Hillsborough County
Florida

Hillsborough County
Southeast County Landfill Sinkhole Remediation
Stage 5 – Isolation of Impacted Clay Liner
C.I.P. No. 54061

NARRATIVE APPROACH

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Issued for FDEP Review
February 2013

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NARRATIVE APPROACH
SINKHOLE REMEDIATION STAGE 5 – ISOLATION OF IMPACTED CLAY LINER
HILLSBOROUGH COUNTY – SOUTHEAST COUNTY LANDFILL
PREPARED BY: HDR ENGINEERING, INC.
FEBRUARY 2013

INTRODUCTION

The purpose of this narrative is to provide a summary of the approach to the Southeast County Landfill Sinkhole Remediation Stage 5 – Isolation of Impacted Clay Liner plan (Stage 5 plan). It is the intent of this document to serve as a supplement in the review of the design drawings and technical specifications. Moreover, this document does not provide all the necessary technical information or data for performing a comprehensive review of the Stage 5 plan. Therefore, it is recommended the design plans and technical specifications be reviewed concurrently with this document.

On December 14, 2010, a sinkhole collapse occurred on the west side of the Phase VI disposal area at the Hillsborough County Southeast County Landfill (SCLF). Based on initial observations, the collapse measured approximately 150 to 200 feet wide (at ground surface) and extended below the bottom liner system of the Phase VI disposal area. The existing bottom liner system consists of approximately 5 to 15 feet of waste phosphatic clays (clays from the settling ponds from the former phosphatic mining operations at the SCLF), along with leachate collection trenches and pipes that collect and convey liquids from the west side of Phase VI eastward toward Pump Station B. It was apparent from visual observations that the sinkhole collapse impacted the Phase VI clay liner system as well as existing landfill gas collection and control system (LFGCCS) components in the immediate vicinity of the initial collapse.

A Sinkhole Remediation Action Plan (Plan) was developed by the Hillsborough County Public Utilities Department, Solid Waste Management Group (County), and HDR Engineering, Inc. (HDR) that consisted of a five stage approach. The Plan addressed stabilization, investigation, sinkhole remediation, and repair by isolating the impacted clay liner. As part of the Plan, long-term waste disposal plans for the Phase VI disposal area would also be addressed.

Stage 1 of the Plan provided initial stabilization of the sinkhole to minimize further movement and enlargement of the sinkhole. Stage 1 included completion of nine compaction grout points in order to stabilize the sinkhole area for future investigation. Stage 1 of the Plan was completed on April 7, 2011. A Stage 1 summary report was prepared by HDR and submitted to the Florida Department of Environmental Protection (FDEP) on May 9, 2011.

Stage 2 of the Plan provided additional stabilization of the sinkhole by placing a plug of controlled low-strength material (CLSM) in the bottom of the sinkhole and then backfilling with soils to allow for personnel and equipment to access the top of the sinkhole in performing the geotechnical and geophysical investigation directly below the sinkhole. Stage 2 was completed in August 2011. A Stage 2 Construction Completion Report was submitted to the FDEP on October 19, 2011.

During the development of the sinkhole, components of the LFGCCS within the proximity of the sinkhole were damaged. Following the completion of Stage 2 field work, the LFGCCS within the sinkhole area was temporarily repaired by installing a new above ground header pipe and connecting laterals. These temporary measures were installed to minimize landfill gas surface emissions in the proximity of the sinkhole. A letter report describing this construction was submitted to the FDEP on January 30, 2012.

The Stage 3 – Geophysical and Geotechnical Investigation defined the lateral and vertical configuration of the sinkhole as well as outlined the recommended methodology for the final stabilization of the sinkhole. The Stage 3 geotechnical and geophysical investigations were conducted from November 2011 through March 2012 and the Stage 3 - Site Characterization Report, which estimated the sinkhole depth, shape, and areal limits, was prepared by SDII, Inc. and submitted to FDEP in March 2012.

Stage 4 – Geotechnical Sinkhole Remediation Plan outlined the final deep stabilization plans for the limestone and loose foundation soils surrounding the sinkhole area by filling channels and voids deep below land surface. The Stage 4 plan was prepared by AMEC, Inc. and their recommendation included the installation of a series of concentric deep grout injection points around the exterior limits of the sinkhole. A secondary series of concentric grout injection points was recommended to surround the first series of points to provide overlapping coverage. The goal of the Stage 4 plan is to fill voids and solution channels within the limestone layers as well as provide compaction of the deep loose soils. The grout injection borings will be drilled to approximately 220 to 250 feet below land surface (bls) and compaction grouted from the bottom of the boring to approximately 100 to 150 feet bls. The Stage 4 plan was reviewed and accepted by the FDEP and the County has selected a contractor. The Stage 4 field work for the installation of the deep grout injection points will begin in February 2013.

Stage 5 – Isolation of Impacted Clay Liner was developed to address the isolation of the upper impacted portion of the waste phosphatic clay liner system (clay liner) in the Phase VI disposal area. In addition, the Stage 5 plan will address the temporary final closure of the disposal area surrounding the sinkhole. A

summary of the approach, assumptions, and design criteria used in the development of the Stage 5 – Isolation of Impacted Clay Liner plan is described below.

OBJECTIVES OF STAGE 5 OF THE SINKHOLE REMEDIATION

The overarching objective of the Stage 5 approach is to design and construct an environmentally effective system for minimizing the potential for impacts to underlying soils and groundwater within the area of the sinkhole. Specifically, the objectives for the Stage 5 plan are two-fold. The first objective is to assess and then isolate the outer limits of the impacted clay liner to prohibit leachate from infiltrating into the area of the impacted clay liner. Geotechnical borings were performed to verify the top of the clay liner elevations in the area of the sinkhole for determining the lateral extent of the impacted clay liner. The second objective is to repair the LFGCCS that was impacted by the sinkhole as well as to minimize future stormwater infiltration into the waste mass within the proximity of the sinkhole.

A summary of the key components for the Stage 5 plan is provided below.

1. Vinyl sheet piles used for the cut-off wall will be installed from EL 110 (bottom) to EL 134 (top). The bottom of the vinyl sheet piles will be embedded into the clay liner thereby sealing off the impacted clay liner within the sinkhole area and reducing the potential of leachate on top of the clay liner from flowing back into the sinkhole. This will minimize potential impacts to the groundwater and underlying soil.

2. Installation of a 60-mil textured HDPE geomembrane that extends from the top of vinyl sheet piles, at EL 134, over the entire sinkhole area, which will reduce the potential of leachate and liquids migrating through the waste and into the sinkhole area. This will essentially seal off the sinkhole area.

3. Installation of a final cover system, including a 40-mil textured LLDPE geomembrane, that will extend 25 feet beyond the limits of the vinyl sheet piling within the waste disposal areas. This final cover system will drain surface water away from the sinkhole area thereby reducing infiltration of stormwater into the waste mass and resultant leachate generation.

4. Repair of the landfill gas collection and control system (LFGCCS) will be included as part of the Stage 5 work. New LFG piping will be installed, in similar locations and sizes to pre-sinkhole conditions. A new LFG extraction well will be installed at or near the center of the sinkhole area for additional extraction of LFG from the sinkhole. In addition, two existing LFG extraction wells will be replaced.

5. No additional waste or filling will occur within the limits of the Final Cover System. Thus, no additional loads will be placed on the sinkhole foundation or waste materials. Also, no additional

loads will placed on the waste phosphatic clays within the sinkhole area, or around the vinyl sheet piling; therefore, additional consolidation (settlement) is expected to be minimal and the sheet piles are expected to remain embedded in the waste phosphatic clays.

EVALUATION AND ESTABLISHMENT OF THE LIMITS OF IMPACTED CLAY LINER

Based on boring data collected during Stage 3 of the Plan, specifically boring logs B-S3-1 through B-S3-11 contained in the SDII Stage 3 report, the subsurface limits of the sinkhole can be approximately outlined by borings B-S3-1, -5, -8, -9, -10, & -11. In these borings, the bottom liner system, consisting of the waste phosphatic clay and drainage sands, was either missing or had collapsed several feet below these same soils layers found in the borings surrounding the sinkhole area.

Based on the SPT soil sample data from borings B-S3-2, -3, -6, & -7, the elevation of the top of clay liner did not appear to be impacted by the sinkhole and no voids were recorded in the sands or clays below the clay liner down to the top of limestone strata. It should be noted that all borings in Stage 3 of the Plan were SPT borings with blow count data/soil samples collected at five foot intervals. Given the five foot intervals, the accuracy of determining the actual top of clay elevations could vary as much as +/- 5 feet from actual elevations. Collection of continuous SPT split spoon sampling was needed to determine the waste phosphatic clay elevations with a higher degree of accuracy. This accuracy was required to assess the lateral limits of impacted liner.

HDR and their geotechnical subconsultant, Tierra, Inc. (Tierra), developed a boring program for measuring the top of clay liner elevations. A series of five radial lines, designated as Lines A through E, were designed based on prior data. Each line extended outward from the center of the sinkhole, B-S3-01. Along each line, SPT borings, designated as CLB (clay liner borings), were drilled with the primary purpose of identifying the top of clay within the accuracy of continuous SPT sampling (to approximately +/- 6 inches). The CLB borings were washed down through the waste and within several feet of the top of the dense drainage sands in the majority of the borings; however, in several CLB borings, SPT tests were collected at five foot intervals through the waste to provide the Stage 5 remediation contractors with the relative strength of the waste material. Continuous SPT samples were then collected in all borings in the drainage sand layer and then in the clay. Several CLB, but not all borings, were extended below the waste phosphatic clays to verify the density of the underlying foundation soils. Tierra's report, dated September 6, 2012, including the boring locations and boring logs, is contained in Attachment A.

Based on a review of the top of clay elevations from the CLB borings, the impacted clay liner surface was sloped relatively steeply down toward the center of the sinkhole. At some locations near the center of the sinkhole, there was no evidence of the clay liner. The lateral limits of the impacted clay where the clay liner slope was similar to the surrounding clay liner occurred at approximately EL 113. The top of clay elevations outside of the limits of impacted clay are generally flat, and borings drilled through the clays indicate that the subgrade foundation soils remain relatively dense with no voids recorded. The exception

to this sloping trend was along Line A and E. By design, and prior to the sinkhole collapse, the clay liner along Line A and E drains southward and eastward toward leachate collection trenches that convey leachate toward Pump Station B. After the development of the sinkhole, the area continues to drain to the south and east, but it is recommended that the sinkhole area be isolated to divert leachate around the sinkhole and toward the leachate collection system within the Phase VI area. Refer to Boring Profiles A through E in Attachment A for boring information and top of clay liner elevations.

ISOLATION OF THE IMPACTED CLAY LINER AREA

Based on the boring information obtained by SDII and Tierra during Stage 3 of the Plan, the lateral extent of the impact to the foundation soils and the clay liner can be approximated with a reasonable degree of accuracy. For the purpose of isolating the clay liner impacted by the sinkhole, a vinyl sheet pile cut-off wall and geomembrane cover system was selected to enclose the sinkhole area and isolate the limits of impacted clay liner from the surrounding unimpacted clay liner within the Phase VI disposal area. A final cover system will also be installed and extended beyond the limits of the vinyl sheet pile cut-off wall to minimize downward infiltration of stormwater into the waste mass within the proximity of the sinkhole.

Excavation Plan for Installation of Vinyl Sheet Pile

The sinkhole was initially stabilized by pumping CLSM (grout) into the sinkhole. Once the CLSM had been pumped into the sinkhole and filled to approximately EL 115, it was allowed to cure and harden. After several days, the sinkhole was then backfilled with clean sandy soils. The sideslopes over the sinkhole area were then regraded to a 6(h):1(v) slope. This slope was shallow enough to allow drill rigs to traverse the sideslopes and drill over the sinkhole area for the Stage 3 investigation.

The vinyl sheet pile driving equipment will require a flat, horizontal working area/platform to be able to drive the sheet piles vertically through the waste and into the clay liner. A 20-foot (minimum) working area, set at EL 133, will be excavated around and on the inside of the sheet pile cut-off wall alignment. An additional 8-foot offset on the outside of the sheet pile alignment will allow for working room and ancillary equipment. To achieve the working area grade for the sheet pile installation, the existing 6(h):1(v) slope will be cut using 2(h):1(v) temporary side slopes. As such, the excavation will cut into the waste mass and soils previously backfilled over the CLSM. During excavation, if inclement weather is pending, the exposed waste on the side slopes will be covered with a minimum of 6-inches of clean soil or rain tarps. Moreover, once the excavation is completed, a 12-mil thick rain cover will be placed over the exposed waste to prohibit stormwater from commingling with waste. In addition, during the excavation and until the rain cover is installed, a containment berm will be constructed along the west side of the excavation area to contain all stormwater and prevent it from being conveyed into the stormwater system. The rain cover will remain in place until the sheet pile cut-off wall is complete and backfilling of the excavation commences.

