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HILLSBOROUGH COUNTY SOUTHEAST COUNTY LANDFILL CAPACITY EXPANSION, SECTION 8 CERTIFICATION OF CONSTRUCTION COMPLETION REPORT RESPONSE TO DEP REQUEST FOR ADDITIONAL INFORMATION

Permit #35453-009-SC

Prepared for:

HILLSBOROUGH COUNTY
SOLID WASTE MANAGEMENT DEPARTMENT
COUNTY CENTER
601 E. Kennedy Boulevard, 24th Floor
Tampa, Florida 33601

JONES EDMUNDS & ASSOCIATES, INC.
324 S. Hyde Park Avenue, Suite 250
Tampa, Florida 33606

JONES EDMUNDS
Certificate of Authorization #1841

May 2006

JONES EDMUNDS

May 1, 2006

Dept. of Environmental Protection

MAY 02 2006

Southwest District

Ms. Susan Pelz, P.E.
Florida Department of Environmental Protection
Southwest District
13051 North Telecom Parkway
Temple Terrace, Florida 33637-0926

Subject: Response to Request for Additional Information
Southeast County Landfill, Hillsborough County
Capacity Expansion Section 8
Certification of Construction Completion
Permit No. 35453-009-SC
Jones Edmunds Project No. 08449-020-01

Dear Ms. Pelz:

On behalf of the Hillsborough County Solid Waste Management Department (SWMD), enclosed are four original copies (signed and sealed by a Professional Engineer, registered in the state of Florida)of the Hillsborough County Southeast County Landfill Capacity Expansion, Section 8, Class I Landfill Certification of Construction Completion, Response to DEP Request for Additional Information, dated May 1, 2006. Please note that only one of the four originals contain the VHS video tape for the video inspection of the leachate collection system pipes.

This response to the subject RAI was delayed to allow for review/discussion of the submittal during our April 27, 2006 meeting. However, time did not allow for the review of the subject submittal. Thus, rather than scheduling another meeting, we are submitting this response to answer your questions. We would prefer, if possible, to resolve any additional issues you may have during your review by providing information directly to you (on an as-needed basis) rather than going through another RAI process.

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Jones Edmunds believes that the enclosed responses to the comments/questions presented in the request for additional information are complete and responsive. Please call us if you have any questions or require additional information.

Sincerely,

Richard A. Siemering
Project Manager

Joseph. H, O'Neill, P.E.
Solid Waste Department Manager

cc: Patricia V. Berry, SWMD
Larry Ruiz, SWMD
Ron Cope, EPC
John Arnold, Jones Edmunds

Enclosures

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HILLSBOROUGH COUNTY
SOUTHEAST COUNTY LANDFILL
CAPACITY EXPANSION, SECTION 8 CLASS I LANDFILL

CERTIFICATION OF CONSTRUCTION
COMPLETION REPORT

RESPONSE TO
DEP REQUEST FOR
ADDITIONAL INFORMATION

Permit #35453-009-SC

Prepared for:

HILLSBOROUGH COUNTY SOLID WASTE MANAGEMENT DEPARTMENT
COUNTY CENTER
601 E. Kennedy Boulevard, 24th Floor
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Prepared by:

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May 2006

MAY 01 2006

Joseph H. O'Neill, P.E.
Florida P.E. No. 52049

HILLSBOROUGH COUNTY
SOUTHEAST COUNTY LANDFILL
CAPACITY EXPANSION, SECTION 8 CLASS I LANDFILL
CERTIFICATION OF CONSTRUCTION COMPLETION REPORT
RESPONSE TO DEP RAI

Permit #35453-009-SC

May 2006

The following information is provided in response to the Florida Department of Environmental Protection (DEP) request for additional information, prepared by Susan J. Pelz, P.E., dated March 17, 2006. Information in this response letter is provided in the order requested in the referenced correspondence. In each case, the DEP request is repeated with the response immediately following.

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ATTACHMENTS

RESPONSES TO COMMENTS

HILLSBOROUGH COUNTY SOUTHEAST COUNTY LANDFILL CAPACITY EXPANSION, SECTION 8, CERTIFICATION OF CONSTRUCTION COMPLETION REPORT (1 VOLUME), DATED FEBRUARY 28, 2006 (RECEIVED MARCH 3, 2006), PREPARED BY JONES EDMUNDS & ASSOCIATES

Comment 1: Section 2, Subgrade.

a. *Please provide a plan sheet that includes all of the subgrade test locations.*

Response 1.a: The enclosed subgrade test location drawings are submitted with this response and to be placed into SCS Engineers' Partial Construction Certification, Volume 1, Attachment 4-2.

b. *Attachment 2-1, Burcaw report dated December 5, 2005. It appears that the material from Whetherington Tractor Service was used for the subbase and not the subgrade. Please provide revised information that includes the moisture-density relationship information in Section 3 for the subbase. Please clarify where the soils from "racetrack and infields road" were used in the project. Please provide a plan sheet that includes the subgrade test locations included in this report.*

Response 1.b: The Weatherington Tractor Service (WTS) borrow pit soils were used for the subbase. Burcaw was contracted by ERC to provide the soil test reports from three potential borrow sites for subgrade and subbase soils for use on the project. However, only the Shelly Lake Mines and WTS borrow pits were used for this project. Soils from the Racetrack and Infield Roads borrow site were not used in the project and were mistakenly placed into the final report.

Soil test results for the subbase soil used from WTS borrow site were provided in the Burcaw report. In addition, Faulkner Engineering conducted additional moisture-density testing as the subbase was being installed. Please refer to testing included in the Jones Edmunds' Report, Section 3.

The plans sheets for the subgrade test locations were prepared by SCS Engineers and a copy of the plan sheets is being submitted with this response letter. These drawings are to be included in Volume 1 of 2, Attachment 4-2, of SCS Engineers certification report.

c. *Attachment 2-2, Subgrade Survey. Please clarify the term "GRND" used on some of the spot elevations.*

Response 1.c: "GRND" refers to a "Ground" spot elevation along the Section 7/8 bottom interface.

Comment 2: Section 3, Subbase (low permeability clay layer).

a. *Attachment 3-1. The Faulkner report dated September 28, 2005 includes a "Sample Location Plan." However, it does not appear that Faulkner samples 21A and 9A are shown on this Figure, and several other sample locations ("TP" and "SCS") do not appear to be addressed in the report.*

Response 2.a: See SCS Engineers' Certification Report, Volume 1, Section 5, Attachment 5-3, Figure 1 for the "Sample Location Plan". The Subbase sample point 9A is shown on Figure 1 and shares the same point as SCS -4. Sample 21A is shown in Figure 1 as sample 21.

TP was used in the field for "Test Pad." However, the lab identified these test samples as point numbers P-1 through P-5 as shown in Qore's CQC test results (e.g., P-1 = TP-1). SCS points SCS-1 through SCS-6 are shown in PSI's CQA test results as Sample Source 1 through 6 (e.g., Sample Source 1 = SCS-1).

b. *Attachment 3-2, Subbase survey. The elevations shown on this survey do not appear to correlate with the design elevations shown on Sheet 5 of 9. In some locations, the elevations are greater than one foot lower than the design elevations. Based on this, the geotechnical evaluations submitted as part of the construction permit application may no longer be valid. Please provide revised settlement and slope stability calculations based on the constructed elevations of Section 8.*

Response 2.b: The contours on the subbase survey as provided in Attachment 3-2 and as compared to the design grades as shown on Sheet 5 of 9 of the permit drawings meet the grading tolerances allowed by the project specifications. Moreover, the survey grade contours were overlaid on top of the contours on Sheet 5 of 9 of the permit drawings and were found to match closely. During our review of point data and contours, we observed no area where the contour elevations varied by 1 foot or more as referenced in your comment. Therefore, we do not believe that revising the settlement and slope stability calculations is warranted. A comparison of the as-built contours versus the design contours for the subgrade and subbase are provided in Attachment 2.b.

Comment 3: Section 4, Geomembrane/Geocomposite installation.

a. *§4.4.4. The report indicates that the criterion for geomembrane seams to pass is four out of five specimens must meet the require yield strengths (shear and peel). However, Specification Section 02776-3.05.B.6. requires that all specimens must meet the required seam strengths. Please revise the narrative as appropriate.*

Response 3.a: The statement that the criterion for geomembrane seams to pass is four out of five specimens must meet the required yield strengths (shear and peel) is contained in the Jones Edmunds' Report, Section 4, Paragraph 4.4.5. This page has been revised (see Attachment R3.a) to reflect that all specimens must meet the required

yield strengths (shear and peel). A review of the destructive seam test results indicate that all five specimens for each test passed the project specifications.

b. *§4.5. Please discuss geocomposite transmissivity testing in this section.*

Response 3.b: Conformance testing results for the geocomposite, including transmissivity results, are provided in SCS Engineers' Report, Section 6. The geocomposite met the project requirements including that for transmissivity. Therefore, no additional narrative is warranted.

c. *Attachment 4-1, Daily Field Reports.*

1) *10/05/05. Please explain how a HDPE pipe was used to "depress swell [sic] floor/shape and adjust grade." Please provide photos of this activity.*

Response 3.c.1): A large-diameter HDPE pipe was used to smooth out grades near the area where the HDPE leachate collection pipe transitioned to meet/match the existing Section 7 leachate collection pipe. Some high points were observed in limited small areas. However, rather than excavate the area and potentially mix subgrade and subbase soils together, the HDPE was used to smooth or "depress" the high point. The pipe used for smoothing out the grade was discarded and not used in the project. A photograph showing the use of the HDPE pipe for smoothing out the grade is included in Attachment R3.c.1.

2) *10/08/05. Please provide photos of the "wet drainage."*

Response 3.c.2): The term "wet drainage" refers to low areas at or near the low points along the south side of Section 8 (sump areas). A photograph showing the wet drainage in included in Attachment R3.c.2.

3) *10/18/05, 10/21/05, 10/27/05, 11/11/05. Please provide photos of the "debris," "sticks, rocks" that were removed from the protective cover soil.*

Response 3.c.3): Small amounts of debris (e.g., sticks and rocks) were sometimes observed in the protective cover soil. The placement of the protective cover soil was closely monitored for such type of "debris" and if observed, was removed from the soil by hand. A photograph showing the small rocks and sticks is included in Attachment R3.c.3.

4) *11/3/05. Please show the location where the "dozer hit geocomposite" on the panel layout drawings. Please provide photos of the damage and repairs.*

Response 3.c.4): The panel layout drawing and testing/repair location drawing as shown in the Jones Edmunds' Report, Section 4, Attachment 4-2 has been revised to

indicate where the dozer hit the geocomposite (middle of Panel 48, approximately 160 feet south of the anchor trench, as shown in Attachment R3.c.4). The geocomposite was lifted off the geomembrane and the geomembrane was inspected for damage. No damage to the geomembrane was observed. The geocomposite was repaired. Photographs of the damaged geocomposite are included in Attachment R3.c.4.

5) 11/9/05. This report indicates that the liner "blew out" on the east separation berm. However the non-destructive testing logs in the QES QA report, Section 6 do not indicate any seam failures on the separation berms. Please explain this inconsistency and provide revised information as appropriate. Please explain why the "blow out" occurred.

Response 3.c.5): The "BERM BLOW OUT" is documented in Section 6 of QES' CQA Report (Enclosure 2), "East Interior Separation Berm" on two separate forms—the NON-DESTRUCTIVE TEST LOG (date – 11/10/05, Panel 1) and GEOMEMBRANE REPAIR LOG (date 11/10/05, Repair No. 1 and R-1 on the separation berm as-built drawings).

The "blow out" occurred at the extrusion weld on the East Separation Berm. The "blow out " was a result of trapped air pressure within the berm being forced out of the toe of slope as the soil was placed over the extrusion welded East Separation Berm. This did not occur on the West Separation Berm since a section was left unwelded, allowing the trapped air to escape. A 2-foot long cap strip was fusion welded to repair the geomembrane rather than re-heating a previously heated fusion welded area.

6) 11/17/05. Please explain the reference to "alternate cover soil." Please provide borrow source testing results for the "alternate cover soil."

Response 3.c.6): The term "alternate cover soil" was used in the daily report to reference soils that had a slightly different color than the previous protective cover soil despite coming from the same borrow source. Upon further assessment, the soils looked similar to that previously received from Shelly Mines. Several times during the course of the project, soils were brought to the site early in the morning and/or coming with a high, initial moisture content which as a result appeared to be darker in color. Upon spreading and drying out of the soils, the colors faded. This is not uncommon. Therefore, no additional testing was required. All the materials came from the same borrow pit.

7) 11/19/05. Please clarify why ERC was "excavating/digging a work pit to work under dozer- [and] QES directed them to line pit with 60 mil HDPE." Please clarify where this activity occurred.

Response 3.c.7): The contractor had a mechanical problem with their dozer and as a result, they needed to work underneath the equipment. To gain more room to work

under the dozer, the contractor dug a small pit (approximately 2 feet deep x 3 feet wide x 4 feet long). For precautionary reasons (e.g., potential leaking fluids), QES recommended that the contractor install a 60-mil HDPE sheet of geomembrane liner under their work area prior to working on equipment that may contain fluid leaks. No leaks occurred and the temporary geomembrane sheet was discarded and not used in the project.

8) 11/25/05. Please clarify what was being dumped outside the east berm.

Response 3.c.8): Top soil was being dumped outside of the east berm for use in repairing/regrading the existing stormwater swale along the east access road.

9) 11/29/05. Please provide photos of the "water leaking through 8" tee ball plug." Please clarify the location of this occurrence.

Response 3.c.9): The use of a pneumatic ball plug requires that the plug be re-inflated at times to provide an adequate seal. However, when the plug slightly deflates, leakage may occur until the plug is re-inflated. Leakage occurred at times at all three locations where the new HDPE leachate collection piping was connected to the existing Section 7 leachate collection piping along the south area of Section 8. A photograph of the tee and ball plug valve is included in Attachment R3.c.9.

10) 12/7/05. Please clarify the reference to "low areas."

Response 3.c.10): After reviewing the surveyed elevations of the tire chip layer, several areas did not meet the specified elevations. These areas were referred to as "low area." Thereafter, QES requested that the contractor add the specified amount of tire chips to all "low areas" and the contractor installed additional tire chips to meet the required grade.

See Response 3.c.2.

11) 12/13/05. Please clarify if the figures at the end of this section are intended to be Section 7 and Section 8. It appears that only Section 7 is provided.

Response 3.c.11): The intent of Figure 1 at the back of the daily field reports is to correlate the leachate collection pipe designations for Section 7 and 8. Leachate collection piping is discussed and shown in the Jones Edmunds' Report, Section 5.

d. *Attachment 4-2, Panel Layouts.*

1) Secondary. Please provide a repair number for the "cap" shown on panels 27/28. Please clarify the location of repair R10 (it appears that two R11 were shown). Please note the location of repair R48. Please clarify the location of SDT-8C *(results for this test were provided in Attachment 4-4). Please clarify the location of R48 (the repair log lists the location as 27-28). Please clarify if the cap from DT-8A to R48 was extrusion welded. Please clarify the location of R89 (the repair logs lists the location as 41-Tie). Please clarify the location of R146 (the repair logs list this as 47-48).*

Response 3.d.1): The repair number for the "cap" shown on panels 27/28 is R44 (see below the word "Cap" on the panel as-built drawing).

R10 is located according to the geomembrane repair log at panel intersection— 2-16-17. The R10 repair as shown at this location on the secondary as-built drawing is a typographical error (indicates two R11s). However, the R10 repair is correctly shown and included in the secondary geomembrane repair log in QES' CQA Report (Enclosure 1).

R48 is documented on both the geomembrane repair log and the secondary as-built drawing at the south end of panels S27/S28.

SDT-8C failed in the field and was not sent to the laboratory. Therefore there is no TRI laboratory result for SDT-8C. SDT-8A and SDT-8B bound the limits of the portion of the failed seams. SDT-8C was mislabeled in the field and was later corrected to SDT-26. The TRI laboratory test result for SDT-26 is included in the revised TRI test report (see Attachment R3.d.1).

The cap from DT-8A to R48 was an extrusion weld and was welded on 9/29/05 by Tech ID V.V., Machine N0. 15 as shown in QES' secondary repair log (Enclosure 1).

QES' CQA Report (Enclosure 1), Section 2 - Secondary Geomembrane Repair Log, shows the geomembrane repair log column <u>PANEL/SEAM ID</u> as 41-tie-in and the column <u>LOCATION</u> is 5' north. This simply means that R89 is located on Panel No. 41, 5 feet north of the south end of panel 41.

The correct location of R146 is Panel No. 46-47, not 47-48. This page of the Secondary Geomembrane Repair Log has been corrected and included in Attachment R3.d.1.

2) *Primary. Please provide photos of the damage from forklift (R57 through R66) and subsequent repairs. Please explain how it was determined that the secondary geocomposite and liner were not impacted by this event. This event does not appear to have been included in the Daily Reports. Please explain.*

Response 3.d.2): The damage to the geomembrane occurred <u>before</u> the geomembrane roll was deployed. The roll puncture damage was caused by the loader forks while unloading the geomembrane rolls. The damage went through some of the rolled layers and thus the full extent of the damage became apparent as the roll was deployed,

thereby requiring small repairs where the forks had damaged the geomembrane. The repair numbers are repairs - R57 through R66. All repairs were fully documented and passed QA testing.

e. *Attachment 4-4, Destructive test results. Please provide the result for SDT-8. Please clarify if "SDS" tests are the same as "SDT" tests. Please provide the results for SDS-26.*

Response 3.e: SDS and SDT are the same identifier (SDS is secondary destructive sample and SDT is secondary destructive test).

See Response 3.d.1 regarding SDT-8C.

Comment 4: Section 5, Leachate collection/detection system.

a. *Attachment 5-1, pipe survey. Please provide a signed and sealed as-built pipe survey.*

Response 4.a: A signed and sealed as-built pipe survey is provided in Attachment R4.a.

b. *Attachment 5-3, woven geotextile. Please provide conformance test results for this material (see CQA Plan §6.2.2.).*

Response 4.b: Conformance test results for the woven geotextile are provided in Attachment R4.b.

Comment 5: Section 6, protective cover installation.

a. *Attachment 6-2, CQA test results. Please specify the company that conducted the permeability test that resulted in hydraulic conductivity = 5.6 x 10–3 cm/sec. Please explain why the drainage sand (protective soil) would include "hard pan." It does not appear that this description correlates with the requirements of Specification 02220-2.05.A. Please provide the complete Qore report. Since Faulkner Engineering Services was a subcontractor to the contractor and provided CQC testing, please explain why the Faulkner summary of test result is included in this Attachment.*

Response 5.a: Ardaman and Associates conducted the CQA permeability testing on the sand sample with a hydraulic conductivity of 5.6 x 10-3 cm/s (reference file number 05-9718 on both the permeability, proctor, and grain size analysis).

"Hardpan" is commonly used to describe soils that have been compacted into a harden soil. However, once reworked, they tend to break down into their original grain sizes. The fact that the drainage sand has some "hard pan" pieces does not affect the permeability of the sample.

"Hard pan" is not a "stone." All other properties match the Specification 02220-2.05A.

A complete copy of the QORE report is included in Attachment R5.a.

A copy of the Faulkner summary of testing must have been mistakenly copied and placed in this section. Please remove from this section.

b. *Attachment 6-3, protective cover soil survey. Please provide a signed and sealed as-built protective soil survey. It appears that the locations of the survey points on this survey do not correlate with the survey points on the clay subbase survey (Attachment 3-2) or the tire chip survey (Attachment 7-1) as required by Specification 01050-3.01.C. Please provide surveys that meet this requirement. Based on a comparison of points on the clay subbase survey and the protective soil survey, it appears that in some locations, the protective soil layer did not meet the thickness requirements of Rule 62-701.400(4)(b), F.A.C., and Specific Condition #9.b.*

Response 5.b: A signed and sealed as-built survey for the protective cover soil is provided in Attachment R5.b. Identical points were established on a maximum 50-foot grid on the clay subbase, protective cover soil, and tire chip surveys. The contractor also provided additional points on all three surveys for grade checks. The grid points were compared for construction quality control so that the minimum thickness requirements were met for the clay subbase, protective cover soil, and the tire chips. Jones Edmunds reviewed the grid point elevations and confirmed the minimum required depths for the clay subbase, protective soil cover, and tire chip layers.

Comment 6: Section 7, Processed tires.

a. *Attachment 7-1, survey. Please provide a signed and sealed as-built tire chip layer survey. Please include an outline of the disposal cell on this survey. See also Comment #5.b., above.*

Response 6.a: A signed and sealed as-built tire chip survey is provided in Attachment R6.a. An outline of the disposal cell is included on the as-built final survey. See Response 5.b regarding verification of the thickness of the tire chip layer.

Comment 7: Section 9, LCS videotape. Please provide a copy of the videotape and Florida Jet Clean report.

Response 7: A copy of the LCS videotape and Florida Jet Clean's Report is included in Attachment R7.

Comment 8: Section 10, Final survey. Please provide a signed and sealed as-built final survey. See also Comment #5.b. above.

Response 8: **A signed and sealed as-built final survey is provided in Attachment R8. An outline of the disposal cell is included on the as-built final survey. See Response 5.b regarding verification of the thickness of the clay subbase, protective cover soil, and tire chip layers.**

Comment 9: Section 11, Photographs.

a. November 2005.

1) 11/1/05. Please clarify if the excavator in this photo is "low ground pressure" equipment. Please clarify how damage was prevented in the layers underlying the excavator. Please provide additional photos of the separation berm construction, including geomembrane welding, testing, etc.

Response 9.a.1): **The excavator as shown in the referenced photograph was used for placing soil on top of the separation berms. The on-site CQA representative observed the excavator at all times while it was within the Section 8 cell to ensure that no rutting or severe twisting/turning occurred that could have potentially jeopardized the integrity of the underlying liner system as a result of the equipment.**

2) 11/3/05. Please clarify if the brown soil on the left of this photo is the protective soil layer.

Response 9.a.2): **The soil to the left in the subject photograph is protective cover soil in a rough grade condition.**

<u>JONES EDMUNDS ENCLOSURE 2, QES CQA REPORT</u>

Comment 10: Section 1, Subbase. Please provide CQA test results for the subbase.

Response 10: **The CQA test results for the clay subbase soil were provided in SCS Engineers' Report, Section 5, Attachment 5-3. The CQA testing of the subbase was completed by PSI (identified as test #1 through test #6)**

Comment 11: Section 2, Secondary geomembrane.

a. Please provide additional photos for this portion of the construction. Photographs may be provided on a compact disk instead of hard copy.

Response 11.a: **Additional photographs of the secondary geocomposite are included in Attachment R11.a.**

b. Non-destructive test logs.

1) *This log (page 4) indicates that seam 52-54 was vacuum box tested. However, the seaming logs (sheet 5) indicate that this seam is a fusion welded seam. Please explain how a double fusion weld is adequately tested by vacuum box. This does not seem to meet the requirements of Specification 02776-3.06.A.1. and 2.*

Response 11.b.1): The seam connecting Panel 52-54 was a short fusion-welded seam covered by a patch and was extrusion welded in accordance with the Secondary Geomembrane Repair Log Panel/Seam ID 52-53-54 (page 5) and then tested with a vacuum box in accordance with the specifications and the CQA plan. The repairs were likely the result of a "burn-out" of the fusion welder. The seam has been seamed and tested in compliance with the specifications.

2) *This log (page 6) indicates that seam 27-tie in was tested by air channel. However, the seaming log (page 4) indicates that this was extrusion welded. Since extrusion welds cannot be tested by air channel pressure testing, please clarify.*

Response 11.b.2): The 27-Tie was initially double fusion welded and passed the air test. However, the CQA monitor and the installer decided to extrude weld the entire south tie-in (Section 7 panels to Section 8 panels). As such, the flap for the 27-Tie was then extrusion welded and then vacuum box tested along with the entire east-west seam connecting the Section 7 panels to the Section 8 panels. The seam is in compliance with specifications.

c. *Repair logs.*

1) *Please clarify the location of R48 (page 2). The comments indicate that it is located at DT-8A, but it does not appear to be shown in this location on the panel layout drawing.*

Response 11.c.1): See Response 3.d.1.

2) *Please clarify the type of repair for R86 (page 4).*

Response 11.c.2): The repair of the area within R86 used a small patch, extrusion weld, and then retested – see R86A.

d. *Destructive test log. Please provide test results for DT-8C. Please clarify the status of test DT-8A. The repair logs (page 2-R48) indicate that this DT failed.*

Response 11.d: See Response 3.d.1.

Comment 12: Section 4, Primary geomembrane.

a. *Seaming logs. Please clarify why there is an entry for seam 51-t1 at 3:00pm (page 5) and at 3:40 pm (page 7).*

Response 12.a: The welding for this seam likely was not performed continuously (e.g., stopped for destructive test sampling) and therefore two separate seaming entries are provided for the one seam. In addition, a destructive sample was taken from the seam which may indicate that during seaming process, the CQA monitor wanted to test a portion of the seam for quality control purposes (i.e. PDT 28 was taken) which would also support two different seaming times.

b. *Non-destructive test logs.*

1) *Please clarify the reference to seam #21-26B (10/5/05, page 2). This seam does not appear to be shown on the seaming logs. Please clarify the type of seam.*

Response 12.b.1): Seam 21-26 was double fusion welded. A short piece of the weld failed (Seam 26B – a 6 foot section) and was repaired (see Primary Geomembrane Repair Log, page 2, R35) and then vacuum box tested (see Seam 21-26A) The majority of the 26- foot long seam passed the initial air testing (See Primary Geomembrane Non-Destructive Testing Log, page2).

2) *Seams 43A-42, 21-7, 21-12 (page 3), 21-25, 24-25 (page 4) are indicated to be extrusion welds. However, the seaming logs indicate that these seams are fusion welds. Please clarify.*

Response 12.b.2): These seams initially failed air testing, were repaired via extrusion welding, and then passed the vacuum box testing.

c. *Repair logs. Please provide photos of repairs R57-R66. Please explain how it was determined (and provide photos as appropriate) that the forklift did not damage the underlying secondary liner and geocomposite. See also Comment #3.d(2).*

Response 12.c: See Response 3.d.2. Photographs showing the repairs were not taken for the subject area and therefore are not available.

Comment 13: Section 6, Interior Separation Berms. Please provide additional photos of the separation berm construction, including welding to primary geomembrane. Please discuss the east berm "blow out" mentioned in the Daily Reports (Attachment 4-1).

Response 13: See Response 3.c.5. Additional photographs of the separation berm construction are provided in Attachment R13.

Comment 14: Section 7, HDPE pipe & protective soil. Please provide CQA test results for the protective soil cover.

Response 14: **The CQA test results for the protective soil cover were provided in the Jones Edmunds' Report, Section 6, Attachment 6-2.**

PARTIAL CONSTRUCTION CERTIFICATION REPORT- CAPACITY EXPANSION, SECTION 8, DATED SEPTEMBER 30, 2005 (RECEIVED MARCH 3, 2006), PREPARED BY SCS ENGINEERS, VOLUME I.

Comment 15: Section 1.

a. *§1.3. Please provide calculations that demonstrate that the revised drainage sand gradation will not result in excessive clogging of the geotextile.*

Response 15.a: **Contained in Attachment R15.a are the geotextile calculations that show that the small revision to the protective soil gradation will not result in excessive geotextile clogging.**

b. *§1.7 Please revise this section to include the requirement for double the frequency for the first 5 acres of liner. Please provide density tests from the soils CQA firm as required by CQA Plan §5.4.*

Response 15.b: **Paragraph 1.7 of SCS Engineers' Report has been modified to reflect the requirement for double the frequency for testing for the first 5 acres of clay subbase (see Attachment R15.b). The density tests from the soils CQC firm are provided in SCS Engineers' Report, Section 5, Attachment 5-3. The required testing frequency for the subbase is two tests per acre, with four tests per acre for the first 5 acres. Therefore, a total of 24 tests were required to be taken to be in compliance with the specifications. A total of 10 density tests were taken on the clay test strip and an additional 24 density tests were performed during the installation of the subbase in order to be in compliance with the specifications, for a total of 34 density tests. All 34 tests as required were provided in SCS Engineers' Report, Attachment 5. Paragraph 5.4 of the CQA plan does not provide a requirement for CQA sampling/density tests. Therefore, CQA density test results for the subbase are not included.**

Comment 16: Section 3, Excavation. Please clarify if Attachment 3-1 is intended to represent the contours shown on Sheet 3 of 9 in the permitted plans.

Response 16: **The referenced Sheet 3 of 9 in the Section 8 permit application represents limits and depth of excavation based on available geotechnical information during design. During actual excavation, phosphatic clay was not encountered below approximately elevation 118 NGVD. This was further evidenced by the dewatering swales cut to approximately elevation 116 NGVD. The areas were proof-rolled and observed by the CQA representatives, which demonstrated adequate yield strength of the soils. No yielding or pumping of the natural soils were encountered. The natural**

soils were identified because small tree stumps and palmetto debris were observed at this elevation. This was the natural ground elevation prior to the area being bermed and filled by the phosphate mining company. This area (the Phase I-VI and Capacity Expansion Area) were used as settlement basins where the waste phosphatic clay slimes were allowed to settle out of the wash water from the mining operations. Hence, waste phosphatic clays will not be present below this elevation unless it is an isolated low point. The low point of the excavation in the northeast corner was excavated to elevation 113.5 NGVD and no clays were observed. Therefore, an engineering judgment was made that since there appeared to be no further lenses of clay below elevation 118 NGVD, the limits and depth of excavation is as shown in SCS Engineers' Report, Section 3, Attachment 3-1. Therefore, Sheet 3 of 9 of the permit application should not be expected to exactly correlate to the survey shown in the referenced Attachment 3-1.

