LOOSE         | SOFT         |
|       | 12              | 36.7                          | .....                    |    |     |     | 10 | LOOSE              | STIFF        |
|       | 6               | 18.4                          | .....                    |    |     |     | 5  | LOOSE              | MEDIUM STIFF |
| 12 ft | 7               | 21.4                          | .....                    |    |     |     | 6  | LOOSE              | MEDIUM STIFF |
|       | 8               | 24.5                          | .....                    |    |     |     | 6  | LOOSE              | MEDIUM STIFF |
|       | 8               | 24.5                          | .....                    |    |     |     | 6  | LOOSE              | MEDIUM STIFF |
| 4 m   | 13 ft           | 27.5                          | .....                    |    |     |     | 7  | LOOSE              | MEDIUM STIFF |

HOLE #: WC-4

**WILDCAT DYNAMIC CONE LOG**

Page 2 of 2

PROJECT: Walnut Street SWM Sinkhole

PROJECT NUMBER:

5160

| DEPTH | BLOWS<br>PER 10 cm | RESISTANCE<br>Kg/cm <sup>2</sup> | GRAPH OF CONE RESISTANCE |    |     |     | N'  | TESTED CONSISTENCY |              |
|-------|--------------------|----------------------------------|--------------------------|----|-----|-----|-----|--------------------|--------------|
|       |                    |                                  | 0                        | 50 | 100 | 150 |     | NON-COHESIVE       | COHESIVE     |
|       | 6                  | 16.6                             | ....                     |    |     |     | 4   | VERY LOOSE         | SOFT         |
|       | 6                  | 16.6                             | ....                     |    |     |     | 4   | VERY LOOSE         | SOFT         |
| 14 ft | 8                  | 22.2                             | .....                    |    |     |     | 6   | LOOSE              | MEDIUM STIFF |
|       | 11                 | 30.5                             | .....                    |    |     |     | 8   | LOOSE              | MEDIUM STIFF |
|       | 17                 | 47.1                             | .....                    |    |     |     | 13  | MEDIUM DENSE       | STIFF        |
| 15 ft | 14                 | 38.8                             | .....                    |    |     |     | 11  | MEDIUM DENSE       | STIFF        |
|       | 30                 | 83.1                             | .....                    |    |     |     | 23  | MEDIUM DENSE       | VERY STIFF   |
|       | 100                | 277.0                            | REFUSAL @ 15.7'          |    |     |     | 25+ | VERY DENSE         | HARD         |
| 16 ft |                    |                                  |                          |    |     |     |     |                    |              |
| 5 m   |                    |                                  |                          |    |     |     |     |                    |              |
| 17 ft |                    |                                  |                          |    |     |     |     |                    |              |
| 18 ft |                    |                                  |                          |    |     |     |     |                    |              |
| 19 ft |                    |                                  |                          |    |     |     |     |                    |              |
| 6 m   |                    |                                  |                          |    |     |     |     |                    |              |
| 20 ft |                    |                                  |                          |    |     |     |     |                    |              |
| 21 ft |                    |                                  |                          |    |     |     |     |                    |              |
| 22 ft |                    |                                  |                          |    |     |     |     |                    |              |
| 7 m   |                    |                                  |                          |    |     |     |     |                    |              |
| 23 ft |                    |                                  |                          |    |     |     |     |                    |              |
| 24 ft |                    |                                  |                          |    |     |     |     |                    |              |
| 25 ft |                    |                                  |                          |    |     |     |     |                    |              |
| 26 ft |                    |                                  |                          |    |     |     |     |                    |              |
| 8 m   |                    |                                  |                          |    |     |     |     |                    |              |
| 27 ft |                    |                                  |                          |    |     |     |     |                    |              |
| 28 ft |                    |                                  |                          |    |     |     |     |                    |              |
| 29 ft |                    |                                  |                          |    |     |     |     |                    |              |
| 9 m   |                    |                                  |                          |    |     |     |     |                    |              |