The material excavated for preparing the sheet pile cut-off wall work area will be a mixture of waste and soil; however, the area directly above the sinkhole will consist of mostly clean sandy soils since this area was backfilled with clean soils during Stage 3 of the Plan. During excavation, the waste and any soil mixed with waste material will be stockpiled east of the excavation. A continuous soil berm will be placed around the stockpile to contain runoff from the stockpiled material (Waste Stockpile and Relocation Area). Clean soil will be stockpiled separately from the excavated waste.

Vinyl Sheet Pile System and Installation

Vinyl Sheet Pile Material Selection

The Phase VI disposal area at the SCLF contains a mixture of Class I waste and waste to energy (WTE) Class I ash. To prolong the life of the sheet pile material, a vinyl sheet pile material was recommended due the chemical resistance of the vinyl material. HDR researched similar applications and discovered that a vinyl sheet piling was used at the Pinellas County Bridgeway Acres Landfill as part of a waste containment project. Bridgeway Acres Landfill is also a Class I Landfill and also contains a Class I/WTE ash mixture of waste material. Several other materials for the sheet pile were considered by HDR (steel, aluminum, etc.) but costs or limited life expectancy in a Class I/WTE ash environment made these materials less resistant to degradation for long-term isolation.

Vinyl Sheet Pile Alignment

The limits of the vinyl sheet pile cut-off wall were offset a minimum of 10 feet from the limits of impacted clay liner to be conservative. Each sheet pile is approximately 30 inches in width. A curve can be formed by deflecting a sheet up to 6 to 8 degrees relative to the adjacent sheet pile. Thus, relatively smooth transition curves can be accomplished along the proposed alignment. Specialty panel connectors are available for 90 degree connections.

Vinyl Sheet Pile Installation and Embedment

Driving vinyl sheet piles through the waste materials and very dense sands (SPT N>50) above the clay liner could potentially damage the vinyl sheet pile. As such, the initial installation of the sheet pile will be accomplished by pre-punching at each location along the sheet pile alignment with a separate steel pile having the same dimensions as the vinyl sheet pile. The pre-punch steel sheet pile will be driven through the waste and dense sands to within 1 to 2 feet of the top of the clay liner. It is common practice to pre-punch through dense soils to reduce potential damage to the vinyl sheet piles.

Upon extraction of the pre-punch steel sheet pile, a separate, specially made sheet pile mandrel with mechanical levers, called a PileClaw™ (or equipment of equal performance) will be attached to a vinyl sheet pile. The vinyl sheet pile and PileClaw™ will be driven into the pre-punched hole down through the

waste and dense sands and into the clay liner. The mechanical levers will then be activated and the vinyl sheet pile released. The steel PileClaw™ will then be extracted from the hole and the vinyl sheet pile will remain in-place.

The bottom of the sheet pile will be installed to a depth equal to EL 110. On average, the bottom of the vinyl sheet piling will extend one to three feet into the clay. Since the clay is soft, the clay will press back and seal against the vinyl sheet pile, thus forming a barrier to prevent leachate located on top of the clay liner from flowing into the sinkhole area.

Top of Vinyl Sheet Pile

The top of the vinyl sheet pile will be set at EL 134, approximately one foot above the working floor area at EL 133, to allow the PileClaw™ to be disconnected from the vinyl sheet piling. The interlocking of the vinyl sheet piles will provide frictional resistance. This resistance, as well as the skin friction along the surface of the piling, will reduce the potential of the adjacent installed sheet piles from sinking into the clay. In addition, during the installation of each sheet pile, the PileClaw™ clamps onto the previously installed adjoining sheet pile, holding the installed sheet pile in place. The top of the sheet piles will be surveyed upon final completion of the entire cut-off wall to verify the top of the sheet piles have remained at EL 134. Additional blocking may be used to prevent sheet piles from sinking, as deemed necessary by the CQA Engineer.

Construction Quality Assurance Verification

Construction Quality Assurance verification of the sheet pile cut-off wall installation will be accomplished both visually and with confirmation borings.

Visual Observation

Since the top of clay liner varies slightly in elevation, upon extraction of the steel sheet piles, the tips of both the pre-punch and PileClaw™ will be inspected for clay to verify the vinyl sheet pile was extended into the clay liner. If clay is not present upon extraction of the PileClaw™, the vinyl sheet pile will be pushed with the hydraulic rams of the pile driving equipment for approximately two additional feet. Since the clay is typically soft, it will be easy for the vinyl sheet to be pushed and this can be visually documented. If no clay is observed on the PileClaw™ and the vinyl sheet pile meets with resistance, the entire sheet pile will be removed and the location pre-punched again. The depth of the second pre-punch will be recorded. The steel sheet pile and the PileClaw™ will be wiped clean prior to re-use to allow for visual observation of clays. This will be considered a supplementary verification; however, the primary verification of the elevation of the top of the clay liner will be completed by geotechnical borings as described below.

Geotechnical SPT Borings

Residual clay on the PileClaw™ will provide for additional confirmation that the vinyl sheet pile is embedded into the clay liner. However, clay may not be observed at all times given the plasticity of the clay and/or the clay being scraped off of the PileClaw™ during extraction. Therefore, to make certain that the vinyl sheet piles are installed two to three feet into the clay liner, eight geotechnical SPT borings along the actual alignment will be performed prior to the installation of the vinyl sheet piles to confirm the elevation and thickness of the drainage sand and top elevation of the clay liner. The locations will be surveyed and initial ground elevations taken. From the initial ground surface, the borings may be washed through the waste material to EL 120 (just above the drainage sand). Continuous SPT sampling will then be completed through the drainage sand and into the upper 1 to 3 feet of the clay liner. Using this continuous SPT sampling, the top of clay liner can be determined to within +/- 6 inches. Therefore, the data from the eight geotechnical SPT borings, coupled with the existing boring data within the proximity of the vinyl sheet pile alignment, will provide sufficient data to determine the top of clay liner elevations along the vinyl sheet pile alignment and ensure that each vinyl sheet pile is embedded in the clay liner.

Installation of Geomembrane Cover over Vinyl Sheet Pile Area

Once the vinyl sheet pile cut-off wall has been installed, soil will be placed over the sheet piles and a continuous anchor trench will be excavated on the outside of the sheet piles. The interior and sideslopes of the excavation (on the interior side of the vinyl sheet piling system) will be lined with a 60-mil textured HDPE geomembrane. The geomembrane will cover the entire interior of the sheet pile system and extend past the vinyl sheet piling and into the anchor trench. Thus, the geomembrane will form a barrier to prevent infiltration of leachate and liquids into the interior of the sinkhole area. A 12-inch sand layer will be placed over the 60-mil geomembrane to provide protection during the subsequent backfilling of the excavation.

Backfilling with Excavated Waste and Soils

Waste material or sandy soils with waste that was stockpiled from the excavation for the vinyl sheet piling installation will be used as backfill material and compacted within the limits of excavation. The excavated backfill waste materials will be placed and compacted in one to two foot lifts until the backfill is within 12-inches of the proposed grades for the geomembrane in the final cover system.

Remaining Waste within the Waste Stockpile and Relocation Area

The existing waste in place has a density of at least 1,400 pounds per cubic yard. During excavation for the sheet pile cut-off wall, the excavated waste and soil density will decrease resulting in a greater volume of material. Moreover, during backfilling of the excavation using the previously excavated waste, the results of the compaction effort likely will not be equal to the previous in-situ waste density. As a result,

surplus excavated waste (e.g., 10,000 to 25.000 cubic yards) will reside within the Waste Stockpile and Relocation Area. The location of the Waste Stockpile and Relocation Area is well outside of the area impacted by the sinkhole. Since future waste filling will occur in Phase VI, the residual waste at the Waste Stockpile and Relocation area will remain. However, the stockpile will be graded to a 4(h):1(v) side slope, will be no greater than 10 feet high (e.g., 10-foot lift), will receive 18 inches of intermediate cover soil, and will be sodded. In addition, the top of the stockpile and the surrounding area will be graded to promote positive drainage along the existing drainage pattern. Given that the existing waste load within this area of Phase VI has been in place for over seven years, and based on Ardaman & Associates', Inc. (Ardaman) clay consolidation studies and reports for Phases I-VI, HDR does not believe that the residual waste stockpile will affect future loading/consolidation of the clay liner or impact the leachate flow along the top of the clay liner.

Final Cover System Installation

The final cover system will consist of a 12-inch compacted soil subgrade, overlain by a 40-mil LLDPE textured geomembrane (both sides); a drainage geocomposite, and 24-inches of protective cover soils (the upper 6-inches will be capable of supporting vegetation). The final cover system will extend a minimum of 25 feet beyond the limits of the underlying vinyl sheet piling to provide additional coverage over the sinkhole area and reduce potential infiltration of liquids into the sinkhole area. The final cover system will be tested, inspected, and documented for use at a future date when the Phase VI side slopes are officially closed as part of the permitted closure activities for this area. Wood posts will be installed along the final cover anchor trench.

The proposed final cover system over the sinkhole area has similar geosynthetic components that were designed for use in the final closure system for the Section 7, 8, and 9 disposal areas (Reference the Jones Edmunds and Associate's Section 9 Construction Permit Application, dated March 2006 for slope stability calculations). The Section 7, 8, and 9 sideslopes are steeper (3 horizontal to 1 vertical) then the proposed slope over the sinkhole area. The final cover system slope over the sinkhole area is 6 (h):1 (v), and thus the Factor of Safety against sliding and slope stability is greater than the same system designed for the Section 7, 8, and 8 disposal area. In summary, the proposed 6 (h):1 (v) sideslope is stable.

Anchoring the Final Cover System into Existing Phase VI Berm

The perimeter berm on the west side of Phase VI was lined with a 36-mil chlorosulfonated polyethylene-reinforced (CSPE or Hypalon) geomembrane that extends from the anchor trench at the top of the berm, down a 4(h):1(v) sideslope, and is keyed into the waste phosphatic clays at the bottom of the Phase VI disposal area. The Hypalon geomembrane within Phase VI was installed in the late 1990s. Due to the age of the Hypalon, and given the difficulties in making repairs to aged Hypalon material, the geosynthetic materials for the final closure system will extend over and past the Hypalon anchor trench and be anchored in a separate anchor trench. Thus, no disturbance of the Hypalon geomembrane is anticipated.

Final Grading and Long-term Plans for the Sinkhole Area

Once the final cover system has been placed over the sinkhole area, no further waste or fill will be placed directly above this area. Since the clay liner in the sinkhole area had already been loaded for more than the seven year consolidation period recommended by Ardaman in 1983, and no additional loads will be placed in this area, minimal additional settlement in the clay liner is anticipated. Thus, the sheet piles should remain embedded in the clay liner with little or no movement and will provide long-term isolation of the sinkhole area.

REPAIR OF THE IMPACTED LANDFILL GAS COLLECTION AND CONTROL SYSTEM

The LFGCCS within the sinkhole area was damaged and rendered inoperable as a result of the sinkhole collapse. The LFG isolation valves north and south of the sinkhole area were immediately closed in order to prohibit oxygen intrusion into the LFGCCS. Upon completion of the temporary backfill material installed as part of the Stage 2 work, a temporary above ground LFG header and laterals were installed to re-connect the wells and horizontal collectors in the area to allow for limited extraction of LFG from the sinkhole area. In addition, in performing the excavation for the installation of the vinyl sheet pile cut-off wall, non-operational LFG appurtenances will be removed and/or abandoned in place. The Stage 5 plan includes the repair of the original LFG header pipe as well as replacement of LFG vertical extraction wells, installation of an additional LFG vertical extraction well, installation of lateral piping to connect to LFG vertical wells and horizontal collectors, replacement of a U-trap for condensate collection, and removal and installation of an additional isolation valve. The repairs and enhancements to the LFGCCS are designed to provide LFG collection and extraction per the pre-sinkhole conditions and in accordance with the previously permitted LFGCCS design intent.

LFG Header Pipe

A 16-inch diameter SDR 17 HDPE header pipe will be installed at a similar location, depth, and slope as the pre-sinkhole header pipe. The 16-inch header pipe will connect to AR-5 and terminate just north of existing valve V-7.

U-Trap

A U-trap will be installed to collect and drain condensate from the 16-inch LFG header to an existing leachate cleanout pipe located on the west side of Phase VI.

Lateral, Air, and Condensate Piping

HDPE lateral piping, air piping, and condensate piping will be installed from the LFG header to existing vertical extraction wells and horizontal collectors including HC-7R, HC-6R, LCO-5-1R, EW-10C (new vertical LFG extraction well), EW-10B, EW-11B, HC-5R, and LCO-6-1R.