Comment 17: Section 4, Backfill & compaction.

a. *Please provide a survey that includes contours and an outline of the disposal cell.*

Response 17.a: See the final as-built survey in Attachment R.8.

b. *Attachment 4-2, Drawings of testing points per lift. Please provide these drawings.*

Response 17.b: The Drawings for Attachment 4-2, prepared by SCS Engineers for the subgrade test locations are enclosed as part of this Response submittal.

c. *Attachment 4-3, Burcaw/Faulkner test results. Please provide a figure that shows the locations of these test points.*

Response 17.c: See response to 17.b.

Comment 18: Section 5, Subbase.

a. *Attachment 5-1, Survey. Please provide a survey that includes contours and an outline of the disposal cell.*

Response 18.a: An outline of the disposal cell is included on the final as-built survey included in Attachment R.8.

b. *Attachment 5-2, borrow source testing. Please provide a complete copy of the Faulkner borrow source report. Please specify the consolidation stress for the hydraulic conductivity testing.*

Response 18.b: The Faulkner borrow source included in SCS Engineers' Report, Attachment 5-2, contains permeability testing, using EPA Method 9100 and ASTM D

5084, proctor tests, Atterburg limits, and gradation analyses. A copy of the testing consolidation stress used by Faulkner during testing is included in Attachment R18.b. The permeability for the soils are included and meets the project specifications.

c. *Attachment 5-3, CQA results (borrow source).*

1) *Please provide a table or list of test results that correlate with those shown on Figure 1. Please include a north arrow and scale on Figure 1.*

Response 18.c.1): In the CQA test results performed by PSI and as shown in Attachment 5-3, PSI sample Test #1 correlates to SCS -1 as shown on Figure 1, Test #2 correlates to SCS-2 on Figure 1, etc. Therefore, a table is not warranted. Figure 1 has been revised to include a north arrow and scale (Attachment R18.c.1).

2) *Please clarify the source of the material tested by PSI. The descriptions do not appear to correlate with the material used for the subbase. Please specify the consolidation stress of the samples.*

Response 18.c.2): The six samples are actual compacted samples taken from the subbbase material as it was installed on this project. All material used for this project came from the selected borrow source (Weatherington borrow source). All samples were classified as clayey sands (SC) soils. Color is not an engineering property and colors can change within the same borrow source when exposed to air. In addition, the color noted by an on-site technician may vary.

The consolidation stress of the samples is shown in the PSI test reports as "Pore Pressure" (psi). The isotropic consolidation stress is the net difference between the chamber pressure and the back pressure applied to the triaxial permeability testing equipment. The consolidation stresses are shown on the test results and are in compliance with the project specifications.

d. *Attachment 5-4, CQC results.*

1) *Test strip. Please show the locations of samples P1, P2 and P3 on Figure 1 (Attachment 5-3). Please show the location of the test pad on Figure 1 (Attachment 5-3). Since Qore is the soil CQA contractor, please explain why Qore appears to have been contracted by Burcaw to conduct permeability tests.*

Response 18.d.1): The locations of samples P1, P2, and P3 are shown in Figure 1 as TP-1, TP-2, and TP-3 (TP = Test Pad). The location of the 200-foot-by-50-foot test pad was located in the southeast corner of the Section 8 cell (see sample locations TP-1 through TP-6). Burcaw used Qore as a subcontractor for the permeability tests. Burcaw did not have the resources to perform the flexible wall permeability tests.

2) *Please be advised that since ASTM method D5084 was not used, the tests conducted by Qore do not appear meet the requirements of Rule 62-701.400(8)(c) or (d), F.A.C. Please clarify why the description of the materials tested by Qore do not appear to correlate with the borrow source report. Please provide information that demonstrates that adequate hydraulic conductivity testing was conducted on the subbase.*

Response 18.d.2): The letter from Qore for the Flexible Wall Permeability Testing incorrectly states the ASTM reference (D-422) rather than ASTM D 5084. As shown on the actual test reports, ASTM method D 5084 was used for the Flexible Wall Permeability Testing and therefore meets the requirements of Rule 62-701.400(8)(c) and (d), FAC, and is adequate for demonstrating the hydraulic conductivity of the clay subbase. The description of the material/color ranges from an orange clayey sand to a brown sandy clay, depending on the location of the borrow source pit and both can be classified as SC (sandy clay).

Comment 19: Section 6, Geosynthetics.

a. *Attachment 6-2, panel placement logs. It does not appear that these logs correlate with the logs provided in JEA, Attachment 4-3. Please clarify the purpose of these logs.*

Response 19.a: The panel logs in Jones Edmunds' Report supersede the panel logs in the SCS Engineers' Report. Therefore, please disregard the panel logs in the SCS Engineers' Report.

b. *Attachment 6-3, MQA.*

1) *Please explain each column in the summary sheets. Please clarify why some roll numbers are bold text. Please clarify which of these rolls were used on this project (see also "Test Results").*

Response 19.b.1): A heading on top of each column was provided and indicates the geosynthetic material type, testing, and units for the tests. Geocomposite rolls are formed by heat bonding geotextile material on both sides of a central core geonet. The final geocomposite roll number is shown in bold letters for each roll. The individual geotextile rolls and geonet rolls, marked in bold letters, were used to make the final geocomposite rolls and were also tested by the manufacturer. To make sure that the manufacturer conducted testing on the actual individual rolls, or rolls from the same production lot, bold lettering was used to identify the actual rolls used to make the final geocomposite rolls. The rolls with test results bounding the actual rolls were identified from the MQC documentation.

2) *Batch 2, Section 2, geonet. Please provide a legible copy of this section.*

Response 19.b.2): The documentation for Batch 2, Section 2, geonet appears to be legible.

3) *Please clarify why some test results are blank in the lot summary tables.*

Response 19.b.3): The MQC frequency of testing for the geonet and geotextile do not correspond to the geocomposite batch runs. One length of geonet and/or geotextile often make-up several batches/rolls of geocomposite. Therefore, the geonet and geotextile lot testing is not included for all rolls (separate testing frequencies) which explains why some of the lot summary tables are blank.

4) *Please clarify if Batch 7 is the same as Batch 8. Please clarify why Section 4 (geocomposite) of Batch 8 is different from batch 7 when the geonet and geotextile are the same for batches 7 and 8.*

Response 19.b.4): Batch 7 and Batch 8 are different production runs for making complete final rolls of geocomposite. However, some of the same component materials (geotextile and geonet) may have been used during both production runs. The individual lengths of the geotextile and geonet rolls are longer than the length of geocomposite produced in each "Batch" production run. Therefore, the next "Batch" run would be produced with the same materials.

As shown in the Section 4 MQC documentation, Batch 7 was a production run completed on January 11, 2005, for making geocomposite roll numbers 4504242-4504281. As shown in the Section 4 MQC documentation, Batch 8 was a production run completed on January 11, 2005, for the making of geocomposite roll numbers 4504282-4504319.

Geonet and geotextile (lots) were incorporated in separate batch production runs (e.g., 7 and 8) while the final production of the geocomposite resulted in two separate batches. Thus, the test results for the geonet and the geotextile can be identical (same lot) but put together (forming the actual geocomposite) during separate batch runs.

c. *Attachment 6-4, CQA, geocomposite. Please provide test results for each of the tests required by Specifications Tables 02930-1, 2 and 3, and CQA Plan §6.3.3.2. Since there were 8 batches (lots) of geocomposite, please clarify why 8 conformance samples were not taken of the geocomposite.*

Response 19.c: Please refer to the Response 19.b.4 for a discussion on how different batch production runs can used to make groups of final geocomposite rolls. A listing below indicates the different production dates for each batch.

Batch 1 – December 7, 2004
Batch 2 – December 7, 2004 – CQA sample taken on geocomposite roll 4504074

Batch 3 – December 7, 2004 – CQA sample taken on geocomposite roll 4504082
Batch 4 – December 7, 2004 – CQA sample taken on geocomposite roll 4504124
Batch 5 – December 7, 2004
Batch 6- January 11, 2005 – CQA sample taken on geocomposite roll 4504203
Batch 7 – January 11, 2005
Batch 8 – January 11, 2005 – CQA sample taken on geocomposite roll 4504282
Batch 9 – January 19, 2005 – CQA sample taken on geocomposite roll 4504326

CQA testing was conducted as shown above to cover the different production dates of the final geocomposite product. As discussed, the length of the geotextile and geonet rolls are longer than the final geocomposite rolls. Therefore, the individual components were used to make multiple geocomposite rolls.

The testing frequencies in Specification Section 02930 are for MQC/CQC. The CQA frequency for testing for the geonet, geotextile, and fusion of the geotextile/geonet is one per 100,000 square feet. Given that the Section 8 cell is 6.8 acres, only three tests per layer (secondary and primary) are required, totaling six tests for either MQC/CQC or the CQA testing. Therefore, the number of CQA conformance tests performed and provided in SCS Engineers' Report, Attachment 6-4 (six total tests), meets the requirements of the specifications. Both the MQC/CQC and the CQA testing meet or exceed the project specifications.

d. *Attachment 6-7, CQA geomembrane. Please provide test results for oxidative induction time.*

Response 19.d: Contained in Attachment R19.d are the oxidation inductive times and Notched Constant Tensile (NCTL) stress test results supplied by GSE for the geomembrane installed on this project. The OIT and NCTL test results meet or exceed the requirements of the project specifications.

e. *Attachment 6-8, panel placement logs. Please provide legible copies of the information in this section.*

Response 19.e: Please refer to the QES CQA Report, geomembrane placement logs, Enclosure 1 in the Jones Edmunds' Report. The geomembrane placement logs in QES' Report supersedes SCS Engineers' panel placement logs.

f. *Attachment 6-11, repair logs. Please clarify if the information in this section is duplicated in QES Section 2.*

Response 19.f: The repair logs in QES' report supersede SCS Engineers' testing. Please disregard the repair logs in SCS Engineers' report and refer to QES' CQA Report (Enclosure 1).

Comment 20: Section 7, drainage sand, pipe.

a. *Attachment 7-2. Please clarify where corrugated HDPE pipe is used in this project.*

Response 20.a: Corrugated HDPE pipe was not used in the project.

VOLUME II.

Comment 21: Section 8.

a. *Attachment 8-1.*

1) *2/12/05. Please clarify if this photo shows the excavation of phosphatic clay. Please clarify the type of white material in the background.*

Response 21.a.1): The white material in the background of this photograph is the undisturbed sand tailings.

2) *7/22/05. Please clarify the reference to "landfill material" in this photo.*

Response 21.a.2): The reference to "landfill material" is incorrect and should be "backfill material" (soils).

3) *7/27/05. Please explain what the light colored material that appears to be imbedded in the clay layer is.*

Response 21.a.3): The subbase material was excavated from a natural borrow source with some variations in colors. All the testing was completed on the soils from the borrow source and during installation. All tests passed the project specifications.

4) *8/20/05. This photo appears to show notable ruts in the subgrade. However, the photo indicates that the area is "ready for clay." Please explain.*

Response 21.a.4): The comment that the subgrade was "ready for clay" was meant to indicate that the subgrade was at or near the design elevation. Additional compaction occurred before the installation of the subbase.

5) *9/1/05. Please explain what the light colored material that appears to be imbedded in the clay layer is.*

Response 21.a.5): The light-colored material imbedded in the clay material appears to be some slight discolorization of the clayey soil.

6) *9/15/05. Please clarify what the black rectangular object in the eastern portion of the photo is.*

Response 21.a.6): The referenced rectangular object in the eastern part of the photo is vegetation on the side slope of Section 7.

7) *9/20/05. Due to gray material protruding through the orange clay, this photo appears to show the subbase (clay) too thin at the top of slope. Please discuss.*

Response 21.a.7): The gray material sparsely spread out near the anchor trench is not readily identifiable. If the clay subbase were too thin, the dark brown subgrade soils would have been noticeable, not a light gray material. The subbase thickness was surveyed and meets the required 6-inch thickness.

8) *Please provide photos from 9/28/05 through 9/30/05.*

Response 21.a.8): Photographs for 9/28/2005 through 9/30/2005 are provided in Attachment R21.a.8.

b. *Attachment 8-2, Daily Reports.*

1) *Many of these reports indicate multiple pages for a particular date, but only one page was provided. Please review the information submitted and verify if all pages have been provided.*

Response 21.b.1): It appears that all pages have been provided.

2) *2/17/05, 8/25/05. Please clarify why the contractor was primarily concerned about H2S and not methane.*

Response 21.b.2): We cannot answer for the contractor as to why they were primarily concerned with H2S and not methane.

3) *2/18/05, 2/24/05. Please clarify if the geocomposites that were stored on the ground were cleaned prior to storing on tires (up off of the ground).*

Response 21.b.3): Some rolls of geocomposite were temporarily stored on the ground and later moved and stored off the ground. The geocomposite rolls are wrapped in plastic. As such, the actual geocomposite was not subject to dirt or other debris while temporarily stored on the ground.

4) *3/10/05. Please clarify the reference to "install temp weir." Please explain the purpose and specify the discharge location for this weir.*

Response 21.b.4): The reference to the "install temp weir" on the figure attached to the daily report refers to a piece of pipe temporary placed over the discharge structure

in Basin "C." This was temporarily put in place to allow sediment to settle out of the runoff from the Section 8 construction area and not to overflow into the discharge structure and into the lake adjacent to Basin "C."

5) 4/14/05. Please provide a copy of the direct shear test results for the sand referenced in this report.

Response 21.b.5): All required test results for the soils have been provided as required in the project specifications and CQA plan.

6) 4/28/05. Please provide the OIT and stress crack results referenced in this report.

Response 21.b.6): See Response 19.d.

<u>PLAN SHEETS TITLED, SOUTHEAST COUNTY LANDFILL SECTION 8 CAPACITY EXPANSION CONSTRUCTION DRAWINGS (9 SHEETS), DATED FEBRUARY 28, 2006 (RECEIVED MARCH 3, 2006), PREPARED BY JONES EDMUNDS & ASSOCIATES</u>

Comment 22: Please include a description of all changes to the drawings/design in the narrative report (§1.3).

Response 22: See revised narrative in Attachment R22.

Comment 23: Sheet 5. Please specify the changes in Details 5/8 and 6/8.

Response 23: Detail 5/8 provides for the gravel pack around the eastern-most leachate collection, at the toe of the east side slope. The previous design for the gravel pack around the leachate collection pipe did not account for the pipe to be located near the toe of slope. The intent of the design was not altered.

Detail 6/8 provides for a slight change in the configuration of the reducer and wye to account for existing conditions. The intent of the design was not altered.

Comment 24: Sheet 6. Please specify the changes in Detail 6/9.

Response 24: Detail 6/9 provides for as-built conditions of the primary and secondary geomembrane in the southwest corner of Section 8. This tie-in was not provided for in the design documents. Therefore, there is no change in the design.

Comment 25: Sheet 7. Please explain how it was determined that phosphatic clay was not encountered below +118 ft. NGVD.

Response 25: See Response 16.

Comment 26: Sheet 8. Please verify the detail number for the separation berm detail. It appears that there are two Detail 6 on this sheet.

Response 26: There are two Details 6 on this sheet. Revised sheets 5 and 8 with the corrected detail references are provided in Attachment R26.

Comment 27: Sheet 9. Please provide elevations for the tie-in detail shown on this sheet.

Response 27: Elevations for the Section 8 southwest corner tie-in are provided on the final as-built survey.

GENERAL:

Comment 28: It does not appear that all of the deviations shown on the plans are described in the narrative reports (§1.3, JEA; §1.3, SCS, vol.I). Please provide revised narratives that include all changes in the design (e.g., separation berms).

Response 28: See revised narrative in Attachment R22.

Comment 29: It does not appear that CQA testing of the soil materials was conducted in accordance with Rule 62-701.400(8)(b), F.A.C. Please provide soil CQA test results that comply with the requirements of this Rule and CQA Plan §5.4. The Department acknowledges that two permeability test results were provided in JEA Attachment 6-2.

Response 29: CQA and CQC soil testing was performed in accordance with the project specifications, CQA plan, and Rule 62-701.400(8)(b) (e.g., Ardaman, PSI, and Qore).

Comment 30: SCS, Volume I, Section 6. It does not appear that the all of the geosynthetics conformance testing required by the Specifications and CQA Plan were conducted (e.g., see Spec. 02930-3.01.D., 02776-3.02.C., CQAP 6.3.2.2, 6.3.2.3, 6.3.3.2, 6.3.3.3).

Response 30: The geosynthetics conformance testing provided in the original Construction Certification Report and the additional information provided in this Response to RAI No.1 conforms to the project specifications and CQA plan.

ATTACHMENTS

ATTACHMENT R2.b
DESIGN/AS-BUILT CONTOUR COMPARISONS
FOR SUBGRADE AND CLAY SUBBASE

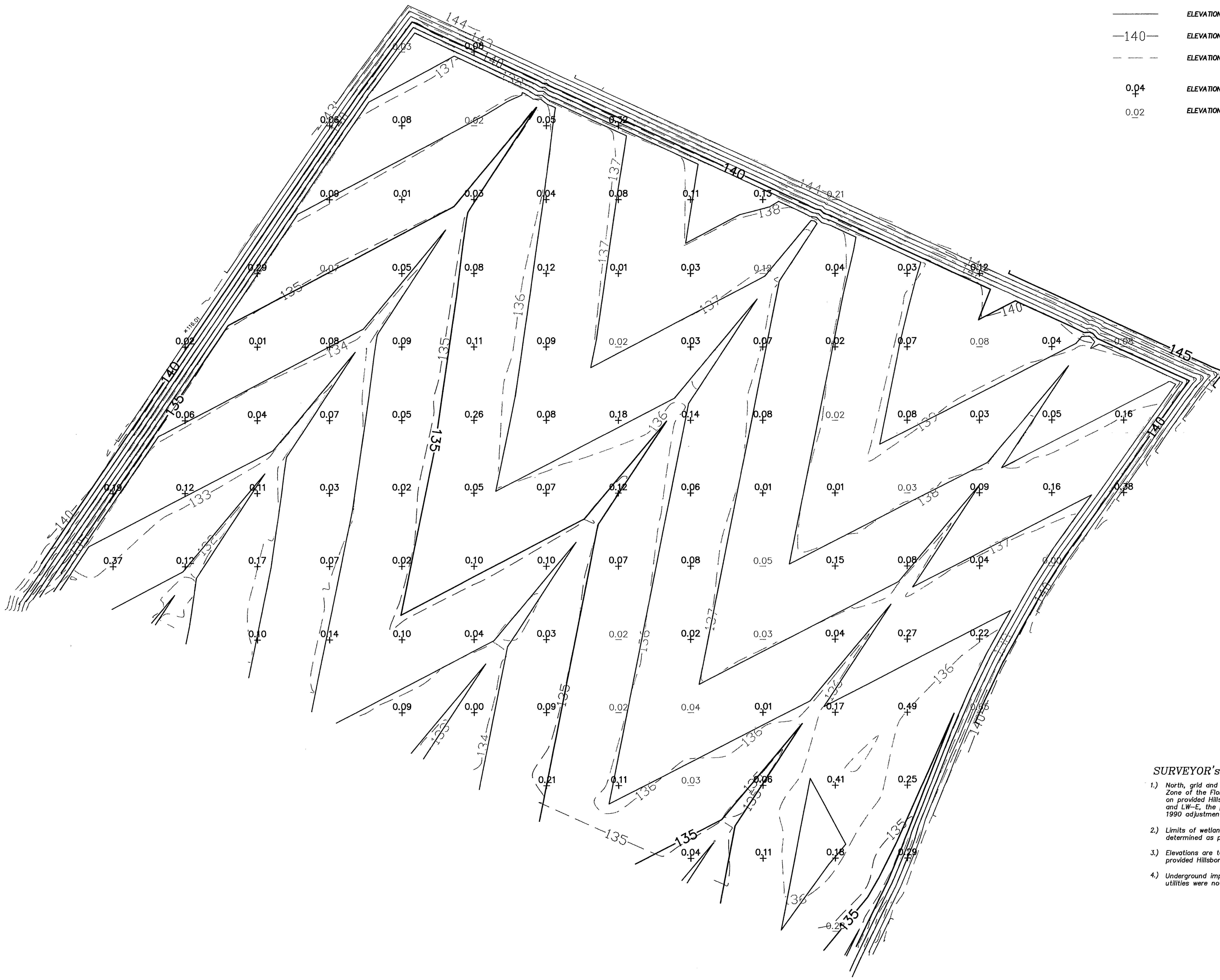
ATTACHMENT R3.a
REVISED PAGES FOR JONES EDMUNDS' REPORT
SECTION 4, PARAGRAPH 4.4.5

1573294 (1)

NORTH
SCALE: 1" = 40'

LEGEND:

ELEV.	ELEVATION
△	CONTROL POINT
923 / 138.42 / 1268	SPOT ELEVATION P&A POINT NUMBER, ELEVATION ERC POINT NUMBER
923 / 138.42 / 1268	SPOT ELEVATION ON TEST PAD P&A POINT NUMBER, ELEVATION ERC POINT NUMBER
—140—	ELEVATION CONTOUR (SCS ENGINEERS' DESIGN) 5 FOOT INTERVALS
———	ELEVATION CONTOUR (SCS ENGINEERS' DESIGN) 1 FOOT INTERVALS
—140—	ELEVATION CONTOUR (PICKETT AS-BUILT) 5 FOOT INTERVALS
— — —	ELEVATION CONTOUR (PICKETT AS-BUILT) 1 FOOT INTERVALS
0.04	ELEVATION DIFFERENCE (HIGHER) BETWEEN AS-BUILT AND SCS ENGINEERS' DESIGN
0.02	ELEVATION DIFFERENCE (LOWER) BETWEEN AS-BUILT AND SCS ENGINEERS' DESIGN



SURVEYOR's NOTES:

1.) North, grid and the Coordinates shown hereon are based on the West Zone of the Florida State Plane Coordinate System, and are based on provided Hillsborough County Horizontal Control Monument LW-D and LW-E, the published values used for this survey are NAD 83 1990 adjustment.

2.) Limits of wetlands under governmental jurisdiction was not determined as part of this survey.

3.) Elevations are to National Geodetic Vertical Datum of 1929 and are based on provided Hillsborough County Horizontal Control Monument LW-D, elevation is 118.68'

4.) Underground improvements, encroachments, foundations and/or utilities were not located as a part of this survey.

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
MAY - 2 2006
SOUTHWEST DISTRICT TAMPA

DEBORAH L. PEAVEY, P.S.M.
FLORIDA REGISTRATION No. 6345
PICKETT AND ASSOCIATES, INC.
FLORIDA REGISTRATION No. LB 364

9/12/05
DATE OF FIELD SURVEY

CLAY SUB-BASE-SECTION 8 EXPANSION

AS-BUILT SURVEY
LOCATED IN SECTION 24, TOWNSHIP 31 SOUTH, RANGE 21 EAST
PREPARED FOR: ERC

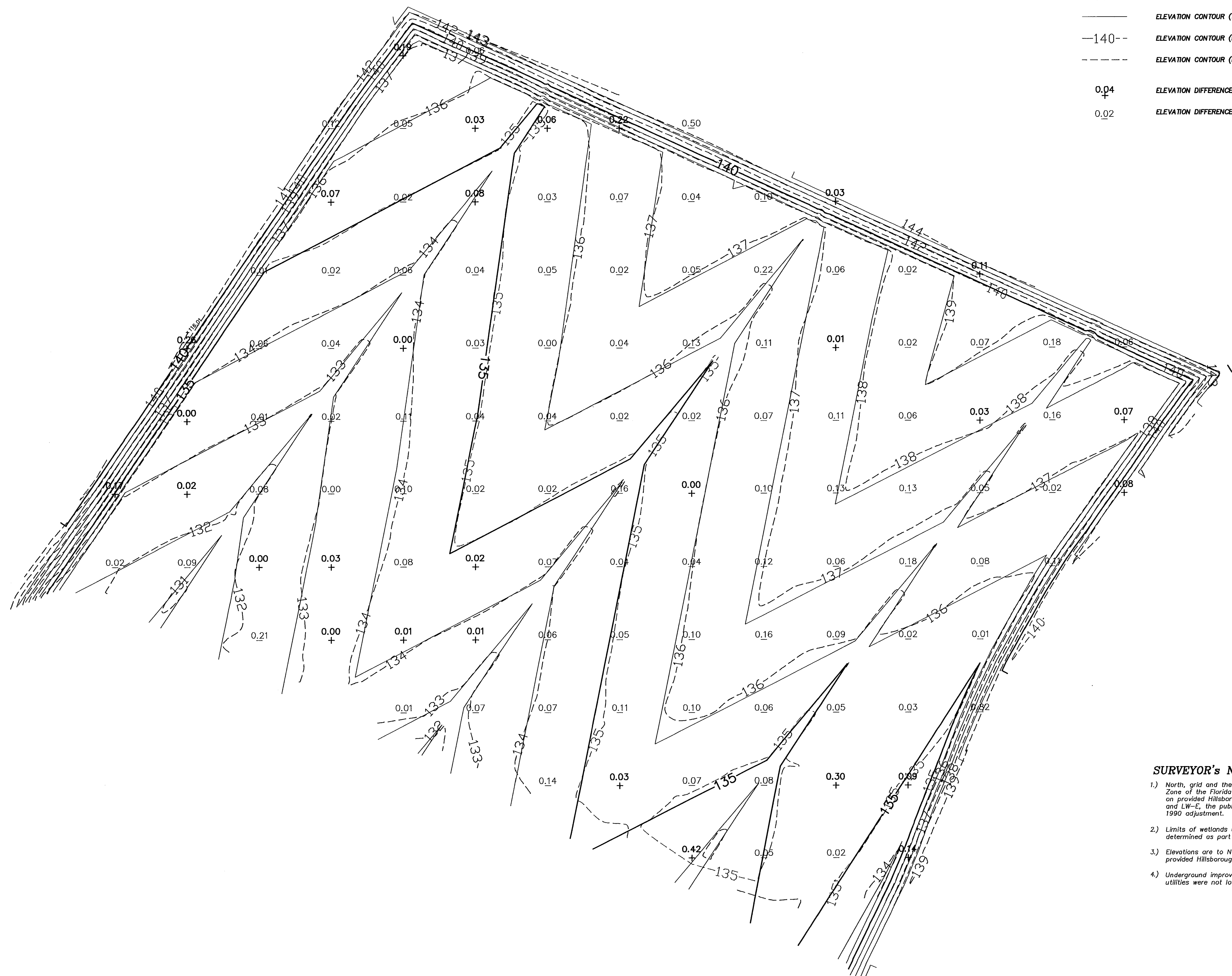
No.	DATE	APPROVED	REVISION
1	9/13/05	D.L.P.	FIRST ISSUE
2	9/20/05	D.L.P.	ADDITIONAL ASBUILT DATA
3	9/26/05	D.L.P.	ADDITIONAL ASBUILT DATA
4	10/6/05	D.L.P.	ADDITIONAL ASBUILT DATA & CONTOURS

NOT VALID WITHOUT THE SIGNATURE AND THE ORIGINAL RAISED SEAL OF A FLORIDA LICENSED SURVEYOR AND MAPPER

PICKETT
SURVEYING & PHOTOGRAMMETRY
PICKETT & ASSOCIATES, INC. LICENSED BUSINESS No. LB364
475 SOUTH FIRST AVENUE, BARTOW, FLORIDA 33830
502 WEST MAIN STREET, WAUCHULA, FLORIDA 33873

HORIZ. SCALE: 1" = 40'	FIELD BOOK(S): 482	CHECKED BY: DLP	DRAWING NAME
VERT. SCALE: N/A	PAGE(S): 136-139	DRAWN BY: DLP	13551-ASB7

PROJECT No.	No.
13551	1
DRAWING No.	OF
LD 3070	1



NORTH
SCALE: 1" = 40'

LEGEND:

ELEV.	ELEVATION
	CONTROL POINT
+ 923 / 138.42 / 1268	SPOT ELEVATION P&A POINT NUMBER, ELEVATION ERC POINT NUMBER
+ 923 / 138.42 / 1268	SPOT ELEVATION ON TEST PAD P&A POINT NUMBER, ELEVATION ERC POINT NUMBER
—140—	ELEVATION CONTOUR (SCS ENGINEERS' DESIGN) 5 FOOT INTERVALS
———	ELEVATION CONTOUR (SCS ENGINEERS' DESIGN) 1 FOOT INTERVALS
—140- -	ELEVATION CONTOUR (PICKETT AS-BUILT) 5 FOOT INTERVALS
- - - - -	ELEVATION CONTOUR (PICKETT AS-BUILT) 1 FOOT INTERVALS
0.04 +	ELEVATION DIFFERENCE (HIGHER) BETWEEN AS-BUILT AND SCS ENGINEERS' DESIGN
0.02	ELEVATION DIFFERENCE (LOWER) BETWEEN AS-BUILT AND SCS ENGINEERS' DESIGN

SURVEYOR's NOTES:

1.) North, grid and the Coordinates shown hereon are based on the West Zone of the Florida State Plane Coordinate System, and are based on provided Hillsborough County Horizontal Control Monument LW-D and LW-E, the published values used for this survey are NAD 83 1990 adjustment.