LFG Vertical Extraction Wells - Replacement and New Well

As a result of the excavation for the sheet pile cut-off wall, existing LFG vertical extraction wells EW-10 and EW-11 will be required to be cut down at or just above the excavation grade. Once the sheet pile has been installed, the excavation area will be backfilled with waste and soil to final cover grades. Extending the existing wells to the final cover grades will be difficult. The wells will likely be damaged during backfilling operations, and the length of perforated pipe will likely decrease. Therefore, EW-10 and EW-11 will be abandoned and replacement wells EW-10B and EW-11B will be installed once the backfilling is complete. An additional new LFG vertical extraction well, EW-10C, will be installed at or near the center of the sinkhole, extending down near the top of the CLSM, to collect LFG within the actual proximity of the sinkhole collapse.

The three LFG extraction wells to be installed are within the sheet pile cut-off wall area. Prior to backfilling the excavation, a 60-mil textured HDPE geomembrane will be installed within and just beyond the limits of the sheet pile cut-off wall. Installation of the geomembrane over the sheet pile area is not required and is a redundant measure for minimizing the potential for leachate to infiltrate into the sinkhole area. In addition, as part of the final cover system, a geomembrane will be installed as a barrier layer to minimize stormwater infiltration into the waste mass, particularly within the area of the sinkhole.

In order to properly install LFG extraction wells EW-10B, EW-11B, and EW-10C, the boring and vertical well piping will need to penetrate the 60-mil textured HDPE geomembrane. The penetrations through the geomembrane will be sealed using a bentonite plug which will extend below and above the elevation of the geomembrane at each of the three well locations. Given that the 60-mil textured HDPE geomembrane is a redundant measure, the final cover system includes a geomembrane barrier layer, and the LFG extraction well penetrations through the 60-mil textured HDPE geomembrane will be adequately sealed with a thick bentonite plug, the LFG well penetrations will not adversely impact the intent or performance of the 60-mil textured HDPE geomembrane.

LFGCCS Effectiveness

The intent of the repairs to the impacted LFGCCS is to restore the system back to the pre-sinkhole LFG collection efficiency. As shown on the design drawings, very little has been revised as compared to the original permitted design drawings. Moreover, an additional LFG vertical extraction well is being provided to further optimize LFG collection within the sinkhole area.

Therefore, based on the original permitted design, the repairs provided in the Stage 5 plan will ensure that the LFGCCS will continue to provide comprehensive LFG extraction, meet the requirements set forth in the site's Title V permit, and minimize the potential for surface emissions.

LONG-TERM PLANS FOR THE AREA IMMEDIATELY SURROUNDING THE SINKHOLE AREA

The long-term fill sequence plan for the Phase VI disposal area is to resume waste filling operations; however, the Facility's fill sequence plans will be modified to show that no additional waste or fill will be placed over the sinkhole area. The modification to the Phases I-VI fill sequence plans will be provided to the FDEP as part of the Facility's permit renewal which will be submitted on or before June 15, 2013.

CONCLUSION

In conclusion, the Stage 5 portion of the Plan is designed to complete the remediation of the sinkhole. Stage 5 has four components: installation of sheet piling, installation of a 60-mil HDPE geomembrane, replacement of the LFGCCS; and installation of a final cover system. The sheet pile will divert existing leachate away from the sinkhole, limiting leachate impacts to the groundwater and underlying soils in the sinkhole area. The 60-mil HDPE geomembrane will encapsulate the sinkhole area, reducing leachate caused by flow of liquid through existing waste due to stormwater or compaction of waste. Replacement LFG piping will be installed to collect gas emissions from the landfill, similar to pre-sinkhole development conditions to reduce landfill gas emissions. Finally, installation of a final cover system will reduce the potential for leachate generation from stormwater flow through the intermediate cover system.

Stage 5 construction is scheduled to start shortly after the Stage 4 remediation work has been completed and related documentation has been submitted to FDEP. The anticipated start for the Stage 4 work is February 4, 2013, with completion scheduled for May 2013. The Stage 5 construction effort is anticipated to begin in the third quarter of 2013.

ATTACHMENT A

TIERRA, INC REPORT

TIERRA

September 6, 2012

HDR, Inc.
5426 Bay Center Drive, Suite 400
Tampa, Florida 33609

Attn: Mr. Richard Siemering, P.E.

RE: Geotechnical Drilling Services
SE County Landfill Stage 5
Hillsborough County, Florida
Tierra Project No.: 6511-12-089

Mr. Siemering:

Tierra, Inc. has completed Geotechnical Drilling Services for the above referenced project. The results of the field tests are presented herein.

As requested, Tierra performed twenty-three (23) Standard Penetration Test (SPT) borings at the subject site. The boring locations were directed by others in the field. The boring locations were survey located by Pickett & Associates, Inc. The boring ground surface elevations were also surveyed and recorded by Pickett & Associates, Inc. The boring locations are shown on the attached **Boring Location Plan (Sheet 1)**. A copy of the survey information provided by Pickett & Associates, Inc. is attached for reference.

The SPT borings were performed with the use of a CME-55 drill rig. The soil sampling was performed in general accordance with ASTM D-1586 - "Penetration Test and Split-Barrel Sampling of Soils". To perform each boring, steel casing was advanced through the existing landfill material to depths ranging from approximately 20 to 45 feet below the existing grades. The soil borings were advanced using mud-rotary wash-drilling methods. The drilling fluid used to advance the casing through the landfill materials was replaced with "clean" drilling fluid prior to advancing the test borings beyond the casing depth.

For Test Borings CLB-3, CLB-6, CLB-10, CLB-14, and CLB-19, samples were taken at 5 foot intervals from the ground surface to approximately 10 to 14 feet above the bottom of the landfill material layer. Continuous 2 foot samples were then taken to several feet into or below the waste phosphatic clay layer, at which point, sampling returned to 5 foot intervals, to the boring termination depths.

7351 Temple Terrace Highway • Tampa, FL 33637
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Florida Certificate of Authorization No. 6486

For all other borings, rotary wash drilling was used from the ground surface down to approximately 10 to 14 feet above the waste phosphatic clay layer. Continuous 2 foot samples were then taken to boring termination depths. The elevation of the top of the waste phosphatic clay (TOC) is provided on **Sheet 1**.

It should be noted that all sampling was performed with the use of an automatic hammer. The *FDOT Soils and Foundations Handbook,* Section 4.1 indicates that SPT N-values obtained during SPT tests performed using an automatic hammer can be converted for design purposes to an equivalent safety hammer N-value by the following relationship:

$N_{ES} = X * N_{AUTO}$

Where:

N_{ES} = The Equivalent Safety Hammer N-value

X = The Equivalent Safety Hammer Conversion Factor

and

N_{AUTO} = The Automatic Hammer N-value

Based on the results of an FDOT study, a value of 1.24 should be used for X in the above relationship.

The soil types encountered during geotechnical explorations at the site and used for the subject study are listed below.

Stratum Number	Typical Soil Description	Unified Soil Classification System Symbol
	Landfill Material (Not Sampled)	---(1)
1	Gray to Light Brown Waste Phosphatic CLAY	CH
2	Gray to Dark Brown Fine SAND to SAND with Silt	SP/SP-SM
3	Brown to Gray Silty-Clayey SAND to Clayey SAND to Sandy CLAY	SM-SC/SC/CL
4	Gray to Green Sandy SILT to Sandy CLAY	MH/CH
5	Weathered Limestone	---(2)
6	Landfill Material Including Soil	---(1)
7	Gray to Brown Fine SAND to Silty SAND with Landfill Material	SP/SM
8	Brown Silty SAND	SM

(1) USCS does not have a classification symbol for Landfill Material
(2) USCS does not have a classification symbol for Weathered Limestone

Representative soil samples collected from the SPT borings were classified and stratified in general accordance with the Unified Soil Classification System. A Geotechnical Engineer based soil stratification on a visual review of the recovered samples and interpretation of the field boring logs. The boring stratification lines represent the approximate boundaries between soil types of significantly different engineering properties; however, the actual transition may be gradual. In some cases, small variations in properties not considered pertinent to our engineering evaluation may have been abbreviated or omitted for clarity. The boring profiles represent the conditions at the particular boring location and variations do occur between the borings. The results of the test borings completed for this study are provided on **Sheets 2 through 5** of this report.

The groundwater level was not apparent in any of the borings. When performing SPT borings, the use of drilling fluid can limit the ability to obtain accurate groundwater table measurements when the groundwater table depth is greater than the depth where the drilling fluid is introduced. As a result, GNA (Groundwater Not Apparent) is indicated on the soil profiles in the attachments.

Tierra, Inc. appreciates the opportunity to be of service to HDR, Inc. on this project. If you have any questions or comments regarding this report, please contact our office at your earliest convenience.

Sincerely,

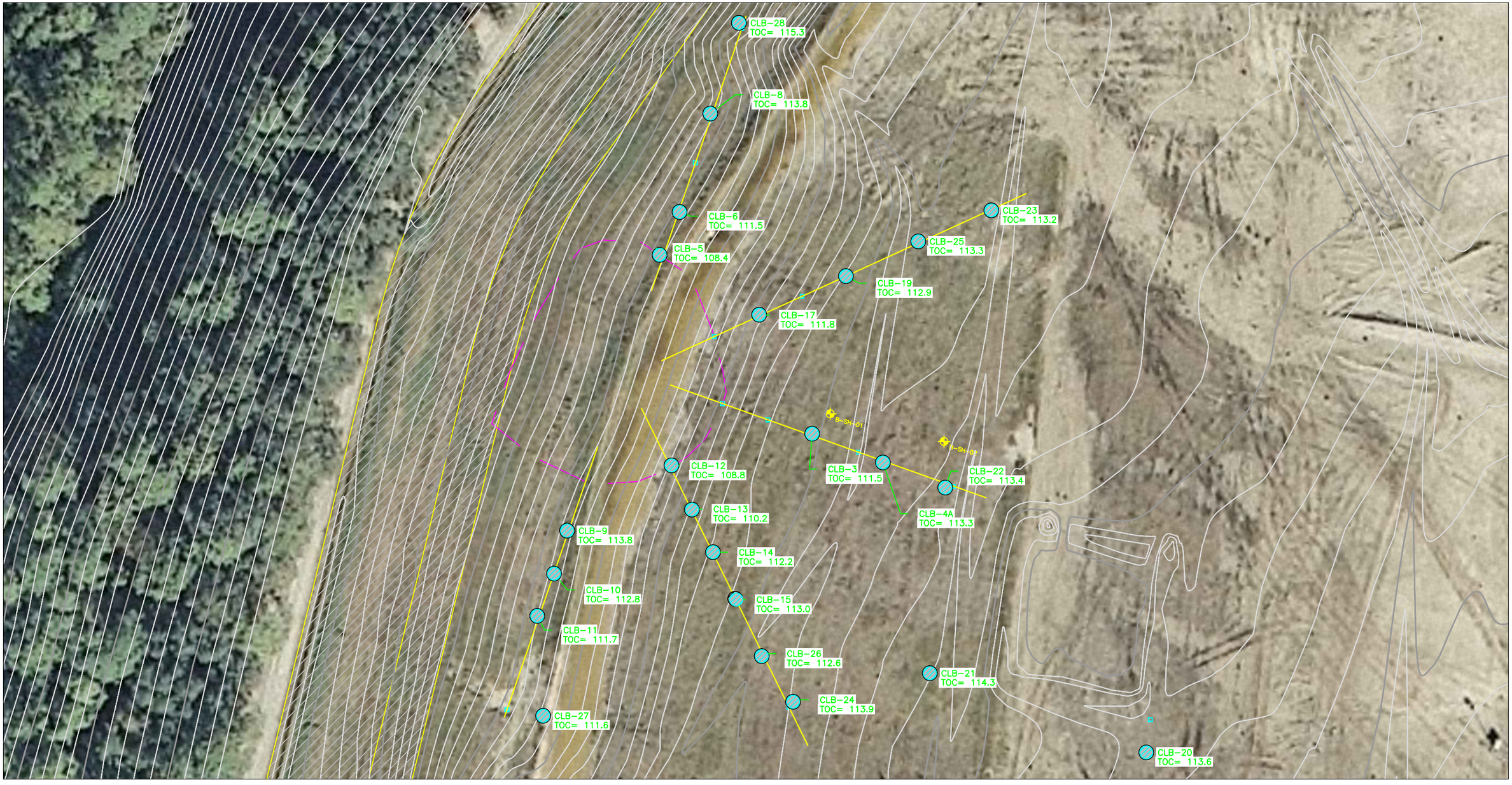
TIERRA, INC.

Danny McBride, E.I.
Geotechnical Engineer Intern

Larry P. Moore, P.E.
Principal Geotechnical Engineer
Florida License No. 47673

Attachments: Boring Location Plan (Sheet 1)
Soil Profiles (Sheets 2 - 5)
Survey Information – Pickett & Associates, Inc.

Cc: Mr. Barry Meyer, P.E. – HDR, Inc.
Mr. Joe O'Neill, P.E. – Civil Design Services



NOTE: BASE MAP PROVIDED BY HDR, INC.