2.) Limits of wetlands under governmental jurisdiction was not determined as part of this survey.

3.) Elevations are to National Geodetic Vertical Datum of 1929 and are based on provided Hillsborough County Horizontal Control Monument LW-D, elevation is 118.68'

4.) Underground improvements, encroachments, foundations and/or utilities were not located as a part of this survey.

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
MAY - 2 2006
SOUTHWEST DISTRICT TAMPA

DEBORAH L. PEAVEY, P.S.M.
FLORIDA REGISTRATION No. 6345
PICKETT AND ASSOCIATES, INC.
FLORIDA REGISTRATION No. LB 364

8/16/05
DATE OF FIELD SURVEY

SUBGRADE-SECTION 8 EXPANSION

AS-BUILT SURVEY

LOCATED IN SECTION 24, TOWNSHIP 31 SOUTH, RANGE 21 EAST
PREPARED FOR: ERC

PICKETT
SURVEYING & PHOTOGRAMMETRY
PICKETT & ASSOCIATES, INC.

HORIZ. SCALE: 1" = 40'	FIELD BOOK(S): 482	CHECKED BY: DLP	DRAWING NAME 13551-ASB6
VERT. SCALE: N/A	PAGE(S): 129	DRAWN BY: DLP	

NOT VALID WITHOUT THE SIGNATURE AND THE ORIGINAL RAISED SEAL OF A FLORIDA LICENSED SURVEYOR AND MAPPER

No.	DATE	APPROVED	REVISION
1	8/17/05	D.L.P.	FIRST ISSUE
2	8/25/05	D.L.P.	ADDITIONAL AS-BUILT DATA
3	9/26/05	D.L.P.	ADDITIONAL AS-BUILT DATA
3	10/4/05	D.L.P.	ADDITIONAL AS-BUILT DATA & CONTOURS

PROJECT No.	No.
13551	1
DRAWING No.	OF
LD 3050	1

produced bubbles were marked, repaired, and retested.

A summary of nondestructive seam testing, conducted by TRI/Environmental, is presented in QES' CQA Report (see Enclosure No. 2). Nondestructive seam testing information includes the date, panel numbers (indicating which seam was tested), location, Technician ID, CQA representative's initials, and pass or fail designation. Air pressure test results also include start time, start pressure, end time, and end pressure.

4.4.5 Destructive Seam Testing

Jones Edmunds and QES were responsible for the following components of destructive seam testing:

1. Identifying and documenting sample locations.
2. Observing field testing.
3. Labeling and shipping samples for laboratory testing.

QES collected destructive geomembrane seam samples at an approximate frequency of one per 500 linear feet of production seaming. The destructive samples were collected from locations selected by QES' CQA representative. The locations were based on observations made during the day, from past history of the seamer and machine, and from the seam location itself.

When a potential sampling site was identified, a sample was cut into four parts; one for laboratory testing, one for Owner's archives, and two for the geomembrane installer (one for field test one for their archive).

Destructive testing consisted of shear strength tests which were performed on five specimens from each sample in accordance with ASTM D 6392-99. The acceptance criteria for the bond seam (shear) strength test for all welds was that ~~four~~all~~-of the~~ five specimens must have a yield strength of at least 120 pounds-per-inch without failure occurring within the weld. Peel adhesion acceptance for fusion welds required four out of five specimens to meet a minimum value of 90 pounds-per-inch without failure. The criteria for the adhesion peel test for extrusion welds was a minimum strength of 78 pounds-per-inch and all samples had to meet strength value. These test values were taken from the manufacturer's specified minimum value for the test.

The total length of geomembrane seams for both the primary and secondary was 29,002 linear feet (Secondary 14,626.5 LF; Primary 14,375.5 LF). Based on a destructive sampling/testing frequency of one sample per 500 linear feet of seam, a minimum number of 58 destructive samples would be needed to meet the project specifications. A total of 32 initial destructive samples (not including retests for failures) were tested for the secondary geomembrane liner and 29 initial destructive samples (not including retests for failures) were tested for the primary geomembrane liner (a total of 61 samples - see Enclosure No. 2). Two (secondary geomembrane only) of the 61 samples failed lab testing. These two seam failures were then tracked at least 10 feet to each side of the failing test until passing results were achieved in the field and then destructive seam samples were sent in for testing. The failed seams were repaired and retested and passed both field testing and laboratory testing. All destructive testing of geomembrane seams were performed by TRI Environmental, Inc. in Austin, Texas. A summary of all destructive tests is provided in QES' CQA Report (see Enclosure No. 2). Laboratory test results (Test ID – P=primary geomembrane and S=secondary geomembrane) for the destructive test samples are provided in Attachment 4-4 of this Report.

4.4.6 Defect and Repair Monitoring

Panels were visually examined for damage during deployment and on an ongoing basis throughout the installation process. Defects found on the geomembrane panels and seams were marked and documented by the CQA representative and were repaired by GSI. The repaired portion of the seam was reconstructed in accordance with the project specifications.

Typical geomembrane repairs consisted of:

1. Patching holes created by cutting field seams for nondestructive air testing and for destructive test samples.

2. Repairing imperfections or defects encountered in the geomembrane during visual inspections.

3. Repairing field seams identified by failed nondestructive tests, or seams requiring additional reconstruction.

4. Repairing cross seams at panel intersections where fusion welding machines could not provide a proper welded seam.

5. Repairing seams where GSI performed internal QC testing, location of burnouts caused by slowed fusion welding machines, and the intersection of irregularly shaped panels such as comers and tie-ins.

Repairs were observed and documented by the QES' CQA field technician. A summary of defects and repairs for the geomembrane liner system are presented in the repair logs contained in QES' CQA Report (see Enclosure No. 2).

4.4.7 Formal Walk-Through Inspections

The geomembrane was inspected in sections to verify that all liner installation data was collected and to verify that all destructive testing and repairs were successfully completed. GSI's superintendent, Jones Edmunds' project representative, and QES' CQA representative performed these walk-throughs for every section of liner installed prior to allowing the installation geocomposite and protective soil cover.

4.5 GEOCOMPOSITE PANEL PLACEMENT (SECONDARY AND PRIMARY)

On top of both the secondary and primary geomembranes, a geocomposite was installed. The geocomposite, manufactured by Tenax, Inc., consisted of a HDPE geonet (Triplanar) with a 6 oz/sy geotextile adhered to both sides of the geonet. Additional information and conformance testing for the geocomposite is provided in SCS Engineers' Report (see Enclosure No. 1).

After the installation and testing of the geomembrane was completed, the geocomposite panels were deployed and installed. Each geocomposite panel was overlapped 6-inches over the adjacent panel (6-inch overlap for geotextile and 4-inch overlap for the geonet) and the geonet was tied together with nylon straps. The top geotextile was machine sewn together and laid flat to minimize the potential for soil or sediment infiltration into the geonet. Each geocomposite panel was inspected to make certain that no excessive slack was apparent so as not to "fold-over" during loading.

The geocomposite panels were generally deployed and installed from east to west in the cell. A geocomposite placement log is provided in QES' CQA Report (see Enclosure No. 2) for the secondary liner, primary liner, and separation berms.

ATTACHMENT R3.c.1
PHOTOGRAPH OF HDPE PIPE

Response 3.c.1, 10/05/2005 – Southeast County Landfill, Section 8 Capacity Expansion, Hillsborough County, Florida
Use of scrap HDPE pipe to smooth grades.

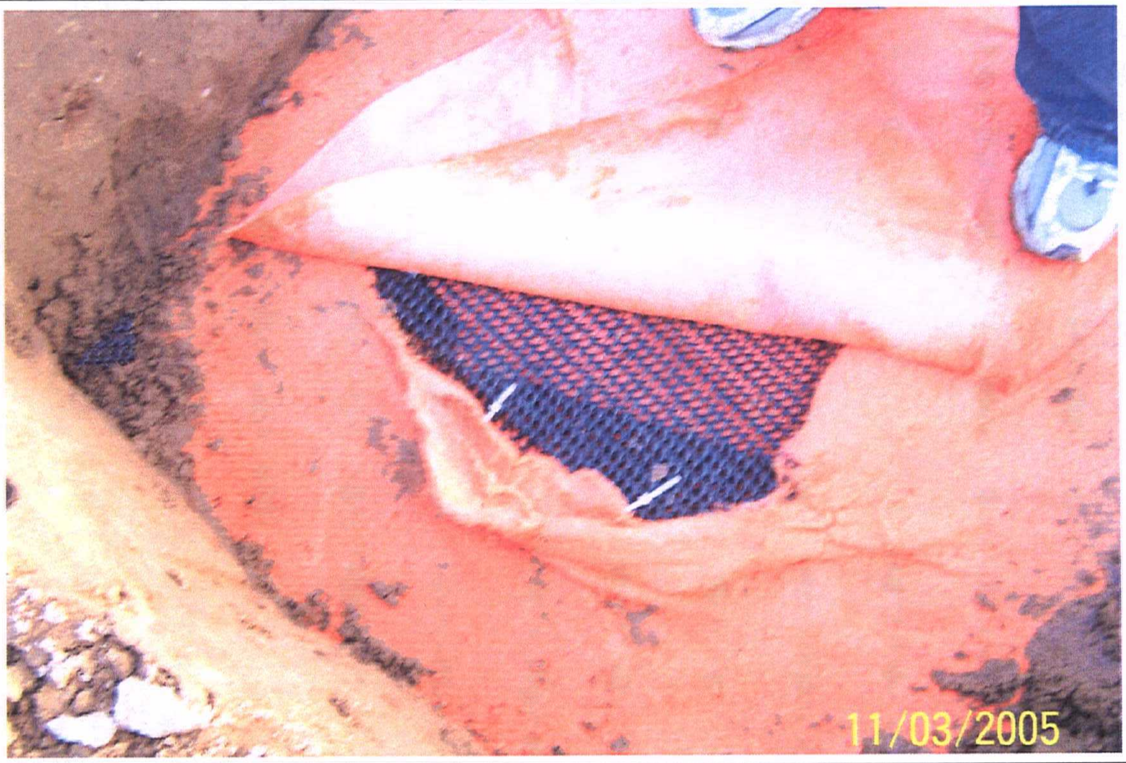
ATTACHMENT R3.c.2
PHOTOGRAPH OF WET DRAINAGE

Response 3.c.2, 10/08/2005 – Southeast County Landfill, Section 8 Capacity Expansion, Hillsborough County, Florida
"Wet Drainage" on top of geocomposite.

ATTACHMENT R3.c.3
PHOTOGRAPH OF SMALL ROCKS AND STICKS

Response 3.c.3, 10/18/2005 – Southeast County Landfill, Section 8 Capacity Expansion, Hillsborough County, Florida
Workers picking out small amounts of debris from protective cover soil.

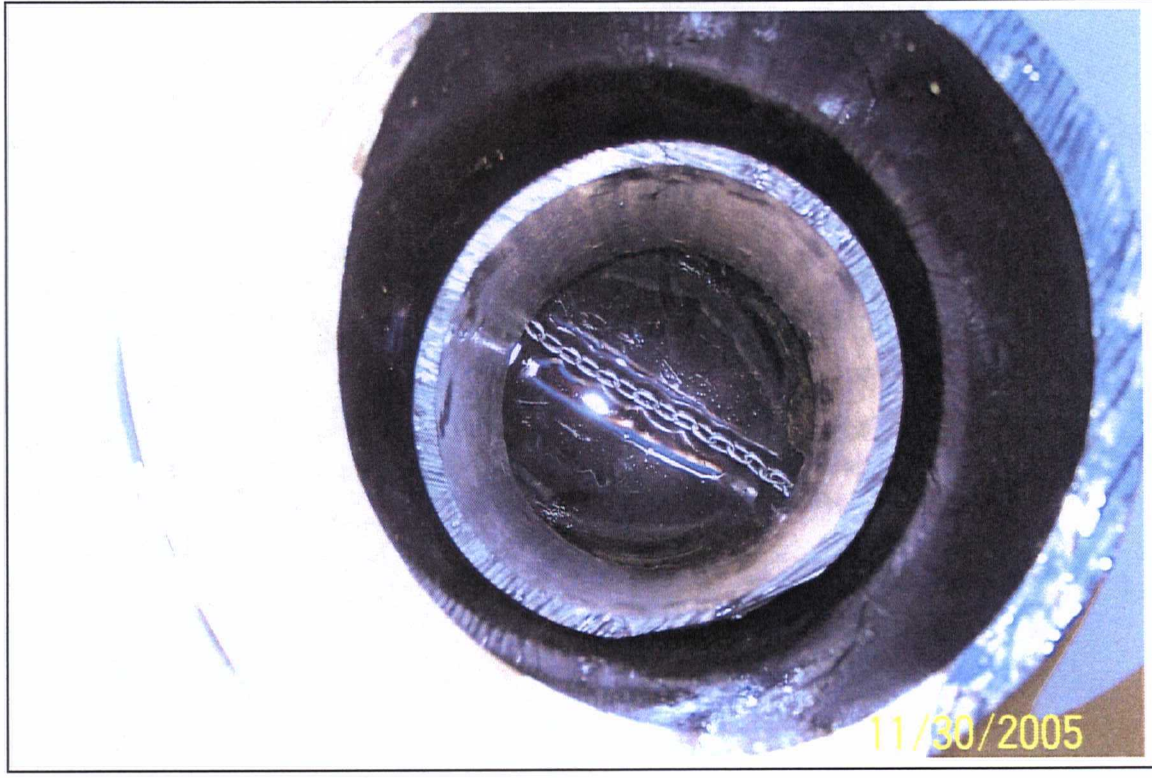
ATTACHMENT R3.c.4
REVISED PANEL LAYOUT DRAWING AND PHOTOGRAPHS



Response 3.c.4, 11/03/2005 – Southeast County Landfill, Section 8 Capacity Expansion, Hillsborough County, Florida
Damage to the geocomposite which was later repaired.

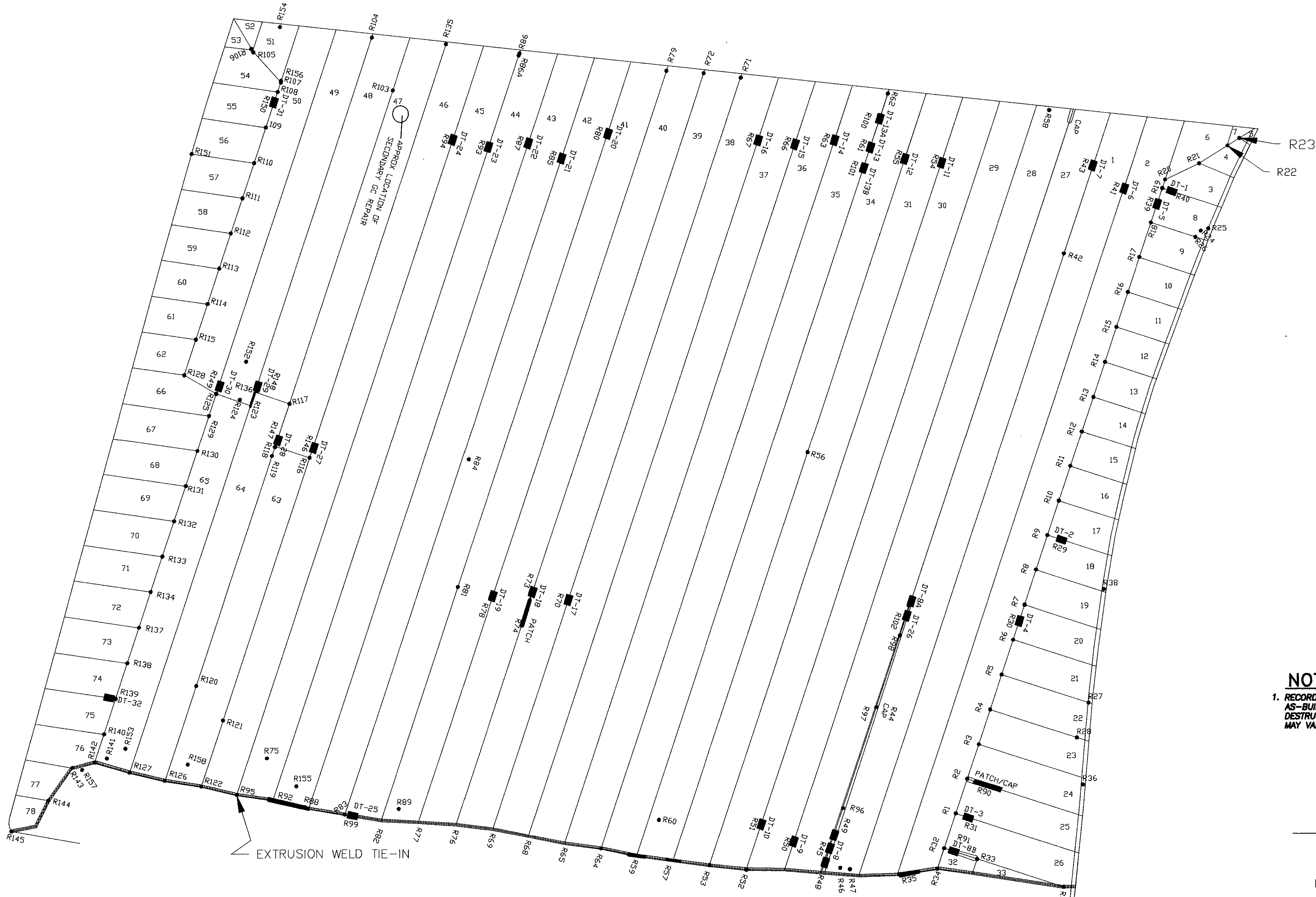
Response 3.c.4, 11/03/2005 – Southeast County Landfill, Section 8 Capacity Expansion, Hillsborough County, Florida
Repaired geocomposite.

ATTACHMENT R3.c.9
PHOTOGRAPH OF BALL PLUG VALVE



Response 3.c.9, 11/30/2005 – Southeast County Landfill, Section 8 Capacity Expansion, Hillsborough County, Florida
Water leaking through ball plug valve.

ATTACHMENT R3.d.1
REVISED TRI LABORATORY RESULTS FOR SDT-8C/SDT-26 AND CORRECTED REPAIR LOG FOR R146



FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
MAY - 2 2006
SOUTHWEST DISTRICT TAMPA

NOTE:

1. RECORD DRAWING IS NOT A SURVEYED AS-BUILT. LOCATIONS OF REPAIRS, DESTRUCTIVE TESTS, AND EXTRUSION WELDS MAY VARY SLIGHTLY.

LEGEND

(line)	PANEL OUTLINE
#	PANEL NUMBER
●	PATCH
□DT#	DESTRUCTIVE TEST
⊗	PIPE BOOT
(bar)	CAP PATCH
(wavy line)	EXTRUSION WELD

SCALE
0 25 50

DRAWN BY: ESW | DATE: 10-20K
CHKD BY: | DATE:
SCALE: 1" = 50'-0"
JOB #: | EST #:

REVISIONS
NO. | DATE

GEO-SYNTHETICS, INC.
W239 N428 PEWAUKEE ROAD
WAUKESHA, WI 53188
262-524-7979

GEO-SYNTHETICS, INC

PROJECT NAME & LOCATION:
S.E. HILLSBOROUGH LF
TAMPA, FL

MATERIAL & DRAWING DESCRIPTION:
60 MIL TEXTURED HDPE - SECONDARY
RECORD DRAWING

FILENAME
S.E. HILLSBORO. RECORD

DRAWING #
RD-1

TRI / Environmental, Inc.
A Texas Research International Company

DESTRUCTIVE SEAM QUALITY ASSURANCE TEST RESULTS

TRI Client: Jones, Edmunds & Associates

Project: S.E. Hillsborough County Landfill, Hillsborough, FL, Section 8

Material: HDPE
SAME DAY Peel and Shear (ASTM D 6392/GRI GM19/D 4437/NSF 54)
TRI Log #: E2242-88-03

PARAMETER		TEST REPLICATE NUMBER 1	2	3	4	5	MEAN
Sample ID:	**SDS-25**						
Weld:	**Single Extrusion**						
							Peel
Peel Strength (ppi)		159	166	170	161	173	166
Peel Incursion (%)		<10	<10	<10	<10	<10	
Peel Locus of Failure Code		SE	SE	SE	SE	SE	
Peel NSF Failure Code		FTB	FTB	FTB	FTB	FTB	
							Shear
Shear Strength (ppi)		176	173	174	176	173	174
Shear Elongation @ Break (%)		>50	>50	>50	>50	>50	
Sample ID:	**SDS-26**						
Weld:	**Single Extrusion**						
							Peel
Peel Strength (ppi)		122	141	120	113	105	120
Peel Incursion (%)		<10	<10	<10	<10	<10	
Peel Locus of Failure Code		SE	SE	SE	SE	SE	
Peel NSF Failure Code		FTB	FTB	FTB	FTB	FTB	
							Shear
Shear Strength (ppi)		177	178	180	176	177	178
Shear Elongation @ Break (%)		>50	>50	>50	>50	>50	

GeosyntheticTesting.com
9063 Bee Caves Road / Austin, TX 78733 / 512 263 2101 / fax: 512 263 2558

QUALITY ENVIRONMENTAL SERVICES

SECONDARY

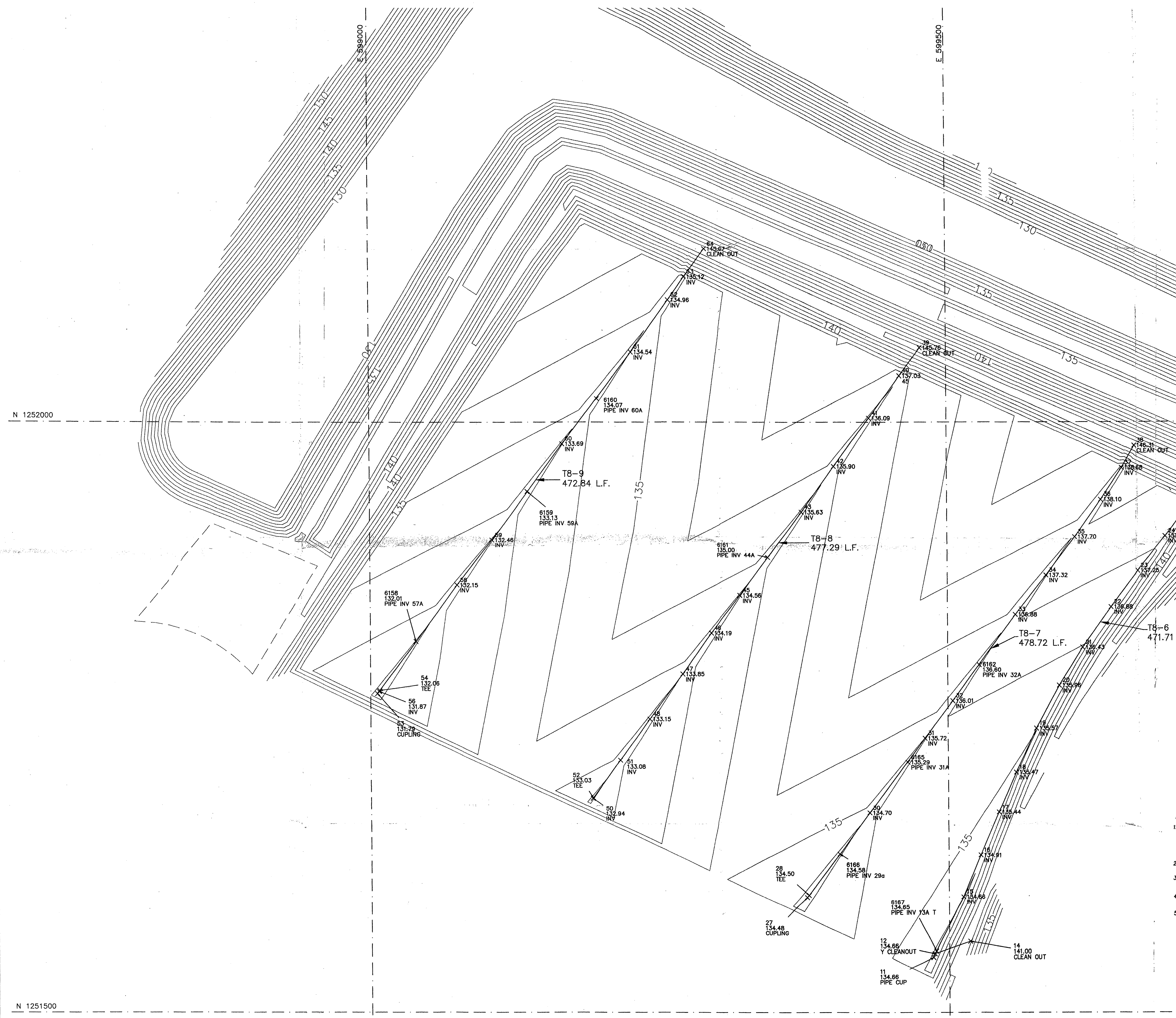
GEOMEMBRANE REPAIR LOG

PAGE	6
PROJECT TITLE	Southeast County Capacity Expansion Section 8
PROJECT NO.	0844902001

DATE REPAIRED	REPAIR NO.	PANEL/ SEAM ID	LOCATION	SIZE OF REPAIR	TECH ID	MACH. NO.	DATE TESTED	TESTED BY	COMMENTS
10/03/05	126	63-64-TIE	AT TIE-IN	2 X 4	AP	42	10/06/05	JB	
10/03/05	127	64-65-TIE	AT TIE-IN	TWELD	AP	42	10/06/05	JB	
10/06/05	128	62-66-50	WEST SLOPE	2 X 2	AP	42	10/06/05	JB	BUTT
10/06/05	129	65-66-67	WEST SLOPE	TWELD	AP	42	10/06/05	JB	BUTT
10/06/05	130	67-68-65	WEST SLOPE	TWELD	AP	42	10/06/05	JB	BUTT
10/06/05	131	68-69-65	WEST SLOPE	TWELD	AP	42	10/06/05	JB	BUTT
10/06/05	132	69-70-65	WEST SLOPE	TWELD	AP	42	10/06/05	SKIP	BUTT
10/06/05	133	70-71-65	WEST SLOPE	TWELD	AP	42	10/06/05	SKIP	BUTT
10/06/05	134	71-72-65	WEST SLOPE	TWELD	AP	42	10/06/05	SKIP	BUTT
10/06/05	135	46-47	TOP OF N SLOPE	1 X 1	VV	15	10/06/05	JB	BUTT
10/06/05	136	48-49-64/65	BUTT	2 X 9	VV	15	10/06/05	JB	BUTT
10/06/05	137	72-73-65	WEST SLOPE	TWELD	AP	42	10/06/05	JB	BUTT
10/06/05	138	73-74-65	WEST SLOPE	TWELD	AP	42	10/06/05	JB	BUTT
10/06/05	139	74-75-65	WEST SLOPE	2 X 4	AP	42	10/06/05	JB	BUTT
10/06/05	140	75-76-65	WEST SLOPE	TWELD	AP	42	10/06/05	JB	BUTT
10/03/05	141	65	7' S	1 X 1	AP	42	10/06/05	JB	S TIE-IN
10/03/05	142	76-65-TIE	TIE-IN	2 X 2	AP	42	10/06/05	JB	
10/03/05	143	76-77-TIE	BOTTOM	1 X 1	AP	42	10/06/05	JB	
10/03/05	144	77-78-TIE	WEST SLOPE	TWELD	AP	42	10/06/05	JB	
10/03/05	145	78-TIE	WEST SLOPE	3 X 5	AP	42	10/06/05	JB	IN TRENCH
10/06/05	146	46- 47-~~48~~	BUTT	2 X 4	VV	15	10/06/05	JB	
10/06/05	147	64-47	BUTT	2 X 4	VV	15	10/06/05	JB	
10/06/05	148	48-49	BUTT	2 X 4	VV	15	10/06/05	JB	
10/06/05	149	49-50	BUTT	2 X 5	AP	42	10/06/05	JB	
10/04/05	150	50-55	BUTT	2 X 4	VV	15	10/06/05	JB	

ATTACHMENT R4.a
SIGNED AND SEALED AS-BUILT PIPE SURVEY

ATTACHMENT R4.b
GEOTEXTILE CONFORMANCE TEST RESULTS



NORTH
SCALE: 1" = 40'

LEGEND:

ELEV.	ELEVATION
△	CONTROL POINT
+ 923 138.42 1268	SPOT ELEVATION P&A POINT NUMBER, ELEVATION PIPE INFORMATION

SURVEYOR's NOTES:

1.) North, grid and the Coordinates shown hereon are based on the West Zone of the Florida State Plane Coordinate System, and are based on provided Hillsborough County Horizontal Control Monument LW-D and LW-E, the published values used for this survey are NAD 83 1990 adjustment.

2.) Shaded Contours shown hereon was provided by client.

3.) Elevations are to National Geodetic Vertical Datum of 1929 and are based on provided Hillsborough County Horizontal Control Monument LW-D, elevation is 118.68'

4.) Underground improvements, encroachments, foundations and/or utilities were not located as a part of this survey.

5.) Contours shown are design subgrade contours as provided by client.