BORING LOCATION PLAN

0 50'

PLAN SCALE

N

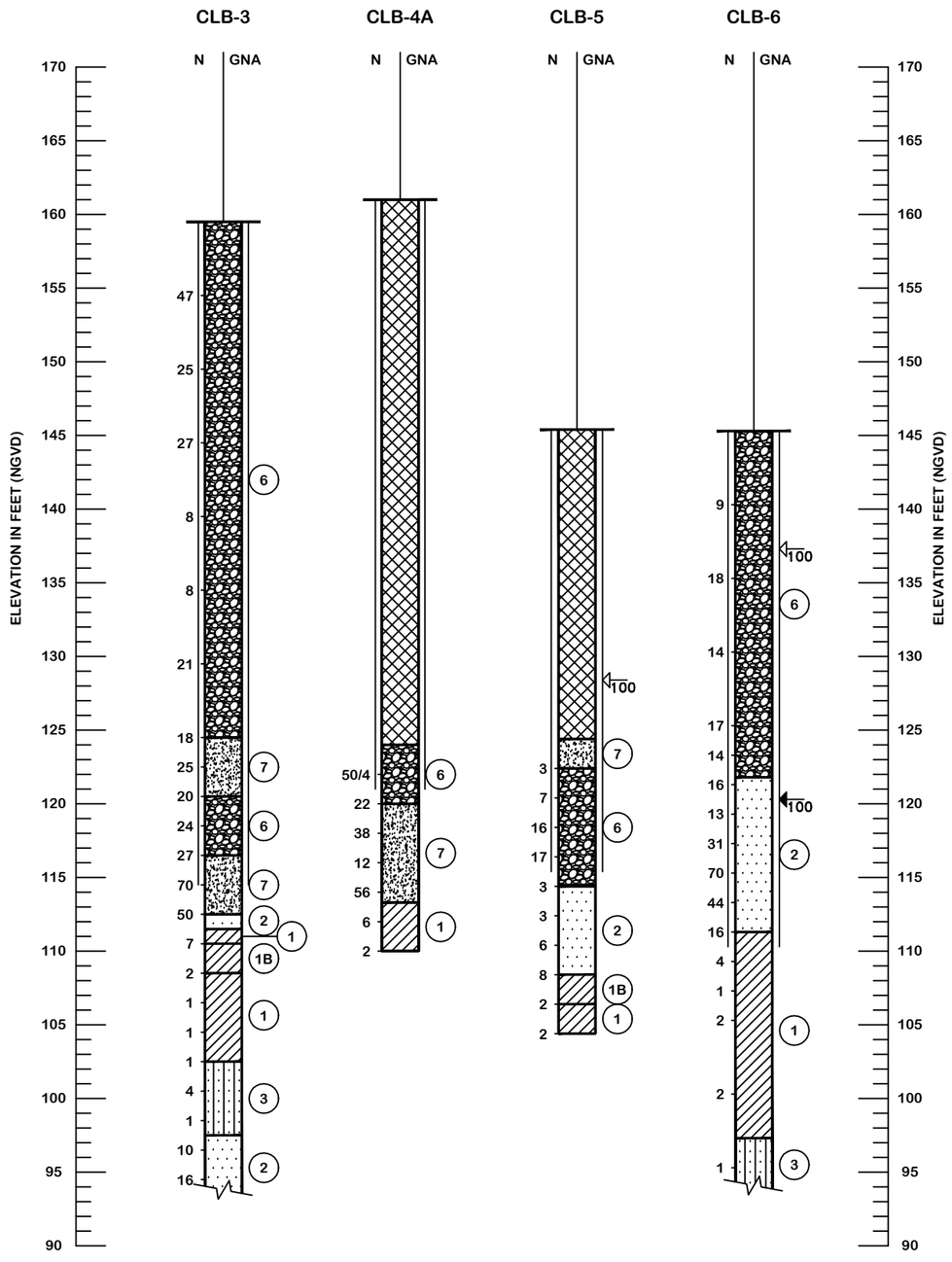
LEGEND

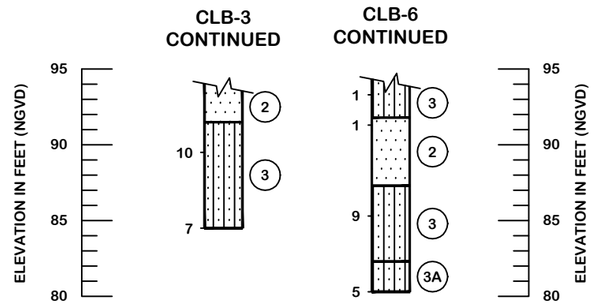
APPROXIMATE LOCATION OF SPT BORING

TOC = 113.30 TOP OF CLAY ELEVATION, FEET (NGVD 29)

DRAWN BY: SW CHECKED BY: DM	APPROVED BY: LPM DATE: AUG 2012	ENGINEER OF RECORD: LARRY P. MOORE, P.E. FLORIDA LICENSE NO.: 47673	TIERRA 7351 Temple Terrace Highway Tampa, Florida 33637 Phone: 813-989-1354 Fax: 813-989-1355 FL Cert. No.: 6486	SCALE: NOTED	PROJECT NUMBER: 6511-12-089	GEOTECHNICAL ENGINEERING SERVICES SE COUNTY LANDFILL HILLSBOROUGH COUNTY, FLORIDA	SHEET 1

SOIL PROFILES





LEGEND

1. GRAY TO LIGHT BROWN WASTE PHOSPHATIC CLAY (CH)
2. GRAY TO DARK BROWN FINE SAND TO SAND WITH SILT (SP/SP-SM)
3. BROWN TO GRAY SILTY-CLAYEY SAND TO CLAYEY SAND TO SANDY CLAY (SM-SC/SC/CL)
4. GRAY TO GREEN SANDY SILT TO SANDY CLAY (MH/CH)
5. WEATHERED LIMESTONE
6. LANDFILL MATERIAL INCLUDING SOIL
7. GRAY TO BROWN FINE SAND TO SILTY SAND WITH LANDFILL MATERIAL (SP/SM)
8. BROWN SILTY SAND (SM)

LANDFILL MATERIAL (NOT SAMPLED)

A - WITH PHOSPHATE GRANULES
B - WITH WOOD/PLANT MATTER

N	SPT N-VALUE IN BLOWS/FOOT FOR 12 INCHES OF PENETRATION (UNLESS OTHERWISE NOTED)
SP	UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D 2488) GROUP SYMBOL AS DETERMINED BY VISUAL REVIEW
GNA	GROUNDWATER LEVEL NOT APPARENT DUE TO DRILLING METHOD USED
50/4	NUMBER OF BLOWS FOR 4 INCHES OF PENETRATION
	CASING
100	LOSS OF CIRCULATION OF DRILLING FLUID (100%)
100	REGAINED CIRCULATION OF DRILLING FLUID (100%)
WR	FELL UNDER WEIGHT OF ROD
WH	FELL UNDER WEIGHT OF ROD AND HAMMER
NGVD	NATIONAL GEODETIC VERTICAL DATUM OF 1929
NOTE:	ALL BORINGS PERFORMED WITH THE USE OF AN AUTOMATIC HAMMER

GRANULAR MATERIALS-RELATIVE DENSITY	SPT N-VALUE (BLOWS/FT.)
VERY LOOSE	LESS THAN 3
LOOSE	3 TO 8
MEDIUM	8 TO 24
DENSE	24 TO 40
VERY DENSE	GREATER THAN 40

SILTS AND CLAYS CONSISTENCY	SPT N-VALUE (BLOWS/FT.)
VERY SOFT	LESS THAN 1
SOFT	1 TO 3
FIRM	3 TO 6
STIFF	6 TO 12
VERY STIFF	12 TO 24
HARD	GREATER THAN 24

NOTE: GROUND SURFACE ELEVATIONS AT BORING LOCATIONS WERE PROVIDED BY THE PROJECT SURVEYOR PICKET & ASSOCIATES, INC.

DRAWN BY: SW
CHECKED BY: DM
APPROVED BY: LPM
DATE: AUG 2012
ENGINEER OF RECORD: LARRY P. MOORE, P.E.
FLORIDA LICENSE NO.: 47673

TIERRA
7351 Temple Terrace Highway
Tampa, Florida 33637
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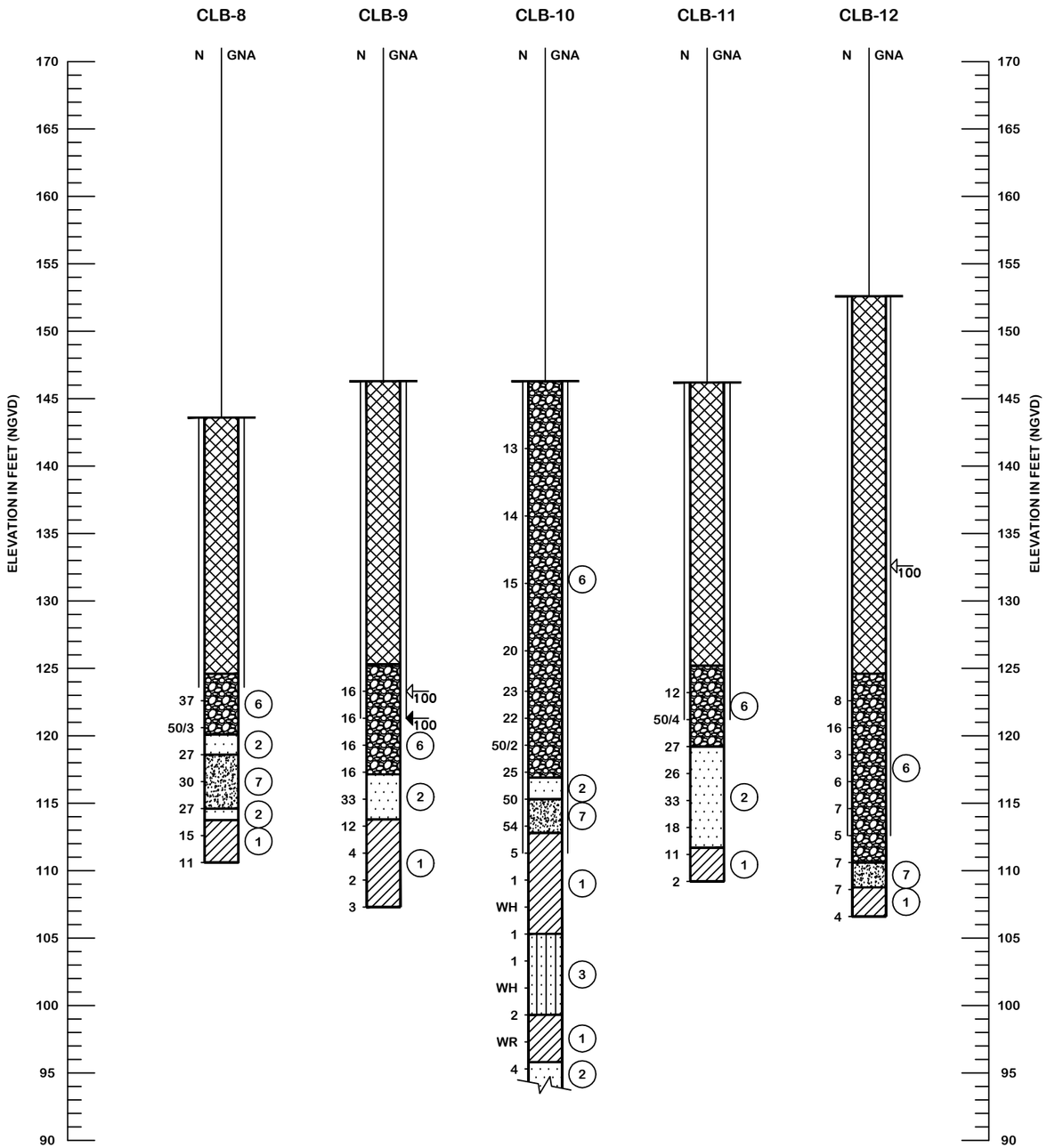
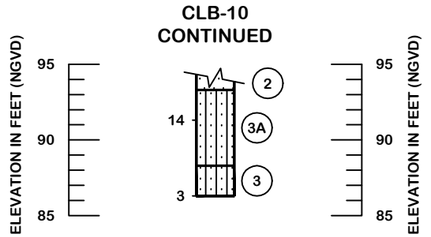
SCALE: NOTED
PROJECT NUMBER: 6511-12-089

GEOTECHNICAL ENGINEERING SERVICES
SE COUNTY LANDFILL
HILLSBOROUGH COUNTY, FLORIDA

SHEET 2

SOIL PROFILES





LEGEND

1. GRAY TO LIGHT BROWN WASTE PHOSPHATIC CLAY (CH)
2. GRAY TO DARK BROWN FINE SAND TO SAND WITH SILT (SP/SP-SM)
3. BROWN TO GRAY SILTY-CLAYEY SAND TO CLAYEY SAND TO SANDY CLAY (SM-SC/SC/CL)
4. GRAY TO GREEN SANDY SILT TO SANDY CLAY (MH/CH)
5. WEATHERED LIMESTONE
6. LANDFILL MATERIAL INCLUDING SOIL
7. GRAY TO BROWN FINE SAND TO SILTY SAND WITH LANDFILL MATERIAL (SP/SM)
8. BROWN SILTY SAND (SM)

LANDFILL MATERIAL (NOT SAMPLED)

A - WITH PHOSPHATE GRANULES
B - WITH WOOD/PLANT MATTER

N	SPT N-VALUE IN BLOWS/FOOT FOR 12 INCHES OF PENETRATION (UNLESS OTHERWISE NOTED)
SP	UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D 2488) GROUP SYMBOL AS DETERMINED BY VISUAL REVIEW
GNA	GROUNDWATER LEVEL NOT APPARENT DUE TO DRILLING METHOD USED
50/4	NUMBER OF BLOWS FOR 4 INCHES OF PENETRATION
	CASING
100	LOSS OF CIRCULATION OF DRILLING FLUID (100%)
100	REGAINED CIRCULATION OF DRILLING FLUID (100%)
WR	FELL UNDER WEIGHT OF ROD
WH	FELL UNDER WEIGHT OF ROD AND HAMMER
NGVD	NATIONAL GEODETIC VERTICAL DATUM OF 1929

NOTE: ALL BORINGS PERFORMED WITH THE USE OF AN AUTOMATIC HAMMER

GRANULAR MATERIALS- RELATIVE DENSITY	SPT N-VALUE (BLOWS/FT.)
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LOOSE	3 TO 8
MEDIUM	8 TO 24
DENSE	24 TO 40
VERY DENSE	GREATER THAN 40

SILTS AND CLAYS CONSISTENCY	SPT N-VALUE (BLOWS/FT.)
VERY SOFT	LESS THAN 1
SOFT	1 TO 3
FIRM	3 TO 6
STIFF	6 TO 12
VERY STIFF	12 TO 24
HARD	GREATER THAN 24

NOTE: GROUND SURFACE ELEVATIONS AT BORING LOCATIONS WERE PROVIDED BY THE PROJECT SURVEYOR PICKET & ASSOCIATES, INC.

DRAWN BY: SW
CHECKED BY: DM

APPROVED BY: LPM
DATE: AUG 2012

ENGINEER OF RECORD:
LARRY P. MOORE, P.E.
FLORIDA LICENSE NO.:
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GEOTECHNICAL ENGINEERING SERVICES
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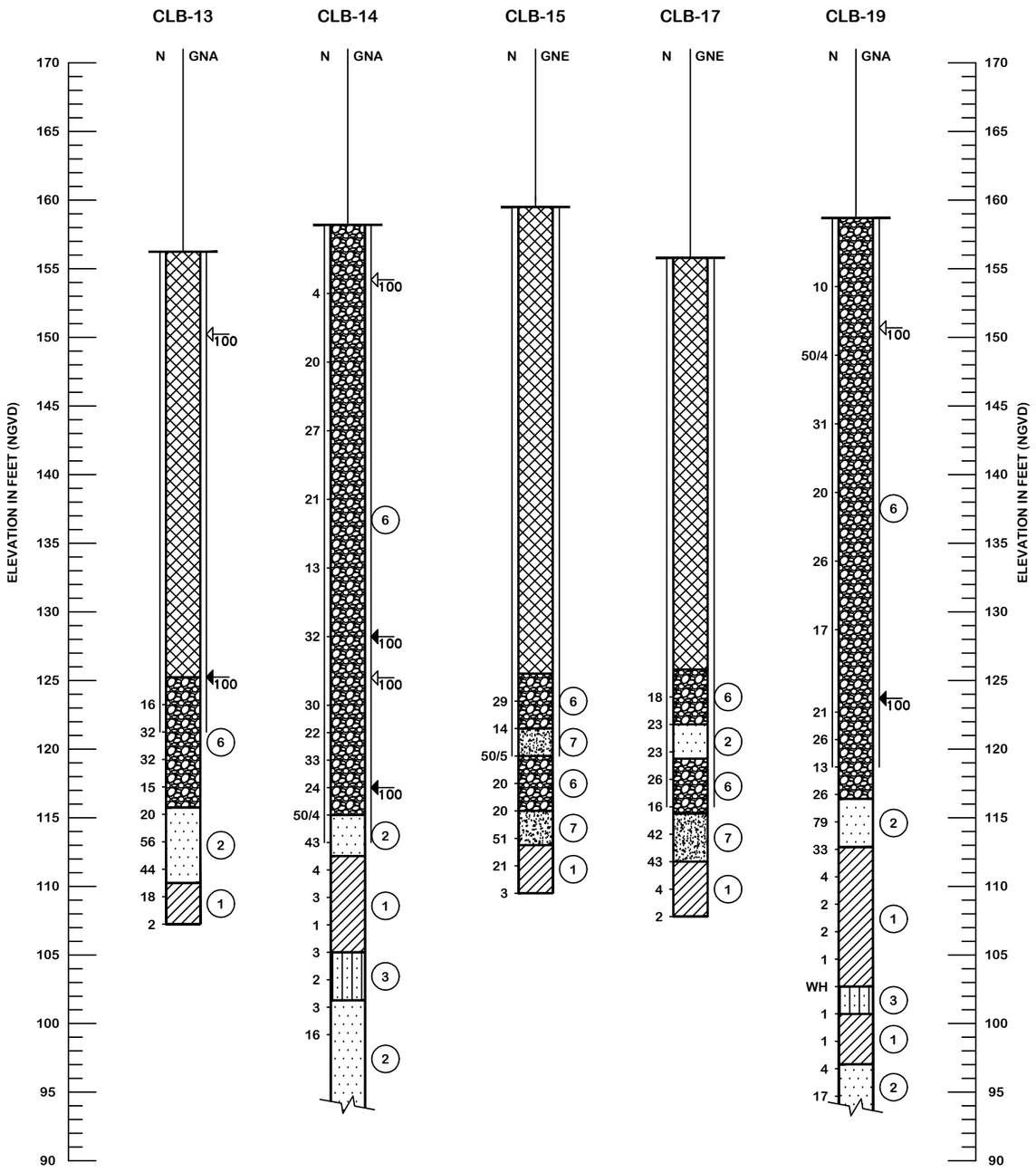
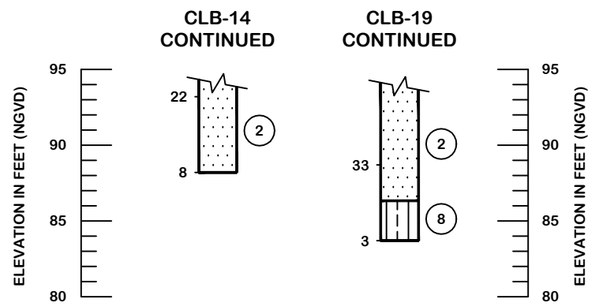
HILLSBOROUGH COUNTY, FLORIDA

SHEET 3

SOIL PROFILES





LEGEND

- LANDFILL MATERIAL (NOT SAMPLED)
- GRAY TO LIGHT BROWN WASTE PHOSPHATIC CLAY (CH)
- 2 — GRAY TO DARK BROWN FINE SAND TO SAND WITH SILT (SP/SP-SM)
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- 4 — GRAY TO GREEN SANDY SILT TO SANDY CLAY (MH/CH)
- 5 — WEATHERED LIMESTONE
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- 7 — GRAY TO BROWN FINE SAND TO SILTY SAND WITH LANDFILL MATERIAL (SP/SM)
- 8 — BROWN SILTY SAND (SM)

A - WITH PHOSPHATE GRANULES
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FIRM	3 TO 6
STIFF	6 TO 12
VERY STIFF	12 TO 24
HARD	GREATER THAN 24

NOTE: GROUND SURFACE ELEVATIONS AT BORING LOCATIONS WERE PROVIDED BY THE PROJECT SURVEYOR PICKET & ASSOCIATES, INC.

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CHECKED BY: DM
APPROVED BY: LPM
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GEOTECHNICAL ENGINEERING SERVICES
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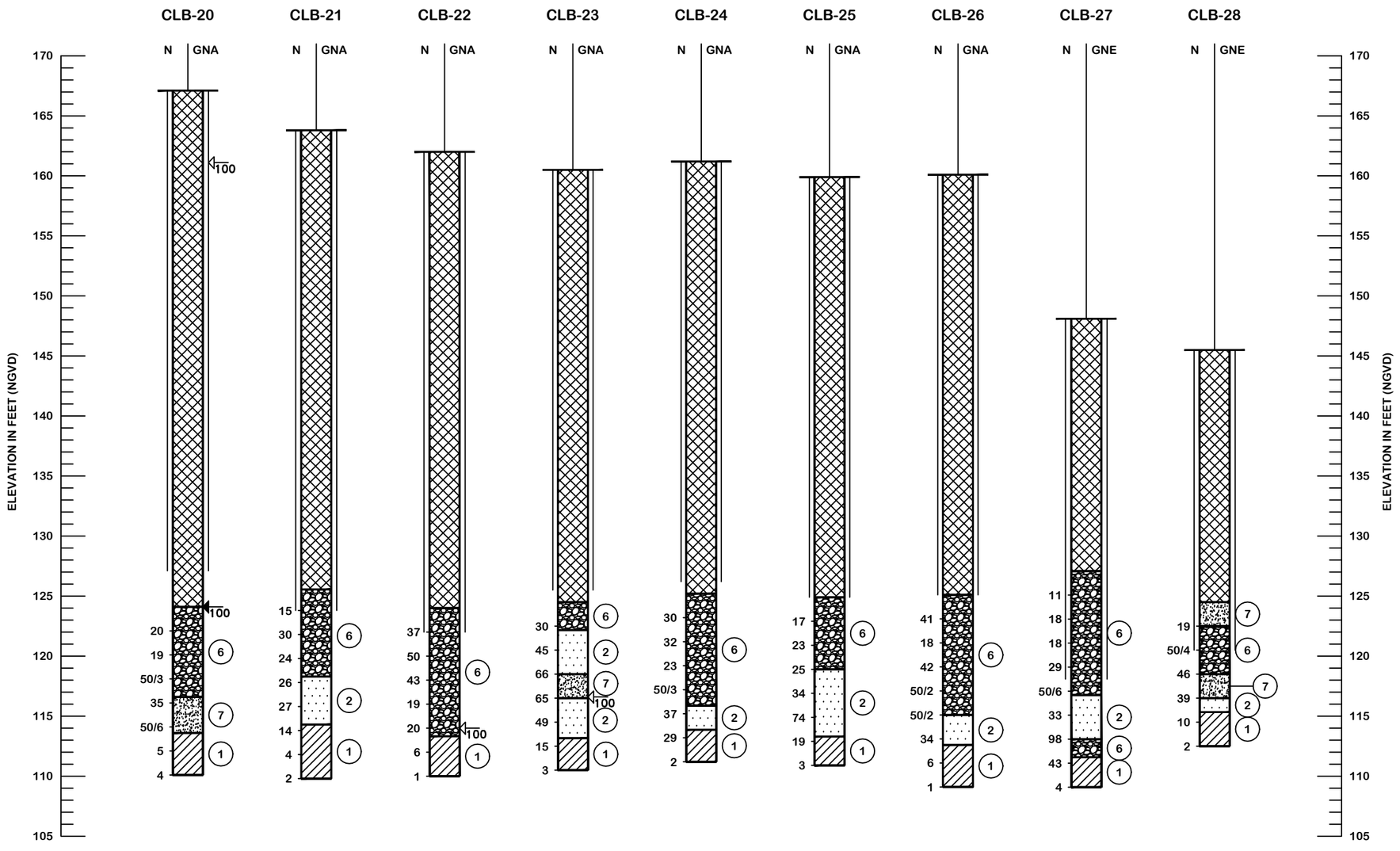
HILLSBOROUGH COUNTY, FLORIDA

SHEET 4

SOIL PROFILES



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6. LANDFILL MATERIAL INCLUDING SOIL
7. GRAY TO BROWN FINE SAND TO SILTY SAND WITH LANDFILL MATERIAL (SP/SM)
8. BROWN SILTY SAND (SM)

LANDFILL MATERIAL (NOT SAMPLED)

A - WITH PHOSPHATE GRANULES
B - WITH WOOD/PLANT MATTER

N	SPT N-VALUE IN BLOWS/FOOT FOR 12 INCHES OF PENETRATION (UNLESS OTHERWISE NOTED)
SP	UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D 2488) GROUP SYMBOL AS DETERMINED BY VISUAL REVIEW
GNA	GROUNDWATER LEVEL NOT APPARENT DUE TO DRILLING METHOD USED
50/4	NUMBER OF BLOWS FOR 4 INCHES OF PENETRATION
	CASING
100	LOSS OF CIRCULATION OF DRILLING FLUID (100%)
100	REGAINED CIRCULATION OF DRILLING FLUID (100%)
WR	FELL UNDER WEIGHT OF ROD
WH	FELL UNDER WEIGHT OF ROD AND HAMMER
NGVD	NATIONAL GEODETIC VERTICAL DATUM OF 1929
NOTE:	ALL BORINGS PERFORMED WITH THE USE OF AN AUTOMATIC HAMMER

GRANULAR MATERIALS-RELATIVE DENSITY	SPT N-VALUE (BLOWS/FT.)
VERY LOOSE	LESS THAN 3
LOOSE	3 TO 8
MEDIUM	8 TO 24
DENSE	24 TO 40
VERY DENSE	GREATER THAN 40

SILTS AND CLAYS CONSISTENCY	SPT N-VALUE (BLOWS/FT.)
VERY SOFT	LESS THAN 1
SOFT	1 TO 3
FIRM	3 TO 6
STIFF	6 TO 12
VERY STIFF	12 TO 24
HARD	GREATER THAN 24

NOTE: GROUND SURFACE ELEVATIONS AT BORING LOCATIONS WERE PROVIDED BY THE PROJECT SURVEYOR PICKET & ASSOCIATES, INC.