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
MAY -2 2006
SOUTHWEST DISTRICT TAMPA

10/26/05
DATE OF FIELD SURVEY

No.	DATE	APPROVED	REVISION
1	10/31/05	D.L.P.	FIRST ISSUE
2	11/8/05	D.L.P.	ADDED ADDITIONAL PIPE DATA
3	12/19/05	D.L.P.	REVISED NOTES AND ADDED PIPE LENGTH
4	1/4/06	D.L.P.	REVISED TITLE BLOCK

NOT VALID WITHOUT THE SIGNATURE AND THE ORIGINAL RAISED SEAL OF A FLORIDA LICENSED SURVEYOR AND MAPPER

PICKETT
SURVEYING & PHOTOGRAMMETRY
PICKETT & ASSOCIATES, INC. LICENSED BUSINESS No. LB364

475 SOUTH FIRST AVENUE
BARTOW, FLORIDA 33830
PHONE: (863)-533-9095
FAX: (863)-534-1464

502 WEST MAIN STREET
WAUCHULA, FLORIDA 33873
PHONE: (863)-773-3990
FAX: (863)-773-3922

HORIZ. SCALE: 1" = 40'	FIELD BOOK(S): 482	CHECKED BY: DLP	DRAWING NAME
VERT. SCALE: N/A	PAGE(S): 157-158	DRAWN BY: DLP	13551-ASBpipe

AS-BUILT SURVEY OF 8" HDPE PIPE SE LANDFILL-SECTION 8 EXPANSION

LOCATED IN SECTION 24, T31S, R21E
HILLSBOROUGH COUNTY, FLORIDA
PREPARED FOR: ERC

PROJECT No.	No.
13551	1
DRAWING No.	OF
LD 3127	1

GEOTEXTILE TEST RESULTS

TRI Client: Jones, Edmunds & Associates, Inc.
Project: SE Hillsborough County Landfill, Section 8

Material: Woven Geotextile
Sample Identification: M404
TRI Log #: E2256-56-07

PARAMETER	TEST REPLICATE NUMBER 1	2	3	4	5	6	7	8	9	10	MEAN	STD. DEV.
Mass/Unit Area (ASTM D 5261)												
5" Diameter Circle (grams)	2.57	2.59	2.59	2.60	2.58	2.58	2.60	2.58	2.58	2.60		
Mass/Unit Area (oz/sq.yd)	5.98	6.02	6.02	6.05	6.00	6.00	6.05	6.00	6.00	6.05	6.02	0.02
Puncture Resistance (ASTM D 4833)												
Puncture Strength (lbs)	134	118	115	131	135	111	131	124	112	138	122	9
	123	119	122	111	113							
Apparent Opening Size (ASTM D 4751)												
Opening Size Diameter (mm)	0.355	0.425	0.355	0.425	0.425						0.397	0.034
US Sieve No.	45	40	45	40	40						40	

PARAMETER

Constant Head Permittivity (ASTM D 4491, 2 in. Constant Head)

Water Temp. (C): 21
Correction Factor: 0.9759

Trial =>:	1					2					MEAN	STD. DEV.
Thickness (mils)	27	27	27	27	27	28	28	28	28	28		
Time (s)	10	10	10	10	10	10	10	10	10	10		
Flow (L)	2.52	2.56	2.56	2.56	2.56	2.48	2.52	2.52	2.48	2.48		
Permittivity (s-1)	2.45	2.49	2.49	2.49	2.49	2.41	2.45	2.45	2.41	2.41		
Flow rate (GPM/ft2)	183	186	186	186	186	180	183	183	180	180		
Permeability (cm/s)	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17		
Trial =>:	**3**					**4**						
Thickness (mils)	27	27	27	27	27	27	27	27	27	27		
Time (s)	10	10	10	10	10	10	10	10	10	10		
Flow (L)	2.48	2.52	2.52	2.52	2.52	2.60	2.56	2.60	2.60	2.60		
Permittivity (s-1)	2.41	2.45	2.45	2.45	2.45	2.52	2.49	2.52	2.52	2.52	2.46	0.04
Flow rate (GPM/ft2)	180	183	183	183	183	189	186	189	189	189	184	3
Permeability (cm/s)	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.00

TEMPERATURE CORRECTED VALUES		
	Permittivity (s-1)	2.41
	Flow rate (GPM/ft2)	180
	Permeability (cm/s)	0.17

April 18, 2006

Mail To: **Bill To:**

Mr. Joseph O'Neill **<= Same (P.O. # 40288)**
Jones, Edmunds & Associates, Inc.
324 South Hyde Park Avenue, Suite 250
Tampa, FL 33606

email: joneill@jonesedmunds.com
cc email: rsiemering@jonesedmunds.com - Richard Siemering

Dear Mr. O'Neill:

Thank you for consulting TRI/Environmental, Inc. (TRI) for your geosynthetics testing needs. TRI is pleased to submit this final report for laboratory testing.

Project:		SE Hillsborough County Landfill, Section 8
TRI Job Reference Number:		E2256-56-07
Material(s) Tested:		1 Woven Geotextile(s)
Test(s) Requested:	Updating ===>	Mass/Unit Area (ASTM D 5261)
	Updating ===>	Puncture Strength (ASTM D 4833)
	Updating ===>	Apparent Opening Size (ASTM D 4751)
	Updating ===>	Permittivity (ASTM D 4491)

If you have any questions or require any additional information, please call us at 1-800-880-8378.

Sincerely,

Sam R. Allen

Sam R. Allen
Vice President and Division Manager
Geosynthetic Services Division

ATTACHMENT R5.a
Qore Report (Protective Cover Soil)

NOV 28 2005

QORE

PROPERTY SCIENCES

November 21, 2005

Jones Edmunds
324 South Hyde Park Avenue, Suite 250
Tampa, Florida 33606

Attention: Mr. Joseph O'Neill

Subject: Jones Edmunds Drainage Sand Evaluation
QORE Job No. 26669

Gentlemen:

QORE, Inc. has completed the laboratory testing on the soil samples sent by your office. The following tests were performed:

- Standard Proctor (ASTM D-698)
- Rigid Wall Permeability Test (ASTM D-2434)
- Sieve Analysis (ASTM D-422)

QORE, Inc. performs soil tests in general accordance with the applicable American Society for Testing and Materials (ASTM) or AASHTO procedures. These procedures are generally recognized as the basis for uniformity and consistency of test results in the geotechnical engineering profession. All the work is supervised by a qualified engineer. Attached are test results for your review.

QORE, Inc. appreciates the opportunity to provide these laboratory services. Please contact us if you have any questions concerning this report or if we may be of further service.

Respectfully submitted,
QORE, Inc.

Jim Hanson
Geotechnical Laboratory Supervisor

C. Scott Fletcher, P.E.
Chief Geotechnical Engineer
Reg. Ga. 16170

JH/CSF/rs
Enclosures

Moisture/Density Relationship of Soil

QORE™ PROPERTY SCIENCES

11420 Johns Creek Parkway Duluth, GA 30097 (770) 476-3555 Fax (770) 476-0213

Project: JONES EDWARDS DRAINAGE SAND EVALUATION

Job No.: 26669

Report No.: 297950

Date: 11/17/2005

Client: JONES EDMUNDS

Sample No.: 1

Date Sampled: 11/16/2005

Visual Classification: BROWN SAND

Location:

Test Method: B

Procedure: ASTM D-698

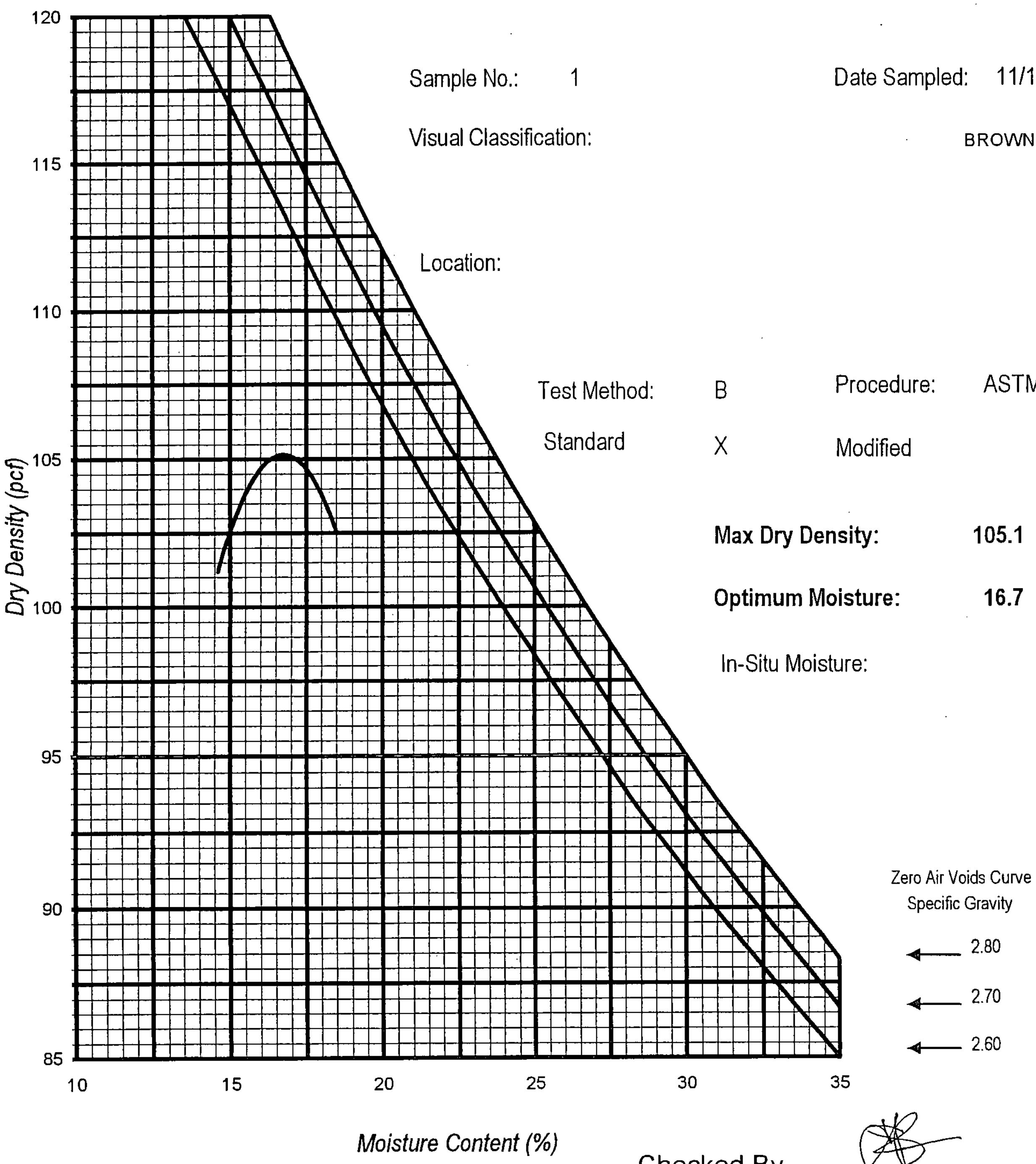
Standard X

Modified

Max Dry Density: **105.1** pcf

Optimum Moisture: **16.7** %

In-Situ Moisture: %



Checked By________________

QORE PROPERTY SCIENCES

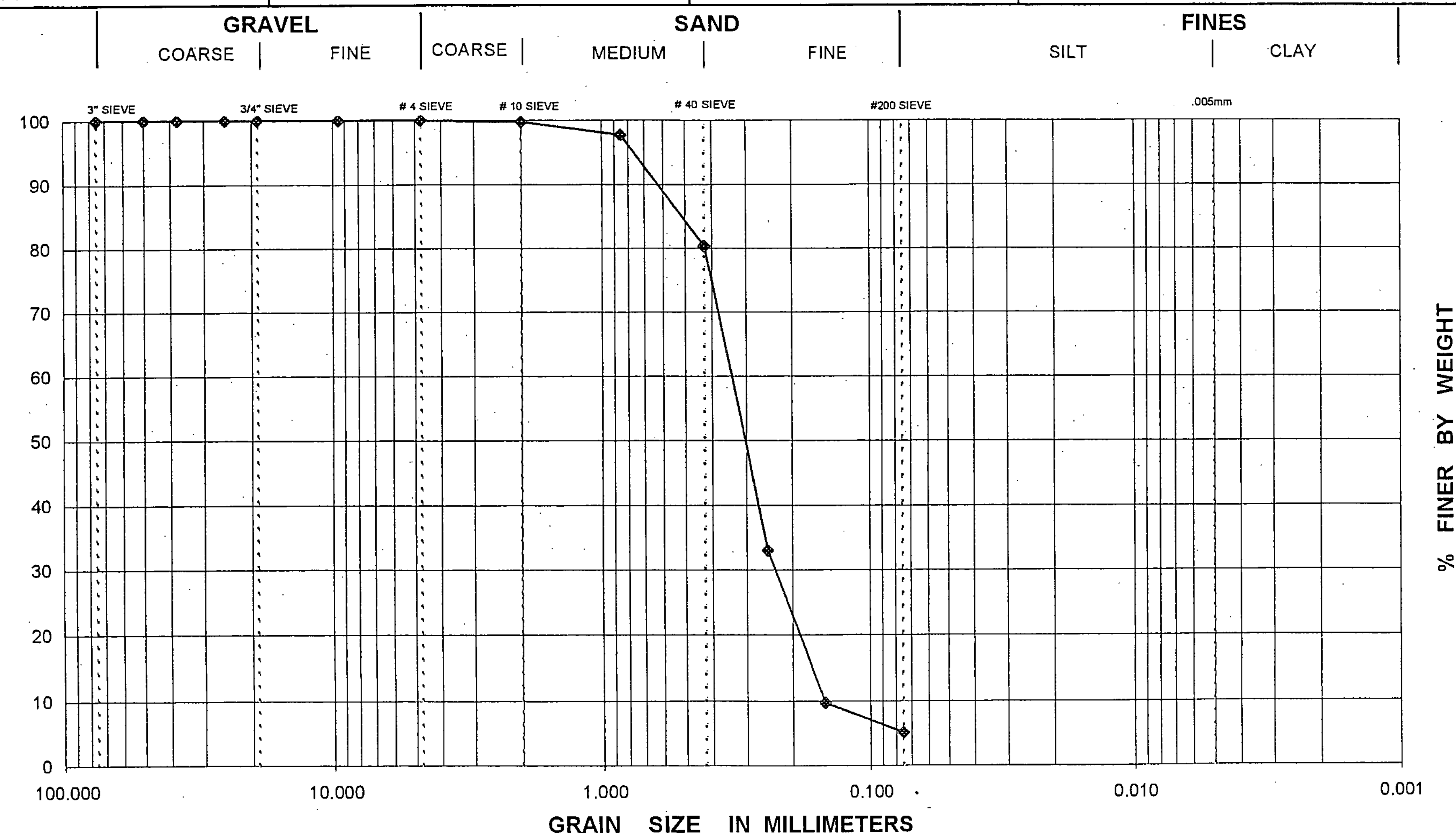
PARTICLE- SIZE DISTRIBUTION TEST REPORT

SIEVE AND HYDROMETER ASTM D422 0

AASHTO R18

REV1,9/17/03

JOB NAME :	*Jones Edmunds Drainage Sand Evaluation*						
JOB NO. :	*26669*	REPORT NO. :	-	DATE :	11/15/05	REVIEWED BY :	
BORING / PIT NO. :	-	DEPTH / ELEV. :	-	SAMPLE NO. :	*1*	SAMPLE TYPE :	*BULK*
SAMPLE LOCATION : -							
SOIL DESCRIPTION :	*Brown sand*					SP. GRAVITY, Gs :	-
LIQUID LIMIT, % :	-	PLASTICITY INDEX , % :	-	MOISTURE , % :	-	FINES , % :	*5*
D10 , MM :	-	D30 , MM :	-	D60 , MM :	-	COEFF. OF CURVATURE , C_C :	-
CLASSIFICATION		UNIFIED :	-	AASHTO :	-	COEFF. OF UNIFORMITY , C_U :	-

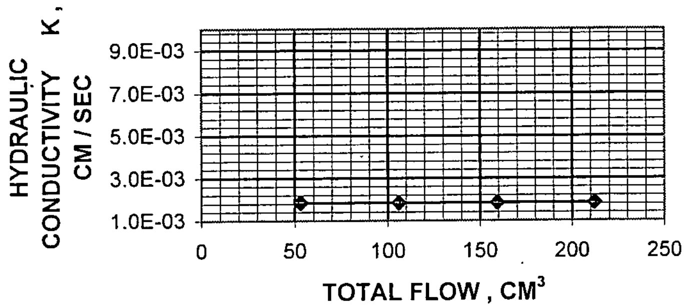


RIGID WALL PERMEABILITY TEST REPORT
(ASTM D 2434)

AASHTO R18

REV0, 11/15/02

JOB NAME :	Jones Edmunds Drainage Sand Evaluation						
JOB NO. :	26669	REPORT NO:	-	DATE :	11/17/05	REVIEWED BY:	
BORING / PIT :	-	DEPTH / ELEV. :		SAMPLE NO. :	1	SAMPLE TYPE :	BULK
SAMPLE LOCATION :	-					SP. GRAVITY, G_s :	2.73
MATERIAL DESCRIPTION :	Brown sand						
D_{max}, MM :	-	D_{60}, MM :	-	D_{30}, MM :	-	D_{10}, MM :	-
CLASSIFICATION :		UNIFIED :	-	AASHTO :	-	FINES , % :	5



SPECIMEN FINAL PROPERTIES			
SPECIMEN DIAMETER	D	4.0	INCHES
SPECIMEN LENGTH	L	4.7	INCHES
DRY UNIT WEIGHT	γ_{dry}	99	PCF
VOID RATIO	e	0.7	
PERMEATION			
HYDRAULIC GRADIENT	i	0.43	
TEMPERATURE	T	22	°C
TOTAL FLOW	Q	259	CM^3

HYDRAULIC CONDUCTIVITY, K	
1.9E-03	cm/sec @ 20 °C

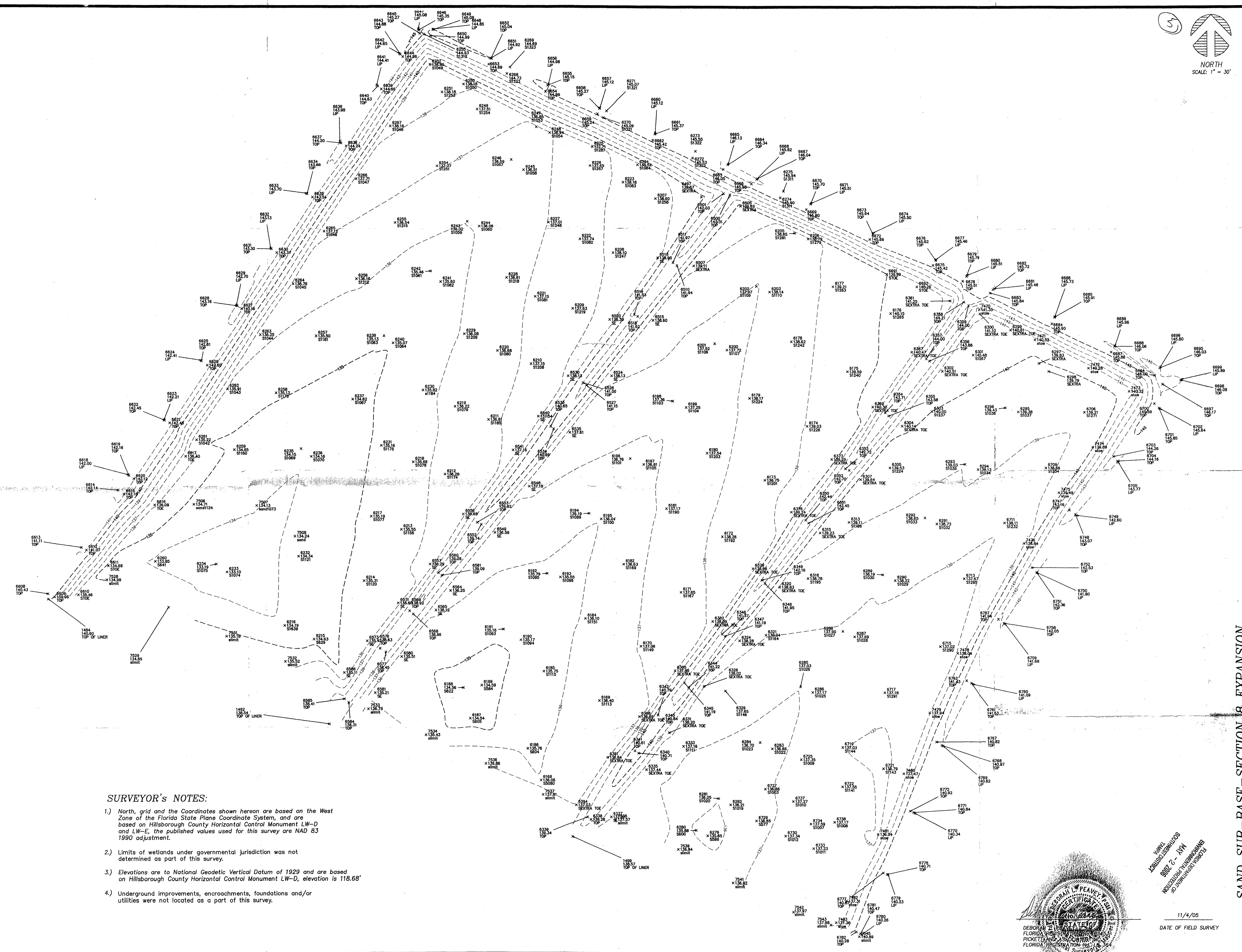
PERMEANT PROPERTIES

Tap Water
@ 22 °C

REMOLDED SOIL PROPERTIES

Material was compacted in the mold to 95 % of dry density of 105.1pcf .

ATTACHMENT R5.b
SIGNED AND SEALED AS-BUILT SURVEY
FOR PROTECTIVE COVER SOIL



SURVEYOR's NOTES:

1.) North, grid and the Coordinates shown hereon are based on the West Zone of the Florida State Plane Coordinate System, and are based on Hillsborough County Horizontal Control Monument LW–D and LW–E, the published values used for this survey are NAD 83 1990 adjustment.

2.) Limits of wetlands under governmental jurisdiction was not determined as part of this survey.

3.) Elevations are to National Geodetic Vertical Datum of 1929 and are based on Hillsborough County Horizontal Control Monument LW–D, elevation is 118.68'

4.) Underground improvements, encroachments, foundations and/or utilities were not located as a part of this survey.

11/4/05
DATE OF FIELD SURVEY

SAND SUB-BASE-SECTION 8 EXPANSION

AS-BUILT SURVEY

LOCATED IN SECTION 24, TOWNSHIP 31 SOUTH, RANGE 21 EAST
PREPARED FOR: ERC

No.	DATE	APPROVED	REVISION
1	11/8/05	D.L.P.	FIRST ISSUE
2	11/17/05	D.L.P.	ADDITIONAL ASBUILT OF SAND
3	11/19/05	D.L.P.	ADDITIONAL ASBUILT OF SAND
4	12/7/05	D.L.P.	ADDITIONAL ASBUILT OF SAND

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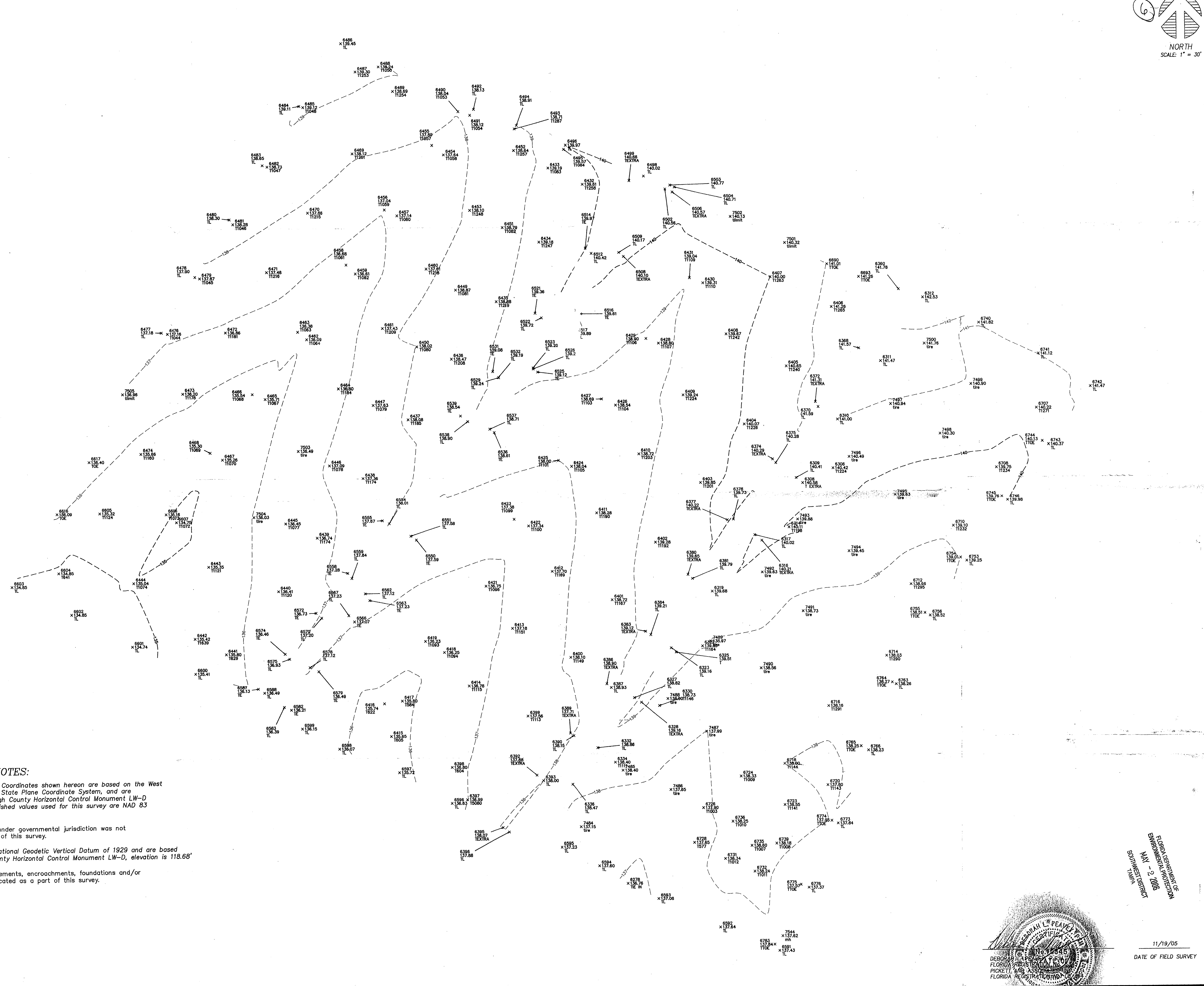
FAX: (863)-773-3922

HORIZ. SCALE: 1" = 40'	FIELD BOOK(S):	600	CHECKED BY: DLP	DRAWING NAME
VERT. SCALE: N/A	PAGE(S):	1–4	DRAWN BY: DLP	13551–SAND.dwg

PROJECT No.	No.
13551	1
DRAWING No.	OF
LD 3141	1

ATTACHMENT R6.a
SIGNED AND SEALED AS-BUILT SURVEY
FOR TIRE CHIPS



NORTH
SCALE: 1" = 30'

SURVEYOR's NOTES:

1.) North, grid and the Coordinates shown hereon are based on the West Zone of the Florida State Plane Coordinate System, and are based on Hillsborough County Horizontal Control Monument LW–D and LW–E, the published values used for this survey are NAD 83 1990 adjustment.

2.) Limits of wetlands under governmental jurisdiction was not determined as part of this survey.

3.) Elevations are to National Geodetic Vertical Datum of 1929 and are based on Hillsborough County Horizontal Control Monument LW–D, elevation is 118.68'

4.) Underground improvements, encroachments, foundations and/or utilities were not located as a part of this survey.

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
MAY - 2 2006
SOUTHWEST DISTRICT
TAMPA

11/19/05
DATE OF FIELD SURVEY

TIRE SUB-BASE–SECTION 8 EXPANSION

AS-BUILT SURVEY

LOCATED IN SECTION 24, TOWNSHIP 31 SOUTH, RANGE 21 EAST
PREPARED FOR: ERC

PICKETT
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HORIZ. SCALE: 1" = 40'	FIELD BOOK(S):	600	CHECKED BY:	DLP	DRAWING NAME
VERT. SCALE: N/A	PAGE(S):	1-4	DRAWN BY:	DLP	13551-TIRE.dwg

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No.	DATE	APPROVED	REVISION
1	11/20/05	D.L.P.	FIRST ISSUE
2	11/21/05	D.L.P.	ADDITIONAL ASBUILT DATA
3	12/7/05	D.L.P.	ADDITIONAL ASBUILT DATA

PROJECT No.	No.
13551	1
DRAWING No.	OF
LD 3161	1

ATTACHMENT R7
LCS VIDEOTAPE AND JET CLEAN REPORT

Pipe Graphic Report of PLR T8 9 CO X for ERC

Job 2	**Contract** 2		**Cassette** 1	**Surveyed On** 12/12/2005	**Sheet** 4
Operator WCR	**Van Reference**		**Weather** Dry		

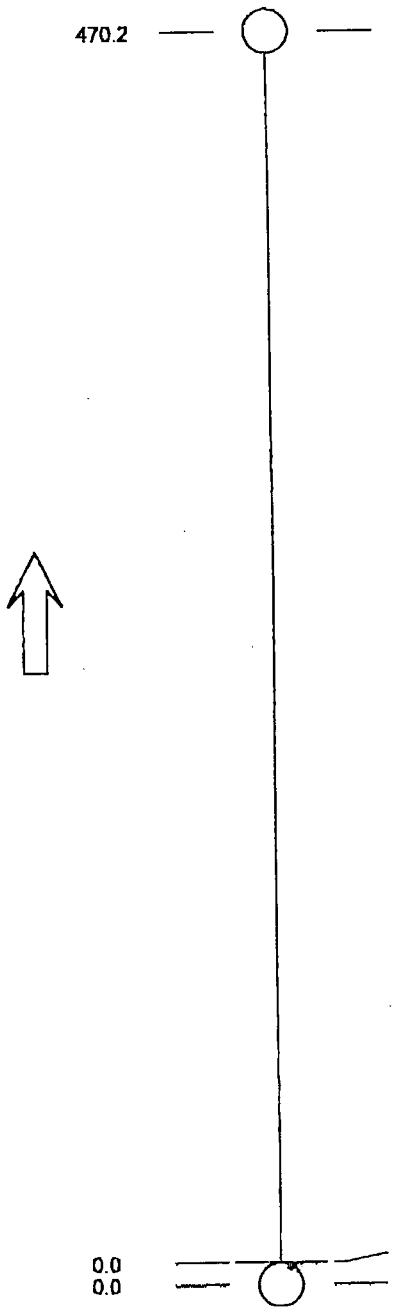
Road Name 672 **Place Name** S.E.HILLS.CO. L.F.
Location type Landfill
Surface
Survey purpose Pre-adoption - normally new sewers for adoption

Pipe Use Leachate	**Schedule length** 470.2 **Ft**	**From** T8 9 CO **Depth** **Ft**
Shape Circular	**Size** 8 **by** **Ins**	**To** T AT 7 **Depth** **Ft**
Material HDPE	**Joint spacing** **Ft**	**Direction** Down
Lining	**Year laid** 05 **Cat** A	**Pre-clean** Y **Last cleaned**

General note SECTION 8 LATERAL T 9
Location note NEW CELL

Structural Service Constructional
Miscellaneous Hydraulic

Distance (Ft) Description (Showing all categories) Media



470.2 — T AT 7 (Downstream. Depth = Ft) Tape end:

0.0 — Water level 0%
0.0 — T8 9 CO (Upstream. Depth = Ft) Tape start:

Pipe Graphic Report of PLR T8 8 CO X for ERC

Job 2	**Contract** 2	**Cassette** 1	**Surveyed On** 12/12/2005	**Sheet** 3
Operator WCR	**Van Reference**	**Weather** Dry		

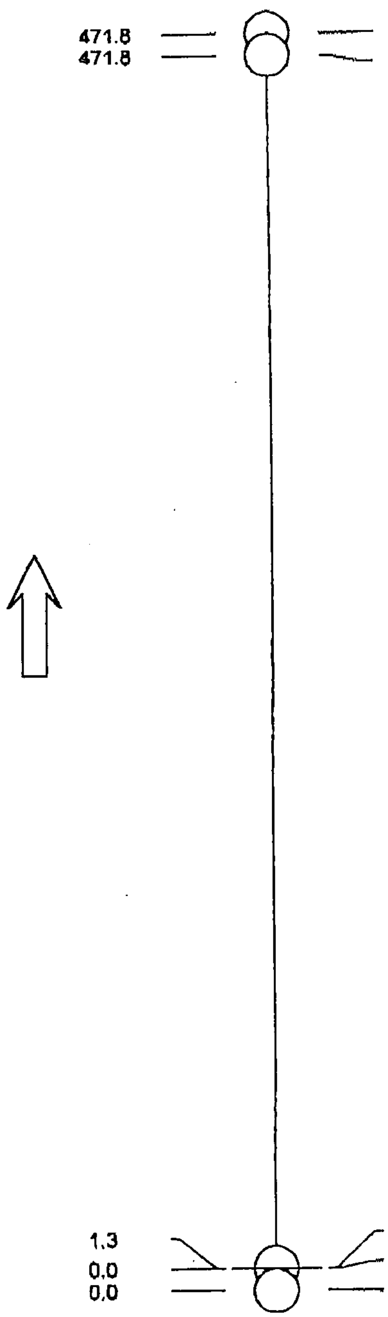
Road Name 672 **Place Name** S.E.HILLS.CO. L.F.
Location type Landfill
Surface
Survey purpose Pre-adoption - normally new sewers for adoption

Pipe Use Leachate	**Schedule length** 471.8 **Ft**	**From** T8 8 CO **Depth** **Ft**
Shape Circular	**Size** 8 **by** **ins**	**To** T AT 7 **Depth** **Ft**
Material HDPE	**Joint spacing** **Ft**	**Direction** Down
Lining	**Year laid** 05 **Cat** A	**Pre-clean** Y **Last cleaned**

General note SECTION 8 LATERAL T 8
Location note NEW CELL

Structural | Service | Constructional
Miscellaneous | Hydraulic

Distance (Ft)	Description (Showing all categories)	Media
471.8	T AT 7 (Downstream. Depth = Ft) Tape end:	
471.8	Manhole/Node [T]	
1.3	Manhole/Node [T]	
0.0	Water level 0%	
0.0	T8 8 CO (Upstream. Depth = Ft) Tape start:	



Pipe Graphic Report of PLR T8 T7 CO X for ERC

Job 2	**Contract** 2	**Cassette** 1	**Surveyed On** 12/12/2005	**Sheet** 2
Operator WCR	**Van Reference**	**Weather** Dry		

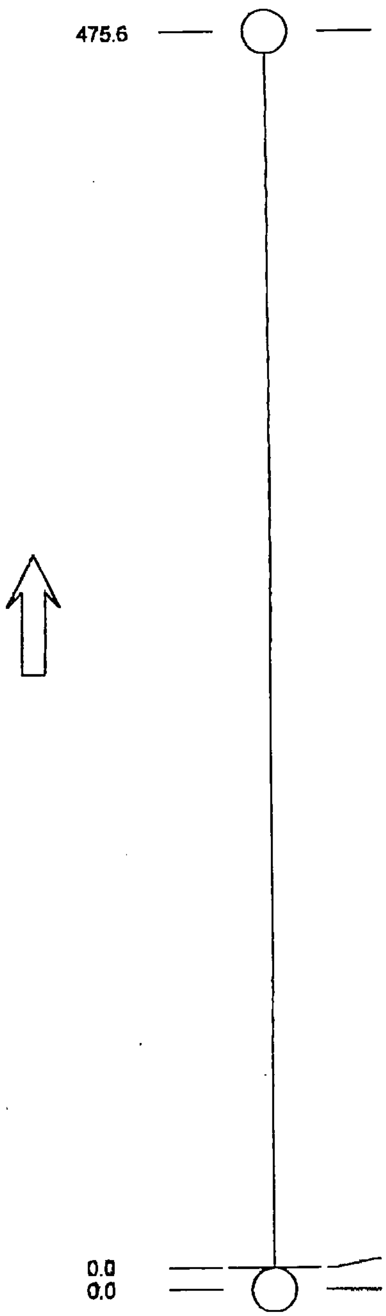
Road Name 672 — **Place Name** S.E.HILLS.CO. L.F.
Location type Landfill
Surface
Survey purpose Pre-adoption - normally new sewers for adoption

Pipe Use Leachate	**Schedule length** 475.6 **Ft**	**From** T8 T7 CO **Depth** **Ft**
Shape Circular	**Size** 8 **by** **Ins**	**To** T AT 7 **Depth** **Ft**
Material HDPE	**Joint spacing** **Ft**	**Direction** Down
Lining	**Year laid** 05 **Cat** A	**Pre-clean** Y **Last cleaned**

General note SECTION 8 LATERAL T 7
Location note NEW CELL

Structural — Service — Constructional
Miscellaneous — Hydraulic

Distance (Ft) — Description (Showing all categories) — Media



475.6 — T AT 7 (Downstream. Depth = Ft) Tape end:

0.0 — Water level 0%
0.0 — T8 T7 CO (Upstream. Depth = Ft) Tape start:

Pipe Graphic Report of PLR ENDCAP X for ERC

Job 2	***Contract*** 2	***Cassette*** 1	***Surveyed On*** 12/12/2005 ***Sheet*** 1
Operator WCR	***Van Reference***	***Weather*** Dry	

Road Name 672 ***Place Name*** S.E.HILLS.CO. L.F.
Location type Landfill
Surface
Survey purpose Pre-adoption - normally new sewers for adoption

Pipe Use Leachate	***Schedule length*** 462.4 ***Ft***	***From*** ENDCAP ***Depth*** ***Ft***
Shape Circular	***Size*** 8 ***by*** ***Ins***	***To*** T AT 7 ***Depth*** ***Ft***
Material HDPE	***Joint spacing*** ***Ft***	***Direction*** Down
Lining	***Year laid*** 05 ***Cat*** A	***Pre-clean*** Y ***Last cleaned***

General note SECTION 8 LATERAL T 6
Location note NEW CELL VIDEO IN REVERSE

Structural Service Constructional
Miscellaneous Hydraulic

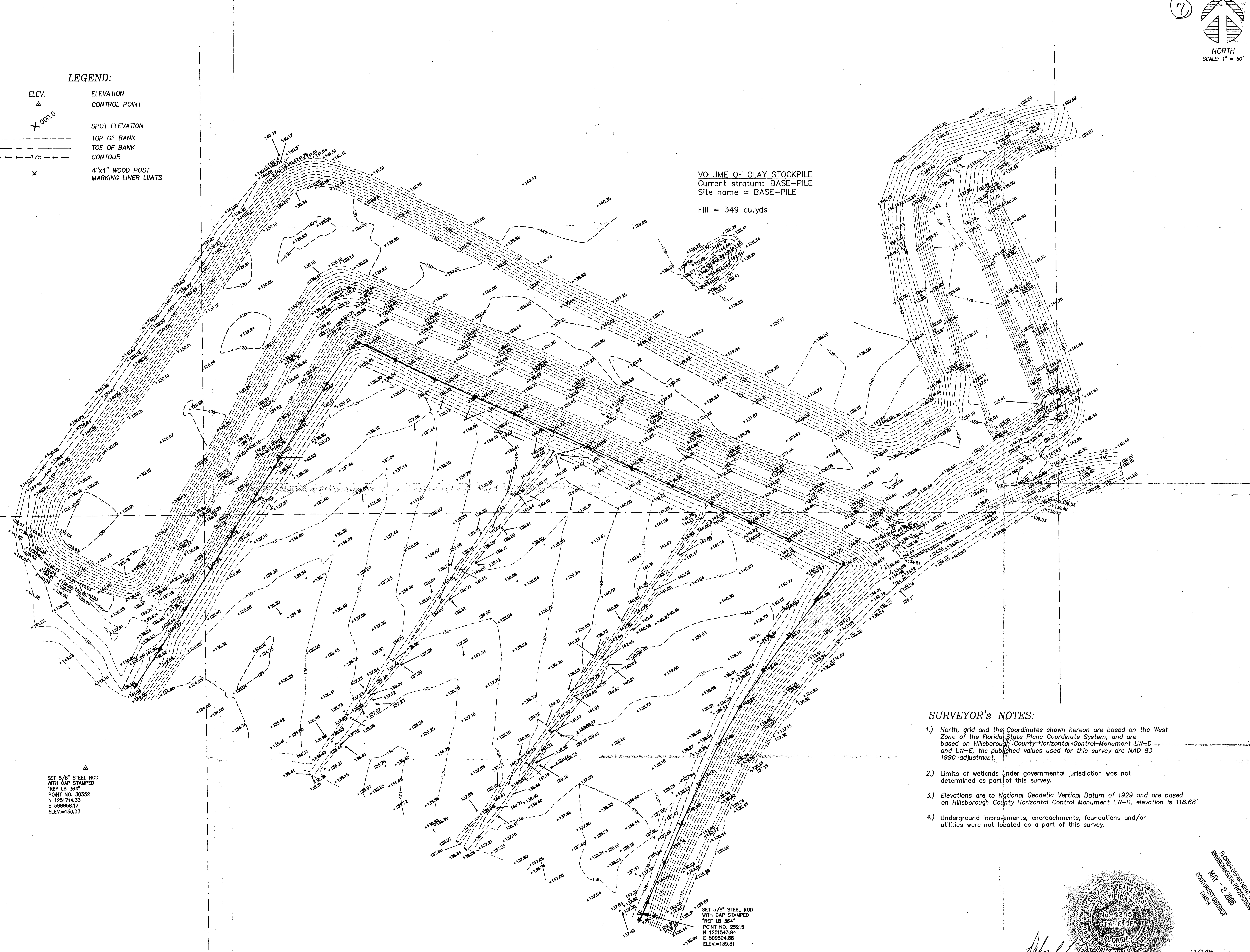
Distance (Ft)	Description (Showing all categories)	Media
462.4	T AT 7 (Downstream. Depth = Ft) Tape end:	
0.0	Water level 0%	
0.0	ENDCAP (Upstream. Depth = Ft) Tape start:	

CCTV Surveys List for ERC

Number of surveys in this list is 4 as of Tuesday, December 13, 2005 Unit of measure: Ft

Setup	Date	Road	Start M'hole	Finish M'hole	Scheduled Length	Surveyed length
1	12/12/2005	672	ENDCAP	T AT 7	462.4	462.4
2	12/12/2005	672	T8 T7 CO	T AT 7	475.6	475.6
3	12/12/2005	672	T8 8 CO	T AT 7	471.8	471.8
4	12/12/2005	672	T8 9 CO	T AT 7	470.2	470.2
				Total Scheduled Length	1,880.0	
				Total length surveyed		1,880.0

ATTACHMENT R8
SIGNED AND SEALED FINAL AS-BUILT SURVEY



SURVEYOR's NOTES:

1.) North, grid and the Coordinates shown hereon are based on the West Zone of the Florida State Plane Coordinate System, and are based on Hillsborough County Horizontal Control Monument LW-D and LW-E, the published values used for this survey are NAD 83 1990 adjustment.

2.) Limits of wetlands under governmental jurisdiction was not determined as part of this survey.

3.) Elevations are to National Geodetic Vertical Datum of 1929 and are based on Hillsborough County Horizontal Control Monument LW-D, elevation is 118.68'

4.) Underground improvements, encroachments, foundations and/or utilities were not located as a part of this survey.

DEBORAH L. PEAVEY, P.S.M.
FLORIDA REGISTRATION No. 6345
PICKETT AND ASSOCIATES, INC.
FLORIDA REGISTRATION No. LB 364

12/7/05
DATE OF FIELD SURVEY

DEBORAH L. PEAVEY, PSM CERTIFICATE No. 6345 STATE OF FLORIDA PROFESSIONAL SURVEYOR & MAPPER

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
MAY - 2 2006
SOUTHWEST DISTRICT
TAMPA

FINAL TOPO-SECTION 8 EXPANSION

AS-BUILT SURVEY

LOCATED IN SECTION 24, TOWNSHIP 31 SOUTH, RANGE 21 EAST
PREPARED FOR: EPC

PROJECT No.	No.
13551	1
DRAWING No.	OF
LD 3169	1

PICKETT
SURVEYING & PHOTOGRAMMETRY
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HORIZ. SCALE: 1" = 50'	FIELD BOOK(S): 600	CHECKED BY: DLP	DRAWING NAME
VERT. SCALE: N/A	PAGE(S): 10-12	DRAWN BY: DLP	13551-final-overallsite

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No.	DATE	APPROVED	REVISION
1	12/20/05	D.L.P.	FIRST ISSUE

ATTACHMENT R11.a
PHOTOGRAPHS OF SECONDARY GEOCOMPOSITE

Response 11.a, 09/29/2005 – Southeast County Landfill, Section 8 Capacity Expansion, Hillsborough County, Florida
Installation of secondary geocomposite.

Response 11.a, 09/29/2005 – Southeast County Landfill, Section 8 Capacity Expansion, Hillsborough County, Florida
Installation of secondary geocomposite.

ATTACHMENT R13
PHOTOGRAPHS OF SEPARATION BERMS

Response 13, 11/08/2005 – Southeast County Landfill, Section 8 Capacity Expansion, Hillsborough County, Florida
Installation of separation berms.

Response 13, 11/01/2005 – Southeast County Landfill, Section 8 Capacity Expansion, Hillsborough County, Florida
Installation of separation berms.

ATTACHMENT R15.a
Geotextile Clogging Calculations

PROBLEM: Determine geotextile parameters for proposed design application.

1) RETENTION CRITERIA

In order for filter fabric to work as a permeable constraint to stop adjacent particles of filter material from washing through the fabric, the following criteria must be met ***(Source: Reference 1, pg. 12-16)***

DATA:

$Cu'_{drainage\ sand} = (d'_{100}/d'_0)^{1/2}$ ***(Source: Reference 1, pg. 12)***

where: $Cu'_{drainage\ sand}$ = linear coefficient of uniformity of the sand
d'_{100} = obtained through linear projection through the central portion of the sand particle curve
d'_0 = obtained through linear projection through the central portion of the sand particle curve

If:	$1 < Cu'_{drainage\ sand} < 3$	***(Source: Reference 1, pg. 6)***
Then:	$AOS_{geotextile} < (2)*(Cu'_{drainage\ sand})*(d_{50})$	***(Source: Reference 1, pg. 6)***
If:	$Cu'_{drainage\ sand} > 3$	***(Source: Reference 1, pg. 6)***
Then:	$AOS_{geotextile} < (18)*(d_{50})/(Cu'_{drainage\ sand})$	***(Source: Reference 1, pg. 6)***

CALCULATIONS:

d'_o=	0.12	mm	***(Source: Reference 2)***
d_{50}=	0.27	mm	***(Source: Reference 2)***
d'_{100}=	0.62	mm	***(Source: Reference 2)***

$Cu'_{drainage\ sand}$= 2.27 therefore,

Conclusion:

$AOS_{geotextile} \leq$ 1.23 mm

2) PERMEABILITY

A. Approximate the flow rate through a known sample of sand (drainage layer) with known permeability.
(Source: Reference 2)

DATA:

Flow rate through sand, $Q_S=k_s*i_s*A$

k_s =	0.0019	cm/sec	0.0037	ft/min	***(Source: Reference 2)***
h_s=	1.0	ft			
h_w=	1.5	ft			
i_s =	1.5				
A=	1.0	ft^2			

where: k_s = sand hydraulic conductivity
h_s= height of sand layer
h_w= hydraulic head
i_s = hydraulic gradient
A= unit area

CALCULATIONS:

$Q_S=k_s*i_s*A$

Q_S=	0.006	ft^3/min/ft^2
Q_S=	0.042	gal/min/ft^2

B. Determine a required minimum geotextile permittivity by approximating a geotextile flow rate, $Q_{G\ allow}$, that is at minimum, greater than the drainage layer flow rate, Q_S. **($Q_{G\ allow} \geq Q_S$)**

DATA:

Flow rate through geotextile

$Q_{G\ allow}=Q_S$	0.042	gal/min/ft^2	
h_s=	1.0	ft	
h_w=	1.0	ft	
i_s =	1.0		
CF=	60000		*(Source: Reference 3, 15.1.4.2, Note 10)*
RF_{SCB}=	10.00		*(Source: Reference 4, pg. 150)*
RF_{CR}=	2.00		*(Source: Reference 4, pg. 150)*
RF_{IN}=	1.20		*(Source: Reference 4, pg. 150)*
RF_{CC}=	1.50		*(Source: Reference 4, pg. 150)*
RF_{BC}=	10.00		*(Source: Reference 4, pg. 150)*

where: $Q_S=Q_{G\ allow}$= Allowable flow rate through geotextile equated to flow rate through sand
h_s= height of sand layer
h_w= hydraulic head
i_s = hydraulic gradient
CF= Conversion Factor from permititivity to flow in units of (l/m^3/min)
RF_{SCB}= Reduction Factor for soil clogging and blinding
RF_{CR}= Reduction Factor for creep reduction of voids
RF_{IN}= Reduction Factor for void intrusion
RF_{CC}= Reduction Factor for chemical clogging
RF_{BC}= Reduction Factor for biological clogging
Ψ= Required permittivity

CALCULATIONS:

$Q_{G\ ult}=Q_{G\ allow}*(RF_{SCB}*RF_{CR}*RF_{IN}*RF_{CC}*RF_{BC})$

$Q_{G\ ult}=$	15.07	gal/min/ft^2
$Q_{G\ ult}/h_{w}=$	15.07	gal/min/ft^3
$Q_{G\ ult}/h_{w}=$	2014.6511	l/min/m^3
$\Psi=(Q_{G\ ult}/h_{w})/CF=$	0.0336	s^{-1}

Conclusion: The minimum geoxtile permittivity to ensure that the flow rate through the geotextile is greater than that of the drainage layer is= 0.0336 s^{-1}

Woven Geotextile Conformance Test Results

AOS	**0.397 mm**	***(Source: Reference 5; SKAPS M404 Woven Geotextile)***
Permittivity	**2.46 s-1**	***(Source: Reference 5; SKAPS M404 Woven Geotextile)***

AOSgeotextile <	**1.23 mm**	**Minimum required**
Permittivity >	**0.0336 s-1**	**Minimum required**

REFERENCE 1

Solid Waste Landfill Design Series

A series of workshops in Orlando, Florida
presented by

UNIVERSITY OF FLORIDA
TREEO CENTER

and
Florida Department of Environmental Protection

VOLUME 2

Landfill Design and Construction

LANDFILL
DESIGN CONSTRUCTION

GEOTEXTILE
FILTER
DESIGN

Presented by

J.P. Giroud and R.C. Bachus
GeoSyntec Consultants
One Park Place
621 N.W. 53rd Street, Suite 650
Boca Raton, Florida 33487
Telephone: (561) 995-0900
Telefax: (561) 995-0995

H-11

The geotextile filter
between sand and pipe
is not the same as
the geotextile filter
between soil and gravel.

DESIGN
FOR
FILTRATION

FILTER CRITERIA
FOR
GEOTEXTILES

GEOTEXTILE FILTER

- Allow water to pass freely
- Prevent migration of soil particles

SIMILARITY BETWEEN
GEOTEXTILE AND GRANULAR
FILTER CRITERIA

OVERVIEW OF CRITERIA
OF
GRANULAR FILTERS

FILTER CRITERIA

- RETENTION CRITERION
- PERMEABILITY CRITERION

MEANING OF RETENTION CRITERION FOR GRANULAR FILTERS

d_{15} (filter) < 4 d_{85} (soil) (1)

$\frac{d_{15} \text{ (filter)}}{4}$ < d_{85} (soil) (2)

filter OPENINGS < d_{85} (soil) (3)

A O S
Apparent Opening Size

GEOTEXTILE APPARENT OPENING SIZE (AOS) can be expressed in

mm	or U.S. Sieve No.
0.075	200
0.100	140
0.150	100
0.210	70
0.300	50

Example: Specify a maximum AOS

AOS (mm) < 0.150 mm

AOS (Sieve No.) > 100

RETENTION CRITERION

$O_{95} < I_R d_{85}$

Simplistic
filter criteria
may be dangerous.

FILTER CRITERIA

- RETENTION CRITERION
- PERMEABILITY CRITERION
- POROSITY CRITERION

PERCENT OPEN AREA

$$A = \frac{\text{Area of Openings}}{\text{Total Area}}$$

POROSITY

$$n = \frac{\text{Volume of Voids}}{\text{Total Volume}}$$

ROLE OF
GEOTEXTILE
THICKNESS

RETENTION CRITERION
FOR
FINE SOILS

RISK OF PIPING
Fine soils with
little cohesion
(low plasticity soils)

SELECTION OF GEOTEXTILE FILTER FOR GEONET DRAIN

GEOTEXTILE FILTERS

- wovens (monofilament)
- nonwovens (needlepunched, heatbonded)

GEOTEXTILE SELECTION FOR FILTRATION

WOVEN OR NONWOVEN?

As typically indicated by filter criteria:

- MONOFILAMENT WOVEN - typically used with sands
- OTHER WOVENS - usually not suitable
- NONWOVENS - typically used with silts and clays

HEATBONDED OR NEEDLEPUNCHED?

Equivalent regarding filter criteria, but:

- HEATBONDED - recommended with drainage nets
- NEEDLEPUNCHED - often preferred with gravel drains

SURVIVABILITY

GEOTEXTILE FILTER SURVIVABILITY

	(1)	(2)	
GRAB	80	180	lbs
TEAR	25	50	lbs
PUNCTURE	25	80	lbs
BURST	130	290	psi

(1) Less severe conditions
(2) More severe conditions

$k_s = 1 \times 10^{-5}$ m/s (1×10^{-3} cm/sec)

- A polyester needlepunched nonwoven geotextile filter is considered. This geotextile has the following properties:

  - Mass per unit area: 0.34 kg/m^2 (10 oz/yd^2)

  - Permittivity (measured under a compressive stress equal to the field overburden stress):

    $\psi_g = 0.3\ s^{-1}$

  - Thickness (measured under a compressive stress equal to the field overburden stress):

    $t_g = 2$ mm

  - Apparent opening size (AOS):

    $O_{95} = 150\ \mu m$ (U.S. Sieve No. 100)

  - Grab strength: 1020 N (230 lbs)

  - Tear strength: 555 N (125 lbs)

  - Puncture strength: 555 N (125 lbs)

  - Burst strength: 2750 kPa (400 psi)

- First, determine the linear coefficient of uniformity. According to Figure 3:

  $d'_0 = 0.007$ mm $\qquad d'_{100} = 17$ mm

  Hence:

  $$C'_u = \sqrt{17/0.007} = 49$$

- Then, use Giroud's retention criterion (Table 1).

  Using the linear coefficient of uniformity calculated above and considering that the protective cover soil in a landfill is dense (due to high overburden stress and assuming it has been properly compacted), Table 1 shows that the following criterion should be used:

  $$O_{95} < 18\ d_{50} / C'$$

  where: O_{95} = apparent opening size (AOS) of the filter; d_{50} = soil particle size such that 50% by weight of soil particles are smaller than d_{50}; and C' = linear coefficient of uniformity.

  With the value $C' = 49$ calculated in Step 1, the above equation becomes:

  $$O_{95} < 18\ d_{50} / 49$$

  According to Figure 2, $d_{50} = 0.47$ mm.

  Hence:

  $$O_{95} < 0.17 \text{ mm (U.S. Sieve No. 100)}$$

  In other words, the apparent opening size (AOS) of the geotextile filter must be less than 0.17 mm (or the U.S. Sieve number used to express the geotextile filter AOS should be larger than 100). Many available nonwoven geotextiles meet this requirement.

C_u. If this were done with the particle size distribution curve shown in Figure 2, we would obtain the following new values for d_{100}, d_{85}, etc., as shown in Figure 5:

new $d_{100} = 4.75$ mm = actual d_{80}
new $d_{85} = 1.6$ mm = actual d_{68} (since $80\% \times 85\% = 68\%$)
new $d_{60} = 0.4$ mm = actual d_{48} (since $80\% \times 60\% = 48\%$)
new $d_{10} = 0.005$ mm = actual d_8 (since $80\% \times 10\% = 8\%$)

As a result:

new C_u = new d_{60}/new $d_{10} = 0.4 / 0.005 = 80$

According to Table 2, the FHWA criterion to use in this case is:

$O_{95} < d_{85}$ (using, of course, the new d_{85})

Hence:

$O_{95} < 1.6$ mm (U.S. Sieve No. 10)

In other words, according to this design method, the apparent opening size (AOS) of the geotextile filter must be less than 1.6 mm (or the U.S. Sieve number used to express the geotextile AOS should be no less than 10).

- Selected Method

The filter opening size value of 1.6 mm obtained with the second method, 1.6 mm, is very large and, in our judgment, may lead to soil piping. On the other hand, a filter with 1.6 mm openings is less likely to clog than a filter with 0.17 mm openings, as determined using the first method.

In the case of a filter used for a leachate collection system, clogging of the filter would only delay leachate collection, whereas piping would cause clogging of the

A factor of safety of 10 or more is recommended when lack of permeability of the filter could have catastrophic consequences, e.g., dams and soil layers on slopes. As a result, Equation 8 may range from $k_g > k_s$, when $i_s = 1$ and no safety factor is needed, to $k_g > 100\ k_s$ or more in the case if a very thin dam clay core.

Alternatively, the method recommended by the FHWA is as follows:

- For small gradients and stable soil:

$k_g > k_s$ (Equation 4)

- For high gradients and erodible soils:

$$k_g > 10\ k_s \qquad \text{(Equation 5)}$$

The value of the soil hydraulic conductivity, k_g, to be used in Equations 3, 4, and 5 should be measured under a compressive stress equal to the one expected in the field. In many cases, the geotextile permittivity, ψ_g, is given. The geotextile hydraulic conductivity, k_g, can then be derived as follows:

$$k_g = \psi_g\ t_g \qquad \text{(Equation 6)}$$

where: t_g = geotextile thickness under the compressive stress expected in the field.