DRAWN BY: SW
CHECKED BY: DM

APPROVED BY: LPM
DATE: AUG 2012

ENGINEER OF RECORD:
LARRY P. MOORE, P.E.
FLORIDA LICENSE NO.:
47673

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Phone: 813-989-1354 Fax: 813-989-1355
FL Cert. No.: 6486

SCALE: NOTED

PROJECT NUMBER: 6511-12-089

GEOTECHNICAL ENGINEERING SERVICES
SE COUNTY LANDFILL
HILLSBOROUGH COUNTY, FLORIDA

SHEET 5

SURVEYOR'S REPORT

Southeast Landfill
Survey of Twenty-Four Soil Borings
Hillsborough County, Florida

Prepared for:

HDR | ONE COMPANY *Many Solutions®*

Prepared by:

PICKETT
SURVEYING & PHOTOGRAMMETRY

PICKETT & ASSOCIATES PROJECT NO.: 12131-14
TYPE OF SURVEY: SPECIFIC PURPOSE SURVEY
DATE OF SURVEY: 07/02/12
DATE OF THIS REPORT: 07/03/12
Revision 1: Added Soil Borings CLB-20 & CLB-21

NOTE: THIS REPORT IS NOT VALID WITHOUT THE SIGNATURE AND ORIGINAL RAISED SEAL OF A FLORIDA LICENSED SURVEYOR AND MAPPER.

Pickett & Associates, Inc. • 475 South First Avenue • Bartow, FL 33830 • (863) 533-9095

PROJECT DESCRIPTION

The specific purpose of this project was to locate twenty-four (24) soil borings and determine the elevation of the ground at each location at the Hillsborough County Southeast Landfill.

ACCURACY STATEMENT

All points have an estimated horizontal positional accuracy of 0.10' or less and a vertical positional accuracy of 0.10' or less. All control established in this area is subject to ground settlement. All coordinates and elevations are in US Survey Feet.

DATUM

HORIZONTAL

North and the Coordinates are based on the West Zone of the Florida State Plane Coordinate System, North American Datum of 1983, 1990 adjustment and are based upon provided control referenced to Hillsborough County Horizontal Control Monuments LW-H (PID AG8963) and BY-E (PID AG8747).

VERTICAL

Elevations are to National Geodetic Vertical Datum of 1929 (NGVD29) and are based upon provided control referenced to Hillsborough County Horizontal Control Monument VR-B (PID AG9078), elevation is 103.08' from Hillsborough County's Vertical Control Network.

METHODS

Site control points set for the purpose of this survey were surveyed using Real Time Kinematic (RTK) Global Positioning System (GPS) RTK GPS and were observed at least twice with a new initialization between each observation. Observations have at least 10 minute intervals between them.

Boring coordinates and elevations as listed in Project Results were measured using a Trimble 5600 total station and are based on the site control specified above.

PROJECT RESULTS

CONTROL

POINT# 151399
Set Nail & Disk
stamped "LB 364"
N 1251664.21
E 595291.75
Elevation 126.27'

POINT# 151397
Set 5/8" steel Rod & Cap
stamped "REF. PT. LB 364"
N 1251473.69
E 595210.26
Elevation 130.79'

GROUND ELEVATIONS AT BORING LOCATIONS

CLB-2
N 1251417.67
E 595392.06
Ground Elevation = 158.3'

CLB-3
N 1251410.34
E 595415.47
Ground Elevation = 159.5'

CLB-4A
N 1251395.46
E 595452.13
Ground Elevation = 161.0'

CLB-5
N 1251503.00
E 595336.45
Ground Elevation = 145.4'

CLB-6
N 1251525.21
E 595346.72
Ground Elevation = 145.3'

CLB-8
N 1251576.20
E 595362.71
Ground Elevation = 143.6'

CLB-9
N 1251360.11
E 595288.46
Ground Elevation = 146.3'

CLB-10
N 1251337.84
E 595281.65
Ground Elevation = 146.3'

CLB-11
N 1251315.13
E 595272.93
Ground Elevation = 146.2'

CLB-12
N 1251393.91
E 595342.57
Ground Elevation = 152.6'

CLB-13
N 1251371.03
E 595353.18
Ground Elevation = 156.2'

CLB-14
N 1251348.98
E 595364.05
Ground Elevation = 158.2'

CLB-15
N 1251324.88
E 595375.61
Ground Elevation = 159.5'

CLB-17
N 1251471.97
E 595388.01
Ground Elevation = 155.8'

CLB-18
N 1251481.51
E 595410.11
Ground Elevation = 156.6'

~~CLB-20~~ CLB-21
N 1251286.31
E 595476.47
Ground Elevation = 163.8'

~~CLB-21~~ CLB-20
N 1251245.25
E 595588.73
Ground Elevation = 167.1'

CLB-22
N 1251382.44
E 595484.47
Ground Elevation = 162.0'

CLB-23
N 1251526.11
E 595508.39
Ground Elevation = 160.5'

CLB-24
N 1251271.44
E 595405.55
Ground Elevation = 161.2'

CLB-25
N 1251510.01
E 595470.47
Ground Elevation = 159.9'

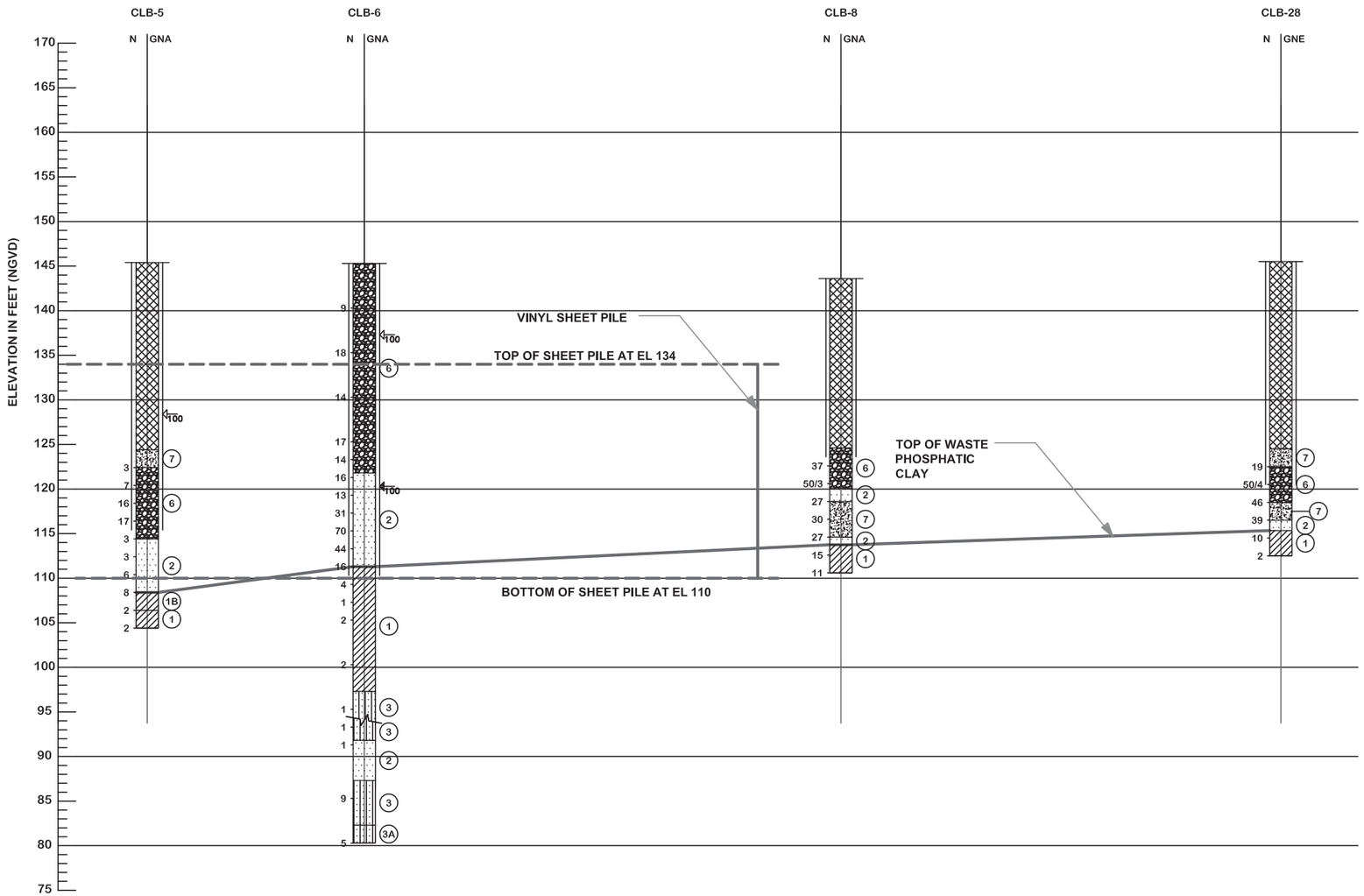
CLB-26
N 1251297.11
E 595389.34
Ground Elevation = 160.1'

CLB-27
N 1251264.22
E 595275.99
Ground Elevation = 148.1'

CLB-28
N 1251623.22
E 595377.52
Ground Elevation = 145.5'

Gregory A. Prather, P.S.M.
Florida Registration No. 5135
Pickett & Associates, Inc.
Florida Registration No. 364

7/2/12
Survey Date



LEGEND

- (1) GRAY TO LIGHT BROWN WASTE PHOSPHATIC CLAY (CH)
- (2) GRAY TO DARK BROWN FINE SAND TO SAND WITH SILT (SP/SP-SM)
- (3) BROWN TO GRAY SILTY-CLAYEY SAND TO CLAYEY SAND TO SANDY CLAY (SM-SC/SC/CL)
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GRANULAR MATERIALS-RELATIVE DENSITY	SPT N-VALUE (BLOWS/FT.)
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VERY DENSE	GREATER THAN 40

SILTS AND CLAYS CONSISTENCY	SPT N-VALUE (BLOWS/FT.)
VERY SOFT	LESS THAN 1
SOFT	1 TO 3
FIRM	3 TO 6
STIFF	6 TO 12
VERY STIFF	12 TO 24
HARD	GREATER THAN 24

NOTE: GROUND SURFACE ELEVATIONS AT BORING LOCATIONS WERE PROVIDED BY THE PROJECT SURVEYOR PICKET & ASSOCIATES, INC.