- Example

The hydraulic conductivity of the considered geotextile is given by Equation 6, using the values of $\psi_g = 0.3\ s^{-1}$ and $t_g = 2 \times 10^{-3}$ m provided in the "Given Data" Section:

$$k_g = 0.3 \times 2 \times 10^{-3} = 6 \times 10^{-4}\ \text{m/s}$$

where: n = geotextile porosity or planar porosity; μ = geotextile mass per unit area; t_g = geotextile thickness; and ρ_f = density of filaments. (Note: The value of n obtained using Equation 7 must be multiplied by 100 to express the porosity of a nonwoven as a percentage or to obtain the percent open area of a woven.)

- Example

In this project, a needlepunched nonwoven geotextile is considered. Most needlepunched nonwoven geotextiles have a porosity of approximately 90%. Therefore, it is expected that the porosity requirement of 30% will easily be met. This is verified below.

The porosity of the considered nonwoven geotextile under the project overburden stress can be calculated using Equation 7, knowing that the density of polyester is 1380 kg/m^3:

$$n = 1 - 0.34/(2 \times 10^{-3} \times 1380)$$

$$n = 0.88 = 88\%$$

As expected, this value is greater than the required 30%.

<u>Step 4</u>. Survivability Requirements

- Method

The geotextile filter must withstand stresses due to construction activities. Survivability requirements that must be met by geotextiles used in drainage applications are given in Table 3.

$k_g > \ 1 \times 10^{-5}$ m/s (1×10^{-3} cm/sec)

- Porosity:

  - nonwovens: porosity > 30%
  - wovens: percent open area > 4%

- Survivability Requirements

  - Grab strength: 800 N (180 lbs)
  - Tear strength: 220 N (50 lbs)
  - Puncture strength: 360 N (80 lbs)
  - Burst strength: 2000 kPa (290 psi)

The geotextile filter considered in the "Given Data" Section at the beginning of this design example meets all the above requirements. In addition, hydraulic transmissivity tests should be conducted on a specimen including the considered synthetic drainage layer and geotextile filter, as well as the adjacent soil, to verify that the synthetic drainage layer has the required hydraulic transmissivity with these boundary conditions. The hydraulic transmissivity test must be conducted under a compressive stress at least equal to the expected field compressive stress.

Table 1. *Giroud's Retention Criterion for Geotextile Filters.* [Giroud, 1982]

Density index of the soil (Relative density)		Linear coefficient of uniformity of the soil	
		$1 < C_u' < 3$	$C_u' > 3$
loose soil	$I_D < 35\%$	$O_{95} < C_u' \, d_{50}$	$O_{95} < (9/C_u') \, d_{50}$
medium dense soil	$35\% < I_D < 65\%$	$O_{95} < 1.5 \, C_u' \, d_{50}$	$O_{95} < (13.5/C_u') \, d_{50}$
dense soil	$I_D > 65\%$	$O_{95} < 2 \, C_u' \, d_{50}$	$O_{95} < (18/C_u') \, d_{50}$

Table 3. *Geotextile Filter Survivability Requirements.* [FHWA, 1985]

Property	Class (A)	Class (B)	Test Method
Grab strength	800 N (180 lbs)	360 N (80 lbs)	ASTM D1682
Tear strength	220 N (50 lbs)	110 N (25 lbs)	ASTM D1117
Puncture strength	360 N (80 lbs)	110 N (25 lbs)	ASTM D3787
Burst strength	2000 kPa (290 psi)	900 kPa (130 psi)	ASTM D3786

(A) "Unprotected".

(B) "Protected", i.e., in trench, with rounded gravel; or in contact with concrete slab or geomembrane.

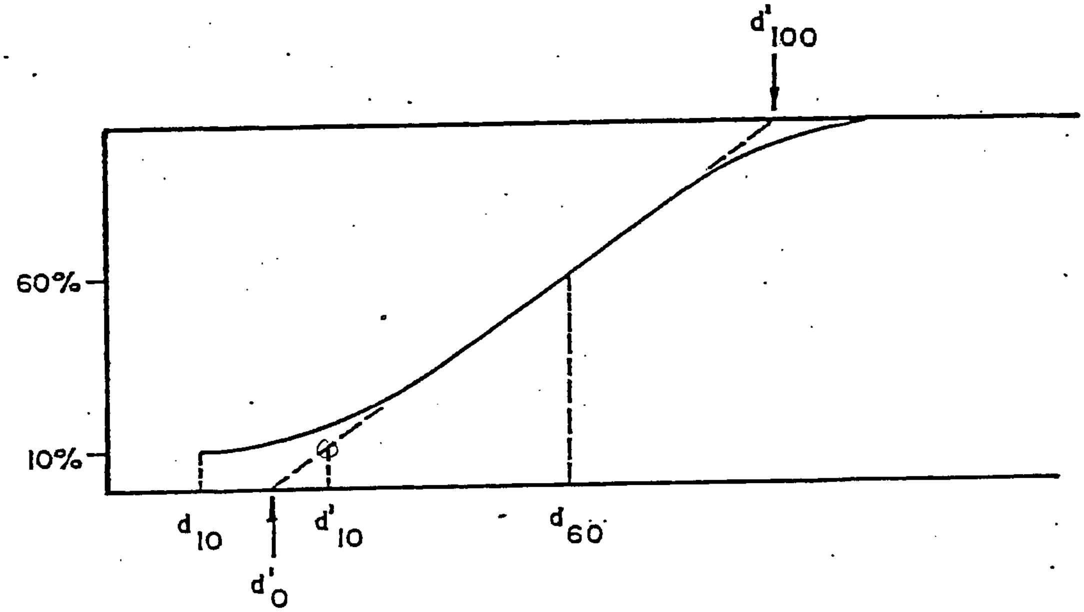


Figure 3. *Determination of the Linear Coefficient of Uniformity.*

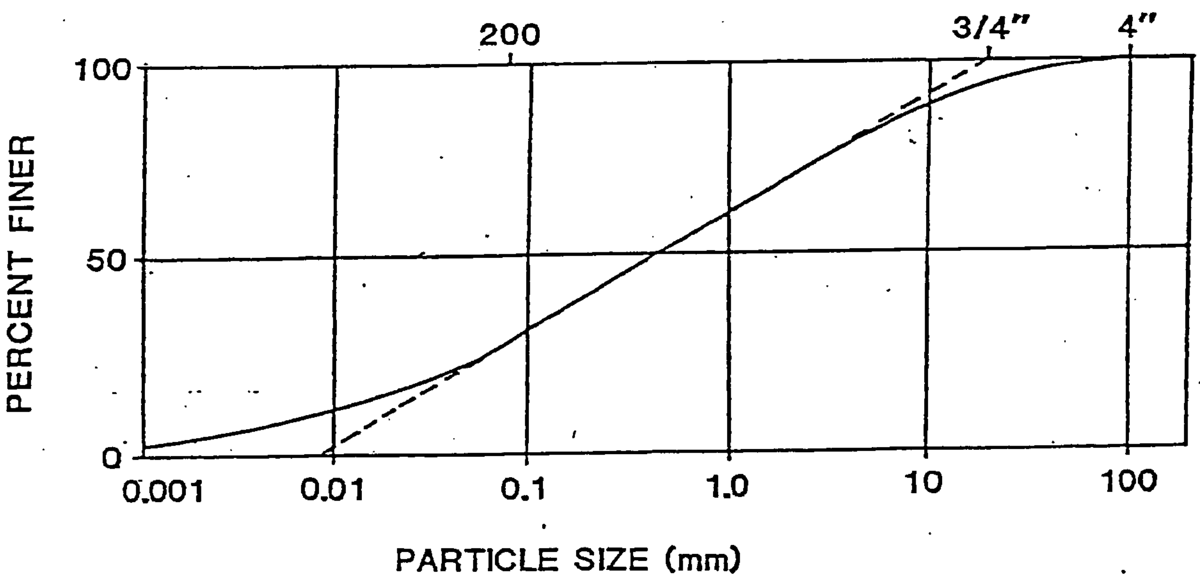


Figure 4. *Determination of the Linear Coefficient of Uniformity for the Considered Soil.*

REFERENCE 2

OCT 12 2005

ARDAMAN & ASSOCIATES, INC.
Geotechnical, Environmental and Materials consultant
3925 Coconut Palm Drive, Suite 115
Tampa, Florida 33619
(813) 620-3389 FAX (813) 628-4008

LETTER OF TRANSMITTAL

DATE: 10/11/05 JOB NO.: 05-53-9718

RE: Hillsborough County Southeast Landfill
Section 8 Construction
Southeast Hillsborough County, Florida
(813) 258-0703 FAX (813) 254-6860

TO: Jones Edmunds and Associates
324 South Hyde Park Avenue, Suite 250
Tampa, Florida 33606
Attention: Mr. Joe O'Neil

WE ARE SENDING YOU: [X] Attached [ ] Under Separate cover via ________ the following items:
[ ] Shop Drawings [ ] Prints [ ] Plans [ ] Specifications
[ ] Copy of Letter [ ] Change Order [ ] Samples
[ ] ________

COPIES	DATE	NO.	DESCRIPTION
2		3601	Standard Proctor Test Results
2		3601	Grain Size Distribution Curve

THESE ARE TRANSMITTED: (as checked below)

[ ] For approval [ ] Approved as submitted [ ] Resubmit ____ copies for approval
[X] For your use [ ] Approved as noted [ ] Submit ____ copies for distribution
[ ] As requested [ ] Returned for corrections [ ] Return ____ corrected prints
[ ] For review and comment [ ] For Bids Due ________
[ ] Prints Returned After Loan To Us [ ] ________

REMARKS:

COPY TO:

SIGNED Jonathan Sink

Faulkner Engineering Services, Inc.
12904 Dupont Circle, Tampa, Florida 33626
813-818-0307 Office
813-818-8381 Fax
www.faulknereng.com

Southeast County Landfill, Section 8
Hillsborough County, Florida

Client: Jerry L. Pinder
ERC General Contracting Services, Inc.
890 Carter Road, Suite 170
Winter Garden, FL 34787

Report Date: November 28, 2005

Project Number: 05-010

SUMMARY OF TEST RESULTS

PROTECTIVE COVER LAYER

Drainage Sand Location Number	Drainage Sand Sample Location				Hydraulic Conductivity (cm/sec)	Percent Passing Sieve (%)				
						No. 10	No. 30	No. 50	No. 70	No. 200
Per Section 2220.2.05					Minimum 1.0E-03	Maximum 100%	Maximum 95%	Maximum 65%	Maximum 20%	Between 0 to 5 %
1	N	1251835.56	E	599003.69	4.90E-03	100	95	59	18	4.2
2	N	1252071.13	E	599152.80	7.90E-03	100	95	65	17	4.0
3	N	1251822.84	E	599.149.99	4.90E-03	100	94	63	16	3.4
4	N	1252009.76	E	599326.82	2.10E-03	100	94	60	20	4.4
5	N	1251739.53	E	599316.08	2.50E-03	100	94	53	20	4.2
6	N	1251919.84	E	599507.39	1.90E-03	100	93	60	19	4.0
7	N	1251702.39	E	599511.56	Pending			Pending		

Respectfully Submitted,
Faulkner Engineering Services, Inc.

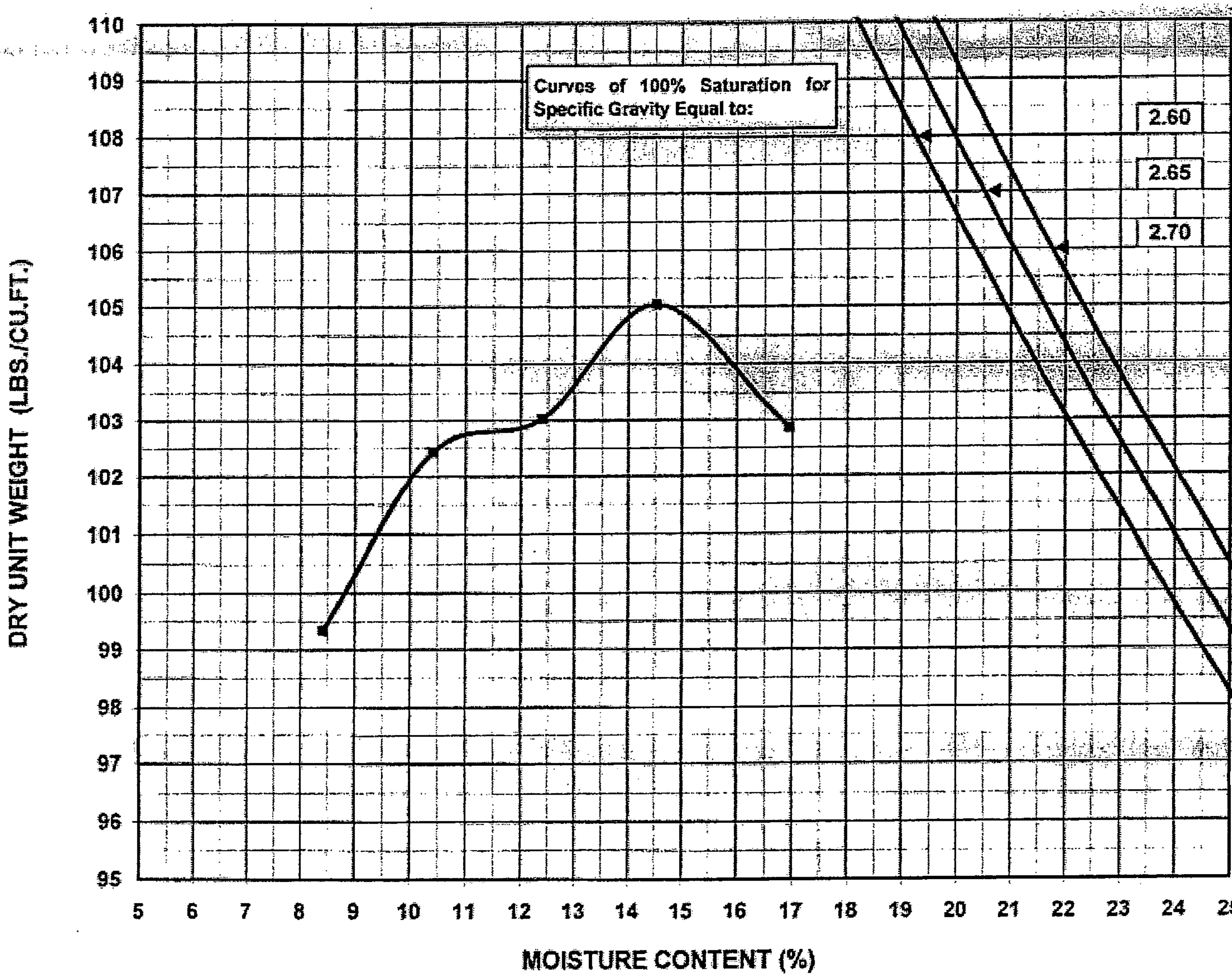
JRG, Jr. 11/28/05

John R. Gregos, Jr., P.E.
Florida Registration No. 58528

ARDAMAN & ASSOCIATES, INC.
3925 COCONUT PALM DRIVE, SUITE 115
TAMPA, FLORIDA 33619
(813) 620-3389, FAX (813) 628-4008

Project Name:	Hills. Co. Southeast Landfill - Section 8	Date Sampled:	10/6/05
Project Location:	Southeast Hillsborough County, Florida	Sampled By:	Client
File Number:	05-53-9718	Date Tested:	10/10/05
Client Name:	Jones Edmunds and Associates	Tested By:	JH
Lab Number:	3601		

MOISTURE-DENSITY RELATIONSHIP



Maximum Dry Density: 105.0 pcf

Optimum Moisture Content: 14.5 percent

Soil Description: Brown fine sand (SP) with some hard pan

Sample Location: Unknown

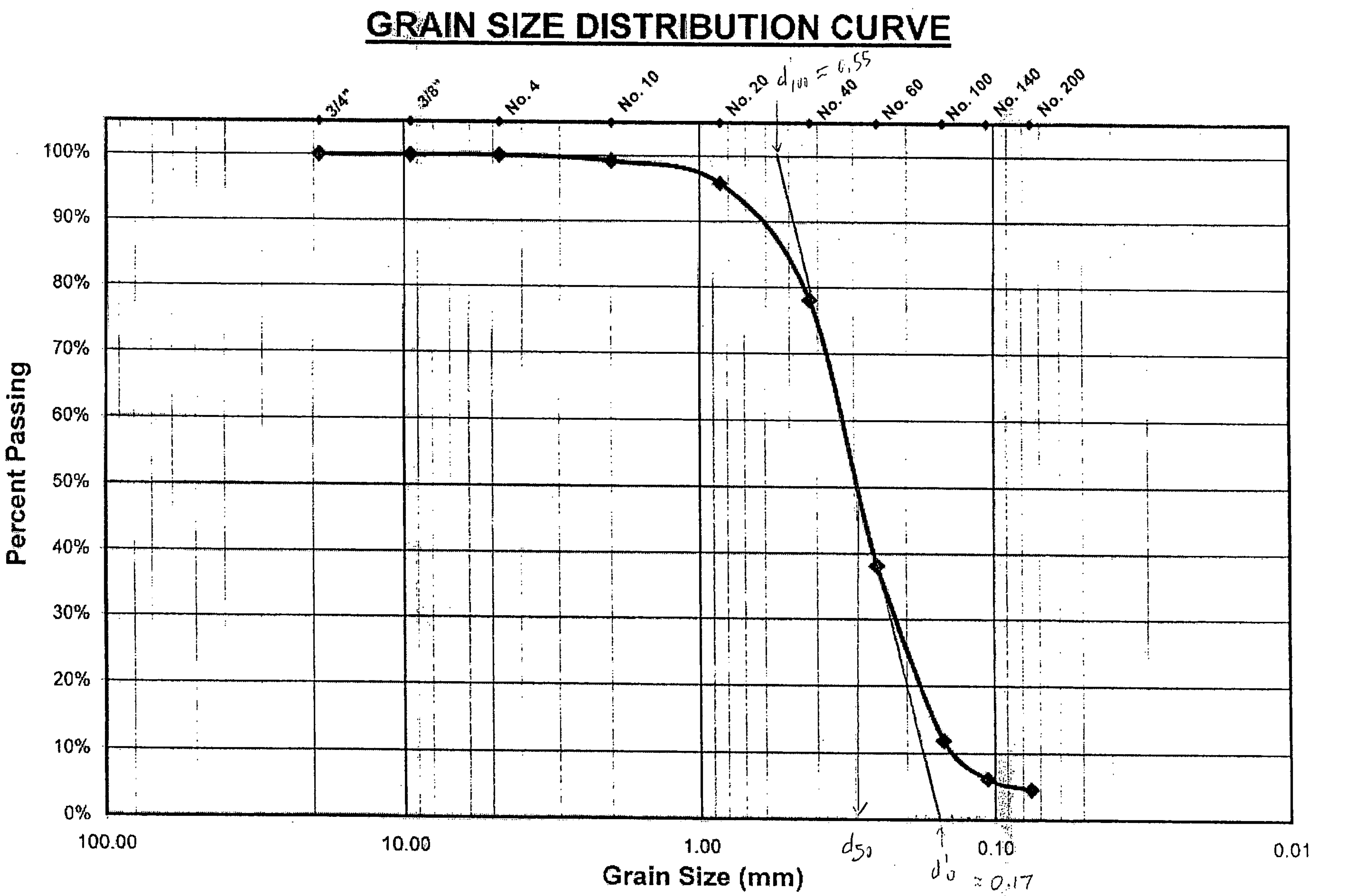
Test Method: ____ Modified Proctor (AASHTO T-180 / ASTM D-1557)

A Standard Proctor (AASHTO T-99 / ASTM D-698)

Rammer Type: Mechanical

Preparation Method: Dry

BEST AVAILABLE COPY



GRAVEL: > 4.75 mm	Laboratory Testing of Sample No. 3601
SAND (course to medium): < 4.75 mm & > 0.425 mm	
SAND (fine): < 0.425 mm & > 0.075 mm	Brown fine sand (SP) with some hard pan
SILT: < 0.075 mm & > 0.002 mm	Hills. Co. Southeast Landfill - Section 8
CLAY: < 0.002 mm	A&A File No. 05-53-9718

SUMMARY OF SOIL TESTS

QORE PROPERTY SCIENCES

JOB NAME : Jones Edmunds Drainage Sand Evaluation
JOB NO. : 26669 **REPORT NO. :** **DATE :** 11/18/05 **REVIEWED BY :**

SAMPLE NUMBER	SAMPLE TYPE	IN- SITU MOISTURE	FINES	ATTERBERG LIMITS			STANDARD PROCTOR ASTM D 698		REMOLD PERMEABILITY ASTM D 5084			SHELBY TUBE PERMEABILITY			SAND	
		ASTM D 2216	ASTM D 422	ASTM D 4318			MAX. DRY DENSITY	OPTIMUM MOISTURE	MOISTURE	COMPACTION	HYDRAULIC CONDUCTIVITY K	MOISTURE	DRY DENSITY	HYDRAULIC CONDUCTIVITY ASTM D 5084 K	MAXIMUM PARTICLE SIZE ASTM D 422	HYDRAULIC CONDUCTIVITY ASTM D 2434 K
				LL	PL	PI										
		%	%	%	%	%	PCF	%			CM / SEC	%	PCF	CM / SEC	MM	CM / SEC
1	Bulk	-	5	-	-	-	105.1	16.7	-	-	-	-	-	-	-	1.90E-03
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-
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REFERENCE 3

Designation: D 4491 – 99a (Reapproved 2004)

Standard Test Methods for Water Permeability of Geotextiles by Permittivity[1]

This standard is issued under the fixed designation D 4491; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

This standard has been approved for use by agencies of the Department of Defense.

1. Scope

1.1 These test methods cover procedures for determining the hydraulic conductivity (water permeability) of geotextiles in terms of permittivity under standard testing conditions, in the uncompressed state. Included are two procedures: the constant head method and the falling head method.

1.2 The values stated in SI units are to be regarded as the standard. The inch-pound units stated in parentheses are provided for information only.

1.3 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:* [2]

D 123 Terminology Relating to Textiles

D 653 Terminology Relating to Soil, Rock, and Contained Fluids

D 4439 Terminology for Geotextiles

D 5199 Test Method for Measuring Nominal Thickness of Geotextiles and Geomembranes

E 691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method

3. Terminology

3.1 *Definitions:*

3.1.1 *geotechnics, n*—the application of scientific methods and engineering principles to the acquisition, interpretation, and use of knowledge of materials of the earth's crust to the solution of engineering problems.

3.1.1.1 *Discussion*—Geotechnics embraces the fields of soil mechanics, rock mechanics, and many of the engineering aspects of geology, geophysics, hydrology, and related sciences.

3.1.2 *geotextile, n*—a permeable geosynthetic comprised solely of textiles.

3.1.3 *permeability, n*—the rate of flow of a liquid under a differential pressure through a material.

3.1.3.1 *Discussion*—The nominal thickness is used as it is difficult to evaluate the pressure on the geotextile during the test, thereby making it difficult to determine the thickness of the fabric under these test conditions.

3.1.4 *permeability, n—of geotextiles,* hydraulic conductivity.

3.1.5 *permittivity, (ψ), (T−1), n—of geotextiles,* the volumetric flow rate of water per unit cross sectional area per unit head under laminar flow conditions, in the normal direction through a geotextile.

3.1.6 For the definitions of other terms relating to geotextiles, refer to Terminology D 4439. For the definitions of textile terms, refer to Terminology D 123. For the definition of coefficient of permeability, refer to Terminology D 653.

4. Summary of Test Methods

4.1 These test methods describe procedures for determining the permittivity of geotextiles using constant head or falling head test procedures, as follows:

4.1.1 *Constant Head Test*—A head of 50 mm (2 in.) of water is maintained on the geotextile throughout the test. The quantity of flow is measured versus time. The constant head test is used when the flow rate of water through the geotextile is so large that it is difficult to obtain readings of head change versus time in the falling head test.

[1] These test methods are under the jurisdiction of ASTM Committee D35 on Geosynthetics and are the direct responsibility of Subcommittee D35.03 on Permeability and Filtration.

Current edition approved Dec. 10, 1999. Published March 2000. Originally apporoved in 1985. Last previous edition approved in 1999 as D 4491 – 99a.

[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

FIG. 1 Constant and Falling Head Permeability Apparatus

minimum of 150 L/min of air in connection with a non-collapsible storage tank with a large enough storage capacity for the test series, or at least one specimen at a time.

8.2 Allow the de-aired water to stand in a closed storage tank under a slight vacuum until room temperature is attained.

9. Specimen Preparation

9.1 To obtain a representative value of permittivity, take four specimens from each full width laboratory sample as described below.

9.2 Referring to Fig. 2, select four specimens, A, B, C, and D, as follows:

9.2.1 Select four specimens equally spaced along a diagonal line extending from the lower left hand corner to the upper right hand corner of the laboratory sample. Neither specimen A or D shall be closer to the corner of the laboratory sample than 200 mm (8 in.).

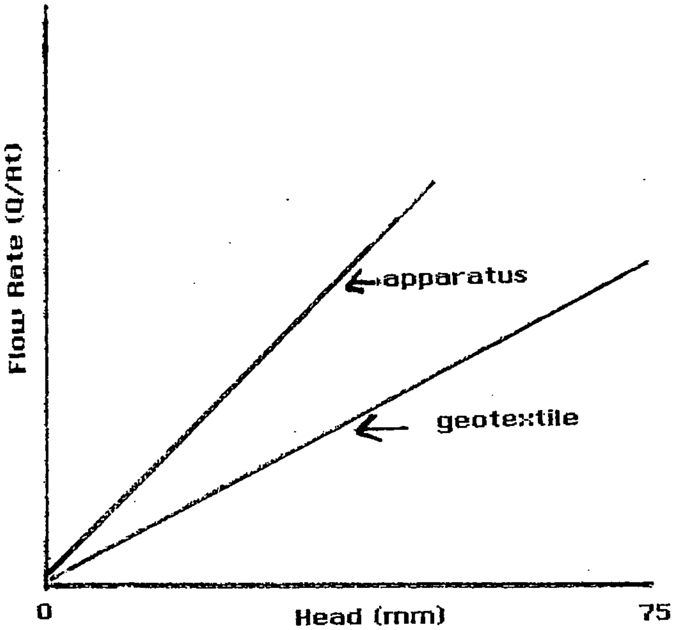


FIG. 3 Calibration Curve

TABLE 1 Viscosity of Water Versus Temperature

Temperature, °C	Viscosity (Poiseuille)[A]
0	1.7921×10^{-3}
1	1.7313×10^{-3}
2	1.6278×10^{-3}
3	1.6191×10^{-3}
4	1.5674×10^{-3}
5	1.5188×10^{-3}
6	1.4728×10^{-3}
7	1.4284×10^{-3}
8	1.3860×10^{-3}
9	1.3462×10^{-3}
10	1.3077×10^{-3}
11	1.2713×10^{-3}
12	1.2363×10^{-3}
13	1.2028×10^{-3}
14	1.1709×10^{-3}
15	1.1404×10^{-3}
16	1.1111×10^{-3}
17	1.0828×10^{-3}
18	1.0559×10^{-3}
19	1.0299×10^{-3}
20	1.0050×10^{-3}
21	0.9810×10^{-3}
22	0.9579×10^{-3}
23	0.9358×10^{-3}
24	0.9142×10^{-3}
25	0.8937×10^{-3}

[A]Poiseuille = kg s^{-1} m^{-1} = Nsm.

12. Calculation

12.1 Calculate the permittivity, ψ, as follows:

$$\psi = QR_t/hAt \quad (1)$$

where:

ψ = permittivity, s^{-1},
Q = quantity of flow, mm^3,
h = head of water on the specimen, mm,
A = cross-sectional area of test area of specimen, mm^2,
t = time for flow (Q), s, and
R_t = temperature correction factor determined using Eq 2.

$$R_t = u_t/u20_c \quad (2)$$

where:

u_t = water viscosity at test temperature, millipoises, as determined from Table 1, and
$u20_c$ = water viscosity at 20°C, mP.

12.2 Calculate the permittivity for the five sets of readings per specimen at the 50 mm (2 in.) head.

12.3 Determine the average permittivity for the individual specimen tests.

12.4 Determine the average permittivity for the four specimens tested.

12.5 Determine the standard deviation and coefficient of variation for the four specimens tested.

FALLING HEAD TEST

13. Procedure

13.1 Proceed as in 11.1 through 11.5.

NOTE 9—**Caution:** The falling head procedure should not be performed for geotextiles with a permittivity greater than 0.05 sec^{-1} unless the system is equipped with an automated data acquisition system that would measure elapsed time for the drop in head from 80 to 20 mm on the manometer.

13.2 Adjust the discharge pipe so that its outlet is slightly above the level of the specimen.

13.3 By increasing the flow from the water supply, adjust the water level to 150 mm (6 in.). Once the water is at this level, shut off the water supply and allow the water level to fall to 80 mm (3.2 in.). At this point, start the stop watch and determine the time for the water level to fall to the 20-mm (⅘-in.) level. Record the inside diameter (d) of the upper unit, the diameter (D) of the exposed portion of the specimen, and the water temperature (T). Make at least five readings per specimen. All measurements in 13.3 are in relation to the outlet water.