BORING PROFILE A

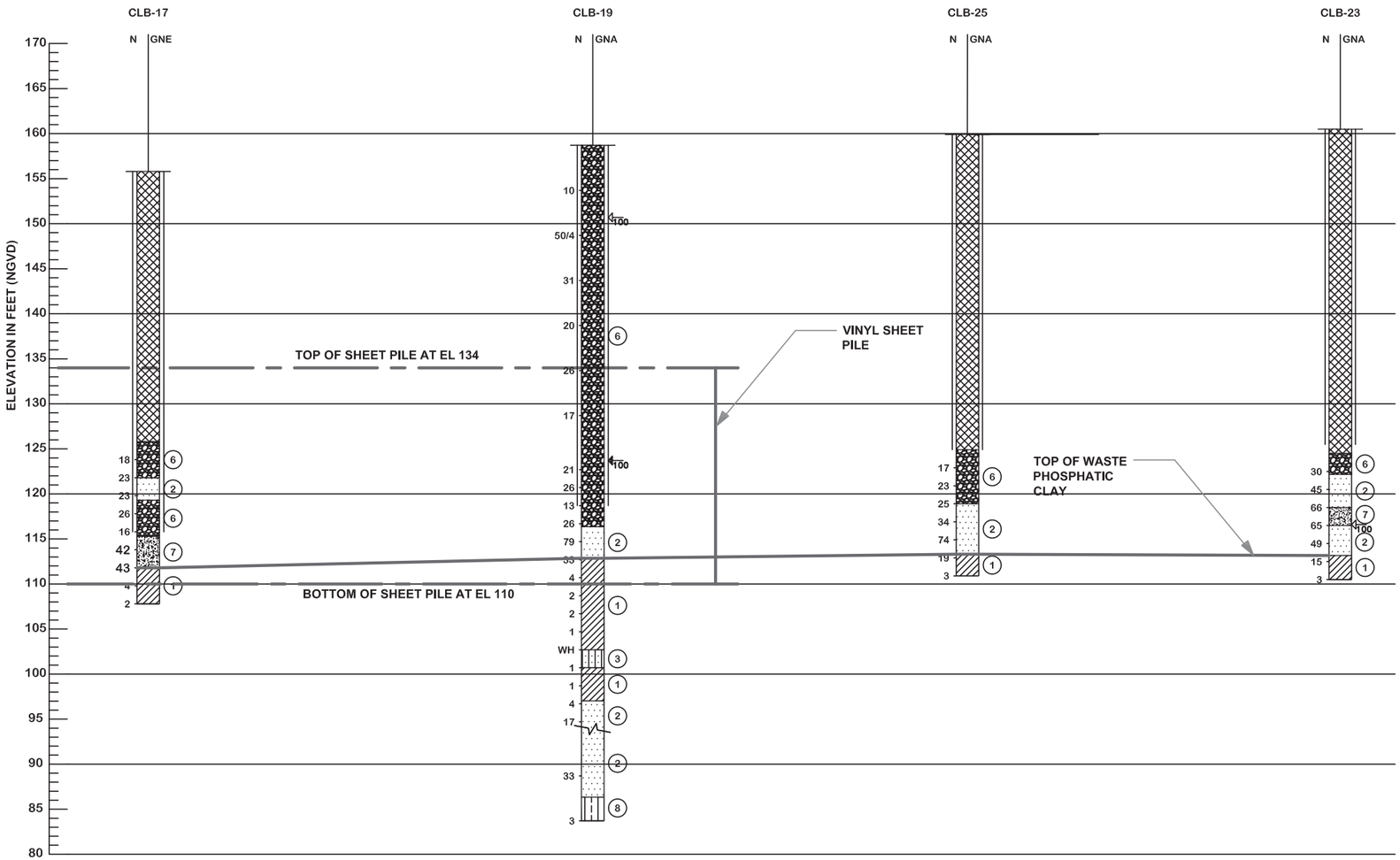
PROJECT NAME & LOCATION:
Stage 5 Report
Southeast County Landfill
Hillsborough County, Florida

ENGINEER:
JOSEPH H O'NEILL, PE
PE No. 52049

SCALE:
NTS

CLIENT NAME:
HDR, INC.

CIVIL DESIGN SERVICES INCORPORATED
11012 N. RIDGEDALE ROAD
TEMPLE TERRACE, FL 33617
(813) 629-1965 OFFICE
(813) 914-7347 FAX
www.civildesignservicesinc.com
CERTIFICATE OF AUTHORIZATION 28923



LEGEND

- LANDFILL MATERIAL (NOT SAMPLED)
- (1) GRAY TO LIGHT BROWN WASTE PHOSPHATIC CLAY (CH)
- (2) GRAY TO DARK BROWN FINE SAND TO SAND WITH SILT (SP/SP-SM)
- (3) BROWN TO GRAY SILTY-CLAYEY SAND TO CLAYEY SAND TO SANDY CLAY (SM-SC/SC/CL)
- (4) GRAY TO GREEN SANDY SILT TO SANDY CLAY (MH/CH)
- (5) WEATHERED LIMESTONE
- (6) LANDFILL MATERIAL INCLUDING SOIL
- (7) GRAY TO BROWN FINE SAND TO SILTY SAND WITH LANDFILL MATERIAL (SP/SM)
- (8) BROWN SILTY SAND (SM)
  - A - WITH PHOSPHATE GRANULES
  - B - WITH WOOD/PLANT MATTER

N	SPT N-VALUE IN BLOWS/FOOT FOR 12 INCHES OF PENETRATION (UNLESS OTHERWISE NOTED)
SP	UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D 2488) GROUP SYMBOL AS DETERMINED BY VISUAL REVIEW
GNA	GROUNDWATER LEVEL NOT APPARENT DUE TO DRILLING METHOD USED
50/4	NUMBER OF BLOWS FOR 4 INCHES OF PENETRATION
	CASING
100	LOSS OF CIRCULATION OF DRILLING FLUID (100%)
100	REGAINED CIRCULATION OF DRILLING FLUID (100%)
WR	FELL UNDER WEIGHT OF ROD
WH	FELL UNDER WEIGHT OF ROD AND HAMMER
NGVD	NATIONAL GEODETIC VERTICAL DATUM OF 1929
NOTE:	ALL BORINGS PERFORMED WITH THE USE OF AN AUTOMATIC HAMMER

GRANULAR MATERIALS-RELATIVE DENSITY	SPT N-VALUE (BLOWS/FT.)
VERY LOOSE	LESS THAN 3
LOOSE	3 TO 8
MEDIUM	8 TO 24
DENSE	24 TO 40
VERY DENSE	GREATER THAN 40
SILTS AND CLAYS CONSISTENCY	**SPT N-VALUE (BLOWS/FT.)**
VERY SOFT	LESS THAN 1
SOFT	1 TO 3
FIRM	3 TO 6
STIFF	6 TO 12
VERY STIFF	12 TO 24
HARD	GREATER THAN 24

NOTE: GROUND SURFACE ELEVATIONS AT BORING LOCATIONS WERE PROVIDED BY THE PROJECT SURVEYOR PICKET & ASSOCIATES, INC.

BORING PROFILE B

PROJECT NAME & LOCATION:
Stage 5 Report
Southeast County Landfill
Hillsborough County, Florida

ENGINEER:
JOSEPH H O'NEILL, PE
PE No. 52049

SCALE:
NTS

CLIENT NAME:
HDR, INC.

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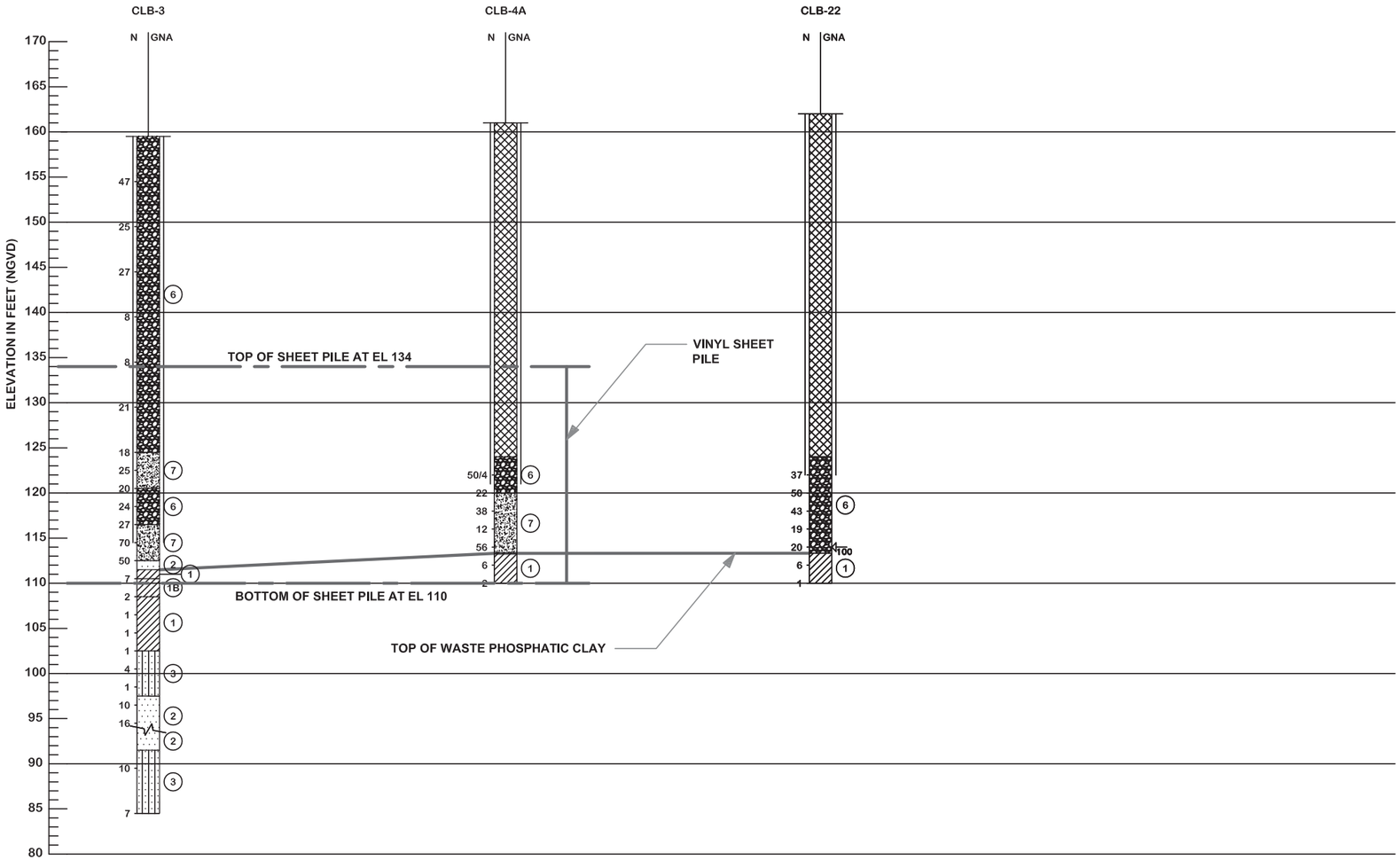

LEGEND

- LANDFILL MATERIAL (NOT SAMPLED)
- (1) GRAY TO LIGHT BROWN WASTE PHOSPHATIC CLAY (CH)
- (2) GRAY TO DARK BROWN FINE SAND TO SAND WITH SILT (SP/SP-SM)
- (3) BROWN TO GRAY SILTY-CLAYEY SAND TO CLAYEY SAND TO SANDY CLAY (SM-SC/SC/CL)
- (4) GRAY TO GREEN SANDY SILT TO SANDY CLAY (MH/CH)
- (5) WEATHERED LIMESTONE
- (6) LANDFILL MATERIAL INCLUDING SOIL
- (7) GRAY TO BROWN FINE SAND TO SILTY SAND WITH LANDFILL MATERIAL (SP/SM)
- (8) BROWN SILTY SAND (SM)

A - WITH PHOSPHATE GRANULES
B - WITH WOOD/PLANT MATTER

N	SPT N-VALUE IN BLOWS/FOOT FOR 12 INCHES OF PENETRATION (UNLESS OTHERWISE NOTED)
SP	UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D 2488) GROUP SYMBOL AS DETERMINED BY VISUAL REVIEW
GNA	GROUNDWATER LEVEL NOT APPARENT DUE TO DRILLING METHOD USED
50/4	NUMBER OF BLOWS FOR 4 INCHES OF PENETRATION
	CASING
100	LOSS OF CIRCULATION OF DRILLING FLUID (100%)
100	REGAINED CIRCULATION OF DRILLING FLUID (100%)
WR	FELL UNDER WEIGHT OF ROD
WH	FELL UNDER WEIGHT OF ROD AND HAMMER
NGVD	NATIONAL GEODETIC VERTICAL DATUM OF 1929
NOTE:	ALL BORINGS PERFORMED WITH THE USE OF AN AUTOMATIC HAMMER

GRANULAR MATERIALS-RELATIVE DENSITY	SPT N-VALUE (BLOWS/FT.)
VERY LOOSE	LESS THAN 3
LOOSE	3 TO 8
MEDIUM	8 TO 24
DENSE	24 TO 40
VERY DENSE	GREATER THAN 40
SILTS AND CLAYS CONSISTENCY	**SPT N-VALUE (BLOWS/FT.)**
VERY SOFT	LESS THAN 1
SOFT	1 TO 3
FIRM	3 TO 6
STIFF	6 TO 12
VERY STIFF	12 TO 24
HARD	GREATER THAN 24

NOTE: GROUND SURFACE ELEVATIONS AT BORING LOCATIONS WERE PROVIDED BY THE PROJECT SURVEYOR PICKET & ASSOCIATES, INC.

BORING PROFILE C

PROJECT NAME & LOCATION:
Stage 5 Report
Southeast County Landfill
Hillsborough County, Florida

ENGINEER:
JOSEPH H O'NEILL, PE
PE No. 52049

SCALE:
NTS

CLIENT NAME:
HDR, INC.