13.4 Repeat the procedure on the remaining specimens.

14. Calculation

14.1 Calculate the permittivity, ψ, as follows:

$$\psi = [(a/At)\ \ln(h_0/h_1)]R_t \quad (3)$$

where:

A = $\pi D^2/4$—cross-sectional test area of specimen, mm^2,
a = $\pi d^2/4$—cross-sectional area of standpipe above specimen,
t = time for head to drop from h_0 to h_1, s,
h_0 = initial head (80 mm),
h_1 = final head (20 mm), and
R_t = temperature correction factor determined from Eq 2.

14.2 Repeat calculations for the five sets of data per specimen. Determine the average permittivity for the individual specimens tested.

15. Report

15.1 The report shall include the following:

REFERENCE 4

Fourth Edition

Designing with Geosynthetics

Robert M. Koerner, Ph.D., P.E.

H. L. Bowman Professor of Civil Engineering,
Drexel University and Director, Geosynthetic
Research Institute

PRENTICE HALL
Upper Saddle River, New Jersey 07458

TABLE 2.12 RECOMMENDED REDUCTION FACTOR VALUES FOR USE IN EQ. (2.25a)

	Range of Reduction Factors				
Application	Soil Clogging and Blinding*	Creep Reduction of Voids	Intrusion into Voids	Chemical Clogging†	Biological Clogging
Retaining wall filters	2.0 to 4.0	1.5 to 2.0	1.0 to 1.2	1.0 to 1.2	1.0 to 1.3
Underdrain filters	5.0 to 10	1.0 to 1.5	1.0 to 1.2	1.2 to 1.5	2.0 to 4.0
Erosion-control filters	2.0 to 10	1.0 to 1.5	1.0 to 1.2	1.0 to 1.2	2.0 to 4.0
Landfill filters	5.0 to 10	1.5 to 2.0	1.0 to 1.2	1.2 to 1.5	5 to 10‡
Gravity drainage	2.0 to 4.0	2.0 to 3.0	1.0 to 1.2	1.2 to 1.5	1.2 to 1.5
Pressure drainage	2.0 to 3.0	2.0 to 3.0	1.0 to 1.2	1.1 to 1.3	1.1 to 1.3

*If stone riprap or concrete blocks cover the surface of the geotextile, use either the upper values or include an additional reduction factor.

†Values can be higher particularly for high alkalinity groundwater.

‡Values can be higher for turbidity and/or for microorganism contents greater than 5000 mg/l.

$$q_{\text{allow}} = q_{\text{ult}}\left(\frac{1}{\Pi \text{RF}}\right) \tag{2.25b}$$

where

q_{allow} = allowable flow rate,
q_{ult} = ultimate flow rate,
RF_{SCB} = reduction factor for soil clogging and blinding,
RF_{CR} = reduction factor for creep reduction of void space,
RF_{IN} = reduction factor for adjacent materials intruding into geotextile's void space,
RF_{CC} = reduction factor for chemical clogging,
RF_{BC} = reduction factor for biological clogging, and
ΠRF = value of cumulative reduction factors.

As with Eqs. (2.24) for strength reduction, this flow-reduction equation could also have included additional site-specific terms, such as blocking of a portion of the geotextile's surface by riprap or concrete blocks.

2.5 DESIGNING FOR SEPARATION

Application areas for geotextiles used for the separation function were given in Section 1.3.3. There are many specific applications, and it could be said, in a general sense, that geotextiles always serve a separation function. If they do not also serve this function, any other function, including the primary one, will not be served properly. This should not give the impression that the geotextile function of separation always plays a secondary role. Many situations call for separation only, and in such cases the geotextiles serve a significant and worthwhile function.

REFERENCE 5

TRI/ENVIRONMENTAL, INC.
A Texas Research International Company

April 18, 2006

Mail To:

Mr. Joseph O'Neill
Jones, Edmunds & Associates, Inc.
324 South Hyde Park Avenue, Suite 250
Tampa, FL 33606

email: joneill@jonesedmunds.com
cc email: rsiemering@jonesedmunds.com - Richard Siemering

Bill To:

<= Same (P.O. # 40288)

Dear Mr. O'Neill:

Thank you for consulting TRI/Environmental, Inc. (TRI) for your geosynthetics testing needs. TRI is pleased to submit this final report for laboratory testing.

Project:		SE Hillsborough County Landfill, Section 8
TRI Job Reference Number:		E2256-56-07
Material(s) Tested:		1 Woven Geotextile(s)
Test(s) Requested:	Updating ===>	Mass/Unit Area (ASTM D 5261)
	Updating ===>	Puncture Strength (ASTM D 4833)
	Updating ===>	Apparent Opening Size (ASTM D 4751)
	Updating ===>	Permittivity (ASTM D 4491)

If you have any questions or require any additional information, please call us at 1-800-880-8378.

Sincerely,

Sam R. Allen
Vice President and Division Manager
Geosynthetic Services Division

GEOTEXTILE TEST RESULTS

TRI Client: Jones, Edmunds & Associates, Inc.
Project: SE Hillsborough County Landfill, Section 8

Material: Woven Geotextile
Sample Identification: M404
TRI Log #: E2256-56-07

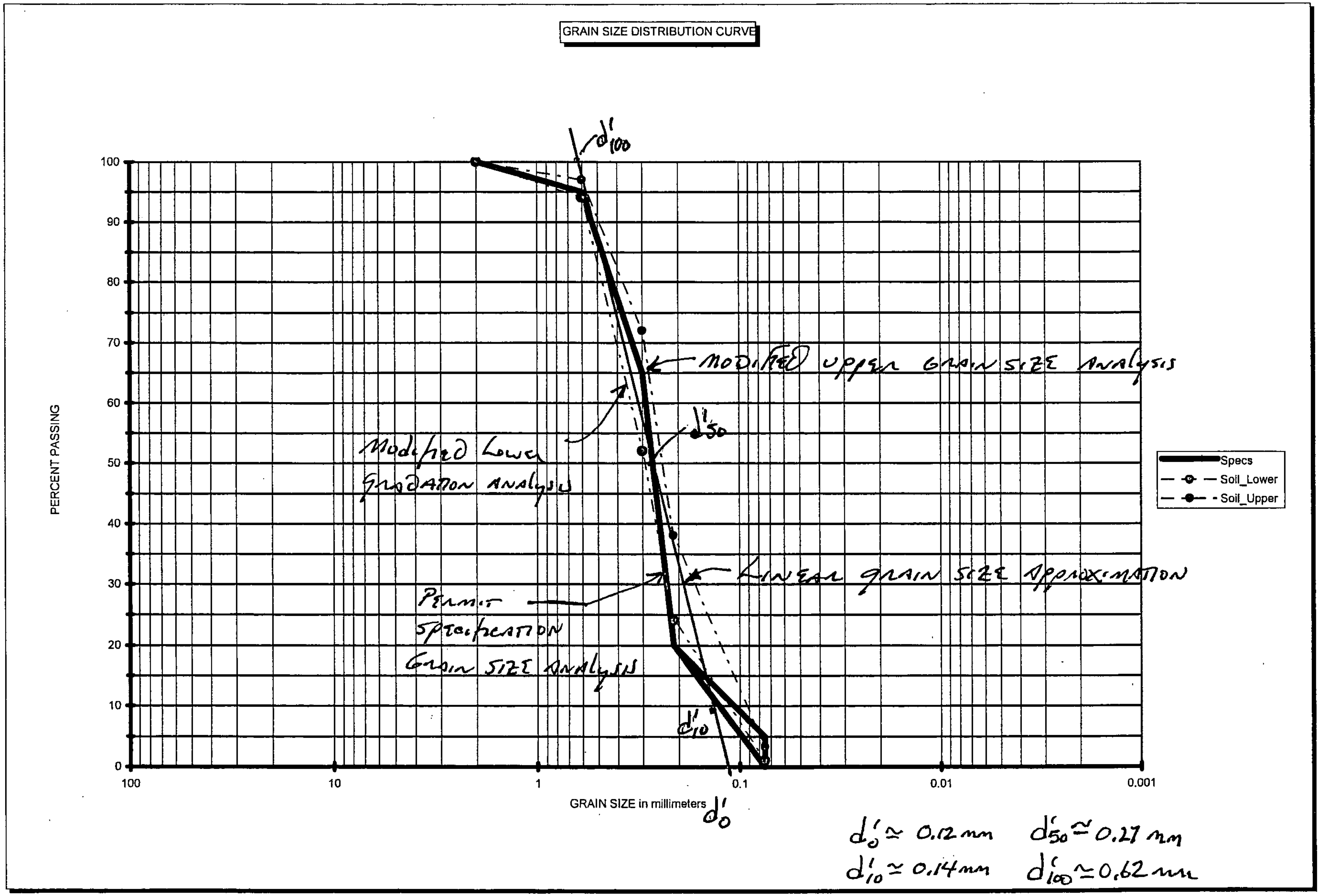
PARAMETER	TEST REPLICATE NUMBER 1	2	3	4	5	6	7	8	9	10	MEAN	STD. DEV.
Mass/Unit Area (ASTM D 5261)												
5" Diameter Circle (grams)	2.57	2.59	2.59	2.60	2.58	2.58	2.60	2.58	2.58	2.60		
Mass/Unit Area (oz/sq.yd)	5.98	6.02	6.02	6.05	6.00	6.00	6.05	6.00	6.00	6.05	6.02	0.02
Puncture Resistance (ASTM D 4833)												
Puncture Strength (lbs)	134	118	115	131	135	111	131	124	112	138	122	9
	123	119	122	111	113							
Apparent Opening Size (ASTM D 4751)												
Opening Size Diameter (mm)	0.355	0.425	0.355	0.425	0.425						0.397	0.034
US Sieve No.	45	40	45	40	40						40	
PARAMETER												

Constant Head Permittivity (ASTM D 4491, 2 in. Constant Head)

Water Temp. (C):	21
Correction Factor:	0.9759

Trial =>:	1					2					MEAN	STD. DEV.
Thickness (mils)	27	27	27	27	27	28	28	28	28	28		
Time (s)	10	10	10	10	10	10	10	10	10	10		
Flow (L)	2.52	2.56	2.56	2.56	2.56	2.48	2.52	2.52	2.48	2.48		
Permittivity (s-1)	2.45	2.49	2.49	2.49	2.49	2.41	2.45	2.45	2.41	2.41		
Flow rate (GPM/ft2)	183	186	186	186	186	180	183	183	180	180		
Permeability (cm/s)	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17		
Trial =>:	**3**					**4**						
Thickness (mils)	27	27	27	27	27	27	27	27	27	27		
Time (s)	10	10	10	10	10	10	10	10	10	10		
Flow (L)	2.48	2.52	2.52	2.52	2.52	2.60	2.56	2.60	2.60	2.60		
Permittivity (s-1)	2.41	2.45	2.45	2.45	2.45	2.52	2.49	2.52	2.52	2.52	2.46	0.04
Flow rate (GPM/ft2)	180	183	183	183	183	189	186	189	189	189	184	3
Permeability (cm/s)	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.00

TEMPERATURE CORRECTED VALUES		
	Permittivity (s-1)	2.41
	Flow rate (GPM/ft2)	180
	Permeability (cm/s)	0.17


GRAIN SIZE DISTRIBUTION CURVE
PERCENT PASSING
100
90
80
70
60
50
40
30
20
10
0
100
10
1
0.1
0.01
0.001
GRAIN SIZE in millimeters
Specs
Soil_Lower
Soil_Upper

Permit Specifications (Grain Size Analysis)

MODIFIED:

Sieve No.	Specification (percent passing)	Range of Values Test Results
10	100	100
30	95	94 – 97
50	65	52 – 72
70	20	24 – 38
200	0 - 5	1 – 3.2

modified grain size analysis upper/lower bounds

See Section 7 for CQA / CQC test results for protective sand.

1.4 PRECONSTRUCTION

A preconstruction topographic survey by Pickett and Associates is included in Section 2.

1.5 EXCAVATION OF SECTION 8 CELL

An excavation topographic survey by Pickett and Associates is included in Section 3.

1.6 BACKFILL OF SECTION 8 CELL

Prior to installation of the clay subbase, the Section 8 cell subgrade was prepared by excavating, backfilling, and compacting to the grade as shown on the Construction Drawings. The surface of the prepared subgrade was free of sticks and roots larger than ½ - inch diameter and 3 feet in length, organic mater, and stones larger than 1-inch in any dimension. Suitable subgrade soil material included poorly graded sand (SP), silty sand (SM), or clayey sand (SC) as classified by the Unified Soil Classification System. Suitable soil materials were not excessively wet or dry and were within three percent of the optimum moisture content range to achieve 95 percent of maximum dry density as determined by the Standard Proctor test. The specifications required a minimum of two in-place density tests per acre per lift.

Refer to Section 4 for CQC (i.e., Faulkner and Burcaw) Density Reports including the test location map and a topographic survey from Pickett and Associates.

1.7 INSTALLATION OF LOW PERMEABILITY SOIL SUBBASE

Prior to installation of the 60-mil HDPE liner system, the Section 8 clay subbase was constructed. Material for the clay subbase was obtained from a borrow source offsite. The subbase was installed in six-inch lifts and compacted to the grades as shown on the Construction Drawings. The surface of the installed subbase was free of sticks, roots organic mater, and stones larger than 1-inch in any dimension. Suitable subbase soil material included poorly graded clayey sand (SP-SC), clayey sand (SC), fat clay (CH), or lean clay (CL) as classified by the Unified Soil Classification System. Suitable soil materials were not excessively wet or dry and were within three percent of the optimum moisture content range of 95 percent of maximum dry density as determined by the Standard Proctor test. The maximum hydraulic conductivity for the constructed subbase of $1x10^{-5}$ cm/sec was achieved as

ATTACHMENT R15.b
REVISED SCS ENGINEERS' REPORT, PARAGRAPH 1.7

MODIFIED:

Sieve No.	Specification (percent passing)	Range of Values Test Results
10	100	100
30	95	94 – 97
50	65	52 – 72
70	20	24 – 38
200	0 - 5	1 – 3.2

See Section 7 for CQA / CQC test results for protective sand.

1.4 PRECONSTRUCTION

A preconstruction topographic survey by Pickett and Associates is included in Section 2.

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Refer to Section 4 for CQC (i.e., Faulkner and Burcaw) Density Reports including the test location map and a topographic survey from Pickett and Associates.

1.7 INSTALLATION OF LOW PERMEABILITY SOIL SUBBASE

Prior to installation of the 60-mil HDPE liner system, the Section 8 clay subbase was constructed. Material for the clay subbase was obtained from a borrow source offsite. The subbase was installed in six-inch lifts and compacted to the grades as shown on the Construction Drawings. The surface of the installed subbase was free of sticks, roots organic mater, and stones larger than ~~1~~1/4-inch in any dimension. Suitable subbase soil material included poorly graded clayey sand (SP-SC), clayey sand (SC), fat clay (CH), or lean clay (CL) as classified by the Unified Soil Classification System. Suitable soil materials were not excessively wet or dry and were within three percent of the optimum moisture content range of 95 percent of maximum dry density as determined by the Standard Proctor test. The maximum hydraulic conductivity for the constructed subbase of $1x10^{-5}$ cm/sec was achieved as demonstrated in Section 5. The specifications required a minimum of two in-place density tests per acre per lift and four in-place density tests for the first five acres, totaling 26 tests.

In accordance with the project specifications, the Contractor prior to the installation of the subbase constructed a test section 50 feet wide by 200 feet long to verify that the proposed subbase and construction techniques would consistently achieve the specified parameters as presented in Table 02221-1 of the project specifications. In accordance with the specifications, the CQC consultant performed the necessary tests on the test strip and subbase borrow source. Refer to Section 5 for the following test results: Hydraulic Conductivity Test (EPA Test Method 9100) and Permeability tests (ASTM D 5084).

SCS Engineers' CQA performed the Permeability tests (ASTM D 5084). Refer to Section 5 for the test results by PSI.

In accordance with the specifications, Pickett and Associates completed a subbase survey. The subbase survey is contained in Section 5.

1.8 GEOSYNTHETIC INSTALLATION

SCS Engineers' CQA Representative was on-site full-time to observe construction activities during the geomembrane / geocomposite liner system installation, in accordance with Florida Department of Environmental Protection (FDEP) rules. Section 6 discusses the geomembrane / geocomposite CQA activities in further detail and contains TRI Destructive Sample test results pertaining to the geosynthetic installation of the Southeast County, Landfill Capacity Expansion - Section 8 (Section 8). The proposed panel layouts and geosynthetic installation logs through September 30, 2005 are also included in Section 6. The CQA daily field log for the liner installation through September 30, 2005 is included in Section 6.

As part of the specifications, the manufacturer, GSE and Tenax were required to perform initial conformance tests on the geomembrane and geocomposite prior to delivery. The results were recorded in certificates for each roll of geomembrane and geocomposite, and are contained in Section 6.

1.9 INSTALLATION OF DRAINAGE SAND, PIPES, ROCK, BALL PLUG VALVE

1.9.1 Drainage Sand

The permeability of the installed drainage sand varied from 1.4×10^{-3} to 5.8×10^{-3} centimeters per second (cm/s). The minimum permeability per specification is 1.0×10^{-3} cm/s. The permeability and sieve analyses of the drainage sand are contained in Section 7.

1.9.2 Pipes

The Quality Control Certifications for the HDPE pipe used in the collection / detection system is contained in Section 7.

1.9.3 <u>Ball Plug Valve</u>

Refer to Section 7 for ball plug valve information.

1.10 CONSTRUCTION DRAWINGS

SCS performed revisions to the Construction Drawings through September 30, 2005. The Construction Drawings can be found in Attachment 1-2 in this section.

1.11 DOCUMENTATION

Section 8 contains the construction photographs which are representative of construction activities as work progressed during completion of Section 8 at the Southeast County, Landfill Capacity Expansion through September 30, 2005.

Section 8 contains SCS Field Reports through September 30, 2005.

ATTACHMENT R18.b
Faulkner Testing Consolidation Stress

FAULKNER
ENGINEERING SERVICES, Inc.

GEOTECHNICAL ENGINEERING
& CONSTRUCTION
MATERIALS TESTING

April 11, 2006

Mr. Jerry L. Pinder
ERC General Contracting Services, Inc.
890 Carter Road, Suite 170
Winter Garden, Florida 34787

RE: Permeability Testing (ASTM D5084) Information
SOUTHEAST COUNTY LANDFILL EXPANSION, SECTION 8
Hillsborough County, Florida
FES Project No.: 05-010

Dear Mr. Pinder:

Faulkner Engineering Services, Inc. (FES) representatives were requested by Mr. Joseph O'Neill, P.E. of Jones Edmunds to provide some additional information concerning the consolidation pressure during the permeability sample testing.

The consolidation pressure utilized during ASTM D5084 sample testing was 10 pounds per square inch (psi).

If you should have any questions or we can be of further service, please do not hesitate to contact us at our office.

Respectfully Submitted,
Faulkner Engineering Services, Inc.

4/11/06

John R. Gregos, Jr., P.E.
Florida Registration No. 58628

cc: Jones Edmunds, Joseph O'Neill, P.E.

g:\2005 cmt projects\05-010 se county landfill (erc) cmt\SE Landfill Permeability Information.doc

12904 Dupont Circle • Tampa, FL 33626 • Ph: 813-818-8307 • Fax: 813-818-8381
www.faulknereng.com

ATTACHMENT R18.c.1
REVISED FIGURE 1

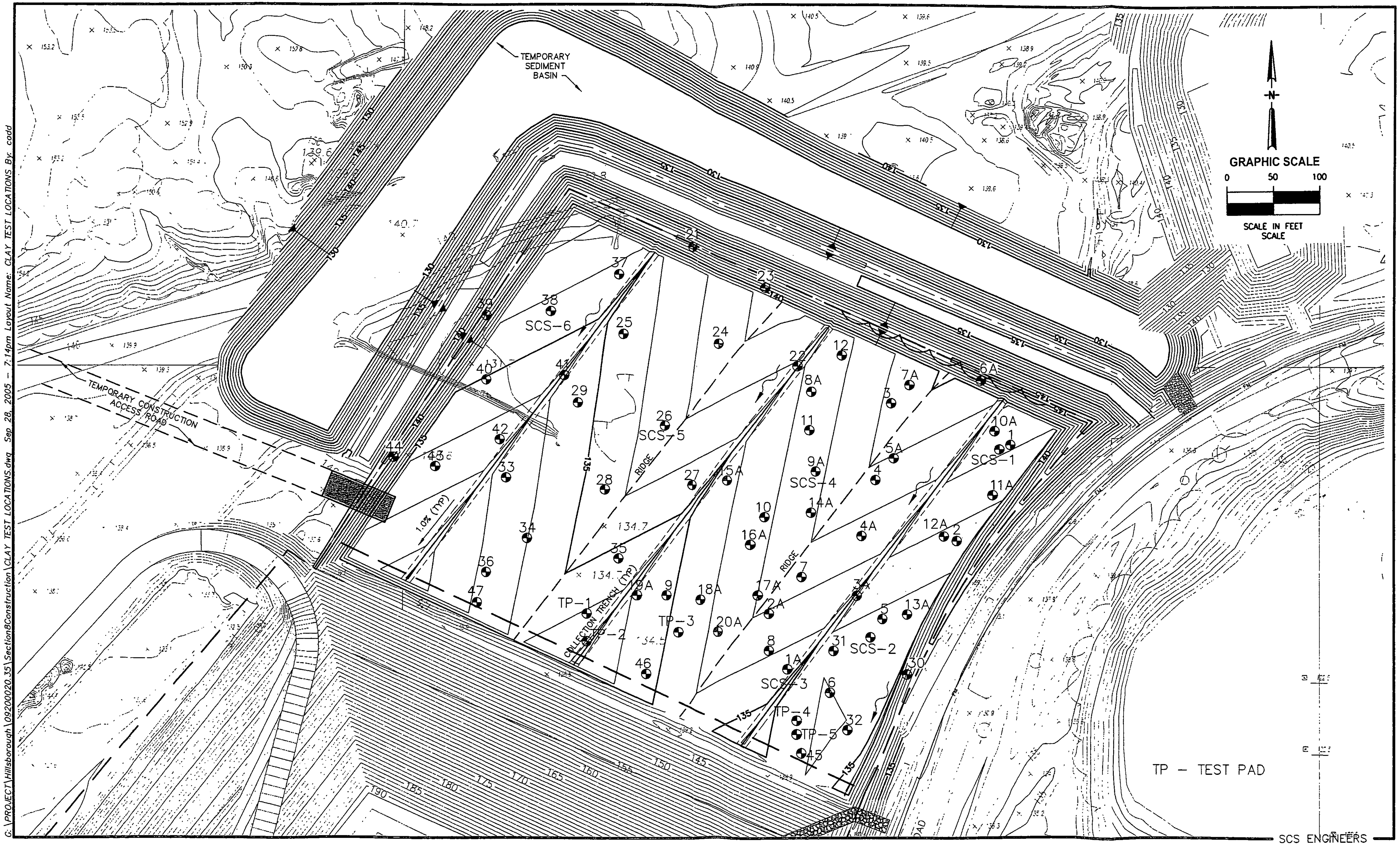


Figure 1. CLAY TEST LOCATIONS, SOUTHEAST COUNTY LANDFILL, HILLSBOROUGH COUNTY, FLORIDA

ATTACHMENT R19.d
GSE – OIT and NCTL Test Results

Report Date
4/10/2006

GSE

Quality Assurance Laboratory Test Results

Job Name: S.E. Hillsborough Landfill
Sales Order: 38867

Required Testing: ASTM D 3895 -- Standard Test Method for Oxidative Induction Time of Polyolefins by Differential Scanning Calorimetry

Custom Frequency: 1/200,000 lbs

Custom Criteria: >100 minutes

Product Code	Resin Lot Number	Test Results
HDT060AW00	8250206	PASS
HDT060AW00	8250210	PASS

Approved By: Jane Allen
Date Approved: April 28, 2005

The above stated data shall not be reproduced except in full, without the written approval of the laboratory.

Report Date
4/10/2006

GSE

Quality Assurance Laboratory Test Results

Job Name: S.E. Hillsborough Landfill
Sales Order: 38867

Required Testing: ASTM D 5397 - Standard Test Method for Evaluation of Stress Crack Resistance of Polyolefin Geomembranes Using Notched Constant Tensile Load Test

Custom Frequency: 1/Resin Lot

Custom Criteria: >200 hours

Product Code	Resin Lot	Test Results
HDT060AW00	8250206	PASS
HDT060AW00	8250210	PASS

Approved By: Jane Allen
Date Approved: April 28, 2005

ATTACHMENT R21.A.8
PHOTOGRAPHS FOR 9/28/05 THROUGH 9/30/05

Response 21.a.8, 9/28/2005 – Southeast County Landfill, Section 8 Capacity Expansion, Hillsborough County, Florida
Stormwater on liner after storm event.

Response 21.a.8, 9/29/2005 – Southeast County Landfill, Section 8 Capacity Expansion, Hillsborough County, Florida
Deployment of secondary geocomposite.

Response 21.a.8, 9/29/2005 – Southeast County Landfill, Section 8 Capacity Expansion, Hillsborough County, Florida
Secondary geomembrane and geocomposite along east area of cell.

Response 21.a.8, 9/30/2005 – Southeast County Landfill, Section 8 Capacity Expansion, Hillsborough County, Florida
Secondary geocomposite.

ATTACHMENT R22
REVISED NARRATIVE

1.3 CONSTRUCTION MODIFICATIONS TO PERMIT

In addition to the construction modifications to the permit referenced in SCS Engineers' Partial Certification of Construction Completion Report for the construction of the Southeast County Class I Landfill (SCLF) Capacity Expansion Section 8, Hillsborough County, Florida (see Enclosure No. 1), the following are construction modifications, reviewed by Jones Edmunds, to the permit.

1. Enlarged and connected the temporary sediment pond within the northeast area of Section 8 to allow for an extended period of time for sediment to fall out of suspension (see Attachment 1-2 of this Report for a copy of the project Record Drawings). This modification did not alter or modify the original landfill expansion and was performed to enhance long-term operational activities and to minimize sediment transport.

2. Deleted the requirement (Permit Specific Condition 16(8) for liner electrical flood testing as approved by Ms. Susan Pelz, P.E., of the FDEP-Southwest District in October 2005. Given the slope and elevation differences across the cell bottom, flooding the entire bottom of the cell was not feasible and therefore electrical conductivity testing would have been only accomplished in the lower portion of the cell. In lieu of the electrical flood testing, Jones Edmunds' provided on-site, full-time CQA technicians during the entire backfill operations over the liner system to ensure integrity of the bottom liner system.

3. The slope of the leachate collection piping was revised to in order to match the existing Section 7 pipe inverts (four pipes) which were approximately one-foot higher than anticipated. As a result, the slope of the Section 8 leachate collection pipes were slightly less than 1 percent (e.g., from east to west, 0.75 percent, 0.92 percent, 0.92 percent, and 0.74 percent , respectively). Accounting for the allowed vertical tolerances, the pipes are close to the design slope of 1 percent. In addition, the slight change in pipe slope should not have an effect on leachate collection or conveyance.

1.4 PRECONSTRUCTION

See SCS Engineers' Report for the preconstruction topographic survey by Pickett and Associates.

1.5 EXCAVATION OF SECTION 8 CELL

See SCS Engineers' Report for the excavation topographic survey by Pickett and Associates.

1.6 BACKFILL OF SECTION 8 CELL

See SCS Engineers' Report for information relating to the backfill (subgrade) of the Section 8 cell. Final signed and sealed geotechnical reports and topographic survey for the subgrade soil are included in Section 2 of this Report.

1.7 INSTALLATION OF LOW PERMEABILITY SOIL SUBBASE

See SCS Engineers' Report for information relating to the installation of low permeability soil subbase within the Section 8 cell. Final signed and sealed geotechnical reports and topographic survey for the low permeability soil subbase are included in Section 3 of this Report.

1.8 GEOSYNTHETIC INSTALLATION AND DAILY FIELD REPORTS

Jones Edmunds' Construction Quality Assurance (CQA) representatives, Quality Environmental Services, Inc. (QES) were on-site full-time during the entire duration of the installation of the geosynthetics to observe construction activities related to the installation of the geomembrane and geocomposite liner system in accordance with FDEP rules. QES' Report (see Enclosure No. 2) includes the logs, test results, panel layouts, and other documentation relating to the installation and testing of the liner system (e.g., geosynthetics). Section 4 of this Report provides for additional information for liner construction CQA activities including daily field reports and geosynthetic testing.

The daily field reports as shown in Section 4 of this Report include the observations made of the construction activities that were on-going at the site from geosynthetics installation, as well as observations made through the end of the project.

1.9 INSTALLATION OF LEACHATE COLLECTION PIPING

The leachate pipe material certifications are provided in SCS Engineers' Report (see Enclosure No. 1). Information relating to the installation of the leachate collection piping, including the gravel pack and geotextile, is included in Section 5 of this Report.

1.10 INSTALLATION OF PROTECTIVE COVER SOIL

Installation and soils testing for the 12-inch thick protective cover soil layer over the bottom liner system is discussed in Section 6 of this Report. The permeability of the protective cover soil varied from 1.4×10^{-3} to 5.8×10^{-3} cm/sec. The minimum permeability per the specifications is 1.0×10^{-3} cm/sec. The soil permeability and sieve analyses for the 12-inch thick protective cover soil layer, including a topographic survey of top of protective cover soil layer are provided in Section 6 of this Report.

1.11 INSTALLATION OF PROCESSED TIRE CHIPS

Installation of the 12-inch thick layer of processed tire chips over the protective cover soil layer is discussed in Section 7 of this Report.

1.12 FINAL SITE CONDITIONS

The final site conditions are discussed in Section 10 of this Report, including a final topographic survey of the constructed Section 8 landfill cell.

1.13 RECORD DRAWINGS

Record drawings were maintained at the site and updated on a monthly basis to reflect any changes in the permit drawings. Final Record Drawings are provided in Attachment 1-2 of this Section.

1.14 CONSTRUCTION PHOTOGRAPHS

Section 11 of this Report contains the construction photographs which are representative of construction activities as work progressed during the completion of the Section 8 landfill cell.

ATTACHMENT R26
REVISED DRAWINGS – SHEETS 5 AND 8

∗ = REVISED POINT

HORIZONTAL GRADING CONTROL TABLE

	POINT NO.	NORTHING	EASTING	ELEV. (FT)
	1	1,251,940.03	599,751.75	145.00
	2	1,252,008.00	599,597.78	145.00
∗	3	1,252,140.73	599,297.23	144.00
∗	4	1,252,192.69	599,179.68	143.40
∗	5	1,252,122.80	599,129.59	143.00
∗	6	1,252,007.95	599,054.13	142.00
	7	1,251,893.11	598,978.76	141.00
	8	1,251,778.20	598,903.47	140.00
∗	9	1,251,797.89	598,874.81	–
∗	10	(DELETED)	(DELETED)	–
∗	11	1,251,790.63	598,940.12	133.50
	12	1,252,169.14	599,185.68	138.00
	13	1,252,123.77	599,273.67	136.00
	14	1,251,764.93	599,003.12	132.00
	15	1,251,701.10	599,120.25	135.00
	16	1,252,069.67	599,412.97	139.00
	17	1,252,043.86	599,464.45	138.00
	18	1,251,674.32	599,185.61	134.00
	19	1,251,619.22	599,301.62	135.70
∗	20	1,251,993.65	599,595.39	141.00
	21	1,251,965.26	599,655.11	140.00
	22	1,251,587.89	599,370.59	135.00
	23	1,251,536.93	599,482.77	135.00
	24	1,251,557.26	599,493.24	134.00
	25	1,251,705.52	599,559.13	135.00
	26	1,251,775.81	599,598.31	136.00
∗	27	1,251,854.72	599,654.46	137.00
∗	28	(DELETED)	(DELETED)	–
∗	29	(DELETED)	(DELETED)	–
∗	30	1,251,930.55	599,712.40	137.92
	31	1,251,928.24	599,740.08	145.00
∗	32	1,251,905.41	599,719.38	144.00
∗	33	1,251,883.13	599,700.49	143.00
	34	1,251,850.27	599,673.55	142.00
	35	1,251,774.05	599,618.14	141.00
	36	1,251,698.42	599,575.74	140.00
	37	1,251,634.74	599,546.37	139.00
	38	1,251,564.39	599,516.86	139.00

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
MAY - 2 2006
SOUTHWEST DISTRICT TAMPA

RECORD DRAWINGS

LTR.	DATE	REVISIONS	BY	APPRD.
1		SCS REVISION –ALIGNMENT OF TOP OF BERM MODIFIED; NORTH SWALE MODIFIED; GRADING POINTS MODIFIED		
2	2/28/06	RECORD DRAWING TOPOGRAPHY MODIFIED	JHV	JHO

DESIGNED SCS ENGINEERS
DRAWN GRD
CHECKED JHO/JPA

JONES EDMUNDS
730 NE WALDO ROAD, GAINESVILLE, FLORIDA 32641 / (352) 377-5821
324 S HYDE PARK AVE, TAMPA, FLORIDA 33606 / (813) 258-0703

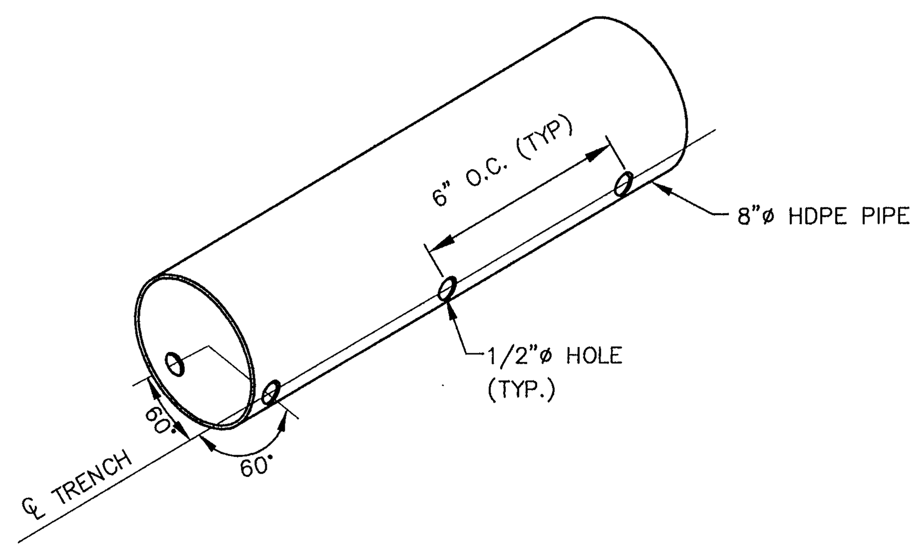
HILLSBOROUGH COUNTY
SOLID WASTE MANAGEMENT DEPARTMENT
SOUTHEAST COUNTY LANDFILL

SECTION 8 CAPACITY EXPANSION
LCR GRADING PLAN (TOP OF CLAY SUBBASE)
CONSTRUCTION DRAWINGS

CERTIFICATE OF AUTHORIZATION #1841
APPROVED BY
JOSEPH H. O'NEILL, P.E.
P.E. # 052049

DATE 2/28/06
PROJECT NO. 08449-020-01
SCALE AS SHOWN
DWG. NO. 5

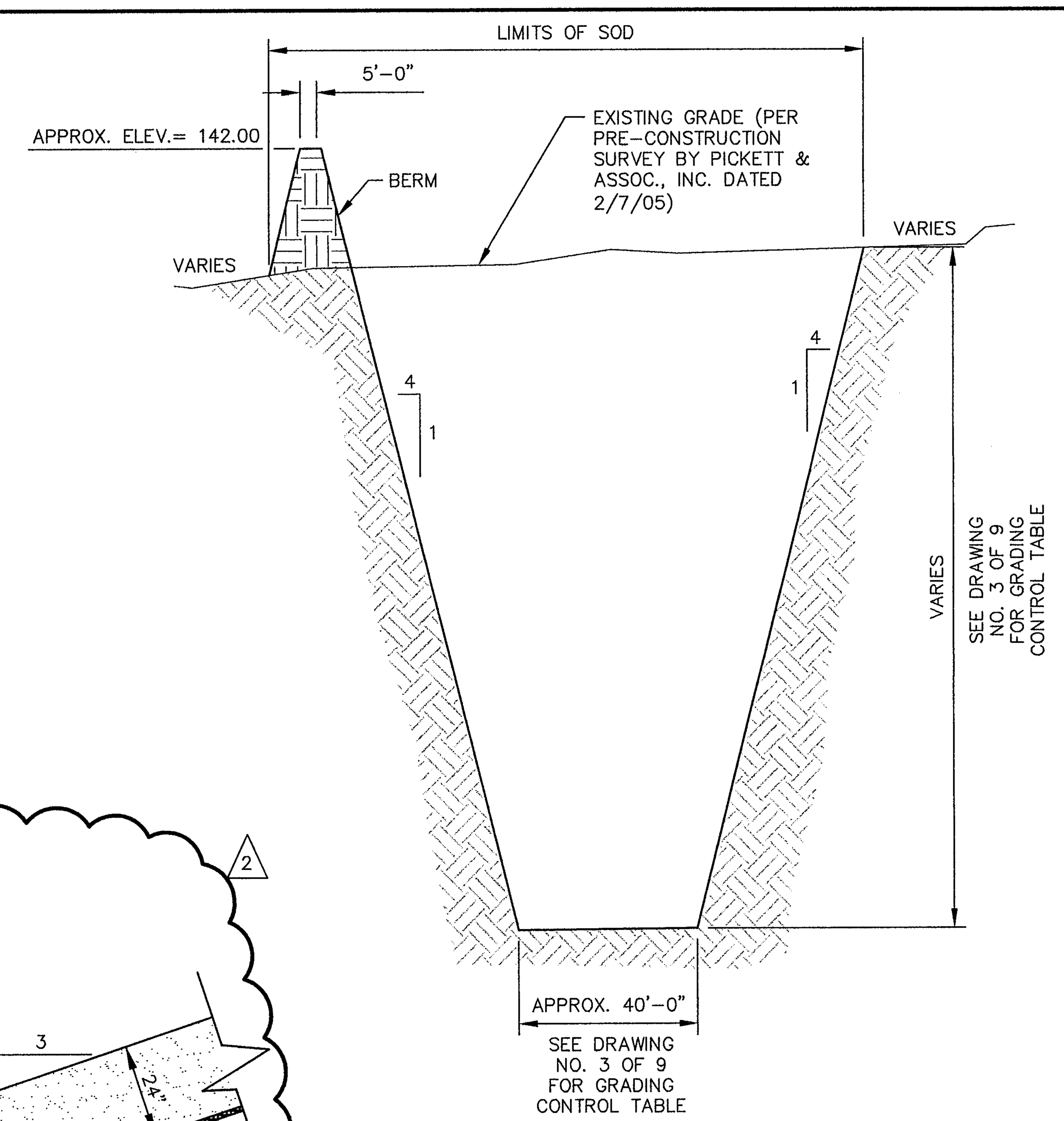
© Jones Edmunds 2436



NOTE: CONTRACTOR SHALL PLACE PERFORATED PIPE AS SHOWN (HOLES TOWARDS BOTTOM OF TRENCH).

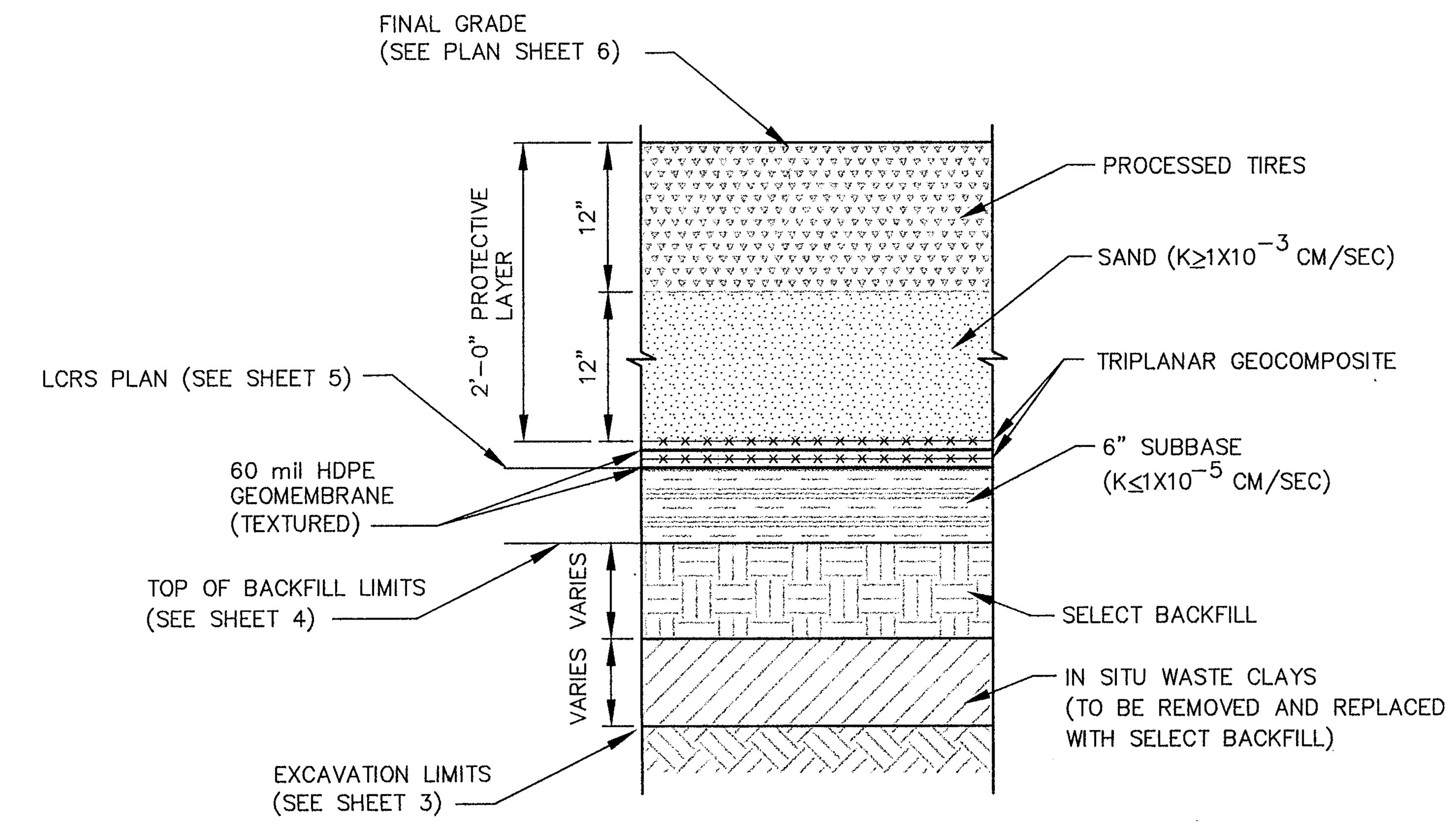
PIPE PERFORATION DETAIL 4 / 8|8

NOT TO SCALE



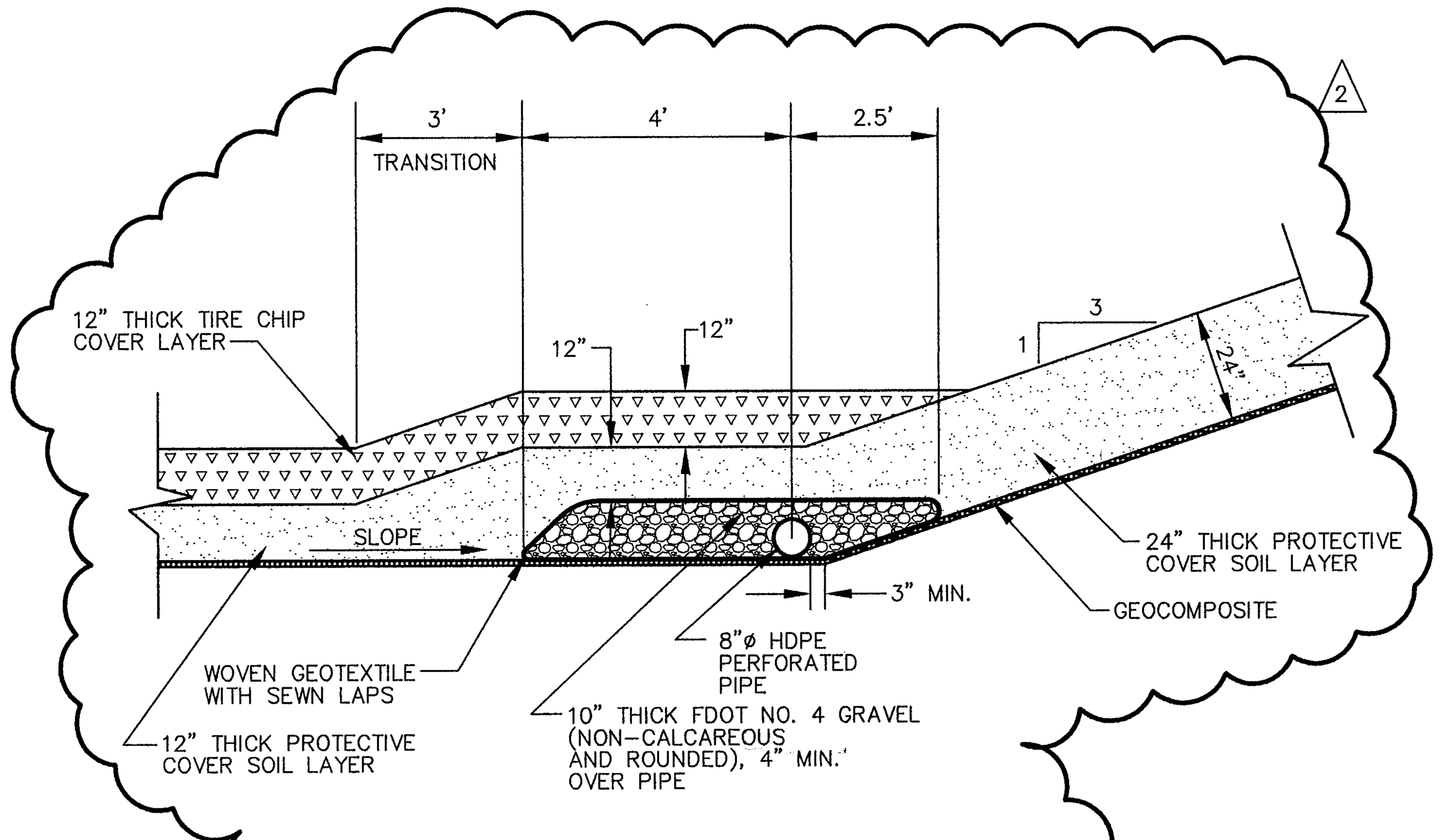
NORTH STORMWATER DIVERSION SWALE "A" DETAIL 3 / 3|8

NOT TO SCALE



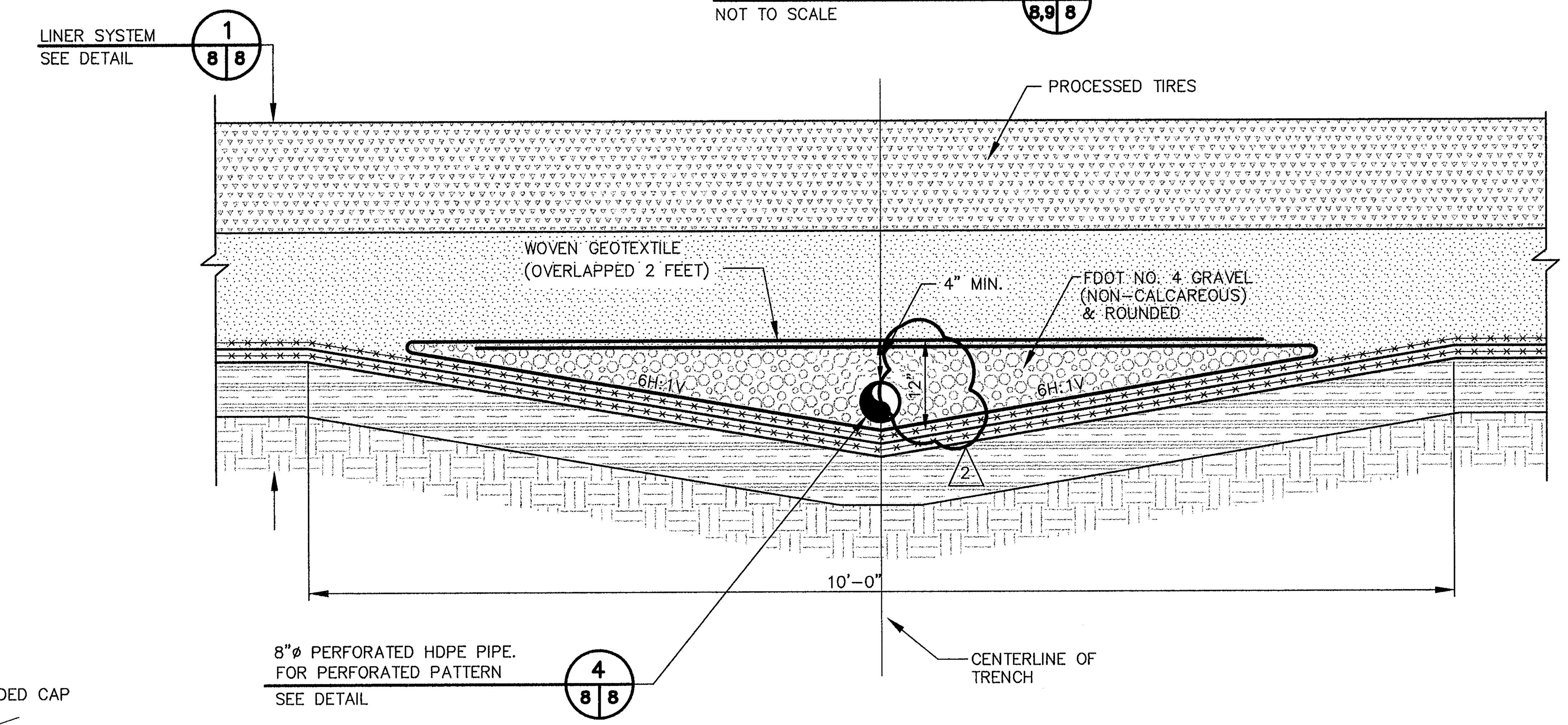
LINER SYSTEM DETAIL 1 / 8,9|8

NOT TO SCALE



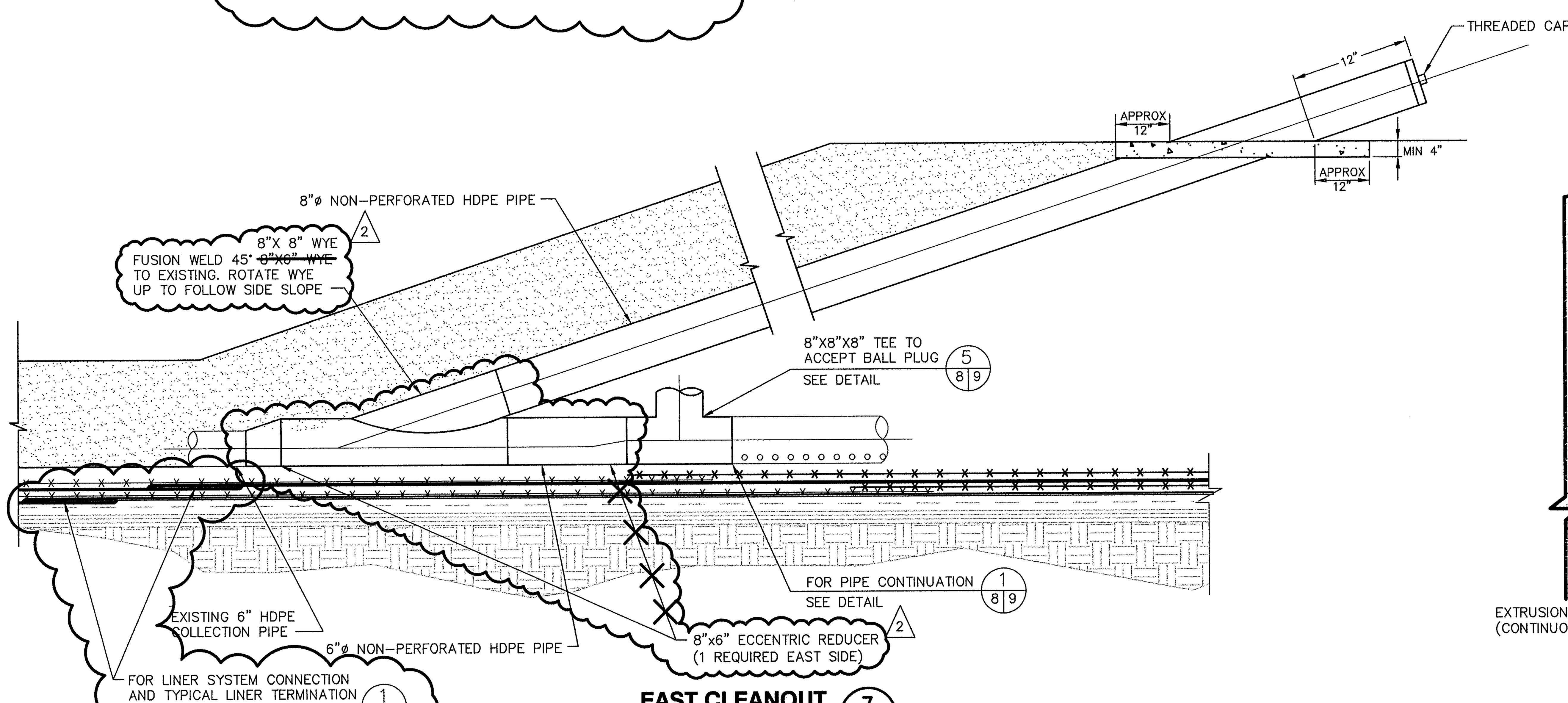
EAST COLLECTION TRENCH DETAIL 5 / 4|8

NOT TO SCALE



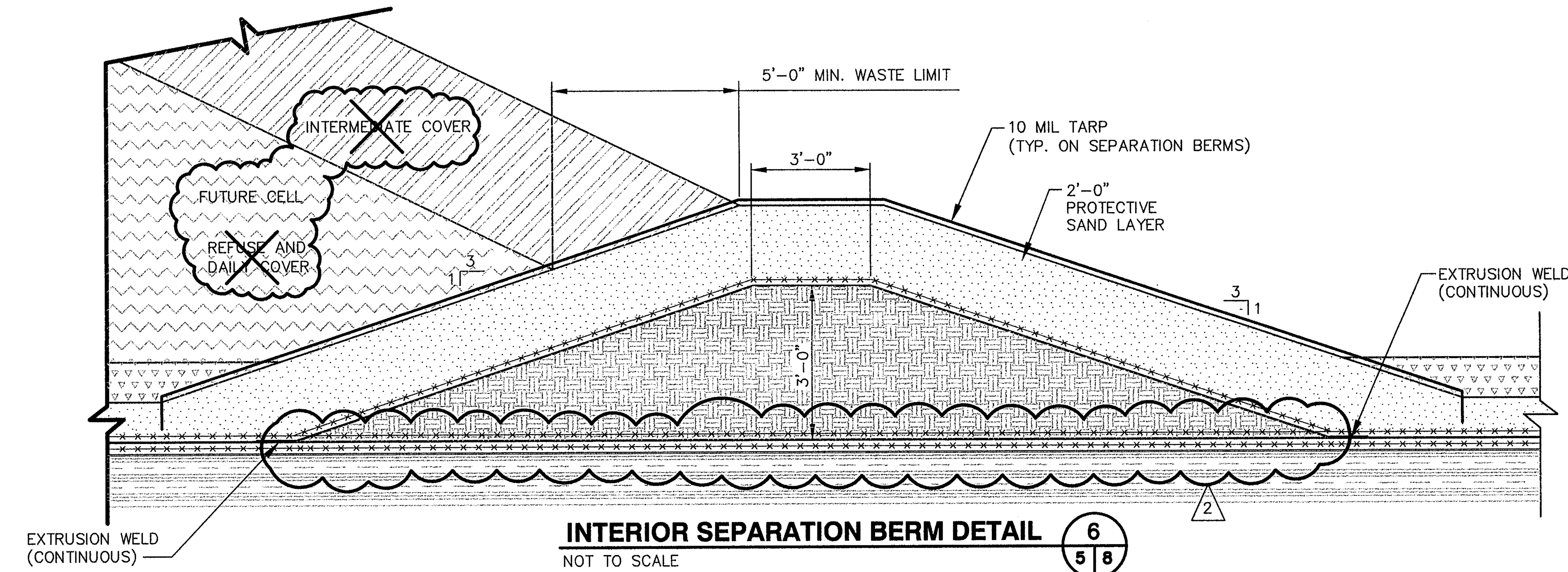
TYPICAL COLLECTION TRENCH DETAIL 2 / 4|8

NOT TO SCALE



EAST CLEANOUT 7 / 5|8

NOT TO SCALE



INTERIOR SEPARATION BERM DETAIL 6 / 5|8

NOT TO SCALE

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION MAY - 2 2006 SOUTHWEST DISTRICT TAMPA

RECORD DRAWINGS

LTR.	DATE	REVISIONS	BY	APPRD.
1		SCS REVISIONS - NORTH SWALE MODIFIED		
2	2/28/06	EAST COLLECTION TRENCH DETAIL ADDED; ADDITIONAL ROCK PLACED OVER PIPES; 8x8 WYE ADDED; GEOCOMPOSITE ADDED	JHV	JHO

DESIGNED	SCS ENGINEERS
DRAWN	GRD
CHECKED	JHO/JPA

JONES EDMUNDS

730 NE WALDO ROAD, GAINESVILLE, FLORIDA 32641 / (352) 377-5821
324 S HYDE PARK AVE, TAMPA, FLORIDA 33606 / (813) 258-0703

HILLSBOROUGH COUNTY
SOLID WASTE MANAGEMENT DEPARTMENT
SOUTHEAST COUNTY LANDFILL

SECTION 8 CAPACITY EXPANSION
DETAILS -1
CONSTRUCTION DRAWINGS

CERTIFICATE OF AUTHORIZATION 1841
P.E. 52049

DATE	PROJECT NO.
2/28/06	08449-020-01
SCALE	DWG. NO.
AS SHOWN	8

Plotted: 4/12/06 8:40am JVance

N:\08449 Hillsborough County\020-SELF Section 8\Certification Drawings\0844902001-C-08-Det1a.dwg

Edited: 00/00/00 0:00 login