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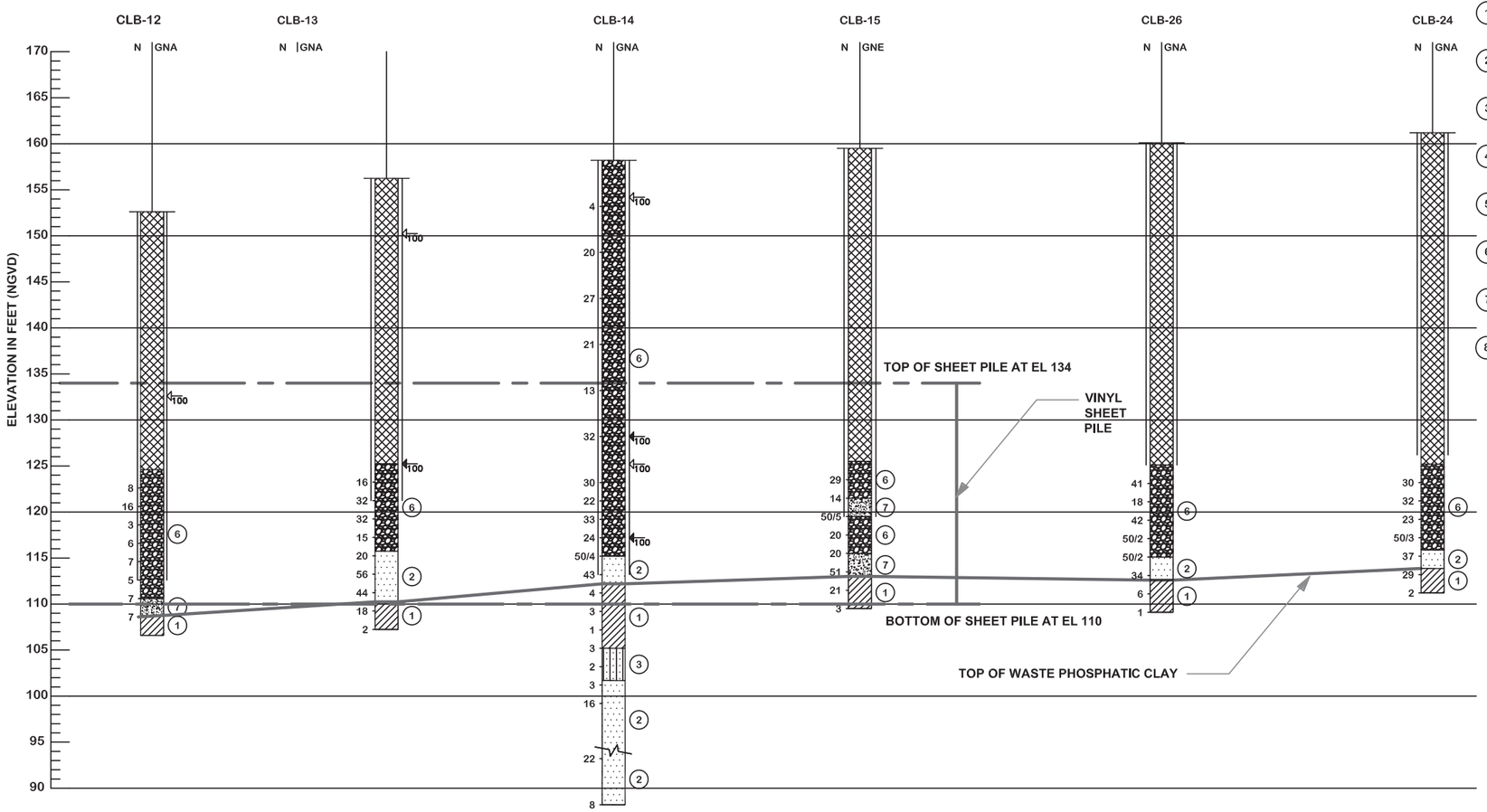

LEGEND

- LANDFILL MATERIAL (NOT SAMPLED)
- (1) GRAY TO LIGHT BROWN WASTE PHOSPHATIC CLAY (CH)
- (2) GRAY TO DARK BROWN FINE SAND TO SAND WITH SILT (SP/SP-SM)
- (3) BROWN TO GRAY SILTY-CLAYEY SAND TO CLAYEY SAND TO SANDY CLAY (SM-SC/SC/CL)
- (4) GRAY TO GREEN SANDY SILT TO SANDY CLAY (MH/CH)
- (5) WEATHERED LIMESTONE
- (6) LANDFILL MATERIAL INCLUDING SOIL
- (7) GRAY TO BROWN FINE SAND TO SILTY SAND WITH LANDFILL MATERIAL (SP/SM)
- (8) BROWN SILTY SAND (SM)

A - WITH PHOSPHATE GRANULES
B - WITH WOOD/PLANT MATTER

N	SPT N-VALUE IN BLOWS/FOOT FOR 12 INCHES OF PENETRATION (UNLESS OTHERWISE NOTED)
SP	UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D 2488) GROUP SYMBOL AS DETERMINED BY VISUAL REVIEW
GNA	GROUNDWATER LEVEL NOT APPARENT DUE TO DRILLING METHOD USED
50/4	NUMBER OF BLOWS FOR 4 INCHES OF PENETRATION
	CASING
100	LOSS OF CIRCULATION OF DRILLING FLUID (100%)
100	REGAINED CIRCULATION OF DRILLING FLUID (100%)
WR	FELL UNDER WEIGHT OF ROD
WH	FELL UNDER WEIGHT OF ROD AND HAMMER
NGVD	NATIONAL GEODETIC VERTICAL DATUM OF 1929
NOTE:	ALL BORINGS PERFORMED WITH THE USE OF AN AUTOMATIC HAMMER

GRANULAR MATERIALS-RELATIVE DENSITY	SPT N-VALUE (BLOWS/FT.)
VERY LOOSE	LESS THAN 3
LOOSE	3 TO 8
MEDIUM	8 TO 24
DENSE	24 TO 40
VERY DENSE	GREATER THAN 40
SILTS AND CLAYS CONSISTENCY	**SPT N-VALUE (BLOWS/FT.)**
VERY SOFT	LESS THAN 1
SOFT	1 TO 3
FIRM	3 TO 6
STIFF	6 TO 12
VERY STIFF	12 TO 24
HARD	GREATER THAN 24

NOTE: GROUND SURFACE ELEVATIONS AT BORING LOCATIONS WERE PROVIDED BY THE PROJECT SURVEYOR PICKET & ASSOCIATES, INC.

BORING PROFILE D

PROJECT NAME & LOCATION:
Stage 5 Report
Southeast County Landfill
Hillsborough County, Florida

ENGINEER:
JOSEPH H O'NEILL, PE
PE No. 52049

SCALE:
NTS

CLIENT NAME:
HDR, INC.

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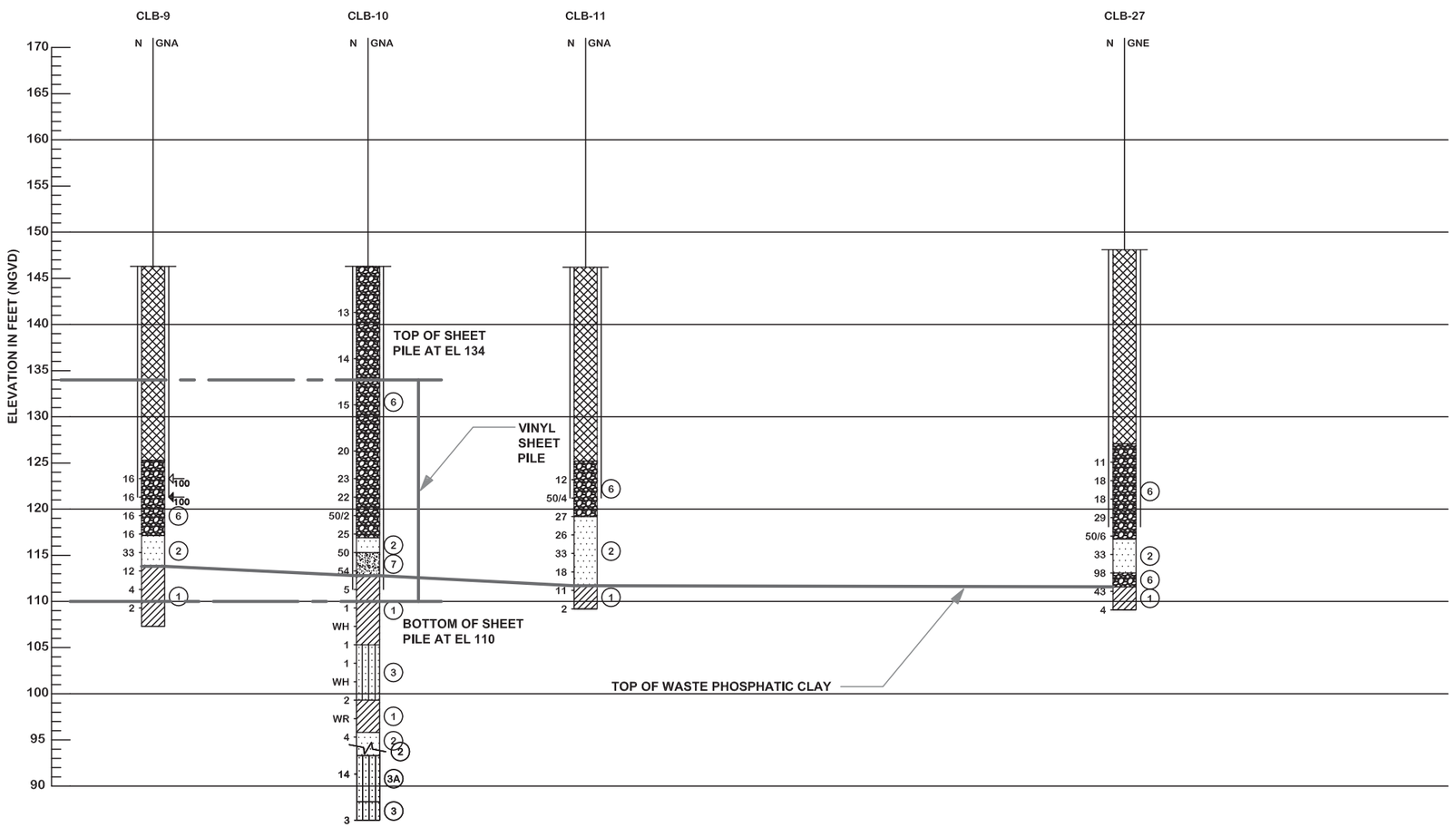

LEGEND

- LANDFILL MATERIAL (NOT SAMPLED)
- (1) GRAY TO LIGHT BROWN WASTE PHOSPHATIC CLAY (CH)
- (2) GRAY TO DARK BROWN FINE SAND TO SAND WITH SILT (SP/SP-SM)
- (3) BROWN TO GRAY SILTY-CLAYEY SAND TO CLAYEY SAND TO SANDY CLAY (SM-SC/SC/CL)
- (4) GRAY TO GREEN SANDY SILT TO SANDY CLAY (MH/CH)
- (5) WEATHERED LIMESTONE
- (6) LANDFILL MATERIAL INCLUDING SOIL
- (7) GRAY TO BROWN FINE SAND TO SILTY SAND WITH LANDFILL MATERIAL (SP/SM)
- (8) BROWN SILTY SAND (SM)

A - WITH PHOSPHATE GRANULES
B - WITH WOOD/PLANT MATTER

N	SPT N-VALUE IN BLOWS/FOOT FOR 12 INCHES OF PENETRATION (UNLESS OTHERWISE NOTED)
SP	UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D 2488) GROUP SYMBOL AS DETERMINED BY VISUAL REVIEW
GNA	GROUNDWATER LEVEL NOT APPARENT DUE TO DRILLING METHOD USED
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GRANULAR MATERIALS-RELATIVE DENSITY	SPT N-VALUE (BLOWS/FT.)
VERY LOOSE	LESS THAN 3
LOOSE	3 TO 8
MEDIUM	8 TO 24
DENSE	24 TO 40
VERY DENSE	GREATER THAN 40
SILTS AND CLAYS CONSISTENCY	**SPT N-VALUE (BLOWS/FT.)**
VERY SOFT	LESS THAN 1
SOFT	1 TO 3
FIRM	3 TO 6
STIFF	6 TO 12
VERY STIFF	12 TO 24
HARD	GREATER THAN 24

NOTE: GROUND SURFACE ELEVATIONS AT BORING LOCATIONS WERE PROVIDED BY THE PROJECT SURVEYOR PICKET & ASSOCIATES, INC.

BORING PROFILE E

PROJECT NAME & LOCATION:
Stage 5 Report
Southeast County Landfill
Hillsborough County, Florida

ENGINEER:
JOSEPH H O'NEILL, PE
PE No. 52049

SCALE:
NTS

CLIENT NAME:
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